



**TRANSMISSION**  
**GENERATION CONNECTION CAPACITY**  
**ASSESSMENT OF THE 2023 TRANSMISSION**  
**NETWORK (GCCA – 2023)**

**Phase 2**

Reference No.: GP\_21/182

October 2021

Compiled by	Recommended by	Supported by	Approved by
 Siyanda Ncwane	 Ronald Marais	 Jacob Machinjike	 Segomoco cheppers
Chief Engineer- Strategic Grid Planning	Senior Manager- Strategic Grid Planning-	General Manager - Grid Planning and Development	Group Executive- Transmission Division
Date: 25/10/2021	Date: 25/10/2021	Date: 25/10/2021	Date: 25 Oct 2021

## **DISCLAIMER**

The publication of the Generation Connection Capacity Assessment (GCCA) of the transmission network is to inform stakeholders of the potential capacity available on the Eskom transmission network to facilitate the connection of generation projects. The GCCA is based on the information currently available and is subject to change. The information contained in this document does not constitute advice; it is a guideline to assist stakeholders. Eskom Holdings SOC Limited makes no representations regarding the suitability of the information to be used for any other purpose. All information is provided “AS IS” without warranty of any kind and is subject to change without notice. The entire risk arising out of its use remains with the recipient. In no event shall Eskom Holdings SOC Limited be liable for any direct, consequential, incidental, special, punitive, or any other damages whatsoever.

While the GCCA will be updated periodically, Eskom Holdings SOC Limited makes no representation or warranty as to the accuracy, reliability, validity, or completeness of the information in this document. Eskom does, however, endeavour to release the GCCA based on the best available information at its disposal at all times to ensure that the stakeholders are kept informed about the developments in the transmission network. Thus, the information contained in this document represents the most up-to-date information that was available at the time it was released.

Eskom Transmission Division  
Megawatt Park, Maxwell Drive, Sunninghill, Sandton  
PO Box 1091, Johannesburg, 2000, South Africa  
[www.eskom.co.za](http://www.eskom.co.za)

## TABLE OF CONTENTS

1. Introduction .....	1
2. Assumptions .....	1
3. Methodology .....	2
3.1. Level 1: Transformer Capacity .....	2
3.2. Level 2: Substation Transfer Capacity.....	3
3.3. Level 3 and 4: Local and Supply Area Capacity .....	4
4. Results.....	4
4.1. Supply Area Capacity .....	4
4.2. Local Area Capacity.....	5
4.3. Northern Cape Substation and Transformer Capacity .....	7
4.4. Northern Cape Summary of Results .....	7
4.5. Hydra Cluster Substation and Transformer Capacity .....	10
4.6. Hydra Cluster Summary of Results .....	10
4.7. Western Cape Substation and Transformer Capacity .....	12
4.8. Western Cape Summary of Results .....	12
4.9. Eastern Cape Substation and Transformer Capacity .....	14
4.10. Eastern Cape Summary of Results .....	14
4.11. Free State Substation and Transformer Capacity .....	16
4.12. Free State Summary of Results .....	16
4.13. North West Substation and Transformer Capacity .....	18
4.14. North West Summary of Results .....	18
4.15. KwaZulu-Natal Substation and Transformer Capacity .....	20
4.16. KwaZulu-Natal Summary of Results .....	20
4.17. Gauteng Substation and Transformer Capacity .....	23
4.18. Gauteng Summary of Results .....	24
4.19. Mpumalanga Substation and Transformer Capacity.....	28
4.20. Mpumalanga Summary of Results .....	28
4.21. Limpopo Substation and Transformer Capacity .....	31
4.22. Limpopo Summary of Results .....	31
4.23. Pelly Substation and Transformer Capacity .....	34
4.24. Pelly Summary of Results .....	34
5. Conclusion.....	36
6. Development Team.....	36

## TABLE OF FIGURES

Figure 1: Generation connection capacity limit hierarchy. ....	2
Figure 2: Transformer capacity assessment.....	3
Figure 3: Substation transfer capacity assessment .....	4
Figure 4: Area limit calculation .....	4
Figure 5: Supply area capacity.....	5
Figure 6: Local area capacity in supply areas evaluated in phase 1 of the GCCA-2023.....	6
Figure 7: Local area capacity in supply areas evaluated in phase 2 of the GCCA-2023.....	6
Figure 8: Northern Cape supply area generation connection capacity.....	7
Figure 9: Hydra cluster supply area generation connection capacity.....	10
Figure 10: Western Cape supply area generation connection capacity .....	12
Figure 11: Eastern Cape supply area generation connection capacity .....	14
Figure 12: Free State supply area generation connection capacity .....	16
Figure 13: North West supply area generation connection capacity .....	18
Figure 14: KwaZulu-Natal supply area generation connection capacity.....	20
Figure 15: Johannesburg local area generation connection capacity .....	23
Figure 16: East Rand and West Rand local areas generation connection capacity .....	23
Figure 17: Vaal local area generation connection capacity.....	24
Figure 18: Mpumalanga supply area generation connection capacity .....	28
Figure 19: Limpopo supply area generation connection capacity .....	31
Figure 20: Pelly supply area generation connection capacity .....	34

## TABLE OF TABLES

Table 1: Northern Cape summary of results.....	8
Table 2: Hydra cluster summary of results .....	11
Table 3: Western Cape summary of results .....	13
Table 4: Eastern Cape summary of results .....	15
Table 5: Free State summary of results.....	17
Table 6: North West summary of results .....	19
Table 7: KwaZulu-Natal summary of results.....	21
Table 8: Gauteng summary of results .....	25
Table 9: Mpumalanga summary of results.....	29
Table 10: Limpopo summary of results .....	32
Table 11: Pelly summary of results .....	35

# 1. Introduction

The launch of the renewable energy independent power producer procurement programme (REIPPPP) attracts a large number of applications from independent power producers (IPP) for connection to the Eskom grid.

To be considered in the REIPPPP, IPPs go through a bidding process where they indicate the amount of power they can supply and the feasibility of supplying this power in a cost-effective way. IPPs therefore need to identify sections of the network with available generation connection capacity where they can connect to. This causes IPPs to constantly contact Eskom with requests for information regarding the available capacity on the network at different nodes. To make information on generation connection capacity within the network readily accessible, Eskom developed the generation connection capacity assessment (GCCA) report.

The GCCA-2023 Phase 1 report that was published in July 2021 provided the generation connection capacity available at six supply areas: Northern Cape, Hydra Cluster, Western Cape, Eastern Cape, Free State and North West. The GCCA-2023 Phase 2 evaluates the generation connection capacity at the remaining supply areas within the Eskom transmission network and includes areas covered in Phase 1 so as to provide a comprehensive view of the entire country.

# 2. Assumptions

The key assumption changes from previous GCCAs published are as follows:

- The connection of approved bidders from the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) will result in a reduction in the available generation connection capacity, more so in the already constrained Northern Cape area.
- There is a reduction in the load forecast due to the downturn of the economy.
- Customers have delayed projects to connect new load into the power system.
- Reprioritisation and deferral of transmission projects mainly due to funding constraints will result in delays to facilitate new connections.
- Improved renewable plant generation assumptions were developed using measured data.
- Improved oversight and identification of upstream network constraints through wider area monitoring of the power system is implemented.

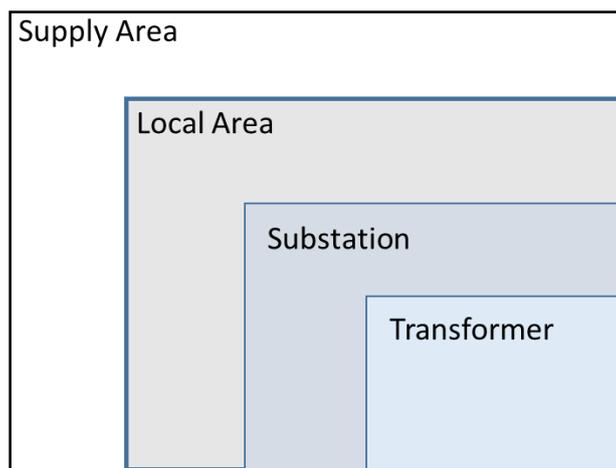
### 3. Methodology

For Phase 1, the southern part of the South African transmission network was subdivided into six supply areas covering the area south from the North West and Free State provinces to the Western Cape.

For Phase 2, the eastern, central and northern parts of the South African transmission network was subdivided into five supply areas covering KwaZulu-Natal, Mpumalanga, Gauteng and Limpopo provinces.

The departure from provinces and customer load networks (CLNs) to supply areas is deemed to be more appropriate for this type of assessment. Provincial boundaries may therefore not be respected when referring to provincial names for some supply areas.

The generation connection capacity results are assessed using the hierarchy shown in Figure 1. The generation capacity that can be connected must be restricted by the lowest limit in the hierarchy.



**Figure 1: Generation connection capacity limit hierarchy.**

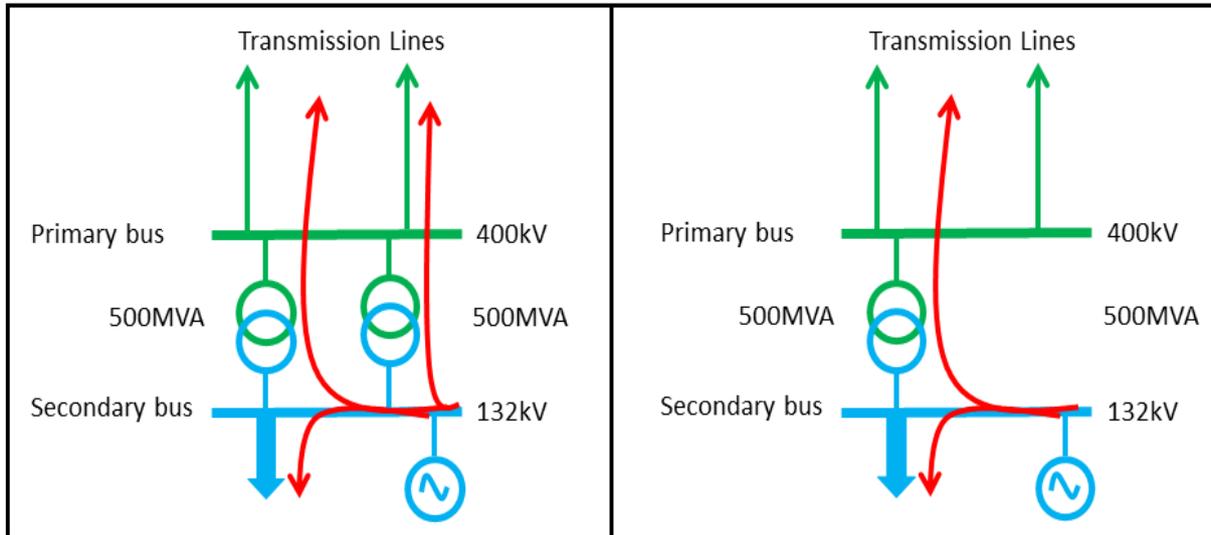
#### 3.1. Level 1: Transformer Capacity

At level 1, the local substation transformation capacity is assessed assuming an N-0 level of reliability. The generation connection capacity available is evaluated considering the full transformation capacity and assuming that the generators operate at a 0.95 power factor.

When a generator is connected to the secondary busbar in a substation, the power generated is first absorbed by the local load and the excess is fed upstream through the transformers.

The red arrows in Figure 2 depict the flow of power when the generator is connected to a substation.

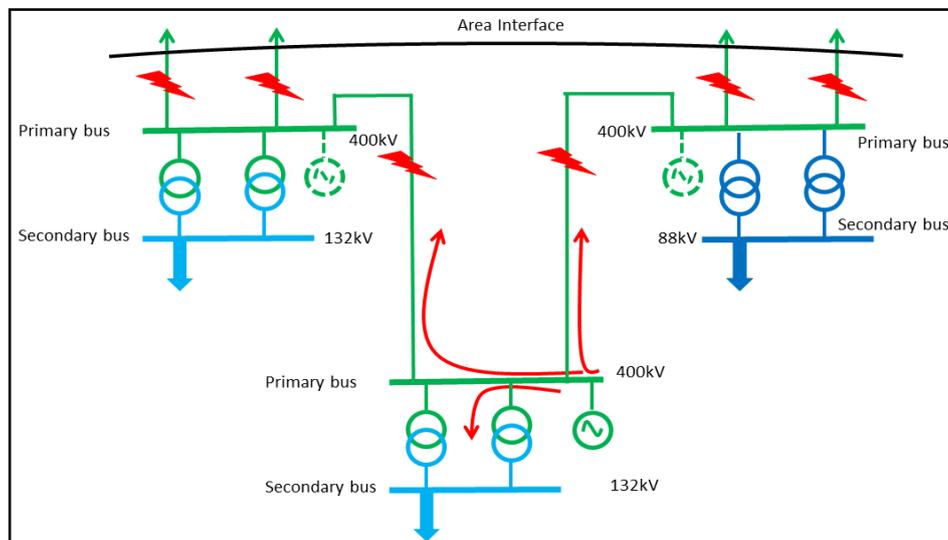
The capacity of a substation's transformation is fixed, but the substation load varies throughout the day. This means that the lower the load connected at a substation, the lower the generation capacity that can be connected at the substation secondary busbar.



**Figure 2: Transformer capacity assessment**

### 3.2. Level 2: Substation Transfer Capacity

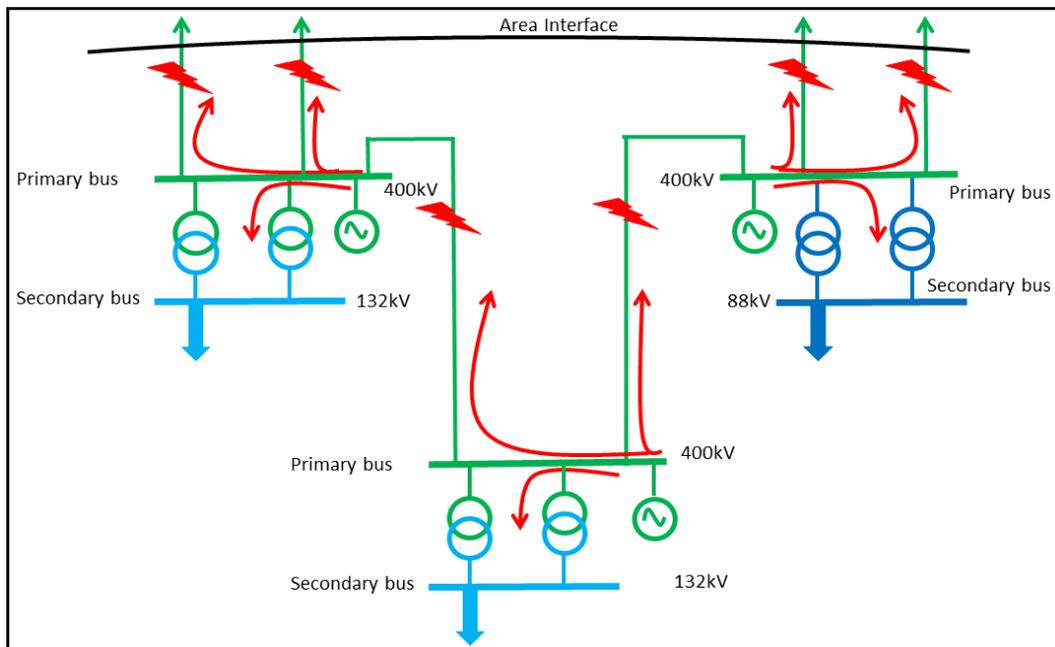
At level 2, the substation transfer capacity is evaluated by connecting a generator at each substation primary busbar one at a time, as shown in Figure 3. The network is assessed under all credible N-1 line contingencies.



**Figure 3: Substation transfer capacity assessment**

### **3.3. Level 3 and 4: Local and Supply Area Capacity**

At levels 3 and 4, the generation connection capacity is assessed at an area level by scaling all the connected generation in proportion to their values as determined from level 2. The available area generation connection capacity is evaluated by connecting generators at each substation's primary busbar as shown in Figure 4. The network is assessed under all credible N-1 line contingencies.



**Figure 4: Area limit calculation**

## **4. Results**

### **4.1. Supply Area Capacity**

The eleven supply areas within the Eskom transmission network are limited to about 30 GW of generation capacity. The generation connection capacity available within each supply area is shown in Figure 5. The power corridors of the Greater Cape area comprising of the Western Cape, Northern Cape and Eastern Cape networks are highly constrained and very limited generation can be accommodated further to what has already been approved. Substantial upstream network strengthening will therefore be required to facilitate new generation capacity

in these areas. In contrast, the KwaZulu-Natal, Mpumalanga, Gauteng and North West supply areas have the ability to accommodate between 4 GW to 7 GW of generation each.

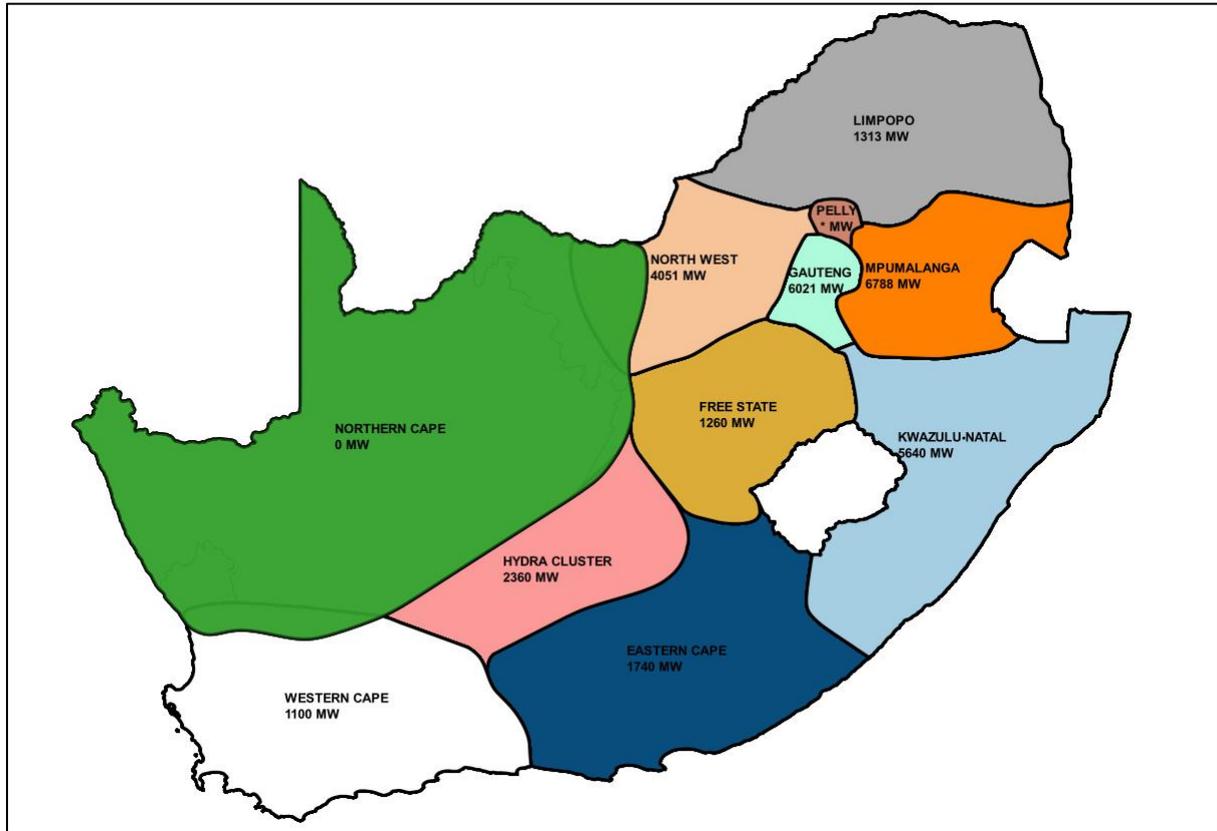


Figure 5: Supply area capacity

#### 4.2. Local Area Capacity

The eleven supply areas consist of local areas, each of which has its own available capacity. Figure 6 and Figure 7 show the generation connection capacity available in each supply area as well as their respective local areas.

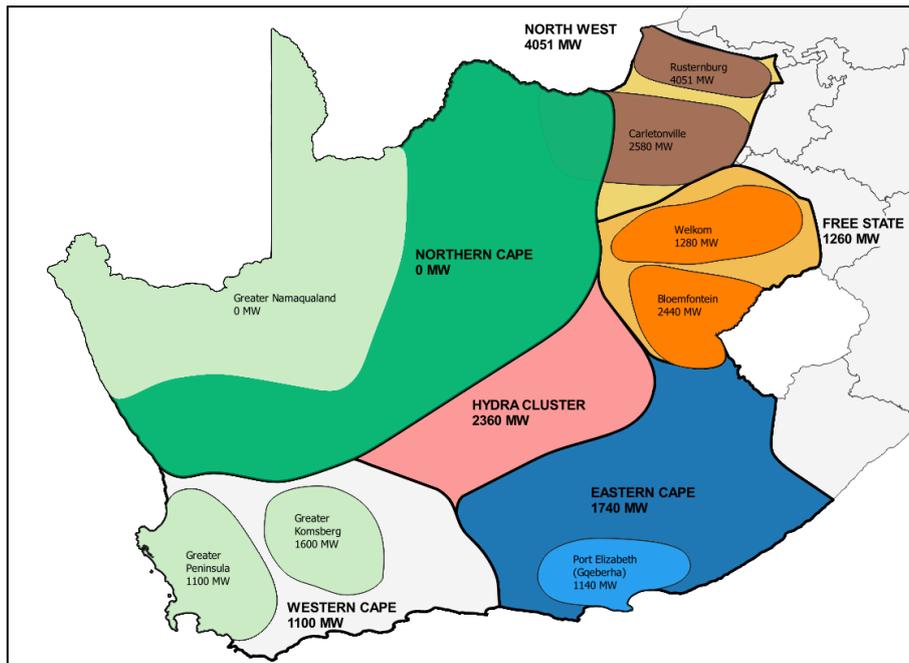


Figure 6: Local area capacity in supply areas evaluated in phase 1 of the GCCA-2023.

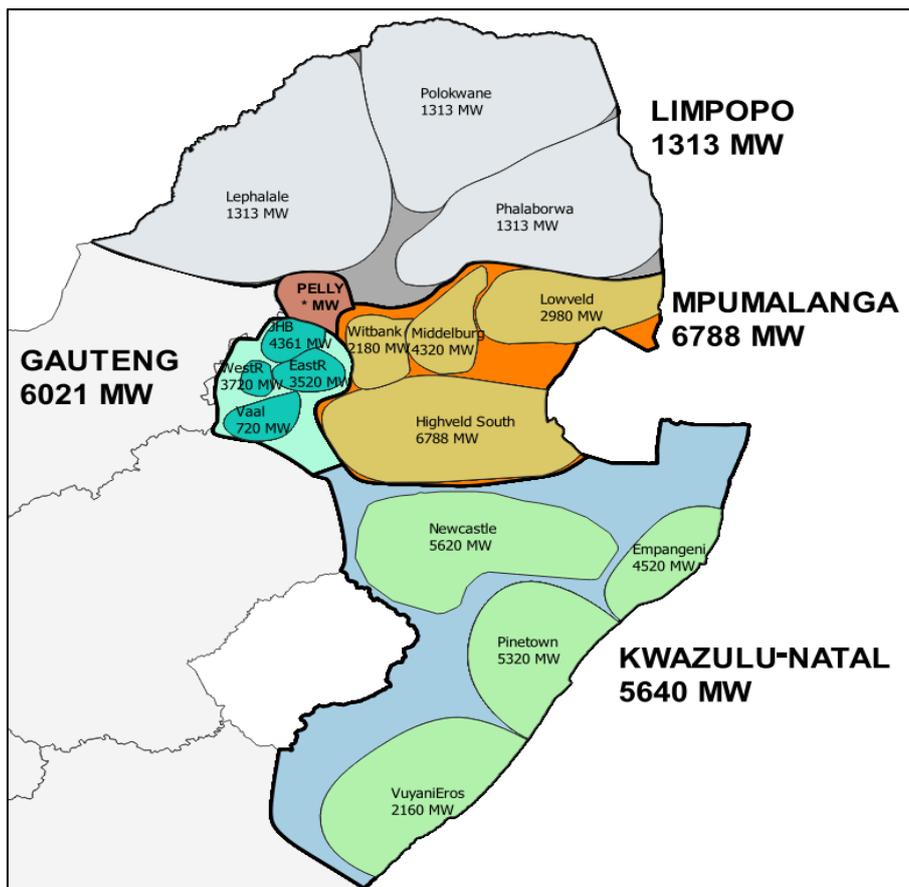


Figure 7: Local area capacity in supply areas evaluated in phase 2 of the GCCA-2023.

With the exception of the Northern Cape, it is evident that within the eleven supply areas, the local areas have capacity ranging from 700 MW to 6.8 GW. In most cases the supply area becomes the constraint whilst the local area network is adequate. Therefore, to unlock the available local area capacity, upstream strengthening is required.

### 4.3. Northern Cape Substation and Transformer Capacity

Figure 8 shows the substation transfer capacity and transformer capacity within the Northern Cape area.

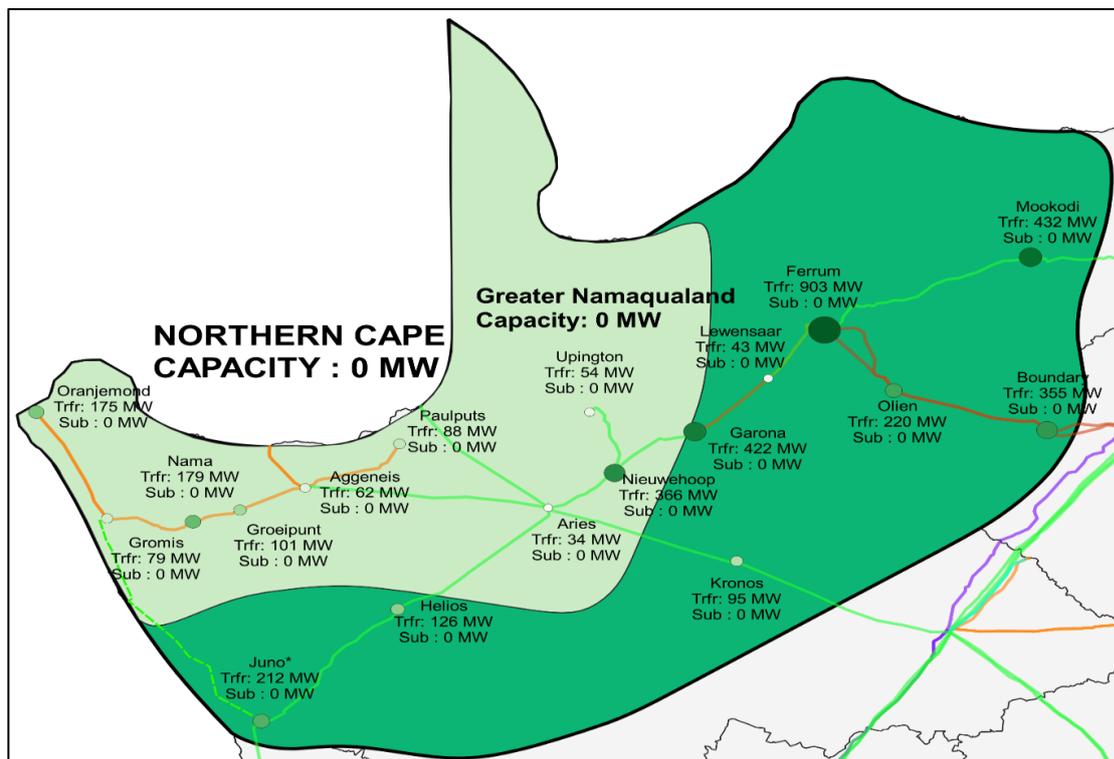


Figure 8: Northern Cape supply area generation connection capacity.

The Northern Cape supply area has transformation capacity at all of the substations, however it does not have substation transfer capacity.

### 4.4. Northern Cape Summary of Results

Table 1 summarises the available generation connection capacity within the Northern Cape supply area.

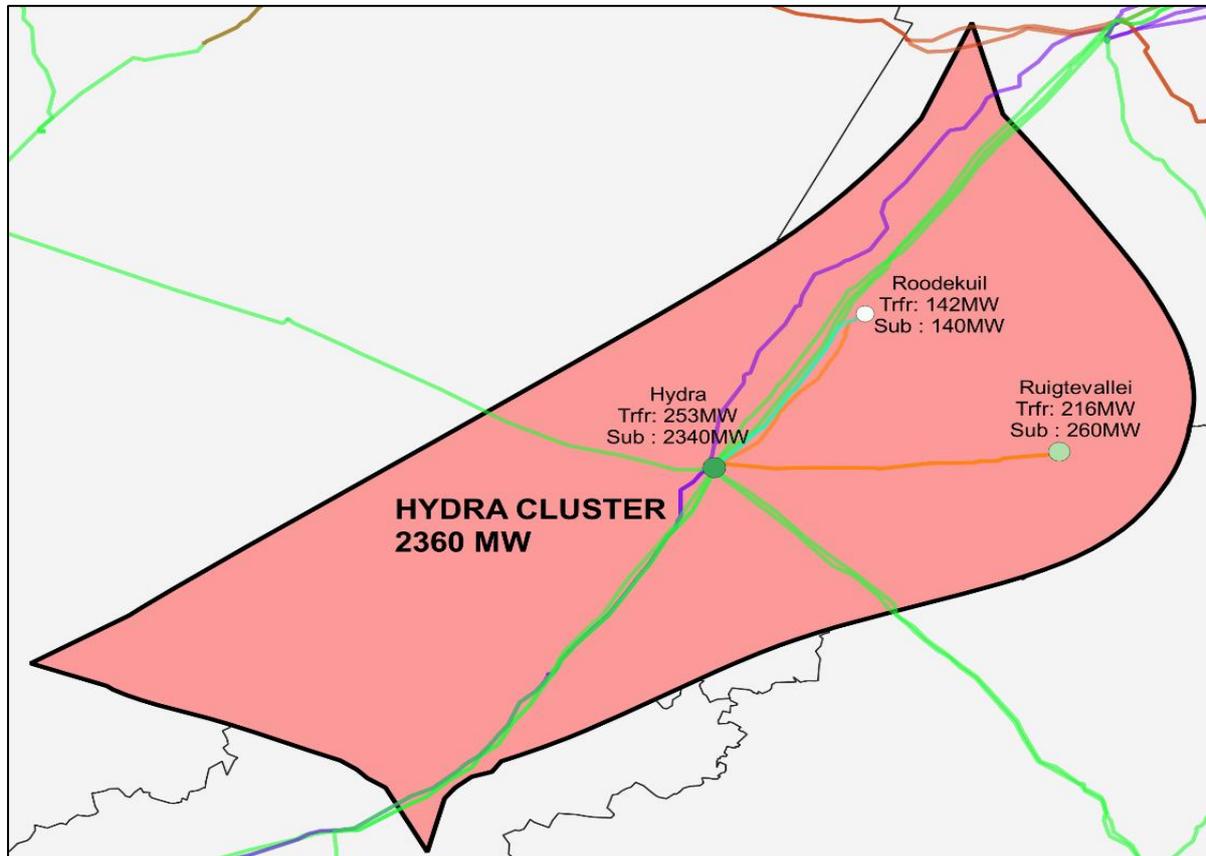
**Table 1: Northern Cape summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
Northern Cape	Greater Namaqualand	Aggeneis	400/220	2	315	630	-	-	-	-	62	0	0	0
			220/66	2	40	80	26	40	0	0				
		Gromis	220/66	2	40	80	3,38	0	0	0	79	0		
		Groeipunt	220/132	1	250	250	0	0	137	0	101			
		Paulputs	220/132	1	250	250	16	294	0	0	88	0		
			220/132	1	125	125		0	0	0				
		Oranjemond	220/66	2	80	160	23	0	0	0	175	0		
		Nama	220/66	2	80	160	27	0	0	0	179	0		
		Upington	400/132	1	500	500	38	383	0	75	54	0		
	Nieuwehoop	400/132	1	250	250	0	0	0	347	366	0			
		400/132	1	500	500		0	0						
	Aries	400/22	1	45	45	1,1	9,65	0	0	34	0			
	Northern Cape	Kronos	400/132	1	250	565	21	225	238	0	95	0		
			400/132	1	315			0	0	0				
		Olien	275/132	1	150	400	78,6	258	0	0	220	0		
			275/132	1	250									
		Ferrum	400/132	2	500	1150*	134	324	0	0	903	0		
			275/132	2	250			0	0	0				
132/66	3		80	0	0			0	0					

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
		Garona	275/132	1	125	125	28	50	0	150	422	0		
			400/132	1	500	500		0	0	0				
		Lewensaar	275/22	1	40	40	46,6	0	0	0	85	0		
		Boundary	275/132	2	250	500	108	228	0	0	355	0		
		Helios	400/132	1	500	500	1,75	75	276	0	126	0		
			400/22	1	45	45				0				
		Juno	400/132	2	120	240	126	9	100	0	212	0		
Mookodi	400/132	2	250	500	32	75	0	0	432	0				

#### 4.5. Hydra Cluster Substation and Transformer Capacity

Figure 9 shows the substation transfer capacity and transformer capacity within the Hydra cluster.



**Figure 9: Hydra cluster supply area generation connection capacity**

The Hydra cluster has transformation capacity and substation transfer capacity available at all of the substations.

#### 4.6. Hydra Cluster Summary of Results

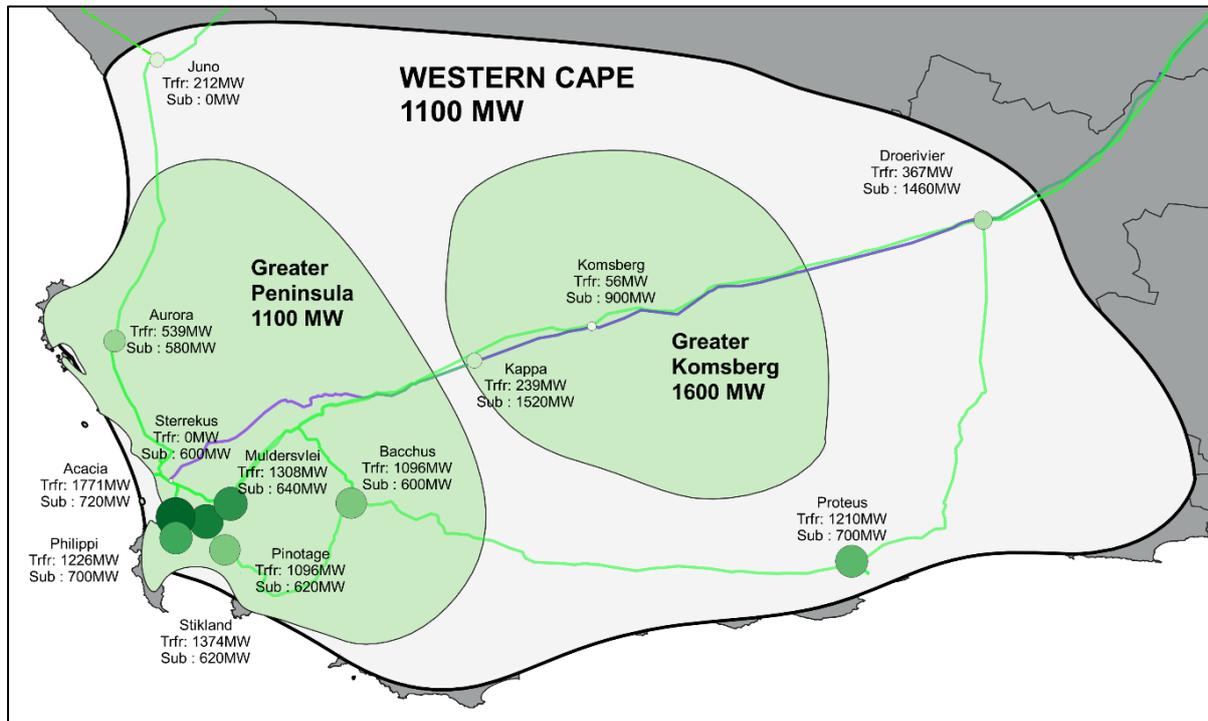
Table 2 summarises the available generation connection capacity within the Hydra cluster supply area.

**Table 2: Hydra cluster summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
Hydra Cluster	Hydra Cluster	Hydra	400/132	2	240	480	102	317	152	0	89	2340	2360	2360
				1	500	500	0	0	236	75	164			
		Roodekuil	220/132	1	125	125	23	0	0	0	142	140		
		Ruigtevallei	220/132	1	250	250	48	70	0	0	216	260		

#### 4.7. Western Cape Substation and Transformer Capacity

Figure 10 shows the substation transfer capacity and transformer capacity within the Western Cape supply area.



**Figure 10: Western Cape supply area generation connection capacity**

The Western Cape supply area has transformation capacity at all the substations. Furthermore, the Western Cape supply area has available transfer capacity at all the substations.

#### 4.8. Western Cape Summary of Results

Table 3 summarises the available generation connection capacity within the Western Cape supply area.

**Table 3: Western Cape summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)	
Western Cape	Greater Komsberg	Komsberg	400/132	1	500	500	0	0	419	0	56	900	1600	1100	
		Kappa	765/400	1	2000	2000	-	-	-	-	-	-			1520
			400/132	1	500	500	0	0	108	128	239				
	Greater Peninsula	Stikland	400/132	2	500	1000	118	0	0	0	0	1374	620		
		Aurora	400/132	1	500	1000	213	89	159	320	539	580			
			400/132	2	250										
		Acacia	400/132	3	500	1500	346	0	0	0	0	1771	720		
		Pinotage	400/132	2	500	1000	146	0	0	0	0	1096	620		
		Muldersvlei	400/132	3	500	1500	21	0	138	0	0	1308	640		
		Bacchus	400/132	2	500	1000	236	36	58	0	0	1096	600		
		Sterrekus	765/400	1	2000	2000	-	-	-	-	-	-	600		
		Philippi	400/132	2	500	1000	276	0	0	0	0	1226	700		
		Droerivier	400/132	1	250	250	0	0	0	0	0	367	1460		
			400/132	1	125	125		0	0	0					
	Western Cape	Proteus	400/132	2	500	1000	239	0	0	0	0	1210	700		

#### 4.9. Eastern Cape Substation and Transformer Capacity

Figure 11 shows the substation transfer capacity and transformer capacity within the Eastern Cape supply area.

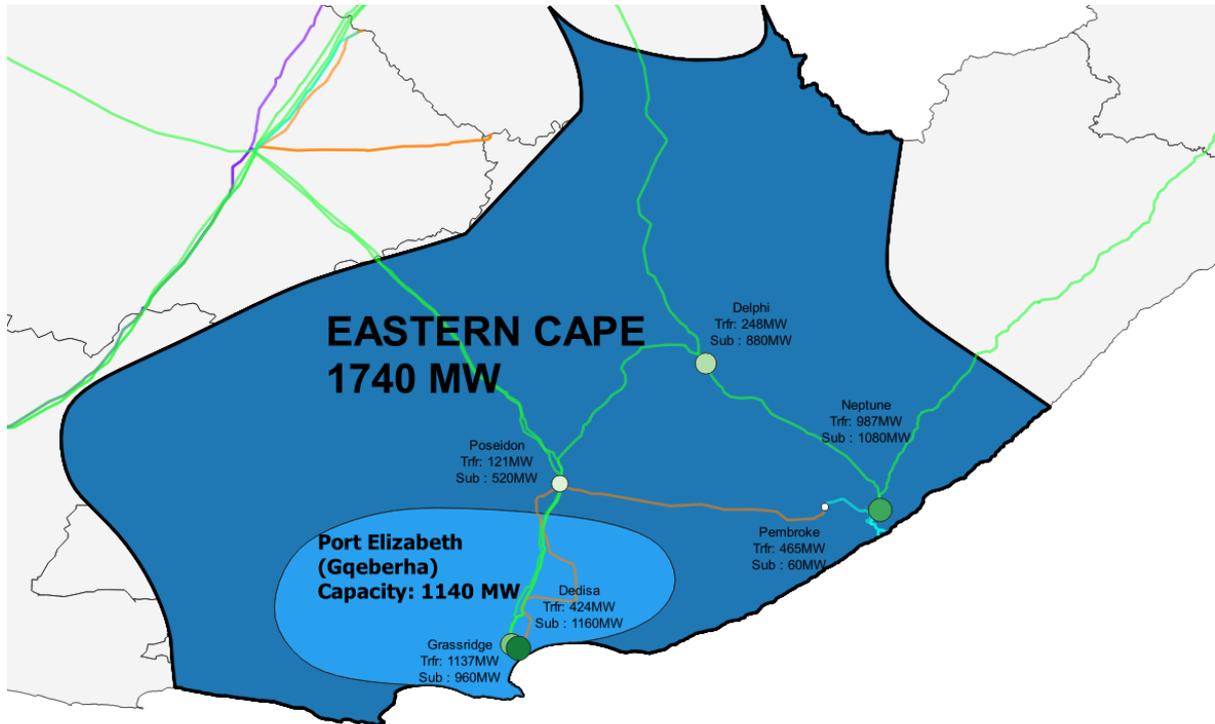


Figure 11: Eastern Cape supply area generation connection capacity

The Eastern Cape supply area has transformation capacity and substation transfer capacity available at all the substations.

#### 4.10. Eastern Cape Summary of Results

Table 4 summarises the available generation connection capacity within the Eastern Cape supply area.

**Table 4: Eastern Cape summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)		
Eastern Cape	Port Elizabeth (Gqeberha)	Grassridge	400/132	2	500	1000	302	0	724	75	1137	960	1140	1740		
			220/132	2	360	720										
		Dedisa	400/132	2	500	1000	122	0	0	648	424	1160				
	Eastern Cape	Eastern Cape	Neptune	400/132	2	500	1000	38	0	0	0	987	1080		1740	
			Delphi	400/132	2	125	250	110	0	100	0	248	880			
			Pembroke	220/132	2	250	500	43	0	53	0	465	60			
			Poseidon	400/220	2	500	1000	-	-	-	-	-	-			520
				400/132	1	500	500	0	0	484	0	0				
				220/132	2	125	250	47	0	164	0	121	320			
				220/66	2	40	80	17	0	0	0	93				

#### 4.11. Free State Substation and Transformer Capacity

Figure 12 shows the substation transfer capacity and transformer capacity within the Free State supply area.

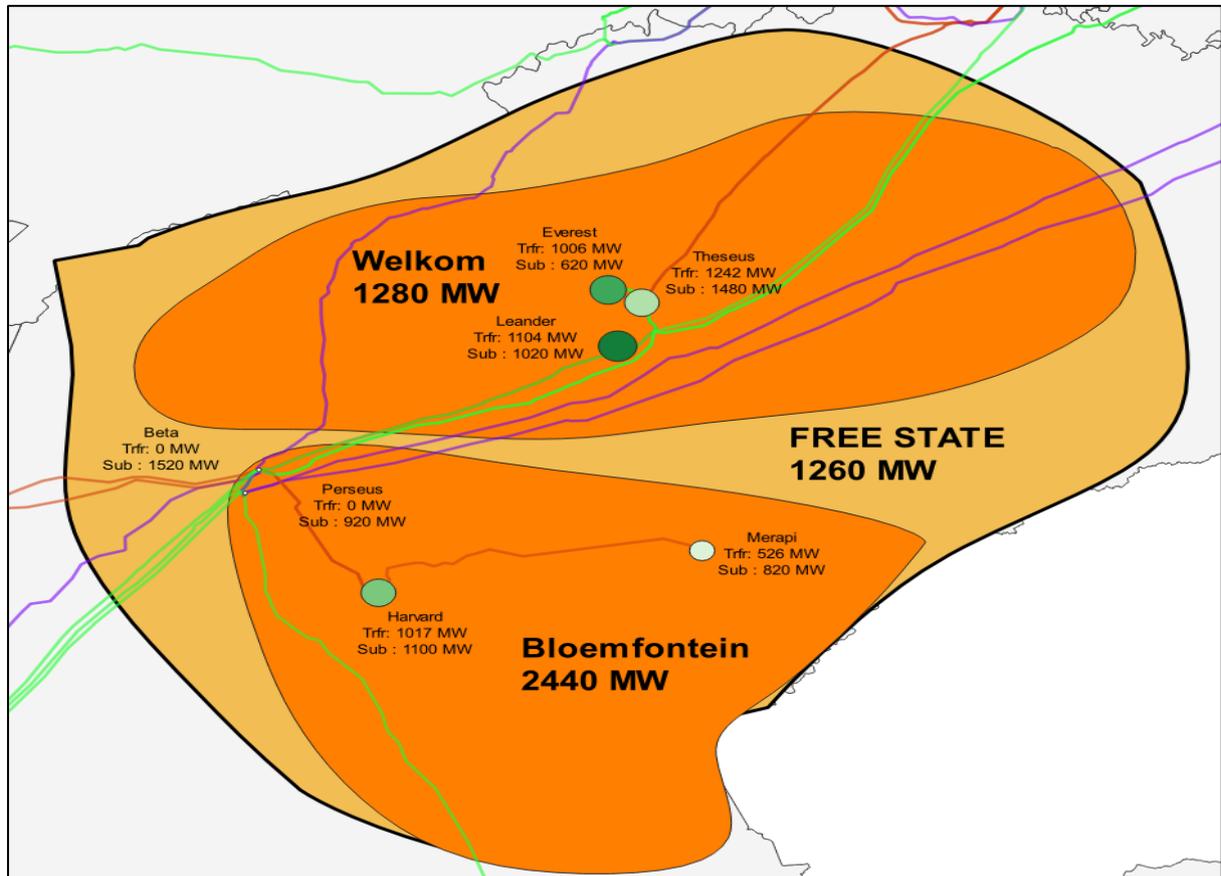


Figure 12: Free State supply area generation connection capacity

The Free State supply area has transformation capacity and substation transfer capacity available at all the substations.

#### 4.12. Free State Summary of Results

Table 5 summarises the available generation connection capacity within the Free State supply area.

**Table 5: Free State summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
Free State	Bloemfontein	Perseus	765/400	1	2000	2000	-	-	-	-	-	920	2440	1260
			400/275	2	400	800	-	-	-	-	-	760		
			400/275	1	800	800	-	-	-	-	-	-		
		Beta	765/400	2	2000	4000	-	-	-	-	-	1520		
		Harvard	275/132	2	500	1000	131	64	0	0	1017	1100		
		Merapi	275/132	2	250	500	51	0	0	0	525	820		
	Welkom	Leander	400/132	2	500	1000	154	0	0	0	1104	1020	1280	
		Theseus	400/132	2	500	1000	292	0	0	0	1242	1480		
		Everest	275/132	2	500	1000	56	0	0	0	1006	620		

#### 4.13. North West Substation and Transformer Capacity

Figure 13 shows the substation transfer capacity and transformer capacity within the North West supply area.

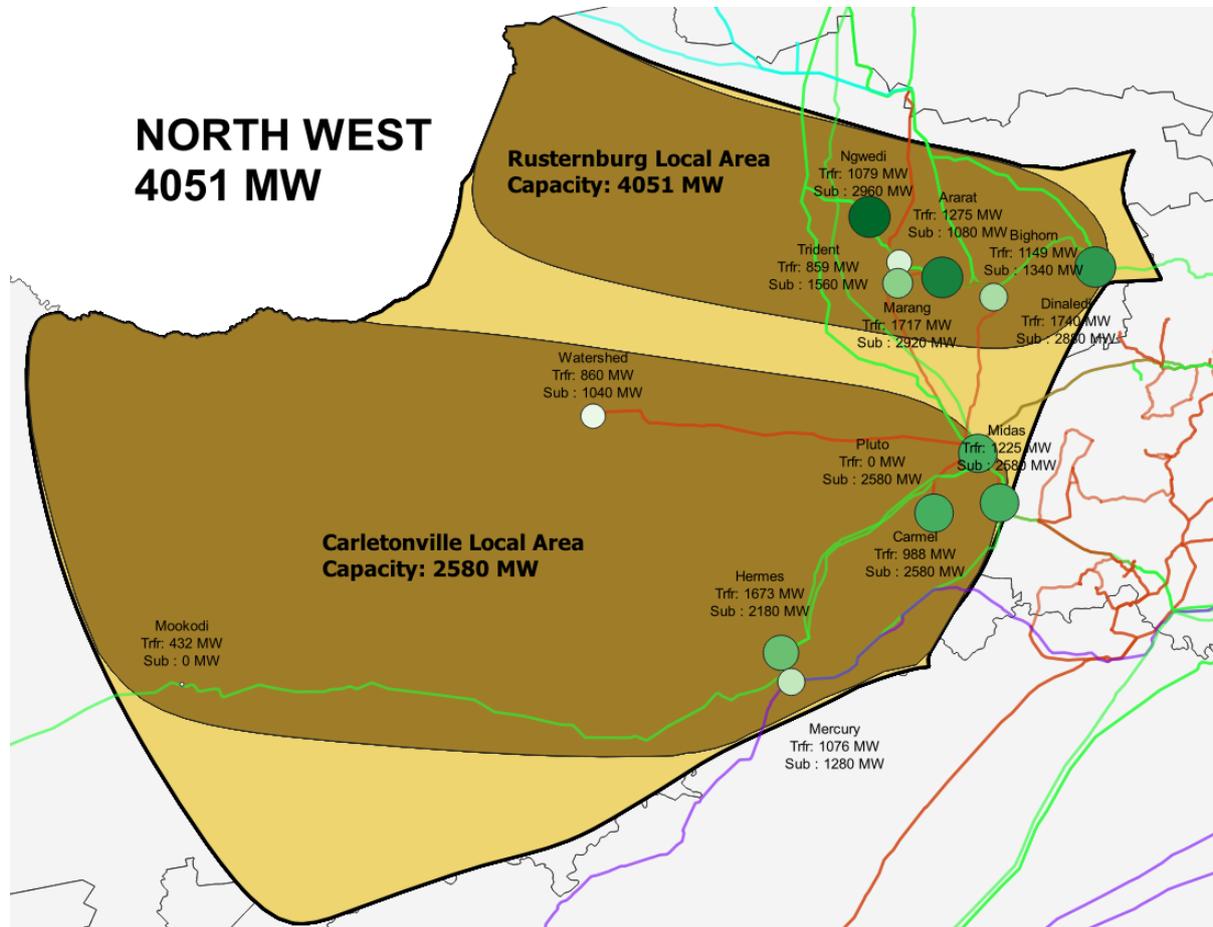


Figure 13: North West supply area generation connection capacity

The North West has transformation capacity and substation transfer capacity available at all the substations except for Mookodi and Pluto.

#### 4.14. North West Summary of Results

Table 6 summarises the available generation connection capacity within the North West supply area.

Table 6: North West summary of results

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
North West	Rustenburg	Dinaledi	400/132	3	500	1500	315	0	0	0	1740	2880	4051	4051
		Marang	400/88	4	315	1260	520	0	0	0	1717	2920		
		Ngwedi	400/132	2	500	1000	129	0	0	0	1079	2960		
		Ararat	275/88	3	315	945	377	0	0	0	1275	1080		
		Bighorn	400/275	2	800	1600	-	-	-	-	-	3400		
			275/88	3	315	945	265	0	0	0	1149	1340		
	Trident	275/88	2	315	630	260	0	0	0	859	1560			
	Carletonville	Midas	400/132	2	500	1000	275	0	0	0	1225	2580	2580	
		Pluto	400/275	1	800	800	-	-	-	-	-	2580		
			400/275	1	750	750	-	-	-	-	-			
		Hermes	400/132	3	500	1500	248	0	0	0	1673	2180		
			132/88	1	180	180	38	0	0	0	361			
			132/88	1	160	160								
		Mercury	400/132	2	500	1000	194	67,9	0	0	1076	1280		
		Watershed	275/132	1	250	250	60	75	0	0	223	1040		
	275/88		2	315	630	38	0	0	0	637				
	Carmel	275/132	2	500	1000	38	0	0	0	988	495			

#### 4.15. KwaZulu-Natal Substation and Transformer Capacity

Figure 14 shows the substation transfer capacity and transformer capacity within the KwaZulu-Natal supply area.

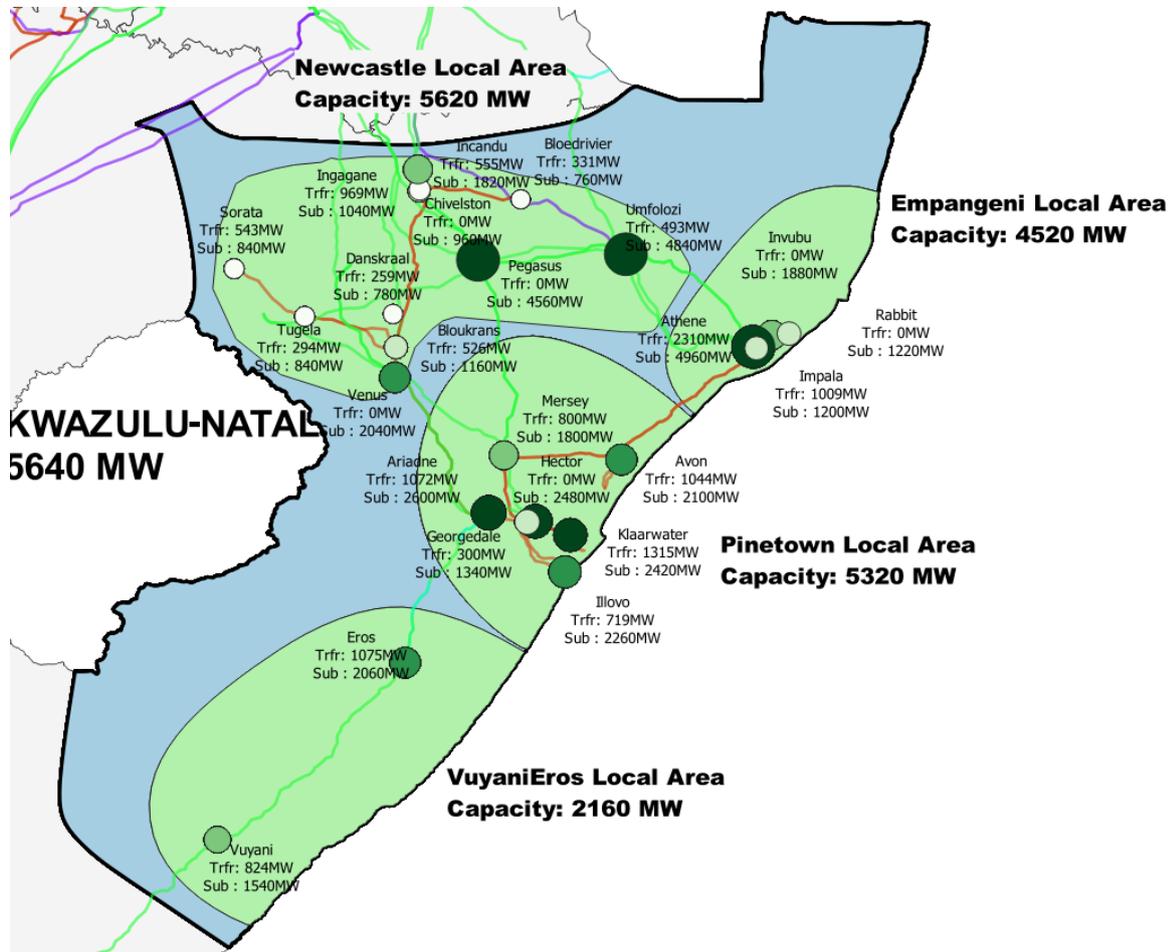


Figure 14: KwaZulu-Natal supply area generation connection capacity

The KwaZulu-Natal supply area has transformation capacity and substation transfer capacity available at all the substations. In the supply area, substations with zero transformer capacity are substations without MV transformation (transmission to transmission voltage substations, eg 400/275 kV transformation).

#### 4.16. KwaZulu-Natal Summary of Results

Table 7 summarises the available generation connection capacity within the KwaZulu-Natal supply area.

**Table 7: KwaZulu-Natal summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
KwaZulu-Natal	Empangeni	Invubu	400/275	3	800	2400	-	-	-	-	-	1880	4520	5640
			275	-	-	-	-	-	-	-	-	2020		
		Athene	400/132	4	500	2000	410	0	0	0	2310	4960		
		Impala	275/132	4	250	1000	59	0	0	0	1009	1200		
		Rabbit	275	-	-	-	-	-	-	-	-	1220		
	Pinetown	Mersey	400/275	3	800	2400	-	-	-	-	-	2540	5320	
			275/132	3	250	750	88	0	0	0	800	1800		
		Ariadne	400/132	2	500	1000	122	0	0	0	1072	2600		
		Hector	400/275	3	800	2400	-	-	-	-	-	2800		
			275	-	-	-	-	-	-	-	-	2480		
		Klaarwater	275/132	2	315	1130	242	0	0	0	1315	2420		
			275/132	2	250									
		Georgedale	275/132	1	250	250	62	0	0	0	300	1340		
		Illovo	275/132	2	250	500	344	0	100	0	719	2260		
		Avon	275/132	3	250	750	331	0	0	0	1044	2100		
		Ottawa	275/132	2	315	630	0	0	0	0	599	1400		
		Durban South	275/132	4	315	1260	83	0	0	0	1280	1300		
		Lotus Park	275/132	1	315	315		0	0	0	299	780		

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)		
	Vuyani-Eros	Durban North	275/132	2	315	630	0	0	0	0	599	920	2160			
		Vuyani	400/132	2	400	800	64	0	0	0	824	1540				
		Eros	400/132	2	500	1000	125	0	0	0	1075	2060				
	KwaZulu-Natal		Tugela	275/132	2	180	360	16	64	0	0	294	840		5620	
			Bloedrivier	275/88	2	160	320	27	0	0	0	331	760			
			Ingagane	275/88	2	500	1000	19	0	0	0	969	1040			
			Danskraal	275/132	2	125	250	22	0	0	0	259	780			
			Bloukrans	275/132	2	250	500	51	0	0	0	526	1160			
			Chivelston	400/275	1	800	800	-	-	-	-	-	-			4100
				275	-	-	-	-	-	-	-	-	-			960
			Incandu	400/132	1	500	500	80	0	0	0	555	1820			
			Sorata	275/132	1	500	500	68	0	0	0	543	840			
			Venus	400/275	2	800	1600	0	0	0	0	-	3600			
				275	-	-	-	-	-	-	-	-	-			2040
			Umfolozi	400/88	1	315	315	42	0	0	0	493	4840			
					1	160	160									
Pegasus	400	-	-	-	-	-	-	-	-	-	4560					

#### 4.17. Gauteng Substation and Transformer Capacity

Figure 15 to Figure 17 show local area substation transfer capacity and transformer capacity within the Gauteng supply area.

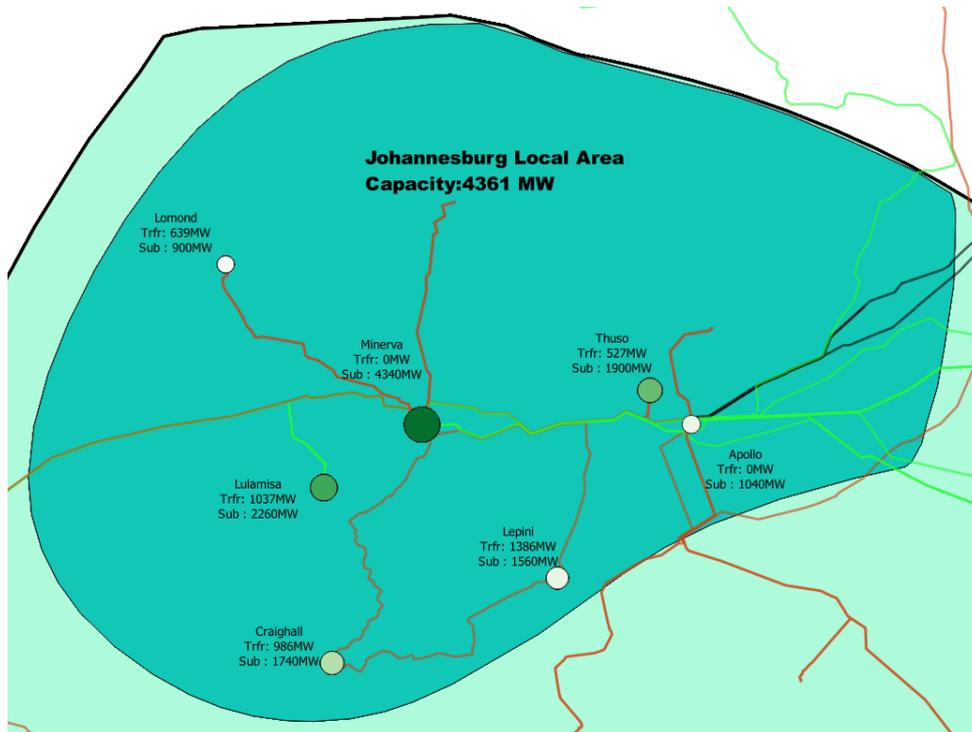


Figure 15: Johannesburg local area generation connection capacity

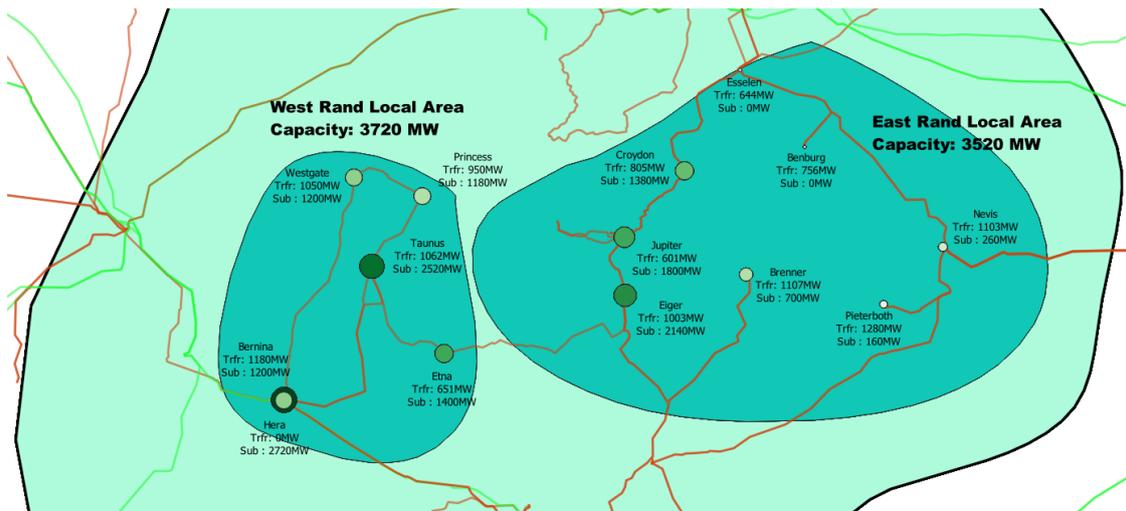
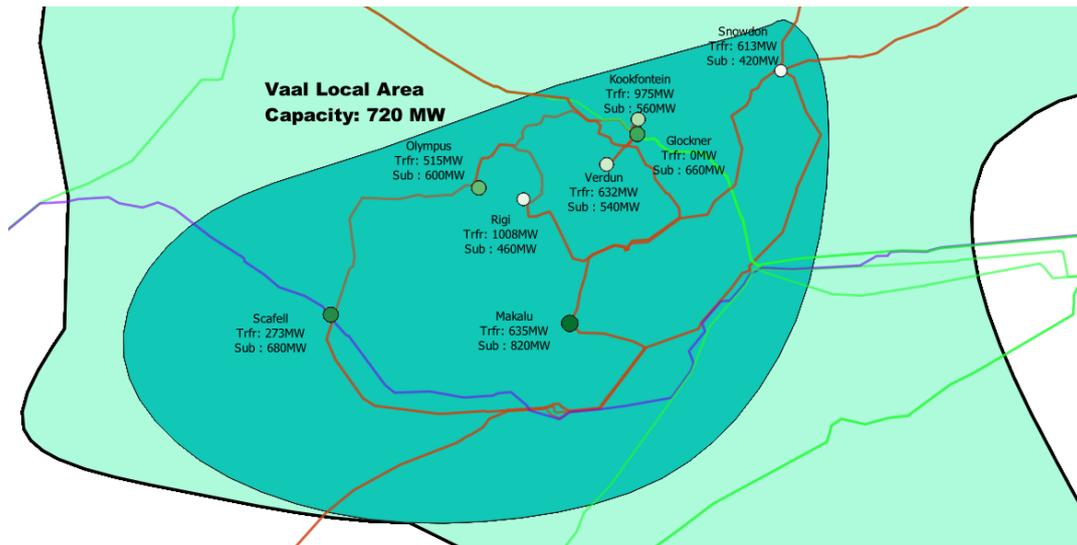


Figure 16: East Rand and West Rand local areas generation connection capacity



**Figure 17: Vaal local area generation connection capacity**

The Gauteng supply area has transformation capacity and substation transfer capacity available at all the substations, except for Esselen and Benburg. The rest of the substations with zero transformer capacity are substations without MV transformation (transmission to transmission voltage substations, eg 400/275 kV transformation).

#### **4.18. Gauteng Summary of Results**

Table 8 summarises the available generation connection capacity within the Gauteng supply area.

**Table 8: Gauteng summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)	
Gauteng	Johannesburg	Apollo	400/275	2	1000	2800	-	0	0	0	-	2800	4361	6021	
				1	800										
				275	-	-	-	-	-	-	-	-			1040
		Lulamisa	400/88	3	315	945	139	0	0	0	1037	2260			
		Minerva	400/275	4	800	3200	-	0	0	0	-	4340			
			275	-	-	-	-	-	-	-	-	4340			
		Njala	275/132	4	250	1000	263	0	0	0	1213	1040			
		Thuso	400/132	2	250	500	52	0	0	0	527	1900			
		Craighall	275/88	3	315	945	88	0	0	0	986	1740			
		Kwagga	275/132	4	300	1200	316	0	0	0	1456	1460			
	Lepini	275/88	4	315	1260	189	0	0	0	1386	1560				
	Lomond	275/88	2	315	630	90	50	0	0	639	900				
	Delta	275/88	3	250	750	100	0	0	0	812	1420				
	East Rand	Jupiter	275/88	3	180	540	88	0	0	0	601	1800	3520		
		Croydon	275/132	3	250	750	93	0	0	0	805	1380			
		Esselen	275/132	2	180	360	64	0	0	0	644	0			
275/132			1	250	250										
275/88			2	315	630	85								0	0
Prospect	275/88	4	250	1000	175	0	0	0	1125	1600					

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
		Fordsburg	275/88	4	250	1000	113	0	0	0	1063	1420		
		Eiger	275/88	3	315	945	105	0	0	0	1003	2140		
		Pieterboth	275/88	4	315	1260	83	0	0	0	1280	160		
		Brenner	275/88	3	315	945	209	0	0	0	1107	1240		
		Benburg	275/132	3	250	750	43	0	0	0	756	0		
		Sebenza	275/88	2	315	630	12	0	0	0	611	1600		
		Nevis	275/132	2	500	1000	153	0	0	0	1103	260		
	West Rand	Hera	400/275	2	800	1600	-	0	0	0	-	2720	3720	
			275	-	-	-	-	-	-	-	-	2720		
		Princess	275/88	3	315	945	52	0	0	0	950	1180		
		Taunus	275/132	3	500	1500	195	0	0	0	1620	2520		
		Westgate	275/132	2	500	1000	100	0	0	0	1050	1200		
		Etna	275/88	2	315	630	53	0	0	0	651	1400		
		Bernina	275/132	2	500	1000	230	0	0	0	1180	1200		
	Vaal	Glockner	400/275	3	800	2400	-	0	0	0	-	860	720	
			275	-	-	-	-	-	-	-	-	660		
		Kookfontein	275/88	3	315	945	77	0	0	0	975	560		
		Verdun	275/88	2	315	630	33	0	0	0	632	540		
		Snowdon	275/88	3	160	480	157	0	0	0	613	420		
		Makalu	275/88	4	160	640	27	0	0	0	635	820		

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
		Rigi	275/88	3	315	945	110	0	0	0	1008	460		
		Scafell	275/132	2	135	270	17	0	0	0	273	680		
		Olympus	275/132	2	250	500	40	0	0	0	515	600		
			275/33	4	120	480	3	0	0	0	459			

#### 4.19. Mpumalanga Substation and Transformer Capacity

Figure 18 shows the substation transfer capacity and transformer capacity within the Mpumalanga supply area. The Komatiport Substation limit is not quantified due to the need for additional studies. As such, the limit will be assessed on receipt of a formal application.

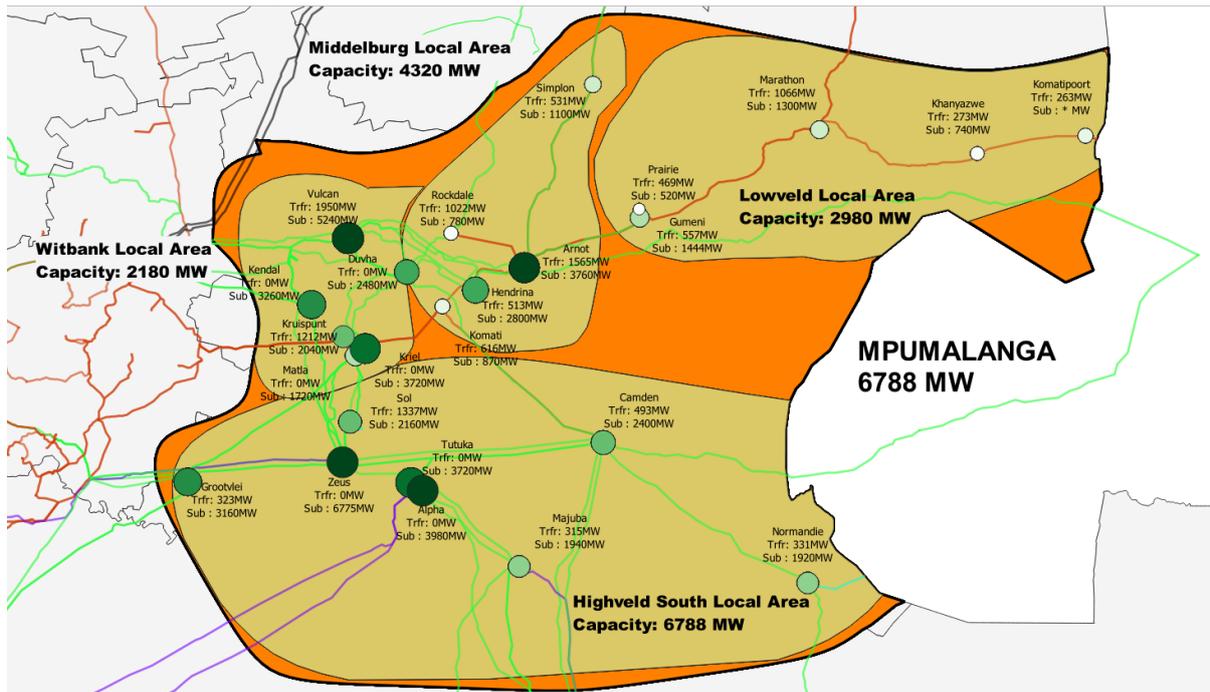


Figure 18: Mpumalanga supply area generation connection capacity

The Mpumalanga supply area has transformation capacity and substation transfer capacity available at all the substations. The rest of the substations with zero transformer capacity are substations without MV transformation (transmission to transmission voltage substations, eg 400/275 kV transformation).

#### 4.20. Mpumalanga Summary of Results

Table 9 summarises the available generation connection capacity within the Mpumalanga supply area. The Komatiport substation limit is not quantified due to the need for additional studies to be performed. The Komatiport substation limit value will be assessed for each application received.

**Table 9: Mpumalanga summary of results**

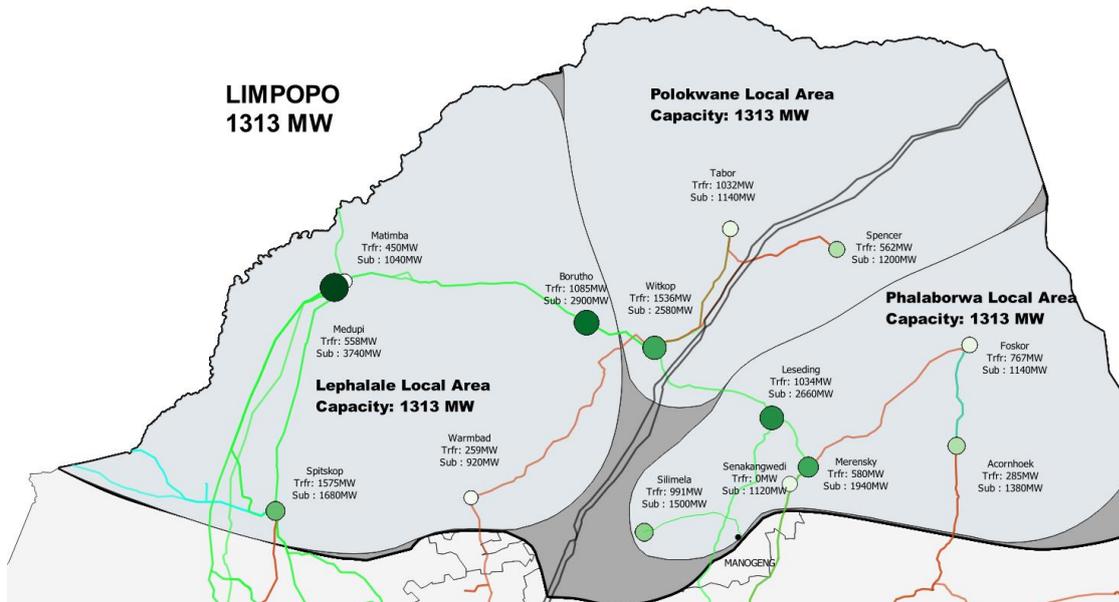
Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
Mpumalanga	Highveld South	Grootvlei	400/132	2	160	320	19	0	0	0	323	3160	6788	6788
		Sol	400/132	2	500	1000	387	0	0	0	1337	2160		
		Tutuka	400	0	0	0	0	0	0	0	0	3720		
		Majuba	400/88	2	160	320	11	0	0	0	315	1940		
		Normandie	400/132	2	250	500	16	0	0	0	491	1920		
			400/88	2	160	320	27	0	0	0	331			
		Camden	400/275	2	400	800	0	0	0	0	-	6788		
			275/88	3	160	480	37	0	0	0	493	2400		
		Zeus	400	2	2000	4000	-	-	-	-	-	6775		
	Alpha	400	3	2000	6000	-	-	-	-	-	3980			
	Middelburg	Arnot	400/275	1	800	800	5	0	0	0	1565	3760		
			400/275	2	400	800								
			275	-	-	-	-						-	
		Hendrina	400/132	2	250	500	38	0	0	0	513	2800	4320	
		Duvha	400	-	-	-	-	-	-	-	-	2480		
		Rockdale	275/132	2	500	1000	72	0	0	0	1022	780		
			132/88	2	80	160	17	0	0	0	226			
	132/88		2	30	60									
Simplon	275/132	2	250	500	56	0	0					0	531	1100

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
		Komati	275/132	2	250	500	22	0	0	0	616	870		
			275/132	1	125	125								
			275/88	1	160	160								
	Witbank	Vulcan	400/132	2	500	1000	193	0	0	0	1950	5240		
			400/132	2	300	600								
			400/132	1	250	250								
		Kruispunt	275/132	4	250	1000	262	0	0	0	1212	2040		
		Kendal	400	-	-	-	-	-	-	-	-	3260		
		Matla	400/275	1	800	800	-	-	-	-	-	4380		
			275	-	-	-	-	-	-	-	-	1720		
	Kriel	400	-	-	-	-	-	-	-	-	3720			
	Lowveld	Gumeni	400/132	1	500	500	82	0	0	0	557	1444		
		Khanyazwe	275/132	1	250	250	36	0	0	0	273	740		
		Marathon	275/132	2	500	1000	116	0	0	0	1066	1300		
		Komatipoort	275/132	2	125	250	26	0	0	0	263	*		
		Prairie	275/88	2	240	480	13	0	0	0	469	520		

\* : Capacity will be assessed on receipt of a formal application

## 4.21. Limpopo Substation and Transformer Capacity

Figure 19 shows the substation transfer capacity and transformer capacity within the Limpopo supply area.



**Figure 19: Limpopo supply area generation connection capacity**

Except for Senakangwedi Substation which does not have transformers, the Limpopo supply area has transformation capacity and substation transfer capacity available at all the substations.

## 4.22. Limpopo Summary of Results

Table 10 summarises the available generation connection capacity within the Limpopo supply area.

**Table 10: Limpopo summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)	
Limpopo	Polokwane	Tabor	400/132	1	500	500	110	28	0	0	1032	2100	1313	1313	
			275/132	2	250	500						1140			
		Witkop	400/275	2	400	800	-	-	-	-	-	-			3260
			400/132	3	500	1500	141	30	0	0	1536	2580			
			275	-	-	-	-	-	-	-	-	-			2580
		Spencer	275/132	2	250	500	87	0	0	0	562	1200			
	Lephalale	Borutho	400/132	2	500	1000	135	0	0	0	1085	2900	1313		
		Spitskop	400/275	2	800	1600	-	-	-	-	-	-			3740
			400/132	3	500	1500	150	0	0	0	1575	1680			
			275/88	2	315	630	61	0	0	0	660	920			
		Warmbad	275/132	2	125	250	21	0	0	0	259	920			
			132/66	2	48	96	8	0	0	0	99	1040			
		Matimba	400/132	2	250	500	35	60	0	0	450	1040			
	Medupi	400/132	2	250	500	83	0	0	0	558	3740				
	Phalaborwa	Acornhoek	275/132	2	125	250	47	0	0	0	285	1380	1313		
		Foskor	275/132	3	250	750	54	0	0	0	767	1140			
		Leseding	400/132	2	500	1000	84	0	0	0	1034	2660			
		Merensky	400/275	2	400	800	-	-	-	-	-	-			3200
			400/132	1	500	500	105	0	0	0	580				

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
			275/132	2	250	500		0	0	0	475	1940		
		Silimela	400/132	2	500	1000	41	0	0	0	991	1500		
		Senakangwedi	275	-	-	-	-	-	-	-	-	1120		

#### 4.23. Pelly Substation and Transformer Capacity

Figure 20 shows the transformer capacity of the Pelly supply area. The substation limit, local area limit and supply area limit is not quantified due to the need for additional studies. As such, these limits will be assessed on receipt of a formal application. .

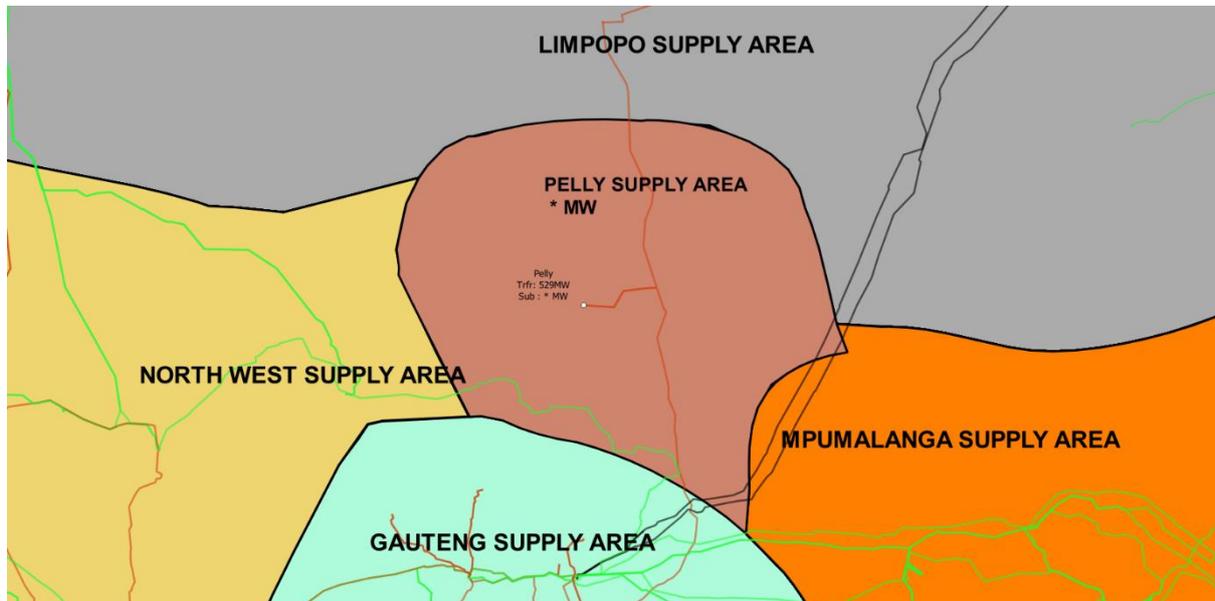


Figure 20: Pelly supply area generation connection capacity

#### 4.24. Pelly Summary of Results

Table 11 summarises the available generation connection capacity at the Pelly substation supply area. Only the Pelly transformer limit results are shown in the table below.

**Table 11: Pelly summary of results**

Supply Area	Local Area	Substation	Voltage (kV)	No. of Transformers	Transformer Size (MVA)	Total Capacity (MVA)	Load (MW)	Approved REIPPPP Solar Gen (MW)	Approved REIPPPP Wind Gen (MW)	Approved RMIPPPP Gen (MW)	Transformer Limit (MW)	Substation Limit (MW)	Local Area Limit (MW)	Supply Area Limit (MW)
Pelly	Pelly	Pelly	275/132	2	250	500	54	0	0	0	529	*	*	*

\*: Capacity will be assessed on receipt of a formal application

## 5. Conclusion

The publication of the GCCA-2023 is to inform stakeholders of the potential capacity available on the Eskom transmission network to facilitate the connection of generation projects. The announcement of preferred bidders from previous rounds and new REIPPPP bid windows in the future will trigger a revision of the GCCA document.

## 6. Development Team

This document was developed by the following team members.

I. Mokwena	Engineer- Strategic Grid Planning
S. G. Satimburwa	Senior Engineer- Strategic Grid Planning
S. Ferreira	Senior Technologist GIS- Strategic Grid Planning
C. Ndlhovu	Chief Engineer- Strategic Grid Planning
S. Ncwane	Chief Engineer- Strategic Grid Planning
R. Marais	Senior Manager- Strategic Grid Planning