

# **Transmission Grid Expansion – Challenge, Actions & Opportunities**

## **Consulting Engineers South Africa (CESA)**

Date: 10 August 2022





- Background
- What is the **CHALLENGE**?
- Major projects in the TDP
- Recent and planned infrastructure additions
- Recent and planned capex
- Current grid capacity
- Status of resource adequacy
- What **ACTIONS** has Transmission taken?



## Current situation

The IRP 2019 gazetted in Nov 2019, proposes **9.8 GW** of new generation capacity to be connected by **2025** followed by **17 GW** of capacity (of which 11 GW is for RE) to be connected between **2026 to 2030**. Failure to deliver will lead to a security of electricity supply risk for the country

Current network reliability constraints (i.e. N-1), meeting organic demand growth and closing the refurbishment backlog also require significant new network infrastructure

This will require an **acceleration of investments** in Transmission infrastructure by development of new corridors and substations, and strengthening at existing substations over the period 2022 – 2031 to address both the IRP2019 as well as the network strengthening requirements across the country for **security of supply**



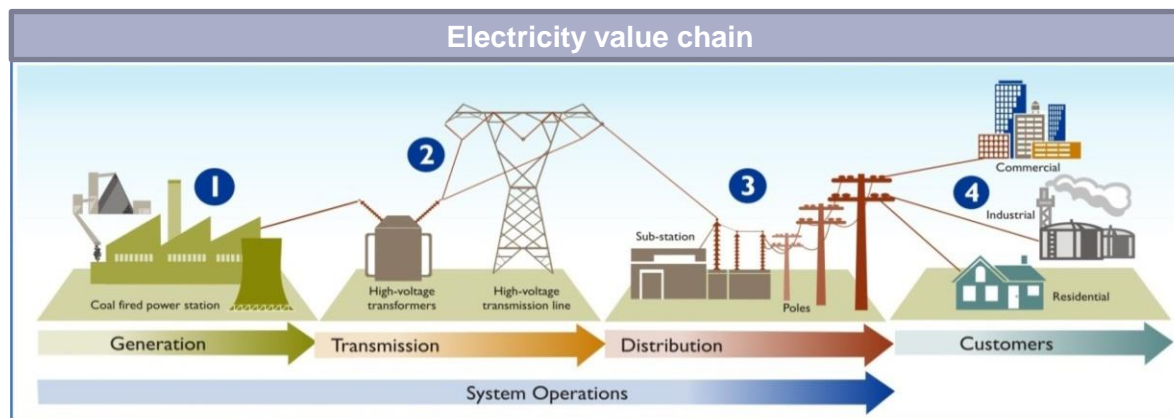
## Problem statement

The grid strengthening required to accommodate this aggressive renewable integration and other needs requires **significant investments**

Timeline to implement Transmission lines can be **8 – 10 years**, due to **servitude challenges**

The **resource capacity** in the country across the delivery value chain is limited

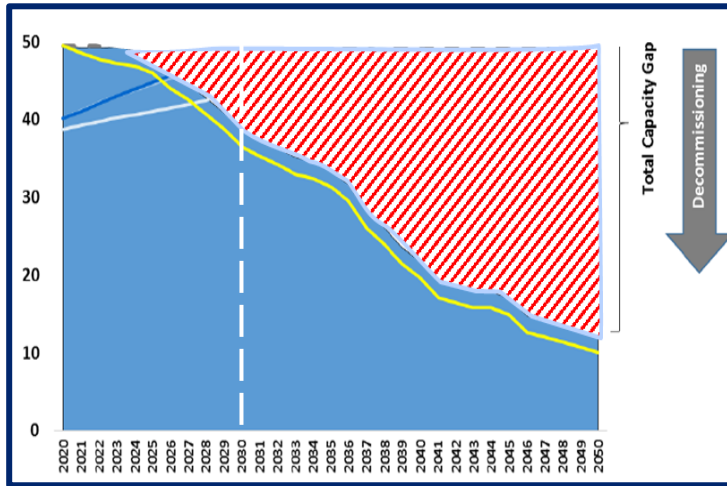
**Capital requirements** to achieve the TDP are substantial





# What is the CHALLENGE?

We are facing coal decommissioning – 9,5GW by 2030 and continues beyond



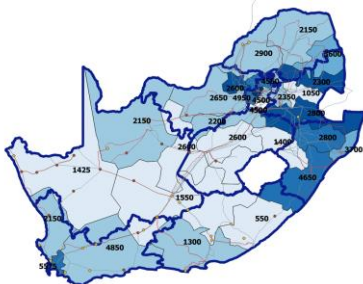
IRP process has done its work

	IRP 2019						Delta
	Coal	Storage	PV	Wind	Gas	Total	
2020	1433		114	300		1847	0
2021	1433		300	818		2551	0
2022	711	513	1400	1600		4224	3113
2023	750		1000	1600		3350	2850
2024				1600	1000	2600	2100
2025			1000	1600		2600	1730
2026				1600		1600	-3150
2027	750			1600	2000	4350	550
2028			1000	1600		2600	-1800
2029		1575	1000	1600		4175	-1275
2030			1000	1600		2600	0
Totals:	5077	2088	6814	15518	3000	32497	4118

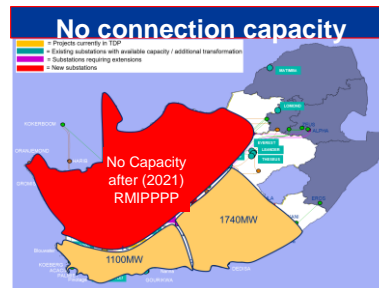
9.7GW

17GW

1.87 GW						11.66 GW					
2022	711			400		711	444	513	400	1000	1000
2023	500					750	500			1000	1000
2024	500									1000	1000
2025				670	200					1000	1000



Not only brought forward  
but also compressed



Renewables brought forward from 2018 IRP to 2019 IRP by 9,8GW

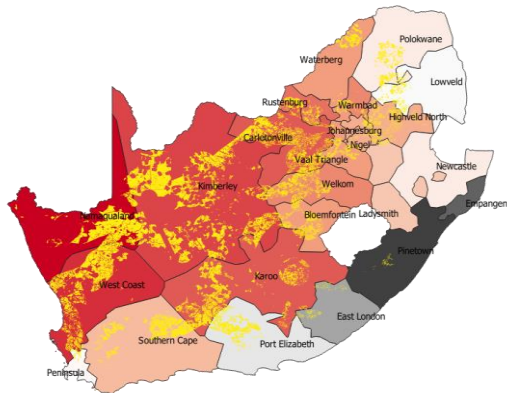
NB: Excludes acceleration of BW6 from 2600MW to 5200MW



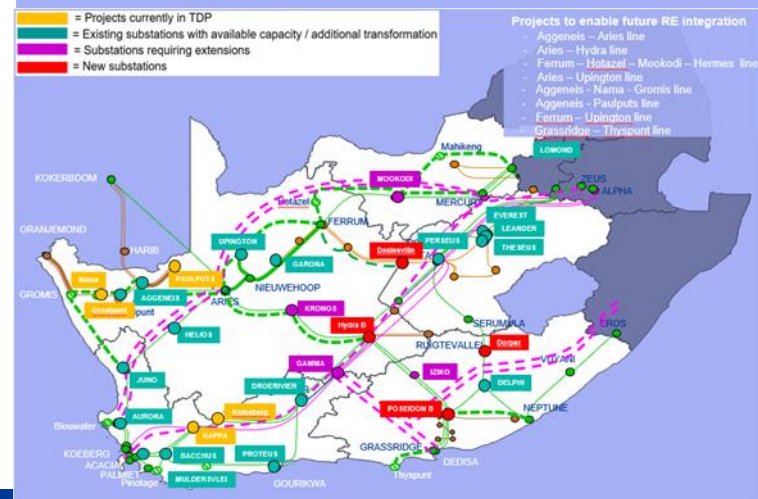
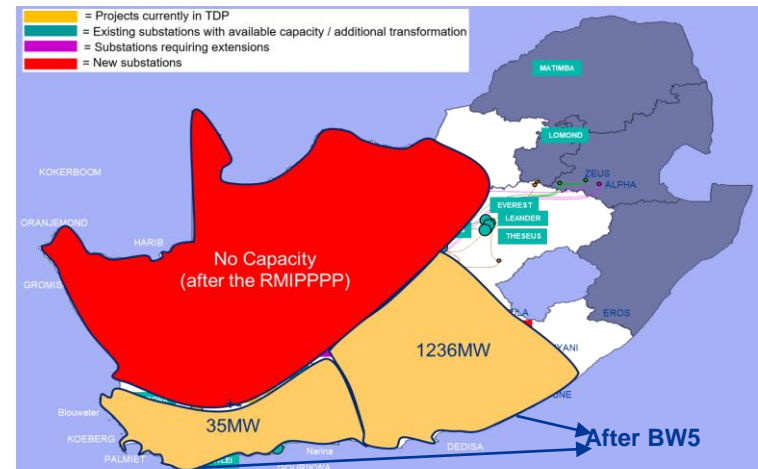
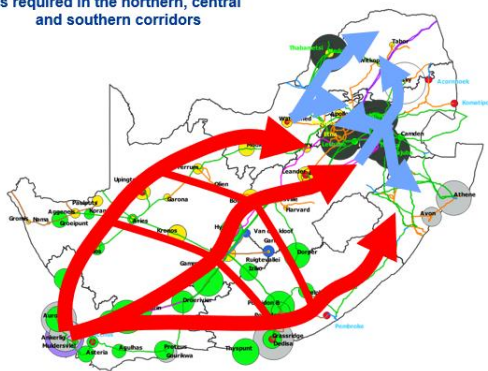
# What is the CHALLENGE?

Northern Cape with most efficient solar resource taking into account DFFE and CSIR restriction areas has no connection capacity after BW5 / RMIPPP

Solar sites(yellow) & lowest cost(red)



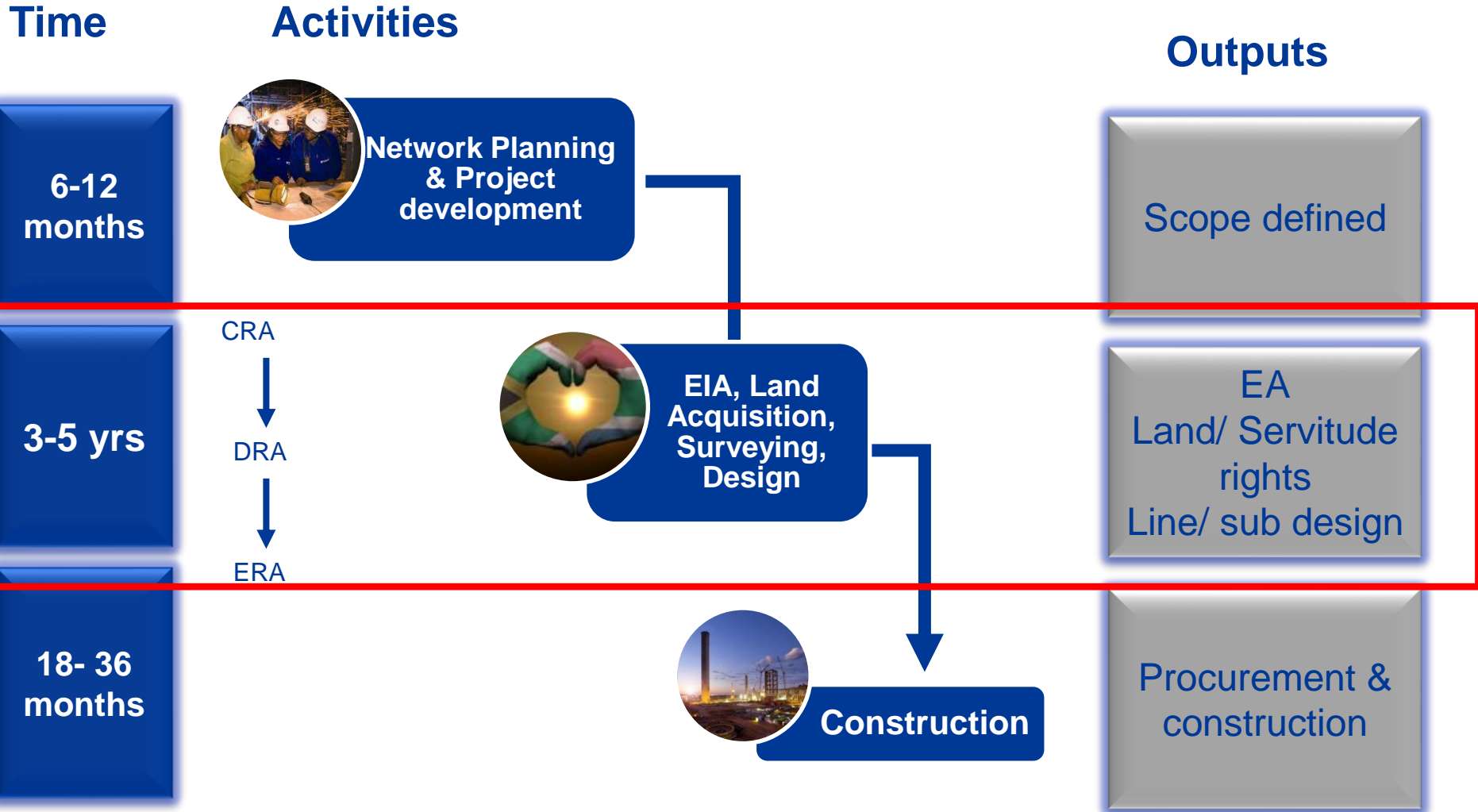
Significant transmission development is required in the northern, central and southern corridors



Transmission network infrastructure augmentation in areas with Renewable Energy resources is critical for the country to maximise on the lowest cost energy



# What is the CHALLENGE?



Identification / siting and securing suitable land or rights is a lengthy process particularly for linear developments and influences the timing and success of a projects



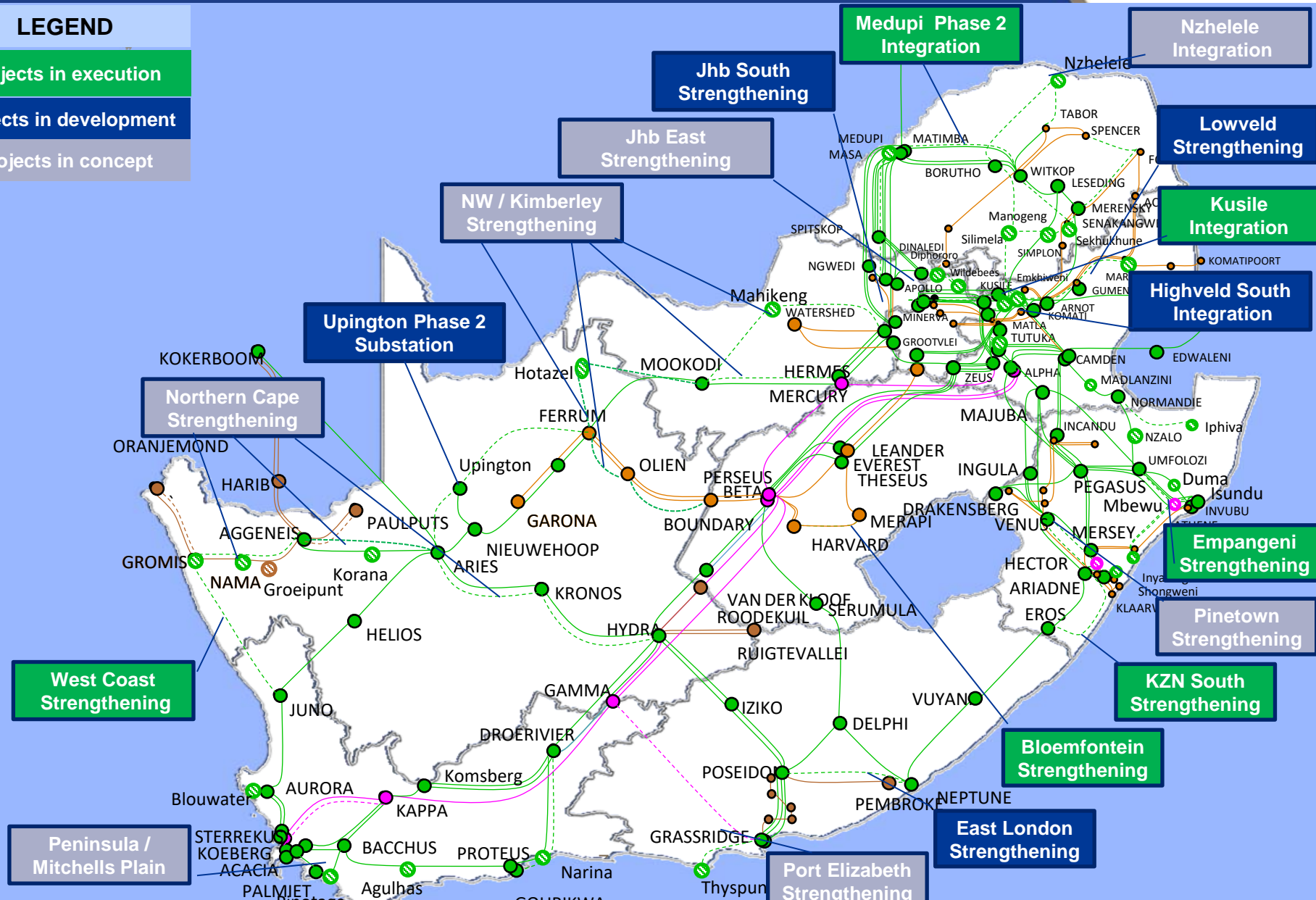
# Major projects in the TDP FY22-FY31

## LEGEND

Projects in execution

Projects in development

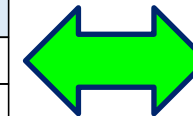
Projects in concept





# Planned Infrastructure Additions

Transmission Assets Nationally	New Assets expected	New Assets expected	Total New Assets
	2022 - 2026	2027 - 2031	
Power lines (km)			
765 kV	76	2668	2744
400 kV	2348	3015	5363
275 kV	174	125	299
Total length (km)	2598	5808	8406
Transformers			
Number of units	35	84	119
Total capacity (MVA)	13445	45 345	58790
Capacitors			
Number of units	7	15	22
Total capacity (MVar)	376	836	1212
Reactors			
Number of units	8	21	29
Total capacity (MVar)	760	4 500	5260

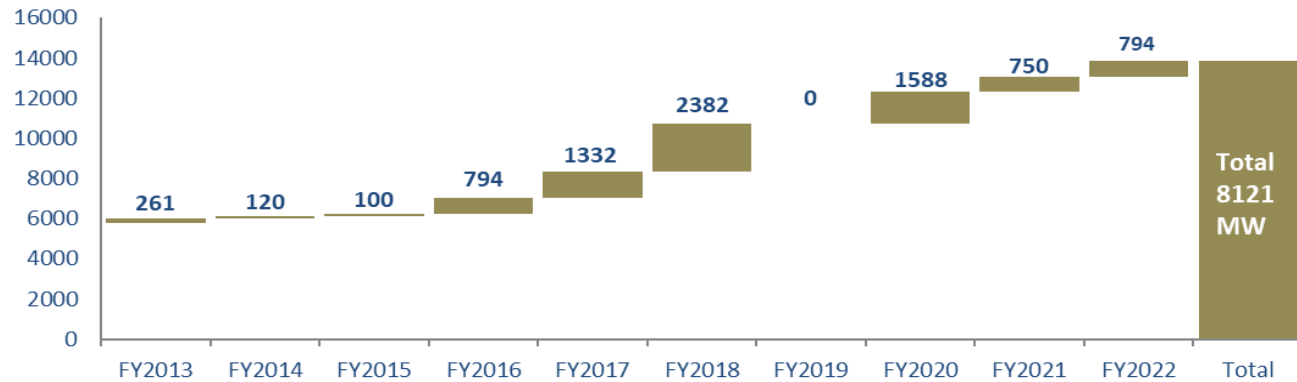


Based on the TDP  
network requirements  
for sustainability

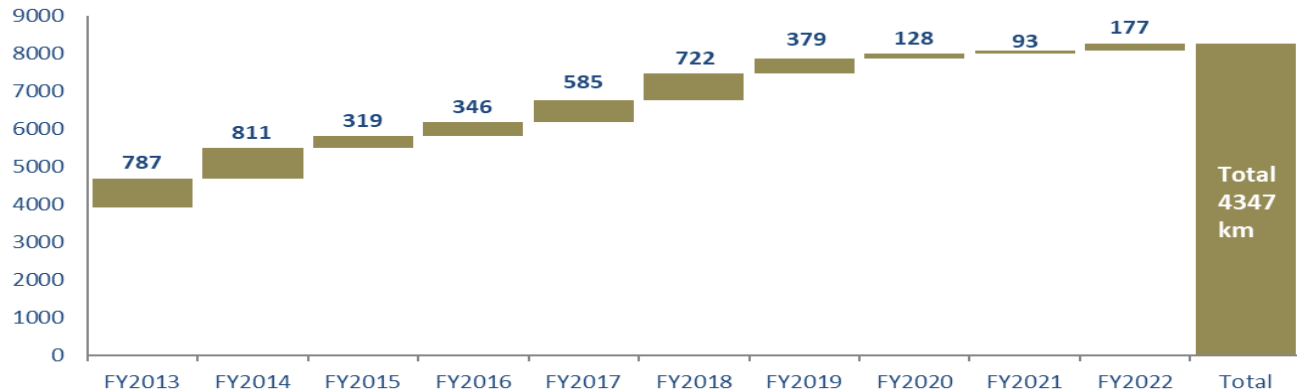


# Recent Infrastructure Additions

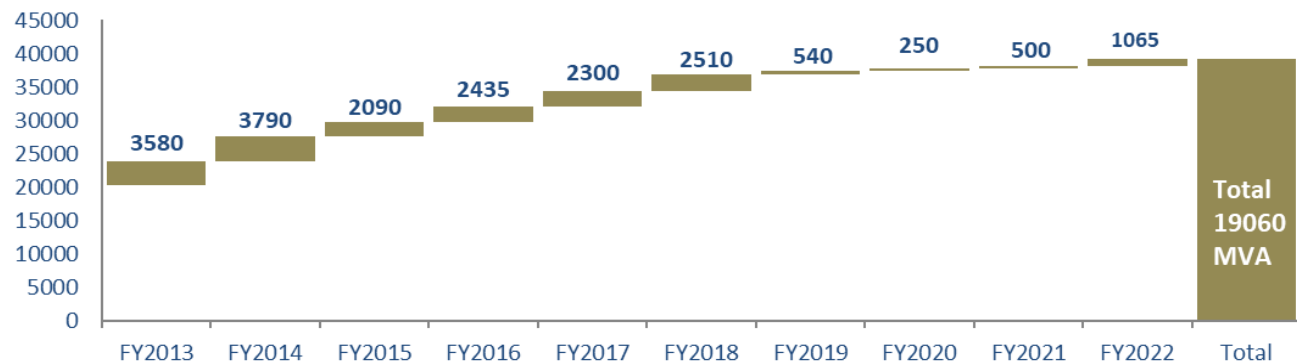
## Generation Integration (MW)



## Transmission lines (km)



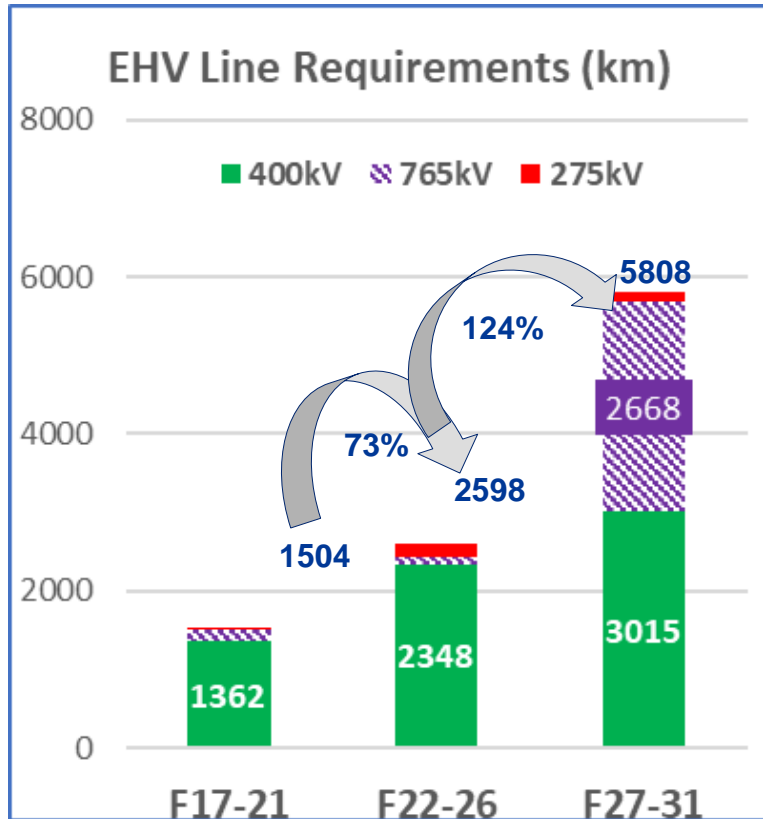
## Transmission Substations (MVA)



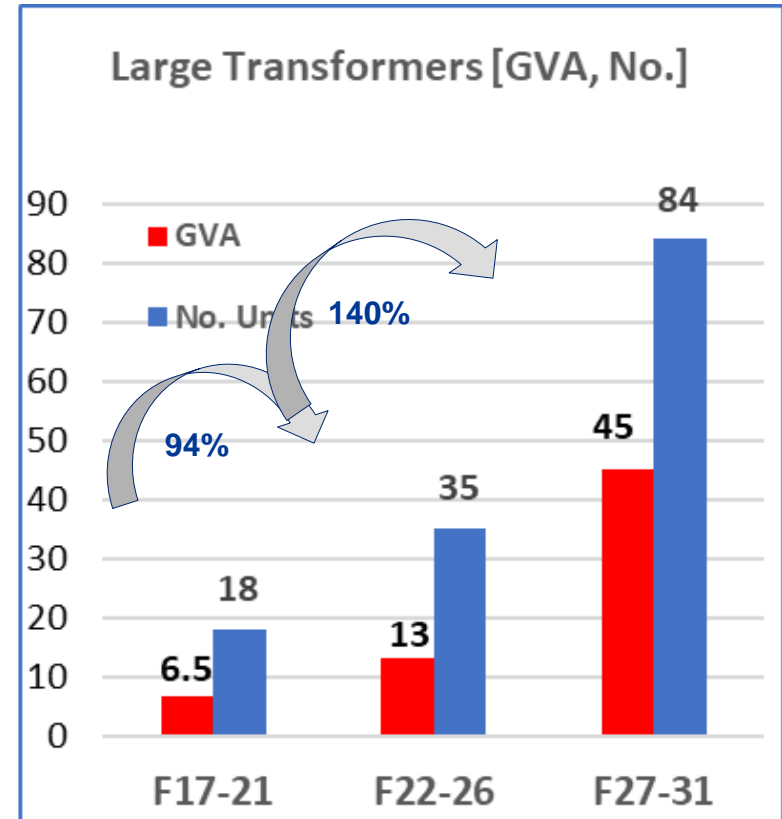


# Recent and Planned Infrastructure Additions

~ 8406 km of line:



~ 119 transformers ~ 58 GVA:

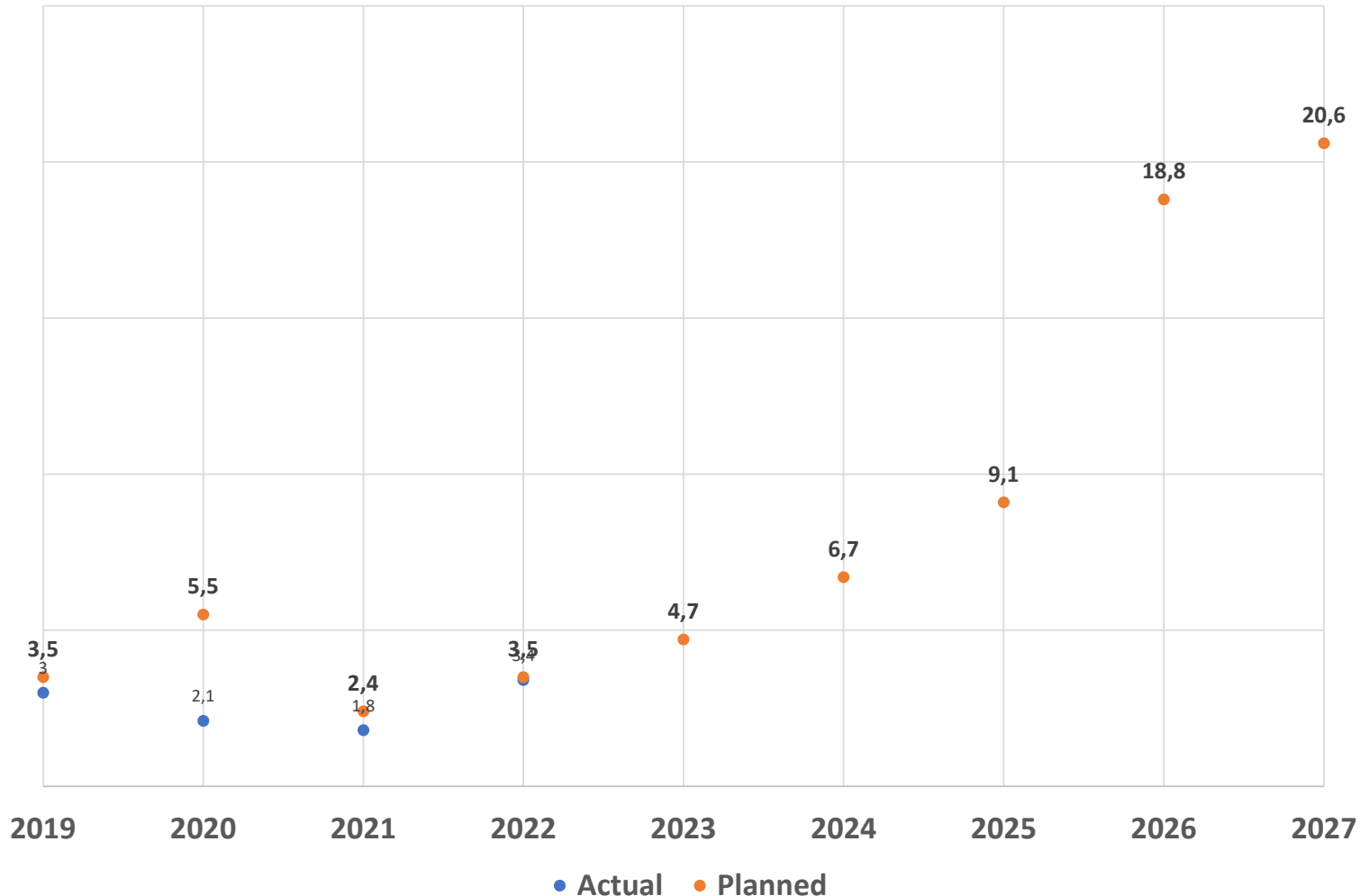


- F22-26 cf F17-21: **73%** increase in line km, **94%** increase in transformers
- F27-31: **124%** increase in line km, **140%** increase in transformers



# Recent and Planned Capex

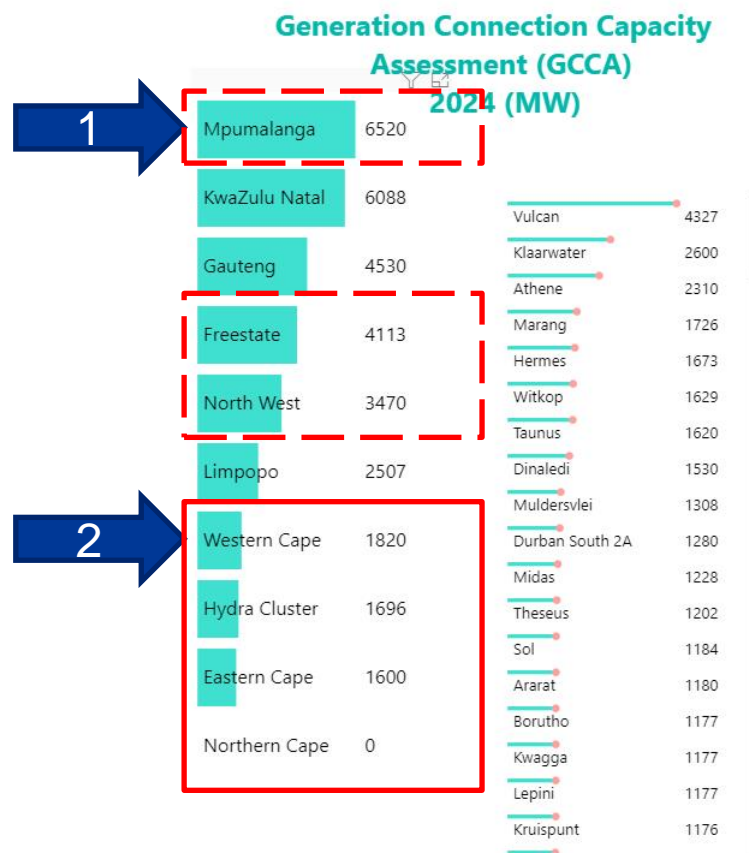
Trend of Historical and Future Capital Budgets



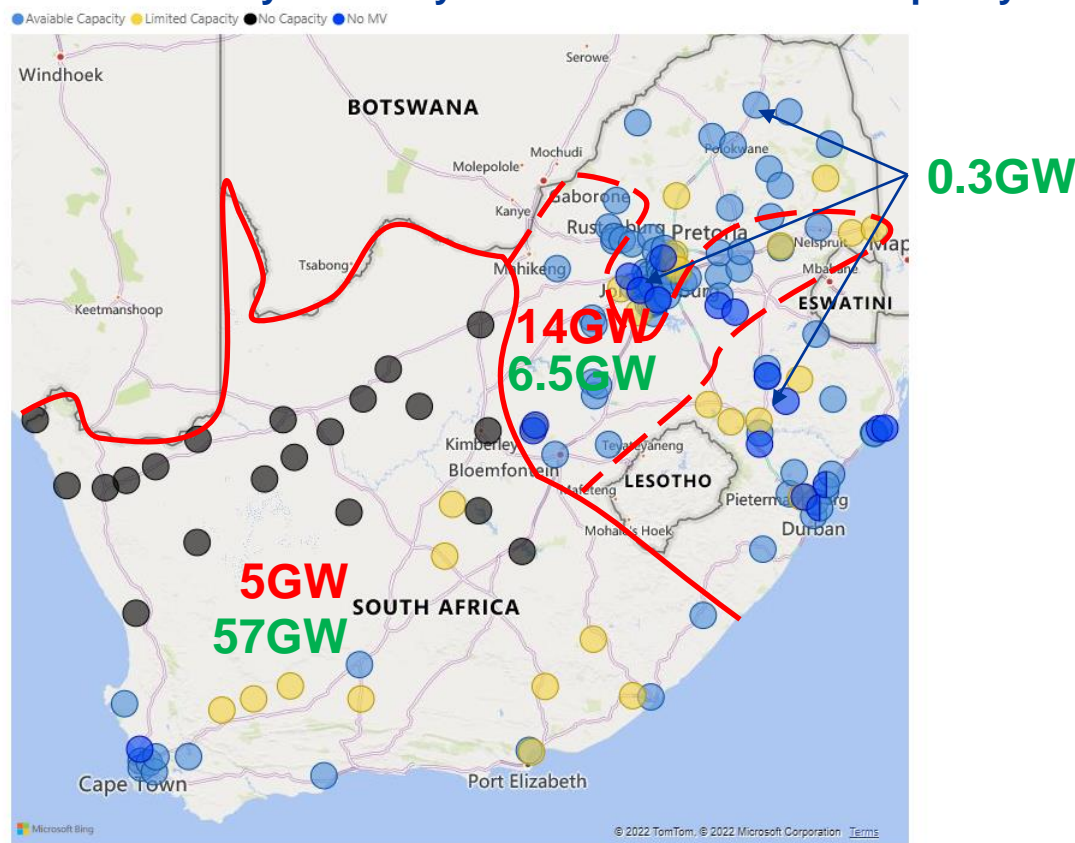


# Current Grid Capacity – North & South

1. Eskom grid unlocking - **Mpumalanga initiative** to encourage use of grid capacity
2. Enable additional capacity for renewables in the Western Cape by dispatching management of OCGT.
3. Access to grid capacity though local grid expansions identified.
4. Initiated major corridor strengthening.



## 32 GW of Existing Tx Grid Supply Area Capacity Max ~19 GW likely for Utility Scale Renewable Grid Capacity





# Current Grid Capacity – North & South

## Background

New projects required to accelerate connection of IPPs in the grid. These projects are required by **2027**.

## Summary of North

12 projects requiring 27 transformers.  
R8,1Bn investment, of which R3Bn is in the TDP.

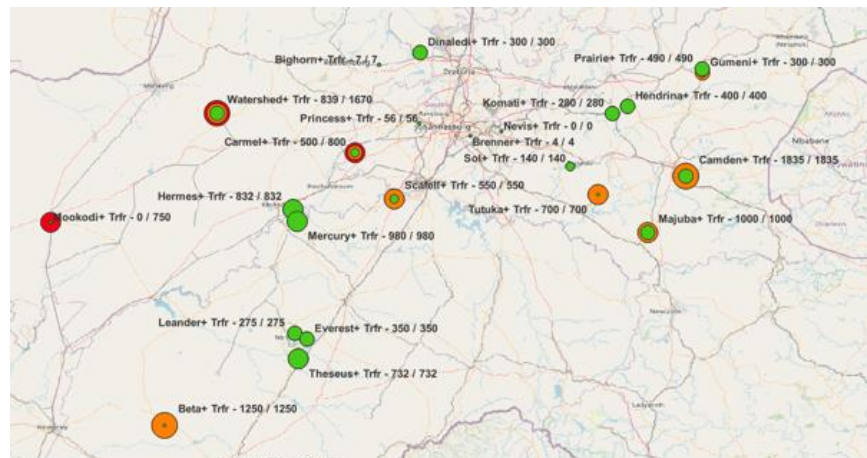
## Summary of South

10 projects requiring 18 transformers.  
R5,8Bn investment, of which R3,9Bn is in the TDP.

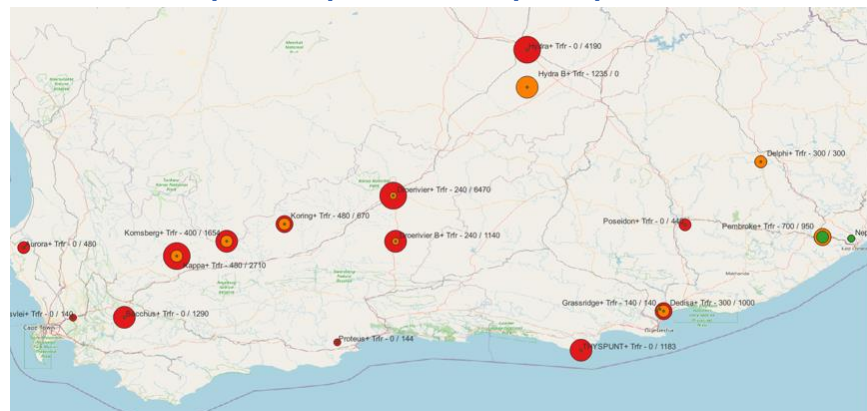
## Summary

Projects in the TDP require rephasing.  
There are 18 additional projects, requiring R7Bn and 36 transformers

## North (Inland) – 5.7GW (now) to 12,3GW



## South (Inland) – 0.7GW (now) to 4,7GW





ITEM	CURRENT CAPACITY	SHORTFALL	PLANS
Large Power Transformers	~ 4? per year	~ 8 per year immediate	Local hesitant to expand; accredited 14 overseas factories; 7 more planned
Steel	30k tonn/year	23k tonn/yr from FY29; mills adequate; require a 2nd fabricator	Require a second supplier; industry development. May require permission to import
Insulators	15k per year	Small risk from FY30	Can be delivered if certainty around volumes is guaranteed
Conductor	20k km per year	10k km per year from FY30	OEM recently presented better plans
Line Construction	400km per year	400 - 800km per year	Training of existing; incubation of new; international players



# What ACTIONS has Transmission taken?

1. TDP SteerCo, initially chaired by COO and now by GE; Dec '20
2. 9 Streams looking at Planning, Proj Dev't, Lands & Rights, Procurement, Execution, Finance, Stakeholder Management, SD&L
3. Some key items being driven
  - 3.1 Engagement of DPWI/DPE at ministerial level regarding **release of govt land** and **expropriation** (Wave 1 of projects)
  - 3.2 Eskom achieving **expropriation** in the ERA act
  - 3.3 Engagement with DEFF planned to request **quicker environmental approvals** for areas not classified as low and medium risk
  - 3.4 Engagements with DTIC on **exemptions from localisation** requirements, in particular transformers and possibly fabricated structural steel
  - 3.5 Pre-qualification of **addition transformer manufacturers undertaken by** Eskom [8 (previous) - 14 (now) - 21 planned]
  - 3.6 Decision taken to augment project development capability with **OE**; specification under development



## 3. Some key items being driven (contd)

3.7 Looking at contracting options such as **EPC**; 13 projects identified

3.8 Availability of **enabling contracts** (professional services, commodities) tightly managed

3.9 Strict management of **schedules** and **reporting visibility** – tool under development



**END**

