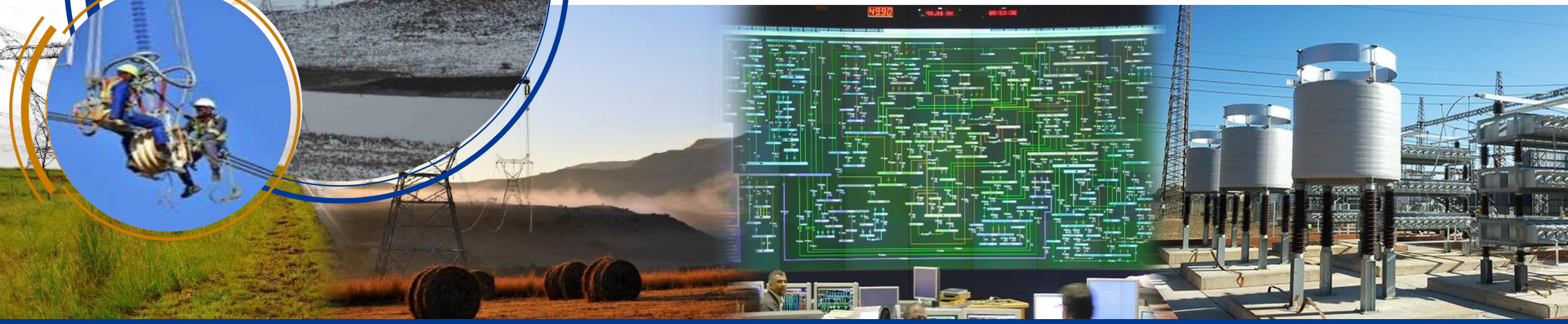
Eskom
National Transmission Company South Africa ™

Transmission Infrastructure Plan

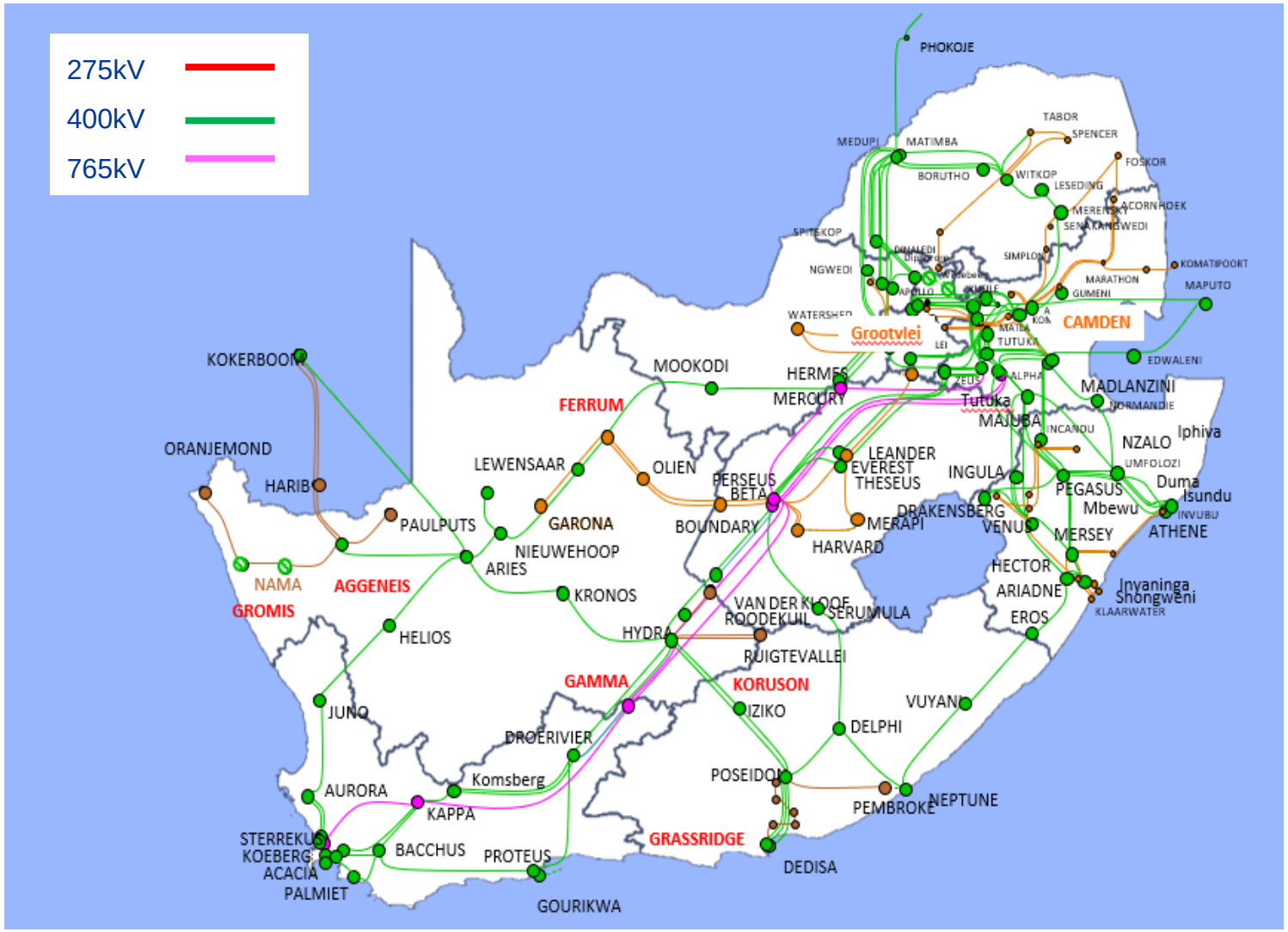
Briefing to the Portfolio Committee on Electricity and Energy

Segomoco Scheppers

04 December 2024



Transmission network overview



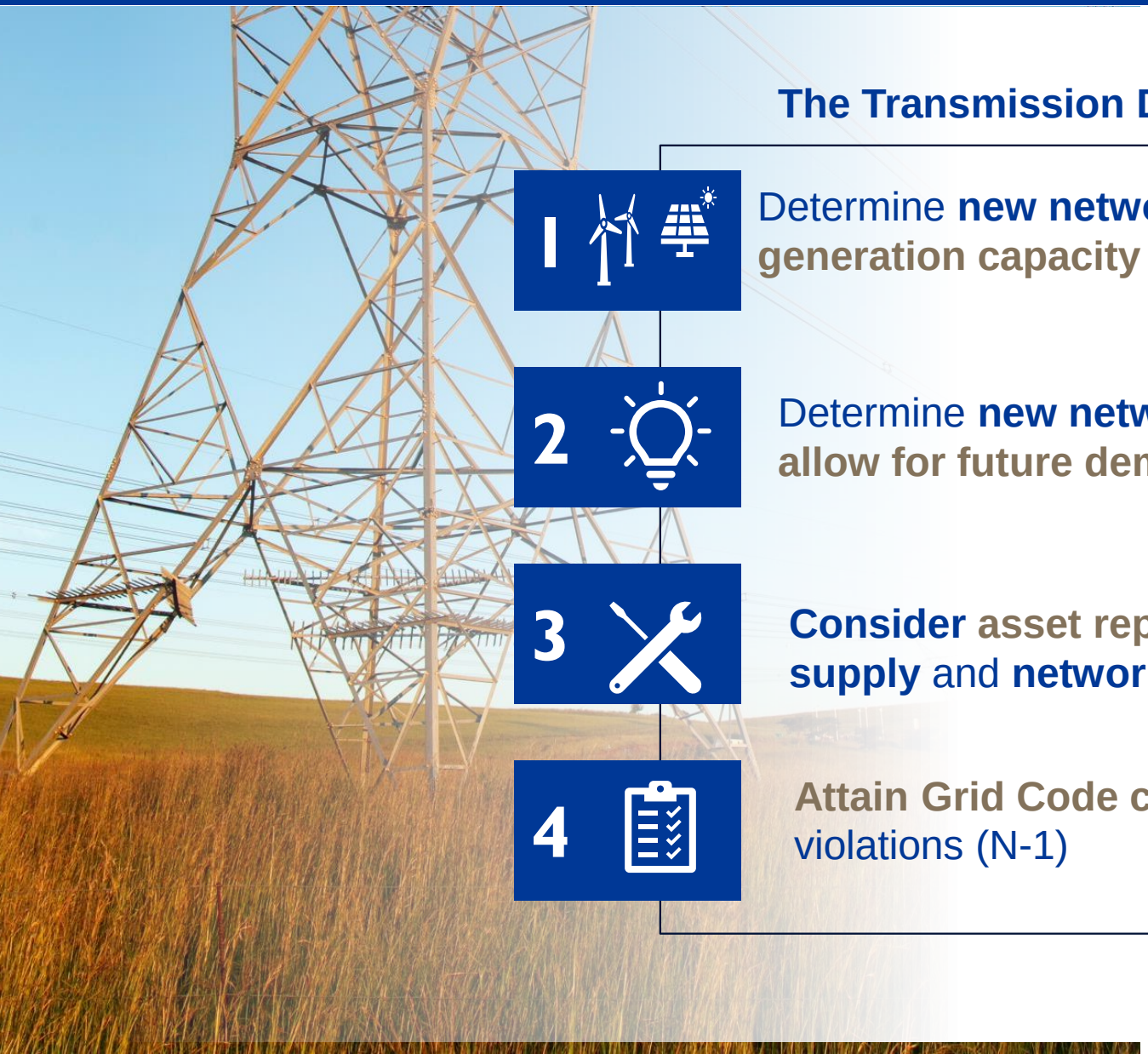
Facts and Figures

Asset base @ 31 March 2024

- 33 328 km of high voltage / extra high voltage (HV/EHV) lines
- 155 995 MVA installed transformer capacity
- 453 Transformers
- 171 Substations

Staffing ~ 3 647 employees @ Oct 2024

The Transmission Development Plan



The Transmission Development Plan has four main objectives

1. Determine **new network infrastructure requirements** to **integrate new generation capacity** and **address system stability requirements**

2. Determine **new network infrastructure requirements** to sustain and **allow for future demand growth**

3. **Consider asset replacement requirements** to ensure **reliability of supply** and **network optimisation**

4. **Attain Grid Code compliance** by resolving both substation and line violations (N-1)

TDP overview | Transition from centralised Gx in the north to distributed VRE in south requires grid expansion

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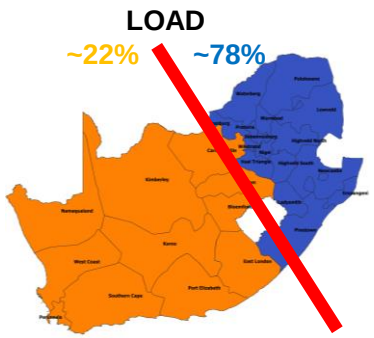
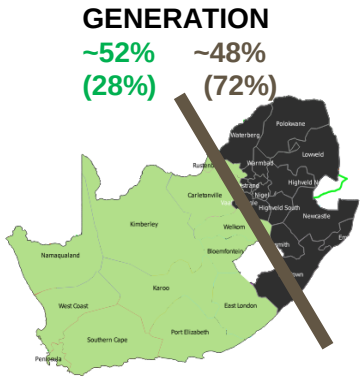
Major corridors required

Future load vs. generation patterns requires transmission infrastructure upgrades

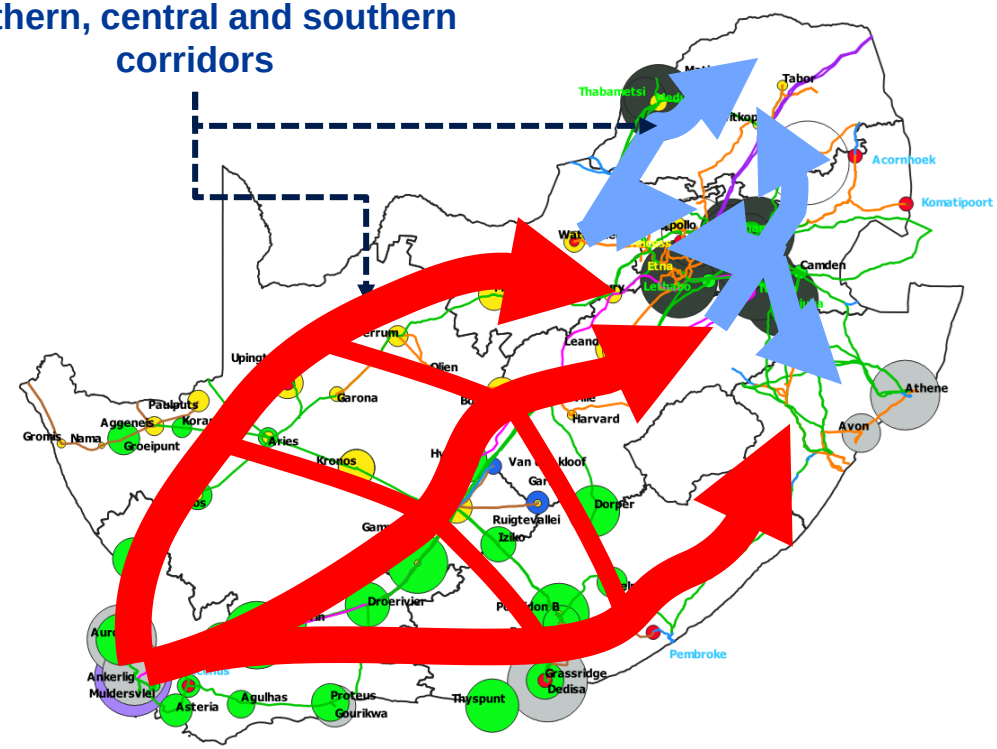


Lower load in the South remains



Generation increase in the South

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



Key insights

- **Historically**, the architecture the Tx network was **designed to dispatch power** from the **centralised** power pools in Mpumalanga and Limpopo to **load centres across the country**
- The **ramping down** of some of the **baseload coal plants**, mainly in **Mpumalanga**, will likely be **replaced with distributed RE**, mainly Wind and Solar from the **broader Cape regions**
- Significant **new transmission corridors** or **lines** are required to transport the power from these regions to the **load centres** in the **northern parts of the country**
- The **transmission infrastructure upgrades must** enable **security of supply, enable lower cost renewables in optimal resource areas**
- **Transmission infrastructure typically takes 8-10 years to complete** (in line with international standards) and poses a significant risk to SA's energy transition.

TDP overview | Transition from centralised Gx in the north to distributed VRE in south requires grid expansion

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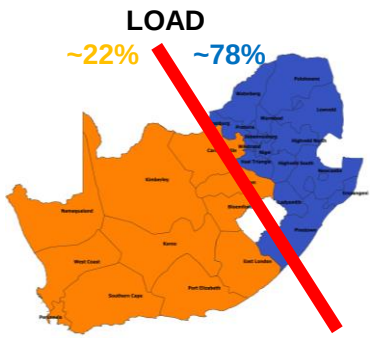

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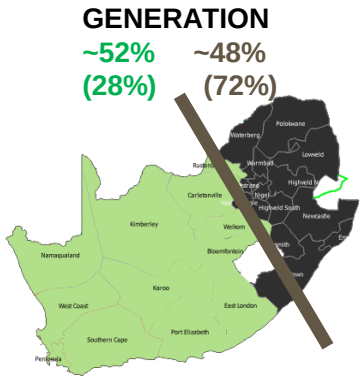

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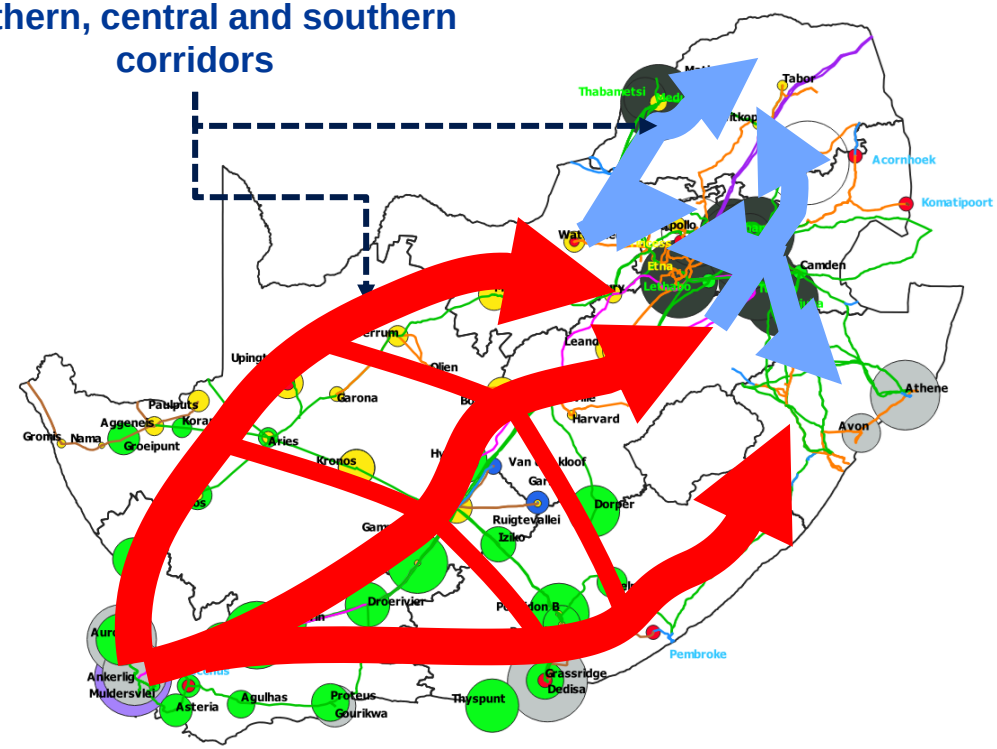

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TDP overview | Summary of infrastructure requirements

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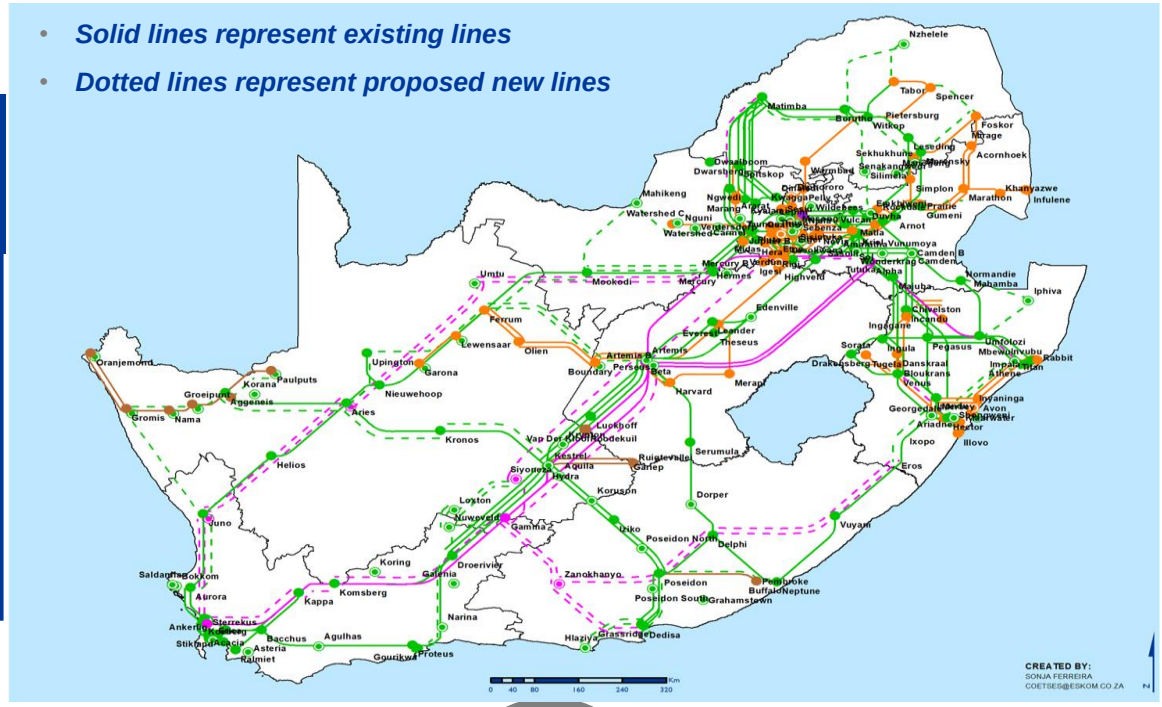
Power Lines (km)

Transmission Assets Nationally	Total New Assets: 2025 - 2029	Total New Assets: 2030 - 2034	Total New Assets: 2025 - 2034
Power lines (km)			
765 kV	767	6190	6957
400 kV	4251	3226	7477
275 kV	26	34	60
Total length (km)	5044	9450	14494

- *Solid lines represent existing lines*
- *Dotted lines represent proposed new lines*



Transformers

Transmission Assets Nationally	Total New Assets: 2025 - 2029	Total New Assets: 2030 - 2034	Total New Assets: 2025 - 2034
Transformers			
Number of Units	87	123	210
Capacity (MVA)	41325	91325	132650

Reactors

Transmission Assets Nationally	Total New Assets: 2025 - 2029	Total New Assets: 2030 - 2034	Total New Assets: 2025 - 2034
Reactors			
Number of Units	14	45	59
Capacity (MVar)	3260	13000	16260

Synchronous Condensers

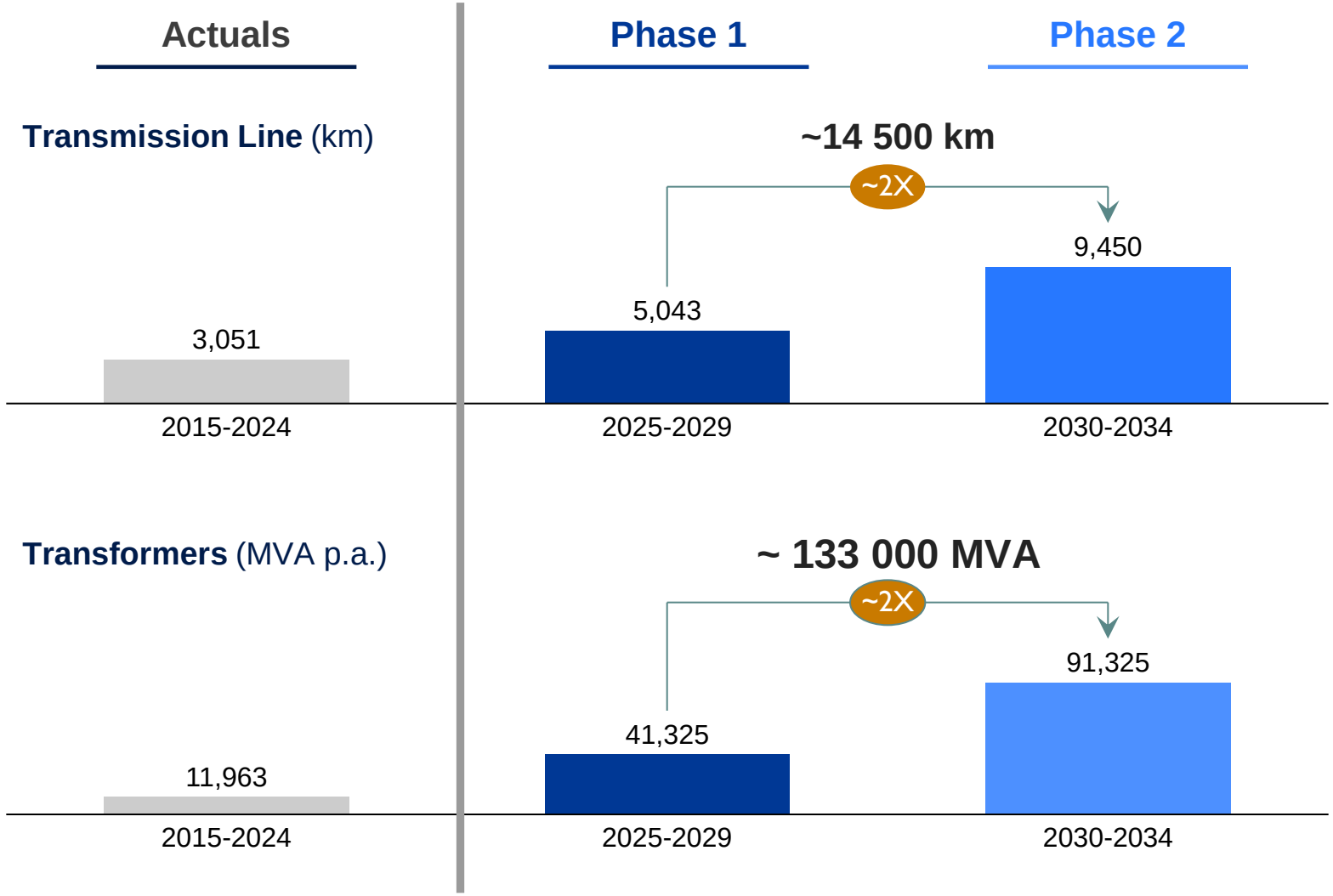
Synchronous Condensers to be to installed at 7 substations

Capacitors

Transmission Assets Nationally	Total New Assets: 2025 - 2029	Total New Assets: 2030 - 2034	Total New Assets: 2025 - 2034
Capacitors			
Number of Units	15	25	40
Capacity (MVar)	1032	1660	2692

The transmission grid is central to security of supply and advancing the just energy transition

TDP overview | NTCSA needs to deliver a step change in infrastructure rollout, with most of this occurring in Phase 2



Source: TDP 2024

Transmission Lines

- ~14 500 km of lines to be installed over 2025 to 2034
- ~5X greater than the actual installation over 2015-2024
- Phase 2 is ~ 2X larger than Phase 1

Transformers

- ~133 000 MVA required by 2034
- ~10 X greater than the actual installation over 2015-2024
- Phase 2 is ~ 2X larger than Phase 1

TDP overview | 2 phases for TDP: Phase 1 maximises existing corridors, whilst Phase 2 requires new 765 kV corridors

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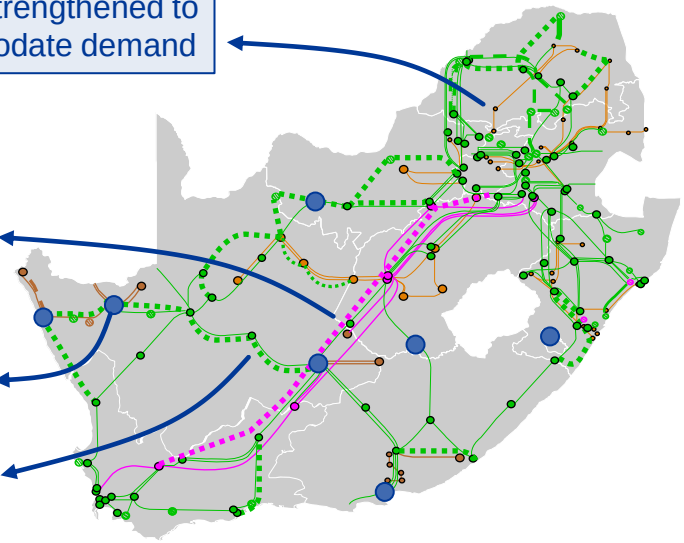
Phase 1: Maximise & augment current corridors
(2025-2029)

Interior strengthened to accommodate demand

765 kV backbone expanded to maximise evacuation to north

7 substations need synchronous condensers needed to maintain grid integrity & accommodate VRE

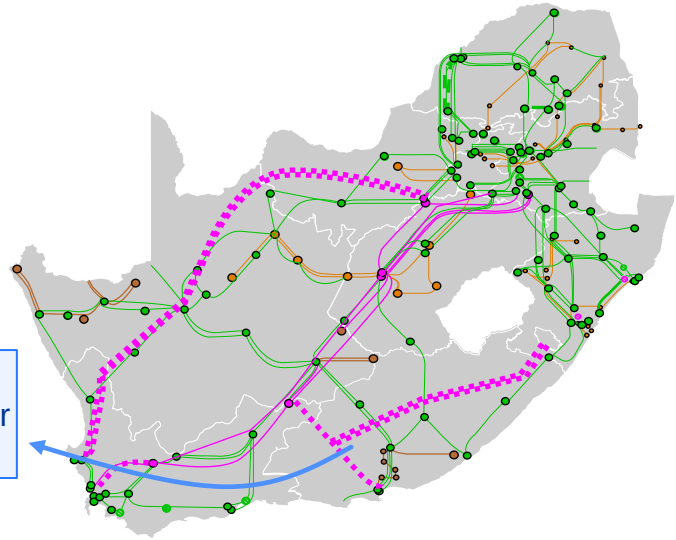
400 kV system maximized with new lines & transformers allow for evacuation via backbone



Generation: ~30 GW new connection capacity from 2024
Demand: Peak demand increases to 39 GW from 34 GW in 2024

Phase 2: Install 2x 765 kV corridors
(2030-2034)

New 765 kV backbones required to evacuate power to load centres



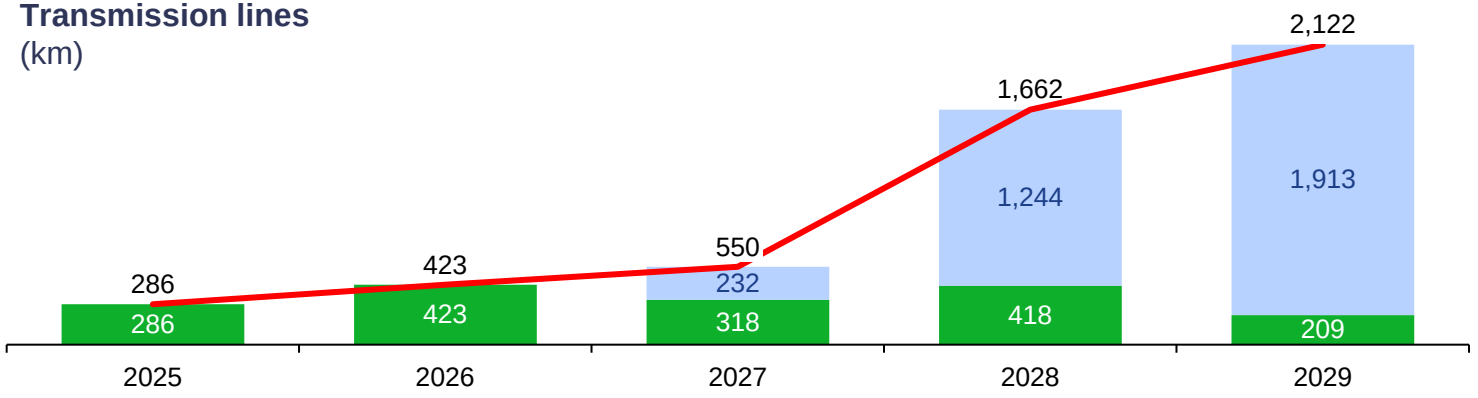
Generation: ~26 GW new connection capacity from 2029
Demand: Peak demand increases to ~43 GW in 2034

Planned Line | Existing Line | Synchronous Condenser | Voltage (kV): 220, 275, 400, 533, 765

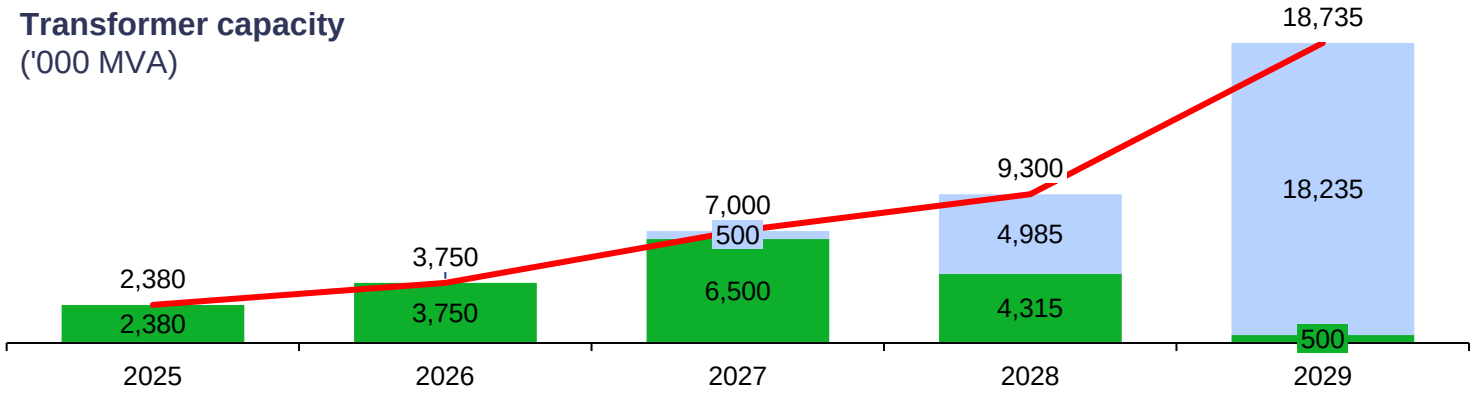
Source: TDP 2024

TDP pipeline | Projects are ready for execution through to 2029, with remaining projects in development

Transmission lines
(km)



Transformer capacity
('000 MVA)



Under Development Ready for Execution Target

Tx lines

Ready for Execution

- 15 projects (~ 1 700 km) ready for or already under execution

In development

- 29 projects (~3 300 km) under various stages of development

Transformer Capacity

Ready for Execution

- 28 projects (~17 500 MVA) ready for or already under execution

In development

- 36 projects (~24 000 MVA) under development
- Transformer projects have a shorter development cycle compared to Transmission lines

Project adds connect new generation and demand and ensure reliability

Delivery mechanisms | NTCSA is implementing through various delivery mechanisms while exploring alternate model to ensure it can deliver the TDP

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1. EPCM

- Historically NTCSA has utilised the project delivery strategy of EPCM (Engineer, Procure and Construction Management) for both expansion and refurbishment projects.
- NTCSA is responsible for, manages the full PLCM (from concept to implementation) and secures its own funding.

2. Self-Build

- NTCSA may approve a self-build methodology where a private company will build transmission infrastructure or project and possibly transfer back to NTCSA.

3. EPC / OE

- The EPC and OE strategies were adopted to supplement the internal resource capacity. A decision was taken to incorporate these strategies for TDP projects.
- Allows NTCSA to reduce the number of contracts to be managed and to further supplement TDP execution.

4. PSPs

- Private Sector Participation (PSP) emerged as potential alternative delivery mechanism.
- NTCSA investigating possible private sector participation in collaboration with Government

~60%
of the TDP physicals (MVA's and km)

~40%
of the TDP physicals (MVA's and km)

Delivery challenges | These can broadly be categorised as land- and supply chain related

Acquiring Land and servitude rights

- Landowner holdouts prevent projects from being commenced or energized; Projects are being escalated to Ministry and NECOM for increased focus

Servitude encroachment & access

- Land parcels that are secured on the route may have informal housing encroaching, creating both a safety risk and preventing project teams from accessing Tx lines
- Projects are being escalated to NECOM for increased focus

Line construction capacity

- Local industry on capable of 800 km p.a., with requirement reaching 1 600 km by 2028 already.
- Incubation program started, 2 companies already graduated
- OE panel contract has been established
- EPC Lines Engineering panel contract has been established

Large Transformers

- Local supply capacity is adequate for Class 1 & 2
- One single supplier for Class 3b. No local supplier for Class 4.
- NTCSA has pre-qualified 22 international factories, up from 8 by the beginning of 2022.
- 101 transformer panel contract Class 3b transformers
- Initiated development of new enabling agreement that has not yet been issued – to cater for all transformer classes.

Steel

- The country has one supplier of fabricated structural steel
- RFI issued to the market for structural steel for powerlines to determine the capability and capacity of the local industry.
- 6 Steel suppliers invited to prepare prototype towers
  - 2 suppliers completed the prototype in Oct 2024
  - 4 suppliers planned final prototypes inspection is Dec 2024

Concluding Remarks

- The key drivers for new transmission infrastructure are associated with:
  - An increase in **new generation capacity** mainly in areas with limited grid thereby requiring substantial grid expansions to transport the power to load centres across the country
  - Ensuring the **reliability** of the interconnected power system
  - **Sustaining** the existing transmission asset base to meet the current and future demand growth
- The TDP highlights the requirement of ~14,500 km of additional transmission lines (5,000 km by 2029) and ~133 000MVA transformer capacity (~41 000 MVA by 2029) by 2034, as well as several refurbishment projects.
- Corporate Plan had made provision for R112 billion (revision in progress) for the first 5-year period of the TDP up to 2029. Delivery will be dependent on revenue/tariff application through NERSA, mobilization of capital, contractors, suppliers and skilled workers and professionals.
- Maintaining **system security** and **stability**, due to large scale renewable energy integration, will increasingly become a challenge into the future and is being addressed by the introduction of synchronous condensers at strategic locations on the transmission grid
- Several **challenges** to delivering on the TDP 2024 have been identified and actions are already in progress to address them (along with initiatives to alleviate grid constraints in the short term)
- The implementation of the TDP 2024 is critical to the security of energy supply, advancing the just energy transition and economic growth

Thank you