Transmission
10 Year Development Plan
2015 – 2024

Public Forum

Welcome!

The Eskom Transmission 10 Year Development Plan: 2015 – 2024

(TDP 2014)

Public Forum
10 October 2014

Overview and Purpose

The Objective of the TDP Public Forum is to:

- Contextualise the planning timelines relating to the demand forecast and generation patterns
- Share assumptions and results from the Transmission Development Plan 2015 ï 2024
- Share information and results relating to the integration of RE as per the DOE IPP programs
- Share information on the estimated Transmission Capital Investment Requirements for period 2015 ï 2024
- To solicit comments and inputs from stakeholders on the Transmission Plans

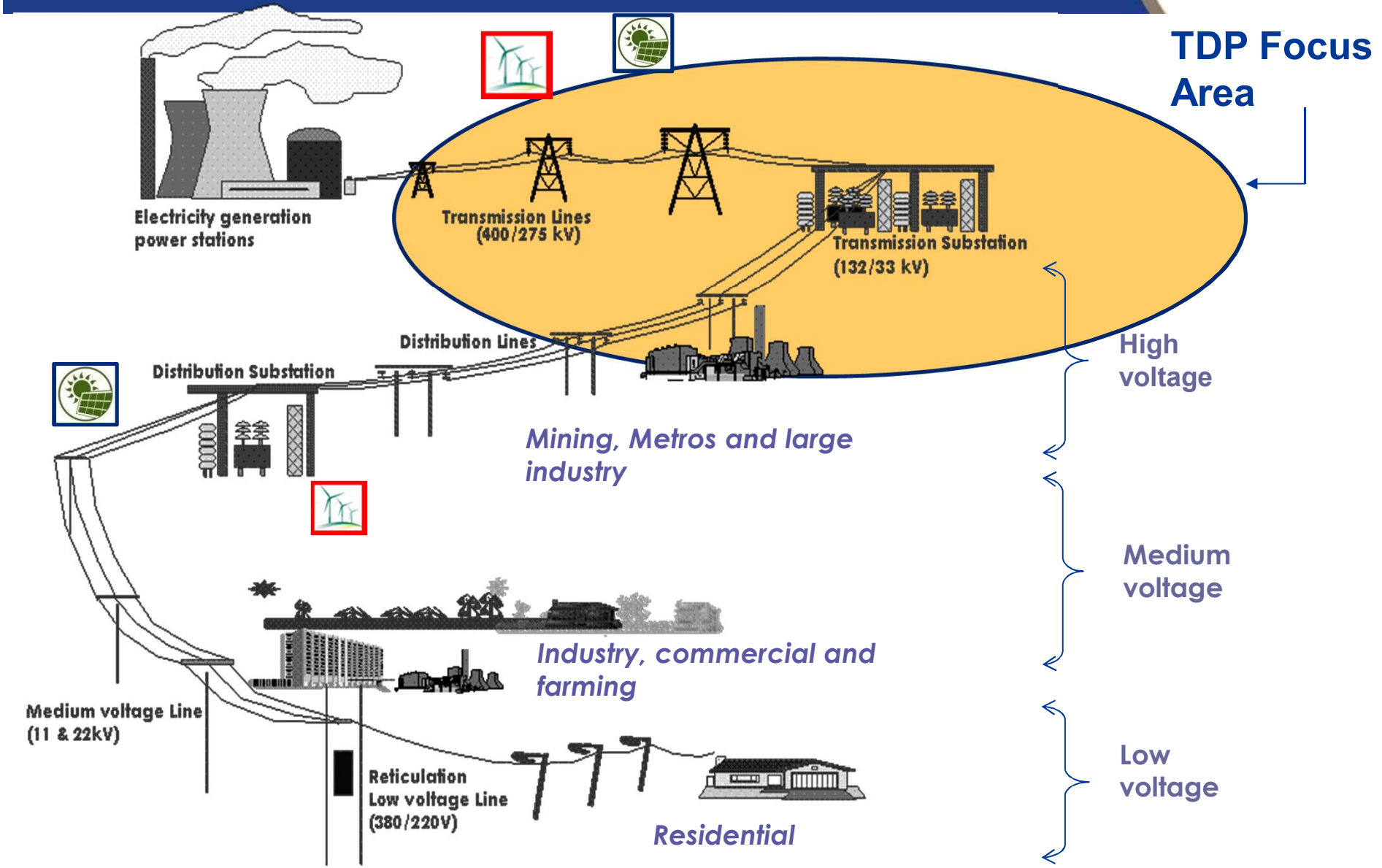
Basis of the TDP 2014:

The TDP 2014 was formulated to address the following:

- Attain N-1 Grid Code reliability compliance by resolving both substation and line violations
- Determine new network infrastructure requirements to sustain and allow for future demand growth
- Determine new network infrastructure requirements to integrate new generation (Eskom and IPPs)

Planning for the South African Integrated Power System

Electricity Value Chain



The Different Plans

Integrated Resource Plan

- The Department of Energy (Energy Planner) is accountable for the Country Electricity Plan, which is called the Integrated Resource Plan For Electricity (IRP 2010-2030).
- The Integrated Resource Plan (IRP) is intended to drive all new generation capacity development.
- NERSA licences new generators according to this determination.

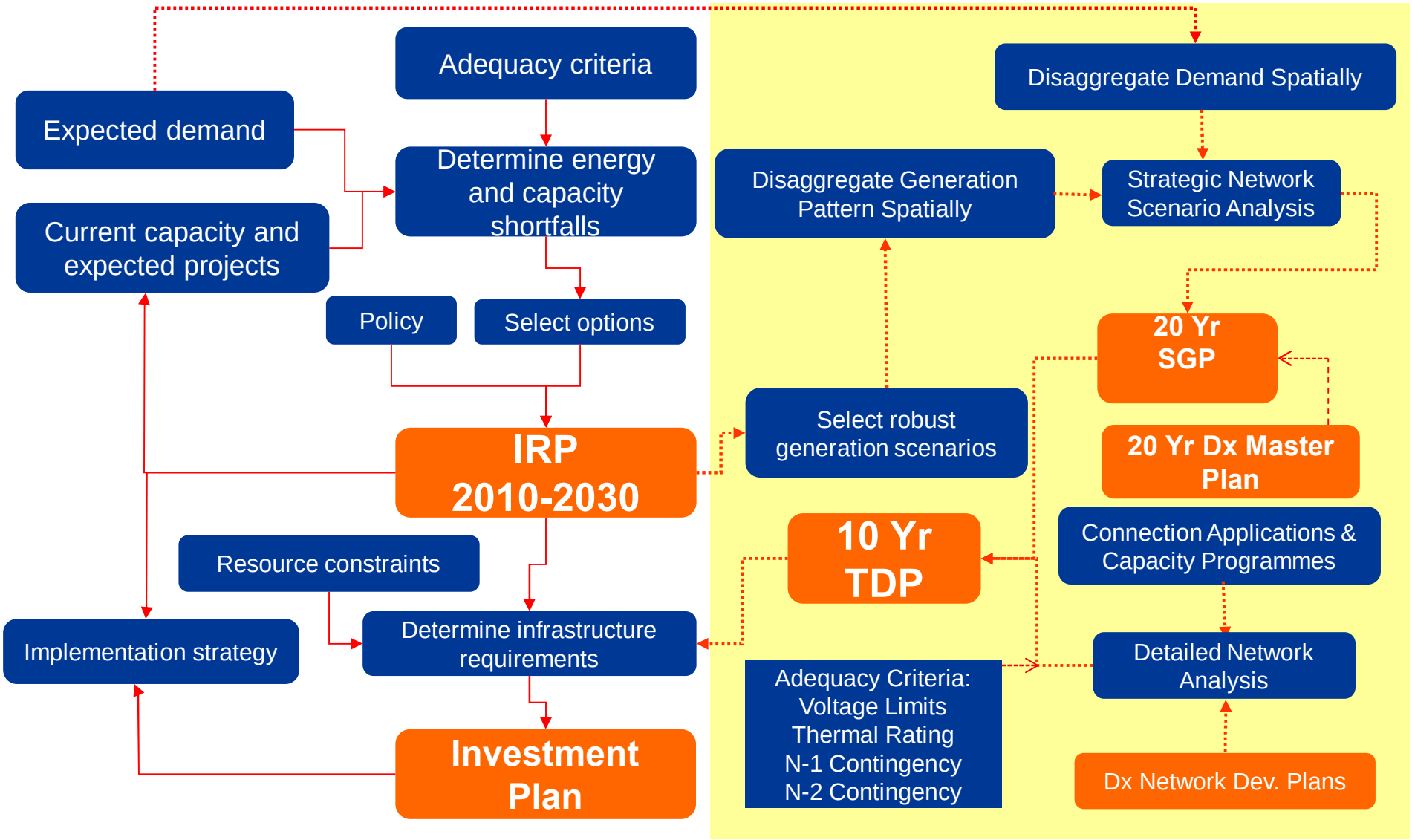
Strategic Grid Plan

- The Strategic Grid Plan formulates long term strategic transmission corridor requirements
- The Plan is based on a range of generation scenarios, and associated strategic network analysis
- Horizon date is 20 years
- Updated every 2 - 3 years

Transmission Development Plan

- The Transmission Development Plan (TDP) represents the transmission network infrastructure investment requirements
- The TDP covers a 10 year window
- Updated annually
- Indicates financial commitments required in the short to medium term

Linkages between the various plans



Transmission Development Plan

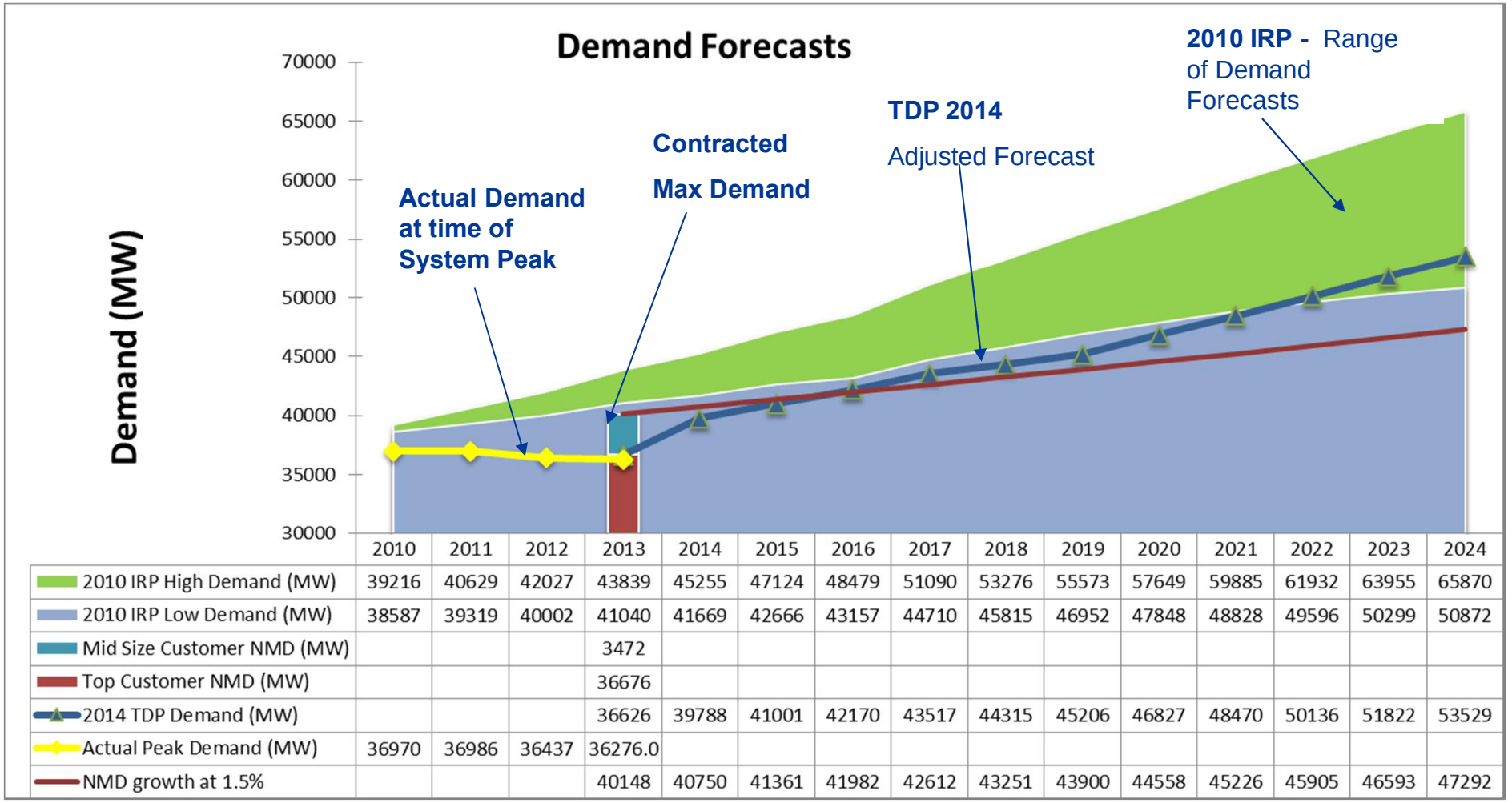
TDP 2015 – 2024

Overview

Transmission System Planning

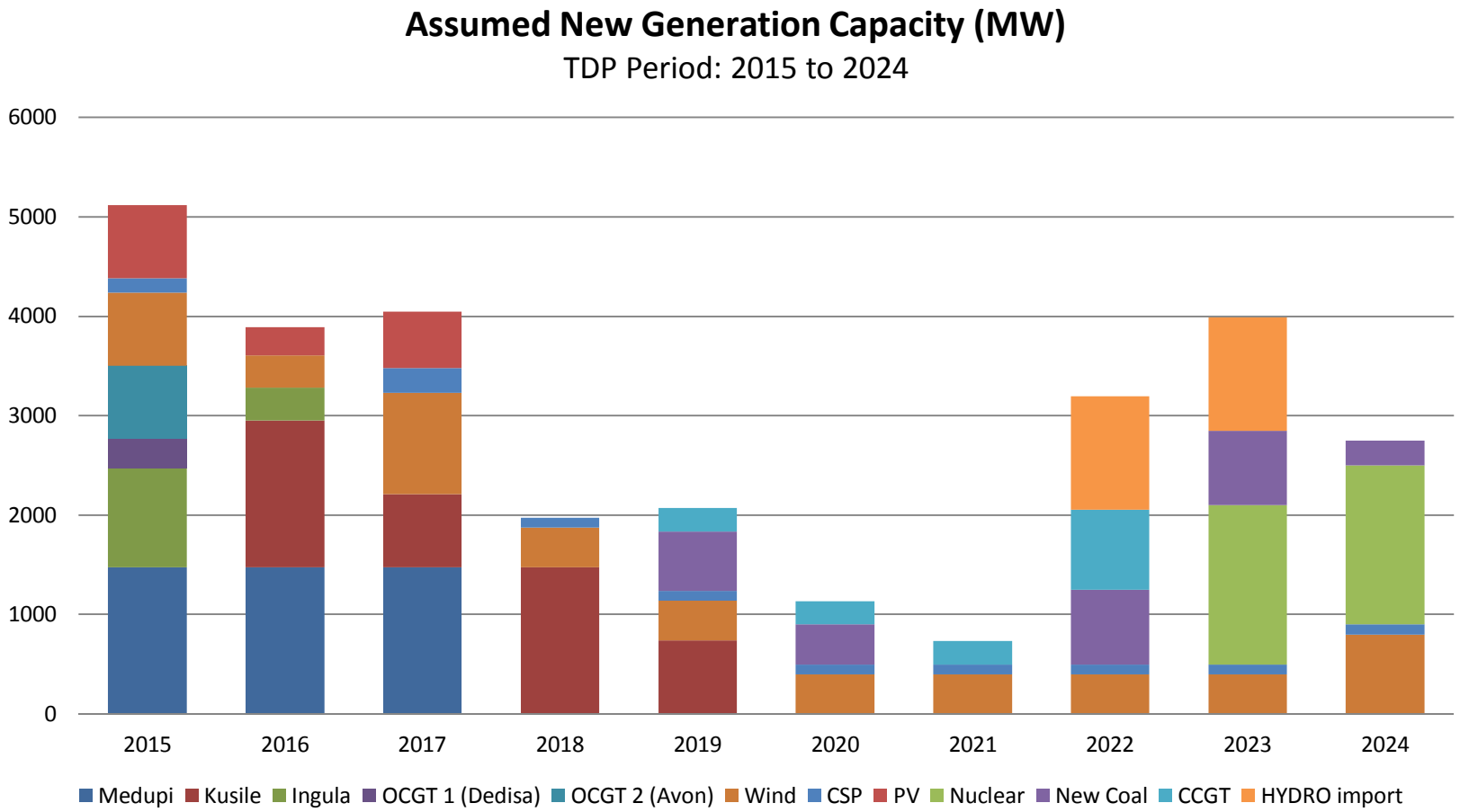
- **The purpose of the transmission system is to optimally and reliably transport the power from the source of generation to the location of the load**
- **Role of Transmission System Planner (TSP) is in accordance with the Eskom Transmission License issued by NERSA. The TSP is required to conduct the following activities for the *electricity supply industry***
  - To plan and augment the Transmission System
  - Planning and augmentation to be in accordance with the Grid Code
  - Customer connections to take place subject to a connection agreement
  - Compliance monitoring is part of Eskom Transmission license
- **Network Code of SAGC specifies the following for transmission planning**
  - ***Technical criteria***
    - Voltage & thermal limits, reliability criteria, generation integration, etc.
    - Generator connection conditions (Protection, Islanding, Governing , Black Start ,etc)
    - Connection conditions for generators, distributors and end-use customers (Protection, Power Factor, Fault Levels, etc)
  - ***Planning Process***
  - ***Investment Criteria***

Assumed Transmission Capacity Forecast and Comparisons



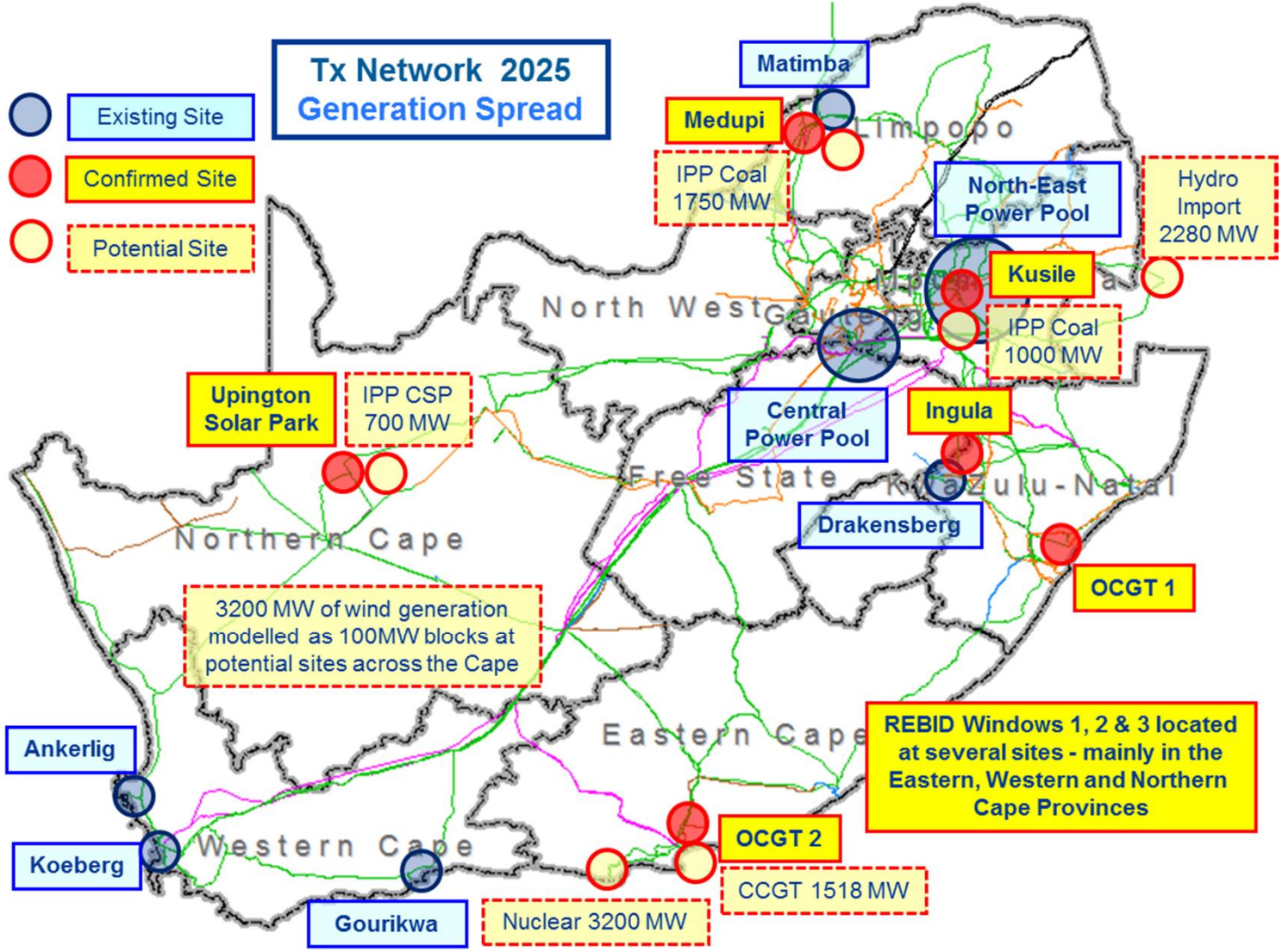
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
2010 IRP High Demand (MW)	39216	40629	42027	43839	45255	47124	48479	51090	53276	55573	57649	59885	61932	63955	65870
2010 IRP Low Demand (MW)	38587	39319	40002	41040	41669	42666	43157	44710	45815	46952	47848	48828	49596	50299	50872
Mid Size Customer NMD (MW)				3472											
Top Customer NMD (MW)				36676											
2014 TDP Demand (MW)				36626	39788	41001	42170	43517	44315	45206	46827	48470	50136	51822	53529
Actual Peak Demand (MW)	36970	36986	36437	36276.0											
NMD growth at 1.5%				40148	40750	41361	41982	42612	43251	43900	44558	45226	45905	46593	47292

Assumed Generation Capacity Plan



- **Assumptions above are based on the 2010 IRP with the following changes from the 2012 TDP:**
  - Medupi & Kusile rollout periods changed. Medupi from 2015. First unit of Kusile from 2016
  - Ingula will now be completed between 2015 and 2016
  - Co-Generation reduced from 3 x 200MW to 2 x 200MW units
  - Additional Coal (IPPs) added.

Assumed Generation Pattern



To date, a large amount of construction work has been completed, adding ~6,137 MW, ~5,524.3 km of transmission network, and ~24,565 MVA sub-stations . . .

Eskom

Megawatts

MW of capacity

0, 290, 1,351, 1,043, 1,770, 452, 315, 535, 261, 120, 0

Sere Windfarm (100MW)
Ingula Unit 3 (333 MW)

YE Target: 433 MW

6,137

Transmission

Km line

Historic performance

659, 237, 430, 480, 418.30, 600.30, 443.40, 631.3, 787, 811, 27

YE Target: 315 km

5,524.3

Substations

Transformer Capacity - MVAs

5,280, 1,090, 1,000, 1,355, 1,375, 1,630, 5,940, 2,525, 3,580, 3,790, 0

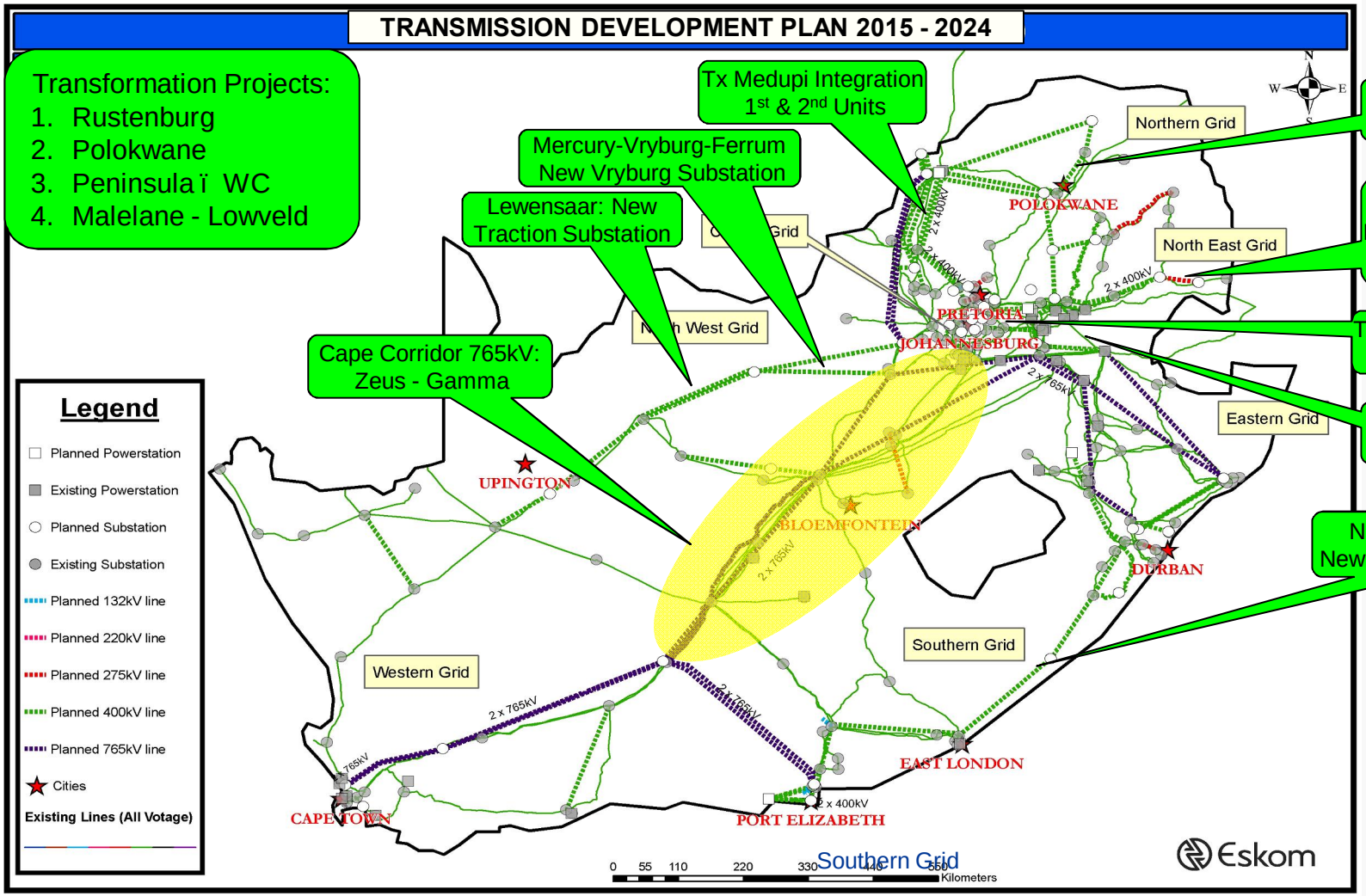
Kusile HV Yard (90 MVA)
Sterrekus (2,000 MVA)

YE Target: 2,090 MVA

27,565

FY 2004/5 | **FY 2005/6** | **FY 2006/7** | **FY 2007/8** | **FY 2008/9** | **FY 2009/10** | **FY 2010/11** | **FY 2011/12** | **FY 2012/13** | **FY 2013/14** | **FY 2014/15** | **Total**

Major Projects Completed Recently:

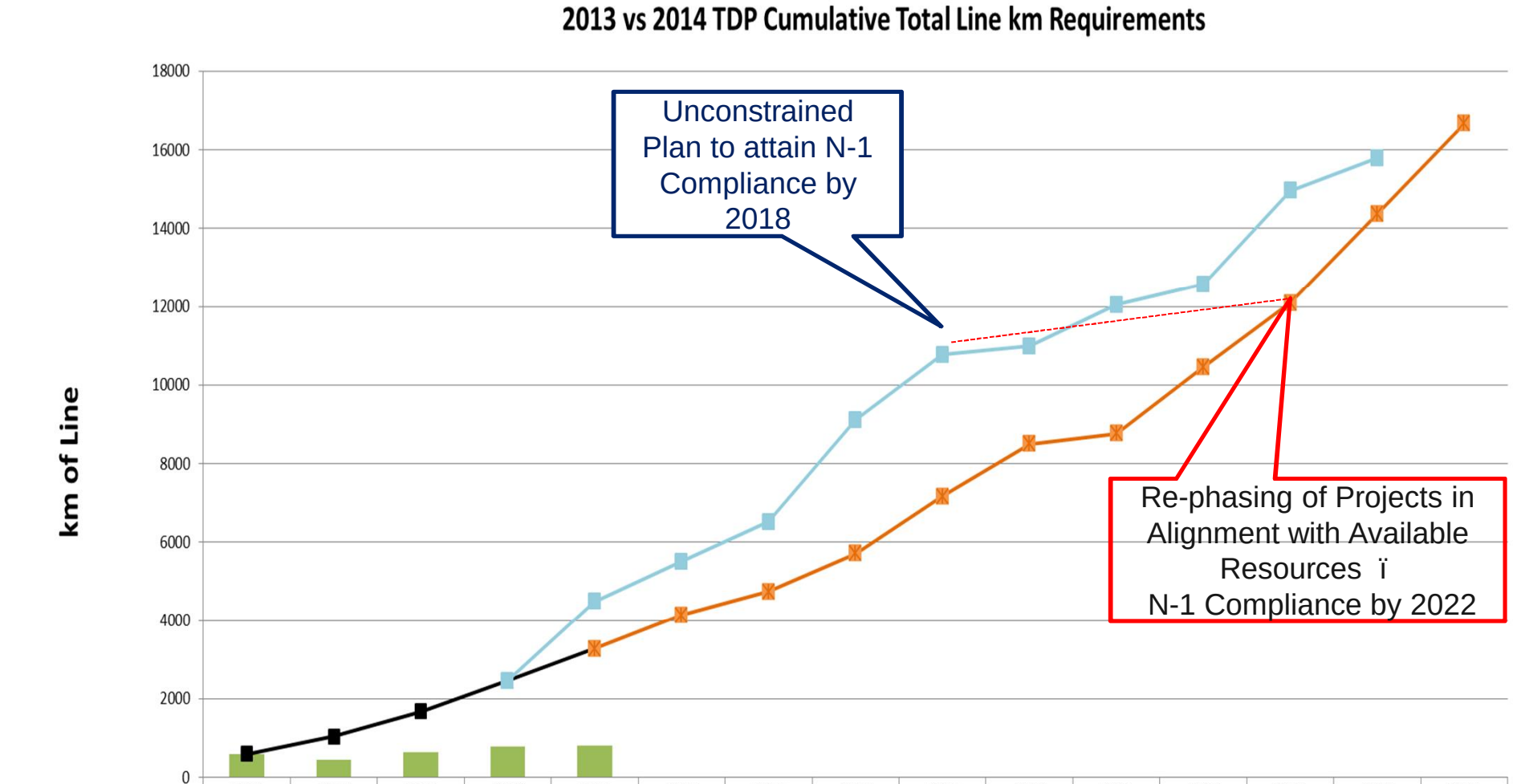


Summary of Transmission Infrastructure Requirements over the TDP Period: 2015 - 2024

Transmission Assets	New Assets expected in 2015 - 2019	New Assets expected in 2020 - 2024	Total New Assets
Total kms of lines	**5235**	**8161**	**13396**
HVDC lines (km)	0	0	**0**
765kV line (km)	760	3180	**3940**
400kV lines (km)	4315	4782	**9097**
275kV lines (km)	160	199	**359**
Total Transformer MVA	**29490**	**51895**	**81385**
Transformers (no)	72	109	**181**
Capacitors (no)	20	12	**32**
Reactors (no)	17	14	**31**

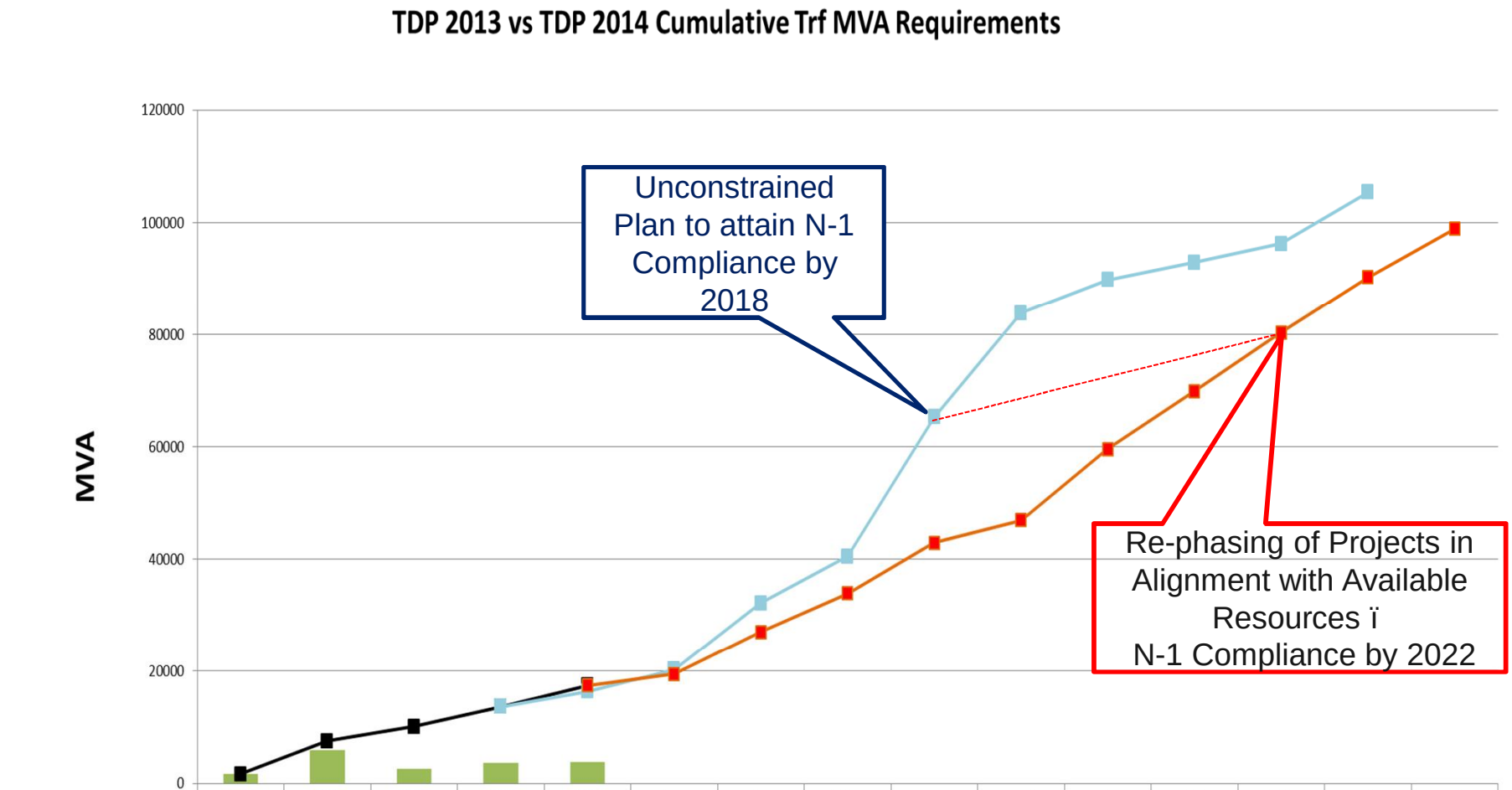
- **The km of Transmission Lines required compared to the previous TDP is stable**
- **The net amount of Transformation MVA (83600 vs 81400 MVA) is also stable taking into account that 3790 MVA was installed last year**

2013 VS 2014 TDP Cumulative Line Requirements
Impacts of Re-Phasing / Re-Prioritisation



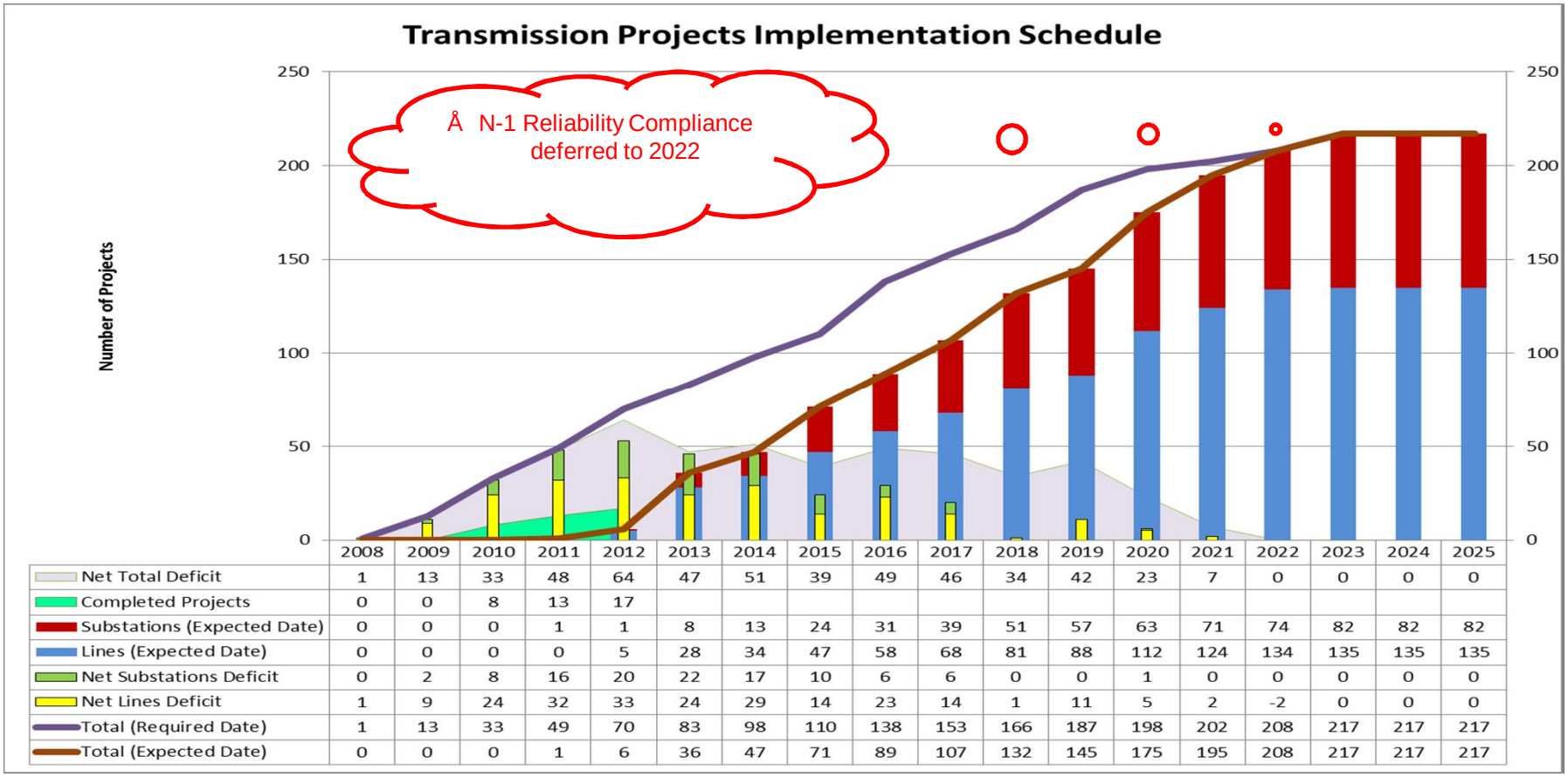
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Actual built	600	443	631	787	811										
Actual Built Acccumulated	600	1043	1674	2461	3272										
2013 TDP				2461	4492	5516	6523	9119	10777	10982	12042	12578	14957	15792	
2014 TDP					3272	4140	4746	5718	7165	8507	8760	10458	12094	14375	16668

2013 VS 2014 Cumulative Transformer Requirements
Impacts of Re-Phasing / Re-Prioritisation



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Actual Installed	1630	5940	2525	3580	3790										
Actual Installed Cumulated	1630	7570	10095	13675	17465										
2013 TDP				13675	16425	20295	32170	40545	65235	83785	89785	92910	96225	105390	
2014 TDP					17465	19485	27065	33920	42955	46955	59575	69875	80290	90235	98850

N-1 Compliance Outlook with the Reprioritised Plan



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Net Total Deficit	1	13	33	48	64	47	51	39	49	46	34	42	23	7	0	0	0	0
Completed Projects	0	0	8	13	17													
Substations (Expected Date)	0	0	0	1	1	8	13	24	31	39	51	57	63	71	74	82	82	82
Lines (Expected Date)	0	0	0	0	5	28	34	47	58	68	81	88	112	124	134	135	135	135
Net Substations Deficit	0	2	8	16	20	22	17	10	6	6	0	0	1	0	0	0	0	0
Net Lines Deficit	1	9	24	32	33	24	29	14	23	14	1	11	5	2	-2	0	0	0
Total (Required Date)	1	13	33	49	70	83	98	110	138	153	166	187	198	202	208	217	217	217
Total (Expected Date)	0	0	0	1	6	36	47	71	89	107	132	145	175	195	208	217	217	217

Compliance Yr based on unconstrained capex budget

Compliance Yr based on reprioritised and rephrased plan

Note. **The 2022 date is based on the assumption that CAPEX constrains will be resolved in the short term**

Summary: Re-Phasing & Re-Prioritisation

How do you decide which project to execute and which to defer ?

- Projects in execution to continue as per plan

- Re-evaluate all projects in the portfolio in terms of readiness:
  - Servitudes acquired
  - Detail designs concluded
  - Interdependencies eg. Customer Connections (ensure alignment of plans)
  - Constructability / executability challenges
  - Valid business case

- Evaluate projects against criticality ï Reliability , Customer Connections, Safety , Statutory

- Value adding benefits: power transfer improvements, economic impacts etc.

- ñBang for buckò

Planning for the South African Renewable Energy IPP Integration

IRP capacities need to be allocated to market players – so far clear focus on allocating the RE capacities

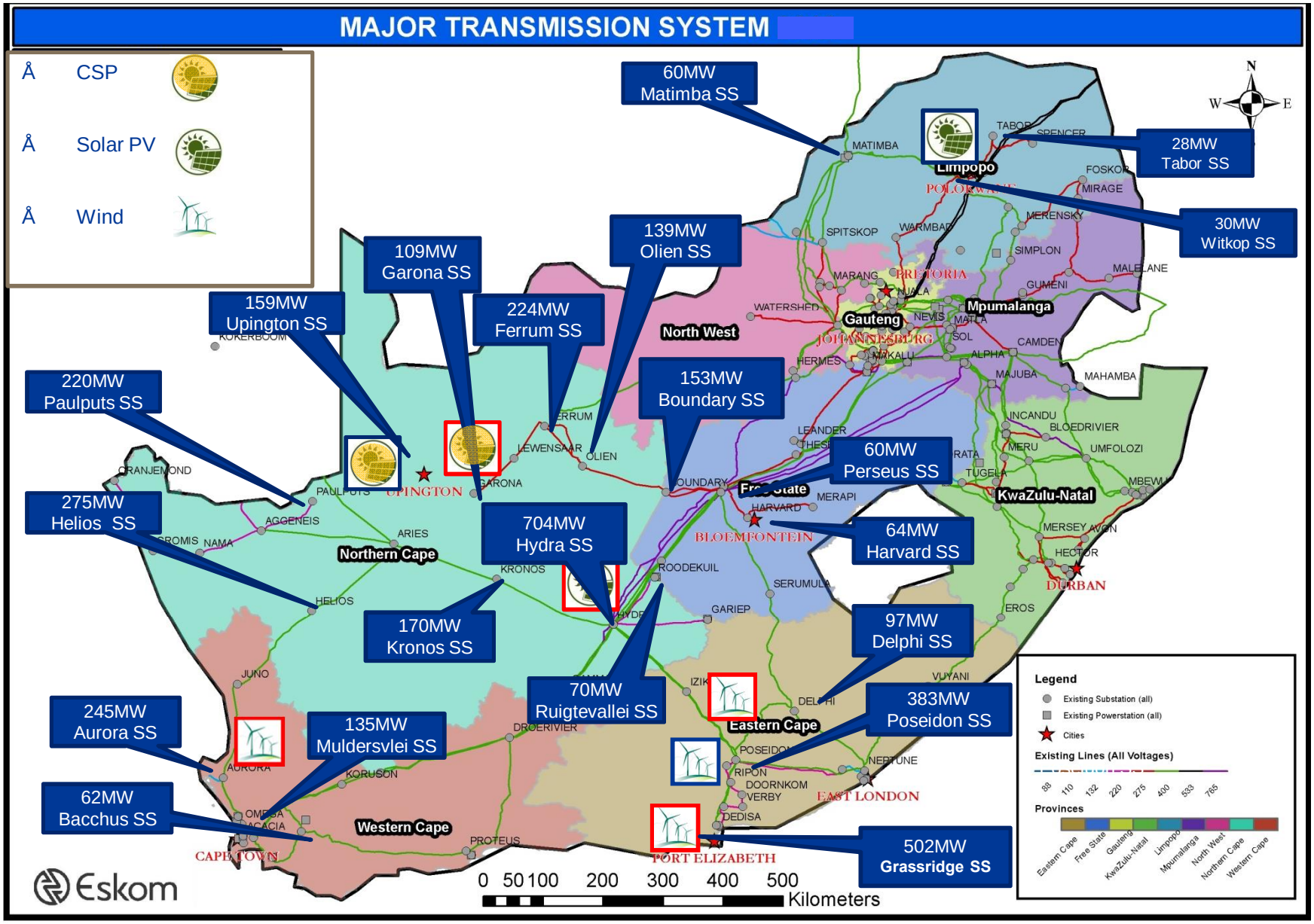
	New build options							
	Coal (PF, FBC, imports, own build)	Nuclear	Import hydro	Gas – CCGT	Peak – OCGT	Wind	CSP	Solar PV
	MW	MW	MW	MW	MW	MW	MW	MW
2010	0	0	0	0	0	0	0	0
2011	0	0	0	0	0	0	0	0
2012	0	0	0	0	0	0	0	300
2013	0	0	0	0	0	0	0	300
2014	500[1]	0	0	0	0	400	0	300
2015	500[1]	0	0	0	0	400	0	300
2016	0	0	0	0	0	400	100	300
2017	0	0	0	0	0	400	100	300
2018	0	0	0	0	0	400[4]	100[4]	[illegible]
2019	250	0	0	237[3]	0	400[4]	[illegible]	300[4]
2020	250	0	0	237[3]	0	[illegible]	100	300
2021	250	0	0	237[3]	0	400	100	300
2022	250	0	1 143[2]		805	400	100	300
2023	250	1 600	1 183[2]	0	805	400	100	300
2024	250	1 600	283[2]	0	0	800	100	300
2025	250	1 600	0	0	805	1 600	100	1 000
2026				0	0	400	0	500
2027	250	0	0	0	0	1 600	0	500
2028	1 000			474	690	0	0	500
2029	250	1 600	0	237	805	0	0	1 000
2030	1 000	0	0	948	0	0	0	1 000
Total	6 250	9 600	2 609	2 370	3 910	8 400	1 000	8 400

Firm commitment necessary now

Final commitment in IRP 2012

1. Built, owned & operated by IPPs 2. Commitment necessary due to required high-voltage infrastructure, which has long lead time 3. Commitment necessary due to required gas infrastructure, which has long lead time 4. Possibly required grid upgrade has long lead time and thus makes commitment to power capacity necessary

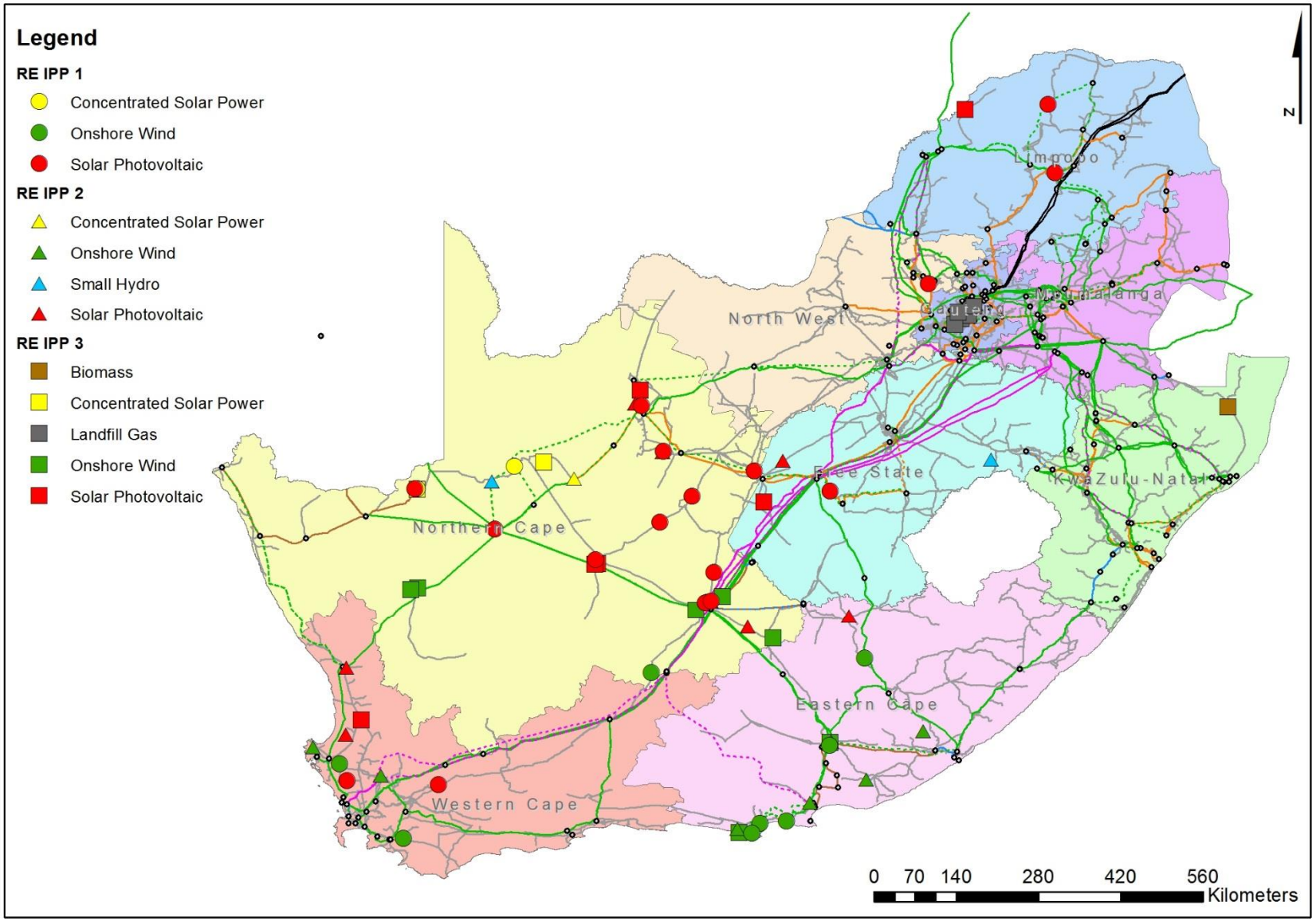
Transmission Connection Requirements:
DoE RE Program 1 - 3 (Successful Bidders)



Department of Energy RE IPP Programme

Description	RE IPP 1	RE IPP 2	RE IPP 3	RE IPP 4
Cost Estimate Letters	~270	>190	~500	~220
DoE Applications	54	79	93<97	~81
Preferred Bidders (Nr)	28	19	21	N/A
DOE MW allocated	1436	1054	1475	N/A
Eskom connected Bidders (Nr)	27	16	19	N/A
Eskom connected MW	1431	884	1456	N/A
IPPs connected to date	26	7	0	N/A
IPP MW connected to date	1337	333	0	N/A

Transmission Network Requirements for RE-IPPs 1,2&3



REBID Programme Success

Enabling factors

- Available network capacity
- Diversification
- Large RE interest

Stakeholder

- Cooperation between DOE/DEA/Eskom/NERSA and RE association/developers
- Public communication of network capacity (GCCA) i.e. GCCA 2012 and GCCA 2016
- Development of generation application process

Continuous improvement

- Feedback and learnings
- Adapting processes and policies (Self Build)

Background

Risks to Grid Access

- Servitude and EIA restrictions .
- Limited spare capacity on networks after REBID 1, 2 and 3.
- Quotations are issued on an individual basis.
- Misaligned project development durations:
  - Long Tx lines: 6 - 8 years
  - Distributed IPP plants: 2 - 5 years

Mitigation

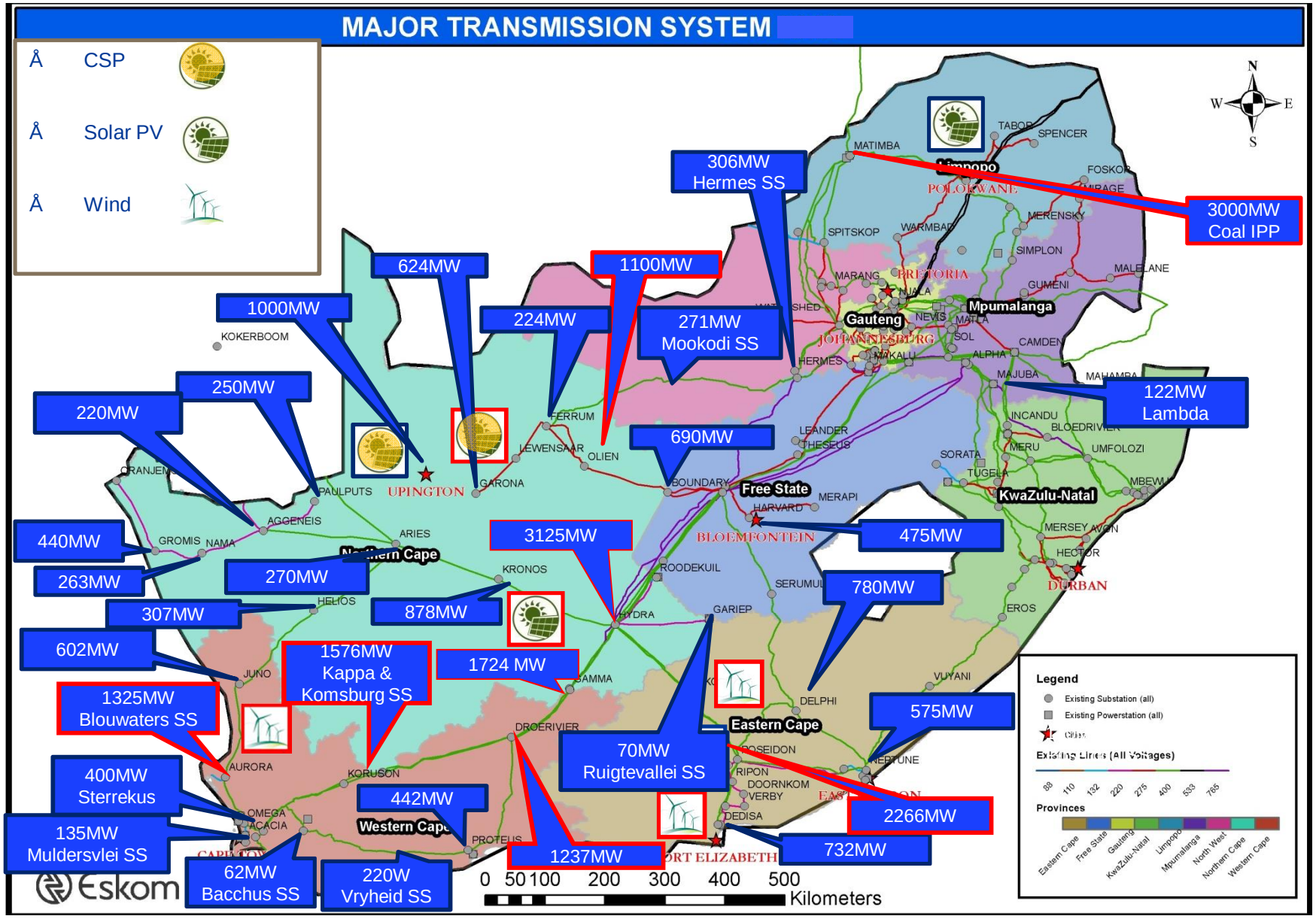
- Strategically Enable RE ñCollection Zonesòwith new transmission infrastructure.

Assumption for Strategic IPP Study

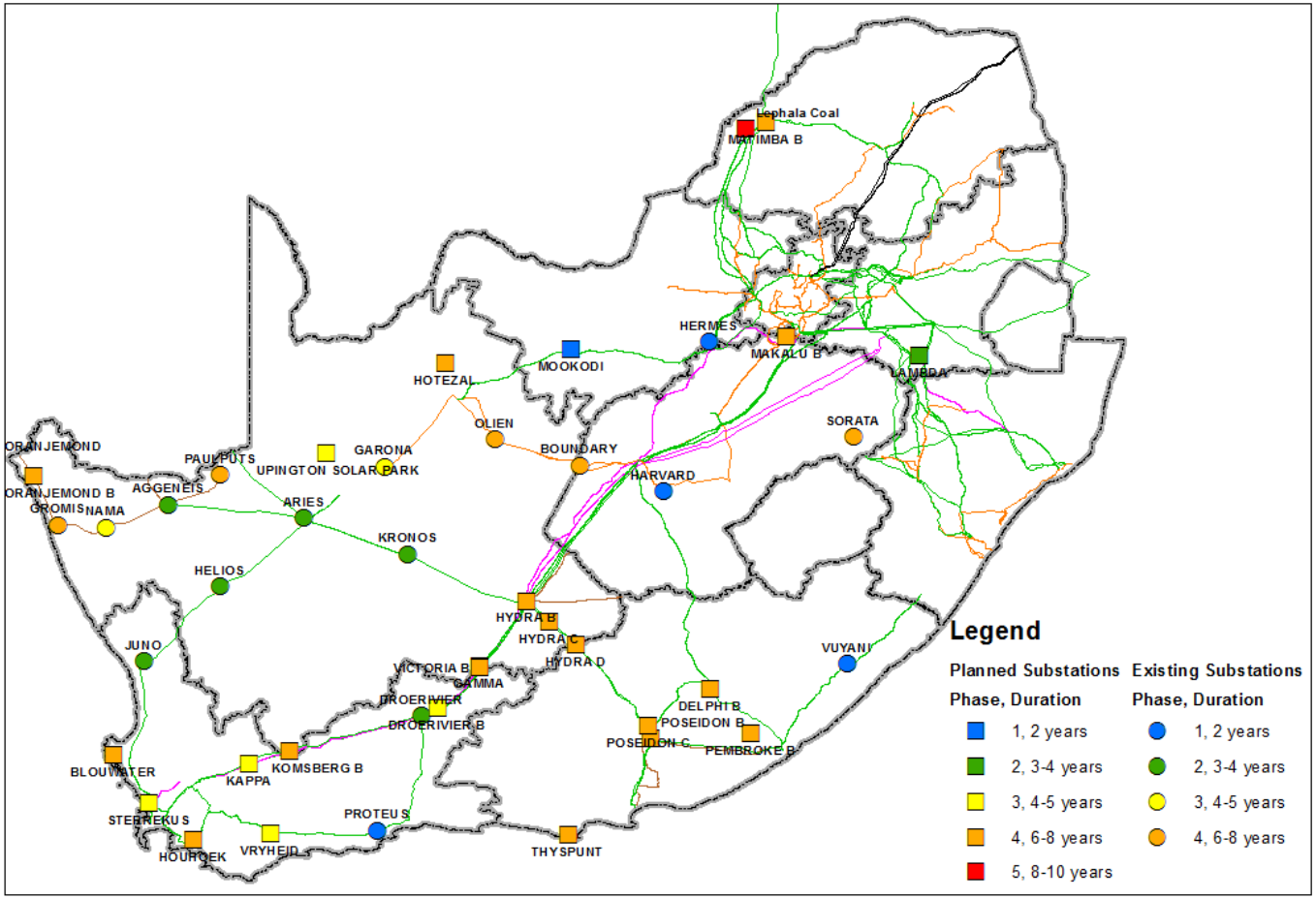
Applications Received by the GAU till Dec 2012 together with information received by the IPPs.

Operating Unit	IPP Quantity	Generation Capacity (MW)
Gauteng	29	1,145
Limpopo	33	1,388
North West	49	1,892
Kwazulu-Natal	33	833
Free State	34	1,340
Northern Cape	201	12,741
Eastern Cape	57	4,998
Western Cape	103	8,025
Mpumalanga	28	3,779
TOTAL	567	**36,141**

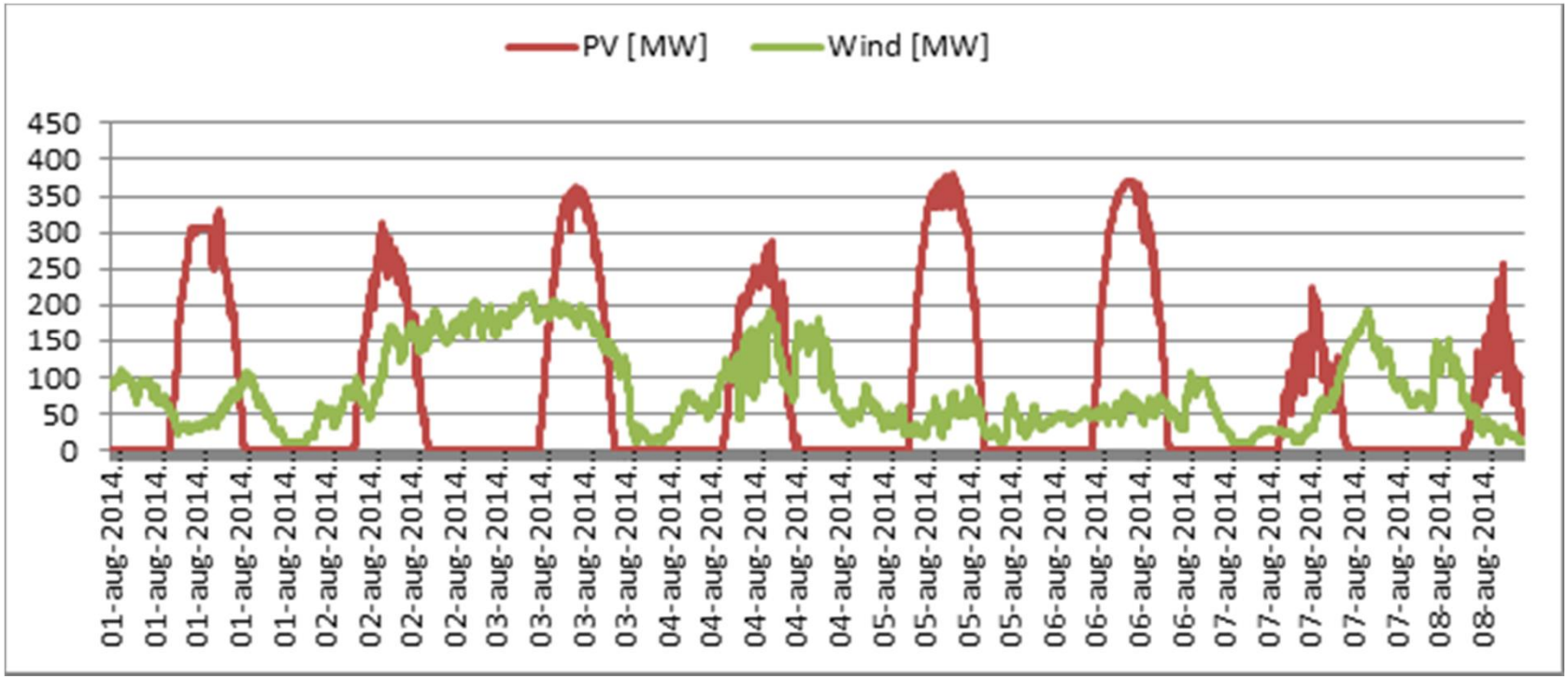
Transmission Connection Requirements for all applications



Geo-spatial study results

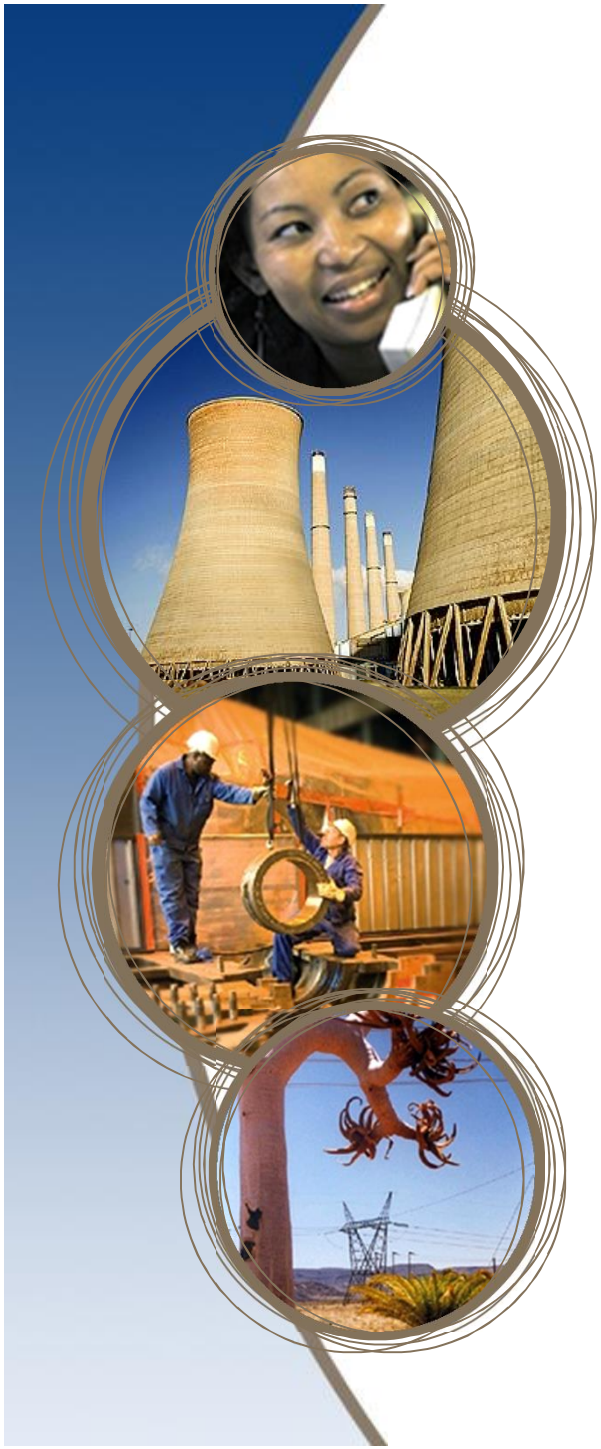


Typical Wind & Solar Production Profile



Summary: Transmission RE Integration

- Integration of the DOE RE BIDs 1 and 2 are in execution and in most cases are on track
- Integration of the DOE RE Bid 3 is accommodated within the allocated Transmission budget and is awaiting acceptance of Budget Quotes from the preferred bidders before execution
- Integration of potential IPPs, beyond Bid window 3, that require ñdeepò strengthening are at risk due to lack of Capex in the Transmission plan in the MYPD3 allocation ï (discussions are currently underway with the DOE, National Treasury & NERSA to consider other ñfunding modelsò for the next rounds of the DOE RE IPP program)



Transmission

Provincial Development Plans

2015 - 2024

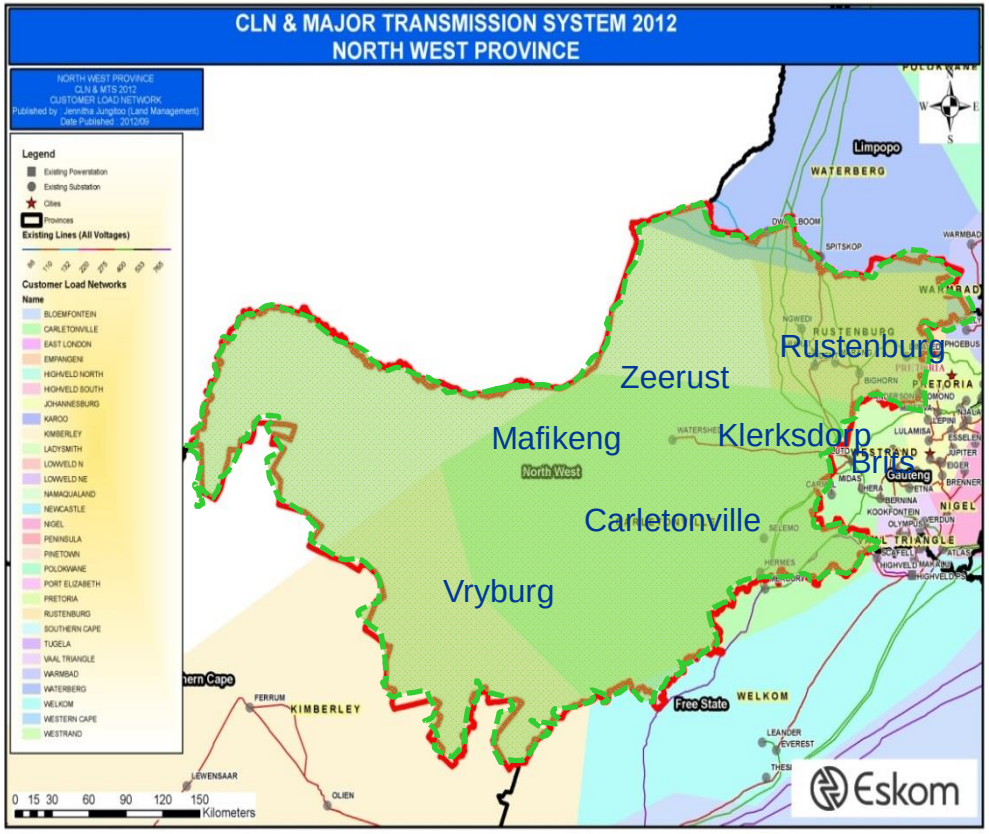
NORTH WEST PROVINCE

TDP 2015 - 2024

By: Queen Melato

Powering your world

North West Province Profile



Generation:

- Matimba Power Station in Limpopo
- Medupi Power Station

Economic activity:

- Mining (30%), Industrial (30%), Re-distributors (10%),
- Commercial (5%), Agricultural (5%) & Residential (20%)

Load drivers (Rustenburg CLN):

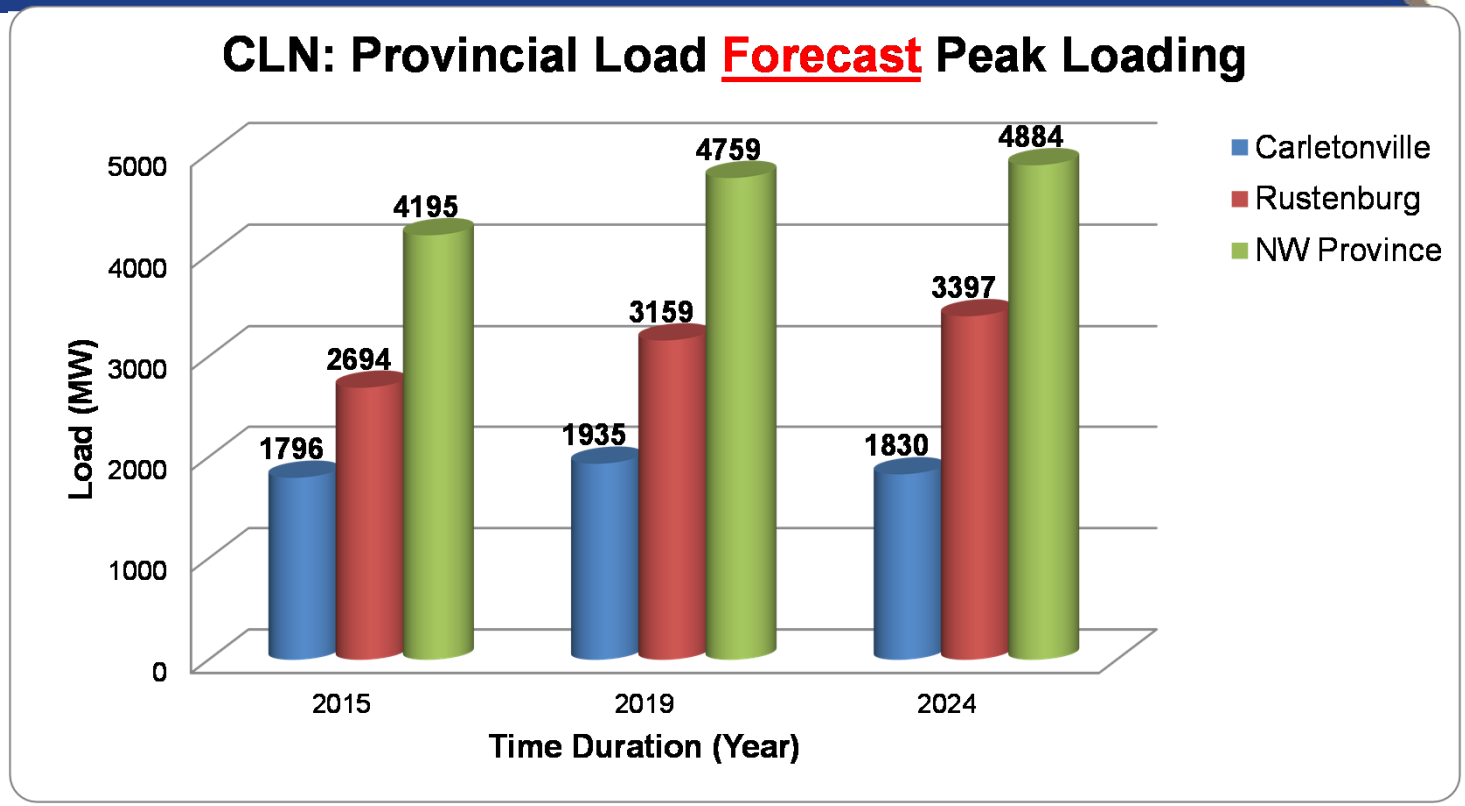
- Platinum mining and smelting operations
- Home to the largest platinum refinery; and two largest platinum mines
- The 4th largest integrated ferrochrome producer is based in the North West Province

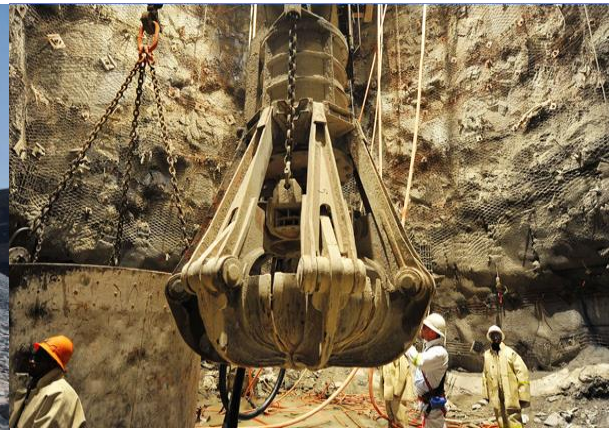
Load drivers (Carletonville CLN):

- Supplies predominantly gold mines
- Richest gold-producing hub




Electricity Demand Forecast



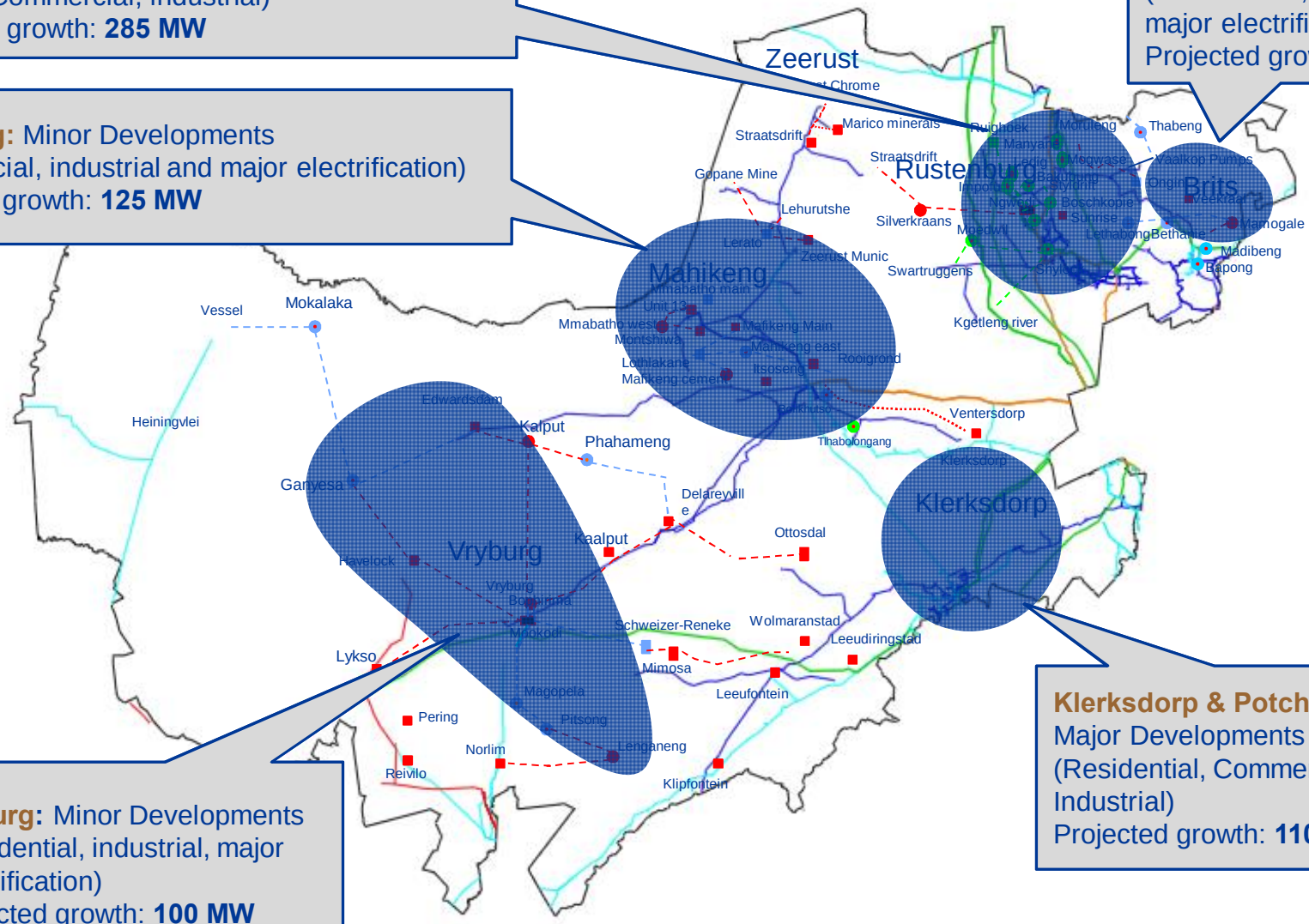


Key Distribution Infrastructure

Rustenburg: Major Developments
(Mining, Commercial, industrial)
Projected growth: **285 MW**

Brits: Minor Developments
(Commercial, industrial and major electrification)
Projected growth : **60 MW**

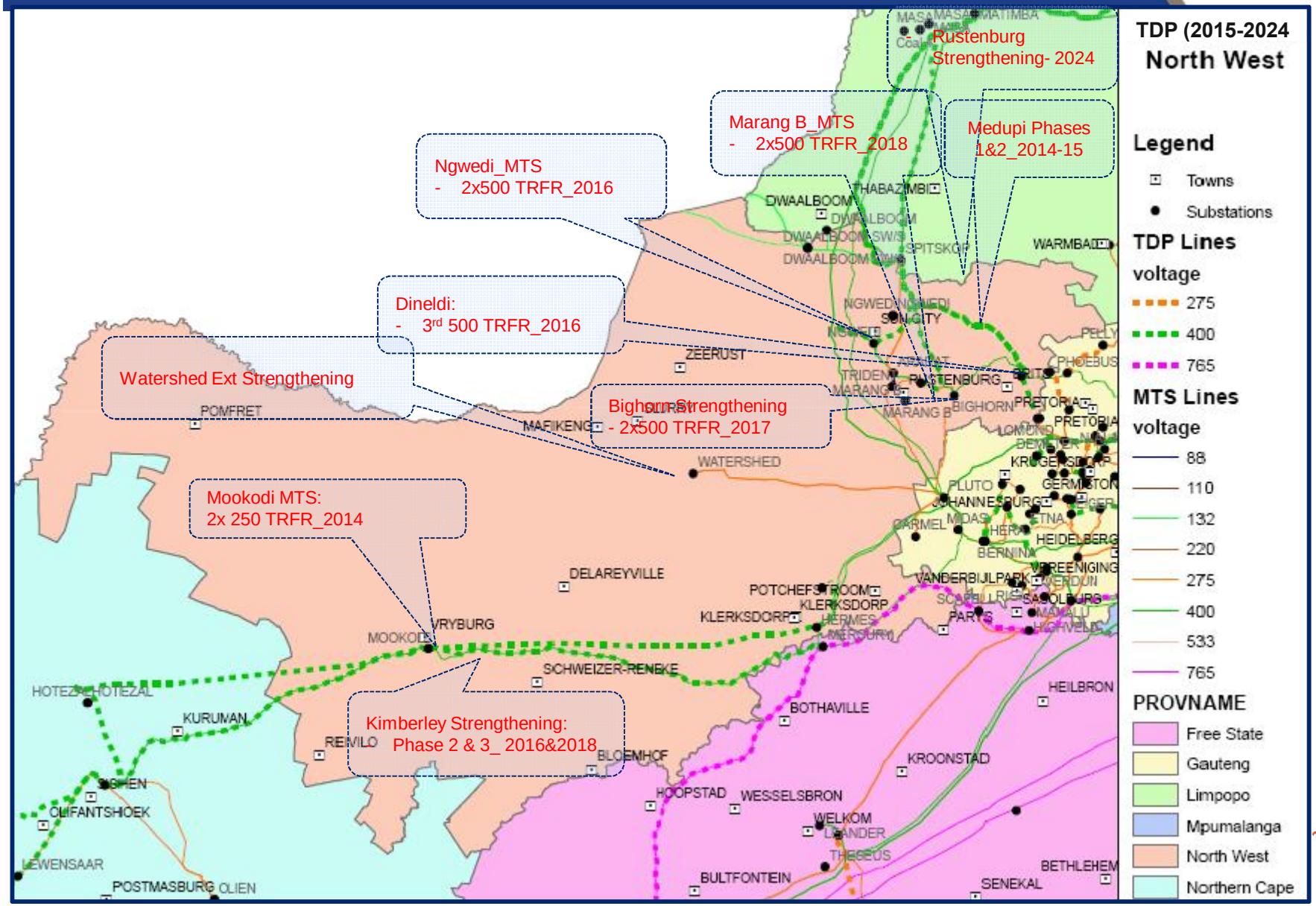
Mahikeng: Minor Developments
(Commercial, industrial and major electrification)
Projected growth: **125 MW**



Vryburg: Minor Developments
(Residential, industrial, major electrification)
Projected growth: **100 MW**

Klerksdorp & Potchefstroom:
Major Developments
(Residential, Commercial, Industrial)
Projected growth: **110 MW**

Provincial TDP Overview



Thank you

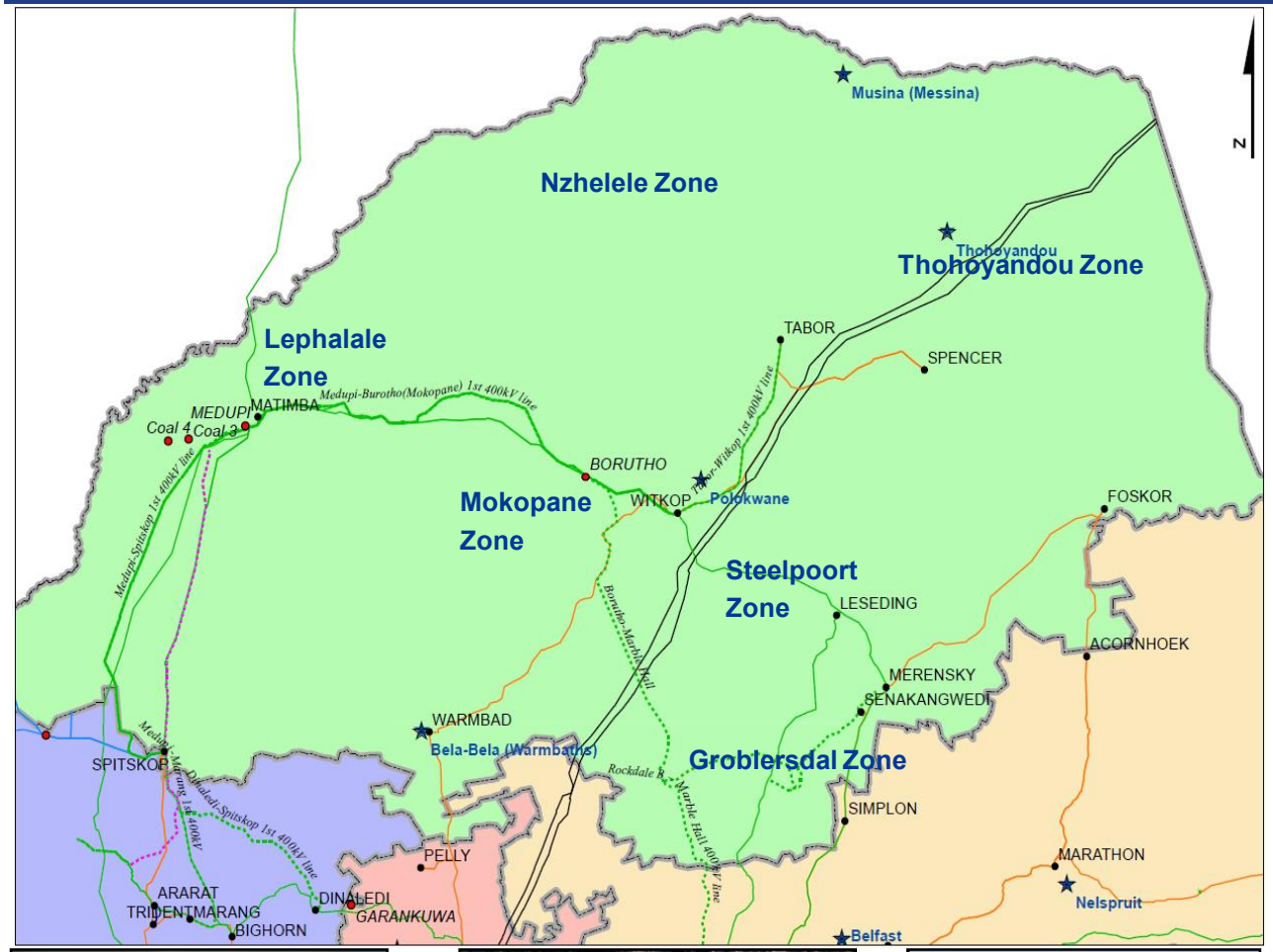
LIMPOPO PROVINCE

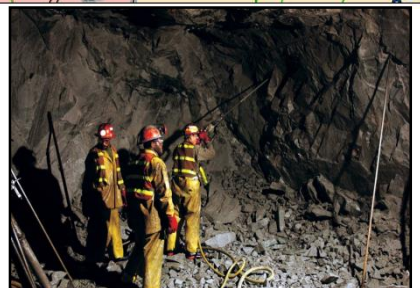
TDP 2015 - 2024

By: Dalton Matshidza

Powering your world

Limpopo Province Profile





Generation

- Matimba Power Station = 3805MW
- Medupi Power Station in progress (Construction) = 4800MW

Transmission

- Load demand = 3269MW
- Number of Substations = 10
- Transmission Supply Areas (CLNs) = 3

(Polokwane, Lephalale and Phalaborwa)

General

- Economic mix - Platinum mining, Coal, high concentration of Electrification, Game Farms, Industrial, Farming, Residential & Commercial, International Tie Line ï Botswana

Key Developmental Areas

- Nzhelele/Thohoyandou Zone
- Mokopane Zone
- Lephalale Zone
- Steelpoort Zone
- Groblersdal Zone

Limpopo Province Network Expansion Drivers

Economic Activity (Growth):

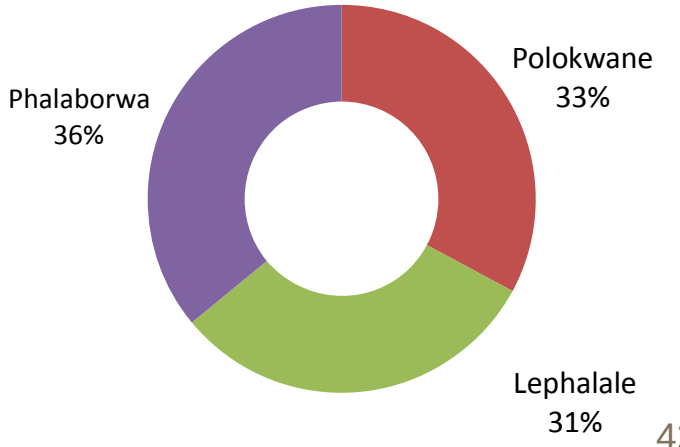
- Industrial 30%
- Mining 30%
- Commercial 5%
- Residential 20%
- Agricultural 5%
- Re-distributors 10%

Transmission Supply Areas (CLN's)	Percentage Growth	2015	2020	2024
Polokwane	2.24%	1311	1468	1593
Lephalale	6.0%	1070	1341	1510
Phalaborwa	4.0%	1222	1656	1751

Major Provincial Development Locations:

- Nzhelele Zone ï Electrification, Agriculture, Industrial, Diamond and Coal Mining
- Mokopane Zone ï Platinum mining
- Lephalale Zone - Integration of Medupi Power Station and Coal mining
- Steelpoort Zone - Chrome and Platinum mining
- Groblersdal Zone - Electrification, Agriculture and Platinum mining

Limpopo CLN % Contribution to 2024 Load



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Limpopo Province Network Expansion Drivers

Major Developments / Main Load Drivers

Nzhelele Substation Integration will supply Nzhelele/Thohoyandou – Electrification, Agriculture, Industrial, Diamond and Coal Mining

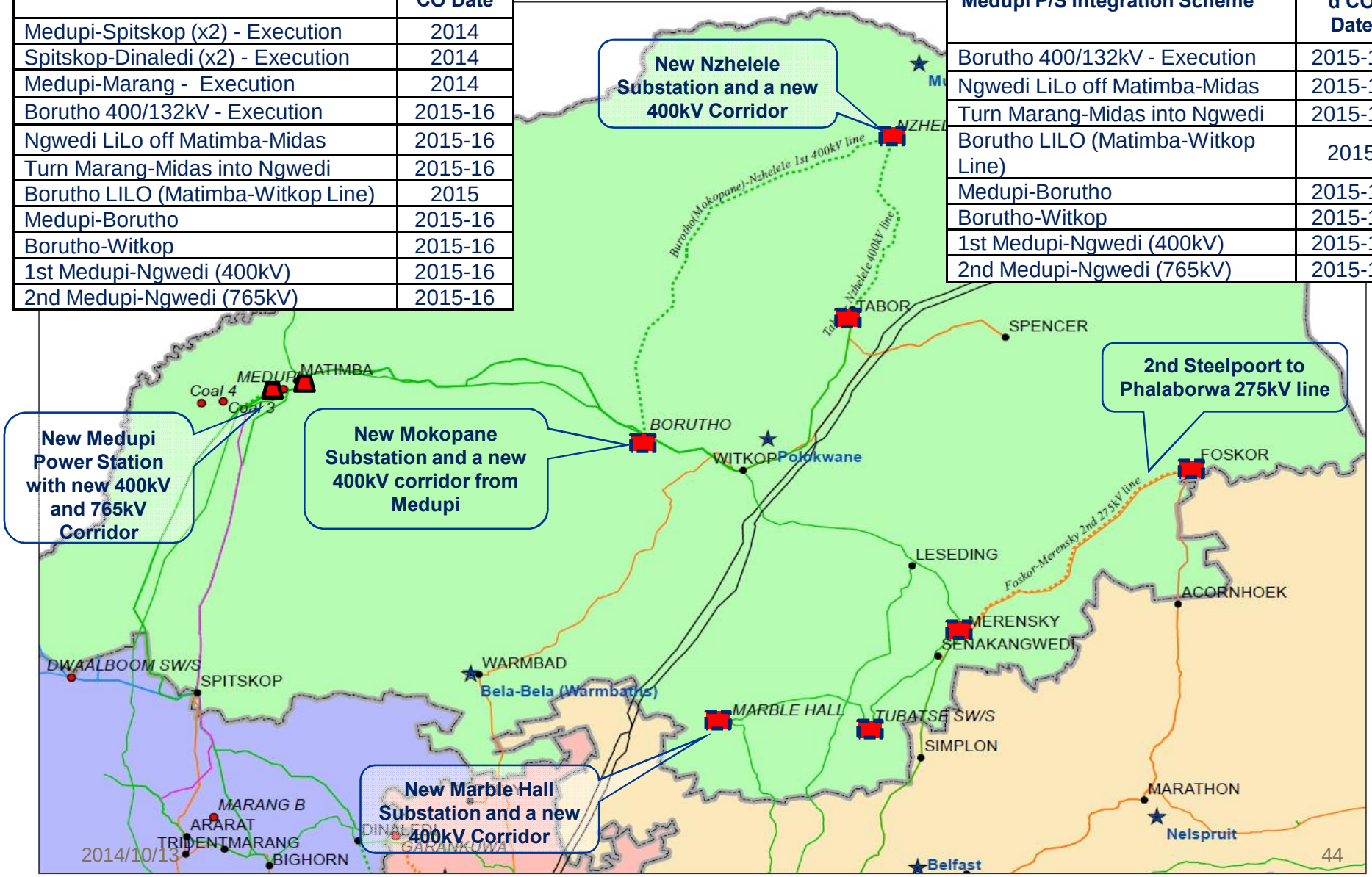
Medupi Power Station – Coal mining in the Waterberg area (Lephalale) and the new 400kV and 765kV Corridor

Marble Hall and Steelpoort new Substations– Electrification, Chrome and Platinum mining in the Groblersdal and Steelpoort areas

Limpopo Province Development Plans (2014 – 2019)

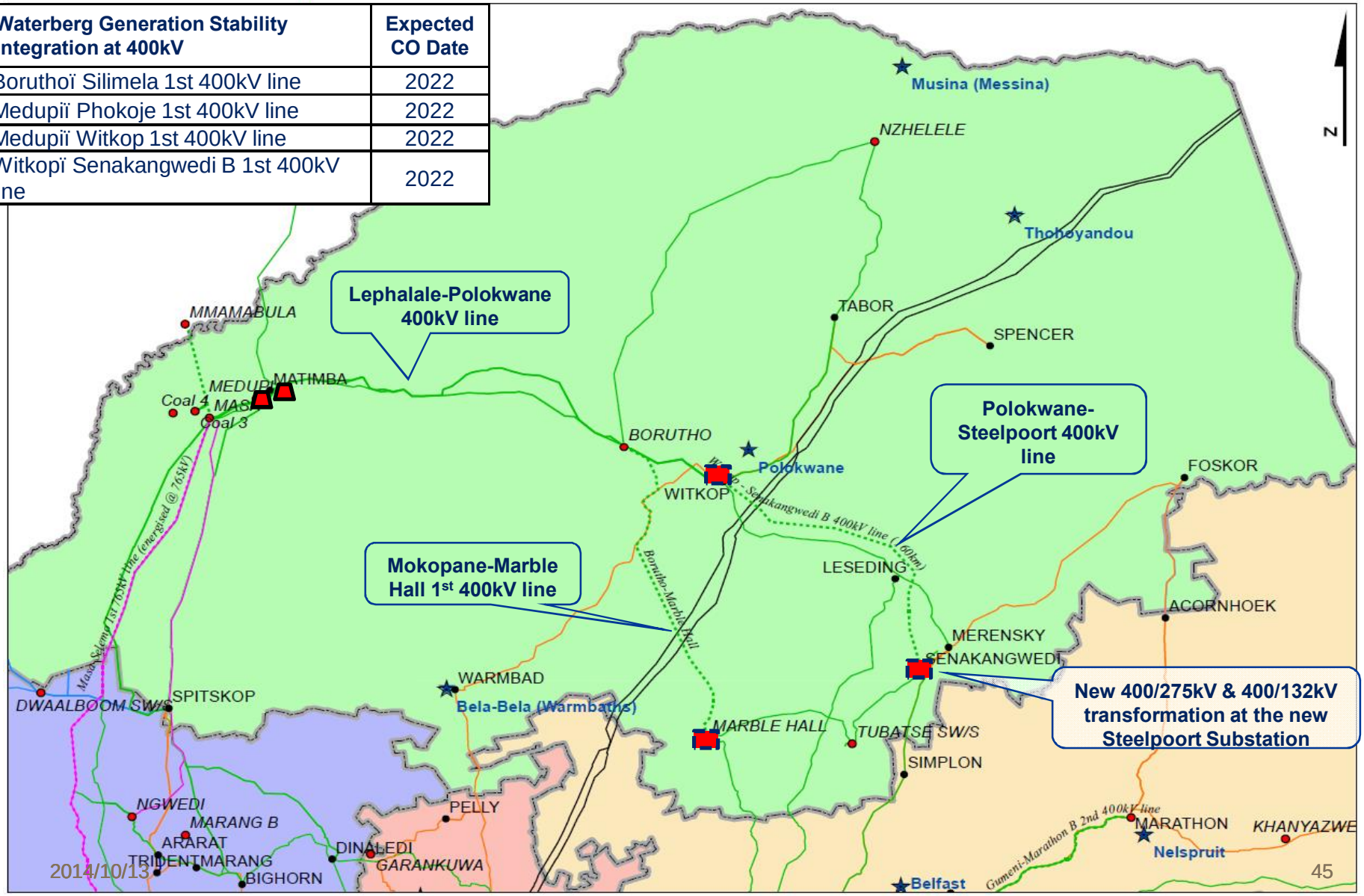
Medupi P/S Integration Scheme	Expected CO Date
Medupi-Spitskop (x2) - Execution	2014
Spitskop-Dinaledi (x2) - Execution	2014
Medupi-Marang - Execution	2014
Borutho 400/132kV - Execution	2015-16
Ngwedi LiLo off Matimba-Midas	2015-16
Turn Marang-Midas into Ngwedi	2015-16
Borutho LILO (Matimba-Witkop Line)	2015
Medupi-Borutho	2015-16
Borutho-Witkop	2015-16
1st Medupi-Ngwedi (400kV)	2015-16
2nd Medupi-Ngwedi (765kV)	2015-16

Medupi P/S Integration Scheme	Expected CO Date
Borutho 400/132kV - Execution	2015-16
Ngwedi LiLo off Matimba-Midas	2015-16
Turn Marang-Midas into Ngwedi	2015-16
Borutho LILO (Matimba-Witkop Line)	2015
Medupi-Borutho	2015-16
Borutho-Witkop	2015-16
1st Medupi-Ngwedi (400kV)	2015-16
2nd Medupi-Ngwedi (765kV)	2015-16



Limpopo Province Development Plans (2019 – 2024)

Waterberg Generation Stability Integration at 400kV	Expected CO Date
Boruthoï Silimela 1st 400kV line	2022
Medupiï Phokoje 1st 400kV line	2022
Medupiï Witkop 1st 400kV line	2022
Witkopï Senakangwedi B 1st 400kV line	2022



Thank you

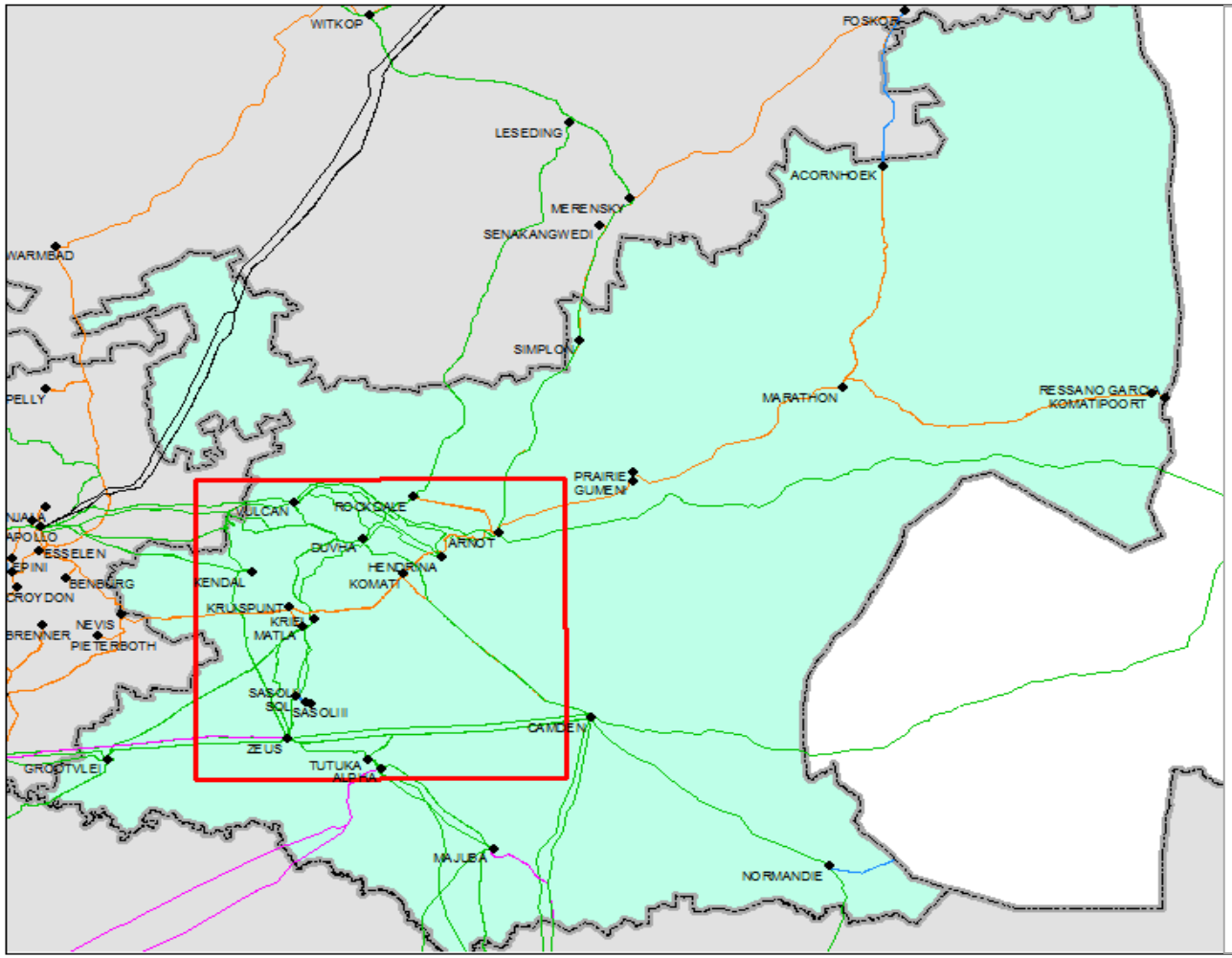
MPUMALANGA PROVINCE

TDP 2015 - 2024

By: Makoanyane Theku

Powering your world

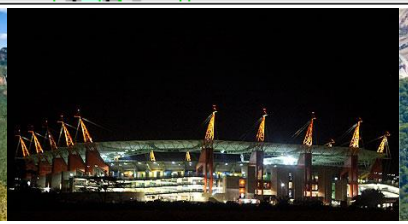
Mpumalanga Province Profile



- **Power Generation**
  - Power Stations: 11
  - MW installed: 22 704MW
- **Geographic area**

  Geographic Areas: Witbank,, Nelspruit, Middelburg, Kwaggafontein, Ermelo & Secunda

  Customer Load Networks (areas)
  - ✓ Lowveld CLN
  - ✓ Highveld North CLN
  - ✓ Highveld South CLN
- **Economic activities**
  - ✓ Industrial
  - ✓ Mining
  - ✓ Commercial
  - ✓ Agricultural
  - ✓ Re-distributors
  - ✓ Tourism

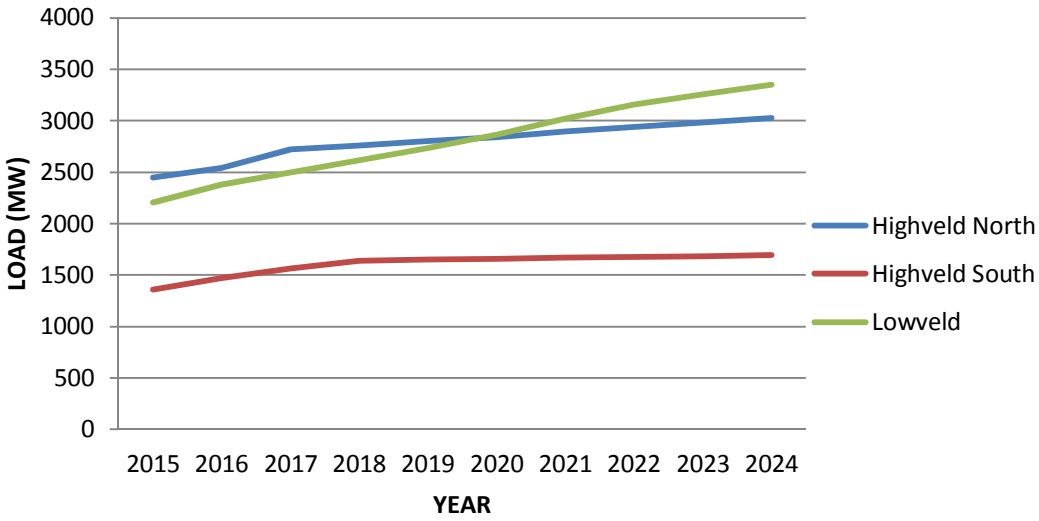


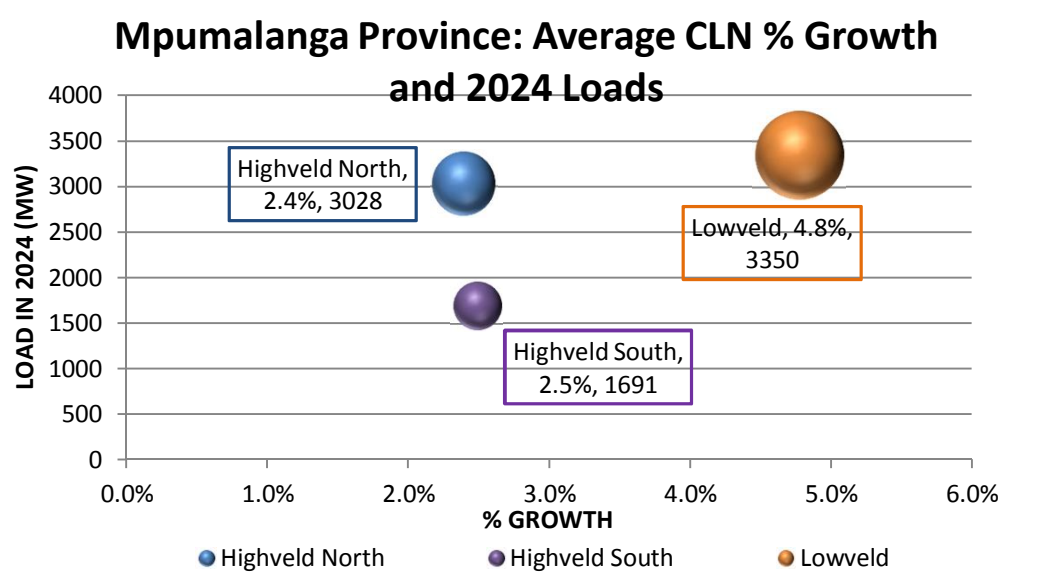
Current - Mpumalanga

0 15 30 60 90 120 Kilometers

Created by:
Transmission
Grid Planning
2014/06/25

Mpumalanga Province: Expansion Drivers





Electrical infrastructure development objectives

- Enable economic development
  - Provincial
  - National
- Improve power transfer capacity and network reliability

Major provincial developments

- Integration of Kusile Power Station, located about 20km west of Witbank

Challenges in establishing and maintaining electrical infrastructure

- Delays in servitude acquisition
- Theft and vandalism of transmission and distribution infrastructure

Mpumalanga Province: Expansion Drivers

Major developments / Main load drivers


Infrastructure: Kusile


Tourism

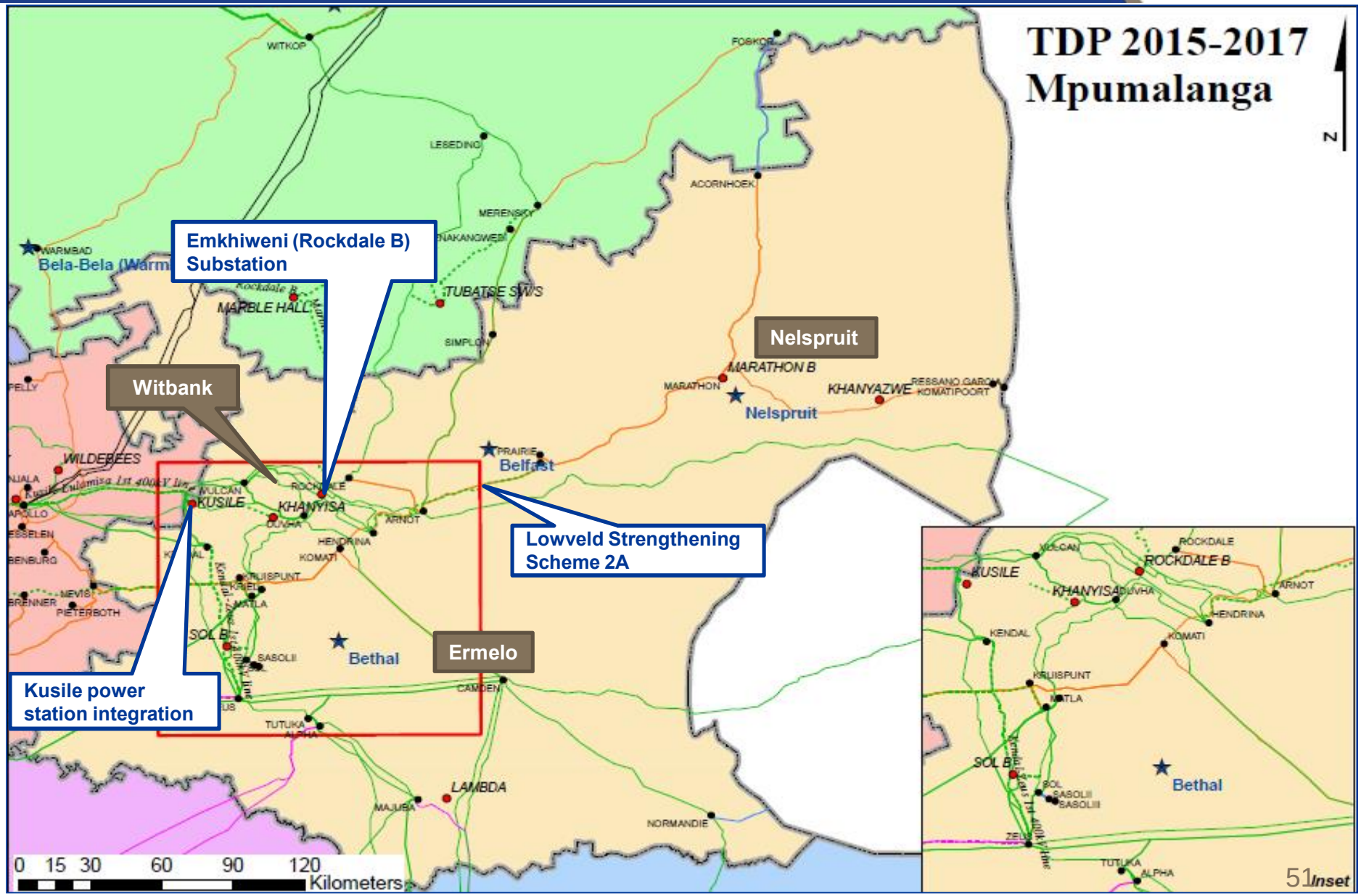
Load growth drivers

- Mining
- Agriculture
- Manufacturing
- Infrastructure developments
- Electrification
- Tourism

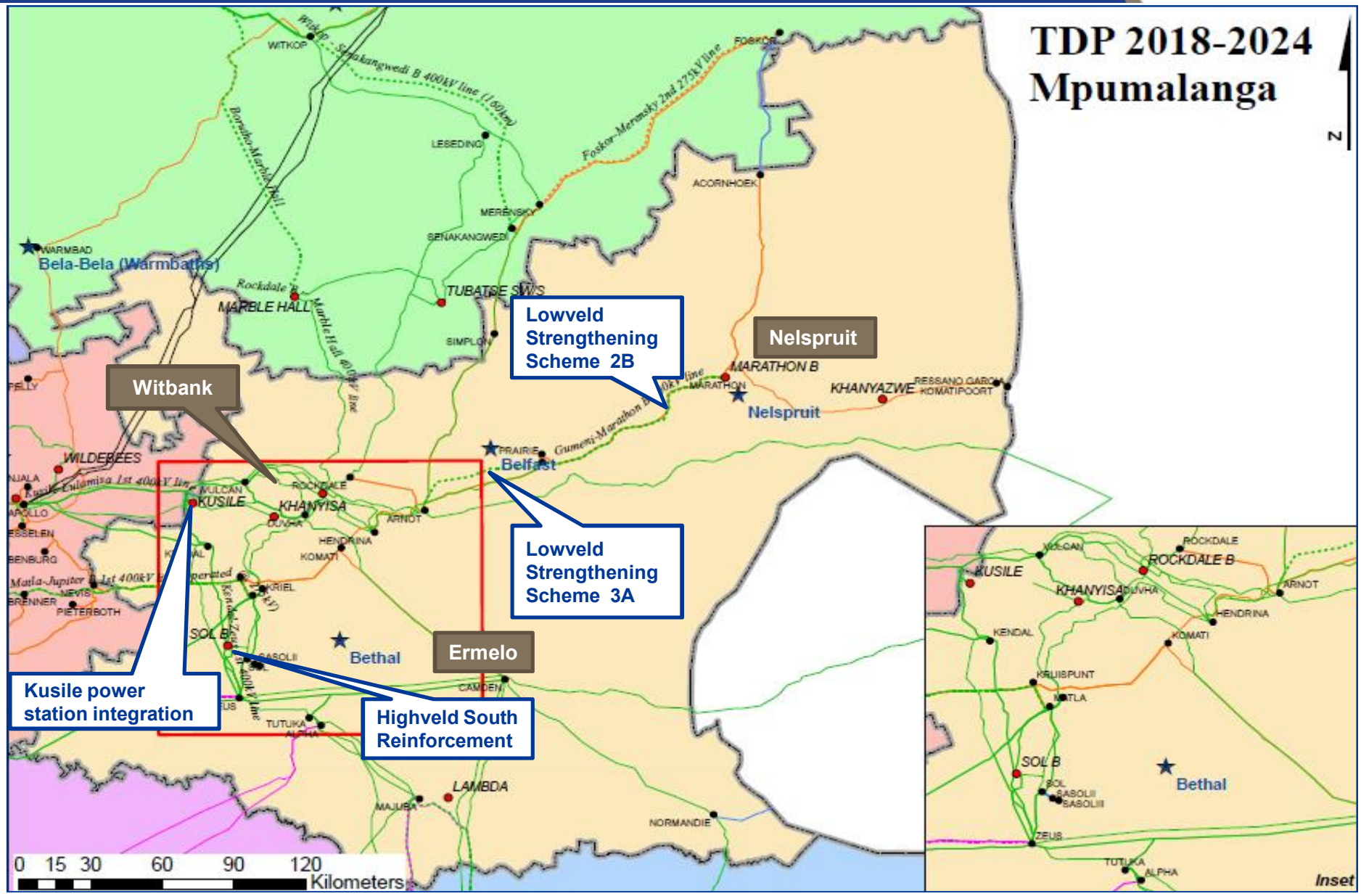

Mining & Infrastructure: Coal line


Universal access to electricity, sanitation and water supply

Mpumalanga Province: Development Plans



Mpumalanga Province: Development Plans



Thank you

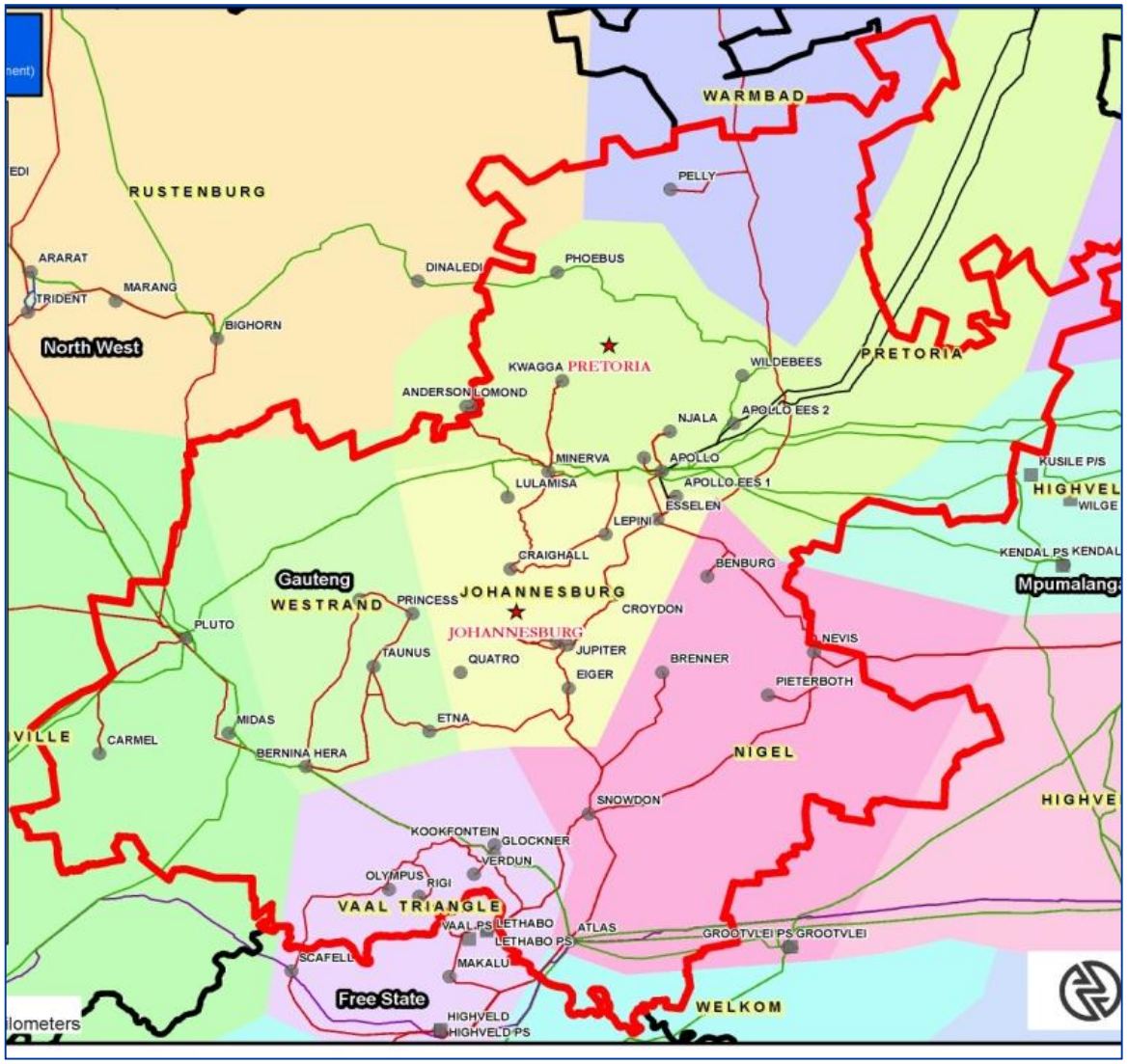
GAUTENG PROVINCE

TDP 2015 - 2024

By: Tonderayi Gumunyu

Powering your world

Gauteng Province Profile



Generation

- Kelvin Power Station = 70MW
- Rooiwal Power Station = 60MW
- Bulk supply from Mpumalanga, Free state, Lephalale and Apollo HVDC (from Mozambique).

Geographical Supply Area

- Johannesburg North, Johannesburg South, East Rand, West Rand, Vaal and Pretoria.

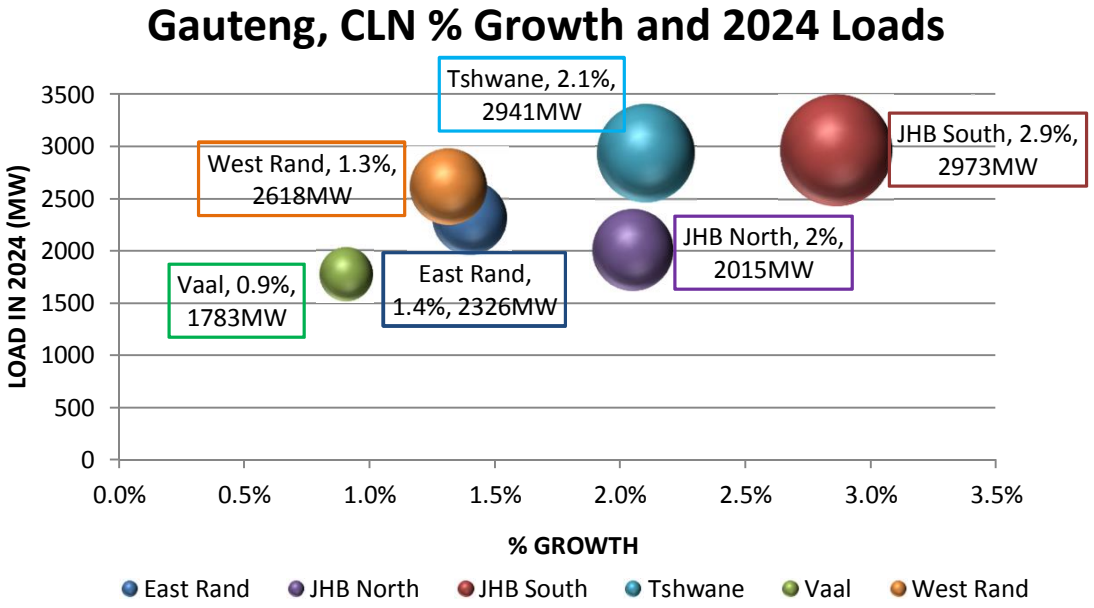
Economic Activity

- Re-distributors, Residential and Commercial.

Gauteng Province Expansion Drivers

Economic mix:

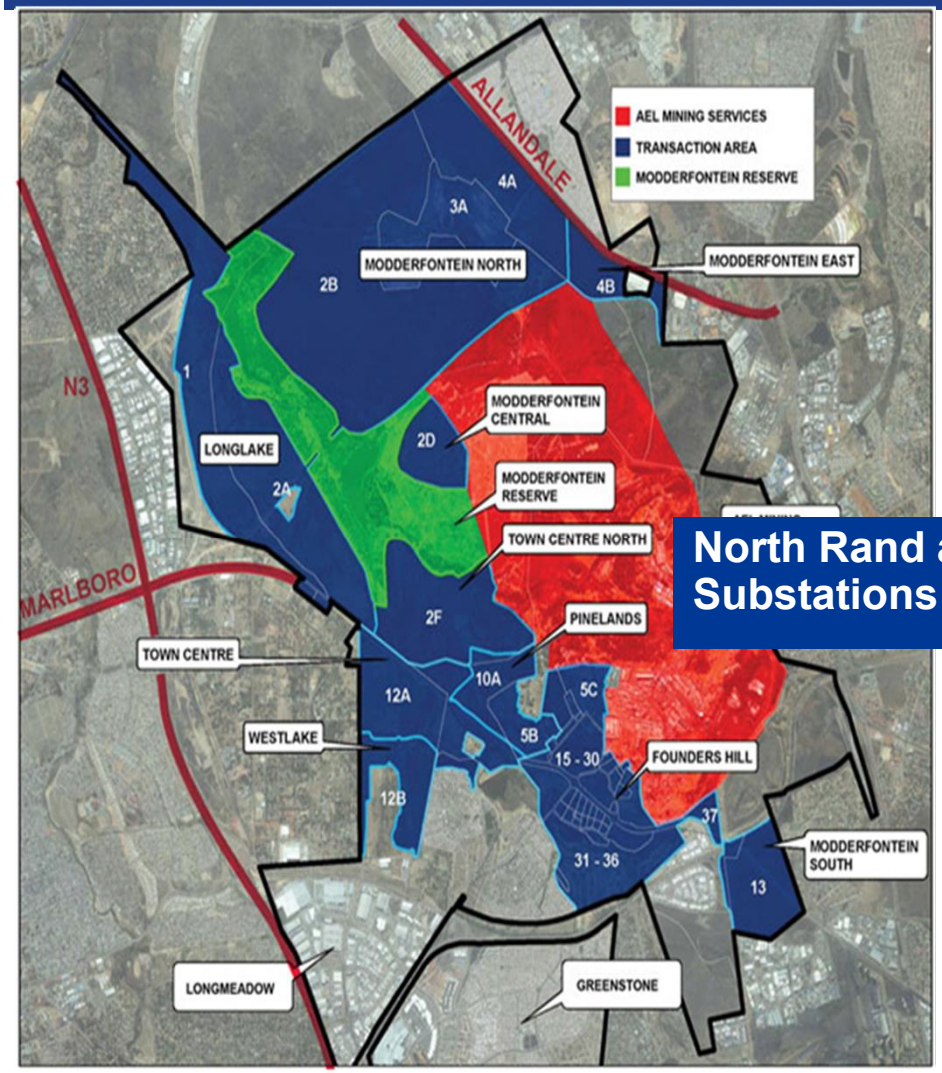
- Industrial 1.7%
- Mining 1.5%
- Commercial 10%
- Residential 9.8%
- Agricultural 1.9%
- Re-distributors 75.1%

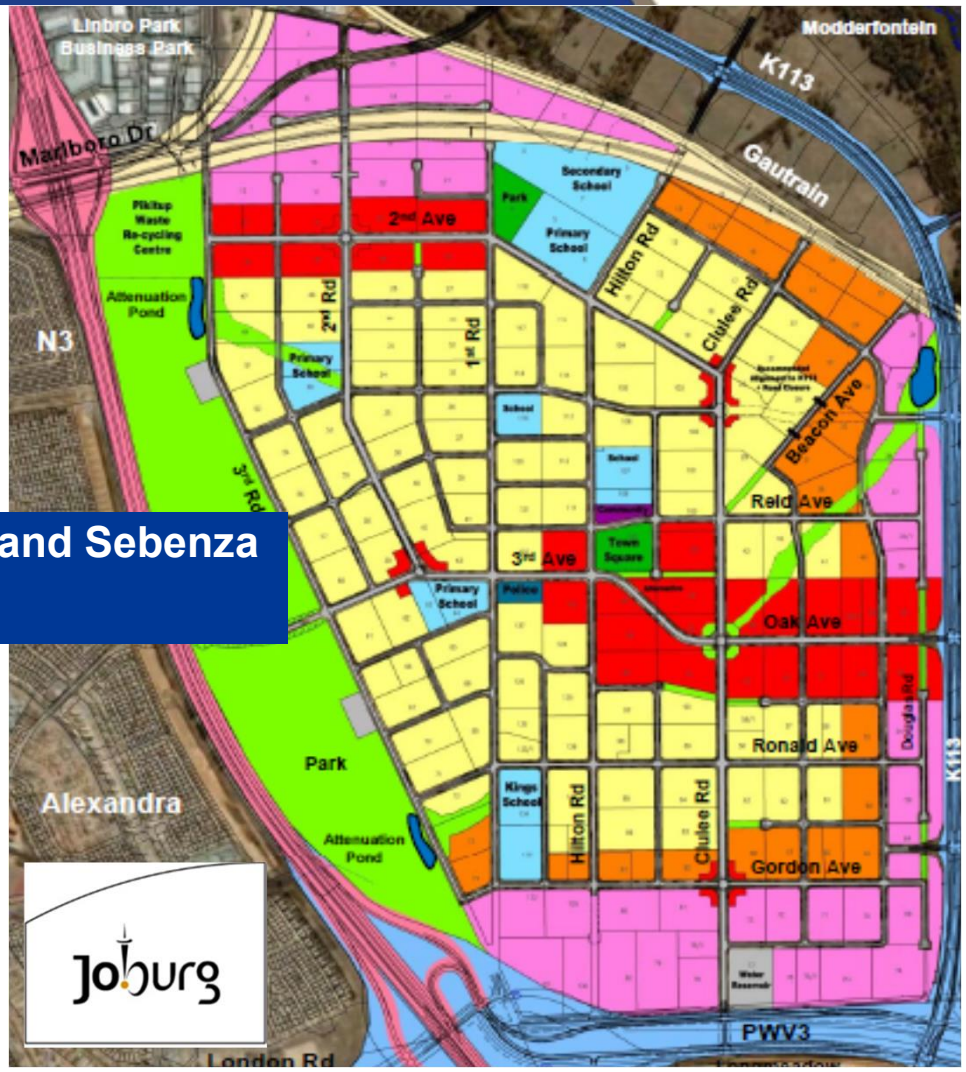


Major Provincial Developments locations:

- Midrand/ Kyalami area
- Soweto and Randfontein areas
- Modderfontein/Edenvale area
- Tshwane area

Key Developments in Joburg South / East Rand





North Rand and Sebenza Substations

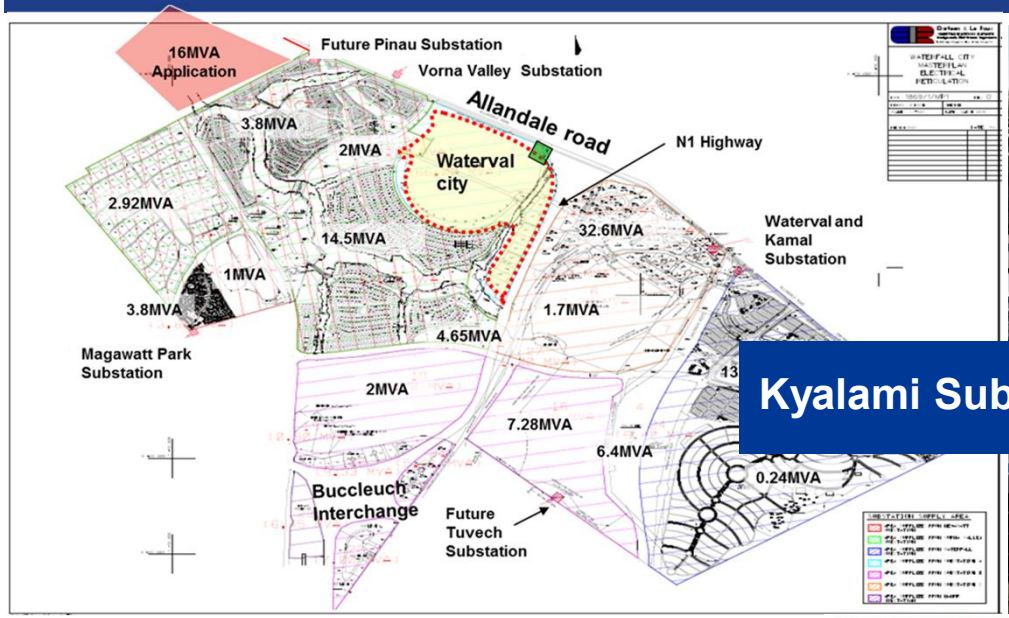
Zendai Modderfontein (Mixed Development)

- 30 000 Housing units, commercial and light industry envisaged
- Potential 200 000 jobs

Linbro Park (Mixed Development)

- 20 000 Housing units, commercial and light industry envisaged
- Alexandra Township re-blocking

Key Developments in Joburg North / West Rand

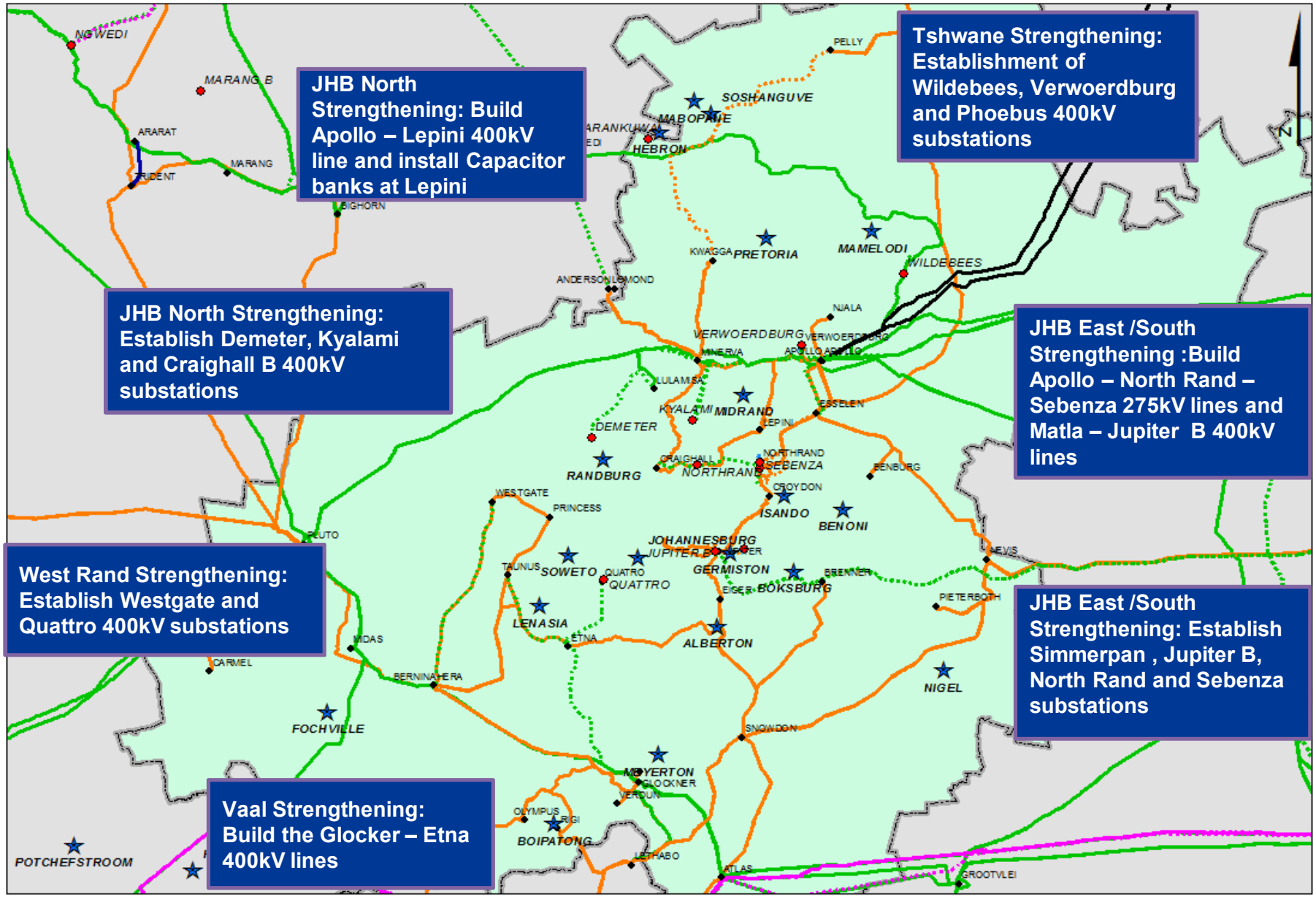


Kyalami Substation

Orlando Precinct

Quattro Substation

Gauteng Province Development Plans



Thank you

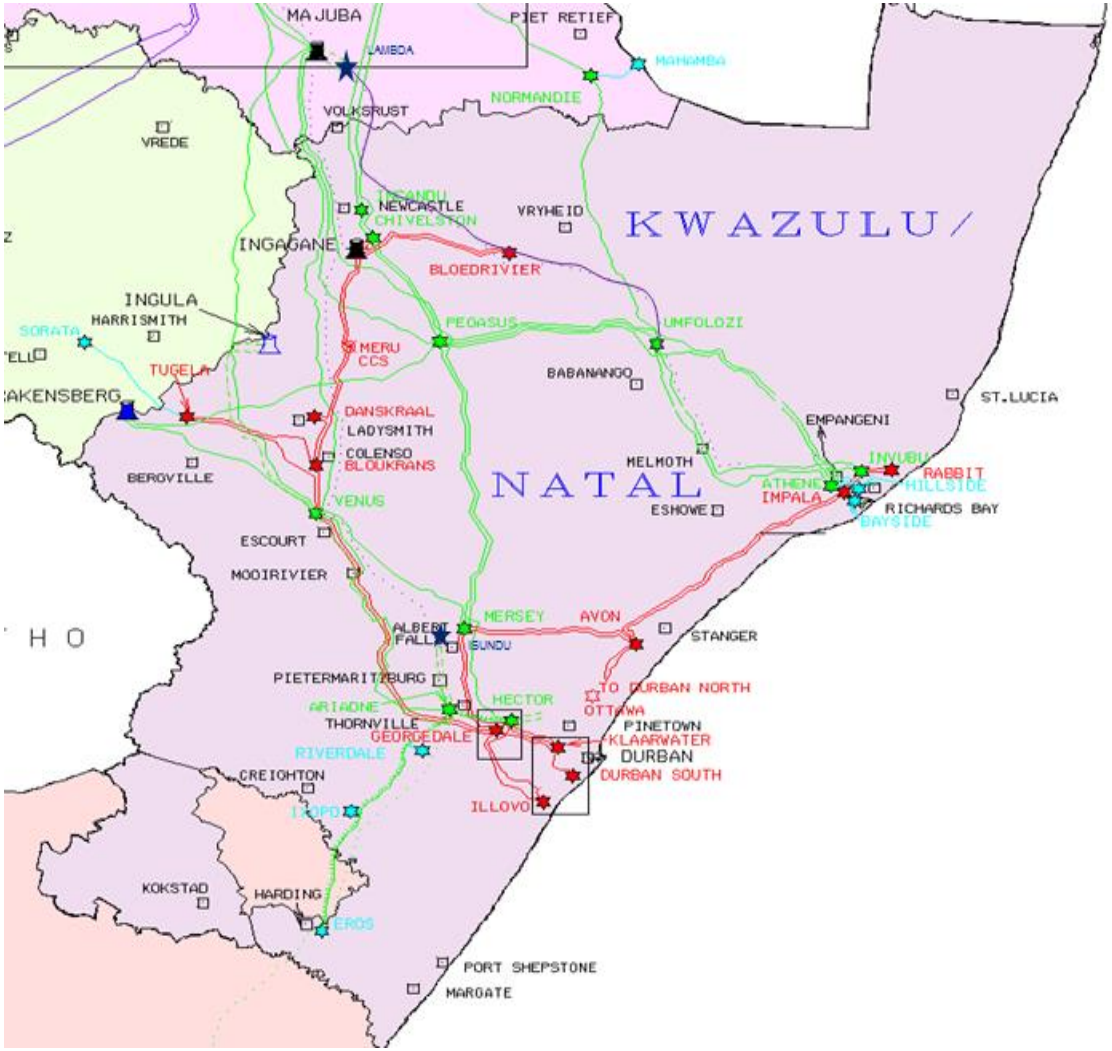
KWAZULU NATAL PROVINCE

TDP 2015 - 2024

By: Thokozani Bengani

Powering your world

KwaZulu-Natal Province

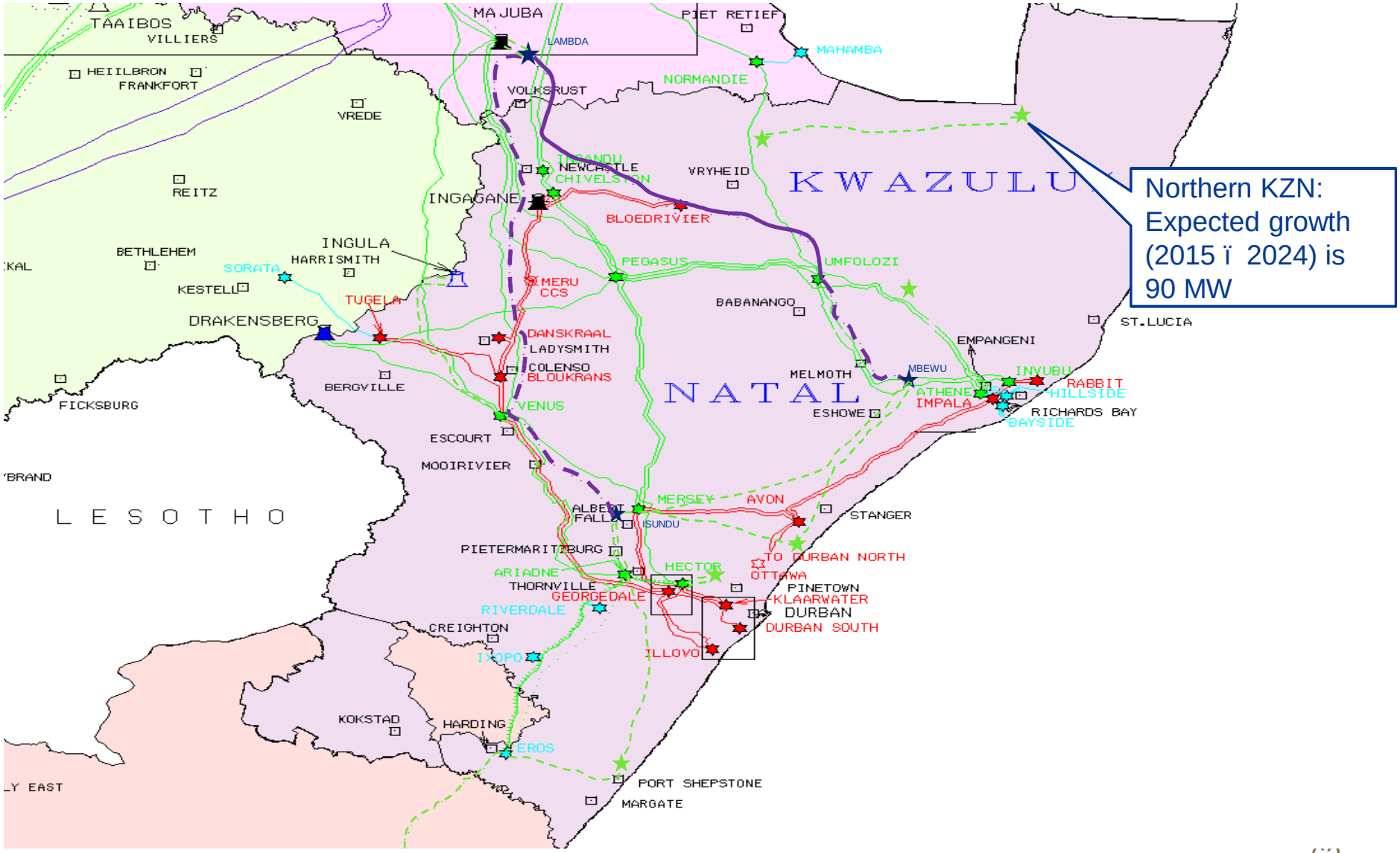


- **Generation**
- Drakensberg Pumped Storage with 1000MW installed capacity
- Ingula Pumped Storage under construction ï planned capacity 1330MW
- Avon OCGT IPP under construction ï planned capacity 670 MW

- **Economic Activity**
- Load demand in 2013 = 6 730 MW
- Expected demand in 2024 = 8654 MW
- Load distribution:

  Re-distributors, Commercial, Mining, Industrial, Residential, Agriculture & Traction

Key Developments in Northern KwaZulu-Natal



Northern KZN: Expected growth (2015 ï 2024) is 90 MW

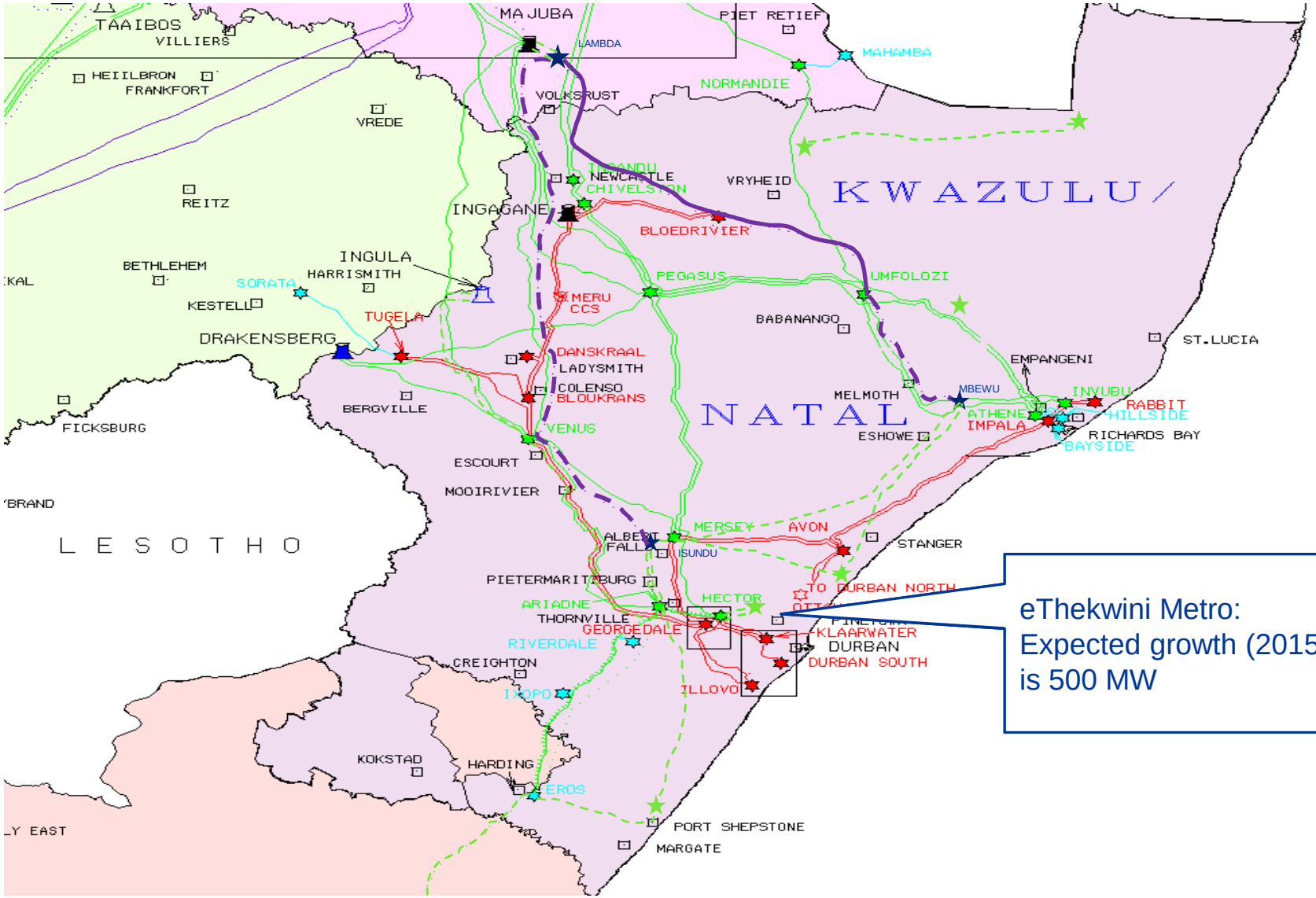
Key Developments in Northern KwaZulu-Natal

iSimangaliso wetland park: tourism

Integration of Candover Substation

Universal access to electricity, sanitation and water supply

Key Developments in eThekwini Metropolitan

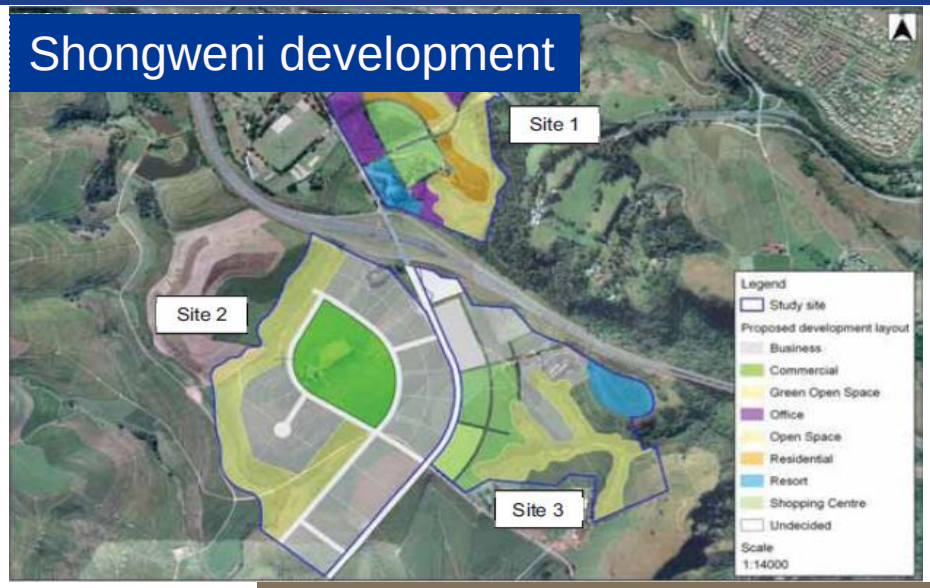


eThekwini Metro:
Expected growth (2015-2024) is 500 MW

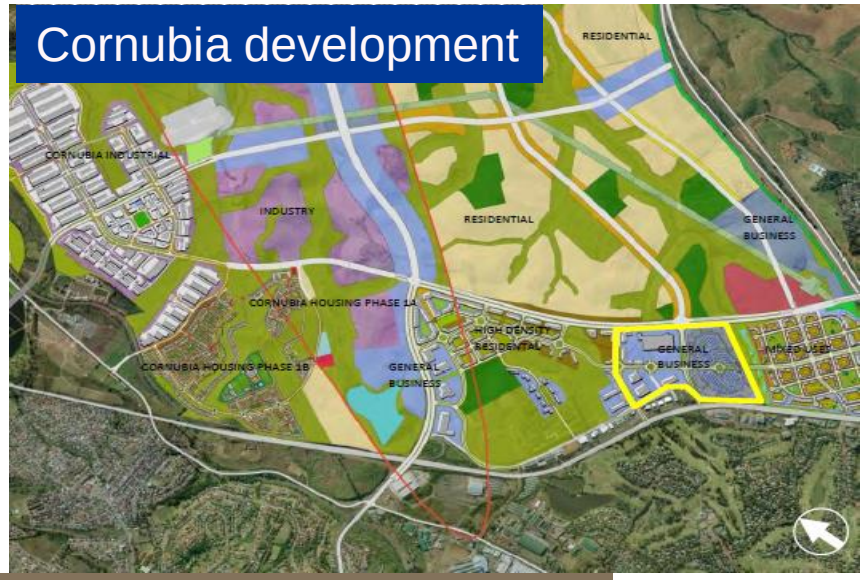
Key Developments in eThekwini Metropolitan

Eskom

Shongweni development

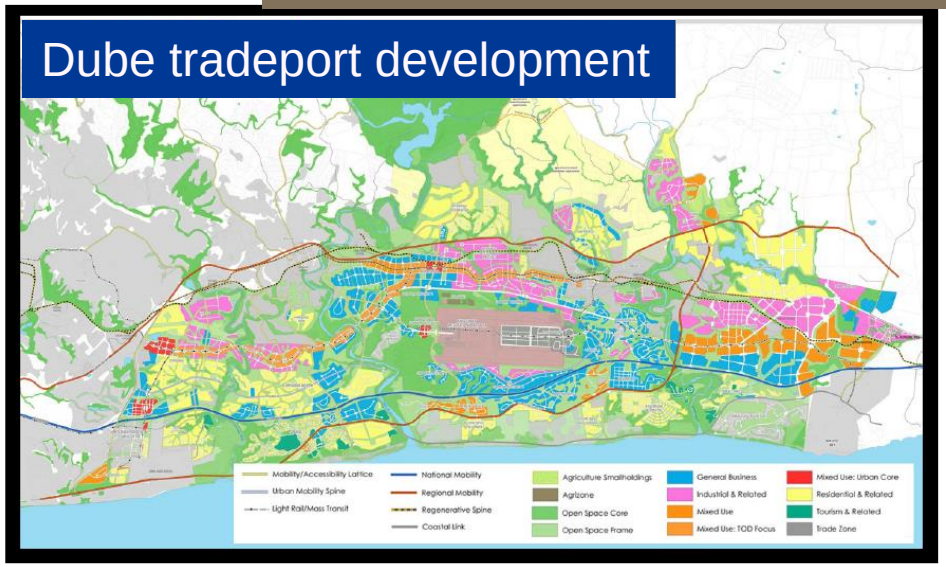


Cornubia development



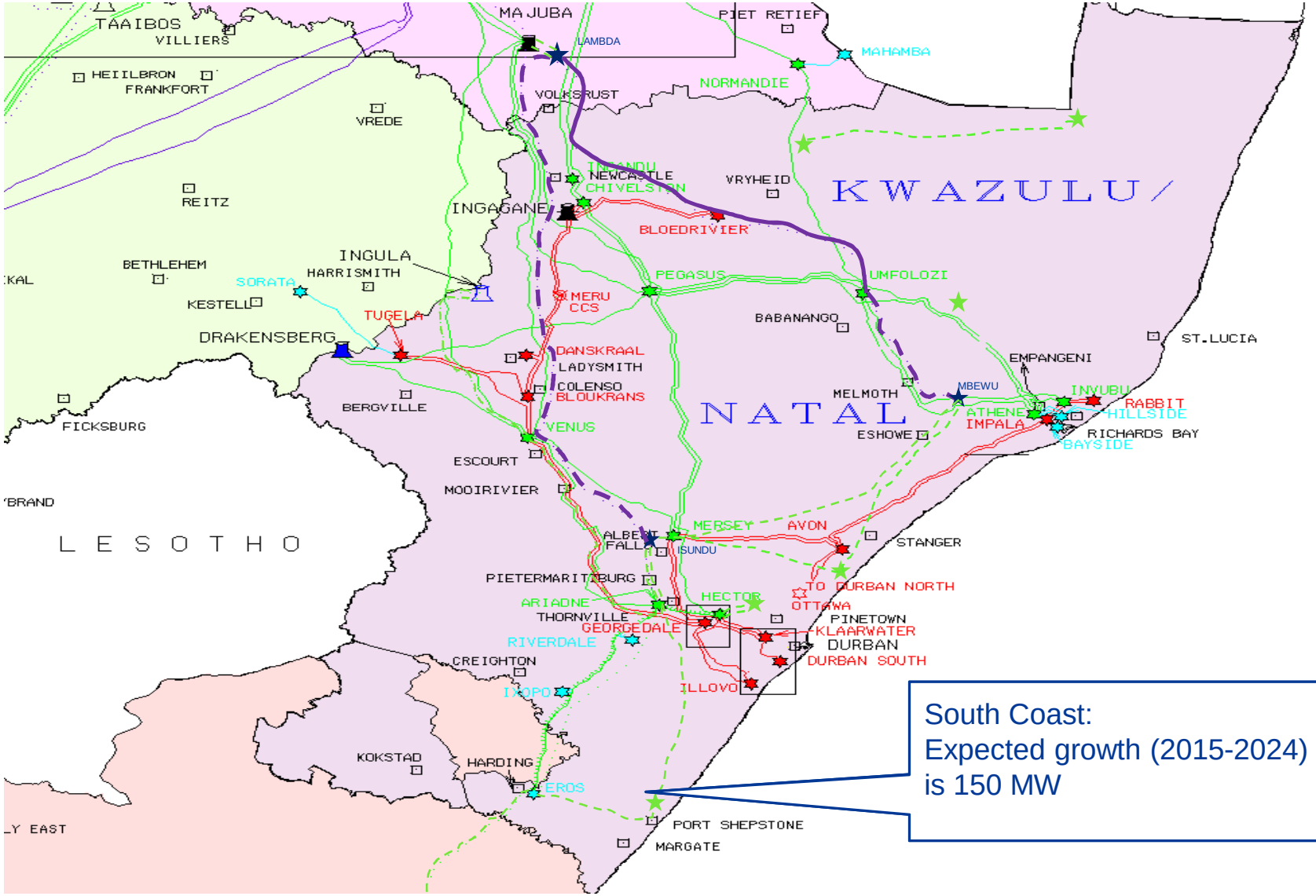
Integration of Shongweni & Inyaninga Substations

Dube tradeport development



Old airport dig-out

Key Developments in the South Coast



South Coast:
Expected growth (2015-2024)
is 150 MW

Key Developments in the South Coast

South coast: commercial & tourism

New Multi Product Pipeline (NMPP)

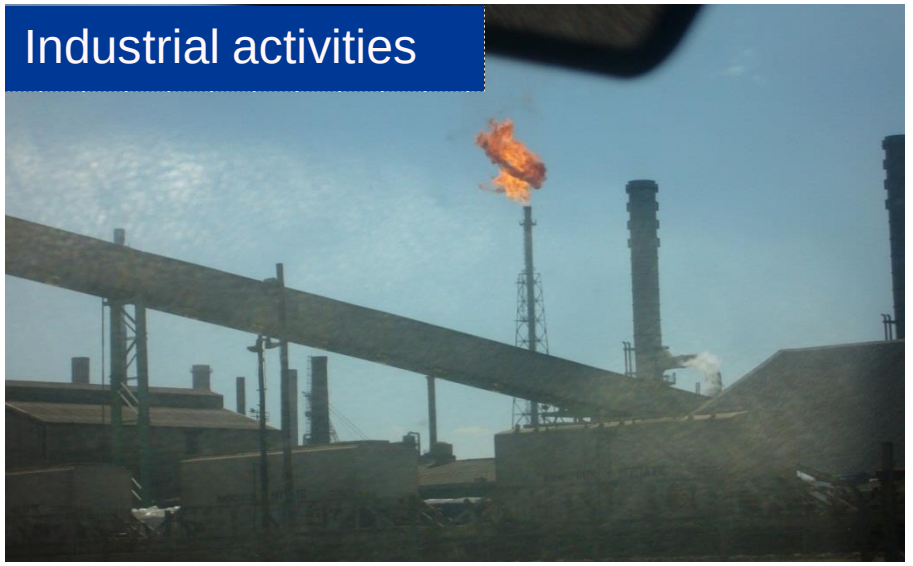
2nd Ariadne-Eros 400 kV line & Integration of St Faiths Substation

Universal access to electricity, sanitation and water supply

Key Developments in Empangeni, Ulundi, Vryheid & Newcastle

Coal Mining & Ermelo-Richards Bay Coal line

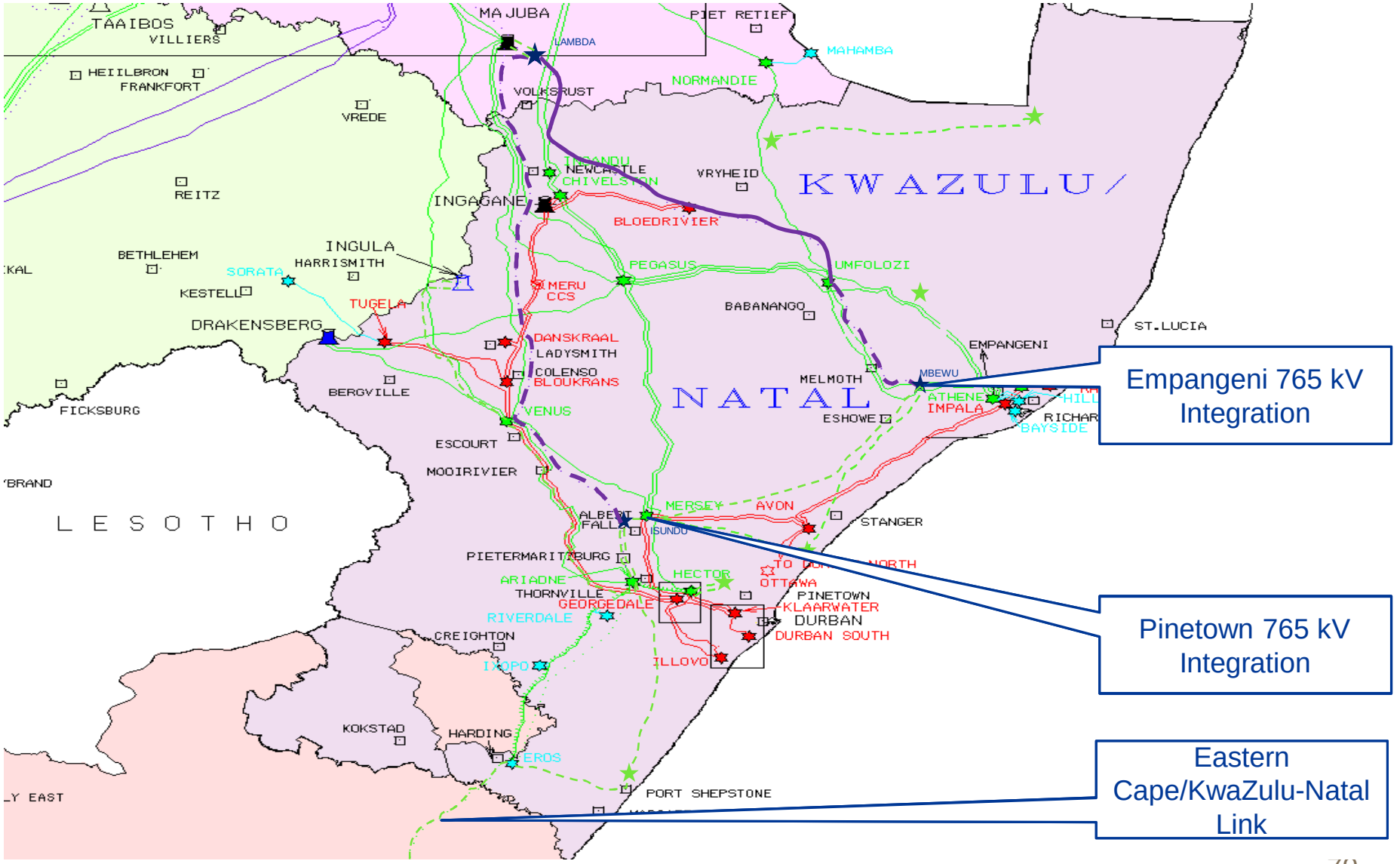
Industrial activities



Universal access to electricity, sanitation and water supply

Expected growth (2015-2024) is 380 MW

System Reliability Improvement Initiatives



Empangeni 765 kV Integration

Pinetown 765 kV Integration

Eastern Cape/KwaZulu-Natal Link

Thank you

FREE STATE PROVINCE

TDP 2015 - 2024

By: Thokozani Bengani

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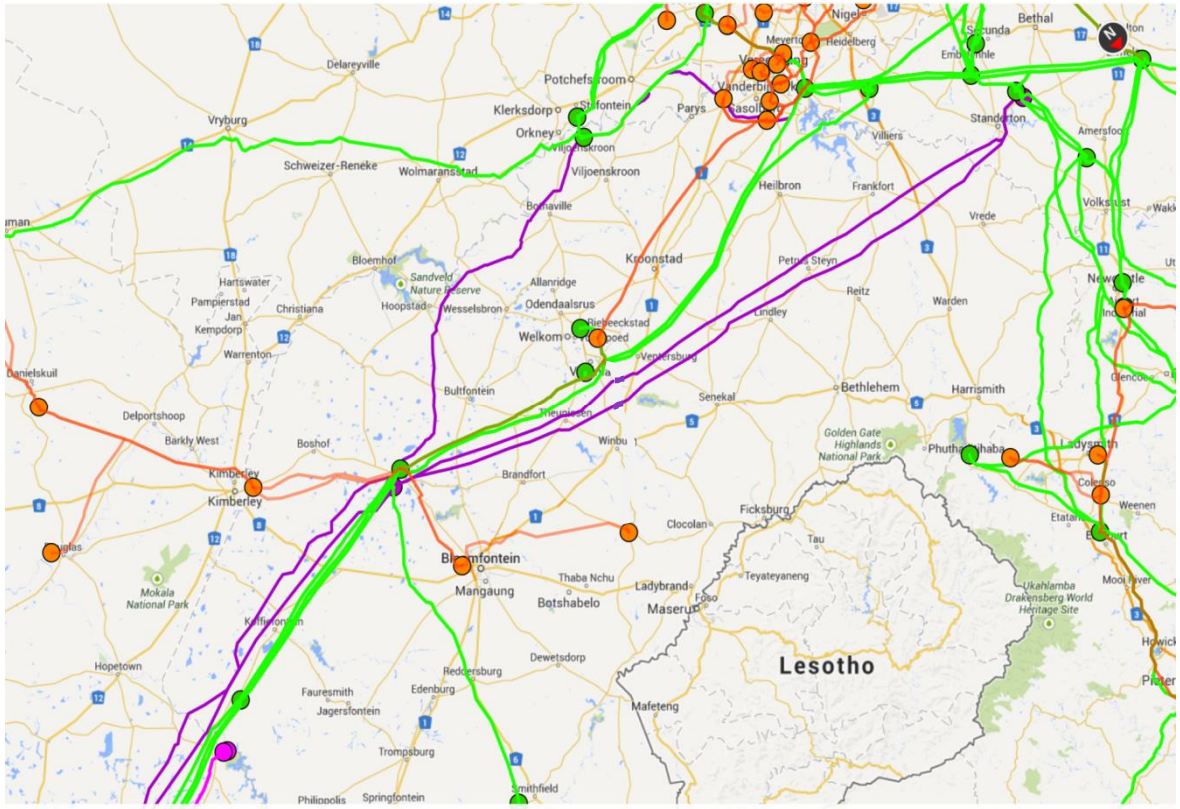
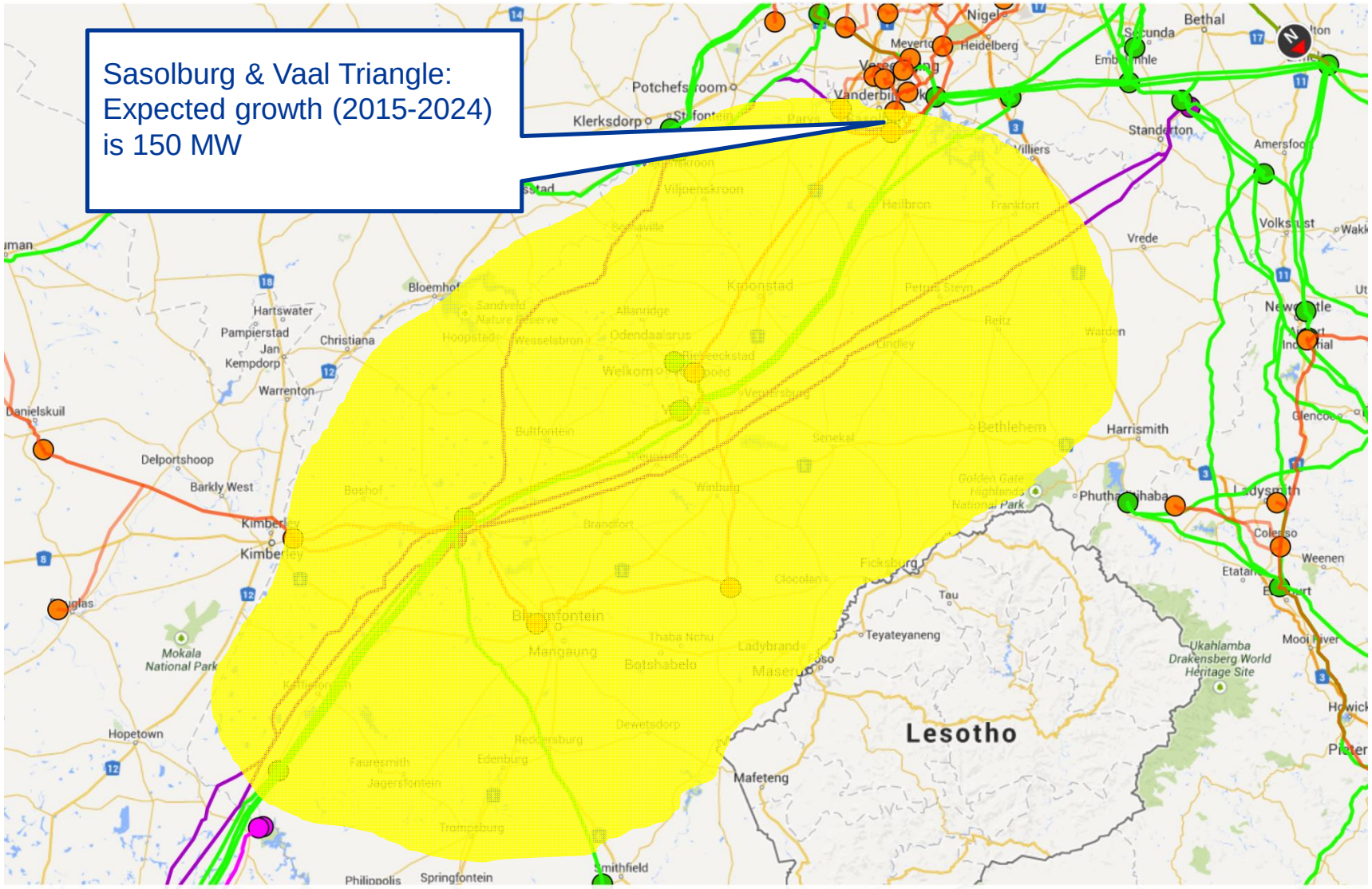
Free State Province



- **Generation**
- Lethabo Power Station: 3558 MW
- **Economic Activity**
- Load demand in 2013 = 2039 MW
- Expected demand in 2024 = 2430 MW
- Load distribution = Mining, Industrial, Re-distributors, Commercial, Agricultural, Residential, Traction & International

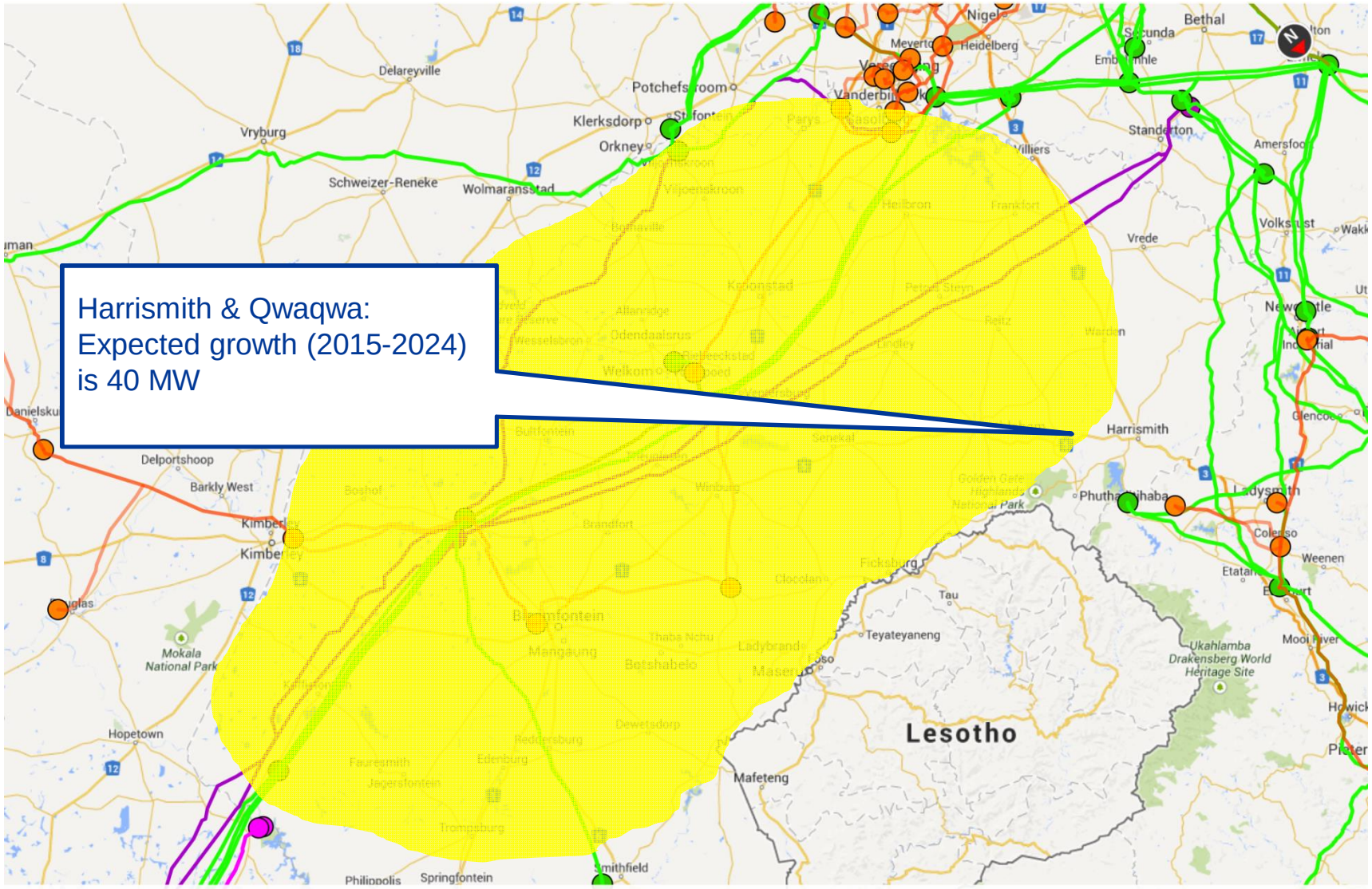
Key Developments in Sasolburg & Vaal Triangle



Key Developments in Sasolburg & Vaal Triangle

Integration of Makalu B Substation

Key Developments in Eastern Free State

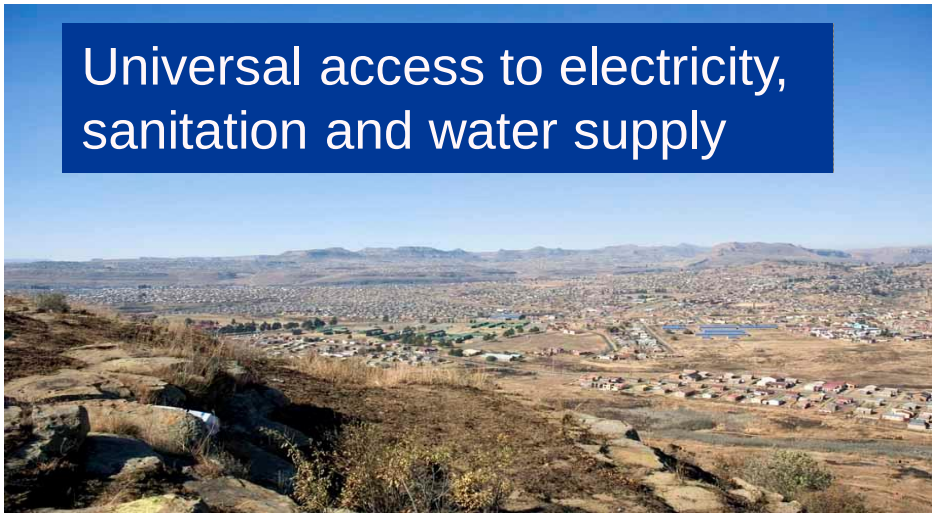


Key Developments in Eastern Free State

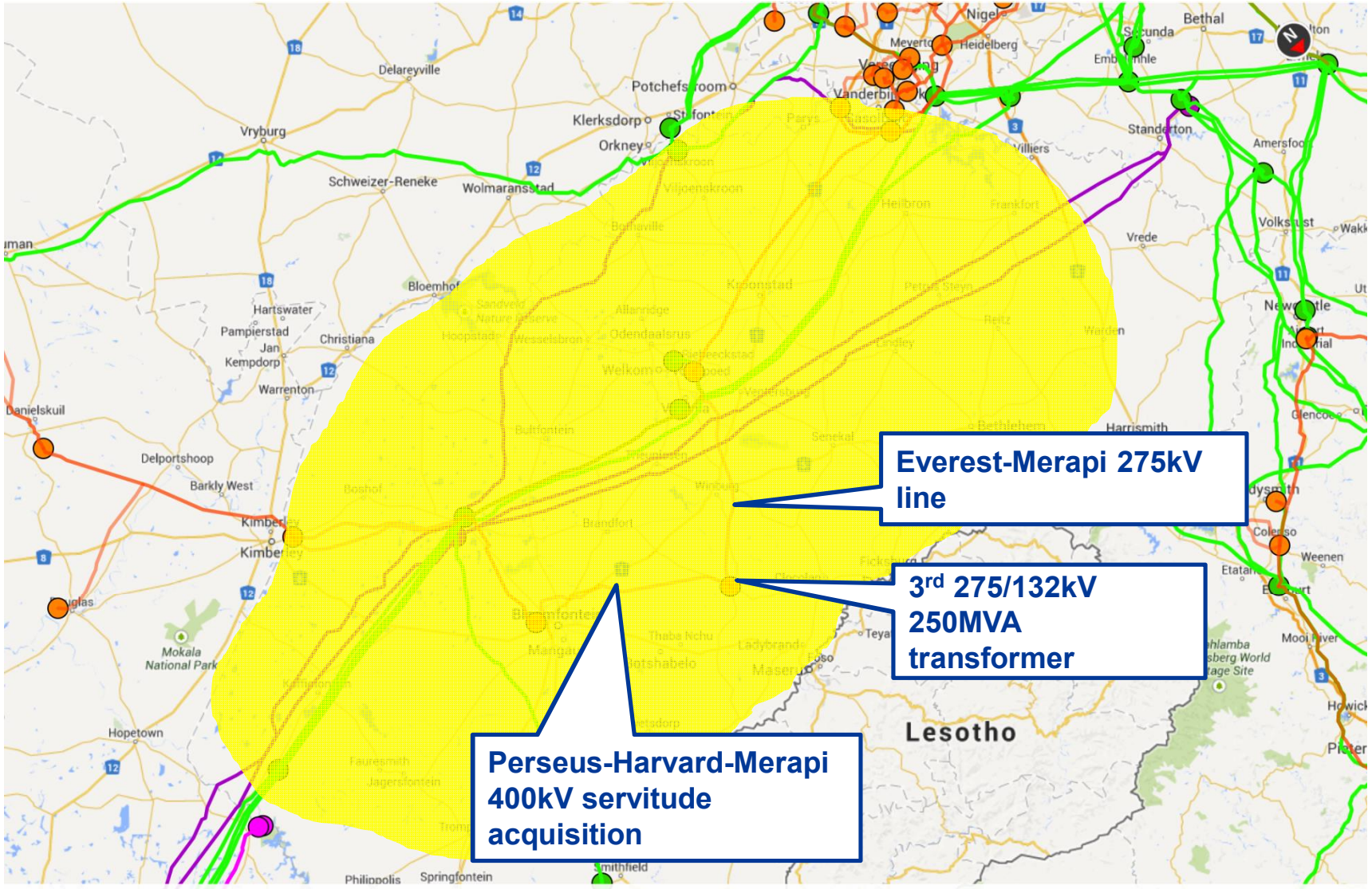
New Multi Product Pipeline (NMPP)

Extension of Sorata Substation

Universal access to electricity, sanitation and water supply



System Reliability Improvement Initiatives



Thank you

NORTHERN CAPE PROVINCE

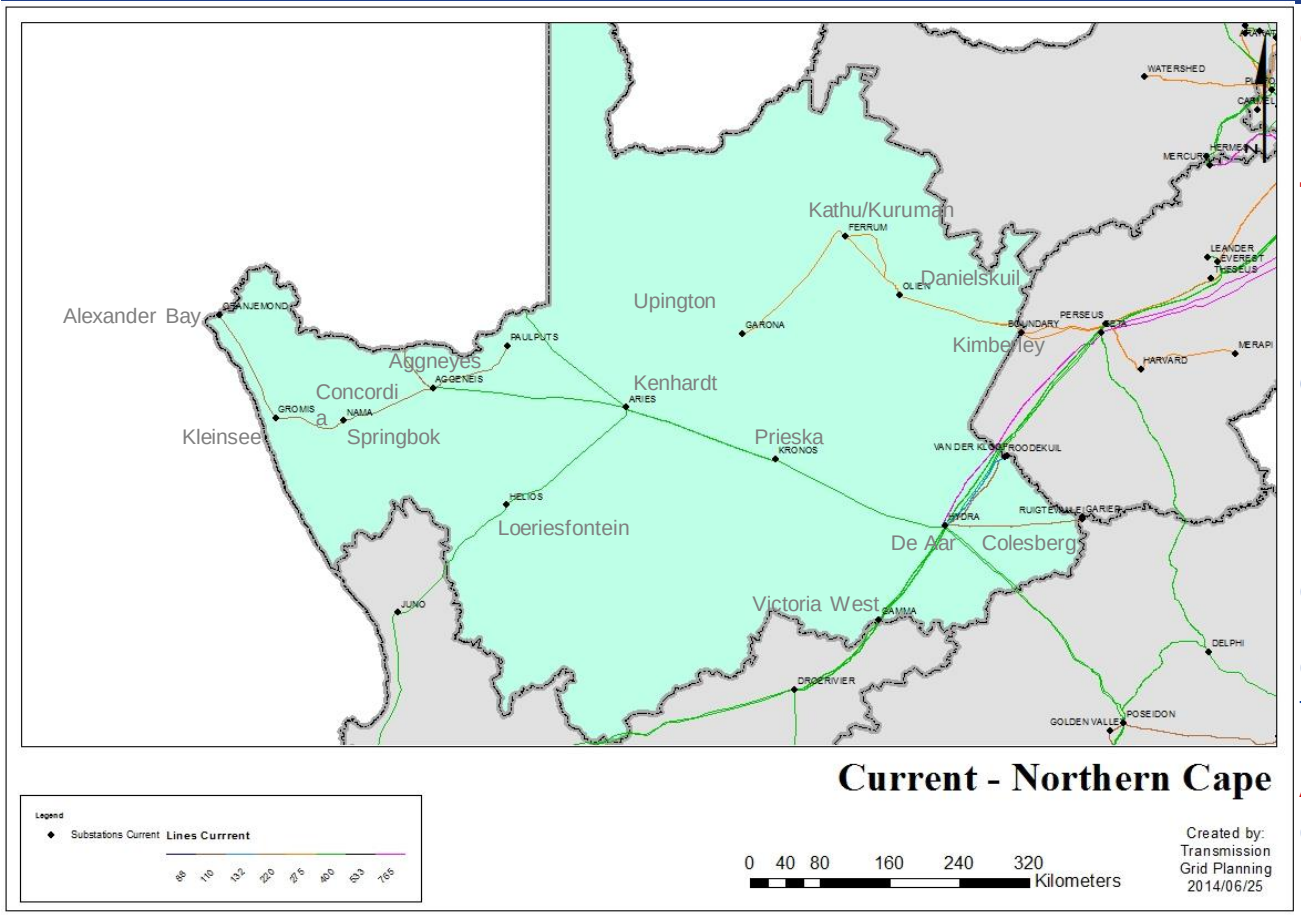
TDP 2015 - 2024

By: Jamila Kombe

Powering your world

1923-2013

Northern Cape Province Profile



Generation

- Van Der Kloof PS = **240 MW**

Transmission

Number of Main Substations = 15
Number of CLNs = 4
Radial network impacting Reliability & QoS during outages

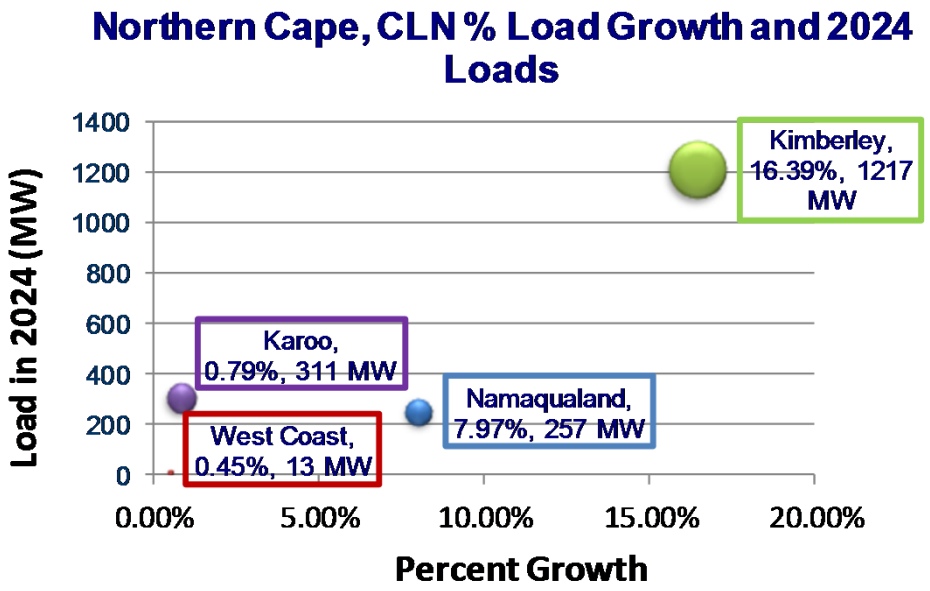
Distribution

Geographical Area: Kimberley & Upington Distribution Zones, 15 Customer Network Centres from Springbok, Calvinia, De Aar, to Jan Kemdorp.

Approx. Economic mix:

Commercial (21%)
Mining (52%)
Agriculture (27%)

Northern Cape Province Expansion Drivers



Load Drivers

- Anticipated mining loads in the Kimberley Area
- Natural Load Growth

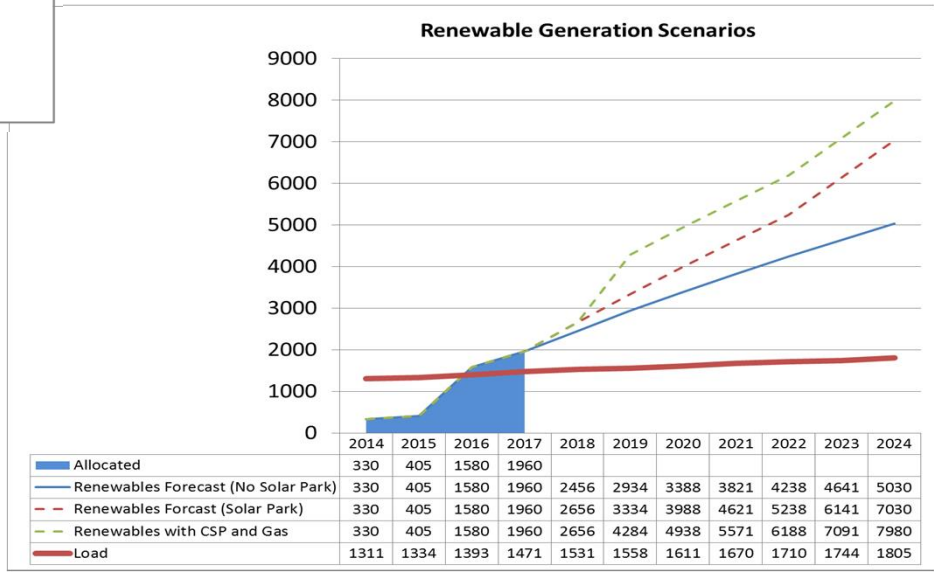
Generation Drivers

- Huge solar resources
- REIPP Programme
  - Round 1 ï 689 MW
  - Round 2 ï 330.1MW
  - Round 3 ï 1016 MW

Economic growth (2014-2030)

- Agriculture ï 35% from 37%
- Mining ï 47% from -2%
- Manufacturing ï 47% from 31%
- Construction ï 48% from 38%

Generation will exceed load by 2016/2017



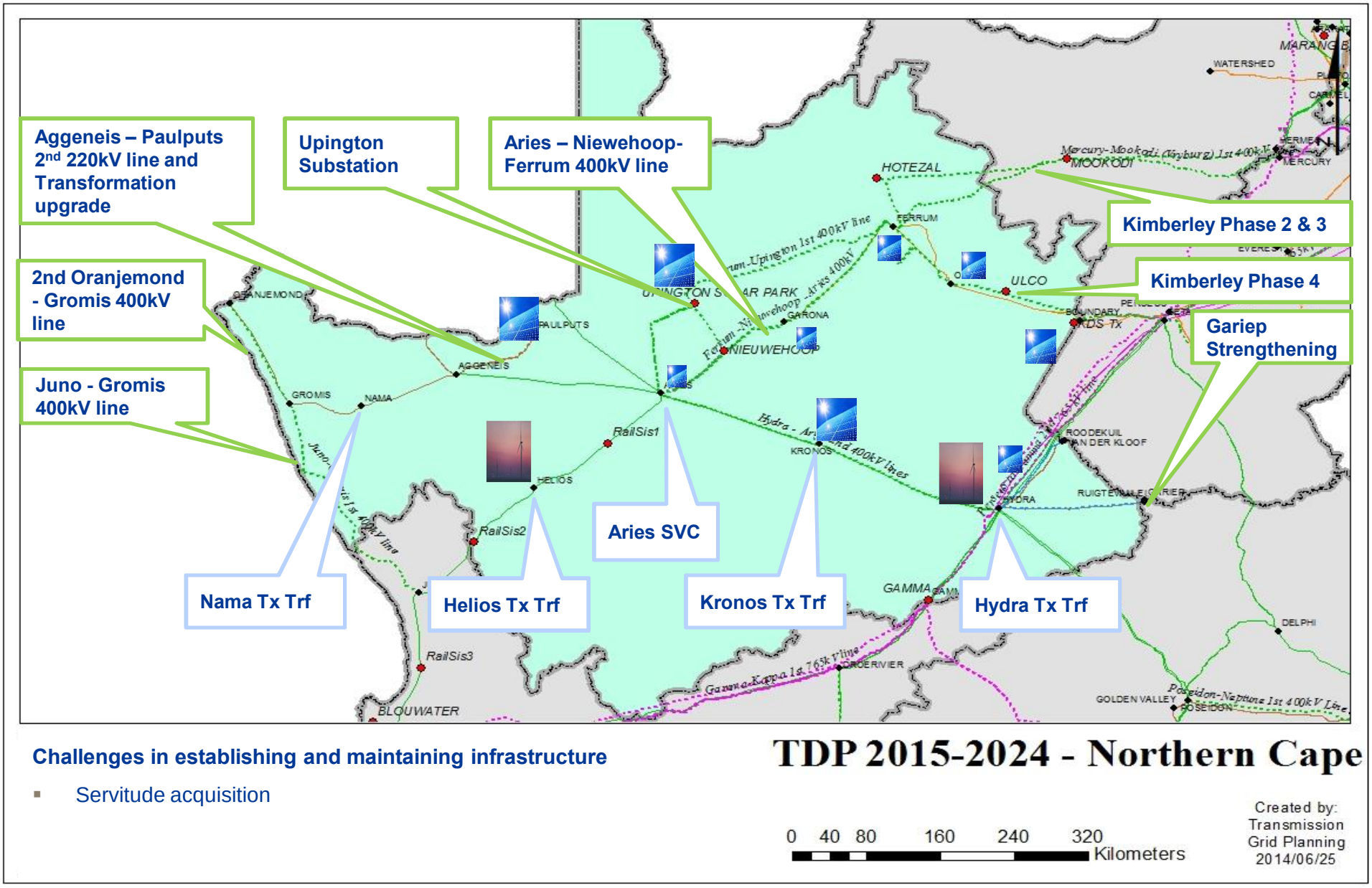
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Allocated	330	405	1580	1960							
Renewables Forecast (No Solar Park)	330	405	1580	1960	2456	2934	3388	3821	4238	4641	5030
Renewables Forcast (Solar Park)	330	405	1580	1960	2656	3334	3988	4621	5238	6141	7030
Renewables with CSP and Gas	330	405	1580	1960	2656	4284	4938	5571	6188	7091	7980
Load	1311	1334	1393	1471	1531	1558	1611	1670	1710	1744	1805

KEY DEVELOPMENTS IN THE NORTHERN CAPE

PV and CSP are over 65% of the connections

Transnet Orex tonnage increase and Kimberley potential mining

Northern Cape Province: Development Plans



Challenges in establishing and maintaining infrastructure

- Servitude acquisition

TDP 2015-2024 - Northern Cape

Created by:
Transmission
Grid Planning
2014/06/25

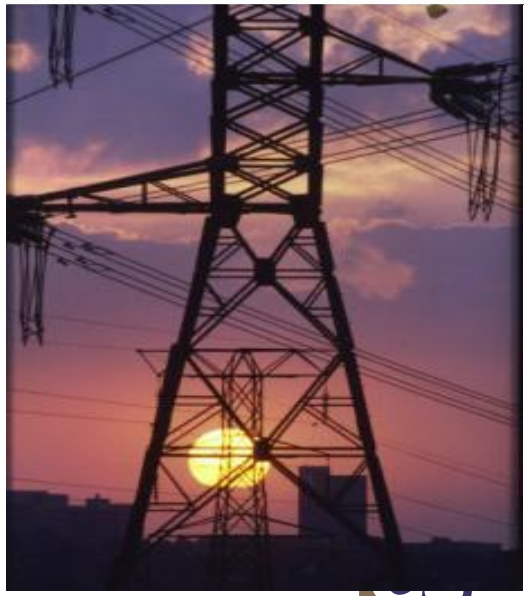
Northern Cape Province ï Current Projects 2014 ï 2019

Current Projects:

To strengthen the network around Kimberley and support increase in anticipated mining activity, and IPPôs the following projects are being executed:

- Kimberley Strengthening Phase 2 (Mercury-Mookodi-Ferrum 400kV line)
- Gariep Strengthening (Ruigtevallei Hydra De-rate to 132kV, Ruigtevallei Dreunberg)
- *Garona Strengthening (Kronos transformation + Kronos Cuprum 2x132kV lines)
- *Paulputs 2nd Transformer (250MVA)
- Nama 2X20MVA 66/22kV transformer establishment
- Aries ï Nieuwehoop 400kV line
- Aries 400kV SVC installation
- Nieuwehoop ï Ferrum 400kV line
- * Upington Solar Park Phase 1 (Upington S/S & Upington ï Nieuwehoop 400kV line
- *Hydra 500MVA 400/132kV Transformer
- Kimberley Strengthening Phase 3 (Hermes-Mookodi-Hotazel-Ferrum line)
- 2nd Gromis - Oranjemond 220kV (400kV) lines

*IPP Dependency



1923-2013

Northern Cape Province ï Planned Projects Beyond 2019

Planned Projects:

Further network strengthening is planned to improve network reliability and support future growth in the Kimberley CLN (customer load network); and to facilitate integration of Renewable Energy such as Wind & Solar Parks (CSP / PV).

The following projects are planned:

- Aggeneis-Paulputs 2nd 220kV (built at 400kV) line
- Juno - Gromis 400kV line
- *Kronos 2nd 250MVA transformer
- Helios 400/132/66kV Transformation
- *Paulputs 3rd Transformer
- *Hydra B 400/132kV Substation
- Upington Solar Park Phase 2
- Kimberley Phase 4 (Beta ï Ferrum 400kV corridor)
- Hydra ï Aries 2nd 400kV line (Outside current TDP) ï Strategic

*IPP Dependency

Thank you

EASTERN CAPE PROVINCE

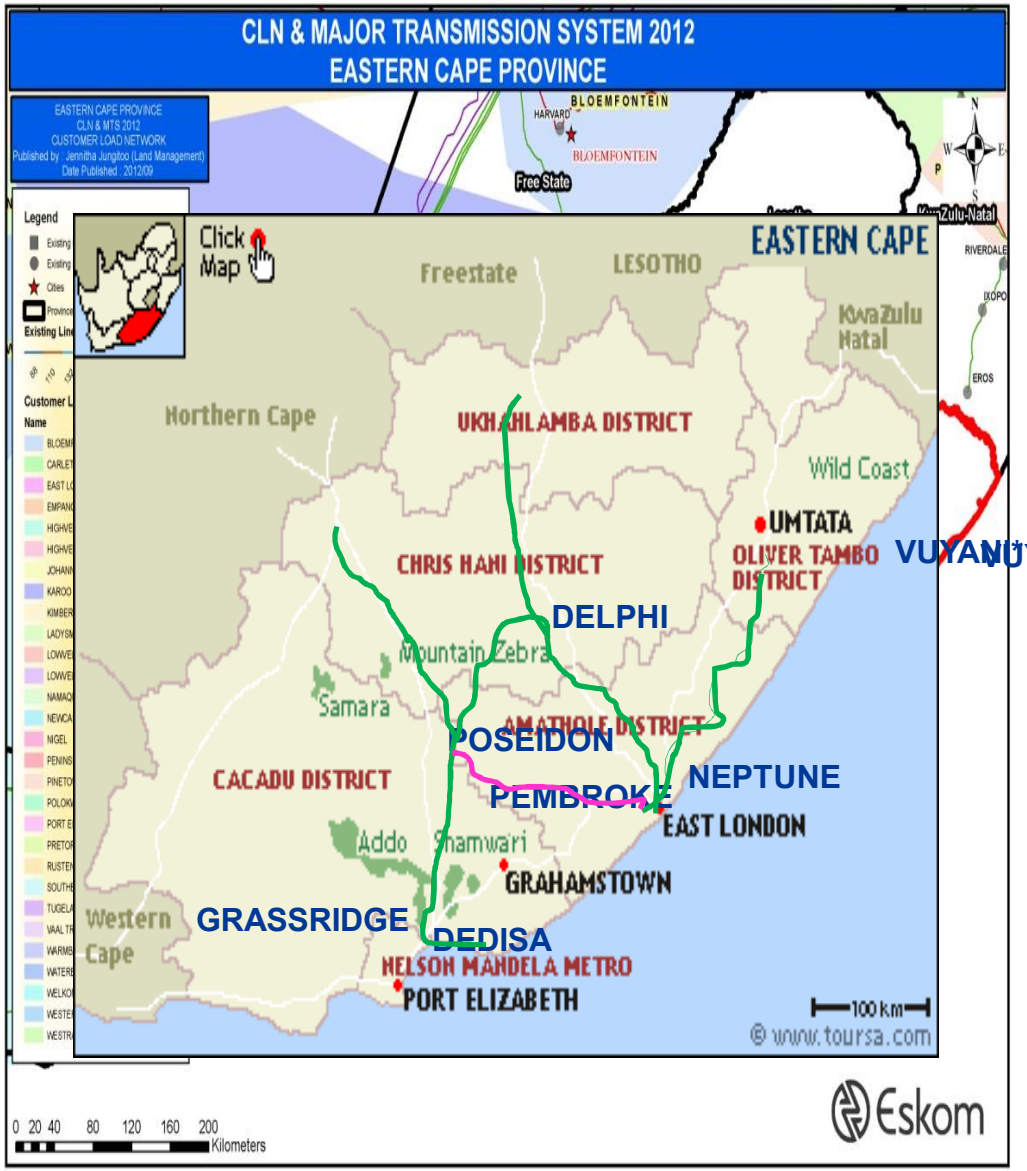
TDP 2015 – 2024

By: Caswell Ndlhovu

Powering your world

1923-2013

Eastern Cape Province Profile



General

- EC Population 6.7 million (0.4% growth)
- Economic Mix
  - Motor vehicle assembly industry*, Construction*, Light industry, Food processing, Textiles and Clothing, Farming, Residential and Commercial,

Generation in Eastern Cape (870MW)

- (NC) Gariep 4x90MW = 360MW
- (EC) Port Rex 3x57MW = 171MW
- Renewable Wind to feature prominently in future, current renewable connections amount to 340MW to Grow to +1000MW

Load Served

- Load demand = 1 445 >>>2100MW
- Electricity Penetration - 75:60:30
  Lighting (75) :Cooking(60): Heating(30)

nelson mandela bay

BUFFALO CITY
METROPOLITAN MUNICIPALITY

Eastern Cape Expansion Drivers

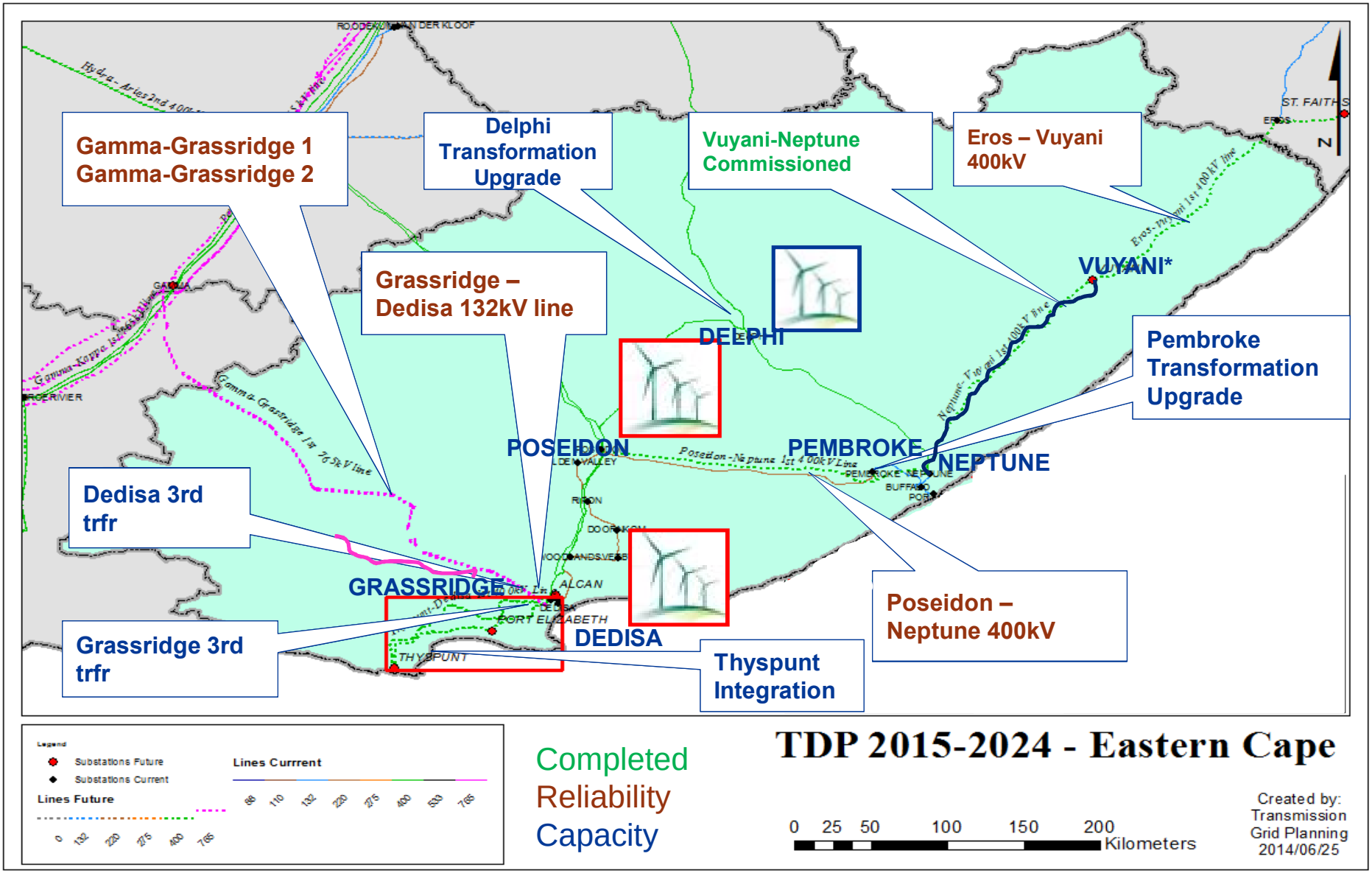
- Manufacturing (5%) ï Auto Industry - Exports
- Construction (11%) ï Commercial Growth
- Agriculture, Forestry and Agro Processing
- Tourism and Sports
- Renewables and Possible Nuclear
- Rural Electrification

COEGA IDZ (400MW)

AUTO MANUFACTURING FOR EXPORTS (DETROIT OF AFRICA)

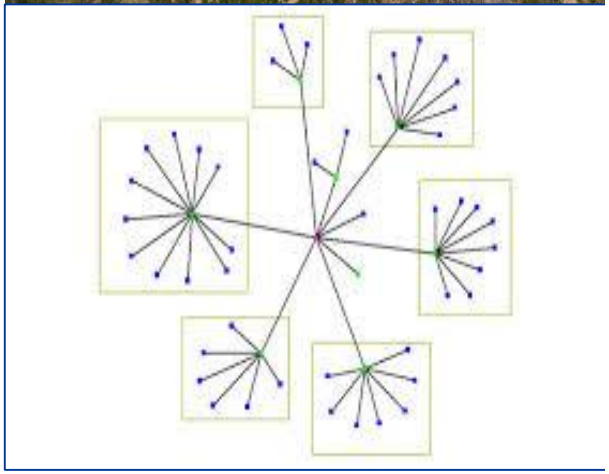
RENEWABLE IPPs (1000MW)

Eastern Cape Province: Development Plan



Renewables in the Eastern Cape

- **Round 1 – 3**
  - 100% Wind
    - Poseidon 380MW
    - Grassridge 500MW
    - Delphi 100MW
  - Access to Grassridge and Poseidon fully blocked
  - Benefits from commissioned about 240MW renewables in the Eastern Cape beginning to be realised (lower trfr loadings)
  - As more diversity is realised due to dispersion full value of renewables will be attained
- **Round 4 and beyond**
  - Future planning will revolve around collector stations to prevent blockages and sub-optimal usage of resources



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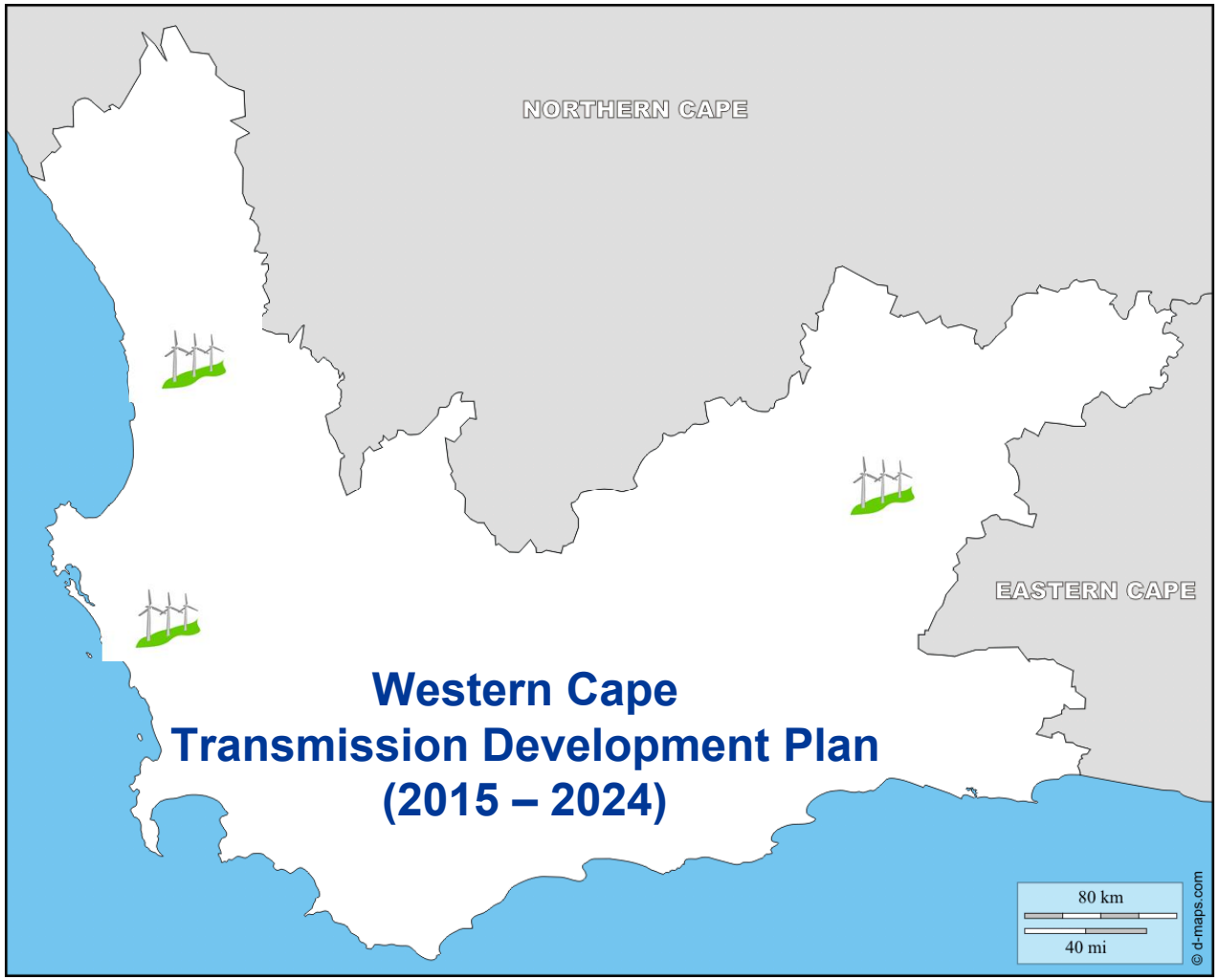
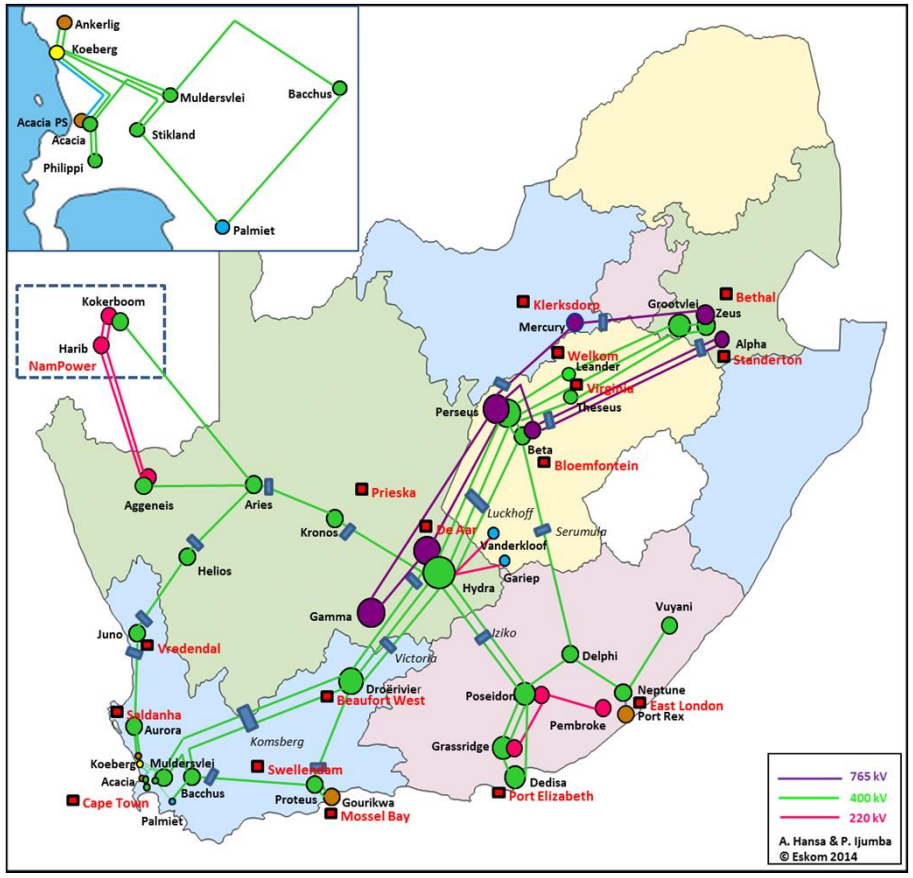


Western Cape Transmission Development Plan (2015 – 2024)

By: Ahmed Hansa

Western Cape Province Profile



Customers

- 324 000 customers
- Residential: 93%
- Agriculture: 4%
- Industrial, mining and commercial: 3%
- 3675 MW of load

Generation

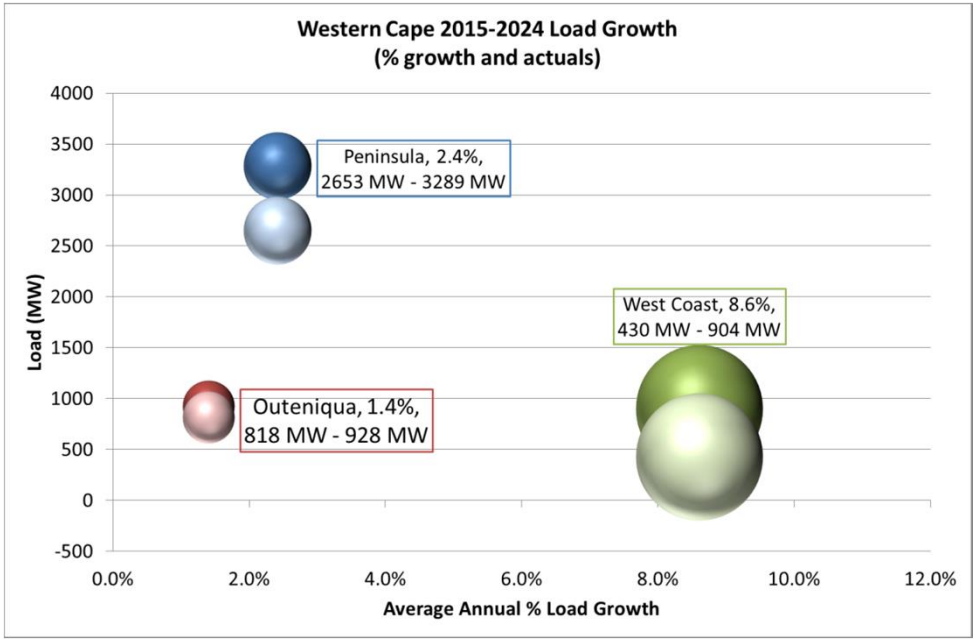
Eskom Power Stations		
Acacia	19	171 MW
Ankerlig	21	1 327 MW
Gourikwa	22	740 MW
Koeberg	5	1 830 MW
Klipheuwel	23	3 MW
Palmiet	18	400 MW
Total		**4 471 MW**

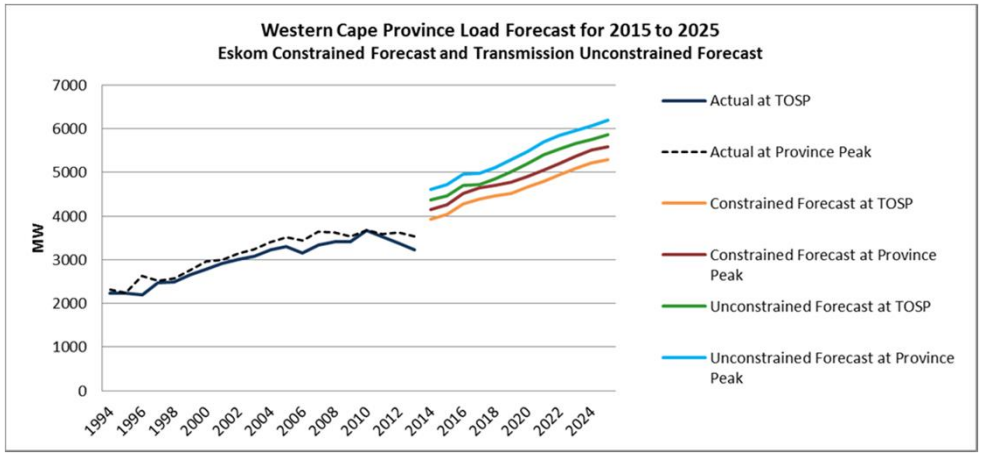
Network Coverage

- Vredendal
- Saldanha
- Cape Town
- Mossel bay
- George
- Beaufort West

Expansion Drivers

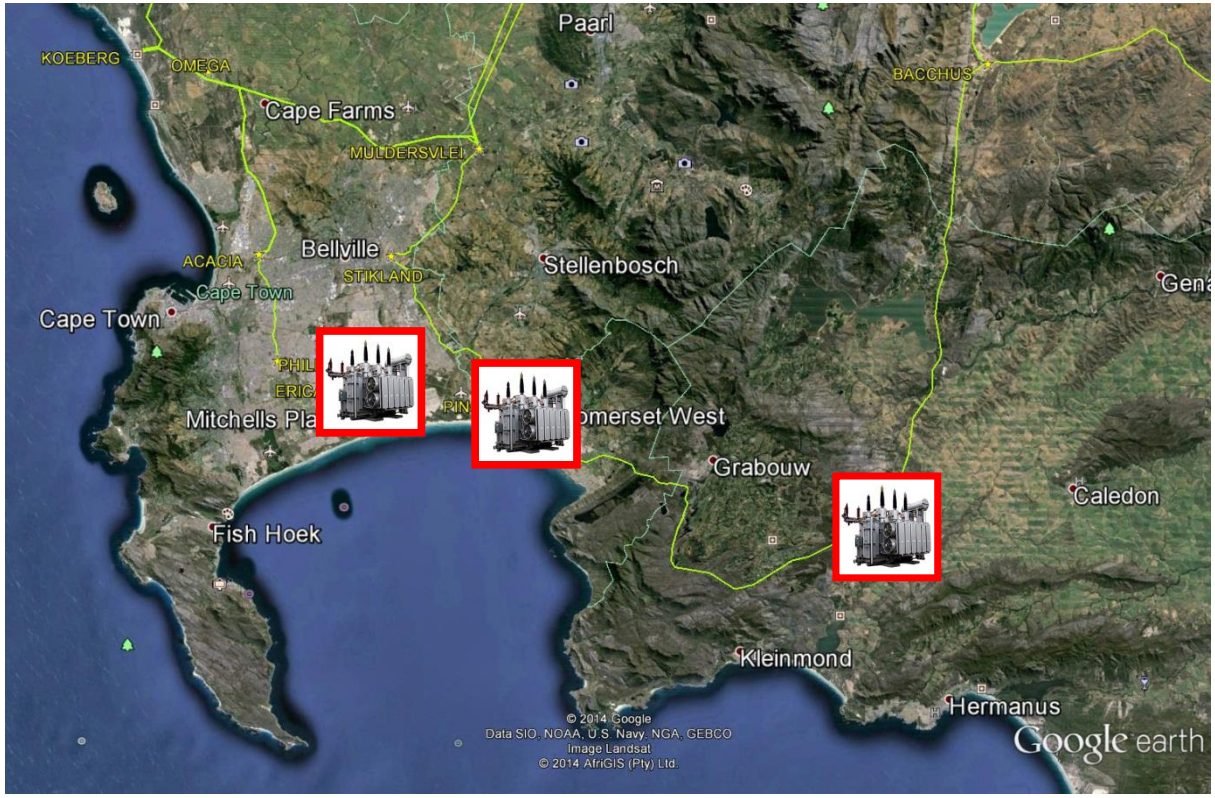
- One of the fastest growing economies in the country.
- Financial and business services, manufacturing, tourism, agriculture and fishing, wine and brandy.
- Economy is dominated by the city of Cape Town
- Huge potential for renewable energy penetration
- Gas & oil imports are also major drivers





Peninsula

Residential, commercial and light industrial load growths in the Peninsula

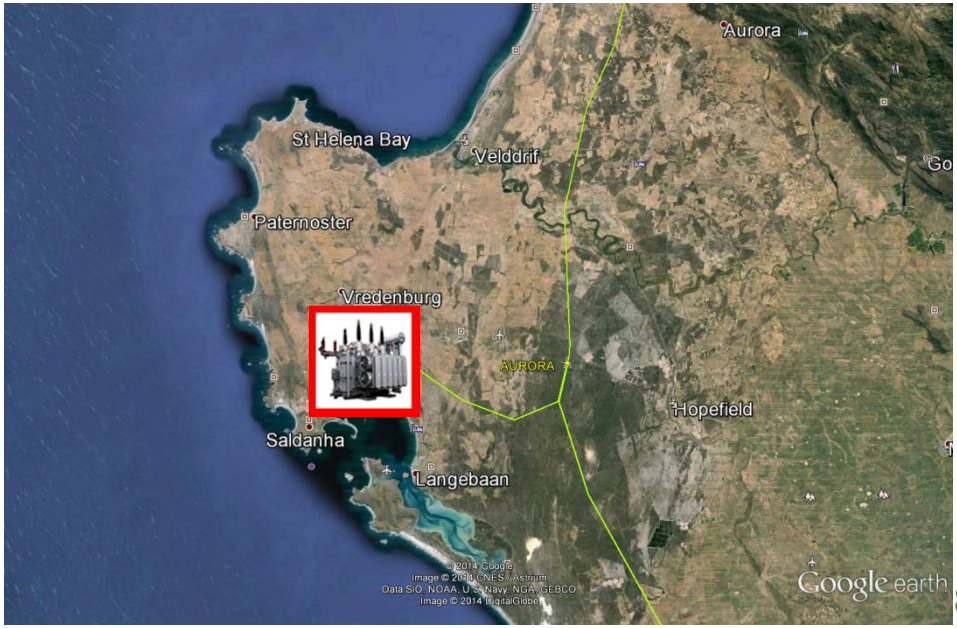


Integration of new 400/132 kV substations: Mitchell's Plain (Erica), Firgrove (Pinotage) and Houhoek (Asteria)

West Coast

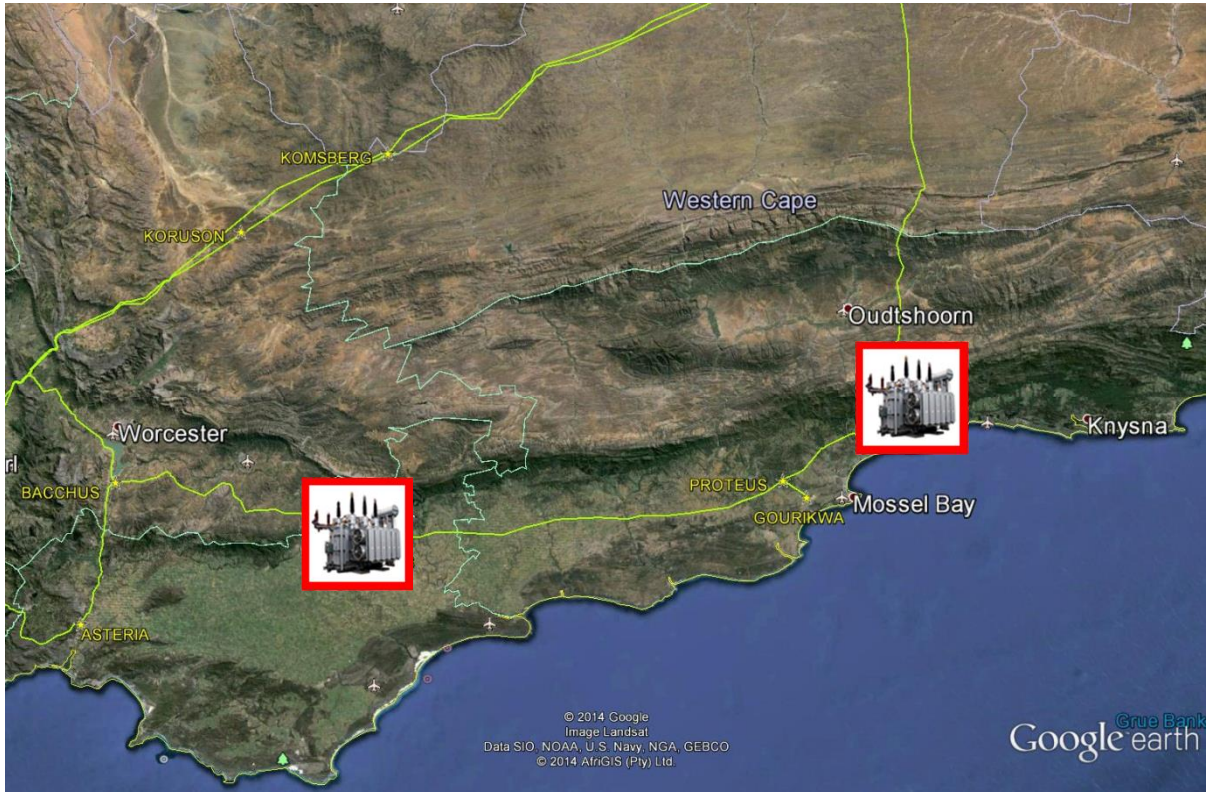
Substantial load growth in the West Coast is expected due to the **Saldanha Bay IDZ**.

Integration of new 400/132 kV substation: Blouwater



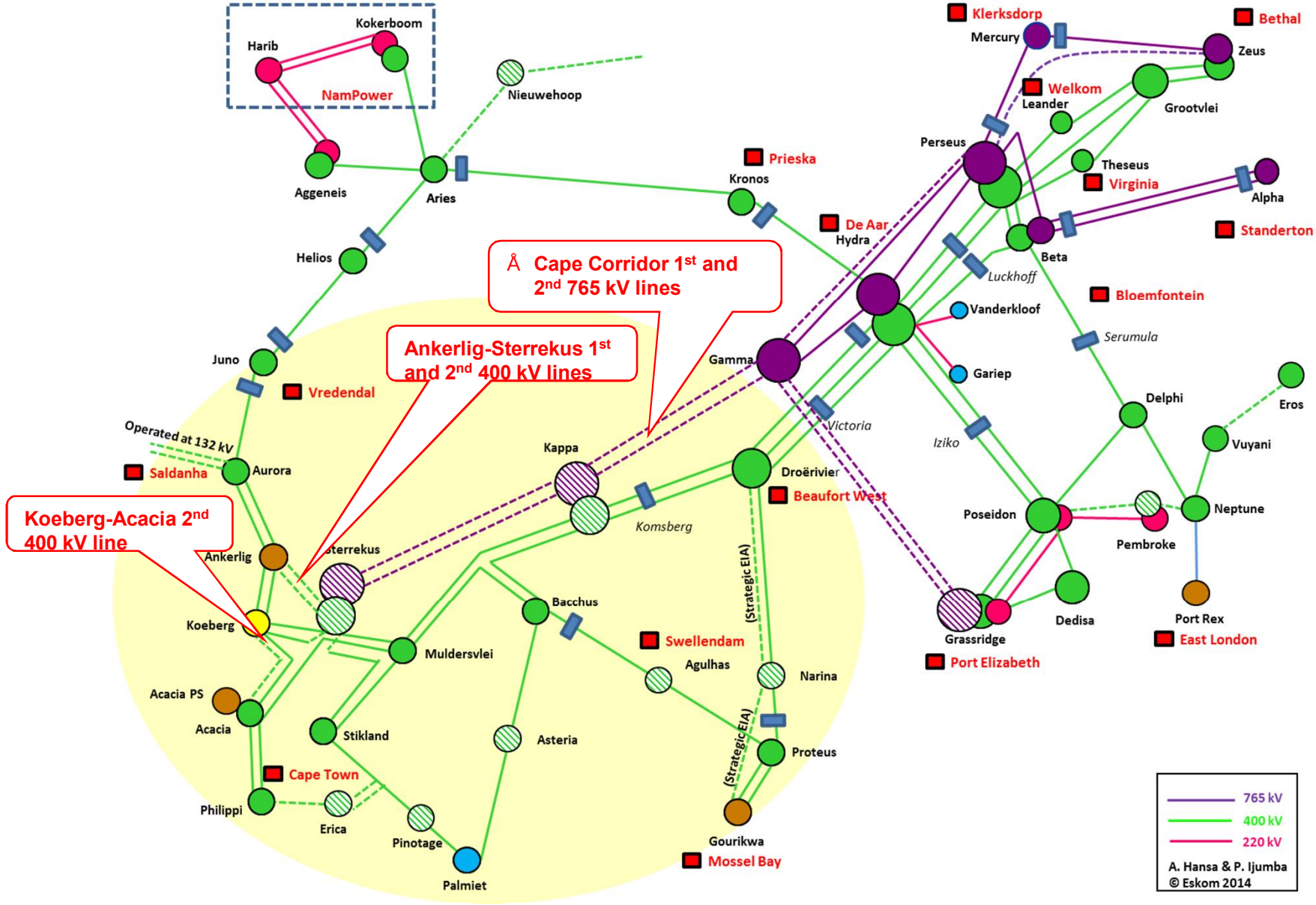
Outeniqua

- Area will mainly develop for tourism.
- Huge potential and interest for IPP wind generation.



Integration of new 400/132 kV substations: Vryheid (Agulhas) and Blanco (Narina)

Western Cape TDP Overview



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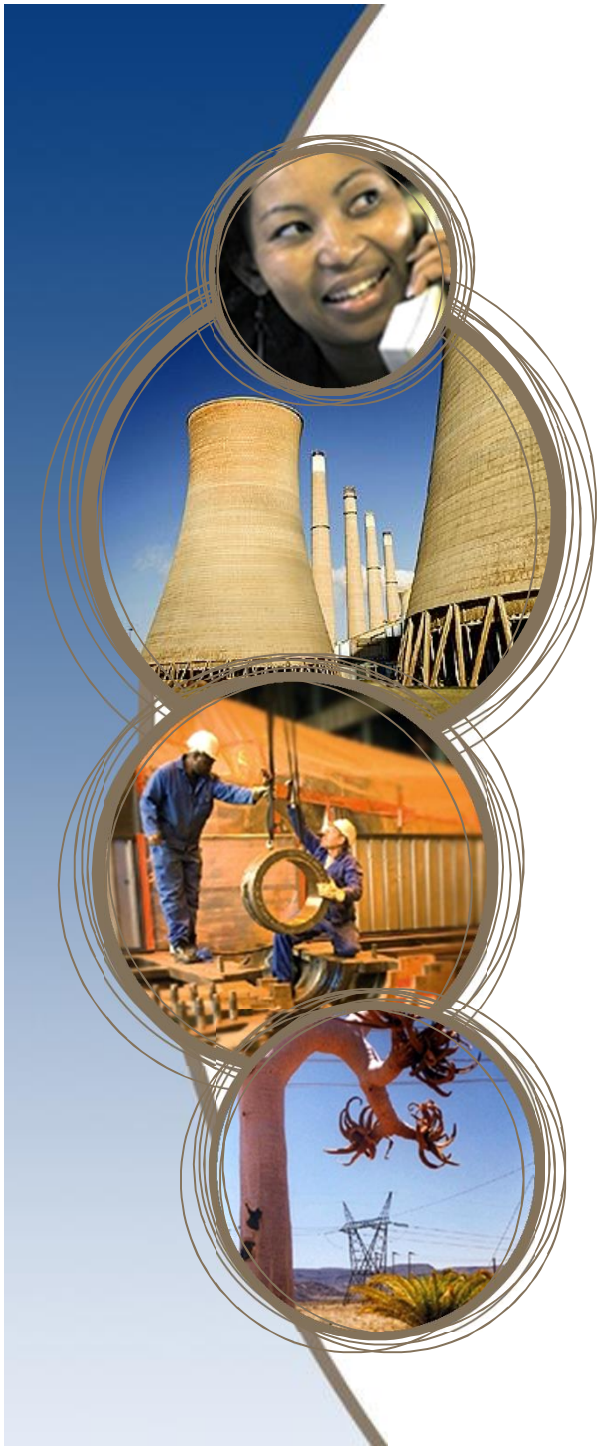


TRANSMISSION

DEVELOPMENT PLAN 2014

Capex Analysis

By: Agnes Mlambo

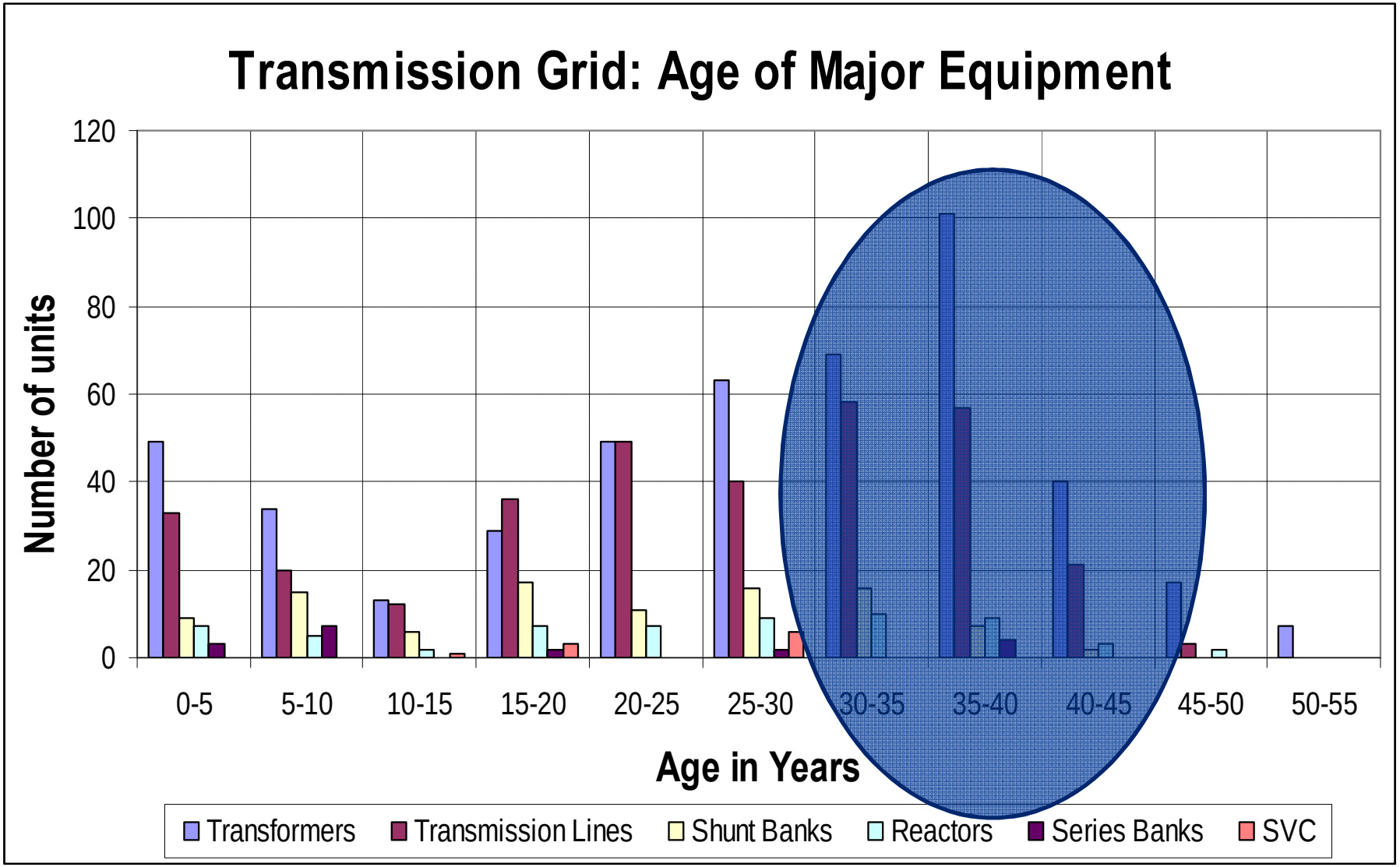
Transmission Capital Expenditure Drivers

1. **Capacity Expansion and Network Strengthening**:
   - Connection of new and anticipated *customer loads* and *generation*
   - N-1 Reliability Investments
   - Mitigation of Fault-level Exceedances (existing and anticipated)
   - Resolution of Quality of Supply excursions
   - Securing of Servitudes and Environmental Authorisations
   - Compliance (Regulatory, OHSAct, Environmental etc.)

2. **Refurbishment** (i.e. Extension of Life of Existing Assets):
   - Refurbishment of aging equipment (CTs, VTs, Surge Arresters, H.V. Circuit Breakers and Power Transformers)
   - Replacement of substation batteries and electronic components for protection and control systems, corroded conductors etc. (these not repairable)
   - Targeted Asset Performance Improvements (lines and substation equipment)
   - Physical security improvements and surveillance and monitoring at our key assets and sites
   - Strategic and operational spares holding (to reduce SML<1 and MI risk)
   - Compliance (Regulatory, OHSAct, NKP Act, Environmental etc.)

3. **Asset Purchases**:
   - Specialised equipment for: live-line work; fault location systems, and online condition monitoring, etc.

Age Profile of Transmission Assets



10 Year Transmission Capex Summary

Categories	FY15-24 (Rm)
Capacity Expansion	145,968
Refurbishment	7,680
Capital spares	2,397
EIA and servitudes	5,150
Strategic	1,066
Production Equipment	519
Total	**162,779**

TDP CAPEX Challenges: R146bn ?

- TDP Projects had to be prioritised and re-phased in alignment with available CAPEX, resulting in the following programmes continuing as per plan:
  - Integration of the Medupi, Kusile, Ingula projects
  - Integration of the DOE RE Bids 1, 2, and 3
  - Connection of future IPP and Load connections that do NOT require deep strengthening
  - Integration of the Eskom CSP, Sere, and RE projects near Upington
  - EIA and Servitudes Acquisition
  - Projects in execution to continue as per plan
  - Projects addressing safety issues ï deemed highly critical

- Key programmes at risk:
  - Connection of new loads and IPPs that require deep strengthening
  - Integration of the future REBID IPP projects (IPPs beyond REBID 3).
  - N-1 compliance will be delayed from 2016 to 2022 (subject to availability of Capex going forward)

Thank you

TDP Observations - Conclusions

- The TDP infrastructure requirements over the 10 year period is fairly consistent to that presented in the 2012 TDP as well as the CAPEX requirements (R146bn vs R149bn)
- Projects had to be re-prioritised and re-phased to align with more realistic completion dates project readiness analysis and available CAPEX.
- Projects required for the DOE Renewable Energy (RE) IPP programs 1 & 2 are in most cases on track, some completed while others are in execution or nearing completion.
- Projects to address the DOE RE IPP program 3 are awaiting the ñgo aheadòto move into execution.
- Apply value engineering principles ñscrubbingòto identify opportunities for cost savings

TDP Observations – Conclusions cont.

- Continue with strategic EIAs and servitude acquisitions
- Continue with project development (concept and detail designs) on all projects while the investment decisions will be based on project criticality, readiness and available resources
- Consider ñSelf Buildòand other project ñfundingòmethodologies where applicable
- The conclusion is that the transmission projects in this TDP will result in the overall network becoming Grid Code compliant, while catering for increased load growth and integration of new generation and this is crucial for the economic growth and development of SA.

Thank you