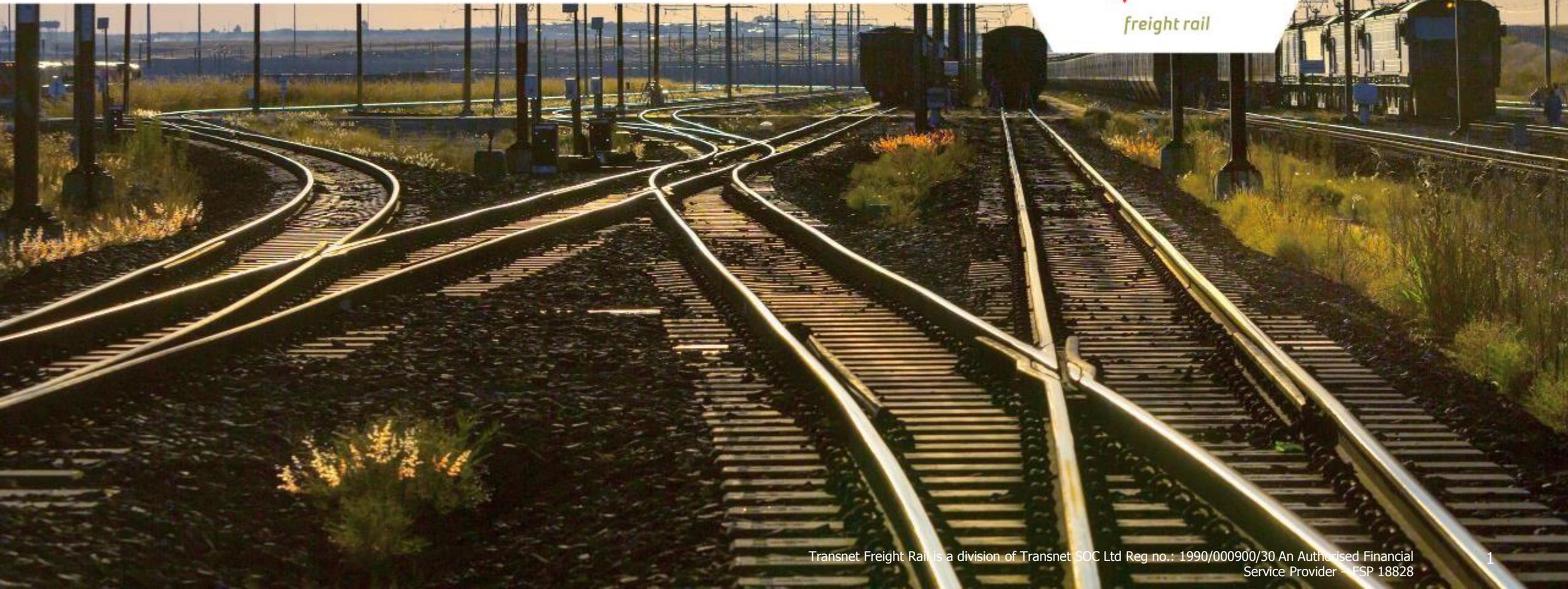


“Challenges and developments facing SA Coal Logistics”

IHS Energy SA Coal Conference

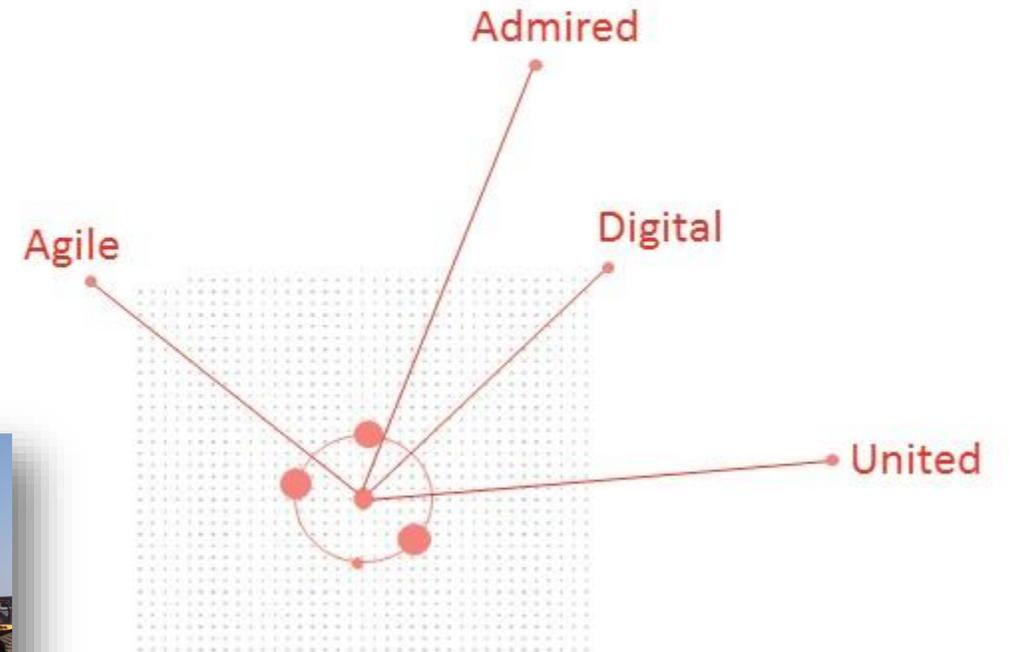
1 February 2019

Mandisa Mondli, General Manager: Coal BU - Transnet Freight Rail



Overview

- ❖ SA Competitiveness
- ❖ The Transnet Business and Mandate
- ❖ The Coal Line: Profile
- ❖ Export Coal Philosophy
- ❖ Challenges and Opportunities
- ❖ New Developments
- ❖ Conclusions



SA Competitiveness: Global Reserves



Global Reserves (bt)			Global Production (mt)	
USA	1	237.29	2	906
Russia	2	157.01	6	357
China	3	114.5	1	3,87
Australia	4	76.46	3	644
India	5	60.6	4	537
Germany	6	40.7	8	185
Ukraine	7	33.8	10	60
Kazakhstan	8	33.6	9	108
South Africa	9	30.1	7	269
Indonesia	10	28	5	458

Source: World Energy Council 2016

- ❑ Despite large reserves of coal that remain across the world, electricity generation alternatives are emerging and slowing down dependence on coal.
 - ✓ European countries have diversified their energy mix reducing reliance on coal significantly.
 - ✓ However, Asia and Africa are still at a level where countries are facilitating access to basic electricity and advancing their industrial sectors, and are likely to strongly rely on coal for power generation.
- ❑ South Africa *remains in the top 10 producing countries* putting it in a fairly competitive level with the rest of global producers.

SA Competitiveness : Coal Quality

Country	Exports (2018)	Grade	Heating value	Ash	Sulphur
USA	52mt	B	5,850 – 6,000	14%	1.0%
Indonesia	344mt	C	5,500	13.99%	
Australia	208mt	B	5,850 – 6,000	15%	0.75%
Russia	149.3mt	B	5,850 – 6,000	15%	0.75%
Colombia	84mt	B	5,850 – 6,000	11%	0.85%
S Africa	78mt	B	5,500 - 6,000	17%	1.0%

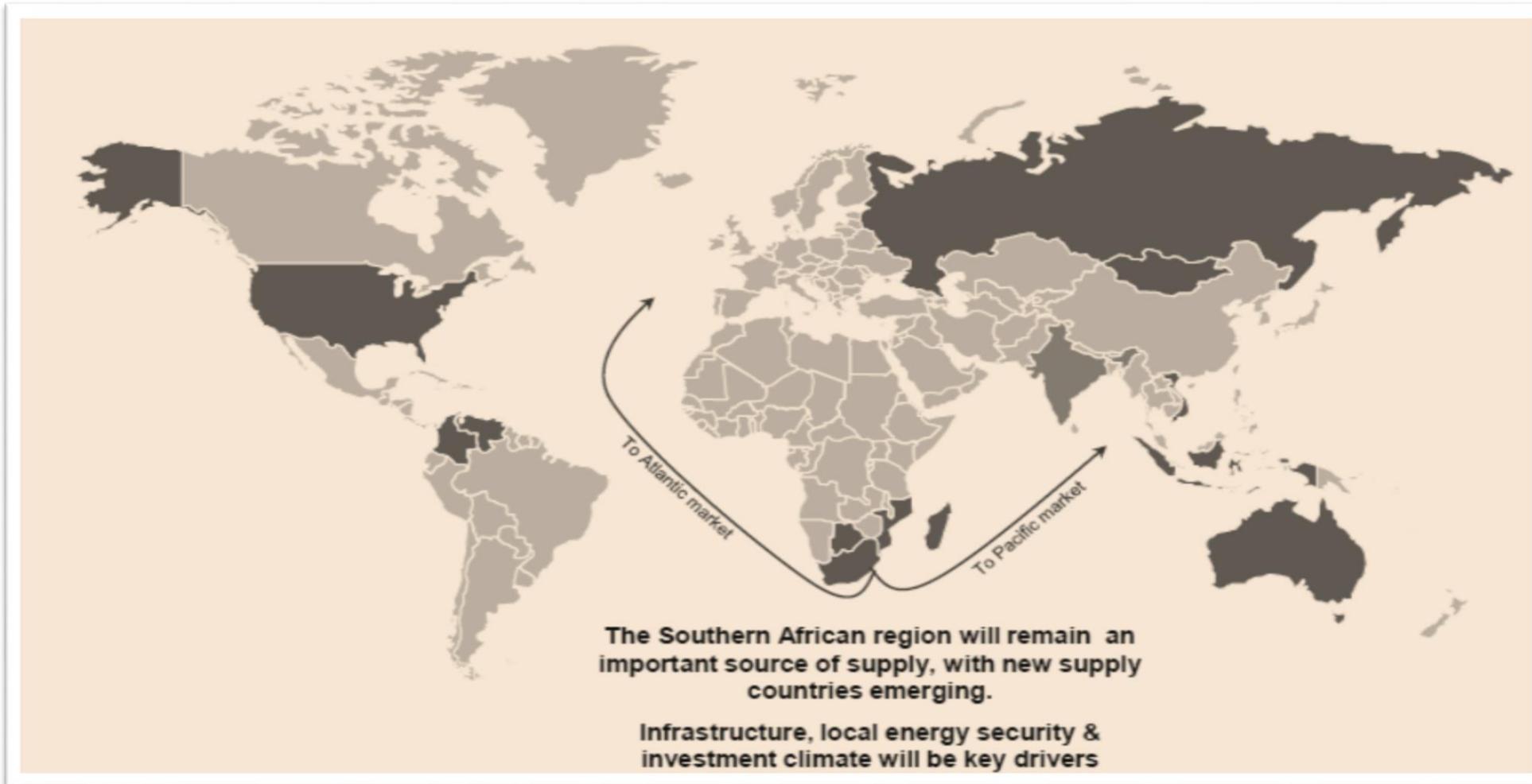
Grade	Calorific Value Range (in kCal/kg)
A	Exceeds 6200
B	5600 - 6200
C	4940 - 5600
D	4200 -4940
E	3360 - 4200

Source: Global Coal

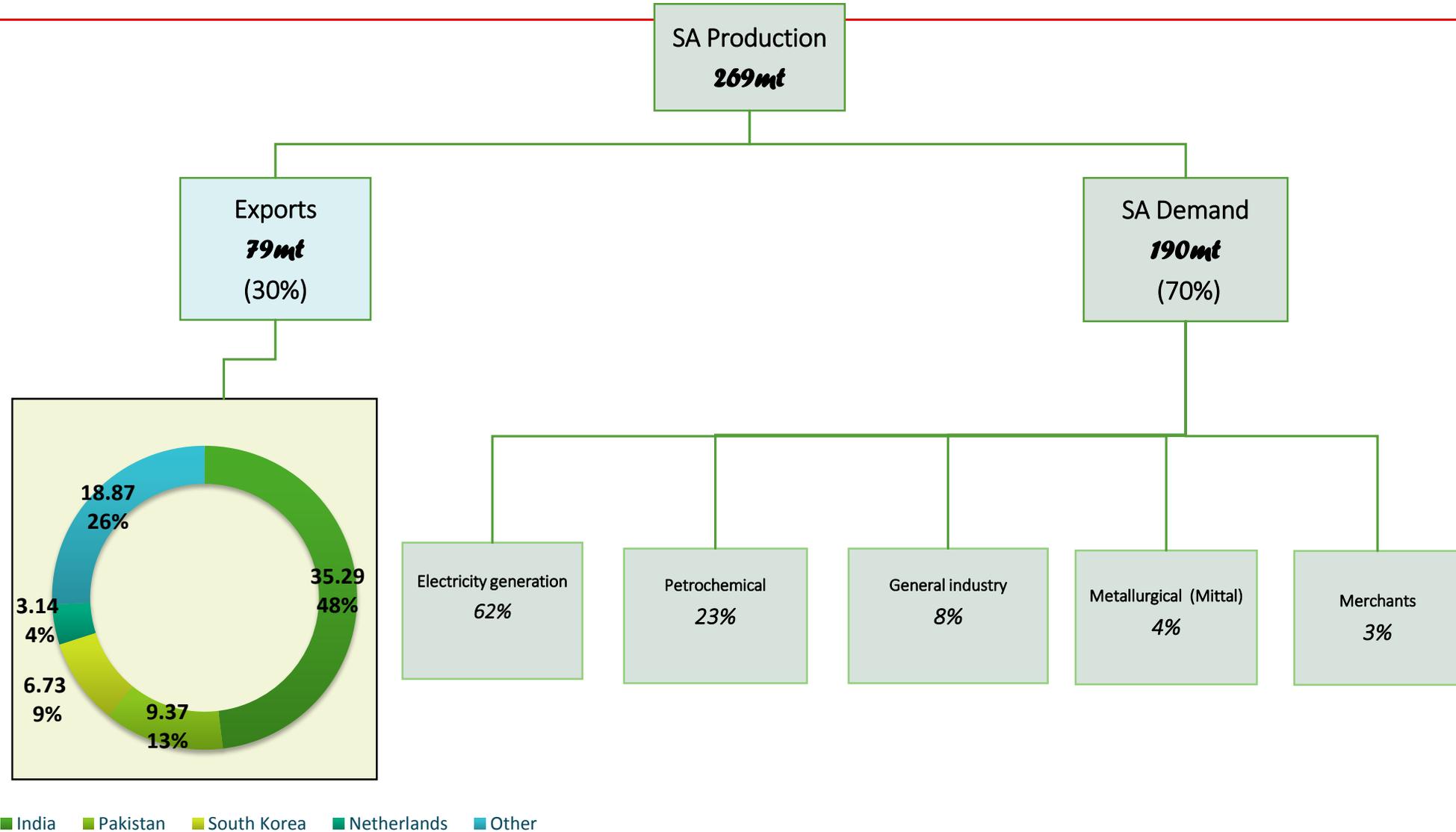
- South Africa’s coal quality is graded B , the second best coal quality in the world and compares well with major coal exporting countries globally.
- SA largely produces two types of coal i.e. bituminous and anthracite coal.
- Bituminous is generally used for power generation, as evidenced by the biggest global exports destinations such as China, India, Pakistan, Netherlands, etc.

SA Competitiveness : SA Position

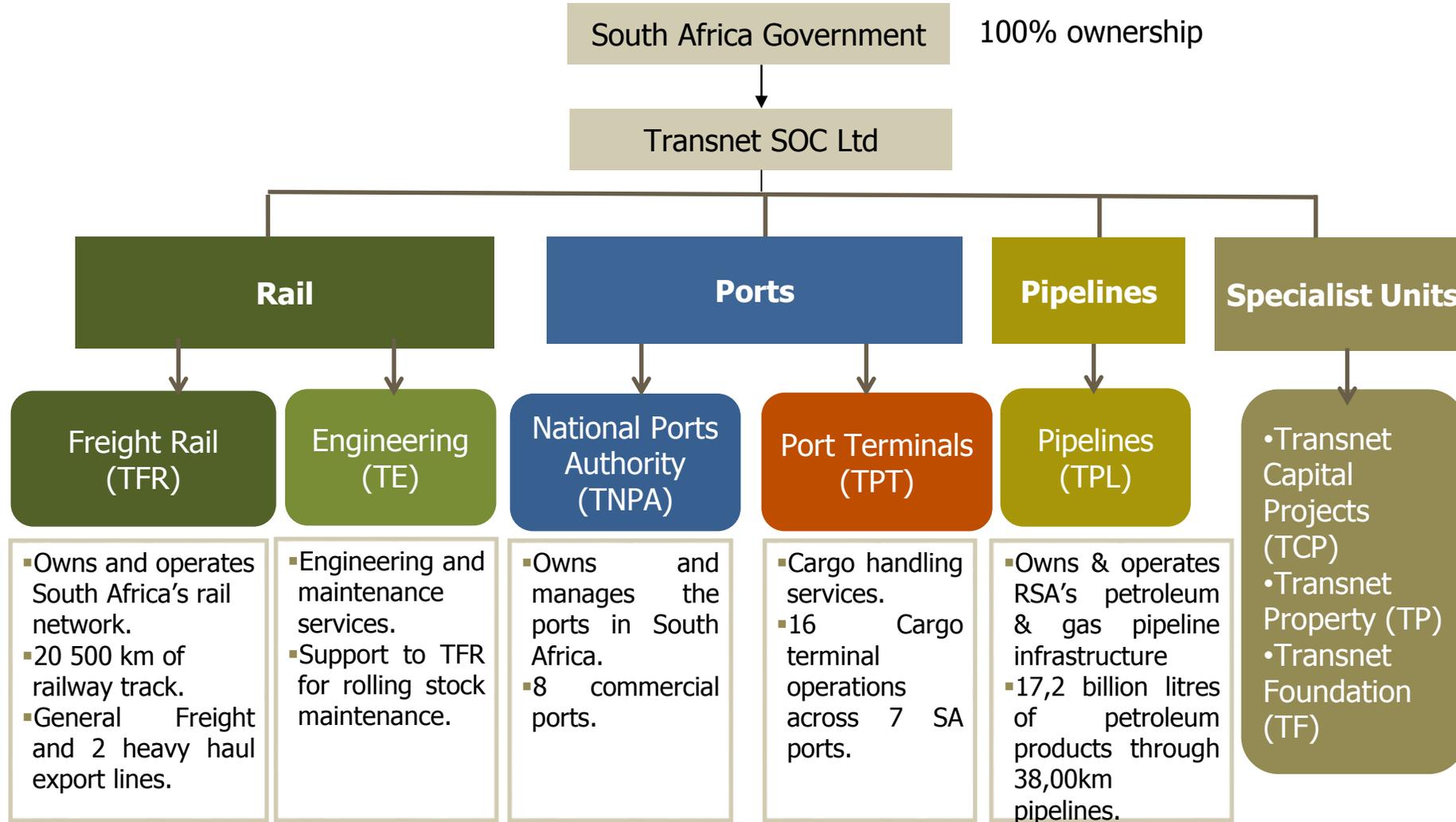
Southern Africa can position itself to benefit from coal demand growth in the East



SA Coal Production Allocation



Transnet: Custodian of ports, rail, pipelines



Transnet's critical role in furthering South Africa's developmental objectives

Transnet's mandate, vision, and mission



Mandate

- Assist in lowering the cost of doing business in South Africa, enabling economic growth and ensuring security of supply through providing appropriate (port, rail and pipeline) infrastructure in a cost-effective and efficient manner
- Strategic objectives are aligned with national plans and the SSI



Vision

- **Fuelling Africa's growth and development as the leading provider of innovative supply chain solutions.**



Mission

- **Linking economies; connecting people; growing Africa!**

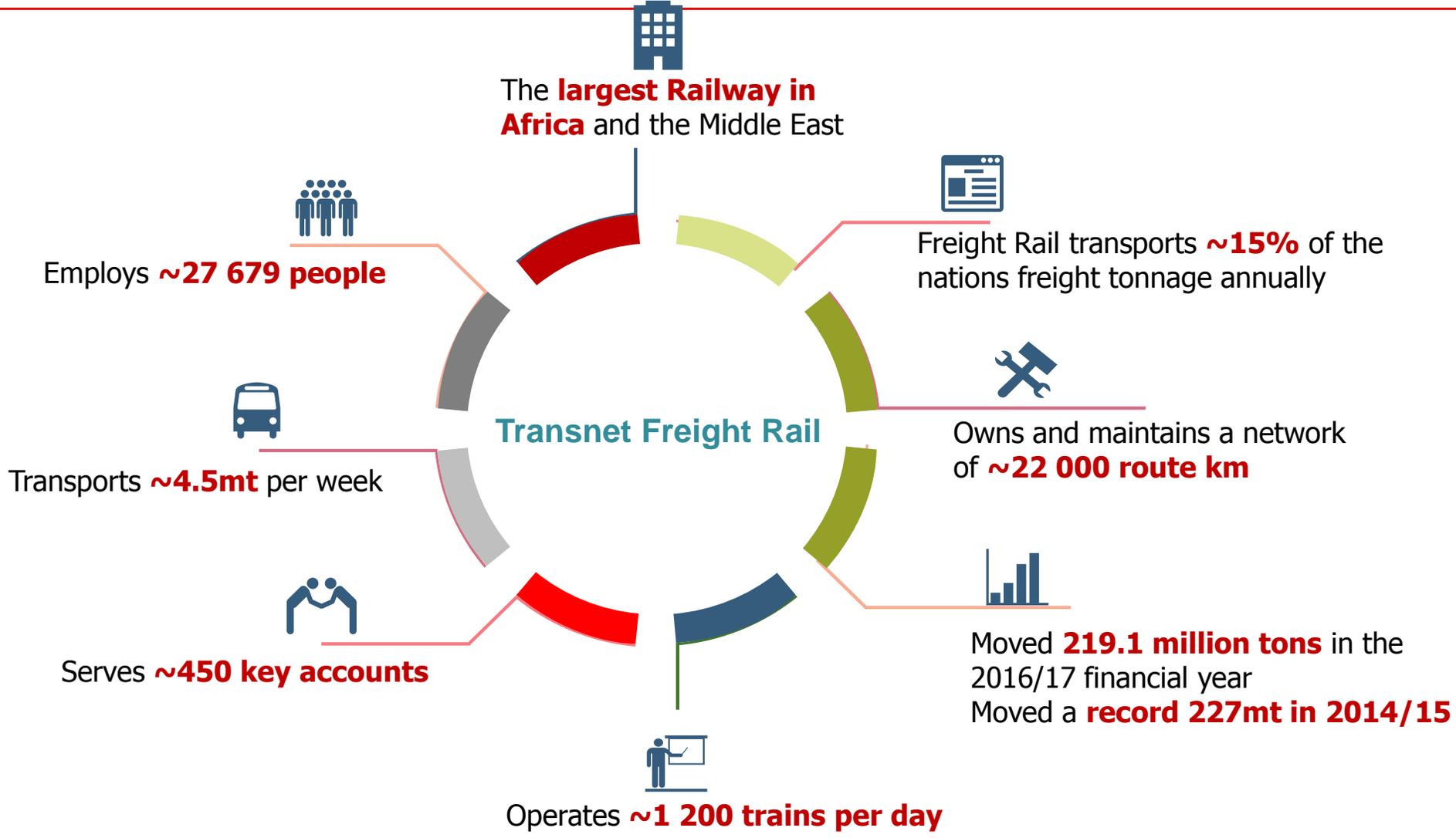
Public value creation



- SOEs have to balance economic, social and other objectives by remaining financially sustainable, while creating value for citizens and society
- The "Inclusive wealth" of a country includes the sum of three kinds of assets:
 - manufactured capital (e.g. roads, machinery, buildings)
 - human capital (people's health and skills)
 - natural capital (e.g. forests and fossil fuels)
- Creating public value is linked to Transnet's mandate

In response, Transnet is actively refreshing its brand as it moves into new markets, expanding its service offering, and redefining its market position

Transnet Freight Rail: largest Operating Division in the Transnet Group



MDS : Core Strategies and Objectives

2018/19 is the last Year of the 7 Year Strategy



Goal : Top 5 Railway - Financially sustainable, Integrated Logistics Service Provider, Innovative, Employer of Choice, World Class Customer Service, Gold Standard Operations and Capital Execution

Transnet Strategy

Core Strategies

Market Development

Operational Efficiency

Capital Investment

Regional Integration

Safety

People

Objectives

- To build market reputation & credibility
- To increase market share
- To develop a customer centric culture

- To improve performance productivity and operational efficiency
- To contribute to a reduction in the cost of logistics

- To create capacity ahead of demand
- To maintain, upgrade and modernise the rail system

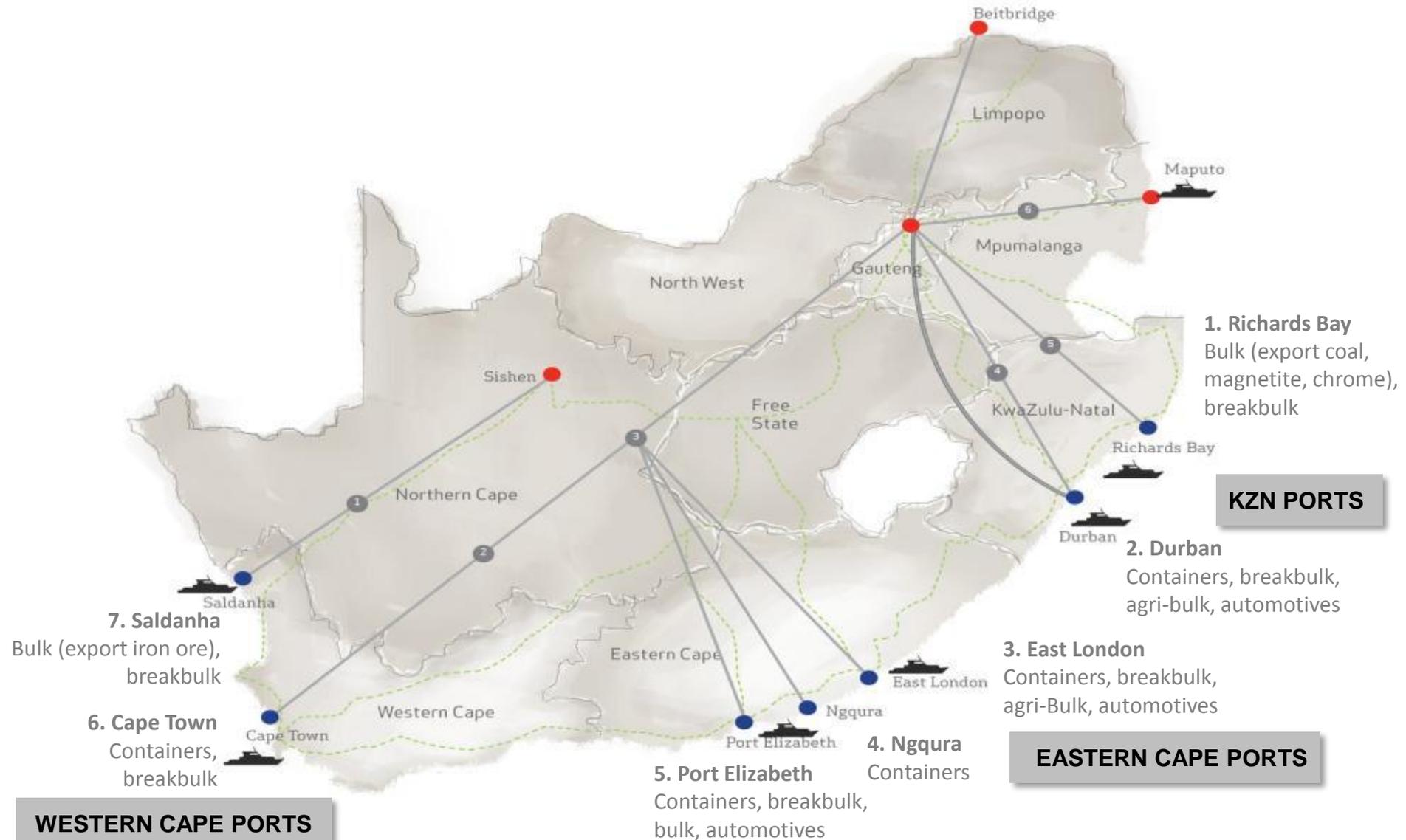
- To develop an integrated Regional rail system with economic growth opportunities

- To build and maintain a healthy and safe working and operations environment

- To develop skills
- To create sustainable employment opportunities
- To transform the business to a high performance culture

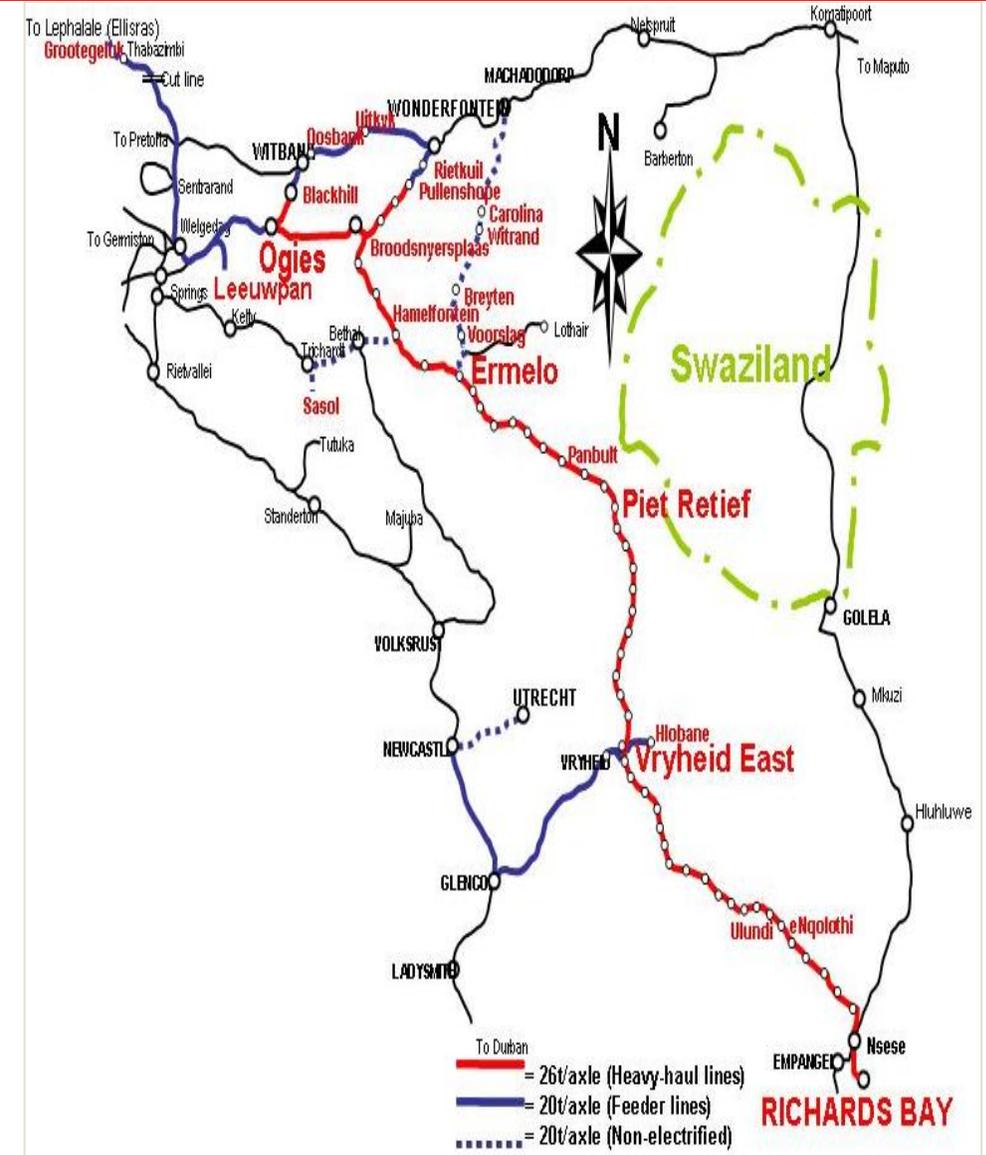
Financial Sustainability

Transnet operates an integrated network and is a logistics leader in the region – World Class Pit to Port Coal Exports

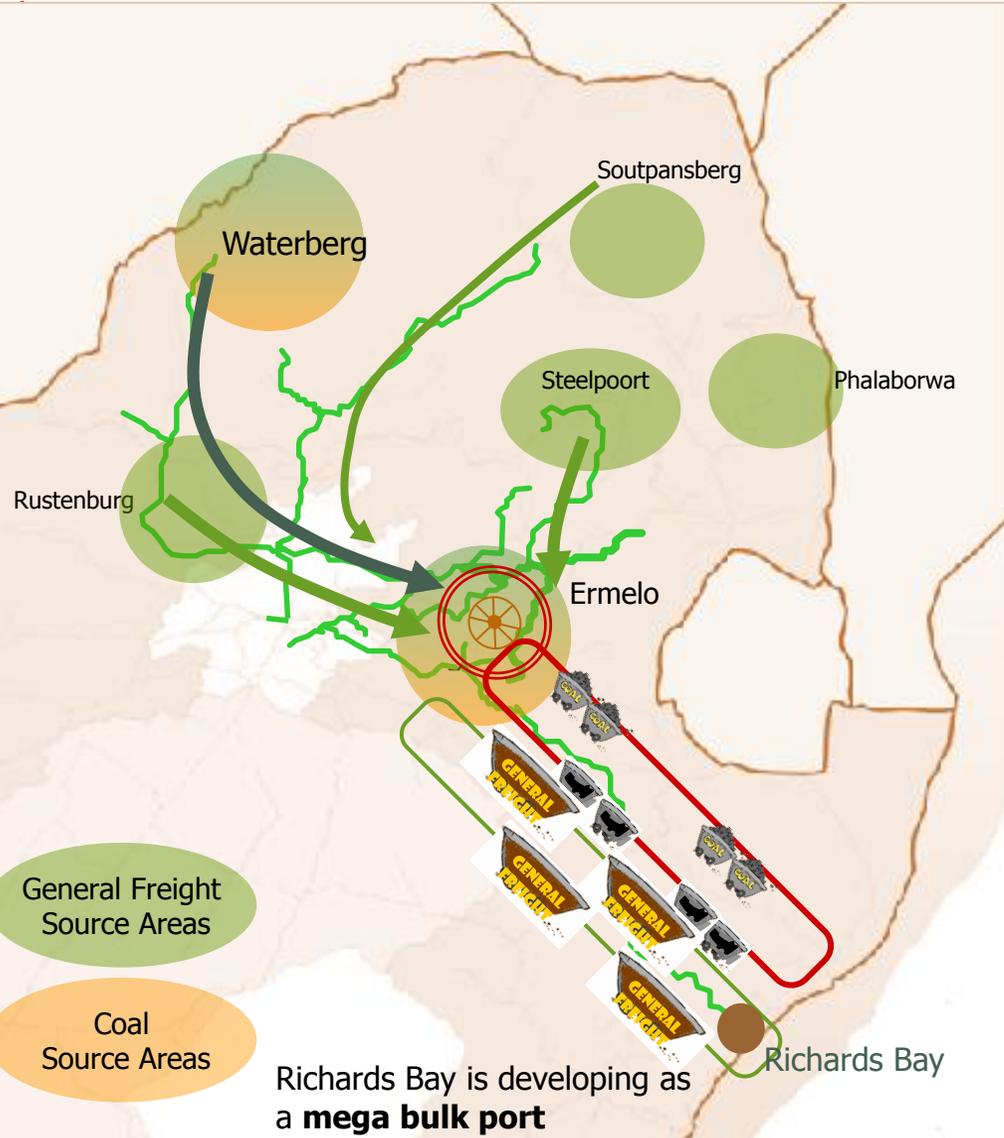


The Coal Line: Profile

Distance	+/- 748km from Blackhill to Richards Bay
Topography	<ul style="list-style-type: none"> o Descends from 1700m altitude to sea level o Undulating topography and high rainfall
Axle loads	26 t/axle on heavy haul and some feeder lines
Ruling Gradient	1:100 North of Ermelo 1:160 for loaded trains South of Ermelo on one of the two tracks, and 1:66 for empties
Traction	3kV DC: North of Ermelo 25kV AC: South of Ermelo
Civil	137 bridges, 37 tunnels Overvaal tunnel = 4 km (single)
# of lines	Double, 3rd line on some feeder sections
Authorisation	Colour light signalling with CTC
Locomotives	<ul style="list-style-type: none"> o 7E/11E on AC, 10E on DC sections o 110 AC/DC 19E in operation o 100 new AC/DC 21E in production
Wagons	CCL gondola: max payload of 84 tons
Gross tons per train	22 000 tons at 2,2km in length
Volumes in 2017/18	77.016 Mtpa export coal
Capacity	95 Mtpa (81 Mtpa export coal; 14 Mtpa general freight)
Competitiveness	Most affordable global coal transporter



Coal Line Operating Model – a World Class model for Heavy Haul Operations



Operating Philosophy

- **Rolling Stock – 21&19E AC/DC Locomotives** provide required tractive effort; Reduce cycle time in change over yards & increase reliability and availability of the locomotive fleet
- North of Ermelo 100 wagon, 3kV DC network ;
- South of Ermelo 200 wagon, 25 kV AC network
- Train **Configuration and Technology : ECP / WDP:** Electronically Controlled Pneumatic braking system & Wire Distributed Power Increase capacity; Improve train handling; Improve turnaround time; Increase Safety margins
- **Jumbo Wagons** – Capacity 84 tons/wagon and 16 600 Tons/Train of 200 wagons
- **100 wagon trains** on the feeder lines from Waterberg, Mpumalanga and outlying areas
- Train sets combined at Ermelo as **200 wagon trains** to RBCT
- **Maintenance Philosophy** – Technology for continuous condition monitoring of the system. Integrated annual maintenance shutdown – Rail, Terminal, Ports, Coal Customers

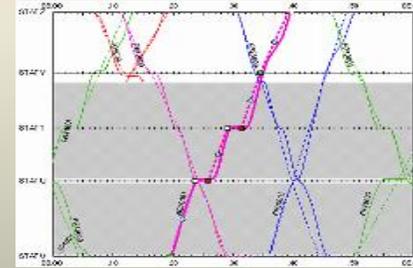
Capacity Creation through an integration of initiatives to expand the system at globally competitive supply chain cost



Maintenance Philosophy



Train Authorisation Systems



Operating Models



Technology

Capacity Creation Framework



Telecommunications



Customer loading & offloading facilities

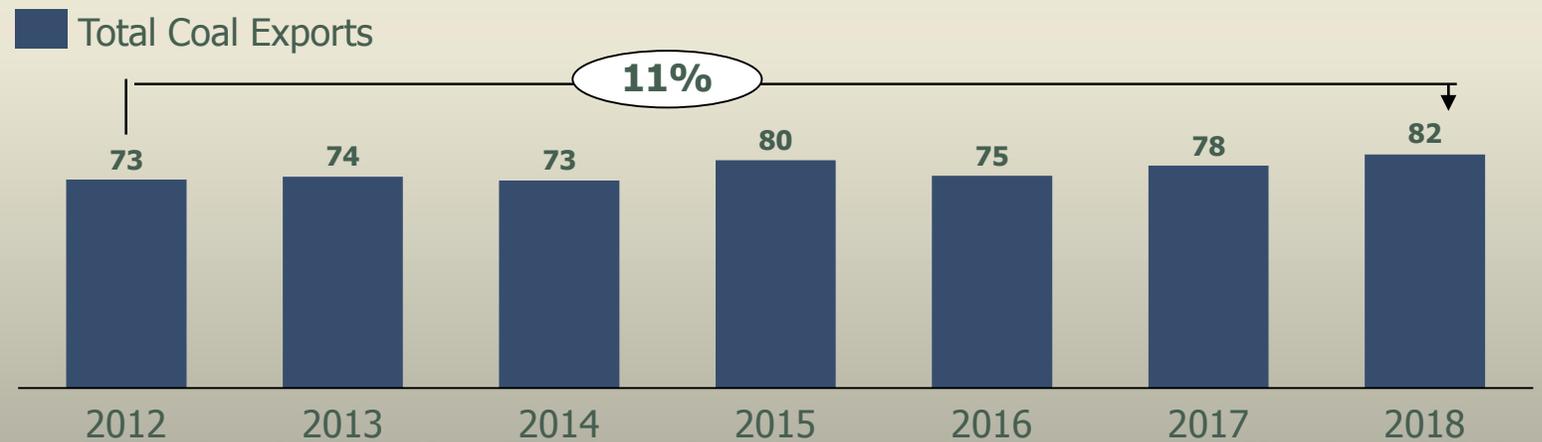
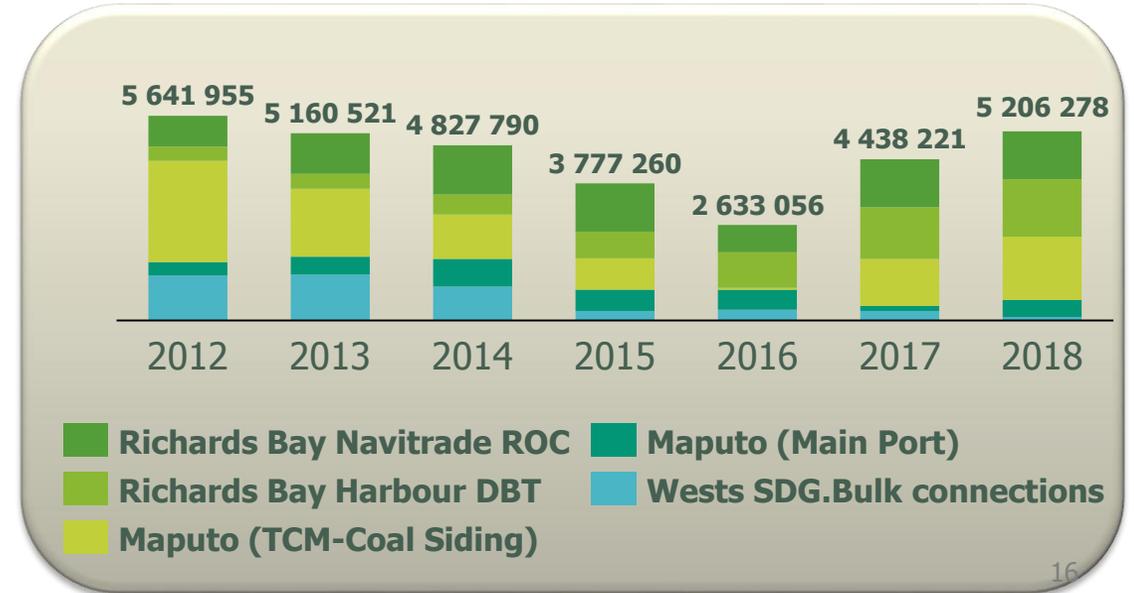
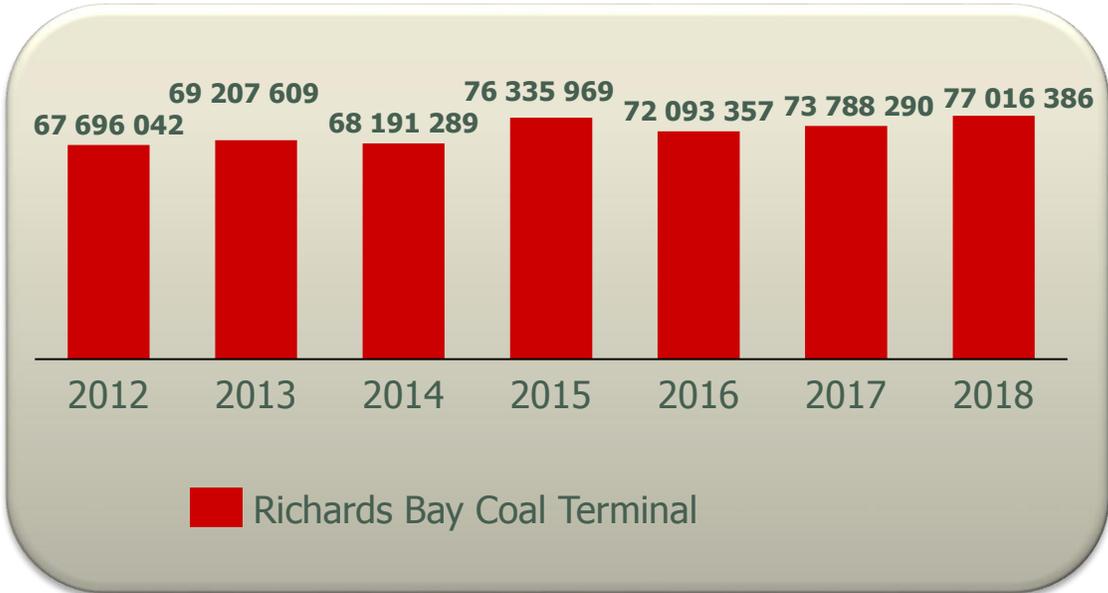


Rolling Stock



Condition assessment systems

Transnet has been building capacity to export coal through Richards Bay and other Ports

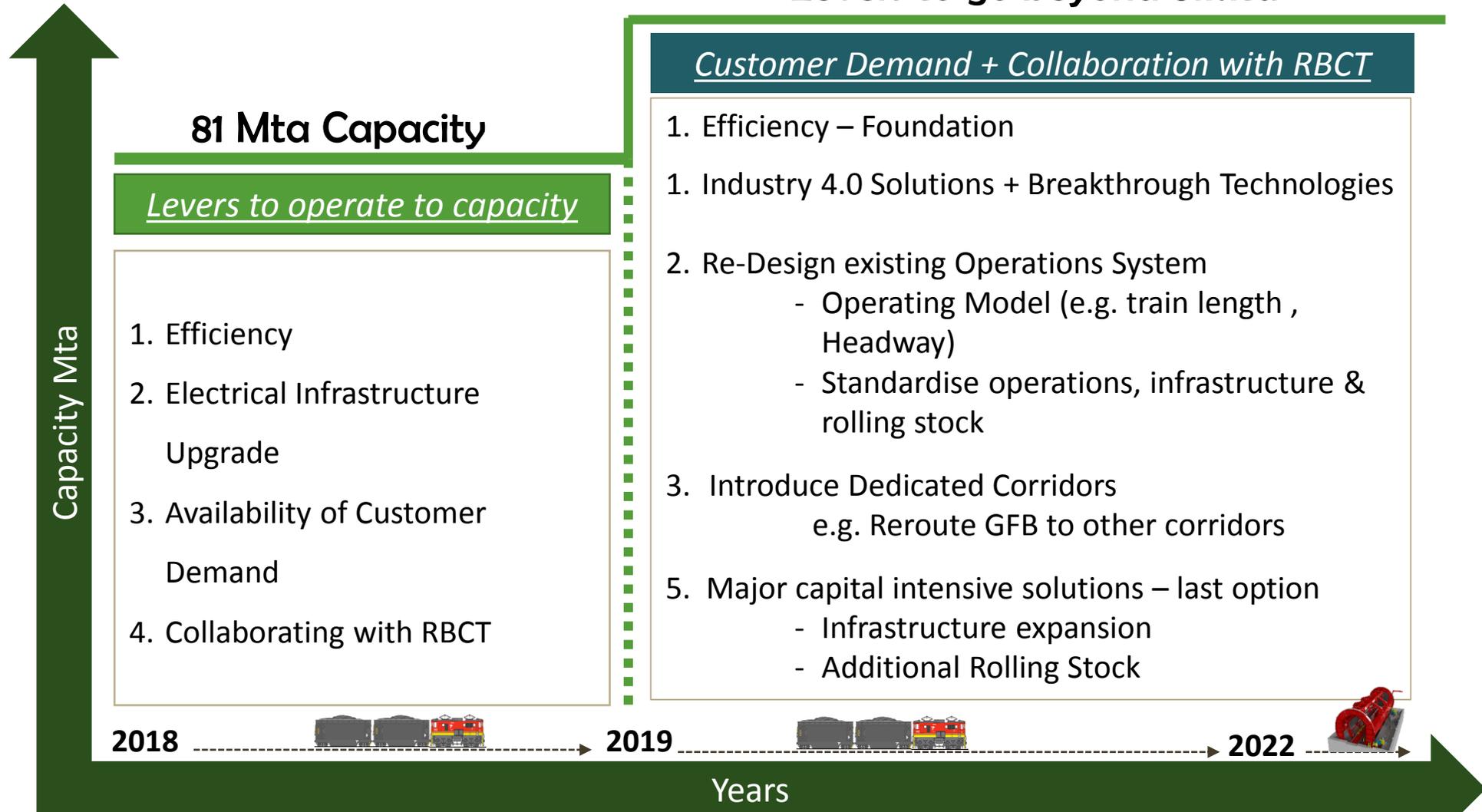


SA Coal Logistics Challenges and Opportunities

- ❖ **Impact of the Green Economy**
 - ❖ **The future of coal remains uncertain - New energy sources being explored and gaining momentum**
 - ❖ **Low investor interest towards new coal mining and coal power generation**
- ❖ **Tedious process and onerous requirements to be met for new mining activities**
- ❖ **Lack of credible future coal demand and commitment from market (investment certainty; return on investment)**
- ❖ **High cost of shipping - Regulation from International Maritime Organisation (IMO)**
- ❖ **Coal Sourcing points moving away from traditional coal fields towards north (Infrastructure, Turn Around Times, utilization rate, etc.)**
- ❖ **Lack of infrastructure and investment connecting coal deposits and the port**
- ❖ **Low coal production; Lack of rapid loading facilities; Railing to stockpile (no vessel nomination)**
- ❖ **Cable theft; vandalism of rail infrastructure; Inclement weather impact sometimes leading to port closures**
- ❖ **Overvaal tunnel remains a constraint**
- ❖ **Competition between domestic and export coal prices (power generation becoming expensive)**
- ❖ **Only 10 vs 40 mil Tons of rail friendly coal for power stations, actually moves by rail per annum**
- ❖ **Policy certainty could enhance attractiveness to industry players**
- ❖ **Optimization, synchronization of capacity within SA coal value chains (coal production, rail, RBCT, Port Terminal and Marine capacity)**

New Developments: Capacity Creation Approaches for Coal System - Options

Levers to go beyond 81Mta



New Developments: Efficiency Projects: Bypass of Empty Trains (Ermelo)

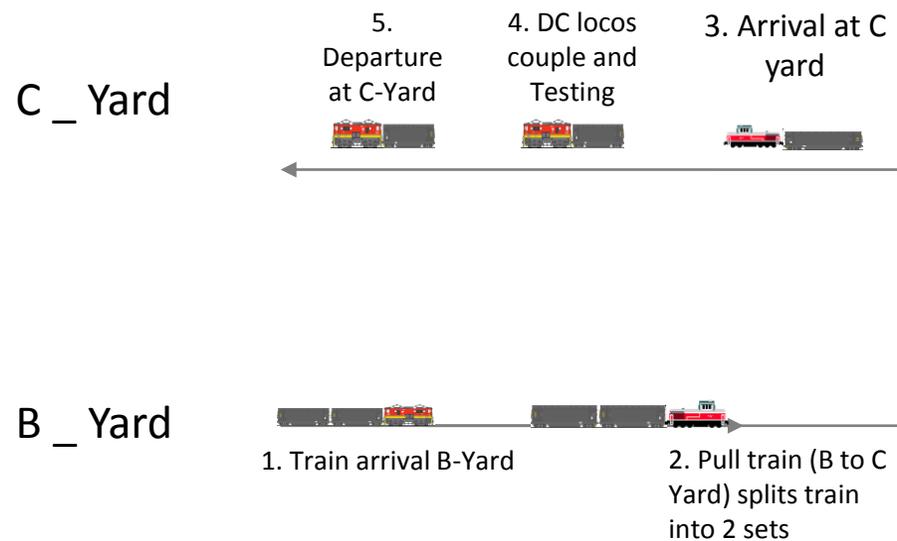
Current Process : Empty Leg

1. Train Arrival at B-Yard
2. Pull Load to C-Yard split into 2 sets
3. Arrival at C-Yard
4. Couple DC locomotives and Test
5. Depart at C-Yard

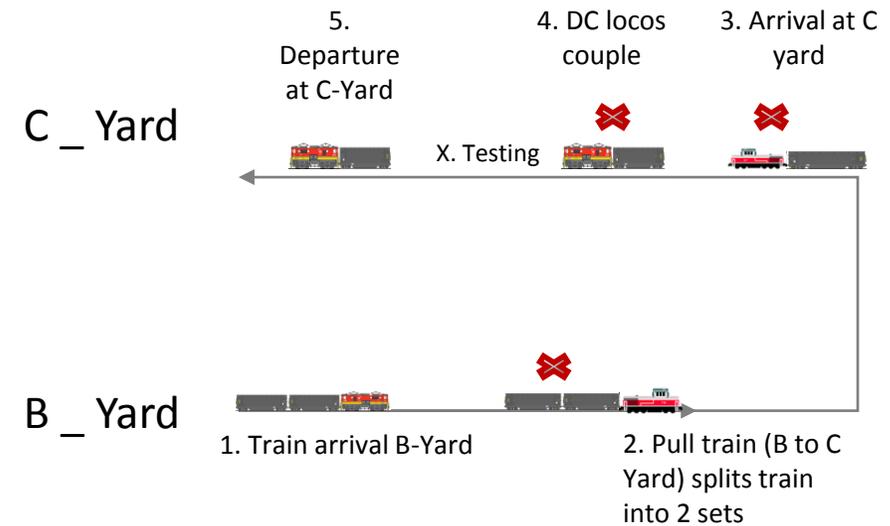
Future Process : Empty Leg

1. Train Arrival at B-Yard
2. Change current AC to DC
3. Test
4. Depart at C-Yard

Reference:



Reference:



Plans and Benefit

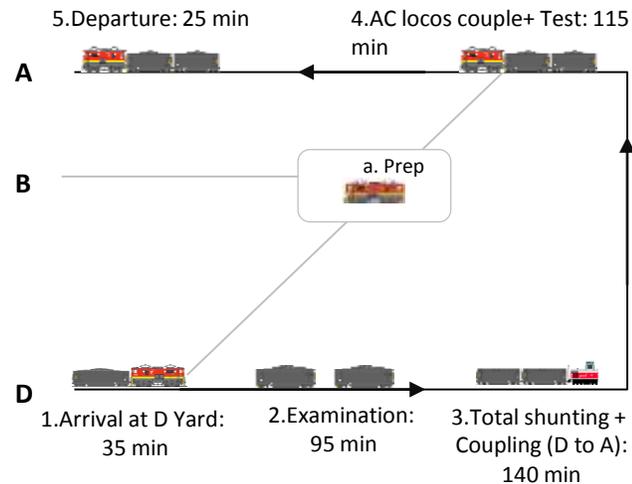
No.	Description	Opportunity
2.	By pass Ermelo	270min

New Developments: Efficiency Projects: Electrification of the Ermelo Yard

Current Process : Loaded Leg

1. Loaded trains coming from the mine enter through D-Yard and Uncouple locomotives (Arrival)
2. Load get examined
3. Shunt load using Diesel locomotive to A – Yard
4. Couple Electric locomotives & Test
5. Depart to Richards Bay

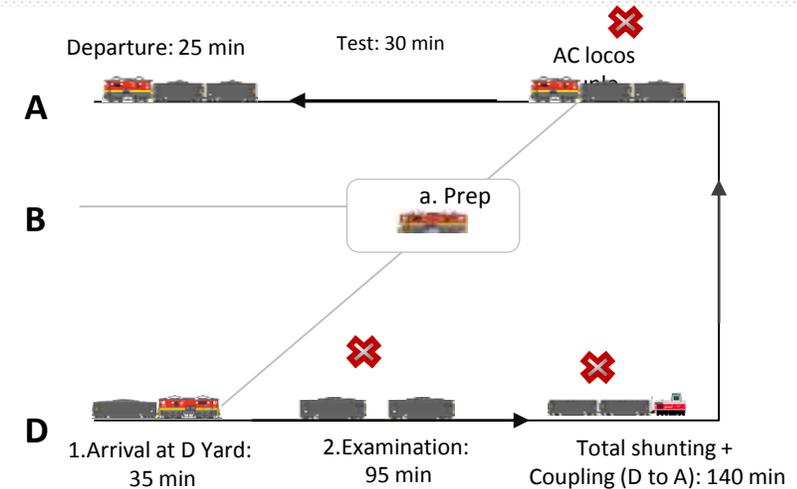
Reference:



Future Process: Loaded Leg

1. Loaded trains coming from the mine enter through D-Yard
2. Pull load using Electric Locomotives from D – Yard to A – Yard (On the fly will switch the locomotive from AC to DC automatically)
3. Test the train
4. Depart to Richards Bay

Reference:

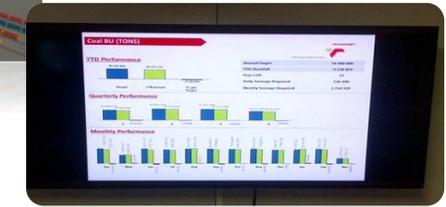


Plans and Benefit

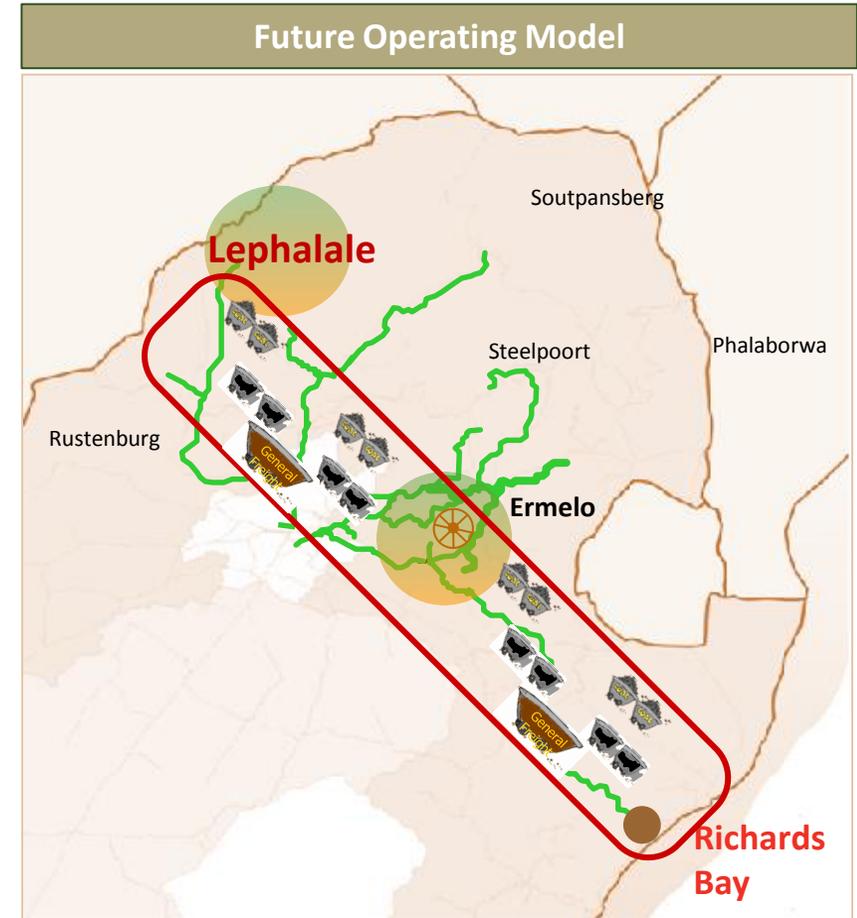
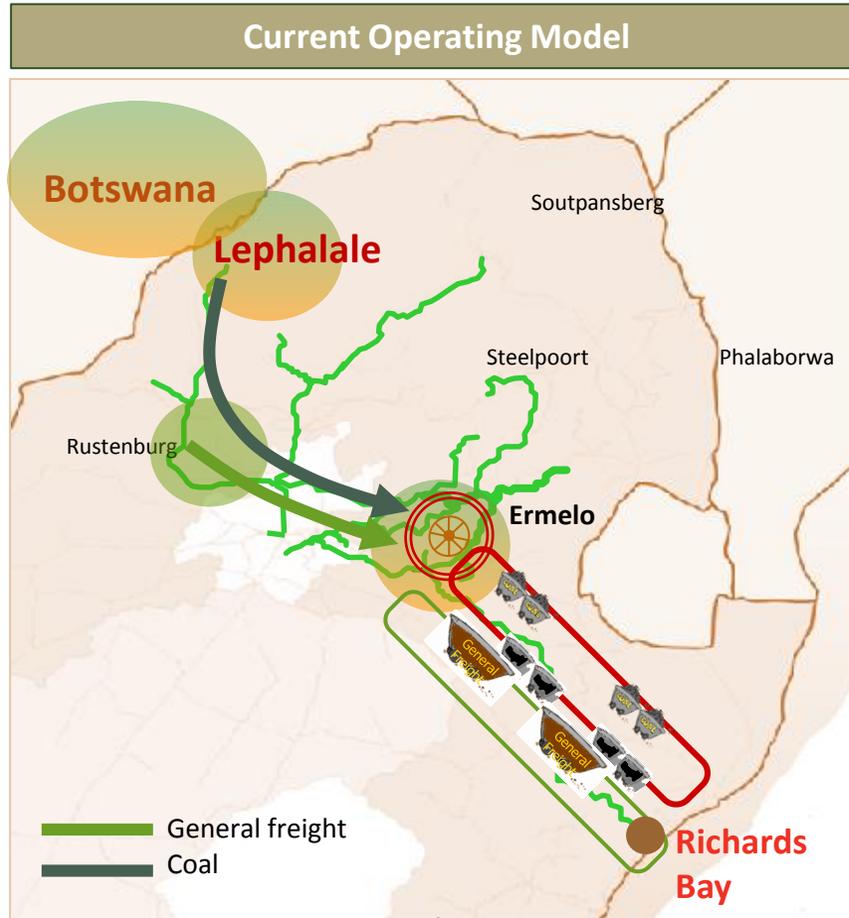
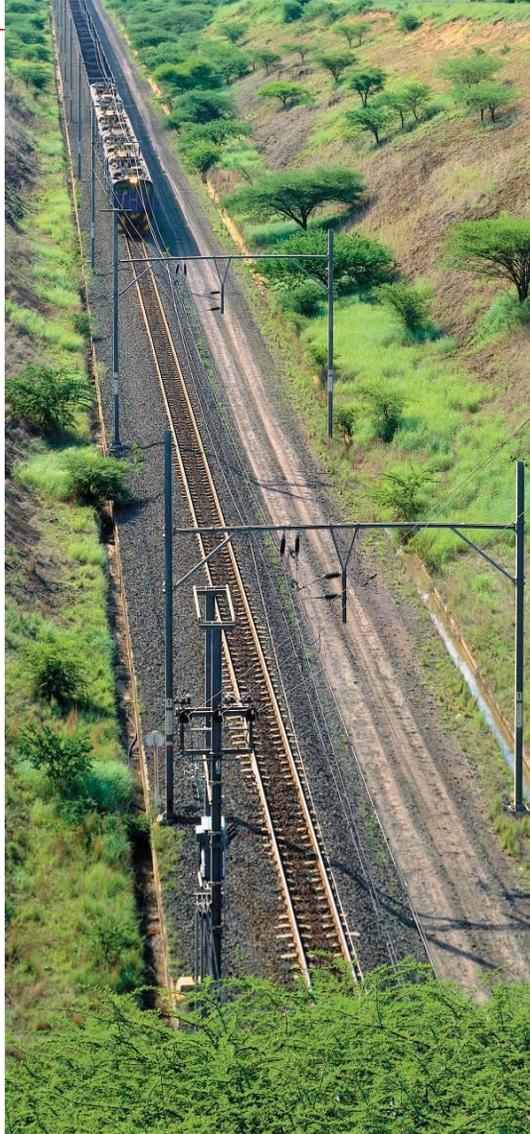
No.	Phase	Description	Opportunity
1.	Phase 1	On the fly - Electrify 2 lines	4 hrs
2.	Phase 2	Electrifying the rest of Ermelo Yard	8 hrs

New Developments: Coal Future Plans: Automatic Train Road Map

No	Project Name
1	Automated Yards (Points and Signal Control)
2	In Cab and Signaling Controls
3	Automatic Train Control
4	Mobile track sanding equipment implementation
5	Re-Planning Visual Simulation Tool (Any Logic)
6	Visual Management Screens at the Yard
7	Yard cameras

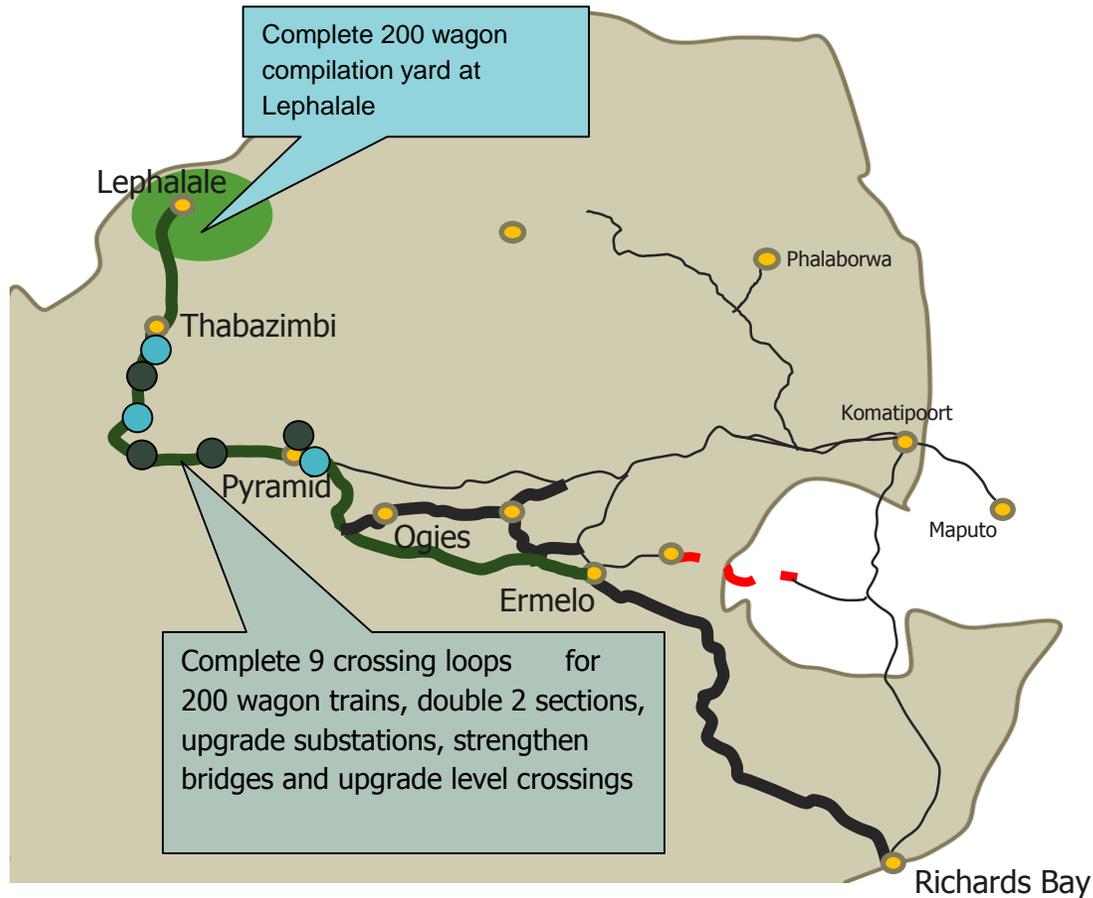


New Developments : Operating Model for Extended Heavy Haul Operations to convey Coal from Waterberg and Botswana reserves



Development of Waterberg corridor into semi-heavy haul operation
Extension of the 'pipe' from 600km to 1200km

New Developments - Coal Future Plans : Waterberg Existing Line Upgrades



Waterberg Existing line project is part of the Waterberg programme and aims to increase capacity from Lephalale - Pyramid south from 2.3mtpa to 24mtpa for export coal. The programme is split into stages and every stage is activated with aligned to validated volume demand

Project Characteristics

- Upgrading of the existing line to increase capacity to **24mtpa** in stages (1-5)
- Lengthening/construction of loops
- Strengthening of Bridges
- Level crossing upgrades
- Construct network stabilizing Facility (NSF) at Lephalale and consolidation yards
- Doubling of sections
- Electrification

Benefits

- Unlock the Waterberg
- Capacity creation
- Stimulate mining activity in the region

Current Status

- Stage 1: completed
- Stage 2: Execution, completion by 2019 (9.5mtpa)
- Stage 3: Execution, completion by 2020 (13.5mtpa)
- Stage 4: Feasibility, completion by 2021 (24mtpa)
- Stage 5: Feasibility, completion by 2027 (efficiency, 24mtpa)

Coal Future Plans: New Heavy Haul Line between Lephalale and Ermelo



Project Characteristics

- Increase Coal tonnages from Limpopo & Botswana : 40mtpa – 100+ mtpa

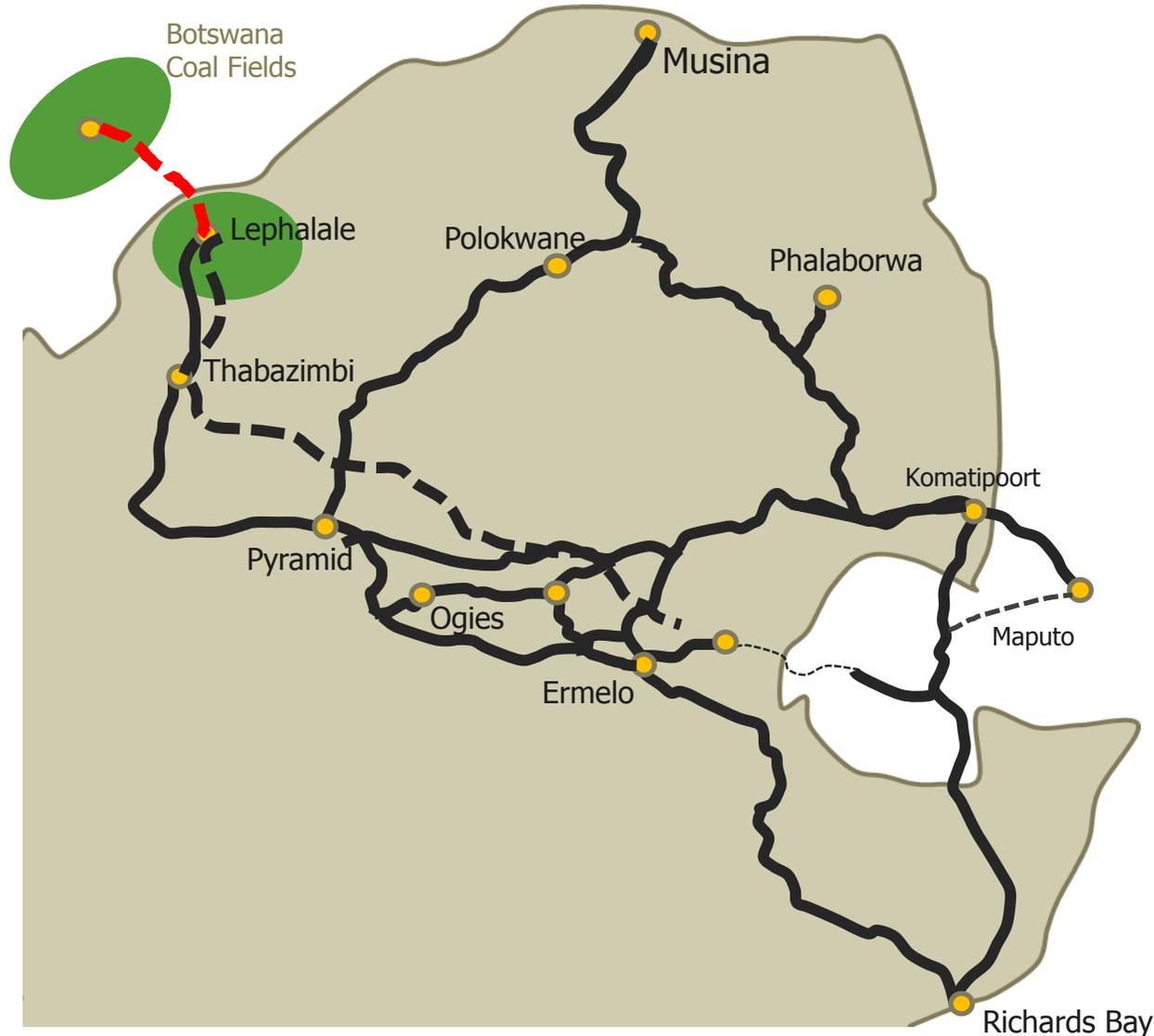
Benefits

- Provide world class heavy haul rail infrastructure to optimise economic and mining development in Waterberg and Botswana
- 26t/axle
- 200 wagon train

Current Status

- FEL 1 (conceptual study) completed.
- FEL 2 (Pre-feasibility study in progress)
- Implementation to take place post 2022

Coal Future Plans: Heavy Haul Rail Link to Botswana in Collaboration with Botswana Railways



Project Characteristics

- Provide a rail link to unlock Botswana coal reserves - potential for up to 100Mtpa
- Need to construct 3-4km bridge to cross the Limpopo River

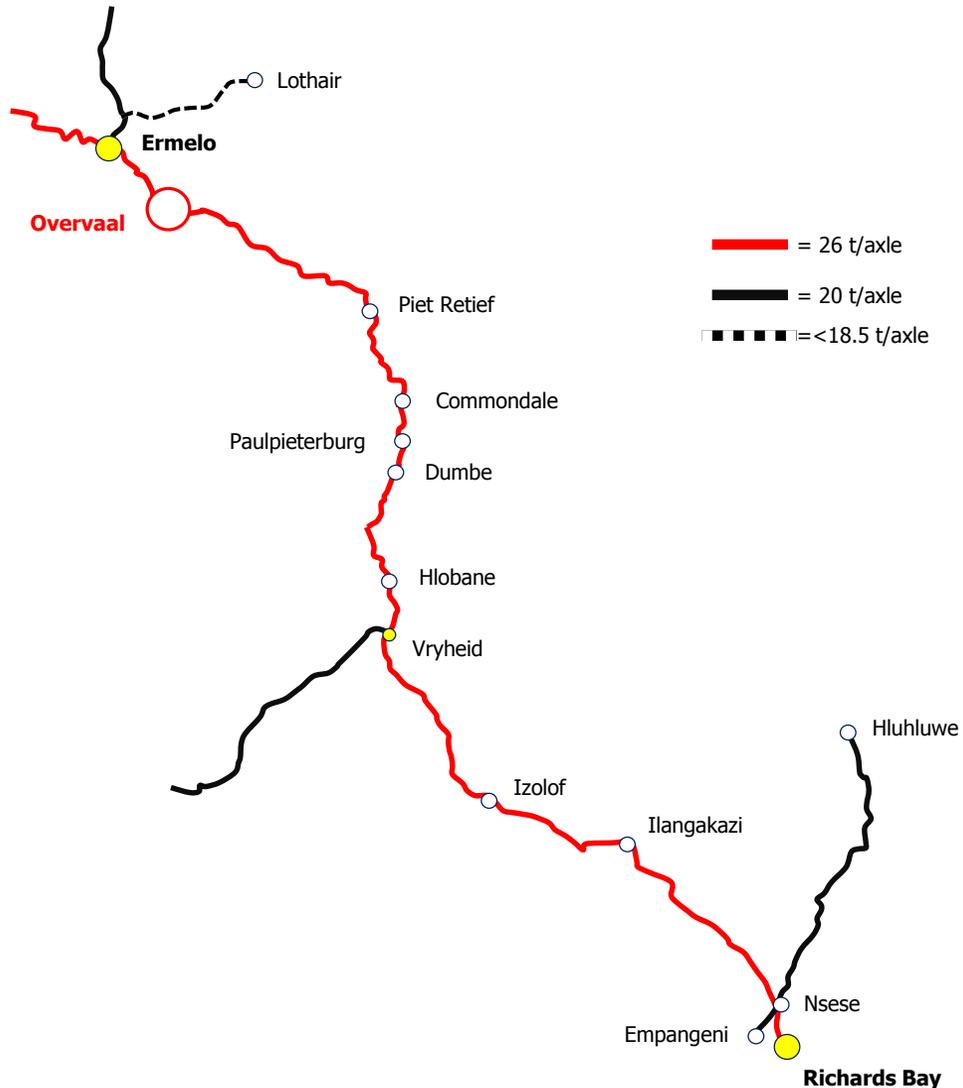
Benefits

- Stimulate economic growth in Botswana and Limpopo province
- Provide a route to unlock Botswana coal reserves
- Link Botswana mines to TFR rail network

Current Status

- FEL 1 (conceptual study) completed
- MOU under review
- FEL 2 Project to kickoff after MOU is signed by 2 countries
- Implementation to take place post 2022

New Developments: Overvaal Tunnel Doubling – Construct new tunnel with two railway lines



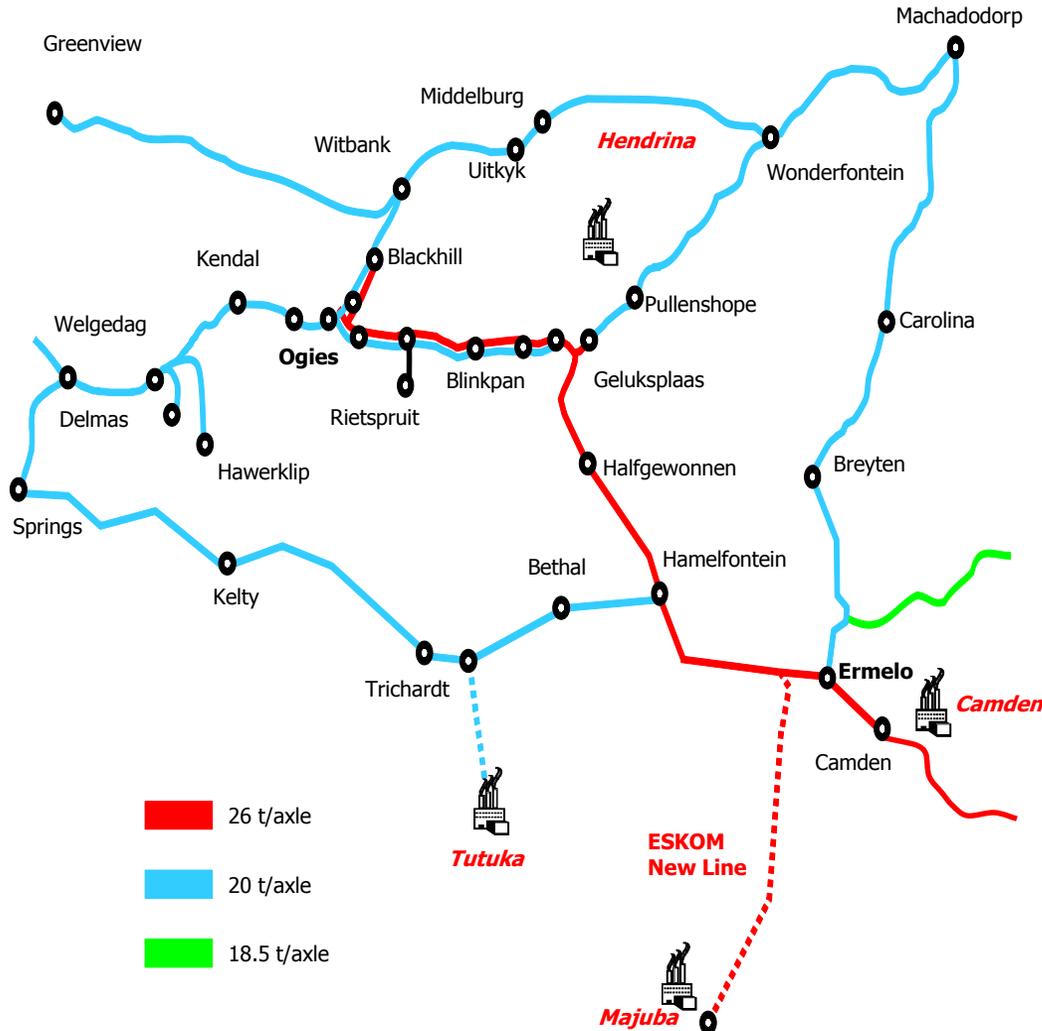
Project Description

- The tunnel currently has one line
- The project objective is to construct an additional tunnel next to the existing one to have two rail lines (2024)

Project Status Quo

- Design and tender specifications compiled
- Finalising Governance processes
 - Procurement process to kick off soon

New Developments: Coal Backbone Upgrade – Coal export growth to 91mtpa



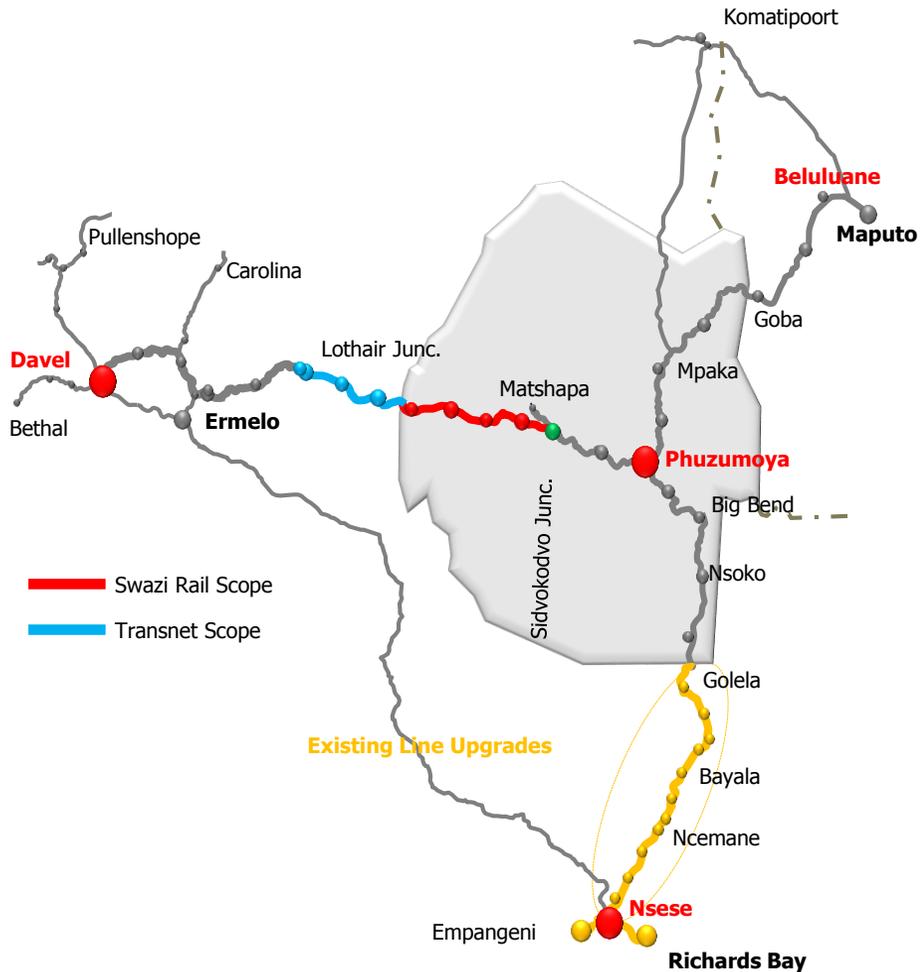
Project Description

- The project aims to upgrade the coal rail system north of Ermelo to meet future demands for domestic and export coal
- The coal backbone is the common denominator of the coal system and acts as the conduit for coal flows for ESKOM, the Waterberg, Swazi Link and Exports
- This includes accommodating coal export growth to 91mtpa while at the same time migrating 9mtpa of additional ESKOM coal from road to rail.

Project Status Quo

- The project is currently in FEL-2 and must still undergo the gate review.

New Developments: Swazi Rail Link – Provide capacity in 3 phases 16 – 32 - 43mtpa



Project Description

- A bilateral project between Transnet and Swaziland Railway, aimed at establishing a strategic rail link from **Lothair** to **Sidvokodvo** in Swaziland
- The link seeks to create a dedicated Export General Freight (GF) rail corridor to the eastern seaboard ports of Richards Bay and Maputo

Project Status Quo

- The New Link Project (Lothair to Sidvokodvo) has completed FEL-3
- The Upgrade Projects (Sidvokodvo to Golela, Davel to Lothair, Golela to Nsezi) are at different FEL stages (FEL2 & 3)

Conclusion



- South Africa has developed expertise to efficiently and cost effectively transport coal by rail from mines to ports for export.
- Current export capacity of >80mtpa will be significantly increased by investment in capacity creation programmes
- Transnet will declare beyond 81 mtpa capacity in the new FY
- Major capital programmes will proceed as demand certainty increases
- Collaboration with prospective public and private sector partners will accelerate developments
- Undivided attention given to improving operations efficiency, the foundation for building the future
- The Coal System Rail Capacity Creation Approach will ensure customer demand is matched at all times
- Heavy Haul Operations Business of Transnet has started with defining the future of our Heavy Haul Railway under Industry 4.0
- There is a compelling case to apply the already proven successes of the Heavy Haul industry in non heavy Haul operations, especially in Africa.
- Great opportunity to grow other terminals (non-RBCT) and Eskom to realize SA's road to rail aspirations.

TRANSNET



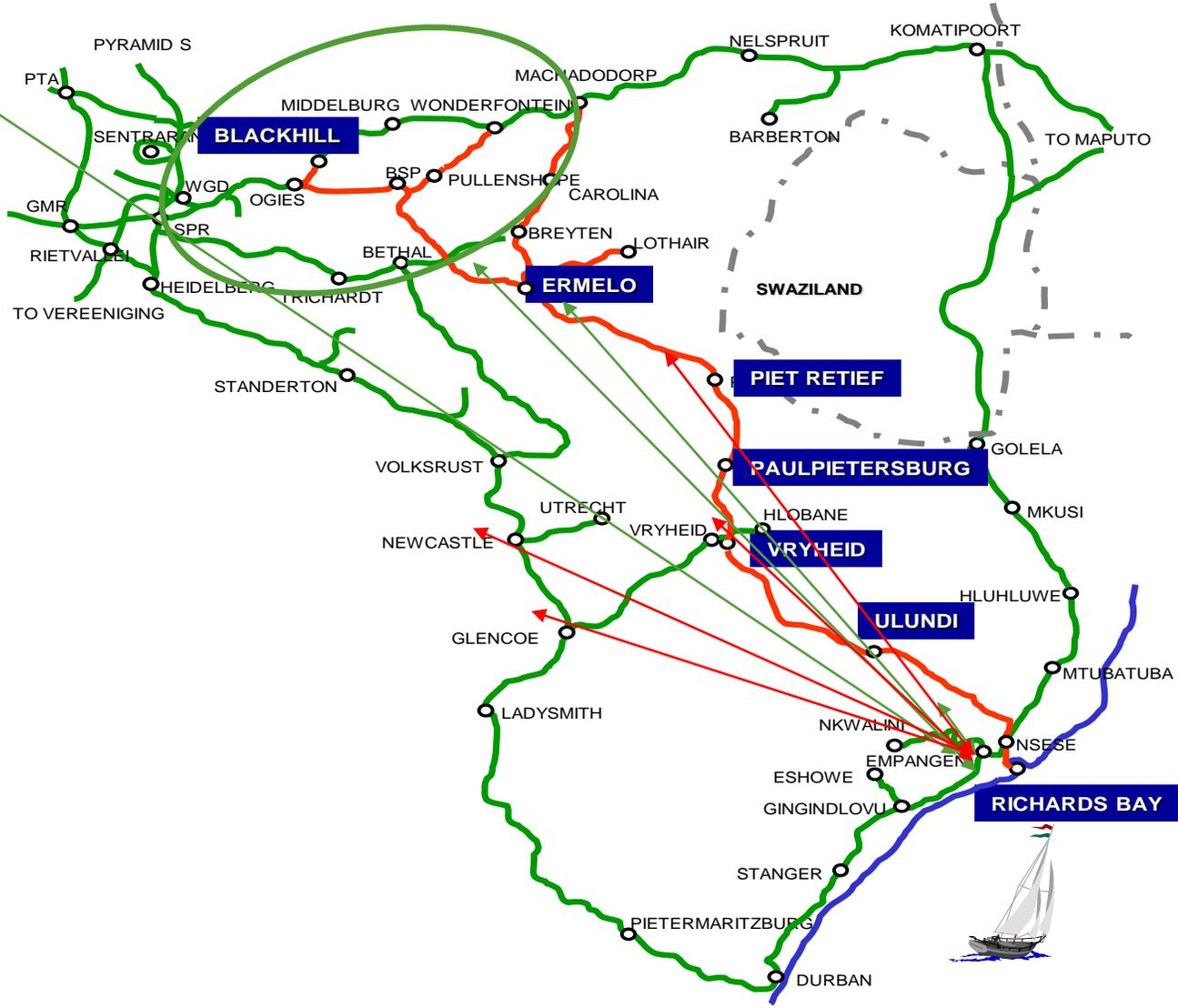
freight rail



Export Coal = Weekly Flow - RBCT

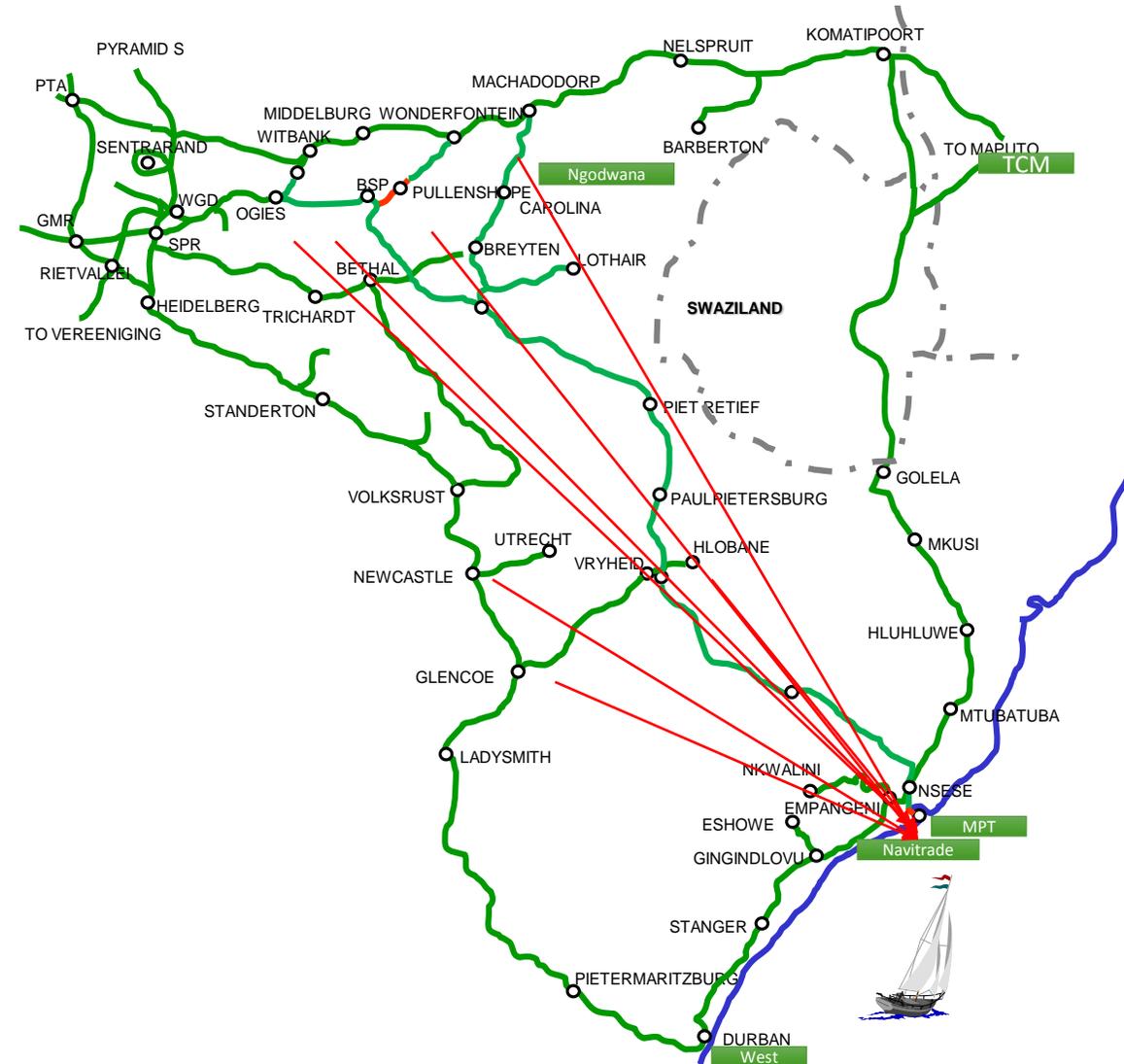
Number of Tipplers	5
Total Yard Machines (Stacker/reclaimer)	10
Number of Stacker Reclaimers	7
Number of dedicated stackers	2
Number of dedicated Reclaimers	1
Number of shiploaders	4
Rate of offloading a train	5500tph
Time in Tippler excluding handling Time to offload Train (hh:mm)	01:54
Stockpile Capacity	8.2 Million
Rate of loading vessel	4000tph
Size of biggest vessel	203 000 tons
Average Vessel size	100 000tons
Length of line	4*(1,3km)
offloading rate, how long to offload a train	4hrs
How long does it take a train from mines to port	29 hrs
Total cycle time	60 hrs
How many locomotives & wagons	200wp/t - 6 x 21E or 19E

Grootegeluk



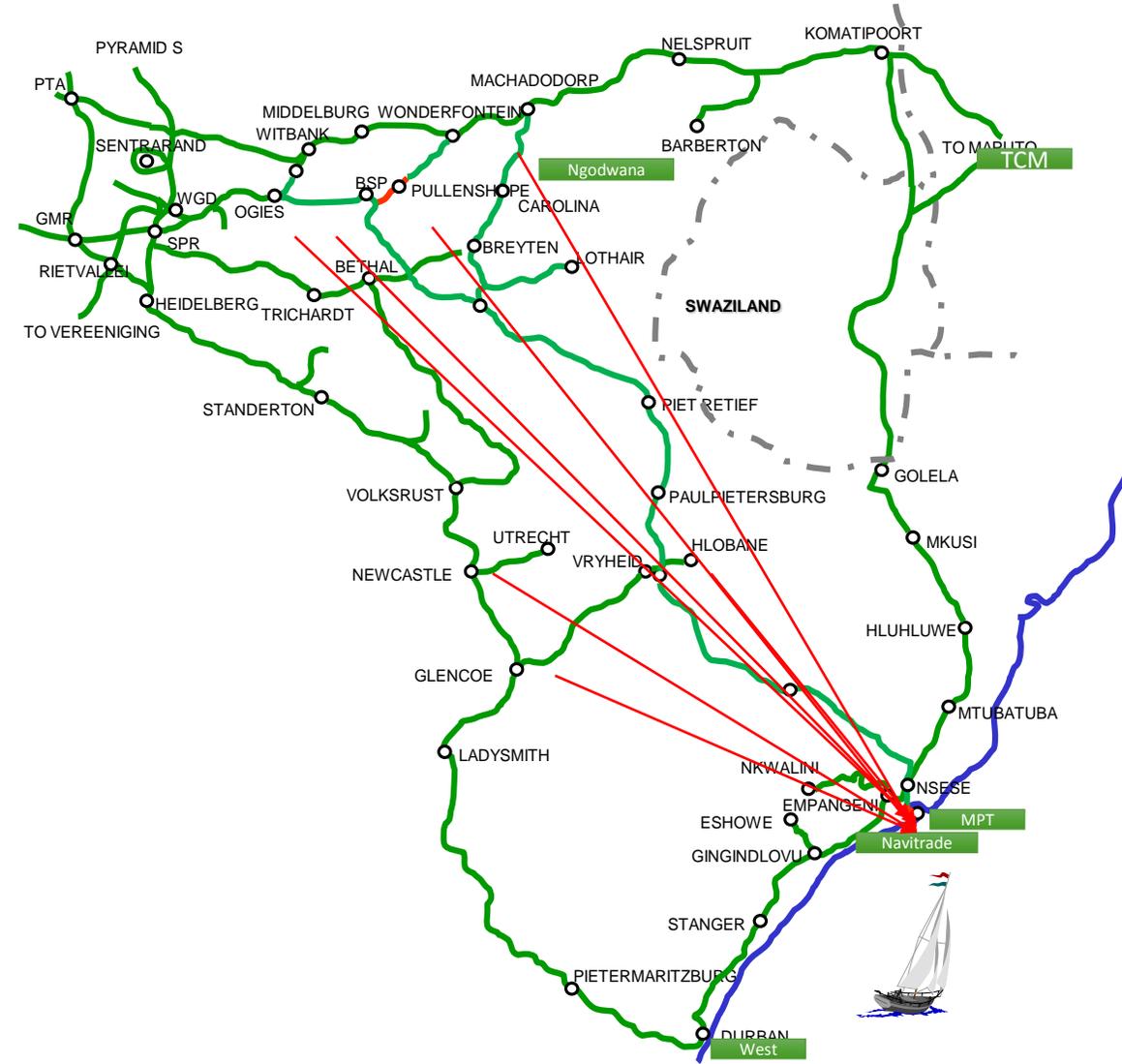
Non – Eskom Domestic – Weekly flow – RBTG

RBTG	
Number of Tiplers	2
Total Yard Machines (Stacker/reclaimer)	0
Number of Stacker Reclaimers	
Number of dedicated stackers	1
Number of dedicated Reclaimers	3
Number of shiploaders	
Rate of offloading a train	8mpw(r) 4mpw(c)
Time in Tippler excluding handling Time to offload Train (hh:mm)	4:00
Stockpile Capacity	50 000 per week
Rate of loading vessel	600t/h
Size of biggest vessel	75kt
Average Vessel size	55kt
Length of line	4 lines (50wgn)
	7mpw & 6hrs per train
Loading rate, how long to load a train	
How long does it take a train from mines to port	30 hrs
Total cycle time	96 hrs
How many locomotives & wagons	50 wp/t – 2 x 22E



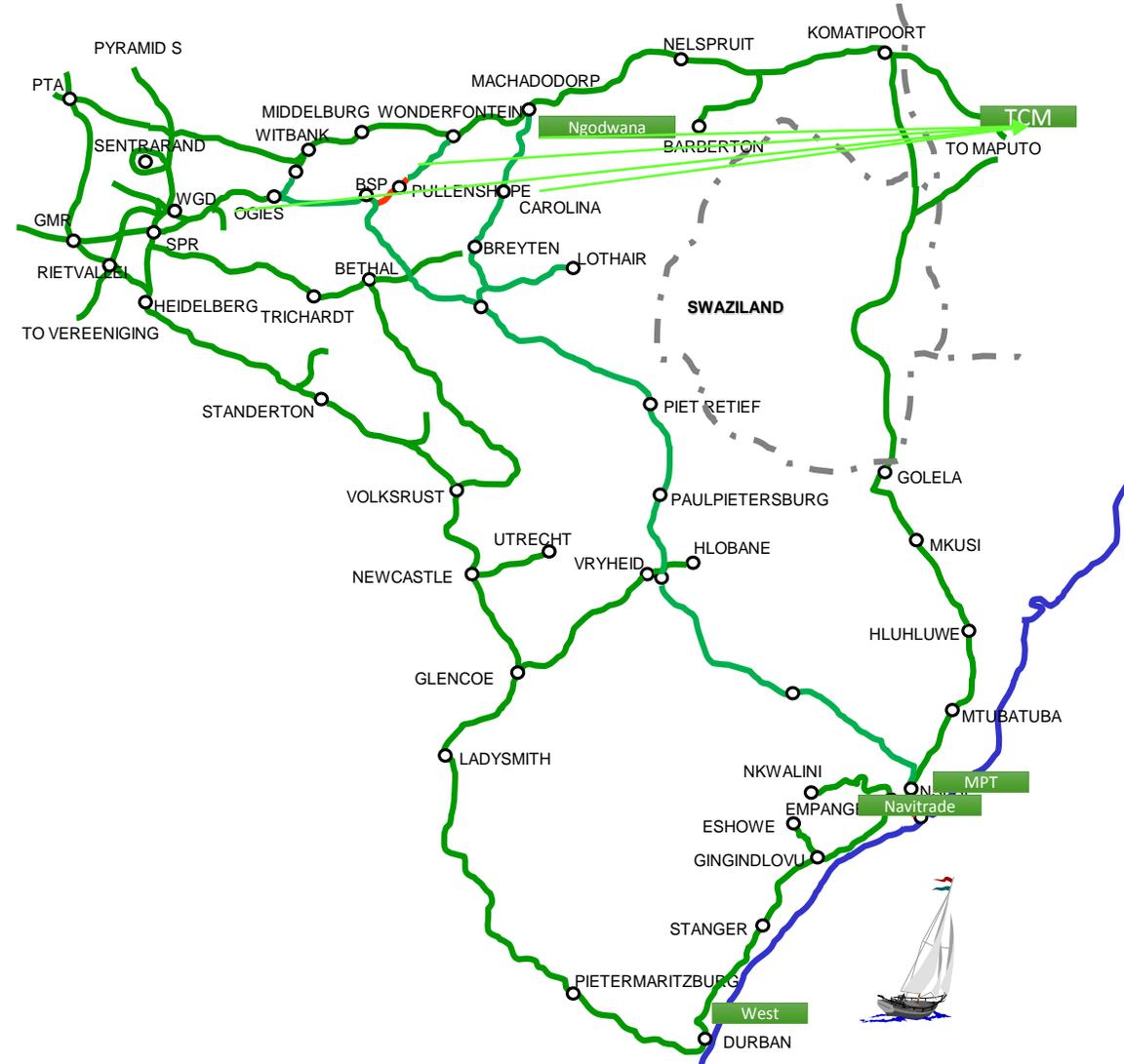
Non – Eskom Domestic – Weekly flow – MPT

MPT	
Number of Tippers	N/A
Total Yard Machines (Stacker/rec	N/A
Number of Back Actors	6
Number of Back Actors	5
Number of dedicated Reclaimers	n/a
Number of shiploaders	
Rate of offloading a train	15h
Time in Backactor excluding handling Time to offload Train (hh:mm)	10h/train
Stockpile Capacity	
Rate of loading vessel	n/a
Size of biggest vessel	60 kt
Average Vessel size	35 Kt
Length of line	103 CFRs
Loading rate, how long to load a train	6 hrs
How long does it take a train from mines to port	30 hrs
Total cycle time	120 hrs
How many locomotives & wagons	40 Wp/t – 2 x 22E



Non – Eskom Domestic – Weekly flow – TCM

TCM	
Number of Tippers	1
Total Yard Machines (Stacker/reclaimer)	N/A
Number of Stacker Reclaimers	n/a
Number of dedicated stackers	n/a
Number of dedicated Reclaimers	n/a
Number of shiploaders	n/a
Rate of offloading a train	12h/t/d
Time in Tippler excluding handling Time to offload Train (hh:mm)	4,5hrs
Stockpile Capacity	150kt
Rate of loading vessel	
Size of biggest vessel	70kt
Average Vessel size	50 kt
Length of line	1
Loading rate, how long to load a train	4 minutes per wagon,(6hrs)
How long does it take a train from mines to port	9 hrs
Total cycle time	15
How many locomotives & wagons	50 wp/t – 3 x 18E



Non – Eskom Domestic – Weekly flow – MPM

MPM	
Number of back actor	2
Total Yard Machines (Stacker/reclaimer)	n/a
Number of Stacker Reclaimers	n/a
Number of dedicated stackers	n/a
Number of dedicated Reclaimers	n/a
Number of shiploaders	n/a
Rate of offloading a train	24hrs
Time in backactors excluding handling Time to offload Train (hh:mm)	20hrs
Stockpile Capacity	100kt
Rate of loading vessel	6/7 days
Size of biggest vessel	70kt
Average Vessel size	50kt
Length of line	2lines of (600m)
Loading rate, how long to load a train	6hrs
How long does it take a train from mines to port	15hrs
Total cycle time	56hrs
How many locomotives & wagons	50 wp/t – 3 x 18E

