

TRANSNET



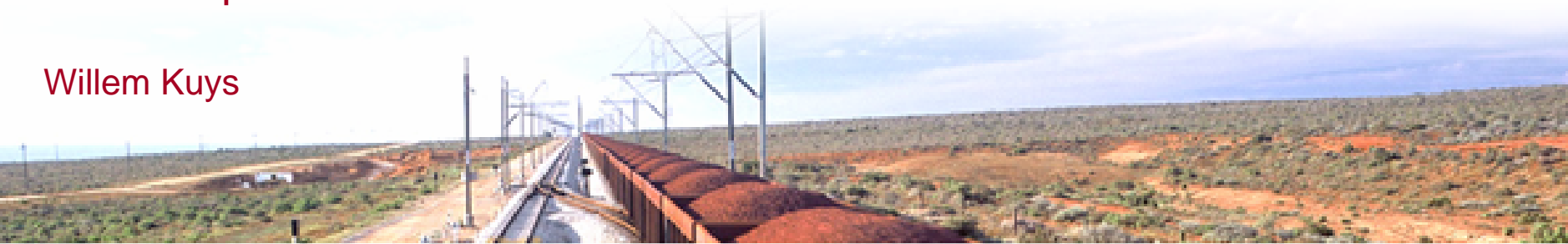
freight rail

ORE LINE: Capacity Expansion

PRESENTATION to the Railway & Harbour Engineering
Division of SAICE

on 11 September 2007

Willem Kuys



Content

History

International Iron Ore Trade

Design Parameters

Broad plan

- Infrastructure
- Distributed Power
- Locomotives
- Wagons
- Power Supply
- Signalling

Volume and Capacity Build-up



History

- The 861 kilometre line was built by Iscor and opened in 1976 with a capacity of 17,5 mtpa
- The line has 10 crossing loops for train crossings spaced 80-90 kilometres apart
- Spoornet took over the line 1977 as a 15 year run-out project
- Idea was that line would revert back to Iscor after 15 years.
- Assmang started exporting iron ore over the Ore line from Beeshoek (70 km south of Sishen) in 1978
- The capacity of the line was increased in 2002/03 by installing intermediate loops increasing these to 20



Ore Line

Arlington

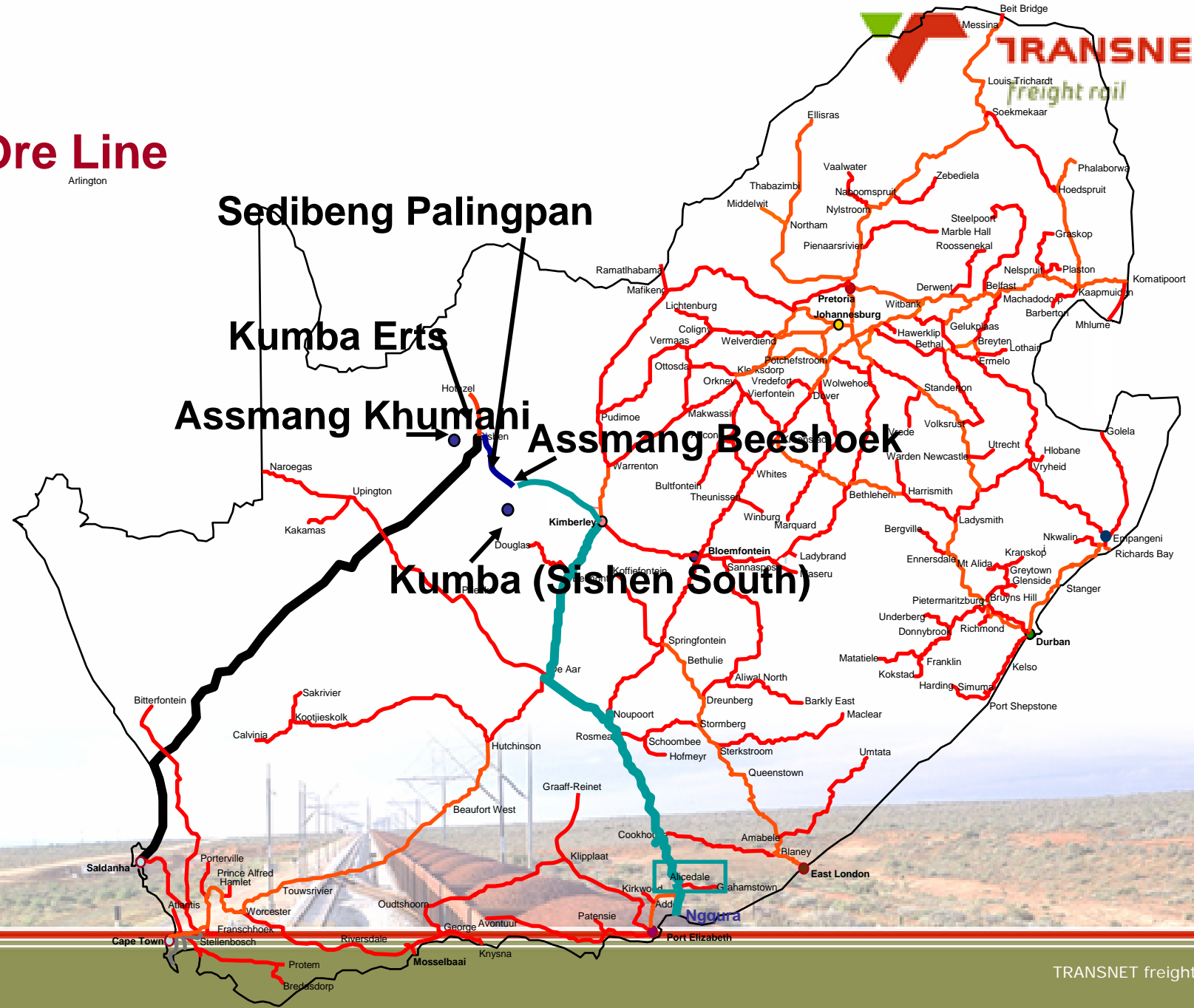
Sedibeng Palingpan

Kumba Erts

Assmang Khumani

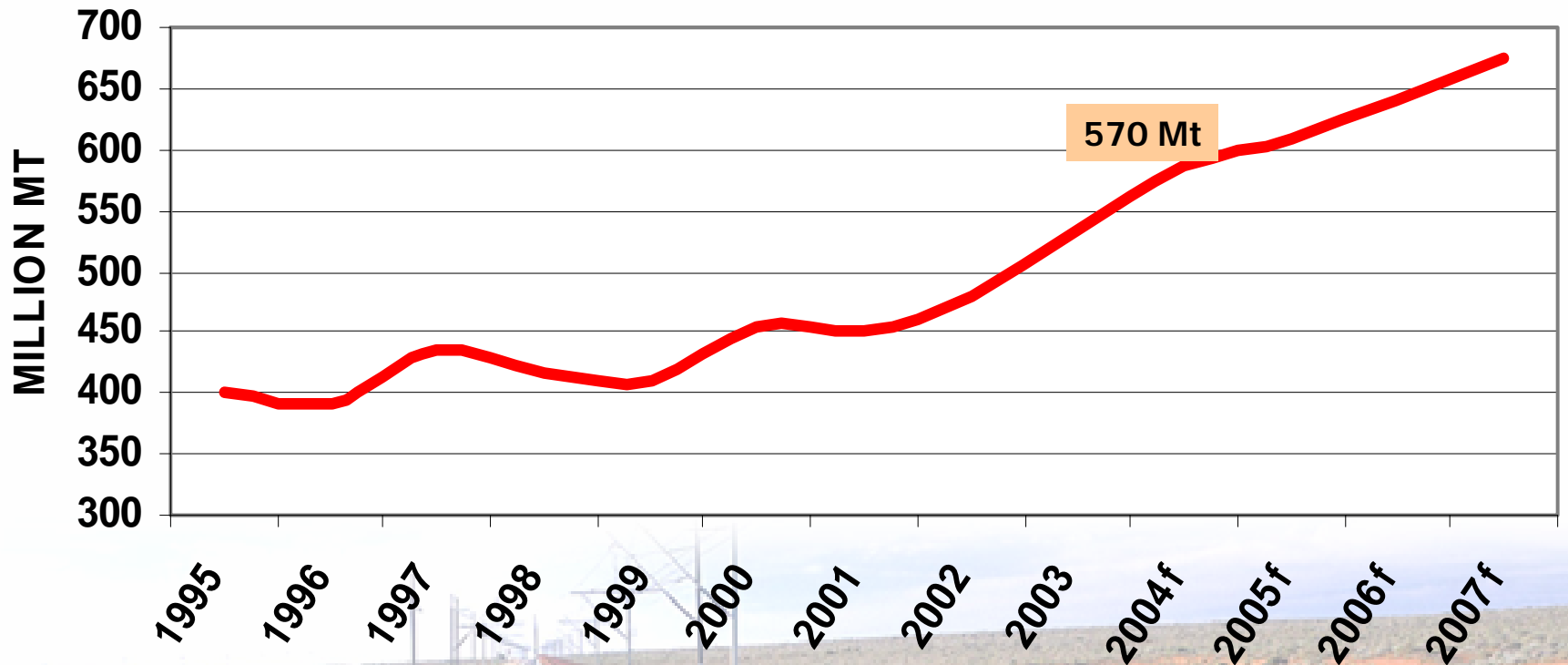
Assmang Beeshoek

Kumba (Sishen South)



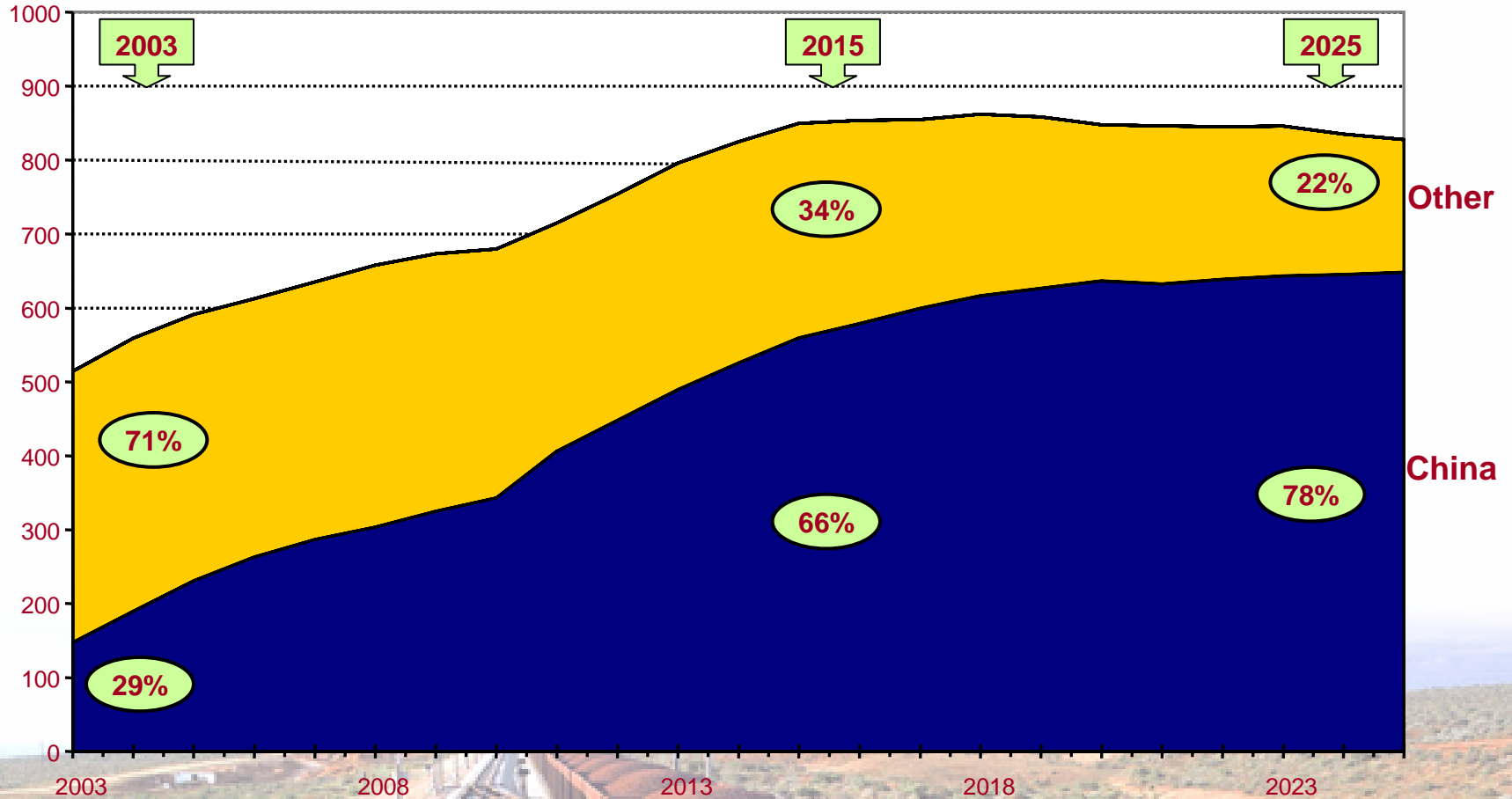
SEABORNE TRADE OF IRON ORE

Growing at 5.3% p.a.



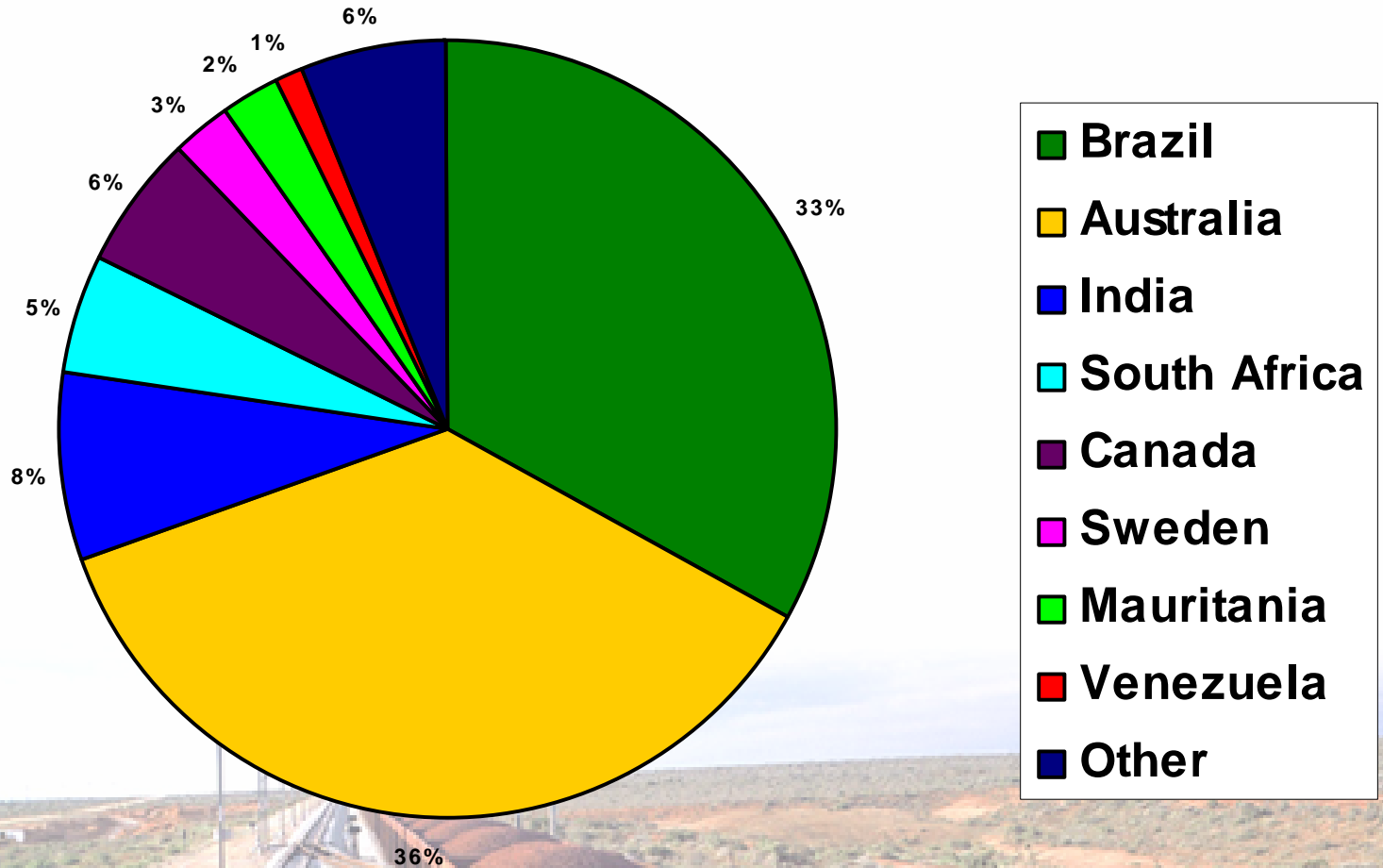
MARKET ANALYSIS – DEMAND

SEABORNE IRON ORE IMPORTS



China will become the dominant iron ore importer

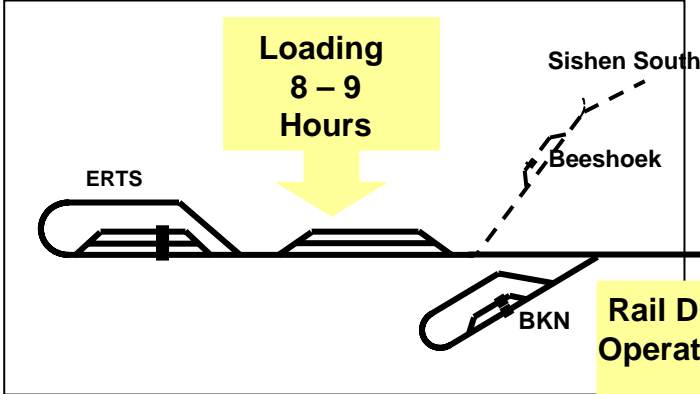
MARKET SHARE OF THE SEABORNE MARKET



IRON ORE LINE LAYOUT



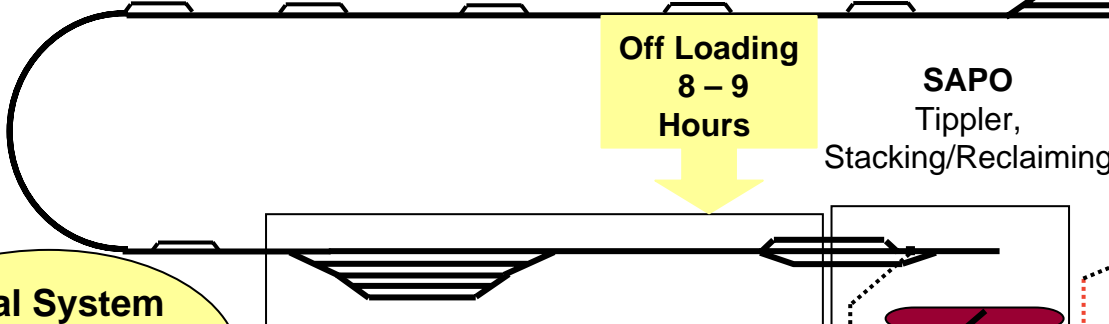
KUMBA/ASSMANG Loading Stations



Loading
8 – 9
Hours

RAIL OPERATIONS
Train operations, Crews,
Traffic Control, Perway, Communication,
Signalling, Power supply & Infrastructure
maintenance

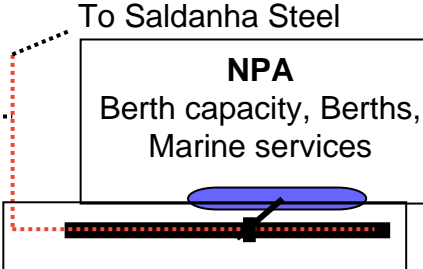
**Rail Distance of 861 km; Single line Train
Operations : Loaded throughput 22 hours;
Empty thoughput 20 hours**



Halfweg – Re-
manning of trains
Crew book off

**Total System
cycle time
Time +/- 64 Hours
(Loading to loading)**

SALKOR
Compiling/De-compiling
trains,
Shunting, NTG, Wagon &
Locomotive maintenance



Shipping
patterns

Source: Iron Ore Line Production and Investment teams

New design: Focus areas

Operational re-design

Assessment of infrastructure

Efficiency improvement

New technologies

Rail infrastructure establishment

New rolling stock



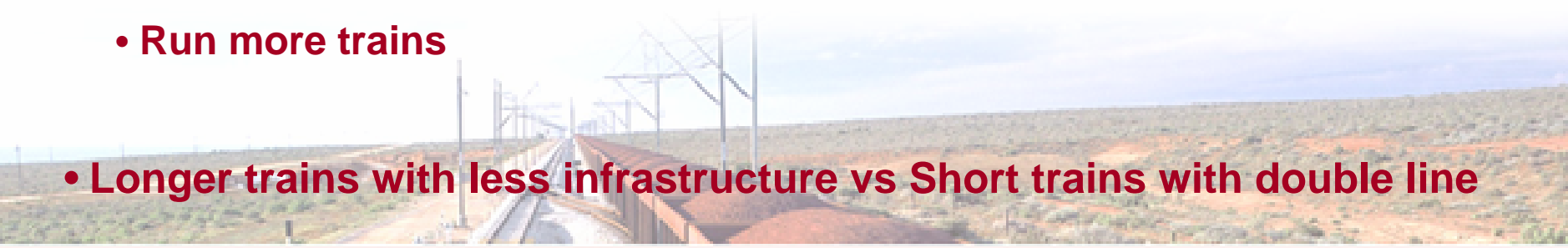
Operational Re-design

- **Present infrastructure and train design limited capacity to 37 mtpa**
- **Various configurations of train consists and lengths were investigated for the way forward**
- **Basic principles of capacity**
 - Distance between crossing loops
 - Speed of trains
 - Train lengths



Infrastructure Configuration

- **Single line track layout**
 - Crossing loop spacing and train speed determine number of slots
- **Higher throughput volumes:**
 - **Single line with limited slots**
 - **More slots**
 - **More tonnage per slot**
 - * **More crossing loops**
 - * **Longer trains**
 - * **Longer crossing loops**
 - **Double line**
 - **Run more trains**
- **Longer trains with less infrastructure vs Short trains with double line**



Train Configuration

- **Spoornet solution**
 - Longer trains
 - **Presently**
 - 2 by 108 = 216 wagon trains with headend locomotives
 - **Planned**
 - 3 by 114 = 342 wagon trains with distributed power
 - 40 slot grid with 28 trains/week **Even loops**
 - 72 slot grid with 44 trains/week **All loops**
 - **Future**
 - 3 by 140 = 420 wagon trains with distributed power
 - 72 slot grid with 44 trains per week **All loops**
- Or
- 40 loops with 2 by 114 = 228 wagon trains

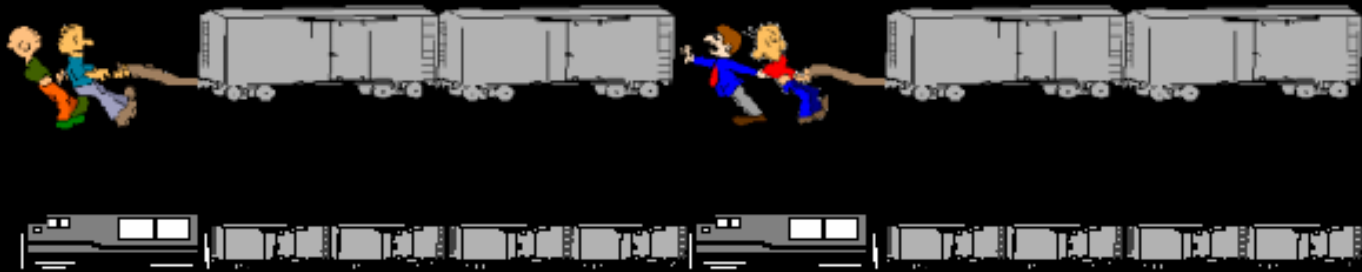


Distributed Power (DP)

- **Distributed Powered (DP) trains to be deployed**
- **Locomotives are distributed through the train**



Distributed Power



Enhanced Throughput / Reduced Operating Cost

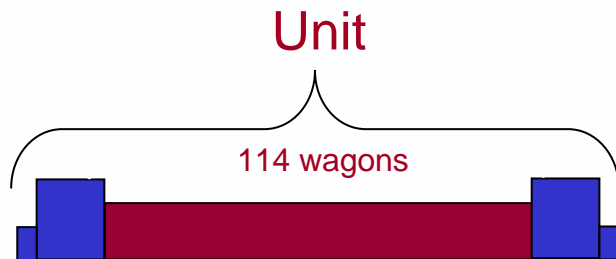
Distributed Power (DP)

- Distributed Powered (DP) trains to be deployed
- Locomotives are distributed through the train
- Locomotives in train are remote controlled by radio
- Train forces and train dynamics significantly improved
- Braking improved, shorter stopping distances
- Enables longer trains with one crew



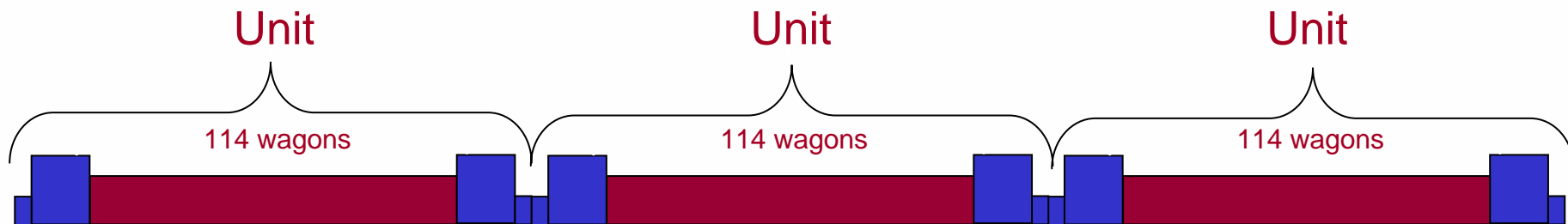
Train Operations

- Train unit = 114 wagons with a locomotive attached at each end



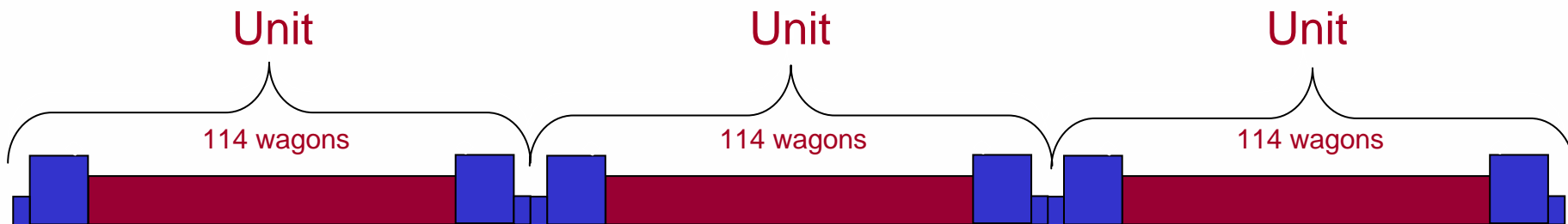
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Train Operations

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- Main line train can run with 1, 2 or 3 units and improves flexibility
- Main line train decompiled for loading and off loading at terminals
- Locomotives remained coupled to units at terminals

Design Parameters

	Present	47 mtpa	61/90 mtpa
Wagons/train	216	342	420
Train length	2 430	3 850	5 020m
Wagon payload	100/85	100/85	100
Net ton/train	20 000/ 21 600	34 200/ 29 070	42 000
Slots per week	28	28/44	44
Distributed power	none	Electric/diesel mixed	Electric
Train loading time	8 hours	8 hours	6:45 hours

Changes to increase capacity

- Increase the length of ALL loops (odd & even) to accommodate the 342 wagon trains
- Build new loop (7A) to replace loop 7
- Upgrade yard capacity to operate 342 wagon trains in Salkor yard, link line to the port and at loading sidings
- Install 1:20 crossing at loops to decrease the cycle times on the line
- Increase energy supply from Eskom to accommodate 9 active locomotives in a sub-section (feeder lines, sub-station, etc)
 - Build feeder substations
 - Build Eskom transmission lines & substations

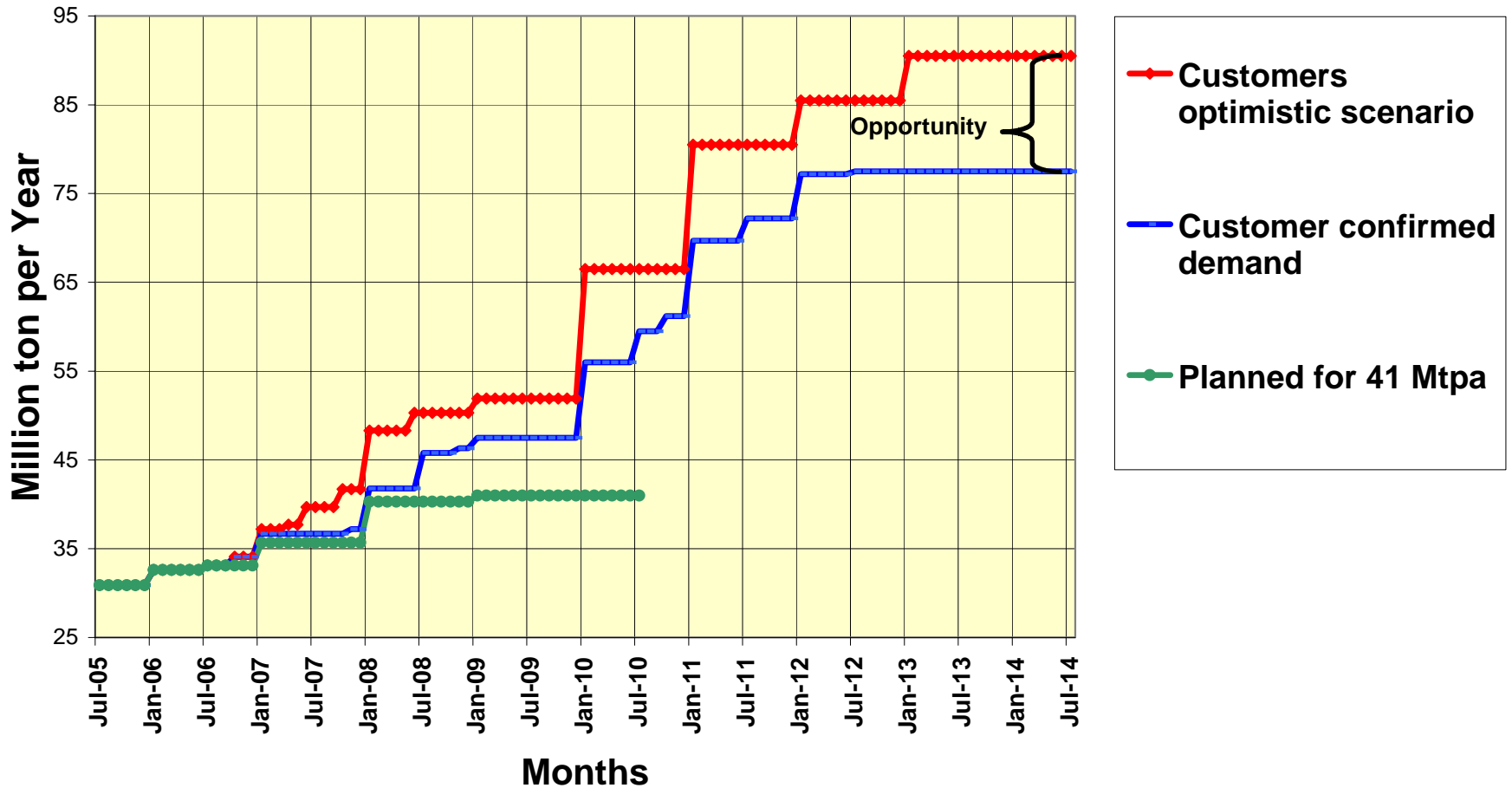


Changes to increase capacity

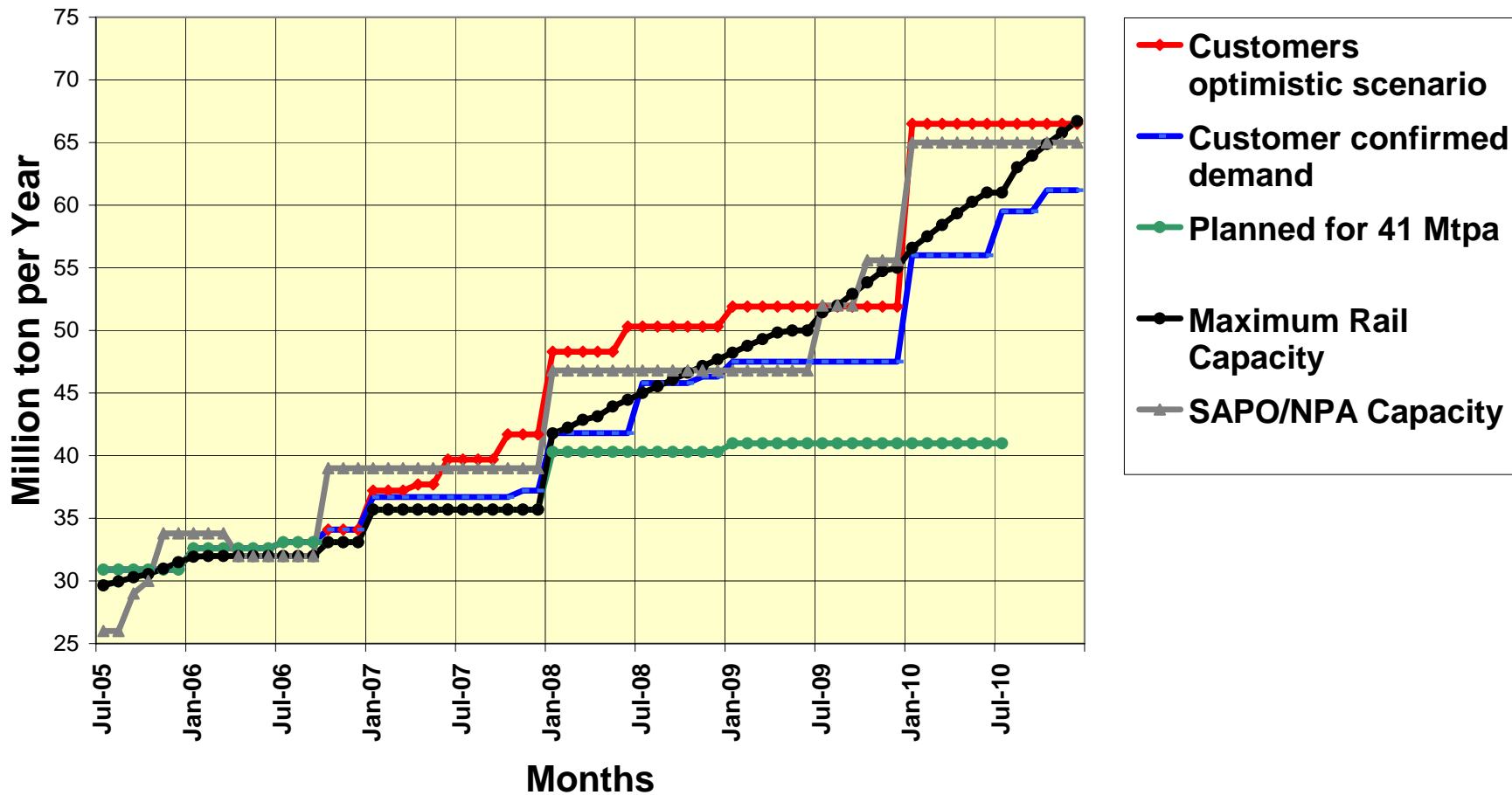
- **Change rolling stock maintenance facilities to in-yard maintenance**
- **Replace the signaling system with electronic switching**
- **Upgrade and new equipment at Saldanha Port and loading sidings**
- **Upgrade 1000 85 ton payload wagons to 100 ton**
- **Purchase 1070 new 100 ton payload wagons**
- **Purchase new electric locomotives**
- **Install DP in existing and new locomotives**
- **Electric brakes in all electric and some diesel locomotives**
- **Repeater stations along railway line to relay DP signals.**



Volume Demand Scenarios



Capacity Build-up



Critical Assumptions

- **Wagon turnaround time from Sishen - 56 hours (currently 64 hours)**
- **Wagon turnaround time from Beeshoek - 72 hours (currently 84 hours)**
- **Operational efficiency of line 93%**
- **Locomotives remain on train during loading**
- **Train follow-up time 4 hours 12 mins**
- **Load-out rates at loading stations 5400 tonnes/hour**
- **Dual tipping of wagons**



Thank you

