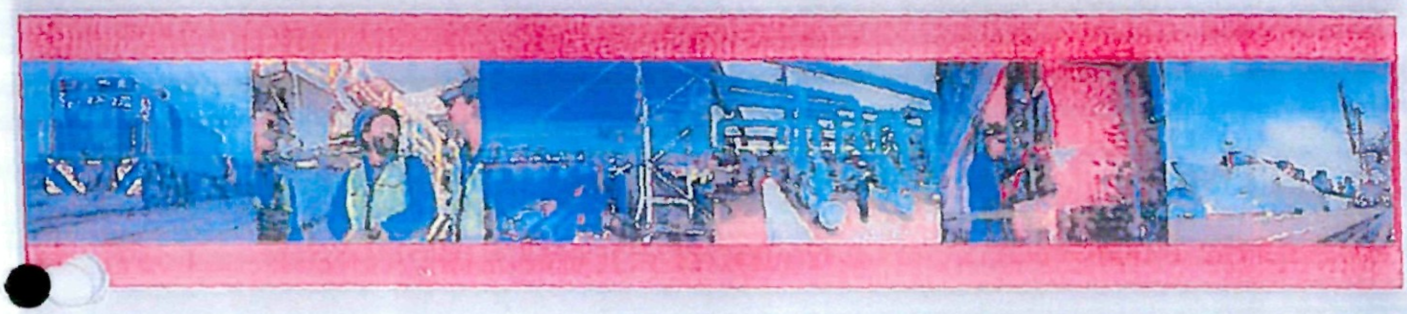
EXHIBIT 1

Procurement of 1064 Locomotives for the General Freight Business



Date of Submission	25th April, 2013
Addressed To	Transnet Board of Directors
Title of Submission	Procurement of 1064 Locomotives for the General Freight Business – Final Version

Contents

A. PURPOSE

This business case provides the rationale to invest in the profitable General Freight Business (GFB) by procuring 1064 new locomotives (465 diesel, 599 electric). This business case demonstrates a clear need to *accelerate locomotive deployment* to enable delivery against Transnet's Market Demand Strategy (MDS) and achieve South Africa's broader socioeconomic objectives. The new locomotive purchase will:

- Create value for Transnet by enabling TFR to deliver 170 mt by 2018/19 and thereby achieve its MDS target. This will result in a positive NPV (R2.7 billion at the TFR hurdle rate of 18.56 percent and R34.1 billion at the TFR WACC of 12.56 percent), top-line growth, enhanced return on assets (ROA), and an improved environmental footprint.
- Lower the cost of doing business in South Africa by enabling operational efficiencies that will increase customer satisfaction and facilitate a shift from road to rail.
- Create and preserve 28,000[1] direct and indirect South African jobs, and R78 billion in economic impact through local supplier development.

A robust procurement strategy that is aligned with Government socio-economic policies and appropriate governance processes have been designed and instituted to ensure transparency, fairness, and value maximisation for Transnet and South Africa. A funding plan and forex management strategy are detailed in the business case.

The risks that are inherent in a procurement event of this nature have been identified and mitigation strategies are in place. Accordingly, it is recommended that the 1064 Locomotives Business Case be approved with estimated total costs of the acquisition of R38.6 billion as per the Corporate Plan (excluding the potential effects from forex hedging, forex escalation and other price escalations).

[1] Proportional to MDS-related job creation of 288,000

B. EXECUTIVE SUMMARY

Business need

Transnet Freight Rail (TFR) is moving from a strategy of "responding to confirmed demand" to creating "capacity to unlock demand". The MDS is informed by future planned investments that support the move from road to rail by targeting rail-friendly traffic currently on the road as well as other volume growth opportunities. As part of Transnet's MDS, TFR has committed to grow its volumes by 143 million tonnes, from 208 million tonnes to 350 million tonnes; over 60 percent of this growth is expected to be delivered by the General Freight Business (GFB), which will grow from the current 82.6 million tonnes to 170 million tonnes by 2019. TFR plans to invest R194 billion in capital to deliver this growth in total volumes; of this, R143 billion is planned to be invested in GFB, R19 billion in export iron ore and R32 billion in export coal. Of the total capital invested in GFB, 53 percent will be expansionary and 47 percent sustaining capital.

This investment in growing GFB volumes make business sense, as it lowers the cost of doing business and accelerates a modal shift from road to rail. The majority (85 percent) of the growth in GFB demand is generated by: rail-friendly bulk commodities that need to be transported long distances such as manganese, magnetite, and domestic iron ore; bulk commodities with certain demand, like coal needed for Eskom's power stations; and container-based commodities for which existing demand moves on road and will shift to rail. Moreover, South Africa is well-positioned on global cost curves for GFB commodities that are exported, such as manganese, magnetite, and thermal coal, which mitigates the volume downside due to inevitable global commodity volatility.

Current and new fleet requirements

The average age of the TFR GFB fleet is currently 32 years and comprises 1889 locomotives, which are broadly divided into workhorses and shunters, with the workhorses being the prime income generators. There was a major procurement of over 1000 locally manufactured electric locomotives in the 1970s and 1980s, which became the workhorses of the current fleet. No new locomotives were purchased for GFB from 1992 through to 2008 when the GFB fleet was augmented by a series of purchases that included 50 "like new" diesels, 100 diesels, and 43 diesels; currently, 95 new electrics are on order from China. These purchases were not sufficient to meet market demand and achieve a road to rail migration.

The economic design life of a locomotive is 30 years. In the absence of new locomotives, the workhorse fleet was given life-extending upgrades where possible that extended the working life to 45 years. However, this has resulted in increased maintenance costs as well as difficulty in obtaining spares. As the most cost-effective and technology-compatible options for extending the life of a locomotive are exhausted, further extensions are no longer economically cost-effective or technologically practical.

Proposed way forward on locomotive fleet expansion-related economic impact

The recommended way forward is for TFR to proceed with programmatic procurement of new locomotives. TFR has explored two options: continuing with the status quo, which is economically unviable and does not support the volume ramp-up envisaged by the MDS, putting the entire MDS at risk; new locomotive acquisition is the only viable and recommended option:

- **A status quo scenario.** The current fleet has already begun to run out. Based on TFR's current Locomotive Fleet Plan, the number of locomotives in the GFB fleet will decline from 1889 in 2014 to 1592 by 2019, with further run-out thereafter as the oldest and costliest assets in the fleet are retired. Half the fleet will be retired within 10 years and nearly the entire fleet within 20 years. If this run-out is not addressed, TFR would only have capacity to transport 85 million tonnes in 2019 – 85 million tonnes short of its MDS commitment, representing a cumulative revenue shortfall versus the MDS plan of R73 billion over this period. MDS will not be executed and there will be a negative impact on cash interest cover (CIC) and gearing.
- **A new locomotive procurement scenario.** TFR has to invest in new locomotives to replace its current aged fleet and to support its planned volume ramp-up. To achieve this, TFR needs to procure of 1064 locomotives (465 diesel and 599 electric) over the next 7 years. Procuring 1064 new locomotives between 2013/2014 and 2018/2019 would have a positive NPV of R2.7 billion (discounted using TFR's hurdle rate of 18.56 percent; NPV would be R34.1 billion if discounted using TFR's WACC of 12.56 percent). Accordingly, the only viable solution to deliver on GFB's R53.8 billion revenue MDS target in 2019 is to procure new locomotives.

Benefits of the 1064 locomotive acquisition programme

The 1064 locomotive acquisition will benefit Transnet, South Africa and South African business.

For Transnet, the locomotive acquisition programme will:

- Enhance locomotive operational efficiency thereby increasing asset utilisation.
  - TFR will leverage new technology specification locomotive efficiencies. The new locomotives increase the rate of the fleet's availability and reliability. In addition, further operational efficiencies may be possible by leveraging increased tractive effort to limit the number of locos needed for a given flow or redesign of flows altogether (e.g., some flows have both AC and DC lines, which currently require stops and changeovers between different locomotive types but will not with dual-electric locomotives).
  - The programme offers TFR an opportunity to standardise its locomotive fleet by procuring a limited number of locomotive types. This will result in a host of benefits including simplified maintenance.
- Create business opportunities for Transnet Engineering (TE) to substantially participate in the localisation programme and thereby retain a portion of the locomotives' spend within Transnet.
- Significantly impact TE with respect to maintenance practices and consolidation of maintenance depots where the new locomotives have extended service intervals and on-board diagnostic health monitoring systems where full advantage is to be taken of the currently available technology and international best practice. This is the result of a full deployment plan developed by business unit, year, class of locomotive and depot.
- Enhance Transnet's return on assets and increase financial sustainability. This will be driven by volume growth and declining unit costs of production and will be achieved despite the increase in depreciation.

For South Africa, this large-scale procurement programme will:

- Create R68 billion in localisation benefits for the South African economy. Transnet stipulates local content of 55 percent for diesel and 60 percent for electric locomotives. Given the economies of scale on the purchase of 1064 locomotives with the stipulated localisation requirements, desired localisation can be achieved for only a 2 percent average cost of localisation – an additional investment of just over R600 million. This equates to a highly attractive benefit cost ratio of more than 125 to 1.

- Catalyse the sustainable development of a South African locomotive production industry based on the procurement of 1064 locomotives over approximately 7 years and an estimated on-going annual need of 80 locomotives driven by TFR's 30-year replacement life policy.
- Develop manufacturing skills, which will ultimately support not only the locomotive industry but also South Africa's manufacturing sector more broadly.
- 28,000 indirect and direct South African jobs, created and preserved.
- Achieve greater road safety and fewer road fatalities by supporting the shift from road to rail
- Energy savings will be achieved, with 8- 10% lower fuel consumption for diesels and 18% energy savings for electrics. For the diesel locomotives alone, this will result in savings of over 31,000 tonnes of CO_2 and R5 million per year by 2018/2019.

For South African business, the locomotive acquisition will:

- Increase customer satisfaction and enhance the ease of doing business as higher locomotive reliability results in better adherence to schedules.
- Lower the cost of doing business by catalysing a shift from road to rail, which is a more cost-effective mode of transportation for distances over 300 kilometres. Given the spatial dispersion of South African centres of economic activity and the distances between the centres of production and ports, this will benefit most businesses.
- Lower infrastructure repair costs driven by the road to rail shift as damage to roads from the current trucking of commodities like coal is reduced. In addition, it will contribute towards a reduction in road traffic fatalities.

Programmatic procurement strategy and evaluation criteria

Transnet's procurement strategy for the acquisition of 1064 new locomotives, approved by the Board, includes the following key aspects:

- Alignment with the Government of South Africa's socioeconomic policy framework, including CSDP, NGP, NDP, SSI, and IPAP2.
- Increasing local content through developing skills, creating jobs, and transferring technology. Transnet's programmatic procurement strategy follows threshold requirements for locomotive localisation, in line with those designated by the National Treasury (i.e., 55 percent for diesel, 60 percent for electrical locomotives).
- Approaching the market through an open tender process to attract the broadest possible supplier base and maximise value for South Africa and Transnet. Tenders have been issued for both locomotive types. The RFP closure date is April 28th, 2013.
- A six-step evaluation methodology will be applied based on the evaluation criteria: price 60 percent; supplier development 20 percent; and Broad-Based Black Economic Empowerment (B-BBEE) 20 percent.

Managing sensitivities and risks

Procuring Transnet's 1064 new locomotives in the most capital-efficient way requires a detailed understanding of inherent volatilities, risks, and mitigation plans. The locomotive requirement and the pace at which Transnet needs to deploy its capital in the base case scenario is shaped by two factors:

- **Volume volatility.** TFR's overall locomotive procurement programme is based on current, validated MDS GFB volumes. However, given the volatility in the global and domestic economy, the realisation of these volumes may be different than planned. If volumes grow faster or, vice versa, slower than the MDS plan, Transnet must adjust its locomotive procurement accordingly. This flexibility needs to be built into its procurement and contracting strategy to enable it to accelerate or throttle back the pace of locomotive purchases without penalties.
- **Operational efficiency potential.** TFR's current Fleet Plan estimates the number of locomotives including the potential efficiencies that can be captured from technology improvements and operational flexibility of new locomotives. Further operational efficiencies may be possible by leveraging increased tractive effort to limit the number of locomotives needed for a given flow or redesign of flows altogether. These operational efficiencies have not been incorporated in the business case- capturing them could reduce the number of locomotives needed and improve the upside of this business case. The aforementioned flexibility Transnet builds into its procurement strategy will also address this sensitivity.

The following are some of the key risks and sensitivities that are important to consider and mitigate:

- **Volumes.** Of all variables, volume risk has the greatest potential to impact NPV. For example, with a slight underperformance (7 percent versus MDS targets), Transnet would experience revenue shortfalls of R16.4 billion and a reduction in NPV of R1.7 billion. However, under the worst case scenario (growth of volumes in line with GDP as opposed to MDS), NPV would be reduced by over R20 billion. This reinforces the aforementioned need for a flexible procurement and contracting strategy, allowing locomotives to be brought online as they are needed.
- **Delivery schedule.** TFR already has a shortfall of DC electrics, with the electric locomotive shortfall projected to grow to approximately 122 electrics and 32 diesels by 2015. Given the previously expected timelines to procure new locomotives locally, TFR may not be able to close this shortfall until the end of the MDS period. Under the base case (procurement in line with schedules stipulated in the RFP), R13.3 billion in MDS revenues would be at risk; this would more than double under a moderately delayed scenario with further downside under the worst-case scenario. As a result, procurement and production timelines are being tightly managed to ensure the swiftest possible locomotive delivery, and immediate mitigation strategies are being explored. These include front-loading orders with international suppliers and exploring leasing options.
- **Tariffs.** The MDS GFB tariffs are expected to increase faster than CPI through 2020 (7 percent versus 6 percent). Given that the pricing on almost all GFB commodities is below the cost of full economic recovery even after taking into account all efficiencies, the pricing corridor in TFR's plan is achievable. However, should global and local economic conditions create challenges and tariffs above CPI cannot be implemented, the implication would be a reduction in the NPV of the business case by upwards of R4 billion.
- **Foreign exchange exposure.** Assuming target levels of localisation, a change in the Rand to US dollar exchange rate of 10 percent would represent a ~R1.2 billion impact on capital expenditure. Given 15 percent devaluation of the rand against the US dollar over the past year

alone, such volatility is not unrealistic. See the Treasury Section below for the mitigation strategy.

- **Locomotive purchase price.** Closely linked to foreign exchange fluctuations are additional locomotive price risks that need to be actively managed during contracting and negotiations (e.g., change order risks related to detailed specifications). A purchase price increase of 10 percent would have a -R1.5 billion impact on NPV.

Transnet Treasury requirements relating to the locomotive acquisition

Funding plan. The acquisition of 1064 locomotives will cost R38.6 billion and has been included in the overall MDS funding amount of R86.5 billion over the next 6 years. Consequently, the funding options will include those in the borrowing plan as contained in the approved Transnet Corporate Plan 2013/2014. A mixture of cash generated by operations and external borrowing will be used to fund the acquisition. Two-thirds are assumed to be financed using cash generated by operations, and about R13 billion will need to raised externally. The external funding will be raised utilising both the Global Medium Term Note programme for dollar funding and established domestic sources for Rand funding – e.g., the Domestic Medium Term Note programme. In addition, options like development finance institutions (DFIs) and export credit agencies (ECAs) will be considered to lower the cost of funding.

Foreign exchange exposure management. Transnet's Group policy on Financial Risk Management requires that all contracts must be either Rand-based or effectively hedged to minimise the risk of financial loss due to exchange rate fluctuations. Should a Rand-based contract not be possible, hedge accounting will be applied to manage any foreign exchange volatility. The project will be hedged according to the Group Financial Risk Management Framework.

Robust governance

Given the magnitude of this transaction, Transnet has developed a clear governance framework, including:

- The highest standards of confidentiality, reinforced through a High-Value Tender process with oversight from Transnet Internal Audit.
- A 1064 Locomotive Steering Committee meeting, chaired by the Group Chief Executive Officer, has been instituted. This Steering Committee is constituted as a sub-committee of Group ExCo.
- A PMO has been established at TFR with specific responsibilities for: tracking progress towards milestones; establishing and owning a virtual data room based on best practice; scheduling Steering Committee meetings at the request of the Chair and following up on action items; and ensuring that confidentiality protocols are in place.

Ensuring operational readiness

TFR has operational readiness plans in place to ensure efficient deployment of its new locomotives:

- **Critical path interdependencies – integrating locomotives, demand, wagons, infrastructure and operations.** Wagons are tightly linked to the commodities they transport, while locomotives relate to the mass but not the commodity itself; thus, locomotives are allocated according to the tonnes transported over the particular operating section.

  The proposed diesel locomotives can operate over most of the network with the notable exception of long tunnels. Current single voltage electric locomotives (AC or DC) are confined according to the current electrification network. This imposes operational inefficiencies due to the traction changes. The new electric locomotives will be dual voltage, eliminating the need to change tractive power and enabling trains to bypass yards.

In addition to the flexibility afforded by the locomotive standardisation above, the 1064 locomotive dependencies with megaprojects, such as Manganese and Waterberg, have been considered and addressed. Human Resources planning is equally critical to execute a programme of this magnitude. For example, to support the overall TFR fleet ramp-up, TFR will need to train 3065 train drivers and assistants. To address current driver shortfalls and increasing requirements over time, TFR will need to begin training drivers immediately.

- **Maintenance regime.** TE will be significantly impacted with respect to maintenance practices and the consolidation of maintenance depots. New locomotives have extended service intervals and on-board diagnostic health monitoring systems, requiring a different maintenance regime than TE currently delivers (e.g., larger "super depots" for large-scale maintenance, with smaller stations for refuelling and other basic services).

Conclusion

Transnet's purchase of 1064 locomotives is a critical procurement event that will facilitate Transnet's delivery against its MDS targets, transform the business, increase operational efficiencies and support local supplier development. Transnet's procurement strategy will be flexible enough to adapt to actual locomotive demand that is realised over time.

Recommendation

Transnet recommends to the Board of Directors for approval:

- The acquisition of 1064 locomotives for the General Freight Business
- Estimated total costs of the acquisition of R38.6 billion as per the Corporate Plan (excluding the potential effects from forex hedging, forex escalation and other price escalations).

Signed by:

Brian Molefe	Siyabonga Gama	Anoj Singh
Group Chief Executive	TFR Chief Executive	Group Chief Financial Officer

Johannesburg, 25th April 2013

C. BUSINESS CASE

1. Context

Transnet's MDS is driven by Transnet's shift in strategic focus from "responding to confirmed demand" to creating "capacity to unlock demand". In addition, it is a response to the National Development Plan and National Growth Plan imperatives seeking to contribute to South African economic growth and create jobs on an unprecedented scale.

Shift in Transnet's strategic focus and resulting infrastructure needs

The TFR MDS was borne of a number of strategic drivers. These include:

- The intent to make a significant contribution to national objectives embedded in the New Growth Path and the National Development Plan – to create capacity, to enable an export-led strategy, to develop infrastructure and to create jobs and develop skills.
- To address the legacy structural imbalances in the freight transport system. Significant tonnages of freight are conveyed by road rather than rail which contribute to high logistics costs (and compromises country competitiveness) and to the cost of externalities. Greater tonnages of traffic being transported by rail would make a significant contribution to reducing the number of heavy trucks on roads; overall transport and logistics costs; cost of externalities i.e., road damage, road accidents, road congestion, noise pollution, carbon emissions, the impact of rising fuel prices.
- To pursue opportunities for growth in transportable GDP by targeting rail-friendly opportunities.

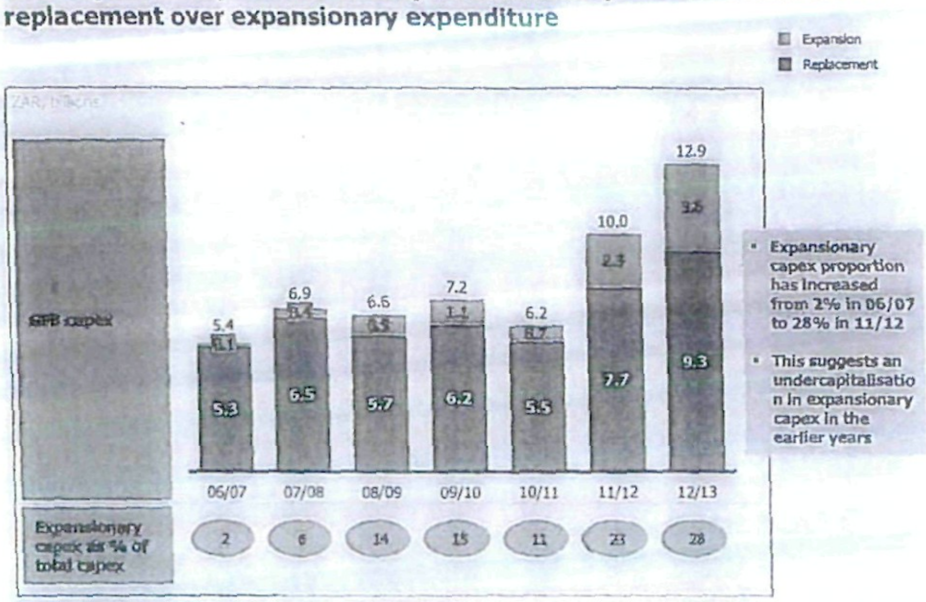
The MDS is informed by future planned investments that generate rail-friendly traffic and target rail-friendly traffic currently on the road. As part of this strategy, TFR has committed to grow its volumes by 142 million tonnes to 350 million tonnes by 2018/19. Over 60 percent of this growth is expected to be delivered by the General Freight Business (GFB), which will grow from the current 82.6 million tonnes to 170 million tonnes by 2019 and is the focus of this business case. To enable this strategy, Transnet plans to invest R308 billion over the next 7 years. The total investment directed to TFR will be R194 billion to deliver on its significant volume growth targets; of this R143 billion is planned to be invested in GFB, R19 billion in export iron ore, and R32 billion in export coal. Of the total capital invested in GFB, 53 percent will be in expansionary projects.

GFB's current situation is an important point of departure to fully understand the business case. While TFR has steadily ramped up investments since 2004/05, these have been largely directed at the export iron ore and export coal businesses. By contrast, little has been spent on expanding GFB capacity and infrastructure since 1992. Even in more recent years, as per the Exhibit below, the focus of GFB capex has been maintenance rather than expansion.

Even in more recent years, as seen in the exhibit below, the focus of GFB capex has been maintenance rather than expansion.

EXHIBIT 1

GFB expansionary has historically been undercapitalised with focus on replacement over expansionary expenditure



This has left GFB highly undercapitalised, with its aging infrastructure unable to meet current market demand let alone generate and service new freight demand in sectors where South Africa has a comparative advantage. This not only limits the growth of Transnet but more importantly hampers the growth of South Africa's economy and leaves the cost of doing business in South Africa uncompetitive, particularly as the road share of total freight transport has increased over time at the expense of rail. It is therefore imperative to rectify this and to enable TFR to service current rail-friendly demand, stimulate further demand, and catalyse a shift from road to rail.

The MDS will address these issues, laying out a plan to improve financial stability, productivity, and operational efficiency and to shift demand from road to rail. Through this strategy, Transnet will: reduce its cost of doing business while becoming more carbon efficient; enable economic growth, job creation, and skills development; and create opportunities for localisation, empowerment, and transformation.

Investing in GFB is a sound business decision. The growth in GFB volumes is driven by commodities and flows that are rail-friendly and attractive for TFR. The majority (85 percent) of the growth in GFB demand is generated by rail-friendly bulk commodities that need to be transported long distances – manganese, magnetite, domestic iron ore, containers; with certain demand – e.g., coal needed for Eskom's power stations; and commodities for which existing demand moves on road and will shift to rail. Moreover, South Africa is well-positioned on global cost curves for GFB commodities such as manganese, magnetite, and thermal coal, which mitigates the volume downside due to inevitable global commodity volatility.

Although global growth has been constrained by the slowdown in global and local economic activity, the strategic intent of the MDS remains, and volumes are projected to grow from 82.6 million tonnes in 2012/13 to 170 million tonnes in 2018/19.

National Development Plan (NDP) and National Growth Plan (NGP) imperatives

Transnet is an important enabler of South Africa's NDP and NGP.

Alignment with priority infrastructure initiatives for South Africa

The NDP aims to address poverty and inequality by creating a favourable environment for public and private investment to create jobs and increase disposable incomes. Its imperatives include economic growth, job creation and skills transfer, infrastructure investment in rail, power, and other industry, a reduction of GHG emissions, and positioning South Africa positively. To achieve full employment, the economy will have to create 11 million jobs by 2030, requiring economic growth of 5.4 percent. The South African government has made infrastructure a major priority, recently announcing the establishment of a Presidential Infrastructure Coordinating Commission and planning investments of more than R800 billion over the next 3 years. Transnet's major infrastructure projects are important pillars of Strategic Integrated Projects (SIPS) and playing their role in delivering on economic growth and job creation objectives.

GHG emission commitments

As a state-owned enterprise and one of the top 10 carbon emitters in South Africa, Transnet has placed reducing carbon emissions high on its agenda. South Africa – having set aggressive targets for carbon mitigation (a 34 percent reduction by 2020 committed at COP 15[2] in Copenhagen) and hosting COP 17[3] in Durban in 2011 – will count on state-owned entities to be role models in this regard.

With the National Treasury making significant strides towards implementing a carbon tax, and the Department of Environmental Affairs developing national marginal abatement cost curves (MACCs) and carbon budgets, carbon reduction will become a strategic imperative for major emitters like Transnet.

2. Business need

To deliver on MDS, GFB will need to grow its volumes transported from 82.6 million tonnes to 170 million tonnes between 2012/13 and 2018/19.

2.1 The shift from road to rail

One of the drivers of this shift is TFR's stated objective to capture market share from road. The rationale for this is that:

- Rail is cheaper than road for long-haul transportation of large parcel sizes, thus reducing the cost of doing business and making South African goods more competitive.
- Rail produces lower emissions per gross tonne kilometre than road, thus assisting South Africa's GHG emissions reduction effort.
- Haulage by road damages road infrastructure, requiring a significant investment to repair the roads.

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[2] The 15th Conference of the Parties (COP 15) to the United Nations Framework Convention on Climate Change (UNFCCC) – Copenhagen.

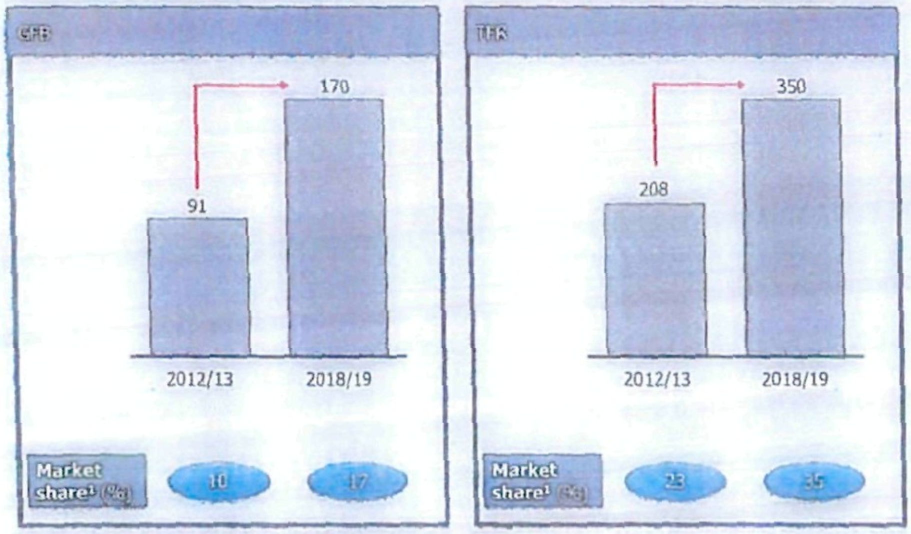
[3] The 17th Conference of the Parties (COP 17) to the United Nations Framework Convention on Climate Change (UNFCCC) – Durban, South Africa.

Furthermore, for developing economies like South Africa, economic growth results in a relatively higher increase in trade volumes – and therefore freight demand – than GDP growth rates would otherwise imply (i.e., a higher container volume multiplier, which measures the marginal effect of economic growth on freight volumes).

Therefore, given the clear impetus for volume growth and a shift from road to rail, delivering on the MDS depends on TFR's ability to capture volumes. TFR plans to capture rail-friendly volumes from road by developing a comprehensive value proposition based on customer needs. Rail-friendly goods are typically mineral and mining commodities and some manufactured goods, as well as raw material inputs to manufactured goods (such as steel and cement) that are conveyed from siding to siding in large parcel sizes, over relatively long distances. 66% of the projected volume growth of 79.2mt from 2013/14 to 2018/19 will be transported over distances greater than 300kms, a distance by which rail is cheaper than road. Transnet believes the rest of the flows will have preference for rail transportation (e.g., the bulk of the remaining volumes relate to Eskom coal flows which are rail preferred due to Eskom simplifying their logistics chain, public sentiment against road transportation for coal and reducing the damage to road infrastructure). TFR's market share is expected to grow from 23% to 35% as shown in the exhibit below.

EXHIBIT 2

Both GFB and TFR are expected to capture significant market-share over the MDS period



1 Refers to share of total South African land freight market
SOURCE: TFR corporate plan 2013/14

2.2 GFB demand increase by commodity

From the TFR Corporate Plan, freight rail volume projections per commodity from 2013-2019 are summarised in the following exhibit. The projections represent a market demand view of volumes in support of South Africa's New Growth Path (moderated in line with port capacity and Eskom electricity supply), and they reflect a significant growth in volume for the overall general freight commodities.

EXHIBIT 3

MDS volumes by commodity

Business Unit	2013/14 Budget	2014/15	2015/16	2016/17	2017/18	2018/19
Agriculture & Bulk Liquid	12.66	14.39	15.63	18.02	18.66	19.26
Coal	16.86	19.92	24.93	36.34	44.61	48
Manganese	8.7	8.72	11.57	13.05	15.56	17.03
Containers and Automotive	12.63	14.27	18.32	19.94	15.25	16.71
Mineral Mining & Chrome	18.53	20.32	24.45	28.89	30.11	30.57
Steel & Cement	21.84	26.66	32.37	35.23	36.47	38.89
General Freight (mt)	**91.21**	**104.27**	**127.27**	**151.46**	**160.66**	**170.45**
Coal (Export Coal)	77	81	81	84	95	97.5
Export Iron Ore	61.5	62.3	62.3	70.3	78.3	82.5
TFR Total (mt)	**229.71**	**247.57**	**270.57**	**305.76**	**333.96**	**350.45**

To capture these increases in freight demand, GFB has developed a commodity-level commercial strategy. The next two exhibits show the sources of growth from the major commodity flows and the various strategies developed to address them. See Supporting Documentation section E1 for the full 7-year commodity growth. Growth in coal volumes will be driven by Eskom's shift from road to rail on the Eskom-Tutuka and Eskom-Majuba flows and the development of new power stations. Steel and cement will be driven by a competitive pricing strategy aiming to capture domestic coal, and iron ore volume growth from the government infrastructure development plan. The focus on unlocking capacity for junior miners will capture volume growth from manganese export. Mineral volume growth will be secured through penetrative pricing strategies in the growing market.

EXHIBIT 4

Rationale for 79mt increased commodity demand for GFB from 91mt in 2013/14 to 170mt in 2018/19 (1/2)

Flow	Commercial strategy	Key flows	Growth (Δ mt)	Rationale
Coal	• Capture increasing coal export volumes • Eskom move from road to rail • Secure volumes through take or pay contracts	• Export TCM/ Maputo	8.1	• TCM to expand due to Limpopo projects (Vele and Makhado)
		• Eskom – Tutuka	6.5	• Transition from rail containers to tippler solutions in 2 years
		• Eskom – Majuba	5.2	• Eskom road to rail migration plan
		• Coal - Other	11.3	• Sustained strong demand for SA coal due to China and India emerging as net thermal coal importers
Steel and cement	• Customer-focused value proposition to secure volumes • Revision of pricing strategy • Exploring markets ex-SA	• Coal (domestic)	3.8	• Driven by growth in other industries (e.g., Steel, timber)
		• Iron ore (domestic Sishen)	2.8	• Domestic and regional consumption of steel fuelling demand for iron-ore & new iron ore export from Thabazimbi to Richards Bay/Maputo
		• S&C - Other	10.4	• Cement volumes to increase in line with SA's GDP growth (4% on average) • Freight rail is also targeting rail-friendly volumes in this sector
Manganese	• Unlock capacity for junior miners • Capacity review process	• Manganese	8.3	• SA's share of world output set to grow with expansion projects planned by both traditional miners and junior miners

EXHIBIT 5

Rationale for the 79mt increased commodity demand for GFB from 91mt in 2013/14 to 170mt in 2018/19 (2/2)

Flow	Commercial strategy	Key flows	Growth (Δ mt)	Rationale
Mineral, mining and chrome	• Pricing aimed at market penetration	• Magnetite (Export Maputo)	2.4	• Demand from China driven by steel production
		• MMC - Other	9.6	• Gold ore and other minerals enjoy healthy demand
Intermodal	• Containerise mineral products • Develop Freight hubs in key areas	• Coal (Eskom – Camden)	2.6	• Demand increase driven by increased electricity usage
		• Containers	1.6	• Rail container volumes to increase in line with Freight rail's objective of increasing market share along key intermodal routes such as the Natcor
Agriculture and bulk liquid	• Transnet Rail and Port capacity support for agri-logistics and rural infrastructure • Demand shift from road to rail	• Grain, maize, wheat and foodstuffs	2.1	• Demand increase driven by increased electricity usage
		• Other	4.5	• Increased over border demand from Botswana and Mozambique • Sappi expansion
Total			79.2	

2.3 Investment history and locomotive fleet run-out in GFB

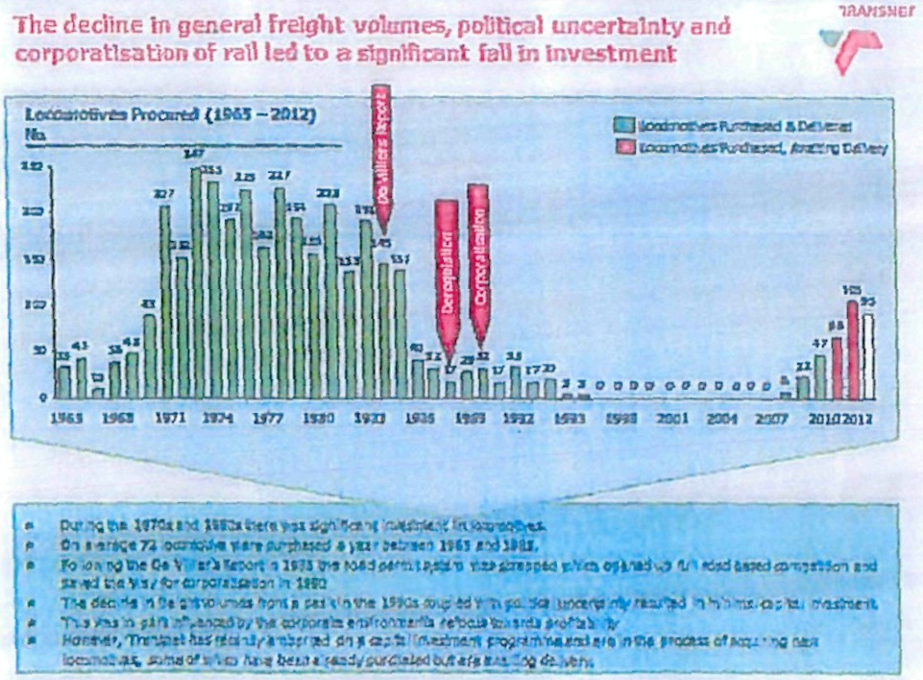
Overview

This section demonstrates that the current fleet is incapable of meeting demand. Half the fleet will need to be retired within 10 years and nearly the entire fleet within 20 years.

Investment history

TFR is generally considered to be under capitalised with an aging infrastructure unable to deliver and consequently hampering South Africa's economic growth. TFR has three distinct areas of operations, namely General Freight, Coal Export and Iron Ore Export. The Coal and Iron Ore Export operations are ring-fenced operations with assets dedicated to a single commodity. Since 2004/05, they have been upgraded and expanded to take advantage of the commodity boom. By contrast, little has been spent on General Freight since 1992, as can be seen in the next exhibit.

EXHIBIT 6



Source: Team Analysis, Transnet Locomotive Modernisation Fleet Plan – December 2010

Remedial actions to mitigate locomotive run-out

The expected useful life of a locomotive is 30 years with a full mid-life intervention at approximately 16 to 18 years, which is part of the normal life cycle of the locomotive. The average age of the TFR General Freight Locomotives is 32 years and current programs have extended the life if the workhorse locomotives to a maximum of 45 years. All the locomotives that were suitable for life extending interventions have already been targeted and the remaining locomotives are technologically incompatible.

Locomotive mid-life interventions are part of the normal life-cycle process to achieve the design life of a locomotive. The mechanical components have a life of 30 years but the electrical and electronic components and systems have a shorter life based on natural degradation and the rapid evolution of control technology. Electrical spares generally have a ten year guaranteed availability after which they become obsolete and often unavailable. Component replacement within the design life of a locomotive is not life extending but part of the planned total cost of ownership.

However, although Transnet policy assumes a locomotive lifecycle of 30 years, two primary strategies were adopted to mitigate locomotive run-outs and extend the useful locomotive life to 45 years.

The first implementation was to upgrade the workhorse 6E series of locomotives to the 18E series through a partial redesign, a rebuild and upgrade of components, and the replacement of the electro-mechanical control system with an electronic control system. These upgrades improved locomotive output from 170kN to 200kN and extended locomotive life by 15 years. The first of the upgraded locomotives will run out in 2017/18.

The second implementation was an upgrade program to the class 34D and 37D locomotives supplied by General Electric (GE) and General Motors (GM). These upgrade programs comprise a mix of extensive routine maintenance, rewiring and partial body repair. The differentiating upgrade feature is replacing the outdated and obsolete control systems with state of the art electronic control systems which improve control and prevent driver abuse. By analogy, it can be compared to traction control on a modern motor car that prevents wheel spin.

The impact of undercapitalisation on locomotive performance

The extension to 45 years was a consequence of not being able to afford new locomotives at the time and was not a formal restatement of policy; given the low investment in GFB By extending a locomotive's life to 45 years, TFR has suffered higher faults per million kilometres, lower gross tonne kilometres, and substantially higher maintenance costs. This has decreased customer satisfaction, leading to a shift from rail to road, increased the Total Cost of Ownership (TCO) of locomotives and reduced TFR's ROA.

Life extension programmes normally range from 10 to 15 years. Beyond the 15-year period the technology becomes outdated. Although refurbishment options may seem cost-effective on the surface, as the life of a locomotive is extended, failures increase. As locomotives age, maintenance becomes increasingly difficult. Spares become difficult to obtain because of shrinking markets and outdated technologies. There are also fewer skills to maintain dated technologies, as newer entrants are unwilling to skill themselves on previous technologies. These operational inefficiencies and failure rates have compromised TFR's ability to increase its volumes and have contributed to a rail-to-road shift.

Lease vs. buy

For leasing to be an effective option, there should be a viable and readily accessible market for leased locomotives. This is not the case for Transnet and South Africa.

South Africa is almost unique in the world with its narrow meter gauge (as opposed to standard gauge) 3kV electrification network. There is only one other railway (in India) with similar infrastructure. Because of this, all the electric locomotives for South Africa have been bespoke designs.

There is an international market for diesel locomotives, but for South Africa this is moderated by distance from those markets and the metre gauge, which requires shipping and change of the bogies to accommodate the wider standard gauge. There is a limited Africa market but this is again moderated by the infrastructure limitation of 15 tonnes per axle.

Without a viable second hand market, the lessor would price the long term risk into the leasing costs resulting in higher net costs for TFR.

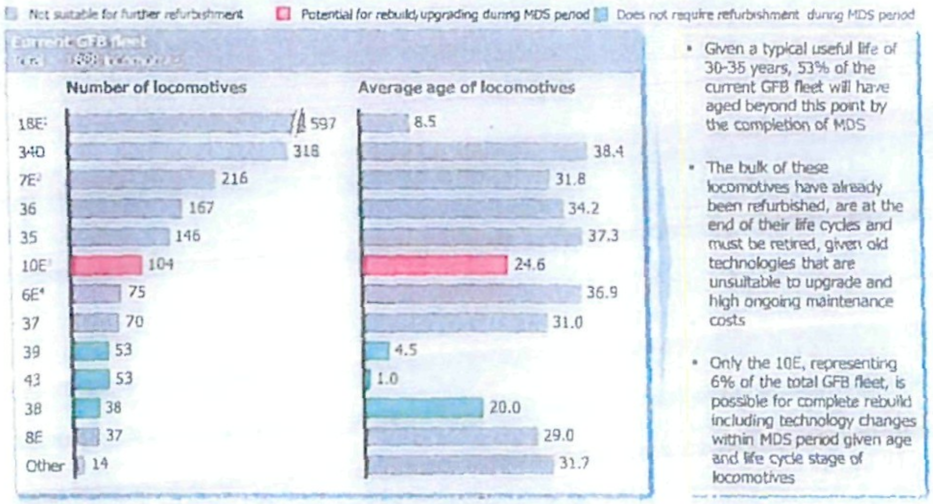
Implication for Transnet

Purchasing new locomotives would allow TFR to depreciate its costs over a 30-year useful life. More importantly, due to the increased reliability that new locomotives provide, Transnet would be able to significantly increase the volumes it transports. This would drive substantially higher ROA for the business.

Leasing is not an option and through past refurbishment strategies, ***TFR has exhausted almost all meaningful rebuild opportunities***. Thus, even if it were decided to extend the life of current assets once again (and suffer continued operational inefficiencies and lower ROA), TFR would not be able to do so. The next exhibit shows life extension options are limited to 6 percent of the fleet, as the aged locomotives have gone through extensive refurbishment over time to a point where they can no longer be refurbished. Even the "young" locomotives in the fleet are refurbished versions of older models. For example, although the 18E is listed at an average age of 8.5 years, it is, in reality, an upgraded version of the 6E, a locomotive that was purchased in the 1970s.

EXHIBIT 7

The current GFB fleet is aged – life extending options have been exhausted - only 6% targeted for a complete rebuild

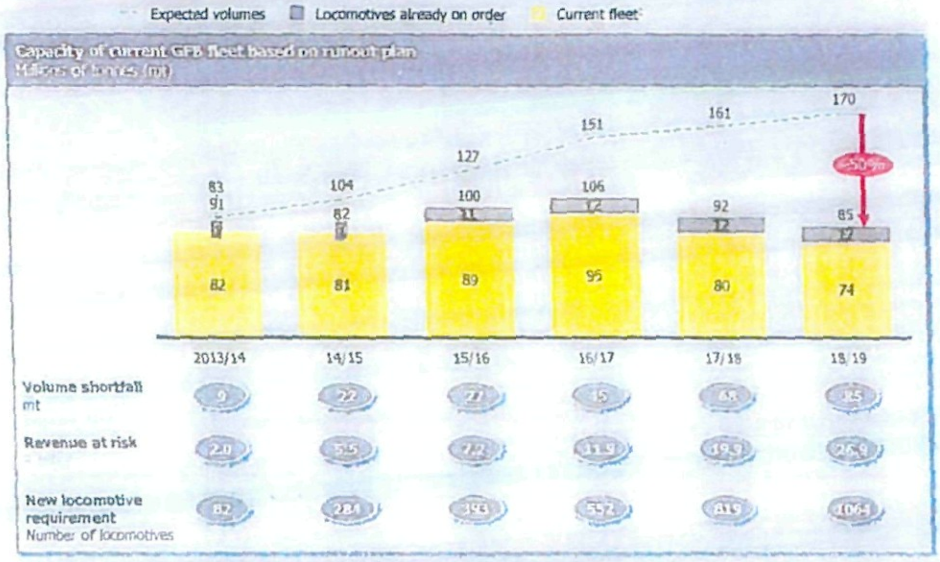


1 18Es show "young age" however are an upgraded version of 6E, which was purchased in the 1970s
2 Includes 7E, 7E1, 7E2, and 7E3
3 10E is included in fleet plan estimate
4 Includes 6E, 6E1

Conclusion: TFR will experience a R73 billion revenue shortfall if the procurement option is not exercised. The next exhibit shows that, unless new locomotives are purchased, the fleet will lose 85million tonnes per annum in capacity by 2018/19.

EXHIBIT 8

Given the current trajectory of TFR's fleet runout plan, cumulative revenues of R73bn will be at risk by the end of MDS in 2019, with further revenue at risk thereafter



1 Includes cascading from Export Ore and Export Coal lines to GFB

3. Proposed solution

3.1 Overview

To meet the fleet requirements necessary to support the MDS volumes, TFR needs to procure 1064 new locomotives. However, flexibility must be built into procurement to account for two factors – demand fluctuations and operational efficiencies captured – that will ultimately affect the timing of locomotive requirements.

3.2 Locomotives required to service market demand

TFR's Locomotive Fleet Plan was presented to the Transnet Board in April 2011 and was approved. This plan provided details on the fleet's composition; how it would run-out subject to the availability of funding; the locomotive upgrades; and the new locomotives required to achieve volumes of 110 million tonnes per annum. Since then, the plan has been updated to reflect the fleet GFB requires to meet the revised MDS volumes, which ramp up from 82.6 million tonnes in 2012/2013, to 127 million tonnes in 2015/16, to 170 million tonnes in 2018/19.

The plan's key objectives are to:

- Maintain and expand current capacity to meet the increasing demand:
    - New locomotives required to sustain the current fleet.

- New locomotives required to deliver the increase in volumes.

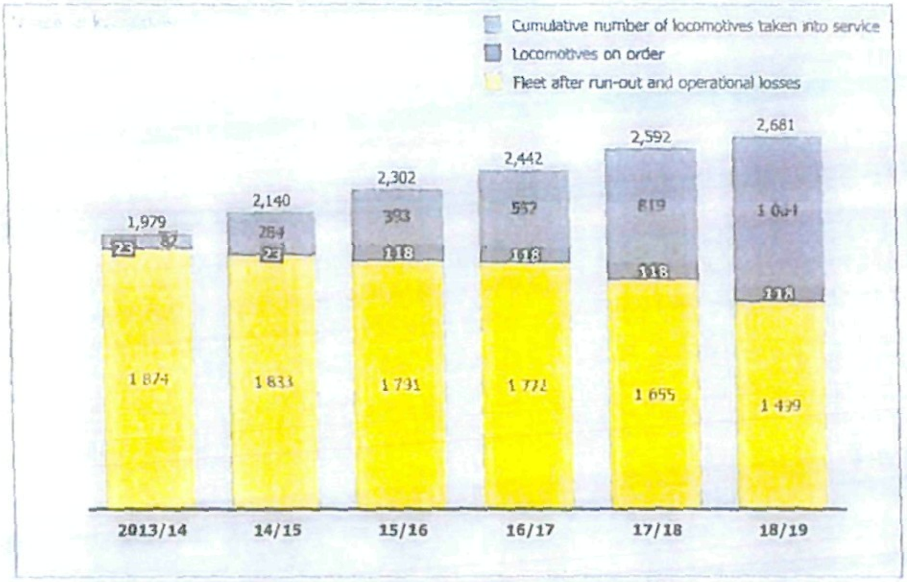
- Standardise the fleet to resolve both operational and maintenance difficulties – such as training drivers, planning route designs, and maintaining locomotives – that arise with a diverse fleet of multiple locomotive types.
- Capture improved operational efficiencies provided by new generation locomotives.

The following exhibit summarises the current and proposed locomotive fleet for general freight up to 2018/19.

The Fleet Plan is Transnet's current estimate of the number of locomotives it will require to meet its MDS commitments.

EXHIBIT 9

Locomotives required according to fleet plan



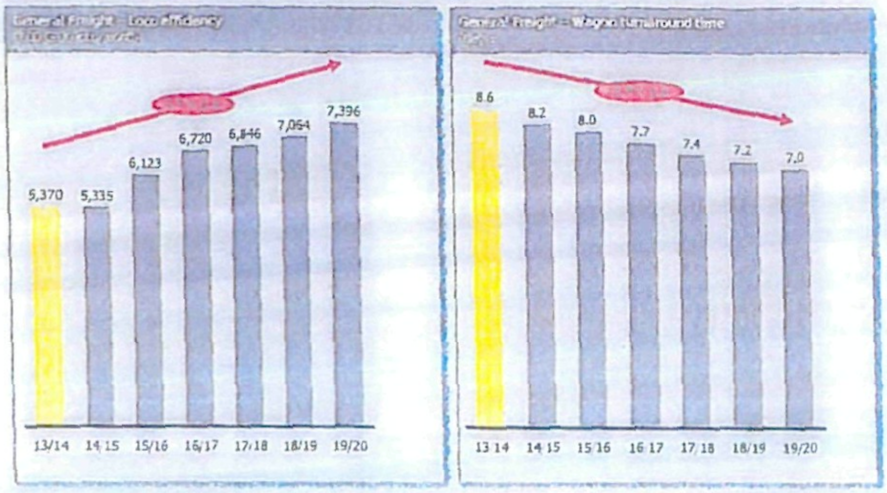
3.2.1 New locomotive procurement

New locomotive procurement is a catalyst to unlock this demand through standardisation which increases flexibility to deliver increased operational efficiencies. This will increase customer satisfaction and enable the shift from road to rail. For example, the exhibit below shows how locomotive efficiency and wagon turnaround times would improve with a renewed fleet. Refer note below.

However, the ultimate number of locomotives needed could change over time depending on the operational efficiencies captured and volumes realised.

EXHIBIT 10

Improved operational performance and increased customer satisfaction from the upgraded fleet



SOURCE 2013/2014 Transnet Corporate Plan

The increase in locomotive efficiency is based on three factors; firstly, an inherent improvement in utilisation of the current fleet; secondly, in greater tractive effort per locomotive of the proposed procurements; and thirdly, operational flexibility.

Volumes

Increasing volumes during the MDS period are a primary driver of locomotive requirements. However, Transnet's ability to meet the targets set out in the MDS will depend on external market conditions, including the growth of the South African economy and changes in the demand for commodities shipped. Should conditions change (e.g., modifications to Eskom's new build timelines would have a significant impact on domestic coal requirements, and a slowdown in GDP growth would result in fewer containers shipped), locomotive demand will change. As a result, locomotive procurement timelines must be flexible enough to adapt to potential changes in volumes based on macroeconomic and demand conditions.

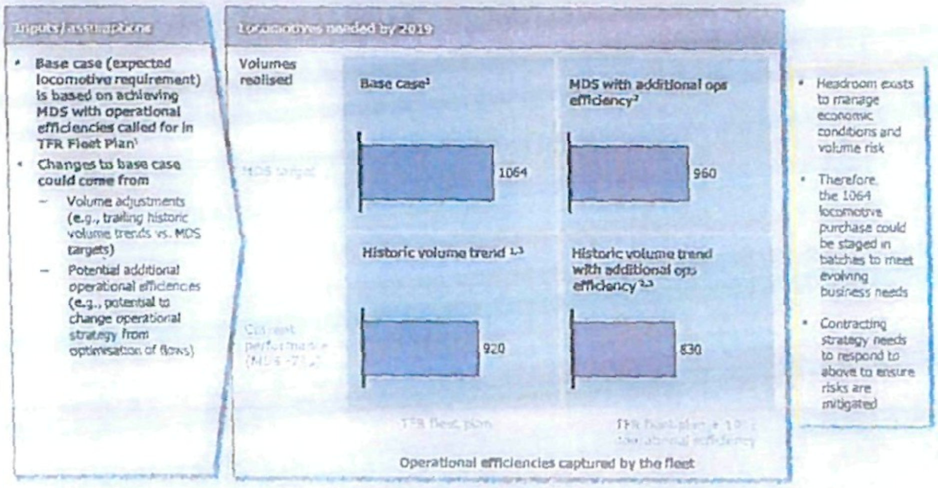
Operational efficiencies

The Fleet Plan will be affected by the operational efficiencies captured from new locomotive technology. The plan takes the position that new locomotives' improved performance will enable operational efficiencies to be captured (e.g., increased availability, reliability and operational flexibility and lower maintenance). Rightly – and conservatively – the Fleet Plan does not estimate unproven potential additional operational efficiencies that could be achieved from optimisation of flows based on the new technologies (e.g., running dual-electric locomotives across routes that previously required multiple changeovers from AC to DC technologies).

The following exhibit shows how different assumptions of volume and operational efficiency could ultimately lead to different locomotive requirements. Thus, to account for factors that could affect how quickly locomotives are needed, Transnet must pursue a flexible procurement schedule, building in trigger points that will be staged throughout the MDS period.

EXHIBIT 11

The need for 1064 locomotives is determined by the realisation of volumes and operational efficiencies – which informs the procurement strategy



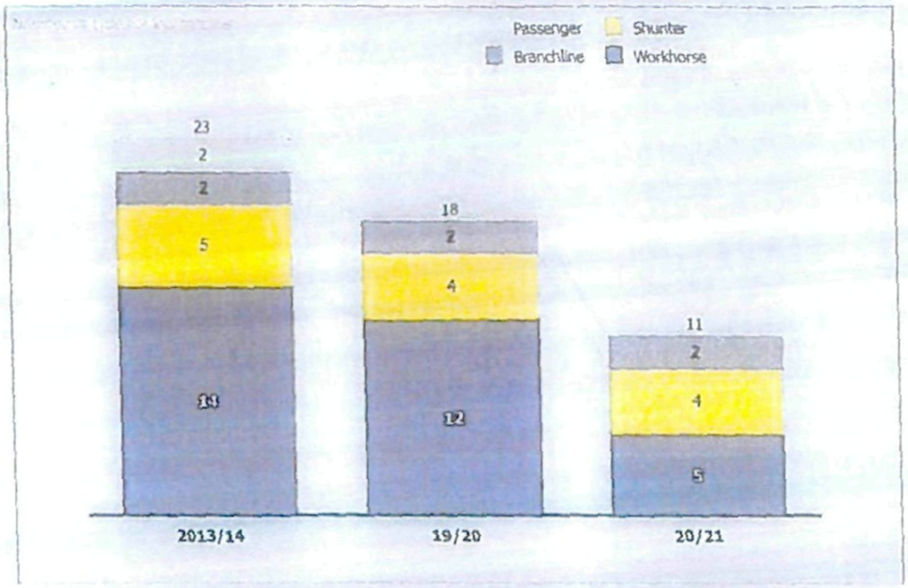
1 This incorporates benefits from increased availability and reliability, standardisation of the fleet and lower maintenance costs
2 Assumes potential additional 10% increase in operational efficiency as a result of a flexible new operating strategy
3 Based on 2011-2013 shortfall vs. MDS of 7.37%

3.3 Impact on locomotive standardisation

The purchase of relatively small numbers of locomotives at a time in the past has resulted in a diverse fleet which in turn has not delivered the benefits of standardisation. The TFR locomotive fleet plan recommends progressive standardisation of the locomotive fleet to enhance interoperability, minimise spares holding and simplify maintenance procedures and driver training. With the imminent run out of the current fleet there will be a natural rationalisation of current locomotive types as depicted in the exhibit below.

EXHIBIT 12

Procurement of the 1064 locomotives will result in locomotive standardisation, reducing types of locomotives from 23 currently to 11 by 2020/21



While 20/21 is outside the current 7 Year MDS, it reflects the "waterfall" run out of locomotives that lies just outside of the current 7 year MDS. The exhibit is a summary from the General Freight Locomotive fleet plan where the run out of each type and class can be seen. It refers only to GFB and does it reflect the heavy haul classes of the export coal and iron ore lines. Where locomotives are cascaded from the Coal Export Line to General Freight, the classes and types are included.

To prevent further diversification of the fleet, it has been recommended that the electric workhorses and diesel workhorses be procured from no more than two OEMs. In the event that the proposed procurement coincides with a type and class already in use, it will be benefit the standardisation program.

3.4 Impact on safety

Aside from the human component, safety on the GFB network will be determined by locomotives, wagons and infrastructure. The procurement of the 1064 locomotives is expected to improve safety in the GFB network. The new locomotives will have the following systems, which will provide safety advancements to the user and TFR:

- Onboard computers (OBC) that will prevent drivers from exceeding speed limits. Some of the locomotives in the current fleet have been fitted with OBC and it shown a proven ability to modify driver behaviour to adhere to speed limits and improve safety.
- Cameras employed as standard equipment which will allow behaviour modification as well as allow TFR to have real time data during any incident that should occur.
- Electronic Brake Rack over the current mechanical brake racks. This will allow for better monitoring and application of brakes.

- Remote monitoring of locomotives while in operation. This will allow monitoring of the usage of the locomotives and remote pick up of any breaches in application of parameters being exceeded. This will therefore allow behavioural modification and a reduction in abuse of the assets which in turn will bring down unscheduled failures and costs thus providing the evolution in maintenance to Reliability Centred Maintenance.

New wagons will retain existing systems which have been proven to be effective with regards to safety. The planned increase in the axle load of the core network (See Network standardisation- section C6) will also improve the structural integrity of the network.

3.5 Role of Transnet Engineering (TE)

Rolling stock covers a range of asset classes used by railways for specific purposes, including wagons and locomotives. TE is already competitive in wagon manufacture and the procurement of 1064 locomotives could position it for similar competitiveness in locomotive manufacture.

At the base level, South Africa has remained competitive in the production of wagons, which retain very high levels of local content. Local manufacturers such as TE continue to hold dominant market positions in this space and export to customers outside SA. In addition, they behave very much as OEMs through their understanding of the technology and design requirements of this type of rolling stock. In recent years, TE has developed capabilities in more complex forms of rolling stock such as locomotive assembly and associated component assembly and manufacture. Various other players in the private sector have also benefited from recent purchases of locomotives through the Competitive Supplier Development Programme (CSDP) driven by Transnet.

TE currently does locomotive maintenance for TFR. However, the purchase of 1064 locomotives by TFR could create an additional opportunity for TE to play a strategic role in design, integration and supplier development of locomotives in addition to its expected role in maintenance. This could elevate TE beyond the assembly function to hold a more strategic position in the future development of locomotive technologies and enhanced maintenance capability as shown in exhibit 12. However this opportunity is subject to competitive bidding against other local suppliers.

Scope of work for TE

There are two categories of local work that emerge from the 1064 locomotive tender where TE could be strategically repositioned:

- Development of locomotive technologies and capabilities in integrated design and control system design and the adaptation of these systems to local operating environments.
- Development and design of high-value complex components and alignment of maintenance regimes to best serve the needs of Transnet Freight Rail as the operator of these assets.

The drive to localise a considerable portion of a locomotive would be undertaken to competitively position local private sector suppliers, particularly those demonstrating strong B-BBEE credentials. Thus, whilst Transnet would seek to empower TE strategically and as an integrator and assembler of locomotives, the majority of lower tier supply would be outsourced competitively to competent local manufactures.

The main focus for TE lies in the area of final assembly of the locomotive, development of important sub systems and integration of the locomotive control systems. This additional scope of work would provide TE with additional skills in ongoing locomotive maintenance and the feedback from the maintenance programmes associated with existing locomotives would provide valuable insights into the design and manufacture of the various sub-assemblies and components that make up the new diesel and electric locomotives.

Although TE is strategically positioned to play a dominant role in these areas it would do so under the custodianship/leadership of the locomotive OEM selected to provide the diesel and electric locomotive contracts. In addition, providing this scope of work would require integrating the supply base from both local private sector specialist firms and global specialists in each respective area. This would open up considerable scope for local manufactures to play a role in conjunction with the locomotive OEM and TE in elevating South Africa's manufacturing capability in each of these areas.

Opportunities for private sector in local content

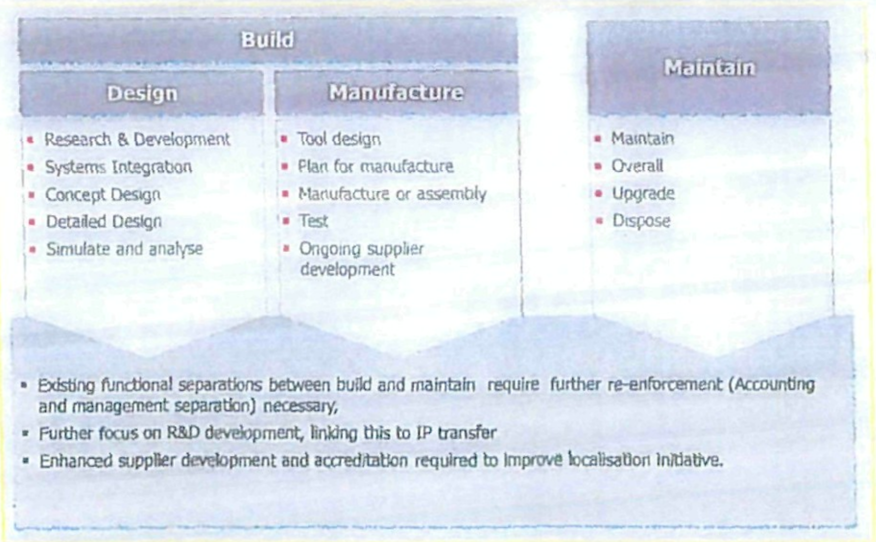
Transnet Engineering (TE) must obtain certain skills through the approach described above in order to reposition itself strategically.

Transnet's detailed component analysis is based a market related costs structure informed by the bills of materials used in assembly and maintenance of various locomotive components. It thus closely emulates current market pricing within the locomotive market.

The analysis identifies certain areas of expertise and components where Transnet Engineering will be strategically positioned, as well as scope of work and expertise that will directly benefit South African private sector manufacturers.

EXHIBIT 13

Greater specialisation and focus by splitting Build and Maintain functions within Transnet Engineering



Impact of the new deployment plan on TE

Locomotive deployment is never static and changes dynamically in accordance with commodity and market requirements. It is also influenced by standardisation of maintenance facilities and crew trained in operating a particular type of locomotive. The proposed new locomotives are however specified to enhance standardisation and be deployed over the entire core network with the exception of diesels going through long tunnels.

The new deployment plan will also significantly alter the way TE operates. It will have an impact on:

- **Locomotive maintenance strategy and practices.** The new locomotives will have added features that will reduce maintenance and increase reliability, requiring a contemporary maintenance regime to exploit these features. For example, the Class 34 diesels generally have a 28-day intervention where the locomotive travels to a depot, with major interventions taking place at specific depots. The new Class 43 diesels, however, have a service interval of 90 days that can possibly be extended to 180 days. Where an intervention may be required between service intervals, this would entail the technician coming to the locomotive rather than the locomotive going to the depot. As TFR improves its efficiencies, it will result in lower downtime and increased availability of locomotives.
- **Maintenance technologies.** New maintenance technologies are anticipated, include:
  - LCMS. A Locomotive Control Monitoring System continuously reports the locomotive status to a central Locomotive Control, helping achieve optimum locomotive utilisation.
  - Acoustic Bearing Monitor. This wayside equipment acoustically monitors the rolling stock bearings as they pass the wayside station, analysing the bearing "noise signature" for signs of failure. The signature provides sufficient warning that the locomotive can be diverted to a depot for bearing replacement in a timely fashion. This extracts the maximum possible life out of the bearing as opposed to the conservative time-centred replacement that is the current practice.
- **Skills and staffing.** The skills needed will change from a mechanical maintenance paradigm (electrical and diesel fitter) to one of an electronic diagnostician. Should this change not be contextualised and internalised and old maintenance practices continue, reliability and availability will be compromised and locomotive life will be lessened. Although maintenance staffing requirements will be reduced, potential exists to reallocate these resources to build-based activities.
- **Depot evaluation.** Current, older locomotives must be serviced for several weeks at a time. Even for some of the heaviest maintenance, a new locomotive is expected to be in a workshop for no more than 72 to 96 hours. This will bring about a shift in the way TE conducts maintenance operations. Today, Transnet has over 130 locations throughout the country. In the future, TE will require a smaller number of very large super-depots that can handle a range of activities, including all types of major component exchange for both diesel and electric locomotives. Additional smaller facilities will still be required for servicing, fuelling, preparation, and vehicle recovery in case of breakdown.

See the Supporting Documentation section E5 (Deployment Plan) for more detail on TE's new maintenance philosophy and proposed changes.

3.6 Other benefits to South Africa

Lower costs of transportation

As described in the Business Needs Section, a more efficient and reliable fleet will support the transition from road to rail, which is typically more cost-effective for transporting goods more than 300 kilometres. This shift will lower infrastructure repair costs (given the damage to roads from the current trucking of commodities like coal) and contribute towards a reduction in road traffic fatalities.

Lower costs of emissions per tonne

Modern locomotive technologies will also result in energy savings – (8- 10% lower consumption for diesels and 18% energy savings for electrics) given manufacturer insights and internal studies conducted. Therefore, this will result in savings of over 31,000[4] tonnes of CO_2 and R5[5] million per year by 2018/19 for diesel locomotives and potential additional savings in electrics. Today's diesel fleet is more than 30 years old and therefore not emission-efficient. The electric locomotives, which haul approximately 86 percent of the total gross tonne kilometres moved per annum, are not considered heavy polluters. However, given the coal pollution from Eskom electricity generation, total emissions attributable to the locomotives are higher. The new electricity-increased energy efficiency would lessen their environmental impact, as well as the demand on the power grid.

Although meeting Transnet's MDS targets would naturally entail increased locomotive use – and thus increased emissions – the new locomotives' greater energy efficiency will help offset this. The new diesels and electrics would, at a minimum, meet United States Environmental Protection Agency Tier 3 and Tier 4 standards when they come into effect. For diesels, the new locomotives are expected to be 10 percent more efficient in energy conversion than current diesels. In electrics, the Ore Line 9E and the new 15E series are at least 18 percent more efficient in energy conversion. A similar improvement is expected in the new general freight electric workhorse with AC traction motors that will replace the 18E series with DC traction motors.

4. Detailed analysis of recommended option

4.1 Financial analysis overview

4.1.1 Overview

The capital expenditure for the 1064 locomotive procurement transaction is expected to be R38.6 billion, assuming current exchange rate assumptions hold. Using TFR's hurdle rate of 18.56 percent, the NPV of the transaction is R2.7 billion; applying TFR's WACC of 12.56%, would increase the NPV to R34.1 billion. The following sections describe the approach used to calculate the NPV and expected capital expenditure.

4.1.2 Base case NPV

Key assumptions into this base case NPV calculation are in the exhibit below.

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[4] Savings over the current locomotive emissions per MGTK

[5] Given the expected tariff structure from 2015

EXHIBIT 14

The NPV of the 1064 locomotives transaction is R2.7bn (hurdle rate) or R34.1bn (WACC)

Base case assumptions	
Fleet strategy	• Increased operational efficiencies from new locomotives called for in TFR Fleet Plan will be achieved • Run-out optimised for current refurbishment state, by loco class
Volume	• Delivery on MDS targets, with volumes increasing from 91mt in 2013/14 to 170mt in 2018/19
Delivery schedule	• Delivery schedule called for in the diesel and electric RFPs can be met (e.g., calls for first 100 diesels in 2013/14 and first 65 electrics in 2014/15) • All 1064 locomotives procured by 2019
Forex	• Current forward ZAR/USD exchange rates at average of 11.0 over the acquisition period
Price	• USD 2.6 million/R25.2 million per diesel and USD3.5 million / R33.9 million per electric, assuming 50% localisation and a 2% localisation premium. RSA component escalated with inflation. USD component escalated at US inflation and converted back to ZAR based on forward exchange rate
Tariffs	• Tariffs as per MDS commitments (escalation ~7% per year from 0.42 R/tonKm in 2013/14 to 0.58 R/tonKm in 2018/19)

Capex: R38.6bn aligned to corporate plan[1]

NPV: R2.7bn[2]

1 Escalated capex for the acquisiton of 1064 locomotives in 2013 14 - 2018/19
2 Calculated using hurdle rate of 18.56%; NPV would be R34.1bn if TFR's WACC of 12.56% is used

4.1.3 Fleet plan versus RFP delivery timelines

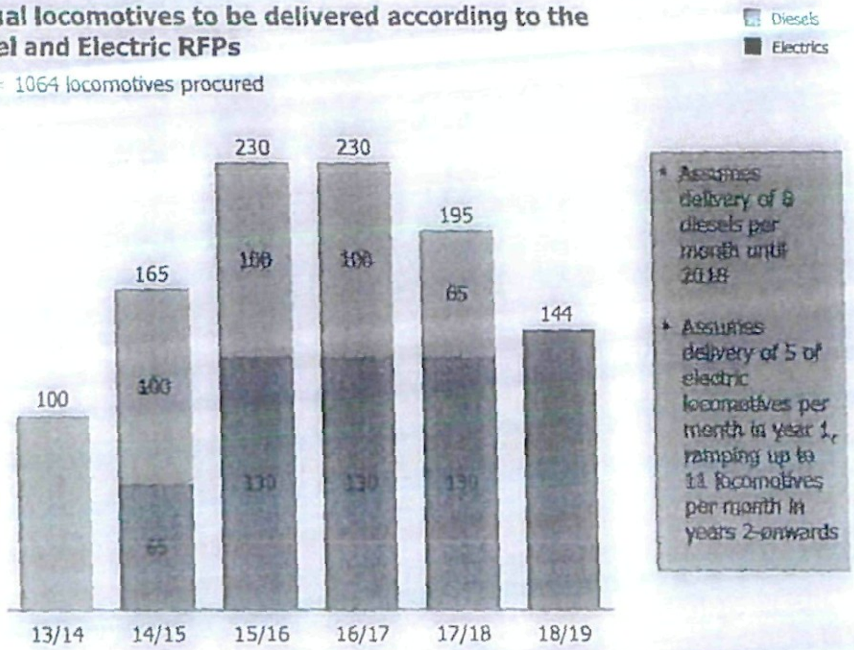
The number of locomotives required to deliver MDS is based on TFR's Fleet Plan and planned run-out strategy. It is based on the assumption that TFR will capture operational efficiencies from new locomotives (e.g., increased availability, reliability and operational flexibility, lower maintenance costs). This fleet requirement is also driven by volumes, which are assumed to be TFR's MDS targets for GFB.

The 465 diesel and 599 electric RFP delivery timelines, which are currently in the market, were used to understand the timing of the locomotives. The exhibit below details the locomotive delivery timelines that were modelled as per the RFPs and used as the base case assumption.

EXHIBIT 15

Annual locomotives to be delivered according to the Diesel and Electric RFPs

Total = 1064 locomotives procured



4.2 Approach to revenue calculations

Revenues were calculated based on the incremental volumes attributed to the 1064 procured locomotives and the average forecasted GFB tariffs from the MDS 2012/13. Volumes to be attributed to the 1064 locomotives were calculated using a bottom-up approach, which used historical GFB productivity (million gross tonne kilometres, MGTK) for each of the locomotive types and the number of locomotives within each type aggregated to a fleet level productivity capacity. The incremental volumes for the 1064 procured locomotives were calculated on the difference between the capacity required to achieve the MDS and the existing fleet capacity, subject to the maximum capacity of the procured locomotives.

Bottom-up volume calculations based on locomotive productivity

The total MGTK was transformed into net tonnes volumes using a historical GTK/NTK ratio and forecasted average distance using the MDS forecasts. Locomotive productivity assumptions for locomotives without an applicable historical productivity were based on similar locomotive types within the fleet. The productivity estimates for the new procured locomotives were based on the historical average productivity levels achieved by the TFR fleet. The existing fleet breakdown and productivity for 2013/14 is detailed in the exhibit below.

EXHIBIT 16

Existing fleet GFB at 2013/14			
Fleet type	Number of locos	GTKm per loco	Cumulative GTKM
6E	75	33	2 507
7E	58	130	7 520
7E1	48	107	5 137
7E2	45	94	4 217
7E3	65	98	6 351
8E	37	1	19
10E	104	133	13 795
14E	8	41	330
18E	597	57	34 026
33D	5	8	38
34D	318	24	7 689
35D	146	7	1 006
36D	167	1	244
37D	70	20	1 372
38D	38	22	827
39D	53	54	2 852
43D	55	80	4 395
Total	**1 889**	**49**	**92 324**

Volume capacity was calculated and split across three different categories:

- TFR fleet requirement capacity (based on TFR fleet requirements, Supporting Documentation Section E4-7-Year Locomotive Requirement).
- Existing TFR fleet capacity (based on the TFR fleet run-out schedule and expected locomotives on order, Supporting Documentation Section E2 -General Fleet Runout).
- 1064 procured locomotives capacity (based on the procurement assumptions above).

The incremental volumes for the 1064 procured locomotives were calculated on the difference between the capacity required to achieve the MDS and the existing fleet capacity, subject to the maximum capacity of the procured locomotives. The existing fleet capacity also accounts for lost capacity due to locomotive write-offs due to incidents, with 7 diesels and 8 electric locomotives assumed to be written off each year. The productivity lost was based on average locomotive productivity for diesel and electric locomotives.

EXHIBIT 17

Productivity MGTK (2013/14 to 2018/19)						
	2013/14	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**
MDS required capacity	**86,401**	**98,479**	**120,811**	**138,409**	**148,467**	**158,434**
Existing fleet capacity	79,403	79,697	98,478	101,730	90,848	86,130
Written-off (lost) capacity	1,101	2,201	3,302	4,446	5,591	6,736
Required capacity	**8,099**	**20,983**	**25,634**	**41,126**	**63,211**	**79,040**

Translation into volumes required

The aforementioned required capacity amount is converted into required net tonnes based on the average distance travelled for GFB traffic and the historical ratio of GTK to NTK.

The table below represents the incremental volumes attributed to the 1064 locomotives. TFR experience a large volume shortfall in the first 3 years due to DC locomotive shortfalls. Without planned mitigation strategies, this shortfall will persist till 2018/19 given that TFR fleet requirements are assessed as of the beginning of the fiscal year but locomotives would be delivered throughout the year (e.g., in 2018/19, 1064 locomotives are required at the start of the year, but the 1064th locomotive will only be expected later that year). Refer to Section 5 on Risks for a description of TFR's planned mitigation strategy.

These volumes can be combined with the expected tariffs for GFB during the MDS period, as per the exhibit below:

EXHIBIT 18

Volumes (net tonnes)						
	2013/14	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**
MDS target	**91**	**104**	**127**	**151**	**161**	**170**
Existing fleet	83	82	100	106	92	85
1064 locomotives	1	7	21	41	60	77
Volume shortfall	7	15	6	4	9	8

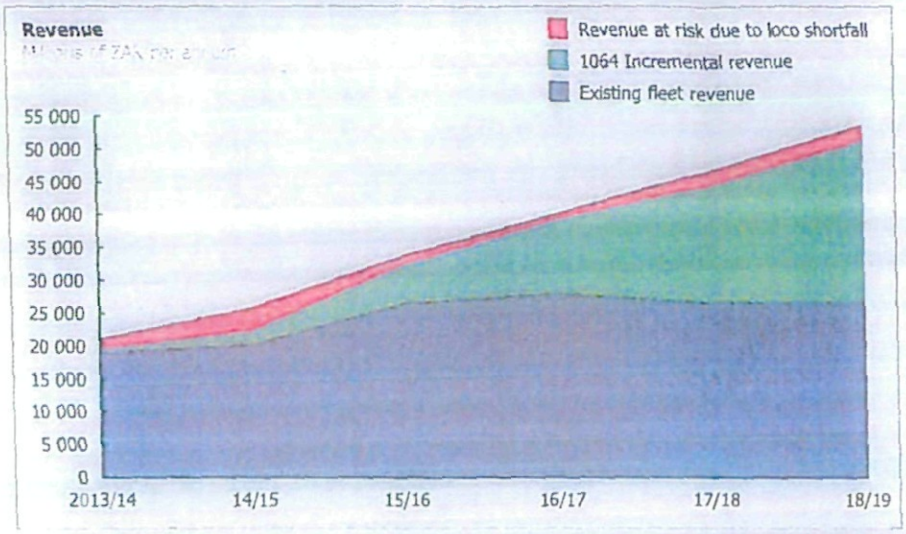
As per the exhibit below, putting volumes and tariffs together yields a view of revenues – MDS targets, revenues allocated to the existing fleet, revenues derived from the new locomotives, and potential shortfalls.

EXHIBIT 19

GFB tariff average (R/Net tonKm)					
2013/14	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**
0.42	0.45	0.48	0.50	0.54	0.58

EXHIBIT 20

The 1064 locomotives are instrumental in capturing MDS target revenues, but a revenue shortfall will persist due to procurement timelines lagging target demand



4.3 Approach to cost calculations

Cost schedules were calculated for the entire life cycle of the 1064 fleet split into the categories listed below, including: a) Total cost of ownership (TCO); and b) capital and other costs, including wagon cost, infrastructure cost, overheads, and tax.

4.3.1 Total cost of ownership of new locomotives

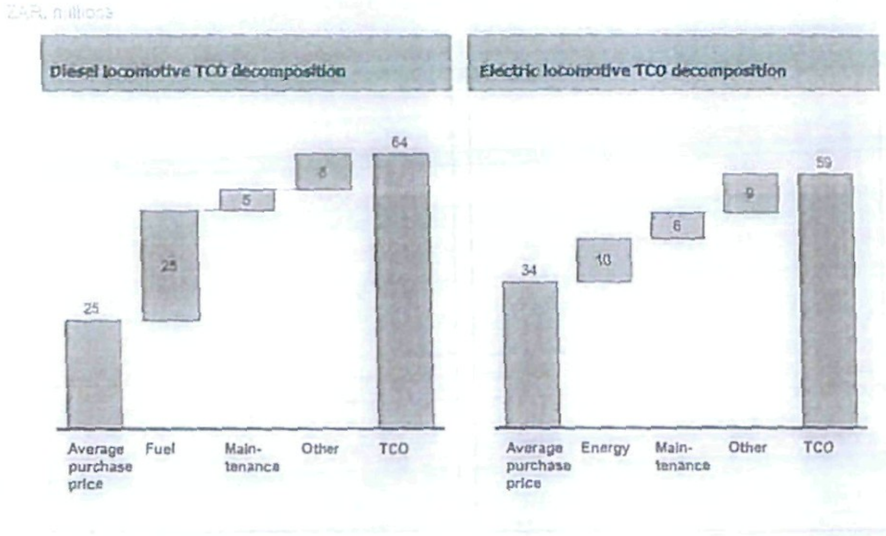
The TCO of locomotives was calculated using bottom up analysis and expert input and has the following components:

- **Purchase price.** As mentioned above, the purchase price is assumed to be R25 million (US $2.6 million) for a diesel locomotive and R34 million (US $3.5 million) for an electric locomotive in 2013/14. The purchase price of both diesel and electric locomotives assumes a conservative 50 percent localisation component with a 2 percent localisation premium applied. The localisation component ramps up over time. The USD price component was forecasted by escalating at USD inflation and converting back to ZAR using forward ZAR/USD hedge rates. The local price component was escalated at South African PPI. Refer to Exhibit 21 for the TCO breakdown and Exhibit 22 for the purchase price cost breakdown. An important consideration in the negotiation of the purchase price is the amortisation of the development costs over the quantity ordered demonstrated in Exhibit 23. The analysis indicates that the procurement order quantity for the 1064 locomotives will significantly reduce the development costs component of the locomotive price and has been factored into determine the price estimates.

- **Diesel costs.** The diesel costs for the 465 locomotives were based on the GTK of the locomotives and diesel consumption per GTK. Prices were escalated from a 2013/14 price of R11 per litre escalated at R/USD forward rate percentage change and US inflation.
- **Electricity costs.** The electricity costs for the 599 locomotives were based on the GTK of the locomotives and consumption per GTK. Electricity costs were escalated at forecasted Eskom tariff rate increases of 8 percent up to 2017/18 and an average of forecasted CPI and PPI thereafter.
- **Maintenance costs.** Expected maintenance cycles over the lifecycle of locomotives were calculated. The cash flow profiles for diesel and electric locomotives are presented in Exhibit 24.
- **Insurance.** Assumes an expected wreck cost per year escalated at the average of CPI and PPI.

EXHIBIT 21

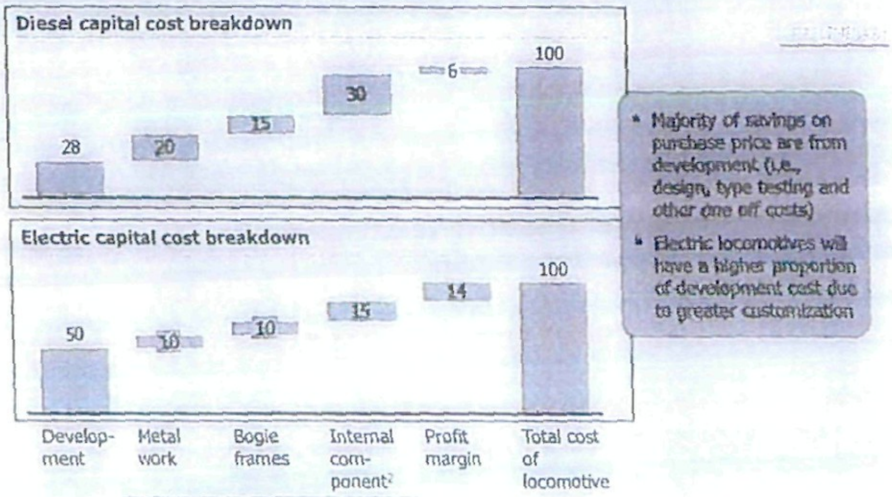
Electric locomotives have a lower TCO than diesels, but their upfront cost is higher than diesel locos



SOURCE: Transnet 1064 Loco Business Case, Expert interviews

EXHIBIT 22

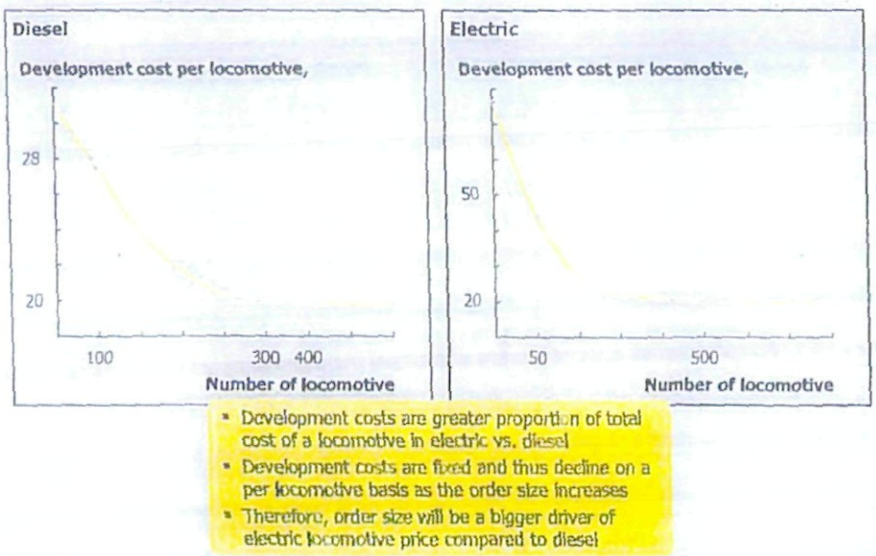
Development costs are the largest components of total capital cost of both diesel and electric locomotivemotives



1 Based on standard locomotivemotives with an order of 100 locomotives delivered
2 Traction motor, wiring, alternator, control system, etc.

EXHIBIT 23

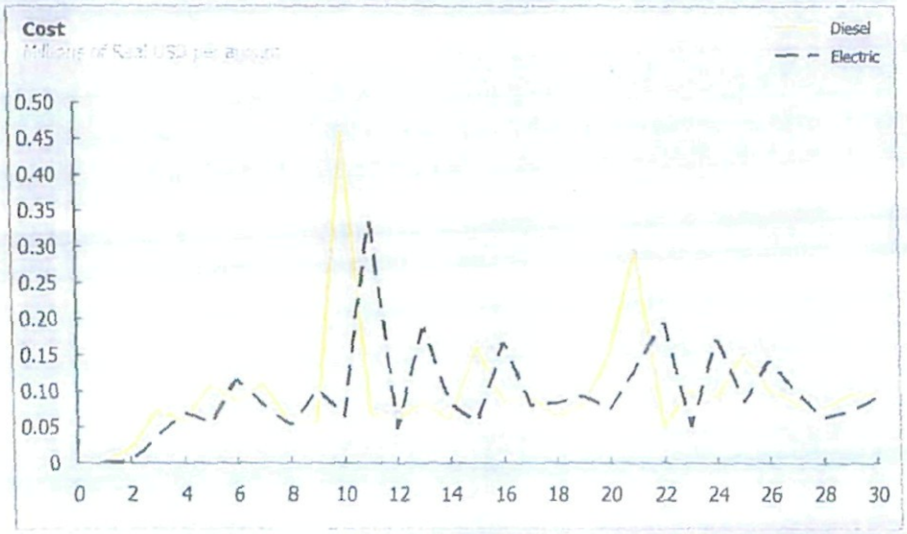
Electric locomotive price is more sensitive to order size than diesel locomotives



SOURCE: Source

EXHIBIT 24

Maintenance TCO for Diesel and Electric locomotives for a 30 year lifecycle



4.3.2 Capital and other costs

Capital cost outflows for the procured locomotives have been structured with a conservative payment strategy of 90 percent of the locomotive purchase is paid on delivery of the locomotive and 10 percent on acceptance. Upfront costs of R250 million for diesel locomotives and R300 million for electric locomotives will be paid on signing the supplier contract and will offset against the cost of the first batch purchased. The purchase price of both diesel and electric locomotives assumes a 50 percent localisation component, with a 2 percent localisation premium applied.

In addition to modelling the capital costs for locomotives to be procured for the 1064, associated wagon and infrastructure costs have been allocated as per the 2013 Transnet Corporate Plan – the exhibit below shows the capital costs for diesel and electric locomotives, wagons, and infrastructure.

EXHIBIT 25

Capital expenditure schedule								
Rm Cashflow	**PV**	**13/14**	**14/15**	**15/16**	**16/17**	**17/18**	**18/19**	**19/20**
Diesels	8 314	2 433	2 552	2 709	2 881	2 064	0	0
Electrics	12 252	300	1 860	4 665	5 042	5 360	6 284	217
Wagon capex	10 017	3 022	3 417	3 462	3 228	2 559	649	0
Wagon copex	1 583	3	23	70	151	242	339	420
Infra capex	9 513	1 026	2 787	3 379	3 023	3 092	4 967	0
Infra copex	8 978	60	384	795	1 249	1 627	1 837	2 253
Total	**50 656**	**6 844**	**11 023**	**15 079**	**15 575**	**14 944**	**14 075**	**2 890**

- **Wagon costs:** Costs were calculated based on the expansionary number of wagons required to achieve 170 million tonnes (16,459 wagons) based on the proposed capex budget in the Supporting Documentation Section E12 (Wagon Requirements). Opex and copex costs are incurred according to incremental volumes moved.
- **Infrastructure costs.** Costs were calculated using the total required expansionary GFB infrastructure to deliver 170 million tonnes based on the latest corporate plan. Infrastructure copex costs are incurred according to incremental volumes moved.
- **Overhead costs.** GFB overhead costs were calculated using actual 2011/12 TFR overhead costs allocated according to the ratio of GFB personnel to total TFR personnel. Procured 1064 overhead costs were allocated from the GFB overhead costs on the ratio of 1064 incremental volumes to GFB volume required.
- **Tax costs.** Tax costs were based on an assumed tax rate of 28 percent and calculated against net cash flows (revenues – costs) and adjusted for capital cost distributions of locomotive, wagons, and infrastructure expansion. The capital costs for locomotives and wagons were depreciated over 5 years since the purchase date and infrastructure has been depreciated over 30 years. Tax credit income has been included as a cash inflow in the following year of accrual.

4.4 Breakeven points for NPV: volumes and tariffs

The business case proves to be neutral at the following volumes and tariffs:

- Volume (everything else fixed). CAGR of 11.7 percent from 2013/14 to 2018/19(160 mt p.a. realised in 2018/19 vs. 170 mt p.a. as per MDS), which is below the MDS target of 13.3 percent.
- Tariffs (everything else fixed). CAGR of 6.1 percent from 2013/14 to 2018/19, which falls directly between CPI (5.6 percent) and the MDS target (6.6 percent).

5. Treasury Considerations

The acquisition of 1064 locomotives will cost R38.6 billion and has been included in the overall MDS funding amount of R86.5 billion over the next 6 years. Consequently, the funding options will include those in the borrowing plan as contained in the approved Transnet Corporate Plan 2013/2014. A mixture of cash generated by operations and external borrowing will be used to fund the acquisition. Two-thirds are assumed to be financed using cash generated by operations, and about R13 billion will need to raised externally. The external funding will be raised utilising both the Global Medium Term Note programme for dollar funding and established domestic sources for Rand funding – e.g., the Domestic Medium Term Note programme. In addition, options like development finance institutions (DFIs) and export credit agencies (ECAs) will be considered to lower the cost of funding.

EXHIBIT 26

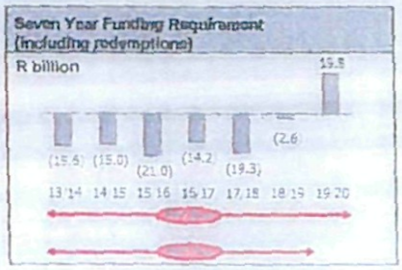
Funding plan

Objectives of Funding Plan

- Ensure sufficient cash is available to meet operational and capital requirements
- Diversify funding sources
- Raise cost effective funding;
- Manage interest rate, foreign exchange and refinancing risk;
- Manage liquidity risk, and
- Reduce WACD.

Focus for 2013/14

- Continue to use the domestic capital markets as a primary funding source with emphasis on the following:
    - Issue new long term fixed bonds;
    - Issue medium term floating rate note bonds;
    - Use commercial paper for working capital needs.
- Continue utilising Export Credit Agency and DFI funding;
- Upsize the GMTN Programme to $[illegible]bn and issue a Global ZAR bond under the Programme;
- Implement a Debt Redemption Fund;
- Explore Project Finance for MDS mega projects;
- Explore opportunistic bank and private placement funding.



The planned new fleet is estimated to cost R38.6 billion using escalated calendar year 2013 prices. The acquisition of the 1064 locomotives will be funded using a mixture of cash generated by operations and external borrowings. Assuming that two-thirds will be financed using cash generated by operations, about R13 billion will need to be raised externally.

5.1 Funding options

EXHIBIT 27: POTENTIAL FUNDING SOURCES FOR MDS

Potential funding sources

	Available facilities	Expected drawdowns 2013/14
Development Finance Institutions (DFI's)		
African Development Bank A loan	R1,7 billion	R1,7 billion
Export Credit Agency (ECAs)		
US Exim Tranche 2	R1,3 billion	R1,3 billion
Global Medium-term Note (GMTN)		
Available under the GMTN Programme[1] US$250 million	(R2 billion)	R2 billion
Domestic Medium-term Note (DMTN)		
Available under the DMTN Programme (Commercial Paper (CP) and Bonds)	±R22,5 billion	
• Available for bond issuance		R4,4 billion
• Available for CP issuance		R3,3 billion
Bank loans (Domestic banks)		R1,9 billion
DFIs/ECAs		R1,0 billion
Committed facilities available within 24 hour notice	R5,0 billion	
Total	R33,0 billion	R15,6 billion

1 [illegible]

Transnet will further explore new funding solutions investors and markets such as

- Issuing bonds in other markets (Yen, US Dollar, Euro, Australian Dollar Swiss Franc Sukuk markets) The cost of the possible funding to be raised will be evaluated relative to Rand funding
- Issuing a Global ZAR Bond in the international debt capital markets
- Project bonds and project finance
- Extending the duration of Transnet's existing domestic bonds as well as the issuance of new types of bonds for purposes of building Transnet's yield curve, and
- Expand Development Finance Institution (DFIs) and Export Credit Agency (ECA) financing thereby further diversifying Transnet's funding sources

Based on the above, Transnet's ability to meet its short and long-term funding requirements is adequate and will not impact the going concern financial position of the Company.

2

EXHIBIT 28

Amount in R billions	13/14	14/15	15/16	16/17	17/18	18/19	19/20	Total expenditure
Diesel locomotives - 465	2.43	2.55	2.71	2.88	2.06	-	-	12.63
Electric locomotives - 599	0.30	1.86	4.67	5.04	5.36	6.28	0.22	23.73
Locomotive contingency	0.17	0.27	0.45	0.49	0.46	0.39	0.01	2.24
Total	**2.90**	**4.68**	**7.83**	**8.41**	**7.88**	**6.67**	**0.23**	**38.60**

5.1.1 Funding risks

The fleet cost is based on a set of assumptions including the timing of contracting, ZAR/USD exchange rate, and the mix between local and foreign content, interest rate, volume growth, revenue growth, inflation, operational efficiencies, and steel prices. Any negative movement on the base assumptions exposes TFR to a potential risk. In addition to the abovementioned risks and sensitivities (see Section 7), the following risks and implications need to be closely monitored:

- Implications to funding of actual versus planned cash flows.
- The implications of Basel III on swap costs, terms and conditions of derivative transactions, and availability and quantum of credit lines, monitor ETC and impacts on cash interest cover, gearing and S&P liquidity ratio.

5.2 Forex risk mitigation

Forex risk mitigation will be imperative for a transaction of this size. A change in the Rand to US dollar exchange rate of 10 percent would represent a R1.2 billion impact based on the amount of localization assumed. Given 15 percent devaluation of the rand against the US dollar over the past year alone, such volatility is not unrealistic. Forward exchange rate projections suggest a devaluation of the Rand versus the US dollar over the next few years.

Transnet's hedging approach

Transnet's preferred option is to enter into Rand based supplier agreements with OEMs, with the hedges undertaken by the OEMs themselves. However, even when hedging is conducted by the OEM, Transnet ultimately pays for the cost of hedging, which is factored into the purchase price. The main advantage of a Rand based supplier agreement is the elimination of volatility in the Group's financials and the non-utilisation of bank credit lines for hedging purposes.

Should Transnet not be in a position to enter into a Rand based agreement, all foreign exchange exposures will have to be hedged as per the Board approved Financial Risk Management Framework (FRMF). It is anticipated that Transnet should be in a position to obtain the necessary credit lines to hedge the FX risk exposures. However, this cannot be guaranteed, as a number of banks will have to be approached to diversify their risk exposures and the banks will have to obtain approval from their respective credit committees. However, there is a risk that the magnitude of this transaction will add pressure to the availability of hedging lines for future MDS requirements.

Long dated hedges as anticipated in this transaction are expensive due to banks' capital requirements. The exhibit below shows Transnet Treasury's view of a ZAR/USD forward curve including the cost of hedging, used in the business case.

EXHIBIT 29

Spot	1 Year	2 Year	3 Year	4 Year	5 Year	6 year	7 year
$R9.13	$R9.59	$R10.04	$R10.52	$R11.00	$R11.48	$R11.98	$R12.55

Impact of localisation

Localisation of production is a natural hedge. Exposure would increase with lower a lower level of localisation (and, by extension, decrease with a higher level of localisation). The exhibit below shows foreign currency exposure for a 10 percent devaluation scenario to be ~R1.2 billion given 70% localisation of component manufacture. Without any localisation, exposure under this scenario would be ~R4 billion, suggesting a localisation benefit of ~R2.8 billion.

EXHIBIT 30

	Forward Rand value of imported component at current market rates	Impact of a 5% weakening of Rand against USD	Impact of a 10% weakening of Rand against USD
Assuming a 60% localisation	R15.4 bn	R0.8 bn	R1.5 bn
Assuming a 70% localisation	R11.6 bn	R0.6 bn	R1.2 bn
Assuming a 80% localisation	R7.7 bn	R0.4 bn	R0.8 bn

Thus, hedge accounting will be used to minimise exchange rate volatility on the Group income statement, but localisation is a critical lever to reduce the ultimate cost of the hedge.

6. Operational readiness

6.1 HR plan

A procurement event of this magnitude will require a significant increase in in GFB's workforce. GFB's 7-year human resource requirements are part of a TFR-wide workforce plan as train drivers and assistants are often interchangeable across TFR's businesses. All train personnel are sourced from Transnet's School of Rail.

According to TFR's 7-Year Man Plan (see Section E10) 2012 figures, TFR has a driver shortfall of 529. It is also estimated that over the life of MDS, TFR will require an additional 3 065 drivers above current staffing levels. This need is dependent on delivery against MDS volumes across the GFB, Coal and Ore businesses.

Currently, TFR only has capacity to train on average 500 drivers per year. However, at its peak in 2015-2016, TFR will require an additional 791 drivers. TFR has transitioned from a mandatory Refresher Training every 2 years to a Continuous Professional Learning programme. This will cut training time from 22 days every 2 years at the School of Rail to 6 days every 2 years on site according to best practice as shown in the exhibit below, freeing capacity at the School for additional training of new recruits. This expected reduction in training time is based on a joint exercise done with DB Siyaya and international benchmarking of TFR's methods in conjunction with other railways.

EXHIBIT 31

The new CPL programme will significantly reduce the training time and fee capacity at the School of Rail

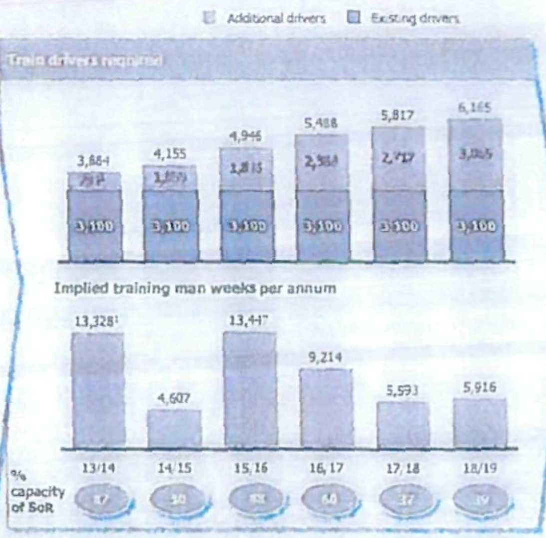
	Refresher training	New CPL programme
Length	22	6
Frequency	Once every 2 years	Continuously over 2 years
Location	School of Rail	Operational area
Content	Not sensitive to operational needs	Determined by BU and train
Impact	Does not promote continuous proficiency	Promotes continuous proficiency

EXHIBIT 32

Under the new training philosophy, Transnet's School of Rail can supply enough train drivers and assistants to sustain the 1064 delivery schedule

Assumptions

- Average training of new crew – 15 weeks
- School of Rail capacity – 8,500 man weeks (500 new students)
- All drivers previously had mandatory Refresher training- 22 days every 2 years at SoR
- Migration to a Continuous Professional Learning programme frees up capacity (6,820 man weeks). This capacity can be used for new drivers



Implications

- Under the new training philosophy, School of Rail has enough capacity to meet crew requirements for the 1064 locomotive delivery schedule
- To meet the need for drivers, School of Rail must start training of new drivers immediately

1 Includes a 2012 shortfall of 529 which has not been met yet and thus carried forward

The exhibit above shows the drivers required every year over the MDS period, highlighting how many additional drivers need to be trained. It also shows the School's capacity requirements over the period. The new training philosophy will give an additional 6,820 man weeks (80 percent increase) of capacity to the facility, allowing it to meet TFR requirements. However, TFR will need to start training new drivers immediately to close the driver shortfall before the peak demand period in 2015/16. In addition, the one man crew project, if successfully tested, will allow TFR to fast track trained assistants to become train drivers if successfully tested.

6.2 Infrastructure dependencies

To deliver against MDS volumes, the 1064 locomotives must perform as part of a railway system well equipped to move such volumes. Therefore, sustaining and expanding investment in infrastructure and other key projects within the system will be critical to support MDS delivery.

Infrastructure dependencies

Locomotive deployment is tightly mapped to the railway infrastructure and routes. Route characteristics (e.g., power source on route, axle loading capacity, and the presence of long tunnels or tight bends) largely determine the type of locomotive that can be used on a particular route.

As part of the MDS' planned R308 billion spend, TFR will also invest in projects to sustain and expand rail network capacity and footprint. The strategy pursued by the Rail Network over the 9-year planning horizon covers two key strategic focus areas to enable volume growth and systemically improve the safety of operations. Programmes aim to:

- Expand infrastructure, creating capacity ahead of demand. Supporting Information Section E12 (Infrastructure Plans) depicts the current status of the network in terms of axle loading and electrification, respectively, and Section FII depicts the future status of the network in terms of axle loading and electrification are also depicted in Section E11.
- Sustain existing infrastructure through accelerated maintenance programmes. In addition to the railway network, there are also programmes for the sustenance and expansion of supporting infrastructure. The tables in the Supporting documentation Section E11 are extracted from the TFR Business Plan 2013/14 – 2018/19 and detail both the expansion and the sustaining maintenance programmes for Perway, Electrical, Signalling, and Telecommunications.

The exhibit below shows key strategic projects planned over the 7-year period involving both the extension of the electrified network and the axle loading of specific routes.

EXHIBIT 33

Key infrastructure programmes will enable the 1064 locomotives' delivery of expected volumes

ZAR billions

Rail line section	Total seven year spend (ZAR bn)	Timeline
Eskom and coal line to 91mtpa+	8	2012-2019
Waterberg	5	2012-2020
Ore line to 90mtpa	6	2012-2019
Swazi rail link (SA Portion only)	0	2012-2015
Manganese General Freight 16mtpa	11	2012-2019
Gauteng Freight ring	0	2018-2019
Terminals	0	2012-2018
Maputo link	1	2012-2016
Natcor	0	2013-2017
Grand total	**31**	

EXHIBIT 34

Expansionary infrastructure expenditure timeline

Bold text = interdependencies with GFB volume expansion

Business focus	Preparation for growth	Sustained growth	Consolidate
Infrastructure expansion: Perway/axle loading	• **Increase axle loading** • Increase coal line capacity to 81mt • **Eskom 32mt project** • **Partial doubling of RCB-Nsezi line** • **Waterberg – Phases 2-5 additional passing loops** • **Manganese 16mtpa (Hotazel – Coega)** • Swazi rail link 15mt. • **Increase axle loading on Groenbult–Hoedspruit**	• Increase axle loading • Increase coal line capacity to 81mt • Coal 91mt project (including Overall tunnel doubling) • **Eskom 32mt project** • **Geluksplaas grade separation** • **Line tripling Broodsnyersplaas-Ermelo** • **Waterberg – Phases 2-5 additional passing loops** • **Manganese 16mtpa (Hotazel – Coega)** • **Ore line Phase 2A to 82.5mtpa** • Swazi rail link 15mt	• **Increase axle loading** • **Overall tunnel doubling** • Coal 91mt project (including Overvaal tunnel doubling) • **Eskom 32mt project** • **Line tripling Broodsnyersplaas-Ermelo** • Swazi rail link 15mt • Doubling of all critical deviations
Infrastructure expansion: Electrical	• Increase electrical capacity on the AC section on the coal line • **Upgrade section Rooikop-Newcastle. Manganese 16mtpa New and Upgraded sub-stations and OHTE**	• **Manganese 16mtpa New and Upgraded substations** • Ore line Phase 2A to 82.5mtpa power upgrade (including of OHTE) • Increase electrical capacity on the AC section on the coal line • Coal 91mt project • **Upgrade substations and electrical equipment** • **Commence with the conversion of 3kV DC to 25kVAC Ermelo-Pyramid South**	• **Completion of the conversion of 3kVDC to 25kVAC Ermelo-Pyramid South** • Coal 91mt project • **Eskom 32mt project** • **Upgrade substations and electrical equipment** • **Waterberg – Phase 6 (23mtpa) commence with the electrification of Thabazimbi-Lephalale** • **Conversion of 3kVDC to 25kVAC on Ermelo-Pyramid South**
Infrastructure expansion: Signaling	• **Manganese 16mtpa**	• **Pyramid South – Lephalale: Communication based authorisation (CBA) pilot installation** • **Manganese 16mtpa**	• Commence with the re-signaling of the coal line (CBA)

Considering the existing network capacity and the expectation that these projects will be competed according to plan, network capacity is not seen as a constraint to achieving the MDS targets.

Network Standardisation

Network standardisation is a long term project extending well beyond the current 7 Year MDS. This project is expected to include increasing axle loading in the core network (that conveys roughly 90% of GFB traffic); extending the 25 kV AC to close gaps in the existing electrification network and replacing the 3kV DC electrification network with the 25 kV AC network in high tonnage corridors as shown in the exhibits above.

Excluding the export iron ore and export coal lines with their 30 and 26 ton per axle loading respectively, the core network for general freight traffic, which has a loading capability of 20 tonnes per axle, conveys more than 90% of the general freight traffic. This core network will be enhanced to 26 tonnes per axle as part of the maintenance program. Increasing the axle loading capability of the network enables increased wagon loads which increase the tonnes throughput per train. The majority of growth is in mineral and mining commodities which will be the prime drivers for heavier axle loads. There are no plans to increase the axle loading capabilities of branch lines of 18.5 tonnes per axle and lower as it is not warranted by the anticipated traffic growth.

The extension of the 25 kV AC electrification is firstly strategically targeted to close gaps in the existing electrification network that conveys high tonnages to reduce locomotive changeovers and the operating delays that they introduce. Secondly, the 25 kV AC network will replace the existing 3kV DC electrification network in high tonnage corridors. This is because the 25 kV AC is technically better suited to the high volumes requiring a lighter mast and fittings and fewer substations spaced further apart; this is less restrictive on the number of trains in the section. Finally, the 25 kV AC will be extended into currently non-electrified lines as and when the volumes make it economically viable.

6.3 Wagons

Transporting the volumes envisaged in the MDS requires sufficient an appropriate rolling stock in wagons and locomotives. TFR has three distinct operations; General Freight Business, and the heavy haul operations of the Coal Export and Iron Ore Export Lines. Each of these has their own unique set of wagons and locomotives. This business case addresses the General Freight locomotive requirements only though they are lightly interlinked with the other operations.

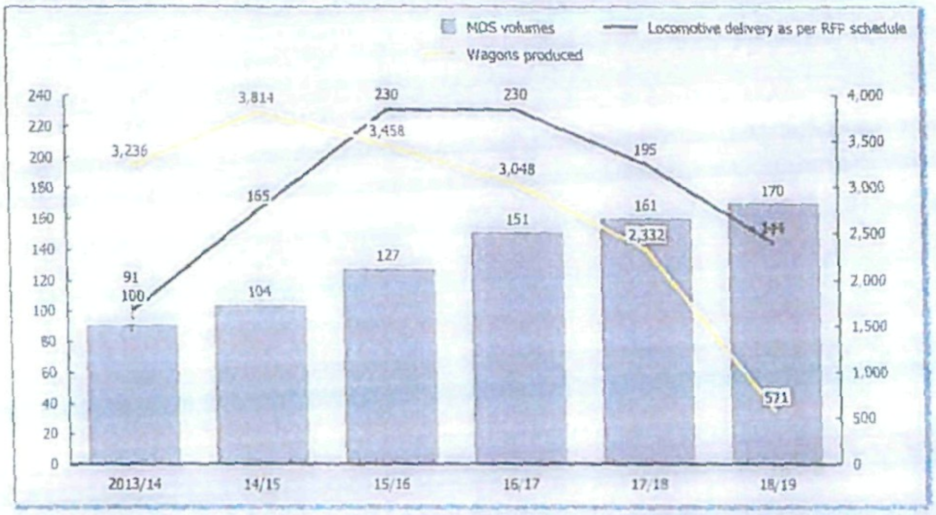
The MDS predicates growth over a number of flows and which extend over a number of operating areas where locomotives are changed because of traction changes dictated by the rail network infrastructure. Wagons are tightly linked to the commodities they transport while locomotives relate to the mass but not the commodity itself; accordingly locomotives are allocated according to the tonnes transported over the particular operating section.

To meet MDS volumes, wagon capacity needs to expand for all TFR businesses. In addition to producing new wagons through TE, there are various life extension strategies are in place to sustain capacity within the business.

Wagon production

EXHIBIT 35

The wagon build programme will deliver wagons in advance of demand thus enabling the delivery of MDS volumes



The exhibit above shows that wagon production will peak well in advance of MDS volumes and locomotive delivery. Therefore, wagon capacity will likely not be a constraint in the delivery of MDS volumes.

In addition to all these elements, TFR has also developed a change management plan including assimilation of new technology, implementation of the new operational philosophy and execution of the new maintenance strategy. (See section E16, Change management plan)

7. Risk management

7.1 Risk overview

A transaction of this magnitude in the public sector has inherent risks that should be addressed. Some of the main categories of risks are planning risk, market risk, exchange rate risk, operational readiness risk, transaction governance, legal risk, and exogenous risk. Transnet uses a CURA framework to categorise and assess risks, as per the exhibit below.

EXHIBIT 36

Risk assessment and rating

- High medium likelihood, high impact
- Medium likelihood, medium impact
- High medium likelihood, medium impact, Medium likelihood, high impact
- Low likelihood, low impact

Risk		Risk ranking	Mitigation action
Planning		I	• Specialized procurement and planning team • Conservative payment regimes to incentivize delivery • Optimize number of OEMs for planning required and benefit realized
Market		I	• Staged procurement strategy to maintain flexibility in delivery schedule and continuous monitoring of performance against MDS estimates • Execute against Market Development Strategy • Clean sheet costing to unpack key locomotive cost components
Exchange rate		I	• Hedge all foreseeable foreign currency-based expenditure as per Transnet policy
Operational readiness	Skills	II	• Develop people infrastructure plan • Upgrade training modules in line with new locomotives • Include maintenance staff training in supplier contract
	Maintenance	II	• Implementation of 7 year maintenance plan • Increase capacity by increasing production lines and shifts • Regular review of build programme that aligns TRE factories
	Infrastructure	III	• Develop infrastructure expansion business plan • Implement Infrastructure maintenance plan
	Technology	V	• The IATS[1] technologies as part of the new locomotives specifications • School of Rail to provide appropriate IATS training
Transaction governance		II	• Minimize size of working team and minimize dissemination information where possible while enforcing strictest confidentiality • Enforce protocol on document sharing and data rooms
Legal		I	• Ensure transparent procurement process with accountability • Contract with multiple OEMs
Exogenous		II	• Explore long term supplier agreements with Eskom while also taking advantage of electric locomotive regenerative powers

1 Information and Administrative Technology Services

7.2 Planning and delivery risk

There are three elements of delivery risk: approval delays, procurement process delays, and production delays. First, a lack of the appropriate approvals at the required time could result in delays in the transaction process. A major risk is TFR's current PPPFA exemption status that has lapsed. TFR is currently awaiting a PPPFA exemption for the 1064 locomotive procurement that will allow it to procure using the 60:20:20[6] criteria as planned. Second, procurement delays during the tender and negotiation processes may also cause delivery risk and will be managed by the TFR procurement team with a robust procurement strategy, processes, and contingency plans. Third, production risk may arise if a supplier is unable to meet its delivery targets for the 1064 locomotives. Delays of the delivery schedule are a critical risk to Transnet's ability to meet its MDS commitments and the sensitivities are modelled below.

7.2.1 Delivery schedule sensitivities

Given expected production and procurement timelines, it is unclear whether the quantities demanded by the RFP (100 diesel locos in 2013/14) are achievable.

Even assuming that the RFP procurement schedules are achieved, as per the base case in Exhibit 37, TFR would experience locomotive shortfalls from 2014 to 2019, peaking at approximately 150 locomotives in 2014-2015, because of the procurement delivery lagging the required fleet demand. This results in a cumulative volume shortfall of 49 million tonnes for the MDS period.

[6] Breakdown of bid evaluation criteria: 60 percent price, 20 percent local supplier development, and 20 percent B-BBEE.

Delivery schedule sensitivity 1 and 2, which factor in delays in procurement and production, show significant impact on volume shortfalls (110 million tonnes and 155 million tonnes respectively), highlighting the importance of expediting delivery schedule to meet MDS targets.

Delivery schedules impact the cash interest cover CIC ratio significantly, decreasing the ratio for 3.6X to 3.0X.

To mitigate the risk of delays, TFR will pursue a number of strategies simultaneously, including contracting multiple suppliers; staging procurement by using international suppliers for initial batches as local supplier development ramps up; and pursuing a conservative payment strategy[7] to incentivise delivery. TFR will also examine mitigation strategies to address the immediate locomotive shortfalls, including leveraging existing contracts, front-loading orders with international suppliers, exploring leasing, and revising the fleet run-out strategy.

7.3 Market risk

The inherent risk – which is also the greatest risk to realisation of Transnet's road to rail strategy – is that anticipated market growth will not materialise. This growth is dependent on South Africa's economic growth and the growth of its trading partners. Realisation of this risk could result in underutilised assets and diminished financial performance given the high-fixed-cost nature of the business. In addition, given that tariffs are projected to grow at a faster rate than CPI under the MDS plan, there is a risk that tariff increases are not fully realised. Other key business risks include inflated purchase prices (not related to forex changes) and cost increases exceeding forecasts.

7.3.1 Volume

Purchasing 1064 locomotives without matched volume demand will lead to a significant loss of value on the transaction. Sensitivities 1 (shortfall vs. MDS) and 2 (growth with GDP) in Exhibit 37 indicate the large swings in NPV due to MDS volumes not materialising with NPV dropping to R1.0 billion and –R20 billion, respectively.

Should sensitivity 2 (the worst case scenario, with volumes growing with GDP) materialise, the gap in NPV from the base case would only be closed with annual tariff increases of 14% during the MDS period. The infeasibility of increasing tariffs at this rate further underscores the importance of a flexible procurement strategy with key determinates regularly reviewed to inform the strategy

Volume sensitivities also have the biggest impact on CIC, with Sensitivity 1 decreasing the cash interest cover ratio (CIC) from 3.3X to 3.1X in 2013/14 and Sensitivity 2 decreasing the CIC from 4.1X to 2.7X from 2015/16 onwards. To mitigate this risk, as mentioned in Section 3, Proposed Solution, TFR should stage procurement to maintain flexibility.

Exhibit 37 demonstrates that tariff growth impacts the NPV value significantly, with CPI-related growth 1 percent lower than the MDS base case of 7 percent, results in an NPV of –R1.5 billion. Accelerated tariff growth 1 percent above MDS results in a positive NPV of R7.8 billion. Tariffs have a marginal impact on CIC with the biggest impact in 2015/16, dropping from 4.0X to 3.9X. To mitigate the value at risk, TFR will execute against its Market Development Strategy, building strong customer satisfaction that will enable it to deliver target volumes.

[7] Bulk of payment made on delivery and acceptance.

EXHIBIT 37

Demand, tariffs, and delivery schedule risks must be managed (1/2)

Greatest impact on NPV

	Sensitivities: Base case	Sensitivities: Sensitivity 1	Sensitivities: Sensitivity 2	Impact: Base case	Impact: Sensitivity 1	Impact: Sensitivity 2
1 Delivery schedule	• Delivery as per RFP; first 100 diesels in 2013-2014; first 65 electrics in 2014/15	• 6 months to complete procurement process • 12-month diesel production • 22-month electric production • ~120 diesels per year • ~125 electrics per year	• 8 months to complete procurement process • 18-month diesel production • 28-month electric production • ~120 diesels per year • ~125 electrics per year	• Volume impact: -49mt • Revenue impact: -R13.3bn • NPV: R2.7bn • CIC: 3.3x to 3.1x (2013/14)	• Volume impact: -110mt • Revenue impact: -R30.2bn • NPV: R2.2bn • CIC: 3.6x to 3.0x (2014/15)	• Volume impact: -155mt • Revenue impact: -R43.1bn • NPV: R1.5bn • CIC: 3.6x to 3.0x (2014/15)
2 Volume	• MDS volumes achieved	• Current performance vs. MDS (~7% below)	• Volumes grow with projected GDP	• NPV: R2.7bn	• Volume impact: -59mt • Revenue impact: -R16.4bn • NPV: R1.0bn • CIC: 3.3x to 3.1x (2013/14)	• Volume impact: -235mt • Revenue impact: -R57.9bn • NPV: -R2.0bn • CIC: 4.1x to 2.7x (2015/17)
3 Tariffs	• ~7% annual escalation to 2019 and CPI thereafter	• Escalation with CPI (~6%)	• Escalation at more than MDS (8%) to 2019, CPI thereafter	• NPV: R2.7bn	• Revenue impact: -R5.4bn • NPV: -R1.5bn • CIC: 4.0x to 3.9x (2015/16)	• Revenue impact: +R9.7bn • NPV: R7.8bn

7.3.2 Purchase price

There are two elements of price risk. Firstly, there is the risk that TFR will not be able to purchase locomotives at the price estimates in this business case. Purchase price sensitivities detailed in Exhibit 38 indicate a moderate impact on NPV with a 10 percent increase in base price resulting in a reduction in NPV of R1.5 billion. To mitigate the risk of inflated purchase prices, clean sheet costing should be performed to unpack components of the locomotive price and support effective commercial negotiations. Secondly, there is the risk that price escalations in the future will be higher than current assumptions. To mitigate this, Transnet will deploy capable procurement team with a clear and effective contracting strategy.

7.3.3 Costs

Exhibit 38 indicates that cost base movements will have a moderate impact on NPV, decreasing it by R3.5 billion for a 5 percent increase in base costs. Costs have been budgeted according to Transnet's Corporate Plan.

7.4 Forex risk

Forex movement sensitivities in Exhibit 38 indicate a moderate impact on NPV with a 10 percent devaluation in Rand versus USD resulting in a -R2.4 billion movement in NPV. To mitigate the risk of exchange rate fluctuations, the project will be hedged according to the Group policy.

EXHIBIT 38

Demand, tariffs, and delivery schedule risks must be managed (2/2)

	Sensitivities			Impact		
	Base case	Sensitivity 1	Sensitivity 2	Base case	Sensitivity 1	Sensitivity 2
4 Fleet strategy	• TFR Fleet Plan	• TFR fleet plan with 5% additional efficiencies	• TFR Fleet Plan with 10% additional efficiencies	• NPV: R2.7bn	• NPV: R5.2bn	• NPV: R7.6bn
5 Forex	• Hedging at current forward rate	• 10% devaluation of ZAR vs. USD	• 10% appreciation of ZAR vs. USD	• NPV: R2.7bn	• NPV: R0.3bn	• NPV: R5.2bn
6 Price	• USD2.6m (diesel), USD3.5m (electric) before escalation	• Price increase by 10% over base case	• Price decrease by 10% from base case	• NPV: R2.7bn	• NPV: R1.2bn	• NPV: R4.3bn
7 Costs	• Costs classified as locomotives, wagons and infrastructure with an allocation of GFB overheads	• 5% increase on base costs	• 5% decrease in base costs	• NPV: R2.7bn	• NPV: -R0.5bn	• NPV: R6.3bn

7.5 Transaction governance risk

For a transaction such as this, confidentiality is of the utmost importance to maintain the integrity of the procurement process and prevent unwanted media interest. Failure to uphold strict confidentiality may result in procurement delays or even compromise the entire transaction. This risk will be mitigated by implementing a governance framework that includes a High-Value Tender (HVT) process, a Steering committee to oversee the transaction and protocols (e.g. PMO and data room) to monitor and track the transaction. These items are described in depth in Governance (see section C8) and briefly below:

- A key objective of the High-Value Tender (HVT) Gateway Review Process is to provide real-time guidance, support and assurance against the PPM, tender management control framework, and procurement best practice at each gateway in the tender process.
- The 1064 Locomotives Steering Committee, which is chaired by the Transnet Group Chief Executive, has taken overall ownership of the final draft business case for locomotive investment and the procurement process.
- A PMO has been established at TFR with specific responsibilities for tracking progress towards milestones and establishing and owning a virtual data room to track dissemination of information and flag incidences.

7.6 Operational readiness risk

Operational readiness risk refers to TFR's potential inability to integrate the new fleet into its operations because of a lack of skills, infrastructure capacity, long-term maintenance strategy, and poor technology integration in the fleet. Operational readiness, as well as Transnet's preparations, are detailed in the operational readiness section 6.

7.7 Exogenous risks

7.7.1 Energy security

Eskom supply remains constrained as South Africa's reserve margins have dropped to as low as just over 1 percent in the past 6 months compared to best practice of 15 percent. It is almost certain that South Africa will experience electricity shortages in the next few years. The resulting power outages will likely have knock-on effects on industry and slow down economic growth in the medium term as electricity supply continues to lag demand. Transnet faces at least four inter-related major risks related to energy security that must be appropriately mitigated:

- Delays could occur in Eskom's IRP build programme, resulting in a shortage of electricity for South Africa. South Africa hopes to meet forecasted demand by adding 21 GW of new capacity by 2030 through the IRP build programme. However, the programme is running behind schedule. Strike action and equipment failure earlier this year has made it likely that the Medupi plant will miss its deadline of coming online at the end of 2013. IPPs and nuclear power plants will most likely not have the capacity to have any meaningful impact on the supply shortfall in the medium term given the current lack of regulatory frameworks and procurement delays. Furthermore, Eskom has only been granted about 50 percent of the tariff increases it requires to finance infrastructure investment, which may also have long-term implications for Eskom's ability to meet demand.
- Energy costs could increase should the IRP's planned capacity be commissioned on schedule but at a cost much higher than in the initial plan. The cost of electricity is expected to rise at 8 percent per annum in the next 5 years to finance the required infrastructure investment. The planned migration to relatively more expensive clean energy will cause energy costs to rise even further.
- Timely decisions may not be made for electricity supply beyond Kusile capacity, resulting in a shortage of power beyond 2017.
- Electrification infrastructure may not be installed in the appropriate geographies to enable Transnet to capture volumes from new regions as planned.

7.7.2 Potential strike action

Given recent history, there is some risk of strike action along the local supply chain over the life of the transaction (i.e., at locomotive assembly factories, TFR, coal mines, and Eskom). Strike action at any point in the supply chain could delay delivery of locomotives, increase costs, and compromise operations of the fleet, resulting in lower volumes moved.

8. Governance

To ensure effective governance of the 1064 locomotives transaction, a number of structures have been implemented:

- A Steering Committee with the primary purpose of providing oversight of the transaction, including developing a business case, submitting this business case to the appropriate governing bodies, and overseeing the procurement process.
- A high-value tender process managed in conjunction with Transnet Internal Audit (TIA) with the mandate to protect against fraud and corruption.
- A Project Management Office (PAO) to manage processes and timelines related to the transaction, including a confidential data room and the management of non-disclosure agreements (NDAs) and access to information.

8.1 Steering Committee

The 1064 Locomotives Steering Committee, which is chaired by the Transnet Group Chief Executive, has taken overall ownership of the final draft business case for locomotive investment and the procurement process. Key activities that have been overseen by the Steering Committee include:

- Developing the business case and approval for submission to Transnet's governing bodies.
- Submission of the business case to the Department of Public Enterprise (DPE)
- Appointment of working team members and accountabilities.
- Understanding operational requirements and alignment to business case
- Recommending a procurement strategy, including goals related to environmental issues, supplier development and localisation.
- Understanding and recommending strategies to address all legal ramifications of the locomotive procurement process.
- Ensuring procurement process transparency.

8.2 High-Value Tender Process (HVT)

Objective of the HVT

- A key objective of the High-Value Tender (HVT) Gateway Review Process is to provide real-time guidance, support and assurance against the PPM, tender management control framework, and procurement best practice at each gateway on tenders above R50 million.
- The purpose of the HVT Gateway Review Process is to increase the likelihood that the processes undertaken for these tenders are fair, transparent, equitable, competitive and cost-effective.
- The High-Value Tender (HVT) Gateway Review Process provides a platform for:
  - Providing assurance to BAC and other key stakeholders within Transnet on the effectiveness of the processes followed for high-value tenders.
  - Providing input into updating of procurement procedures and supporting controls, thereby strengthening the overall control environment for high-value tenders over time.
  - Fewer queries/challenges raised by DACs and/or bidders during high-value tenders
  - Reduction in timelines due to reduction in number of re-tenders resulting in faster capacity creation.

- Rolling out and sharing of best practice across all ODs to improve the efficiency of procurement processes.
- Long term up-skilling of procurement staff.

Design principles of the HVT

- Drawing on recent lessons learnt from 85 electric and 43 diesel locomotives tenders, enhance the overall tender process for improved efficiency, effectiveness and enhanced control.
- Play a greater role in the planning and coordinating activities to support the PMO.
- Ensure full integration with the Risk (Forensic) management plan developed for the 1064 locomotive acquisition.
- Introduce an international peer-review mechanism to bolster the team structure in the evaluation and negotiation stages to make the award "bullet-proof".
- Provide end-to-end support including the contracting stage to ensure there is no "leakage" between negotiations and contracting stages.
- Generally place added emphasis on ensuring that TIA is proactively involved at all stages of the gateway review process and are able to fully share best practices and insights with the evaluation, negotiation and acquisition council review teams.

EXHIBIT 39

Approach to the 1064 Locos HVT

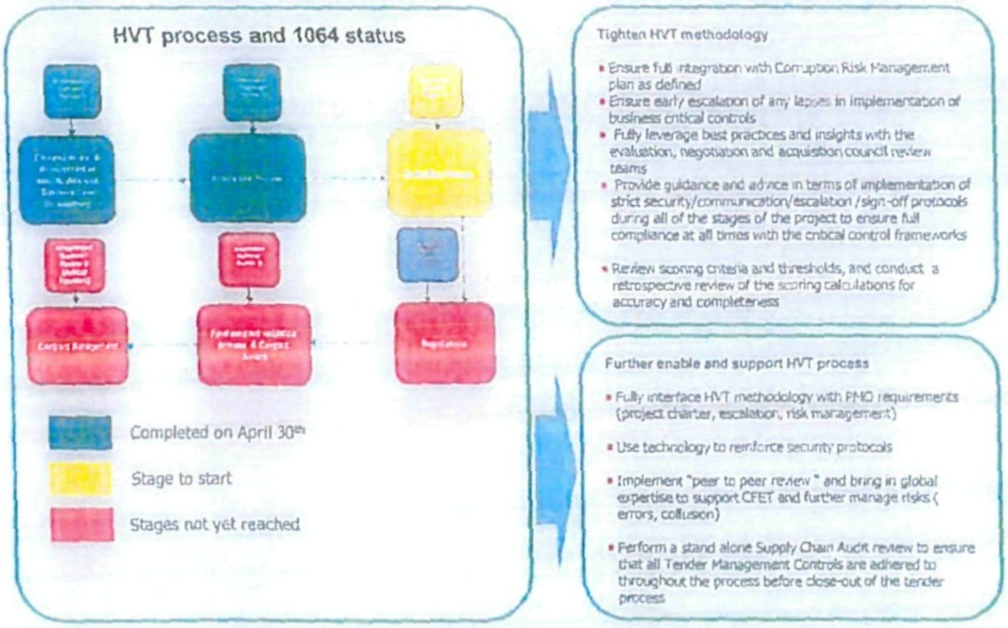


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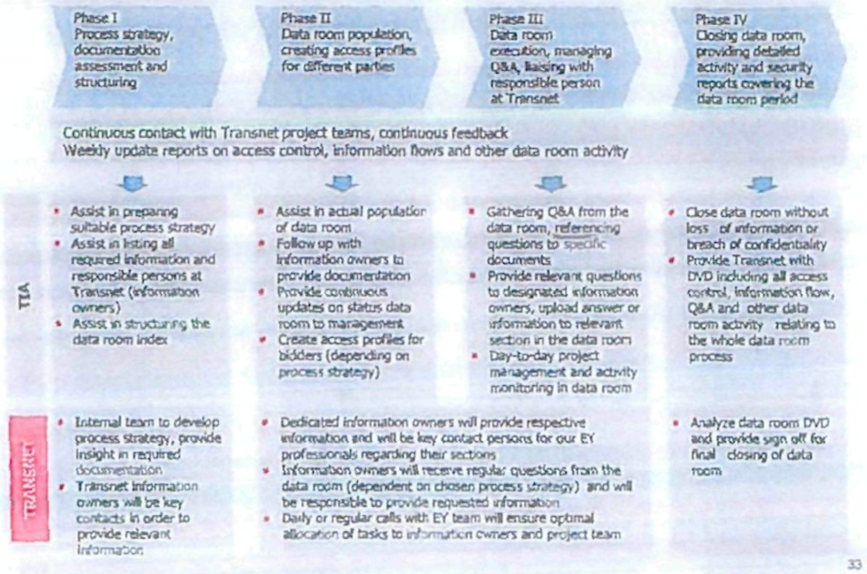
EXHIBIT 40

Data Room Project Management Process



8.3 Project Management Office (PMO)

A PMO has been established to monitor process and timelines related to the 1064 locomotives transaction, including the following items:

- Tracking project milestones and critical path and ensuring that progress is on-track against key deliverables.
- Scheduling Steering Committee meetings at the request of the Chair (GCE).
- Following up on action items emerging from SteerCo meetings.
- Ensure implementation of key confidentiality protocols/requirements (e.g., NDAs signed by all parties, data room access is restricted to a small group, etc.).

The PMO is also responsible for owning and managing the transaction's central data repository ("data room"). This includes:

- Maintaining and regularly work with content owners to ensure availability of latest final deliverables (e.g., RFP, Business Case, etc.) and working documents (industry analyses, cost build ups, etc.).
- Categorising and standardising file names to enable easy tracking.
- Most critically, the data room will also provide transparency (as needed) to enable tracking of downloads (who, when, frequency) and assist in internal auditing.

9. Conclusion

Having explored all options, Transnet's purchase of 1064 locomotives is a critical procurement event that will transform the business, increase operational efficiencies, support local supplier development, and enable Transnet to meet its MDS targets.

Key risks are being mitigated: volume volatility will be addressed through flexible procurement, foreign exchange risks are being mitigated through hedging and potential shortfalls are being mitigated through efficient procurement and accelerated locomotive orders. The business will be operationally ready to take on new locomotives and interdependencies are being planned for.

Therefore, Transnet recommends the purchase of 1064 new locomotives (465 diesel, 599 electric) at an estimated purchase price of R38.6 billion.

D. PROCUREMENT STRATEGY

The benefits in this section are contingent on:

- Responses from bidders
- PPPFA exemption
- Post-tender negotiations

1. Overview

1.1 Contracting strategy

Transnet's contracting strategy includes a number of key aspects, including alignment with the Government of South Africa's socioeconomic policy framework, an open tender process, approaches to ensure flexibility and an appropriate number of suppliers. The outcome of Transnet's contracting strategy is subject to bid evaluations and supplier negotiations.

Socioeconomic policy and localisation

The transaction will be aligned with the Government of South Africa's socioeconomic policy framework, including CSDP, NGP, NDP, SSI, and IPAP2. In addition, local content will be increased through skills development, job creation and technology transfer. Transnet's programmatic procurement strategy follows threshold requirements for locomotive localisation, in line with those designated by the National Treasury (i.e., 55 percent for diesel, 60 percent for electrical locomotives). To ensure sufficient locomotive production to enable development of local industry in South Africa, Transnet will procure a minimum number of locomotives per year, which will be agreed upon with vendors through negotiations.

A six-step evaluation methodology will be applied, based on the evaluation criteria: price 60 percent; supplier development 20 percent; and Broad-Based Black Economic Empowerment (B-BBEE) 20 percent.

Open tender process

Transnet is approaching the market through an open tender process to attract the broadest possible supplier base and maximise value for South Africa and Transnet. Tenders have been issued for both locomotive types. The RFP closure date is April 28th, 2013. Integrity of the transaction will be ensured through a High Value Tender (HVT) process overseen by Transnet Internal Audit (TIA).

Once OEMs are selected through the open tender process, Transnet reserves the right to contract independently with the chosen OEMs for the transfer of skills and support of maintenance activities.

The aforementioned localisation requirements suggest an opportunity for TE to be involved in locomotive production. However, TE will compete with other bidders for local content. The selected OEMs will in turn partner with the most competitive local supplier(s).

Flexibility

There will be flexibility to adapt procurement to the way locomotive demand materialises – based on volumes achieved and operational efficiencies realised. Transnet will conduct an annual forward review of its locomotive fleet requirements. This long-term view will enable it to amend order quantities as required while sustaining local industry development, providing sufficient notice to account for the production lead times of manufacturers (e.g., 18-24 months). The ultimate number of locomotives procured is assumed to remain fixed, as is the aforementioned minimum quantity, but flexible procurement could impact the timing by which Transnet acquires its 1064 locomotives subject to annual reviews of Transnet's fleet requirements.

Number of suppliers

A number of factors will inform the decision on the number of suppliers Transnet will select through the procurement process:

- Ability to deliver against timeline. To fast-track timelines and mitigate potential locomotive shortfalls, Transnet may procure from more than one supplier in parallel, which could increase the number of suppliers needed.
- Ability to achieve standardisation. Transnet's new maintenance philosophy will require interoperability. This will lead to a stronger balance sheet and reduce the requirement for spares. However, this could reduce the number of suppliers needed.
- Ability to secure supply and price. Security of supply and protection against potential price escalations – both for locomotive prices and after-sales support and maintenance – suggest the need for more than one supplier.

1.2 Procurement overview

In accordance with Transnet's Board approved Supply Chain Policy Transnet shall apply Section 217 of the Constitution of the Republic of South Africa, (Act No 108 of 1996, as amended) by contracting for goods and services in accordance with a system which is fair, equitable, transparent, competitive and cost effective.

Transnet shall reform all its procurement activities in order to align them in an integrated manner with national developmental goals, relevant legislation that enforces the goals and relevant governmental supply chain management approaches that are cost-effective.

Transnet has been mandated by government to assist in lowering the cost of doing business in South Africa, enabling economic growth and security of supply through appropriate ports, rail and pipeline infrastructure as well as operations in a cost effective and efficient manner within acceptable benchmark standards.

The aim of the Supply Chain Policy is to ensure that Transnet gets value for money in the procurement of goods and services in order to fulfil its mandate while redressing the economic imbalances that have been caused by unfair discrimination in the past.

The focus for Transnet with respect to its SD activities will involve, among others, the leveraging of its procurement to increase local content through the development of skills, job creation and technology transfer. This will lead to decreased costs in its supply chain and an overall increase in its competitiveness. Transnet's aim is to build stronger and more meaningful relationships with its suppliers, to find mutually beneficial mechanisms to extract maximum value.

Transnet's procurement of rolling stock and in particular the 1064 locomotives provides a unique opportunity for both localised assembly and localised manufacture of component parts, but in addition an opportunity to strategically re-position the rolling stock industry. This is particularly true of the role and function of the largest incumbent rolling stock manufacturer in South Africa, Transnet Engineering as well as players in the private sector.

There is a drive by Government to increase the localisation of rolling stock. Government has strong leverage over the procurement of these assets as they reside almost completely within state owned companies, predominantly in Transnet and PRASA. Other sectors such as mining and the power sector bear close similarities in the production processes and heavy engineering requirements associated with rolling stock and thus the manufacturing sector would benefit substantially through the additional manufacturing capability and demand that this order would provide.

The Department of Trade and Industry (DTI) have identified the localisation opportunities in rolling stock as part of a number of key sectors within the industrialisation programme of South Africa as contained within the Industrial Policy Action Plan (2011/12). Transnet has identified the same opportunities as part of its MDS and through its Supplier Development Plan seeks to develop and empower local business providing goods and services to the parastatal.

2. Procurement strategy

Transnet promotes open competitive bidding as its default procurement mechanism since this is the best means of obtaining value for money. All Transnet procurement shall be done in a way that ensures that Transnet obtains quality goods and services at competitive prices. It was therefore decided to follow an open tender process for the locomotives acquisitions. In crafting the procurement strategy, which informed the RFPs, the following aspects were focussed on and considered.

Transformation and Empowerment

In order to address economic imbalances that have been caused by unfair discrimination, government developed the black economic empowerment policy.

- Black economic empowerment is broad-based;
- Black economic empowerment is an inclusive process;
- Black economic empowerment is associated with good governance; and
- Black economic empowerment is part of the country's growth strategy.

Government uses a number of instruments to achieve black economic empowerment. It has developed a "balanced scorecard" to measure progress made in achieving B-BBEE objectives by enterprises and sectors. This has been included in the tender.

In evaluating and awarding the locomotive tenders, Transnet shall award preference points in regard to the contribution that a supplier makes towards the achievement of broad-based black economic empowerment objectives, namely.

- Ownership and Control;
- Management;
- Skills Development;
- Employment Equity;
- Preferential Procurement;

- Enterprise Development; and
- Socio-economic Development.

Additionally, Transnet will award further recognition points for B-BBEE based on the extent to which a supplier commits to improving its B-BBEE status over the contract period. This is referred to as Further Recognition Criteria (FRC).

B-BBEE has been set as 20 points in the overall scoring for the tenders assuming PPPFA exemption is given.

Job creation

Transnet must be a major contributor to job creation. Therefore, Transnet's procurement shall focus consistently on areas that have the potential for creating employment on a large scale in order to contribute substantially to the national employment creation effort. As the main economic agent in the South African transport and logistics infrastructure, Transnet's planned capital expenditure forms the big bulk of Transnet's procurement spend. This is the single largest procurement spend of the MDS and as such has been planned on a programmatic basis so as to obtain maximum benefit to achieve industrialisation which will in turn create long- term sustainable job opportunities particularly among the previously disadvantaged members of the South African society.

Local Content

This procurement has been designed in a manner that builds industry capacity around its build programme. Transnet has identified this as its key programmatic procurement and consequently developed a long-term procurement and local content plan. Tender requirements include local procurement and supplier development (SD), which will also address the transformation agenda.

Transnet has included the local content percentages as detailed in the National Treasury Instruction Note issued on 16th July 2012 that highlights a local content percentage of 55 percent for diesel and 60 percent for electric locomotives. This is in line with the DTI's Industrial Policy Action Plan II in driving strategic fleets. Local content is included as a threshold.

Current local content for diesel locomotives and for electric locomotives has increased over the recent acquisitions due to the CSDP. The technology and competence in the production of locomotives occupy a different space in the challenge to localise in comparison to wagons. Globally, there are few large suppliers or OEMs of locomotives and their market dominance of the technology, the supply chain, and the know-how require nuanced and technology capture localisation strategies in order to create real sustainable local manufacturing benefits.

The approach adopted by Transnet has been to stipulate the following required minimum threshold requirements for locomotive localisation that are in line with those designated by National Treasury as highlighted above:

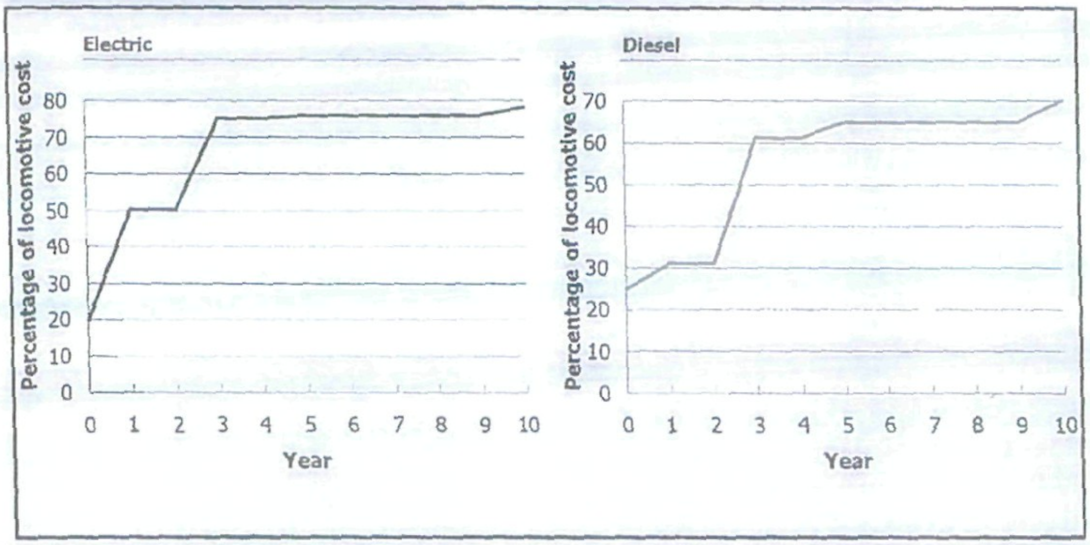
1. 55 percent for diesel locomotives; and
2. 60 percent for electric locomotives.

Transnet's assessment of this opportunity is that the economies of scale in purchasing 1064 locomotives are sufficiently large so as to create localisation opportunities that could elevate percentage localisation above these minimum thresholds at very little additional price premium to Transnet.

South African component suppliers are not yet able to produce the inputs and require build-up to reach substantial levels of localisation. Transnet estimates that this will take at least a full 3 years to complete, even though there may be certain components (particularly those used in electric locomotives) that can be localised much earlier.

EXHIBIT 41

Estimated time to localise localisable components across diesel and electric locomotive platforms



A detailed component analysis undertaken by Transnet demonstrates that price premium is not static across the percentage rise in local content, but rather is informed by the cost of production of the individual components making up a locomotive.

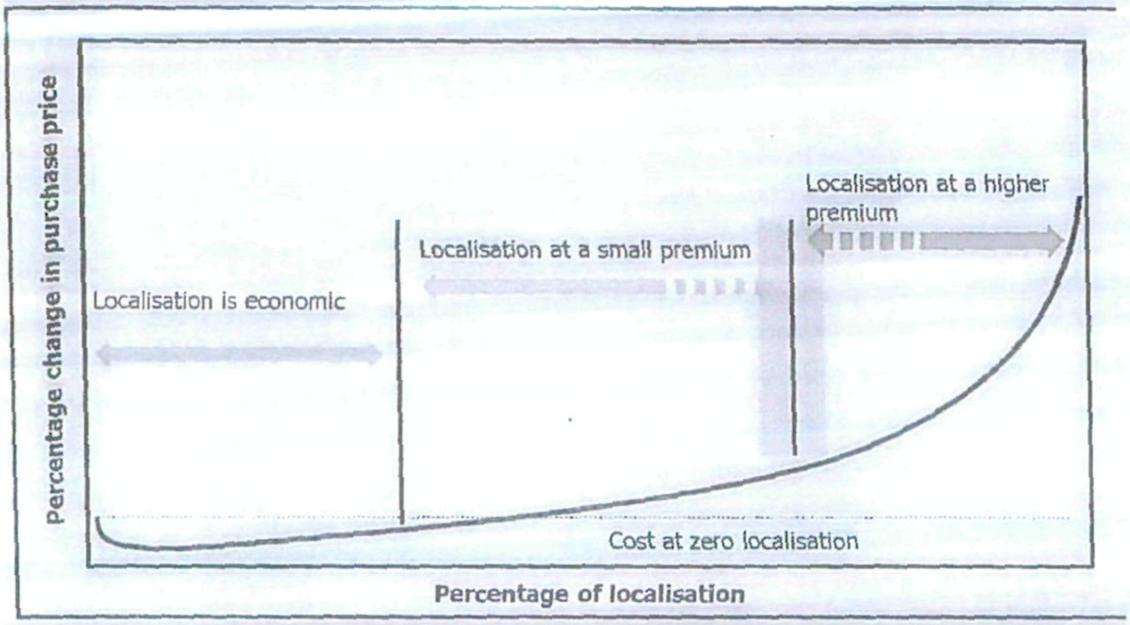
In certain areas, particularly in assembly and fabrication, South African localisation is economic especially given the order size of 465 diesels and 599 electric locomotives.

For other components, although not yet localised, a relatively small price premium is evident. In these cases similar industrial production capability is already available in South Africa and needs to be re-aligned to the production needs of locomotive components. The capital equipment setup cost is low for components such as under-frames, radiators, transformers, etc.

However, as localisation requirements increase, certain components begin to have substantial price premiums associated with their local production. Examples include engines, control systems, specialised braking equipment, etc.

EXHIBIT 42

Cost to localise increases with increasing level of localisation

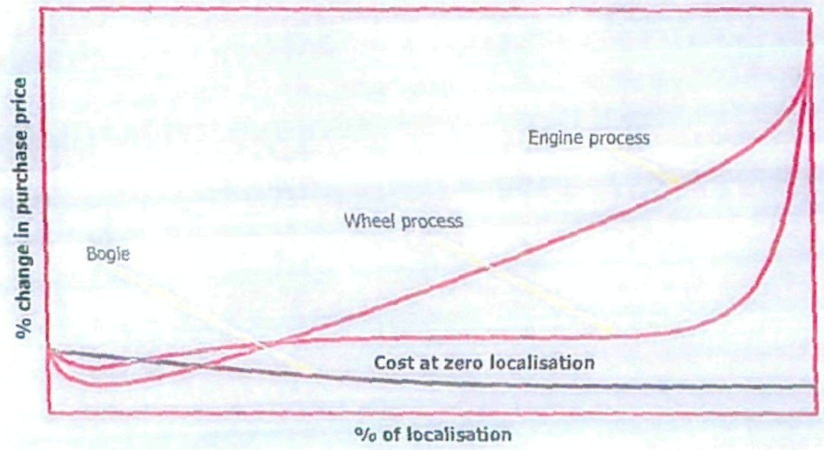


A grey zone exists where the limit of localisation is dependent on OEM investment in manufacturing in South Africa. Part of the way the Transnet RFP is structured is to attempt to capture as much localisation as possible within the grey zone without overly inflating the price premium paid.

As each component within a locomotive has its own price to localisation curve, Transnet could expect to pay different premiums for each sub-set of local component manufacture. By way of an example:

EXHIBIT 43

Each component within a locomotive has its own price verse localisation curve



1. ***Engine process***. Initial benefits are achieved through utilising cheaper skilled labour in assembly. Increased localisation comes at a high cost as specialised parts could only be manufactured locally in small production runs with insufficient economies of scale to bring down the unit costs of such parts.
2. ***Wheel process***. Small benefits are achieved through some local assembly and a slight premium is paid as forging is undertaken locally. As the manufacture of a complete bearing moves locally, the costs increase steeply due to small, highly technical bearing production runs; and
3. ***Bogie***. Benefits are achieved through utilising a competitive manufacturing process and reduced transport costs of not having to bring bulky items such as bogies to SA.

One of the characteristic of the curves for many component items analysed is that the price-premium grows rapidly at high levels of local content requirements (80 percent to 100 percent). By way of an example, for wheel assembly, much of the wheel could be localised at relatively low cost, including the bearings. However, the rollers within each bearing are parts that cannot be economically localised and are produced at just a few global sites. This is due to technological complexity in the production process, safety criticality of the item, and the need for high production volumes to make the production runs cost-efficient. By implication, forcing high localisation requirements on such components will result in uneconomic price premiums as well as possible compromises in safety critical items such as braking systems, wheel assemblies, etc.

Transnet's detailed component analysis is summarised into 14 component groups for both diesel and electric locomotives. The cost structure is based on 18 separate bills of materials obtained from the current assembly and maintenance of locomotives and thus closely emulates current market pricing.

Target localisation is based on a component by component assessment of localisation potential for each particular component within a component group. Because of the complexity and high cost to localise certain individual components (often small components), the analysis seldom reaches full 100 percent local content as is evident in the tables below. The cost to localise is based on an assessment of the capital cost to set up a production plant for the various components within each category. The time frame to localise is based on a similar approach. The findings demonstrate the potential to localise overall local content in excess of the Treasury Note requirements of 55 percent and 60 percent for a diesel and electric locomotive.

EXHIBIT 44

Electric locomotive pricing per component set, current and target localisation, and estimated cost to localise

Percent

				Percentage of	
Categories	**Total cost %**	**Current local %**	**Target local %**	**Cost to local**	**Accum local**
Locomotive assembly	21	19	20	0.29	20
Main transformer	16	0	13	1.33	33
Main power traction system incl. aux systems	15	0	8	0.87	41
Main power traction motors	14	0	11	6.33	53
Propulsion switch gear	9	0	6	1.53	58
Bogie	4	0	4	0.25	62
Cooling, ventilation, and filtration systems	4	0	3	0.80	65
Locomotive control systems	4	0	2	4.90	67
Drivers cab	3	1	3	0.15	70
Auxiliary supply	3	0	3	2.12	73
Wheel system	2	0	2	9.10	74
Pneumatic supply system	1	0	1	5.81	76
Braking system	1	0	0	3.94	76
Coupling system	1	0	1	1.00	77
Other	1	0	0		
Grand total	**100%**	**21%**	**77%**		

EXHIBIT 45

Diesel locomotive pricing per component set, current and target localisation, and estimated cost to localise

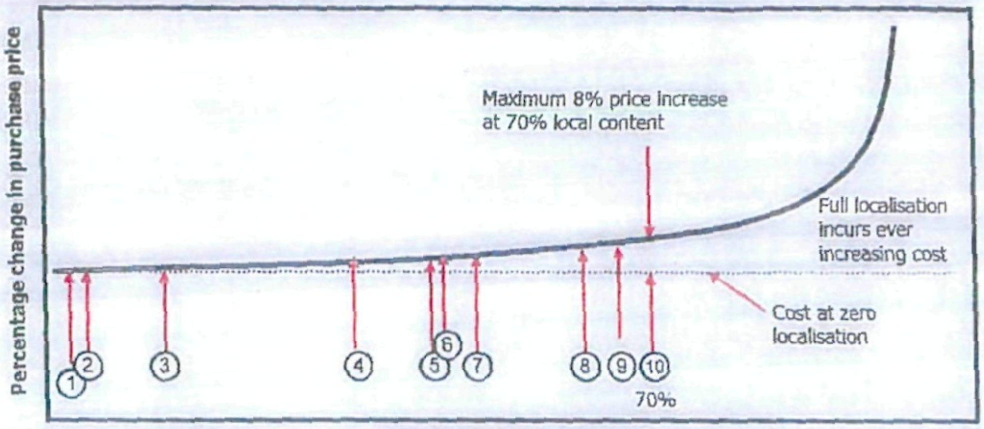
Percent

Categories	Total cost %	Current local %	Target local %	Percentage of: Cost to local	Percentage of: Accum local
Drivers cab	2	0	2	0.27	2
Bogie	4	3	4	0.27	6
Locomotive assembly	22	20	22	0.32	28
Cooling, ventilation, and filtration systems	5	0	4	0.68	32
Main power traction system incl. aux systems	23	0	10	0.82	42
Coupling system	1	0	1	1.03	43
Underframe (i-beams)	1	0	1	1.25	44
Locomotive control systems	6	0	3	3.44	47
Braking system	2	0	0	5.59	47
Main power traction motors	17	0	14	6.33	61
Wheel system	3	0	3	6.45	64
Pneumatic supply system	2	0	1	7.38	65
Engine system	13	0	5	8.07	70
Other	1	0	0		
Grand total	**100%**	**24%**	**70%**		

As is demonstrated in these tables, the difference between current and expected 3- to 5-year localisation requirements are significant. The relatively easy localisation opportunities have already largely been taken and further localisation will require not only additional capital investment but also the appropriate testing and quality control of both the production facility and the parts produced.

EXHIBIT 46

Local content of 70 percent overall incurs up to an 8 percent increase in purchase price



Item #	Category	% increase	Item #	Category	% increase
1	Drivers cab	0.27	6	Aux supply	2.1
2	Bogie	0.27	7	Control system	3.4
3	Loco assembly	0.33	8	Traction motors	6.3
4	Main transformer	1.3	9	Wheel system	6.5
5	Propswitch gear	1.5	10	Engine system	8.0

A key finding of the analysis is that the nature of the price premium curve as shown above for a generic locomotive is such that Transnet could achieve a high level of localisation at relatively small price premiums. For diesel and electric locomotives, localisation of 70 percent and 77 percent respectively could be achieved at an average price premium of less than 2 percent. This percentage is calculated as the average price premium paid for a locomotive – i.e., including some items with no price premium and others such as engine assembly with an estimated 8 percent price premium.

This is provided that three conditions are met:

1. That components are localised up to a level that is economically viable (i.e., that price premiums for each set of component are economic);
2. That realistic time frame targets are set to reach full localisation potential. Shortening these time periods would in itself result in considerable uneconomic price premiums; and
3. That some minimum annual order size for locomotive production is guaranteed to the market over the life of the 1064 locomotive supply contracts. The analysis indicates that a guaranteed minimum order size of 50 diesel and 70 electric locomotives is required annually for the life of the contract.

The Benefits of Localisation

The benefits associated with localisation are considerable and, based on the estimates for 70 percent localisation for diesel locomotives and 77 percent for electric locomotives, the following benefits are evident:

Enterprise benefits to Transnet are considerable and include the design and integration capabilities that would be passed to Transnet Engineering through a structured programme of localisation; an enhanced Research and Development base in conjunction with the selected OEMs to develop and refine technologies for both the South African and African locomotive market; and re-engineering capability to design and provide technologies aligned to the needs of the South African rail market.

Benefits to the manufacturing sector will include key industrial capability in:

- Traction motors and traction control equipment;
- Locomotive control system capability;
- Locomotive electrical systems; and
- Large diesel engine capability.

In addition, there will be considerable benefits in related industries such as: heavy engineering, component manufacture such as found in the auto sector; electromechanical, electrical machinery, and software systems and design.

Benefits to the South African economy include benefits to a number of related sectors that would enhance capability and export potential. There would be R78 billion in economic impact for South Africa at a small localisation premium of 2 percent, implying a cost of localisation of 2 percent given expected levels of local supplier development. The resulting benefit-to-cost ratio of localisation is thus greater than 125 to 1 in favour of localisation. Multiplier benefits would be substantial and for each Rand of localised production there is an expected average multiplier of R2.74 across the economy.

Procurement strategy summary

- Issue open tenders for both locomotive types.
- Local content thresholds of 55 percent and 60 percent for diesel and electric locomotives respectively as per PPPFA and National Treasury Instruction Note.
- SD/BBBEE (40 percent) threshold.
- Technical threshold.
- Stage 2 will comprise price (60 percent), Supplier Development (20 percent), and B-BBEE (20 percent).
- B-BBEE included for scorecard (10 points) and FRC (10 points).

Reasons for following an open tender programmatic process

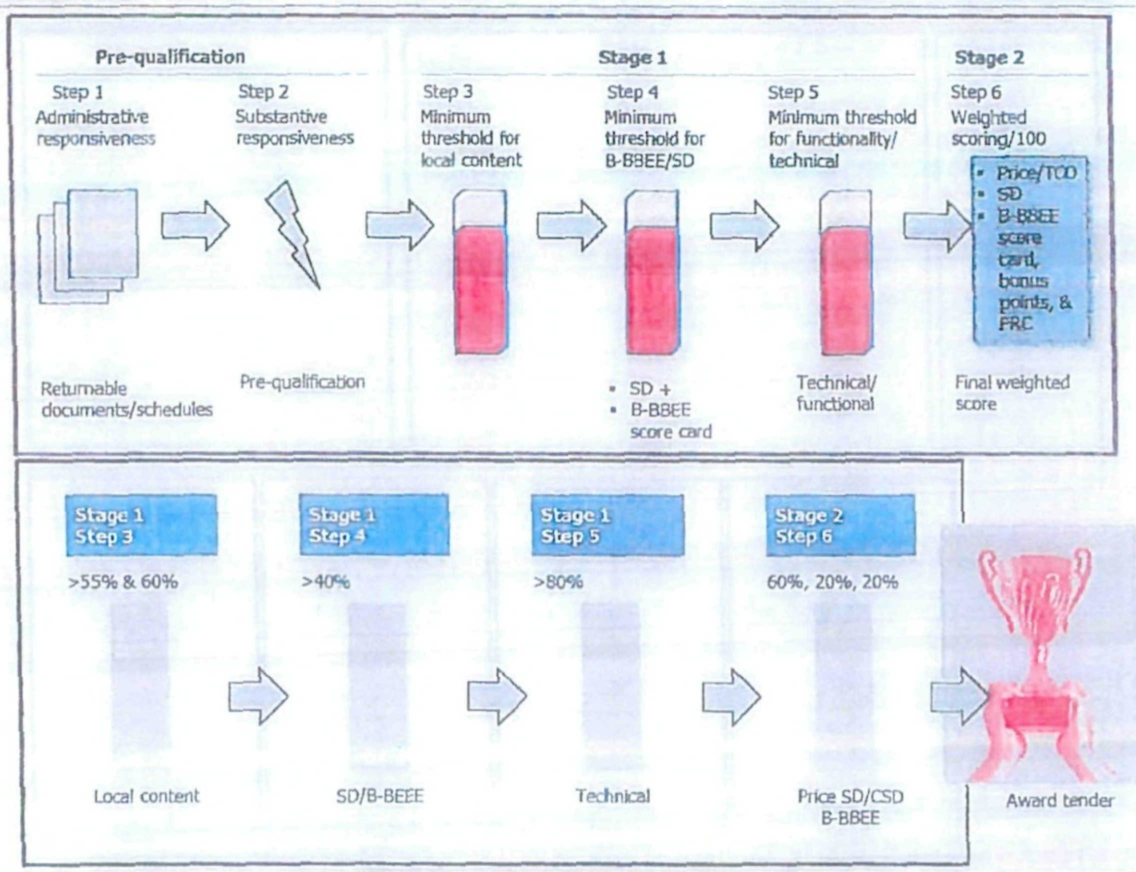
To ensure the bidding process is as fair and transparent as possible. As a long-term procurement event, open tender will identify suppliers with whom TFR can partner, to ensure value for money and compliance with Transnet's support for the NGP and government objectives. The programmatic nature of this purchase requires TFR to find suppliers who can commit to delivering on governments industrialisation objectives, which include:

- Localisation and industrialisation
- The creation of jobs
- The transfer of technical skills, IP, and know-how to the South African industry

- Increasing the capability and capacity of the South African rolling stock industry
- Reducing capital leakage
- Increasing South Africa's exports
- Integrating of South African suppliers into the locomotive OEMs' global supply chains
- Long-term security of demand will allow suppliers to commit to investing in SA operations
- Suppliers must commit to transferring skills to SA suppliers to allow for the long-term maintenance of the locomotives post warranty period.

Evaluation methodology

EXHIBIT 47



- Stage 1 with minimum disqualifying thresholds, will follow a three-step process, starting with the Local Content (Step 3), followed by the SD/B-BBEE (Step 4) evaluation, and finally the Technical (Step 5) evaluation. Stage 2 will comprise the commercial (Step 6) evaluation including price (60 percent) and supplier development (20 percent) and B-BBEE (20 percent)
- In line with categories for local content identified by the DTI, 55 percent and 60 percent minimum threshold of local content will be applicable to diesel and electric locomotives, respectively. These thresholds will need to be equalled or exceeded for the submission to qualify for SD/B-BBEE evaluation.

- A minimum threshold of 40 percent will be set for the SD/B-BBEE criteria evaluation. This threshold needs to be equalled or exceeded for the submission to qualify for Step 5.
- A minimum threshold of 80 percent will be set for the technical criteria evaluation. This threshold needs to be equalled or exceeded for the submission to qualify for Step 6.
- Once the minimum criteria thresholds are both met or exceeded, the supplier's submissions will be evaluated against price, SD, and B-BBEE.

3. Localisation

Since 2010, there have been significant changes in the South African policy environment, as well as to Transnet's strategic objectives. The New Growth Path (NGP) was launched in 2010 and at the end of 2011, the National Development Plan (NDP). Transnet realised the need and opportunity to develop a more holistic approach to supplier development, incorporating changes to the policy environment, lessons learned from previous SD initiatives, and Transnet's development of a holistic Supply Chain Policy and Framework, as well as its new corporate strategy, the MDS.

The South African government has highlighted supplier development as one of the ways with which to improve the local economy. SD is achieved by "procuring in such a way as to increase the competiveness, capacity and capability of the local supply base, where there are comparative advantages and potential competitive advantages of local supply" and is derived from the Competitive Supplier Development Programme (CSDP), which is a government initiative run by the Department of Public Enterprises. At Transnet, SD is driven through procurement with a focus on delivering transformation and empowerment as well as economic growth.

The transformation element ensures that procurement transactions bring historically disadvantaged individuals (HDIs) into the economic mainstream through the advancement of HDI ownership. It addresses economic disparities and entrenched social inequalities through the use of the B-BBEE scorecard and the seven pillars which make up the score card.

Growth of the local supply base is achieved through leveraging high-value procurement to achieve (where applicable) industrialisation, localisation, technology transfer, job creation and preservation, developing industry specific skills, enterprise development (ED), and rural integration.

The above has been factored into the locomotive tenders as has been highlighted in the Procurement Strategy Section and as is evidenced in the evaluation methodology.

Transnet has extracted SD value through some benchmark Competitive Supplier Development Programme (CSDP) locomotive acquisition contracts. These include:

- 100 X General Electric Locomotives – 54 percent SD commitment
- General Electric Long Term Parts Agreement – 12 percent SD commitment
- Electo-motive Diesel Long Term Parts Agreement – 41 percent SD commitment
- 32 X Mitsui/Venus Locomotives – 40 percent SD commitment
- 50 X Electro-motive Diesel Locomotives – 67 percent SD commitment
- 44 X Mitsui/Venus Locomotives – 39 percent SD commitment
- 43 X General Electric Locomotives – 65 percent SD commitment.

These commitments have been achieved with purchases being made sporadically and on a transactional basis; therefore, we expect greater benefit to be achieved from a programmatic procurement of this nature given the size and stable pattern of demand it creates. The benefit will obviously be limited if PPPFA exemption is not obtained.

Government envisages SOC expenditure as one of the key levers to achieve transformation and growth. The 1064 locomotive procurement provides a great opportunity to fulfil government's SD aspirations.

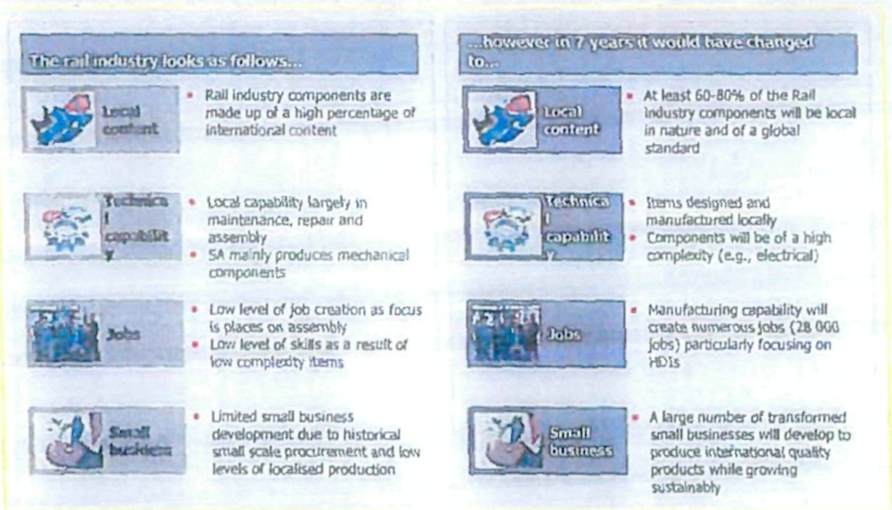
This spend will be leveraged to extract SD value in a manner that increases employment and also facilitates diversification beyond South Africa's current reliance on traditional commodities and non-tradable services. It will address the shortfall in artisan and technical skills by increasing the education level and skills capability. An equitable socio-economic society will be promoted through the integration of HDIs into the mainstream economy within the rail industry. Small businesses will be enabled in a manner that allows them to successfully compete in the South African economy. There will also be rural development throughout the country ensuring the sustainability of these communities.

Transnet's main focus with regards to these two tenders will be around the industrialisation of the rail industry. This spend can be leveraged in order to industrialise this sector and create sustainability. A large number of jobs will be created while ensuring that the local industry produces world-class products that can be exported. The will also be a large portion of spend on maintenance and upgrading of new and existing locomotives and wagons, which will ensure sustainability.

Our intention is to take the rail industry as it stands and fundamentally shift it within 7 years. This shift is illustrated in below.

EXHIBIT 48

Fundamental shift of the Rail industry over the next 7 years



4. Comparison of benefits between 90/10 and 60/20/20 methodologies

The 60/20/20 approach to localisation targets will create 30 percent greater total economic benefits (40 percent greater net benefits) at a significantly lower localisation cost, as shown in the exhibit below. Calculations are based on a total contract value of R38.6 billion.

The 60/20/20 approach will facilitate a local spend of an estimated R28.4 billion at an additional cost of R621 million. The overall benefit to the South African economy, factoring in the multiplier effect, is R78 billion (a net benefit R77 billion after deducting expected costs); this assumes high localisation levels of 70 percent for Diesels and 77 percent for Electrics. The 90/10 approach will facilitate local spend of an estimated R22.1 billion at an additional cost of R4.5 to 6.0 billion. The benefit to the South African economy based on the multiplier effect is R 61 billion (a net benefit ~R56 billion). This is based on 55 percent localisation for Diesels and 60 percent for Electrics.

EXHIBIT 49

The 60/20/20 approach to localisation will provide more benefits compared to the 90/10 approach

	60/20/20			90/10		
	Propose local spend (Rm)	Additional cost to localise (Rm)	Benefits through multiplier effect (Rm)	Proposed local spend (Rm)	Additional cost to localise (Rm) range	Benefits through multiplier effect (Rm)
Diesel locomotive	9,803	250	26,860	7,653	1,222 to 1,697	20,970
Electrical locomotive	18,626	371	51,036	14,467	3,235 to 4,313	39,639
Total	**28,429**	**621**	**77,896**	**22,120**	**4,457 to 6,010**	**60,609**

E. SUPPORTING DOCUMENTATION

1. 7-year commodity growth

	GENERAL FREIGHT GROUP FLOW	YEAR 2013/14 Budget	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	Tons Increase	MAJOR ASSUMPTIONS/INITIATIVES
AGRICULTURE & BULK LIQUID	GRAIN, MAIZE, WHEAT & FOODSTUFFS	4 184	4 377	4 950	5 844	6 055	6 304	6 635	2 451	Domestic harvests average between 10mtpa - 14mtpa, weather permitting. Demand projection represents TFR's increased share of total market demand as more traffic is shifted from road to rail. Agri-logistics and rural infrastructure - Transnet's rail and port capacity to support agri-logistics including branch lines development
	COMMODITIES NOT CLASSIFIED IN GROUPS	2 762	2 822	3 101	3 796	4 018	4 147	4 335	1 573	OTHER AGRICULTURE PRODUCE for instance BEANS, FMCG (SUGAR etc) as well as GASSES. Demand projections indicates increased volumes by rail in support of the NMPP. Also, there has been increased overborder demand from Botswana and Mozambique
	TIMBER	2 490	2 576	2 834	3 363	3 485	3 546	5 118	2 628	- Sappi Ngodwana – Production expansion will increase demand in 2013 by 115,000 tons from Piet Retief and Lothair areas. The plant will be completed in 2013. '- The expansion of the Sappi SAICCOR Wood yard rail to increase timber intake by 75,000 pa by 2013. Mondi Iswepe building new private siding
	PETROLEUM LIQUIDS (DOMESTIC)	1 381	1 381	1 472	1 643	1 691	1 731	1 750	0 369	
	IRON ORE (SWAZILAND HEMATITE)	0 000	1 210	1 210	1 210	1 210	1 210	1 210	1 210	
	CHEMICALS	0 801	0 871	0 895	0 975	0 983	0 976	1 009	0 208	
	PETROLEUM LIQUIDS (OVERBORDER)	0 790	0 790	0 830	0 897	0 921	0 944	0 956	0 166	
	COAL (DOMESTIC - OTHERS)	0 104	0 108	0 109	0 115	0 118	0 118	0 124	0 020	
	LIME	0 061	0 062	0 069	0 073	0 076	0 077	0 080	0 019	
	ROCK PHOSPHATE (DOMESTIC OTHER)	0 054	0 056	0 062	0 067	0 069	0 071	0 073	0 019	
	COAL (EXPORT RICHARDS BAY - DBT)	0 030	0 033	0 034	0 034	0 034	0 034	0 033	0 002	
	CONTAINERS (3M, 6M, 12M & NON ISO STANDARD)	0 001	0 001	0 001	0 001	0 001	0 001	0 001	0 000	
	TOTAL AGRICULTURE & BULK LIQUID	**12,659**	**14.388**	**15.628**	**18,018**	**18.681**	**19.259**	**21.324**	**8.665**	
COAL	COAL (ESKOM - MAJUBA)	8 794	9 332	12 054	13 636	13 816	14 000	14 000	5 206	Eskom road to rail migration plan. Eskom Majuba heavy haul line coming on stream in 2014 - increase tons to 14mt
	COAL (EXPORT TCM/MAPUTO)	3 680	4 376	5 925	6 421	9 043	11 735	10 964	7 284	TCM expansion plan is to grow to 16mt in the next five years due to Limpopo projects (Vele and Makhado).
	COAL (ESKOM - TUTUKA)	0 000	0 000	0 000	5 500	6 000	6 500	7 500	7 500	Thuthuka will use container rail solutions for the next two years and tippler solutions thereafter. TFR Business case for these have been approved.
	COAL (DOMESTIC - OTHERS)	1 881	2 036	2 825	2 889	3.047	3 047	3 388	1 507	Coal deliveries to the Mondi and SAPPI papermills, will increase based on the growth in electricity usage over the next year.
	COAL (EXPORT DURBAN WESTS)	1 434	1 771	2 237	2 940	2 940	2 960	2 705	1 272	Transnet: SA Coal transportation system development, Export coal line, Waterberg developments, Swazi Rail link, Coal backbone capacity, Eskom Road to Rail, Cross-border connections.
	COAL (ESKOM - GROOTVLEI)	0 000	0 000	0 000	0 000	5 000	5 000	5 000	5 000	Grootvlei will use container rail solutions for the next two years and tippler solutions thereafter. TFR Business case for these have been approved.
	COAL (EXPORT RICHARDS BAY NAVITRATE)	0 538	1 046	1 183	1 854	1 854	1 854	1 998	1 360	Transnet: SA Coal transportation system development, Export coal line, Waterberg developments, Swazi Rail link, Coal backbone capacity, Eskom Road to Rail, Cross-border connections
	COAL (ESKOM - ARNOT)	0 000	0 000	0 000	2 000	2 000	2 000	2 000	2 000	Commissioning and conclusion of the Arnot Powerstation
	COAL (EXPORT RICHARDS BAY - DBT)	0 430	0 617	0 702	0 901	0 901	0 901	0 969	0 540	
	TOTAL COAL	**16.856**	**19.818**	**24.927**	**36.341**	**41.606**	**47.897**	**48.525**	**31.669**	
EXPORT IRON ORE LINE & MANGANESE	MANGANESE (EXPORT - ALGOABAY PE)	5 100	5 100	8 000	9 897	13 138	14 357	16 000	10 900	SA's share of world output set to grow with junior miners and organic growth of traditional clients. New entrants are expected to commence with their respective productions in 2013 14. Global economy recovers from the current slump and demand from China does not subside. 16mtpa Manganese expansion in Ngqura materialises. South Eastern node & corridor development - Transnet: Ngqura Transhipment Hub, integrated CDC development and Manganese Export Corridor.
	MANGANESE (DOMESTIC)	1 950	1 950	1 900	1 567	1 560	1 705	1.900	0 050	
	MANGANESE (EXPORT DURBAN)	1 300	1 300	1 200	0 989	0 164	0 179	0 200	-1 100	
	FERRO MANGANESE	0 255	0 266	0 375	0 495	0 598	0 631	0 700	0 445	
	COAL (DOMESTIC - OTHERS)	0 095	0 100	0 100	0 100	0 100	0 100	0 100	0 005	
	TOTAL EXPORT IRON ORE LINE & MANGANESE	**8.700**	**8,715**	**11.575**	**13.047**	**15.560**	**17.032**	**18.900**	**10.200**	

INTERMODAL	CONTAINERS (3M, 6M, 12M & NON-ISO STANDARD)	8 832	8 096	9 273	10 293	10 358	10 883	11 647	2 796	Linked to GDP growth. Refurbishment and establishment of terminals. Containerising mineral products at key loading sites. Development of Freight Hubs in areas such as Polokwane and Bloemfontein; New Castle Terminal. Delink Strategy: Kingsrest Yard Rail Stack; Reconfigure Bayhead Yard to push back trains. Durban – Free State – Gauteng Logistics and Industrial Corridor - Transnet. Port of Durban expansions, new dig-out port, Natcor rail capacity expansion, Gauteng hubs and terminals development Transnet Integrated Container Strategy in consultation with current and potential customers.
	COAL (ESKOM - CAMDEN COAL IN CONTAINERS)	2 647	2 200	2 966	4 272	4 376	5 272	5 798	3 151	Coal deliveries to the Powerstations will increase based on the growth in electricity usage over the next years. Camden will use container rail solutions for the next two years and tippler solutions thereafter. TFR Business case for these have been approved.
	COAL (ESKOM - GROOTVLEI COAL IN CONTAINERS)	0.600	1.827	2.736	4.861	0.000	0.000	0.000	-0.600	
	COAL (ESKOM - TUTUKA COAL IN CONTAINERS)	0.000	1.800	2.583	0.000	0.000	0.000	0.000	0.000	
	AUTOMOTIVE (MOTORVEHICLES)	0.490	0.310	0.414	0.438	0.465	0.493	1.274	0.784	
	COMMODITIES NOT CLASSIFIED IN GROUPS	0.026	0.026	0.029	0.034	0.036	0.037	0.040	0.014	
	STEEL (DOMESTIC)	0.014	0.010	0.015	0.017	0.019	0.019	0.022	0.008	
	CEMENT	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	
	TOTAL INTERMODAL	**12.878**	**14.289**	**18.321**	**19.985**	**15.233**	**16.705**	**18.781**	**6.153**	
MINERAL MINING & CHROME	COMMODITIES NOT CLASSIFIED IN GROUPS	4.261	3.553	4.825	6.756	6.918	7.007	7.477	3.216	Included in this group is Gold Ore & Other lesser Minerals and Ore Mining. These commodities currently enjoy a healthy demand.
	MAGNETITE (EXPORT RICHARDSBAY)	4.170	4.293	4.782	5.300	5.300	5.300	5.300	1.130	Demand mainly from China – driven by increased steel production. Export growth indicates modest increase and domestic consumption is set to grow once local beneficiation projects are started.
	CHROME (EXPORT RICHARDSBAY)	2.755	3.466	4.359	5.160	5.395	5.555	5.715	2.960	
	MAGNETITE (EXPORT MAPUTO)	2.405	3.567	4.250	4.615	4.839	4.839	6.000	3.595	Demand mainly from China – driven by increased steel production. Export growth indicates modest increase and domestic consumption is set to grow once local beneficiation projects are started.
	ROCK PHOSPHATE (DOMESTIC RICHARDS BAY NAV TRATE ROC)	1.717	1.929	2.232	2.618	2.822	2.822	3.000	1.283	Building Diner 9 to support current 7 year demand
	FERRO-CHROME	1.809	1.954	2.174	2.429	2.572	2.665	2.790	0.981	
	CHROME (DOMESTIC)	0.423	0.457	0.542	0.595	0.600	0.605	0.610	0.187	
	ROCK PHOSPHATE (EXPORT RICHARDS BAY)	0.297	0.334	0.366	0.435	0.560	0.554	0.600	0.303	
	MAGNETITE (DOMESTIC BROODSNYERSPLAAS)	0.164	0.164	0.241	0.281	0.374	0.476	0.800	0.636	
	COAL (DOMESTIC - OTHERS)	0.262	0.295	0.310	0.310	0.310	0.310	0.310	0.048	
	CHROME (EXPORT DURBAN)	0.195	0.202	0.238	0.250	0.260	0.260	0.270	0.075	
	CHROME (EXPORT MAPUTO)	0.026	0.040	0.057	0.072	0.084	0.094	0.104	0.078	
	CHEMICALS	0.037	0.040	0.042	0.044	0.052	0.054	0.058	0.021	
	LIME	0.010	0.010	0.016	0.020	0.022	0.024	0.027	0.017	
	FERRO-MANGANESE	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.001	
	TOTAL MINERAL MINING & CHROME	**18.532**	**20.357**	**24.434**	**28.892**	**30.110**	**30.567**	**33.063**	**14.531**	
STEEL & CEMENT	COAL (DOMESTIC - OTHERS)	5.240	6.611	7.660	8.485	9.024	9.024	9.511	4.271	Driven by growth in other industries, e.g. steel, cement, timber etc
	CEMENT	4.585	5.204	5.661	6.111	6.265	6.271	6.343	1.758	Volumes to increase in line with SA's GDP growth (4% on average). TFR also targeting rail-friendly volumes in this sector. There is roughly 4mt of bagged cement currently on road. The Road to Rail strategy aim is to target 300,000 tons in the 1st year and gradually capture more over the 7 year period.
	IRON ORE (DOMESTIC - SISHEN IRON ORE YARD)	3.702	4.020	4.156	4.286	4.413	4.464	4.465	0.762	
	IRON ORE (DOMESTIC SISHEN)	1.082	2.673	3.639	3.731	3.833	3.839	3.840	2.758	Increases in domestic steel production supported by government infrastructure development plan Domestic and regional consumption of steel fuelling demand for iron-ore & new export project by Aquila from Thabazimbi to Maputo.
	COMMODITIES NOT CLASSIFIED IN GROUPS	1.774	1.848	1.937	2.338	2.4[illegible]	2.784	2.879	1.105	These include dolomite, iron slag etc used in the production processes of the Steel Manufacturers and is linked to increased output in the production processes.
	LIME	1.451	1.536	2.186	2.417	2.[illegible]	2.497	2.595	1.144	Lime used in the production processes of the Steel Manufacturers and is linked to increased output in the production processes.
	IRON ORE (DOMESTIC ROOSSENEKAL)	1.639	2.160	2.159	2.152	2.153	2.159	2.160	0.521	
	IRON ORE (EXPORT MAPUTO)	0.000	0.000	1.332	1.945	1.999	3.999	4.000	4.000	
	IRON ORE (DOMESTIC - THABAZIMBI)	1.265	1.337	1.718	1.841	1.899	1.899	1.900	0.635	
	STEEL (EXPORT - DURBAN)	0.460	0.560	0.634	0.907	0.932	0.932	0.937	0.477	
	STEEL (DOMESTIC)	0.339	0.365	0.427	0.627	0.629	0.628	0.632	0.293	
	IRON ORE (DOMESTIC BEESHOEK)	0.203	0.215	0.247	0.263	0.270	0.270	0.270	0.067	
	STEEL (EXPORT - RICHARDSBAY)	0.078	0.088	0.088	0.104	0.104	0.104	0.105	0.027	
	IRON ORE (DOMESTIC POSTMASBURG)	0.005	0.010	0.012	0.012	0.012	0.012	0.012	0.007	
	STEEL (EXPORT MAPUTO)	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.000	
	TOTAL STEEL & CEMENT	**21.836**	**26.657**	**32.367**	**35.228**	**36.460**	**38.894**	**39.659**	**17.834**	
	TOTAL MOS	**91.212**	**104.265**	**127.272**	**151.461**	**160.659**	**170.454**	**180.252**	**89.041**	

2. General Freight fleet runout

Locos		GFB FLEET			Runouts and upgrades out same year							Wreck repairs from previous year, Casualties same year											
Type	Class	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31	31/32
6E	6E		18																				
	6E1		183	163	75	25																	
7E	7E		67	67	58	58	29																
	7E1				48	48	48	48	48	48	24												
	7E2		43	43	46	45	23																
	7E3		65	65	65	65	65	65	65	65	65	65	65	65	65	65	54	43	32	21	10		
	7E4							17	17	17	7												
8E	8E		68	37	37	37	37	25	13														
9E	9E																						
10E	10E		45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45
	10E1		30	60	37	39	41	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
	10E2		17	17	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
11E	11E				1	1	1	11	23	19	19	19	19	19	19	19	19	19	19	19	9		
12E	12E																						
14E	14E		1	1	1	1	1	1	1	1													
	14E1		7	7	7	7	7	7	4	1													
15E	15E																						
18E	18E		898	828	597	647	697	727	727	727	632	632	582	532	482	432	382	332	282	232	182	132	82
19E	19E																						
20E	20E																						
20E	NewE																						
31	31 GE																						
32	32 GE																						
33	33 GE		17		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
34	34 GE		107	173	199	199	204	190	176	150	125	75	26										
	34 GM		85	85	119	119	124	111	95	79	79	79	79	89	44	19							
35	35 GE		48	43	39	39	39	36	32	29	25	18	10	2									
	35 GM		110	110	107	107	107	107	107	94	80	57	33	10									
36	36 GE		94	94	86	86	86	86	86	86	88	72	58	44	30	16							
	36 GM		83	83	81	81	81	81	81	81	81	81	81	81	81	67	53	39	25	11			
37	37 GM		60	60	70	70	58	46	34	22	10												
38	X38		36	38	38	38	38	38	38	38	38	38	19										
39	39 GM		68	66	53	53	53	53	53	53	53	53	53	53	48	48	48	48	48	48	48	48	48
43	43 GE		27	27	53	53	53	53	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
NewD	NewD																						
91	91 GE																						
Grand Total			1730	1744	1888	1890	1864	1832	1776	1886	1750	1365	1201	1051	945	842	732	657	582	507	425	356	306
Diesel Fleet (before wrecks)			706	758	850	850	848	806	753	883	828	524	410	310	254	201	152	138	124	110	99	99	99
Electric Fleet (Before Wrecks)			1024	990	1038	1040	1016	1026	1023	1003	922	841	791	741	691	641	580	519	458	397	326	257	207

3. Locomotive run-out mitigation

Total Maintenance cost for Wagons and Locomotives

By inspection the cost per annum increase of locomotive maintenance is significantly greater than that of wagon maintenance. Locomotive maintenance increase from R2 377m to R3 335 over the five year period 2007/08 – 2011/12; an increase of 40 percent. By contrast wagon maintenance, which does not have the same level of technology, increased from R2 044 to R2 234 over the same period: an increase of 9.3 percent. All maintenance is performed by Transnet Engineering.[8]

Locomotive class comparison Maintenance cost vs. NTK for the last 5 years

This figure shows the average cost of maintenance per class of locomotive over the past five years against its performance measured in Net Ton Kilometres.

[8] The increasing proportion of copex to opex in locomotive maintenance is a function of changes in accounting procedures as a greater proportion of maintenance is capitalised according international accounting standards.

The new locomotives such as the 15E, 19E and 43D cannot be directly compared to the older locomotives as the new locomotives have not seen five full years of service but even making allowance for the shorter service, the savings in maintenance costs is evident.

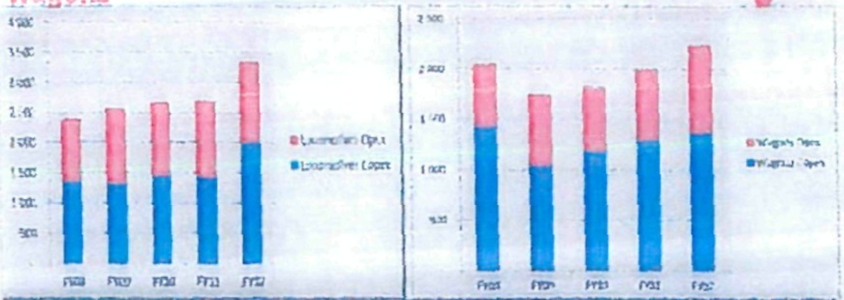
The three locomotives (excluding the new locomotives) with the best ratio of NTK/Cost of Maintenance are the heavy haul locomotives 9E, 11E and 7E1.

The workhorse locomotives that have a poor NTK/Cost of Maintenance ratio include the 18E, 6E 34-000, 34-400 series.

The locomotives that have the worst NTK/Cost of Maintenance ratio include the 37-000, 7E2, 34-800, and the 33, 35 and 36 classes. These are amongst the oldest locomotives.

1. EXHIBIT 50

Total maintenance cost for locomotives and wagons



	FY08 (R)	FY09 (R)	FY10 (R)	FY11 (R)	FY12 (R)
Locomotives	**2 377**	**2 [illegible]**	**[illegible]**	**[illegible]**	**[illegible]**
Capex	1 159	1 310	1 452	[illegible]	2 003
Opex	[illegible]	1 232	1 265	[illegible]	[illegible]
Wagons	**2 044**	**1 743**	**1 822**	**[illegible]**	**2 234**
Capex	1 430	1 051	1 181	1 281	[illegible]
Opex	614	[illegible]	641	[illegible]	[illegible]
Grand Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			CAPEX		
Locomotive Upgrade	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wagon upgrade	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

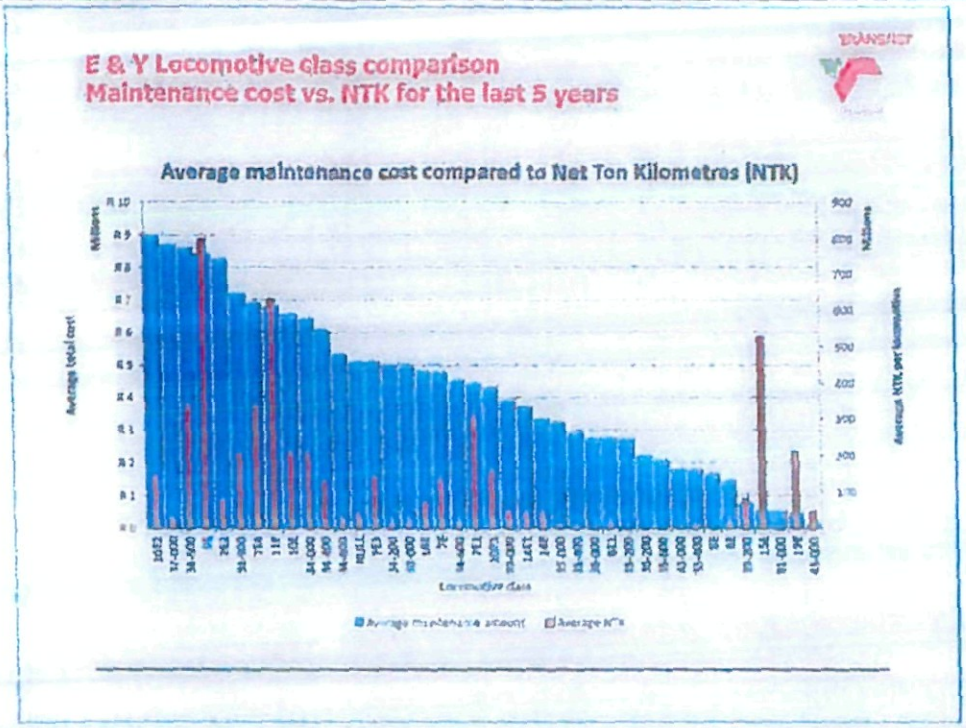
TFR has exhausted the life extension possibilities of its current "workhorse" fleet which are the primary contributors to GTK / NTK. Extending the life of "shunters" and "haulers" does not contribute to increasing GTK / NTK as the locomotives are not used and cannot be used for the heavy loads of main line operations.

The SMILIP programme for new traction power was developed circa 2002. When this programme was not accepted TFR responded by extending the life of the current workhorse fleet.

The life extension / upgrade programme included:

- 650 6E1 series upgrade to new class 18E providing a 12-15 year life extension. 120 upgrades are still be completed by March 2016. By 2018 the first of the upgrades will start to runout.
- 150 class 34 GE locomotives programmed for fitting with new Britestar Control systems with 55 still to be completed. As the locomotives are already over 35 years old this is a palliative.
- 75 class 34 GM locomotives fitted with new Nexsys Control Systems. A further 20 are programmed for 2013. As these locomotives are already 38 years old, this decision will be reconsidered in anticipation of the new locomotives.
- Other interventions were more essential maintenance than life extension strategies. The above programs result in extend the run out age from a designed 30 years to 45 years.
- The locomotives suitable for upgrade / life extension have already all being targeted. The balance of the fleet does not lend itself to similar interventions.

EXHIBIT 51



4. Locomotive 7-year locomotive requirement

GFB 7 YEAR LOCOMOTIVE REQUIREMENT

GFB	GROUP	2011/2012	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	2022/2023
6E/6E1	6E	183	172	134	43								
18E	18E	506	521	662	744	760	715	715	665	615	565	515	465
7E	7E	54	66	42	42	42							
7E1	7E1	0	-	21	21	21	46	46	46	46	46	46	46
7E2	7E	32	34	34	34	34	34						
7E3	7E	11	65	65	65	65	65	65	65	65	65	65	65
8E	8E	58	54	37	33	24	12	12					
9E	9E		30	4	4								
10E1	10E	23	26	36	36	36	53	62	45	45	45	45	45
10E2	10E	59	58	62	62	62	62	62	62	62	62	62	62
14E1	14E	8	8	8									
33	GE	17											
34	GE	115	188	188	188	188	142	142	142	120	120	120	120
34	GM	82	90	94	94	94	94	94	94	94	94	94	94
35	GE	65	69	74	77	79	79	79	79	79	79	79	79
35	GM	79	86	93	93	96	96	96	96	96	96	96	96
36	GE	87	90	90	98	98	98	98	98	98	98	98	98
36	GM	81	84	84	92	92	92	92	92	92	92	92	92
37	GM	48	50	50	50	25	25						
38	X38	34	38	38	38	38	38	38	38	38	38	38	38
39	GM	55	50	50	50	50	50	50	50	50	50	50	50
43	GE	34	62	113	113	113	125	113	113	113	113	113	113
44D NEW		0	-	-	82	179	279	362	393	465	515	535	545
20E		0	-	-	81	202	332	462	599	671	721	771	821
Total		1641	1841	1979	2140	2302	2442	2592	2681	2753	2803	2823	2833

5. Deployment plan

EXHIBIT 52

Table of Contents

TRANSNET

EXHIBIT 53

GLOSSARY

MUS – MUSSINA
PRZ – PYRAMID SOUTH
PHW – PHALABORWA
NLP – NELSPRUIT
KMD – KAAPMUIDEN
KTR – KOMATIPOORT
HLF – HALFWEG
SLD – SALDANHA
BLE – BELLVILLE
KGR – KRUGERSDORP
ELN – EAST LONDON
NAS – NATALSPRUIT
WED – WELGEDACHT
KAZ – KASERNE
SBG – SASOLBURG
MEI – MAFIKENG
SPR – SPRINGS
TIT – TRICHARDT
BPR – BRAKPAN
ISO – ISANDO
BFX – BLOEMFONTEIN
NWT – NOUPOORT
HZL – HOTAZEL
PMG – POSTMASBURG
BEC – BEACONSFIELD
PCM – POTCHEFSTROOM
BIJ - BIJLKOR
MTN – MEYERTON
NCS – NEWCASTLE
DSL – DANSKRAAL
DNR – DURBAN
DER – DE AAR
PE – PORT ELIZABETH

EXHIBIT 54

43D Deployment Plan

Efficiency and Volume Growth

Financial year 11/12 – 13/14

143X43D

	Phalaborwa	Saldanha	Welgedacht (Eskom Coal)	Ermelo	Pyramid south
Financial Year 11/12	27				
Financial Year 12/13	35	30			
Financial Year 13/14	17		16	13	5
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

- Cascading of locos due to this injection is per BU
- The 43D locomotives will run from PHW to RCB and has eliminated loco change-over thereby improving loco and wagon cycle time
- Fuelling will be done both in Phalaborwa and Richards Bay

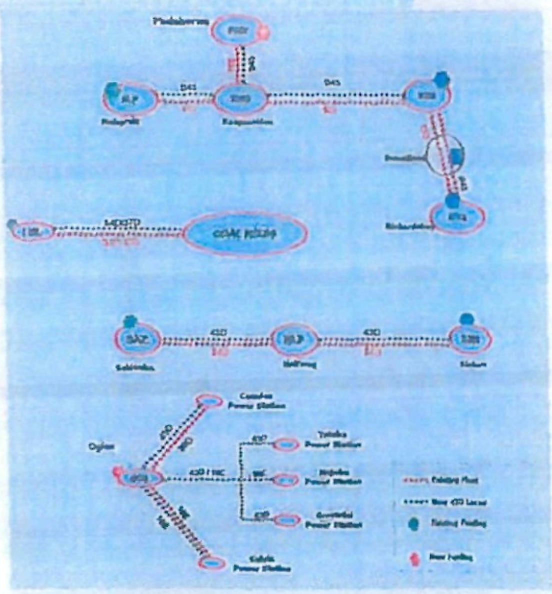


EXHIBIT 55

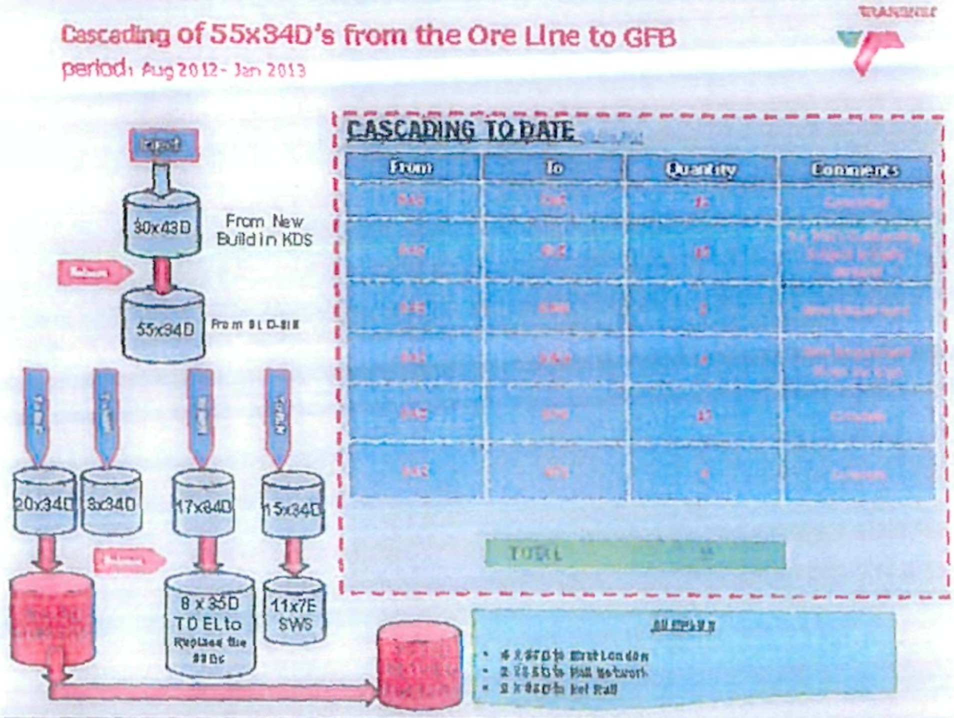


EXHIBIT 56

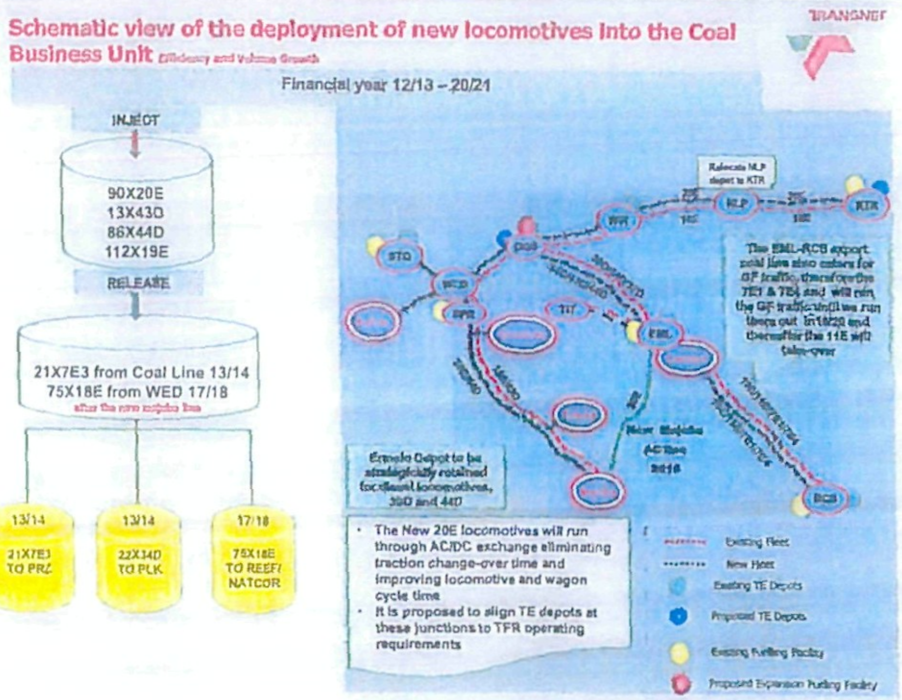


EXHIBIT 57

New Locomotives Deployment Plan
Efficiency and Volume Growth

TRANSNET

Financial year 12/13 – 20/21
High Level Delivery, Cascading and Run out Plan for the Domestic and Export Coal Business Unit

	Current Fin Yr 12/13	Fin Yr 13/14	Fin Yr 14/15	Fin Yr 15/16	Fin Yr 16/17	Fin Yr 17/18	Fin Yr 18/19	Fin Yr 19/20	Fin Yr 20/21
EML 10E1	53	53	53	53	26	—	—	—	—
RCB Dual Loco (10E1)						33	44	44	44
RCB 7E1	48	—	—	—	—	—	—	—	—
RCB 7E4	37	37	37	37	—	—	—	—	—
RCB 11E	48	43	48	48	36	22	27	27	27
RCB 19E	110	[illegible]	110	(50) 160	(50) 222	222	222	222	222
EML 34D	37	[illegible]	18	18	—	—	—	—	—
EML 37D	30	[illegible]	30	30	15	—	—	—	—
EML 43D	—	[illegible]	13	13	13	13	13	13	13
EML 44D	—	[illegible]	—	—	20	(10) 30	30	30	30
TOTALS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
RCB 7E1	—	48	48	48	48	48	48	—	—
RCB 7E3	33	32	22	11	—	—	—	—	—
RCB 7E4	—	—	—	—	37	37	37	—	—
EML 10E1	9	9	9	9	8	37	—	—	—
RCB 11E	—	—	—	—	9	23	18	18	18
RCB New Batch Elec	—	—	—	—	—	—	—	50	(50) 100
WED 15E	75	75	75	75	75	75	35	—	—
WED 43D	—	18	—	—	—	—	—	—	—
WED 20E	—	—	—	—	—	30	(30) 60	(30) 90	90
WED 44D	—	—	22	(20) 42	68	68	90	68	68
TOTALS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grand Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EXHIBIT 58

TRANSNET

Deployment Strategy & Benefits : Coal

Coal : RBCT

- The 19E's will be increased from 110 to 222 from 2015/2016 to 2016/2017. The following strategic changes are envisaged:
  - It is to be noted that the 222 x 19E/equivalent's will run from RCB to various mines directly with only driver hot-seat changes.
  - The process will start 2013/2014.
  - This will reduce the cycle time of locomotives from 58 to 41 hours and wagons from 62 to 48 hours
  - This increases the volumes capacity of the current wagon fleet from 81 to 94.7 mtons.
  - By operating design all 19E/equivalent will be maintained in RCB.
  - This requires that all investment for maintenance at Ermelo to be reviewed as this depot will be retained for diesel locomotives maintenance (39200's and 43D/44D's). Capacity has to be reviewed as the maintenance work content on these locomotives is considerably less than the current fleet.
  - Richards bay will become a super maintenance depot. (Based on GF practices)
- Cascade 11E's to GF traffic by 2016/2017. This could reduce to zero based on dual power processing and the clear the deck position of the 10E1s.
- The whole diesel fleet to be replace by new diesels by 2016/2017.
- Provide for the Under Floor Wheel Lathe at Richards Bay as it will be a singular super locomotive depot for TFR.
- 67XOld Diesels (34D/37D) swapped with 43XNew Diesels (43D/44D), however the figure will be reviewed.

EXHIBIT 59

Deployment Strategy & Benefits : Coal

TRANSNET

General Freight

- General Freight traffic on the Coal line will be injected with 21 x 7E1 from the 1 May 2013. The figure will be increased to 48 by 2015/2016.
- The 7E1 and 7E4 that are ring-fenced for the Coal line general freight traffic will run-out in 2019/2020, however if the efficiencies from PRZ are realized this run-out will be earlier.
- The 7E3 will be cascaded to Pyramid South to capture the growth in Coal, Chrome and Ferrochrome from the Rustenburg area.
- All 7E3's will be cascaded to Pyramid South by 2015/2016.
- Note that with dual power processing, the 7E type locomotives will also be eliminated from the Coal line.
- All traffic from Waterburg area will be dual powered thereby removing the need for Pyramid South.

EXHIBIT 60

Deployment Strategy & Benefits : Coal

TRANSNET

- The following are the benefits:
  - Reduced fuel consumption with new diesel locomotives being introduced
  - Improved cycle times for rolling stock
  - Improved reliability
  - Better utilisation of crews
  - Reduced handling and shunting
- Impact on Crew and Maintenance depot
  - Richards Bay to be the Super Locomotive Maintenance depot
  - Standardise the Ermelo depot to few locomotive types, specifically diesels (39200's. 43D's and 44D's)
  - Training crew on the new locomotives
  - Ermelo yard strength and crew strength will be reviewed to the new operating standards
  - Book off at Ermelo will be reviewed as some loading station can take 200 wagon trains straight in
- Necessitated required changes
  - System cannot afford to run a 41 hour and a 56 hour cycle as it will not be seamless and will be somewhat counter-productive.
  - This will then require the 10E1's to be converted to dual power for a one type 41 hour operation.
- Financial Impact Analysis
  - Savings due the introduction of the new operating model from 1 September:

EXHIBIT 61

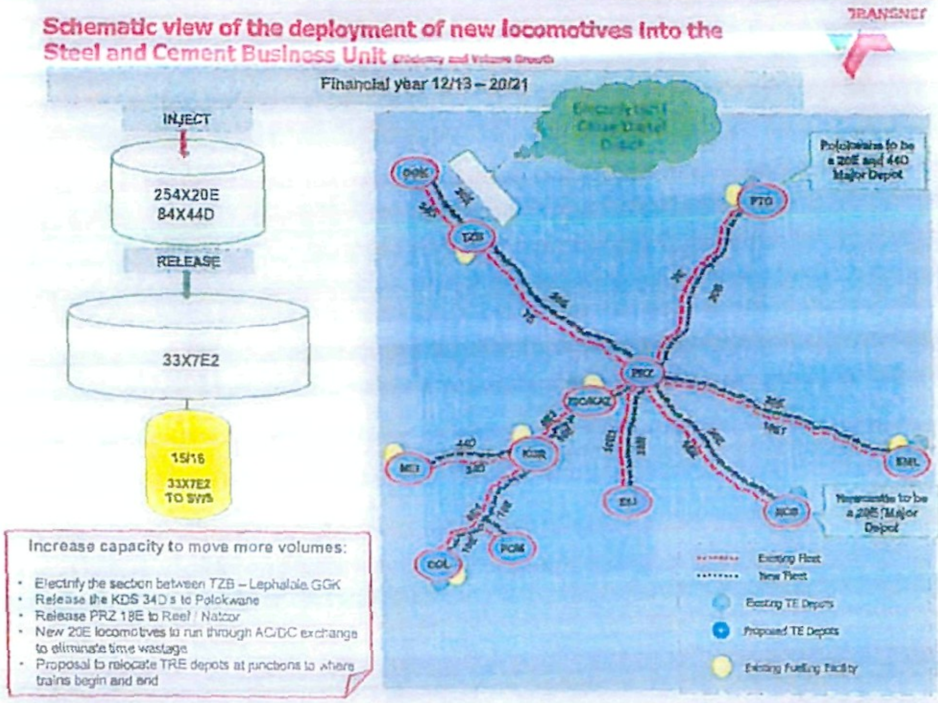


EXHIBIT 62

TRANSNET

New Locomotives Deployment Plan

Efficiency and Volume Growth

Financial year 12/13 – 20/21

High Level Delivery, Cascading and Run out Plan for the Steel and Cement Business Unit

	Current Fin Yr 12/13	Fin Yr 13/14	Fin Yr 14/15	Fin Yr 15/16	Fin Yr 16/17	Fin Yr 17/18	Fin Yr 18/19	Fin Yr 19/20	Fin Yr 20/21
RCB 20E	—	—	—	24	(45) 69	(30) 99	(30) 129	(35) 164	(90) 254
PRZ 7E2	33	33	33	—	—	—	—	—	—
PRZ 7E3	18	(21) 34	34	(21) 55	(11) 66	66	66	33	—
PRZ 10E1	30	30	30	30	(18) 48	—	—	—	—
RCB Dual Loco 10E1	—	—	—	—	—	48	48	48	48
PRZ 18E	15	18	—	—	—	—	—	—	—
TZB 34D	18	—	—	—	—	—	—	—	—
COL 6E1	34	—	—	—	—	—	—	—	—
COL 18E	—	34	(10) 44	44	44	44	44	44	44
KGR 34D	28	28	28	28	14	—	—	—	—
TZB 39D	13	20	20	20	20	20	—	—	—
KGR 44D	—	—	—	—	40	40	(12) 52	52	52
PRZ 43D	—	5	5	—	—	—	—	—	—
PLK 34D	24	(22) 46	46	46	46	48	46	26	—
PLK 44D	—	—	—	15	(2) 17	17	(15) 32	32	32
TOTALS	[illegible]	246	[illegible]	262	364	[illegible]	417	[illegible]	[illegible]

EXHIBIT 63

Deployment Strategy & Benefits : SAC

TRANSNET

General Freight

- The introduction of the dual locomotives at Pyramid South will see all flows from origin to destination on the AC/DC route running with single type of locomotive. Flows such as Chrome to Richards bay; Coal & Iron Ore to Newcastle and Vereeniging, Cement to Polokwane and including over border traffic. This will eliminate traction change over at Pyramid South and Ermelo there by improving cycle time and enhancing asset utilisation.
- The efficiency of 20E's will play an important role in the release of 7E locomotives to areas where they are needed or for early run-out to reduce the cost of maintenance.
- Electrification of the section between Thabazimbi and Grootegeluk become vital for dual loco system, hence the need to fast tracked to 2015/2016
- The expectation is that once the dual 20E's are deployed it will negate the need for 10E1's in its current form, this calls for the 10E1's to be upgraded to dual powered.

Impact on Crew and maintenance depot

- Koedoespoort diesel depot required to be down scaled as the number of diesels will be reduced.
- Thabazimbi no longer required as a maintenance depot
- Retraining of crew on new routes.
- Introduce new book-off practices.
- Pyramid South to be a run through yard with minimum processing for maize trains, cement trains etc.
- The new electric locomotive will be running to Richards Bay, Newcastle, Bijlkor and Durban, therefore these areas need to prepare for the maintenance of these locomotives.
- Upgrade the coligny depot to increase its scope of work and down-scale activities in Sentrarand depot.
- Polokwane to be a 20E and 44D depot
- Newcastle to be a 20E depot
- The yard capacity at Pyramid will require to be reviewed

11

EXHIBIT 64

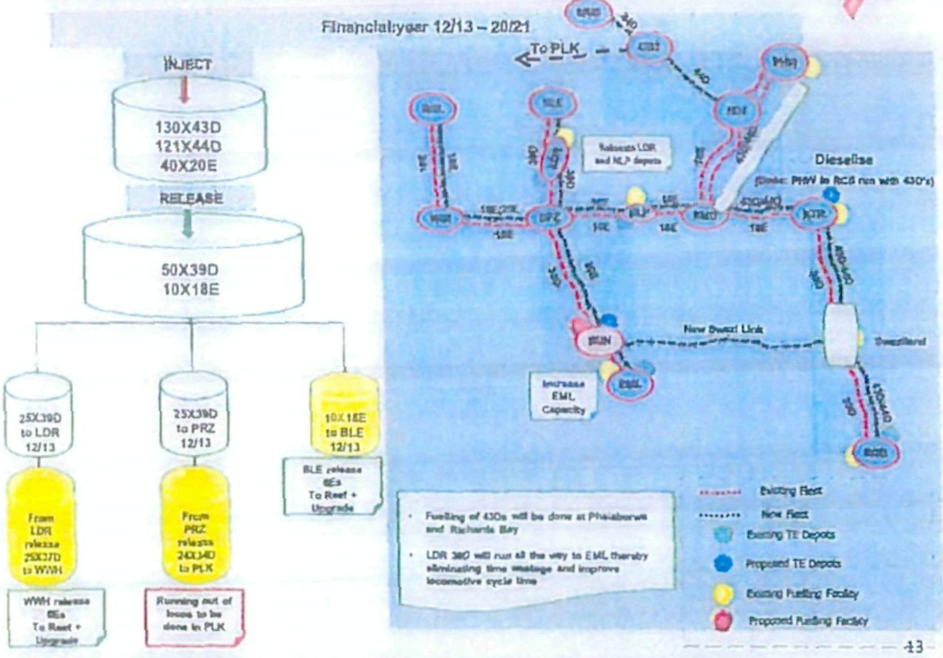
Deployment Strategy & Benefits : SAC

Financial Impact Analysis

- Pyramid yard strength to be addressed
- Cycle time from Lephalale to Richardsbay will be reduced conservatively by 30 hours
- This impacts on wagon requirements for the these tons to be calculated
- Fuel savings from replacing old diesels with new
- Pyramid South and Rustenburg yard no longer needed as holding yards, parking of Pyramid South 7E2's and 7E3's, Krugersdorp 34D and the Polokwane 34D's: SAVINGS

EXHIBIT 65

Schematic view of the deployment of new locomotives into the Mineral Mining and Chrome Business Unit Efficiency and Volume Growth



13

EXHIBIT 66

TRANSNET

New Locomotives Deployment Plan
Efficiency and Volume Growth

Financial year 12/13 – 20/21

High Level Delivery, Cascading and Run out Plan for the Mineral Mining and Chrome Business Unit

	Current Fin Yr 12/13	Fin Yr 13/14	Fin Yr 14/15	Fin Yr 15/16	Fin Yr 16/17	Fin Yr 17/18	Fin Yr 18/19	Fin Yr 19/20	Fin Yr 20/21
WIR 20E	—	—	—	—	—	20	(10) 30	(10) 40	40
EMG 39D	8	—	—	—	—	—	—	—	—
WIR 18E	83	83	83	83	83	63	43	43	43
EML 39D	27	30	30	30	30	30	50	50	50
PHW 43D	62	(17) 79	(16) 95	(5) 100	100	(30) 130	130	130	130
PHW 44D	—	—	—	—	—	12	(10) 22	22	22
RCB 44D	—	—	—	—	—	18	(8) 26	26	26
EML 44D	—	—	—	—	14	14	14	14	14
Swazi Link 44D	—	—	—	—	—	—	30	(24) 54	(5) 59
TOTALS	180	192	208	213	227	277	345	379	384

EXHIBIT 67

TRANSNET

Deployment Strategy & Benefits : MMC

General Freight

- Note the original deployment was 89 locomotives for required MDS tons, based on th efficiencies achieved this was dropped to 79 locomotives for the same tons. The GTKs was achieved in advance of what the business case stated.
- Increase the 62 x 43D's at Phalaborwa to 79 to capture the growth in Magnetite and coal from Musina by 2013/2014.
- The locomotive cycle time has improved from 72 hours to 55 hours with the injection of the 43D's
- Wagon cycle time has improved from 7 days to 5 days on the corridor.
- Deployed 39D's at Lydenburg
- Eliminated locomotive change over at Belfast. Running the 39D's all the way to Ermelo.
- A 100 wagon train was tested successfully between Lydenburg and Ermelo.
- Steelpoort to be 104 wagon RDP train
- Investigate the future growth plans for the Roossenekal area and keep Witbank depot in the meantime

Impact on Crew and Maintenance depot

- Nelspruit
  - Relocate the crew and maintenance depot at Nelspruit to Komatipoort

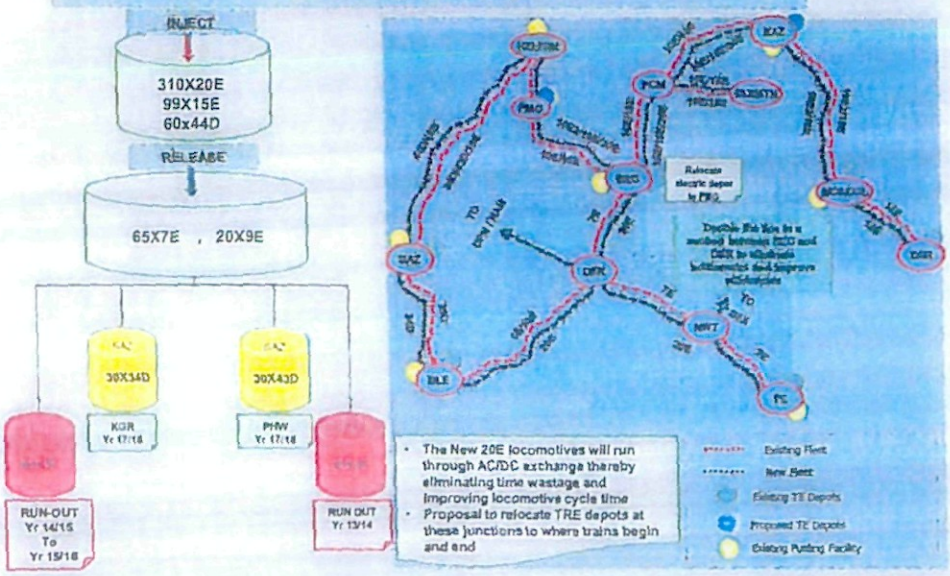
Komatipoort
  - Komatipoort to have a 12 ton crane and a drop-pit.
- Waterval Boven
  - Relocate the crew depot Witbank and Komatipoort
- Lydenburg
  - The corridor has been standardised to 39D's only
  - Future maintenance to be done at Ermelo
  - Relocate Lydenburg as a Loco and Crew depot to Steelpoort

EXHIBIT 68

Schematic view of the deployment of new locomotives into the Iron Ore and Manganese Business Unit
Efficiency and Volume Growth

TRANSNET

Financial year 12/13 – 20/21



16

EXHIBIT 69

New Locomotives Deployment Plan
Efficiency and Volume Growth

TRANSNET

Financial year 12/13 – 20/21

High Level Delivery, Cascading and Run out Plan for the Iron Ore and Manganese Business Unit

GFB	Current Fin Yr 12/13	Fin Yr 13/14	Fin Yr 14/15	Fin Yr 15/16	Fin Yr 16/17	Fin Yr 17/18	Fin Yr 18/19	Fin Yr 19/20	Fin Yr 20/21
PMG 20E	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PMG 20E	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SWS 7E	50	[illegible]	[illegible]	—	—	—	—	—	—
EWS 7E2	12	13	—	[illegible]	—	—	—	—	—
PMG 18E2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—
PMG Dpl.$ loco (diesel)						[illegible]	[illegible]	[illegible]	[illegible]
PMG 18E	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SAZ 34D	[illegible]	30	30	30	30	—	—	—	—
SAZ 5E	[illegible]	4	4	4	4	4	4	4	4
SAZ 44D	—	—	—	—	—	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]									
SAZ 15E	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
SAZ 43D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	—	—	—	—
SAZ 44D	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EXHIBIT 70

Deployment Strategy & Benefits : IOM

Ore Line

- The Ore line 15E will increase from the current 44 x 15E to 76 x 15E by 2013/2014 financial. This will further be increase by 24 x 15E to meet the MDS volume budgets.
- The 30 x 9E will be reduce to a rough figure of 4 to cater for GF traffic on the Ore Line and mine shunting requirement. This will address the Saldanha Coal service and the containerised manganese to Saldanha.
- An injection of 30 x 43D's will be used to on the long trains due to power supply constraint. This will also improve reliability and fuel consumption.
- The 34 class diesels will reduce to 30 x 34D's to cater for other GF traffic, Infra and shunting purposes.
- By 2017/2018 all diesels on the Ore Line to be replaced by the new 44D diesels

General Freight Lines

- The deployment of the new electric dual powered locomotives will bring benefit in the manner in which trains are operated. The new AC/DC locomotives will have the capability to run through the interchange at Beaconsfield and Beaufort West thereby eliminating traction change over time.
- The dual powered locomotives for Postmasburg depot will service both the PMG-PE route and the Gauteng-Cape Town/PE route with Swartkops being the super depot.
- Swartkops 7E's retired in 2015/2016, 33XPRZ 7E2 cascaded to Swartkops to be retired in Swartkops the 2016/2017.
- 10E/2 to be converted to dual power locomotives and this will impact positively on the cycle times.

Impact on Crew and Maintenance depot

- Beaconsfield maintenance depot no longer required
- Investigate the possibility of De Aar as a book-off place
- Postmasburg to be the a critical turn around locomotive maintenance depot.

EXHIBIT 71

Deployment Strategy & Benefits : IOM

Financial Impact Analysis

- Car and container trains to Kaalfontein and Kazerne from PE will have an improvement in cycle time of 10 hours.
- Further fuel saving will be achieved with moving the combination of 15E and 34s to 15E and 43000. this is approximated to be around 1M litres
- Yard capacity to be reviewed at Kimberly due to run through and only hot seat changes.
- Parking of SWS 7E by 2015/2016:

EXHIBIT 72

Deployment Strategy & Benefits : IOM

TRANSNET

Financial Impact Analysis

- Car and container trains to Kaalfontein and Kazerne from PE will have an improvement in cycle time of 10 hours.
- Further fuel saving will be achieved with moving the combination of 15E and 34s to 15E and 43000. this is approximated to be around 1M litres
- Yard capacity to be reviewed at Kimberly due to run through and only hot seat changes.
- Parking of SWS 7E by 2015/2016:

EXHIBIT 73

New Locomotives Deployment Plan

Efficiency and Volume Growth

TRANSNET

Financial year 12/13 – 20/21

High Level Delivery, Cascading and Run out Plan for the Container and Automotive Business Unit

	Current Fin Yr 12/13	Fin Yr 13/14	Fin Yr 14/15	Fin Yr 15/16	Fin Yr 16/17	Fin Yr 17/18	Fin Yr 18/19	Fin Yr 19/20	Fin Yr 20/21
DBO 18E	222	222	222	222	222	(30) 252	(10) 262	262	262
BFX 34D	44	44	44	44	24	—	—	—	—
BFX 44D	—	—	—	30	(10) 40	40	40	(10) 50	50
WWB 37D	39	39	39	27	15	—	—	—	—
WWB 44D	—	—	13	(20) 33	33	33	(10) 43	(6) 49	49
TOTALS	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EXHIBIT 74

TRANSNET

Deployment Strategy & Benefits : CAB

General Freight

- Kazerne/City Deep
  - Postmasburg/Swartkops 20E locomotive fleet will cater also for the corridor to Cape Town. This will improve the container services between Gauteng and Cape Town
  - Reviewing the containers to Port Elizabeth to run via Beaconsfield. Including the motorcars.
  - This will improve on the assets cycle time thereby eliminating traction change overs at Beaconsfield and Beaufort West.

- Impact on Crew and maintenance depot
  - Retraining of crew on the new locomotives.
  - Introduce book-off where feasible.
  - Bellville to be major depot while Kaserne becomes a supporting depot for the new electric locomotives.
  - Review viability of Wentworth maintenance depot considering maintenance cycle times of 44D's versus 37D's and the 37D failures rates.

- Financial Impact Analysis
  - Fuel savings when replacing 34/37 with 44Ds
  - Parking of Wentworth 37D by 2017/2018 and Bloemfontein 34D by 2017/2018: SAVING

EXHIBIT 75

TRANSNET

Schematic view of the deployment of new locomotives into the Agriculture, Timber, Bulk Liquids and Africa Trade Business Unit Efficiency and Volume Growth

Financial year 12/13 – 20/21

EXHIBIT 76

TRANSNET

New Locomotives Deployment Plan

Efficiency and Volume Growth

Financial year 12/13 → 20/21

High Level Delivery, Cascading and Run out Plan for the Agriculture and Africa Trade Business Unit

	Current Fin Yr 12/13	Fin Yr 13/14	Fin Yr 14/15	Fin Yr 15/16	Fin Yr 16/17	Fin Yr 17/18	Fin Yr 18/19	Fin Yr 19/20	Fin Yr 20/21
BLE 35D	29	13	13	13	13	13	13	13	13
BLE 34D	14	14	14	14	14	14	14	14	14
BLE 18E	27	27	27	27	27	15	15	15	15
CPK 18E	5	5	(10) 15	15	15	15	15	15	15
STQ 6E (CPK+WSH+COL+KBD)	133	83	33	—	—	—	—	—	—
JHB 18E	—	50	(50) 100	100	100	(12) 112	(40) 152	(55) 207	(28) 235
SPR 35D	12	—	—	—	—	—	—	—	—
SPR 34D	17	(11) 28	28	28	28	28	28	28	28
CBE 34D	16	20	20	20	20	20	20	20	20
CBE 44D	—	—	—	—	—	—	15	15	15
TOTALS	253	240	230	217	217	217	272	327	355

EXHIBIT 77

TRANSNET

Deployment Strategy & Benefits : ABL

General Freight

- The Sentrarand depot will start to receive 18E's from 2013/2014.
- The 6E locomotives will be phased out by 2016/2017, with the rest upgraded to 18Es.
- Dieselise the Springfontein to East London and make Springfontein a run through yard.
- The depots under ABL will be standardised to 18E's on DC areas.
- The Polokwane 34D retired in 2020/2021 as we receive new diesels.
- Beaufort West no longer required as a change –over yard

Impact on Crew and maintenance depot

- Retraining of crew on the new locomotives.
- Introduce book-off were feasible.

6. Business unit power sheets

See attached power sheer excel file "20130418 Supporting Document F6 Business Unit Power Sheets"

1777

7. NPV analysis

Present Value to Start of Fin Year 2014

	PV	2014	2015	2016	2017	2018	2019	2025	2030	2035	2040	2045	2046	2047	2048	2049
Total volumes (Net tons)		91	104	127	151	161	170	170	170	170	170	170	170	170	170	170
Incremental Volumes (Net tons)		1	7	21	41	60	77	87	89	89	89	77	60	40	21	5
Tariffs Average (R/Tonkm)		0.42	0.45	0.48	0.50	0.54	0.58	0.84	1.12	1.50	2.01	2.69	2.85	3.02	3.20	3.39
Average distance (Kms)		557	551	553	533	539	542	542	542	542	542	547	542	547	542	542
Revenue	109 104	272	1835	5517	10947	17437	24195	40540	54252	72601	97156	111386	91952	65835	36392	9884
Total Diesel TCO	22 080	2674	3323	4040	4846	4729	3047	4894	6196	8745	13214	9320	8621	3475	0	0
Diesel TCO																
Initial capital outlay	8 314	2 583	2 703	2 876	3 056	2 190	0	0	0	0	0	0	0	0	0	0
Disposal value	0															
Fuel	8 657	90	450	874	1 233	1 713	2 004	2 814	3 735	4 956	6 577	5 600	3 940	2 067	0	0
Maintenance	1 849	1	14	63	124	220	327	986	869	1 584	1 687	1 187	896	470	0	0
Personnel costs	3 029	0	130	256	398	559	662	1 018	1 462	2 069	2 769	2 377	1 675	880	0	0
Insurance	49	0	7	5	7	10	11	16	21	28	38	33	23	12	0	0
Emissions	182	0	9	17	26	36	42	60	80	107	144	123	87	46	0	0
0% Hedging costs (included in purchase price)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Electric TCO	21 763	318	2016	5216	6033	6892	8431	5396	5485	7082	10190	11523	9642	7261	4617	1266
Electric TCO																
Initial capital outlay	22 252	318	1 974	4 951	5 352	5 689	6 670	0	0	0	0	0	0	0	0	0
Disposal value	0															
Fuel	3 801	0	21	133	337	577	840	1 465	1 956	2 611	3 486	4 318	3 683	2 768	1 731	470
Maintenance	1 724	0	0	1	17	70	152	835	1 346	1 403	2 599	2 109	1 610	1 224	839	240
Personnel costs	3 401	0	17	110	275	468	692	1 312	1 863	2 665	3 567	4 428	3 779	2 841	1 778	483
Insurance	53	0	0	2	5	8	12	21	27	37	43	61	52	39	24	7
Emissions	531	0	3	19	48	80	117	204	273	366	487	608	519	390	244	66
0% Hedging costs (included in purchase price)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Contingency adjustment to corporate plan																
Total Wagon costs	12 463	3028	3456	3579	3424	2943	1128	[illegible]	1238	1698	2331	2741	2275	1637	910	248
Purchase cost	10 017	3022	3417	3462	3228	2559	649	0	0	0	0	0	0	0	0	0
Capex	1 583	3	23	70	151	247	339	591	817	1135	1577	1877	1561	1126	627	172
Opex	863	3	17	48	95	142	190	318	421	563	754	864	714	511	282	77
Total infrastructure costs	18 491	1085	3171	4173	4272	4719	6803	3038	4065	5440	7280	8345	6890	4933	2727	741
Expansion	9 513	1026	2787	3379	3023	3092	4967	0	0	0	0	0	0	0	0	0
Capex and replacement capex	8 978	60	384	795	1249	1627	1837	3038	4065	5440	7280	8345	6890	4933	2727	741
Overhead costs	23 910	112	659	1585	2781	4055	5163	8539	11427	15291	20489	23456	19367	13866	7865	2092
[illegible] before tax	10 897	[illegible]	-10772	-13077	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
28% Effective Tax costs (negative = credit)	7 658	0	-341	-789	-1039	-1016	-290	5240	7073	9446	12619	15540	13101	9630	5686	1553
Cashflow after tax	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

8. Risk register

No	Key Elements	Risk Something will Occur	Impacts leading to..	Causes created by..	Controls controlled by..
1	Change Management Risk	Ineffective change management in implementing the strategies as encompassed in the	• Lack of buy in from labour • Lower employee morale • Employee resistance • Relocation of people	• Lack of understanding as to the business need for the changes • Ineffective communication resulting from the communication	None Pending deployment plan approval
2	Volumes Risk	Volumes Risk associated with the late delivery (1 064	• Loss of Revenue (R70.9bn) • Loss of Tonnages	• Current planned timelines may be at risk for local production) and suggest annual locomotive shortages peaking at 150 electrics and 70 diesels in 2015	• Close monitoring of the delivery schedule • 1 064 steerco
3	Planning Risk	Incorrect fleet life cycle planning	• tonnages not materialising as a result of the unavailability and unreliability of the fleet • projects falling behind schedule • underutilised assets • inability to deliver the fleet as per the plan	• Severely underestimating the contractual complexities • Adding additional requirements and complexities to the contract • Lengthy approval processes causing delays and mismatch between scheduled deployment and operational requirements • Non alignment between rolling stock planning network planning and technology planning • There is an inherent risk with the increase in number of OEM's The number of OEM's used for locomotives increases the acquisition time for design and testing and increases the contractual complexities • Unrealistic timelines creating undue pressure on fast tracking the time taken for design and testing • Lack of co-ordination and integration between the various Capital projects • Protracted negotiations • TFR lack of capacity to manage contracts • Lack of capacity / capability from the supplier to execute contracts within the required time frame • Ineffective lifecycle planning	• Standard agreement & standardised technical specifications • 1 064 loco steer committee • Improved approval process of prototypes prior to planned builds ahead of demand (Wagons & loco's upgrade) • Signed off user requirement specifications (Wagons) • Alignment of fleet deployment plan according to traffic file • Procurement controlled by current procurement strategy • Aggressive delivery forced by conservative payment regimes • None • None • Contract management process • Project Management, contractual terms for terminating and contract penalty clauses • Resuscitate of the fleet plan • Deployment plan

No	Key Elements	Risk Something will Occur	Impacts leading to..	Causes caused by..	Controls controlled by..
4	Market Risk	Inherent risk that the commercial sectors that the wagons and locomotives are built for do not achieve the anticipated market growth	• tonnages not materialising as a result of the unavailability and unreliability of the fleet • projects falling behind schedule • underutilised assets	• lower than anticipated customer demand • The anticipated customer demand does not materialise • The customer demand exceeds planned demand • not obtaining the right wagon mix for the right volumes of commodities at the right time	• Annual budget review of the demand (Demand file) • Logistic integration function (monitors asset performance & allocate resources)) • Annual budget review of the demand (Demand file) • Financial KPI focusing on asset utilisation (Return on total assets) • Annual/ Quarterly review of the build programme to align TE factories (wagon fleet)
5	Skills Risk	Lack of required skills to build maintain project manage and utilise the new fleet	• Delay in the execution of the fleet plan • Delay in project schedule/ deployment • Underutilised assets • Poor assets handling assets	• Insufficient maintenance skills (artisans, technicians) • Insufficient new generation technology maintenance skills • Train drivers not adequately equipped to utilise the new fleet • Inadequate transfer of knowledge of skills from the OEM to Transnet • Lack of project management skills	• Maintenance staffing plan • Succession plan & training with SOR • Train Drivers are trained in accordance with training plan • Training is built in the contract with the suppliers to train the maintainer (TRE) on the new technology • Project management staffing plan
6	Exogenous Risks	Impact of Eskom generation capacity shortage on the fleet plan Impact of strike action at major supplier plants	• Projects delay commissioning • Power shortages • Cost overruns • Scope creep	• Eskoms inability to secure long term sourcing contracts • Industrial action from major suppliers • Earthquakes • Floods • War • Sanctions or trade restrictions the world countries • Component prices going up	• Efficiency Improvement initiatives • Energy Saving Initiatives • Establish Energy Efficiency Forum • High level engagement with Eskom as to plans to address shortage of capacity (including contractual agreements with Eskom) • Complete list of TFR projects submitted to Eskom • Contracts clauses • Contract - under the force majeure clauses • The force majeure is valid for six months of which afterwards Transnet can terminate contract or apply breach of contract terms • SLA with suppliers of TRE • TFR and TRE annual price review and escalation to TFR

No	Key Elements	Risk Something will Occur	Impacts leading to...	Causes caused by...	Controls controlled by...
7	Governance Risk	Lengthy Approval processes Treasury note on supplier development has introduced uncertainty	• Delay in the execution of the fle	• long lead time in obtaining approvals as per PFMA requirements by DPE	• Project approval governance process
8	Operational Readiness	Inability to integrate new fleet into operations (readiness of the entire supply chain)	• loss of revenue • Poor return on investment • Delay in deployment • Underutilised capacity	• Lack of capacity by School Of Rail School Of Engineering & curriculum readiness (Skills) • Lack of maintenance capacity (Facilities and Personnel) at TE • Lack of capacity & facility alignment with TPT & Customers • Lack of fully integrated technology plan • Lack of Rail network maintenance capacity, poor condition of the track • Inadequate systems to support the operability of the fleet post deployment (Existing IT related systems) • Lack of proper handover of the asset to operations and maintenance • Impact of the deployment plan on the organisation i.e. fleet & ITP once the deployment plan has approved	• OR implementation guideline and Training approach & guideline • Maintenance Philosophy and Deployment Plan • Customer relations management • Technology plan • Rail Network Maintenance Plan • IT Plan and contracts • Draft Handover policy • Change impact Assessment
9	Maintenance Risk	Inability to align maintenance and build plan to the fleet plan	• Not meeting the delivery schedule • Exceeding planned unit price • Work not performed according to works instructions	• Supplier to deliver on the TFR mandate (normal scheduled maintenance, new build programme, major fleet overhaul	• 7 year maintenance plan (TRE) • Delivery of materials is planned ahead of demand • Annual/Quarterly review of build programme that align TRE factories • Production lines at TRE doubled • Additional material suppliers sourced • Some factories operating 24 hour shifts to mitigate risk of delay to schedule • Fix unit prices for major components
10	Technology implementation Risk	No clear identification of the technology functional needs and user requirements specifications	• Inadequate functionality of the fl	• Inadequate process to define the URS • Lack of fleet ownership to identify the technology functional needs (no clear URS)	• Project management process • Signed off URS
11	Technology risk	Inappropriate technology	• Wrong technology deployed Non optimal functional of the fleet	Lack of knowledge and expertise to provide correct specified technologies	Technology management section with experts

9. Fraud risk management plan

[illegible]							
Activities	Status	Responsibility	Progress to date	Start date	End Date	Objective	Measurement
Rollout Awareness Education/Training sessions to internal stakeholders involved in the 1064 Locomotive Acquisition process, which includes Fraud, Ethics & Information Security		Forensic Champion / TIA Forensic OD Leader				- Employees involved in the Locomotive acquisition process become aware of fraud and are able to identify incidents of possible fraud and report their allegations effectively	- Training to be aligned to 1064 Locomotive Acquisition plan / strategy.
Monitor the roll-out of Supplier Integrity Pacts for suppliers bidding for the supply of the Locomotives.		Forensic Champion / TIA Forensic OD Leader				- Ensure that suppliers bidding for the supply of locomotives are being made aware of the Supplier Integrity Pact and its content - Ensure that suppliers bidding for the supply of locomotives sign the Supplier Integrity Pact as part of their contractual obligations with Transnet	- Feedback provided at monthly Locomotives Acquisition Steering Committee
Perform a Fraud Risk Assessment on the 1064 Locomotive Acquisition process		Forensic Champion / TIA Forensic OD Leader				- Identify fraud risks associated with the Locomotive acquisition process. - Ensure controls and action plans are in place to mitigate fraud and corruption risks relevant to acquisition process	- Workshops to be scheduled with stakeholders timeously and - Fraud Risk Document distributed to all key Stakeholders involved in the acquisition process.
- Establishment of a Locomotive Acquisition Steering Committee (LSC) - Finalize the Mandate and terms of reference for the LSC.		Forensic Champion				- Ensure that there is oversight and that key stakeholders are held accountable in terms of their obligations in the locomotive acquisition process.	- Finalise terms of reference and mandate for the Locomotive Acquisition Steering committee.
High Value Gateway Review Process		Forensic Champion				- Provide assurance that due process is complied with in the acquisition of the Locomotives.	Timely delivery of assurance reports to Locomotives Acquisition Steering committee.
Conduct a Conflict of Interest compliance check for employees involved in the 1064 Locomotive Acquisition process		Forensic Champion / TIA Forensic OD Leader				- Determine compliance with the Declaration of Interest and Related Party Disclosures Policy - Identify possible conflicts of interest	- Timeous delivery of the final report to Steering Committee.
Conduct a Gifts compliance check for stakeholders involved in the 1064 Locomotive Acquisition process		Forensic Champion / TIA Forensic OD Leader				- Determine compliance with the Gifts Policy - Identify possible incidents of non compliance	- Timeous delivery of the final report to Steering Committee.
Conduct a Delegation of Authority compliance check for stakeholders involved in the 1064 Locomotive Acquisition process		Forensic Champion / TIA Forensic OD Leader				- Determine compliance with the Delegation of Authority framework - Identify possible incidents of non compliance	- Timeous delivery of the final report to Steering Committee.
Perform Vendor Due Diligence on all entities that proposed for 1064 locomotives, including site visits, 3rd tier business interests against Transnet restricted vendors and their directors		Forensic Champion / TIA Forensic OD Leader				- Determine compliance with all Transnet related Policies	- Timeous delivery of the final report to Steering Committee.
Conduct Memecast and Harddrive Analysis on all internal stakeholders involved in the 1064 Locomotive Acquisition process.		Forensic Champion / TIA Forensic OD Leader				Indentify possible fraud / corruption being committed by stakeholders in the 1064 Locomotive Acquisition process	-Timely delivery of reports to Management and the Locomotives Acquisition Steering Committee
Review and enhance OEM site visit guidelines		Forensic Champion / TIA Forensic OD Leader				- To ensure that dealings with OEMs are kept at arms length during site visits by Transnet employees or agents	- Timeous delivery of the enhanced OEM site visit guidelines to the Steering Committee for adoption.

10. 7-year man plan

	Yr12/13	Yr13/14	Yr14/15	Yr15/16	Yr16/17	Yr17/18	Yr18/19
Natcor							
Required	752	805	861	1025	1137	1205	1278
Available	408	408	408	408	408	408	408
Delta	344	397	453	617	729	797	870
Natcor2							
Required	216	231	247	294	327	346	367
Available	146	146	146	146	146	146	146
Delta	70	85	101	148	181	200	221
Coalline							
Required	783	838	896	1067	1184	1255	1330
Available	417	417	417	417	417	417	417
Delta	366	421	479	650	767	838	913
Ore line							
Required	156	167	179	213	236	250	265
Available	107	107	107	107	107	107	107
Delta	49	60	72	106	129	143	158
Capecor1&2							
Required	598	640	685	815	904	959	1016
Available	426	426	426	426	426	426	426
Delta	172	214	259	389	478	533	590
Hockeystick							
Required	278	297	318	379	420	446	472
Available	191	191	191	191	191	191	191
Delta	87	106	127	188	229	255	281
Westcor							
Required	128	137	147	174	194	205	217
Available	109	109	109	109	109	109	109
Delta	19	28	38	65	85	96	108
Northcor							
Required	236	253	270	322	357	378	401
Available	158	158	158	158	158	158	158
Delta	78	95	112	164	199	220	243
Sentracor							
Required	270	289	309	368	408	433	459
Available	208	208	208	208	208	208	208
Delta	62	81	101	160	200	225	251
Eastcor							
Required	212	227	243	289	321	340	360
Available	180	180	180	180	180	180	180
Delta	32	47	63	109	141	160	180
	Yr12/13	Yr13/14	Yr14/15	Yr15/16	Yr16/17	Yr17/18	Yr18/19
Required	**3629**	**3884**	**4155**	**4946**	**5488**	**5817**	**6165**
Available	**3100**	**3100**	**3100**	**3100**	**3100**	**3100**	**3100**

Delta	529	784	1055	1846	2388	2717	3065

11. Infrastructure plans

EXHIBIT 78

Track / Perway – Axle loading (Current status)

EXHIBIT 79

Electrification (Current status)

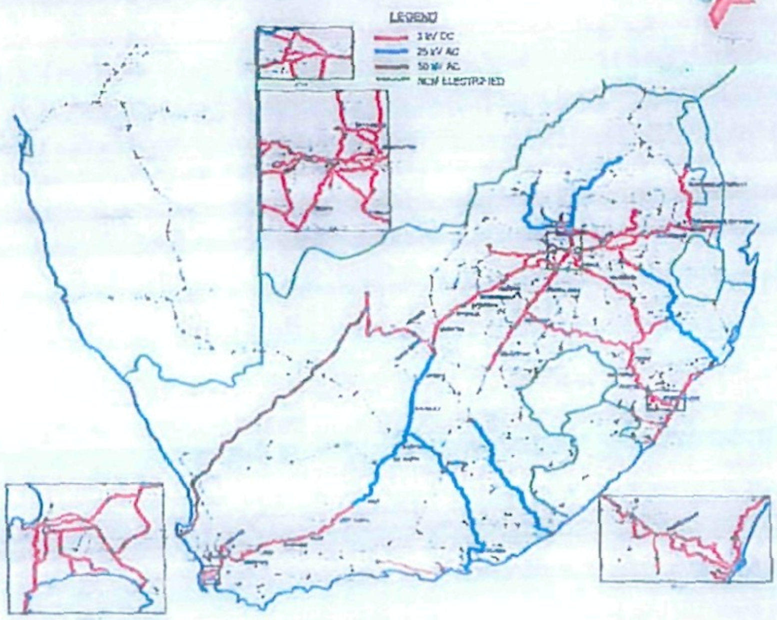


EXHIBIT 80

Expansionary infrastructure expenditure timeline

Business focus	Preparation for growth	Sustained growth	Consolidate
Infrastructure expansion: Perway/axle loading	• Increase axle loading • Increase coal line capacity to 81mt • Eskom 32mt project • Partial doubling of RCB-Nsezi line • Waterberg – Phases 2-5 additional passing loops • Manganese 16mtpa (Hotazel – Coega) • Swazi rail link 15mt. • Increase axle loading on Groenbult– Hoedspruit	• Increase axle loading • Increase coal line capacity to 81mt • Coal 91mt project (including Overall tunnel doubling) • Eskom 32mt project • Geluksplaas grade separation • Line tripling Broodsnyersplaas-Ermelo • Waterberg – Phases 2-5 additional passing loops • Manganese 16mtpa (Hotazel – Coega) • Ore line Phase 2A to 82.5mtpa • Swazi rail link 15mt	• Increase axle loading • Overall tunnel doubling • Coal 91mt project (including Overvaal tunnel doubling) • Eskom 32mt project • Line tripling Broodsnyersplaas-Ermelo • Swazi rail link 15mt • Doubling of all critical deviations
Infrastructure expansion: Electrical	• Increase electrical capacity on the AC section on the coal line • Upgrade section Rooikop-Newcastle. Manganese 16mtpa New and Upgraded sub-stations and OHTE	• Manganese 16mtpa New and Upgraded substations • Ore line Phase 2A to 82.5mtpa power upgrade (including of OHTE) • Increase electrical capacity on the AC section on the coal line • Coal 91mt project • Upgrade substations and electrical equipment • Commence with the conversion of 3kV DC to 25kVAC Ermelo-Pyramid South	• Completion of the conversion of 3kVDC to 25kVAC Ermelo-Pyramid South • Coal 91mt project • Eskom 32mt project • Upgrade substations and electrical equipment • Waterberg – Phase 6 (23mtpa) commence with the electrification of Thabazimbi-Lephalale • Conversion of 3kVDC to 25kVAC on Ermelo-Pyramid South
Infrastructure expansion: Signaling	• Manganese 16mtpa	• Pyramid South – Lephalale: Communication based authorisation (CBA) pilot installation • Manganese 16mtpa	• Commence with the re-signaling of the coal line (CBA)

EXHIBIT 81

Track / Perway – Axle loading (Future status)

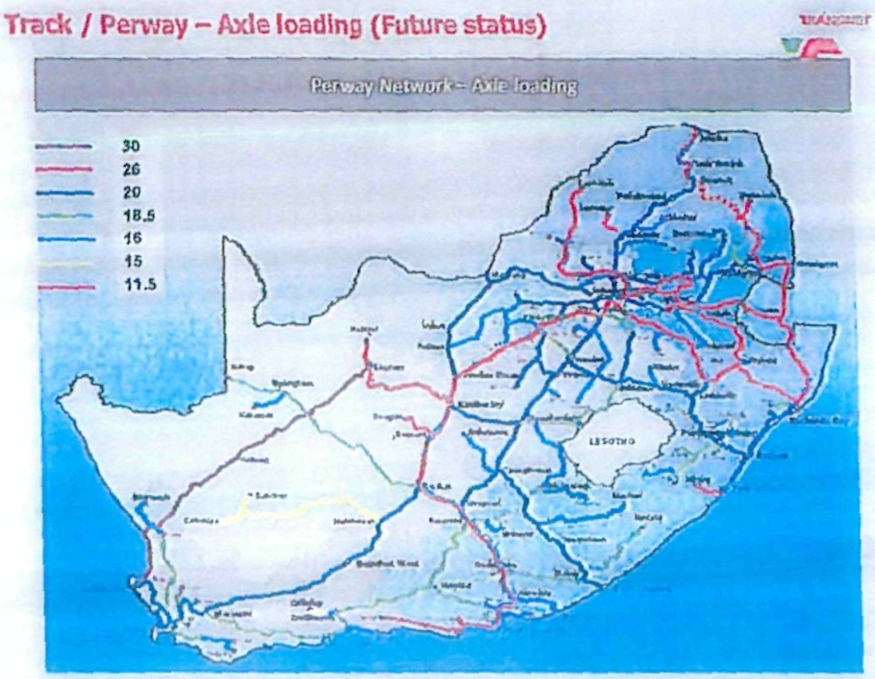
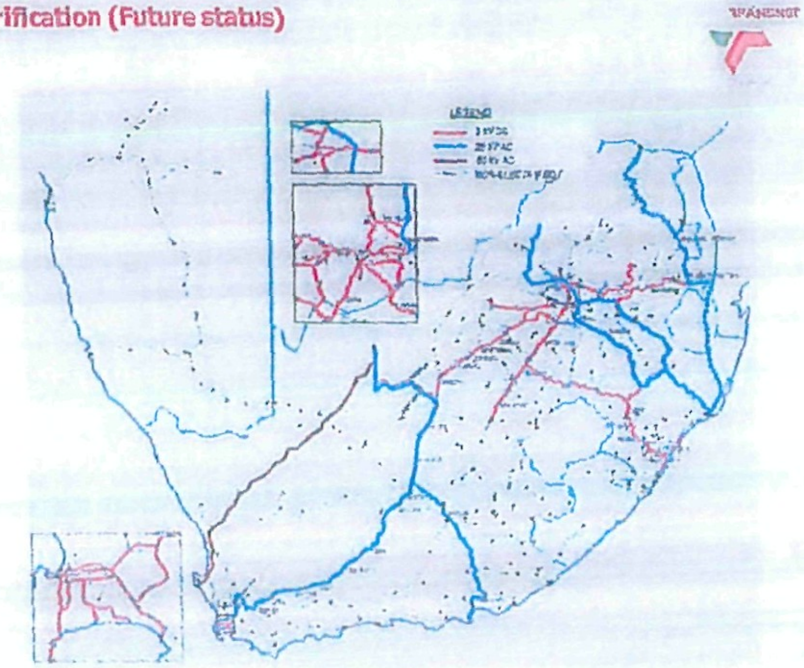


EXHIBIT 82

Electrification (Future status)



Transnet Freight Rail	Capital projects	
1064 Locomotives Team	25/04/2013	Page 105 of 117

EXHIBIT 83

Maintenance infrastructure expenditure timeline (1/3)

Business focus	Preparation for growth	Sustained growth	Consolidate
Infrastructure maintenance: sustaining Perway	• Increase on-track machines capacity and productivity • Accelerated rail replacement (765km to 865km) • Increase sleeper replacement (480 000 – 550 000/year) • Increase ballast screening (690km – 750km) • One line rail break mitigation plan. Wayside Intelligent Longstress measurement System (WILMA), Ultrasonic Broken Rail Detector System (UBRD) • Longstress measurement system (WILMA) – Natcor and coal line • Infrastructure sustains (General Freight business) tunnels and bridges • Additional three rail trains • Level crossing elimination/Level crossing protection (new bridges/protection systems) • Drainage rehabilitation • Formation rehabilitation • Install wheel impact monitoring and weigh-in motion (WIM-WIM) system	• Increase on-track machines capacity and productivity • Accelerated rail replacement (865km to 1 065km) • Increase sleeper replacement (550 000 to 650 000/year) • Increase ballast screening (750 – 800km) • Longstress measurement systems (WILMA) for core lines • Infrastructure sustains (General Freight business) tunnels and bridges • UBRD systems on General Freight business core lines • Level crossing elimination/Level crossing protection (new bridges/protection systems) • Drainage rehabilitation • Formation rehabilitation • Install wheel impact monitoring and weigh-in motion (WIM-WIM) system	• Increase on-track machines capacity and productivity • Accelerated rail replacement (1 065km to 1 200km) • Maintain sleeper replacement at 650 000/year • Increase ballast screening (800km – 850km) • Longstress measurement systems (WILMA) for core lines • Infrastructure Sustain (General Freight business) tunnels and bridges • UBRD systems on General Freight businesses core lines • Level crossing elimination level crossing protection (new bridges protection systems) • Drainage rehabilitation • Formation rehabilitation

2

EXHIBIT 84

Maintenance infrastructure expenditure timeline (2/3)

Business focus	Preparation for growth	Sustained growth	Consolidate
Infrastructure maintenance: Sustaining electrical	• Primary circuit breaker replacement • Track breaker replacement • Upgrade and replace switchgear (distribution subs) • Traction substations 25-year lifecycle intervention • Traction substations 50-year lifecycle intervention • Sabotage/vandalism/theft projects	• Primary circuit breaker replacement • Track breaker replacement • Upgrade and replace switchgear (distribution subs) • Traction substations 25-year lifecycle intervention • Traction substations 50-year lifecycle intervention • Sabotage/vandalism/theft projects	• Traction substations 25-year lifecycle intervention • Traction substations 50-year lifecycle intervention • Sabotage/vandalism/theft projects
Infrastructure maintenance: Sustaining signaling	• Consolidation of single manned cabins • Centralisation of CTCs • Subsystem replacement to extend life (e.g., replace track circuits, remote control systems, power equipment) • Migrate systems from copper to optic fibre (coal line, Manganese corridor, Natcor, Sentrarand area, Houtheuwel – Klerksdorp) • Installation of electronic interlocking systems (three pilot sites) • Resignalling of Kamfersdam – Postmasburg • Resignalling of Bellville – Wellington • Resignalling of Umgeni – Stanger • In-motion weighbridges • Upgrade/replace measurement systems	• Centralisation of CTCs • Subsystem replacement to extend life (e.g., replace track circuits, remote control systems, power equipment) • Migrate systems from copper to optic fibre (Port Elizabeth – De Aar, De Aar – Wellington, Empangeni, Ogies) • Rationalisation of signaling systems in the central region (Gauteng area) • Remodeling track layout and resignalling Gauteng area (Elsburg – India – Jupiter – Wattles) • Resignalling of Bellville – Wellington • Resignalling of Umgeni – Stanger • Replace PEL interlockings in the Karoo and Port Elizabeth • Upgrade/replace measurement systems	• Subsystem replacement to extend life (e.g., replace track circuits, remove control systems, power equipment) • Migrate systems from copper to optic fibre • Replace PEL interlockings in the Karoo and Port Elizabeth • Coal line: Upgrade/replace the Vehicle Identification System (VIS) • Resignalling projects on General Freight business lines commence

3

Transnet Freight Rail	Capital projects	
1064 Locomotives Team	25/04/2013	Page 107 of 117

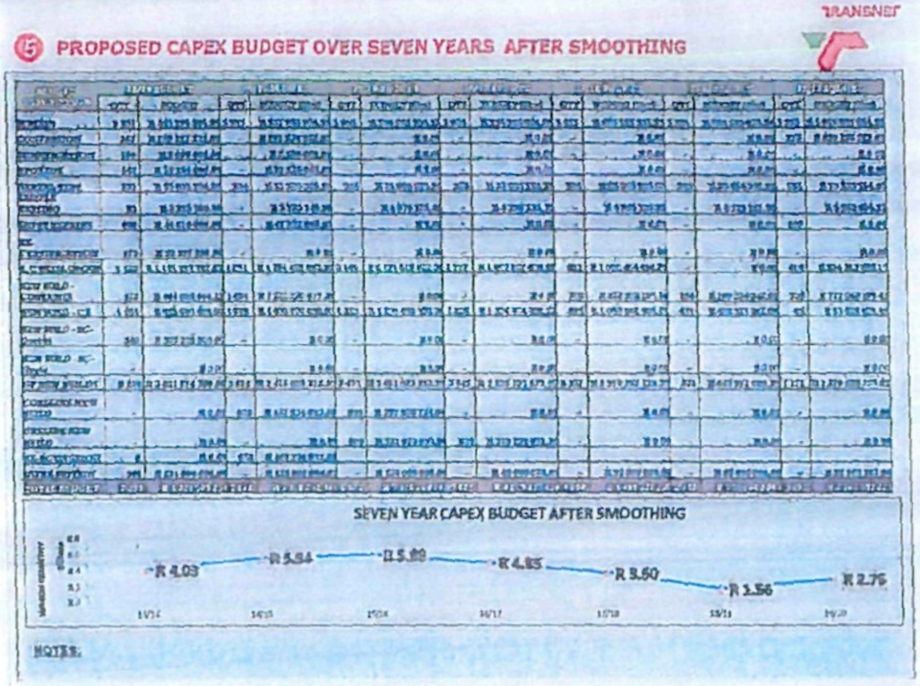
EXHIBIT 85

Maintenance infrastructure expenditure timeline (3/3)

Business focus	Preparation for growth	Sustained growth	Consolidate
Infrastructure maintenance: Sustaining telecoms	• Upgrade national optical fibre cable network • Upgrade and replace access multiplexers • Improve train communication in rail tunnels countrywide • Provision of new telecommunication backbone infrastructure • Train radios Phase 4 • Replace unstable masts and towers • De-copper in Empangeni, Ermelo and Ogies	• Upgrade national optical fibre cable network • Upgrade and replace access multiplexers • Improve train communication in rail tunnels countrywide • Provision of new telecommunication backbone infrastructure • Train radios Phase 4 • Replace unstable masts and towers	• Upgrade national optical fibre cable network • Upgrade and replace access multiplexers

12. Wagon requirements

EXHIBIT 86



13. Locomotive types and capacity

EXHIBIT 87

The GFB fleet currently has a total capacity of ~92 MGTK per year

Electric			Diesel		
Loco type	Number in fleet	Total capacity (MGTK p.a.)	Loco type	Number in fleet	Total capacity (MGTK p.a.)
6E	75	2,507	33	5	38
7E	216	23,224	34	318	7,689
8E	37	19	35	146	1,006
9E	0	0	36	167	244
10E	104	13,795	37	70	1,372
11E	1	130	38	38	827
14E	8	330	39	53	2,852
18E	597	34,026	43	53	4,235
Total	1038	74,031	Total	850	18,626

The current fleet is made up of 66 percent electric and 34 percent diesel with a total fleet size of 1,888 locomotives and capacity of 92 million gross ton kilometres per year. The active GFB fleet includes both the operational fleet and the fleet undergoing maintenance, but excludes mothballed locomotives. The operational fleet consists of the locomotives available for operations. Typically, 12 percent of the active fleet's locomotives are undergoing maintenance or minor repairs, but this varies depending on the level of reliability of individual locomotives and locomotive classes at any point in time.

The operational fleet is categorised into "shunters" and "workhorses." Workhorses are the prime movers, hauling loads between hubs, and generate the income earning net ton kilometres. They are TFR's inputs in locomotive efficiency measures. Shunters are primarily used to place and clear loaded wagons and compile trains before departure. Although shunters are not prime income earners, they are an essential component of operations and an overhead cost that must be covered.

14. Locomotive specifications

Locomotives have a long lifespan and the technology is constantly evolving. Therefore, to maintain efficiencies and capacity, TFR needs to procure recently designed locomotive types that not only enable it to deliver on the Fleet Plan but also capture the aforementioned operational efficiencies.

EXHIBIT 88

Doc ID

TRANSNET

General locomotive specifications

Locomotive feature	Electric		Diesel	
Energy source	• 25 kv AC and 3 kv DC		Diesel	
Maximum axle load (tonnes)	22		22	
Continuous tractive effort[1]	Bo-Bo 267	Co-Co 400	Bo-Bo 267	Co-Co 400
Base speed	34		34	
Maximum operating speed (km/hr)	100		100	

1 Bo-Bo: 2521 kw at 34 km/hr and Co-Co: 3778 kw at 34 km/hr

SOURCE: 1064 Loco Business Case Annexure K- Locomotive Specifications

4

Exhibit 9, above, shows the high-level specifications of the locomotives to be procured. A major feature of the procurement is that it offers suppliers the choice of providing either Bo-Bo[9] or Co-Co[10] wheel configurations. It also requires the electric locomotives to run on both AC and DC lines given South Africa's gridline structure.

The proposed locomotives have significant improvements in engine design and lower pollutants per tonne kilometre. They are 8 percent more fuel efficient and are also more powerful, with a continuous tractive effort of 349 kN compared to the 218 kN of the class 34 diesels in dry conditions.

A direct comparison of class 6E and 18E to the proposed new locomotive is not possible. However, our knowledge of and experience with the recently delivered 19E and 15E suggest TFR can expect an electrical

[9] Two-wheel configuration

[10] Three-wheel configuration

efficiency improvement of at least 18 percent, as well as regenerative capability that feeds power back into the Eskom grid. The design calls for a tractive effort between 267 and 400 kN, which is considerably higher than the 170 kN of the 6E series or the 200 kN of the 18E series.

15. Technology

The new locomotives will all be equipped with new technology which is currently being retrofitted to the existing fleet. The technologies are summarised below.

- Integrated Asset Tracking to track locomotives and wagons using a combination of tracking technologies including GPS and GPRS.
- Electronic Control Pneumatic Braking (ECPB). This enhances the current pressurised air brake system by sending an electric signal via a control cable simultaneously to all wagons to apply their brakes. This eliminates the propagation delay encountered in the traditional system where the signal is pneumatically transmitted from the locomotive down the length of the train. A result of this system trains brake more responsively and more evenly and safer. It is being implemented on all 200 wagon trains.
- Radio Distributed Power enables driverless locomotives to be placed within the length of the train and remotely control them from the lead locomotive. This enables longer and safer trains as the tractive forces are more evenly distributed along the length of the train. Coupler breakages because are reduced to being eliminated as the tractive forces are no longer concentrated at the leading locomotive consist.

This technology was pioneered on the Iron Ore Export Line and will be used in other heavy haul operations but will not be universally fitted.

- Cab based authorisation, control and communication systems. This cab mounted equipment provides an unobtrusive visual display to the driver with easy and intuitive controls and inputs. There are also interfaces to the locomotive controls providing automatic stop features in the event of over speeding or failure to adhere to a valid command.

All new locomotive designs will incorporate the design ergonomics of these systems and interfaces to the locomotive controls conception through to commissioning.

Retrofitting this equipment to existing locomotives almost always results in suboptimal ergonomic designs and control interfaces.

- Electronic Fuel Injection Engine Technology provides better green fuel efficiencies and higher power output using micro controllers that intelligently switches the engine on and off to eliminate excessive idling. Indications are that these could reduce the energy bill for these locomotives with up to 10 percent.
- Data Loggers report on the condition (health) of the locomotive fleet, thereby optimising maintenance and improving efficiencies in the maintenance of the locomotive fleet. It is planned

that this information is transmitted back to the central locomotive control for maintenance planning and to analytically develop preventative maintenance measures.

- Trip Optimisers are being tested and evaluated for diesels and are being considered for electric locomotives. The Trip Optimiser results in significant fuel and energy savings as it computes the best match for the throttle / notch position of the locomotive to preloaded profile for the trip and running time to be achieved. Using the trip optimiser ensures that only the optimum power is applied at any one time and integrated over the trip, the minimum energy is consumed. As a stand-alone system with automatic throttle control, energy savings of 3 percent - 17 percent are indicated in the commercial literature depending on the locomotive type, track conditions and driver behaviour. Further savings are possible depending on the degree of integration into other systems such as Dynamic Brake Control, Integration with Train Authorisation Systems and ultimately Movement Planning.

16. Change management plan

Area	Scope	Responsibility and Plan
1 New Train Crew	Train 3065 drivers over life of MDS	**Responsible:** School of Rail and Logistics Integration Current there is a capacity of 500 drivers and 500 train assistants per year This will be continuously reviewed based on the following lean initiatives 1 One man crew project that will allow TFR to fast track trained assistants to become train drivers 2 Continuous Professional Learning program being put in place of the current relicensing program This will reduce the relicensing program from 22 days per 2 years down to 6 days per 2 years as per international alignment best practice 3 Improving train running times with the injection of the new, more reliable and operationally flexible fleet of locomotives will require a review of number of drivers required 4 Create sufficient capacity for additional new recruits Caveat start training immediately Plan: • Training maximum number of drivers possible to close shortfall and create excess supply for years where SoR cannot meet demand • Supplement new drivers by fast tracking trained assistants to become train drivers
2 Existing Train Crew	• Retrain existing crew onto new locomotives	**Responsible:** School of Rail and Logistics Integration Conversion takes place according to rollout Diesel – Diesel and Electric – Electric 8 working days and three supervised "quarantined" trips under local section manager Diesel – Electric and Electric - Diesel : 15 working days and three supervised "quarantined" trips under local section manager: • Phalabora – Richards Bay : completed for class 43D • Saldahna- completed for Class 43D • Welgedag and Ogies – underway for Majuba
3 New train operating p	• Consult train crew on new operating practise's	**Responsible:** General Manager Logistics Integration supported by Change Leadership Plan: • Already implemented Phalabora – Richards Bay (Use lessons learned to prepare consultation material) • Prepare consultation material based on deployment plan – end April 2013 • Prepare roll out countrywide based on loco deployment plan • Consult with labour on trains running through and by passing yards Crew change in-line • Conduct face to face engagements with Train Crew Staff (Section Managers/Train drivers, Train Assistants and loco prep crews) based on deployment plan timelines
4 Current Locomotive T	• Electronic Control Pneumatic Braking • Radio Controlled Power • On Board Computers with speed profile and limit of authorisation movement control	**Responsible:** School of Rail and Logistics Integration Current technologies being further rolled out Plan: • Plan developed to bring current drivers and personal to the latest technologies being deployed • Continuously update training material with the later technologies being deployed to deliver new recruits to the new technologies • Included in conversion course where required • Points above apply to School of Engineering

5	New Locomotive Technologies - Driver		
5.1	Cab Based Authorisatio	• Similar to the On Board Computer but with additional features to fully replace lineside signalling systems	**Responsible:** Development Technology Management Implementation Capital Program Training Material: Technology Management (Technical Lead) Rail Directives (Train Working Regulations) School of Rail (Compile Training Material) Training School of Rail **Plan:** As the new technology is rolled out by corridor. Not directly linked to the 1064 but will require retro-fitting as and when.
5.2	Trip Optimisers	• Computes the best match for throttle / notch position against preloaded speed and gradient profile	**Responsible:** Development Technology Management Implementation Capital Program Training Material: Technology Management (Technical Lead) Rail Directives (Train Working Regulations) School of Rail (Compile Training Material) Training School of Rail **Plan:** • Incorporated into driver training. As the new technology is accepted and rolled out
6	Locomotive Commiss	• Ensure sufficient skilled technical staff to receive and commission locomotives on delivery	**Risk:** Identified as a Key Risk **Responsible:** Capital Program **Plan:** • Sufficient skilled technical staff exist within Transnet, particularly in Transnet Engineering as Locomotive Fleet managers and similar • Identify the Transnet pool of skilled staff competent to commission / accept locomotives – Capital Program • Compile commissioning schedule – Capital Program • Initial Liaison with TE for secondment of staff for the duration of locomotive commissioning process – TFR CE and TE CE
			• Detail and dynamic liaison with TE according to delivery schedule – Capital Program
7	Locomotive Planning TFR		
7.1	TFR - "Loco Control"	• Monitoring and Oversight of locomotive planning and utilisation • Accountable for locomotive allocation to Business Units • Final accountability for locomotive utilisation • Accountable for locomotives meeting maintenance schedules • Receive, analyse and utilise info from on board Loco Monitoring System • Receive, analyse and utilise info from wayside Acoustic Bearing Monitor System • Direct extra-ordinary maintenance	**Responsible:** General Manager, Logistics Integration **Plan:** • Develop Staff structure – complete • Approve Structure – Chief Opt Off - complete • Approve structure – CE and GM Human Capital – awaiting final signature • Appoint staff – Target commence 1 June 2013 – complete Dec 2013 Note: Many staff with requisite skills exist within Transnet and TE
7.2	TFR - Loco Resource Pl	• Strategic, tactical and operational planning and deployment of locomotives • Deviation monitoring and corrective action	**Responsible:** General Manager Capital Program and Information Technology for system capability General Manager, Logistics integration for planning (see Loco Control) Business Units for operational execution Plan • Integrated Asset and Train Planning capability being revamped and upgraded – Capital Program – 24 months (Business Case, Tender, Procure, Commission and Train, Implement)
7.3	Loco Condition and Log	• Current condition of locomotive • Planned maintenance schedule • Loco history	**Responsible:** General Manager, Capital Program and Information Technology for system capability General Manager, Logistics Integration for operational use **Plan:** • Integrate with TE systems • Load maintenance programs • Integrate with track and wayside monitoring equipment Hot Box detectors In motion weigh bridge Acoustic Bearing Detectors

8	Locomotive Maintenance TE		
8.1	Align maintenance par	• Workshop new maintenance paradigm with TE	**Responsible:** CE TFR with CE TE on high level implications General Manager, Capital Program COO and General Manager, Logistics Integration on practical implementation with their TE counterparts **Paradigm:** Time determined condition based maintenance, fit-on fit-off, OEM / specialised repair of fit on fit off components and not workshop repair, predictive analysis from monitoring systems, spares ready for called-in locomotive, technician to locomotive and not locomotive to workshop/depot, impact on skills, impact on staff numbers, impact on depots **Plan:** • Workshop maintenance paradigms, skills transfer from OEM, skills training, staff requirements and workshop locations • Plan engagement with Labour • Complete in line with award process (Adjudication informs the process)
8.2	Skills	• To have sufficient and proper skills in place to maintain new technology/ locomotives	**Responsible:** TE COO and GM Locomotives Supported by General Manager, Capital Program and General Manager, Logistics Integration **Plan:** • In conjunction with OEM's, determine required skill set/s • Informed by maintenance plans, determine number of technicians required and skills • Assess current artisans for skills migration (from mechanic and electrician to diagnostician) • Determine staffing per depot based on locomotive deployment (Two months after adjudication) • Have technical support from the relevant OEMs for a defined period to ensure that maintenance activities remain relevant and to required standard. This ensures that there is a smooth transition of technology understanding as well as reducing the risk of fleet reliability diminishing due to poor quality maintenance
8.3	Depots	• To optimise maintenance depots based on maintenance workload and new practices	**Responsible:** TE COO and GM Locomotives Informed by General Manager, Capital Program and General Manager, Logistics Integration **Plan:** • TFR informs required maintenance facilities based on deployment and workload – done – see deployment plan • TFR and TE align on final depot location, facilities required – end June 2013 • TE consolidates depots to final plan – according to rollout and deployment and consolidation of current fleet
8.4	Labour	• Consult with labour on impact of maintenance practises and skills on staffing requirements	**Responsible:** TE COO and GM Locomotives Supported by General Manager, Logistics Integration and General Manager, Capital Program, Executive Manager Employee Relations **Plan:** • Workshop with labour based new maintenance paradigm and requirements (end July 2013) • Ongoing consultation on affected depot by depot basis
8.5	Spares	• To ensure correct and sufficient spares	**Responsible:** TE COO and GM Locomotives Supported by General Manager, Logistics Integration and General Manager, Capital Program **Plan:** • Determine spares holdings based on OEM maintenance schedules • Initial spares supply to be negotiated as part of contract • Adjust requirements based on practical experience • With Procurement, set up mechanisms to minimise delivery delay • On basis of pending maintenance work, ensure spares are on the workshop floor to await arrival of locomotive • Have full OEM support for the fleets deployed

Project Authorisation Signatures

Transnet Freight Rail

Submission recommended:

Siyabonga Gama Chief Executive: Freight Rail	Date

Transnet Group

Submission recommended:

Anoj Singh Chief Financial Officer	Date

Submission recommended:

Brian Molefe Group Chief Executive	Date

EXHIBIT 2

SECRET

1064 TECHNICAL EVALUATION REPORT

599 GFB Dual Voltage Electric Locomotives

Specification No BBF 3795

(Tender TFRAC-HO-8608)

465 GFB Diesel Electric Locomotives

Specification No BBF 3701

(Tender TFRAC-HO-8609)

Document Classification: **SECRET**

25 October 2013

EXECUTIVE SUMMARY

This document presents the technical evaluation process, findings and results of the **fifth stage** of the tender evaluation process for Transnet's 1064 new GFB locomotives.

Seven bids for the 599 electric locomotives (tender number HOAC-HO-8608, technical specification BBF 3795 (Rev 4)) and four bids for the 465 diesel locomotives (tender number HOAC-HO-8609, technical specification BBF 3701 (Rev 3)) passed through the initial four stages of tender evaluations.

The tender documents for the eleven bids were evaluated by the technical teams and the **risks** relating to the various sections of the technical specification are listed in the annexures of this report. These risks should be mitigated through further clarifications and agreements during technical negotiations with the preferred bidder(s), before signing the contract, as changes to the technical designs later on during the design review phases may result in variation orders.

The **options** that need to be considered in order to comply with the specifications have also been listed. There are two categories of options to be considered, namely:

(a) options required to comply with the specification requirements (i.e. desirable requirements) and

(b) options that are over and above the basic requirements, but that were offered to enhance the product (e.g. the trip optimiser).

It is imperative that the "OPTIONS" be used by the finance department to determine the same base line for the offers during the financial adjudication process.

TECHNICAL EVALUATION RESULTS

The ranking of the tenderers in terms of scores achieved in terms of compliance to the technical specifications were as follows:

599 Electric Bo-Bo Locomotives

Ranking	Tenderer Number	Tenderer Name	Final Score
1	T2	CSR E-Loco Supply Proprietary Limited	96.5%
2	T1	BOMBARDIER Transportation	96.1%
	T7	MITSUI / TOSHIBA (MARS)	96.1%
3	T5	SIEMENS	91.9%
4	T3	ALSTOM Rail Consortium	89.7%
5	T6	CNR Import and Export Corporation LTD	86.1%
DSQ	T4	BONGIVELI	72.6%

Table 1: Ranking and final scores for the seven electric Bo-Bo locomotive tenders.

Six of the seven 599 Bo-Bo tenderers passed the minimum threshold of 80%. Tenderer 4 did not achieve the minimum 80% threshold. (Tenderer 4 did also not comply with all the mandatory clauses and has therefore been disqualified). Two of the 599 Bo-Bo tenderers scored the same and share the second place in the rankings.

599 Electric Co-Co Locomotives

Ranking	Tenderer Number	Tenderer Name	Final Score
1	T2	CSR E-Loco Supply Proprietary Limited	96.5%
2	T1	BOMBARDIER Transportation	96.0%
3	T7	MITSUI / TOSHIBA (MARS)	95.9%
4	T5	SIEMENS	92.1%
5	T3	ALSTOM Rail Consortium	89.8%
DSQ	T4	BONGIVELI	69.6%
N/A	T6	CNR Import and Export Corporation LTD	0.0%

Table 2: Ranking and final scores for the seven electric Co-Co locomotive tenders.

Tenderer T6 only submitted a Bo-Bo locomotive proposal and has not been scored. Five of the six 599 Co-Co tenderers passed the minimum threshold of 80%. Tenderer 4 did not achieve the minimum 80% threshold.

Five of the six 599 Co-Co tenderers passed all the MANDATORY clauses. Tenderer 4 did not comply with all the mandatory disqualifying clauses. Some of the sections of the specification in which tenderer 4 failed to comply include Control Systems, Brake Systems, Electrical Safety, Locomotive Power and Pantographs amongst others.

465 Diesel Bo-Bo Locomotives

None of the four 465 diesel tenderers proposed a Bo-Bo locomotive due to challenges with providing the required power whilst still conforming to the maximum permissible axle loading of 22 ton per axle.

465 Diesel Co-Co Locomotives

Ranking	Tenderer Number	Tenderer Name	Final Score
1	T2	CSR LOLIWE CONSORTIUM	95.6%
2	T1	CNR Import and Export Corporation LTD	92.9%
3	T3	EMD AFRICA	86.2%
4	T4	GE SOUTH AFRICA	86.1%

Table 3: Ranking and final scores for the four diesel Co-Co locomotive tenders.

All tenders passed the minimum threshold of 80%.

All four the diesel locomotive tenders complied with all the MANDATORY requirements in specification

PERFORMANCE

Different performance characteristics were provided by the respective bidders. All the tenderers achieved minimum performance requirements, however some tenderers offered locomotives that will perform higher than specified.

The tractive and braking effort of the class 19E (26t/axle) and the class 15E (30t/axle) have been normalised to 22 ton/axle. The lines of the "Existing TFR loco (normalised)" are shown as a reference line (dotted line). These comparative graphs for the 599 electric locomotives are shown in APPENDIX C, APPENDIX D for the Bo-Bo offers and in APPENDIX G and APPENDIX H for the Co-Co offers. For the 465 Co-Co diesel locomotives the class 43 tractive braking effort characteristics have been used as reference to which the offered locomotives can be compared. These comparative graphs are shown in APPENDIX J and APPENDIX K.

Of the successful tenderers for the 599 electric locomotives, the tractive effort characteristics offered by T2(electric) has offered the highest performance.

Of the tenderers for the 465 electric locomotives, tenderer T3(diesel) is offering the locomotive with the highest power. However the offer is for a bogie control locomotive, which will have an effect on the allowable wheel diameter difference per bogie and between bogies. The allowable differences in wheel diameters will have an impact on the long-term maintenance practices and as such on the life cycle cost of the locomotives.

This must be assessed during the life cycle cost evaluation. (With bogie controlled locomotives, the failure of a power system component results in a 50% loss of TE(tractive effort) or BE (braking effort), which will result in an increase in the turn-around time of the affected train, but the financial impact cannot be definitively quantified.)

The differences in performance should influence the decision when there are tenderers that are close to each other on pricing.

RECOMMENDATIONS

Based on the findings of the technical team in terms of tenderer T4(electric)'s failure to comply with some of the **mandatory** clauses. it is recommended that Tenderer 4 does not continue to the next stage of the adjudication. The list of mandatory clauses on which T4 defaulted is included in this report.

- End of Executive Summary -

Compiled: ____________ **Supported:** ______________

Compiled	Supported
Winfried Mörs	**Frikkie Harris**
Principal Engineer	**Principal Engineer**
(Traction Technology)	**(Capital Program)**

TABLE OF CONTENTS

Contents

TABLE OF APPENDICES

TECHNICAL COMPARISONS

TECHNICAL RISKS

TECHNICAL OPTIONS

1 PROCESS FOLLOWED DURING SPECIFICATIONS AND EVALUATION

1.1 Evaluation Stages

The technical evaluation teams were informed that there would be six stages in the tender evaluations, namely:

Stage 1&2: Responsiveness and Substantive

Stage 3&4: Local Content and Supplier Development

Stage 5: **Technical Evaluation**

Stage 6: Financial

1.2 Mandate

The mandate, responsibility and involvement of the technical teams during the 1064 tender evaluation process was limited to stage 5, namely to:

(a) determine the level of compliance to the TFR technical specifications with judgement of compliance level based only on the submitted information - the teams were requested to base their evaluation purely on the information contained in the tender documents; (i.e. knowledge of tenderers capabilities and or products based on previous projects, e.g. the class 20E (CSR), the class 19E (Toshiba) and the Class 43 locos (GE) should not be used);

(b) early identification of potential technical risks (i.e. early identification of items that may need to be further negotiated during the technical negotiations with "preferred bidders");

(c) providing of a technical evaluation summary report.

The technical team understanding was that the final technical score would **NOT** be transferred to the next stage of the evaluation, but that the technical scores would only be used as a "gate" through which the locos have to pass to reach the next stage of the tender evaluation, using a minimum technical pass rate of 80%. The technical scores therefore DO NOT influence the final outcome of who the tender would be awarded to.

The tenderer's scores were ranked from highest level of technical compliance to the lowest and the unsuccessful technical bids were highlighted in red.

1.3 Technical team support to the financial evaluation

Some members of the technical team was also requested to prepare to render further assistance to the next stage of the evaluation, by starting to look for the various OPTIONS that were offered by each of the respective tenders and which will be required for FULL COMPLIANCE and which should therefore be included into the base price of all the locomotives for a comparative financial evaluation.

1.4 Security and confidentiality

The team members were each appointed to the technical evaluation panel by a letter from the TFR CE. All technical evaluation team members were required to sign confidentiality agreements and declarations of interest. The technical team was isolated in a separate working area with restricted access.

On the first day a presentation was held by the TIA Forensic Division to sensitise the members of the technical team about the nature of fraud and the risks thereof. Technical team members were requested not to have any contact with any representative of the tenders and in case such communication was unavoidable, that the nature of the communications be declared on the daily register held in the evaluation room.

No correspondence with or further clarification requests from tenderers were allowed during the technical evaluation process, i.e. the technical evaluation was based purely on the submitted information supplied by the tenderers at the time of tender (files and CDs).

No personal computers were used during the technical evaluation, the technical team was provided with 5 laptops on which the scoring and report writing was performed.

At the end of each day the information (technical evaluation score sheets and technical risk reports by team members) from the computers were transferred to an external USB hard-disk. Access to this hard-disk was controlled by staff from TFR SCS (Supply Chain Services), using a register of information transferred between the five laptops.

The technical evaluation process was constantly supervised by a member of the TIA (Transnet Internal Audit) section. Mr. Craig Raman and Ms Princess Nsibande.

1.5 Segregation

The following information was NOT provided to the technical teams:

- Financial Information (cost of locomotives).
- Financial implications associated with exercising technical options provided to the technical teams.
- Any details of considerations or issues identified during the initial 4 stages of the tender evaluation.

All financial and other company information was withheld from the technical evaluation team and only the technical information (files) submitted by the various tenderers were provided. (The information contained on the CDs was kept under the control of the SCS representatives and only the relevant technical sections were provided to the technical teams as and when it was required.)

Due to the many tenderers, a very large number of files with technical information were received, requiring the technical teams to break up and each just handle their particular section of the specification of the evaluation. The sections were independently scored by the various sub-teams as listed below.

The technical evaluation team was split up into two groups, one group focussing on the mechanical aspects of the evaluation and the other group focussing on the electrical and control systems aspects. The two groups of evaluation team members are listed in APPENDIX WW and APPENDIX XX.

The mechanical teams started their part of the evaluation two weeks before the electrical teams, since most of the electrical team members were at that stage in China with design reviews and tests of the class 20E.

In order to share some of the findings and discuss some of the vital issues, intermediate meetings were held between the two groups in order to discuss items requiring a common understanding / agreement.

1.6 Assessment responsibility of technical teams

The clause-by-clause response spread sheets from the various tenderers were combined into a single spread sheet and submitted to the technical evaluation teams, together with the supporting technical documentation. These spread sheets are not included in this report and are separately available as signed documents.

The technical evaluation teams were instructed to check the tenderers self-evaluation in order to verify the compliance level to the requirements stated in each of the clauses and to apply the following scoring system. Three possible outcomes only, namely **full compliance** (score=2), **partial-compliance** (score=1) **or non-compliance** (score=0). MANDATORY clauses could only be scored **full compliance** or **non-compliance**.

The maximum score possible was calculated by multiplying the maximum score (i.e. 2) by the weight of each clause (10 or 3) and then summing these values for all clauses in the specification. This means that a section's weight in the entire specification is directly proportional to the number of clauses in that section (more specifically the maximum score for that section).

The various sections of the specification (A6-00 to A6-22) were not given individual weights relative to each other. A non-discriminate weighting system was applied (each of the clauses in the specification carrying the same weight). (This means that some of the sections, where more clauses were stipulated resulted in that section's total weighted score being much higher than a section where there were fewer clauses.)

The sections with fewer clauses (e.g. signalling EMC) could however decide whether the locos are acceptable at all or not, based on MANDATORY requirements.

1.7 Clause-by-clause Self-assessments

The tenderers were required to each submit their own clause-by-clause self-assessment as part of their response to the specifications, indicating their level of compliance from their own perspective. They were also requested to add comments next to each clause to substantiate or support their claims.

(*Note*: Items printed in italics were copied from the RFP documents.)

Tenderers were requested to provide the following possible self-assessments:

For each Essential or Desirable requirement, scoring shall be done on the following basis	
Full Compliance	2
Partial Compliance	1
Non- Compliance	0

Mandatory requirement clauses are not scored; (Full compliance to ALL the mandatory requirements is mandatory)	
Full Compliance	Full compliance to all mandatory clauses is mandatory.
Partial Compliance	Tender disqualification
Non- Compliance	Tender disqualification

- *For all instances where the response is "Non Compliance", please provide indicative cost and the impact to delivery if the requirement is not negotiable*
- *If there is a feature of the proposed solution that is not listed on the spread sheet, please provide the details and potential benefits to TFR of the feature*

The purpose of this spread sheet is for TFR to understand the gaps between the proposed solution and TFR's standard specification. Please provide comments that will assist in determining the overall best proposal.

1.8 Evidence and cross-reference requirements

The following instructions for populating the clause-by-clause self-assessment spread sheets were included in the specifications:

PROPOSAL RESPONSE REQUIREMENTS:

5.1 *It is essential that, over and above submission of a detailed technical description of the locomotive and its sub-systems being offered, tenderers must also submit a clause-by-clause self-assessment to each of the clauses of the specification, stating its level of compliance to each of the clauses (i.e. full compliance, partial compliance or non-compliance).*

5.2 *It is a mandatory requirement that the clause-by-clause response must also contain comments, evidence and detailed information (inclusive of cross references to the technical description) to each of the clauses in order to substantiate full-, partial and/or non-compliance of the tender's compliance self-assessments.*

TFR reserves the right to rate any inadequately substantiated clause as non-

compliant.

5.3 *To submit a detailed description of each subsystem in the locomotive for each type of locomotives proposed. This description shall include all schematics, drawings and part lists for Transnet Freight Rail to fully understand the technology being offered.*

In order to ensure an objective evaluation of the technical submissions, the focus of the technical evaluation was directed to ensuring evidence of compliance to each clause-by-clause response to the technical specification was provided.

2 Clause types

In order to ensure that TRANSNET specifications are not prescriptive to the locomotive designers, the requirements in the technical specifications were:

(a) predominantly functional and high-level (as opposed to a detailed low-level "nuts and bolts"-spec)

(b) clauses classified as either one of three types of requirements, namely **mandatory**, **essential** and **desired**.

2.1 Revised Classification

This approach allowed tenderers to propose "standard" or "off-the-shelf" type designs that include the latest available technology, whilst also providing tenderers with adequate information to optimally configure their proposals to the TRANSNET specific needs.

Abbreviation	Clause type	Weight Explanation as per Intro	Weight
MAN	Mandatory	Statutory requirements, safety critical requirements, strategic obsolescence management objectives and clauses, that if not met, will result in the locos not being usable on all TFR lines.	Not scored, disqualification if not FULL COMPLIANCE
ESS	Essential	Requirements that are critical to achieve performance requirements and/or alignment with TFR's strategic objectives and philosophy.	10
[illegible]	Desirable	Requirements which shall be considered in the design of the vehicle to provide the best whole life value solution across the train and infrastructure. The extent to which these are complied with will enhance support of TFR's business case for these locomotives.	3

It should be noted that the classification of the clauses had been revised, making sure that the Mandatory clauses are NOT scored, but that they are treated as disqualifiers

2.2 Previous definitions were as follows:

Requirement Classification	Definition	Weight
Mandatory	Requirements that are critical to TFR and that may lead to tenderer disqualification if not met.	10
Essential	Requirements that have been deemed essential because the analysis conducted by Transnet Freight Rail indicated that these requirements are necessary to deliver locomotives that meet TFR's key objectives and satisfy TFR's business case.	10 or 6
Desirable	Requirements that exceed the essential requirements, which shall be considered in the design of the vehicle to provide the best whole life value solution across the train and infrastructure. The extent to which achievement of these requirements strengthens TFR's business case for these locomotives shall determine whether the desirable requirements are worth providing.	3 or 1

Note: Mandatory clauses are generally clauses that relate to safety critical items and or compliance to other legal requirements. Not all mandatory clauses are reasons for disqualification, as in some cases alternatives could be offered.

2.3 Verification of accuracy of evaluation

In order to improve on the accuracy of the scoring, additional responsive requirements were added to the technical specifications, requiring tenderers to:

(a) perform their own compliance self-assessments
(b) provide substantiating evidence

The Excel-scoring sheets were also extensively prepared prior to the commencement of the technical evaluation with colour coded evaluation boxes and cross-checking formulas to eliminate scoring administration mistakes.

The score sheets were extensively cross-checked by members of the project management teams as well as by SCS and TIA for completeness (ensuring that all the clauses in all the sections had in fact been scored) and for non-conformances to the mandatory clauses.

3 DETAIL OF SCORING PER SECTION

3.1 Scores for the 599 Bo-Bo electric locomotive tenders

Section	Description	Tenderer 1 Bo-Bo	Tenderer 2 Bo-Bo	Tenderer 3 Bo-Bo	Tenderer 4 Bo-Bo	Tenderer 5 Bo-Bo	Tenderer 6 Bo-Bo	Tenderer 7 Bo-Bo	MAX Possible Score
A6_01	General Information and Requirements	630	630	610	580	570	580	600	630
A6_02	Locomotive Control System	1835	1841	1733	1106	1523	1743	1924	2190
A6_03	Simulation	20	20	0	20	20	20	20	20
A6_04	Rotating Machines	1324	1324	1311	1209	1279	1259	1324	1356
A6_05	Locomotive Transformer	809	742	775	539	740	778	774	880
A6_06	Locomotive Brakes	704	704	695	531	674	662	704	704
A6_07	Compressed Air and Vacuum Supply Systems	1481	1504	1458	1372	1494	1458	1504	1504
A6_08	Locomotive Air Supply and Auxiliaries	272	272	272	172	272	272	272	272
A6_09	Air and Vacuum Brakes General	606	606	606	586	606	606	596	606
A6_10	Coupling System	260	280	270	200	300	300	260	300
A6_11	Locomotive General and Driver's Compartment	1044	1024	964	106	1014	426	1014	1044
A6_12	Main Power Systems	2720	2801	2594	2527	2606	2673	2729	2834
A6_13	Locomotive Ablution Requirements	500	500	0	0	500	40	500	500

A6_14	Locomotive Maintenance	826	856	721	129	770	786	826	856
A6_15	Configuration Management	20	10	10	10	20	10	20	20
A6_15A	Interactive Electronic Manuals	300	300	300	300	300	300	300	300
A6_15B	Drawings	66	86	63	86	63	86	53	86
A6_16	Quality Assurance	566	566	566	566	566	566	566	566
A6_17	Locomotive Wheelsets Bearings, Gearwheels and Pinions, Gearcases, Suspension Bearings	2140	2170	2060	2160	2127	2140	2160	2170
A6_18	Electrical Infrastructure and Civil Infrastructure	58	58	58	55	58	58	58	58
A6_19	Communication and Train Authorisation operational Systems	260	230	260	0	200	230	240	260
A6_20	Electrical Safety Locomotive Power and Pantographs	6	6	6	6	6	6	6	6
A6_21	Structural Integrity	300	300	270	300	280	280	300	300
A6_22	Acceptance and Commissioning Tests	724	724	718	643	724	372	721	724
TOTAL SCORE		17471	17554	16320	13208	16712	15651	17471	18186
PERCENTAGE SCORE		96.1%	96.5%	89.7%	72.6%	91.9%	86.1%	96.1%	
SCORE RANKING		2	1	5	DISQ	4	6	2	

3.2 Scores for the 599 Co-Co electric locomotive tenders

Section	Description	Tenderer 1 Co-Co	Tenderer 2 Co-Co	Tenderer 3 Co-Co	Tenderer 4 Co-Co	Tenderer 5 Co-Co	Tenderer 6 Co-Co	Tenderer 7 Co-Co	MAX Possible Score
A6_01	General Information and Requirements	630	630	610	580	570	0	600	630
A6_02	Locomotive Control System	1815	1841	1733	1106	1529	0	1924	2190
A6_03	Simulation	20	20	0	20	20	0	20	20
A6_04	Rotating Machines	1324	1324	1311	1209	1279	0	1324	1356
A6_05	Locomotive Transformer	809	742	775	0	766	0	774	880
A6_06	Locomotive Brakes	704	704	695	531	674	0	704	704
A6_07	Compressed Air and Vacuum Supply Systems	1481	1504	1458	1372	1494	0	1504	1504
A6_08	Locomotive Air Supply and Auxiliaries	272	272	272	172	272	0	272	272
A6_09	Air and Vacuum Brakes General	606	606	606	586	606	0	596	606
A6_10	Coupling System	260	280	270	200	300	0	260	300
A6_11	Locomotive General and Driver's Compartment	1044	1024	964	106	1014	0	1014	1044
A6_12	Main Power Systems	2720	2801	2594	2517	2606	0	2716	2834
A6_13	Locomotive Ablution Requirements	500	500	0	0	500	0	500	500
A6_14	Locomotive Maintenance	826	856	721	129	770	0	826	856

A6_15	Configuration Management	20	10	10	10	20	0	20	20
A6_15A	Interactive Electronic Manuals	300	300	300	300	300	0	300	300
A6_15B	Drawings	66	86	63	86	63	0	53	86
A6_16	Quality Assurance	566	566	566	566	566	0	566	566
A6_17	Locomotive Wheelsets, Bearings, Gearwheels and Pinions, Gearcases, Suspension Bearings	2140	2170	2060	2160	2127	0	2160	2170
A6_18	Electrical Infrastructure and Civil Infrastructure	58	58	58	55	58	0	58	58
A6_19	Communication and Train Authorisation operational Systems	260	230	260	0	200	0	230	260
A6_20	Electrical Safety, Locomotive Power and Pantographs	6	6	6	6	6	0	6	6
A6_21	Structural Integrity	300	300	290	300	280	0	300	300
A6_22	Acceptance and Commissioning Tests	724	724	718	648	724	0	721	724
TOTAL SCORE		17451	17554	16340	12659	16744	0	17448	18186
PERCENTAGE SCORE		96.0%	96.5%	89.8%	69.6%	92.1%	0.0%	95.9%	
SCORE RANKING		2	1	5	DSQ	4	0	3	

3.3 Scores for the 465 Co-Co electric locomotive tenders

Section	Description	Tenderer 1 Co-Co	Tenderer 2 Co-Co	Tenderer 3 Co-Co	Tenderer 4 Co-Co	MAX Possible Score
A6_01	Locomotive General Information and Requirements	897	874	854	887	900
A6_02	Locomotive Control System	2134	2435	1990	1654	2634
A6_03	Simulation	20	20	20	20	20
A6_04	Rotating Machines	1358	1324	1010	1221	1370
A6_05	Diesel Engine	244	244	244	228	244
A6_06	Locomotive Brakes	224	204	224	224	224
A6_07	Compressed Air and Vacuum Supply Systems	798	748	792	798	798
A6_08	Locomotive Air Supply and Auxiliaries	26	46	46	46	46
A6_09	Air and Vacuum Brakes General	540	540	540	530	540
A6_10	Coupling System	280	280	280	280	280
A6_11	Locomotive General and Driver's Compartment	978	1005	998	1025	1058
A6_12	Main Power Systems	2847	2806	2326	2336	2922
A6_13	Locomotive Ablution Requirements	480	480	460	480	480

4 GENERAL RISKS

4.1 GENERAL RISK (1): Lack of differentiation of quality between offers

As previously reported, the combination of the "functional specification" with the "serial stages" applied in the tender evaluation process means that any locomotive that passes the minimal technical requirements would be considered in the financial evaluation that follows in stage 6.

This technical evaluation (stage 5) therefore will allow any locomotive that complies to the absolute minimum requirements and the technical evaluation to pass through. This in itself is the FIRST RISK concern that needs to be raised, namely that management must understand that the process will allow both a "SUZUKI" as well as a "ROLLS ROYCE" to pass through the technical evaluation.

The technical evaluation can **NOT** differentiate between **quality** of a SUZUKI and a ROLLS ROYCE, nor can it differentiate between expected **reliability** of the technologies.

4.2 GENERAL RISK (2): Uncertainties regarding deployment of locomotives causing sub-optimal application of locomotives and higher costs per kN tractive effort delivered

The specifications were originally written for GFB locomotives (at the time of compiling the specifications), however the specifications also made provision for both Bo-Bo and Co-Co locomotives.

It must be understood that some of the locomotives may be considered for heavy haul application.

It was required that tenderers should submit pricing for a combination between Bo-Bo and Co-Co (RFP documents) as indicated in Table 4: Combinations of split between Bo-Bo and Co-Co price submissions in Table 4:

Bo-Bo	Co-Co
100%	0%
75%	25%
50%	50%
25%	75%
0%	100%

Table 4: Combinations of split between Bo-Bo and Co-Co price submissions

Logistics Integration should preferably take part in the financial evaluation in order to determine the optimal combination to satisfy Transnet's deployment and operational needs.

A6_14	Locomotive Maintenance	707	866	881	910	956
A6_15	Configuration Management	10	20	10	10	20
A6_15A	Interactive Electronic Manuals	440	440	420	410	500
A6_15B	Drawings	146	146	73	83	146
A6_16	Quality Assurance	566	566	556	566	566
A6_17	Locomotive Safety Requirements	186	186	156	166	186
A6_18	Electrical Infrastructure and Civil Infrastructure	724	724	724	714	724
A6_19	Communication and Train Authorisation Operational Systems	230	280	240	240	280
TOTAL SCORE		13835	14234	12844	12828	14894
PERCENTAGE SCORE		92.9%	95.8%	86.2%	86.1%	
SCORE RANKING		2	1	3	4	

Once the Logistics Integrator has provided the desired Bo-Bo-Co-Co-combination and the required technical options, such as number of locomotives to be fitted with RDP or WDP, trip optimiser, types of bogies required, etc. then all options must be included in the final pricing model to ensure that sufficient ETC (Estimated Total Cost) is available.

5 REASONS FOR DISQUALIFICATION OF TENDERER 4

Please refer to APPENDIX UU and APPENDIX VV.

6 TECHNICAL RISKS

6.1 Main technical risks for the 599 electric locomotives

Please refer to the attached risk appendices.

6.2 Main technical risks for the 465 diesel locomotives

Please refer to the attached risk appendices.

6.3 Traction Motor 6 year Guarantee

Non-service proven traction motors are being offered. A standard clause must be included in the contract whereby the successful bidders will have to agree to a six year guarantee. (This is the same way in which the class 43 loco's non-service proven traction motors risk has been mitigated).

7 CONCLUSIONS

Of the seven tenders received for the 599 electric locomotives, six of the Bo-Bo and five of the Co-Co technical proposals complied to the minimum 80% threshold set for compliance to technical requirements.

All four the tenders for the 465 diesel locomotives complied to the minimum technical requirements of 80%.

The technical risks that have to be further clarified and negotiated with the preferred bidder(s) have been identified and are listed.

TRANSNET FREIGHT RAIL - SECRET

COMPARISONS

TRANSNET FREIGHT RAIL - SECRET

APPENDIX A: COMPARISON OF THE LOCOMOTIVE MAIN PERFORMANCE PARAMETERS FOR 599 Bo-Bo ELECTRICAL – TENDERS 1, 2, 3 AND 4

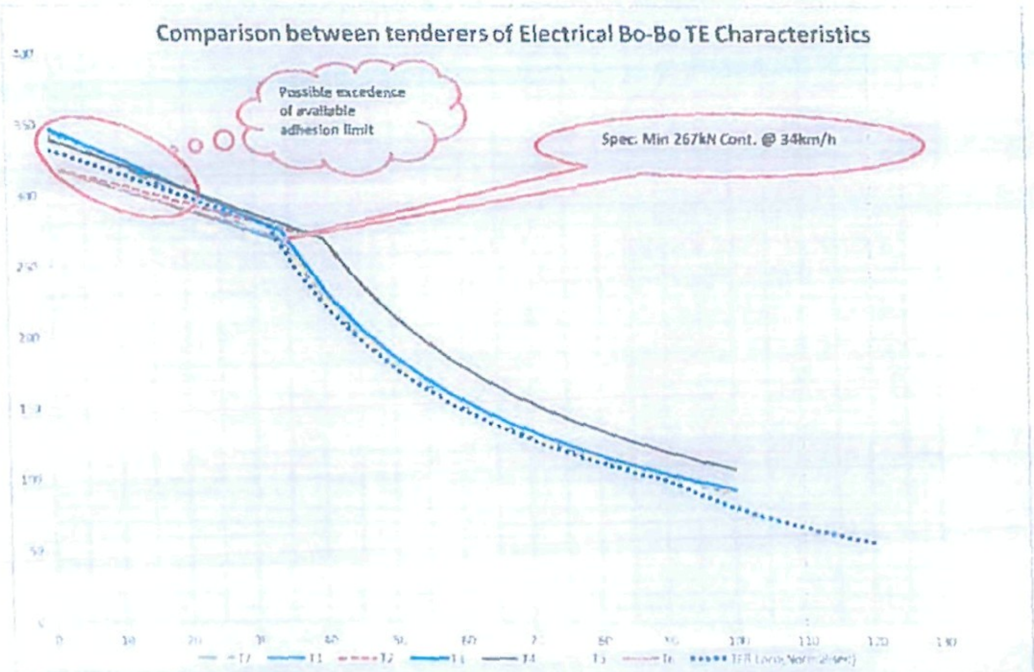
PARAMETER	Specification Requirement	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Starting Tractive Effort (kN)	N/A	320 kN	320 kN	347 kN	340 kN
Continuous TE (kN)	267 kN @ 34 km/h	269 kN @ 34 km/h	270 kN @ 40 km/h	275 3 kN @ 34 km/h	270 kN @ 40 km/h
Calculated Power at wheels (kW)	2522	2541	3000	2600	3000
Adhesion (%)	31%	31%	31%	25%	
Braking Effort (kN)	200 kN @ (5 to 45 km/h)	250 kN @ (5 to 37 km/h)	200 kN @ (5 to 54 km/h)	210 kN @ (5 to 45 km/h)	200 kN @ (4 to 54 km/h)
Power at Wheels (kW)	2521 kW	2540 kW	3100 kW	2600 kW	3000 kW
Axle Control	Yes	Yes	Yes	Yes	Yes
Length (m)	N/A	19 4 m	18 3 m	18 3 m	18 7 m
Axle Mass (tons)	22 tons	22 tons	22 tons	22 tons	22 tons
ECP/WDP/RDP (See Note 1)	Option Pricing	Offered	Offered	Offered	Offered
Max Speed (km/h)	100 km/h	100 km/h	100 km/h	100 km/h	100 km/h
AC/DC on-the-fly	On-the-fly	Yes	Yes	Yes	No
100% Power Range (AC)	22.5 - 30 kV	22 - 30kV	22 5 - 30 kV	22.5 - 29 kV	22.5 - 29 kV
100% Power Range (DC)	2.8 - 4 kV	2 8 - 4 kV	2.8 - 3.9 kV	2 8 - 4 kV	2.8 -3.8 kV

Note: 1: Ensure that the tenderers gave the prices for this option.

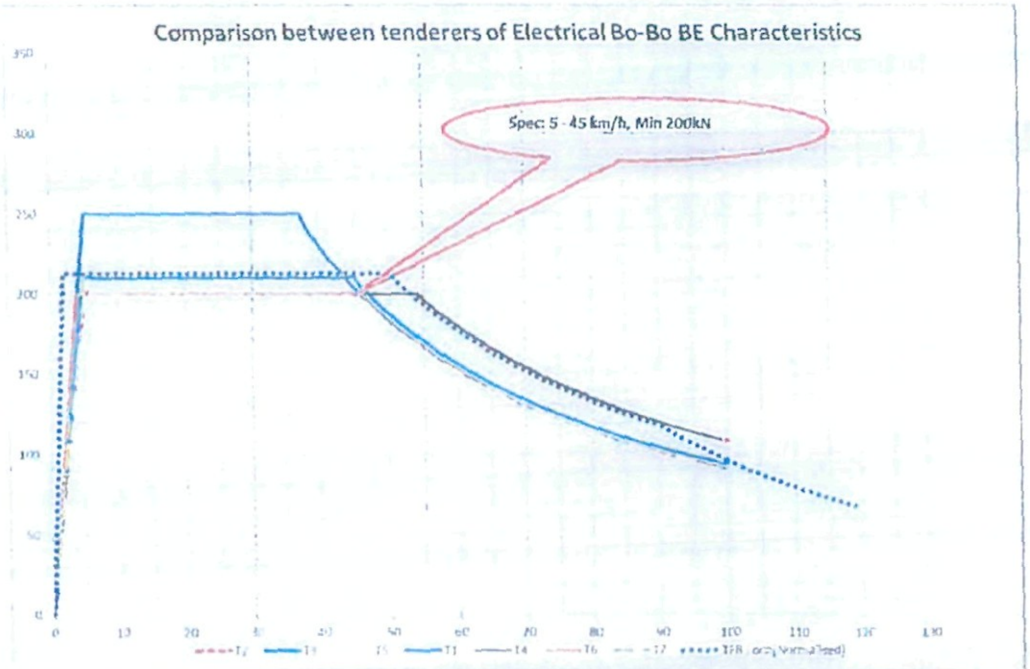
APPENDIX B: COMPARISON OF THE LOCOMOTIVE MAIN PERFORMANCE PARAMETERS FOR 599 Bo-Bo ELECTRICAL – TENDERS 5, 6 AND 7

PARAMETER	Specification Requirement	Tenderer 5	Tenderer 6	Tenderer 7
Starting Tractive Effort (kN)	N/A	300 kN	320 kN	345 kN
Continuous TE (kN)	267 kN @ 34 km/h	267 kN @ 34 km/h	270 kN @ 34 km/h	267 kN @ 34 km/h
Calculated Power at wheels [kW]	2522	2522	2550	2522
Adhesion (%)	31%	31%	31%	31%
Braking Effort (kN)	200 kN @ (5 to 45 km/h)	200 kN @ (5 to 45 km/h)	200 kN @ (4 to 46 km/h)	211 kN @ (5 to 45 km/h)
Power at Wheels (kW)	2521 kW	3200 kW	2550 kW	2637kW
Axle Control	Yes	Yes	Yes	Yes
Length (m)	N/A	19.5 m	20m	18.95 m
Axle Mass (tons)	22 tons	22 tons	22 tons	22 tons
ECP/WDP/RDP	Option Pricing	Offered	Offered	Offered
Max Speed (km/h)	100 km/h	100 km/h	100 km/h	100 km/h
AC/DC on-the fly	On-the-fly	Yes	Yes	Yes
100% Power Range (AC)	22.5 - 30 kV	22.5 - 30 kV	22.5 - 29 kV	22.5 - 30 kV
100% Power Range (DC)	2.8 - 4 kV	2.8 - 4 kV	3 - 3.9 kV	2.8 - 4 kV

APPENDIX C: COMPARISON OF THE TRACTIVE EFFORT CHARACTERISTICS OF THE 7 DIFFERENT 599 Bo-Bo OFFERS VS. AN EXISTING TFR ELECTRICAL LOCOMOTIVE



APPENDIX D: COMPARISON OF THE BRAKING EFFORT CHARACTERISTICS OF THE 7 DIFFERENT 599 Bo-Bo OFFERS VS. AN EXISTING TFR ELECTRICAL LOCOMOTIVE



APPENDIX E: COMPARISON OF THE LOCOMOTIVE MAIN PERFORMANCE PARAMETERS FOR 599 Co-Co ELECTRIC LOCOMOTIVES – TENDERS 1, 2, 3 AND 4

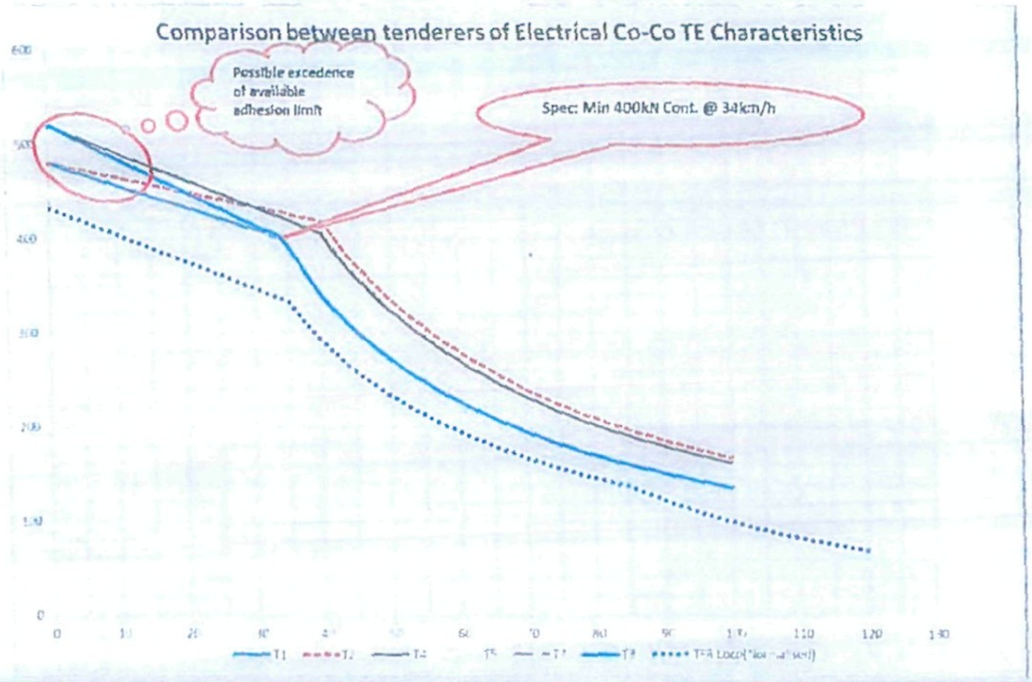
PARAMETER	Specification Requirement	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Starting Tractive Effort (kN)		480kN	480 kN	520 kN	519 kN
Continuous TE (kN)	400 kN @ 34 km/h	400 kN @ 34 km/h	418.5 kN @ 40 km/h	400 kN @ 34 km/h	405 kN @ 40 km/h
Calculated Power at wheels (kW)	3778	3778	4650	3778	4500
Adhesion (%)	31%	31%	32%	32%	32%
Braking Effort (kN)	300 kN @ (5 to 45 km/h)	375 kN @ (5 to 37 km/h)	300 kN @ (5 to 55 km/h)	315 kN @ (5 to 45 km/h)	300 kN @ (5 to 45 km/h)
Power at Wheels (kW)	3778 kW	3800 kW	4650 kW	3900 kW	4500 kW
Axle Control	Yes	Yes	Yes	Yes	Yes
Length (m)	N/A	22.2 m	20.7 m	21.38 m	21.5 m
Axle Mass (tons)	22 tons	22 tons	22 tons	22 tons	22 tons
ECP/WDP/RDP	Option Pricing	Offered	Offered	Offered	Offered
Max Speed (km/h)	100 km/h	100 km/h	100 km/h	100 km/h	100 km/h
AC/DC	On-the-fly	Yes	Yes	Yes	Yes
100% Power Range (AC)	22.5 - 30 kV	22 - 30kV	22.5 - 30 kV	22.5 - 29 kV	22.5 - 29 kV
100% Power Range (DC)	2.8 - 4 kV	2.8 - 4 kV	2.8 - 3.9 kV	2.8 - 4 kV	2.8 - 3.8 kV

APPENDIX F: COMPARISON OF THE MAIN PERFORMANCE PARAMETERS FOR 599 Co-Co ELECTRIC LOCOMOTIVES – TENDERS 5, 6 AND 7

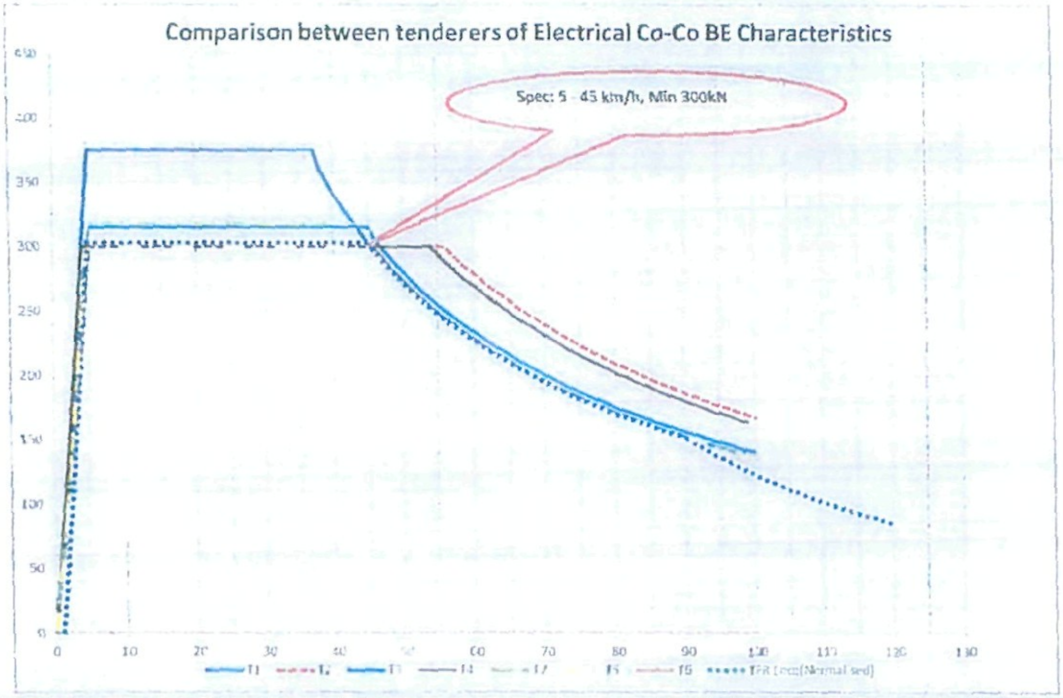
PARAMETER	Specification Requirement	Tenderer 5	Tenderer 6	Tenderer 7
Starting Tractive Effort (kN)		450 kN	(note 1)	518 kN
Continuous TE (kN)	400 kN @ 34 km/h	400 kN @ 34 km/h		400 kN @ 34km/h
Calculated Power at wheels (kW)	3778	3778		3778
Adhesion (%)	31%	32%		31%
Braking Effort (kN)	300 kN @ (5 to 45 km/h)	300 kN @ (5 to 45 km/h)		318 kN @ (5 to 48 km/h)
Power at Wheels (kW)	3778 kW	3778 kW		3778 kW
Axle Control	Yes	Yes		Yes
Length (m)	N/A	21.5 m		20.4 m
Axle Mass (tons)	22 tons	22 tons		22 tons
ECP/WDP/RDP	Option Pricing	Offered		Offered
Max Speed (km/h)	100 km/h	100 km/h		100 km/h
AC/DC	On-the fly	Yes		Yes
100% Power Range (AC)	22.5 - 30 kV	22.5 - 30 kV		22.5 - 30 kV
100% Power Range (DC)	2.8 - 4 kV	2.8 - 4 kV		2.8 - 4 kV

Notes:(1) Co-Co Not Offered by Tenderer 6

APPENDIX G: COMPARISON OF THE TRACTIVE EFFORT CHARACTERISTICS OF THE 6 DIFFERENT 599 Co-Co OFFERS VS. AN EXISTING TFR ELECTRICAL LOCOMOTIVE



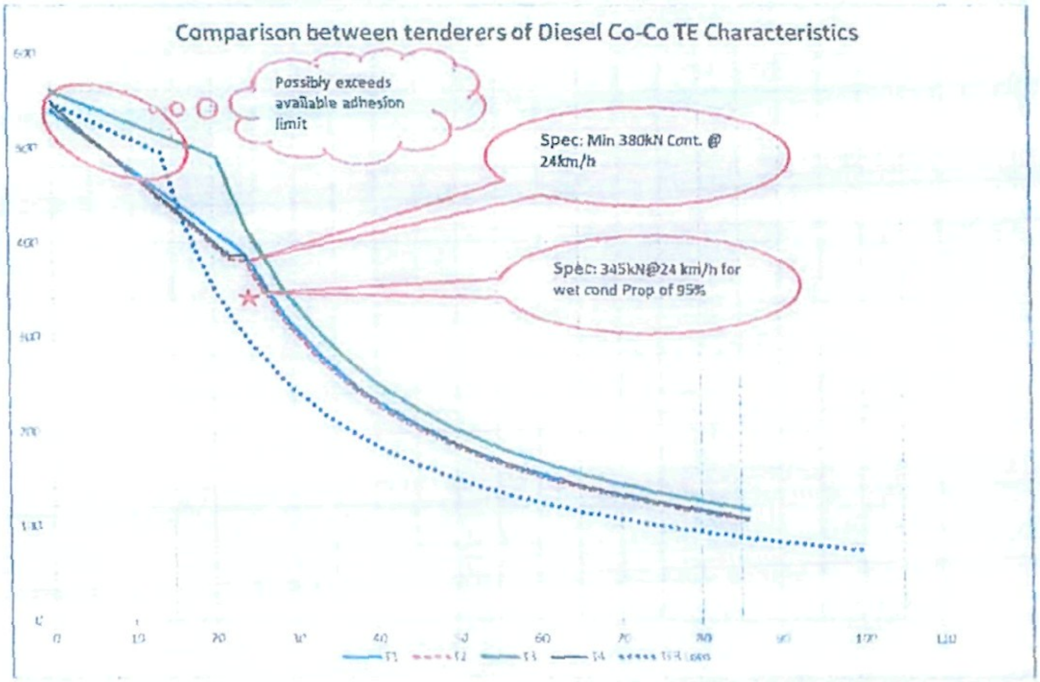
APPENDIX H: COMPARISON OF THE BRAKING EFFORT CHARACTERISTICS OF THE 6 DIFFERENT 599 Co-Co OFFERS VS. AN EXISTING TFR ELECTRIC LOCOMOTIVE



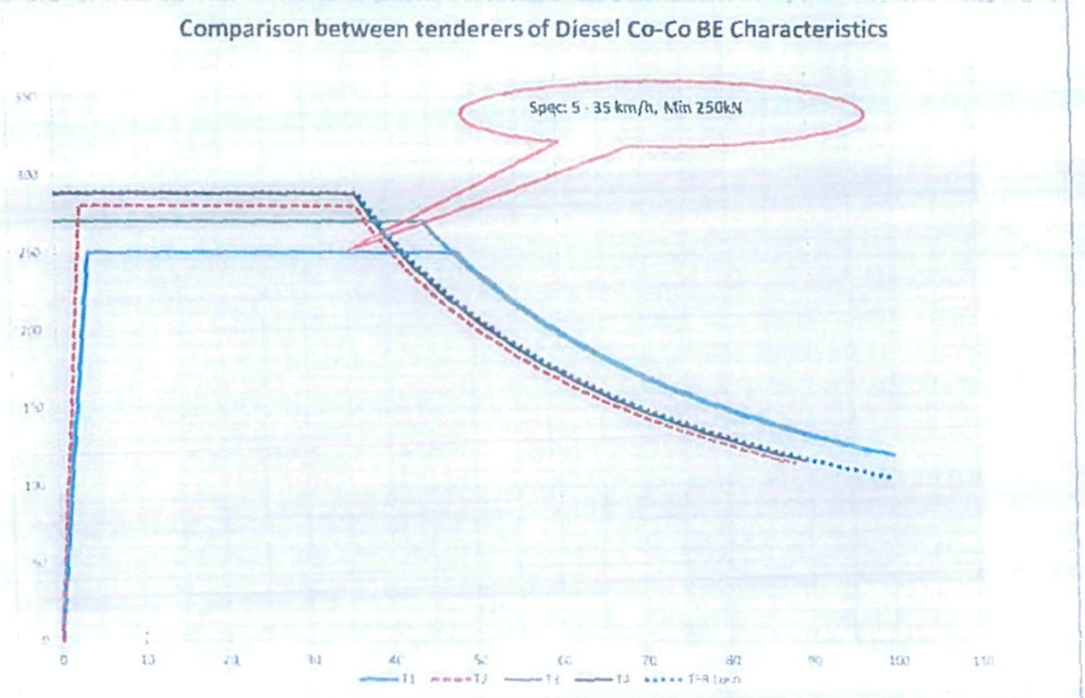
APPENDIX I: COMPARISON OF THE LOCOMOTIVE MAIN PERFORMANCE PARAMETERS FOR 465 DIESEL LOCOMOTIVES

PARAMETER	Specification Requirement	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Starting Tractive Effort (kN)		540kN	548 kN	560 kN	548 kN
Continuous TE (kN)	380 kN @ 24 km/h	387 kN @ 24 km/h	380 kN @ 24 km/h	490 kN @ 20 km/h	386 kN @ 24 km/h
Calculated Power on Wheels (kW)	2533.3	2580.0	2533.3	2790.0	2573.3
Adhesion (%)	31%	31%	31%	31%	31%
Braking Effort (kN)	250 kN @ (0 to 35 km/h)	250 kN @ (4 to 48 km/h)	280 kN @ (3 to 36 km/h)	270 kN @ (0 to 44 km/h)	288 kN @ (0 to 36 km/h)
Axle Control	Yes	Yes	Yes	No	Yes
Length (m)	N/A	21.030 m	23.000 m	21.869 m	20.536 m
Axle Mass (tons)	21 tons	21 tons	21 tons	21 tons	21 tons
ECP/WDP/RDP	Option Pricing	Offered	Offered	Offered	Offered
Max Speed (km/h)	100 km/h	100 km/h	100 km/h	100 km/h	100 km/h

APPENDIX J: COMPARISON OF THE TRACTIVE EFFORT CHARACTERISTICS FOR 465 DIESEL LOCOMOTIVES



APPENDIX K: COMPARISON OF THE BRAKING EFFORT CHARACTERISTICS FOR 465 DIESEL LOCOMOTIVES



APPENDIX L: COMPARISON OF EQUIPMENT RATINGS FOR 599 ELECTRIC LOCOMOTIVE TENDERS 1, 2, 3 AND 4

Description	Tenderer 1		Tenderer 2		Tenderer 3		Tenderer 4	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
Loco Mass(tons)	88	132	88	132	88	132	88	132
Traction control	MITRAC TCMS	MITRAC TCMS	YES	YES	(TCMS, AGATE CONTROL 3)	(TCMS, AGATE CONTROL 3)	AC 800PEC (BORDLINE CC 1500MS)	AC 800PEC (BORDLINE CC 1500MS)
Transformer MVA	3.64	5.184	[illegible]	5.64	[illegible]	5.52	3.4	[illegible]
Transformer BIL(kV)	190	190	190	190	175	175	175	175
Roof BIL(kV)	Chosen according standard EN 50124-1	Chosen according standard EN 50124-1	NO INFO PROVIDED	NO INFO PROVIDED	NO INFO PROVIDED	NO INFO PROVIDED	NO INFO PROVIDED	NO INFO PROVIDED
TM (kW)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	665	[illegible]	[illegible]

Description	Tenderer 1		Tenderer 2		Tenderer 3		Tenderer 4	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
Roof Equipment clearance(mm)	[illegible]	NO INFO PROVIDED [illegible] 4.1.1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
APU ratings(kVA)	160	[illegible]	[illegible]	[illegible]	[illegible]	3*110	[illegible]	[illegible]
THD(APU)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10%
Stall TE(kN)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	510
Stall Adhesion demand%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Continuous TE(kN)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BE(KN)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	315	[illegible]	300

Description	Tenderer 1		Tenderer 2		Tenderer 3		Tenderer 4	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
New wheel(mm)	1220	1220	1220	1220	1250	1250	1220	1220
Worn wheel(mm)	1125	1135	1140	1140	1170	1170	1140	1141
BRE Grids(kW)	1170(2X585)	1800(2X 900)	4x565	6x685	2x600	2x600	NOT SPECIFIED	NOT SPECIFIED
25kV Max loco efficient	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY	0.83	0.83	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY
3kV Max loco efficient	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY	0.55	0.85	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY

Description	Tenderer 1		Tenderer 2		Tenderer 3		Tenderer 4	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
Wheel diameter difference allowed in bogie(mm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] "tenders comment section A6-12 clause 3.5.1	[illegible] "tenders comment section A6-12 clause 3.5.1"	[illegible]	[illegible]

Description	Tenderer 1		Tenderer 2		Tenderer 3		Tenderer 4	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
Wheel diameter difference allowed between bogies(mm)	maximum difference in wheel diameter between bogies comply with Specification RSE/TE/SPC/[illegible]	maximum difference in wheel diameter between bogie comply with Specification RSE/TE/SPC/[illegible]	11	11	There is no limitation from an axle to another in the range from [illegible] to [illegible]. On the same axle the wheel profiles shall be machined within an envelope of [illegible] "tenders comment section A6-12 clause 3.5.1	There is no limitation from an axle to another in the range from [illegible]. On the same axle the wheel profiles shall be machined within an envelope of 0.25mm "tenders comment section A6-12 clause 3.5.1	[illegible]	[illegible]
Full power Vline AC(KV)	[illegible]	[illegible]	22.5 to [illegible]	[illegible]	22.5 to 29	22.5 to 29	22.5 to [illegible]	22.5 to 29
Vline AC Maximum(KV)	[illegible]	[illegible]	31	31	30	30	31	31
Vline AC Minimum(KV)	[illegible]	[illegible]	17	17	17	17	17	17
Full power Vline	2.8 to 4	2.8 to 4	2.8 to 3.3		2.8 to 4	2.8 to 4	2.8 to 3.8	2.8 to 3.8

Description	Tenderer 1		Tenderer 2		Tenderer 3		Tenderer 4	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
DC(kV)								
Vline DC Maximum(kV)	4.1	4.1	4	4	4.5	4.5	4	4
Vline DC Minimum(kV)	2.5	2.5	2	2	2.8	2.8	2	2
DC link voltage (25kV)	[illegible]	[illegible]	[illegible]	[illegible]	3.1	3.1	[illegible] TO [illegible]	[illegible] TO 3.6
T/M temperature monitoring by sensor	YES	YES	YES	YES	YES	YES	YES	YES
TM Blower(KW)	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED	NOT SPECIFIED
Battery capacity(Ah)	[illegible]	[illegible]	120	120	[illegible]	[illegible]	NOT SPECIFIED	NOT SPECIFIED
Battery charger(kW)	15	15	12	12	12	[illegible]	11	11
TM airflow	[illegible]	[illegible]	1.5m³/s	1.5m³/s	[illegible]	[illegible]	[illegible]	[illegible]
Gear ratio	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Axle load(t)	[illegible]	22	22	22	22	[illegible]	22	22
Traction power	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Description	Tenderer 1		Tenderer 2		Tenderer 3		Tenderer 4	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
(Continuous)(kW)								[illegible]
IGBT ratings(kV)	6.5kV 750A/500A (Infineon & Mitsubishi)	6.5kV 750A/500A (Infineon & Mitsubishi)	6.5	6.5	6.5	6.5	NOT SPECIFIED	[illegible]
Auxiliary voltage supply control	VVVF & CVCF	VVVF & CVCF	VVVF & CVCF	VVVF & CVCF	VVVF & CVCF	VVVF & CVCF	VVVF & CVCF	VVVF & CVCF
Remote communication between BOF and locomotives control system for data download	OEM OR TRITON	OEM OR TRITON	OEM OR TRITON	OEM OR TRITON	OEM	OEM	[illegible]	[illegible]
DDU Resolution	HIGH RESOLUTION NO FURTHER INFO PROVIDED	HIGH RESOLUTION NO FURTHER INFO PROVIDED	NOT EVIDENCE FOUND	NOT EVIDENCE FOUND	[illegible]	[illegible]	[illegible]	[illegible]

Description	Tenderer 1		Tenderer 2		Tenderer 3		Tenderer 4	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
DDU Viewing angle	Vertical: [illegible] up to [illegible] down Horizontal: [illegible] left and right	Vertical: [illegible] up to [illegible] down Horizontal: [illegible] left and right	[illegible] (right/left), 45° (top), 55 (bottom)	[illegible] (right/left), 45° (top), 55 (bottom)	[illegible]	[illegible]	[illegible]	[illegible]
DDU Screen size	10.4" [illegible]	10.4" [illegible]	NO EVIDENCE FOUND	NO EVIDENCE FOUND	[illegible]	[illegible]	[illegible]	[illegible]

APPENDIX M: COMPARISON OF THE LOCOMOTIVE EQUIPMENT RATINGS FOR 599 ELECTRICAL TENDERS 5, 6 AND 7

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
Loco Mass(tons)	88	132	88	No evidence for COCO	88	132
Traction control	SITRAC	SITRAC	[illegible] CONVERTER	YES	YES	YES
Transformer MVA	2.6	3.8	3.35	No evidence for COCO	3.12	[illegible]
Transformer BIL(KV)	[illegible]	[illegible]	150	No evidence for COCO	150	150
Roof BIL(kV)	170	170	NOT SPECIFIED	No evidence for COCO	170	170
TM (kW)	[illegible] "CALCULATED"	[illegible] "CALCULATED"	658	No evidence for COCO	643	643

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
Roof Equipment clearance(mm)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
APU ratings(KVA)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
THD(APU)	<10%	<10%	[illegible]	[illegible]	[illegible]	[illegible]
Stall TE(kN)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Stall Adhes on demand%	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Continuous TE(kN)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
BE(kN)	[illegible]	300	[illegible]	[illegible]	211	318
New wheel(mm)	1220	1221	1220	[illegible]	1220	1220
Worn wheel(mm)	1140	1140	1170	[illegible]	1120	1136
BRE Grids(kW)	1100/TOWER [illegible]	1700/tower 2xtower/loco	2X1150	[illegible]	[illegible]	[illegible]
25kV Max loco efficient	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY	TOTAL EFFICIENCY VALUE MORE THAN 0.85	[illegible]	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY
3kV Max loco efficient	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY	TOTAL EFFICIENCY VALUE MORE THAN 0.85	[illegible]	REPRESENTEND IN CURVES FORMAT ONLY	REPRESENTEND IN CURVES FORMAT ONLY

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
Wheel diameter difference allowed in bogie(mm)	The mechanical bogie design allows maximum difference between the axles of one bogie of 40 mm in diameter	The mechanical bogie design allows maximum difference between the axles of one bogie of 40 mm in diameter	The maximum allowable difference in wheel diameter between two axles in the same truck should be not more than [illegible]		From the traction propulsion system and the traction control side up to 50 mm difference could be allowed [illegible]	From the traction propulsion system and the traction control side up to 50 mm difference could be allowed [illegible]

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
					gaps and clearances between components and between components and the loading gauge, etc. The implication is that the primary static spring deflection need to be maintained with easily fitted packing to compensate for wheel sets with different wheel diameters within practical limits mentioned. It will be the aim to accommodate wheel sets with wheel size differences up to 30 mm [1 O.T. (15 mm on radius ##) for a total packing of 35 mm (** + ##, clearly it would be ideal to avoid the necessity of frame/body height restoration **). These matters will need clarification and agreement between all parties involved at Design Review stage. "REFER TO TENDER'S	maintained with easily fitted packing to compensate for wheel sets with different wheel diameters within practical limits mentioned. It will be the aim to accommodate wheel sets with wheel size differences up to 30 mm [1 O.T. (15 mm on radius ##) for a total packing of 35 mm (** + ##, clearly it would be ideal to avoid the necessity of frame/body height restoration **). These matters will need clarification and agreement between all parties involved at Design Review stage. "REFER TO TENDER'S COMMENTS SECTION 06-12 CLAUSE 4.1

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
					COMMENTS SECTION 06-12 CLAUSE 4.1	
Wheel diameter difference allowed between bogies(mm)	The mechanical bogie design allows maximum difference between the axles of 2 different bogies of 80 mm in diameter	The mechanical bogie design allows maximum difference between the axles of 2 different bogies of 80 mm in diameter	[illegible]	[illegible]	[illegible]	[illegible]

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
					[illegible]	[illegible] **"REFER TO TENDER'S COMMENTS SECTION 06-12 CLAUSE 4.1**

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
					[illegible] "REFER TO TENDER'S COMMENTS SECTION 06-12 CLAUSE 4.3"	
Full power Vline AC(kV)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vline AC Maximum(kV)	30	30	[illegible]	[illegible]	30	[illegible]
Vline AC Minimum(kV)	[illegible]	17.5	17.5	17.5	[illegible]	17
Full power Vline DC(kV)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Vline DC Maximum(kV)	[illegible]	4	[illegible]	4	[illegible]	4
Vline DC Minimum(kV)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
DC link voltage (25kV)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
T/M temperature monitoring by sensor	YES	YES	YES	[illegible]	YES	YES
TM Blower(kW)	1X7.6/4 PER LOCO	1X7.6/6 PER LOCO	[illegible]	[illegible]	18.5 1TM/BOGIE	30 1TM/BOGIE
Battery capacity(Ah)	100	150	130	[illegible]	220	220
Battery charger(kW)	11	11	11	[illegible]	25	25
TM airflow	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Gear ratio	[illegible]	[illegible]	5.53	[illegible]	[illegible]	[illegible]
Axle load(t)	22	22	22	22	22	22

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
Traction power (Continuous)(kW)	2521	3778	2521	3773	2520 (DC) 3000 (AC)	3778
IGBT ratings(kV)	3.3/6.5 (ABB)	3.3/6.5 (ABB)	6500V/[illegible]A	6500V/[illegible] A	6500V/750A	6500/750A
Auxiliary voltage supply control	VVVF & CVCF	VVVF & CVCF	VVVF & CVCF	[illegible]	VVVF (IGBT WITH CVCF)	VVVF (IGBT WITH CVCF)
Remote communication between BOF and locomotives control system for data download	OEM	OEM	[illegible]	[illegible]	OEM OR [illegible]	OEM OR [illegible]
DDU Resolution	640*480 pixels	[illegible]	[illegible]	[illegible]	SVGA 800 x 600 pixel	SVGA 800 x 600 pixel

Description	Tenderer 5		Tenderer 6		Tenderer 7	
	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
DDU Viewing angle	Viewing angle with contrast ratio >= 10, Typically ±80 (right/left), 45° (top), 55° (bottom)	Viewing angle with contrast ratio >= 10, Typically ±80 (right/left), 45° (top), 55° (bottom)	140° horizontal 127 vertical	[illegible]	[illegible]	[illegible]
DDU Screen size	10"	10"	3x0x214x0.9mm	[illegible]	10.4	10.4

APPENDIX N: COMPARISON OF THE LOCOMOTIVE MAIN EQUIPMENT RATINGS FOR 465 DIESEL TENDERS

[illegible]	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Mass Loco (T)	126 t +/-3%	126t (1+/-3%)	126t	123.5-129.8t at 2/3 service level for sand and fuel
Wheel Diameter (New) (mm)	1016	1068	1067	1041
Wheel Diameter (Fully Worn) (mm)	946	993	996	965
Bogie Type	Co-Co	Co-Co	Co-Co	Co-Co
*Coupler Type **	AAR E/F	AAR E	E type	E type
Fuel Tank Capacity (l)	>/=7000	7000	7200	7000
Battery Charger Capacity	12kW (Bordline-M10)	12kW	Not stated	Not stated

Note: E, E F-type both acceptable

[illegible]	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Engine Type	MTU 20V4000R63L	R12V280ZJ 4-Stroke	16-710G3C-T3 2-Stroke	GE Evolution series, V12, 4-Stroke
Power (HP)	4424	4400	4500	4200
Power (KW)	3300	3282	3357	3133
Rotational speed (r/min)	1800	1000	950	1050
Emission (must be IIIA)	EU IIIA	EU IIIA/TIER II	US EPA TIER3 *	EU IIIA
Coolant	Nalcool 2000	Nalcool 2000	Nalcool 2000	Borate Nitrate Treated Water

Note: * US EPA TIER3 is more stringent than EU IIIA

ALTERNATOR	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Type	WGX 560 pb6	CDJF208B	EMD TA17TBEA/CA9E	GESGMG210, 3 Phase
Drive	Direct, engine flange coupling	Direct Engine Flange Coupler	Not Specified	Direct, engine flange coupling
Rated Capacity (kW)/HP	3450/2760kW	3500kVA @ pf 0.95 =3325KW	Not Specified	4000HP=2984kW
Rated Speed (r/min)	1800	1000	Not Specified	1050
Rated DC Link	1800 Vdc	1700 Vdc	-	1350 Vdc

[illegible]	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Type	AMXL450-FAIMD0CF06	YQ 452 or CDJD115	EMD A2916-8 AC	GE5GEB24, 3 Phase
Gear Ratio	88/19	90/17	92/15	85/18
Rated Power (kW) (Given)	448kW:Continuous Rating 535kW:1 Hour Rating 800kW:10 min Rating	452kW Continuous Rating 345kW 1 Hour Rating 125kW 10 min Rating	*"EMD uses AC Traction motors which typically do not have short time ratings as long as the motor is operated at the continuous TE levels continuously at any speeds."*	450kW:Continuous Rating 495kW 1 Hour Rating 548kW:10 min Rating
Rated Speed (r/min)	603	567	*Details will be provided during the design review*	667HP = 497.6kW
Motor Cooling Airflow	1.5m^{3}/s @15[illegible]0Pa	1.5m^{3}/s @1500Pa	(1.2-1.25m^{3}/s) +/-5%	(1.13m^{3}/s) +/-5%
Traction Motor Weight (kg)	1830kg +/-3%	1800kg +/-5%	2040	1968
Individual TM Cut-Out	Yes	Yes	No (Bogie cut-out)	Yes
Degree of Protection	2xPT100	2xPT100	Motor Thermal Protection (EM2000 Control System)	Motor Thermal Protection
Insulation Thermal Index	Class 200	Class 200	Class 200	Class H

[illegible]	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Brake Resistor Capacity (kW)	2x1500kW 1 7Ω @-10 C 2.5Ω @ Hot	6x600kW 6x3.55Ω @20 C 6x4.2Ω @640 C	3100kW	3900RHP
Brake Resistor Capacity (Calculated) (kW)	3133.3	2284.7	3172.5	2707.2

[illegible]	Tenderer 1	Tenderer 2	Tenderer 3	Tenderer 4
Type	KNORR-BREMSE VV450-4	6CD4UC	Gardner Denver WLSA9F	GEK-114748, WLPC9G
Drive	AC Motor	AC Motor	Mechanically Shaft Driven	AC Motor
Rated Displacement (Compressor) (m^3/s)	0.053	0.076	0.0434	0.042
Rated Displacement (Exhauster) (m^3/s)	0.158	0.304	0.21	0.163

TECHNICAL RISKS IDENTIFIED

APPENDIX O: RISK REPORT: 599 ELECTRIC LOCOS & 465 DIESEL LOCOS – DR ROBERT FRÖHLING

Comments from Mechanical Technology with respect to 1064 Tender Evaluation Project

(Document creation date: 2013-03-28)

(Last edit date: 2013-08-28 Revision No: 1)

Team members involved

Dr. Robert Fröhling

Mr. Georg Hettasch

Mr. Sheraton Singh

Mr. Mesham Sivnarain

599 Electric Locomotive Submissions

Tenderer 1
No comments

Tenderer 2
No comments

Tenderer 3
Please note that separate technical compliances matrices have been supplied for the Co-Co and Bo-Bo option. Compliance level was evaluated using the comments of both responses. Transformer cage: The Transformer cage is offered as an option. If this option is taken it is important that the axle load limit of 22 Ton is not exceeded.

Please note that the structural draft and buff load requirements are not complied too for the Bo-Bo locomotive design option. Should this option be selected an agreement on the design criteria needs to be reached prior to awarding the tender.

Bogie Options:

The following Co-Co bogie options are offered:

1. Bolsterless Co-Co bogie (base offer)
2. 15E type Co-Co bogie (option)
3. 15E type self-steering Co-Co bogie (option)

From the above 3 bogies, the bolsterless Co-Co bogie (base offer) option is recommended. If required further discussions on the bogie choice shall be conducted prior to the awarding of the tender.

The following Bo-Bo bogie options are offered:

1. Bolsterless Bo-Bo bogie (base offer)
2. 19E type Bo-Bo bogie (option)
3. 19E type self-steering Bo-Bo bogie (option)

From the above 3 bogies, the bolsterless self-steering Bo-Bo bogie option (base offer) is recommended. If required further discussions on the bogie choice shall be conducted prior to the awarding of the tender.

Tenderer 4
Very little information supplied in documentation

Tenderer 5
An active yaw damper was offered as an option. Advantages of this system are increased stability, longer wheel life, lower rail wear and low track forces. Furthermore, a wheel flange lubrication system was offered. Advantages of this system include reduced wheel flange wear and rail

gauge wear. Both these options should be considered should the tender be awarded to this bidder. The compliance with respect to transformer cage is met for the Co-Co locomotive but not for the Bo-Bo locomotive due to mass limitations.

Tenderer 6
This tenderer indicates the he cannot meet the carbody structural strength requirements, in particular the required buff and draft loads.

Tenderer 7

The following Co-Co bogie options are offered:

1. Bolsterless Co-Co bogie (base offer)
2. Bolsterless self-steering Co-Co bogie (option)
3. 15E type Co-Co bogie (base offer)
4. 15E type self-steering Co-Co bogie (option)

From the above 4 bogies, the bolsterless self-steering Co-Co bogie option is recommended if an agreement can be reached to convert the bogie to standard non-self-steering bolsterless Co-Co bogie (base offer) should the steering mechanism produce undesirable results

The following Bo-Bo bogie options are offered:

1. Bolsterless Bo-Bo bogie (base offer)
2. Bolsterless self-steering Bo-Bo bogie (option)
3. 19E type Bo-Bo bogie (base offer)
4. 19E type self-steering Bo-Bo bogie (option)

From the above 4 bogies, the bolsterless self-steering Bo-Bo bogie option is recommended if an agreement can be reached to convert the bogie to standard non-self-steering bolsterless Bo-Bo bogie (base offer) should the steering mechanism produce undesirable results

. Continued on next page

Diesel Locomotive Submissions

Tenderer 1
No comments

Tenderer 2
A radial steering mechanism for the Co-Co bogie was offered. This could have a significant benefit in terms of wheel life.

Tenderer 3
No comments

Tenderer 4
No comments

APPENDIX P: RISK REPORT: 599 ELECTRIC LOCOS – A6-01 – WHEELS – JOSEPH BONGA

Section A6-01 (Electrical)

599 ELECTRIC LOCOMOTIVES

Tenderer no 1

Tenderer no 1 offers new wheel at 1220 and worn wheels at 1136. The worn wheel diameter (1136) can only be acceptable on conditions that the coupler height difference and the wheel structural integrity are acceptable.

Tenderer 2

1. Material EA4T for the axle is accepted because it is superior to the material that was requested.

2. 60° centre requested by ZELC is unacceptable

3. The ISO spec can be used for the design of the gear wheel but the material selection will have to be from BS235

Tenderer 3

1. Offers new wheel at 1250 and worn wheels at 1170. The worn wheel diameter (1170) can only be acceptable on conditions that the coupler height difference and the wheel structural integrity are acceptable
2. Tyred wheels are not acceptable

Tenderer 4

Not much information provided on the tender documents

Tenderer 5

1. Offers new wheel at 1220 and worn wheels at 1140. The worn wheel diameter (1140) can only be acceptable on conditions that the coupler height difference and the wheel structural integrity are acceptable

2. Material EA4T for the axle is accepted because it is superior to the material that was requested

3. TFR is requires class C.

Tenderer 6

No comment

Tenderer 7

Material certificate of the wheel and FEA are required

APPENDIX Q: RISK REPORT: 465 ELECTRIC LOCOS – A6-01 – WHEELS – JOSEPH BONGA

Section A6-01 (Diesels)

465 DIESEL LOCOMOTIVES

Tenderer 1

No comment

Tenderer 2

The design calculations must be done according to AARS660 standard

Tenderer 3

No comment

Tenderer 4

Class B wheel is provided, but the option of tyring must also be provided

APPENDIX R: RISK REPORT: 599 ELECTRIC LOCOS (T1 TO T4) - A6-04 – ROTATING MACHINES - JOEL MATHONSI

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 1		TENDERER 2		TENDERER 3		TENDERER 4	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
D2.1	It is a desired requirement that locomotive components and or sub-systems are to be service proven	Risk (Traction Motor not yet designed and its still a concept)	Risk (Traction Motor not yet designed and its still a concept)	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"
1.4	Risk (Traction Motor not yet designed and its still a concept)	"Risk (Traction Motor not yet designed and its still a concept)"		"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"

1.10	It is essential that the Tenderer declares the continuous rating, 1-hour rating and 10-minute rating of both the traction motors and the electrical source.	-	-	-	-	-	-	"Risk No evidence found"	"Risk No evidence found"
1.25	It is an essential requirement that the gear ratio be provided at the time of tender.	-	-	-	-	-	-	"RISK a gear ratio of 6.06 was submitted, however a clarification is required to confirm this value"	"RISK a gear ratio of 6.06 was submitted, however a clarification is required to confirm this value"

5.2.1	It is an essential requirement that no derating will be allowed for operation at high altitude	-	-	-	-	-	-	RISK The tenderer states that de-rating will not be necessary when operating below 1000m	RISK The tenderer states that de-rating will not be necessary when operating below 1000m
5.2.2	When a motor is tested at a site above 1000m above sea level the standard rated output shall be achieved	-	-	-	-	-	-	RISK The tenderer states that de-rating will not be necessary when operating below 1000m	RISK The tenderer states that de-rating will not be necessary when operating below 1000m

APPENDIX S: RISK REPORT: 599 ELECTRIC LOCOS (T5 TO T7) - A6-04 – ROTATING MACHINES - JOEL MATHONSI

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
D2.1	It is a desired requirement that locomotive components and or sub-systems are to be service proven	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"
1.4	Risk (Traction Motor not yet designed and its still a concept)	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"	"Risk (Traction Motor not yet designed and its still a concept)"

1.10	It is essential that the Tenderer declares the continuous rating, 1-hour rating and 10-minute rating of both the traction motors and the electrical source.	"Risk No traction motor rating submitted on the refered chapter 3.2.2 as the info is for the loco not a traction motor."	"Risk No traction motor rating submitted on the refered chapter 3.2.2 as the info is for the loco not a traction motor."	-	-	-	-
1.3	It is essential that the traction motor characteristics being supplied meet the tractive effort and electric braking effort requirements detailed in this specification. Graphs must be submitted depicting the TM Voltage and Current versus Tractive Effort and Speed.	"Risk No traction motor rating submitted"	"Risk No traction motor rating submitted"	-	-	-	-

APPENDIX T: RISK REPORT: 599 ELECTRIC LOCOS (T1 TO T4) - A6-12 – MAIN POWER SYSTEM - JOEL MATHONSI

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 1		TENDERER 2		TENDERER 3		TENDERER 4	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
1.4.1	It is a mandatory requirement (ESKOM safety requirement) that the locomotive(s) rapidly switch off (open VCB) when power supplied from the AC overhead traction supply system is interrupted, both in powering and in braking (continued AC regen in the presence of an interrupted ESKOM supply) exceeding 1 second shall NOT be allowed when the power supply utility or substation itself interrupts the traction power supply	RISK: "Tests with Eskom and contractor must be performed"	RISK: "Tests with Eskom and contract or must be perform ed"	RISK: "Tests with Eskom and contractor must be performed"	RISK: "Tests with Eskom and contractor must be performed"	RISK: "Tests with Eskom and contractor must be performed"	RISK: "Tests with Eskom and contractor must be performed"	RISK: "Tests with Eskom and contractor must be performed"	RISK: "Tests with Eskom and contractor must be performed"

1.4.1	Please also refer to Sguda's report								
1.5.1.2	It is an essential requirement that the BIL of all the roof equipment be aligned with the BIL specified for the transformer in section 05. Full details must be submitted at time of tender	**RISK**	**RISK**	**RISK**	**RISK**	**RISK**	**RISK**	**RISK:** "No evidence of BIL supplied"	**RISK:** "No evidence of BIL supplied"
2.0.3.1	On DC sections typically this would be between 2,800 V and 4,000 V dc							**RISK:** "Evidence states 2.8kV to 3.8kV"	**RISK:** "Evidence states 2.8kV to 3.8kV"
2.0.3.2	On AC sections typically this would be between 22,500 V and 30,000 V AC rms.							**RISK:** "Evidence states 22.5kV to 29kV"	**RISK:** "Evidence states 22.5kV to 29kV"

2.10.1	It is an essential requirement that the design of the roof and roof equipment is such that all roof equipment is optimally shielded against the impact of contact with other loose foreign obstructions from the overhead track equipment. (e.g. minimal exposed roof equipment, special barriers, relocation of equipment inside the locomotive where possible)					**OPTION** "However the tenderer submitted options for High Voltage equipment block. This should not be an option as the High Voltage equipment block is just a relocation of some roof equipment into inside locomotive."	**OPTION** "However the tenderer submitted options for High Voltage equipment block. This should not be an option as the High Voltage equipment block is just a relocation of some roof equipment into inside locomotive."		

3.4	It is an essential requirement that a double sourcing policy be applied in order to provide exchangeable IGBT modules from more than one IGBT manufacturer for all the auxiliary power converter circuits.									RISK: "No evidence found of neither double sourcing nor data sheet for IGBT"	RISK: "No evidence found of neither double sourcing nor data sheet for IGBT"
3.11.8	It is a desired requirement that the converter cooling system provide for high reliability of operation of the converters, minimum maintenance and minimum contamination of semi-conductor devices and associated components									Risk: "What compliance level is this?"	Risk: "What compliance level is this?"

6.4.1	It is a mandatory requirement that with a "dead" lead locomotive application, the installed battery capacity must be such that the locomotive can be operated for at least 4 hours, with the pantograph lowered, whilst controlling a live trailing locomotive (with critical equipment still on)	**Risk:** Ni Cad batteries offered	**Risk:** Ni Cad batteries offered					**Risk:** No reference to batteries	**Risk:** No reference to batteries
6.4.2.1	It is an essential requirement that NiCad batteries are NOT supplied (NiCad is not acceptable)							**Risk:** No reference to batteries	**Risk:** No reference to batteries

6.7.3	For diesel locomotives it is a essential that provision shall be made for steam heat vehicles by providing sufficient power, a circuit breaker (80 A and 110 V) and plugs at each end of the locomotive.	Option	Option	Risk: No reference to CB & plugs	Risk: No reference to CB & plugs				
6.8.1	It is essential that the electrical electronic control cubicles, low voltage compartments and power conversion cubicles shall be pressurized to a positive pressure of not less than 100 Pa primary and secondary filtered air							Risk: The Machine Room requires Pressurization	Risk: The Machine Room requires Pressurization

6.9.1	It is a mandatory requirement that tenderers provide full details of the type(s) of interlocks offered							**Risk:** "No details of type(s) of interlocks provided".	**Risk:** "No details of type(s) of interlocks provided"
6.11.1	It is an essential requirement that the required on-board and land based energy consumption monitoring systems and tools be provided that will enable Transnet to effectively perform detailed energy management and energy optimisation of the fleet of locomotives.							**Risk:** Require more evidence	**Risk:** Require more evidence

6.11.2	It is a desired requirement that the proposed on board energy measurement system deployed on the locomotives comply with international standards and as a minimum meet the accuracy, integration period and data storage requirements specified in EN 50463.							**Risk:** Require more evidence	**Risk:** Require more evidence
6.11.4	It is an essential requirement that the on-board energy measurement system be fully integrated into the control system and comply with the requirements as described in the control system section of this specification.							**Risk:** Require more evidence	**Risk:** Require more evidence

7.4.4	It is a desired requirement that additional tests be performed on the traction motors after 2 and 5 years in operation (once wear and tear has occurred) to establish if any detrimental deterioration has occurred. The tenderer shall propose a long term plan to perform these investigations and measurements.	Option								

APPENDIX U: RISK REPORT: 599 ELECTRIC LOCOS (T5 TO T7) - A6-12 – MAIN POWER SYSTEMS - JOEL MATHONSI

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
1.4.1	It is a mandatory requirement (ESKOM safety requirement) that the locomotive(s) rapidly switch off (open VCB) when power supplied from the AC overhead traction supply system is interrupted, both in powering and in braking (continued AC regen in the presence of an interrupted ESKOM supply) exceeding 1 second shall NOT be allowed when the power supply utility or substation itself interrupts the traction power supply	**RISK:** Tests with Eskom and contractor must be performed"	**RISK:** "Tests with Eskom and contractor must be performed"	**RISK:** Tests with Eskom and contractor must be performed"	**RISK:** "Tests with Eskom and contractor must be performed"	**RISK:** "Tests with Eskom and contractor must be performed"	**RISK:** "Tests with Eskom and contractor must be performed"

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
1.5.1.2	It is an essential requirement that the BIL of all the roof equipment be aligned with the BIL specified for the transformer in section 05. Full details must be submitted at time of tender.	**RISK**	**RISK**	**RISK:** "Conflicting information as the evidence refers to Transformer BIL of 150kV."	**RISK:** "Conflicting information as the evidence refers to Transformer BIL of 150kV."	**RISK**	**RISK**
2.0.3.1	On DC sections typically this would be between 2,800 V and 4,000 V dc	**RISK:** "Evidence states cont TE from 2.8kV to 3.61kV"	**RISK:** "Evidence states cont TE from 2.8kV to 3.61kV"	**RISK:** "Evidence states 3kV to 3.8kV"	**RISK:** "Evidence states 3kV to 3.8kV"		
2.0.3.2	On AC sections typically this would be between 22,500 V and 30,000 V AC rms	**RISK:** "2.6MVA Transformer considered too small"	**RISK:** "2.6MVA Transforme r considered too small"	22.5KV to 29KV	22.5KV to 29KV		

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
2.4.1	It is an essential requirement that traction motor and traction drive system design allows that individual motors that fail in service can be cut out on a per axle basis.	Risk: "Tenderer refers to loss of 50% Traction in certain applications . Clarity must be sought."	Risk: "Tenderer refers to loss of 50% Traction in certain applications Clarity must be sought."				
2.4.1.2	It is a desired requirement that full TE and BE performance can be achieved even in the event of one traction motor traction inverter failure	RISK	RISK				
2.10.1	It is an essential requirement that the design of the roof and roof equipment is such that all roof equipment is			RISK: "No evidence found except for drawing(annexure 1-04) with no	RISK: "No evidence found except for drawing(annexure 1-04)"		

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
	optimally shielded against the impact of contact with other loose foreign obstructions from the overhead track equipment. (e.g. minimal exposed roof equipment, special barriers, relocation of equipment inside the locomotive where possible)			explanation of clause 2.10.1."			
5.4	It is an essential requirement that the worst case hot spot temperature does not exceed 600 degrees Celsius. Provision shall be made for a 200 degrees C temperature rise in air intake in tunnels of trailing locomotives (Guaranteed value, all weather conditions)	**RISK:** "The comments suggest the loco cannot operate in rheostatic braking mode through tunnels"	**RISK:** "The comments suggest the loco cannot operate in rheostatic braking mode through tunnels"				

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
6.4.1	It is a mandatory requirement that with a "dead" lead locomotive application, the installed battery capacity must be such that the locomotive can be operated for at least 4 hours, with the pantograph lowered, whilst controlling a live trailing locomotive (with critical equipment still on).			Risk: No reference to batteries	Risk: No reference to batteries	Risk: Toshiba have previously unsuccessfully tested 78Ah	Risk: Toshiba have previously unsuccessfully tested 78Ah
6 7 3	For diesel locomotives it is a essential that provision shall be made for steam heat vehicles by providing sufficient power, a circuit breaker (80 A and 110 V) and plugs at each end of the locomotive.	Option Tender document states optional	Option Tender document states optional		Risk: No evidence provided	Risk: No evidence provided	

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
6.11.1	It is an essential requirement that the required on-board and land based energy consumption monitoring systems and tools be provided that will enable Transnet to effectively perform detailed energy management and energy optimisation of the fleet of locomotives			Risk: Require more evidence	Risk: Require more evidence		
6.11.2	It is a desired requirement that the proposed on board energy measurement system deployed on the locomotives comply with international standards and as a minimum meet the accuracy, integration period and data storage requirements specified in			Risk: Require more evidence	Risk: Require more evidence		

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
	EN 50463.						
6.11.3	It is an essential requirement that the proposed on board energy measurement system offers flexibility and features to enable Transnet to measure and record energy such that Transnet can differentiate between energy consumption (during powering), energy regenerated (i.e. regenerative braking energy; both for AC and DC territories), energy dissipated in the on-board brake resistors and energy consumption during idling periods			Risk: Require more evidence	Risk: Require more evidence		

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
6.11.4	It is an essential requirement that the on-board energy measurement system be fully integrated into the control system and comply with the requirements as described in the control system section of this specification			**Risk:** Require more evidence	**Risk:** Require more evidence		
7.3.3	It is an essential requirement that at least the following equipment systems be used during such tests, or covered in the submission of documentary proof:			**Risk:** More evidence required	**Risk:** More evidence required		

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 5		TENDERER 6		TENDERER 7	
		Bo-Bo	Co-Co	Bo-Bo	Co-Co	Bo-Bo	Co-Co
7.3.4	It is a desired requirement that the test installation should at least have the capacity to verify the performance of a bogie set of equipment, but, preferably a full locomotive installation.			Risk: More evidence required	Risk: More evidence required		

APPENDIX V: RISKS - 599 ELECTRIC LOCOMOTIVES - A6-12- MAIN POWER SYSTEMS – SGUDA SIBANDE AND ASHEEN SINGH

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
1.4.1	Main Power Systems	More detailed information required on how to implement on regen especially in reference to instances where Eskom is not receptive	More detailed information required on how to implement on regen especially in reference to instances where Eskom is not receptive.	More detailed information required on how to implement on regen especially in reference to instances where Eskom is not receptive	More detailed information required on how to implement on regen especially in reference to instances where Eskom is not receptive.	More detailed information required on how to implement on regen especially in reference to instances where Eskom is not receptive	More detailed information required on how to implement on regen especially in reference to instances where Eskom is not receptive	More detailed information required on how to implement on regen especially in reference to instances where Eskom is not receptive
2.6.1	Automatic Change-Over Functionality	Clarification on whether locomotive will be able to changover at maximum speed plus 10 percent and it is a mandatory requirement	Clarification on whether locomotive will be able to changover at maximum speed plus 10 percent and it is a mandatory requirement	Clarification on whether locomotive will be able to changover at maximum speed plus 10 percent and it is a mandatory requirement	Clarification on whether locomotive will be able to changover at maximum speed plus 10 percent and it is a mandatory requirement.	Clarification on whether locomotive will be able to changover at maximum speed plus 10 percent and it is a mandatory requirement.	Clarification on whether locomotive will be able to changover at maximum speed plus 10 percent and it is a mandatory requirement	Clarification on whether locomotive will be able to changover at maximum speed plus 10 percent and it is a mandatory requirement
2.10 2.10.1	Roof Equipment	Equipment is inside the locomotive as a standard. Require	Sensitive HV equipment must be inside the	Sensitive HV equipment located in the locomotive is	Sensitive HV equipment must be inside the	Sensitive HV equipment must be inside the	Sensitive HV equipment must be inside the	Equipment is inside the locomotive as a

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
	Design	that the remaining roof equipment is moved to the extreme safe side in case pantograph is torn off during a hook up and damages roof equipment in its path (centralised roof equipment).	locomotive and not on the roof. Require that the remaining roof equipment is moved to the extreme safe side in case pantograph is torn off during a hook up and damages roof equipment in its path (centralised roof equipment).	an option. IT SHOULD BE A STANDARD AND INCLUDED IN BASE PRICE. Require that the remaining roof equipment is moved to the extreme safe side in case pantograph is torn off during a hook up and damages roof equipment in its path (centralised roof equipment)	locomotive and not on the roof. Require that the remaining roof equipment is moved to an extreme side in case pantograph is torn off during a hook up and damages roof equipment in its path (centralised roof equipment).	locomotive and not on the roof Require that the remaining roof equipment is moved to the extreme safe side in case pantograph is torn off during a hook up and damages roof equipment in its path (centralised roof equipment)	locomotive and not on the roof Require that the remaining roof equipment is moved to an extreme side in case pantograph is torn off during a hook up and damages roof equipment in its path (centralised roof equipment)	standard. Require that the remaining roof equipment is moved to the extreme safe side in case pantograph is torn off during a hook up and damages roof equipment in its path (centralised roof equipment)
3.10.3	Capacitors, High Voltage indication and discharging systems	This information is safety related and more detailed information required as per clause.	This information is safety related and more detailed information required as per clause.	This information is safety related and more detailed information required as per clause	This information is safety related and more detailed information required as per clause.	This information is safety related and more detailed information required as per clause.	This information is safety related and more detailed information required as per clause	This information is safety related and more detailed information required as per clause

APPENDIX W: RISKS - 599 ELECTRIC LOCOMOTIVES - A6-20 - ELECTRICAL SAFETY, LOCOMOTIVE POWER AND PANTOGRAPHS – SGUDA SIBANDE AND ASHEEN SINGH

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
1.4	Electrical Safety. Earthing. Cables & Conductors	More specific information to be provided with regards to intrinsic safety, uniquely coded keys, means to prevent bypass under any circumstances. ALL HV cubicle doors shall be hinged and no lock bars are allowed, the interlocking shall be such that the interlocking cannot be completed unless ALL doors are in position and locked. This information is safety related and must be clarified in detail and accepted before proceeding further. NO EXCEPTIONS AS	NO SAFETY INTERLOCKING BARS ARE ALLOWED. More specific information to be provided with regards to intrinsic safety, uniquely coded keys, means to prevent bypass under any circumstances. ALL HV cubicle doors shall be hinged and no lock bars are allowed, the interlocking shall be such that the interlocking cannot be completed unless ALL doors are in position and locked This information is safety related and must be clarified in	More specific information to be provided with regards to intrinsic safety, uniquely coded keys, means to prevent bypass under any circumstances. ALL HV cubicle doors shall be hinged and no lock bars are allowed, the interlocking shall be such that the interlocking cannot be completed unless ALL doors are in position and locked This information is safety related and must be clarified in detail and accepted before proceeding further. NO	NO SAFETY INTERLOCKING BARS ARE ALLOWED. More specific information to be provided with regards to intrinsic safety, uniquely coded keys, means to prevent bypass under any circumstances ALL HV cubicle doors shall be hinged and no lock bars are allowed, the interlocking shall be such that the interlocking cannot be completed unless ALL doors are in	NO SAFETY INTERLOCKING BARS ARE ALLOWED. More specific information to be provided with regards to intrinsic safety, uniquely coded keys, means to prevent bypass under any circumstances. ALL HV cubicle doors shall be hinged and no lock bars are allowed the interlocking shall be such that the interlocking cannot be completed unless ALL doors are in	NO SAFETY INTERLOCKING BARS ARE ALLOWED. More specific information to be provided with regards to intrinsic safety, uniquely coded keys, means to prevent bypass under any circumstances ALL HV cubicle doors shall be hinged and no lock bars are allowed, the interlocking shall be such that the interlocking cannot be completed unless ALL doors are in	More specific information to be provided with regards to intrinsic safety, uniquely coded keys, means to prevent bypass under any circumstances ALL HV cubicle doors shall be hinged and no lock bars are allowed, the interlocking shall be such that the interlocking cannot be completed unless ALL doors are in position and locked This information is safety related and

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
		THIS IS MANDATORY	detail and accepted before proceeding further. NO EXCEPTIONS AS THIS IS MANDATORY.	EXCEPTIONS AS THIS IS MANDATORY	position and locked. This information is safety related and must be clarified in detail and accepted before proceeding further. NO EXCEPTIONS AS THIS IS MANDATORY.	position and locked. This information is safety related and must be clarified in detail and accepted before proceeding further. NO EXCEPTIONS AS THIS IS MANDATORY	position and locked. This information is safety related and must be clarified in detail and accepted before proceeding further. NO EXCEPTIONS AS THIS IS MANDATORY	must be clarified in detail and accepted before proceeding further. NO EXCEPTIONS AS THIS IS MANDATORY.
3.1	Pantographs and Pantograph-OHTE interaction	The pantograph must be controlled by means of air bellows instead of the traditional springs. More information must be provided on pantograph dimensions and collector head profile which must conform to UIC profile which shall be approved by Transnet.	The pantograph must be controlled by means of air bellows instead of the traditional springs. More information must be provided on pantograph dimensions and collector head profile which must conform to UIC profile which shall be approved by	The pantograph must be controlled by means of air bellows instead of the traditional springs. More information must be provided on pantograph dimensions and collector head profile which must conform to UIC profile which shall be approved by	The pantograph must be controlled by means of air bellows instead of the traditional springs. More information must be provided on pantograph dimensions and collector head profile which must conform to UIC profile which	The pantograph must be controlled by means of air bellows instead of the traditional springs. More information must be provided on pantograph dimensions and collector head profile which must conform to UIC profile which	The pantograph must be controlled by means of air bellows instead of the traditional springs. More information must be provided on pantograph dimensions and collector head profile which must conform to UIC profile which	The pantograph must be controlled by means of air bellows instead of the traditional springs. More information must be provided on pantograph dimensions and collector head profile which must conform to UIC profile which

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
			Transnet	Transnet	shall be approved by Transnet	shall be approved by Transnet	shall be approved by Transnet	shall be approved by Transnet
3.5.1	Pantographs and Pantograph OHTE interaction	More detailed information required with regards to safe activation of ADD, for example with regards to opening either the VCB or the HSCB first before lowering pantographs	It is essential that the ADD system is cross coupled - such that operation of any one ADD shall immediately lower the other pantographs safely. That is by first opening either the VCB or the HSCB	It is essential that the ADD system is cross coupled - such that operation of any one ADD shall immediately lower the other pantographs safely. That is by first opening either the VCB or the HSCB	It is essential that the ADD system is cross coupled - such that operation of any one ADD shall immediately lower the other pantographs safely. That is by first opening either the VCB or the HSCB	It is essential that the ADD system is cross coupled - such that operation of any one ADD shall immediately lower the other pantographs safely. That is by first opening either the VCB or the HSCB	It is essential that the ADD system is cross coupled - such that operation of any one ADD shall immediately lower the other pantographs safely. That is by first opening either the VCB or the HSCB	It is essential that the ADD system is cross coupled - such that operation of any one ADD shall immediately lower the other pantographs safely. That is by first opening either the VCB or the HSCB

APPENDIX X: RISKS - 465 DIESEL LOCOMOTIVES - A6-12- MAIN POWER SYSTEMS – JOEL MATHONSI

Compiled by: Joel Mathonsi, Trevor Downward and Phumudzo Rannenyeni

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
2.4.1	It is an essential requirement that the traction motor and traction drive system design allows that individual motors that fail in service can be cut out separately (i.e. without affecting operability of the other motors).	-	-	Risk: Tenderer does not meet requirement. Loss of 50% tractive and braking power which is unacceptable to Transnet	-
2.4.1.1	It is a desired requirement that individual motors can be cut out remotely via the consist network control (see section 02).	Clarity: Conflict Evidence in page 148 of 201 refers "Individual motors can be cut out remotely via the consist network control".	-	-	Risk Option

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
2.4.1.2	It is a desired requirement that full TE and BE performance can be achieved even in the event of one traction motor traction inverter failure.	-	Clarity: Conflict Evidence in page 148 of 201 refers: Full TE and BE performance can be achieved even in the event of one traction motor traction inverter failure during the constant power area. But this can't achieve during the constant moment because of the influence of adhesion	-	-
2.4.1.3	It is a desired requirement that load sharing between axles shall be controlled to within 2%.	-	Clarity: Conflict Evidence in page 148 of 201 refers: The load sharing between axles will be controlled to within 2%.	-	-

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
2.5.1	It is an essential requirement that a blended braking system be provided (electric-and mechanical braking under emergency and penalty vigilance braking conditions)	-	Clarity: Conflict Evidence as stated in page 149 of 201: A blended braking system will be provided (electric-and mechanical braking under emergency and penalty vigilance braking conditions).	-	-
2.5.2	It is an essential requirement that it shall be possible to cut-out the electric braking separately on each locomotive in the consist.	-	Clarity: Conflict Evidence as stated in page 149 of 201: It is possible to cut-out the electric braking separately on each locomotive in the consist.	-	-
2.5.2.1	It is a desired requirement that it shall be possible to cut-out the electric braking separately and remotely on each locomotive in the consist via the consist network control.	-	Clarity: Conflict Evidence as stated in page 149 of 201: It is possible to cut-out the electric braking separately	-	-

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
			and remotely on each locomotive in the consist via the consist network control		
3.9.2	It is an essential requirement that all high voltage capacitors be provided with a secondary (back-up system) to ensure that it is effectively discharged automatically discharged (to below 50 Volt) within 2 minutes, should any of the primary discharge mechanisms fail, or when access to exposed high voltage becomes possible when high voltage barriers or high voltage interlock systems fail or malfunction.	Risk: Discharge time should be within 2 minutes	-	-	-
4.1.4	It is an essential requirement that the chosen propulsion system topology be comprehensively justified in terms of Mission Reliability (inclusive of the impact of cutting out of individual traction motors on the total tractive effort of the locomotive)	-	-	Risk: Traction motors must be individually cut out	-

CLAUSE No:	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
6.6.3.2	It is a mandatory requirement that the operation of all interlocks and protective relays be supervised automatically by the control system and that in case of failure events, the affected high voltage equipment immediately be shut down and isolated and specific error messages be indicated on the Driver's Display Unit	Risk: no indication of compliance level Tender to clarify compliance level of feedback of Control System to DDU	-	-	-
6.10.1	It is an essential requirement that the on-board energy and fuel measurement system be fully integrated into the control system and comply with the requirements as described in the control system section of this specification.	Risk: Refer to section A6-02, clause 54	Risk: Refer to section A6-02, clause 54	Risk: Refer to section A6-02, clause 54	Refer to section A6-02 Clause 54.1 thru 54.6
6.10.2	It is an essential requirement that full details of the proposed energy measurement and and energy management systems be provided as part of the tender documentation	Risk: Full details required	Risk: Refer to section A6-02, clause 54	Risk: Refer to section A6-02, clause 54	Refer to section A6-02 Clause 54.1 thru 54.7

APPENDIX Y: RISKS - 465 DIESEL LOCOMOTIVES - A6-04 – ROTATING MACHINES – JOEL MATHONSI

CLAUSE No	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
D2.2	It is a desired requirement that locomotive components and or sub-systems are to be service proven	-	Risk: All new machines must be type test	-	Risk: All new machines must be type tested
I 12	It is an essential requirement that the capacity of the traction bearings be such as to give a minimum B-10 service life of 2 000 000 km	-	-	Risk: 50% of specified service life ofered	Risk: Bearing life does not meet specification
I 3	It is an essential requirement that the traction motor characteristics being supplied meet the tractive effort and dynamic braking effort requirements detailed in this specification. Graphs must be submitted depicting the TM Voltage and Current versus Tractive Effort and Speed at the time of tender				Risk TM rated at 550HP, 578HP required to meet TE curve

CLAUSE No	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
5.3	It is an essential requirement that for the purpose of this Specification, the first locomotive set of traction motors (four or six) be subjected to type tests.	-	-	-	Risk: TM type test was done at 550HP and submission requires 580HP
5.4.1	It is an essential requirement that these declared ratings shall be verified by short time overload tests on the type test motors with nominal and minimum required air flow.	-	-	-	Risk: TM type test was done at 550HP and submission requires 580HP
5.8	It is an essential requirement that at least one of the traction motors installed on the first locomotive be instrumented internally and externally for temperature rise measurements. (This motor shall be removed after the acceptance test period.)	-	-	Risk: TFR requires comparisons of test results of the same type tested Traction Motor for both bench test and field test	Risk: TM type test was done at 550HP and submission requires 580HP. TFR requires comparisons of test results of the same type tested Traction Motor for both bench test and field test

CLAUSE No	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
5.8.1	It is essential that temperature probes be installed in such positions that the maximum temperatures at various positions on the stator windings be measureable in order to determine the differences in temperatures as opposed to an average value.	-	-	-	Risk: TM type test was done at 550HP and submission requires 580HP. TFR requires comparisons of test results of the same type tested Traction Motor for both bench test and field test

APPENDIX Z: RISKS - 465 DIESEL LOCOMOTIVES - A6-04 – DIESEL ENGINE – JOEL MATHONSI

CLAUSE No.	SPECIFICATION REQUIREMENTS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
1.3	It is a mandatory requirement that the diesel engine offered shall be of the low emission type. The engine offered shall at least have EU IIIA status.	-	Risk-TFR cannot validate that Tier II is equivalent to EU IIIA and the bidder may not be able to meet this specification. See emission test report and conclusion on 7.18, 8.13 Technical Report	-	-

1 3 1	It is an essential requirement that tenderers include supporting documentation to demonstrate that this requirement is met, as part of its tender submission.	-	Risk-TFR cannot validate that Tier II is equivalent to EU IIIA and the bidder may not be able to meet this specification. See emission test report and conclusion on T18, 8.13 Technical Report	-	-
1 3 2	It is a desirable requirement that the diesel engine offered should meet an emission standard more severe than the minimum specified in clause 1 3	-	Risk-TFR cannot validate that Tier II is equivalent to EU IIIA and the bidder may not be able to meet this specification. See emission test report and conclusion on T18, 8.13 Technical Report	-	-

1.5	It is an essential requirement that tenderers shall submit guaranteed fuel consumption in g/kWh for each engine operating point (Notch position as well as corresponding speed and power to be indicated). It is an essential requirement that the results curve be applicable or adjusted to UIC reference conditions (i.e atmospheric pressure 100kPa, ambient temperature 25 deg C & relative air humidity 30%) Essential auxiliaries driven by the diesel engine shall be clearly defined.	-	-	Risk-The compressor and Auxilliary Generator are shaft driven A6_05_1_5_FuelConsumption Engine performance graph 2	-
1.10	Transnet makes use of an environmentally friendly cooling system / rust inhabitant additive called Nalcool 2000. For logistic reasons it is desirable that the contractor will use the same product. It is however an essential requirement that should an alternative product be proposed, it be acceptable in terms of South African environmental requirements. For detail refer to Transnet's specification PD_COMP_NAT_SPEC_799.	-	-	-	Risk-TFR is uncertain if Borate nitrate meets the spec prescribed by Transnet. No data sheet provided on Borate Nitrate by bidder

APPENDIX AA: RISKS - 599 ELECTRIC LOCOMOTIVES – T5 to T7 - A6-19 – ELECTROMAGNETIC COMPATIBILITY – DR. BENNIE STEYN

CLAUSE	ITEM	TENDERER 5	TENDERER 6	TENDERER 7
A6-19		Siemens	CNR	Toshiba (MARS)
3 1		Input filter design is designed for 8 locomotives at 1 Ohm. This might raise the cost of the overall design. During the design review it should be ensured that the contractor is aware that an interference monitor is an alternative to the impedance requirement.	No harmonic current data is supplied in order to evaluate risks in terms of the compatibility. Harmonic voltages are however supplied indicating the availability of suitable simulation models being available.	
3 2	Although conformance to BBB2274 is MAN in all respects the supplier is required to provide information to prove compatibility with the following train detection devices as specified in BBB2274. Simulation results of the line current in the frequency domain is acceptable, given that the simulation conditions are clearly stated		High Risk. No calculation, simulation or measured results for the line current are provided. Calculation for the overhead voltage and point of common coupling is given but this is insufficient to draw conclusions	
3 3			Medium risk. Psofometric noise is addressed indirectly	

APPENDIX BB: RISKS - 599 ELECTRIC and 465 DIESEL LOCOMOTIVES – A6-19 – COMMUNICATIONS AND TRAIN AUTHORISATION SYSTEMS – NKULULEKO GHOBOZI

Brief summary of the evaluation from our perspective

Comms Tech was looking at the following loco design aspects

1) 19 inch rack Equipment Cubicle size, location and supply
2) Antenna installation and placement
3) Free issued onboard operational systems installation
4) Locomotive control system to TRITON interface
5) Bi-directional (TRITON LAN – WAN) communication capabilities of control system
6) OBC Brake interface
7) Alternative direct WiFi GPRS comms

General comments:

1. A majority of the bidders did not explicitly indicate full comprehension of TFR requirements regarding comms interfaces and the equipment cubicle requirements.
2. It can be noted that some of the requirements from TFR side may be a challenge to expand on when stating compliance.
3. Some suppliers used loco schematics and diagrams to demonstrate some comprehension of the requirements

4. Most suppliers can be engaged to comply during design reviews to ensure full compliance, based on the foundation presented in the proposal
5. Most bidders present a high risk of non-compliance to requirements for broadcasting control system information on the TRITON network.
6. Clause by clause comments where risks were identified are in the score-sheet, where scores are < 2.
7. TFR systems equipment cubicle must not be shared with locomotive equipment

Specific Risks:

1) EMD proposed an extremely small equipment rack (1 metre height) relative to the specification (1.8 metres) This is not acceptable at all. EMD also failed to indicate compliance to control system information broadcast in TFR protocol. The proposed location of the rack is also a concern They proposed fitment in the nose of the locomotive.
2) GE indicated some constraints with regards to WAN to the locomotive control system GE intends to use some of the 19inch rack space for some of their equipment.
3) Toshiba has various explicitly stated constraints. Dependence on TFR systems for loco functions, e.g GPS using TCS 19 inch rack dimensions proposed are a concern There isn't enough information on the brake interface
4) Bongiveli had limited to no information to make a technical judgement in support of any technical claims The bidder demonstrates no comprehension of the requirements
5) Alstom presents a marginally high risk to ensure compliance Some interfaces were not defined nor could be derived from the proposal
6) The CNR locomotive design does not take account of Antenna requirements and TRITON interfaces.
7) The rest of the bidders presented proposals that can still be influenced during design reviews, with the only risk being extent of development effort and expertise.

Least Risk:

1) CSR Loliwe presented the most comprehensive solution with regards to TRITON interface
2) Based on previous experience (43Class) GE has the capability to interface with the TRITON system
3) Bombardier presented a low risk design that caters to the majority of the evaluated requirement

A design review during award negotiations is essential to ensure that the claimed compliance is enforced and understood from the onset. Else, there is a high risk of bidders not adhering to specs or claiming variation orders on requirements that were part of the original RFP. Furthermore, if this is not done, there is a risk of delays in the delivery of the required functions if development effort is not applied timeously

APPENDIX CC: RISKS – 599 ELECTRIC LOCOMOTIVES - A6-02 – CONTROL SYSTEMS TECHNOLOGY – ELVIS TSHIVHILINGE

#	CLAUSE	ITEM DESCRIPTION	RISK LEVEL	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
1	2.1	Hardware	HIGH			The tenderer only guarantees parts until the end of the fleet defect protection period	The Tenderer must clarify how they intend to comply with this requirement. No evidence found, however tenderer states full compliance			
2	2.3	Short circuit protection of I/O interfaces and isolation from the low voltage wiring	MEDIUM		The Tenderer must clarify how the electronic cards are short circuit protected as well as isolation from low voltage				The Tenderer must provide more details inclusive of the circuitry showing how short circuit protection is implemented as well as isolation.	

3	2.4	Inter locomotive network communication preferably via WTB	HIGH						The Tenderer is not sure which control system they will use. The Tenderer must clarify and confirm the control system they will use before the contract is signed. TFR will accept systems which are service proven	
4	2.8	Hardwiring of safety critical signals between locomotives in a consist	HIGH		The proposed function as described under Tenderer's comments using DDU is not acceptable to TFR				The tenderer did not provide details explaining how they intend to comply with this requirement as per this clause	

5	2.9	Supply of 2 DDU's which are preferably service proven within the Transnet environment	MEDIUM						It is not clear whether the proposed DDU is service proven as required in this clause. The Tenderer must provide more details regarding the layout and functions/buttons provided in the Technical submission.	
6	2.4 14.2 17.2 29.2 29.3 40.3	Wired Transmission Bus (WTB)	HIGH							The Tenderer has noted in their responses to various clauses that they will experience a restriction in some requirements based on the limited transmission rate of the WTB. The tenderer provides ETB as a superior alternative.

7	2.10	Hardware	LOW			The Tenderer must provide additional information with regards to the proposed dedicated brake system screen in order for TFR to confirm that the screen layout is in line with TFR requirements of RDP ECP WDP functionality				
8	2.11	Minimum IP rating of IP65 for all screens	MEDIUM		The Tenderer must also specify the IP rating at the back of the screen. It is not clear whether the specified IP rating also includes the Brake Screen				The IP rating of the back of the DDU must be at least IP 54. The proposed DDU screen IP 20 rating is not acceptable to TFR	

9	2.12	Supply of a dedicated GPS antenna for the control system for the locomotive to use	HIGH					The Tenderer must make use of its own GPS module information provided on page 147 and page 153 clearly states that the control system will make use of TRITON GPS. Evidence found in Technical Description page 175		

10	2.13	Communication with TFR's LAN	MEDIUM	Tenderer's Train to way side equipment transmits data to the Tenderer's server and they offer Transnet access to the server. It is preferable to Transnet to have all locomotive running data stored on an internal Transnet server developed by the Tenderer. Details and will be discussed during technical negotiations.	The Tenderer must clarify to TFR whether they will provide BOTH TRITON and own GSM communication system	TFR must request the Tenderer to clarify whether the base price includes data communication (hardware and software) with TFR LAN integration with TFR TRITON			Tenderer to confirm whether they will use own GSM for data communication between locomotive and TFR land based server	

11	2.15	Tolerance of high potential differences between locomotive bodies without any damage to the locomotives	LOW						The tenderer does not mention the maximum allowable potential deference between locomotive bodies, refer to AS-01 appendix pg 44	
13	2.16	Supply of all hardware and software required to perform tests on the control system modules	MEDIUM		The Tenderer did not provide test equipment as part of the tender submission as requested under "clarification"	The tenderer must provide TFR with an example of a test bench which the tenderer uses to test some of the major system components in their existing fleet.			Tenderer must provide more details listing the types of test benches as well as the list of equipment to be tested.	
14	2.17	All the control system modules are to have LED status lights	LOW						It is not clear whether other electronic equipment other than MCU will have LEDs	

15	2.19	High Voltage Interlocking	HIGH		The Tenderer must provide more information explaining how they intend to implement HV interlocking system	Further clarification is required in order to establish that the tenderer interlocking system is fully compliant with TFR requirements. Information provided on page 60 of chapter 3 section 7 paragraph 5.5.2 (Figure 57 BVR) does not clearly state that the interlocking cannot be overridden, furthermore it does not specify in detail how the interlocking system for individual HV cubicles work		Tenderer adheres to the requirement, however their method of interlocking using rods is not preferable to Transnet. Transnet would prefer interlocking built into the doors of cubicles		

16	2.20	Analogue gauges for the drivers cab	1 O'S			Tenderer must be informed that the speed display must be integrated into the DDU and this speed display will be used as the main driving speed display for the driver. The speedometer proposed by the tenderer in this submission may be used as backup					

17	2.22	Black Box Recorder	HIGH		The Tenderer must clearly specify "crash hardness" of the black box recorder.			Tenderer must supply more information about their Black box. The documentation provided gives the impression that data may be sent to TRITON, and if successfully received by TRITON, it is then deleted from the TCMS memory. This could lead to a loss of information. Tenderer must clarify on the method of storage of Black Box data		

18	2.24	Master Controller Handles	HIGH						Tenderer must provide details for the master controller for TFR to review	The Tenderer's proposed Master Controller does not have two handles, but rather one handle for traction and braking and a switch for direction or neutral
19	2.25	Throttle handle is to have 20 mechanical notches for both traction and electrical braking	HIGH		The Tenderer must provide additional information with regard to the robustness of the master controller without mechanical notches for TFR to review and consider.				Tenderer must provide details for the master controller for TFR to review	
20	2.26 2.26.1 2.27	Contractor to provide their own service proven master controller	HIGH		Clause 2.6.1 - The Tenderer must provide additional information with regard to the robustness of the master controller without mechanical notches for TFR to review and consider				Tenderer must provide details for the master controller for TFR to review	

21	2.27 2.27.1	Electro-Magnetic Compatibility	HIGH		The Tenderer must specify the specification to which they will suppress all radio equipment to ensure that interference with other equipment is minimised No evidence was found in the Tenderer's technical submission			Tenderer states that their own EMC specification will be adhered to. The tenderer must supply this specification to Transnet for review. Additionally, the Tenderer should indicate which international standard's the Tenderer's specification is based on.		

22	3.1.1	Obsolescence period		•	The statement provided in the Tenderer's comments does not clearly state how the Tenderer intends to maintain the software for the 30 year period	Clarification required. Tenderer must clarify whether software upgrades will be done over the 30 year period or only until the end of the fleet defect period				The Tenderer states that they will maintain software during fleet defect period. The Tenderer must fully comply with this requirement since it will have significant financial impact to TFR

23	3.1.2	Immediate Software modifications at any time during the life span of the locomotive should the changes be safety related	HIGH	The Tenderer must confirm whether compliance to this requirement will mean additional cost will be incurred by TFR Information provided in Appendix 5 Obsolescence Management does not clearly state whether they will implement this for TFR				Tenderer must clarify whether the TFR will incur any cost for the compliance of this requirement as implemented as per the "Tenderer Obselescence Management" document submitted as part of the technical submission.	The Tenderer must clarify whether safety related software changes will be done at an additional cost to the base price offer.	

24	3.1.3	The locomotive is to use end user variables so that parameters are configurable by Transnet	HIGH		The Tenderer's proposal to adjust maximum speed limit on the DDU is not acceptable to TFR. Ref. Volume 3 Bo Bo submission page 71 clause 3.6.1				End user variables stored in a removable SD Card, care must be taken to prevent locomotive operation without the SD card or a corrupt SD card. Refer to section 6.2 Annex 6-01 pg 43	
25	4.2	Design of auxiliary compressor such that the probability of it lowering are very slim	HIGH		The Tenderer must clarify whether the main air from Main compressor feeds the pantograph air system.					
26	4.5	Automatic control of auxiliary machines by the control system	HIGH		It is not clear from the Tenderer's comments whether there is a timing between running auxiliary machines when the system is operating under CVCF system.					

27	4.7	Pantograph selector switch	HIGH			The Tenderer must be requested to provide the pantograph selector switch as this is a requirement which is in line with the rest of Transnet locomotives No switch is proposed			Electrical Schematics provided as part of the Technical submission shows that both Pantographs are raised at the same time, there is no pantograph isolator switch shown on the schematics (ref page 2 Annex 1-03)	

28	4.8	High voltage equipment protection	HIGH	The Tenderer must provide more details indicating that this requirement will be complied with under all operating conditions e.g.. When pantograph is raised for the first time, when VCB is opened while locomotive is going through Neutral section etc.		The tenderer must be requested to clarify whether the sensing devices are integrated in the locomotive control system to ensure that this requirement is complied with fully.				

29	6.1.3	TFR configurable system.	HIGH		The Tenderer must provide more details regarding TDAS software, emphasis must be made to the configurable functionality of the software TFR requirement is not to have view signals selection functionality but logging functionality	TFR requires that the Tenderer offers a system where signals are configurable					

30	6.1.4	Fault logging	HIGH					It is unclear whether the tenderer plans to delete the fault log entries once they have been successfully transferred to TRITON. This could result in loss of information when TRITON is able to accept the entries but not transmit these entries to the ground system because of some failure. The tenderer is required to specify how they intend to address this problem.	The list of the signals provided under Tenderer's comments may not be sufficient	

31	6.1.5	Number of recorded faults before the oldest fault is overwritten	LOW		The Tenderer must reconfirm the 40000 faults which can be recorded					
32	6.1.6	Occurrence and recovery of faults on the fault logger	LOW		Information provided on page 69 and 70 under section 3.4.2 of Volume 3 Bo-Bo Technical submission does not make any reference to time when the fault recovers; also the proposed method used in this section is not ACCEPTABLE to TFR The Tenderer must include all additional information inclusive of snap shop other signals etc relevant to the fault on each and every occurrence.					

33	7.2	Storage of data on the data recorder	HIGH					Tenderer must confirm that energy data will be stored in the black box		
34	7.3	Recording of the data every 1 second for certain signals	HIGH						Proposed method in the Tenderer's comments of recording only when the status changes is not acceptable. Tenderer must review and implement as per TFR requirement	
35	7.4	Data recorder is to have the capability to store data up to 168 hours	HIGH						It is not clear from the Tenderer's documents if 64 analogue and 64 digital can be logged every second for 168 hours	
36	7.5	The supplied system (Black Box) should be configurable	HIGH		The Tenderer must provide more details regarding TDAS software					

37	7.6	Data recorder minimum recording time with a minimum of 64 analogue and 64 digital signals	HIGH							The tenderer does not indicate the number of signals that can be recorded and still achieve the minimum of 168 hours of recording
38	7.8	Downloadable data recorder contents via GSM and wi-fi or TRITON	MEDIUM			The Tenderer stated that they will not use TRITON, this needs to be clarified with the Tenderer. Also, the proposed OEM Communication system is not included in the base price offer				

39	7.10	Supply of all necessary PC software to download data recorder	HIGH	The Tenderer must confirm that PC software for data download will be provided to TFR at no additional cost. TFR also will like to have unlimited usage on multiple PCs	The Tenderer does not clearly state that the software will be provided to TFR. The Tenderer must clarify whether TDAS software will be provided and if cost is already included in the base price offer			The Tenderer must confirm that PC software for data download will be provided to TFR at no additional cost. TFR also will like to have unlimited usage on multiple PCs		

40	8.1	Transient recorder Sampling Rate	HIGH	During clarifications , it was indicated to the Tenderer that the Transient Recorder must have the capabilities to record IGHT signals. The Tenderer must clarify whether the existing or proposed Transient Recorder will be capable of meeting this TFR expectation		Transient recording of 20ms as proposed by the Tenderer is not acceptable to TFR. This item must be included in the RISK register since it will compromise TFR ability to conduct root cause analysis.		The tenderer offers a transient recorder solution which has a sampling rate of 100ms. This is unacceptable to Transnet. The transient recorder should have a sampling rate in the micro second range.		

41	8.3	Settable (By Transnet) trigger condition for the transient recorder	HIGH		Tenderer comments states that only analogue threshold may be configured states that all the trigger conditions are included and no need to change. The tenderer may not be too keen to change pre-existing trigger conditions						
42	8.6	Number of Transient recorders available	HIGH				The Tenderer must provide more information about the proposed transient recorder. No evidence found, however tenderer states full compliance				

43	8.7	Transient recorders are to be configurable and downloadable via a laptop	HIGH		Tenderers comments contradicts an earlier comment made on clause 8.3 and 8.4 stating that there will be no need to configure the transient recorders trigger points.						
44	8.9	Supply of all software required for transient recorder data download and analysis	HIGH	The Tenderer must confirm that PC software for transient recorder will be provided to TFR at no additional cost. TFR also will like to have unlimited usage on multiple PCs							

45	9.1	Monitoring and logging of all major components	HIGH			No evidence found The Tenderer must clarify whether the existing Netbox fulfills this requirement	The Tenderer must provide more information with regard to this requirement. TFR requires this information in order for ease of maintenance No evidence found, however tenderer states full compliance			
46	9.4	Number of devices that can be monitored	MEDIUM			This item is to be clarified during the technical discussions. There are other items that can be added to the given list in the "Tenders comments" column			The list proposed under Tenderer's comments is not exhaustive enough, TFR would like the Tenderer to also monitor Pantographs, running hours of the Traction motors, compressors etc	

47	9.6	Entering an equipment component serial number via the DDU or laptop	MEDIUM		Tenderer must realise this requirement by implementing a password					
48	10.1 10.2	Connection of a laptop to the control system for high level fault finding by maintenance staff	HIGH				The Tenderer must provide more information regarding other systems other than Drive Control Page 13 of Technical Specification	The Tenderer must provide more details of the software used to monitor signals in real time and confirm that this is also done through the laptop		

49	10.3	Logging and graphical viewing of signals in real time	HIGH					The proposed number of signals that can be viewed in real time is NOT acceptable to TFR. This is a serious limitation for fault analysis and testing by TFR maintenance staff. Tenderer's response to the clause indicates their compliance		

50	10.4	Offline viewing of signals from the logs	HIGH					The Tenderer must provide more details of the software used to view signals offline. Tenderer must be made aware that the capability to view more than 8 signals offline is required by TFR		
51	10.5	Sampling rate of stored data	HIGH			The tenderer does not specify whether the sampling rate we use during the recording of signals. More details of Train Tracer UTM is required from the tenderer in order for TFR to understand the functionality of the software			Tenderer is offering 50 ms sampling rate	

52	10.6	Supply of all PC software for real time signal analysis	HIGH				The Tenderer must clarify whether TFR will incur cost for all PC software and TFR will also require to use the software on multiple laptops			
53	11.3	Supply of a self-test functionality in the control system which tests the health of the locomotive	MEDIU M		The Tenderer must provide more details explaining how the dedicated diagnosis functionality works, inclusive of the conditions under which this function works					

54	11.4 11.5	Self-Test Duration	MEDIUM		Clause 11.4 - The Tenderer must provide more details explaining how the dedicated diagnosis functionality works, inclusive of the conditions under which this function works. The Tenderer does not mention that machines such as Traction motor blower etc. are tested Clause 11.5 - Tenderers comments on clause 11.3 does not state if this test will be performed by drivers or automatically by the control system.	Clause 11.4 – During technical discussions the tenderer must be requested to provide the functionality to meet this requirement. TFR requires this requirement in order for the maintenance personnel to be able to troubleshoot and fault find Clause 11.5 - No evidence provided. The information provided on page 45 chapter 3 section 1 does not meet this requirement, the self-test as describe in the section it requires locomotive batteries to be turned on and off in order for this automatic self-test function to be activated		The tenderer offers a self-test functionality to perform daily diagnostic checking on the locomotive. Tenderer must specify how long the self-test function must operate for. The conditions for the self-test to be run must be clarified by the tenderer. Will the locomotive or train be required to stop every 24 hours to run this test, including during operations?	Clause 11.4 – The Tenderer must also conduct self-test function on auxiliary machines	

55	14.2	Drivers reset is to be performed on any locomotive within the consist when executed from the lead locomotive	HIGH		The Tenderer proposal of doing master reset by turning the corresponding switch is not acceptable to TFR, TFR would like this to be done on the DDU					The tenderer states in their response to the clause that performing a driver s reset on trailing locomotives may not be realized due to restrictions in WTB.
56	15.1 15.3	Master reset execution	HIGH		Master reset must also be possible to be done through DDU					
57	15.4	Modification of the master reset code	MEDIUM		It must be possible to modify master reset code remotely via TRITON or own GSM system					
58	15.8	Performing a master reset remotely or via a laptop	LOW		It must be possible to perform master reset remotely via TRITON or own GSM system					
59	16.1	Notch off reset	HIGH					The Tenderer must provide more details explaining how this feature will be implemented		

60	17.2	Common DDU screens between locomotives in the same consist	HIGH			The Tenderer must clarify to TFR regarding the type of information from trailing locomotives to be displayed on the DDU's				

61	18.1	Conditions for locked axle detection	HIGH	Information provided in Appendix I is not clear whether the locked axle detection will be determined by measuring amongst others motor voltage and current. The Tenderer must clarify during Technical negotiations what method they will use in order to fully comply with this requirement.	TFR understands from the Tenderer's Technical submission that the Tenderer will use speed probe ONLY (not motor voltages and currents) The tenderer, on page 68 of section 3.3.3.15 of volume 3 part 2, states that can distinguish between a locked axle and a speed probe failure (see clause 18.2). The tenderer must provide more details explaining how the locked axle detection system works	TFR understands from the Tenderer's Technical submission that the Tenderer will use speed probe ONLY (not motor voltages and currents). TFR must request the Tenderer to provide more details regarding the functionality of the proposed system during technical discussion.				

62	19.1	Wheel diameter calculation using the speed probes and the GPS speed	HIGH		Tenderer's comments does not give full details of how GPS speed will be used for automatic wheel diameter calibration, conditions at which wheel diameter calibration will be performed are not stated					
63	20.2 20.3 20.4 42.2	Diesel MU control	HIGH					AAR 27 pin functional allocation shown on page 149 of Technical Description is different to what TFR specified on document BBF1643 The Tenderer must confirm that the BBF1643 will be complied with		

64	21.1	Fitment of heat smoke fire detectors on the locomotive	HIGH						Tenderer must provide more details regarding the type of sensors for fire detection	
65	22.6	Synchronization of date and time between the control system and the brake system	HIGH	The Tenderer must clarify whether the time between Brake system and Locomotive control system will be synchronised, details of which system will have master clock as well as whether the GPS time will be provided must be clarified No evidence found, however the tenderer states full compliance						

66	23.1	Control system dedicated Ethernet port for connection to TRITON	LOW			TFR can accept m12 to RJ45 cable; we do not recommend the use of adapter Page 45 chapter 3 section 1				
67	24.1 24.4 24.6	Access to the control system via GSM from the TFR LAN	LOW			The Tenderer does not comply with this requirement, the implications of this is that there will be no provision for TFR to have access to locomotive control system this will seriously limit TFR with regard to accessing information such as event history monitoring signals remotely etc				

68	24.2	Hardware and software for remote access to control system	LOW							The tenderer has not made it clear whether the hardware allowing communications to the back office will be provided by themselves or whether they are assuming such hardware is the responsibility of Transnet.
69	25.3	Maximum adhesion and toggling of the control system for silica or blastrite control	HIGH		The Tenderer does not specify whether they will achieve maximum adhesion if either silica sand or blasrite is used.	The tenderer might not be able to achieve required adhesion when Blastrite is used			The Tenderer does not specify whether they will achieve maximum adhesion if either silica sand or blasrite is used. Refer to section 5.24 Annex 6-01 Pg 37	
70	26.1	Supply of an advanced wheel slip detection and correction system	HIGH		The Tenderer must provide more details regarding how they intend to achieve advanced wheel slip detectection					

71	26.7	Anti-plugging function of locomotive to also protect other locomotives without anti-plugging	HIGH		The Tenderer must clarify whether they comply with this requirement. Comments referenced under clause 26.6 does not necessarily mean that locomotives without anti plugging protection will be protected	Tenderer must clarify why they cannot disable MU signal for direction selection when locomotive(s) is at speed. There is no need at this stage to know the type of locomotive in order to commit to this requirement				
72	27.2	Battery Capacity	HIGH			No evidence was found The Tenderer must clarify to TFR the conditions under which the 4 hours requirement will be met		The Tenderer must clarify what loads will be supported for a period of 4 hours on battery power		The Tenderer must clarify what loads will be supported for a period of 4 hours on battery power

73	27.3 27.5	Battery Low Voltage Protection	HIGH					The Tenderer's design includes some circuitry which is permanently connected to the battery supply and thus bypassing the battery low voltage protection. The tenderer must clarify if these permanently connected circuits have a time out or other means of preventing deep battery discharge		
74	27.7	Limiting the charging current to prevent damage to the locomotive batteries	HIGH		The Tenderer must clarify the maximum charging current which the battery charger limits the current at					

75	30.1	Manual override function	MEDIUM		The Tenderer must provide more details regarding the functionality of the manual override feature	The Tenderer did not specify how the manual override requirement will be implemented on any of their technical submission				

76	31.1	REMB activation	HIGH			The Tenderer did not specify how REMB functionality will be implemented on any of their technical submission		Tenderer's response to the clause indicates that their intention is to apply an emergency brake penalty when the REMB is activated Transnet prefers that that the emergency brake application is not applied with the REMB activation to avoid unnecessary mechanical jerking. The train driver can manually apply an emergency brake should this be required in addition to opening MCB and dropping all pantographs		

77	32.1	Tractive and braking effort of trailing locomotives	HIGH							Transnet understands that the Tenderer will offer support in terms of setting up the effort calculations during commissioning tests, however additional costs will be charged to TFR if other classes of locomotives are to be factored in after commissioning test. The tractive and braking effort curves should form a section of the user defined variables in order for Transnet to add new locomotives the future.

78	32.3	DDU's should be able to operate under any temperature conditions that can be experienced in South Africa	HIGH		The tenderer does not state the operating temperature for the DDU's				Tenderer's proposed DDU has operating temperature of between -20 to -50 deg C (ref page 23 of Annex 6-01 section 4.6). The DDU might not fully operate in the current high south African temperatures	
79	32.5	The use of service proven DDU's is recommended	HIGH						It is not clear whether the proposed DDU is service proven as required in this clause. The Tenderer must provide more details regarding the layout and functions buttons provided in the Technical submission	

80	32.6	DDU Failure	HIGH							The tenderer must clarify that, in the event of a failure of a DDU, the remaining DDU will be fully functional, meaning all information that was available of both DDU's will be accessible from the remaining DDU
81	32.7	Maximum viewing angle of the DDU screens	MEDIUM		Information provided in the technical submission contradicts with the information provided in the Tenderer's comments					
82	32.13	Supply of procedures and special test equipment to verify measurements	MEDIUM			Tenderer must provide a list and also clarify when will the required special test equipment be supplied			The Tenderer must provide more details explaining the types and list of test benches as well as the list of different electronic modules that are to be tested in-house. Relevant software must also be provided.	

83	32.18	DDU resolution.	MEDIUM	The evidence which the Tenderer provided states that the proposed DDU resolution is "high resolution". Tenderer must quantify their statement of "high resolution", giving an answer in pixels by pixels.					The proposed 800x600 DDU resolution is less that the specified TFR requirement. Refer to section 4.7 anex 6-01 pg 24	
84	32.21	Display and logging of the park brake status	HIGH			Recording of the park brake status is not mentioned				

85	34.1	74V digital inputs from OBC to control or brake system for penalty and emergency applications	HIGH	The Tenderer must provide more details explaining how they will implement this feature so that TFR can understand the method which the Tenderer intends to use.	The Tenderer did not provide proposal detailing alternative option as requested during clarification.	No evidence was found on Tenderer technical submission. The Tenderers were requested to provide options as part of the tender during clarification			The Tenderer did not provide proposal detailing alternative option as requested during clarification.	

86	34.2	Broadcast of operational and maintenance data onto the TRITON network	MEDIUM			The Tenderer must clarify what is it that the Tenderer would like to discuss with TFR during Design Review (as they indicated in their comments). TFR would like to understand whether the Tenderer wants to discuss the content of the data or compliance to the requirements, the comment from the Tenderer is not clear.				

87	36.2	Synchronization of all control system units using GPS date and time	HIGH		The Tenderer must clarify whether they will comply with this requirement. No evidence was found on the technical submission form the Tenderer						
88	37.1	Logging of the vigilance trip event in the event history	HIGH		The Tenderer must clarify whether they will log an event when vigilance is activated						
89	40.3	Slow speed operation	HIGH								Tenderer states that the target speed may not be adjusted during slow speed operation due to limitations of WTB

90	40.5	Notch off reset when in slow speed control mode	HIGH		The comments provided by the Tenderer under Tenderer's comments is correct, however, the requirement on this clause requires the Tenderer to implement a Notch Off reset in order to ensure that when slow speed mode has been exited, and the master controller is not in the neutral position(OFF), the control system will not allow traction until the driver moves the master controller to an OFF position.					

91	40.7	Limit in the drift in average speed during slow speed loading	MEDIUM		The Tenderer must confirm compliance to the requirement. This will have serious implications for loading process in the mines					

92	41.1 41.2 47.1 47.2 47.3	Traversing of the neutral section or voltage change-over section	HIGH	The Evidence found in Appendix I page 50 indicates that this functionality is provided, however the feature for the driver to activate or deactivate the automatic change-over must be removed. The locomotive must automatically transverse a change-over section or neutral section at all times	Figure 1 section 2 page 131 volume 3, the Tenderer proposes the use of two track magnets, this is not required and the Tenderer must rectify their proposal	Tenderer must be requested to provide more details explaining what their proposal is to achieve this requirement				

93	45.1	Locomotive MU consist.	HIGH							Information provided by the Tenderer in F918 page 20 figure 5, page 22 figure 10 show 8 locomotives. It is not clear whether the Tenderer will provide 8xMU or 6xMU locomotives. The tenderer must confirm whether 8xMU locos comply with 50Hz impedance

94	51.1 51.2 51.3 51.4 51.5	Compressor control	HIGH		Clause 51.1-51.5 - The description of the compresser control logic found in section 6.2.3 pg 104 is accepted however there is no mention of A12 A8 sensors	The Tenderer may not be able to fully comply to this requirement Tenderer states that they asked TFR for clarification and TFR did not respond to them. This issue must now be clarified with the Tenderer since we might have a problem with the Tenderer not being able to correctly control compressor in accordance with our requirements				

95	52.1 52.3	ADD integration with control system	HIGH							Tenderer note provided in F018 page 41 raises concern with regards to the full implementation of the ADD functionality through communications bus. It is not clear whether the tenderer will be able to fully integrate ADD system through the control system such that the required operation is realised
96	52.2	Input to the control system upon activation of the ADD	HIGH	The Tenderer must clarify how the activation of ADD in trailing locomotives will be implemented						

97	54	Energy management system	HIGH					Tenderer must either provide Railsys planning system to accompany the OPTIONAL DAS system, or develop a new framework to accompany the DAS system. The Tenderer must also provide the cost for land based energy analysis system so that it can be included in the base price		Tenderer describes the energy management system which they propose to download energy data to a supplier controlled server. It is preferable to Transnet to have all locomotive running data stored on an internal Transnet server developed by the tenderer

98	54.2	Supply of a complementary land based energy management system	HIGH						1. The Tenderer must provide more details explaining the tenderer's EMS proposal incusive of the method used to measure as well as the method used to distinguish different types of energy(Consumed, Regenerated, rheostatic and idling energy) 2. The Tenderer must also provide more information with regard to the land based system. The information must clearly state the proposed analysis software, location of the server and description of how data will be remotely transmitted to the land based server	

99	54.1 54.3 54.4 54.7 54.8 54.8.3 54.8.	[illegible] management system			Clause 54.1 - The Tenderer must provide more details explaining the tenderer's EMS proposal incusive of the method used to measure as well as the method used to distinguish different types of energy(Consumed, Regenerated, rheostatic and idling energy) Clause 54.2 - 1. The Tenderer must provide more details explaining the tenderer's EMS proposal incusive of the method used to measure as well as the method used to distinguish different types of energy(Consumed, Regenerated, rheostatic and idling energy) 2. The Tenderer must also provide more information [illegible] land based system. The information must clearly state the proposed [illegible]	The proposed on board energy measuring system does not include "Idling energy", the Tenderer must provide this information as part of what the Tenderer is intending to provide [illegible] 2. The Tenderer must [illegible]				

TRANSNET FREIGHT RAIL - SECRET | Page [illegible] of [illegible]

100	54.6 54.8.1 54.8.2	Drivers to configure the energy measurement system for trip reports	HIGH		Clause 54.6 – the Tenderer must provide TFR with the proposal in order to comply with this requirement Clause 54.8.1 – the Tenderer must provide TFR with the proposal for TFR to review and comment	The Tenderer must provide more details clearly indicating what the Eco-Driving system" capabilities are inclusive of the type of information shown to the driver and also how the driver interacts with "eco driving system"				
101	54.9	Supply of full details of the proposed comprehensive EMS system	MEDIUM		Tenderer must provide comprehensive EMS proposal for TFR to review and comment				Tenderer must provide comprehensive EMS proposal for TFR to review and comment	
102	55.3	Availability of circuit diagrams for all electronic modules	HIGH			There is no evidence of any electronic modules and it is advised that the Tenderer submit this in any format (e.g. block diagrams, etc)				

103	General	Central (Vehicle) Control Unit redundancy	HIGH	The tenderer must clarify whether a redundant VCU is optional or included in the base locomotive price. A redundant VCU is required.				Tenderer offers a redundant CCU as an optional addition. This must be added to the base price as it is required for reliability.		

104	General	Supporting Documentation	HIGH				The Tenderer has a severe lack of supporting documentation which provides evidence of their compliance to clauses! Without such documentation, it becomes difficult to assess the Tenderer's compliance to the clauses. As well as what is provided with the base locomotive and what features are optional additions			Several inconsistencies between the Tenderers response to the clauses and the evidence provided in documentation is contradictory. One example is clause 32.6 which the tenderer states no analogue meters will be provided, whilst F018 page 61 states that analogue meters will be provided

APPENDIX DD: RISKS – 465 DIESEL LOCOMOTIVES - A6-02 – CONTROL SYSTEMS TECHNOLOGY – ELVIS TSHIVHILINGE

#	CLAUSE	ITEM DESCRIPTION	RISK LEVEL	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
1	2.1	**Guarantee of obsolescence management for the life span (30 years) of the locomotive**					Tenderer comments indicate that they will provide spare parts for 20 years, this is not in line with TFR requirement of 30 years and must be clarified during Technical discussions
2	2.3	**Short circuit I O interface protection and electrical isolation from low voltage wiring**		The Tenderer must provide more details explaining "short circuit protection per channel" principle	Information provided on section 5.2.4 page 36, file 5 part 1 is not sufficient. The Tenderer must provide more details explaining the type and method of protection proposed.	The Tenderer must provide more details regarding how short circuit protection will be implemented for TFR to review. No evidence was found but Tenderer confirms full compliance	
3	2.4	**Communication between locomotives via a inter loco network bus with preference given to AAR5509 (DB Modem)**		The Tenderer must provide reasons for using IEC 61 375 as requested in the specification	The Tenderer must confirm which inter-locomotive communication system they intend to use. Information shown on figure 5.2 is not clear what the proposal from The Tenderer is		

4	2.6	The supplied jumper cables should have the capability to automatically disconnect in case locomotives are parted without manual disconnect			The Tenderer must provide more details showing the proposal for the jumper cable.		
5	2.9	Supply of 2 DDUs				2 DDU's are proposed but there is no provision made for fitment of the brake system screen	
6	2.10	Supply of a dedicated brake system screen				The Tenderer must be requested to provide a 7dedicated brake s8creen. The tenderer must clarify if one DDU is provided and a dedicated brake system screen	The Tenderer must be requested to provide a dedicated brake screen. Tenderer's response to the clause indicates that they will be supplying integrated screens.
7	2.11 32.17	IP rating of the screens		IP rating (IP 20) at the back of the DDU is too low. TFR recommends at least IP 54	The IP20 rating of the back of the DDU is not sufficient TFR will accept a front IP rating of IP65 and rear IP rating of IP54. Refer to section 5.2.12 page 37.	The Tenderer must provide IP rated display screens	The Tenderer must provide IP rated display screens
8	2.16	Supply of all hardware and software to Transnet used to test control system modules			The tenderer's comments contradicts with section 5.2.18 page 38, file 5 part 1. It is not clear if the tenderer will provide all hardware and software used to test the		The Tenderer does not comply with this requirement. This is a risk which will limit TFR s ability to troubleshoot and fault

					modules (MCU, DDU, I O etc) of the control system to Transnet (bench test and lab simulation equipment) The Tenderer does not comply with this requirement. This is a risk which will limit TFR s ability to troubleshoot and fault find control systems components		find control systems components
9	2.18	**Supply of any software to Transnet that is used to load firmware onto the control system**			Tenderer states that they will partially provide hardware or software to load firmware on the control system software		The tenderer's response to the clause indicates their non-compliance to the requirement
10	2.19	**All locomotive high voltage compartment doors must be interlocked with locomotive high voltage and should be possible to override the interlocking**					The tenderer's response to the clause indicates their compliance with the requirement, however the method of interlocking explained is dependent on the control system function. It is preferable for interlocking to also be mechanical (keys with locks on doors)
11	2.21	**Supply of ADU to display essential 7information**				The Tenderer must be requested to provide ADU with all essential information as per this	

						requirement	
12	2.26	**Supply of a separate master controller key, independent of the master controller**		The Tenderer must clarify whether the key will be provided.			The Tenderer must be requested to provide a key. The tenderer's response does not detail how the master key will be implemented, however indicates that a master key system in one form or another will be integrated
13	2.26.1	**Supply of Tenderers own service proven master controller**		The Tenderer must provide more details for the master controller which the Tenderer intends to supply.			
14	2.27	**Master controller operation protection from radio interference**				The Tenderer must provide more details explaining how they intend to immunise master controller against interference. The Tenderer must also specify international specification to which they will use to comply with this requirement.	The Tenderer must also specify international specification to which they will use to comply with this requirement.
15	2.27.1	**Control system protection from radio and electromagnetic external sources**			The Tenderer must provide an EMC plan detailing the methodology to be used to fully immunise the	The Tenderer must provide EMC plan for TFR to review.	The Tenderer must clarify whether the locomotive will be immunised from mobile

					locomotive systems and sub systems		radio interference. The tenderer's response to the clause indicates that only some shielding will be provided
16	2.27.2	Master controller signals as input to the control system only				The Tenderer must be requested to fully comply with this requirement. The proposal to control trailing locomotive directly from the master controller is not acceptable to TFR.	
17	3.1.1	Maintenance of software for the life span of the locomotive				TFR does not understand what the Tenderer is proposing. It is not clear whether the Tenderer will provide hardware and software required to maintain functionality.	
18	3.1.2	Immediate software modification during the life span of the locomotive should the modification be safety related					The tenderer's response to the clause indicates that they will only provide software changes related to safety during the warranty period and not the life span of the locomotives

							Safety related software changes must be provided by the tenderer for the life span of the locomotive as a minimum requirement
19	3.1.3	**Supply of configurable end user variables**		The tenderer complies with this requirement based on the evidence provided, however the user defined variables will be stored on a removable medium. The tenderer must provide clarification as to how they intend to provide protection against the removal or swapping of this memory.	The tenderer's comments contradict with section 5.3.3 page 4[illegible], file 5 part 1. It is not clear if the tenderer will allow the use of End user variables.	The tenderer must clarify what parameters can be made user defined.	The tenderer states that the addition of user defined variables will be a variation.
20	3.1.5	**The control system should be ready within 60 seconds since the switching on of the battery**					The tenderer must specify the maximum time for setup of the control system.
21	4.4	**Use of energy generated in the traction motors to power auxiliary machines**				The tenderer does not use the energy generated by the traction motors during electric braking. This is inefficient and wasteful.	The tenderer does not use the energy generated by the traction motors during electric braking. This is inefficient and wasteful.
22	5.2	**Occurrence of any fault on the consist must be reported to the**				Based on the tenderer's response to the clause.	

		driver on lead DDU				the system proposed does not report all faults to the driver from trailing locomotives	
23	5.3	**Access of all information about a fault should be available on the DDU**					The Tenderer must be requested to provide relevant information which informs the Driver and Technical staff about the failure fault, information must also include brief troubleshooting guide
24	6.1.4	**Tenderers are to state the number of analogue and digital signals that can stored**					The tenderer's response to the clause indicates that they will only record up 54 signals during fault logging. Additionally these signals cannot be selected by Transnet and are Tenderer standard.
25	6.1.7	**Fault history download via a laptop**					The tenderer's response indicates that the fault history will be downloaded through use of a memory device instead of a connection to a laptop. A memory device could refer to a hard drive, flash stick,

							SD or CF card etc. Further, the response indicates that a laptop is not directly connected to the control system
26	6.1.9	Manual download of fault history from the TFR LAN via the suppliers own GSM system or TRITON		Tenderer 1 will not provide manual download of the fault history from the TFR LAN via either the suppliers own GSM system or via TRITON	The supplier is proposing a web-portal be used to store the information, this may come with additional operating costs.		
27	6.1.10	Supply of access port to the control system in locomotive cab		It is not clear if Tenderer 1 will use this port for to connect to other devices such as Communication link between MCU and DDU ACU, Communication link between MCU and black box recorder, Interface with TRITON LAN, Interface with WIFI module and Interface with GSM GPS module	Tenderer suggest that this ethernet port will be used to interface with TRITON, the WIFI module, GSM GPS module which each must have a dedicated ethernet interface where they are housed in the communication cubicle, 19" rack the ethernet port in the cab is for maintenance personnel to use to connect to the controls system for data downloading, real time signal analysis, modification of end user variables, etc.	The Tenderer must be requested to provide the feature for real time signal monitoring	
28	6.1.11	Use of any USB flash to download data from the EM2000			The tenderer only supports data downloading by Ethernet or Wi-Fi not through a USB flash drive, Refer to section 5.6.2 page	Downloading of data from EM2000 requires a USB adapter	

					42, file 5 part 1		
29	7.1	**Supply of the black box recorder for the control system**					The tenderer's response to the clause indicates that they will supply a customer data recorder The tenderer must clarify that this operates as a black box.
30	7.2	**The data recorder is to be designed such that it can used to accurately determine the events before an incident occurred**					The tenderer's response to the clause indicates that the data recorded could be used to access the driver performance, however the list of signal should not be assumed to be the same as class 43. The list of signals should be discussed further.
31	7.6	**The data recorder must have the capability to store at least 64 digital signals and 64 analogue signals**			It is not clear if the tenderer will comply to this. Refer to section 5.7.6 page 42-43, file 5 part 1		
32	7.7	**Contents of the data recorder must be downloadable via laptop**		Tenderer 1 only mentions black box data downloading via a USB port but no mention data downloading via laptop			
33	7.10	**Supply of necessary PC software to download data recorder**				The comment provided under Clause 8.5 states that EMD license is required. The Tenderer	

						must provide more details explaining what the conditions for this licensing are	
34	8.1	Supply of transient recorders for the control system				The tenderer must clarify if a transient recorder(s) for the control system will be provided.	
35	8.6	Supply of several transient recorders				The tenderer only provides one transient recorder.	
36	8.9 10.6	Supply of software and hardware necessary for transient recorder data analysis and downloading				The comment provided under Clause 8.3 states that EMD license is required. The Tenderer must provide more details explaining what the conditions for this licensing are. TFR will like to have unlimited usage of software on multiple laptops.	The tenderer does not provide Transient recorder
37	8.1 (Should be 8.10)	Supply of the IGBT gate logging transient recorder				The Tenderer must confirm whether transient recorder for IGBT gate logging is provided. The Tenderer's comments are not clear whether this feature is included in the proposed locomotive for TFR.	

38	9.1	Monitoring and usage of all major components subsystems on the locomotive					Based on the tenderer's responses to the following clauses, the tenderer does not fully understand the requirement and attempt to justify a statistics based system which measures the time spent in throttling, idle, braking etc and a solution. The statistics system does not provide benefit to Transnet and the condition monitoring system must be discussed at the technical negotiations. The tenderer's response to the clause indicates that only a few components will be monitored
39	9.3	Supply of a configurable system				The Tenderer must consider giving TFR engineers an opportunity to select data to be monitored during design review	
40	9.4	Number of devices that can be monitored		Only equipment connected to the network bus will be monitored	Only equipment on the network bus will be monitored		

TRANSNET-REF-BUNDLE-03870

	9.9 9.10	Access of operational monitoring data via the DDU					The Tenderer must provide more information with regard to the features available on the statistics file which is described by the tenderer.
41	10.1	Connection of a laptop to the control system by maintenance personnel for high level fault finding				The Tenderer comments indicate that the Tenderer will provide troubleshooting guides which will be used as reference to fault find. TFR requires that the Tenderer provides the functionality which will allow TFR to monitor signals in real time.	The Tenderer does not provide the functionality real time signal monitoring for high level fault finding
42	10.2	View of any signal within the control system in real time				The Tenderer's comments indicate that monitoring of signals in real time can only be monitored via EM2000 Data meter menu. TFR requires that ALL signals be viewed and the Tenderer does not confirm whether all signals can be viewed.	The intention of the clause is to permit real time signal monitoring from a laptop, however the tenderer's solution is via the DDU. The tenderer's response indicates that not all signals can be monitored in real time
43	10.3	Graphical viewing and logging of signals by maintenance personnel			Tenderer 2 states that there is no limit to the if a reasonable refresh time is set - however	The Tenderer does not specify the number of signals which can be	The Tenderer does not provide the functionality real time signal

					the tenderer offers 50 ms which is slower than the specified sampling rate. Refer to section 5.10 page 44, file 5 part 1	viewed simultaneously. It is also not clear from the Tenderer's comments whether signals can be viewed graphically on the current locomotive which the Tenderer proposed for TFR.	monitoring for high level fault finding.
44	10.4 10.5	**Real time signal analysis**		Tenderer only offers an average sampling rate of 50 ms. as the CAN bus only refresh rate is 10 ms	Tenderer only offers an average sampling rate of 50 ms, as the CAN bus only refresh rate is 20 ms.	The tenderer must clarify whether the feature to view logged signals offline is included in the tenderer's base price offer	The Tenderer does not provide the functionality to view signals offline.
45	10.6	**Supply of PC software to achieve real time signal analysis**			The tenderer's non-compliance is in contradiction to section 5.10.6 on page 45, file 5 part 1 it is not clear if the software will be provided or not		
46	12.4	**Employment of three levels of fault resetting**			The tenderer does not have a Master rest as a fault level - this may be a typo		
47	15.1	**Master reset philosophy**				The Tenderer does not implement Master Reset philosophy.	
48	15.4	**Modification of the master reset code via laptop (or remotely via TRITON or GSM network)**		No evidence found the cross reference provided the tenderer must clarify if the master reset code	The tenderer will provide this feature via a cloud based web-portal. this may result in		

				can be modified by laptop or GSM	additional operating costs		
49	15.7	**Master reset cannot be performed on remote ECP WDP RDP locomotives from the lead locomotive**		The tenderer must clarify if the master reset functionality will not be provided in DP mode, however the tenderer does sate that "The master reset can only be performed in the locomotive where a critical fault occurred			
50	15.8	**It must be possible to perform master reset via a laptop**		No evidence found the cross reference provided, the tenderer must clarify if the master reset can be performed by laptop or GSM	The tenderer will provide this feature via a cloud based web-portal, this may result in additional operating costs		
51	17.2	**Information on any DDU can be viewed on any other DDU with the same consist**				The Tenderer does not offer the feature which allows the Driver or technical staff to have access to DDU information from any locomotive.	
52	17.3	**Locomotive orientation with a consist**				Direction detection of trailing locomotives feature must be offered	
53	17.6	**Dual redundancy of the jumper cable**					The tenderer does not offer a redundant MU link

54	17.7	**The protocol used on the inter locomotive network must be AAR5509**		Tenderer provides does not provide AAR5509, only provides standard 27 pin diesel MU. Thus the tender will not comply with this requirement			The tenderer states that some functionality described in the specification will not be realized using the protocol which they have proposed. Alternatively the tenderer proposed the option of eMU, however details of this option have not been provided.
55	17.9	**Jerk control – ramp rates in traction and braking**				The Tenderer does not implement jerk control	
56	18.2	**Differentiation between speed probe failure and locked axle**				The Tenderer system does not differentiate between speed probe failure and locked axle.	The Tenderer system does not differentiate between speed probe failure and locked axle.
57	19.1	**Wheel diameter calculation using GPS speed and speed probes**				The Tenderer uses Radar instead of GPS to calculate wheel diameter	
58	19.3	**Calibrated wheels used to improve traction**					Based on the tenderer's response, the calculated wheel diameters will not be used to improve traction control
59	19.4	**Automatic wheel diameter calibration**				The Tenderer must provide TFR with the accuracy levels to which automatic wheel	

						calibration is done.	
60	20.1	**The control system should have the capability to be aware when the park brake is engaged**					Information provided on sheet 25 of 56 GE technical description shows that the park brake status will not be integrated into the control system, but a separate light indicator will be provided.
61	20.2	**Sending of the park brake status to from all trailing locomotives to the lead locomotive via the inter loco data bus**				Park brake status will not be sent to the lead locomotive	
62	20.4	**Inhibition of traction if park brake is applied on any locomotive within the consist**				The Tenderer must provide more details explaining their proposal. TFR is concerned with the additional cost which might be associated with the implementation of this feature.	
63	20.6	**Park brake is to be applied and released via a pneumatic cock and not an electronic button**		Tenderer 1 must clarify if the park brake can be applied and released via a pneumatic cock. There is no evidence provided in the cross reference provided.			
64	21.1	**The locomotive is to fitted with**		The tenderer will use a	The tenderer does not		The tenderer states that

		heat smoke heat detectors		smoke detector. TFR prefers a heat detector, the tenderer must be requested to install a heat detectors instead of smoke detectors.	mention which type of fire detecting sensors will be used.		provision for a fire detection system will be provided, however the tenderer does not state the type of fire detection system or whether the detection systems are included in the base price. The Tenderer must confirm whether fire detection system is provided on the base price offer
65	21.2	**Integration of fire detection system with the control system and fault reporting in case of a fire on a locomotive**				The Tenderer must provide more information about dedicated MU trainline Will this be part of the 27 pin jumper cable?	
66	22.7	**Transmission of certain inter locomotive brake system commands via the MU link**			The tenderer comments in section 5.22.7 page 50, file 5 part 1, does not clear mention that certain commands will be transffered between locomotives by MU link, the tenderer's comments refers to transmission within the locomotive.	Inter locomotive brake system commands will not be transmitted over the MU link in the current proposed Tenderer's locomotive	
67	24.1	**Access to the control system via GSM from the TFR LAN**		Tenderer 1's GSM module only allows data transfer from the locomotive to the TFR LAN and communication			

	.			from the TFR LAN to the locomotive will not be permitted			
68	24.4	**All functions possible when laptop is connected to the control system should be possible when a GSM connection is established**		Tenderer I's GSM module only allows data transfer from the locomotive to the TFR LAN and communication from the TFR LAN to the locomotive will not be permitted	IT is not clear that the supplier understands this requirement, the requirement means all functions that can be performed by connecting a laptop to the control system, e.g. data downloading, must also be done via the GSM network,		
69	24.5	Sufficient security provided by the tenderer to ensure that there is no unauthorized access to the control system	HIGH	Tenderer I's GSM module only allows data transfer from the locomotive to the TFR LAN and communication from the TFR LAN to the locomotive will not be permitted			
70	24.7	Automatic download of data to a LAN based server through depot Wi-Fi hotspots				The tenderer requires a trigger signal to download data automatically when the locomotive is in a Wi-Fi hotspot	
71	25.3	Achieving maximum adhesion with Silica or Blastrite sand				The tenderer cannot guarantee maximum adhesion with blastrite or silica sand and they are willing to perform tests	The tenderer states that no toggle option will be provided between Blastrite and Silica

72	26.1	**Supply of an advanced wheel slip detection and correction system**					The Tenderer must be requested to provide more information regarding wheel slip detection. The Tenderer does make reference to wheelslip detection on page 37 of 56 GE technical description.
73	26.2	**Automatic load sharing on a locomotive**				The Tenderer will do load sharing per bogie	
	26.3	**Jerk control in both the ramp up and ramp down rates**				Ramp rates must be discussed with TFR during design review before parameters are finalised. This might even require final tuning during acceptance testing.	
74	26.4	**Conformation to ramp up and ramp down rates to TFR specifications**				The Tenderer ramp rate are as follows: 1. Traction: from 0 to 100% in a maximum of 48 seconds (TFR spec 24 seconds) 2. Dynamic braking ramp up from 0 to 100% in a maximum of 24 (TFR spec 3	The tenderer's response to the clause indicates their compliance to the some of the required ramp rate values, however the ramp up rate will not be to TFR specifications. The tenderer should state the ramping rates which differ from the Transnet standards as well as provide reasoning as to the limitations restricting adherence to

						seconds) The Tenderer must also specify ramp down rates for both traction and dynamic braking.	the requirement	
75	26.5						The tenderer's response to the clause indicates their compliance to the some of the required ramp rate values, however the ramp up rate will not be to TFR specifications. The tenderer should state the ramping rates which differ from the Transnet standards as well as provide reasoning as to the limitations restricting adherence to the requirement	
76	26.7	Anti-plugging protection				The comment provided by the Tenderer indicates that there will be no anti-plugging protection for older locomotives		
77	26.8	Measurement of the motor temperature using thermocouples accurately			The tenderer will only display calculated traction motor temperature, Refer to section 5.26.6.12, no mention of dedicated thermocouples.	The tenderer cannot provide the accuracy their thermal mode	The tenderer's response to the clause indicates that they make use of a thermal model to calculate traction motor	

					page 53 file 5 part 1		temperatures, however the model is accurate to + - 5°s instead of the specified +0°s, -2°s TFR specifications.
78	27.2	**Battery capacity to power for at least 4 hours with the engine off**		The tenderer does not state if this requirement will be met.		This feature is not implemented but will be discussed during the design reviews	
79	27.3	**Low battery voltage protection**				The low battery voltage limit is not configurable	The Tenderer does not provide low battery voltage trip out function.
80	27.7	**Limit of the charging current by the battery charger**				The inrush current limiting capabilities must be optimised in conjunction with the battery supplier	
81	29.1	**Manual cut-out of the traction motors**				The Tenderer must provide details explaining why manual cut out feature of trailing locomotives cannot be realised.	
82	29.2	**Manual cut-out by the driver of any subsystem on any locomotive within the consist**			Tenderer does not comply fully. it is not clear which equipment can be cut out, Refer to section 5.29 page 54 file 5 part 1		The tenderer states that the functionality to cut out subsystems on trailing locomotives can not be achieved using the AAR5509 protocol The tenderer can develop this

							functionality at additional cost which would also require the option of the MU provided by the tenderer.
83	29.3	Manual cut out of dynamic braking on trailing locomotives from the lead locomotive					The tenderer states that the functionality to cut out dynamic braking on trailing locomotives can not be achieved using the AAR5509 protocol. The tenderer can develop this functionality at additional cost which would also require the option of the MU provided by the tenderer.
84	30.1	Supply of a manual override function on the locomotive be used by maintenance personnel				The Tenderer must provide list of equipment to be tested	The tenderers response to the clause indicates that manual override functionality will be included in the self-test feature, however the tenderer needs to provide details of this self-test feature
85	31.1	Supply of the REMB on both side of the locomotive cab for the driver and the assistant driver				The positions of the REMBs are not shown on GT46AC locomotive cab layout	

86	32.1	**Display of the total tractive/braking effort for the entire consist including other classes of locomotives**				Tractive braking effort of the entire consist with different classes of locomotives cannot be realised as yet	
87	32.2	**Ergonomic positioning of equipment in the drivers cab**		The cab layout provided in annex 1.5 is not very detailed, additional information is required on how the tenderer aim to adhere to this requirement.			The tenderer states that in order to calculate TE and BF from trailing locomotives which do not have DB modem, additional costs will be incurred for development. The Tenderer must be requested to provide costing for the development of look up table for older types of locomotives
88	32.3	**Ensuring operability of all display screens in all different temperatures that can be experienced in South African environments**			Tenderer complies with -10 degree Celsius to +50 degree Celsius. Refer to section 5.32 page 55 file 5 part I	The Tenderer must state the operating temperature of different display units	
89	32.6	**Operating the locomotive when both DDUs have failed**				The analogue gauges to be used in case of DDU's failing should be discussed during the design reviews.	
90	32.15	**DDU manual and automatic brightness control**				The proposed DDU does not have automatic brightness	

						control	
91	32.16	**Supply of a function to switch from Day to Night mode**				Proposed DDU does not have day night mode	
92	32.17	**The front of the DDU shall be rated at least IP65**		The IP20 rating of the back of the DDU is not sufficient. TFR will accept a front IP rating of IP65 and rear IP rating of IP54.	The IP20 rating of the back of the DDU is not sufficient. TFR will accept a front IP rating of IP65 and rear IP rating of IP54. Refer to section 5.32 page 57 file 5.		
93	32.18	**Supply of a very fine resolution (1024x768 pixels)**		The tenderer proposes a 800x600 resolution for the DDU.	The tenderer proposes a 800x600 resolution for the DDU.		
94	36.2	**Using the GPS date and time to synchronize control system units**				The Tenderer must clarify whether they will use dedicated GPS for the control system	The tenderer's response to the clause indicated that they do not comply with this requirement. The Tenderer must provide more information explaining how they intend to make sure that all control systems times are synchronised
95	38.1	**Relay of power from trailing locomotives to the lead locomotive should the batteries of the leading locomotive fail or die**					The tenderer must provide sufficient reason why the requirement to keep the control system of a failed lead locomotive alive cannot be complied with

96	40.1	**Integrated slow speed control for train speed control during loading processes**			The tenderer's slow speed control plan A is not acceptable to TFR In slow speed mode, the slow speed must be set and adjusted on the DDU not by the use of the master controller handle. The control system must ensure that the speed deviation is within 10% of the desired speed, this may be diffucult to archive if the driver is requested to manually adjust the speed by use of the master controller. Traditionally the master controller handle is moved to notch 1 to start the slow speed and is kept there for as long as the slow speed mode is active, the speed is increment or decrement on the DDU without moving the master controller handle There tenderer did not supply any details of how plan B Speed Control II, would realise this function. Refer to section 5.4[illegible].1 page 5[illegible] file 5		

					part 1		
97	40.6	**Limit of speed oscillations should be within the loading stations' requirements during the loading process**				The Tenderer must provide information explaining the methodology which is used in North America for TFR to review	
98	43.6	**Supply of dummy trainline power supplies and ECP junction boxes**					The tenderer will not provide dummy trainline power supplies
99	44.1	**Supply of a modern sanding system to maximize adhesion**			The tenderer does not provide details supporting why the sand box displayed on figure 5.9 can be regarded as an advanced sanding system.		
100	45.1	**Connection of 8 locomotives into one consist**					The requirement of being able to MU up to 8 locomotives in a consist is not met by the tenderer. The tenderer provides up to 6 MU locomotives in a consist
101	45.2	**Reconfiguration of a consist should both jumper cables be removed or added**					The tenderer does not offer automatic consist reconfiguration when a jumper cable is connected or disconnected.
102	45.3	**The reconfiguration time shall be a maximum of 60 seconds**					The tenderer must clarify the maximum

							reconfiguration time when 8 locomotives are coupled together.
103	45.4	**Inhibiting traction during consist reconfiguration**				The prevention of powering while the consist is reconfiguring will only be implemented at a later stage	
104	45.6	**Recognizing the position of any locomotive in the consist after reconfiguration**		The tenderer needs to clarify if there is a limitation on displaying information about (e g orientation) old and new locomotives in a consist. it seems from the comments that information on old locomotives will not be displayed on the DDU. See tenderer's comments		The Tenderer control system does not have the capability to determine the position of all locomotives in a consist.	
105	48.1	**Receiving air conditioner fault information by the control system**				The Tenderer s comments indicate that the control system will not receive fault information from the air conditioner	
106	50.1	**Detection and logging of earth faults by the control system in the low and high voltage circuits**				The Tenderer does not offer earth fault detection for Low Voltage circuits.	

107	51.1	**Using the A8/A12 convention for compressor control**				The Tenderer must provide more description of how the main compressor control of the proposed locomotives works	
108	51.3	**Opening a local A8 should stop the local compressor**			The tenderer will run all compressors in the consists if any A8 relay is closed - This is not the requirement and may be dangerous, if the A8 relay of a local compressor is opened that compressor must be stopped, regardless of the status of any other A8 relays in the consist.		
109	54.7	**Sending of driver information when the fuel consumption reset button is pressed via TRITON of GSM network**		The tenderer states that data will be send to the TFR LAN via the suppliers' GSM PERIODICALLY, the specification requires this data only be sent when the driver presses the special reset button on the DDU. The tenderer must clarify if they intend to adhere to this requirement, Annex 3.7 section 5.36	The tenderer states that data will be send to the TFR LAN via the suppliers' GSM PERIODICALLY, the specification requires this data only be sent when the driver presses the special reset button on the DDU. The tenderer must clarify if they intend to adhere to this requirement		
110	54.8 54.9	**Supply of back office software and population of a database with information received from**					The Tenderer does not give TFR the back office software which

		the energy management system					will receive information sent from the locomotive
111	54.10	**Tenderers are to propose an additional comprehensive energy management system**		The tenderer only provided responses to the TFR *requirements* and does not offer any additional information such as a comprehensive energy management system proposal, detailing the robustness of the system, the application of a similar system elsewhere, etc,	The tenderer only provided responses to the TFR requirements and does not offer any additional information such as a comprehensive energy management system proposal, detailing the robustness of the system, the application of a simillar system elsewhere, etc, Refer to section 5.50 page 63 file 5 part 1		TFR would like to have the capability to disable the Trip *Optimizer* proposed by the Tenderer. The functionality of the Trip Optimiser will need to be discussed internally with TFR top management in order to establish the viability and possible routes where Trip Optimiser can be used within TFR environment.
112	55.1	**Implementation of modern electronic engine control**		The tenderer states that the MTU diesel engine in the technical proposal may not be the engine used on the final locomotive design, a CAT diesel engine may be used. The tenderer must clarify which engine they intend to use.			
113	55.6	**Logging of any on the engine**					Tenderer indicates in their response that engine faults are recorded in the incident logs but not in the event

							recorder. It seems that the tenderer has labelled their recording systems slightly differently. The tenderer must clarify as to the purpose of the event recorder and the incident logs
114	55.7	**Engine/fuel injection optimization**		Tenderer states that this will only be done at MTU test bench			
115	55.11	**Supply of an AESS system to optimize fuel consumption during idling**		Insufficient details provided on functionality of the proposed AESS system			
116	56.1	**Supply of software algorithms as part of the locomotive documentation**				The Tenderer will not provide TFR with relevant documentation detailing software algorithms which will allow TFR to maintain locomotives and conduct fault finding	The Tenderer will not provide TFR with relevant documentation detailing software algorithms which will allow TFR to maintain locomotives and conduct fault finding.
117	56.2	**Supply of a high level description of all control algorithms as part of the locomotive documentation**				The Tenderer will not provide TFR with relevant documentation detailing software algorithms which will allow TFR to maintain locomotives and conduct fault finding	

118	56.3	**Supply of circuit diagrams for all electronic modules**				The Tenderer will not provide TFR with relevant documentation detailing electrical diagrams for all electronic modules which will allow TFR to maintain locomotives and conduct fault finding	The Tenderer will not provide TFR with relevant documentation detailing electrical diagrams for all electronic modules which will allow TFR to maintain locomotives and conduct fault finding.

APPENDIX EE: RISKS – 599 ELECTRICAL LOCOMOTIVES - A6-01, A6-06 to A6-09 – PERFORMANCE, BRAKE SYSTEMS TECHNOLOGY – MARTHIN MULDER

Marthin Mulder , Justice Ngwenyama , Konrad van der Merwe & Dave Hansen

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
A6 -01 Clause 1.6.3	It is mandatory that tenderers locomotives with dual voltage mode (AC/DC) capability are offered on a standardised platform and automatic change-over between modes shall be possible; i.e. possible to achieve "on-the-fly" change-over from AC to DC and vice versa automatically. See also A6-02 for locomotive parameters and specification				The AC and DC (as offered) will require the driver to change panto and that is not required by TFR.			

	BBF0889 for the parameters of the 3kV DC/25kV AC change over section.							
A6 -01 Clause 4.7.2	The following are the mandatory **minimum** continuous tractive effort requirements available at the wheel tread, for the options of Bo-Bo or Co-Co bogie configurations, at maximum 22 tons / axle loading ; - Bo-Bo @ 31‰ = 267kN (2521kW @ 34km/h) - Co-Co @ 31‰ = 400kN (3778kW @ 34km/h)		The tenderer offered a locomotive at base speed of 40 km h Tenderer must indicate the ability of the locomotive to operate continuously at 34 km h and the specified TE		The tenderer offered locomotive at base speed of 40 km h Tenderer must indicate the ability of the locomotive to operate continuously at 34 km h and the specified TE		TFR's requirement was for Co-Co or Bo-Bo, Tenderer only offered Bo-Bo and can be considered for Bo-Bo configuration	
A6 -01 Clause 5.1.2	Electric braking effort (A fully blended Regenerative and Rheostatic braking system is mandatory). Flat	The BF of this tenderer appears as if doesn't meet the speed range requirement. The level of the BF is higher than						

	top characteristic from not lower than 45 km/h down to as low as possible (but not higher than 5 km/h) with a minimum value of 200kN for Bo-Bo and 300kN for Co-Co configurations are mandatory.	required but at a lower maximum speed						
A6 -01 Clause 9.1	It is a mandatory requirement that Tenderers submit prices for the following options 1.) ECPB with Wire Distributed Power (WDP) 2.) Radio Distributed Power (RDP) 3.) Both ECPB with WDP as well as RDP	Finance to ensure that Tenderers have submitted the pricing of this options.	Finance to ensure that Tenderers have submitted the pricing of this options	Finance to ensure that Tenderers have submitted the pricing of this options	Finance to ensure that Tenderers have submitted the pricing of this options	Finance to ensure that Tenderers have submitted the pricing of this options	Finance to ensure that Tenderers have submitted the pricing of this options	Finance to ensure that Tenderers have submitted the pricing of this options
A6 -03 Clause 1.1	It is mandatory that the locomotive technical			Simulation tool is				

	information requested hereunder, be provided in order to facilitate input to Simu-Train, involving the new locomotive			mandatory and tenderer offered it as an option. Ensure that the price is on Base price and Tenderer commit in proving the information				
A6 -06 Clause 6.4	It is desired that tenderers provide and/or comment on the feasibility to include a level indicator and simplification of the filling system			The Tenderer scored himself Non-compliant This Tenderer does not offer a sand box level indicator Item to be discussed during tender negotiations if the tenderer is				

				successful.				
A6-06 Clause 1.3	It is essential that all brake blocks shall exert equal pressure on the wheels within 5°.					The Tenderer scored himself Partial-compliant. This can be achieved by proper alignment and installation but is difficult to sustain Item to be discussed during tender negotiations if the tenderer is successful	The Tenderer scored himself Partial-compliant. Tolerance on service brake is +5°. -7°. Item to be discussed during tender negotiations if the tenderer is successful	
A6-06 Clause 1.6	It is essential that the brake slack adjusters (to meet the requirements of clause 1.4) shall be incorporated in the unitised package brake system and must ensure an 8mm				The Tenderer did not score himself and did not supply supporting information Transnet scored the Tenderer Non-compliant.			

	minimum brake block clearance				Item to be discussed during tender negotiations if the tenderer is successful			
A6-06 Clause 1.10	It is essential that for the unit package brake design to be such as to ensure that no condition of brake block wear, and or brake maladjustment, will cause the brake equipment to foul or jam against any bogie frame components or prevent one or more of the brake blocks from developing full braking force at the wheels				The Tenderer score himself Full compliant. Transnet scored the Tenderer Non-compliant. Tenderer stated maladjustment of the brake equipment may prevent development of full braking force Item to be discussed during tender negotiations if the tenderer is successful			

A6-06 Clause 1.13	It is essential that provision be made to prevent the block rubbing on the tyre when the brakes are not applied				The Tenderer score himself Partial compliant. Transnet scored the Tenderer Partial-compliant. Item to be discussed during tender negotiations if the tenderer is successful				
A6-06 Clause 1.14	It is essential that the brake rigging be designed to comply to the stopping distance and pressures as per section A6-06, clause 2.2				The Tenderer score himself Partial compliant. Transnet scored the Tenderer Non-compliant. The Tenderer did not supply supporting documentation to indicate brake rigging and				

					pressures to comply with stopping distances Item to be discussed during tender negotiations if the tenderer is successful			
A6-06 Clause 5.1	It is essential that the hand brake will act on an adequate number of axles in order to hold the locomotive stationary on a 2.5% (1:40) gradient without skidding the wheels				The Tenderer score himself Partial compliant Transnet scored the Tenderer Non-compliant The Tenderer did not supply supporting documentation on necessary handbrakes to hold loco on 1 in 40 gradient. Item to be			

					discussed during tender negotiations if the tenderer is successful			
A6-06 Clause 5.3	It is essential that the Contractors submit detailed calculations demonstrating that the brake force requirements for the hand brake system are met.				The Tenderer score himself Partial compliant Transnet scored the Tenderer Non-compliant. The Tenderer did not supply handbrakes calculations Item to be discussed during tender negotiations if the tenderer is successful			
A6-06 Clause 5.4	It is desirable that the spring applied park brake does not apply automatically when the battery circuit				The Tenderer score himself Partial compliant Transnet scored			

	breaker trips				the Tenderer Partial-compliant The Tenderer tendered to supply partial compliant for handbrake not applying when battery circuit breaker trip Item to be discussed during tender negotiations if the tenderer is successful			
A6-06 Clause 6.7.1	It is desirable that the quantity of sand dispersed from any nozzle not differ by more than 10%.						The Tenderer score himself Non-compliant. Transnet scored the Tenderer Non-compliant The Tenderer indicated sand dispersed from	

							any nozzle differ between 0.2 and 0.3 litre per min. Item to be discussed during tender negotiations if the tenderer is successful.	
A6-06 Clause 6.7.2	It is desirable that the quantity of sand dispersed per axle does not differ between locomotives						The Tenderer score himself Non-compliant. Transnet scored the Tenderer Non-compliant. The Tenderer indicated sand dispersed from any nozzle differ between 0.2 and 0.3 litre per min. Item to be discussed during tender negotiations if the tenderer is	

							successful	
A6-06 Clause 7.1	It is essential to submit the calculations indicating the total "static holding ability" that will be achieved.				The Tenderer score himself Partial-compliant. Transnet scored the Tenderer Partial-compliant. The Tenderer indicated increased static holding ability may not achieve 21°. Item to be discussed during tender negotiations if the tenderer is successful			
A6-06 Clause 7.2					The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant.	The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant.	The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant.	

					The Tenderer supplied no calculations for increased static holding ability. Item to be discussed during tender negotiations if the tenderer is successful.	The Tenderer supplied no calculations for increased static holding ability. Item to be discussed during tender negotiations if the tenderer is successful.	The Tenderer supplied no calculations for increased static holding ability. Item to be discussed during tender negotiations if the tenderer is successful.	
A6-06 Clause 7.3	It is essential that the above offer will include the following interlocks: Independent must be applied fully, speed must be 0km/h, a 120kPa brake pipe reduction must be present.				The Tenderer score himself Partial-compliant. Transnet scored the Tenderer Partial-compliant. The Tenderer supplied no information. Item to be discussed during			

					tender negotiations if the tenderer is successful			
A6-07 Clause 1.5	It is essential that a suitable device, to ensure that compressed air will be available for the operation of the locomotive control and brake equipment in the event of the hose couplings between locomotives becoming disconnected, or defective, shall be fitted.			The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant. The Tenderer supplied no check valve on no 1 reservoir Item to be discussed during tender negotiations if the tenderer is successful				
A6-07 Clause 4.6	It is essential that the equipment required to remove moisture from the auxiliary air supply be provided with automatic drainage facilities	The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant						

		The Tenderer supplied no supporting documentation for mini compressor air dryer Item to be discussed during tender negotiations if the tenderer is successful.						
A6-07 Clause 1.6.1	It is essential that a suitable set of mechanically and electrically operated isolating cocks as well as protection devices for the Pantograph reservoir will be offered				The Tenderer score himself Full-compliant Transnet scored the Tenderer Non-compliant The Tenderer supplied no supporting documentation for pantograph			

					Item to be discussed during tender negotiations if the tenderer is successful			
A6-07 Clause 2.1	It is mandatory that an electrically driven compressor of sufficient capacity to deliver at least 0,05 m³ s of free air when operating against a delivery pressure of 1 000 kPa, will be provided on each locomotive				The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant. **This is a disqualifying clause.** TFR has no experience with the suggested compressor, and tenderer supplied no information on the compressor Item to be discussed during tender			

					negotiations if the tenderer is successful.			
A6-07 Clause 2.1.1	It is essential that the compressor will be direct-driven at a speed not exceeding 1 500 r min and will be as silent as possible in operation.				The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant. The compressor tendered is belt driven and not direct drive as the requirement. Item to be discussed during tender negotiations if the tenderer is successful.			
A6-07 Clause 2.13	It is essential to provide A compressor governor.				The Tenderer score himself partial-compliant. Transnet scored the Tenderer Partial-			

					compliant. The tenderer tendered with a soft starter and no governor and supplied no information. Item to be discussed during tender negotiations if the tenderer is successful			
A6-07 Clause 2.14	It is essential that the capacity of the compressor in m³/s shall be stated and Contractors will give full details, including the speed of the compressor and motor.				The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant. The tenderer supplied no information on compressor capacity.			

					Item to be discussed during tender negotiations if the tenderer is successful.			
A6-07 Clause 2.15	It is essential that the Contractors will submit detailed calculations of the anticipated compressed air requirements for the locomotive air equipment as well as for the operation of AAR type direct release air braked trains				The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant. The tenderer supplied no information on air requirement for loco and for AAR direct release brake system. Item to be discussed during tender negotiations if the tenderer is successful.			

A6-07 Clause 4.4	It is essential that contractors shall submit comprehensive details of the compressor, compressed air connections and valves, motor ratings, capacity and functions in addition to those stated in this specification				The Tenderer score himself Full-compliant. Transnet scored the Tenderer Partial-compliant. The tenderer supplied no information on axillary compressor motor rating and capacity Item to be discussed during tender negotiations if the tenderer is successful			
A6-07 Clause 6.6	It is essential that the interiors of all compressed air reservoirs are to be painted.						The Tenderer score himself Partial-compliant. Transnet scored the Tenderer Partial-compliant.	

							The tenderer offered to rust protect instead of paint the interior of the reservoirs Item to be discussed during tender negotiations if the tenderer is successful	
A6-07 Clause 8.1	Copper and painted black steel piping (schedule 40) are essential Contractors shall indicate on the air brake diagram the type and size of piping used						The Tenderer score himself Partial-compliant Transnet scored the Tenderer Partial-compliant The tenderer recommended zinc coated pipes Item to be discussed during tender negotiations if the tenderer is	

							successful.	
A6-07 Clause 8.1.1	It is essential that vacuum piping will have an inside diameter of 65mm					The Tenderer score himself Partial-compliant. Transnet scored the Tenderer Partial-compliant. The tenderer recommended further investigation. Item to be discussed during tender negotiations if the tenderer is successful	The Tenderer score himself Partial-compliant. Transnet scored the Tenderer Non-compliant. The tenderer indicated to use 60mm ID vacuum steel pipes. Item to be discussed during tender negotiations if the tenderer is successful.	
A6-08 Clause 2.2					The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant			

					The tenderer did not supply hooter information. Item to be discussed during tender negotiations if the tenderer is successful.				
A6-08 Clause 2.2	It is essential that the hooters shall be arranged for a joy stick switch on the drivers and assistants desk and also at the rear door of the locomotive will be provided to operate the hooters.				The Tenderer score himself Full-compliant Transnet scored the Tenderer Non-compliant. The tenderer is not compliant to hooter joy stick operation. Item to be discussed during tender negotiations if the tenderer is successful.				

A6-08 Clause 2.4 and 2.5	It is essential that the hooter must only operate on the end of the locomotive at which it is being operated. It is essential that Contractors will submit full details of the hooters offered and shall depict all associated valves, filters etc. on the air supply and brake system schematic				The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant. The tenderer did not supply hooter information on hooter operation on one end of loco and did not provide full details on hooter operation Item to be discussed during tender negotiations if the tenderer is successful			
A6-08 Clause 4.1	It is essential that the Contractors shall state the maximum and minimum air pressure required for the pantograph				The Tenderer score himself Full-compliant. Transnet scored the Tenderer Non-compliant			

	operation, as well as the rated air pressure.				The tenderer did not supply axillary air supply pressure details and no pantograph operation information Item to be discussed during tender negotiations if the tenderer is successful			
A6-09 Clause 4.2	It is essential that every locomotive shall be subjected to the brake pipe restriction test prescribed in test specification AAR S-471 2010 and successfully pass the test before acceptance can be considered.				The Tenderer did not score himself. Transnet scored the Tenderer Non-compliant. The tenderer did not supply information.			

					Item to be discussed during tender negotiations if the tenderer is successful			
A6-09 Clause 6.2	It is essential that the locomotive brakes shall be air operated with an adjustable maximum brake cylinder pressure limited to 350 kPa under dynamic conditions. During a full service application within this range the wheels must not skid when stopping in wet conditions							The Tenderer score himself Partial-complience Transnet scored the Tenderer Partial-compliant The tenderer indicated possible small skids in wet conditions Item to be discussed during tender negotiations if the tenderer is

									successful
A6-10 Clause 1.5					Change scoring from 0 to 2. This is not a concern any more.				
A6-10 Clause 2.4	It is essential for tenderers to submit complete details of the draftgear assembly, including drawings of the drawgear pocket, the drawgear and yoke, as well as the technical performance data of the particular drawgear yoke and drawgear offered and recommended and the standards with which they comply				No information provided				
A6-10 Clause 2.5	It is essential for tenderers to submit complete maintenance details of the				No information provided				

	drawgear provided, included complete tooling required, typical replacement intervals, and a refurbishment procedure							
A6-10 Clause 4.2.2	It is essential for adequate provision to be made for the adjustment of coupler height to compensate for wheel wear on radius of 42 mm. Tenderers shall furnish complete details and illustrations of the method of coupler height adjustment, as well as the range of possible adjustment, on the locomotive offered.	Height adjustment not deemed necessary - no solution offered		No coupler height adjustment suggested.	No information provided			No description provided

APPENDIX FF: RISKS – 465 DIESEL LOCOMOTIVES - A6-01, A6-06 to A6-09 – PERFORMANCE, BRAKE SYSTEMS TECHNOLOGY – MARTHIN MULDER

Marthin Mulder , Justice Ngwenyama , Konrad van der Merwe & Dave Hansen

BRAKE SYSTEM and A6-01 – DIESEL LOCOMOTIVES (BBF 3701- 465 Diesels)

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
A6 -01 Clause 1.9	It is a mandatory requirement that Tenderers submit prices for optional ECPB / WDP complete fitment to locomotives as well as RDP complete fitment to locomotives	Finance to ensure that the price of RDP/ECP/WDP is included as this is normally inflated once the contract is signed This was mandatory in the technical specification	Finance to ensure that the price of RDP/ECP/WDP is included as this is normally inflated once the contract is signed This was mandatory in the technical specification	Finance to ensure that the price of RDP/ECP/WDP is included as this is normally inflated once the contract is signed This was mandatory in the technical specification	Finance to ensure that the price of RDP/ECP/WDP is included as this is normally inflated once the contract is signed This was mandatory in the technical specification
A6 -01 Clause 4.1.3	It is a desired requirement that the base speed (lowest speed at which locomotive can be continuously operated without exceeding its thermal ratings) be 15 km/h.				Evaluated to be Full compliant as the locomotive will look after itself an operate optimally

A6 -01 Clause 4.3.2.1	An individual traction motor cut out facility is essential.			Bogie control is still usable, the Locomotive should be evaluated to determine the capacity.	
A6 -06 Clause 4.1	It is an essential requirement that tenderers submit detailed calculations demonstrating that the brake force requirements for the handbrake system are met.		Tenderer did not supply handbrake calculation details To be discussed during tender negotiations should tenderer be successful		
A6 – 07 Clause 3.3	It is essential requirement that in "maintain" the exhauster shall be capable of maintaining a vacuum in excess of 65 kPa (and not significantly more) in a container of 900 l capacity against a constant leak produced by an opening to atmosphere of a 9 5 mm hole This capacity must be achieved with the diesel engine at idle		Tender scored themselves partial compliance – Testing the maintain feature of the exhauster To be discussed during tender negotiations should tenderer be successful		

A6 -07 Clause 3.4	It is a essential requirement that in "release" the capacity the exhauster shall produce 65 kPa in a container of 900 l capacity against a constant leak produced by an opening to atmosphere of a 9.5 mm hole within 20 seconds after commencing with the test. This capacity may be achieved through the control system		Tender scored themselves partial compliance – Testing the release capacity of the exhauster To be discussed during tender negotiations should tenderer be successful		
A6-07 Clause 6.0	It is essential that an intake air filter preferably of the dry element type be provided, with an indicator to show that filter element is serviceable		Tender scored themselves partial compliance – For dry element filter with an indicator To be discussed during tender negotiations should tenderer be successful		
A6-07 Clause 8.0	It is essential that the exhauster inlet be adequately protected by suitable inline filters preferably of the paper element type		Tender scored themselves partial compliance – For protection of the exhauster with a paper element filter To be discussed during tender negotiations should tenderer be		

			successful		
A6-07 Clause 18.1.3	It is essential that each reservoir be given a hydraulic test to a minimum hydraulic test pressure of 75% in excess of the safety valve setting		Tender scored themselves partial compliance – For hydrostatic testing of main air reservoirs to 75% in excess of the safety valve setting To be discussed during tender negotiations should tenderer be successful		
A6-07 Clause 3.0	It is a desirable requirement that an electrically or mechanically driven compressor be provided on each locomotive of sufficient capacity to deliver at least 0,046 m^3/s of free air when operating against a delivery pressure of 1 000 kPa this capacity shall be achieved with the diesel engine in high idle			Tender scored themselves partial compliance Transnet scored Tenderer Non-compliant – For not achieving the compressor air delivery requirements at idle To be discussed during tender negotiations should tenderer be successful	
A6-08 Clause 1.2	It is essential that the hooters be arranged for hand operation from within the driver's cab A	Tender scored themselves Full compliance Transnet scored Tenderer Non			

	joy stick switch on the drivers and assistants desk	compliant – For tendering with a foot or lanyard operated hooter instead of a joystick or switch To be discussed during tender negotiations should tenderer be successful			
A6-09 Clause 9.0					Tender scored themselves Partial compliance. Transnet scored Tenderer Partial compliant – For tendering with a static holding brake increase of 14.4% instead of the 21% requirement To be discussed during tender negotiations should tenderer be successful
A6-10 Clause 2.5	It is essential for tenderers to submit complete maintenance				This doesn't affect the offer negatively because the

	details of the drawgear provided, included complete tooling required, typical replacement intervals, and a refurbishment procedure.				maintenance info is already with TFR and available from Keystone.

APPENDIX GG: RISKS – 599 ELECTRIC LOCOMOTIVES - A6-05 – TRANSFORMER TECUNOLOGY – VINCENT MALALE

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
11.3	25kV down lead cable T connection -Mandatory	RISK: No suitable evidence found in tender documentation. No reason to believe that tenderer can not comply. (Tenderer will be held to self-assessment of full compliance) Final design proposal to be agreed to during technical negotiations (before signing of contract).	RISK: No suitable evidence found in tender documentation. No reason to believe that tenderer can not comply. (Tenderer will be held to self-assessment of full compliance) Final design proposal to be agreed to during technical negotiations (before signing of contract).	RISK: No suitable evidence found in tender documentation. No reason to believe that tenderer can not comply. (Tenderer will be held to self-assessment of full compliance) Final design proposal to be agreed to during technical negotiations (before signing of contract).	RISK: No suitable evidence found in tender documentation. No reason to believe that tenderer can not comply. (Tenderer will be held to self-assessment of full compliance) Final design proposal to be agreed to during technical negotiations (before signing of contract)	RISK: No suitable evidence found in tender documentation. No reason to believe that tenderer can not comply. (Tenderer will be held to self-assessment of full compliance) Final design proposal to be agreed to during technical negotiations (before signing of contract)	RISK: No suitable evidence found in tender documentation. No reason to believe that tenderer can not comply. (Tenderer will be held to self-assessment of full compliance) Final design proposal to be agreed to during technical negotiations (before signing of contract)	RISK: No suitable evidence found in tender documentation. No reason to believe that tenderer can not comply. (Tenderer will be held to self-assessment of full compliance) Final design proposal to be agreed to during technical negotiations (before signing of contract)
2.1	Design information - Essential				RISK: Tenderer provide insufficient transformer technical data	RISK: Transformer rating for both bo-bo (2.6MVA) & co-co (3.8MVA)	RISK: 3350kVA The tenderer proposed bo-bo main transformer rating small for	RISK: 3120kVA The tenderer proposed bo-bo transformer small for TFR

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
					& 3.3 MVA rating small for application	submission small for application	application.	application
4.1	Basic Insulation Level (BIL) -Essential			RISK: The tenderer proposed transformer has a BIL of 175kV. The tenderer must be requested to provide transformer with BIL of 190kV. If additional costs will be incurred the tenderer must provide TFR with costs for complying & cost must then be included in the base price offer			The tenderer proposed transformer meet TFR requirement, discrepancies of different BIL levels between transformer winding and HV bushing must be discussed at technical negotiation stage.	RISK: The tenderer proposed transformer conforms to BIL level of 150kV as stated in IEC for railway electrified line voltage of 25kV. From TFR past experience, the transformer reliability can compromised during lightning incidents for transformers with BIL rated to 150kV

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
5.1	Temperature rise -Essential			RISK: Tenderer must clarify operating temperatures	RISK: Tenderer must clarify operating temperatures			
5.2	Temperature rise -Essential					RISK: The tenderer proposed transformer winding temperature rise exceed limit of (80K) in locomotive's DC mode of operation		
8.1	Sealing (transformer oil preservation system) -Desirable							RISK: From Transnet previous experience, nitrogen sealed transformer accumulates high levels of combustible gases. How will the tenderer

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
								protect Transnet from this risk?
10.2	Transformer Tank -Essential			RISK: Welded tank cover complicates maintenance when transformer cover needs to be opened				
11.3.1	Transformer HV bushing / down lead cable -Essential					"RISK: Tenderer doesn't give sufficient evidence from tenderer technical documentation."		
11.4	Primary bushing through bushing -Essential							The tenderer must ensure Transnet of the quality of the proposed insulation material used for locomotive

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
								roof through bushings
12.1	RISK: Housing of other equipment (i.e. auxiliary transformers and line filter reactors within the transformer main tank -Essential	RISK: Transformer resonant filter shares same tank, hence failure of either will affect the other	RISK: Transformer resonant filter shares same tank, hence failure of either will affect the other	RISK: Transformer resonant filter shares same tank, hence failure of either will affect the other.	RISK: Transformer resonant filter shares same tank, hence failure of either will affect the other.	RISK: Transformer resonant filter shares same tank, hence failure of either will affect the other	RISK: Transformer resonant filtér shares same tank, hence failure of either will affect the other	RISK: Transformer resonant filter shares same tank, hence failure of either will affect the other.
13.4.2	Oil level indicator -Mandatory			RISK Insufficient evidence from tenderer technical documentation				
13.5.2	Oil Valves for the isolation of oil Pumps and Oil Cooler -Mandatory				RISK: Evidence not clear from tenderer technical documentation			
13.6.	Oil Sampling				RISK:			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
	Drainage and Filtering cocks valves -Mandatory				Evidence not clear from tenderer technical documentation			
13.9.1	Oil cooler blower air flow relay -Essential	RISK: Tenderer doesn't provide air flow relay rather insufficient air flow is detected by fluids temperatures, the risk is any transformer overheating problem can associated with other systems disorder even if is from insufficient air flow problem.				RISK: Tenderer doesn't provide air flow relay rather insufficient air flow is detected by fluids temperatures, the risk is any transformer overheating problem can associated with other systems disorder even if is from insufficient air flow problem.		
16.3	Repair technology -Essential						RISK: Tenderer assures support for minor	

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
							service, support for major maintenance not clear	
17.1.1	Tests -Mandatory					RISK: The tenderer propose replacing the shock and vibration test with FEM calculations. The calculations method findings might be limited, i.e. they might not reveal the actual findings as the practical tests.		
17.1.4	Tests -Desirable	RISK: The tenderer comments that from their experience this test is not necessary, rather						

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
		steady state short circuit calculations can be provided. The calculation methods findings can be limited. Transnet requires that the mechanical integrity of the transformer be proven, hence either test that prove this will be required by Transnet and this must shock and vibration.						
17.1.5	Tests -Essential			"* Transformer temperature rise test are made according to CEI 60310 * The required test cannot be performed on a test bench. The				

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
				one we can use, can accommodate up to two traction motors " "RISK: Tender confused the clause, clause refers to type temperature rise test of transformer alone."				

APPENDIX HH: RISKS – 599 ELECTRIC LOCOMOTIVES - A6-14 – MAINTENANCE – VILVALINGUM NAIR

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
1	Standards							
1 1	It is a desirable requirement that all responses to maintenance, reliability and LCC analysis complies with the following standards. Tenderers are requested to list all other standards to which their answer complies with.				No evidence found			File 5-2 Index 18, Elvis to Confirm LCC in Annexure F
2	GENERAL							
2 2	It is an essential requirement that the tenderer includes a comprehensive costs analysis along principles of life cycle costing (LCC model). Maintenance costs shall include costs for all material	Risk - Elvis to Refer to Binder VII, Annexure I "Financial Total Cost of Ownership Model"			Risk - vol 4 Index 5 partial compliance due to only certain components covered	Vol 3A, Sec Annex K(i), P183/204 Clause 20.5 Elvis to confirm cost		
2 3	It is an essential requirement that the tenderer includes a comprehensive submission and analysis of maintenance strategies and options that is deemed fit for the locomotive fleet being offered	.			Risk - vol 4 Index 5 partial compliance due to only certain components covered			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
2 3 1	It is an essential requirement that the locomotive be designed for extended running maintenance cycles A minimum requirement is 45000km or 3 months between scheduled running maintenance interventions				Risk - vol 4 Index 5 partial compliance due to only certain components covered	Vol 3A Sec Annex K(i), P184-5/204 Clause 20 5		
2 4	It is an essential requirement that the tenderer provides a detailed maintenance plan for the locomotive fleet being offered at the time of tender This must include a detail statement of work for each of the maintenance scheduled interventions envisaged within an annual maintenance cycle This is required to be aggregated up to and including its first major maintenance intervention. This is to be further aggregated for the full life of the asset				Risk - vol 4 Index 5 partial compliance due to only certain components covered, Elvis to confirm	20 5/20 6 Refers to Annex F - Elvis to confirm		
2 4 1	It is an essential requirement that two types of maintenance plan schedules are provided These are • Running maintenance schedule i.e. frequency and task list of maintenance to be done on the locomotive. • Component change out schedule i.e. proposed frequency of major component change outs change-out criteria and an indication of the overhaul intervention				Risk - vol 4 index 5 partial compliance due to only certain components covered	20 5/20 6 Refers to Annex F - Elvis to confirm		

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
	required							
3	**Locomotive Reliability, Availability, Maintainability, Safety (RAMS)**							
3.1	**Locomotive Performance Measurements**							
3 1 1	It is a mandatory requirement that the tenderer shall clearly state and commit the following performance goals for the locomotive being offered				no evidence found Non compliance clause for clause response		As per supply agreement p84	
3 1 2	It is an essential requirement that the performance criteria of 3 1 1 be based on the following definitions				no evidence found Non compliance clause for clause response		As per supply agreement p84	
3.3	Maintenance Plans							
3 3 1	It is an essential requirement that in order to support the above philosophy two types of maintenance plan are required These are					20 5/20 6 Refers to Annex 1 - Elvis to confirm		
3.4	**Component change out and overhaul schedule**							

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
3.4.1	It is an essential requirement that the "fit-on-fit off" of components and module change outs details be supplied for each component or system and must be clearly defined				no evidence	Risk - Annexure F - Elvis to confirm		
3.4.2	The component change out schedule must cover all the major components on the locomotive and it is an essential requirement that tenderers supply details of the maintenance that is required at the Centre of Excellence				no evidence	Risk - Annexure F- Elvis to confirm		
3.5	Development of the maintenance plans							
3.5.2	It is an essential requirement that the tenderer supply detail of potential failure modes of critical and major sub-systems and components				no evidence			Risk - Please provide evidence
3.5.3	It is an essential requirement that this maintenance programme shall provide a detailed preventative maintenance schedule (as well as expected corrective maintenance activities) for the locomotive for each specific service type				Risk - vol 4 index 5 partial compliance due to only certain components covered			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
3.5.4	It is an essential requirement that the tenderer supply detailed checklists for scheduled maintenance activities. The checklist type defines the frequency e.g. an A-shed can refer to every 90 days. The checklist shall briefly explain the respective activities required during the inspection. Each activity must preferably be cross referenced to the maintenance manual where detail on how the activity should be done is described				no evidence	RISK - Annexure F - Elvis to confirm		
3.6	Locomotive Maintainability							
3.6.1	It is an essential requirement that scheduled maintenance on the locomotive should be minimized e.g. the use of synthetic lubricants, if cost effective, should be employed to extend maintenance cycles. Details of this must be supplied		Option - Check synthetic lubrication application should be mandatory		no evidence			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
3 6 2	It is an essential requirement that the tenderer supply a full maintainability matrix of all major systems of the locomotive To meet the stringent availability targets the locomotive design should be such that component change-outs be done in minimum time The following information in the matrix is required >System/Component description >Change-out/replacement time >Staff requirements >Facility requirements (e g cranes trolleys etc) >Special tools	Not fully supplied to requirements			Risk - vol 4 index 5 partial compliance due to only certain components covered	Elvis to confirm in Annexure F		
3.7	SAFETY							
3 7 1	It is a mandatory requirement that safety requirements for operating testing maintaining or storage of the locomotive or its sub systems be stipulated and documented by the contractor These requirements must comply with the Occupational Health and Safety Act and Regulations Act 85 of 1993				no evidence			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
3.7.2	Mandatory Requirement No components and materials, which could pose a health or fire risk to operators and maintenance staff, will be permitted				no evidence			
3.7.3	Mandatory Requirement High voltage equipment covers to be bolted shut or interlocked and to be identified with safety warnings				no evidence			
3.7.4	It is a desirable requirement that tenderers include the necessary instrumentation/sensors in their design to measure and log the important parameters pertaining to the maintenance schedule. Tenderers must comment on the feasibility of using "logged" data for condition based maintenance. Tenders to include experience with such systems				Risk - vol 4 Index 5 partial compliance due to only certain components covered			
4.2	DESIGN FOR EASE OF MAINTENANCE							
4.2.1	It is an essential requirement that tenderers provide the detail of their design and how it enables ease of maintenance for Fit-on-fit-off specific actions. Examples include				No evidence found			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
4 2 1 7	It is an essential requirement that Anfemol military type connectors to specification PD_PEL_NAT_PRAC_001 (see A6-12 Attachment 3) be used		Risk - No evidence	Risk -Only found in Air con spec			no evidence	
5	SERVICE ENGINEERING							
5 1	It is an essential requirement that Tenderers furnish full details of the service engineering and the period of such service engineering commencing not later than delivery of the first locomotive, which they offer and recommend					not fully substantiated apart for P74 of supplier agreement and attachment 41		
5 2 info	It is an essential requirement that service engineers and support staff be stationed full time at the running sheds at which Transnet will receive the locomotives, for the duration of the warranty and DLP periods				No evidence found		Risk - bidder has not quoted for service and expect Transnet to cover the cost	
6	TRAINING OF PERSONNEL							

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
6 1	It is a mandatory requirement that Tenderers undertake training of Transnet's technicians in the maintenance of equipment offered The objective of the training shall be to impart: -				No evidence found			
6 1 7	Training courses with appropriate literature shall be developed for each of the above categories Although the training material must be made available in hard copy to the trainees, electronic versions in an MS Office environment shall be made available to Transnet to ensure that training and training material can be continued and updated over the life cycle of the vehicle Mentioned training material shall be available 90 days prior to first delivered locomotive and training shall be completed 30 days prior to the delivery of the first locomotives				No evidence found			
6 1 8	It is an essential requirement that Training shall be given per module and will include all equipment and all systems				No evidence found			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
6 1 9	It is an essential requirement that the contractor provides control system training to Transnet All study material shall be supplied to TFR and different levels of courses shall be provided for Engineers, Technicians Artisans, and drivers. The tenderer is required to submit examples of training material developed for previous customers		Risk - Elvis to confirm in Supply and Development plan		No evidence found			
7	NUMBERING OF COMPONENTS AND PARTS							
7 1	It is a mandatory requirement that all systems, subsystems and components be uniquely numbered These include amongst others the driving axles gearwheel rims axle boxes, pinions traction motor armature shafts traction motor magnet frames traction motor end covers, traction motor roller suspension bearing housings, gear cases (matching pairs), all brake valves and controllers All components and systems are required to be fitted with RFID tags that use a proven system .		Risk - Evidence given for TM ensure all equipment is including accordingly		No evidence found			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
7 2	It is a mandatory requirement all serial numbers to be permanently labelled on the equipment. Serial numbering format to be advised during Design Review		Risk - Evidence given for TM - ensure all equipment is including accordingly		No evidence found			
7 3	It is a mandatory requirement that manufacturer's initials, manufacturer's serial number, year of manufacture and any other particulars required by Transnet shall be marked in a suitable position on axles, tyres, wheel centres, gear wheel rims, pinions, axle boxes, traction motor armature shafts, traction motor magnet frames, traction motor end covers and traction motor roller suspension bearing housings and on any other parts as agreed during the design review stage		Risk - Evidence given for TM - ensure all equipment is including accordingly					
7 4	It is a mandatory requirement that tenderers furnish a comprehensive list of all individual parts, sub-assemblies and major components specifically applicable to the particular locomotive offered, which will be provided with a manufacturer's identifying serial number together with a representative example of each type of serial number which will		Risk - Evidence given for TM - ensure all equipment is including accordingly		No evidence found			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A5-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
	be used							
7.5	It is a mandatory requirement that the contractor furnish Transnet with component serial number lists showing the serial numbers of the components actually fitted to each locomotive. The component serial number lists shall be in electronic format. To be formalised at Design review stage.		Risk - Evidence given for TM - ensure all equipment e. including accordingly		No evidence found		Risk - Individual component numbers have been identified, but no sample of summary	
8	SPECIAL TOOLS AND EQUIPMENT							
8.1	It is an essential requirement that the Contractor shall furnish, within twelve months of the placing of the contract, specific details and comprehensive recommendations in respect of all special tools and equipment, which are specifically required for the inspection, maintenance, overhaul, calibration and repair of all components and parts of the particular locomotive accepted	Risk, Elvis to confirm, Binder VII, Annexture I		Risk, Elvis to confirm	No evidence found			
8.2	It is a desirable requirement that the contractor supplies all special tools for the duration of the warranty and for Transnet use and at end of the warranty	Risk, Elvis to confirm, Binder VII,			No evidence found			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
	period. Transnet purchases all tools or alternatively tools should form part of the locomotive price	Annexture F						
8 3	It is an essential requirement that tenderers shall specifically quote for the following -		Elvis to confirm Vol 4, Ann 30 Vol 3, Ann 29	Risk. Elvis to confirm			Risk - Elvis to confirm that quote exist in Financial file	Elvis to Confirm
8 4	It is an essential requirement that the recommendations of special tools be grouped into the following categories -	Risk, Elvis to confirm, Binder VII, Annexture F			No evidence			Elvis to confirm
8 5	It is an essential requirement that tenderers shall also indicate for which of the larger special tools and equipment is necessary or desirable to provide for spare parts, and also which tools/equipment require special maintenance instructions and/or data for repair purposes at Centres-of-Excellence	Risk, Elvis to confirm, Binder VII, Annexture F		Risk to clarify prior to contract allocation. Elvis	No evidence found			
8 6	It is an essential requirement that tenderers confirm that their quotations in respect of such tools/equipment include the provision of spare parts catalogues and maintenance instructions for these tools/equipment.	Risk, Elvis to confirm. Binder VII. Annexture F	Elvis to confirm/Vol 4 Ann 30 Vol 3, Ann 29	Risk. Elvis to confirm	No evidence found		Elvis to confirm	Elvis to confirm

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
9	DISASTER RECOVERY							
9 1	It is an essential requirement that provision must be made to recover a locomotive using jacking pads and/or lifting eyes on the nose and/or side of the locomotive				No evidence found			
9 2	It is an essential requirement that jacking pads be provided on the side frames of the locomotive bogies				No evidence found			
9 3	It is a desirable requirement that the design of a Carrier Bogie be provided together with the required user instructions on removing a locomotive from the section	Risk unless this is listed with the special tools under spare parts list Elvis to confirm	No evidence Risk Elvis to confirm in component list		No evidence found	no evidence found		
10	AUXILIARY SUPPLY POWER PLUG							
10 1	It is a mandatory requirement that a shore supply plug-in point be supplied as part of the locomotive As part of the maintenance concept it is Transnet's intention to test locomotives with the overhead line switched off A suitable plug and circuit shall be provided to enable the locomotive auxiliaries to be run from a shore supply while the APU is switched off				No evidence found			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
11	MATERIAL AND SPARES							
11 1	It is mandatory that tenderers must quote on the provision of spare parts and recommend quantities	Risk-no list available but refer to V1 volume 1 Chapter 15 page 8, Elvis to confirm	Risk Annex 29, Elvis to confirm quote and part numbers				P214 - 216 (blank) Supplier agreement Elvis to confirm	Elvis to confirm
11 2	It is essential that tenderers specify in detail the part numbers and quantities and quote on the required consumable and other material required for scheduled maintenance activities for at least the first year of operation	Risk-no list available but refer to V1 volume 1 Chapter 15 page 8, Elvis to confirm.	Risk Annex 29, Elvis to confirm quote and part numbers	Risk Chap 3, Attach 9, Elvis to confirm quote	No evidence		P214 - 216 (blank) Supplier agreement Elvis to confirm	Elvis to confirm
11 3	As Transnet wishes to be assured of a guaranteed availability of spares and components over at least the next 30 years. It is essential that the tenderers provide a list of components over at least the next 30 years	Risk-no list available but refer to V1 volume 1 Chapter 15 page 8, Elvis to confirm			No evidence			

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
11.4	It is essential that the tenderers provide a list of suppliers that will be supplying the following components of the proposed locomotives over the next 30 years	Risk-no list available but refer to V1 volume 1 Chapter 15 page 8. Elvis to confirm			No evidence		P214 - 216 (blank) Supplier agreement Elvis to confirm	
11.5	It is an essential requirement that the tenderers provide a list of recommended spare parts, quantities and associated budget prices. The spare parts list shall be divided in the following categories	Risk-no list available but refer to V1 volume 1 Chapter 15 page 8. Elvis to confirm		Risk Elvis to confirm	No evidence		P214 - 216 (blank) Supplier agreement Elvis to confirm	Elvis to confirm
11.6	It is essential that the recommended spares list should (as applicable) cover at least the following components/subsystems	Risk-Refer to Binder VII "Financial proposal", Annexure F "Financial Total Cost of Ownership (TCO) Model", Elvis to confirm	4	Risk Elvis to confirm	No evidence		P214 - 216 (blank) Supplier agreement Elvis to confirm	Elvis to confirm

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
11 7	It is an essential requirement that the tenderers indicate the lead times associated with the supply of the recommended spares	Risk-Refer to Binder VII "Financial proposal", Annexure F "Financial Total Cost of Ownership (TCO) Model" Elvis to confirm	Risk - Elvis to confirm on quote in Finance file	Risk - As per bidder Clause by Clause response			P214 - 216 (blank) Supplier agreement Elvis to confirm	Elvis to confirm
11 8	It is an essential requirement that spare parts availability is guaranteed for a period of not less than 10 years	Risk-Refer to Binder VII "Financial proposal", Annexure F "Financial Total Cost of Ownership (TCO) Model", Elvis to confirm		Risk - As per bidder Clause by Clause response	No evidence		P214 - 216 (blank) Supplier agreement Elvis to confirm	
12	It is a mandatory requirement that tenderers provide a detailed plan on Obsclescence Management for the locomotive being quoted on The plan must be divided into sections of mechanical design/components electrical design/components and				No evidence	1	Risk, Only scrapping list supplier, but no obsolescence plan submitted	

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
	electronic design/components							
13	**LUBRICATION**							
13 1	It is an essential requirement that the lubrication of all moving parts shall be such that the locomotives shall be capable of running without attention for a period of not less than three months or a distance of not less than 45 000 km				No evidence			
13 2	It is an essential requirement that tenderers provide information regarding the lubricants to be used in the offered locomotives				No evidence			
13 3	It is an essential requirement that if the tenderer selects lubricants which are not available in South Africa then submit its reasons for selecting these lubricants			Risk - As per bidder Clause by Clause response	No evidence		Risk - Grease supplied but no reason for selection, Great Wall and Kluber Isoflex (Possibly no local equivalent)	

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
Section A6-14	Locomotive Maintenance	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification	TFR Clarification
13 3 1	It is an essential requirement that if the tenderer selects lubricants which are not available in South Africa then state the different trade names or equivalent makes which preferably shall be available in the Republic of South Africa			Risk - As per bidder Clause by Clause response	No evidence		Risk - Grease supplied but no reason for selection, Great Wall and Kluber Isoflex (Possibly no local equivalent)	

APPENDIX II: RISKS – 465 DIESEL LOCOMOTIVES - A6-14 – MAINTENANCE – VILVALINGUM NAIR

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
1.1	It is a desirable requirement that all responses to maintenance, reliability and LCC analysis complies with the following standards. Tenderers are requested to list all other standards to which their answer complies with.		Risk Elvis to confirm	Risk: Elvis to Confirm	Risk: Annexure F Elvis
2.2.	It is an essential requirement that the tenderer includes a comprehensive costs analysis along principles of life cycle costing (LCC model). Maintenance costs shall include costs for all material.		Risk. Elvis to confirm.	Risk. Elvis to confirm with finance	Risk. Annexure F Elvis to Confirm
2.3.1	It is an essential requirement that the locomotive be designed for extended running maintenance cycles. A minimum requirement is 45000km or 3 months between scheduled running maintenance interventions	Risk. Annexure [illegible] Routine Maintenance refers to consumables, been changed [illegible]			
2.4	It is an essential requirement that the tenderer provides a detailed maintenance plan for the locomotive fleet being offered at the time of tender. This must include a detail statement of work for each of the maintenance scheduled interventions envisaged within an annual maintenance cycle. This is required to be aggregated up to and including its first major maintenance intervention. This is to be further aggregated for the full life of the asset.	Risk. No evidence found			
3	**Locomotive Reliability, Availability, Maintainability, Safety (RAMS)**				
3.1	**Locomotive Performance Measurements**				

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
3.1.1	It is a mandatory requirement that the tenderer shall clearly state and commit the following performance goals for the locomotive being offered			Risk Clauses not defined	
3.1.2	It is essential that the performance criteria of 3.1.1 be based on the following definitions			Risk	
3.1.3	Transnet requires the highest possible mission reliability and it is a desired requirement that tenderers consider the option of redundancy of critical systems. Tenders shall supply the philosophy and a detailed design of this at tender stage			Risk. Bogie control does not cater for redundancy	
3.5	Development of the maintenance plans				
3.5.1	It is a essential requirement that at time of tender, the tenderer supplies detail of the methodology used to develop the maintenance plans e.g. RCM, condition-based maintenance, use of on-board proactive maintenance tools etc	Risk. Some evidence but no methodology supplied File 2.2.1 Annex 1, 12.5			
3.5.4	It is a essential requirement that the tenderer supply detailed checklists for scheduled maintenance activities. The checklist type defines the frequency e.g. an A-shed can refer to every 90 days. The checklist shall briefly explain the respective activities required during the inspection. Each activity must preferably be cross referenced to the maintenance manual where detail on how the activity should be done is described	Risk. No evidence found of checklist. Some components such as Engine. 1) detailed no time provided			
3.6	Locomotive Maintainability				

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
3.6.2	It is a essential requirement that the tenderer supply a full maintainability matrix of all major systems of the locomotive. To meet the stringent availability targets, the locomotive design should be such that component change-outs be done in minimum time. The following information in the matrix is required: >System/Component description >Change-out replacement time >Staff requirements >Facility requirements (e.g., cranes, trolleys, etc.) >Special tools This information should be supplied for at least the following components: Engine Cylinder Turbocharger Alternator Rectifier or main power converter Inverters Auxiliary alternator Traction motor Blowers and blower motors Compressor Bogie Battery sets Air-conditioning unit		Risk: List of cost per component but not man hours per exchange		
3.6.4	It is a desired requirement that tenderers design for bogie maintenance by using drop-pits, to remove individual wheel and motor sets as well as complete bogies, as these may be used in the future.	Risk: No evidence found and drawing is not clear if this can be done			
3.7	SAFETY				

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
3.7.1	It is a mandatory requirement that safety requirements for operating, testing, maintaining or storage of the locomotive or its sub systems be stipulated and documented by the contractor. These requirements must comply with the Occupational Health and Safety Act and Regulations Act 85 of 1993			Risk: No evidence Found	
3.7.2	Mandatory Requirement. No components and materials which could pose a health or fire risk to operators and maintenance staff, will be permitted			Risk: No evidence Found	
3.7.3	Mandatory Requirement. High voltage equipment covers to be bolted shut or interlocked and to be identified with safety warnings			Risk: No evidence Found	
4.2.1	It is an essential requirement that tenderers provide the detail of their design and how it enables ease of maintenance for Fit-on-fit-off specific actions. Examples include:			Risk: No evidence is given on the sizes of certain components	
4.2.1.14	It is an essential requirement that maintenance operations where the weight limit of 20 kg is exceeded to be supplemented with instructions and special tools and handling requirements		Risk: P101, List of tools No evidence to prove that module are below 20kg	Risk [illegible] financ[illegible]	
4.2.1.15	It is an essential requirement that air-cooling ducts and inlets must have a primary air sieve of stainless steel wire mesh. A 1mm mesh size is desirable. Tenderers may offer an alternative effective sieve arrangement and motivate their choice	Risk: No evidence found		Risk No evidence found	
4.2.1.16	It is an essential requirement that all lamps inside loco are solid state	Risk: Type not mentioned			Risk
4.2.1.17	It is an essential requirement that parking lights are solid state (high visibility LED)	Risk: No evidence found	Risk: no evidence		

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
5	SERVICE ENGINEERING				
5 2	It is an essential requirement that service engineers and support staff be stationed full time at the running sheds at which Transnet will receive the locomotives for the duration of the warranty and DLP periods	Risk. Uncertain if this is as part of the contract			
6	TRAINING OF PERSONNEL				
8	SPECIAL TOOLS AND EQUIPMENT				
8 1	It is a essential requirement that the Contractor shall furnish, within twelve months of the placing of the contract, specific details and comprehensive recommendations in respect of all special tools and equipment, which are specifically required for the inspection, maintenance, overhaul, calibration and repair of all components and parts of the particular locomotive accepted			Risk. Elvis to confirm with finance	
8 2	It is a desirable requirement that the contractor supplies all special tools for the duration of the warranty and for Transnet use and at end of the warranty period Transnet purchases all tools or alternatively tools should form part of the locomotive			Risk Elvis to confirm with finance	Risk
8 3	It is a essential requirement that tenderers shall specifically quote for the following -	Risk. Elvis to confirm financial file		Risk. Elvis to confirm with finance	Risk
8 4	It is a mandatory requirement that the recommendations of special tools be grouped into the following categories -			Risk Elvis to confirm with finance	Risk. Elvis to confirm

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
8.5	It is a essential requirement that tenderers shall also indicate for which of the larger special tools and equipment is necessary or desirable to provide for spare parts and also which tools/equipment require special maintenance instructions and/or data for repair purposes at Centres-of-Excellence.	Risk: Elvis to confirm. Maintenance indicated but no spare parts		Risk. Elvis to confirm with finance	Risk. Elvis to confirm
8.6	It is a essential requirement that tenderers confirm that their quotations in respect of such tools/equipment include the provision of spare parts catalogues and maintenance instructions for these tools equipment.	Risk. Elvis to confirm financial file		Risk. Elvis to confirm with finance	Risk Elvis to confirm
9	DISASTER RECOVERY				
9.2	It is an essential requirement that jacking pads be provided on the side frames of the locomotive bogies	Risk: No evidence found and unclear on drawing		Risk AS 01 4 2 1 1 Semi Radial Bogie	
9.3	It is a desirable requirement that the design of a Carrier Bogie be provided together with the required user instructions on removing a locomotive from the section			Risk No info on pony bogie	Risk Elvis to confirm
10	AUXILIARY SUPPLY POWER PLUG				
10.1	It is a essential requirement that a supply plug-in point be supplied as part of the locomotive to allow charging of batteries from an external supply	Risk. No evidence found Confirm that a phase rotation relay and indicator is fitted	Risk no evidence	Optional	Risk: No evidence found Confirm that a phase rotation relay and indicator is fitted
11	MATERIAL AND SPARES				

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
11.1	It is mandatory that tenderers must quote on the provision of spare parts and recommend quantities	Risk. Elvis to confirm		Risk Elvis to confirm with finance	Risk Elvis to confirm
11.2	It is essential that tenderers specify in detail the part numbers and quantities and quote on the required consumable and other material required for scheduled maintenance activities for at least the first year of operation	Risk. Elvis to confirm		Risk Elvis to confirm with finance	Risk Elvis to confirm
11.3	As Transnet wishes to be assured of a guaranteed availability of spares and components over at least the next 30 years, it is essential that the tenderers provide a list of components over at least the next 30 years	Risk. No evidence found			Risk Elvis to confirm
11.4	It is essential that the tenderers provide a list of suppliers that will be supplying the following components of the proposed locomotives over the next 30 years	Risk. No evidence found			Risk Elvis to confirm
11.5	It is an essential requirement that the tenderers provide a list of recommended spare parts, quantities and associated budget prices. The spare parts list shall be divided in the following categories	Risk. Elvis to confirm		Risk Elvis to confirm with finance	Risk Elvis to confirm
11.6	It is essential that the recommended spares list should (as applicable) cover at least the following components/subsystems	Risk. Elvis to confirm		Risk Elvis to confirm with finance	Risk Elvis to confirm
11.7	It is an essential requirement that the tenderers indicate the lead times associated with the supply of the recommended spares	Risk. Elvis to confirm		Risk Elvis to confirm with finance	Risk Elvis to confirm
11.8	It is an essential requirement that spare parts availability is guaranteed for a period of not less than 10 years	Risk. Elvis to confirm		Elvis to confirm with finance	
13	LUBRICATION				

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
13.1	It is an essential requirement that the lubrication of all moving parts shall be such that the locomotives shall be capable of running without attention for a period of not less than three months or a distance of not less than 45 000 km.			Risk 30 day intervals require component detail inspections	
13.4	It is essential that all grease points should be easily accessible without removal of bolted covers. Grease stations should be used to group grease points where possible.		Risk: Section 17, 8.1.12 To be confirmed at DR		

APPENDIX JJ: RISKS – 599 ELECTRIC LOCOMOTIVES - A6-16– QUALITY SYSTEMS – VILVALINGUM NAIR

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
2.0	Major Quality							
2.1	Documented Quality Management System			No ISO Certificate in file		No ISO Certificate in file	No ISO Certificate in file	
2.1.1	Contractor/Sub Contractor ISO 9001:2008 QMS					Risk: No Evidence	Risk: No Evidence	
2.2	Quality Plans	Risk: State fully compliant. Get verification.	Risk: State fully compliant. Get verification	Risk: State fully compliant. Get verification	Risk: State fully compliant. Get verification	Risk: State fully compliant. Get verification	Risk: State fully compliant. Get verification	Risk: State fully compliant. Get verification
2.3	Competent person responsible for Quality.	No Comments provided		No Comments provided	No Comments provided	No Comments provided	No Comments provided	No Comments provided
2.9	NCR's Raised	Risk: No Comments provided NCR system to Verify.	Risk: Comments provided. Will meet requirement. NCR to verify	Risk: No Comments provided. NCR system to Verify.	Risk: No Comments provided. NCR system to Verify.	Risk: No Comments provided. NCR system to Verify.	Risk: No Comments provided. NCR system to Verify.	Risk: No Comments provided. NCR system to Verify.
3.0	Material	State fully Compliant. No comments provided	State fully Compliant. Will meet requirements.	State fully Compliant. No comments provided	State fully Compliant. No comments provided	State fully Compliant. No comments provided.	State fully Compliant. No comments provided	State fully Compliant. No comments provided

4.0	Sub-Contracting	Risk: State fully Compliant. No comments provided	Risk: State fully Compliant. Comments will meet Requirements	Risk: State fully Compliant.	Risk: State fully Compliant. No comments provided.	Risk: State fully Compliant. No comments provided	Risk: State fully Compliant. No comments provided	Risk: State fully Compliant. No comments provided
5.0	Specifications and drawings.	State fully Compliant. No comments provided	State fully Compliant. Comments will meet requirements.	State fully Compliant. No comments	State fully Compliant. No comments	State fully Compliant. No comments	State fully Compliant. No comments	State fully Compliant. No comments
6.0	Testing Measuring Equipment.	State fully Compliant. No comments	State fully Compliant Comments will meet requirements	State fully Compliant. No comments provided	State fully Compliant. No comments	State fully Compliant. No comments	State fully Compliant. No comments	State fully Compliant. No comments
7.0	Tests, Measurements and Inspection.	State fully Compliant No comments	State fully Compliant Comments will meet requirements	State fully Compliant. No comments provided	State fully Compliant No comments	State fully Compliant. No comments	State fully Compliant. No comments	State fully Compliant. No comments
8.0	Welding.	State fully Compliant. No comments	State fully Compliant Comments will meet requirements	State fully Compliant. No comments provided	State fully Compliant. Comments: Will meet requirements	State fully Compliant. No comments	State fully Compliant. No comments	State fully Compliant. No comments
9.0	Accommodation and Assistance	State fully Compliant. No comments who will carry costs	State fully Compliant Comments will meet requirements	State fully Compliant. Comments: For TFR account to carry costs	State fully Compliant. Comments: Will meet requirements	State fully Compliant. No comments who will carry costs	State fully Compliant. No comments who will carry costs	State fully Compliant No comments who will carry costs

APPENDIX KK: RISKS – 465 DIESEL LOCOMOTIVES - A6-16– QUALITY SYSTEMS – VILVALINGUM NAIR

CLAUSE	ITEM	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4
2.0	Major Quality				
2.1	Documented Quality Management System	Risk: No ISO Certificate in file	Risk: No ISO Certificate in file. State fully Compliant Comments provided " Refer to section 21"	Risk: No ISO Certificate in file. No comment provided	Certificate in file
2.1.1	Contractor Sub Contractor ISO 9001:2008 Quality Management System	Risk: Stated Fully Compliant. Stated in comments Iso9001:2008 and ISO 10005-2005	Risk: Keep referring to section 21. No Information in section 21. Found in File 1 Page 182 refers to q	Risk: Partial Compliant.	Fully Compliant
2.2	Quality Plans	Risk: State Project will be set up with special projection Organisation	Risk: Refer to Section 21: No Info in this section	Risk: State fully compliant. Get verification	Risk: State fully compliant. Get verification
2.3	Competent person responsible for Quality	No Comments provided.	State fully Compliant Comments provided " Refer to section 21"	State fully compliant	Fully Compliant. No Comments provided
2.9	NCR's Raised	Risk: No Comments provided NCR system to Verify	Risk: NCR system to Verify State fully Compliant Comments provided	Risk: No Comments provided NCR system to Verify	Risk: No Comments provided NCR system to Verify

			" Refer to section 21"		
3.0	Material	State fully Compliant. No comments provided	State fully Compliant. Comments provided " Refer to section 21"	State fully Compliant. No comments provided.	State fully Compliant.
4.0	Sub-Contracting	Risk: State fully Compliant. No comments provided.	Risk: State fully Compliant. Comments provided " Refer to section 21"	Risk: State fully Compliant.	Risk: State fully Compliant
5.0	Specifications and drawings	State fully Compliant. No comments provided.	State fully Compliant. Comments provided "Refer to section 21"	State fully Compliant. No comments provided.	State fully Compliant. No comments provided
6.0	Testing Measuring Equipment	State fully Compliant.	State fully Compliant. Comments provided " Refer to section 21"	State fully Compliant.	State fully Compliant.
7.0	Tests, Measurements and Inspection	State Fully compliant. No comments provided.	Risk: State fully Compliant. Comments provided " Refer to section 21"	State Fully compliant	State fully compliant
8.0	Welding	State Fully Compliant. Comments will allocate to meet welding requirements	Risk: State fully Compliant. Comments provided " Refer to section 21"	State fully compliant	State Fully Compliant Comments welder qualified to Part of ANSI AWS D1.1
9.0	Accommodation and Assistance	Risk Fully Compliant Comment is will provide TFR TE with appropriate Diet.	Risk State fully Compliant. Comments provided	Risk State Fully Compliant Comment states Will provide at TFR expense	Risk: State Fully Compliant Costs applicable to Accommodation and assistance. Who will carry costs'

		Accommodation and necessary equipment for the work. Who will carry costs?	" Refer to section 21" Who will carry costs?		

TRANSNET FREIGHT RAIL - SECRET | Page 276 of 323

APPENDIX LL: RISKS – 599 ELECTRIC AND 465 DIESEL LOCOMOTIVES - A6-11 – CAB – JOHAN OBERHOLZER AND EDITH MUFAMADI

BBF3795 (599 Electric Locomotives)

Section A6-11 Clauses 2-10.5.2 and 12-22.8.3

Tenderer 1, 2 and 7 complied with all the requirements specified in Section A6-11.

Tender 3 in clause 5.2 did not provide for two zones in the machinery compartments However this could be explored during design reviews. This will be acceptable as long as the bidder can achieve the desired noise levels.

Tenderer 3 under clause 6.1 provided one DDU to be an option and no provision of LCDM. These must be discussed during contract negotiations to avoid additional cost.

Tenderer 4 and 6 did not provide any information hence they have rated full compliance, which poses a risk of non-compliance. It is important that if ever they are the preferred bidders for this tender, more information is provided before awarding the contract.

Tenderer 5 did not comply with requirement in clause 5.2, they do not intend to separate the machinery compartment into two sections. Mechanical design will be discussed during design reviews.

Section A6-13 Clauses 1-54 (Ablution requirements)

Tenderers 1, 2, 5 and 7 complied fully with all the ablution requirements. Tenderers 4 and 6 did not provide information. Tenderer 3 responded that the toilet system is not provided as base offer but it is provided as an option. The toilet system must be included on the base price.

BBF 3701-465 Diesels Report

Section A6-11 Clauses 1.1-1.18.3; 1.20 -1.20.9.1 and 2.6.2)

Tenderers 1 and 2 submitted cab layout proposals, which do not match the TFR requirements and it is required that some re-arrangements of switches and DDUs must be finalised during design reviews followed by the mock-up. This must be discussed during contract negotiations to avoid additional cost.

Tender 3 fully complied with all the clauses except for the painting. They are offering a solvent base paint instead of water based paint. This will be discussed during design reviews.

Tenderer 4- offered a proposal of a cab layout similar to class 43 DE and is acceptable to TFR. However, in terms of clause 1.8.4, the bidder does not have the seat solution for this requirement. TFR would like to know if there will be any implications if TFR approved seats are used.

In terms of Section A6-13 (1.1-5.4), the provision of a toilet cubicle proposed by Tenderer 3 will be discussed during design reviews. The position of the toilet cubicle will be finalised and the application of the toilet cubicle will be investigated. All the 3 Tenderers complied with all the ablution requirements.

OPTIONS

OPTIONS WHICH REQUIRE ADJUSTMENT OF THE BASE PRICE BEFORE FINANCIAL ADJUDICATION

APPENDIX MM: OPTIONS - 599 ELECTRIC LOCOS – A6-02 – CONTROL SYSTEMS – ELVIS TSHIVHILINGE

Various options have been offered and must be added to the base price for a comparison on base price for a loco that fully complies to specifications.

TECHNICAL OPTIONS OVERVIEW

This section highlights technical options which are related to 599 Electric locomotives. There are three categories of options, namely,

1. Category 1: these are options which are offered by various tenderers and must be included in the base price offer as offered by tenderers
2. Category 2: these are options which Transnet requested the tenderers to offer as options, and must not be included in the base price offer of the tenderers. These options must be evaluated separately.
3. Category 3: these are options which the tenders suggested to Transnet and Transnet must discuss if Transnet requires these options.

CATEGORY 1 – OPTIONS WHICH MUST BE INCLUDED IN THE BASE PRICE OFFER

CATEGORY 1 OPTIONS WHICH REQUIRE ADJUSTMENT OF THE BASE PRICE BEFORE FINANCIAL ADJUDICATION

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	**On-Board to Ground Communication System**	1. Contact Tenderer 4 and ask for a price their on-board to ground communication system hardware and software. This price must be added to the base price before the financial adjudication.	Tenderer 4	A6-02	2.13
2	**Fault Information for Maintenance Personnel**	1. Contact Tenderer 5 and ask for a price to include fault information for maintainers. This will provide easy and fast access to fault information for technicians in the field. This price must be added to the base price before the financial adjudication.	Tenderer 5	A6-02	5.3

3	**WSP Hardware and Software**	1. Contact Tenderer 4 and Tenderer 5 and ask for a price to include WSP hardware and software on the locomotives. This price must be added to the base price before the financial adjudication.	Tenderer 4 Tenderer 5	A6-02 A6-02	22 6.2
4	**Remote Access to Control System**	1. Contact Tenderer 7 and ask for a price for the OEM communications system. This price must be added to the base price before the financial adjudication.	Tenderer 7	A6-02	24.1
5	**Energy Management System**	1. Contact Tenderer 7 and ask for a price for their Railway Energy Management System. This price must be added to the base price before the financial adjudication.	Tenderer 7	A6-02	54.1 54.3 54.4 54.7 54.8
		The Tenderer 3 must be requested to provide "Land Based Energy Management System" inclusive of EN50463 Energy meter which are proposed as an option in the base price offer. The following options must be included in the base price offer of the Tenderer: 1. EN50463 energy meter. 2. Land based energy management system inclusive of hardware, software and relevant tools required.	Tenderer 3		

CATEGORY 1: OPTIONS WHICH REQUIRE ADJUSTMENT OF THE BASE PRICE BEFORE FINANCIAL ADJUDICATION

		3. OEM remote communication system inclusive of communication equipment.			
		1. Contact Tenderer 7 and ask for a price for their Eco-Driver Advisory System This price must be added to the base price before the financial adjudication	Tenderer 7		54.5 54.6 54.8.1 54.8.2 54.8.3
		1. OEM remote communication system inclusive of communication equipment which the Tenderer proposed as an option must be included in the base price offer 2. Eco driving system as proposed by the Tenderer must be included in the base price offer	Tenderer 3		
		1. Contact Tenderer 1 and ask for a price for Mark 2 and Mark 3 Energy Management system. Mark 1 is included in the base locomotive price This price must be added to the base price before the financial adjudication	Tenderer 1		54
		1. Contact Tenderer 5 and ask for a price for their Driver Advisory System. This price must be added to the base price before the financial adjudication.	Tenderer 5		54.8.1 54.8.2 54.8.3
6	**Illustrations of Software Algorithms and High level Descriptions of**	1. Contact Tenderer 5 and ask for a price of including complete illustrations of software algorithms in their documentation 2. Contact Tenderer 5 and ask for a price of including high level descriptions of the control algorithms in their documentation	Tenderer 5	A6-02	55.1 55.2

	Control Algorithms	These prices must be added to the base price before the financial adjudication	.		
7	**Redundant Central (Vehicle) Control Unit**	1. Contact Tenderer 1 and ask for a price for a redundant VCU or whether this is included in the base locomotive price. 2. Contact Tenderer 5 and ask for a price for a redundant CCU These prices must be added to the base price before the financial adjudication	Tenderer 1; Tenderer 5	A6-02	2.5
8	**Supply of 2 Driver Display Units**	1. Only one DDU is supplied in the base offer. During financial discussion the offer for the second DDU must be included in the Tenderers base price. TFR accepts DDU's which are service proven in a similar environment	Tenderer 3	A6-02	2.9 32.6
9	**Fire detection system**	1. The fire detection system is not included in the base offer for tenderer 3 and only provided as an option	Tenderer 3	A6-02	21.1 22.2
		2. Tenderer 5 option to provide fire detection system must be included in the base price offer	Tenderer 5		
10	**Supply of the FFCCTV on the locomotive**	1. The Tenderer must be requested to include FFCCTV offer in the base price offer	Tenderer 3	A6-02	53
11	**Simu-Train**	1. The option for the Simu-Train (locomotive model) must be included in the base price offer for Tenderer 3.	Tenderer 3	A6-03	1
12	**Anti wheel skid tread brake system**	The option for anti-wheel skid tread brake system must be included in the tenderer's base price offer	Tenderer 3	A6 - 09	1.3

CATEGORY 1: OPTIONS WHICH REQUIRE ADJUSTMENT OF THE BASE PRICE BEFORE FINANCIAL ADJUDICATION

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		The option for anti-wheel skid tread brake system must be included in the tenderer's base price offer	Tenderer 5		
13	**Transformer Short circuit test**	The option provided by tenderer 5 must be included in the Tenderer's base price offer	Tenderer 5	A6-05	17.1.4
14	**Transformer Cage**	The option for the transformer cage must be included in the tenderer's base price offer	Tenderer 3	A6-05	[illegible]
15	**Ablution requirements**	The option to provide toilet cubicle must be included in the tenderer's base price offer	Tenderer 3	A6-13	2.1
16	**Wheels**	The option for solid wheels offered by the tenderer must be included in the tenderer's base price offer. Note : Tenderer has offered tyred wheels as base offer	Tenderer 3	A6-17	2.2

TECHNICAL OPTIONS AS REQUESTED BY TFR

[illegible]							
OPTIONS	TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
ECP with Wire Distributed Power (WDP)	√	√	√	√	√	√	√
Radio Distributed Power (RDP)	√	√	√	√	√	√	√
A combination of ECP WDP RDP	√	√	√	√	√	√	√

TECHNICAL OPTIONS AS PROPOSED BY THE TENDERERS

[illegible]						
TENDERER 1	TENDERER 2	TENDERER 3	TENDERER 4	TENDERER 5	TENDERER 6	TENDERER 7
		Solid Forged wheels				
		Shore supply plug				