

Working Towards Improved Delivery of Infrastructure & Engineering Services

CESA Indaba

November 2016



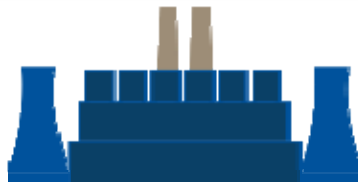
Objectives of the presentation

- Eskom's Capital Programme - overview and update
- Progress made on transformation through the new build program - lessons learnt
- Risks and respective treatment actions
- Opportunities amid tough economic conditions: Eskom's pipeline of projects in the medium to long term
- Eskom's Procurement Models for Engineering Services – getting value for money



A large amount of construction work has been completed from 2005 to date...

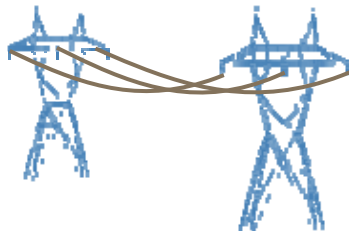
Megawatts



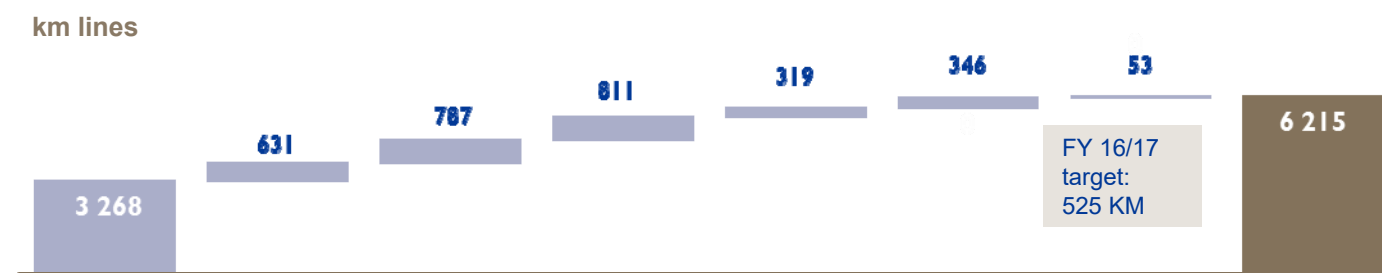
MW of capacity



Transmission



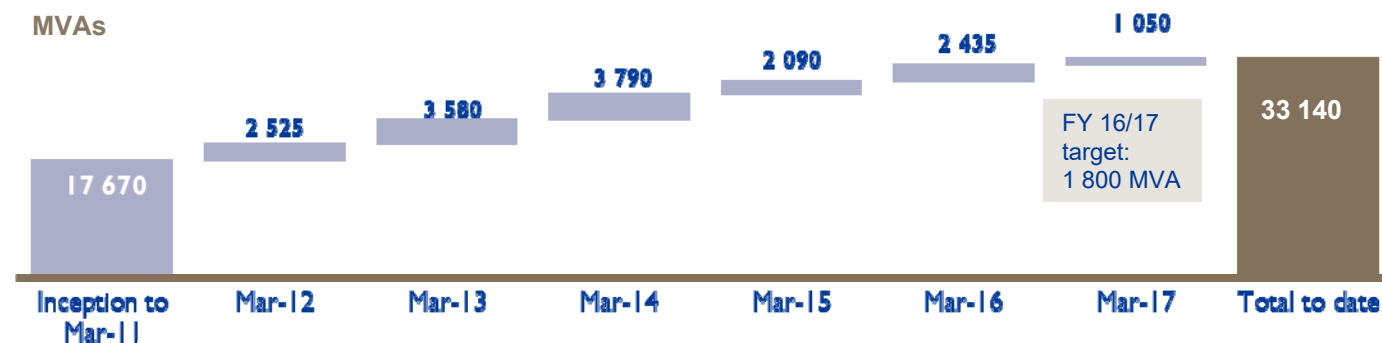
km lines



Substations

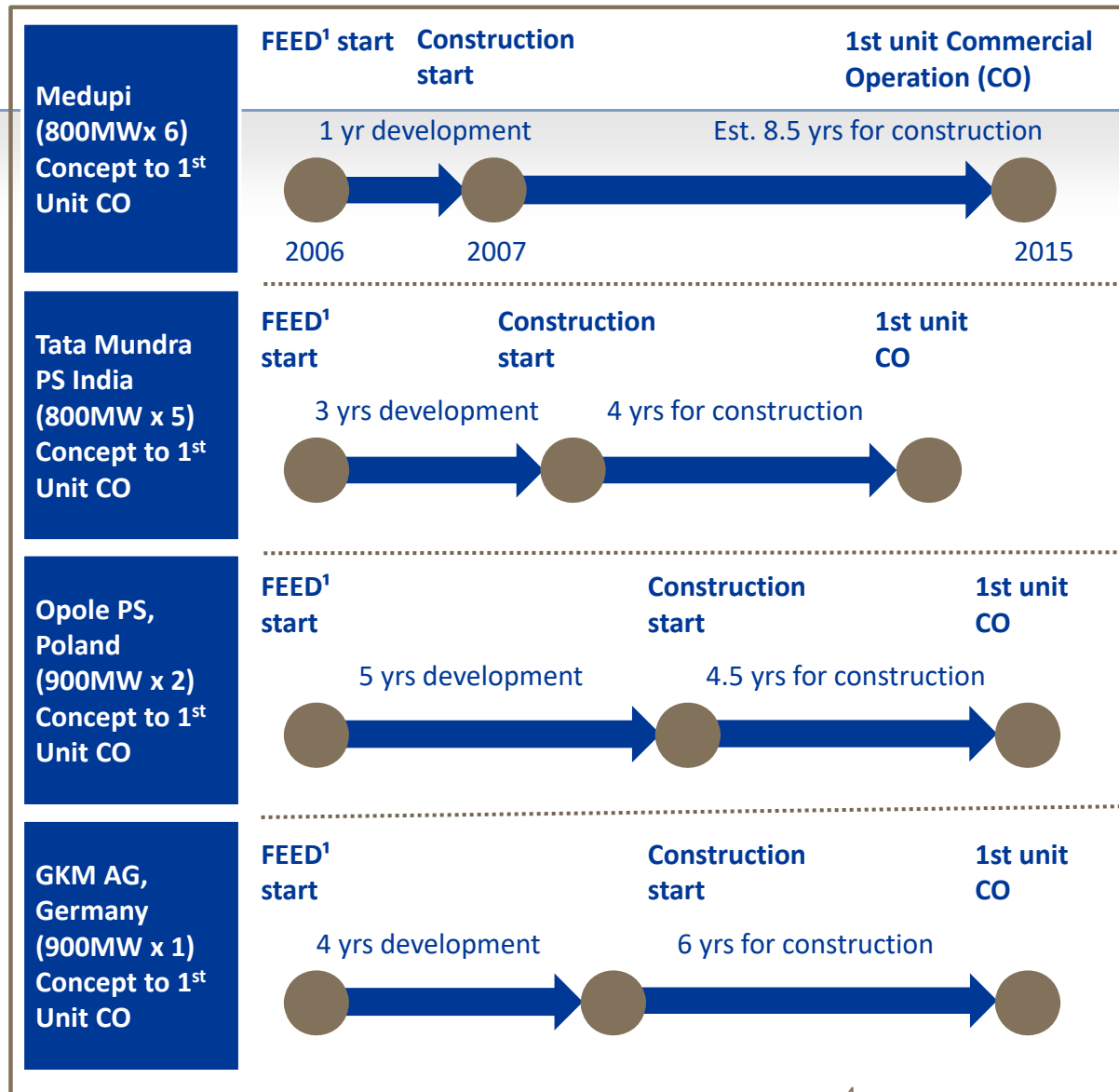


MVAs



- To date, the construction work that has been completed has added ~ 8 030MW of capacity, ~ 6 215km of transmission network and ~ 33 140 of MVAs

The approach taken in comparable projects shows investment in front end engineering and design reduces execution time and increases schedule certainty



- Due to pressure to meet demand Medupi was conceptualised to be delivered on a 48 month schedule. International benchmark for a power plant of this technology shows that a 84-96 month schedule would have been more appropriate.
- Medupi had only 1 year allocated to FEED, the shortest of all the projects profiled. 8.5 years were dedicated to construction.
- Medupi's timeline between project development and the commissioning of the first unit is 9.5 years. It is still shorter than the Germany's GKM AG 10 years.
- Medupi's timeline is equivalent to Poland's, which also took 9.5 years. However Poland had 5 years dedicated to FEED.
- Tata Mundra commissioned the first unit after 7 years, with 3 years allocated to project development. This was only 1.5 years shorter than Medupi's commissioning timeline.
- However, all Mundra's units were commissioned 3.5 months in succession.
- Repeatability and forward planning produced better cost and schedule certainty
- Medupi has more units than the other power stations in this comparison.

¹ FEED: Front-End Engineering Design

Comparison of Eskom and Benchmark Study Costs



Study	Overnight cost comparison (USD/kW)		Levelised cost (LCOE) comparison (USD/MWh)	
	Kusile Pulverised coal with FGD	Medupi Pulverised coal without FGD	Kusile Pulverised coal with FGD	Medupi Pulverised coal without FGD
Electric Power Research Institute (EPRI):				
• EPRI range .	• 2,893 – 3,103	• 2,187 – 2,519	• 88 - 95	• 71 - 78
• Eskom estimate P50	• 2,397	• 2,432	• 50	• 38
• Eskom estimate P80	• 2,451	• 2,482	• 50	• 37
• Conclusion:	• Below range	• In range	• Below range	• Below range
Lazard:				
• Lazard range.	• 3,000 – 8,400	• 3,000 – 8,400	• 85 – 150	• 85 - 150
• Eskom estimate P50	• 3,559	• 3,430	• 50	• 38
• Eskom estimate P80	• 3,811	• 3,548	• 50	• 37
• Conclusion:	• In range	• In range	• Below range	• Below range
International Energy Agency (IEA):				
• IEA range :	• 1,218 – 3,067	• 1,218 – 3,067	• 76 - 107	• 76 – 107
• Eskom estimate P50	• 2,792	• 2,748	• 50	• 38
• Eskom estimate P80	• 2,845	• 2,815	• 50	• 37
• Conclusion:	• In range	• In range	• Below range	• Below range

- In the benchmark table all the benchmarks were adjusted by US PPI to current 2015/16 values, similarly the overnight cost was calculated at current values and converted at a current exchange rate of R15.64.
- **Medupi** - benchmark results show that the Medupi overnight cost is lower than the benchmark range for EPRI and Lazard and in the range for IEA.
- **Kusile** - benchmark results show that the Kusile overnight cost is lower than the benchmark range for EPRI and Lazard and in the range for IEA.

* The Eskom estimate is based on an exchange rate of R15.64 to the US\$

Measures to limit schedule delays and cost overruns

Measure	Description
Enforcement of construction milestone management	<ul style="list-style-type: none"> • Quarterly milestones are enforced and monitored on a daily basis within the project and are reported on a monthly basis to the different executive and management committees
Proactive management of quality and engineering	<ul style="list-style-type: none"> • Establishing an Engineering Control / War room • Capacitating the quality team • Up-skilling supervisors to also manage quality • Conduct regular quality audits to drive compliance
Contractor claims management	<ul style="list-style-type: none"> • Reduce historical claims and build owners claims • Drive claims negotiations together with actions to put pressure on contractors to deliver • Improve claims process proficiency • Deepen our understanding of the contractor internal workings to improve performance
Implementation of an enhanced oversight and assurance capability	<ul style="list-style-type: none"> • Appointment of independent external construction management resources (to be based on-site) to review costs, schedules and provide assurance on the achievement of critical milestones. • Secondment of Eskom internal engineering and construction technical expertise to support the Oversight and Assurance capability • Improve capital project delivery, by pro-actively and accurately identifying risks and issues in the project environment and to adequately address these risks and issues through the relevant areas in the organisation • Optimise the sequence of activities & challenge resources to find “schedule savings” • Improve site productivity by means of productivity enhancement initiatives such as the daily tracking of activities and productivity curves • Enhanced focus on the Boiler package that is currently driving the critical path for projects • Implement sustainable systems or processes to share lessons learned

Key enablers for success

Significantly **improve productivity levels** of the Contractors

Significantly **improve quality performance** of Contractors

Continued **labour stability** on site

Continued **availability of resources** to ensure on-time delivery of all units

Continued satisfactory safety performance at our Construction Sites

Budget availability to ensure completion of all units

Timely resolution of claims – key focus area of Eskom Turnaround Strategy

- The completion of all necessary **project development activities** before commencing of construction.
- The **development, deployment and adoption of internationally benchmarked** project management methodologies, processes and systems.
- The establishment of a **suitably capacitated contract management capability** due to the complexity and extent of contractor claims.
- Additional **owner's oversight** to manage fabrication and installation quality issues of international contractors.
- Additional **owner's supervisory** requirements for local contractors.
- The establishment of suitable levels of **monitoring, oversight and assurance** across the build programme.
- Ensuring an **adequate project pipeline to prevent the loss of skills and capabilities** and to build on the existing capabilities through **continuous improvement**.
- Engaging with the international **asset creation community** to share experiences and lessons.
- **Improved Labour Management on site**, such as securing partnership agreements at an early stage; obtaining full agreement from all contracting parties and Eskom involvement, despite labour issues often being with contractors and sub-contractors.

There have been some valuable lessons learnt on transformation

Description



Positive

- Successful in growing local economies
- Successfully upskilled some contractors to perform activities on a larger project
- Created industries in the manufacturing sector to promote localisation



Negative

- Some partnerships did not work due to
 - The scope of the project was too large and the local company did not have sufficient resources or capabilities
 - The scope was too technical and the local company did not have the intrinsic skill to perform the activity



The projects created risk-adjusted schedules to provide a more realistic view on schedule and funding



1

Industrial Action on Construction Sites

1. **Partnership Agreement** driven together with the external and internal stability plan
2. **Compliance audits**
3. **Visibility of Employee Relations (ER) personnel** on the ground
4. **Skills development and transfer programmes**

2

Contractor capacity and competency

1. Projects implementing **productivity improvement initiatives**, including **focused contractors management**
2. **Increase of on site contract management resources** to improve associated processes such as claims management and contract oversight

P80 Schedule

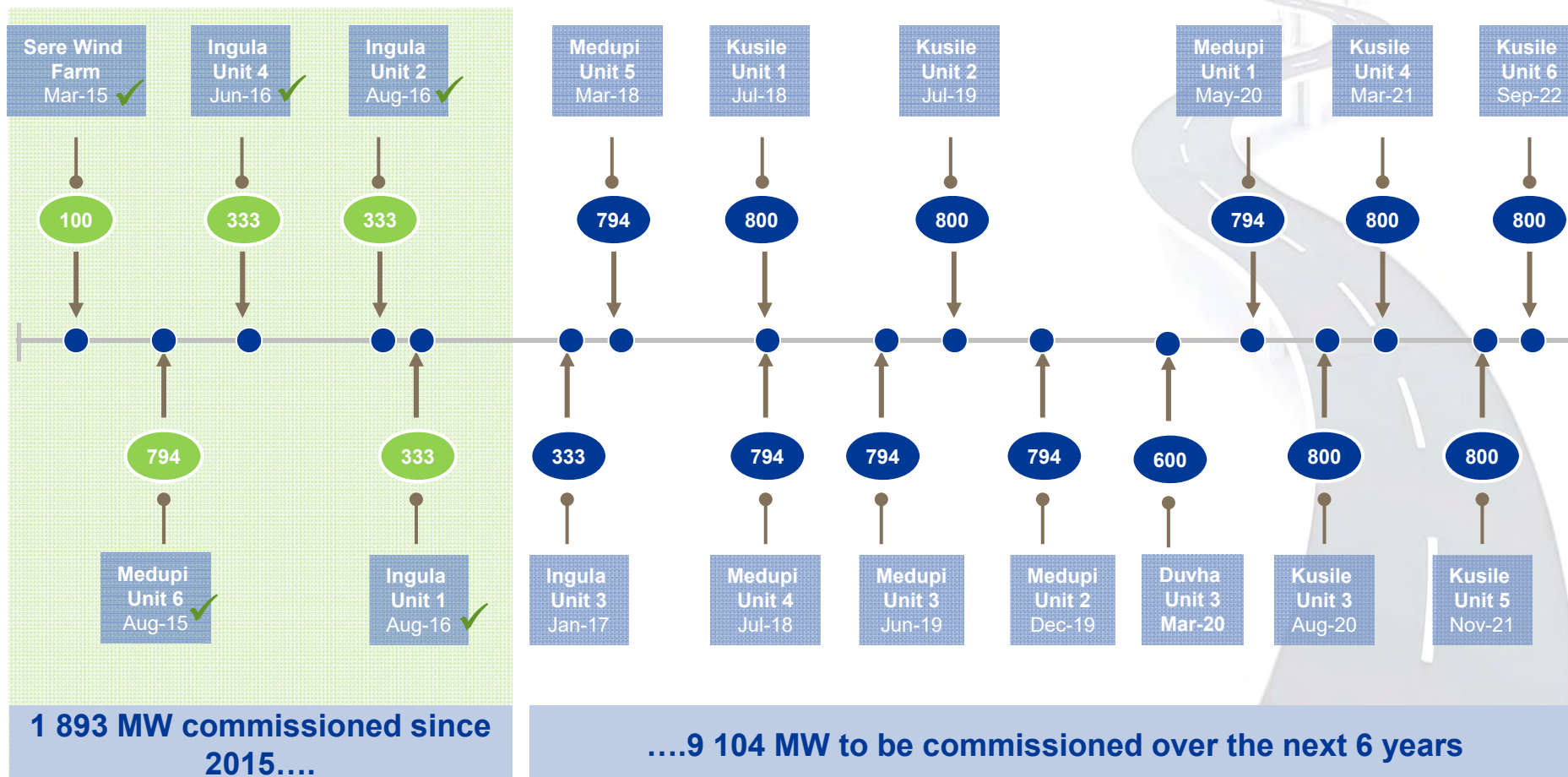
- **Risk-adjusted schedule** that caters for the major risks that the projects are currently facing. It is based on the current contractor performance and risk provision for risks outside the control of the project (for example, weather), based on historical events.
- A P80 schedule is provided when cost certainty is critical, the portfolio is not capital constrained, and the portfolio typically comes in under budget.



We remain focused on bringing new capacity online

2012 - 2016

2017 - 2022



11 002 MW

Deliver Capacity Expansion Plan

Deliver Capacity Expansion	units	2017/18	2018/19	2019/20	2020/21	2021/22
Generation Capacity Installed and Commissioned (Commercial Operation)	MW	1 460	1 594	2 448	2 394	800
Transmission Lines Installed	km	677	596	386	169	267
Transmission transformer capacity installed & commissioned	MVA	2 010	2 050	1150	2 065	3 500

GCD is targeting Nuclear, Gas and Coal 3 as our part of our New Growth Strategy for base load and/or mid-merit plant



Technology	Advantages	Disadvantages	IRP Allocation New Build MW	Schedule view and critical dependencies
Nuclear	<ul style="list-style-type: none"> Clean technology Lower running cost- R/MWh Significant local potential for fleet 	<ul style="list-style-type: none"> High capex outlay Longer construction period 	9,600	<ul style="list-style-type: none"> 1st unit operational 8-10 years after ERA Procurement, contract finalisation and licensing process
Gas	<ul style="list-style-type: none"> Lower carbon footprint Quicker start up times Flexible operation cater for renewables 	<ul style="list-style-type: none"> Currently low availability of local gas supply Gas price volatility 	2,370	<ul style="list-style-type: none"> OCGT conversion to dual fuel – in progress Open cycle to combined cycle 18-24 months after ERA Greenfield CCGT 24-36 months after ERA Dependent on gas supply
Coal 3	<ul style="list-style-type: none"> Current, project development, engineering construction know-how 	<ul style="list-style-type: none"> High cost to comply with latest environmental compliance 	6,250	<ul style="list-style-type: none"> 1st unit operational 4-5 years after ERA

The best procurement models of engineering services, is determined by the objective of the project

	Project Objective	Eskom's engineering role	Procurement approach
Description	<ul style="list-style-type: none">• The Engineering role on an Eskom project is defined through a specific project execution strategy• Factors that influence the project execution strategy includes:<ul style="list-style-type: none">• Localisation• Cost• Risk and Liabilities• Schedules	<ul style="list-style-type: none">• Options for roles:<ul style="list-style-type: none">• Owners Engineer on turn key projects• Architect Engineer for integration of multi package projects• Designer – for components of the plant requiring detailing to enable integration• Up front engineering work is performed by Eskom.• Engineering during project execution performed by Eskom and service providers	<ul style="list-style-type: none">• Eskom procures engineering services for:<ul style="list-style-type: none">• Specialised services where the supplier carries Engineering Liability• To complement internal skill and capacity where Eskom carries Engineering Liability• procurement approach:<ul style="list-style-type: none">• Open enquiry• Closed enquiry (sole source)• Strategic partnerships with panel contractors• Partnerships are often used to leverage on process and tools to facilitate integration and to promote localisation

Currently Eskom performs the overall architect role on most projects...



Description

Phased approach

- Projects are rolled out in a phased manner to allow for easier integration and to source services from different suppliers at different stages of the project

Best value for money

- Eskom ensures value for money by building relationships with engineering service providers after following a competitive procurement process.
- By performing the integration role, Eskom can balance between project spend and controlled delivery
 - By extension this indicates that contractors / designers working on a project should maximise alignment between processes and tools in order to integrate

Repeatability

- If a design will be used in future years, Eskom would normally partner with contractors to
 - Acquire Intellectual property
 - Understand how to perform the design by working alongside the detailed designers
 - Ultimately perform the design and manufacture in collaboration with local suppliers to benefit localisation



Eskom will have a targeted procurement approach – ensuring development of local-based engineering entities



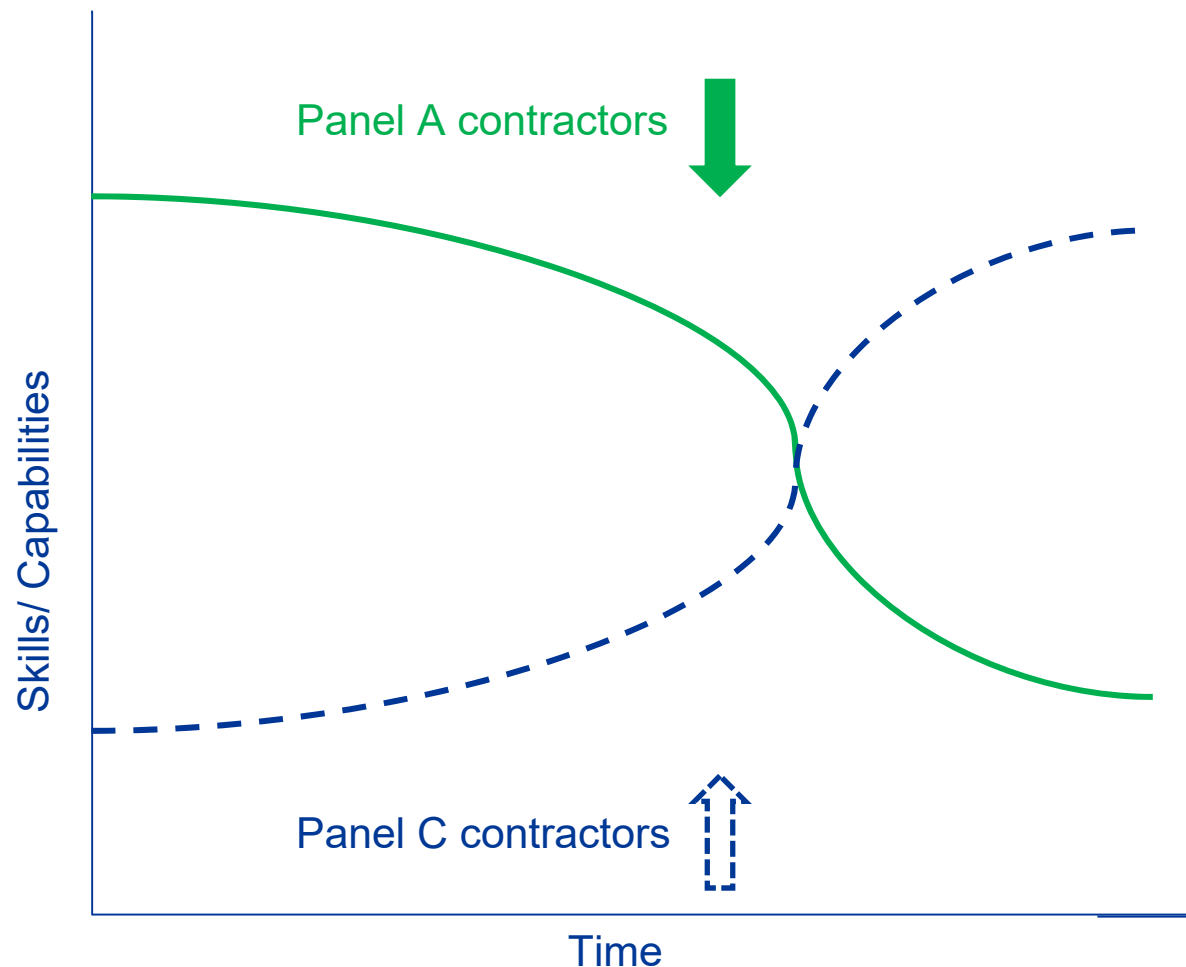
Description	
Contracting	<ul style="list-style-type: none">• Targeted procurement of engineering skills and capabilities is determined by the project scope, risk, schedules and localisation• All contracts have an element of skills development• Projects have a supplier development and localisation (SD&L) element• Panel contracting is often preferred as this makes the integration of the project easier as the tools and capabilities are known as well as enabling Eskom to fulfil its transformational objectives
Panel Contractors	Panel A <ul style="list-style-type: none">• Normally contractors with an international footprint, with demonstrated capabilities for large/complex projects
	Panel B <ul style="list-style-type: none">• Local contractors which normally have international support
	Panel C <ul style="list-style-type: none">• Small companies who specialise in specific designs or that are in development phase

There is a deliberate drive to decrease the utilisation of multinational contractors in Eskom



Illustration of the progress made on transformation

Skills/ Capabilities



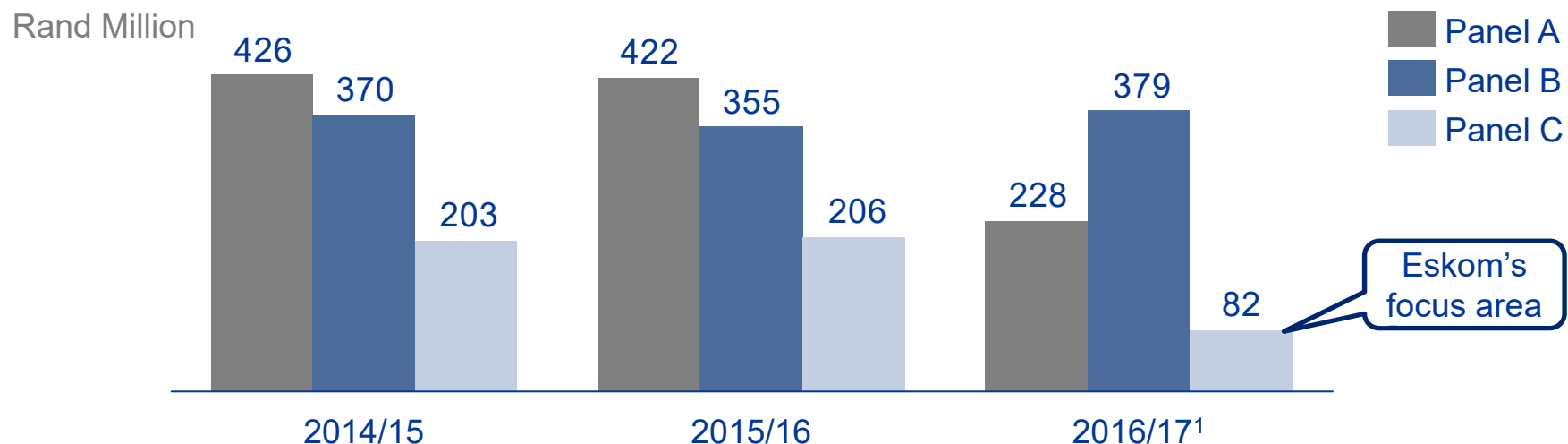
Insights

- Eskom is reducing the dependency on multinational companies
- All multinational companies are required to transfer skills to local consultants and Eskom to improve their capabilities
- These newly upskilled consultants have the opportunity to support Africa
- Eskom provides the platform and training ground for use of consulting skills across Africa

Eskom is striving to reduce using Panel A contractors and opting for panel B and C instead



Historical spend on panel contracts



Panel A - Example

- Arup Tata Power
- Steinmuller Engineering
- Worley Parson

Panel B - Example

- Durapi
- M Tech
- Ariogenix
- Themba
- The Umbani JV
- Norconsult Iyanda
- Aurecon
- Bosch Holdings
- Kentz

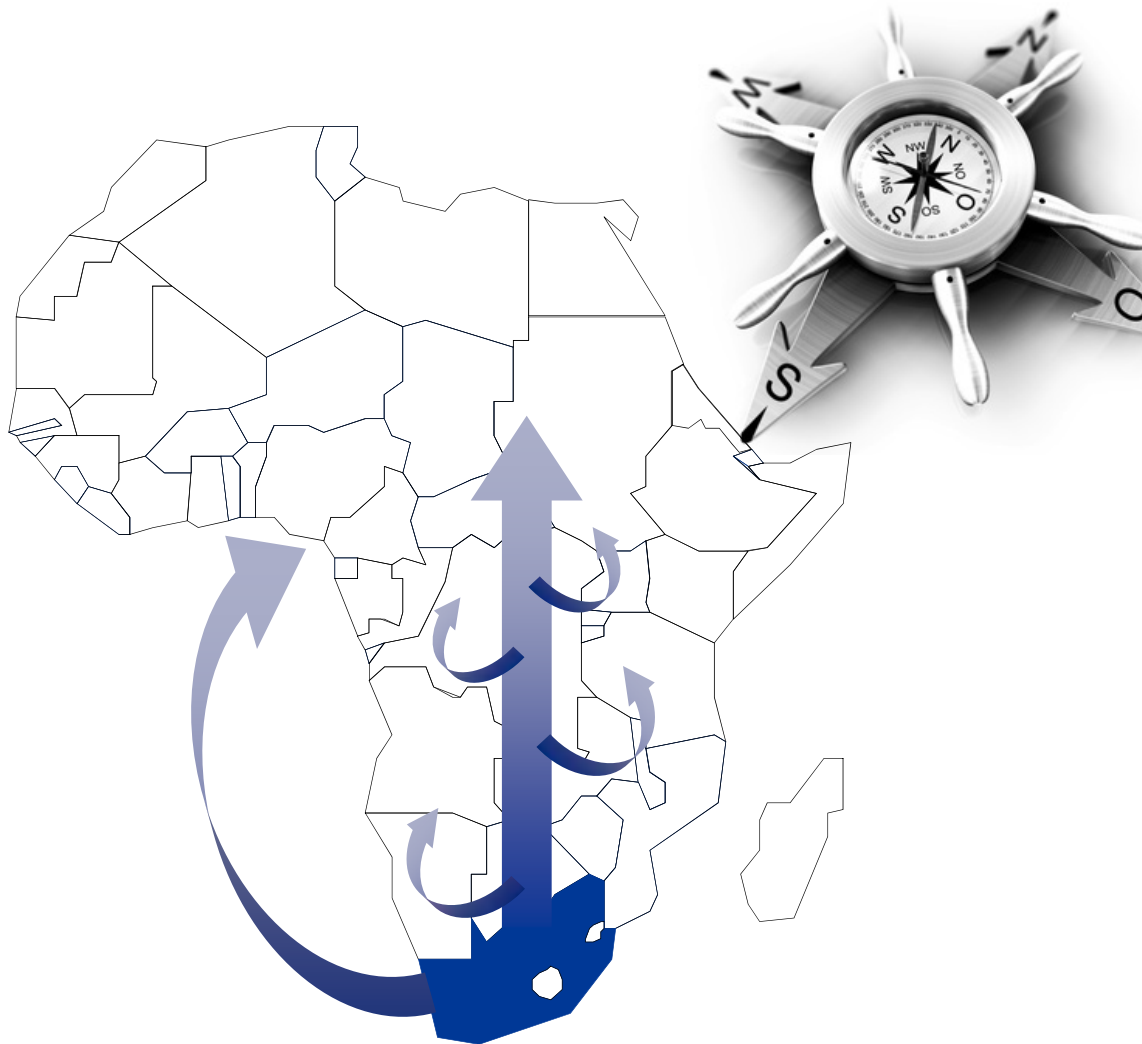
Panel C - Example

- Thabile
- RPS Ilangabi
- ACBO
- BWK Construction
- PAW Engineering
- Madan Singh
- Marwillcor
- Nala
- Mystic Blue
- J&M Project Management

Contractors should also consider to use their skills throughout Africa



Cross border opportunities



Insights

- Contractors should not limit themselves to targeting work within South Africa
- Many cross-border opportunities exist as many African countries are undertaking major build programmes
- Smaller contractors should focus on strategic partnerships with international companies to perform work throughout Africa

Description

Legislation

- Ensuring adherence to Section 217 of the Constitution; applicable provisions of the PFMA and PPPFA
- As an Organ of State Eskom will strive to promote transformation as per the above legislation as well as the BBBEE Act

Contracting strategy

- Eskom where possible will appoint companies that are BBBEE compliant with preference given to:
 - Black Women Owned (from 30%)
 - Black Owned (above 50%)
 - Black Youth Owned (above 50%)
 - Black People with Disabilities (above 50%)
 - Qualifying Small Enterprise (above R10M & below R50M)
 - Exempted Micro Enterprises (up to R10M)

Eskom looks forward to engaging more with CESA Members



Eskom is committed to working towards improved delivery of infrastructure and to support local engineering services

Eskom's expectations is that delegates, who are mainly Consulting Engineers need to be proactive in soliciting contracts from Eskom

