Dominated by long lines that require reactive power compensation
Future 765kV Supergrid / Backbone
31,982 km of OHL

- 132 kV = 882 km
- 220 kV = 1,217 km
- 275 kV = 7,344 km
- 400 kV = 18,872 km
- 533 kV DC = 1,035 km
- 765 kV = 2,608 km

Consisting of:

- 80% Glass cap and pin insulators
- 20% Composite insulators
- Multi bundle phase conductor (up to 6)
- Vast family of conventional and cross rope structures
- Operating in various environments

95% of preventative and corrective maintenance performed live!!
Line Design Cycle

- Planning
- Design
- EIA & Land Acquisition
- Manufacture & Construction
- Commissioning
- Operation and Maintenance

Project Management – Eskom In House Capability

Mainly local
Local and international
Mainly local
Line Engineering Services

• Full detail design of HVAC lines up to 765kV and HVDC up to 800kV

• Providing support to over

  ✓ 31 000 km of transmission lines (220kV, 275kV, 400kV, 533kV-HVDC, 765kV)

  ✓ 340 000 km of Distribution Lines (11kV, 22kV, 66kV, 88kV, 132kV)

• Busy with designs for over 8 000 km of new transmission lines to be built in next 10 years

• Complemented by training and testing facilities, labs and advanced software
Overhead Line Design Phases

- Planning & Load Forecast
- Environmental Study and Route selection
- Conductor Optimisation and Tower Selection
- Electrical Studies (Corona, Rating, Power Transfer)
- Insulation Design
- Hardware Selection
- Foundation design
- Groundwire and OPGW
- Earthing
Netfa is situated at 1500m above sea level and is used to do the following tests: Short Circuit, High Voltage and Materials Installations accredited to ISO 17025:2005 by SANAS.
Future – Line Training Facility (Eskom College)
Low Cost Transmission Lines (Optimisation and performance enhancement)

Pre-1985: Self-Supporting Suspension 100% tower cost

1985: Guyed Vee Suspension 67% tower cost

1995: Cross-rope Suspension 43% tower cost
Cost Savings (material and construction costs)

0-15 degree structures

15-30 degree structures
Highlights / Innovations

- Multi-Circuit Tower (servitude constraints)
- Narrow Servitude Tower (high density residential areas)
- “Sugar-Cane” Towers (prevention of faults due to sugar can fires)
- Live Line Crossings (outage constraints)
- Overhead Lines Training Facility (accelerated skill transfer)
- Micro piles (reduces environmental and physical footprint)
Multi-Circuit Tower - Difficulty to acquire servitudes

- Designed for 500 kV, operated at 400 kV and 132 kV.
Narrow Servitude Tower - Built up areas
“Sugar-Cane” Towers – Prevents production and job losses
Live Line Crossings – Eliminates the need for outages

- To be utilised for: Live line crossings, Rail crossing and Major road crossings
Micro piles

- This reduces environmental and physical footprint
Books

- Overhead Line Design
- Overhead Line Maintenance
- Outdoor High Voltage Insulators
- Inductive Instrument Transformers and Protective Applications
- Transformer Design & Maintenance
- Theoretical Calculations for Conductor Installations
- Theoretical Calculations for Transmission Line Towers
- Corona in Transmission Systems
- Power Quality in Electrical Power Systems
- HVDC Basic Principles & Design
- Thermodynamics for Students & Engineers
- Thermal Science for Engineers
- Basic Engineering Toolkit
Questions ????