Introduction

In an effort to update our stakeholders on Eskom’s massive build programme, we are issuing this monthly update on Eskom’s current new build projects. This includes power stations, transmission lines and other projects. For further details, please email murraya@eskom.co.za

Project Update

Medupi power station
Location: To the west of Lephalale, Limpopo Province

This is a coal-fired power plant project comprising of six 794 MW units rated at 4 764 MW. The first unit should be commissioned by the second half of 2014.

The Medupi construction site this month achieved 4 626 440 man hours without a lost time injury (LTI). The milestone is remarkable for the size, scope and complexity of the Medupi project, the largest construction site in the southern hemisphere. The spread of the project requires many employees to commute and deliver materials by road and the scale of the site places workers at great heights and depths. At its peak the project employed about 18 000 employees from 38 different principal contractors and more than 250 sub-contractors.

- The Unit 6 boiler feed pump 1-directional testing was successfully completed.
- The Unit 4 generator motor was threaded into the stator. This action requires precision as the clearance is only a few millimeters. All stationery equipment between the rotor and the stator can now be fitted and the generator can now be coupled to the LP2 rotor.
- Four water treatment boards went live. This means that commissioning of the water treatment plant can now start. The water treatment plant is important as this will ensure first fire of the boiler.
- One-hour test runs on all of Unit 6 boiler mills were successfully completed. This achievement is one step closer to 1st synchronisation. This means that alignment can now start and gearboxes can be coupled to the motors for cold commissioning readiness.
- The wet run of the submerged scraper conveyer was also successfully completed. This system removes the ash from the bottom of the boiler – another essential step in getting the boiler ready for first fire.
- Six motors in the water treatment plant were safety cleared. Mechanical connections can now be made and the control system can be commissioned once the control system is in place. The water treatment plant is important as this will ensure demineralisation water for first fire of the boiler.

Statistics
- Tons of structural steel used for first unit boiler construction: 20 200
- Cubic meters of concrete placed to date on site: 600 000
Cranes used on site (the largest has capacity of 1 200 tons): 250
Percentage of locals (Lephalale area) employed on site versus total: 46%

**Ingula pumped storage scheme**

**Location:** 23km northeast of Van Reenen, within the Little Drakensberg mountain range on the border between the Free State and KwaZulu-Natal. Ingula is a pumped storage scheme with a planned output of 1 332MW. The station comprises two dams - one at the top and the other at the bottom of the escarpment - underground waterways, an underground powerhouse complex, access tunnels and access roads. The station is planned to be fully operational in 2014/15. The station is 350m underground

**Tailrace tunnel**
- Concrete lining – 93% complete (2 158 of 2 313m complete)
- Cavity grouting: 19% complete (450 complete of 2 313m)
- Consolidation grouting: 19% complete (450m of 2 313m)

**Surge chamber 3 and 4 base construction**
- Installation of formwork in progress for construction of base top slab. The base construction is 90% complete

**Surge chamber 1 and 2 base construction**
- Apex, lift complete
- East wall, lift 3 completed
- West wall, lift 3 pour completed
- Base construction: 78% completed

**Control room**
- Traffic diverted back to west side and east side construction started. All intermediate slabs on the west side completed

**Statistics**
- Rated head: 441m
- Pump flow rate: 240m³/s
- Generating flow rate: 350m³/s
- Energy storage: 21 000 MWh (15.8 generating hours)
- 21st largest pumped storage scheme in the world
- 16km of tunnels, of which 8 are waterways
- Power station will be 116 storeys under ground
- 3 million cubic meter rock was excavated
- A nearby dolerite quarry produced 2.4 million tons of aggregate
- 3 600 tons of steel reinforcement
- Main machine hall housing the generators is the biggest cavern in this type of rock in the world – it measures 185m long by 26m high
**Kusile power station**

**Location:** close to the existing Kendal Power Station in the Victor Khanye Municipal area of the Mpumalanga Province.

The station will consist of six units each rated at approximately 800 MW installed capacity giving a total of 4,800 MW. As such it will be one of the largest coal-fired power stations in the world, once finished. The first unit is planned to go online in December 2014. Kusile will be the first power station in South Africa to have flue gas desulphurisation (FGD) installed. FGD is a state-of-the-art technology, used to remove oxides of sulphur, such as sulphur dioxide, from exhaust flue gases in power plants that burn coal. To help conserve water, the plant will use an air cooling system.

**Safety achievements**
- KCWJV: 4 million lost time injury-free hours
- SSBRJV: 3 million lost time injury-free hours
- CKJV: 3 million lost time injury-free hours
- Alstom: 2 million lost time injury-free hours
- Bateman: 1 million lost time injury-free hours

SSBR won the National Safety Award selected by the National Builder’s Association in recognition of the 3 million lost time injury-free hours worked at Kusile. SSBR attributed their success in this area to the continued leadership and support of KET safety professionals.

**Construction**
- Set the generator stator for Unit 1 (360 tons)
- Completed concrete placement for Unit 3 steam turbine foundation
- Started pulling the cabling required to support backfeed
- Commissioned and energised the high-voltage yard
- 402 local companies have benefited to date - R3.176 billion has been spent on local suppliers and contractors
- Boiler – Unit 1 is 27.7% complete
- Boiler – Unit 2 is 9.3% complete
- Silo construction is 68.0% complete
- Chimney – West is 85.5% complete
- Main Civil Works: 66.1% complete
- Turbine – Unit 1: 56% complete
- Materials handling: 14.6% complete
- The access roads have all been completed

**Statistics**
- Current number of people on site: 16,825
- Size of site: 1,355 hectares
- First concrete was poured on 3 March 2009
- Tons of structural steel used for first unit boiler construction: 20,200
- Cubic meters of concrete placed to date on site: 600,000
- Cranes used on site, the largest is 1,200 tons: 235
- Percentage of locals employed on site versus total: 52%

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**Transmission projects**

**765kV South of Hydra Progress**

The 765kV project group’s activities are presently concentrated on the Hydra - Sterrekus (South of Hydra) scheme. The Gamma – Kappa Transmission line has been scheduled for completion towards the end of the year. Progress has been marred by adverse weather conditions. The Kappa - Sterrekus line construction is scheduled to start early in the new
The Hydra 765kV substation was finally commissioned and the 2000MVA 765/400 kV transformer 31 was put on load in August 2013. This was the culmination of four years of construction work and a year of testing, preparation and commissioning work.

Electrical progress at Gamma substation is in the pre-commissioning phase with commissioning and energisation targeted for the end of 2013. Electrical installation and testing is ongoing at Kappa and Sterrekus substations. Energisation of the southern portion of the portfolio will introduce 2 000 MVA and 1 100km of 765kV transmission lines to the national grid with the strategic benefit of a strengthened feed to the Western Cape. The remaining 2000 MVA transformer will be energized in 2015/2016.

The newest addition to the project portfolio is phase 1 of the Foskor-Acornhoek transformation upgrade scheme. The projects have an ERA completion date of June 2017. Current activities include final design verification and long lead time equipment procurement.

**Northern Grid**

The Kusile high-voltage yard and Duvha Minerva Loop-in lines were successfully commissioned on 29 September 2013. The commissioning included the energisation of the high-voltage yard and the 400kV loop-in loop-out of the Duvha Minerva line. The HV yard is one of the most sophisticated; spanning 692m in length and includes 29 bays in total. No lost-time incidents were reported during the construction period for the HV yard electrical works, the line construction and commissioning activities.

The Borutho Substation Project is one of the key projects in the Polokwane area to address the issues of reliable and uninterrupted supply of electricity. This project will form part of the Medupi transmission integration project and is required for Medupi units 2 and 1 integration. The Borutho substation is situated 60km from the Mokopane town in the Limpopo Province. Once completed, the project will have the following features:
- 2 x 500MVA transformers
- 4 x 400kV feeders
- 5 x 132kV feeders

The local communities also benefit from this project as expenditure and resources are localized. The construction of the project started in January 13 and once completed, will play an integral role in eliminating the voltage collapse in some parts of Limpopo.

**Central Grid**

**Tshwane Strengthening – Verwoerdburg Substation and Apollo Pluto 6km loop-in and out line**

The contract for the construction of the line was placed during September 2013 and the duration for completion is 9 months.

Substation: the main columns steel support and lighting mast have been erected. Construction of the access road T-Junction into the M57 road has been approved by Gauteng Department of Roads and Transport. Thirty percent of the substation work has been completed and within the baseline schedule.
Vaal Strengthening Scheme Phase 1

This project covers upgrades to eight substations within the Vaal South and West Rand regions. The substations form the backbone for power transportation from the Lethabo and Matla power stations to inner Gauteng networks. The key customer base includes metal industries, a large rail network, mines and municipalities.

Glockner substation: the 275kV feeder bay 7, installation of a pantograph, line isolators, circuit breakers, and current transformers still need to be completed. The 275kV feeder bays 1 and 2 installation of line isolators, circuit breakers, current transformers and line traps works have been moved to the end of next year due to delays in commissioning of transformer 1 at Bernina substation.

Bernina and Hera substation: No other work can be done on the 275kV yard until transformer 1 has been commissioned. The expected completion date is end Oct. 2013. All outages have been moved to 2014/5.

Greater East London Strengthening – Central Grid

Vuyani Substation: 85% complete with pre-commissioning of the substation. 1 x 250MVA transformers and 1 x 100MVar reactor have been handed over to Eskom. By end October the second transformer will be handed over to Eskom as well.

Eros Vuyani Line: The line is split into sections A and B. Section A is 95% complete and section B is 64% complete. Section A – five towers still to be erected and stringing for towers 1-12 and associated minor works and rehabilitation from tower 1-20.

Section B - towers 211-268 are not complete due to demands from a local community for electrification before allowing the 400kV line to continue. All the relevant stakeholders are involved in resolving this issue as this is causing major delays in the project.

Ingula scheme integration

Ingula high-voltage yard: The HV Yard is planned to be energized during December 2013 and thereafter the XLPE cable will be installed and energized during next year. Presently cabling work is in progress on gen transformer bays 1 and 2.

Ingula-Venus 94km line: Ninety one kilometres of conductor have been strung. There is a planned outage for end of October 2013 to connect and commission the loop-out line to the Ingula Venus Line. Work in progress is rehabilitation and finalizing minor works. The final commissioning is planned for end of November 2013.

Cape Grid
Greater East London Strengthening

Neptune Substation. The substation connects the 400kV line to Vuyani Substation. It will improve the network reliability, solve Distribution voltage regulation problems and inevitably solve capacity related problems in the former Transkei area.

- All primary equipment has been installed and handed over to the Grid
- Stringing and cabling is complete
- 400kV busbar installation and HVT equipment installation completed
- 400kV Actom isolator installation complete
- 400kV ABB breaker installation complete
- Cabling by Gebane Electrical Services complete
- Stringing by Gebane Electrical Services complete
- All civil works is complete

**Neptune-Vuyani 400kV line**
The Vuyani-Neptune line which runs from Mthatha to East London forms part of the Greater East London Strengthening Scheme. It is one half of the Eros-Neptune 400kV Transmission Network that runs from KwaZulu-Natal to the Eastern Cape that will provide a ring feed when operating with the existing power network. This project is not only aimed at bolstering the capacity of the transmission network in the Eastern Cape, but will also benefit the surrounding rural areas.

**Progress:**
- 450/451 tower foundations have been cast.
- 430 towers have been erected – 95.3% of total towers.
- 147.205 km of phase and earth wire conductors have been regulated – 80% of total line length.

**Tabor Witkop Spencer Network Strengthening**
The Tabor-Witkop 400 kV line forms part of the Tabor Witkop Spencer Network Strengthening Scheme will benefit the area though electrification and planned industrial expansions.

**Progress**
- Tower erection and stringing of the conductor, earth wire and OPGW are in progress.
- 219 foundations complete
- 219 towers fully erected to date.
- 219 towers fully assembled to date.
- 96.6 km of conductor strung and regulated to date.
- Installation of bird diverters and aerial warning spheres is complete.
- Final quality inspections are ongoing
- Defect rectification and rehabilitation by the contractor is ongoing (60%).

**Port Elizabeth strengthening phase**
Grassridge MTS consists of 2x 500 MVA 400/132kV transformers and had a peak loading of 755MW and 715MW in 2008 and 2009 respectively, with Chetty substation contributing to the 2009 peak with a load of 563MW. The remaining 152MW was fed from the Grassridge 132kV busbar to the Eskom Distribution load. Installing an additional 132kV line between Grassridge MTS and Dedisa MTS will transfer the spare capacity from Dedisa to Grassridge and will defer the installation of the 3rd transformer at Grassridge MTS. Construction has not started as yet. Materials are being ordered

**Sishen-Saldanha rail upgrade**
- All work is 100% complete

**Kimberly strengthening project**
The runs from Mercury Substation near Orkney in the North West via a new substation called Mookodi, then to Ferrum Substation in the Kathu area in the Northern Cape. The total length of the line is 428km. The growing and future expected loads in the Sishen area are such that it has become necessary to construct a 400kV line from Mercury to Ferrum to strengthen 132kV and 66kV systems in the area. The proposed Mercury -Ferrum line will be close to 428km thus requiring a line reactor at Ferrum with another reactor at Mookodi for the Mercury-Mookodi 400kV line.

**Mookodi Substation**
- Civil works: All work is 100% complete with defects correction in
progress
• Electrical all works is 90% complete, currently busy with pre commissioning

400kV Mercury – Mookodi line section A
• Construction is complete, but currently busy with minor works

400kV Mercury – Mookodi line section B
• Construction is 73% complete

400kV Ferrum – Mookodi line
• Construction is 100% complete, but currently busy with minor works

Ferrum Substation
All work is 100% complete. Waiting for the completion of the 400kV line construction.

Renewable energy projects

Wind Energy Facility
The Sere Wind Farm Facility is located in a good wind resource area at Skaapvlei Farm within the Matzikama Municipality, in the Western Cape, South Africa.
The National Energy Regulator (NERSA) has granted a license for Eskom’s Sere wind farm, opening the way for construction to go ahead on the R2.4 billion project, which is due to be in full commercial operation by the end of 2014.

The Sere wind farm will generate up to 100 MW of power for the national grid, avoiding nearly 4.7 million tons of carbon emissions over 20 years. Sere takes its name from the Nama word for “cool breeze”.

The project has been funded by a group of development finance institutions, including the World Bank, African Development Bank, Clean Technology Fund and Agence Francaise de Developpement.

Eskom’s Sere wind farm will comprise 46 Siemens 2.3-108 wind turbine generators and is expected to deliver first power to the national grid in the first half of 2014, with full commercial operation scheduled by the end of 2014. The project includes construction of a new substation and a 132 kV distribution line. It will create about up to 170 direct jobs during the construction phase.

It has an expected operating life of 20 years, with average annual energy production of about 233 000MWh, enough clean energy to power about 97 000 standard homes.

Alongside the Sere project, Eskom has a 100 MW Concentrating Solar Plant project near Upington in the Northern Cape, which also has funding from development finance institutions. It has also installed solar photo-voltaic panels to provide auxiliary power at its head office and at two of its coal-fired power stations, with a view to rolling out solar PV across other facilities.

Majuba Rail Project
The construction of this dedicated railway comes as result of Eskom’s initiative to change transportation of coal to a number of power stations, especially Majuba Power Station, from road trucks to rail transportation which resultant positive economic, environmental and social benefits.

Aveng Grinaker-LTA, the civil and earthworks contractor for Eskom’s Majuba Rail Project, is proceeding with the construction activities on the Majuba Rail servitude. Site establishment on the northern side has been completed while on the southern side it has commenced and is nearing completion. The main activities underway are the establishment of the crusher plant, and workshops. The stripping of topsoil has been completed and overburden material removal, service road bed preparation and bulk fill earthworks are in progress.

The construction of structures such as cattle creeps, culverts, agricultural underpass and bridges has started. Initial activities include excavations for bases for the Vaal River Bridge. The Vaal River has also successfully been diverted as per the Water Use License to allow for the establishment of the bridge launching pad.

Major activities for the next quarter include starting with the formation layer works on the whole servitude, and construction of the piers on the bridges.

**Statistics**
Servitude Length: 68km
Total number of people on site: 1 042 (including contractors)
Total number of contractors on site: 5