

## Medupi Power Station Project

February 2014



Medupi is a greenfield coal-fired power plant project located west of Lephalale, Limpopo Province, South Africa. Medupi is the fourth dry-cooled, baseload station built in 20 years by Eskom after Kendal, Majuba and Matimba power stations. The name “Medupi” is a Sepedi word which means “rain that soaks parched lands, giving economic relief”.

The power station will be the fourth largest coal plant in the southern hemisphere, and will be the biggest dry-cooled power station in the world. The boiler and turbine contracts for Medupi are the largest contracts that Eskom has ever signed in its 90-year history. The planned operational life of the station is 50 years.

### Why in Lephalale?

Eskom undertook screening and feasibility studies in order to determine the most viable plant location option for Medupi power station. Assessment criteria included:

- availability and accessibility of primary resources, such as water and coal
- ability of the new power station to connect to the existing Eskom network/grid
- environmental acceptability
- cost of production.

Eskom ranked the Waterberg Coalfields and the Lephalale area in the vicinity of the existing Matimba Power station as the most favourable option for the establishment of a new coal-fired power station due to *inter alia*:

- land availability in close proximity to the primary coal source
- properties of coal in the area are well known due to the experience acquired through the existing Matimba Power Station
- competitive coal prices
- low environmental impact on the chosen site

## Technical information



The new power station will comprise of six units with a gross nominal capacity of 800MW each, resulting in a total capacity of 4 800 MW. Construction activities commenced in May 2007, with the first of the six units of the power plant planned for first power by the end of 2014.

In an effort to improve efficiency of the station, supercritical boilers and turbines will be installed. These operate at higher temperatures and pressures than Eskom's other stations. This baseload station will also use direct dry-cooling due to the water scarcity in the area.

### Interesting facts

- More steel is used than the world's tallest building (the Burj in Dubai) - some 20 200 tons of structural steel was used for the Unit 6 boiler construction. The overall forecast is 120 000 tons of structural steel for all six units.
- The project uses enough concrete to build four Greenpoint Stadiums. Parts and cement weighing the same as seven super tankers that need to be transported over land – the total distance to transport materials to site is equivalent to 20 times around the world. In excess of 1.2 million m<sup>3</sup> of concrete has been placed on site by October 2013. Medupi also has the largest concrete batching facility in South Africa.
- The Medupi boiler house will stand approximately 130 meters in height, equivalent to Sandton City.
- Job creation is expected to peak at 17 000 direct jobs during construction.
- The town of Lephalale's gross domestic product has increased by about 95% per year as a result of the construction activities.
- The power station will directly grow SA's GDP by approximately 0.35% per year.
- About 50% of the project cost is committed and spent locally.
- 22 340 meals are prepared and served daily.
- The 800 ton crane used in the boiler construction area has a boom that can reach 140 m; which is higher than the Sandton City Tower.
- The highest point on site is the top of the chimney – 220 m.
- Improved environmental performance due to air-cooled condensers, lower water usage, air bag filters, low NO<sub>2</sub> burners and supercritical boilers

The uniqueness of this project lies in the fact that Medupi is being built backwards - traditionally Eskom has always started building Unit 1 and ended with Unit 6. This new approach is the result of the rock conglomeration on the southern side which is excavated and reused as the engineering fill on the northern side.

### Construction milestones



The environmental impact assessment for this station was undertaken and a positive record of decision was issued by the Department of Environmental Affairs and Tourism in 2006. The Minister of Environmental Affairs and Tourism considered the appeals lodged against the decision, and confirmed the positive record of decision at the beginning of May 2007.

The official sod-turning ceremony was held at the construction site on 14 August 2007. The then Minister of Public Enterprises, Mr Alec Erwin, and the Premier of Limpopo Province, Mr Sello Moloto, were in attendance.

Medupi terracing work done by Roshcon commenced in May 2007. The Medupi first civil concrete pouring took place on 18 July 2008. The first air cooled condenser concrete slip forming started on 31 October 2008.

- First structural concrete poured on site – 18 July 2008.
- First three air-cooled condenser columns completed – 21 November 2008.
- Unit 6 boiler lift shaft completed – August 2009.
- First structural steel erection on Unit 6 boiler – 9 February 2010.
- First chimney completed at a height of 220m – 12 August 2010.
- Unit 6 generator stator in position – 23 June 2010.
- Unit 6 turbine table handed over – 7 February 2011.
- The 10 000 ton coal silo complete – 8 September 2011.
- Auxiliary boiler complete – 21 November 2011.
- Direct-current supplies energised – 10 February 2012.
- The project commenced the first 24-hour performance testing to run at maximum capacity for the delivery of coal to Medupi from the Grootegeluk mine - 27 November 2012
- September 2013: The Unit 4 generator motor was threaded into the stator. This action requires precision as the clearance is only a few millimeters. All stationary equipment between the rotor and the stator can now be fitted and the generator coupled to the LP2 rotor
- September 2013: The wet run of the submerged scraper conveyer was successfully completed. This system removes the ash from the bottom of the boiler – another essential step in getting the boiler ready for first fire
- January 2014: The boiler separators which were initially installed for Unit 6 have successfully been cut out. The new replacement separators will now be installed. The purpose of the separators is to separate the steam and steam water droplets.
- February 2014: Following close co-operation between Team Medupi and the contractors all boiler issues have been resolved, which allowed for the installation of the Boiler Frame for Unit 1 to commence.
- 10 February 2014: back energising of Unit 6 generator and Unit Transformers via the distributed control system

## Environmental facts

The site was formerly the farm Naauw Ontkomen and was bought from Kumba Coal (Pty) Ltd - now known as Exxaro Coal (Pty) Ltd. The site measures 883 hectares and was previously used for peanut crops, game and cattle grazing.



A thorough environmental approach was followed from the start of construction in 2007. During the clearing of the site many environmental factors were highlighted. A visual beacon on the site was a baobab tree which is believed to be a few hundred years old. The team immediately made plans to preserve this beautiful tree. A lengthy process was put in place to relocate it and plant it

where the entrance to the power station would ultimately be. It was pruned before moving, including a 10-day preparation for transplanting. The aim was to keep the tree as a 3-stem unit for aesthetic purposes. This involved cranes and a truck being employed to move the tree and replant it, under the guidance of a tree expert. On 23 July 2011 a second baobab tree was relocated from the ash dump area to the main entrance area.



Apart from this baobab, many nationally and provincially protected trees were either replanted or transported to a special nursery at the adjacent Matimba power station. This included species such as camel thorns, shepherds trees, leadwoods, tamboti and marulas.

Not only trees are being cared for but some game as well. Some 30 to 40 animals have been relocated to an Eskom game reserve close by during the site clearance and approximately 50 remain which will be managed as part of the ecosystem after construction is complete.



There is also a programme to catch and relocate all snakes, reptiles and problem animals found on site by a local professional snake catcher, including educational talks with caught snakes to workers. 1 293 reptiles have been removed from site since 2007, which includes: rock-and water monitors, tortoises, terrapins, chameleons, scorpions, venomous and non-venomous snakes, baboon spiders *Augacephalus junodi* and burst horned baboon spiders *Ceratogyrus darlingi*, and serval (*Leptailurus serval*).

The clearing of such a huge area involves massive amounts of vegetation and topsoil. This was preserved and used for rehabilitation of the existing Matimba power station ash dump as well as at the Rhino Dump at the Grootegeluk mine.

Medupi aspires to the highest possible standards of environmental performance its Environmental Management System is certified to the ISO 14001 standard. This transcends aspects from conservation to mundane matters such as visual impacts and dust monitoring. To further empower construction personnel to world class performance; the Medupi Power Station is interrogated by a series of independent external and internal audit processes and is visited regularly by the Department of Environmental Affairs Environmental Management inspectors, better known as the "Green Scorpions". These provide an objective overview of current performance and areas of improvement.

In addition to being one of the first coal-fired stations in the Eskom fleet to deploy supercritical technology, Medupi will also be one of the first to include abatement technology such as flue gas desulphurisation which will reduce SO<sub>2</sub> emissions by over 90%. It will also include pulse jet fabric filters, which will remove approximately 99% of particulate matter, and low NO<sub>x</sub> burners. All of this will reduce the environmental impact of its air quality emissions as well as result in the reduction of coal used per MWh produced. Medupi will similarly be the first power station in the fleet to implement lining for its ash dams.

One of the conditions of the Record of Decision was for the Project to establish an independent Environmental Monitoring Committee which continuously oversees the projects compliance to and implementation of environmental conditions. This committee consists of an independent chairperson, members of the local community, Eskom, the Environmental Control Officer (ECO), an ecologist and the co-ordinator of the Lephalale Development Forum. The ECO is based permanently on site and reports to the EMC and government authorities while the EMC meet at a minimum every quarter to review and report on progress.

## Social and economic impacts

Since the beginning of the Medupi Project in August 2007, the project has invested a total of R2.3 billion in infrastructure in Lephalale. To date, Eskom has built 995 houses and bought 321 in the Lephalale area. The contractor villages can house 6 715 workers.



Eskom invested R11.5 million in the upgrading of the initial 2.2 km of the D1675 road leading to the project site. Eskom and Exxaro invested R180 million in the construction of the Kuipersbult road and the expansion of Nelson Mandela road. This investment confirms the commitment that Eskom has made to ensure the safety of its employees and contractors, as well as the community at large.

Eskom has also put in place a Medupi Information Centre in Lephalale, and this facility is serviced by staff, including five information officers, from the various traditional areas. Satellite information offices have been established at three traditional council and two civic structure areas. This centre serves as a first point of contact that disseminates project information to various stakeholders, including, but not limited to, suppliers, local media, and the public, in general. Further initiatives are planned to continue Eskom's social investment in the community for the duration of the project.

Financial support was provided towards the town's electricity, sewerage, and police facilities. This included a donation of R10 million towards the upgrading of the electricity infrastructure through



the supply and installation of 10 MVA transformers to deal with the short-term capacity constraint in the town. Secondly, R31 million was invested to upgrade the Paarl sewerage treatment plant. This ensured the reinstatement of the sprinkler system at the Marapong oxidation ponds (Marapong Sewerage Plant).

Support was provided to wellness clinics and medical equipment to the value of R3.8 million was provided to clinics in Ga-Seleka, Fox Odendaal, Marapong, Shongoane, Abbortspoort, Steenbokpan, and Onverwacht Clinics. Eskom also donated wheelchairs and HIV/Aids care kits to the Marapong HIV/Aids Care Group. Furthermore, Eskom made a donation of six mobile classrooms and payment of six teachers' salaries at local schools for a period of 24 months. Ten desktop computers were donated to the local high school.

To date, a total of 1 296 houses have been built in the town at a cost of more than R1 billion. The Marapong Contractors' Village currently has:



- 4 170 beds for semi-skilled labour; and
- 49 houses (four-bedroomed) for artisans.
- 4 170 staff meals are prepared and served at breakfast and dinner time daily at the village, and 14 500 lunch packs are prepared and served on site in the dining halls.

### Skills development (as of the end of February 2012)

Beneficiaries from trade-related training (basic trade to tertiary education) since the inception of the project:

- Completed training – 233.
- In training – 368.
- Contracted end target – approximately 2000.
- 1 542 learners from 26 local high schools visited Medupi as part of the Education Awareness Programme.
- Successful completion of enhanced business skills programme of 28 contractors at the Contractors' Training Academy. The second intake is in progress.

### Local procurement

Eskom and its contractors have placed contracts to the value of approximately R2.1 billion with Lephalale and Waterberg district-based suppliers since the commencement of the project. In this regard, Eskom alone has a procurement expenditure of R202 million, and approximately 70% of this has been placed with black-women-owned (BWO) suppliers. In addition, Eskom has placed a R500 million feeding contract with Lephalale Site Services, a Mooncloud and Fedics joint venture company.



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