

THE NEED FOR THE MERCURY—PERSEUS TRANSMISSION LINE

The Mercury – Perseus 400kV line will also provide additional capacity to the Western Grid.

3.1 INTRODUCTION

Electricity cannot be stored. It is therefore necessary to generate and deliver power over long distances at the very instant it is needed. In South Africa, thousands of kilometres of high voltage lines transmit power, mainly from the power stations located at Mpumalanga Province coal fields to major substations where the voltage is reduced for distribution to industry, businesses, homes and farms all over the country.

3.2 THE NEED FOR ADDITIONAL TRANSMISSION CAPACITY IN THE PE AREA SOUTHERN REGION

Hundreds of kilometres of 765 kV and 400 kV Transmission lines feed electricity from the Mpumalanga Region to Transmission Substations in the Greater Eastern Cape Region.

Two 765kV and three 400kV Transmission lines feed electricity to Greater Cape Region south of Bloemfontein. These Transmission lines are becoming heavily loaded and they have already reaching their transfer capacity. It is also becoming very difficult to manage outages. This makes it difficult to carry out routine maintenance, the condition of the line can deteriorate and this will result in poor line performance (faults etc.).

Studies have shown a steady 2% per annum average load growth for the area to Greater Cape Region south of Bloemfontein. The load forecasters predict that this load growth of 2% will continue. In addition, a step increase in load demand of between 700 and 1000 megawatts is expected.

3.3 THE NEED TO OPTIMISE THE ELECTRICAL TRANSMISSION SYSTEM

A fault on any of the lines serving area to Greater Cape Region south of Bloemfontein could have a detrimental effect on supply to customers in the area.

Eskom has taken measures to get the most out of the existing Transmission system so that the construction of the new 400 kV line will occur only when needed. These measures include:

- Re-calculation of the thermal loading capability of the Transmission lines into to Greater Cape Region south of Bloemfontein (Perseus substation) based on the measured ambient temperatures in the area. The lines can now be loaded more heavily during cold days when the lines cool down and they do not sag as much.

- When reinforcement options were looked at, the best option was chosen to ensure that an optimised mix of cost, technical benefit and environmental impact was achieved.

It is clear that a new Transmission line will be needed as all options for optimisation of the existing infrastructure have already been studied. The new Transmission line will be brought into operation at the time when the load growth and demand requires it. It is however necessary to secure the necessary servitudes timeously, to ensure this will be possible.

3.4 *CONCLUSION*

A definite twofold need has been identified:

- to optimise the existing system and
- the need for additional capacity to support the 400kV network supplying the Greater Cape Region south of Bloemfontein

By increasing the supply into the 400kV network, the foreseen load growth can be addressed in a suitable and economical way. The medium to long term needs will be addressed by the increased supply due to the new Transmission line.

CHAPTER 4 ALTERNATIVES FOR SATISFYING THE NEED

4.1 INTRODUCTION

Electrical supply constitutes a complex system of generation facilities, substations and Transmission lines. The system operates on a demand-supply structure. The power is generated and transmitted at the moment it is needed. Spare generation capacity is currently available in the system supplied by the coal-fired power stations in the Eastern Transvaal Highveld region. It is therefore not necessary to increase generating capacity to cater for the forecast load growth.

The forecast growth in demand over the next few years urgently requires Eskom to take timeous action. It is therefore necessary to ensure extra supply capacity into the Port Elizabeth area. There is a definite need to overcome the current and future problems on the existing Transmission lines.

The ideal solution should be to:

- meet the projected demand
- optimise existing infrastructure
- minimise cost
- minimise any adverse environmental impact.

4.2 ALTERNATIVES FOR SATISFYING THE NEED

The following alternatives for satisfying the twofold need for additional electrical supply to the region and optimising the existing infrastructure were investigated by Eskom:

4.2.1 The do nothing option

To maintain the status quo is the easy way out. By not taking timeous action, Eskom will end with a situation of not being able to ensure supply into the region in the very near future. This would eventually lead to load shedding which can cause major disruptions of power supply to different areas at different times. This can have a major impact on the economics of the region, as no real economic growth can take place. New township and industrial developments in the region in the near future will cause overloading of the existing Transmission system, with resultant power failures. This option is therefore ruled out because it would neither supply the projected demand for electricity nor optimise the existing infrastructure.

Eskom has taken all measures to date to ensure that the existing Transmission system will be utilised to its full capacity (see section 3.3 above).

4.2.2 Demand side management

Demand Side Management (DSM) can generally be defined as the activities performed by the electricity supply utility, which are designed to produce the desired changes in the load shape through influencing customer usage of electricity and to reduce overall demand by more efficient use. These efforts are intended to produce a flat load duration curve to ensure the most efficient use of installed network capacity. By

reducing peak demand and shifting load from high load to low load periods, reductions in capital expenditure (for network capacity expansion) and operating costs can be achieved. Some of the basic tools are the price signals (such as time of use tariffs) given by the utility and direct load management. This option is practised to a certain extent, but is currently not considered feasible for expansion in this particular region. However, the large concentration of industrial users in this area makes this a very difficult option to pursue.

4.2.3 New generation systems

A new coal fired, gas or nuclear generation plant could be commissioned near to the load centre. This would have a more negative overall impact on the environment. Although this option is being investigated this is a long-term solution and transmitting power through Transmission lines is currently the cheapest way to supply the end customers.

4.2.4 Upgrade existing Transmission lines by using bigger conductors

The physical load on the existing towers would increase substantially and the towers would be inadequate. Furthermore, it would not be possible to remove one 400 kV line from service to perform the upgrading work, as the remaining line would not be able to supply the electrical loads in the region. This option would not optimise the existing infrastructure.

4.2.5 Construct a 765 kV Transmission line between Alpha – Beta Substations

This option proposes a new 765kV line from Alpha-Beta substations. Although this option is plausible it has economic and technical short falls. The line length is approximately 450km and the 765kV doubles the project cost of a 400kV line. In addition further network capacity strengthening will be required north of Alpha. The economic and environmental aspects of this project reduces its current viability compared to the other options

4.2.6 Construct a 2nd 400 kV Transmission line between Grootvlei – Perseus Substations

This option proposes a 2nd 400kV line from Grootvlei to Persues. Although this option is technical plausible it has economic and environmental short falls. The line length is approximately 360km, which is 44% longer than the preferred option (4.2.7). This negatively effects the economic viability of the project and increases the negative environmental effect of the project. All the current 400kV fed south are fed from Grootvlei, a forth line out of Grootvlei increase the dependence of Grootvlei substation.

4.2.6 Construction of a 400 kV Transmission line between Mercury – Perseus Substations

This option proposes a new 400kV line from Mercuty to Perseus. The line length is approximately 250km. The reduced line length and sufficient power transfer capability makes this option attractive. In addition this option reduces the reliance on Grootvlei as the single source feeding the 400kV network south. The economic and reduced environmental effects of this option lends it self to be the preferred option.