

SEA FOR STRATEGIC GRID PLANNING IN SOUTH AFRICA: Enabling the efficient and effective roll out of strategic electricity transmission infrastructure

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Introduction

The design of the future transmission grid in South Africa is undergoing a major change as the generation mix in the future will be very different to the existing situation (DoE, 2011) The biggest impact from a transmission grid aspect is the different spatial location of the new generation sources, in particular the renewable energy sources (Eskom, 2013). These generation resources will be implemented by Independent Power Producers (IPPs) and new power corridors will need to be created to provide grid access for them (Eskom, 2014).

A further challenge that will have to be faced is obtaining the necessary environmental approvals and authorisations to construct the new transmission lines and substations within the new power corridors. Taking these processes into account means that new transmission line projects can take between five and ten years to complete, while IPPs can have their power plants up and running within two to three years after bid award.

Thus a new approach to planning and obtaining environmental authorisations for the transmission grid of the future is required to reduce the response time for the new transmission infrastructure and bring new generation sources online quickly. This paper describes how this new approach has been formulated and implemented in South Africa.

Background and context

Long lead times to grid expansion can be attributed to two main factors, as follows:

1. Protracted environmental authorisation and permitting process

For a major transmission route, it takes on average between three to four years for an Environmental Impact Assessment (EIA) process to be completed in terms of the National Environmental Management Act (NEMA). For long power lines crossing many different land parcels, the risk of an appeal is high, which often results in significant delays in receiving the authorisation. Major routes often trigger many additional environmental permitting requirements, such as Water Use Authorisation, each managed by a different Competent Authority under an independent authorisation process. Only upon EIA authorisation do many of these additional authorising processes commence. The lack of integration between licensing processes leads to inefficiencies in bringing new generation online.

2. Retroactive servitude negotiation process

The EIA process is important in the initial planning and route selection of new power lines. For this reason, it is common practice for the servitude negotiation process to begin after the EIA has been completed when there is greater confidence in the route to be adopted. The problem with this sequence of events, however, is that the Environmental Authorisation (EA) locks grid developers into a predefined route. Therefore, should a grid developer encounter an unwilling landowner during the servitude negotiation process, there is little to no flexibility to adapt the position of the route. In these instances, the developer is forced pay above market rate to the landowner for access to the servitude, undergo an expropriation process or reroute the line, the latter requiring an amendment to the EA, and all options resulting in increased costs and delays to the project.

To assist in resolving these problems, the national Department of Environmental Affairs in South Africa commissioned a Strategic Environmental Assessment in January 2014 which set out to achieve streamlined

and integrated environmental authorisation for transmission infrastructure projects in areas identified as strategically important (hereafter referred to as the 'Power Corridors') from a grid development perspective. Furthermore, on the basis of scoping level environmental pre-assessment of the Power Corridors, the SEA aimed to enable pre-negotiation of servitudes and facilitate upfront investment in advance of project level environmental authorisation in these areas.

Methodology

Identification of Power Corridors

A detailed study was undertaken in 2013 by Eskom, the South African electricity public utility, to investigate future transmission line development requirements up to 2040 to support the changes to South Africa's future generation mix (Eskom, 2014). The study investigated a number of different generation scenarios (including coal, renewables, gas and nuclear), and on this basis, determined the need for five 100km¹ wide Power Corridors where new transmission infrastructure and the upgrade of existing infrastructure will be required. The Power Corridors are hinged on numerous future major substation points (anchor points) where high voltage needs to be stepped down to support regional bulk energy intensive activities.

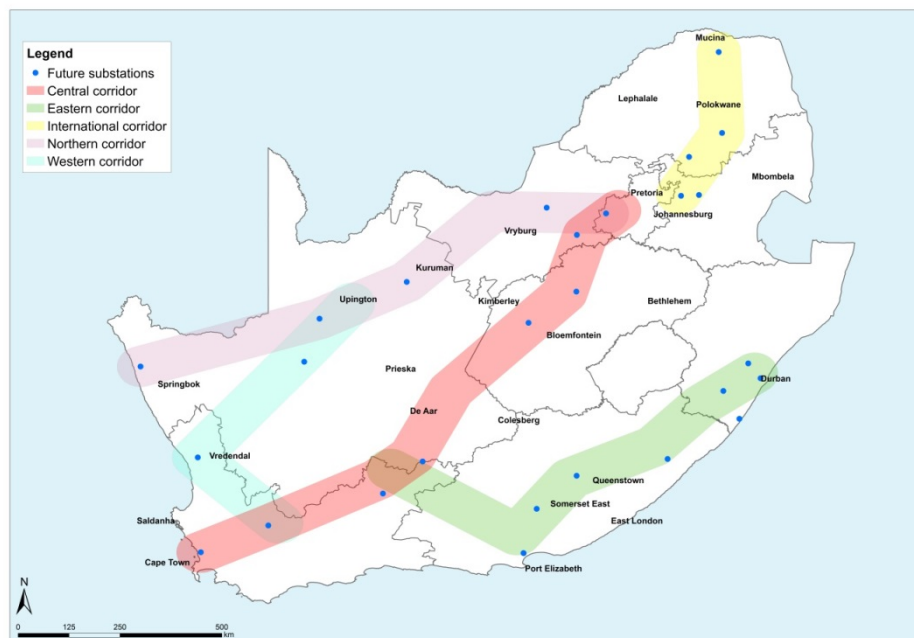


Figure 1: Preliminary Power Corridors based on the Eskom Strategic Grid Plan Study 2040

Refinement of Power Corridors

The position of the Power Corridors underwent refinement as part of the SEA process to ensure optimal positioning in support of areas with the highest demand for transmission level infrastructure (both from a generation and load perspective, where load refers to the power demand) whilst minimising overlay with environmentally sensitive areas. This was done to ensure that areas of the greatest need for transmission infrastructure directly benefit from the declaration of the Power Corridors and associated changes to assessment and authorisation procedures in these areas.

Opportunities mapping was undertaken to spatially identify areas of greatest demand for transmission infrastructure based on inputs from industry and national, provincial and local government. A critical consideration in the opportunities mapping exercise was ensuring that the Power Corridors intersected with the Renewable Energy Development Zones (REDZ), areas identified as outputs from the preceding wind and solar Strategic Environmental Assessment as areas where utility scale wind and solar photovoltaic development should be prioritised on the basis of resource, environmental and socio-economic characteristics.

¹ The Power Corridors are 100km wide to enable the consideration of alternative routing options.

Constraints mapping was also undertaken to identify potential pinch points within the Power Corridors in the context of environmental features (such as National Parks and existing conflicting land uses such as the Square Kilometer Array (SKA) radio-telescope area) and engineering constraints, such as slope. Where pinch points existed and suitable relief was present outside of the Power Corridors, the position of the Power Corridors was shifted in the direction of the relief without compromising the intersection with the critical substation anchor points.

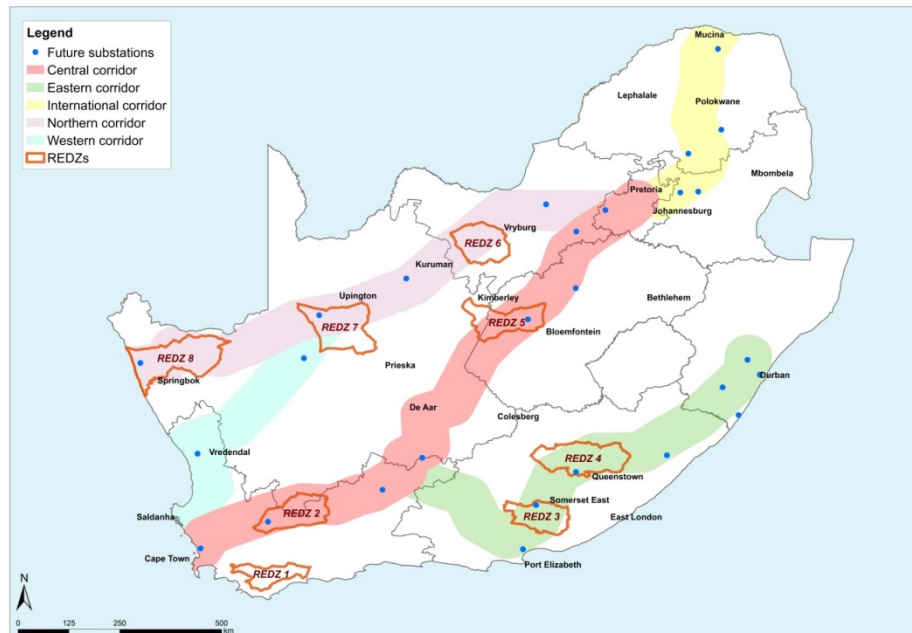


Figure 2: Refined Power Corridors based on opportunities and constraints mapping and showing location of the REDZs

Scoping Level Environmental Assessment

Upon identification of the final Power Corridor positions, specialist teams conducted more in-depth assessments of environmental sensitivities within these areas. Studies were undertaken on aspects considered sensitive to electricity grid infrastructure development and typically investigated as part of an Environmental Impact Assessment for developments of this nature, including avifauna, terrestrial and aquatic biodiversity, heritage, visual impact, agriculture and socio economic. Further aspects of sensitivity in terms of aviation, defence, SKA and mining were determined in consultation with the relevant authorities. The results were used to develop four tiered sensitivity maps (i.e. showing very high, high, medium and low sensitivity) and development protocols for each environmental aspect, the later describing the scope and nature of additional project level assessment requirements within different levels of sensitivity inside of the Power Corridors where applying for environmental authorisation.

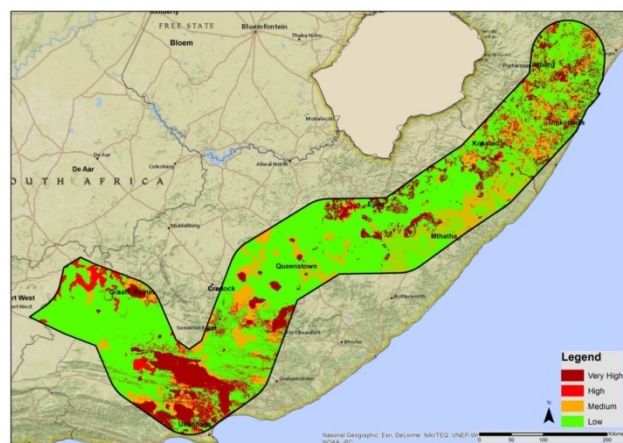


Figure 3: Four-tiered terrestrial biodiversity sensitivity map for Eastern Corridor

Results and Discussion

New Assessment Procedure

On the basis of the specialist pre-assessment work, listed activities linked to electricity grid infrastructure development inside the Power Corridors will require a Basic Assessment (BA) rather than an Environmental Impact Assessment (EIA). This will result in a reduced environmental assessment timeframe of 300 days to 197 days². Furthermore, proposed electricity grid infrastructure inside of the Power Corridors will benefit from a reduced decision making timeframe of 50 days, further streamlining the Basic Assessment process to a maximum timeframe of 147 days from application to receiving a decision on environmental authorisation.

Further to the shortening of the Basic Assessment process, it is proposed that electricity grid infrastructure projects located inside the Power Corridors benefit from integrated assessment and decision making procedures. The integration of assessment procedures will enable, as far as practically possible, synchronisation between the Basic Assessment process in terms of NEMA and the authorisation requirements of other legislation applicable to electricity grid infrastructure projects, such as water use authorisation, as shown in Figure 4.

Proposed Powerline Route within Power Corridor			
Legislation	EIA regulations specify the need for Environmental Authorisation in terms of NEMA	Other permitting, licensing and authorisation requirements mandated in terms of other legislation e.g. Water Use Authorisation in terms of the NWA	Basic Assessment Process
Assessment Requirements	Sensitivity maps and Development Protocols describe the specific assessment requirements of relevant competent authorities in terms of all relevant legislation		
Assessment	Assessment undertaken according to specific assessment requirements described in Development Protocols		
Outputs	Basic Assessment Report and EMPR submitted to competent authorities in terms of NEMA	Information requirements of all relevant Commenting Authorities submitted to relevant Commenting Authority for comment	
Decision Making	Environmental Authorisation (where appropriate) in terms of NEMA by Competent Authority	Comment (in the form of a legally binding decision) provided by all relevant Commenting Authorities within the timeframe of the Basic Assessment process	
Outcome	Integrated authorisation for multiple authorisations/licences and permits provided by Competent Authority in terms of NEMA		

Figure 4: Integration of assessment and decision making procedures of multiple authorities

The shortened timeframe for undertaking assessments for electricity grid infrastructures projects means that a significant amount of work by the Environmental Assessment Practitioner and project proponent will need to be undertaken in advance of submitting an application for environmental authorisation. The effective use of time at pre-application will therefore be critical to ensuring that adequate assessment of potential impacts as well as suitable opportunity for public comment is possible.

The assessment procedure proposed consists of four stages including two pre-application stages, namely 'Screening' phase and 'Specialist Inputs' phase and two post application stages, the 'Basic Assessment' phase and 'Post Authorisation' phase.

Screening

The objective of this phase is to identify a pre-negotiated route which minimises impact to the environment through early consideration of the scoping level sensitivity maps (and additional validation where required) as well as satisfying the necessary technical and budgetary requirements of the developer.

Specialists Inputs

The objective of this phase is for specialists to assess the development envelope³ and determine potential impact and associated mitigation measures in accordance with the development protocols.

² Refers to total elapsed days rather than working days

³ In order to allow for minor changes to the project footprint (i.e. proposed project layout plan, route etc.) following authorisation, as is often found to be a technical requirement, it is necessary for the Competent Authority to approve a development envelope rather than only the physical project footprint. The area that needs to be assessed in detail during the project level impact assessment thus needs to include a buffer from the edge the project footprint, the size of which will be dependent on the voltage of the line. The assessment and approval of such a development envelope will allow for minor changes in the project layout without having to seek amendment or re-

Basic Assessment

This phase reflects the point from which an application for environmental authorisation is made by the proponent to the point at which a decision on the application is made by the Competent Authority in terms of NEMA.

Post Authorisation

The objective of this phase is to assist with the micro-siting of tower positions and the identification of site specific mitigation measures to minimise impact during construction. Inputs from this phase will be used to update the construction Environmental Management Programme Report (EMPR).

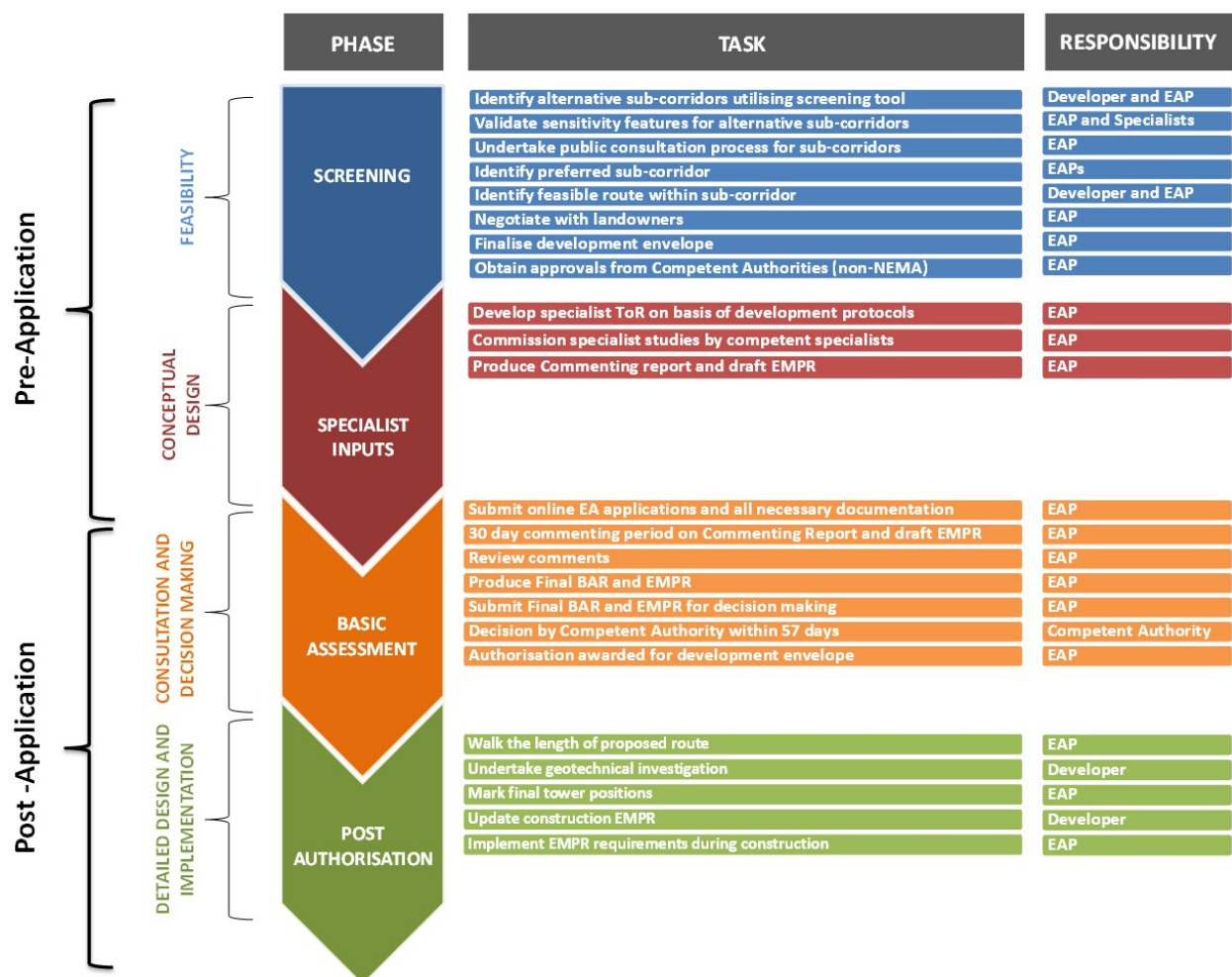


Figure 5: Process to be followed by developer, EAP and decision making authorities for a typical powerline project in the Power Corridors in context of a Basic Assessment process

Conclusions

- The ability to streamline assessment processes at a national scale on the basis of sensitivity mapping at a desktop level is dependent on the quality and availability of high resolution data. Appropriate consultation and agreement with a wide-range of stakeholders is required to source the required data. An evaluation of the confidence limits attributed to each dataset is also required. Where

authorisation, provided that such a change in layout does not impinge on any additional sensitive areas identified in the envelope, or result in any increase in the significance ratings of impacts.

confidence limits for a particular aspect or area are low, the ability to inform decision making without the need to undertake validation (usually in the form of on-the-ground assessment) is therefore also low. Poor quality data or data voids is thus a significant limitation to streamlining assessment procedures.

- Key stakeholder agreement to the development protocols related to matters of water, agriculture, defence, heritage, etc. leads to some level of integration in the environmental assessment processes. However, the ability to create an integrative decision-making and authorisation framework involving the legislative mandates of other government bodies is limited unless a 'one-stop-approach' involving a centralised competent authority is adopted. This approach is challenging and difficult to implement as it requires government bodies to relinquish their mandates. Therefore above anything, the mapping outputs and development protocols developed through the the SEA for aspects not mandated by the Department of Environmental Affairs, serve as an effective planning tool for proponents by enabling them to consider these aspects at the earliest stages of project planning and therefore avoid later problems in project development and implementation.

Next Steps

In February 2016, the Cabinet of the South African government made a decision to gazette the outcomes of the SEAs recently conducted for streamlining the responsible development of wind and solar photovoltaic developments in the REDZs and electricity grid infrastructure in the Power Corridors (Ministry of Presidency, 2016). The outputs of the SEA in the form of maps and development protocols will be put forward for adoption and released for public comments through publication in the Government Gazette. The gazetting process is envisaged to take place in June 2016 and will also constitute the formal public consultation process on the outcomes of the SEA process.

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