Appendix I.5: Detailed Project Description

PROJECT DESCRIPTION

This section provides a description of the location of the project area and the site location alternatives considered for the project. The descriptions encompass the activities to be undertaken during the construction and operational phases as well as the consideration for site accessibility, water demand, supply, storage, and site waste management. This section also considers the need and desirability of the project in accordance with Appendix 1 of GNR 326.

LOCATION OF THE PROPOSED PROJECT

The proposed project will be developed within a project area of approximately 680ha (the entire extent of the proposed project is located within the Central Corridor of the Strategic Transmission Corridors). The Project is located approximately 6km northeast of Fochville, within the Merafong City Local Municipality (MCLM) in the Gauteng Province.

The details of the properties associated with the proposed Project (switching station and powerline), including the 21-digit Surveyor General (SG) codes for the cadastral land parcels are outlined in **Table 0-1** and the boundaries of the farm portions traversed by the Project is shown in **Figure 0-1**. The coordinates of the OHPL route are presented in **Table 0-2** and illustrated in **Figure 0-2**.

Table 0-1 - Farm portions on which the proposed powerline is located

FARM NAME	21 DIGIT SURVEYOR GENERAL CODE OF EACH CADASTRAL LAND PARCEL
Portion 20 of Farm Kraalkop 147IQ	T0IQ00000000014700020
Portion 31 of Kraalkop 147 IQ	T0IQ00000000014700031
Portion 45 of Kraalkop 147 IQ	T0IQ00000000014700045
Portion 46 of Kraalkop 147 IQ	T0IQ00000000014700046
Portion 53 of Kraalkop 147 IQ	T0IQ00000000014700053
Portion 68 of Kraalkop 147 IQ	T0IQ00000000014700068
Portion 11 of Leeuwpoort 356 IQ	T0IQ00000000035600011
Portion 77 of Leeuwpoort 356 IQ	T0IQ00000000035600077

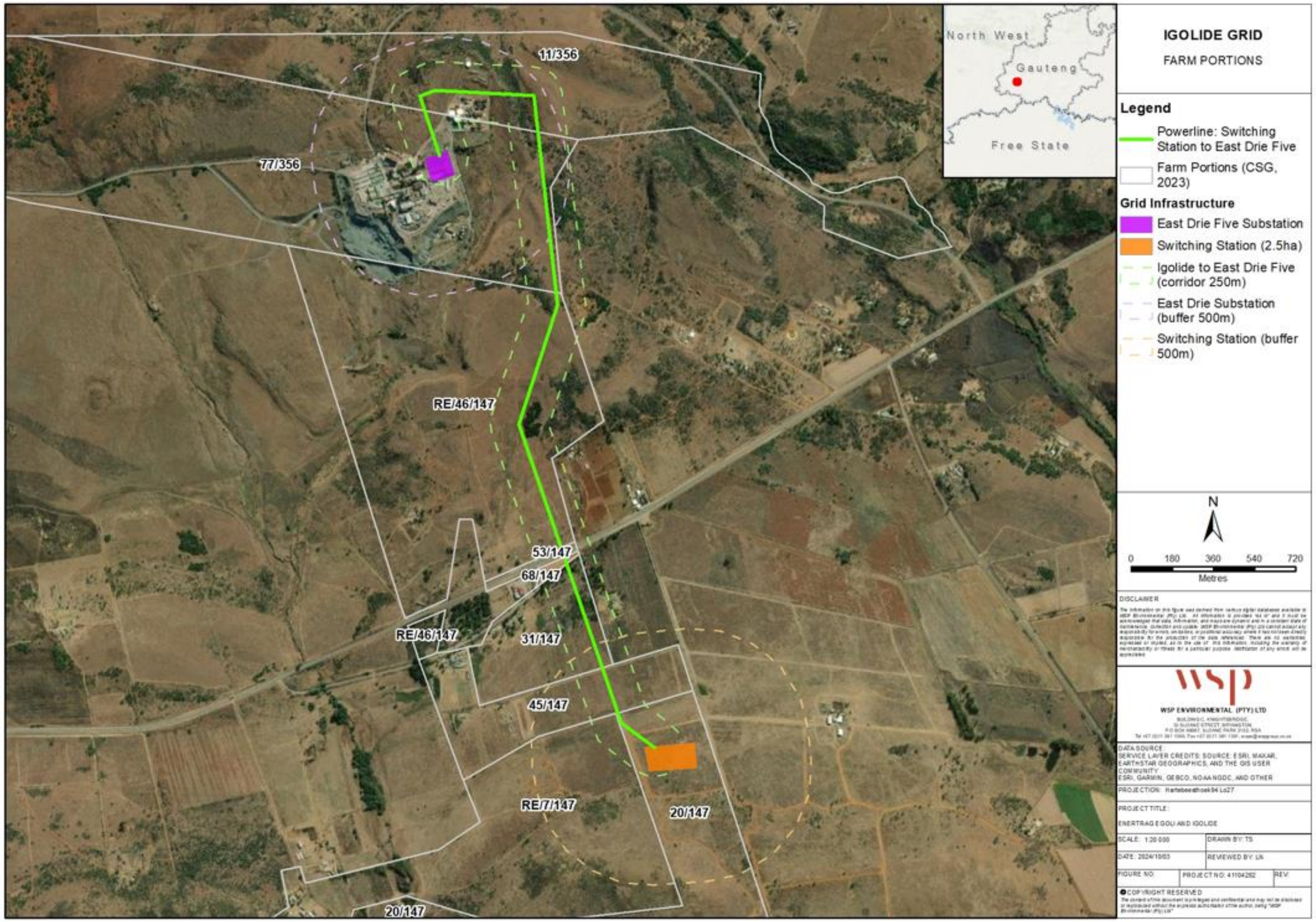
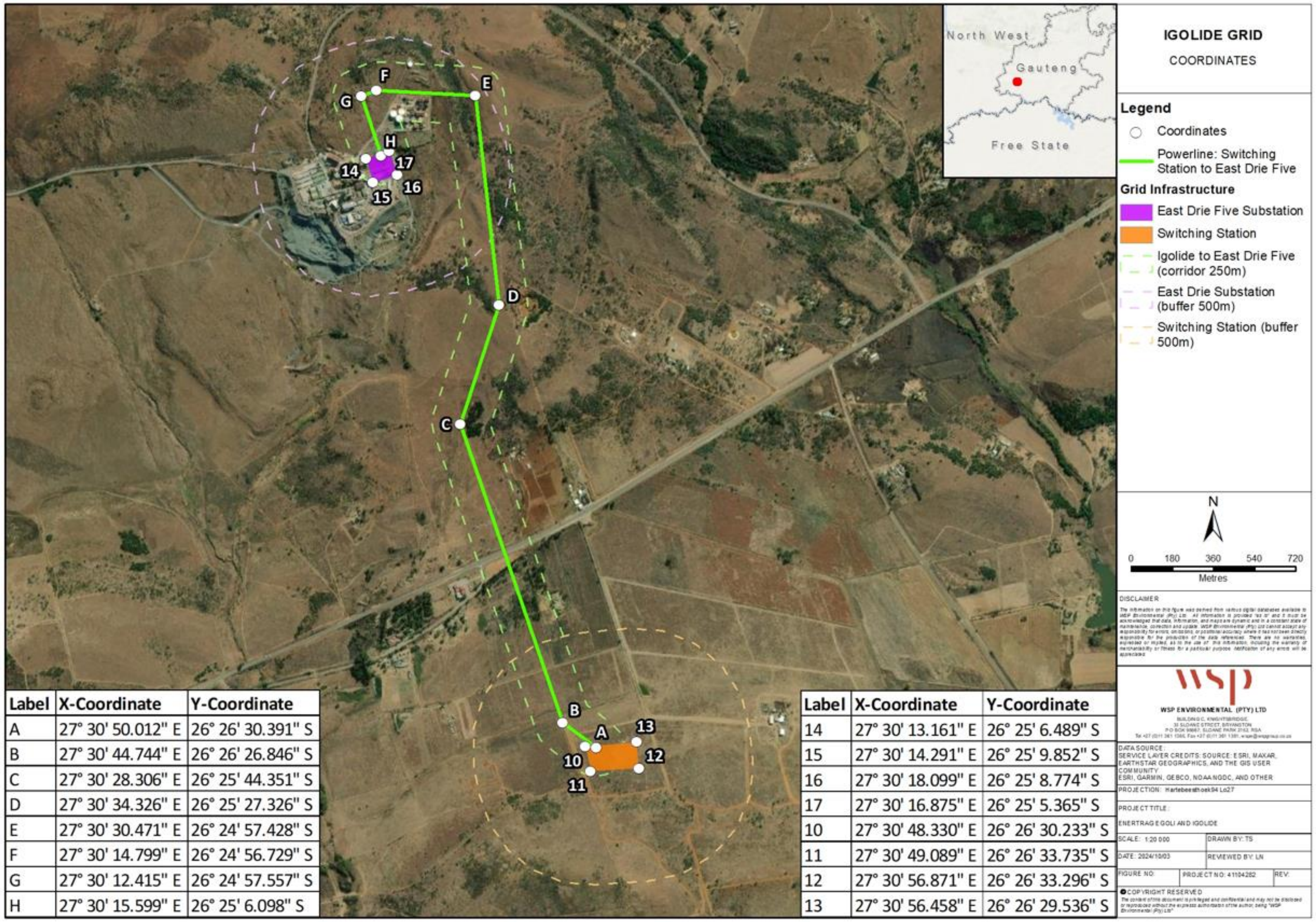


Figure 0-1 - Boundary of the property or properties traversed by the proposed project



Label	X-Coordinate	Y-Coordinate
A	27° 30' 50.012" E	26° 26' 30.391" S
B	27° 30' 44.744" E	26° 26' 26.846" S
C	27° 30' 28.306" E	26° 25' 44.351" S
D	27° 30' 34.326" E	26° 25' 27.326" S
E	27° 30' 30.471" E	26° 24' 57.428" S
F	27° 30' 14.799" E	26° 24' 56.729" S
G	27° 30' 12.415" E	26° 24' 57.557" S
H	27° 30' 15.599" E	26° 25' 6.098" S

Label	X-Coordinate	Y-Coordinate
14	27° 30' 13.161" E	26° 25' 6.489" S
15	27° 30' 14.291" E	26° 25' 9.852" S
16	27° 30' 18.099" E	26° 25' 8.774" S
17	27° 30' 16.875" E	26° 25' 5.365" S
10	27° 30' 48.330" E	26° 26' 30.233" S
11	27° 30' 49.089" E	26° 26' 33.735" S
12	27° 30' 56.871" E	26° 26' 33.296" S
13	27° 30' 56.458" E	26° 26' 29.536" S

Figure 0-2: Locality map with coordinates for the proposed 132kV Grid Connection and associated infrastructure for the Igolide WEF

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Table 0-2 - Co-ordinates of the OHPL route

POINT	LONGITUDE	LATITUDE
A	27° 30' 50.012" E	26° 26' 30.391" S
B	27° 30' 44.744" E	26° 26' 26.846" S
C	27° 30' 28.306" E	26° 25' 44.351" S
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H	27° 30' 15.599" E	26° 25' 6.098" S

PROJECT INFRASTRUCTURE

The proposed project entails the construction of a 132kV grid connection overhead powerline including associated grid connection infrastructure, in order to connect the authorised Igolide WEF to the nearby existing East Drie Five Substation. The powerline will be approximately 4km in length.

The onsite grid switching station will consist of a high voltage substation yard to allow for multiple 132kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The area for the onsite switching station will be up to 2.5ha.The assessment area for the 132kV powerline will cover a corridor of up to 250m, including a 500m wide buffer around the entire perimeter of the proposed substation sites, to allow for flexibility in the design of the final OHL and avoidance of sensitive features, where possible. A technical summary of the 132 kV grid connection and its associated infrastructure is included in **Table 0-3**.

Table 0-3 - Details of the 132kV Grid Connection and associated infrastructure for the proposed Igolide WEF

OVERHEAD POWERLINE	DESCRIPTION
Powerline capacity	132kV
Powerline corridors width	A grid connection corridor has been identified for the assessment and placement of the grid connection infrastructure, comprising 250m (i.e.,125m on either side of centre line). The entire corridor is proposed for development provided the infrastructure remains within the assessed corridor.
Powerline servitude width	32m
Powerline pylons:	Monopole or Lattice pylons, or a combination of both where required and as informed by detailed design

OVERHEAD POWERLINE	DESCRIPTION
Construction clearance required (per pylon)	Permanent footprint sizes may vary depending on design type, however up to 140m^2 may be required for each pylon foundations, depending on the number and design of the foundation.
Powerline pylon height:	40m
Minimum conductor clearance	8.1m
Pylon spacing	Up to 250m apart, depending on complexity and slope of terrain
Pylon designs	Various pylon design types are considered (and will be determined during the detailed design engineering phase), and may include any of the following: - 132kV (single or double circuit) - Intermediate self-supporting monopole - Inline or angle-strain self-supporting monopole - Suspension self-supporting monopole - Triple pole structure - Cross rope suspension; - Guyed "V" Structure - Steel lattice structure; or - Similar pylon design at 132kV specification The above designs may require anchors with guy-wires or be anchorless. For 132kV structures, concrete foundation sizes may vary depending on design type up to 140m^2 (12m by 12m), with depths reaching up to 4m typically in a rectangular 'pad' shape.
Station (Switching station connection components)	
Switching Station	The total footprint for the onsite switching station will be up to 2.5ha in extent. The on-site Eskom switching station will consist of a high voltage substation yard to allow for multiple 132kV feeder bays and transformers, control building, telecommunication infrastructure, and other substation components, as required. Standard substation electrical equipment, including but not limited to transformers, busbars, office area, operation and control room, workshop, and storage area, feeder bays, transformers, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be needed. A 500m buffer around the switching station will be assessed to ensure flexibility in routing the powerline.
Station Capacity	132kV
Corridor width	A grid connection corridor has been identified for the assessment and placement of the grid connection infrastructure, comprising 250m (125m on either side of the centre line) around the entire perimeter of the proposed substation sites. The entire corridor is proposed for development provided the infrastructure remains within the assessed corridor.

OVERHEAD POWERLINE	DESCRIPTION
Associated infrastructure	- Telecommunication infrastructure (including along the length of the powerline and with the substations) - Oil dam(s) - Workshop and controlling building and office area within the substation footprint - Fencing around the substation - Lighting and security infrastructure - All the access road infrastructure to and within the substation - Maintenance road/access track along the length of the powerline for maintenance purposes Further ancillary infrastructure including but not limited to lighting, lightning protection, fencing, buildings required for operation (ablutions, office, workshop and control room, security fencing and gating, parking area, concrete batching plant (if required), waste storage/disposal and storerooms).
Termination works	Upgrades to the existing East Drie Five Substation will also be required, including possible expansion within the yard, where required, with a footprint of up to 4ha. This includes the installation of additional feeder bays to accommodate the power being evacuated from the proposed Igolide WEF and transformer upgrades.
Roads Infrastructure	
Road servitude and access roads	- During construction, a permanent access road along the length of the powerline corridor, between 4 – 6m wide will be established to allow for large crane movement. This track will then be utilised for maintenance during operation. - Permanent access roads to and within the substation, up to 8m wide, will be established. - To access the switching station within the WEF, an authorised access road will be utilised.

OVERHEAD POWERLINE

It is proposed that Igolide WEF will connect to the existing East Drie Five Substation through a 132 kV OHPL (either single or double circuit) between the grid connection substation portion.

The onsite switching station will consist of high voltage substation yard to allow for multiple 132 kV feeder bays and transformers, control building, telecommunication infrastructure, access roads, etc. The area for the switching station will be up to 2.5 ha. The OHPL will have a 250 m corridor (125m on either side of the centre line and the switching station (including terminating substation works) will have a 500m around the entire perimeter of the substation and termination works). This application includes the necessary 132 kV voltage electrical components required for connection at the existing East Drie Five Substation (i.e., the termination works).

ELECTRICITY POWER TRANSMISSION AND DISTRIBUTION

Electricity is carried at high voltages (kilovolts, or kV) along transmission lines in order to reduce the electrical losses that occur over long distances between power generation and consumption points. In order for electricity to be transmitted safely and efficiently over long distances, it must be at a high voltage and a low current. The voltages at which power is generated at the power generation facility are too low for transmission over long distances. To overcome this problem, transformers are installed at the power stations and substations to increase the voltage level.

Transformer's step-up the voltage from, for example, 11 or 22 kV to higher voltages such as 66 kV, 132kV, 220 kV, 275 kV, 400 kV or 765 kV, and feed the generated power into Eskom's national grid.

When the electricity arrives at a distribution substation, bulk supplies of electricity are taken for primary distribution to towns and industrial areas, groups of villages, farms and similar concentrations of consumers. The lines are fed into intermediate substations where transformers reduce (step-down) the voltage level. This could be 11 kV in large factories and 380/220 Volts in shops and homes. Power is distributed to end-users via reticulation power lines and cables. **Figure 0.-4** illustrates a typical distribution system.

As of March 2019, South Africa's transmission network comprised 32,802 km of line length, 167 substations and 152,135 MVA of transformer capacity. All the high voltage lines, plus the transformers and related equipment, form the transmission system also known as the national grid.

COMPONENTS OF A TYPICAL TRANSMISSION LINE SYSTEM

The main components of a typical electrical transmission system include the following:

TRANSMISSION STRUCTURES

Transmission structures are the most visible components of the power transmission system. Their function is to inter alia, keep the high-voltage conductors separated from their surroundings and from each other. Some structure designs reflect the specific function of the structure, while others have come about as a result of technological progress. Structure design alternatives for this project are discussed in **Section** Error! Reference source not found..

CONDUCTORS

Conductors carry the power through and from the grid. Generally, several conductors per phase are strung from structure to structure. The number of conductors per phase depends on the performance of the line, typically, more than one conductor per phase is used when the operating voltage exceeds 132kV. Conductors are constructed primarily of aluminium, aluminium-alloy, steel or other types of materials as appropriate.

SUBSTATIONS

The very high voltages used for power transmission are converted at substations to lower voltages for further distribution and consumer use. Substations vary in size and configuration but may cover several hectares; they are cleared of vegetation and typically surfaced with gravel. They are fenced and are normally reached by a permanent access road. In general, substations include a variety of indoor and outdoor electrical equipment such as switchgear, transformers, control and protection panels and batteries, and usually include other components such as control buildings, fencing, lighting etc.

For the substation to perform it needs sophisticated protection equipment to detect faults and abnormal conditions that may occur on the network. Action may consist for example, of automatically tripping a transmission line to cater for abnormal conditions such as lightning strikes, fires or trees falling on transmission lines. This action is necessary for safety reasons in the event of an accident or to maintain electricity supply and limit the disruption caused.

Figure 0-3 provides an illustration of a typical substation layout.

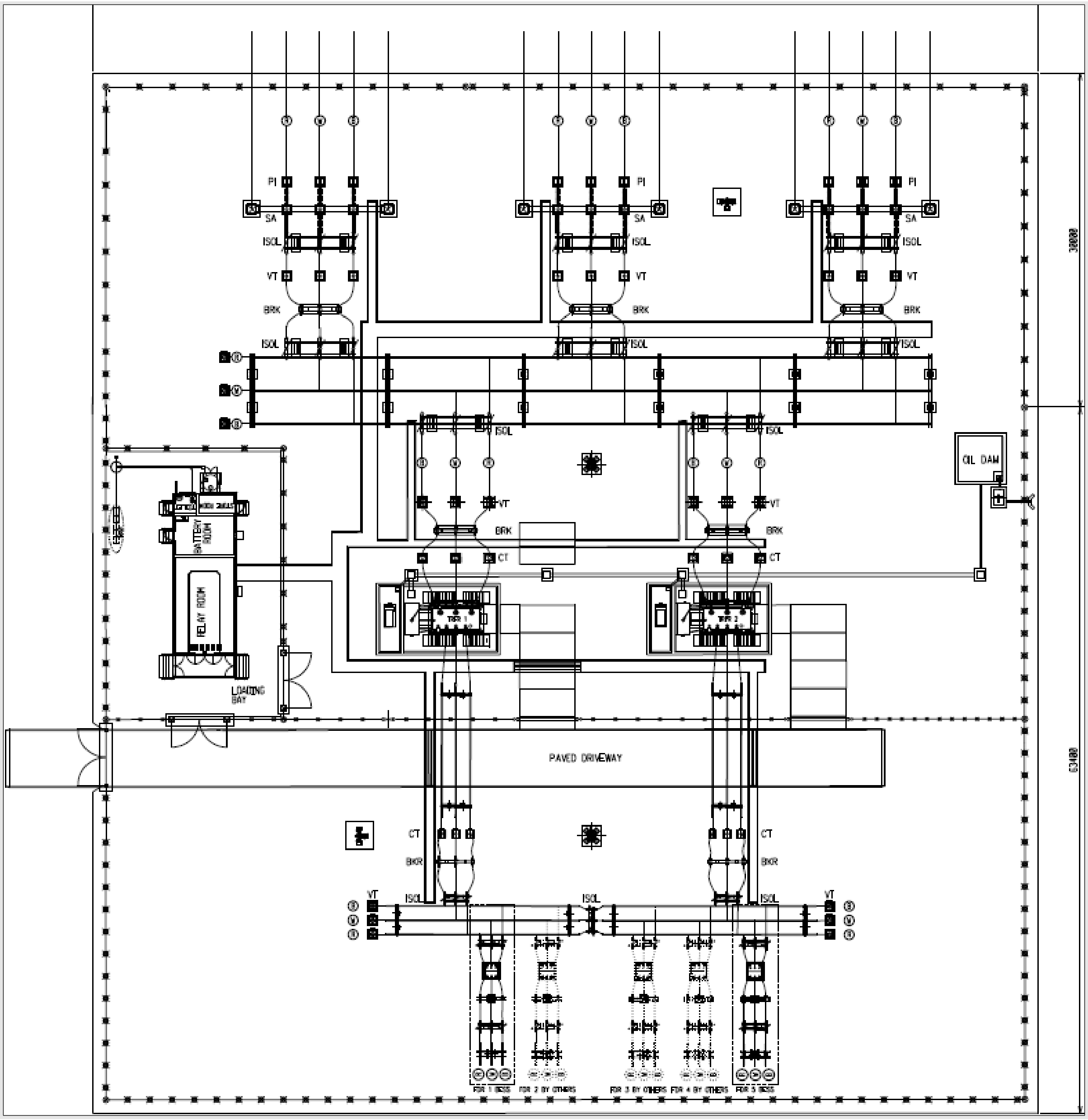

Figure 0-3: Typical Substation Layout (illustrative only)

TRANSFORMERS

Transformers are major items found in a transmission or distribution substation. There may be a number of different types of transformers in a substation such as power transformers, voltage transformers or current transformers.

A power transformer is a very simple device piece of electrical equipment where alternating current (AC) is led through a primary coil of wire, which produces an alternating magnetic field in the ring-shaped core of soft iron. This in turn creates a voltage in a secondary coil, from which the output current can be drawn. If the secondary coil has more turns than the primary coil, the output voltage is higher than the input voltage. This is a step-up transformer. A step-down transformer has more turns in the primary coil than in the secondary coil to reduce the voltage.

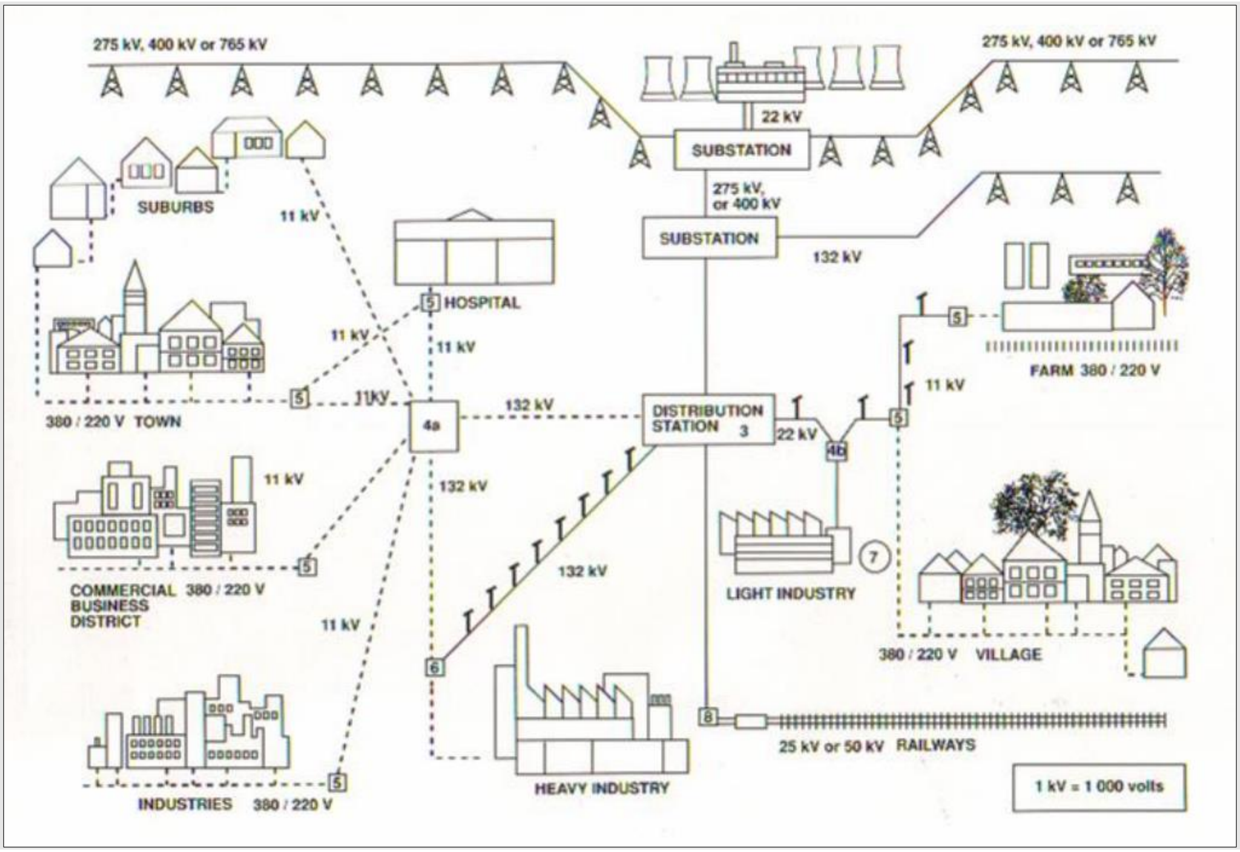

Figure 0.-4: Typical Distribution System

PROPOSED PROJECT DEVELOPMENT ACTIVITIES

The typical steps involved in the construction and operation of a transmission line is summarised below:

- Planning Phase
  - Step 1: Surveying of the development area and negotiation with affected landowners; and
  - Step 2: Final design and micro-siting of the infrastructure based on geotechnical, topographical conditions and potential environmental sensitivities.
- Construction Phase
  - Step 3: Vegetation clearing;
  - Step 4: Assembly and erection of infrastructure on site;
  - Step 5: Stringing of conductors; and
  - Step 6: Rehabilitation of disturbed areas and protection of erosion sensitive areas.
- Operation Phase

Step 7: Continued maintenance during operation.

CONSTRUCTION PHASE

CONSTRUCTION SCHEDULE

Construction of the Overhead Powerline (OHPL) and associated infrastructure is anticipated to take 6 - 24 months.

SITE ESTABLISHMENT AND TRANSPORTATION OF MATERIALS AND EQUIPMENT TO SITE

The selected contractor will establish a temporary site camp including, but not be limited to, temporary offices, laydown areas for equipment and materials, storage facilities, ablutions, waste storage and handling area, and parking area. The location and extent of the Contractors camp, to be established within the Project, are undertaken as part of a different application and are not covered in the EMPr. It is anticipated that materials will be collected on a daily basis from the contractor laydown area for the construction activities along the servitude. This limits areas to be impacted for storage along the servitude as well as for security purposes when activities cease at the end of each day.

The required materials and equipment will be transported to the site via public roads and private farm roads/tracks along the proposed servitude, as far as possible. Large mobile plant including mechanical/hydraulic augers, mobile cranes, bucket trucks/cherry pickers will be used during installation of the OHPL.

LABOUR REQUIREMENTS

During site preparation and installation of Project related infrastructure the selected Contractor, working on behalf of Igolide WEF, is anticipated to require 20-30 people to undertake the required works. Approximately 5% of workers would be highly skilled, 15% medium skilled, and 80% low skilled subject to a skills assessment and confirmation of staffing availability.

VEGETATION CLEARING

Due to the nature of the vegetation within the Project area, which is predominantly sparse, low shrubs and grasses, limited vegetation clearing will be required. Clearing of vegetation will be limited to pylon areas to facilitate installation of each pylon and that required for the substation and associated infrastructure footprints and clearing of roads where existing roads are not available. Clearing will be done in phases along the OHPL route as required prior to installation activities.

INSTALLATION OF OHPL

Standard OHPL installation methods will be employed, which entails the excavations for foundations, planting of tower (concrete casting may be required) and stringing of the conductors.

A number of tower options could be utilised with a maximum height up to 40m above ground level, which are reported to have a life expectancy of more than 25 years. The actual height of the pylons will vary based on the site topography to maintain the specified clearance of the transmission lines.

Once the pylons have been installed, the lines will be strung. The Contractor in collaboration with Eskom will be responsible for functional testing and commissioning of the OHPL. This consists of connecting the line from the common collector substation to the MTS.

SWITCHING STATION

The switching station assessment site is ~2.5ha as the switching station will be located adjacent to the approved 132kV on-site IPP Substation (DFFE reference number: 14/12/16/3/3/2/2385, EA date 31 January 2024) was assessed as part of the Igolide WEF Environmental Authorisation process. A 500m buffer around the switching station has been identified to ensure flexibility in routing the powerline. The switching station will include, but is not limited to:

- A high voltage substation yard to allow for multiple 132kV feeder bays.
- Standard substation electrical equipment, including but not limited to, busbars, office area, operation and control room, workshop and storage area, feeder bays, stringer strain beams, insulators, isolators, conductors, circuit breakers, lightning arrestors, relays, capacitor banks, batteries, wave trappers, switchyard, metering and indication instruments, equipment for carrier current, surge protection and outgoing feeders, as may be required.

- Control building, telecommunication infrastructure, oil dam(s), etc.
- Workshop and office area within the switching station footprint.
- Fencing around the switching station.
- All the access road infrastructure to and within the switching station.
- Associated infrastructure, including but not limited to, lighting, fencing, and buildings required for operation (ablutions, office, workshop and control room, security fencing and gating, parking area, concrete batching plant (if required), waste storage/disposal and storerooms).

DEMOBILISATION

Upon completion of the installation phase, any temporary infrastructure will be removed, and the affected areas rehabilitated.

OPERATIONAL PHASE

Eskom will be responsible for managing the operations of the OHPL and associated infrastructure in line with their internal management systems. Eskom is considered to have the requisite expertise to operate and maintain the transmission line. Eskom will adhere to all existing Safety Codes and Guidelines for the operation and maintenance of the OHPL infrastructure.

During the operational phase there will be little to no project-related movement along the servitude as the only activities are limited to maintaining the servitude (including maintenance of access roads and cutting back or pruning of vegetation to ensure that vegetation does not affect the OHPL), inspection of the powerline and associated infrastructure and repairs when required. Limited impact is expected during operation since there will not be any intrusive work done outside of maintenance in the event that major damage occurs to site infrastructure.

Operation of the OHPL and associated infrastructure will involve the following activities, discussed below.

SERVITUDE MANAGEMENT AND ACCESS ROAD MAINTENANCE

Servitude and access road maintenance is aimed at eliminating hazards, ensuring safety standards are met and facilitating continued maintenance access to the OHPL. The objective is to prevent all forms of potential interruption of power supply due to overly tall vegetation/climbing plants or establishment of illegal structures within the right servitude. It is also to facilitate ease of access for maintenance activities on the OHPL. During the operational phase of the project, the servitude will be maintained to ensure that the OHPL functions optimally and does not compromise the safety of persons within the vicinity of the OHPL.

TRANSMISSION LINE MAINTENANCE AND OPERATIONS

Eskom will develop comprehensive planned and emergency programmes through its technical operations during the operation and maintenance phase for the OHPL. The maintenance activities will include:

- Eskom's Maintenance Team will carry out periodic physical examination of the OHPL and its safety, security and integrity.
- Defects that are identified will be reported for repair. Such defects may include defective conductors, flashed over insulators, defective dampers, vandalised components, amongst others.
- Maintenance/ repairs will then be undertaken.

DECOMMISSIONING PHASE

Decommissioning will be considered when the OHPL is regarded obsolete and will be subject to a separate authorisation and impact assessment process. This is not expected to occur in the near future.

NEED AND DESIRABILITY OF THE PROJECT

The DEA&DP Guideline (2013) states that the essential aim of need and desirability is to determine the suitability (i.e. is the activity proposed in the right location for the suggested land-use/activity) and timing (i.e. is it the right time to develop a given activity) of the development. Therefore, need and desirability addresses whether the development is being proposed at the right time and in the right place. Similarly, the 'Best Practicable Environmental Option' (BPEO) as defined in NEMA is "*the option that provides the most benefit and causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term*."

The development of renewable energy and the associated energy infrastructure is strongly supported at a national, provincial, and local level. The development of, and investment in, renewable energy and associated energy distribution infrastructure is supported by the National Development Plan, New Growth Path Framework and National Infrastructure Plan, which all highlight the importance of energy security and investment in energy infrastructure. The development of the proposed power line is therefore supported by key policy and planning documents and is in line with South Africa's strategic energy planning context (Refer to **Section** Error! Reference source not found.).

The energy security benefits associated with the proposed Igolide WEF is dependent upon it being able to connect to the national grid via the establishment of grid connection infrastructure. The proposed OHPL is therefore essential supporting infrastructure to the wind energy facility development, which, once developed, will generate power from renewable energy resources.

No physical or economic displacement will be required along the proposed route. Furthermore, negative environmental impacts associated with the activity will be mitigated to acceptable levels in accordance with the EMPr.