

## **SITE SELECTION MATRIX FOR THE PROPOSED GK SOLAR PV DEVELOPMENT**

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### **1. Property selection**

The identification of Geel Kop Farm 456 Remaining Extent for the development of the GK Solar PV Development (GK Solar PV) was based on the following location characteristics:

### **2. Proximity to towns with a need for socio-economic upliftment**

The Site is situated approximately 30 km south west of Upington in the Northern Cape Province. The Kai! Garib Local Municipality is typically masked with high rates of unemployment and poverty, which is largely the case throughout the Northern Cape Province. To this extent GK Solar PV is situated in close proximity to the towns of Upington, Kleimoes and Kakamas. Consequently, local labour would be easy to source, which fits in well with the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) economic development criteria for socio-economic upliftment. Currently, a large proportion of local labour is used in the mining and agricultural industry. There are several negatives related to agricultural employment however; that it is very seasonal and it is not always in close proximity to the homes of farm workers, forcing workers to travel large distances on a daily basis to reach their place of employment. Over the years, employment in the mining sector has shown to be very volatile. The Northern Cape has been identified as a node for the development and construction of solar PV generation capacity within South Africa and the locality of GK Solar PV would therefore present new opportunities for local skilled labour through previous work experience on surrounding preferred bidder plants.

### **3. Access to grid**

Power transmission considerations: The new Upington MTS is located in close proximity to the Site. There are two options proposed to connect GK Solar PV to the Upington MTS:

- Option 1: direct powerline to Upington MTS (400/132 kV), via the 132kV Geelkop Collector Substation located between Duneveld PV and Gordonias Solar PV Developments.
- Option 2: connect to Upington MTS (400/132 kV), via a loop in loop out (LILO) into the McTaggerts/Oasis 132kV powerline. The proposed location of the Geelkop Collector Substation is on the eastern boundary of Bushmanland PV.

Ease of access into the Eskom electricity grid is vital to the viability of a solar PV facility. Projects which are in close proximity to a connection point and/or demand centre are favourable, and reduce the losses associated with power transmission. In addition, Eskom's '2040 Transmission Network Study' has drawn on various scenarios to determine the grid's development requirements, as well as to identify critical power corridors for future strategic development, of which the Northern corridor is one of these. The national power corridors consisting of five transmission power corridors of 100 km in width have been gazetted by the Department of Environmental Affairs (DEA) following the outcome of the strategic environmental assessment (SEA) which aimed to identify environmentally acceptable routes over which long-term environmental impact assessment (EIA) approvals can be secured. GK Solar PV falls into the Northern corridor (refer to Figure 1).

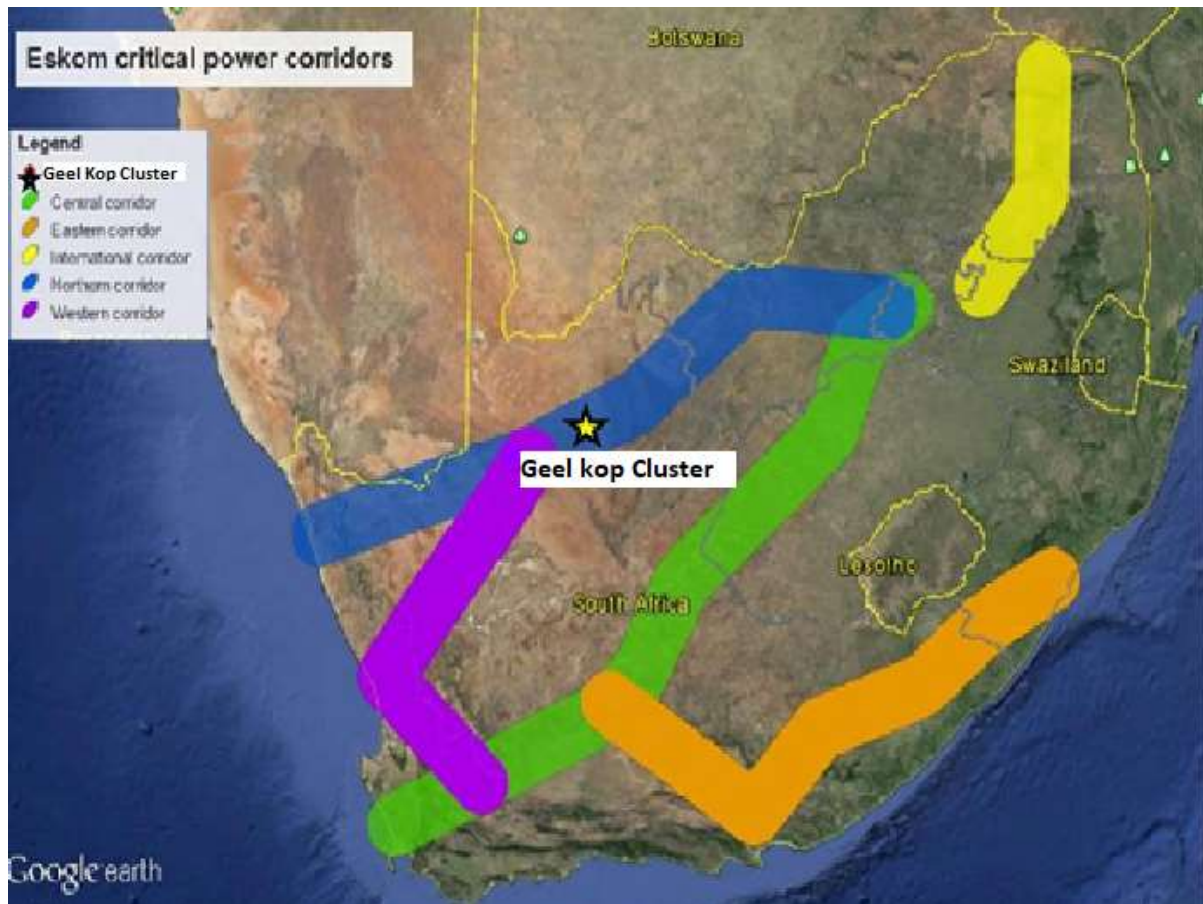


Figure 1: Eskom “Critical Power” Corridors. The Geel Kop PV Cluster is within the northern corridor as shown by the yellow star.

#### 4. Need and Desirability of the Development at the preferred site location

The Upington area has been ear-marked as a hub for the development of solar PV projects due to the viability of the solar resource for the area, and this area is included in the solar corridor which has been identified by the Northern Cape Spatial Development Framework. The overarching objective for the solar energy facility is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. From a regional site selection perspective, this region is considered to be preferred for solar PV development by virtue of its annual solar irradiation values. From a local perspective, the Site has specifically been identified as being highly desirable for the development of a solar PV facility due to its suitable topography (i.e. in terms of slope and local topography), site access (i.e. to facilitate the movement of machinery during the construction phase), land availability, the extent of the site, and enabling optimal placement of the infrastructure considering potential environmental sensitivities or technical constraints, as well as the consolidation of renewable projects within an already identified node.

## 5. REDZ

The DEA has been mandated to undertake a Strategic Environmental Assessment (SEA) process. The wind and solar photovoltaic SEAs were previously undertaken to identify geographical areas most suitable for the rollout of wind and solar photovoltaic energy projects and the supporting electricity grid network (these spatially identified areas have been promulgated in regulations published in terms of the National Environmental Management Act). The DEA and CSIR have released a map with focus areas best suited for the roll-out of wind and solar photovoltaic energy projects in South Africa. The SEA to identify phase 2 REDZ is currently being undertaken. The aim of the assessment is to designate renewable energy development zones (REDZs) within which such development will be incentivised and streamlined. The proposed Geel Kop PV Cluster falls within the gazetted geographical areas / focus area most suitable for the rollout of the development of solar energy projects (called “Upington Solar priority area”) within the Northern Cape Province.

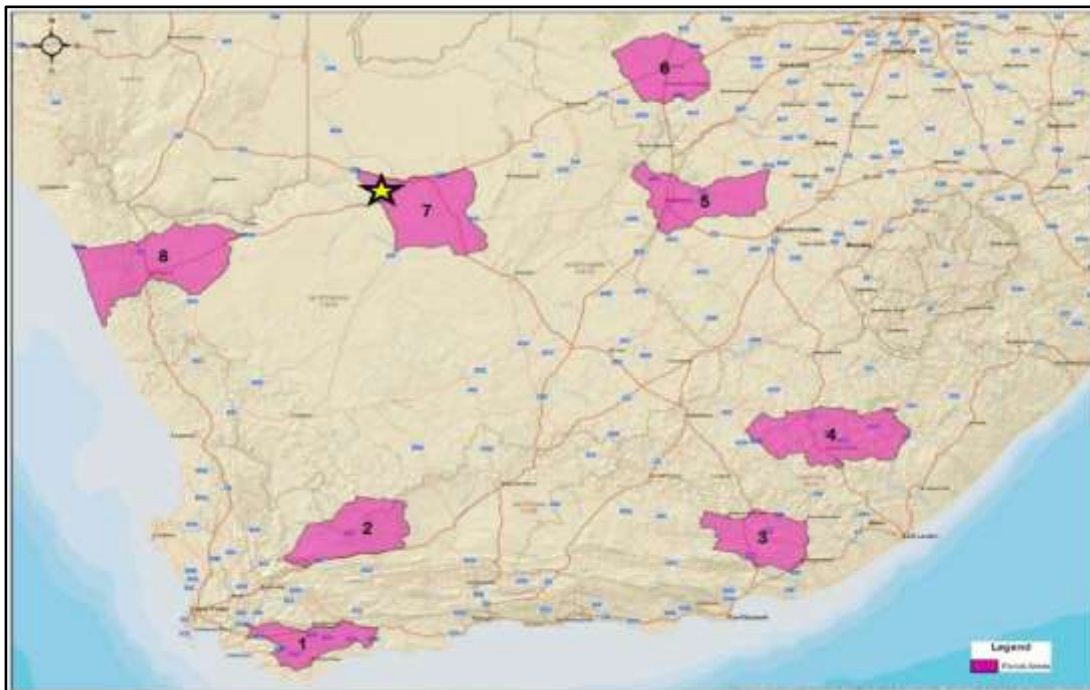


Figure 2: Renewable Energy Development Zones (REDZ) (CSIR 2014), Geel Kop PV Cluster (shown by the yellow star) falls within REDZ 7.

## 6. Agricultural Potential

The unfavourable climate of the Kalahari environment greatly decreases agricultural potential. The area is known to be an agricultural hub but Geel Kop Farm 456 RE is located too far from the Orange River and its fertile banks to ever be considered for high intensity grazing and/or cultivation practices. The proposed development does not encroach on land that is currently being used for grape production which is crucial for the economy of South Africa and the Upington area.

## 7. The Solar Irradiation

The economic viability of a solar PV facility is directly dependent on the annual direct solar irradiation values. The Northern Cape receives the highest average daily direct normal irradiation (DNI) in South Africa. In addition, Upington exhibits some of the best solar irradiation in South Africa, and the world. Global horizontal irradiation (GHI) for the Upington region varies between 2250 and 2300 kWh/m<sup>2</sup>/annum. The GHI for GK Solar PV is in the region of approximately 2278 kWh/m<sup>2</sup>/annum. The high irradiation levels is an important factor in a highly competitive bidding environment under REIPPPP, the economic viability of a project is a critical success factor.

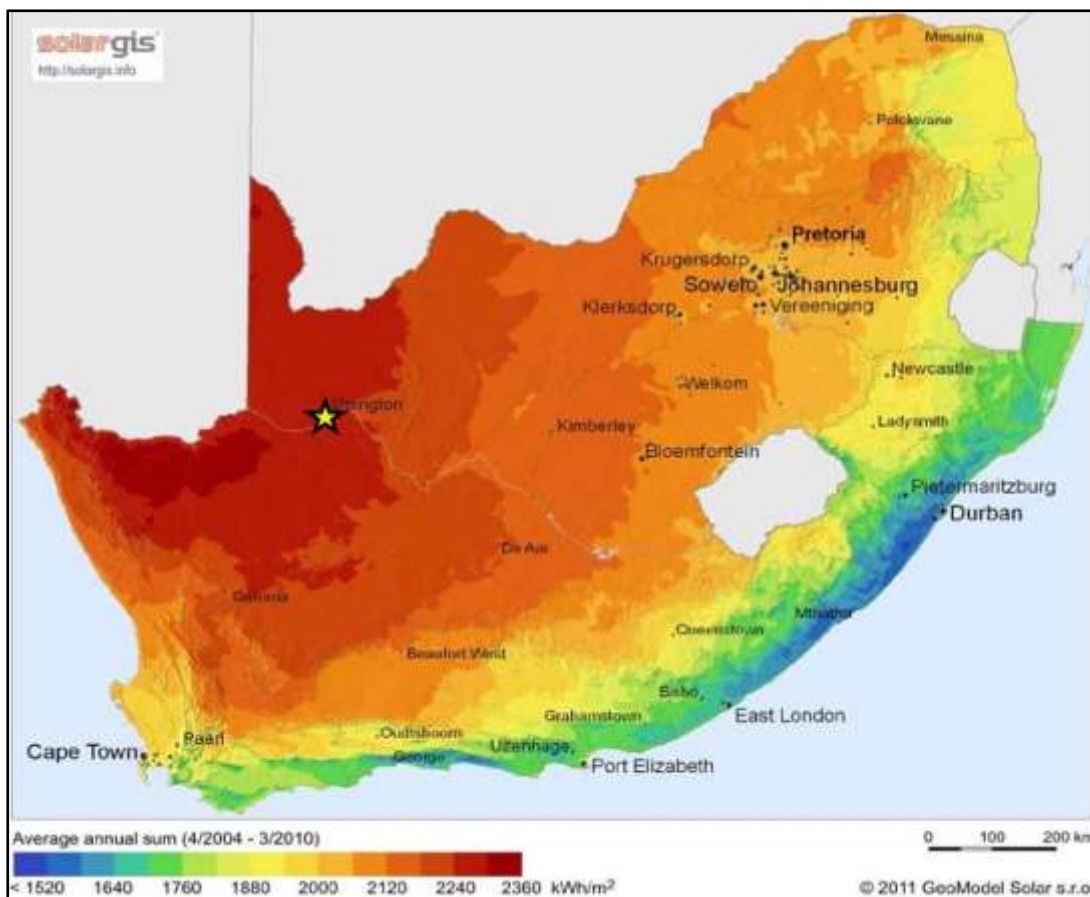


Figure 3: Solar Irradiation for South Africa (Solar GIS).

## 8. Proximity to access road for transportation of material and components

The proximity of the site to the N14 decreases the impact on secondary roads from traffic during the construction and operation phases. As material and components would need to be transported to the project Site during the construction phase of the project, the accessibility of the Site was a key factor in determining the viability of the project, particularly taking transportation costs (direct and indirect) into consideration and the impact of this on project economics and therefore the ability to submit a competitive bid under the Department of Energy’s (DoE) REIPPPP.

## **9. Upington airport**

The Upington airport is located approximately 34km to the north east of the Site, and therefore will not pose any threat to the aviation industry.

## **10. Landowner support**

The selection of a site where the landowner is supportive of the development of renewable energy is essential for ensuring the success of the project. The landowner does not view the development as a conflict with their current land use practices. The support from the landowner for the development to be undertaken on the affected property has been solidified by the provision of the consent for the project to proceed on the property through the signing of a land lease agreement with the developer. The applicant GK Solar PV (Pty) Ltd has an established relationship with the landowner of Geel Kop Farm 456 RE due to developing several PV projects on surrounding landowners' land. Based on the above list of findings it was decided that the proposed Site would be suitable for such a development. Based on the extent of Geel Kop Farm 456 RE, it is believed that the Site could accommodate 100 MW of contracted capacity permitted under the DoE's RFP, and furthermore, that all this power would be able to be absorbed into the national grid via the Upington MTS.