ROSENIA PV

TECHNICAL LAYOUT DEVELOPMENT REPORT FOR ROSENIA PV

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1. INTRODUCTION

Rosenia PV (Pty) Ltd is proposing the establishment of a commercial photovoltaic (PV) solar energy facility (SEF), called Rosenia PV, located on the Remaining Extent of Farm 423 south-east of Beaufort West in the Western Cape Province. Rosenia PV will comprise several arrays of PV panels and associated infrastructure and will have a contracted capacity of up to 120 MW. The project is situated within the Beaufort West Local Municipality within the Central Karoo District Municipality.

Rosenia PV will include solar PV technology (monofacial or bifacial) with either fixed, single or double axis tracking mounting structures, as well as associated infrastructure, which includes:

1. Laydown area;
2. Access and Internal road network;
3. Auxiliary buildings (33 kV switch room, gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);
4. Facility substation transformers and internal electrical reticulation;
5. Inverters and cabling;
6. Battery Energy Storage System (BESS);
7. Rainwater tanks; and
8. Perimeter fencing and security infrastructure.

Figure 1 below depicts a typical layout of a solar PV energy facility.

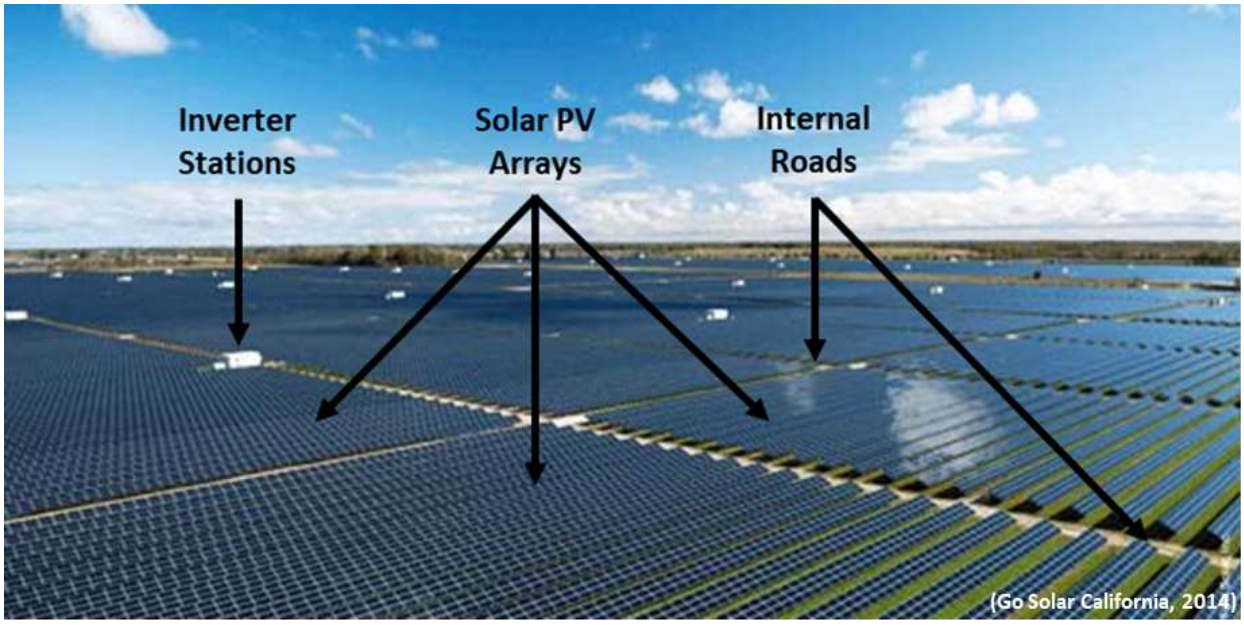

Figure 1: Typical Layout of a Solar PV Energy Facility

Rosenia PV will have a net generating capacity of 120 MW with an estimated maximum footprint of ± 242 ha. The approximate area that each component of Rosenia PV will occupy is summarised in Table 1 below.

Table 1: Component Areas and % of Total Project Area

SEF Component	Estimated Area	% of Total Area (± 240 ha)	% of Study Area (2667.04 ha)
PV array	± 218 ha	90.87 %	8.2 %
Permanent and construction laydown	Up to 4 ha	1.65 %	0.14 %
Auxiliary buildings	± 1 ha	0.40 %	0.04 %
Internal roads	± 8 ha	3.3 %	0.30 %
Substation	± 1 ha	0.40 %	0.04 %
Main Road	Approx. 4 ha	1.65 %	0.14%
BESS	Up to 4 ha	1.65%	0.14

2. LAYOUT DEVELOPMENT

It is customary to develop the final/ detailed construction layout of the Solar PV facility only once an Independent Power Producer (IPP) is awarded a successful bid under the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) or an alternative programme, after which major contracts are negotiated and final equipment suppliers identified. However, for the purpose of the Basic Assessment (BA), in accordance with the minimum requirements prescribed by the Department of Forestry Fisheries and Environmental Affairs (DFFE), two alternative layouts were identified. The following section elaborates on the layout options for Rosenia PV.

2.1 INITIAL ASSESSMENT AREA

The Farm 423 RE, situated within the Central Karoo District Municipality of the Western Cape Province, was identified for the development of the proposed Rosenia PV.

This was based on the favourable location characteristics which included: a competitive solar resource, located within the Beaufort West Renewable Energy Development Zones (REDZ); a viable grid connection; close proximity to towns with a need for socio-economic upliftment; land availability; land owner support; flat topography; no conflict to on-site and surrounding land use practices; easy accessibility; favourable wind and dust considerations; and distance from airports.

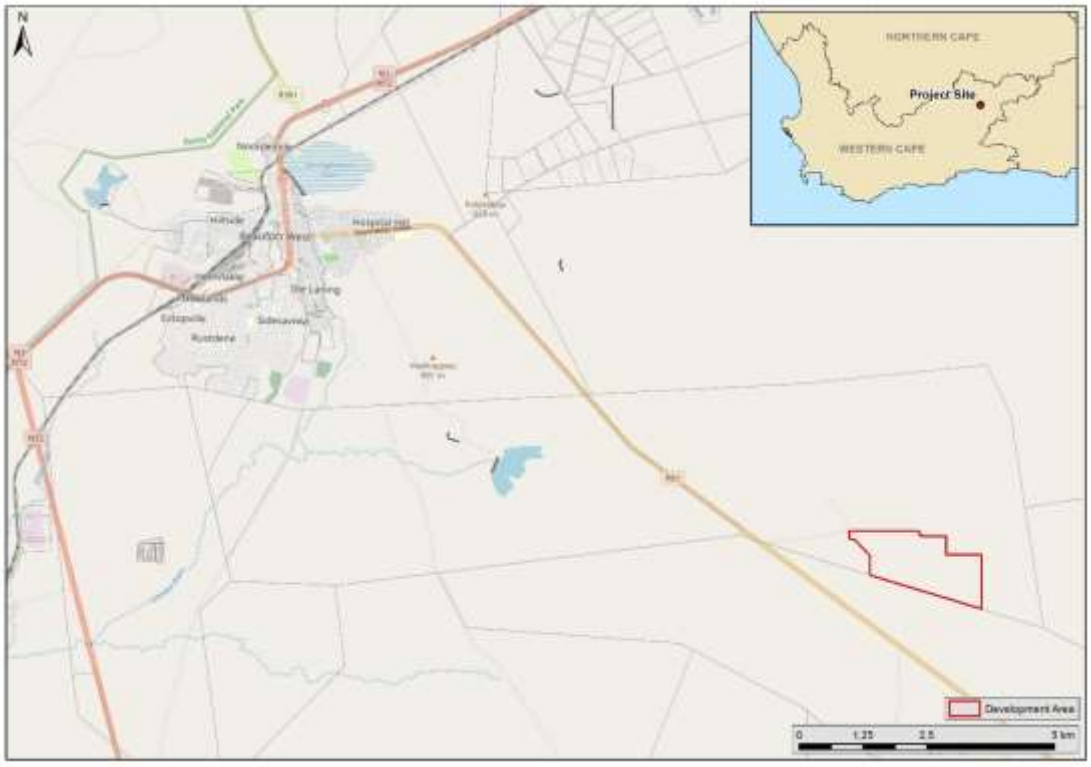

Figure 2: Locality of Rosenia PV within the Property

The initial study area consisted of the entire property being Farm 423 RE in extent 2667.0374[1] ha, which was identified for the development of solar PV during the planning phase of the project. The study area is illustrated in Figure 3 below.

[1] Please refer to Site Selection Matrix (March 2022) for details on the property selection process.

Figure 3: Initial/ Conceptual Study Area

The initial study area did not consider any environmental sensitive areas (to be identified by the various specialist studies). The study area was driven primarily by its proximity to the R61 access road as well as reduced overhead powerline (OHL) distance to connect into the Droerivier Main Transmission Substation (MTS), located ± 17.5 km to the west of Rosenia PV.

2.2 SITE SENSITIVITY SCREENING

Following the identification of the initial/ conceptual study area, various specialists (ecology, heritage (inclusive of archaeology), palaeontology, aquatic/ freshwater and avifauna) were appointed to assist in the site selection process. Each of the specialists mapped the sensitive areas of the initial/ conceptual study area following a site visit. The site sensitivities indicated that an area of approximately 1,570 ha on the eastern portion of the property was suitable for the development of solar PV, as illustrated in yellow in Figure 4 below, noted as the Bulskop PV Cluster Development Area. The preferred layout alternative for Rosenia PV identified during the planning and design phase, aimed to avoid all areas with a high sensitivity as indicated in Figure 4 below.

2.3 LAYOUT ALTERNATIVE 1 (PREFERRED)

Extensive upfront consultation with the various specialists mitigated many of the impacts associated with the planning and design phase. Therefore, the preferred layout alternative (Layout Alternative 1) within the initial/ conceptual area was the only layout alternative considered for Rosenia PV[2] as depicted in Figure 4 below. Layout Alternative 1 predominantly occupies only Medium sensitivity areas.

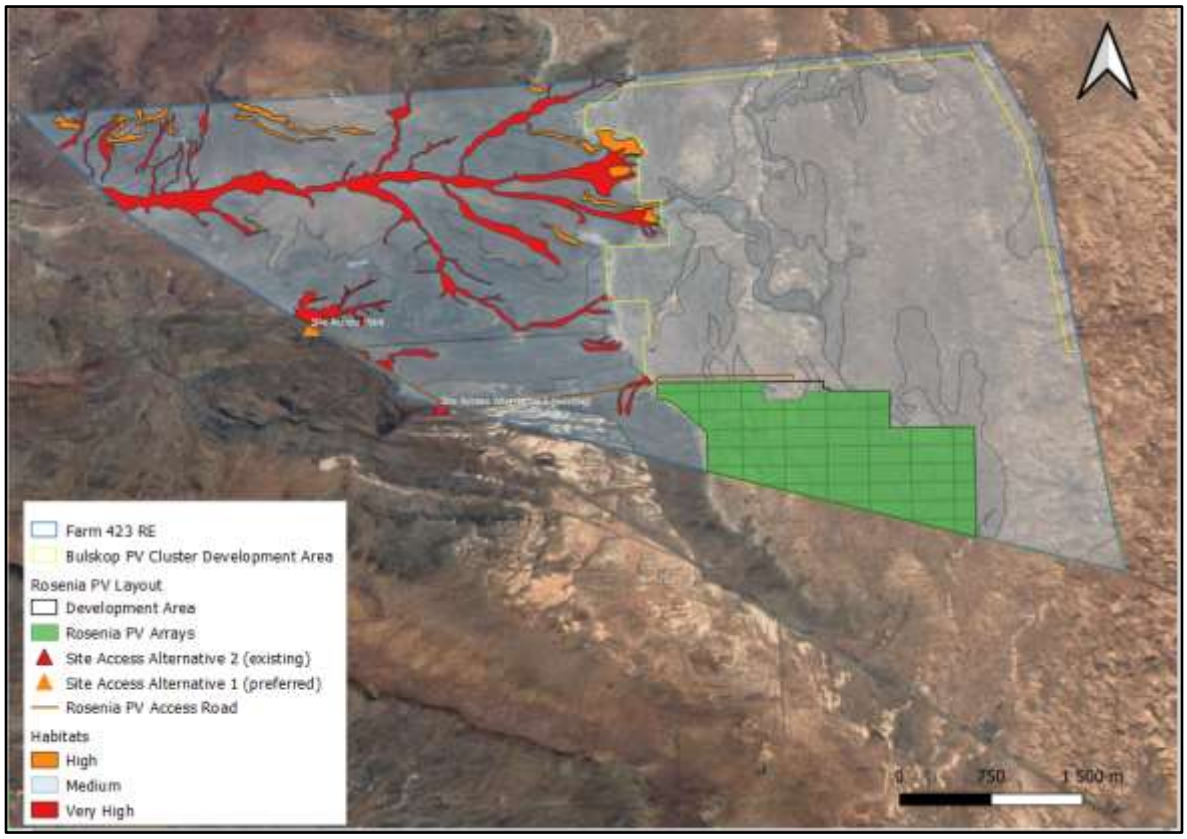

Figure 4: Bulskop PV Cluster Site Development Boundary & Rosenia PV Development Footprint and Site Sensitivity

3. OVERVIEW OF THE SOLAR ENERGY FACILITY

The following section presents an overview of the main components of Rosenia PV.

3.1 SOLAR ARRAY

Solar PV modules are connected in series to form a string. A number of strings are then wired in parallel to form an array of modules. PV modules are mounted on structures that are either fixed,

[2] As required by the NEMA EIA regulations, the preferred alternative (Layout Alternative 1) will be assessed against the "no-go"alternative.

north-facing at a defined angle, or mounted to a single or double axis tracker to optimise electricity yield.

3.2 MOUNTING STRUCTURES

Various options exist for mounting structure foundations, which include cast/ pre-cast concrete (shown in Figure 6), driven/ rammed piles (Figure 7), or ground/ earth screws mounting systems (Figure 8).

Figure 4: Cast Concrete Foundation

(Solar Power Plant Business, 2013)

Figure 5: Driven/ Rammed Steel Pile

(SolarPro, 2010)

Figure 6: Ground Screw

(PV MAGAZINE, 2014)

The impact on agricultural resources and production of these options are considered to be the same, however concrete is least preferred due the effort required at a decommissioning phase in order to remove the concrete from the soil, and therefore its impact on the environment. Rosenia PV will therefore aim to make the most use of pre drilling and backfilling of holes prior to either driven/ rammed piles, or ground/ earth screws mounting systems, and only in certain instances resort to concrete foundations should geotechnical studies necessitate this.

3.3 AUXILIARY BUILDINGS

The auxiliary buildings will comprise of the following as a minimum:

9. 33 kV switch room;
10. Control building/ centre;
11. Offices;
12. Warehouses;
13. Canteen & visitors centre;
14. Staff lockers & ablution; and
15. Gate-house and security.

The total area occupied is approximately 1 ha, excluding the facility switching station/ substation.

3.4 GRID CONNECTION AND CABLING

Rosenia PV intends to connect to the Droeriver MTS (400/132 kV) located ± 17.5 km to the west of Hardeveld PV, via the 132 kV Bulskop collector substation/ switching station located between Salsola PV, Hoodia PV, Bulskop PV and Rosenia PV facilities. The proposed Rosenia PV substation will be up to 1 ha (PV facility component) and feature a step-up transformer/s to transmit electricity via a 132 kV OHL between the Bulskop collector substation/ switching station and onto the

Droerivier MTS.

A grid connection corridor of approximately 300 m wide and 17.5 km long is being assessed (as part of a separate environmental process) to allow for the optimisation of the grid connection and associated infrastructure. The grid connection infrastructure will be developed within the 300 m wide grid connection corridor, which will allow for the avoidance of identified environmental sensitivities. The grid corridor will connect the 6 PV projects to the Droerivier MTS, via the Bulskop collector substation/ switching station.

3.5 BATTERY STORAGE

Renewable energy can currently achieve lower costs than fossil fuels. By incorporating energy storage technologies into renewable energy facilities, electricity can be stored during generation peaks and supplied during demand peaks.

Lower costs coupled with improved efficiencies, high energy density, lightweight design and low environmental risks, make non-liquid/ solid-state (e.g. Lithium battery technologies) the preferred alternative (refer to standalone Battery Storage Technical Development Report).

Rosenia PV BESS will cover a maximum area of approximately 4 ha.

3.6 ACCESS ROUTES AND INTERNAL ROADS

The proposed project site is accessible via the provincial R61 road which runs parallel to the site on the western boundary.

The preferred site access point will be the western access off the R61 as depicted in Figure 9 below. Access Road 1 (brown route in Figure 9) will be a maximum of 10m in width and will be a gravel surface. This route is considered to be the most technically and environmentally preferred access road as it largely follows the existing farm access roads and crosses relatively minor shallow drainage lines. The existing access point 2 in the image below was originally proposed as the preferred access point, however the engineers conducting the Traffic Impact Study advised against utilizing this access point due to potential line of site concerns resulting in safety issues on the R61.

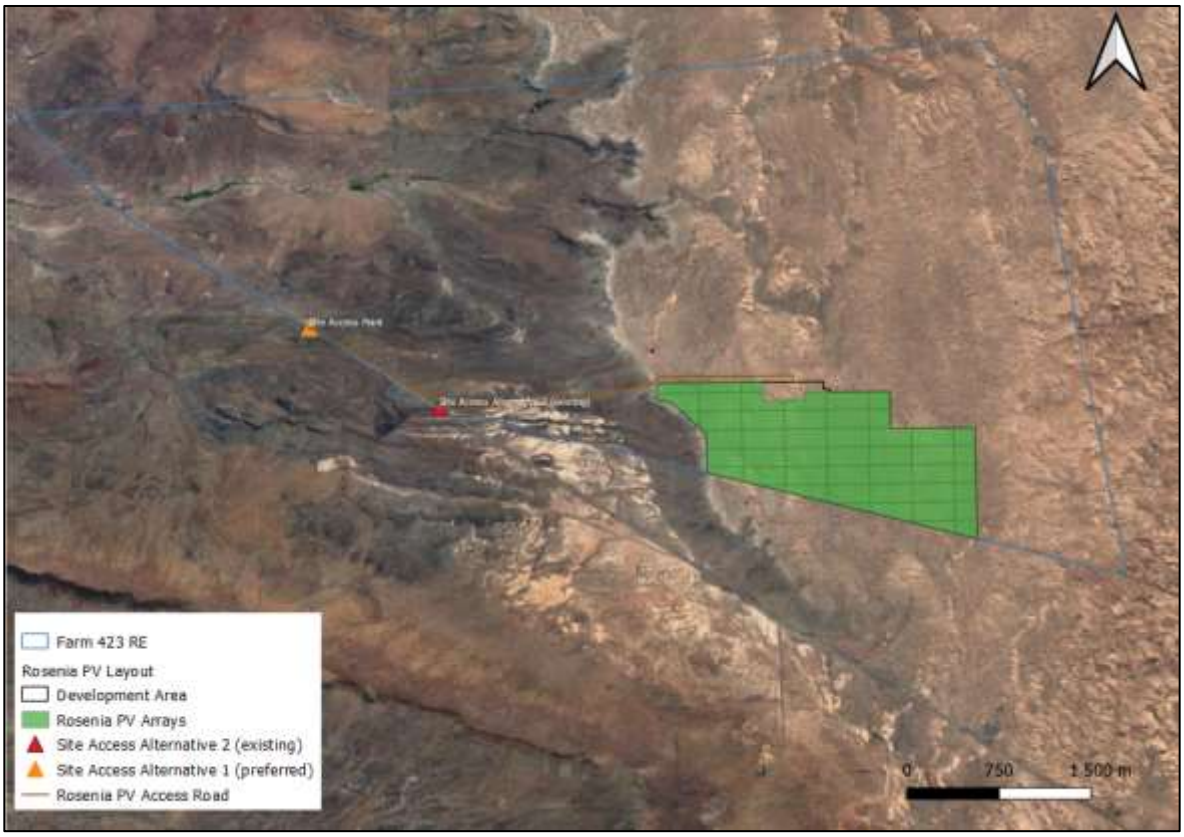

Figure 7: Access Routes to Rosenia PV

The internal road network of Rosenia PV will be gravelled roads, up to 8 m in width, around the solar array periphery as well as be east to west running gravel roads between the blocks used for maintenance and cleaning of solar PV panels.

A detailed transport and traffic study is currently being compiled for the project and will be assessed in the impacts tables of the BA Report. Precautionary measures will be taken to mitigate the risk of ground disturbances where access roads will be constructed. Special attention will be given to drainage, water flow and erosion by applying appropriate building methods.

3.7 SERVICES REQUIRED

3.7.1 Waste Management

3.7.1.1 Solid Waste

Solid waste during the construction phase will mainly be in the form of construction material, excavated substrate and domestic solid waste. All waste will be disposed of in scavenger proof bins and temporarily placed in a central location for removal by the contractor. Any other waste and excess material will be removed once construction is complete and disposed of at a registered waste facility. Excess excavation material will either be spoiled offsite at a registered facility or used for landscaping berms within the overall PV footprint.

3.7.1.2 Sewerage

During the construction phase, chemical ablution facilities will be utilised. These ablution facilities will be maintained, serviced and emptied by an appointed contractor, who will dispose of the effluent at a licensed facility off site. Once construction is complete, the chemical ablution facilities will be removed from the study area. A conservancy tank which will be regularly emptied by a registered service provider will be installed at the Operations & Maintenance building and on-site/ facility substation and the BESS control room.

3.7.1.3 Hazardous substances

During the construction phase, use of the following hazardous substances is anticipated:

16. Cement associated with piling activities and construction of buildings and inverter station plinths;
17. Petrol/ diesel for construction plant; and
18. Limited amounts of lubricants and transformer oils.

Temporary storage and disposal of hazardous waste will be done in compliance with relevant legislation (i.e. stored in covered containers with appropriate bunding). Refuelling areas to be in designated positions, with suitable mitigation to reduce the risk of hydrocarbon spills.

3.7.1.4 Water Supply

Water required during the construction and operation phases will be sourced from (in order of priority):

1. The Local Municipality (LM) - Specific arrangements will be agreed with the Beaufort West Local Municipality in a Service Level Agreement (SLA). Most likely the water will be either trucked in, or otherwise made available for collection at their Water Treatment Plant via a metered standpipe.
2. Investigation into a third-party water supplier which may include a private services company.
3. The investigation of drilling a borehole on site, which includes complete geohydrological testing, groundwater census and a Water Use License Application (WULA) in terms of section 21a of the National Water Act, 1998.

4. CONCLUSION

Layout Alternative 1 (Preferred) has been developed based on key criteria identified above, including inter alia, accessibility, assessment of alternatives, proximity to the Droerivier MTS, as well as consideration of sensitive areas to minimise ecological and other impacts.

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