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## Abbreviations and Acronyms

- **CPV**  Concentrated Photovoltaic
- **DEA**  National Department of Environmental Affairs
- **EIA**  Environmental Impact Assessment
- **IPP**  Independent Power Producer
- **PV**  Photovoltaic
- **SANRAL**  South African National Roads Agency Limited
1 Introduction
RE Capital 11 (Pty) Ltd. as an Independent Power Producer (IPP), is proposing the establishment of a commercial solar energy facility on a site within the Northern Cape to be known as RE Capital 11 (Pty) Ltd. The project is planned to be located on the Remainder of Farm 454, Dyason’s Klip with a planned installed electrical capacity of 75 MW_p.

The proposed facility has a planned peak capacity of be 75 MW_p with an estimated footprint between 200 and 240ha. The initial study area of 510ha is included within for the environmental specialists. The footprint in the EIA is larger than what is physically required for the proposed development, so as to ensure ample development space are available after potential environmental sensitive areas are excluded, as a function of specialist studies and recommendations. The estimated portion of land each component of the facility will typically occupy is summarised in the table below (with the average area per phase taken as 200ha):

<table>
<thead>
<tr>
<th>Component</th>
<th>Estimated extent of each 75 MW plant</th>
<th>Percentage of selected area (+ 200 ha)</th>
<th>Percentage of whole farm (±5725 ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV modules</td>
<td>180 ha (1.8 km^2)</td>
<td>90%</td>
<td>3%</td>
</tr>
<tr>
<td>Internal roads</td>
<td>18 ha (0.18 km^2)</td>
<td>9%</td>
<td>0.31%</td>
</tr>
<tr>
<td>Auxiliary buildings</td>
<td>2 ha (0.02 km^2)</td>
<td>1%</td>
<td>less than 0.1%</td>
</tr>
</tbody>
</table>

The proposed infrastructure that is planned to be constructed includes CPV modules, or a series of solar PV arrays, inverters, internal electrical reticulation, and an internal road network. It will also be necessary to construct an onsite substation which would typically include a transformer to allow the generated power to be connected to Eskom’s electricity grid. Auxiliary buildings, including ablution, workshops, storage areas and fencing are planned to be erected. A distribution line will also be required to distribute the generated electricity from the site to the Eskom substation and grid.

![Figure 1: A typical layout of a solar PV plant](image)

Determining the optimal layout is a costly process which would normally take place once an IPP tender has been awarded to the bidder. For the purpose of the environmental impact assessment, a typical layout will be discussed, alternatives will be investigated and a preliminary high level layout will be drafted.
The final layout design that will be done after bidding will take into account the site constraints identified and recommendations made by the various EIA specialists. With the actual construction, the final plant layout will stay the same in terms of footprint and size, but the exact location of the different components may change within the 510 ha Preliminary Study Site boundary.

2 Scoping Layout

As part of this scoping report different locations for the proposed facility were investigated. For the purpose of referring to RE Capital 3 solar projects (a similar PV solar facility previously developed, and awaiting DEA ROD approval, on the same Remainder of Farm 454, Dyason’s Klip) the figure below illustrates the location of RE Capital 3 solar projects. With regard to RE Capital 11 site location as well as the planning of access roads and power lines for grid connection RE Capital 3 projects have been taken into consideration.

![RE Capital 3 solar projects](image)

**Figure 2: RE Capital 3 solar projects**

2.1 Preliminary Study Site

A preliminary study site of 510 ha was identified as part of study area for the scoping phase of the RE Capital 11 (Pty) Ltd. project. The 510 ha area was identified because of its level surface, road access alternatives, and distance to the new authorised Eskom Upington MTS. The low concentration of nutrients in the soil also means that vegetation is not very dense or high, eliminating the chances of casting shadows on the solar arrays. In addition the land is considered to have a low agriculture potential, with limited carrying capacity. The usage of this low agricultural potential land is believed to have little effect on food security and production thereof.

The identified 510 ha study area has been selected will be referred to as Preliminary Study Site. Please refer to the engineering report of this scoping phase (Solek REC 11, August 2014) for more details regarding the site layout and corresponding expected infrastructure.
These components include frames, solar modules, roads, workshop and admin office area, laydown area, and an onsite substation.

Figure 3: Initial Scoping area (Preliminary Study Site)

2.2 Possible Sensitive Areas
As part of the Environmental Impact assessment phase the ecological study and sensitive areas will be included and mapped in order to evaluate layout alternatives and preferred site layout.

As a first layout option, the possible sensitive areas were added to the original 510ha preliminary study site. These possible drainage lines and sensitive areas will be assessed and confirmed by the specialist studies, especially ecological study.

In the Preliminary Study Site it is proposed to build across the drainage lines in order to keep the solar design as rectangular as possible. The solar frames can be installed using a ramming method which would have the minimum impact on the environment. As far as practically possible the ramming poles would be driven as far as possible from all drainage lines and sensitive areas to take the ecological constraints into account. The preferred site layout is further expected to be altered, so as to reduce the environmental impact of the solar facility on the area, according to the specialist reports and depicted sensitive areas within the impact assessment phase.

The figure below indicates possible sensitive areas, relating to seasonal washers, within the Preliminary Study Site.
2.3 Layout Alternatives
As part of this scoping phase numerous layouts and technologies were taken into consideration before the proposed site area was decided upon. The major points which lead to the proposed site were:

- Area of approximately 240 ha, to ensure the project would be economically viable, allowing for exclusions of environmental sensitive areas;
- Minimal disturbance to water washers and highly sensitive areas;
- Road access to the site with regard to distance and minimal disturbance to sensitive areas;
- Grid connection taking into consideration minimal distance, minimal disturbance to sensitive areas as well as possible other REIPPP Round 4 projects.

The factor having the single biggest influence on the crossing of washers and sensitive areas are the mounting technology. The preferred technology should allow arrays to be constructed over the wash lines and high sensitivity areas while having a minimal effect on the vegetation, mitigating the chances of erosion. Should the specialist findings report however that a building restriction towards the washers or sensitive areas be imposed, the layout will be amended accordingly.

2.3.1 Proposed Site
In order to avoid possible high sensitive areas a proposed site layout has been selected and excludes the possible main drainage line. Based on specialist studies especially the ecological study, the sensitive areas will be evaluated and confirmed in order to finalise alternative plant layouts within the proposed site.
As mentioned above, the solar arrays will be placed in such a way that would have the least influence on the drainage lines while avoiding the ecological sensitive areas where practically possible. Although the annual rainfall within this region is extremely low, the drainage lines were carefully considered and the most viable alternative selected.

Because of the relatively dry climate and low rainfall, natural vegetation tends to be denser within the drainage washers, thus the layout which has the smallest impact on the washers would generally also have the smallest impact on the vegetation.

2.4 Facility layout and components

Please refer to the Engineering report for a detailed list of components and a corresponding explanation in more detail in the Engineering Report. A more detailed Engineering Report with elaborated components and layouts will be incorporated within the Environmental Impact assessment phase.

Components include solar modules, roads, workshop and admin office area, laydown area and an onsite substation. The exact position of these components will be determined with the final plant design after preferred bidder status.

The infrastructure of the Proposed Site layout is expected to have a footprint of approximately 200 ha and is aimed at having the lowest possible environmental impact while maintaining the economic viability of the project.

2.4.1 General Explanation of the Layout:

A general explanation of the components of the layout will be discussed below. For a more detailed overview, refer to the Scoping Engineering Report.
2.4.1.1 Solar Panel Area
The solar arrays are put together with strings of solar modules connected in series, which can be mounted onto single or double axis tracking systems. These frames are typically installed with the single tracking axis in an east-west direction to maximise the system’s output. The standardised length of a solar array would typically be between 50 m and 200 m long. Where a tracker system is used, each of the modules is controlled individually and standardised systems are preferred for economic and practical reasons.

The solar modules will be placed in such a way that it would have the least influence on the washers and avoiding the ecological boundaries set where practically possible.

2.4.1.2 Mounting of the Modules
As discussed in the Engineering Report, the foundation of mountings can either be laid in a small concrete block, driven piers, or a deep seated screw mounting system. The impact on agricultural resources and production of these alternatives are considered equal, although the concrete option will require greater inputs during decommissioning in order to remove the concrete from the soil. As far as practically feasible the poles would be driven in as far as possible from all washes, and taking the ecological constraints into account.

The physical process of ramming the anchors into the ground is done using specific equipment (typically on tracks). In the case where earth screws or rock anchors would be more suitable, the rammed pole would be replaced by one of the former. The figure below shows equipment being used in the ramming process. Some of the ground covering in the medium sensitivity area will be cleared to do the frame installation accurately. Although the site is very flat, some minor excavation may be necessary in certain medium sensitivity areas.

In the areas of high sensitivity, vegetation would be left in place to avoid the risk of erosion. In the unlikely case where brush or trees are high enough to cast shadows they would be trimmed to size.
2.4.1.3 Grid Connection and Cabling
The electrical feeding line (or two lines, depending on the line capacity) is proposed to be constructed to connect the proposed RE Capital 11 project site to the new authorised Eskom Upington MTS. Different grid connection alternative is investigated to reach the MTS substation. The electrical power line/s is planned to run along farm border fences so as to minimise the effect on the environment and practicalities of utilising the farm as far as possible.

A 75 MW installation will have various electrical components to meet the national grid code requirements in order to supply generated electricity onto the national grid. The installed infrastructure will ensure the correct conversion of produced power from the generated panel Direct Current (DC) to Alternate Current (AC), this conversion from DC to AC is done by means of inverter stations. A single inverter station is connected to a series of arrays and would be placed along the service roads to give quick and easy access.

A number of inverter stations will be installed, of which each of these inverter stations are connected to the on-site substation from where a power line is constructed. The power line is constructed from the substation to the point of supply either directly to the MTS substation or onto an existing power line (loop-in/loop-out).

The final placement of the inverter stations and on-site substation would take the ground conditions into consideration, meaning that suitable areas with a minimal impact on the environment would be preferred. Interconnecting cables may be trenched where practically possible. However, in areas of high sensitivity cables would be mounted to the structure to avoid excessive excavation works and clearing of vegetation, should this be required. The inverter stations would typically be built into a transportable container and will have an onsite footprint of 56 m² (14m x 4m). The on-site substation is expected to have a footprint of approximately 400 m² (20m x 20m).

2.4.1.4 Auxiliary Building Area
The main storage, workshop, ablution, and administration facilities are placed in an area where there will be easy access. The final storage and administration areas would also be selected to minimise their impact on the environment by considering the ground conditions and the ecology of the surrounding areas. Since this area may host more human activity than most other parts of the solar facility, it is important to take the surrounding habitat into consideration. The structure erected should not be more than 2000 square meters in area and is referred to as the Storage and Admin facility. Water to the facilities will be supplied by ten 10 kl water tanks. These tanks will also be used as redundant water for operation of the plant.

2.4.1.5 Construction of Roads
In the case where access roads cross the washes or where they are in the close vicinity of the washes special care and precautionary measures must be taken to mitigate the risk of erosion due to ground disturbances. By incorporating precast concrete infrastructure into the construction of these roads the risk of the roads acting as water channels could be avoided. Special attention to drainage, water flow and erosion will be given and potential risks will be mitigated by applying appropriate building methods.
3 Access Routes

As part of this scoping phase five access road alternatives were investigated. Previous REIPPPP round 4 projects and access roads on the same farm land area as well as no objection from SANRAL regarding the access from the N14 at the current Dyason’s Klip farm entrance has been taken into consideration during the planning phase. As per new SANRAL regulations a Transport Traffic Plan to be included in the EIR documentation in order to transport solar panels to the specific solar plant. The Transport plan will be included in the draft Engineering Report of the Environmental Impact Assessment phase.

3.1 Entrance options

Three entrance options to the project site are investigated. Figure 8 depicts the various entrance routes and entrance options towards the proposed RE Capital 11 (Pty) Ltd. site.

The first entrance (1) being directly from the N14 from the existing entrance of the Remainder of Farm 454, Dyason’s Klip. The second possible entrance (2) being the existing Abengoa entrance (Khi Solar One development) and access road from the N14. The third possible (3) entrance being the entrance to Dyason’s Klip farm from the district road (D3276) on the North of the Dyason’s Klip farm.

Solek had previous engagements with “South African National Road Agency” (SANRAL) regarding entrance from the N14 for RE Capital 3 developments on the Remainder of Farm 454, Dyason’s Klip. SANRAL agreed that the existing farm entrance or the existing Abengoa entrance may be used.

3.2 Previous completed EIA layouts

Three similar Solar PV sites have been developed on the Remainder of Farm 454, Dyason’s Klip. These developments are awaiting its final “Record of Decision” (ROD) from the Department of Environmental Affairs.

The development of RE Capital 3 solar projects and the corresponding layout is discussed within the Scoping Layout section of this report and depicted in Figure 2. During the planning of RE Capital 11 site location, its corresponding access roads and power lines for grid connection the RE Capital 3 projects have been taken into consideration.

3.3 Access to the Site

In the scoping phase, five access roads were investigated. These alternative roads are illustrated in Figure 8 and described in more detail within this section.

3.4 Route alternatives

Five different route alternatives are included within the considered access routes of this scoping report. Each of these five access routes utilises one of the discussed entrance options. Figure 8 depicts the alternative access routes towards the project site.

3.4.1 Alternatives 1 and 2

Access road alternatives 1 and 2 utilise the same planned and assessed access roads than that of the Round 4 REIPPPP proposed projects (formerly known as RE Capital 3 (Pty) Ltd project). The RE Capital 3 (Pty) Ltd. access road was planned to follow the existing farm road as far as possible in order to minimize the environmental impact.
From the point where the Round 4 project assessed access roads end (Southern border of RE Capital 3 (Pty) Ltd project site), the two alternative access roads is directed either to the eastern boundary of RE Capital 3 or the western boundary of RE Capital 3.

Route alternative 1 pass RE Capital 3 development towards the western boundary of RE Capital 3 and pass through the 50 meter separation corridor of RE Capital 3B and RE Capital 3C solar farm development.

Route alternative 2 pass RE Capital 3 development towards the eastern boundary of RE Capital 3 and pass through the 50 meter separation distance between the RE Capital 3 eastern border and the farm border.

3.4.2 Alternatives 3 and 4

Access road alternatives 3 and 4 is planned to utilise the existing Abengoa entrance and access road on the neighbouring farm (eastern side of Dyason’s Klip) which was constructed for the Abengoa Khi Solar One project. This neighbouring access road runs through Rooi Punt, Tungsten Lodge entering through the McTaggarts Camp entrance from the N14 at Point 2 depicted within Figure 8.

Access road alternative 3 and access road alternative 4 differs from each other in the way by which they cross over to the Dyason’s Klip farm property.

Alternative 3 utilises the Abengoa road upto the southern border of the Abengoa development from where the proposed Alternative 3 route traverse to the west across Rooipunt and onto the Dyason’s Klip property from where it joins Route alternative 2 (between the Eastern border of RE Capital 3 development and the farm boundary).

Alternative 4 utilises the same access route and existing Abengoa road as Alternative 3, but extends this usage further north to the North-western corner of the existing Abengoa development. The proposed alternative 4 crosses the Abengoa border, the Rooipunt farm onto Dyason’s Klip in this area due to the fact that less environmental impact is expected on crossing of washers.

There is a possibility however that the existing Abengoa access route and traversing of their land could not be used due to servitude negotiations and the financers of the REIPPPP projects requirement that projects are ring-fenced. This option is however added to the scoping report due to the possibility of utilising this option.

3.4.3 Alternative 5

The 5th alternative access road runs in a northern direction on the Eastern boundary of Dyason’s Klip up to the district road D3276 north of the farm Dyason’s Klip 454. This point is indicated by Point 3 on Figure 8.
As part of the Environmental Impact assessment the access road alternatives will be further discussions with the “South African National Road Agency” (SANRAL). SANRAL is governed by various laws by which all national roads should be managed.

With regard to access from the N14, SANRAL agreed to provide consent for using both of the existing access entrances (Point 1 and 2) based on REIPPP Round 4 proposed projects namely RE Capital 3 (Pty) Ltd. These two existing entrances are both from the N14 North to either the project site or via the existing entrance of the adjacent property (Abengoa Khi Solar One).

The proposed entrance at Point 2 is planned to utilise the existing road of Abengoa Khi Solar One project “Access Road alternative 3”, hence reducing additional environmental impacts (additionally to the initial considered options).

With regard to road access alternative 5 entering the farm and project site from the district road D3276 at north east corner of Dyason’s Klip farm boundary, an application and approval process with SANRAL to be completed.

4  Grid Connection and Power Line Routes
In the Scoping Phase six power line route alternatives were investigated, including the loop-in loop – out route option. Because of possible complications with neighbouring projects, it was decided to include alternative option 3 to the South boundary of Tungsten Lodge.

4.1 Loop in Loop out Alternative
The option to loop into the existing 132 kV line is investigated as one of the primary connection alternatives. This option is indicated as “REC 11 PV PLine Loop in Loop out 01” in Figure 9 below.
The other alternative routes will all lead from the individual on-site substations to the authorised Eskom Upington MTS. The ESKOM MTS substation EIR was authorised on the 14th of February 2014 by the Department of Environmental Affairs.

4.2 **Self-build Alternative 1**
The power line alternative options 1 as illustrated in Figure 9 runs along the eastern Dyason’s Klip boundary crossing the neighbouring Rooipunt portion and the Tungsten Lodge property at the northern boundary of Tungsten Lodge farm, but on the Tungsten Lodge property. After crossing the Tungsten Lodge farm, the line runs south along the western boundary of Eskom property towards the new authorised Eskom Upington MTS.

4.3 **Self-build Alternative 2**
The power line alternative options 2 as illustrated in the figure below runs along the eastern Dyason’s Klip boundary up to the existing 132kV power line crossing the neighbouring Rooipunt portion and runs parallel the existing 132kV power line towards the authorised Eskom Upington MTS location.

4.4 **Self-build Alternative 3**
The power line alternative options 3 as illustrated in the figure below follows the same route as alternative 2 and the crosses neighbouring Rooipunt portion and the Tungsten Lodge property at the southern boundary of Tungsten Lodge farm towards the authorised Eskom Upington MTS location.

4.5 **Self-build Alternative 4**
The power line alternative options 4 as illustrated in the figure below follows the same route as alternative 1, but crossing the neighbouring Rooipunt portion and the McTaggarts Camp property at the southern boundary of McTaggarts Camp. The line is located on the property of Mc Taggarts camp when traversing the property. After crossing the Mc Taggarts Camp property the line runs south towards the authorised Eskom Upington MTS location.

4.6 **Self-build Alternative 5**
The power line alternative options 5, as illustrated in the figure below, crossing Rooipunt farm southern boundary, the line is located on the Rooipunt farm itself, where after the line runs south along the western boundary of Eskom property towards the new authorised Eskom Upington MTS.

4.7 **Grid connection discussion**
The loop-in option will be most cost effective, but this is dependent on the capacity on the line. Options 1 and 2 are the next two preferred options, being the shortest distance to the substation and parallel to the existing 132 kV line. However, the feasibility of most of these options will depend on the neighbouring project’s servitude consent. That is also the reason for the large number of alternative options. Negotiations are in progress for all the servitudes.

The routes were all chosen along existing fences or power lines, in order to minimise the additional environmental impact. The environmental impact of these alternatives should all be more or less the same.
The summarised grid connection alternatives and their distances from the onsite substation to the new authorised Eskom Upington MTS or existing 132kV line is illustrated in Table 2.

Table 2 Grid connection alternative distances

<table>
<thead>
<tr>
<th>Alternative grid connection</th>
<th>Distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC 11 PV PLine Loop in Loop out 01</td>
<td>5.1 km</td>
</tr>
<tr>
<td>REC 11 PV PLine Selfbuild 01</td>
<td>9.5 km</td>
</tr>
<tr>
<td>REC 11 PV PLine Selfbuild 02</td>
<td>10.5 km</td>
</tr>
<tr>
<td>REC 11 PV PLine Selfbuild 03</td>
<td>11.7 km</td>
</tr>
<tr>
<td>REC 11 PV PLine Selfbuild 04</td>
<td>9 km</td>
</tr>
<tr>
<td>REC 11 PV PLine Selfbuild 05</td>
<td>20km</td>
</tr>
</tbody>
</table>

5 Other Projects in the Area

When considering South Africa’s irradiation distribution, the Northern Cape Province, and Upington in particular, is known to be one of the most preferred areas for the generation of solar energy in South Africa and even in the world. This can be ascribed to the advantageous sun radiation specifications and the flat planes which are not intensively used except for grazing. The global irradiation in the specific area is between 2400 and 2600 kWh/m$^2$.

The DEA is in the process of identifying Renewable Energy Development zones (REDz) across South Africa, which is typically best, suited for renewable energy generation. Upington and its surrounding area is one of the areas identified to be a Renewable Energy Development Zone.
Other solar projects that are already being developed or proposed in close vicinity to the Dyason’s Klip project (RE Capital 11 (Pty) Ltd) are illustrated in the figure below. Some of these projects have already been awarded preferred bidder status in the previous REIPPPP rounds, while others are still in the planning phase.

![Other Solar Projects in the Area](image)

**Figure 10: Other Solar Projects in the Area**

### 6 Conclusion

The Proposed site within the Preliminary Study site has been selected based on its level surface, road access alternatives, and distance to the new authorised Eskom Upington MTS as well as possible sensitive areas to minimize ecological and environmental impact and optimise project viability.

Specialists have been appointed to perform studies in the required areas of expertise that will be included in the Environmental Impact Assessment phase and reports.

Feedback and confirmation regarding sensitive areas from the ecological specialist study on the Proposed Site to be done. The sensitive areas will be taken into consideration as part of the site layouts and proposed plant layout.

The multiple power line alternatives as well as access route alternatives are all proposed to be constructed along existing fences, routes or power lines. It is suggested that they should all have more or less the same environmental impact. The ecologist can comment further on this. Because of the fact that all the power line and access route alternatives are depended on third party approvals, it is requested that all of them are authorised from an environmental side.