RE Capital 3

December 3

2013

Engineering overview and summary pertaining to environmental aspects of the RE Capital 3 Solar Development. Compiled by Solek (Renewable Energy Engineers)

EIA Engineering Report

Contents

List of Figures

Abbreviations and Acronyms

- DEA National Department of Environmental Affairs
- DAFF Department of Agriculture, Forestry & Fisheries
- DWA Department of Water Affairs
- EA Environmental Authorisation
- EAP Environmental Assessment Practitioner
- EIA Environmental Impact Assessment
- EMP Environmental Management Plan
- IPP Independent Power Producer
- IPPPP Independent Power Producer Procurement Programme
- PPA Power Purchase Agreement
- NEMA National Environmental Management Act
- NERSA National Energy Regulator of South Africa
- PV Photovoltaic
- SID Strategically Important Development
- SANRAL South African National Roads Agency Limited
- UNFCCC United Nations Framework Convention on Climate Change

1 Introduction

RE Capital 3 (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 3 Solar Development, of size 225 MW. The project will consist of and be developed in three phases, consisting of 75 MW each. The Northern Cape is generally known to be one of the best preferred areas for the generation of solar energy in South Africa and even in the world because of abundant solar radiation. The purpose of this facility is to generate electricity from a renewable energy source (i.e. solar radiation) to provide power to the national electricity grid. The proposed development site is located within the Khai Garib Municipality district approximately 25 km west of Upington.

The purpose of this engineering report is to describe the various sections of the facility and provide a transparent view on facility operation and the possible effects on the environment. Solek, a renewable energy engineering company, is primarily responsible for the compilation of this section of the report – a complete company profile is attached in the appendix for the reader's convenience.

The report gives background on the energy market in South Africa and the opportunity for solar energy in the Northern Cape. The overall project and proposed facility is also described in more detail by investigating:

- The basic understanding of solar PV plants
- The description of the proposed solar facility
- The different steps in the construction phase of the proposed facility
- The project operation and maintenance phase
- Financial implications and financial overview (cost implications)
- Planned project timelines
- Overall conclusion

1.1 Background of the energy market in South Africa

The development of renewable energy in South Africa is gaining momentum at a significant pace due to the incentives allocated towards approved projects by the South African government. Eskom's shortfall in energy resulted in the development and construction of Medupi and Kusile coal power stations. The development of these power stations relied heavily on World Bank financial assistance. The loan requirements forced South Africa into developing a renewable energy programme, hence establishing the IPP procurement programme.

According to the Integrated Resource Plan 2010 (IRP 2010-2030), South Africa will require 42 500 MW of additional energy over the following 20 years in order to meet the requirements created by the growing economy.

The Renewable Energy Independent Power Producer Programme has made 3725 MW of power available to be generated as part of a first phase initiative, after which a number of phases would follow. The first two bidding windows have taken up 2459.4 MW of this target. Another round of projects has been awarded in round 3. The Department of Energy (DoE) has set a number of dates for the submission of bid documents for private companies to apply for a licence to generate electricity. The bidding deadlines for the first three stages were as follow:

- 1st Bid Submission: 4 November 2011
- 2nd Bid Submission: 5 March 2012
- 3rd Bid Submission: 19 August 2013

1.2 Opportunity for solar energy in the Northern Cape

When considering South Africa's irradiation distribution, the Northern Cape Province 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 vast flat planes that the province has to offer which are not intensively used except for grazing. The global irradiation in the specific area is between 2400 and 2600 kWh/m^2. Furthermore, specific parts of the Northern Cape can be used for the generation of power without compromising on food security due to the area's low food produce capacity per hectare of usable land. Below is a map which gives an overview of this potential.

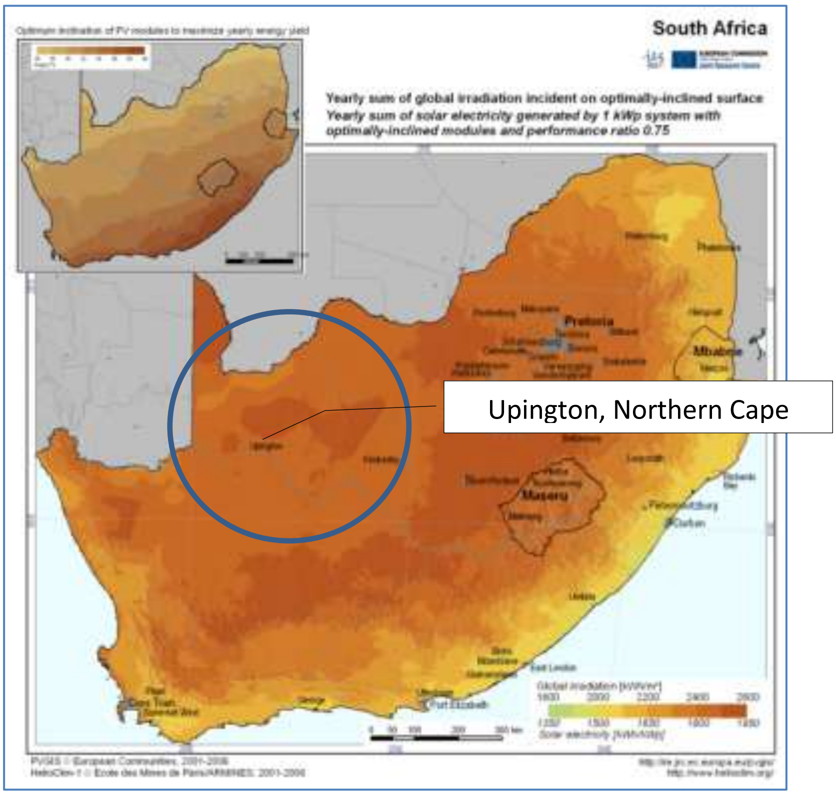

Figure 1: South African solar irradiation distribution

The benefits that the production of energy from the sun holds within the broader South African context outweigh most potential negative impacts the development may have on the bio-physical environment of the property. The contribution and agricultural value of the specific farm should be compared to the impact the national energy crisis could have. This crisis effects job creation, skills development and economic growth potential of the renewable industry.

On the economic front, the proposed project has the potential of making a significantly positive contribution to the local economy. The Northern Cape was well-known for the large number of copper and zinc mines in the area, but since the early 1990s, many of these mines have closed down, leaving a devastating trail of unemployment behind. The local economy, mainly supported by farming, is simply not enough to accommodate the high level of unemployment. In addition, social problems imposed by poverty create a problem in the surrounding area. The proposed development has the opportunity to create a significant amount of career opportunities over its entire lifespan of 20-30 years.

1.3 Overview of the proposed project

The applicant is proposing the establishment of a commercial solar energy facility, known as the RE Capital 3 Solar Development and will be operated under the licence of a company bearing the same name, RE Capital 3 (Pty) Ltd. The proposed development site is located on the Remainder of Farm 454, Dyason's Klip, which is situated within the jurisdiction of the Khai Garib local Municipality in the Northern Cape Province. The purpose of the facility is to assist the government in providing much needed electricity by generating energy from a renewable energy source – the sun.

The proposed facility is planned and designed for the generation of approximately 225 MW. The project will consist of and be developed in three phases, consisting each of 75 MW, which will be fed into the national electricity grid. The proposed development site covers an area of approximately 750 hectares. The identified 750 ha for the development site is located on a section of the total farm (5725.2828 ha). The area is located 5-10 km from the planned new Eskom MTS Substation. The EIA for the new MTS are done independently by Eskom. The exact location of the MTS is still to be made known to the public.

2 Solar energy as a power generation technology

2.1 Basic understanding of solar PV plants

Photovoltaic (PV) panels convert the energy delivered by the sun to direct current (DC) electric energy. The array of panels is connected to an inverter by means of a network of cables. The DC power is inverted to alternating current (AC) power by a grid-tied inverter. The AC power can then be added to the national electricity network (grid). The voltage at which power is generated is stepped up to the required voltage and frequency of the national grid by using a transformer. The electricity is distributed from the on-site transformers via distribution lines to the nearest Eskom substation. From the Eskom substation the electricity is fed into the Eskom grid.

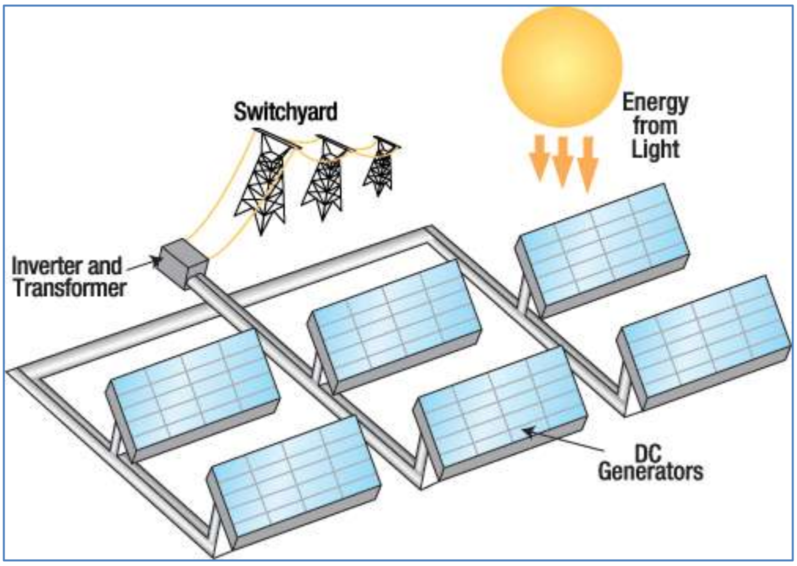

Figure 2: Typical solar PV plant diagram

The infrastructure of the facility includes the ground-mounted panels, cables, access roads, auxiliary roads, an on-site substation, and a distribution line. The primary input of the system is sunlight, which is converted to electricity. The facility also utilises auxiliary electricity from the Eskom grid to power tracker motors in order to optimise the amount of sunlight on the solar PV infrastructure.

Installing either a fixed or dual tracking PV system (CPV modules or arrays of PV panels) is proposed. In a fixed system, the PV module stay in one position, and do not follow the path of the sun. A tracking system is ground-mounted and follows the sun's path with the use of typically single or dual-axis technology in order to maximise the amount of direct sunlight on the Solar PV modules. By following the sun, the tracked array rises quickly to full power and stays there on a clear sunny day, while the fixed array only maintains maximum power for a few hours in the middle of the day.

2.2 Project-related benefits

The single largest benefit of the generation of solar energy is the fact that the electricity is generated by means of a renewable source, the sun. This means that the project is sustainable and environmentally friendly. In essence the energy source cannot become depleted as in the case with fossil fuels (i.e. coal or oil). This type of energy production does not pollute the environment – it is renewable, reliable and does not consume anything close to the amount of natural resources as compared to conventional power generation (e.g. coal power plants). Its long-term environmental benefits are perhaps the most notable of any electricity source. These benefits hold much promise for reducing environmental impacts from electricity production of coal power plants – which is the most common technology used in South Africa.

The production of 225 MW alternative energy is a welcomed supplement to South Africa's electricity supply and aligns with the government's targets of reducing reliance on fossil fuel based electricity. The renewable energy projects are treated as "Strategically Important Developments" (SID's) under the IPP Procurement Programmes, since these projects have the potential to make a significant contribution to the national and local economy.

Not only will the project contribute to the existing electricity grid of Eskom in the area, but also in achieving the 40% share of new power generation being derived from IPP's nationally.

Long-term benefits, particularly related to the local community and society, can be realised through the project, mainly in terms of much needed employment and skills development. Such a project is a very good stimulus for the local and national economy, positively contributing especially to the surrounding community. In addition, the general requirements provided for by government stipulate strong local procurements and local investments into the surrounding communities.

3 Description of the proposed solar facility

The proposed facility will be constructed in three phases, consisting of 75 MW each. Each phase will occupy between 165 and 250 ha (roughly estimated). The area included in the EIA is bigger than what is physically needed for development, but this is to ensure environmental sensitive areas can be avoided. For each phase, 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 1: Component size and percentage for each phase

Component	Estimated extent of each 75 MW plant	Percentage of selected area (+ 200 ha)	Percentage of whole farm (±5725 ha)
PV modules	180 ha (1.8 km^2)	90%	3%
Internal roads	18 ha (0.18 km^2)	9%	0.3%
Auxiliary buildings	2 ha (0.02 km^2)	1%	less than 0.1%

Table 2: Component size and percentage for total plant

Component	Estimated extent of the total plant	Percentage of selected area (+ 600ha)	Percentage of whole farm (±5725 ha)
PV modules	540ha (5.4 km^2)	90%	less than 10%
Internal roads	54ha (0.54 km^2)	9%	less than 0.9%
Auxiliary buildings	6ha (0.06 km^2)	1%	less than 0.1%

The proposed infrastructures that are planned to be constructed include a series of solar PV modules (either constructed in PV arrays or as loose standing modules), inverters, internal electrical reticulation and an internal road network. An on-site substation will need to be constructed - this will typically include a transformer to allow the generated power to be connected to Eskom's electricity grid. Auxiliary buildings, including ablution, workshops and storage areas, 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.

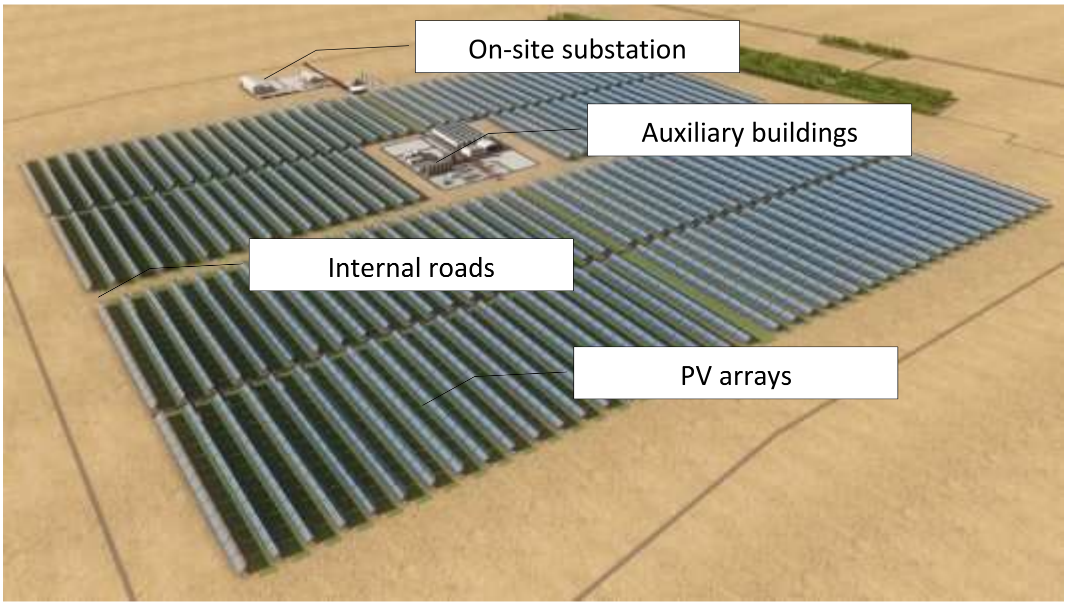

Figure 3: A typical layout of a solar PV plant

3.1 Site development components

The final design will consist of different components. A typical description of the components and their assumed impact are listed below. For more detail on the preliminary layout, please refer to the

Layout Report. Each 75 MW phase will consist of the same development components discussed below:

1. *Position of solar facilities*

The exact position of the solar PV module layout will follow a risk adverse approach and be determined by the recommendations in the environmental specialists' reports in order to avoid all sensitive areas in the positioning of the facility. In addition, the final layout will be influenced by the final detail design of the project once a tender has been awarded. The footprint of each 75 MW phase will be located on approximately 200 ha (between 165 and 250ha) of the proposed site (on the Remainder of Farm 454, Dyason's Klip).


Figure 4: Typical layout of solar modules

2. *Foundation footprint*

The physical footprint of the PV modules on the ground is formed by a network of vertical poles (typically 100 mm in diameter), on which the PV modules are to be mounted (see examples below).


Figure 5: Foundation footprint

Different methods are used to mount the modules to the ground. The mounting structure choice will be influenced by the pricing and technology at the time of construction. Some of the methods include basic drilling or hammering with special tools. Removal of such foundations is possible upon de-commissioning of the project. The modules can also be mounted to the ground in small concrete foundation blocks.

3. *Module height*

The PV panel arrays have an approximate height of 2.5 m, whereas the CPV modules have a height of 10m. A maximum height of 10 m will be considered and assessed in the Environmental Impact Assessment Process. This will allow for flexibility to technology changes in the industry. The maximum height listed here is only a precautionary description due to foreseeable future changes in technology.

4. *Access road to site*

An access road of approximately 6m wide will be required for the facility. The access road alternatives are discussed in more detail later in this report.

5. *Internal roads indication width*

Gravelled internal roads and un-surfaced access tracks are to be provided for. Such access tracks (typically < 6 m wide and limited to the construction site) will form part of the development footprint. Pathways (typically < 6 m wide) between the PV module layout will typically also be provided for to make the cleaning and maintenance of the panels possible. Existing roads will be used as far as possible.

Figure 6: Typical internal road example

6. *On-site substations and transformers*

The step-up substation and its associated infrastructure and internal roads should have a footprint of approximately 0.04 ha (20 m x 20 m). Note that the 0.04 ha is an estimate and included in the entire building footprint of typically < 1 ha.

Figure 7: Typical on-site substation footprint

7. *Cable routes and trench dimensions*

Shallow trenches for electric cables will be required to connect the PV modules to the on-site substation (such electric cables are planned along internal roads and/or along pathways between the PV modules).

Figure 8: Typical cable trenches

8. Connection routes to the distribution/transmission network

Electricity will be transmitted from the on-site step-up substation via a new overhead power line to the planned Eskom substation which is located to the east of the proposed site. A number of possible connection routes are investigated in this EIA. The final preferred route will be subject to the negotiations with the neighbouring farmers and the recommendation of the environmental specialists.

9. Security fence

A perimeter security fence will be constructed around the solar park with a guarded security point.

10. Cut and fill areas

As far as possible, any cut and fill activity along the access roads will be avoided. The majority of the proposed access roads are currently being used by construction vehicles and should not need any alternation. Where alternations might be necessary, input from civil construction engineers will be sourced regarding the cut and fill aspects.

11. Borrow pits

As far as possible, the creation of borrow pits will also be avoided. There is an old tungsten mine on the Dyason's Klip farm. There is still a number of old gravel heaps at the mine site. Road surfacing material required (e.g. gravel/base course or stone) can be sourced from these heaps if required. The current EIA application does not make provision for new borrow pits. Should new borrow pits be required on the property, these will have to be licenced/authorised in terms of the Minerals and Petroleum Resources Development Act and the National Environmental Management Act. To avoid this process a licenced borrow pit in the area would rather be use.

12. Soil heaps

As far as possible, the creation of permanent soil heaps will be avoided. All topsoil removed for the purpose of digging foundations are to be separately stockpiled within the boundaries of the 750 ha development footprint, for later rehabilitation. It is unlikely that major soil heaps will be required for this construction site.

13. Auxiliary buildings

The auxiliary buildings area will typically include:

- A workshop area
- A storeroom area
- A change and ablution room area
- An administrative and security building
- 10 x 10 kl water tanks

Figure 9: Foundation of a typical on-site building

The infrastructure for the auxiliary buildings should occupy approximately 2 ha. The workshop will be used for general maintenance of parts, etc. and will typically be 20 m x 40 m. The storeroom will be used for the storage of small equipment and parts and will typically be 20 m x 30 m. The change and ablution facilities will be very basic and will include toilets, basins and a change area. The administrative and security building will be used as an on-site office and will have a footprint of typically 10 m x 10 m.

The final detailed design and exact coordinated layout of the facility will be designed and finalised should the facility be approved and awarded a tender as an IPP. The component list above is typical to such projects and may deviate due to engineering requirements, new technologies and regulatory changes from the government's tender process. This will be done should the project be approved and the environmental specialists recommendations have been made.

3.2 Project alternatives

In order to propose the best possible design in terms of economic and environmental aspects, several alternatives have been considered. The various alternatives considered in terms of site, layout, technology, and distribution lines are discussed in the following sections.

3.2.1 Site alternatives

Two site alternatives were investigated on the Dyason's Klip farm. The one site is located on the northern part of the farm and the other alternative on the central portion of the farm. It was decided to only proceed with the central site due to the assumed location of the planned MTS substation being closer to the central site.

3.2.2 Layout alternatives

The actual location of the different facility components on the 750 ha development site may vary. Determining the optimal layout is a costly process which would normally take place once an IPP tender has been awarded to the bidder. Several layout alternatives will, however, be considered. The preferred layout will be determined by taking into account the site constraints identified and recommendations made by the various EIA specialists. With the actual construction, the preferred plant layout will stay the same in terms of footprint and size, but the exact location may change within the 750 ha boundary. Sensitive areas identified by participating specialists will be excluded in the detailed design phase.

3.2.3 Technology alternatives

The type of development that was originally considered was either a CSP or a PV facility. (A brief description of CSP technology is given in the section below). Two technology alternatives for PV solar facilities have also been considered for this application. PV facilities generally have a much lower impact on the environment – **a PV facility is therefore proposed for this project**. An overview of the two PV technologies as well as a summary of their advantages and disadvantages is discussed below. The option of constructing a CSP facility has been eliminated and will not be considered or assessed further in this application.

3.2.3.1 Concentrated solar power

CSP facilities operate by concentrating the sun's energy to produce heat that either drives a steam turbine or an external heat engine to produce electricity. CSP facilities consist of a series of heliostats or troughs with mirrors that concentrate sunlight on a receiver tower (although some CSP farms are developed without receiver towers). They potentially have greater impact on birds than PV farms because of the associated central receiver tower, standby focal points and heliostats. A liquid (known as heat transfer fluid, HTF, which usually consists of a mix of oils) or gas medium is heated. The heat is then used to convert water to steam, which is used to generate electricity through steam turbine generators. The heated liquid (HTF) or gas medium is then cooled, condensed, and reused. Evaporation ponds for waste water are needed to separate sludge or solids containing hazardous chemicals from the chemical waste water, cycle water blow down and cleaning liquids. Such materials are removed from the ponds by a licenced waste company. Hazardous waste should be disposed by a hazardous waste facility; waste that is not hazardous should be disposed at a landfill site.

Figure 10: Example site of a CSP Solar Facility

3.2.3.2 PV alternative T1: concentrated photovoltaic solar farm (CPV)

CPV technology differs from conventional photovoltaic systems (PV) in that the CPV modules use different solar cells and include lenses which focus light energy in a more concentrated manner, hence harvesting more energy from the sun. The efficiency of the cells provides benefits relating to capacity per module and reduced spatial requirements. CPV technology systems are much higher, thereby using less space, with the system reaching a maximum height of approximately 10 m. In some cases CPV installations can require a higher amount of water for cooling, unlike PV panels which only require water for cleaning purposes. However, there are alternative cooling methods that do not required additional water. By using CPV technology the impact on the environment can be seen as slightly higher mostly in terms of the height of the module, although some parties see this as an environmental advantage. The height of the modules and the fact that the modules are spread wider apart exposed the ground below the modules to more sunlight than PV arrays, which can allow the vegetation to grow back much quicker than with conventional PV.

PV Alternative T2: Photovoltaic Solar Farm (PV) – the preferred and proposed alternative

Photovoltaic solar power is solar energy that is converted into electricity using photovoltaic solar cells. The captured light moves along a circuit from positive-type semiconductors to negative-type semiconductors in order to create electric voltage. Semiconductors only conduct electricity when exposed to light or heat, as opposed to conductors, which always conduct electricity, and insulators, which never conduct electricity. Power is collected through a structure comprised of many solar cells, usually a solar power panel (also called a PV module). PV modules/solar panels can be combined into an "array" of panels in order to capture a greater amount of solar energy. PV solar panels can either be fixed (rows of tables) or they can be constructed on a single or double axis tracking system. Such a system will use sun sensors to follow the movements of the sun. With the double axis tracking system the sun can be tracked on more than one axis allowing the maximum radiation over the entire solar module.

The fixed tilt solar technology (table installations of rows) is the less expensive option but it has a much lower energy yield than the axis tracking system (free standing panel installation).

3.2.3.3 Summary of the advantages and disadvantages of CPV and PV technology on the environment

	CPV	**PV**
		
Advantages	• Takes up less surface area therefore "footprint" is less, resulting in less impact on soil, agriculture and biodiversity. • More energy can be produced per module. • Because the modules are higher and spread out, the ground in between and under the modules are exposed to more sunlight, allowing vegetation to grow back much quicker	• Lower visual impact (range between 2 m and 5 m in height). • Lower impact on birds due to lower height. • Lower impact on bats due to lower height. • Easier to erect PV technology. • Lower impact on heritage/ culture due to lower impact on landscape. • Easier to transport.
Disadvantages	• Higher visual impact, CPV systems can be up to 10 m high. • Higher impact on birds. • Higher impact on bats. • Requires skilled labour because more difficult to erect. • CPV systems are water intensive. • Higher cultural/ historic impact to the landscape. • Harder to transport – abnormal load.	• PV facilities of the same footprint of CPV facilities produce less power. • The tightly packed PV arrays allow little sunlight through, which can cause the vegetation to grow back slower.

The industry is changing very quickly in terms of costing of the different forms of PV. Tying oneself down to a particular technology at this stage could be detrimental in light of what will be realistic to construct in 2-3 years from now. Due to the fact that the impact on the environment of the two PV technologies is more or less the same, it is requested that the EA allow for either one of the alternatives.

3.2.4 Mounting and film alternatives

PV solar power technology has been identified as the preferred technology to generate electricity in this project. There are, however, several alternatives in terms of the specific solar PV technology to be used. These alternatives can be grouped in terms of mounting and film alternatives but should not trigger any major difference in the impact of the project as explained in this report.

3.2.4.1 Mounting alternatives

There are two major alternatives in terms of solar PV mounting, namely fixed-tilt and tracker mounting technology.

Figure 11: PV tracker mountings

When fixed-tilt solar mounting technology is considered, the solar PV modules are fixed to the ground and do not contain any moving parts. These modules are fixed at a specific north facing angle. This type of technology is less expensive than tracker technology, but it has a lower energy yield due to the limited exposure to sun radiation.

The preferred technology type is known as horizontal tracker technology. This technology is designed to follow the path of the sun across the sky. By using this technology, the modules are exposed to typically 25% more radiation than fixed systems. The design is extremely robust and contains only a few moving parts. It also has more or less the same footprint and infrastructure requirements than that of fixed-tilt designs. The tracker requires approximately 1.8 to 2.3 hectares per megawatt. The tracking design is based on a simple design and makes use of a well proven off-the-shelve technology that is readily available. If conventional PV modules are used, the maximum height of the trackers is typically less than 2 m, but as previously stated, the CPV trackers are much higher, reaching a maximum height of approximately 10 m. The panels will most probably be mounted on either a single axis or a dual axis tracking system, both of which have a similar impact. However, because of unforeseeable changes in technology, it is requested that flexibility be granted in this regard in the EA.

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. Driven piers and deep seated screws are recommended in order to minimise the environmental impact and input during decommissioning of the facility, but will be dependent on mechanical specifications.

If concrete foundations are used, foundation holes will be mechanically excavated to a depth of about 30 cm – 50 cm. The concrete foundation will be poured and be left for up to a week to cure.

Additional geotechnical investigation will probably be required to determine the feasibility of each option. The mounting structure choice will also be influenced by the technology advancement and pricing and should not be specifically indicated. It is requested that the EA allow for either one of these alternatives.

3.2.4.2 Film Alternatives

There are a multitude of different film technologies available today. The best solution, according to research conducted, are either thin film (amorphous silicon or cadmium telluride) or -crystalline cells (mono- or poly-crystalline) depending on the space and irradiance conditions.

As mentioned earlier, the film type do not affect the layout and impact from an environmental perspective and would not affect the environmental impact of the proposed project. Due to the industry changing very quickly in terms of costing of the different film types it is requested that the EA allow for either one of the alternatives.

3.2.5 The “do-nothing” alternative

This portion of the Farm 454, Dyason’s Klip, is currently used for limited stock grazing. The exclusion of 750 ha from the 5725 ha property for the purposes of the solar facility will not have a significant effect on these farming activities. There will also be minimal impact on the agricultural resources (soil and water). Should the do-nothing alternative be considered, the positive impacts associated with the solar facility (increased revenue for the farmer, local employment and generation of electricity from a renewable resource) will not be realised.

Cape EAPrac, the environmental assessment practitioners for this project will report on a full investigation on what environmental impact the option of not developing the proposed facility will have.

4 Construction of the proposed facility

The facility will be developed and constructed in three phases. Each phase will consist of a 75 MW facility. The construction of each 75 MW phase should be between 14-18 months. During the construction activities 5 jobs will be created for each MW of energy. 375 jobs are therefore expected to be created during the construction phase for each 75 MW facility, of which most will ideally be local employments. The construction material and sourcing of required goods can be from the local community and surrounding towns.

Should the project be approved, and all required approvals and licences are obtained from the DEA, NERSA and a Power Purchase agreement (PPA) is secured with Eskom, the construction is envisioned to begin in the second half of 2015. A series of activities would need to be undertaken, to construct the proposed facility and associated infrastructure.

Each facility will be established in different phases namely: the pre-construction, construction, operation and decommissioning phases.

The **preconstruction phase** includes:

1. Conducting of surveys
2. Transporting of the required construction components and equipment to site
3. Pre-site preparation (establishment of temporary services for construction such as lavatories, water, health and safety requirements, site office, etc.)

The **construction phase** includes:

1. Transportation of solar components and equipment to site
2. Establishment of internal access roads
3. Undertaking site preparation (including clearance of vegetation; stripping of topsoil where necessary)
4. Erecting of solar PV frames and panels
5. Constructing the on-site substation
6. Establishment of additional infrastructure (workshop and maintenance buildings)
7. Establishing the underground connections between PV panels and on-site substation
8. Connection of on-site substation to power grid
9. Undertaking site remediation
10. Construction of perimeter fencing

The activities that will be undertaken on site fall under different specialist fields and include:

- **Civil works:** site preparation, site grading, drainage, roads, foundations, storm water & anti-erosion management
- **Mechanical works :** piers installations, mechanical assembly including trackers, mounting of panels
- **Electrical works :** installation from low to high voltage, including substation

For the purpose of the engineering report, the stages of the construction phase that have engineering implications will be discussed. Each 75 MW phase will have similar construction components.

4.1 Transportation of solar components and equipment to site

All solar plant components and equipment are to be transported to the planned site by road. Construction should stretch over a period of approximately 18 months. During this period the majority of the solar PV panels and construction components will be transported by utilising container trucks (e.g. 2 x 40 ft container trucks or a similar option).

Less than 30 containers will be required per installed MW. This will typically include all solar PV components and additional construction equipment. Over the period of 18 months, 2250 containers will therefore be transported to the proposed site. Roughly estimated this amounts to two 2 x 40 ft container trucks per day. Normal construction traffic will also need to be taken into account. The usual civil engineering construction equipment will need to be transported to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.). The components required for the establishment of the on-site substation power line will also need to be transported to the site. Some of this power station equipment may be defined as abnormal loads in terms of the Road Traffic Act (Act No.29 of 1989). Input and approval are to be sought from the relevant road authorities for this purpose.

Transport to the site will be along appropriate national, provincial and local roads. The access roads to the site will be from Upington or Keimoes, along the N14. This is a tarred national road and no alterations should be necessary to handle construction traffic and traffic involved in the operation phase.

In some instances, the smaller farm roads may require some alterations (e.g. widening of corners etc.), due to the dimensional requirements of the loads to be transported during the construction phase (i.e. transformers of the on-site substation). Permission from the local authorities can be obtained in this regard if required.

The exact access routes that are considered will be discussed in more detail later in the document.

4.2 Establishment of internal access roads on the farm

Minor internal maintenance roads on the farm and proposed construction site are to be constructed. Where necessary, gravel may be used to service sections of the existing road on the farm itself. In order to form an access track surface some of the existing vegetation and level the exposed ground surface might need to be stripped off. The impact of this will be assessed by the botanical specialist. These access tracks (typically less than 6 m wide) will form part of the development footprint. In the Scoping Report the width of the internal roads was stipulated as less than 4m. This width has been increased to 6m, in order to allow enough space for the larger vehicles to turn easily. The layout and alignment of these internal roads will be informed by recommendations made by the botanical specialist, as well as the topographical survey. Pathways (typically less than 6 m wide) between the solar PV modules are to be provided for ease of maintenance and cleaning of the panels.

In addition, a fire break (buffer area) that can also serve as an internal road will be constructed around the perimeter edges of the entire proposed site. All gravel access roads constructed will be more or less 6 m wide.

4.3 Site preparation

Cleaning of the surface areas is necessary in order to construct the solar PV plant. This will include clearance of vegetation at the footprint of the solar PV modules, the digging of the on-site substation and workshop area foundations and the establishment of the internal access roads and lay-down areas. Where stripping of the topsoil is required, the soil is planned to either be stockpiled, backfilled and/or spread on site. In the instance where there are cultivated areas currently on the

Figure 12: Illustration of a typical site after preparation

site, the upper 30 cm of the cultivated areas will be stockpiled on the boundaries of the site. The topsoil stockpiles must be protected from erosion by re-establishing vegetation (grasses) on them. The environmental management plan will provide specifications for this vegetation re-establishment.

To reduce the risk of open ground erosion, the site preparation will typically be undertaken in a systematic manner. Where any floral species of concern or sites of cultural/heritage value are involved, measures are to be put in place to attend to the preservation or restoration of these elements as recommended by the botanical specialist.

4.4 Erecting of solar PV modules

Figure 13: On-site construction of the PV arrays

Once the site preparation has been done, and all necessary equipment has been transported to the site, the solar PV modules and structures are assembled on site. Each solar PV module consists of a number of cells, forming a single panel. Each module is capable of generating typically 230 W - 260 W of DC electrical power. If conventional Solar PV technology is used, the solar PV modules are assembled in long rows across the solar PV array, with the rows approximately 5 m apart. The exact amount of modules in each solar PV array is subject to the final facility design and is still to be confirmed. If CPV technology is to be used, the distance between the modules are carefully calculated to ensure the trackers have enough room to rotate and the shadows are taken into account. Foundation holes for the solar PV modules are to be mechanically quarried to a depth of approximately 300 - 500 mm. Driven piers and screws are recommended in order to minimise the environmental impact of the facility, but will be dependent on mechanical specifications.

If concrete foundations are used, foundation holes will be mechanically excavated to a depth of about 300 - 500 mm. The concrete foundation will be poured and be left for up to a week to cure.

4.5 Construct on-site substation

An on-site substation will be necessary to enable the connection between the solar energy plant and the National Eskom electricity grid. The generated voltage is planned to be stepped up to 132 kV by means of an on-site substation in order to be fed into the Eskom grid via the new MTS Eskom substation. The on-site substation and its associated infrastructure and internal roads should have a footprint of approximately 0.04 ha (20mx20m).

The on-site substation is constructed in a few sequential steps. First a site is determined by the recommendations from the reports of the environmental specialists to avoid the most sensitive areas in the positioning of the substation. Once the site is approved, the site clearing and levelling is to be done, after which the access roads to the substation are constructed. Next the substation foundation is laid. Once the foundation is constructed, the assembly, erection and installation of all equipment, including the transformers, are to be completed. The final step is the connection of the conductors to the equipment. The post-construction phase includes the rehabilitation of disturbed areas and protection of erosion sensitive areas. Below is typical on-site substation that connects to the existing Eskom substation.

Figure 14 : Typical on-site substation

4.6 Establishment of additional infrastructure

To minimise the potential ecological impact a project of this scope, a decision was made to limit all activities and storage of equipment to one nominated area. A dedicated construction equipment camp and lay-down area are planned to be established, which will then form part of the auxiliary building area. The laydown area for the construction period will be approximately 2ha. This area will typically be used for the assembly of the solar PV modules and the generation placement/storage of construction equipment. A temporary facility are planned to be used to secure the storage of fuel for the on-site construction vehicles. Necessary control measures will be put in place for correct transfer and use of fuel.

The auxiliary building area will typically consist of the following:

- workshop area
- storeroom area
- change and ablution room area
- administrative and security building
- 10 x 10 kL water tanks

4.7 Connect on-site substation to power grid

In order to evacuate the power generated by the proposed facility and feed it into the Eskom grid, a distribution line would have to be constructed between the proposed on-site substation and the new planned Eskom MTS substation. As stipulated in Eskom's TDP 2013-2022 document, Eskom plans to build a 5 x 500 MVA 400/132 kV transmission substation 5-10 km from the proposed site. The planned MTS substation will be a key substation in the Upington and Northern Cape area. The substation is built in order to distract the energy generated from the distribution network onto the national transmission network. The MTS was planned and designed in such a way to accommodate the proposed renewable projects in the area. With the 5 x 500 MVA 400/132 kV transformer capacity available, the proposed project as well as the surrounding projects in the area should be able to connect onto the grid.

A grid feasibility application has been submitted to Eskom, to confirm the connection possibilities for this project.

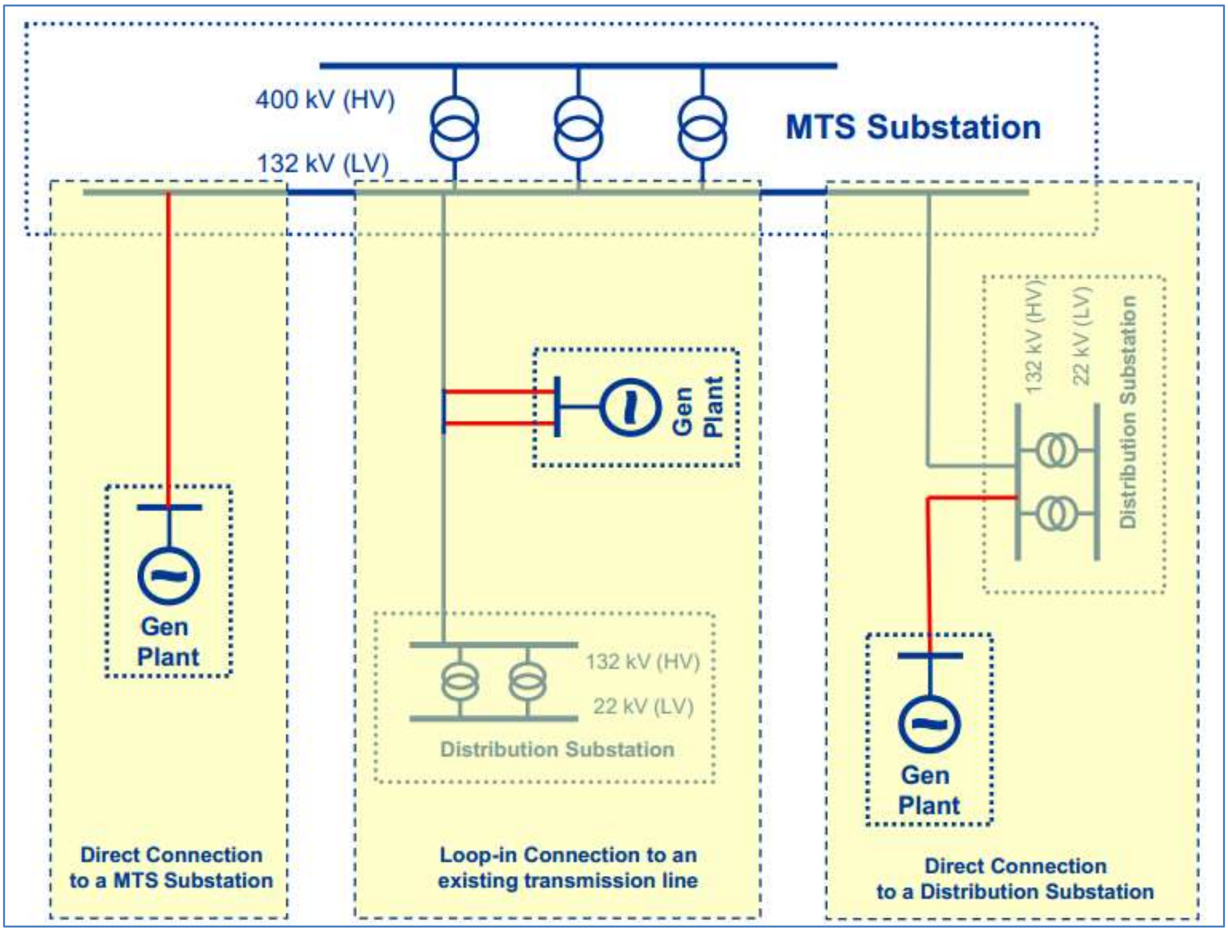

Figure 15: The different connection alternatives

As shown in the figure above, there are different alternatives to connect to the existing Eskom grid. Two of the options that will be investigated are looping into the existing 132 kV line currently running over the farm or building a new line directly to the new MTS Eskom substation. The "loop-in" option will be subject to the available capacity on the existing 132 kV line. The line currently has a total carrying capacity of 80 MW.

If this capacity is already occupied, a new line (or two lines, depending on the line capacity) will be built to the planned Eskom MTS. This line/s will be constructed by the developers, but would be handed over to Eskom for operation and maintenance. Application for the new line/s forms part of this Environmental Process. The location of this line/s will be subject to the final location of the new Eskom MTS substation. The exact location of the planned substation is still to be confirmed by Eskom; three alternatives have been indicated in the Eskom's EIA Reports. The image below shows the three alternative locations and is pointed out by the yellow blocks. Different power line routes are being investigated for the project to accommodate the different Eskom MTS locations. These power line routes are indicated with the orange lines. These alternatives will be explained in a bit more detail in the layout report.

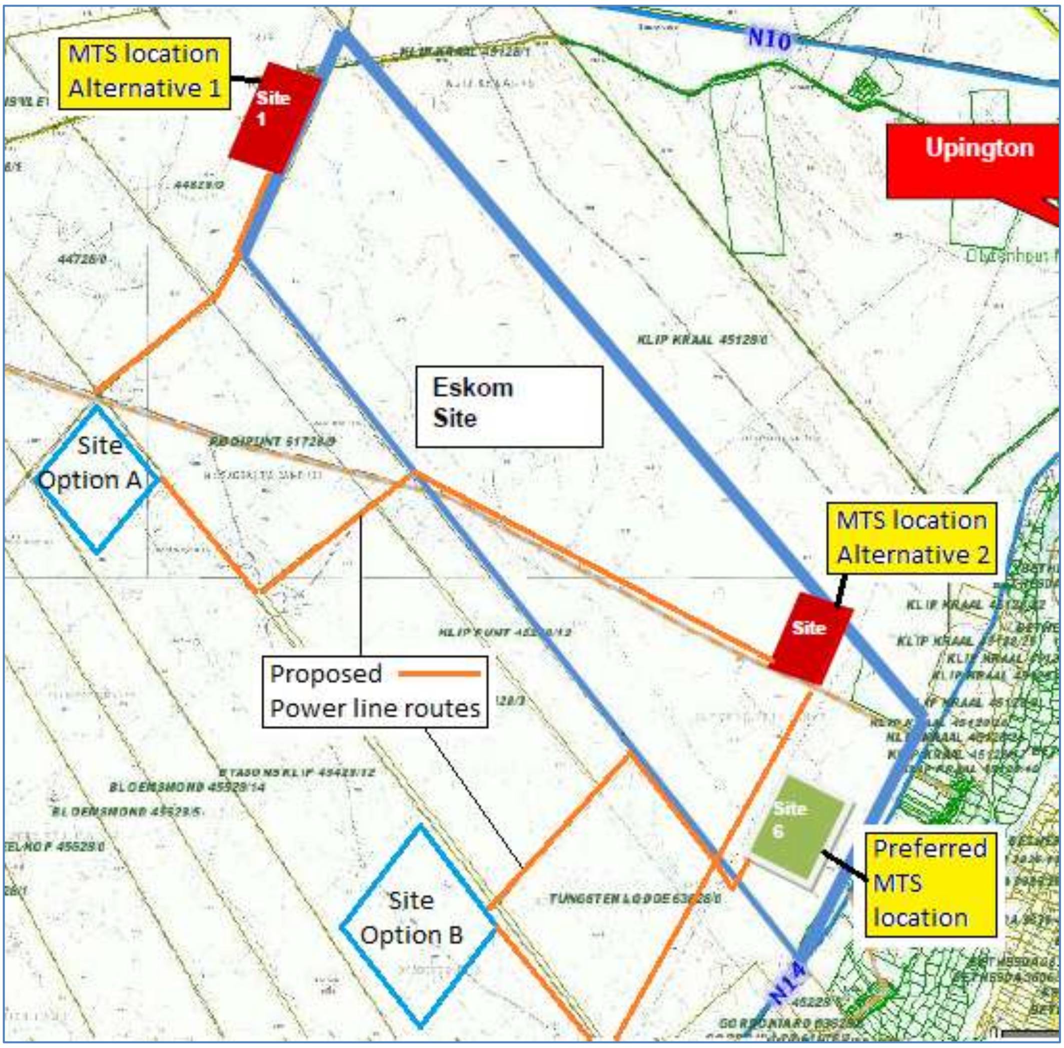

Figure 16: Diagram showing planned MTS locations

Feedback from Eskom on the Draft Engineering Report and Draft Scoping Report provides guidance with regard to the planned expansions, which has been considered during the layout planning of the proposed development. Eskom also provided generic requirements for works at or near Eskom infrastructure. Eskom's recommendations will be taken into account and a declaration letter explaining the process followed has been attached.

4.8 Undertake site remediation

Once construction is completed and once all construction equipment is removed, the site is to be rehabilitated where practical and reasonable. In the case where access routes to the site will not be used during operation, the access points are to be closed and rehabilitated as detailed in the Environmental Management Programme.

5 Access to facility

As mentioned, transport to the site will be along appropriate national, provincial and local roads. The access roads to the site will be from Upington or Keimoes, along the N14. The Dyason's Klip farm entrance is directly from the N14. Different access routes are investigated.

The central site can be access either via the existing farm roads, or a new road that will have to be constructed. There are 5 access road alternatives that are being investigated to determine which one will have the least environmental impact and would be more viable.

Figure 17: Image showing the access roads alternatives for the central site

Alternatives 1, 3 and 5 are on the Dyason's Klip property while options 2 and 4 are on the neighbouring farm, McTaggarts Camp. Alternative 1(the orange line) make use of the existing farm road leading to the north of the Dyason's Klip farm. Alternative 2 (yellow line) make use of the existing road on the neighbouring farm. This alternative might however fall away due to agriculture developments on the neighbouring farm. Alternatives 2, 3, and 4 all run parallel with the farm border to the proposed site. Alternative 3 and 5 is on the Dyason's Klip side of the border, where Alternative 4 is on the McTaggarts camp side of the border. For alternatives 3 and 5, the existing jeep track road will have to be upgraded quite a bit to accommodate the construction vehicle traffic.

Figure 18: Dyason's Klip farm entrance from N14 (Access Options 1 and 5)

Figure 19: McTaggarts Camp entrance from the N14 (Options 2 and 4)

Only option 3 (the green line) will make use of a brand new entrance from the N14. Options 1 and 5 are both using the existing Dyason's Klip farm entrance, while options 2 and 4 will use the entrance being constructed by the CSP developing company, Abengoa on the McTaggarts Camp farm.

These 5 options have been sent through to SANRAL for their review and comment. The feedback will be included in the Final Environmental Impact Report.

6 Establishment of water sources

The project requires about 8 litres of water per panel per annum for the purposes of construction and maintenance (cleaning of the panels). The capacity of the panels that will be used will therefore determine how many water will be required for a 75 MW plant. If a 250 Watt panel is used, a 75 MW plant will consist of more or less 300 000 panels, which will roughly calculate to 6.6 kl of water required per day. The 10 kl capacity tanks will be places on site in order to store 100 000 litres of water at any given time. The water distribution system will distribute water from the ten 10 kl water tanks to a high pressure hose and on to the solar panels. The proposed activity is not a "water intensive activity" (as opposed to CSP technology). Only a limited amount of water is required in low rainfall periods to clean the modules once every quarter so that they can operate at maximum capacity. No chemicals will be used to clean the panels, only water.

Weather conditions, traffic and general dustiness at the site play a role in the exact amount of ground water required to wash the solar PV panels. At present it is assumed that each panel should be washed once every three months.

To further reduce the use of water at the solar facility, the use of alternative panel cleaning methods is also being investigated. The most feasible technology under consideration uses compressed air to blow off any debris from the panel's surface. At this stage the technology is being tested and needs refinement before it would be commercially viable.

6.1 Water sources

1. Boreholes:

The preferred water sources are the existing boreholes on the proposed farm. Four boreholes have been identified on the farm of which two boreholes are situated near the central site. These boreholes are seen as a possible water option for the facility. The small volumes of water required for washing the solar PV modules and for general operational purposes (maximum 7 kl per day or 210 kl per month) can be sourced from these boreholes. According to the farmer the boreholes are strong enough and the water they supply is drinking water quality.

Depending on where on the final design the water tanks will be located, the water from the boreholes will probably be pumped to the water tanks through a pipeline. The pipe diameter will be approximately 150mm-300mm. The pipeline will be laid on the ground, or just below the ground by means of manual excavation. The water pipeline should not result in any additional environmental impacts outside of the main construction area.

2. Storage dam (alternative supply)

An additional option is the storage dam the farmer has on the Dyason's Klip farm. The dam is situated south of the proposed sites and a pipeline will have to be constructed to distribute the water to the proposed sites. As an alternative to the pipeline, trucks can be used to transport the water from the storage dam to the proposed sites. Confirmation on the capacity of the boreholes and the storage dam will be sought from the farmer.

3. Khai Garib municipality (alternative supply)

Permission to use water directly from the two nearest towns, Upington and Keimoes, can be sought from the Khai Garib Municipality. This water will also have to be transported by trucks to the proposed site. This will be seen as the last alternative as transport costs will be significantly higher compared to the other two options.

4. Rainwater

As an additional measure, PVC rainwater tanks could also be placed alongside the on-site buildings to collect the rainwater runoff from the roof. These PVC tanks will then form part of the water storage tanks. If necessary, measures can also be put in place to capture the rainwater runoff from the PV modules.

6.2 Water buffer

Water storing infrastructure is to be provided as part of the auxiliary building footprint area. Storing capacity for two weeks are planned to be provided for. This will add up to ten 10 kl water tanks.

Figure 20: Typical water storage tank

6.3 Water-use permission

The quantity of water required usually qualifies for a general authorisation, but the specific quaternary area in which the development site is situated does not allow for general authorisation. Thus, a formal water use licence would have to be applied for. However, as also stipulated in the official REIPPP documentation (RFP, Volume 1, Part 1, Section 4.5) the DWA will only process water use licence applications from developers who have been selected as Preferred Bidders. Therefore a full assessment of the water-use licence application will only be undertaken by the Department of Water Affairs (DWA) once the project is approved. The EIA application can therefore be submitted without a water licence, as long as there is enough confirmation that there are sufficient water available. A Non-binding Water Confirmation Letter for the project have been applied for at the DWA, in which the DWA is asked to confirm that according to their information there should be adequate water available for the project. The DWA are also registered as a key stakeholder in the environmental process and will have an opportunity to provide any additional input.

6.4 Erosion and storm water control

The risk of water erosion is low because of the extremely low annual rainfall in the area. The ground condition in the Upington area is such that any surface water is very quickly absorbed into the soil. This avoids water build up on the surface and quickly reduces any water flow which might cause water erosion.

On large structures or buildings appropriate guttering would be used around the building to avoid water erosion where roof water would be flowing off the roof. Wherever practically possible rainfall run-off from the roofs/gutters will be captured and stored in rainwater tanks. If this water cannot be captured, water will be channelled into energy dissipating structures to spread the water and slow it down to reduce the risk of erosion. Such a structure could be moulded from precast concrete, loosely packed rock or perforated bags filled with stone.

Any rainfall on the solar modules would be welcomed due to its cleaning effect, but as mentioned before the annual predicted rainfall is very low and would not cause any erosion worth discussing. The solar module surfaces are installed at a relatively large incline with gaps between modules. This does not allow significant water build up on the modules while also reducing the energy in falling droplets. Considering that the modules are on a tracking system, this also means that droplets leaving the solar module surface would not drop onto the same ground areas all the time.

The construction area might cross over a number of seasonal washes. To avoid erosion in these washes recognised building practices will be followed to keep the natural flow of water within its natural borders. It is in the interest of the solar operator to keep the area clean and free of erosion to avoid any damage to the equipment. The solar modules would be installed on frames, allowing for natural water flow underneath the structure.

During the construction phase of the project there might be a risk of wind erosion where natural vegetation is removed. This might increase the risk of damaging sensitive equipment with a sandblasting effect and all parties involved will be vigilant to avoiding this from happening. Note that the construction will take place in three phases. This phased construction approach should also minimise the amount of exposed soil at any one time thus reducing the risk for wind erosion and dust generation. Once the construction on each phase is complete the cleared areas will be revegetated with locally-collected seed of indigenous species and left for vegetation to return to the area naturally. Bare areas will also be packed with brush removed from other parts of the site to encourage natural vegetation regeneration and limit erosion. Any water being used in the cleaning process would speed up this natural vegetation rehabilitation process. Further it will also have a bonding effect on the sandy soil, avoiding the loose sand blowing away causing wind erosion.

Figure 21: Illustration of current vegetation on the farm

Access roads and internal roads would also be designed and build using recognised erosion and storm water management systems. During the construction phase of the solar PV facility temporary solutions would be implemented to ensure that the environment is preserved in a sustainable way by avoiding erosion. The following figure shows a typical temporary solution that would be implemented during the construction phase, basically consisting of an inlet, channel and outlet. During outflow of the water energy is dissipated allowing any particles to sink to the ground which also avoids fast flowing water to sweep particles up from the ground avoiding erosion, by flowing though packed stones acting as a filter.

Figure 22 Installed concrete pipes and culverts

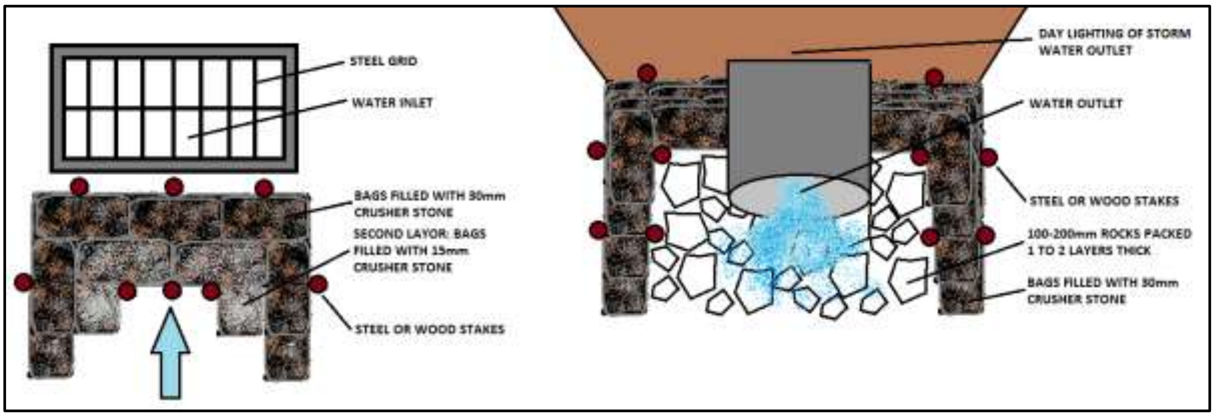

Figure 23 Temporary culvert inlet and outlet

More permanent solutions would be designed to keep storm water under control in a sustainable way. These structures would be built to be aesthetically pleasing by using fixtures such as stones packed in wire mesh to stay in a position or locking retaining walls at the inflow and outflow of the culverts also acting as scour protection. Depending on the situation which is influenced by the type of water control most probably being Steam crossing (in this particular case it would be a dry water wash for most of the year) or a culvert for water runoff management, either portal culverts with bases or reinforced precast concrete pipes would be used as the channelling.

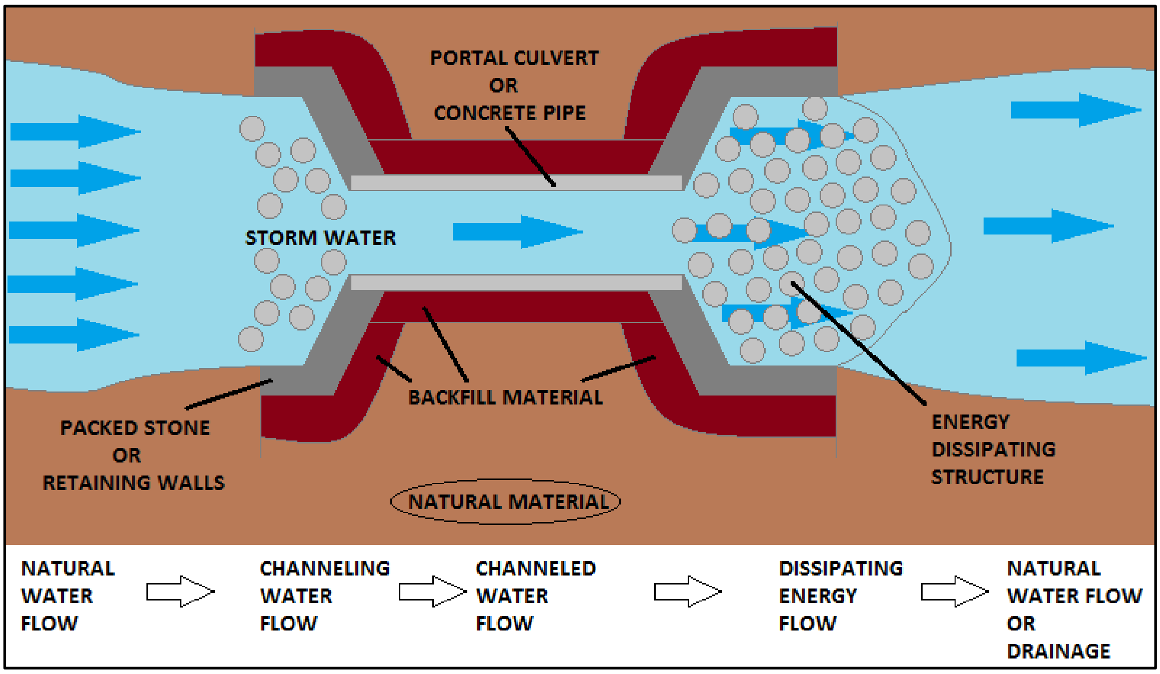

Figure 24 Storm water flow

An alternative to culverts considering drainage line crossings, Low-level River Crossings (LLRC) can be used. A LLRC is a structure that is designed in such a way to provide a bridge when water flow is low, while under high flow conditions water runs over the roadway, without causing damage.

Two types of LLRC can be used depending of the particular situation. A “Causeway” contains openings underneath the surface, which allows passing water through where a “Drift” does not.

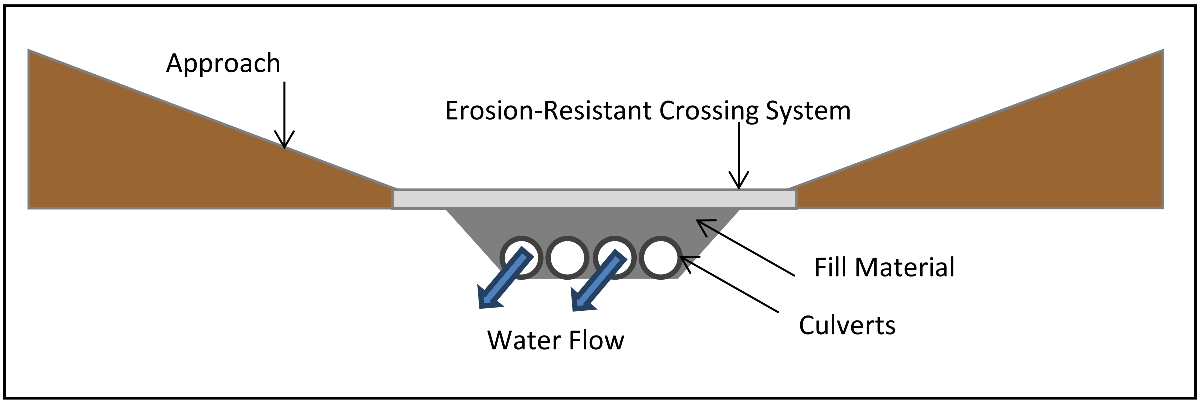

Figure 25: Causeway (Low Level River Crossing)

The same type of erosion control methods discussed with the culverts is taken into account when designing a LLRC. Because a LLRC is designed for water to flow over it, erosion protection is very important. Rock filled baskets, loosely packed rock or perforated bags filled with stone are some of the methods usually considered with LLRC.

The water use licence application process will include application for potential crossings of water courses in terms of section 21(i)&(c) of the national water act. This application process will only commence if the project is selected as a preferred bidder.

Project operation and maintenance phase

The proposed operation of the site is for 25 years. During this life-cycle, the plant will be maintained and monitored. The aim is to generate at full capacity by the second half of 2016. The facility should be operational during daylight hours, except during maintenance, poor weather conditions or breakdowns. Regular maintenance will typically include periodic cleaning, greasing of bearings and inspection. The modules are planned to be cleaned with water or compressed air. Any waste products are to be disposed of in accordance with the National Environmental Management: Waste Act (Act 59 of 2008).

During the operation 1 job will be created for each MW of energy. The staff members will typically include technicians, maintenance and security personnel. Staff can be transported around the site using utility vehicles and a typical mini bus to transport staff from nearby towns of Upington, Keimoes and surrounding community. From time to time additional contract staff may be required for ad hoc ground cleaning or special panel cleaning.

When the solar modules and associated equipment become defective, they will be recycled and re-used where possible in order to avoid the filling of already limited land space.

7 Project decommission phase

The proposed solar energy facility is expected to have a lifespan of approximately 25 years if the specified periodic maintenance is performed. If financially viable and depending on climate factors in 25 years' time (farming may no longer be viable) the PV facility may continue operating. Existing infrastructure and components of the PV facility may be replaced with new technology.

Once the facility has reached the end of its economic life, the infrastructure is to be decommissioned. The decommissioning of the facility would entail the disassembly and replacement of components with other appropriate technologies. However, if not deemed so, then the facility would be completely decommissioned.

Preparation activities for site decommissioning should include confirming the integrity of access to the site. Site access should be able to accommodate the required equipment (e.g. lay down areas, construction platform) and the mobilisation of decommissioning equipment.

The components would be disassembled, reused and recycled where possible, or disposed of in accordance with regulatory requirements. Functional components are planned to be donated to and installed at local schools and clinics to benefit the community.

8 Services Required

Due to the remote location of the proposed site, making use of municipal services is very difficult. It is therefore proposed to manage the Water and Electricity, Sewage and Waste Removal aspects independently.

8.1 Water and Electricity

Electricity will be needed during the construction period as well as the operation period in the support offices etc. The proposed site is approximately 7km away from the nearest Eskom point on the southern part of the Dyason's Klip farm. It is proposed to either use generators for electricity, or alternatively make use of a number of PV panels during the day.

Water will be sourced from the two boreholes close to the site. Permission has been obtained from the farmer in the lease agreement, that the water may be used. According to the farmer the water is drinking water quality. The water will be stored on site in standard 10kl water tanks. Due to the small amount of water needed, water can also be obtained for the Kai Garib municipality and transported to the site by standard water trucks, should the bore hole water not be sufficient.

8.2 Waste effluent, emission and noise management

8.2.1.1 Solid waste management

During the construction phase an estimated amount of less than 5 m^3 non-hazardous solid construction waste are to be produced per month, for the expected 18 month construction period. An independent service provider will be used to safely store all construction waste, and remove it from the site on a scheduled (weekly) waste removal basis. The construction waste, where applicable, are to be disposed at a municipal landfill site that is appropriately licenced. The Environmental Management Programme will address solid waste management during construction.

During the operational phase after construction, the facility should not produce any solid wastes.

8.2.1.2 Liquid effluent (sewage)

The liquid effluent generated is going to be minimal and limited to the ablution facilities. All workers will be transported to site on a daily basis and no workers will be housed on site. Six temporary chemical induced ablution facilities will be on site during construction and during operation of the facility. These chemical toilets will be serviced and emptied on a weekly basis by a private independent contractor. The sewage will be transported to a nearby Waste Water Treatment Works for treatment. The use of a septic vs. conservancy tank will be determined by the local authority.

Due to the locality of the farm, sewage cannot be disposed in a municipal sewage system.

8.2.1.3 Emissions into the atmosphere and noise generation

Very little emissions should be released into the atmosphere and no significant noise should be generated, except during the construction period with drilling and hammering. Due to the site location this should not pose any issue as no residential area is located nearby.

9 Cost implications & revenue

9.1 Project cost overview

Renewable energy projects, such as the proposed solar facility, require significant investment. Funds of equity and debt investors either from foreign or domestic sources are obtained. The cost requirements and potential revenue are discussed in this section, sketching a business case for the development of renewable energy projects within South Africa (specifically solar farms in the Northern Cape).

The project costs consist of two parts, capital cost and running cost. The capital cost pertains to all costs incurred for the establishment of a producing facility. The running cost relates to those costs incurred to ensure that the facility operates as it should throughout its expected lifetime.

Solar PV installations can operate for many years with little maintenance or intervention. Therefore after the initial capital outlay required for building the solar power plant, financial investment is limited. Operating costs are also extremely low compared to existing power technologies.

9.2 Project specific costs

The Re Capital 3 detail costing has not been completed on the date of submitting this engineering report. The project is, however, based on the industry standard cost with capital expenditure that can amount to more or less R30m per megawatt installed capacity. The running cost of a solar PV facility is minimal related to the initial capital cost, contributing to the most significant cost of constructing and running a solar PV facility.

9.3 Revenue streams

The payback of the facility results mainly from electricity sales, intended under the current governmental subsidy, known as the Independent Power Producer Procurement Programme (IPP procurement programme).

The IPP procurement programme portrays fixed ceiling prices for bidders to tender against. The establishment of these ceiling prices is based on industry standard return on investments. The governmental study performed identified the feed-in tariff per technology related to the capital cost required per technology against its revenue potential, identifying the required subsidy per technology to be paid.

In short the subsidy offered by the governmental procurement programme (IPP procurement programme) enables the project to be financially viable by selling electricity at a subsidised price, while the costs of such a facility relates to the industry standard.

As part of the IPP procurement programme preferred bidders will enter into a power purchase agreement between the IPP generator and the Single Buyers Office. National treasury stands in for surety, while NERSA regulates the IPP licences.

NERSA and the IPP procurement programme require an approved EIA Environmental Authorisation/Record of Decision as a gate keeping criteria, where no project would be considered without the EIA Environmental Authorisation being given.

10 Project programme and timelines

As mentioned previously the Re Capital 3 solar development is intended to be lodged under the IPP procurement programme. The programme has definite and stringent timelines, which the project should meet:

#	Description	Timeline
1	IPP procurement programme submission (4th round)	19 Aug 2014
2	Preferred bidders selected	29 October 2014
3	Finalisation of agreements	November 2014 – July 2015
4	Procurement of infrastructure	August 2015 – September 2015
5	Construction	October 2015 – March 2016
6	Commissioning	March 2016 – July 2016

The table above clearly depicts the dependence of the project on the IPP procurement programme's timelines. Any delay within the IPP procurement programme will have a corresponding effect on the timelines of the projects timelines.

11 Conclusion

In conclusion, the overall significance of the proposed Re Capital 3 solar development outweighs the negative impact the project can have. From an environmental perspective the project can be well-managed with sound contingencies being put in place to prevent harm to surrounding areas.

The project does make significant contribution from a social and economic perspective. Such benefits include potential revenue for the landowner, job creation during construction and the 20-30 year operational phase. In addition, much needed electricity is generated and fed into Eskom's national grid, taken from a natural energy resource that is sustainable and carbon-free.

If the recommended mitigation measures contained in the environmental management plan (EMP) are implemented, there should be no lasting significant negative environmental impact arising from the development of the project. This pertains to the construction phase as well as the operational phase. Solar projects use remarkable technology which can ensure a sustainable future for electricity generation. This is especially true since it does not severely impact the environment as with coal power generation or similar technologies.

In the light of the long term benefits the solar development has, upon approval of this application the project can be implemented with minimum environmental negatives.

12 Appendixes

I. Eskom Declaration Letter

II. Solek Company Profile