Draft

Amended Environmental Impact Assessment Report

&

Environmental Management Program

in terms of the

S. 32 Amendment Application for the

Authorised 55 MW Greefspan PV Power Plant 2 & Associated Infrastructure

Pixley ka Seme District Municipality

Northern Cape Province

NEAS REF No: DEA/EIA/UP_DG/0000017/2012
DEA REF No: 12/12/20/2645
EA HOLDER: Greefspan PV Power Plant No 2 (RF) (Pty) Ltd

Van Zyl Environmental Consultants cc

2009/073037/23

EAP Report Number: **2016/24**
Environmental Report Date: **27 September2017**

PROJECT DETAILS

Environmental Authorisation Holder	Greefspan PV Power Plant No. 2 (RF) (Pty) Ltd		
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Project Description:	The construction & operation of the 55MW Greefspan PV Power Plant No. 2 and its associated infrastructure situated on the farm De Rust, a part of the Remainder of Portion 1 of the farm Kwartelspan No. 25, Douglas
Farm name:	De Rust Remaining Extent of Portion 1 of the Farm Kwartelspan No. 25
Physical address where authorised activity will take place:	De Rust on the R357, Douglas, Northern Cape Province (situated between Douglas and Prieska)
Magisterial District or Town:	Douglas, Northern Cape
DEA reference number of the previous environmental authorisation in respect of which an amendment is applied for:	DEA Ref. No.: 14/12/16/3/3/2/249 (12/12/20/2645) NEAS Ref. No.: DEA/EIA/UP_DG/0000017/2012
Date of issue of environmental authorisation:	6 September 2012
Activity/ies for which authorisation was granted:	GN R. 544 Items 10, 11, 22, 29, 47 GN R.545 Items 1, 15 GN R. 546 Item 14

Should this report be used as a reference, it should be cited as follows:
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PUBLIC PARTICIPATION PROCESS

INVITATION TO COMMENT ON THE AMENDED ENVIRONMENTAL IMPACT ASSESSMENT REPORT & ENVIRONMENTAL MANAGEMENT PROGRAM

The amended EIA report & EMPr is available for review at the office of Van Zyl Environmental Consultants.

The availability of the report will be communicated to all potential & registered I&APs. The report will be available for review until **20 November 2017.**

Please submit your written comments, including a declaration of any business, financial, personal or other interest you may have in the approval or rejection of this application, via email, facsimile, or post to:

FOR ATTENTION: **Irmé van Zyl**

Mobile: **072 222 6194**
Telephone: **054 338 0722**
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Always cite the DEA reference number in order to ensure that your comments are allocated correctly.

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DEFINITIONS

Alien species – Plants and animals which do not arrive naturally in an area - they are brought in by humans. Alien plants often force indigenous species out of the area. Mesquite is a good example of an alien species in the Northern Cape.

Alternative – A possible course of action, in place of another, that would meet the same purpose and need defined by the development proposal. Alternatives considered in the EIA process can include location and/or routing alternatives, layout alternatives, process and/or design alternatives, scheduling alternatives or input alternatives.

Aspect – Element of an organisation's activities, products or services that can interact with the environment.

Auditing – A systematic, documented, periodic and objective evaluation of how well the Environmental Management Program is performing. Auditing aims to help safeguard the environment by facilitating management control, including compliance with regulatory requirements. Results of the audit help the organisation to improve its environmental policies and management systems.

Aquifer - a geological formation of porous rock, such as sandstone, that has the ability to store water and may yield water to wells and springs

Biodiversity – The rich variety of plants and animals that live in their own environment. The Succulent Karoo is a good example of rich biodiversity in the Northern Cape.

Built environment – Physical surroundings created by human activity, e.g. buildings, houses, roads, bridges and harbours.

Conservation – Protecting, saving and using resources wisely, especially the biodiversity found in an area.

Contamination – Polluting something or making it impure.

Corrective (or remedial) action – Response required to address an environmental problem that is in conflict with the requirements of the EMPR. The need for corrective action may be determined through monitoring, audits or management review.

Cumulative Impact - an impact that is not necessarily significant in itself, but which may become significant when considered in addition to the existing and potential impacts of other similar or diverse activities in the area

Degradation – The lowering of the quality of the environment through human activities, e.g. river degradation and soil degradation.

Direct Impact - A generally obvious and quantifiable impact, usually associated with the construction, operation or maintenance of an activity, which is caused directly by the activity and generally occurs at the time and place of the activity.

'Do-Nothing' Alternative - The option of not undertaking the proposed activity or any of its alternatives, which provides the baseline against which the impacts of other alternatives should be compared.

Ecology – The scientific study of the relationship between living things (animals, plants and humans) and their environment.

Ecosystem – The relationship and interaction between plants, animals and the non-living environment.

Endangered Species - Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating, including taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Endemic - Having a distribution restricted to a particular area or region.

Environment – Our surroundings, including living and non-living elements, e.g. land, soil, plants, animals, air, water and humans. The environment also refers to our social and economic surroundings, and our effect on our surroundings.

Environmental Impact - An environmental change caused by a human activity.

Environmental Impact Assessment (EIA) – An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of a proposed development. The EIA includes an evaluation of alternatives, recommendations for appropriate management actions for minimising or avoiding negative impacts and for enhancing positive impacts, and proposed monitoring measures.

Environmental Management - Addressing environmental concerns in all stages of development, in order to ensure that the development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management System (EMS) – Environmental Management Systems (EMS) provide guidance on how to manage the environmental impacts of activities, products and services. They detail the organisational structure, responsibilities, practices, procedures, processes and resources for environmental management. The ISO14001 EMS standard has been developed by the International Standards Organisation.

Environmental Management Program - An operational plan that organises and coordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Environmental policy – Statement of intent and principles in relation to overall environmental performance, providing a framework for the setting of objectives and targets.

Force Majeure – An Event of Force Majeure means any circumstance which is beyond the control of the aggrieved party and is not reasonably foreseeable by the same, such as but not limited to: acts of God, orders of the authority, change of laws, etc.

1. An Event of Force Majeure can be:
(a) drought, hail, heavy or torrential rain meaning precipitation of more than 40 mm per hour, floods, tornados, fires, landslides or other adverse natural phenomena except lightning strikes, which prevent the Contractor to perform the Works, get access to the Site or otherwise perform any of its obligations under this Agreement;
(b) epidemics, quarantine restrictions, war or civil conflicts,
(c) national, territorial or sector strikes (other than strikes limited to the Contractor's or its subcontractors' business);
(d) sabotage, terrorism, acts of vandalism, embargoes;
(e) explosions, archaeological finds;
(f) changes in applicable legislation, the revocation or suspension of any authorisation, permit or license or any other decision or act of any authority which cannot be ascribed to the party affected by the force majeure event;
(g) climate conditions that exceed those for which the plant was designed and that are detailed in the respective technical specifications of the plant;
(h) climate or meteorological conditions that, according to health and safety laws and regulations, make the access to the site and/or the execution of the works unsafe or, otherwise, unviable.
2. For the sake of clarity, lightning strikes do not constitute an Event of Force Majeure.

Habitat – The physical environment that is home to plants and animals in an area, where they live, feed and reproduce.

Hazardous waste – Waste, even in small amounts, that can cause damage to plants, animals, their habitat and the well-being of human beings, e.g. waste from factories, detergents, pesticides, hydrocarbons, etc.

Homogeneous - of the same nature; uniform

Hydrology - The science encompassing the behaviour of atmospheric, surface and ground water.

Indirect Impact - An impact that occurs at a different time or place to the activity that causes it.

Impact – A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Indigenous - Having occurred naturally in the area in question before the year 1800.

Indigenous species – Plants and animals that are naturally found in an area.

Infrastructure – The network of facilities and services that are needed for economic activities, e.g. roads, electricity, water, sewerage.

Integrated – Mixing or combining all useful information and factors into a joint or unified whole. See Integrated Environmental Management.

Integrated Environmental Management (IEM) – A way of managing the environment by including environmental factors in all stages of development. This includes thinking about physical, social, cultural and economic factors and consulting with all the people affected by the proposed developments.

Interested and Affected Party (I&AP) - a person, group or organisation interested in or affected by a proposed activity, and any organ of state that may have jurisdiction over any aspect of the activity.

Land use – The use of land for human activities, e.g. residential, commercial, industrial use.

Laydown area - An area that has been cleared for the temporary storage of equipment and supplies. Laydown areas are usually covered with rock and/or gravel to ensure accessibility and safe manoeuvrability for transport and off-loading of vehicles.

Mitigation – Measures designed to avoid, reduce or remedy adverse impacts.

Natural environment – Our physical surroundings, including plants and animals, when they are unspoiled by human activities.

Over-utilisation – Over-using resources - this affects their future use as well as the environment.

Parameter - a set of measurable factors such as temperature, pressure and pH that define a system and determine its behaviour.

Photovoltaic Cell - A cell that converts solar energy into electrical energy.

Photovoltaic Effect - the effect attained when the electrons within a photovoltaic cell are excited by solar radiation.

Photovoltaic Module - a packaged unit consisting of interconnected photovoltaic cells or development.

Policy – A set of aims, guidelines and procedures to assist in the decision-making and management of an organisation or structure. Policies are based on people's values and goals.

Process – Development usually happens through a process – a number of planned steps or stages.

Proponent – Developer or entity applying for environmental approval and ultimately accountable for compliance with conditions stipulated in the Environmental Authorisation (EA) and requirements of the EMPr.

Public Participation Process - a process of involving the public in order to identify needs, address concerns, choose options, plan and monitor in terms of a proposed project, programme

Recycling – Collecting, cleaning and reusing materials.

Red Data Species - a species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or the South African Red Data List

Resources – Parts of our natural environment that we use and protect, e.g. land, forests, water, wildlife, and minerals.

Scoping - a procedure for determining the extent of and approach to an EIA, used to focus the EIA to ensure that only the significant issues and reasonable alternatives are examined

Scoping Report – A report presenting the findings of the scoping phase of the EIA. This report is primarily aimed at reaching closure on the issues and alternatives to be addressed in the EIA (in the case of a full EIA process).

Significant Impact - an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment

Sky glow - Illumination of the night sky when light reflects off particles in the atmosphere such as moisture, dust, or smog.

Stakeholders – A subgroup of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term includes the proponent, authorities and all interested and affected parties.

Storm water management – Strategies implemented to control the surface flow of storm water in such a way as to mitigate erosion, sedimentation and pollution of surface and groundwater resources in the immediate and surrounding environments. This is specifically important during the construction and decommissioning phases of a project.

Sustainable development – Development that is planned to meet the needs of present and future generations, e.g. the need for basic environmental, social and economic services. Sustainable development includes using and maintaining resources responsibly.

Sustainability – Being able to meet the needs of present and future generations.

Topography - graphic representation of the surface features of a place or region on a map, indicating their relative positions and elevations

Waste Management – Classifying, recycling, treatment and disposal of waste generated during construction and decommissioning activities.

Wetlands – An area of land with water mostly at or near the surface, resulting in a waterlogged habitat containing characteristic vegetation species and soil types e.g. vleis, swamps.

Zoning – The control of land use by only allowing a specific type of development in fixed areas or zones

ABBREVIATIONS

BEE	Black Economic Empowerment
BID	Background Information Document
CE	Consulting Engineer
CLO	Community Liaison Officer
CO_2	Carbon dioxide
CSP	Concentrated Solar Power
DAFF	Department of Agriculture, Fisheries and Forestry
DENC	Department of Environment and Nature Conservation
DEA	Department of Environmental Affairs
DM	District Municipality
DNI	Direct Normal Irradiation
DoE	Department of Energy
DR&PW	Provincial Department of Roads and Public Works, Northern Cape
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMC	Electromagnetic Conformance
EMF	Environmental Management Framework
EMPr	Environmental Management Program
EO	Environmental Officer
EPWP	Expanded Public Works Programme
ESO	Environmental Site Officer
ESS	Environmental Scoping Study
F	Fluorides
FIT	Feed-in Tariff
GDP	Gross Domestic Product
GG	Government Gazette
GHG	Greenhouse Gas
GIS	Geographical Information Systems
GN	Government Notice
GPS	Global Positioning System
GWh	Gigawatt Hour
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IPP	Independent Power Producer
kV	Kilovolt
LED	Local Economic Development
MAR	Mean Annual Rainfall
MW	Megawatt
NEMA	National Environmental Management Act
NEM:WA	National Environmental Management: Waste Act
NERSA	National Energy Regulator of South Africa
NO_3 as N	Nitrates
NWA	National Water Act

O&M	Operations and Maintenance
POL	Petrochemicals, Oils and Lubricants
PPE	Personal Protective Equipment
PV	Photovoltaic
REFIT	Renewable Energy Feed-In Tariff
RFQ	Request for Qualification
RFP	Request for Proposal
RoD	Record of Decision
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SMMEs	Small, Medium and Micro Enterprises
RE	Residential Engineer
TDS	Total Dissolved Solids
ToR	Terms of Reference
UV	Ultraviolet
VAC	Visual Absorption Capacity
WMA	Water Management Area

1. SUMMARY AND OVERVIEW OF THE PROPOSED PROJECT

Greefspan PV Power Plant No 2 (RF) (Pty) Ltd is the permit holder of the environmental authorisation for the construction of a 55MW commercial photovoltaic (PV) power station of fixed or tracking systems and associated infrastructure, situated on a part of the Remainder of Portion 1 of the Farm, Kwartelspan No 25, District Hopetown, Pixley Ka Seme District Municipality, Northern Cape Province, hereafter referred to as "the Property". (Appendix L)

The development will have a footprint of approximately 160 ha and the authorised infrastructure associated with this facility includes:

- lighting protection systems, including masts of up to 25m;
- any equipment and upgrades or expansions required to the substation;
- internal service roads (5m) and where required an access road;
- small administrative, control and security buildings (300-400m^2);
- ablution facilities;
- workshops, storerooms and laydown areas;
- perimeter fencing and security systems 10m from nearest PV modules;
- area lighting (movement activated);
- small parking area; and
- internal reticulation approximately 500mm below ground.

The Greefspan PV Power Plant No. 2 environmental authorisation (EA) includes an onsite substation. However, once construction is complete it will be necessary to hand over a portion of the substation (specifically the switching station component) to Eskom, together with the overhead power lines (evacuation lines) that will connect the switching station to the national grid. The ownership of this grid connection infrastructure (switching station and evacuation lines) as well as the EA for this infrastructure must be ceded to Eskom after construction is complete. As such, it is necessary to remove the evacuation lines and switching station from the current EA and place this infrastructure into a separate EA that can be ceded to Eskom i.e. it is necessary to split the EA into two authorisations. Specifically, the description, location, and extent of the authorised development will not change, and the nature and significance of the impacts associated with the development will remain unchanged – it is simply that the existing EA will be split into two separate EAs.

The area required for both the project and Eskom components of the substation would total approximately 9 600 m^2 i.e. less than 1 ha. Separately the areas required are approximately 6 400 m^2 for the project component and 3 200 m^2 for the Eskom component. The separation of the two components into separate EA's does not increase the footprint of the substation. The EA currently includes the onsite substation (project and Eskom portions) and 132 kV grid connection/evacuation line (a double circuit line that will loop in and out of the existing Eskom lines).

Note that the project substation should not be removed from the existing EA.

Note that the property, land owner and Applicant details would be identical to that in the current Environmental Authorisation.

The reasons and/or motivation for the application for amendment:

The Greefspan PV Power Plant No. 2 grid connection (evacuation lines) and Eskom substation component (switching station) will be constructed by the project developer (the Applicant), then handed over at commencement of operation to Eskom. The project developer will retain the ownership of the PV project site as well as the project substation component. After construction, Eskom will become the owner of the grid connection infrastructure (evacuation lines and switching station) and will assume all responsibilities for the operation, maintenance and management of the grid connection infrastructure. To ensure that the permits and the ensuing operational and environmental management obligations associated with the grid connection infrastructure can be handed over to Eskom, it is important that the different activities be split into separate EAs.

The Greefspan PV Power Plant No 2 Project has been awarded Preferred Bidder status under the Department of Energy's Renewable Energy Power Producer Procurement Programme. This means that the Project will sign a power purchase agreement with Eskom Holdings SOC Limited ("Eskom"). The Project is currently waiting for Eskom to finalise the agreements and cannot construct prior to this.

No change in ownership has occurred. The ownership of the connecting lines and switching station (Eskom substation component) would only become Eskom's property after construction, at which point it will be necessary to apply for a change in ownership of the EA.

1.1. Summary of Environmental Impacts due to Amendment Application

Any negative environmental impacts that may occur if the application for amendment is granted, amongst others information on any increases in air emissions, waste generation, discharges to water and impacts of the natural or cultural environment is described and assessed.

The requested amendments would not change the scope of the proposed development; nor increase the level or nature of the impact, which impact was initially assessed and considered when application was made for the environmental authorisation.

Any negative environmental impacts that may occur if the application for amendment is not granted is described and assessed.

If the request to split the grid connection infrastructure into a separate EA is not granted, it will not be possible to cede this portion of the development to Eskom, and the project company would not be able to fulfil Eskom's requirements to connect to the national grid. As such, the development would not be allowed to operate and hence the project and its associated positive impacts such as job creation, local expenditure, and the generation of energy from a clean, renewable source etc. would not occur.

Any positive environmental impacts that may occur if the application for amendment is granted, amongst others the ecological footprint, air emissions, waste generation and discharges to water is described and assessed.

The requested amendments would not change the scope of the proposed development; nor decrease the level or nature of the impact, which impact was initially assessed and considered when application was made for the environmental authorisation. The requested amendments will help to ensure that the authorised Greefspan PV Power Plant No. 2 will proceed, and that all of the positive socio-economic benefits associated with the PV Power Plant will be realised.

The split of the EA will not necessitate an amendment to the lease agreements in place with the landowner.

1.2 Background to the Study

On 28 September 2011 the DEA and the National Energy Regulator of South Africa (NERSA) have issued an environmental authorisation to Greefspan PV Power Plant No. 1 for the construction and operation of a 10MW PV power station consisting of one axis tracker systems and associated infrastructure on an area of approximately 44 ha to the south of the Greefspan substation (Appendix B). This plant is now operational. The size of the study area for this application was approximately 150 ha that was much larger than the eventual footprint of the development.

The Greefspan PV Power Plant No. 2 submitted an application for authorisation and downscaling on the remainder of the area of approximately 100 ha already studied to generate 40MW in accordance with the EIA Regulations, 2010 that was accepted by the Department of Environment Affairs. A basic EIA process was then followed.

On 6 September 2012 an Environmental Authorisation was issued to the Greefspan PV Power Plant No. 2 that would be located on the remainder of the area of approximately 100 ha studied to generate 40MW that would tie into the network on the transmission level. (Appendix L)

The Greefspan PV Power Plant No. 2 then submitted an application for amendment to change the area and power generated from 40MW with a footprint of approximately 100 ha to 55MW with a footprint of approximately 160 ha.

DEA requested that additional information be submitted and public participation be conducted. This was conducted as per the EIA Regulations, 2010. The DEA authorised the first amendment of the EA issued on 12 March 2013. (Appendix L)

The authorised environmental impact assessment study and amendment identified and evaluated potential environmental impacts associated with all aspects of the 55MW project for detailed study, including specialist studies, on the study area. It contained a detailed description of the nature and extent of the 55MW Greefspan PV Power Plant No 2. Information and input from the proponent, specialists, the authorities and Interested and Affected Parties (I&APs) were used to identify and evaluate potential environmental impacts (both social and biophysical) associated with the proposed project. No environmental fatal flaws were identified.

Due to the technical and economical requirements of a PV power station, close proximity to a substation is essential and therefore only one possible site has been identified for the development. The Eskom Greefspan Substation is located on the farm De Rust, a part of the remainder of Portion 1 of the farm Kwartelspan No. 25 in the Northern Cape. The farm is situated approximately 60 km south of Douglas on the R357. This site was selected as it conformed to the criteria for the development of a PV power station.

Environmental, technical and economic feasibility must be taken into account and therefore factors such as meteorology, land availability and land use capability, costs and grid connection capacity have been considered by the permit holder.

The second amendment to the EA dated 6 September 2012 was an administrative amendment and was authorised by DEA on 17 August 2015. The holder of the EA and the validity period was amended. (Appendix L)

The third amendment to the EA dated 6 September 2012 was also an administrative amendment and entailed the amendment of the validity period of authorised activities to commence, amendment of the authorised coordinates of the substation to the coordinates of the site centre point, and to change details of the EA holder (Appendix L). This was authorised by DEA on 6 September 2017.

1.3 Legislative Matters

A fourth amendment application (this application) has been submitted and DEA stipulated in its response letter dated 4 September 2017 that this fourth application for amendment falls within the ambit of amendments to be applied for in terms of Part 02 of Chapter 5 of NEMA, EIA Regulations, 2014 (as amended). It also stipulates that separate reports, EMPr and Layout Plans be compiled and submitted as per the proposed split of the EA. The reports must specify the conditions of the original EA and subsequent amendments that apply to the relevant split.

1.3.1 Conditions of EA dated 6 September 2012

The holder of the EA currently complies with the stipulations of the EA stipulated below. These conditions would all remain applicable to the EA for the Greefspan PV Power Plant 2, after the requested split of the existing EA.

Scope of Authorisation

1. Proposed 40MW[1] Greefspan PV Power Station of fixed or tracking system and associated infrastructure at the Greefspan Substation is approved. Eskom Greefspan Substation is located on the farm De Rust, Remaining Extent of Portion 1 of the farm Kwartelspan No. 25 in the Northern Cape. The proposed PV power station will tie into the network on the transmission level, which is from 33kV to 132kV.
2. Authorisation of the activity is subject to the conditions contained in the authorisation, which form part of the EA and are binding on the holder of the authorisation.
3. The holder of the authorisation is responsible for ensuring compliance with the conditions contained in the EA. This includes any person acting on the holder's behalf, including but not limited to, an agent, servant, contractor, sub-contractor, employee, consultant or any person rendering a service to the holder of the authorisation.

[1] Note that the capacity was subsequently amended to 55MW in the first amendment to the EA, dated 12 March 2013

4. The activities authorised may only be carried out at the property as described above.
5. Any changes to, or deviations from, the project description set out in this authorisation must be approved, in writing, by the Department before such changes or deviations may be effected. In assessing whether to grant such approval or not, the Department may request such information as it deems necessary to evaluate the significance and impacts of such changes or deviations and it may be necessary for the holder of the authorisation to apply for further authorisation in terms of the regulations.
6. This activity must commence within a period of three years from the date of issue of this authorisation. If commencement of the activity does not occur within that period, the authorisation lapses and a new application for environmental authorisation must be made in order for the activity to be undertaken.
7. Commencement with an activity listed in terms of this EA constitutes commencement of all authorised activities.
8. The holder of an EA must notify the competent authority of any alienation, transfer and change of ownership rights in the property on which the activity is to take place.

Notification of Authorisation and Right to Appeal[2]

9. The holder of the EA must notify every registered I&AP, in writing and within twelve calendar days of the date of this EA, of the decision to authorise the activity.
10. The notification referred to must specify the date on which the authorisation was issued; inform the I&AP of the appeal procedure provided for in Chapter 7 of the EIA Regulations, 2010; advise the I&AP that a copy of the EA will be furnished on request; and give the reasons of the competent authority for the decision.
11. The holder of the EA must publish a notice informing I&APs of the decision; informing I&APs where the decision can be accessed; and drawing the attention of I&APs to the fact that an appeal may be lodged against this decision in the newspaper contemplated and used in terms of regulation 54(2)(c) and (d) and which newspaper was used for the placing of advertisements as part of the public participation process.

Management of the Activity

12. The Environmental Management Program (EMPr) submitted as part of the application for EA is hereby approved. This EMPr must be implemented and adhered to.

Monitoring

13. The applicant must appoint a suitably experienced ECO for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in this authorisation are implemented and to ensure compliance with the provisions of the EMPr.
    - 13.1 The ECO shall be appointed before commencement of any authorised activities.
    - 13.2 Once appointed, the name and contact details of the ECO must be submitted to the *Director: Compliance Monitoring* of the DEA.
    - 13.3 The ECO shall keep record of all activities on site, problems identified, transgressions noted and a task schedule of tasks undertaken by the ECO.
    - 13.4 The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is ready for operation.
    - 13.5 Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

[2] Note that the conditions within this section should be amended to align with the EIA Regulations, 2014. The stipulations of notification of previous regulations differ to that of the EIA Regulations, 2014.

Recording and Reporting to the DEA

14. All documentation e.g. audit/monitoring/compliance reports and notifications, required to be submitted to the DEA in terms of this EA, must be submitted to the *Director: Compliance Monitoring* at the DEA.
15. The holder of the EA must submit an environmental audit report to the DEA within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and within 30 days of completion of rehabilitation activities.
16. The environmental audit report must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the EA conditions as well as the requirements of the EMPr.
17. Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

Commencement of the Activity

18. The authorised activity shall not commence within twenty days of the date of signature of the EA.
19. An appeal under section 43 of the NEMA does not suspend an EA or exemption, or any provisions or conditions attached thereto, or any directive, unless the Minister, MEC or delegated organ of state directs otherwise.
20. Should you be notified by the Minister of a suspension of the authorisation pending appeal procedures, you may not commence with the activity until such time that the Minister allows you to commence with such an activity in writing.

Notification to Authorities

21. Fourteen days written notice must be given to the DEA that the activity will commence. Commencement for the purposes of this condition includes site preparation. The notice must include a date on which it is anticipated that the activity will commence, as well as a reference number. This notification period may coincide with the notice of intent to appeal period.

Operation of the Activity

22. Fourteen days written notice must be given to the DEA that the activity operational phase will commence.

Site Closure and Decommissioning

23. Should the activity ever cease or become redundant, the applicant shall undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time.

Specific Conditions

24. The PV power station must be located 60 m from the R 357.
25. If an electrical fence is used, the electric fence contractor must consult an ecologist to discuss the configurations of the fence.
26. No activities shall be allowed to encroach into a water resource without a Water Use License Authorisation (WULA) being in place from the Department of Water Affairs (now Department of Water and Sanitation).
27. The applicant must obtain a wayleave from the Department of Roads and Public Works prior to construction.
28. Anti-collision devices such as bird flappers must be installed where power lines cross avifaunal corridors. The input of an avifaunal specialist must be obtained for the fitting of the anti-collision devices onto specific sections of the line once the exact positions of the towers have been surveyed and pegged.[3]

[3] This condition would no longer apply to this EA after the switching station & evacuation powerlines have been issued a separate EA.

29. A permit must be obtained from all relevant provincial nature conservation agencies for the removal or destruction of indigenous protected and endangered plant and animal species.
30. Copies of permits in respect of condition 29 above required must be submitted to the Department for record keeping.
31. No exotic plants may be used for rehabilitation purposes. Only indigenous plants of the area may be utilised.
32. Vegetation clearing must be kept to an absolute minimum. Mitigation measures must be implemented to reduce the risk of erosion and the invasion of alien species.
33. Construction must include appropriate design measures that allow surface and sub-surface movement of water along drainage lines so as not to impede natural surface and sub-surface flows. Drainage measures must promote the dissipation of storm water run-off.
34. An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate. Any solid waste shall be disposed of at a landfill licensed in terms of section 20 (b) of the National Environment Management Waste Act, 2008 (Act 59 of 2008).

General

35. A copy of this authorisation and the approved EMPr must be kept at the property where the activity will be undertaken. The authorisation and approved EMPr must be produced to any authorised official of the Department who requests to see it and must be made available for inspection by any employee or agent of the holder of the authorisation who works or undertakes work at the property.
36. The holder of the authorisation must notify both the *Director: Integrated Environmental Authorisations* and the *Director: Compliance Monitoring* at the DEA, in writing and within 48 (forty eight) hours, if any conditions of this authorisation cannot be or is not adhered to. Any notification in terms of this condition must be accompanied by reasons for the non-compliance.
37. National government, provincial government, local authorities or committees appointed in terms of the conditions of this authorisation or any other public authority shall not be held responsible for any damages or losses suffered by the applicant or his successor in title in any instance where construction or operation subsequent to construction be temporarily stopped for reasons of non-compliance by the applicant with the conditions of authorisation as set out in this document or any other subsequent document emanating from these conditions of authorisation.

Reasons for the Decision taken by DEA

1. Information Considered in Making the Decision

In reaching its decision, the DEA took, inter alia, the following into consideration:

a) The information contained in the BAR dated 05 June 2012;
b) The comments received from the Department of Water Affairs, Siyancuma Local Municipality, SAHRA, Telkom, DAFF (Forestry) and Rockwell Diamonds and I&APs as included in the BAR dated o5 June 2012;
c) Mitigation measures as proposed in the BAR dated 05 June 2012 and the EMPr;
d) The information contained in the specialist studies contained within Appendix D of the BAR; and
e) The objectives and requirements of relevant legislation, policies and guidelines, including section 2 of the National Environmental Management Act, 1998 (Act 107 of 1998).

2. Key factors considered in making the decision

All information presented to the Department was taken into account in the Department's consideration of the application. A summary of the issues which, in the Department's view, were of the most significance is set out below:

a) The findings of all the specialist studies conducted and their recommended mitigation measures.
b) PV technology exploits the most abundant source of free power from the sun and has potential to meet almost all of mankind's energy needs.
c) The Siyancuma Local Municipality confirmed that there is water available for the construction of the Greefspan PV Power Station and associated infrastructure.
d) The study areas for the Greefspan PV Power Station falls within a vegetation type categorised as least threatened.
e) The construction of the Greefspan PV Power Station has been approved by Eskom in terms of Section 22 of the Electronic Communications Act, No. 36 of 2005.
f) The BAR dated 05 June 2012 identified all legislation and guidelines that have been considered in the preparation of the BAR dated 05 June 2012.
g) The methodology used in assessing the potential impacts identified in the BAR dated 05 June 2012 and the specialist studies have been adequately indicated.
h) A sufficient public participation process was undertaken and the applicant has satisfied the minimum requirements as prescribed in the EIA Regulations, 2010 for public involvement.

3. Findings

After consideration of the information and factors listed above, the DEA made the following findings:

a) The identification and assessment of impacts are detailed in the BAR dated 05 June 2012 and sufficient assessment of the key identified issues and impacts have been completed.
b) If properly maintained the PV Power Station is expected to have a lifespan of approximately 25 years.
c) The proposed project will be situated in close proximity to the Greefspan Substation.
d) The site can be accessed via the R357 provincial road through the already authorised Greefspan 1 roads (12/12/20/1942 & DEAT/EIA/12807/2011).[4]
e) The Eskom Greefspan substation has the grid capacity to accept the electricity that will be generated by the Greefspan PV Power Station.
f) The environmental impact associated with the integration of the new power station to the existing distribution network as the length of the evacuation lines to the Greefspan substation would be less than 200m and would follow the existing servitude of the existing Eskom transmission lines to the Greefspan substation.
g) The Procedure followed for impact assessment is adequate for the decision-making process.
h) The proposed mitigation of impacts identified and assessed adequately curtails the identified impacts.
i) The information contained in the BAR dated 05 June 2012 is accurate and credible.
j) EMPr measures for the pre-construction, construction and rehabilitation phases of the development were proposed and included in the BAR and will be implemented to manage the identified environmental impacts during the construction phase.

In the view of the above, the DEA is satisfied that, subject to compliance with the conditions contained in the EA, the proposed activity will not conflict with the general objectives of integrated environmental management laid down in Chapter 5 of the National Environmental Management Act, 1998 and that any potentially detrimental environmental impacts resulting from the proposed activity can be mitigated to acceptable levels. The application was accordingly granted.

[4] This stipulation should be amended as the site will be accessed directly from the R 357 and not through the already authorised Greefspan PV1 access road.

1.3.2 Conditions of Amendment 1 dated 12 March 2013

The Greefspan PV Power Plant No. 2 submitted an application for amendment to change the area and power generated from 40MW with a footprint of approximately 100 ha to 55MW with a footprint of approximately 160 ha. DEA requested that additional information be submitted and public participation be conducted. This was conducted as per the EIA Regulations, 2010. The DEA authorised the first amendment of the EA on 12 March 2013 (Appendix L).

The condition was that the amendment must be read in conjunction with the EA dated 06 September 2012 and that all registered I&APs be notified in writing of the DEA's decision in respect of the amendment made as well as the provisions regarding the submission of appeals in the EIA Regulations, 2010.

This was done. The permit holder complies with this stipulation. The amended capacity (55MW) and site footprint (~160ha) will remain applicable to the EA for the Greefspan PV Power Plant 2 after the requested split of the EA.

1.3.3 Conditions of Amendment 2 dated 17 August 2015

The second amendment to the EA dated 6 September 2012 was an administrative amendment and was authorised by DEA on 17 August 2015. The holder of the EA and the validity period was amended. (Appendix L)

The condition was that the amendment must be read in conjunction with the EA dated 06 September 2012 as amended and that all registered I&APs be notified in writing of the DEA's decision in respect of the amendment made as well as the provisions regarding the submission of appeals in the EIA Regulations, 2014.

Furthermore, a shapefile of the approved development layout/footprint must be submitted to the DEA within two months from the date of the EA. The shapefile must be created using the Hartebeesthoek 94 Datum and the data should be in Decimal Degree format using the WGS 84 Spheroid. Data must be mapped at a scale of 1:10 000. The metadata must include a description of the base data used for digitizing. The shapefile must be submitted in a zip file using the EIA application reference number as the title.

The permit holder complies with these stipulations. Find attached the proof of the submission of the shapefile (Appendix K). The amended validity period and details of the holder of the EA will remain applicable to the EA for the Greefspan PV Power Plant 2 after the requested split of the EA.

1.3.4 Conditions of Amendment 3 dated 6 September 2017

The third amendment to the EA dated 6 September 2012 was an administrative amendment and entailed the amendment of the validity period of authorised activities to commence, amendment of the authorised coordinates of the substation to the coordinates of the site centre point, and to change details of the EA holder (Appendix L). This was authorised by DEA on 6 September 2017.

The condition was that the amendment must be read in conjunction with the EA dated 06 September 2012 and that all registered I&APs be notified in writing of the DEA's decision in respect of the amendment made as well as the provisions regarding the submission of appeals in the EIA Regulations, 2014.

The permit holder complies with this stipulation. The amended site centre coordinate would remain applicable to the EA for the Greefspan PV Power Plant 2 after the requested split of the EA.

1.4 Listed Activities in terms of EIA Regulations, 2014

Since the EA was issued on 6 September 2012, the EIA Regulations, 2010 has been repealed and replaced with the EIA Regulations, 2014 (as amended). It is therefore required to list the similar listed activities of these regulations to ensure that the relevant activities are still listed and if any additional activities should be listed that was not within the EIA Regulations, 2010 but became relevant with the promulgation of the EIA Regulations, 2014 (as amended).

Table 1: Similar Listings: EIA Regulations, 2010 vs. EIA Regulations, 2014 (as amended)

EIA Regulations, 2010			EIA Regulations, 2014 (as amended)			
Notice No	**Activity**	**Description EIA Regulations, 2010**	**Notice No**	**Activity**	**Description EIA Regulations, 2014**	**Project Description:**
R544, 18 June 2010	**10 (i)**	The construction of facilities or infrastructure for the transmission and distribution of electricity (i) Outside urban areas or industrial area complexes with a capacity of more than 33 but less than 275 kilovolts	R 983, 4 December 2014 (as amended)	11	The development of facilities or infrastructure for the transmission and distribution of electricity – (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	Onsite cabling (internal, underground) will be required to connect the solar panels to the onsite substation. The voltage of the cabling may exceed 33kV
	11 (xi)	The construction of infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.		12 (ii) (c)	The development of- infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	This activity is listed as a precautionary measure due to the wide definition of a watercourse and wetland within the NEMA and NWA.
	22 (ii)	The construction of a road, outside urban areas, where no reserve exists where the road is wider than 8 metres.		24 (ii) (c)	The development of a road- with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters; but excluding a road- which is 1 kilometre or shorter.	A short access road of approximately 10 metres wide could be constructed **should** it be required.
	29 (i)	The expansion of facilities for the generation of electricity where: the electricity output will be increased by 10 megawatts or more, excluding where such expansion takes place on the original development		36 (i)	The expansion of facilities or structures for the generation of electricity from a renewable resource where- the electricity output will be increased by 10 megawatts or more, excluding where such	A 10 MW PV power station has already been authorised at Greefspan Substation. The authorised power station has been constructed by the time construction of the 55 MW power station, which is currently being applied for, commences,

EIA Regulations, 2010			EIA Regulations, 2014 (as amended)			
Notice No	**Activity**	**Description EIA Regulations, 2010**	**Notice No**	**Activity**	**Description EIA Regulations, 2014**	**Project Description:**
		footprint; or			expansion takes place on the original development footprint; or	
	(ii)	regardless the increased output of the facility, the development footprint will be expanded by 1 hectare or more.		(ii)	regardless the increased output of the facility, the development footprint will be expanded by 1 hectare or more.	the development could possibly constitute an expansion of more than 10 MW and more than 1 hectare as the applicant is the same parent company.
	47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-		56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-	
	(ii)	where no reserve exists, where the existing road is wider than 8 metres –		(ii)	where no reserve exists, where the existing road is wider than 8 metres –	It is a possibility that the 10 m wide access road planned and authorised for the 10 MW PV power plant 1 might need to be lengthened by more than 1 km to provide for access of trucks to offload construction equipment nearer to the area that is currently being applied for.
		excluding widening or lengthening occurring inside urban areas.			excluding where widening or lengthening occur inside urban areas.	
R545, 18 June 2010	1	The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.	R 984, 4 December 2014 (as amended)	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more,	The electricity output of the planned PV power station would be 55 MW.
					excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs-	
				(a)	Within an urban area; or	
				(b)	On existing infrastructure.	
	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more		15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-	The construction and operation of the planned 55MW PV power station would require that an area of approximately 160 hectares of indigenous vegetation be cleared.
				(i)	The undertaking of a linear activity; or	
				(ii)	Maintenance purposes undertaken in accordance with a maintenance management plan.	
				28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:	
				(ii)	Will occur outside an urban area, where the total	

EIA Regulations, 2010			EIA Regulations, 2014 (as amended)			
Notice No	**Activity**	**Description EIA Regulations, 2010**	**Notice No**	**Activity**	**Description EIA Regulations, 2014**	**Project Description:**
					land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.	
R546, 18 June 2011	14 (a) i	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, Northern Cape All areas outside urban areas.	R 983, 4 December 2014 (as amended)	27 (i) (ii)	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— the undertaking of a linear activity; or maintenance purposes undertaken in accordance with a maintenance management plan.	The activity will be situated in an area in the Northern Cape where indigenous vegetation constitutes more than 75% of the total vegetation, and more than 5 hectares will be cleared for the construction phase of the proposed PV power station.

The EIA Regulations, 2014 transitional arrangements and commencement is applicable. Section 52 "Continuation of Actions Undertaken and Authorisations Issued Under Previous NEMA Regulations" S 52 (1) states that any actions undertaken in terms of the previous NEMA regulations and which can be undertaken in terms of a provision of these Regulations must be regarded as having been undertaken in terms of the provision of these Regulations.

S 52 (2) states that any authorisation issued in terms of the previous NEMA Regulations must be regarded to be an environmental authorisation issued in terms of these Regulations.

1.5 Other Applicable Legislation and Policies

In terms of the **National Heritage Resources Act, Act No. 25 of 1999**, any person who intends to undertake "*any development or other activity which will change the character of a site – exceeding 5 000 m² in extent*" and "*the construction of a …linear development or barrier exceeding 300 m in length*" must at the very earliest stages of initiating the development notify the responsible heritage resources authority, *viz.* the Northern Cape Provincial Heritage Resources Agency (NCPHRA) and/or the South African Heritage Resources Agency (SAHRA), as well as the Northern Cape Department of Sports, Arts and Culture.

The amended EIA Report will be uploaded to the SAHRIS web portal to enable SAHRA to comment on it. The archaeological impact assessment and palaeontological assessment are attached in Appendices E and F. Find SAHRA's comment attached in Appendix N.

Section 5 of the **Conservation of Agricultural Resources Act, Act No. 43 of 1983**, prohibits the spreading of weeds and Section 6 and Regulation 15 and 15 E of GN R 1048 address the implementation of control measures for alien and invasive plant species. This aspect has been addressed in the Environmental Management Program (Appendix I). This act also makes provision for the conservation of agricultural land.

Subdivision of Agricultural Land Act, Act 70 of 1970 control the subdivision and, in connection therewith, the use of agricultural land. It also controls long term leases over portions of agricultural land.

National Forests Act, Act No. 84 of 1998 and Regulations, Section 7: No person may cut, disturb, damage or destroy any indigenous, living tree in a natural forest, except in terms of a licence issued under Section 7(4) or Section 23; or an exemption from the provisions of this subsection published by the Minister in the Gazette. Sections 12-16 deal with protected trees, with the Minister having the power to declare a particular tree, a group of trees, a particular woodland, or trees belonging to a certain species, to be a protected tree, group of trees, woodland or species. In terms of Section 15, no person may cut, disturb, damage, destroy or remove any protected tree; or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister.

A licence has been issued to the EA holder (Appendix J).

DAFF also administer the **National Veld and Forest Fire Act, Act No. 101 of 1998**.

Section 17 of the **Fencing Act, Act No. 31 of 1963,** states that any person erecting a boundary fence may clean any bush along the line of the fence up to 1.5 metres on each side thereof and remove any tree standing in the immediate line of the fence. However, this provision must be read in conjunction with the environmental legal provisions relevant to protection of flora.

Sections 9-11 of the **National Environmental Management: Air Quality act, Act No. 39 of 2004,** regulates national, provincial and local ambient air quality standards. Activities are addressed in Section 21. Section 22 addresses atmospheric emissions licenses. Dust control measures are also applicable.

The **National Environmental Management: Biodiversity Act, Act No. 10 of 2004** provides for the MEC/Minister to list ecosystems that are threatened and in need of protection (Section 52) and to identify any process or activity in such a listed ecosystem as a threatening process (Section 53). A list of threatened and protected species has been published in terms of Section 56 (1) GG 29657 GN R 151 and GN R 152, Threatened or Protected Species Regulations.

The act also deals with restricted activities involving alien species; restricted activities involving certain alien species totally prohibited; and duty of care relating to listed invasive species.

The **National Environmental Management Waste Act, Act No. 59 of 2008** reforms the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

In terms of the definitions contained in Section 1 of the **National Water Act, Act No. 36 of 1998**, a "water resource" includes a watercourse, surface water, estuary, or aquifer. "Aquifer" means a geological formation which has structures or textures that hold water or permit appreciable water movement through them. "Watercourse" means a river or spring; a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Furthermore, in terms of the definitions contained in Section 1 of the National Water Act, waste "includes any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted".

The Minister of Water and Environmental Affairs is allowed to regulate activities which have a detrimental impact on water resources by declaring them to be controlled activities. No person may undertake a controlled activity unless such person is authorised to do so by or under this Act.

Duty of Care to prevent and remedy the effects of pollution to water resources is addressed in Section 19. Section 20 addresses the procedures to be followed, as well as control of emergency incidents which may impact on a water resource.

Recognised water uses are addressed in terms of Section 21 and the requirements for registration of water uses are stipulated in Section 26 and Section 34.

Siyancuma Local Municipality confirmed that they will be able to supply approximately 60 kl water per day for the duration of the project.

Should the need arise to utilise groundwater resources at any time in future for the operation of the PV power station the relevant EIA and supporting studies is to be used to support the Water Use Application process for the utilisation of groundwater resources.

Section 25 of the **Environment Conservation Act, Act No. 73 of 1989,** as well as the National Noise Control Regulations GN R 154 dated 10 January 1992, regarding noise, vibration and shock, is applicable.

Section 8 of the **Atmospheric Pollution Prevention Act, Act No. 45 of 1965**, regulating controlled areas, as well as Section 27, with regard to dust control, is still applicable.

Section 28 of the **National Environmental Management Act, Act No. 107 of 1998** requires duty of care where reasonable measures are taken to prevent pollution or degradation from occurring, continuing or recurring, or, where this is not possible, to minimise and rectify pollution or degradation of the environment. Section 29 addresses the protection of workers refusing to do environmentally hazardous work. Section 30 addresses procedures to be followed in the event of an emergency incident which may impact on the environment. Access to environmental information and protection of whistle blowers are addressed in Section 31.

Should the developer wish to obtain gravel for the concrete required for the bases of the PV installations rather than outsourcing the supply of concrete, the **Minerals and Petroleum Resources Development Act, Act No. 28 of 2002** may become directly applicable. If the concrete supply is outsourced, this act would be indirectly applicable through the ISO 9001 and ISO 14001 and the cradle-to-grave principles, by which the developer has an obligation to ascertain that the contractor supplying the concrete complies with the relevant legislation by only sourcing gravel from permitted areas.

The **Occupational Health and Safety Act, Act No. 85 of 1993** GN. R. 2281 of 1987 – 10-16: Environmental Regulations for Workplaces are applicable.

The **Northern Cape Nature Conservation Act, Act No. 9 of 2009** addresses protected species in the Northern Cape and the permit application processes related thereto.

Fauna and flora permits have been issued for this planned development (Appendix J).

The **South African Civil Aviation Regulation Act, Act 13 of 2009** controls markings of structures that may influence aviation through the Civil Aviation Technical Standard, SA-CATS-AH 139.01.33 Obstacle Limitations and Markings outside Aerodrome or Heliports.

It states that any structure exceeding 45 m above ground level, or structures where the top of the structure exceeds 150 m above the MEAN ground level, like on top of a hill, the mean ground level considered to be the lowest point in a 3 km radius around such structure. Structures lower than 45 m, which are considered as a danger or a potential danger to aviation, shall be marked as such when specified. Overhead wires, cables, etc., crossing a river, valley or major roads shall be marked and in addition, their supporting towers marked and lighted if an aeronautical study indicates that it could constitute a hazard to aircraft.

The highest structures that would be constructed at the proposed development would be the lightning conductors, which would have a height of 25 m.

National Environmental Management: Protected Areas Act, Act 57 of 2003 and its Regulations are applicable. The EAP is not aware at the time of report writing of any protected areas situated within a 10 km radius of the planned development.

The **Advertising on Roads and Ribbon Development Ac, Act No 21 of 1940** is administered by the Department of Roads and Public Works.

The **Promotion of Access to Information Act, Act No. 2 of 2000** and the **Promotion of Administrative Justice Act, Act No. 3 of 2000** is applicable to all government departments.

The **White Paper on Renewable Energy (2003**) with national targets for renewable energy generation is applicable.

1.6 Terms of Reference

Van Zyl Environmental Consultants has been appointed by the permit holder as well as applicant, Greefspan PV Power Plant No. 2 (RF) (Pty) Ltd, as the independent environmental assessment practitioner (EAP) to manage the amendment application process to amend the EIA and EMPr and conduct the public participation process as stipulated in the EIA Regulations 2014, in terms of the National Environmental Management Act, Act No 107 of 1998 (as amended) for the proposed project. Neither Van Zyl Environmental Consultants nor any of its specialist sub-consultants on this project are subsidiaries of or are affiliated to Greefspan PV Power Plant No. 2 (RF) (Pty) Ltd. Van Zyl Environmental Consultants does not have any interest in secondary developments that may arise from the authorisation of the proposed amendment.

1.7 Details of the Environmental Assessment Practitioner and Expertise

Van Zyl Environmental Consultants is an environmental consulting firm providing environmental management services, including environmental impact assessments and planning to evaluate risk and ensure environmental compliance of proposed developments, as well as the implementation of environmental management tools.

Irmé van Zyl is the sole member of Van Zyl Environmental Consultants and is fulfilling the duties as EAP.

Irmé van Zyl has been working in the environmental management field for almost 19 years. She has experience in environmental impact assessments in terms of the NEMA, NEM:WA, MPRDA, water use licences in terms of NWA, environmental risk assessments, compilation of EMPr's, environmental management, public participation processes, environmental rectification applications and the implementation thereof, acted as environmental control officer during implementation of projects, conducted independent environmental compliance audits, fauna and flora permit and licence applications, and has been involved in environmental studies for a variety of projects throughout the Northern Cape.

These include a butchery, a meat processing plant, residential developments, establishment of a new cemetery and closure of an old cemetery (including management plans for cemeteries), bridges, tourism industry (caravan parks, chalets etc.), wastewater treatment works, a medical care waste treatment facility, illegal disposal of medical waste, a

waste site, PV power stations, a runway, pipelines, borrow pits, roads, a reverse osmosis water purification and brine treatment plant as well as an eco-estate development. (Appendix P)

1.8 Specialist Studies

Specialist studies were conducted on the entire study area of 150 ha. It comprised of:

- Evaluation of impact of the solar plant on wildlife by Ken Coetzee & Wallie Stroebel (Appendix C)
- Biophysical assessment of the proposed Greefspan PV Power Station (Appendix C)
- Biota study by Mr. B.H. Erasmus (Appendix C);
- Avifaunal and bat desktop specialist report by Ms Beryl Wilson (Appendix D);
- Phase 1 archaeological impact study by Mr. David Morris (Appendix E);
- Palaeontological impact study by Dr John Almond (Appendix F);
- Visual Impact Assessment by Mr Gerhard Griesel (AXIS Landscape Architecture) (Appendix G);
- Agricultural Impact Assessment including a soil potential survey by Mr Christo Lubbe (Appendix H).

2. ACTIVITY DESCRIPTION

2.1 Construction Phase Activities

2.1.1 Surveys

Before construction can commence, a number of surveys might be required including, but not limited to, a geotechnical survey, a site survey to confirm the micro footprint, surveying of identified GPS points of PV support structures, and the road servitudes and the internal access roads.

2.1.2 Construction of Access Roads to the Site and Internal Roads

The site where the PV power station is proposed to be developed lies to the northwest of the R357 with Douglas to the north and Prieska to the south from where the development will gain access (Appendix A). A gate will be implemented in the farmer's fence to access to the site.

Internal or service roads would be needed within the site for the construction as well as the operation and maintenance phases. The construction of these tracks would comprise gravel for filling and higher quality surfacing on top. Should this be needed, the gravel is to be sourced from a permitted borrow pit. The strength and durability of the in situ rock strata at the proposed site are currently unknown and are to be assessed via a geotechnical study to be conducted by the project proponent if necessary. The results of this study would indicate whether the vegetation and ground surface could be stripped, and the exposed formation levelled, compacted and used as an access track surface.

2.1.3 Site Preparation and Construction Laydown Areas

Activities would include the removal of vegetation and levelling of the laydown and storage areas for the construction equipment as well as the footprint of each project component. The topsoil would be stripped and stockpiled, backfilled and/or spread on the site. Areas where construction would take place would be levelled. A construction camp and offices, as well as an area for the storage and use of petrochemicals, oils and lubricants (POL), and a storage area for construction equipment and infrastructure, machinery and vehicles would be established. The construction camp and offices would be fenced with ~1,8m fencing. Temporary ablution facilities for workers on site will be implemented and a waste storage area will be implemented with bins for recyclable and non-recyclable materials to be removed weekly.

2.1.4 Transportation of Equipment, Infrastructure and Materials to Site

Equipment and materials required for the construction of the proposed power station would be transported to the study area from various parts of the country by means of national and provincial roads as well as the proposed internal access road.

Civil construction equipment would need to be brought to the site. These could include, among other types of equipment, excavators, trucks, graders, compaction equipment, and cement trucks.

2.1.5 Ancillary Infrastructure

Vegetation would be required to be cleared and areas of the site would need to be levelled. Excavation and lying of foundations of buildings and other structures would be required. Should the area to be constructed be too far from the construction camp, a laydown area to keep building material and equipment would also be required.

In the first phase of development, lightning protection would be provided by galvanised steel masts with a height of up to 25m, which would be founded in excavated holes of 1m x 1m and a depth of 1,5m.

The perimeter fence and security system would be implemented approximately 10m from the nearest PV modules. Holes would be dug up to 600mm and 2,4m fence poles would be concreted into place. The fence would then be erected according to specifications and electrified. Electricity would be supplied underground to the fence and buildings. The type of fencing to be used would be a fence of ~2,4m as it is stronger and more intruder proof.

Lampposts would be installed near to the fence and CCTV cameras near to or on the fence if required.

An infrared detection system may be attached to the lampposts around the perimeter. If not attached to the bottom of lampposts these systems could be installed on low poles. An optic fibre cable could be installed in the fence as a detection system, but this is very expensive. Security systems and personnel would start operating at the beginning of the construction phase.

A concrete batching plant could be erected on site, in Douglas or pre-mixed concrete obtained from an external supplier. The distance to the site from Douglas and Prieska would however be a limiting factor. A large amount of concrete would be required for the bases of the support structures as well as for anchoring and foundations of the entire ancillary infrastructure such as pylons, fencing, poles, buildings etc.

Potable water would be supplied via trucks or small trailers where personnel are working.

For the authorised projects the water for construction and operation would be sourced from the Siyancuma Local Municipality who are a registered Water Service Provider and this arrangement has been confirmed by DWS. (Appendix M)

The bulk of the water is required for concrete in the construction phase. The Siyancuma LM has confirmed that there is water available at the peak draw down rates of 60 600 ℓ/day that is the estimated peak construction demand, required for the authorised project on an on-going basis.

During the construction period chemical toilets would be available on site. A waterborne sewage system would be constructed for operational phase. Grey & sewage water would be contained in closed cell tanks with a size sufficient to contain a month's effluent. When the tank is full, sewage would be removed by the developer or preferably by the local municipality to the sewage works at Douglas.

During the construction phase generators would most likely be used for power supply because of the expanse of the construction site. Alternatively, since the site is generally developed adjacent to the electrical substation, it might be arranged to temporarily source construction power directly from the substations.

General and emergency maintenance of infrastructure, vehicles and machinery would be done on site. Vehicles and machinery would be moved to the nearest workshop to be repaired.

2.1.6 Footing Execution, Positioning and Assembly of Support Structures, and Ancillary Infrastructure

Vegetation and topsoil (15-20cm) would be removed and topsoil stockpiled. Concrete, screw or the driving pile method would be used to anchor the PV panel support structure to the ground.

After transporting the main parts of the structures to the field the structures would be assembled using a small crane. Guide ropes would be used for the hoisting and positioning of the structural components. The main body of the structure would be positioned on the anchors of the foundation footer. Slings would be used to lift the structure, move it and lower it until it rests securely on the surface of the footing. The grill would then be hoisted up and placed on the structure.

Internal electrical reticulation would be approximately 500mm below ground. Vegetation would be removed and trenches dug for the reticulation. Concentration boxes with inspection covers, transformation centres and a distribution centre would be installed.

2.2 Decommissioning of Construction Areas after Completion of Construction Work

All the clean and solid construction waste would be used in backfill or onsite landscaping where possible. This is a use/reuse matter and is usually the most cost-effective as well. Construction waste that is not appropriate for backfill or for landscaping would be disposed of at the closest municipal waste site.

Construction rubble and other waste would be removed to nearest general waste site. The construction camp, infrastructure, equipment, machinery and vehicles that would not be used during the operation and maintenance

phase would be removed. Compacted areas would be ripped where necessary. Topsoil would be replaced in areas where the operational phase would not continue and rehabilitated where practical and reasonable.

2.3 Operational & Maintenance Phase Activities

Electricity would be generated by the PV modules, transferred to the concentration boxes and transformation centres and then to the distribution centre. It would then be transferred via the evacuation power line to the substation from where it would be fed into the Eskom transmission network.

Full-time security personnel may remain on the site and maintenance and control room staff would be required. The entire PV power station would be operational except under circumstances of mechanical breakdown, unfavourable weather conditions or maintenance activities.

Electrical and mechanical maintenance of the PV structures and all ancillary infrastructure will take place as and when necessary.

The PV modules would have to be cleaned regularly. This could either be done by using a vehicle based compressor to wash the modules down with water or by mechanically cleaning the modules with squeegees. The latter option is labour intensive and would create general unskilled jobs. Approximately 1 000m^3 water/annum would be needed for a 5MW power station, should it be cleaned thrice yearly. The water could be obtained from existing/drilled boreholes or potable water could be transported by water truck from the nearest settlement to the site.

Water will be sourced from the Siyancuma LM during construction but during the development process the possibility of using borehole water for the operational phase would be reviewed. If it is deemed feasible the needed studies will be conducted and applications submitted to DWS for water use licenses.

Should underground water or an aquifer be used to supply water for the operational period, water pump tests should be done on boreholes in the area to establish the daily sustainable yield rate of the aquifer. Water should be tested for potability and a demineraliser or water softener implemented if required.

Due to daily activities of general labourers and contractors doing maintenance at the site, as well as security guards changing shifts, personnel would be transported to and from the site regularly. Sewage storage and removal would be applicable in this phase.

Given the number of employees, the general waste generated would not be more than that generated by one or two average households and is therefore insignificant in quantity. It would be stored at the site office/store buildings and could be carted by the staff transport and disposed of at the closest municipal waste site as and when necessary. Bio-degradable waste can be composted rather than carted away. Office waste such as paper and cardboard could be recycled.

2.4 Decommissioning Phase Activities

If properly maintained, the PV power station is expected to have a lifespan of approximately 25 years. Should it be upgraded at the end of this period, its lifespan might possibly be extended to 50 years. The infrastructure would only be decommissioned once it has reached the end of its economic life. Should it be economically feasible or desirable, the following activities would be applicable.

The access integrity to the site would have to be confirmed to accommodate the required equipment, machinery and vehicles needed to remove the infrastructure.

Infrastructure, including fencing and security systems, would be removed and reused at other areas or sold as second-hand material.

Should brick structures be used, structures would be demolished and rubble removed to the nearest general waste site. It could then be used as cover material or filling for other construction sites. Should containers or corrugated iron structures be used, they could either be moved to other sites or sold. Concrete bases for support structures and

lampposts, lightning conductor masts and fencing posts could be removed to the nearest general waste site or, be left in situ on the site.

Compacted areas would be contoured and ripped. If plant growth should not establish, active seeding and planting of indigenous vegetation would be conducted.

3. FEASIBLE AND REASONABLE ALTERNATIVES

3.1 Planning and Design Phase Alternatives

3.1.1 Infrastructure, Technology & Process

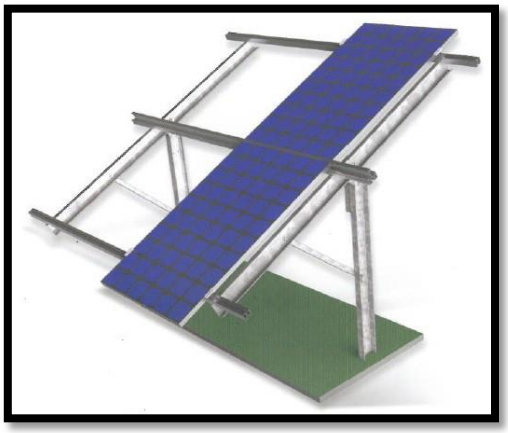
Photovoltaic power plants have a wide range of technologies that can be considered for incorporation into the plant. A number of different technologies and equipment suppliers for the PV plant were investigated. These include the PV module manufacturer, the capacity of the modules, the support structure type, the manufacturer and the inverter type.

Various combinations of fixed, single and two axis trackers, together with different PV modules, were modelled using software packages to arrive at the most efficient and cost-effective package.

Structures

Structures are required to support the PV modules. The options that were initially studied included fixed structures, single-axis trackers and double-axis trackers. (AE-AMD, 2011)

The most visible part of the PV power station will be the PV modules, or solar panels, and their associated structures. Two types of structures are being considered, namely fixed structures (Figures 1-6), which are fixed in one position, and tracker systems (Figures 7-10), which move along with the movement of the sun in order to receive as much energy as possible throughout the day and, with some systems, even throughout the year.



Figures 1-2: Fixed Structures

Figures 3-4: Construction of Fixed Structures


Figures 5-6: PV Solar Plant Consisting of Fixed Structures


Figures 7-8: Tracker Structures

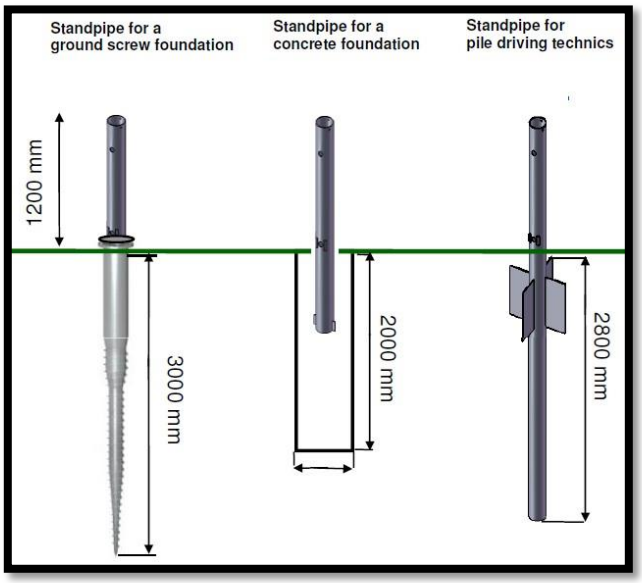



Figure 9-10: Foundation options for trackers

Foundations

For fixed structures, small concrete footings are cast in the ground.

The following foundation options may be considered for tracker structures:

- mass concrete block foundation (Figure 9);
- screw foundation;
- concrete pile foundation; and
- vibratory driven steel pile foundation. (Figure 10)

The preferred technology would possibly be the vibratory driven steel pile foundation due to the fact that it does not use any concrete and therefore no water. Depending on the ground conditions a concrete pile might need to be used.

Both the vibratory driven steel pile foundation and the concrete pile foundation are preferred above the mass concrete foundation, which is situated above ground. After decommissioning, the mass concrete foundation would not be feasible to be removed and would remain a physical and visual obstruction in the veld, while the driven pile and concrete pile would not pose this problem as they would be removed on ground level.

PV Modules

There are various types of PV modules defined according to the materials used:

- Monocrystalline silicon
- Polycrystalline silicon
- Thin-film
- High-concentration

The best available technology not exceeding excessive cost (BATNEEC) option will be followed when PV modules are chosen.

Inverters

There are various types of inverters defined according to their technology:

Inverters would be selected according to quality and efficiency.

Concentrator Boxes

The concentrator boxes are outdoor switchgear boxes or cabinets where the electrical wires from the PV module group are collected. The concentrator boxes are designed for outdoor conditions and are mounted on a concrete base.

Transformation Centre

The transformation centre would be a prefabricated concrete structure built to house the transformer and the associated protection devices. In the transformer, the voltage level would be transformed from 0.38 kV to 36 kV.

Distribution Centre

The distribution centre is where all the medium voltage (MV) lines, coming from the various transformers, are collected. The distribution centre is housed in either a prefabricated or a steel structure. A MV line runs from here to the Eskom substation.

3.1.2 Layout Alternatives

The choice of the PV module and structure is the chief determinant in the layout of the PV plant. Fixed, single and two axis trackers have different spatial requirements.

Based on the preferred equipment choices above, the following additional design criteria were used to establish the layout of the plant:

- A minimum distance of 13 m in the north-south direction and 13 m in the east-west direction must be maintained between trackers. These distances have been optimised using sun path simulation software.
- Structures must be at least 16 m from the centre of any power lines, whether the power lines are single or double.
- Structures must be at least 60 m from the centre of provincial roads.
- Structures must be at least 16 m from any Telkom line.
- A minimum distance of 10 m must be maintained between the structures and the fence to prevent theft and avoid shadows cast by the fence.
- Internal and perimeter service roads must be 5 m in width.
- The main access road must be 10 m in width.

3.1.3 Electrical Grouping Configuration

For approximately 70 PV modules one inverter is required to transform the direct current generated in the PV modules to alternating current. A group may consist of approximately 620 PV Modules which are all connected to a concentrator box (CB).

Depending on the power of the transformer (800 kVA or 630 kVA), four to five groups is connected to each transformation centre (TC).

The transformation centres (TC) are connected to the distribution centre (DC) using line routes of two or three transformation centres (TC), depending on the layout and power.

3.1.4 Electrical Reticulation

The entire electrical reticulation within the PV plant, from the PV structures through to the distribution centre, would be installed underground.

3.1.5 Trenches

The dimensions of the trenches would vary according to the number of cables laid in each trench, as well as their voltage levels. The maximum width is ~0.6 m and maximum depth is ~1.10 m. The cable would be laid in a suitable bedding material such as sand. If the material in the trench is not suitable for bedding, material would be sourced from local commercial sources. The trenches would then be backfilled using material excavated from the trench.

Trenches are usually excavated by means of a TLB, but given the quantity of trenching within the PV plant, specialist trenching machines might be used.

Trenches crossing the internal or perimeter service roads within the power plant would be properly protected in order to prevent degradation due to vehicular traffic.

3.1.6 Ancillary Facilities

Access Roads

This Greefspan 2 site will get access from the R357 provincial road to Douglas to the north and Prieska to the south. A gate would be implemented in the farmer's fence to access the site. This access road would be less than 250 meters long and would be designed and constructed according to the standards set by the Dept. of Roads and Public Works. The road surface would be either tar or paving. A width of 10 m is allowed for the access road reserve. (Appendix B)

Sufficient space would be allowed at the access point and security control to ensure that vehicles do not back up on the road while being processed through security.

The width of the access road would allow the circulation of two trucks in opposite directions at the same time during construction and operation phase.

Service and Perimeter Road

Internal or service roads would be needed within the site for the construction as well as the operation and maintenance phases. The construction of these tracks would comprise gravel for filling and higher quality surfacing on top. Should this be needed, the gravel is to be sourced from a permitted borrow pit. The strength and durability of the in situ rock strata at the proposed site are currently unknown and are to be assessed via a geotechnical study to be conducted by the project proponent if necessary. The results of this study would indicate whether the vegetation and ground surface could be stripped, and the exposed formation levelled, compacted and used as an access track surface.

The layout of these internal roads has been planned due to the fact that not any environmental sensitivity has been identified on the study area by the specialist studies already conducted. The site would be sufficiently cleared to allow access for excavation equipment as well as for rough-terrain vehicles that would deliver the site-assembled PV structures or trackers to their positions.

Vegetative ground cover reduces dust, which has an influence on the efficiency of the PV panels. Rehabilitation and regrowth of the ground cover is thus important to the PV plant and it would be sensible to minimise disruption of the existing vegetative ground cover.

During the operational phase access around the site is generally only required for security and routine inspection. Access for cleaning operations or maintenance is very infrequent, thus the internal service roads need only be tracks.

Service and perimeter road reserve widths would be ~5 m. Service and perimeter roads would give access to different groups of structures and corners are designed to accommodate the turning of trucks. (Appendix B)

Buildings and Parking Area

The buildings and facilities needed to service a PV plant are a control room, a small office, ablution facilities, a kitchen area, a small workshop and a store.

There is space allocated in the PV plant layout for the buildings.

Services for the buildings would be provided as follows:

- Electricity would be sourced from the Eskom substation or the PV site itself.
- The control room and the office may have air-conditioning.
- A waterborne sewage system would be constructed for operational phase. Grey & sewage water would be contained in closed cell tanks with a size sufficient to contain a month's effluent. When the tank is full, sewage would be removed by the developer or preferably by the local municipality to the sewage works at Douglas.
- The small amount of potable water required for use by the site personnel can be provided from a number of sources.
    - Rainwater can be collected off the roof of the buildings.
    - Borehole water can be obtained from the farmer's existing borehole(s) or new boreholes can be drilled.
    - Potable water can be carted in from the local town. The Siyancuma LM, who is a registered water services provider, has indicated that they would have the water capacity available for this supply in the Douglas area (Appendix M).

Should the available water need treatment, the appropriate equipment would be used.

There would be a small hardstand parking/laydown area near the buildings, which would be used during the operational phase.

Fencing

Due to the high material value and risk of theft associated with PV panels and electrical cabling it is imperative that the perimeter fences and security systems get installed and commissioned as soon as practical. This is especially important before the reticulation is operational and hence more difficult to steal.

It is proposed to start by fencing off a delivery, storage and processing area within the site and then to erect the perimeter fence and install additional security systems. This would allow the initial construction start-up activities to begin earlier. The proposed perimeter fence is a non-lethal electrified fence with a height of ~2.4 m.

This type of fencing is very similar to the fencing around many game farms in the area.

Lightning Protection System

To protect the PV plant, equipment and personnel from lightning, a lightning protection system composed of masts and surge arresters would be installed. This system would be designed by a specialist and would comply with the relevant South African laws and standards. Provision has been made for up to 25 m high masts.

Security System

The perimeter, access points and general site may be monitored by CCTV cameras and passive intrusion detection systems. There would be security lighting, which may be linked to the passive intrusion detection systems and would therefore not be on all night. (Figure 11)

Figure 11: Example of security system elements

3.1.7 Activity/Land Use

The applicable Remaining Extent of Portion 1 of the Farm Kwartelspan no. 25, Hopetown District is zoned for agricultural use. The development would be legally bound to the EMPr (Appendix I) which would be enforced by an independent ECO, in consultation with the different government departments such as the DAFF, DEA and DENC.

It is stipulated that vegetation shall be disturbed as little as possible, and this condition would be enforced by the ECO. Should tracking structures be opted for it would be expected that grazing would still be possible on the site after commencement of the operational phase and after rehabilitation of the disturbed areas has been effected to such an extent that sufficient carrying capacity is restored and that the veld would not be degraded further by grazing.

One of the issues associated with fixed panels is the treatment of the ground underneath the structures as this area is permanently in the shadow and hence the vegetation growth is affected. In order to prevent soil erosion and dust a suitable ground cover should be introduced such as gravel.

A rezoning application has been conducted for this development. A "Special Use" zoning has been granted in terms of the Northern Cape Planning and Development Act (Act 7 of 1988) from the Siyancuma Municipality (Appendix M). The Special Use zoning is a zoning to be used where the proposed land use does not fall under their other categories of zonings. The intended use is then defined in the application and approval. The Special Use zoning is defined as a mixed use for Agriculture and PV power plant, with a temporary validity that is only for the generation license period.

3.1.8 'Do Nothing' Alternative

If the requested amendment is not granted, it will not be possible to transfer the ownership of the grid connection infrastructure to Eskom, as required by Eskom in terms of the agreements between the Applicant and Eskom. If Eskom's requirements are not met, Eskom may not be able to assume the operation and long-term maintenance of the grid connection infrastructure, which may result in the PV Project being unable to connect to the national grid, in which case the PV Project may not proceed.

Should the development not proceed, the identified site would not be impacted on from an environmental perspective and would continue to be utilised for agricultural activities on marginal agricultural land and in future possibly mining as a prospecting right has possibly been registered to this property.

Deciding not to proceed with the development would have a negative impact on the socio-economic development of the area. The job creation and poverty alleviation that would have occurred due to the development, would not take place.

In 2006 South Africa sourced approximately 90% of its energy from fossil fuels (coal, oil, gas). Coal, which is the main contributor to the country's carbon dioxide emissions, is the major primary energy supplier with a contribution of 65.9% to the total primary energy supply in 2006. (Subramoney et. al., 2009) Carbon dioxide is the main greenhouse gas connected with climate change. Hydro and renewable energy supply has seen little change since 2004; hydro supply had an increase of about 0.1% since 2004 while renewable supply declined by 0.4% (Subramoney et. al., 2009).

In order to develop sustainably whilst preparing for growing energy demands, South Africa's future energy supply must therefore be diversified with regard to power generation sources. This is also important in the light of the country's commitment under the Copenhagen Accord to reduce its carbon dioxide emissions by 34% below the "business as usual" level by 2020.

The generation of electricity from renewable energy resources offers many potential socio-economic and environmental benefits for South Africa. It can ensure increased energy security, which is highlighted by the current electricity crisis in South Africa, as well as resource saving, as conventional coal-fired plants are major consumers of water during the cooling process.

The energy demand at the Eskom Greefspan Substation grew at a rate of approximately 419kVA per annum from 2007 to 2010 (Du Plessis, 2010).

The development of small-scale, evenly distributed renewable energy supply schemes, such as the one proposed at Eskom Greefspan Substation, is strategically important for the diversification of domestic energy supplies and for avoiding possible energy imports in the future.

Without the implementation of this development, renewable options for future power supply would be compromised and fossil fuel-based energy would possibly be used to supply for the growing demand. This could have significant negative environmental and social impacts.

The 'do nothing' alternative is not a preferred alternative in this application.

3.2 Construction Phase Activities

Pre-construction phase activities would include surveys such as a geotechnical survey, as well as a land survey to confirm the micro footprint of the infrastructure and associated infrastructure.

The construction phase includes all the varied activities and operations needed to develop a fully operational PV power plant. (Appendix B)

Construction phase activities would include but not be limited to:

- site clearing as necessary, which must be kept to a minimum to avoid dust;
- site preparation and construction laydown areas;
- temporary fencing of the construction yard site;
- installation of the perimeter fence;
- construction of access roads to the site and internal service roads;
- delivery of construction materials and equipment;
- foundation excavation;
- installation of foundation piles or concrete;
- installation of electrical reticulation;
- installation of the lightning system;
- assembly of tracking or fixed support structures;
- moving of the assembled support structures to their final positions;
- setting up of electrical equipment;
- construction of buildings;
- installation of the security system; and
- commissioning tests.

The following areas have been defined for construction purposes:

- laydown area;
- assembly area;
- spoil heaps; and
- construction traffic area.

3.2.1 Lay Down Area

The laydown area is the area where different materials such as PV modules, support structure components, motors, gears, electrical devices, tubes for wires, transformers, switchgears and prefabricated structures would be received.

3.2.2 Assembly Area

The assembly area would be equipped for the safe and quick assembly of the support structures and PV modules. An assembly area has been defined. All the necessary materials would be laid out in the assembly area in order to streamline the assembly process. When the support structure is pre-assembled, a rough-terrain vehicle would transport it to its final position to be mounted on its foundation and connected to the electrical reticulation.

3.2.3 Workshop

General and emergency maintenance of infrastructure, vehicles and machinery would be done on site. Vehicles and machinery would be moved to the nearest workshop to be repaired.

3.2.4 Spoil and Concrete Batching

Borrow pit areas would not be needed as gravel, stone and sand would be sourced from commercial sources surrounding Douglas or Prieska. Only a small amount of gravel is needed for concrete production for cross-road trenches, building foundations and concentrator box bases. This gravel can be obtained from commercial sources in

Douglas and transported by truck to the sites. Given that there are no significant earthworks in the construction process, the only spoil envisaged would be material excavated from the trenches or pile holes that is considered unsuitable to be used as backfilling. These should be relatively insignificant volumes and could be spread on site if possible. Should the volume be larger, landscape features such as screening berms around the substation and PV plant could be created from the spoil. These would be covered with topsoil and vegetated.

3.2.5 Construction Traffic

During the construction phase the traffic would peak at about 10 vehicles and 40 to 50 concrete trucks per day while the footings are being cast and then drop to about 20 to 30 vehicles per day while the electrical reticulation is being installed and the PV support structures are being erected. This number is calculated on worst case scenarios. If the preferred option of vibratory driven piles is adopted, the construction traffic would be greatly reduced. The traffic volumes during construction would probably equate those experienced during the harvesting season on the local farms. (AE-AMD, 2011)

3.2.6 Water Usage

For the authorised projects the water for construction and operation would be sourced from the Siyancuma Local Municipality who are a registered Water Service Provider and this arrangement has been confirmed by DWS. Note that this water use would not affect the water rights of landowners. (Appendix M) If feasible and desirable, water may be sourced from groundwater resources, subject to consent from the landowner and the necessary authorisation by DWS.

The concrete requirements and therefore also the water requirements would be determined by the PV technology selected.

The installation of double-axis tracker systems would require a total of about 33 280 m^3 of concrete for the development of a 55 MW PV power plant, amounting to a water requirement of approximately 12 Mℓ if worked on a worst case scenario (AE-AMD, 2011).

Should the single axis tracker system be used, a vibratory driven pile would possibly be the foundation type, depending the outcome of the geotechnical study, and no concrete would be needed for the foundations. Concrete would therefore only be required for the construction of buildings and other ancillary infrastructure. (AE-AMD, 2011).

However, should the ground conditions not be favourable for the driven pile, a concrete pile would be used. A single pile requires approximately 0.6 m^3 of concrete. This amounts to a total concrete requirement of approximately 4 800 m^3 and a total water requirement of approximately 1.7 Mℓ. This method would require significant lower amounts of concrete and therefore water than mass concrete foundations. It would also require fewer trucks to transport the concrete. For this reason the driven pile or concrete pile foundation types were selected. (AE-AMD, 2011)

3.2.7 Ablution Facilities and Sewage

The contractor would be responsible for providing and maintaining chemical toilets on site during the construction period, as well as for the removal of sewage to the municipal sewage works.

3.2.8 Electricity Use

During the construction phase generators would most likely be used for power supply because of the expanse of the construction site. Alternatively, since development would be adjacent to the electrical substation, it might be arranged to temporarily source construction power directly from the substation.

3.2.9 General and Hazardous Waste

The contractor would be responsible for the weekly or more frequent removal of general waste to the municipal waste site. Waste generated on the site should be disposed of in closed bins, which would be located within an enclosed area in the site camp, from where it would be removed to the municipal waste site.

Hazardous waste would be disposed of in impervious, closed bins and kept in a secure area at the site camp until safely removed by a suitably certified company. Proof of safe disposal must be kept on file.

3.2.10 Construction Phase Job Creation

The contracting of an EPC Contractor is proposed. Such a contractor would probably engage specialist subcontractors. These subcontractors usually have their own core staff, but engage local unskilled labour.

3.3 Decommissioning of Construction Areas after Completion of Construction Work

All the clean and solid construction waste would be used in backfill or onsite landscaping where possible. Remaining construction waste would be used for infilling towards the rehabilitation of the nearest possible abandoned old quarry pit, provided that the owner of the quarry and/or the land approves of such infilling. This is a use/reuse matter and is usually the most cost-effective as well. Construction waste that is not appropriate for backfill or for landscaping would be disposed of at the closest municipal waste site where it can be used as cover material for waste.

The construction camp, infrastructure, equipment, machinery and vehicles that would not be used during the operation and maintenance phase would be removed. Compacted areas would be ripped where necessary. Topsoil would be replaced in areas that would not be utilised during the operational phase and would be rehabilitated where practical and reasonable.

3.4 Operational & Maintenance Phase Activities

Electricity would be generated by the PV modules, converted from DC to AC by the inverters, and transferred to the concentrator boxes and transformation centres, from where it would be transferred to the distribution centre. It would then be transferred via the 36 kV evacuation power line to the substation, from where it would be fed into the Eskom transmission network.

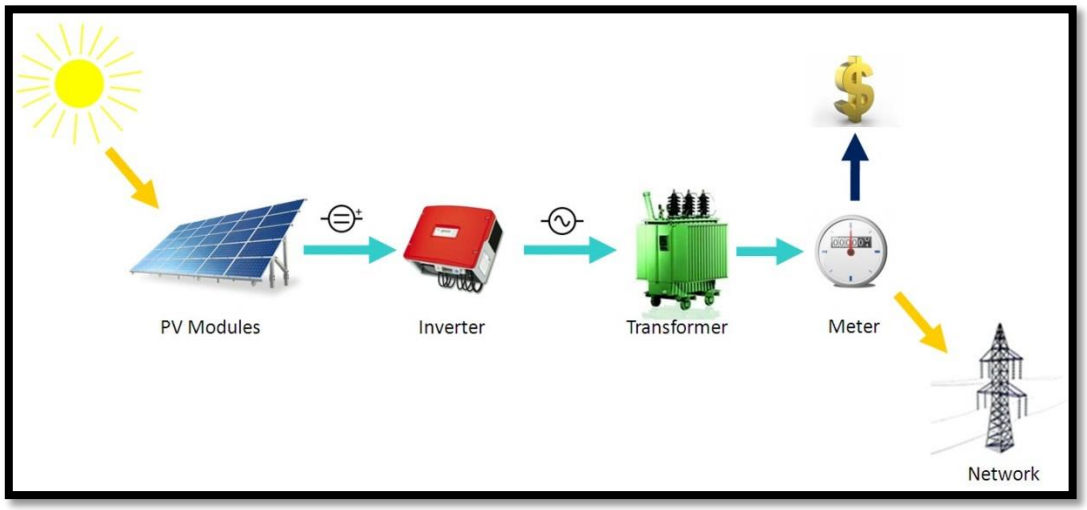


Figure 12: Energy flow in a PV power station

The operational phase includes all operations that are necessary to maintain the PV power plant in a fully operational mode, producing as much electricity as possible and feeding it into the Eskom distribution network. (Figure 12)

Activities occurring during the operational phase include but are not limited to (AE-AMD, 2011):

- verification of the electricity production;
- maintenance and monitoring of a weather station;
- routine inspection of all equipment and systems;
- periodic maintenance;
- cleaning of PV modules; and
- security operations.

The traffic generated by the PV plant during the operational phase would be negligible and would be of the order of four or five vehicles per day. Full-time security personnel would remain on the site and maintenance and control room staff would be required. Electrical and mechanical maintenance of the PV structures and ancillary infrastructure would take place as and when necessary.

3.4.1 Water Usage

A PV plant does not require much water for operation. The only water requirements are for the domestic needs of the security and operational personnel and for the cleaning of the PV panels. The water needed for cleaning is about 75 ℓ per tracker per annum and less than 1 000 ℓ per day would be needed for domestic purposes by the personnel on site. For a 5 MW PV plant the water requirements would therefore not exceed 1 000 kℓ per annum (~8 000 kℓ per annum for a 55 MW PV plant).

It is proposed that two to four security guards should be on site at a time, 24 hrs per day. The operational staff for the three Douglas sites would probably be based in a central control office.

The PV panels would be cleaned approximately thrice per year and would need approximately 75 ℓ per tracker per annum for this purpose. If it is assumed that the water required for cleaning the trackers would be transported to site by a water truck equipped with cleaning equipment, the onsite water requirements would be minimal. (Figure 13)

The Siyancuma LM indicated that they have the water capacity available to provide the water required for the operational phase (Appendix M). If feasible and desirable, water may be sourced from groundwater resources, subject to consent from the landowner and the necessary authorisation by DWS.

Figure 13: Cleaning PV panels

3.4.2 General Waste

Due to daily activities of general labourers and contractors doing maintenance at the site, as well as security guards changing shifts, personnel would be transported to and from the site regularly. Given the number of employees, the general waste generated would not be more than that generated by one or two average households and would therefore be insignificant in quantity. It would be stored at the site office or storage buildings, and could be carted by the staff transport and disposed of at the closest municipal waste site as and when necessary. Biodegradable waste can be composted rather than carted away. Office waste such as paper and cardboard could be recycled where possible.

3.4.3 Sewage

A waterborne sewage system will be implemented during the operational phase. Grey and sewage water would be contained in closed-cell tanks of a size sufficient to contain a month's effluent. When the tank is full, the

contractor/operator or, preferably, the local municipality, would remove sewage to the sewage works at Douglas. Sewage would need to be removed regularly by truck to the sewage facility at Douglas.

3.4.4 Operational Phase Job Creation

A PV power plant would have the following direct onsite staff

- 1 x plant operator – electrical technician
- 1 x security manager – supervisor
- 8 x security guards – NQR

3.5 Decommissioning Phase Activities

After 25 years of operation, the PV plant would either be upgraded or decommissioned.

Upgrading the PV power plant would consist of replacing old PV modules with new ones, increasing the total peak power of the plant (a process called "repowering") or increasing the power of the plant by adding new elements such as support structures, PV modules or transformers. (AE-AMD, 2011)

If the plant is to be decommissioned, the site should be returned to a state close to its original state. All of the components of a PV plant, except for the concrete, have an intrinsic value either for reuse or recycling.

This value would cover the cost of decommissioning the plant and rehabilitating the site (AE-AMD, 2011):

- The PV panels would be removed from the support structures and sent to special recycling facilities without further disassembly at the site. See the recycling process set out in figure 14 on page 36.
- The transformers and electrical control devices would either be reused, with or without reconditioning, or sold as scrap after removal of the fluids.
- The electrical power management and conditioning equipment would be recycled or sold as scrap.
- The underground cable runs could be abandoned in place, or removed. As these cables have a very high scrap value, the latter is more probable.
- The steel in the support structures has high scrap value and the structures would therefore be dismantled and removed to be sold as scrap.
- The steel support structure piles can be removed and sold as scrap. Alternatively the steel or concrete piles can be cut off just below ground level and abandoned.
- The gravel or aggregate on the access road, onsite service roads, electrical substations, transformer pads, and building foundations could be removed and recycled for use in other fill operations if not abandoned.
- The buildings can be taken over by the farmer for his operations. Alternatively, all the reusable material can be removed, the shells demolished and the rubble taken away to a municipal waste site.

Disturbed land areas can be rehabilitated, the rubble removed, the soil scarified and reseeded or replanted with indigenous vegetation.

As part of the decommissioning and rehabilitation process, the soil would be inspected for industrial wastes from minor spills or leaks. Such occurrences would be documented and decontaminated as necessary. Soil testing would be conducted after decommissioning if deemed necessary.

Transportation activities during site decommissioning would be similar to but less than those during site development and construction.

4. COST BENEFIT ANALYSIS OF PV POWER STATIONS

PV technology exploits the most abundant source of free power from the Sun and has the potential to meet almost all of mankind's energy needs. Unlike other sources of energy, PV has a negligible environmental footprint, can be deployed almost anywhere and utilises existing technologies and manufacturing processes, making it cheap and efficient to implement. (Greenpeace, 2011)

There are no substantial limits to the massive deployment of PV power generation. Material and industrial capability are plentiful and the industry has demonstrated an ability to increase production very quickly to meet growing demands. (Greenpeace, 2011)

Sustainable development can be described as a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The concept of sustainability is based on three pillars: social, environmental and economic sustainability. (Greenpeace, 2011)

4.1 Economic Factors

The implementation of the proposed PV power station would:

- stimulate the regional economy;
- promote the local economy development;
- create new job opportunities;
- avoid electricity price fluctuation;
- contribute to network integration;
- network expansion compatible;
- reduce the fossil fuel dependence of the area;
- be part of a high-standardized sector;
- contribute to the import and later possibly export know-how to other countries;
- benefit from proven safety and reliability;
- be easy and has very low maintenance requirements; and
- promote food security.

Support Schemes Benefits

Apart from being a clean and reliable source of electricity, PV generates a number of economic benefits for the entire society. Feed-in Tariffs generate more benefits than what they cost initially to electricity consumers.

The Feed-in Tariffs received by PV plant owners are a benefit to them (Greenpeace, 2011), the land owners, the immediate community and region in general. The overall costs for the Feed-in Tariffs are usually rolled over to final electricity consumers and included in their electricity bills (Greenpeace, 2011) in the long term. In turn they receive all the benefits of a reliable clean energy.

Improving Grid Efficiency

PV power stations can be placed at the centre of an energy generation network or used in a decentralised way (Greenpeace, 2011). These small PV power stations are spread throughout the distribution network in the Douglas and Danïelskuil areas, connecting directly into the grid.

Reduction of Grid Losses

These PV power stations can be considered as a distributed and decentralised source of energy. Producing electricity near the place where it is consumed implies a reduction in the distribution and transmission losses (costs) which are linked to the distance between the point of generation and the point of use. (Greenpeace, 2011)

Energy Security

Once installed, these PV power stations will produce electricity for at least 25 years at a fixed and known cost. Conventional power plants must deal with fluctuating prices for fossil fuels such as oil, gas or coal on the international markets. The certainty of being independent from such fluctuations can be valued depending on the assumptions of the oil, gas and coal prices evolution. (Greenpeace, 2011)

Operating Reserve

PV requires additional operating reserves to ensure the full reliability of PV electricity systems. This cost is due to the variable nature of PV electricity production and is well-known. (Greenpeace, 2011)

Lost Margins for Utilities

Every kWh of PV that would be produced by a PV plant owner or an Independent Power Producer (IPP) instead of a traditional utility will cause that the margins of the utilities will shrink. However, this offers also opportunities for utilities as they will have to adapt their business models transforming into new generation utilities that can take up important tasks in the future electricity grids as aggregators, facilitators and network service providers. (Greenpeace, 2011)

Industry Development

The PV power station would require industrial capacity: raw material providers; module manufacturers; machinery and equipment providers; installers; and other services linked to the electricity system. This generates added value for the community; not only in terms of jobs, but also in terms of industrial development, and business generation. (Greenpeace, 2011)

Moreover, PV power stations would contribute to the structural change needed to build an efficient and distributed energy system. It also contributes to the enhancement of competition in the currently rather concentrated power generation market. (Greenpeace, 2011)

Food Security

Electricity shortages or blackouts have previously caused serious problems and damage to the intensive agriculture farming sector in the Douglas area, putting into jeopardy the very important food security of the region. Alternative sustainable energy production within this area would contribute to ensuring higher reliability in energy supply to the immediate area.

4.2 Environmental Factors

- Clean energy;
- Unlimited resource;
- Free-cost resource;
- Minimal environment impact;
- Other land uses can be performed;
- Produces no radioactive or other hazardous waste;
- Avoids CO2 emissions and reduces the Global Warming;
- Simple technology;
- Low Water Consumption;
- Quiet operation; and
- Visually less obtrusive than CSP and wind power generation.

The damage that is being done to the climate by the use of fossil fuels (i.e. oil, coal and gas) for energy and transport is likely to destroy the livelihoods of millions of people, especially in the developing world. It would also disrupt ecosystems and significantly speed up the extinction of species over the coming decades. (Greenpeace, 2011)

Reduction of Greenhouse Gas Emissions and Climate Change Mitigation

The cost of greenhouse gas emissions from power generation can be easily decreased using PV power generation. Moreover, the carbon footprint of PV systems is decreasing every year. Currently, the external costs to society incurred from burning fossil fuels are not included in electricity prices. (Greenpeace, 2011)

The proposed development would provide clean energy from an unlimited and sustainable resource, which would cause minimal environmental impact and reduce fossil fuel dependence. It would produce minimal waste and avoid CO_2 emissions, and therefore reduce further global warming.

For example, to reach the same production that the Greefspan PV power station would generate over a year, with Gas, Coal or Diesel Generation, CO_2 emissions of respectively 4935 tons, 8931 tons and 6815 tons would be generated as:

- 1 Tep of Natural Gas = 2,1 tons of CO_2;
- 1 Tep of Coal = 3,8 tons of CO_2; and
- 1 Tep of Diesel = 2,9 tons of CO_2. (AE-AMD)

Environmental Footprint of PV Power Generation

The energy it takes to make a solar power system is usually recouped by the energy costs saved over one to three years. Some new generation technologies can even recover the cost of the energy used to produce them within six months, depending on their location. PV systems have a typical life of at least 25 years, ensuring that each panel generates many times more energy than it costs to produce. (Greenpeace, 2011)

Energy Payback Time (EPBT)

The production of PV modules requires energy. The energy payback time (EPBT) indicates the number of years a PV power station has to operate to compensate for the energy it took to produce, install, dismantle and recycle. (Greenpeace, 2011)

The EPBT depends on:

- the level of irradiation (in sunny areas like the Northern Cape the EPBT is shorter than in areas with relatively low solar irradiance);
- the type of system (integrated or not, orientation, inclination; and
- the technology (because of different manufacturing processes and different sensitivities to solar irradiation). (Greenpeace, 2011)

New techniques have been developed to reduce energy consumption. This leads to further decreases in the EPBT of PV systems, improving their sustainability. (Greenpeace, 2011)

The main drivers for further reduction of the EPBT are:

- Reduce: using less materials (for example by reducing the thickness of the silicon wafers);
- Re-use: recycling of materials; and
- Replace: using materials that generate less CO_2. (Greenpeace, 2011)

Higher system efficiencies for converting solar energy into electricity and continuous improvements in the manufacturing processes will contribute to further decrease the EPBT. (Greenpeace, 2011)

Water Consumption

Unlike other technologies, PV power generation require very little water during their operation for cleaning purposes and use by personnel on site. This makes PV a sustainable electricity source in places where water is scarce like in the Northern Cape. Some water is used during the production and construction process. Most of the water indirectly used for PV production comes from the electricity consumption of PV factories (conventional power generation uses

water, amongst others, for cooling). Hence, an increased share of PV in the electricity mix would lower the water requirements during the production process of PV modules. (Greenpeace, 2011)

Recycling

PV modules are designed to generate clean, renewable energy for at least 25 years. The PV industry is working to create solutions that reduce the impact of PV on the environment at all stages of the product life cycle: from raw material sourcing through end-of life collection and recycling. (Greenpeace, 2011)

In 2007, leading manufacturers embraced the concept of producer responsibility and established a voluntary, industry-wide take-back and recycling programme. Now the PV CYCLE association (www.pvcycle.org) is working towards greater environmental sustainability. (Greenpeace, 2011)

Recycling technologies exist for almost all types of photovoltaic products and most manufacturers are engaged in recycling activities. The environmental benefits and burdens of recycling have been assessed through the Chevetogne (Belgium) recycling pilot project. The project shows that the environmental benefits of recycling clearly outnumber the additional environmental burdens (heat, chemical treatment to recover the basic materials enclosed in the modules) that recycling of the modules demands. (Greenpeace, 2011)

PV Modules

PV modules contain materials that can be recovered and reused in either new PV modules or other new products. Industrial recycling processes exist for both thin-film and silicon modules. Materials such as glass, aluminium, as well as a variety of semiconductor materials, are valuable when recovered. (AE AMD, 2011)

Recycling not only benefits the environment by reducing the volume of waste, but also helps to reduce the amount of energy required to provide raw materials and therefore the costs and environmental impacts of producing PV modules. By recycling end-of-life modules, the PV industry enables the sustainable use of PV technology, furthering PV's ability to help meet the energy needs while protecting the environment. (AE AMD, 2011)

The following process, developed by PV CYCLE will be followed by AE-AMD Renewable Energy for all its projects in South Africa: (Figure 14)

Table 2: CO_2 Emissions Reduced by PV Power Stations (derived from figures supplied by AE AMD)

PV Power Plant	**Greefspan**
Total Power Installed (*including all phases*)	55 MW
Annual Estimated Production [kWh]	109 330 648
Annual Estimated Production [Tep]	9 400
CO_2 emission saved vs. Gas Generation [Tons]	19 740
CO_2 emission saved vs. Coal Generation [Tons]	35 724
CO_2 emission saved vs. Diesel Generation [Tons]	27 264

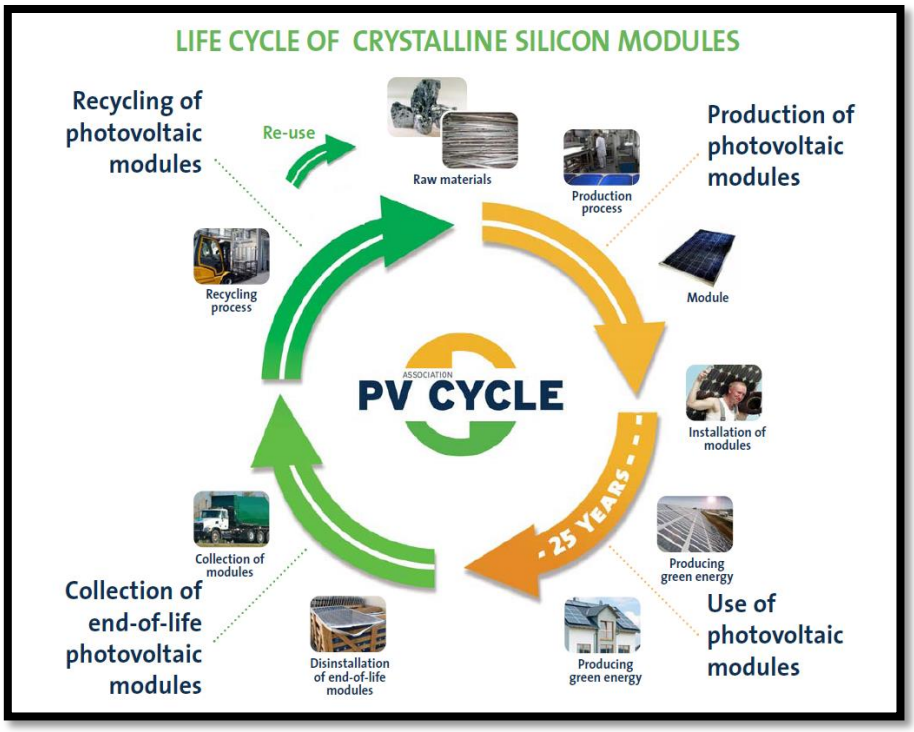


Figure 14: Processes developed by PV CYCLE

Various recycling for PV panels' process are currently being implemented, the following model is the most frequently used:

Stages of Recycling of PV Panels

Activity	Description
Collection	The modules are collected in hoppers and loaded by forklift into a shredder.
Shredder	The modules are reduced in size in a two-step process. Step one uses a shredder to break the modules into large pieces.
Hammer mill	Step-two, the hammer mill, crushes the broken glass into 4-5mm pieces, small enough to ensure the lamination bond is broken.
Film Removal	The semiconductor films are removed by the addition of acid and hydrogen peroxide in a slowly rotating, stainless steel drum.
Solid-Liquid Separation	The drum is slowly emptied into a classifier where glass is separated from the liquids. A rotating screw conveys the glass up an incline, leaving the liquids behind.
Glass-Laminate Material Separation	A vibrating screen separates the glass from the larger pieces of laminate material (which formerly sealed the two pieces of glass together).
Glass Rinsing	The glass is rinsed to remove any residual semiconductor material that physically remains on the glass. The cleaned glass is packaged for recycling.
Precipitation	The metals-rich liquid is pumped to the precipitation unit. The metal compounds are precipitated in three stages at increasing pH.
Dewatering	The precipitated materials are concentrated in a thickening tank. The resulting unrefined semiconductor material is packaged for processing by a third party to create semiconductor material for use in new modules.

4.3 Social Factors

- Creates employment opportunities
- Promotes the sustainable development of the region
- Uses local resources
- Safe technology
- Stable technology
- Produces no dangerous waste
- Ideal for remote installations electricity supply

4.4 Employment

PV products create employment along the entire value chain, from the production of PV products and equipment needed for their production, through the development and installation of the systems, the financing, operation and maintenance of solar power plants, and their decommissioning and rehabilitation. While manufacturing jobs are concentrated in production hubs, the downstream jobs (related to installation, operation and maintenance, financing and power sales) would be mainly local. (Greenpeace, 2011)

During the construction, operational and maintenance phases the local economy would be stimulated and job opportunities created, with the security business as one of the main beneficiaries.

Local resources would, where possible, be utilised from the planning through the construction, operational and maintenance phases.

5 PUBLIC PARTICIPATION

Refer to page ii of this amended EIA report

The proof of public participation will be attached to the final amended EIA report that will be submitted to the DEA.

5.1 Advertisement

The EAP conducting a public participation process will take into account any guidelines applicable to public participation as contemplated in Chapter 6 of the EIA Regulations, 2014 and will give notice to all potential interested and affected parties of the application which is subjected to public participation by—

(a) fixing a notice board at the entrance gate to the Greefspan Substation, next to the R 357 between Douglas and Prieska, conspicuous to the public at the boundary of—
  (i) the site where the activity to which the application relates is or is to be undertaken;
(b) giving written notice to—
  (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
  (ii) the **occupiers** of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
  (v) the municipality which has jurisdiction in the area;
  (vi) any organ of state having jurisdiction in respect of any aspect of the activity;
  (vii) any other party as required by the competent authority; and
  (viii) the competent authority where the application for amendment was lodged.
(c) placing advertisements (Afrikaans and English) in—
  (i) one local newspaper **(Crazy Ads)**; and
(e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desiring of but unable to participate in the process due to—
  (i) illiteracy;
  (ii) disability; or
  (iii) any other disadvantage.

5.2 Content of Advertisements and Notices

The notice board, advertisement or notices:

(a) indicate the details of the application which is subjected to public participation; and
(b) state—
  (i) that the application has been submitted to the competent authority in terms of these Regulations,
  (ii) applied to the application, in the case of an application for environmental authorisation;
  (iii) the nature and location of the activity to which the application relates;
  (iv) where further information on the application or activity can be obtained; and
  (iv) the manner in which and the person to whom representations in respect of the application may be made.

5.3 Placement of Advertisements and Notices

It is not foreseen that the proposed PV power station would have any regional impact beyond the district municipal area of Pixley ka Seme. An advert will be placed, according to stipulations in regulations, in the Crazy Adds, a local newspaper in the area. (Appendix to be attached in final report)

5.4 Determination of Appropriate Measures

During the previous scoping and EIA done for the 10MW PV power plant authorised by DEA at Greefspan Substation, a public meeting was held. Interest was very weak and/or the public accept PV power as energy resource. Stakeholders and registered I&APs did not raise any serious issues during that process nor during subsequent EIA applications and amendments conducted for the Greefspan PV Power Plant No. 2. A public meeting would not add any value during this process. . Therefore a public meeting will not be conducted during this process.

Information of the proposed development is being sent to the ward councillor of the area. Ratepayers associations and traditional authorities are not functioning in the surrounding area.

5.5 Comments and Response Report

The practitioner must record all comments and respond to each comment of the public before the application is submitted. The comments and responses must be captured in a comments and response report as prescribed in the EIA regulations and be attached to this application. The comments and response report must be attached to the report. Appendix will be attached in the final report.

5.6 Authority Participation

Complete list with contact particulars will be attached to the final report.

List of authorities informed:

- *National Government Representatives*:
    - Department of Environmental Affairs;
    - Department of Agriculture, Forestry and Fisheries;
- *Provincial Government Representatives (Northern Cape)*:
    - Department of Environment and Nature Conservation;
    - Department of Agriculture, Land Reform and Rural Development;
    - Department of Forestry (DAFF);
    - Department of Roads and Public Works;
    - Department of Water Affairs;
    - Department of Mineral Resources;
    - Department of Energy;
    - Department of Labour; and
    - Department of Sports, Arts and Culture;
- *Local and District Authorities*:
    - Pixley ka Seme District Municipality;
    - Siyancuma Local Municipality and Ward Councillor; and
- *Other authorities*:
    - South African Heritage Resources Agency;
    - Northern Cape Provincial Heritage Resources Agency; and
    - South African Civil Aviation Authority;
- *Environmental Non-Governmental Organisations*:
    - Endangered Wildlife Trust; and
    - Wildlife and Environment Society of South Africa (Northern Cape)
- *Parastatals*:
    - Eskom; and
    - Telkom;
- *Community-based organisations*:
    - Northern Cape Chamber of Commerce and Industry;
    - Orange Vaal Water Users' Association; and
- *Surrounding landowners*.

6. IMPACT ASSESSMENT

The requested amendment would not change the scope of the proposed development; nor increase the level or nature of the impact, which impact was initially assessed and considered when application was made for the environmental authorisation.

The impact assessment conducted during the initial EIA study and first amendment would therefore remain the same.

An environmental impact matrix was used during the first EIA process to identify possible positive and negative environmental issues for the planning, construction, operation and maintenance, and decommissioning phases. The following aspects were identified:

- water resources;
- soil and agricultural potential (risk of erosion linked to topography of area, land use potential and restriction of land use);
- ecology and biodiversity (impacts on ecology, flora and fauna and especially avifauna);
- social aspects on the macro-, meso-, and micro level;
- visual quality and aesthetics;
- economic impacts (mostly positive);
- traffic impacts (construction, upgrading and decommissioning phases);
- noise (construction, upgrading and decommissioning phases);
- air quality;
- heritage resources; and
- tourism activities.

Regulatory and mitigatory measures with regard to these impacts have also been stipulated in the Environmental Management Program (EMPr) (Appendix I), which forms part of the amended report.

6.1 Construction and Operational Phase Impacts

Many impacts associated with the project would only be effected during the construction phase and would thus be temporary in duration. However, actions performed during the construction phase may cause pollution that would have longer lasting effects on the environment. Construction phase impacts are therefore investigated further during this phase, especially with a view to limit and mitigate lasting effects.

6.1.1 Water Resources

The water use alternatives/options that were considered included groundwater and potable water obtained from the local authority.

For the authorised projects the water for construction and operation would be sourced from the Siyancuma Local Municipality. (Appendix M)

The option of utilising groundwater may still be considered in future.

Geohydrology

The following possible risks to the groundwater have been identified:

- leaching of herbicides that might be needed for alien plant control into the subsurface;
- migration of hydrocarbon fuel spillages (chemical contamination) as well as oils and lubricants by construction vehicles and machinery into the subsurface;
- contamination due to broken or defective PV modules; and
- sewage storage and disposal.

In all instances the spatial scale of contamination is likely to be localised, i.e. encompassing the zone between the source and the Orange River. The duration of this impact is likely to be either long-term (between 15 and 30 years) or

permanent. Mitigation (other than natural mitigation) is likely to be difficult, expensive and time-consuming. Prevention is better than cure.

Groundwater gradients at the study area are not known with any certainty, but it is assumed that they slope in the direction of the Orange River. Any contaminants in the groundwater will therefore form a plume from the source towards the Orange River.

The likelihood of such an impact actually occurring is improbable should all the measures, as stipulated in the EMPr, be implemented.

***Hydrology** (Surface Water)*

There are two rivers of importance flowing through the Pixley ka Seme District, namely the Orange River, forming the north-western boundary, and the Vaal River, to the north-east of the district, which joins the Orange River in the Siyancuma municipal area (Douglas). (Pixley ka Seme, 2008)

The utilisation of these water resources are complicated by the following factors (Pixley ka Seme, 2008):

- the highly intermittent flow of the rivers;
- weakening water quality; and
- the wide variety of consumers within the system, varying from users who need a high degree of assurance for continuous supply, such as commercial/progressive farmers, to users who can adapt to various levels of supply. (Pixley ka Seme, 2008)

The regional economy depends on the existence of the Orange and Vaal Rivers and therefore any activity that would possibly affect it must be considered.

Most of the water needed by the proposed PV power stations would be required during the construction phase and the duration of the use is short-term. The time of use is important as the agricultural sector in this area is highly dependent on the water from the Orange and Vaal Rivers for irrigation purposes, especially during the summer, which is the active growth season for most crops.

Mitigation Measures

Mitigation measures pertaining to water resources are contained in the EMPr (Appendix I)

6.1.2 Soil and Agriculture

Soils

Erosion potential is very low to low where this vegetation type is found. The highest threat to this vegetation type is overgrazing or unsound grazing/farming methods coinciding with prolonged droughts. Overgrazing and other unsound farming practices exacerbate changes in the vegetation composition and prolong droughts. With the predicted global warming or climate change the desertification of this vegetation type is expected to continue. (Mucina & Rutherford, 2006) *Acacia mellifera* (woody shrub) increases when overgrazing takes place over a prolonged period of time.

Soil pollution could take place due to spillage of hazardous chemicals such as petrochemicals that would be stored and used on the construction site.

Soil degradation takes place through the removal, alteration or damage to soil and soil forming processes by land clearing, dust suppression and compaction of soil at roads and development footprints. The direct impacts of degradation and accelerated wind erosion of soil during and after the land clearing activities have been considered.

The potential for soil to erode is the likelihood that erosion will take place when soils are exposed to water and/or wind due to construction activities. The potential for erosion is increased in areas with low-plasticity, fine-grained soils such as in this study area. Due to the flat gradient, percentage of vegetation cover and geology/soil composition

of the site, the Erosion Susceptibility Map for South Africa rates this area as potentially a low erodibility area (Breedlove, 2000).

The proposed activities would cause dust nuisance and limit visibility near farm residences and in areas next to the R357. Dust suppression will suffice as a mitigation measure during the construction phase.

After the rehabilitation of construction areas at the onset of the operational phase the potential for wind erosion would be high due to the low precipitation of this area, but as rehabilitation and the establishment and succession of the plant communities commence, the potential for erosion would be lowered accordingly.

Agriculture

A specialist agricultural study has been conducted and is included in Appendix H. The site was found unsuitable for commercial cultivation due to limiting factors such as shallow soil depth and hard setting carbonate horizons below surface. The low clay percentage results in low water holding capacity and low nutrient availability. Severe climatic conditions further limit commercial cultivation.

The proposed project area could be and is utilised as grazing for game, sheep and cattle.

The construction and operation of a PV Power station should have no high impacts on the agricultural potential of the identified site, except for increasing the possibility of erosion where soil is disturbed, for which mitigation measures were recommended in the report. Commercial agricultural activities can continue normally in the surrounding areas.

Mitigation Measures

The construction and operation of the PV power stations would, in general, not impact on the agricultural potential of the surrounding area.

Table 3: List of impact descriptions and mitigation measures recommended (Appendix H)

Impact description	Mitigation measures recommended
Land loss for grazing	Although low in potential, some of the areas are currently used for grazing. It is recommended that any vegetation removed during construction is re-established once the power station is commissioned
Storm water	Should runoff directions be disturbed by construction activities or by the footprint of the power station, the necessary control measures should be implemented to prevent erosion.
Water erosion	Should soil and gradient be disturbed and vegetation removed during construction, soil should be compacted and vegetation re-established.
Wind erosion	Should soil and gradient be disturbed and vegetation removed during construction, soil should be compacted and vegetation re-established. Windblown dust should be prevented by watering down the working areas.
Construction rubble and other waste may spill into rivers or be carried onto neighbouring agricultural land by runoff water.	Rubble and waste should be removed from the construction site regularly.
Degradation of roads (used by farmers) due to heavy construction vehicles.	Maintenance of roads should be undertaken throughout the construction and operational phases.
Increased heavy vehicle traffic due to construction.	Truck drivers and other heavy machinery operators should be made aware of pedestrians, stray animals and stock herders on the roads.
Loss of farm labour to construction	The proponent should refrain from employing farm labourers for construction purposes. It should be explained to such applicants that they would exchange permanent jobs for

	temporary jobs.
Security risks	All possible measures should be implemented to prevent construction workers from entering neighbouring farms.
Risk of injury to people and animals	The construction site should be fenced in to prevent children and animals entering the site and getting injured.
Potential third party tampering	Permanent security fencing should be erected to prevent ignorant and innocent tampering by third parties.
Depletion of groundwater resources used for stock watering, due to construction activities.	It is recommended that a proper study of the needs for the construction is compared with the needs of local stock farmers and the available groundwater.

6.1.3 Ecology and Biodiversity

Dr Van Rooyen, the ecologist, made the following concluding remarks (Appendix C):

- Twelve specially protected or protected plant species according to the NCNCA, NFA, CITES and NEM:BA were recorded on the site;
- The species richness of the plant communities is relatively high compared to the mean species richness of plant communities along the Orange River westwards, where the mean annual rainfall is lower;
- The threatened status of the vegetation type in the area (Northern Upper Karoo) is considered as 'least threatened';
- The site is not located in any protected area;
- There is one individual of a Protected Tree species on the site;
- There are no Red List plant species with a status higher than 'least concern' on the site;
- No GWC endemic plant species were recorded on the site;
- One Kalahari endemic species (*Acacia haematoxylon*) was recorded on site;
- The Greefspan extended site is bordered on the west and north by other proposed Solar Facility sites, and on the south by the main R357 tar road. Therefore dispersal of fauna could only take place north-east and eastwards and jackal-proof fences could be removed to allow for animal dispersal;
- Any overhead power line should be clearly marked with 'flappers' to prevent bird collisions;
- There are no sensitive habitats such as quartzite ridges, dunes or wetlands on the site;
- The erosion potential of the soils is low;
- The fragmentation of the habitats is considered to be low;
- The sensitivity of the different plant communities is rated as low;
- The significance of impacts on the site is rated as low; and
- Biodiversity offset is not required regarding this proposed development.

Mitigation measures:

Development should be contained within the proposed footprint of the solar facility and unnecessary disturbance adjacent to the site should be avoided.

Dust control measures should be implemented during construction.

The denuded and disturbed areas on site due to construction should be revegetated (e.g. with grasses) as soon as possible.

Establish a monitoring program for the early detection and control of alien invasive plant species.

No alien plant species should be used in landscaping or gardens around the site.

During the pre-construction phase detailed on site surveys and delineation need to be conducted by a suitably qualified land surveyor that will include an assessment of the site specific topography, the micro siting footprint of the PV panel supporting structures as well as all associated infrastructure. This will be done in collaboration with a

suitably qualified ecologist that will ensure that any environmental sensitive aspects identified during the EIA investigation is taken into consideration.

Fauna

The site does not provide a critical habitat for wildlife and no threatened or endangered species are known to occur on the site. No Red Data Book (RDB) species were recorded. (Erasmus, 2010) (Appendix C)

Habitat destruction and fragmentation and the loss of land capability are the main negative impacts on vertebrate species, while contamination of the genetic integrity of species and an increase in predator-prey interaction are considered lesser impacts. (Erasmus, 2010) (Appendix C)

None of the encountered vertebrate species at the study area are unique to the Northern Cape Province and the power generation will only have a medium-term effect on the vertebrate faunal component at the site. The power generation will not impact negatively on the ultimate survival or dynamics of the encountered taxa. (Erasmus, 2010) (Appendix C)

While animals generally avoid contact with humans and human structures, they do grow accustomed to structures, and some species even to humans, after some time.

As the development would be fenced, specific impacts that would result from the type of fencing should be considered.

Ken Coetzee, of Conservation Management Services, analysed the possible effect of a solar PV plant on the game on the neighbouring game farm, Greefspan, owned by the J.A. Wiid Family Trust.

From this study conducted it is clear that the distribution of wild animals, large and small, is not affected by the noise, security lights or visual appearance of the solar PV plant, and that the landowner's belief that animals do not get within 200 m of the solar PV plant boundary is not correct (Coetzee & Stroebel, 2017).

The solar PV installation has absolutely no effect on the carrying capacity of the natural vegetation or the stocking rate that should be used in the game camp. Game animals move freely through the study area to feed, with signs of browsing (branch tips nipped off and branches broken) and grazing (short-grazed Karoo bushes and grasses) almost right up to the PV plant boundary fence. (Coetzee & Stroebel, 2017)

If fewer herbivorous animals make use of the area near to the solar PV plant than the more western parts of the game camp then it is because of better forage availability in those western areas rather than reduced carrying capacity of the vegetation due to the solar PV plant. The denser *Acacia mellifera* (which is highly palatable to browsers) to the west indicates that this may be the case. The denser vegetation to the west also provides cover and shade for resting game animals, something that is not available closer to the PV Plant. (Coetzee & Stroebel, 2017)

The electrification on the existing solar PV plant fence is an excluder for wildlife that would normally move through the non-electrified boundary fence between farms (jackal proof fence). There is practically no movement of wildlife, large or small, through the existing plant boundary fence. (Coetzee & Stroebel, 2017)

Herpetofauna

An approximate total of 37 reptile and seven amphibian species, none of which appear in the current Red Data Book for "Endangered species", may be encountered at the study area. No amphibian species were recorded and it is doubtful whether they would ever occur because no open water is found on site. No reptiles were observed either, but some are sure to be recorded in summer months. All tortoise species currently enjoy protected status. (Erasmus, 2010 (a))

Avifauna and Chiroptera

The surrounding areas around Farm De Rust (portion 1 of Kwartelspan No 25) were considered in the findings in the original specialist report and an additional investigation is therefore unnecessary (Appendix D). (Wilson, 2012)

Farm De Rust (portion 1 of Kwartelspan No 25) is unlikely to constitute critically important habitat or resources for any bird or bat species. The cumulative impact of the additional project development in unlikely to add significantly to the already reported on impacts. (Wilson, 2012)

The specialist's mitigation and management proposals for this development will essentially remain the same as those in the original report and no additions or amendments will be necessary. (Wilson, 2012)

An avifaunal specialist study has been undertaken by Ms Beryl Wilson to assess the potential impacts on local avifauna (birds) and Chiroptera (bats) associated with the development of photovoltaic power stations near Ovaal, Herbert, Greefspan and Welcome Wood Substations, Northern Cape. (Appendix D)

The results indicated an approximate total of 20 bird and four bat species of potential conservation significance that may occur in the general area of which none were considered to be permanently resident at any of the proposed sites. Since birds and bats are highly mobile and often only transient out of breeding season, it is not envisaged that the majority of species expected to be present would be directly and negatively influenced by the PV stations. (Wilson, 2010)

It should be noted that the Blue Crane and all the Vulture species are listed as Vulnerable in the RDB, but also as Endangered in the ToPS. (Wilson, 2010)

Loss of habitat, displacement and disturbance of fauna, and interactions with various electrical infrastructures were the main identified impacts that were taken into consideration with regard to management proposals. (Wilson, 2010)

With any proposed project it is likely that there would be a number of direct and indirect impacts on the fauna occurring in the area. While direct impacts include the death of individuals, removal/destruction of nests, nesting or roosting sites etc., this would be largely experienced at the construction phase and then later during routine monitoring to remove problem species (e.g. semi- or permanently nesting or roosting on the structures). (Wilson, 2010)

The extent to which the electrical infrastructure has already impacted on the resident birds in terms of collisions and electrocutions is indeterminable. Indirect effects such as disturbance and displacement may be less significant, and probably limited to common species in the area. No complete localized extinctions of avifauna or bats are predicted. However, evidence suggests that displaced individuals do suffer a much greater mortality rate. (Wilson, 2010)

Although these factors that could negatively impact on avifaunal species were identified and discussed, the investigated area is not unique in terms of species diversity and ecostatus within the region as a whole. Development of this specific site would not have significant impact on the overall distribution, the survival or dynamics of the encountered avifaunal or Chiroptera species. (Wilson, 2010)

Mitigation Measures

Feasible and practical management proposals include (Wilson, 2010):

- reducing the impact on the ecology of the area with appropriate management practices as recommended by ecological specialists;
- preventing the unnecessary destruction of vegetation in areas prone to soil erosion;
- monitoring the area and associated ecosystems for significant negative changes such as pollution, erosion etc. and taking immediate action to rectify these changes;
- minimising and limiting the destruction or disturbance of vegetation within the areas of activity, as well as in the surrounding areas, thus circumventing the need for an offset area;
- staying clear of drainage areas and sensitive areas and maintaining an appropriate buffer zone between these areas and the erected structures;
- reducing noise, air, soil and water pollution as far as possible;
- prohibiting the intentional killing of birds and bats through onsite supervision and worksite rules;

- educating employees to minimise accidental killings of birds and bats during routine construction and maintenance activities;
- monitoring all electrical infrastructures weekly for bird mortalities (collisions and electrocutions)
- modifying any bird-unsafe electrical pylon structures to insulate dangerous live components, cutting a gap in the earth wire and installing perch deterrents can also be installed to keep birds away from the dangerous areas on the structure;
- minimising bird collisions on newly constructed electrical features by implementing the standard anti-collision devices and diverters currently in use by Eskom
- giving preference and consideration to underground cabling rather than any new overhead structures;
- discouraging nesting, either by removing nests as they are built, or by supplying suitable alternative structures, and by avoiding infrastructure construction designs such as flat or trellised surfaces near key structures; and
- discouraging roosting bats by closing any roosting sites at night once the bats have left for foraging, and by avoiding infrastructures that encourage roosting.

The management proposals listed here are aimed at preventing unnecessary habitat destruction and the subsequent disturbance and displacement of birds and bats in the area, and maintaining suitable habitat and resources where possible. Passive and active discouragement measures are suggested. Emphasis is placed on the safety of conservation-worthy species regarding possible interactions with the various types of electrical infrastructure. Many of the bird species are in fact on the Red Data List due to these fatal contacts. (Wilson, 2010)

Relocation and rescue measures of existing avifauna and Chiroptera are considered unnecessary. (Wilson, 2010)

Despite the use of anti-collision devices and bird diverters, and insulated wires, there can be no guarantee that isolated avifaunal incidents can be totally avoided. With adequate monitoring, these incidents can be identified and remedied as far as possible. (Wilson, 2010)

6.1.4 Social Environment

The main social challenges experienced within the district include:

- low economic growth rate that limits the material needs of communities;
- negative population growth rate due to urbanisation;
- lack of job creation and training institutions in the province resulting in high unemployment rates;
- primary education;
- a desperate need for social activities, services, and youth development; and
- lack of basic services including sanitation.

The sphere of influence of the proposed PV power station has been assessed within the macro system, the mesosystem and the microsystem.

Macro level Impacts

The project is likely to have high long-term, indirect social impacts that might extend to a regional and possibly a national scale. These large-scale social impacts would stem from the experience in the utilisation of solar power that would be gained by constructing and operating the PV power station. This experience and technology could be employed in the future construction of other, similar plants in South Africa. In addition, the project would impact positively on Eskom's capacity to supply electricity.

One of the major benefits of solar power is that it has little environmental impact, with none of the polluting emissions or safety concerns associated with conventional electricity generation technologies. Increased reliance on solar power could therefore help to slow the pace of global climate change.

Although the proposed PV power station could assist to meet electricity demand in South Africa, energy prices would not be reduced over the short term. Indications are that PV power would cost more than Eskom's current price of coal power for the foreseeable future.

Over the longer term, with increasing shortages in fossil fuels, the economic benefits of solar power are likely to become more apparent. As more experience is gained in the utilisation of PV technology, this technology is likely to become more cost-effective.

Increased reliance on solar power would have significant environmental and economic benefits over the long term. Both of these effects would translate into social impacts in the form of increased human wellbeing and prosperity

Mesolevel Impacts

Employment opportunities created by the construction phases would have short-term positive impacts that in turn would improve the lives of individuals and families, but would also cause intrusion by specialist and other workers from outside the community. The magnitude of this impact would depend on the number of construction workers to be employed, either by the developer itself or by contractors. Sourcing of construction workers from the local labour pool is likely to be limited to unskilled workers. However, the construction of PV structures is relatively uncomplicated and therefore the majority of employment opportunities created during the construction phases would be offered to local workers, with contractors importing only their core teams of management and specialist skilled staff. This could have some economic benefits for surrounding communities, although only of a temporary nature.

A void would be left in the local community after the construction phase when workers have departed, but skills development might partially mitigate this impact.

The operational phase of the power station would result in the creation of some employment opportunities in fields such as security and maintenance services. Whether the benefits of these employment opportunities would accrue to surrounding communities would depend on the availability of the necessary skills in these communities.

Some local procurement of goods, materials and services could occur, which would result in positive indirect socio-economic impacts.

The proposed project would put extra pressure on the local and district emergency and fire-fighting services. The district municipality would need to amend its emergency and response plan to incorporate and make provision for the PV power station.

Microlevel Impacts

The physical presence of the construction plant and construction activities as well as during the operational phase would cause direct impacts to the area immediately surrounding the study area. These impacts might be experienced by landowners and residents in the area immediately surrounding the study area.

The construction phase might impact on the safety and security of surrounding communities by giving rise to crime as well as an increase in traffic volumes.

Mitigation Measures

It is recommended that the percentages of local labour as prescribed by EPWP be considered and included in the contract between the developer and the contractor. It is important to establish the number of skilled labourers in the area, as well as the types of skills they have, through liaison with the municipality. This can be conducted through the appointment of a community liaison officer (CLO) through consultation with the local authority. The possible influx of employment seekers could be controlled by making reliable information available to the region through advertisements in local papers and communication with municipalities regarding the proposed development and the type of employment opportunities available.

Theft and crime would be mitigated by erecting the perimeter fence and security systems at commencement of construction.

The EA holder will implement investment activities during the IPP Procurement Programme bid, which has set deliverables concerning this. Close communication with local and district authorities from different departments might

be necessary to coordinate these activities and ensure successful implementation during the pre-construction and construction phase.

The impacts associated with the higher traffic volumes could be accommodated by proper site management, e.g. controlling the size of orders that would be transported to the site at any given time, and by notifying the public through local and regional radio stations when large numbers of freight-carrying vehicles would be on the roads.

Communication should be maintained with the local and district municipalities, and with the public through the local newspapers, to keep the surrounding communities informed about the proceedings of the project as well as the type and number of contracts and employment opportunities that would be available. There will be local people employed for security and maintenance roles in the operational phase. The contractor would train some of these personnel during the construction phase.

Mitigation measures pertaining to the social environment are contained in the following sections of the EMPr (Appendix I).

Community Trust

In terms of the bid requirements for the IPP procurement programme the project will have a Community Trust that will receive a percentage of the operational revenue of the PV project. The funds received by the Trust will be used to support local social and economic development initiatives, which may include educational activities, bursaries, skills training, and other health and social support services and projects.

6.1.5 Economic Impacts

Potential impacts associated with the construction phase include:

- financial and economic impacts;
- stakeholder interest;
- business risk/benefit; and
- damage to property (landowner and developer).

Positive economic and financial impacts have been sufficiently addressed in the social environment section.

Local content

While a high level of both stakeholder and business risk is involved, there are also great potential benefits. Planning and several applications are currently in process. There is thus a high level of financial input, while the developer is not at all assured that leave would be granted to implement the proposed development. The numerous uncertainties associated with the renewable energy strategy launched by NERSA are also influenced by the requirements of the Department of Energy and the Treasury, as well as those set by the different financial institutions.

This impact could only be mitigated by internalising the externalities and clearly identifying and defining aspects related to this development. The purpose of the EIA as a whole is to assist in addressing these aspects very early in the planning phase. The EIA will continue to do so as the project planning (critical project timeline) of the proposed development progresses.

The risk to the landowner, Eskom and the developer with regard to physical damage to infrastructure is moderate and has been taken into consideration in the EIA matrix. Mitigation measures would include good management control and housekeeping, as well as safety and security infrastructure and personnel.

The study area has a grazing capacity of 30 to 32 ha/large stock unit and is best suited for low to medium density grazing activities. The economic gains of a PV power station on the same land would be higher, with more employment opportunities than would be afforded by solely using it for agricultural purposes. The area could potentially still support agricultural use. (Figures 15-16)

Figure 15-16: Dual purpose use of grazing land as well as agriculture

Mitigation Measures

Mitigation measures have been addressed in the following sections of the EMPr (Appendix I):

- Preconstruction phase
  - Project contract and programme
  - Appointments and duties of project team
- Construction and operational phase
  - Crime, safety and security.

6.1.6 Traffic Impacts

During the construction phase traffic impacts would be high as trucks would be needed to transport materials and equipment to the study area, with only the R357 from either Douglas or Prieska as access point. All parts of the infrastructure needed for the proposed development, including support structures, grids for PV modules, PV modules, masts for lightning conduction, and large amounts of ancillary infrastructure, as well as machinery must be transported to and from the study area from various locations in the region. It would definitely have an impact on the traffic volume of the R357 as well as on the condition of the access to the site off the R 357.

During the operational phase traffic would be insignificant, with trucks only needed intermittently to transport infrastructure to the study area during the maintenance and upgrading phases. The O&M phase of the PV power station would have an insignificantly low impact on the traffic volumes of the region as well as on the condition of the R357.

Mitigation of traffic impacts would not be necessary during the operational phase. When upgrades or expansions are to be conducted on a large scale, activities and associated mitigation would revert back to the construction phase.

Possible impacts of traffic on the immediate communities have been discussed in the social environment section and traffic noise etc. will be discussed in the section on noise that is to follow.

Mitigation Measures

Traffic to and from the study area would have to be monitored and controlled closely by the project manager to ensure that congestion of roads would not occur.

Further mitigation measures are stipulated in the EMPr.

6.1.7 Noise

The impact of noise during the operational phase would be negligible, involving possible humming from transformers, wind whistling from overhead evacuation lines and across the PV modules, and guards' radios.

Noise associated with the proposed development would mostly be generated during the construction phase and, to a lesser extent, during the decommissioning phase, and would be limited to noise levels generally associated with

construction. As the development will be situated next to the provincial road carrying low traffic volumes within a sparsely populated area, noise generated by the development during the operational phase is not expected to have a significant impact on the noise receptors in the area.

Mitigation Measures

Mitigation measures pertaining to the noise impacts are contained in the construction and operational phase noise section of the EMPr (Appendix I).

6.1.8 Air Quality

Impacts on air quality would mostly occur during the construction and decommissioning phases and will involve a high dust nuisance. Air quality impacts during the operational phase will be insignificant and limited to vehicle emissions. Mitigation measures are included in the dust section of the construction and operational phase section of the EMPr.

6.1.9 Visual and Aesthetical Impacts

Axis Landscape Architects evaluated all possible visual and cumulative impacts of the proposed layout and extended footprint of Greefspan 2 in relation to original visual impacts of the Greefspan 1 PV power station. The most significant impact will be the enlargement the construction site of the project. This will come about when shrub land areas are cleared to make way for construction areas, roads and stock piles. The change in surface cover from shrub land to exposed soil will diminish the shrub land character of the area and cause a cumulative visual impact. The impact will abate as the project reaches completion.

The cumulative visual impact of the extended Greefspan 2 power station will be moderate due to the enlarged footprint and will contribute to the proposed visual impact of Greefspan 1.

Construction-related activities would have an immediate and obvious impact on the visual and aesthetical aspects of the study area and surrounding areas. Impacts on observers close to the study area, especially those travelling along the R357 directly adjacent to the study area, as well as impacts on potentially sensitive receptors such as landowners and homesteads located within areas of potential visual exposure, have been considered by Axis Landscape Architecture cc (Appendix G). The expected sudden increase in heavy vehicles utilising the roads to the study area might also cause a visual nuisance to other road users and landowners in the area. Dust nuisance would add to the visual impact during construction.

The presence of the proposed PV power station, including its ancillary infrastructure, would have an impact on the visual and aesthetical aspects of the study area and surrounding areas especially during the construction phase (Appendix G).

Potential impacts associated with the construction and operational phases include:

- visual impacts;
- reduction in aesthetic properties;
- littering and housekeeping on the construction site;
- light pollution; and
- dust nuisance and other impacts related to the construction phase.

The key aspects determining the visual impact of any development include its physical dimensions, colour and texture. PV power station infrastructure might be reflective and mostly stands in contrast with the surrounding environment.

The reflection generated by PV modules on tracker systems are always directed at the sun and could therefore only be a nuisance to motorists at ground level around sunrise and sunset, and possibly to air traffic. Glint and glare would possibly be visible to motorists traveling south on the R357 at sunrise but the risk is low due to the low height of the structures, the distance from the road and the visual absorption capacity of the natural vegetation.

PV panels near airports present no greater hazard due to reflected sunlight than parking lots filled with cars. Light is specularly reflected from any smooth surface where the index of refraction is different from that of air. The intensity of the reflection is dependent on the angle between the sun and the solar panel, and the index of refraction of the panel. Multiple reflections from the front and back surfaces of the glass are not apparent in solar panels since they are designed to absorb light and convert it into electricity. (Arce, 2010)

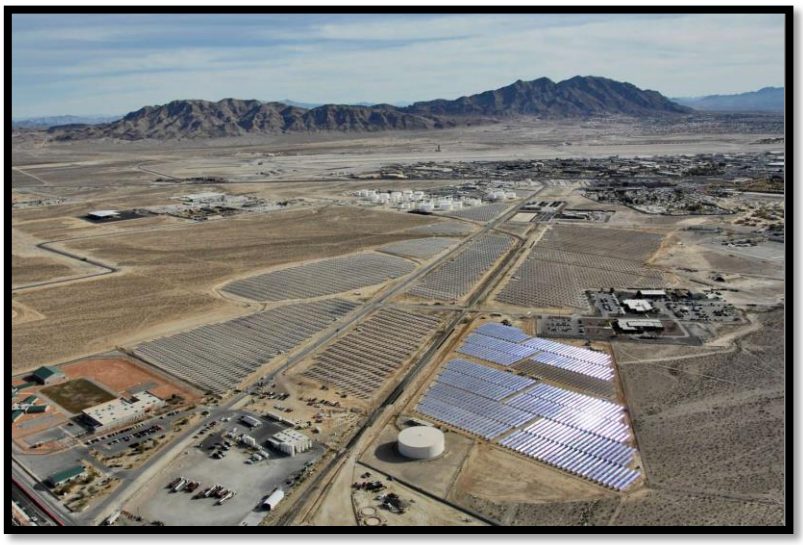


Figure 17: Nellis Air Force Base, Nevada, US (USAF, 2010)

Should air traffic cross the project area, glint and glare might potentially be experienced. This would depend on altitude, relationship to the project area and panel position/angle. However, several large-scale solar projects are operated without incident near major airports such as at Nellis Air Force Base in Nevada, US where a 14.2 MWp PV power plant is operated (Figure 17). (Arce, 2010)

The conclusion is that the proposed PV power station would not cause a substantial increase in solar radiation reflectivity compared to the surrounding environment. (Arce, 2010)

The South African Civil Aviation Regulation Act, Act 13 of 2009 controls markings of structures that may influence aviation through the Civil Aviation Technical Standard, SA-CATS-AH 139.01.33 Obstacle Limitations and Markings outside Aerodrome or Heliports.

The highest structures that would be constructed at the proposed development would be the lightning conductors, which would have a height of 25 m. Cabling would not cross any rivers, valleys or major roads.

The area is not densely populated and the possible impacts due to lighting are expected to be negligible. Security and after-hours operational lighting would not cause any sky glow. Security lighting would be activated by motion detectors and would not be on through the night.

As part of the bid process the Applicant has obtained SACAA consent for the proposed development.

Mitigation Measures

Mitigation measures pertaining to the visual impacts are contained in the EMPr (Appendix I).

6.1.10 Heritage Resources

Archaeological Aspects

A Phase 1 Archaeological Impact Assessment was conducted by Dr David Morris of the McGregor Museum, Kimberley in June 2010 and January 2011 (Appendix E). (Morris, 2011)

The specialist's finding was that, while stone tools were noted across the entire site, they occurred in very low densities and their occurrence there was not of high significance. There were no colonial era built structures in the

areas examined and no artefacts of this period (e.g. porcelain, metal) were noted. The substrate exposed on the hill slope appeared to consist of tillite and no shales were noted. (Morris, 2011)

The Phase 1 Archaeological Impact Assessments are attached in Appendix E of this report.

Palaeontological Aspects

The Palaeontological Impact Assessment: Desktop Study was conducted by Dr John Almond (Appendix F).

Significant additional impacts on fossil heritage resources are not anticipated in the case of the proposed new PV Power Plant II at Greefspan, including the recently proposed extensions to the project area to 160 ha. Given the generally low palaeontological sensitivity of the near-surface rocks in the study region, the cumulative impact of the two adjacent developments is assessed as low. Pending the discovery of new fossil material on site, further palaeontological studies or mitigation for this project is not considered necessary. (Almond, 2010)

Mitigation measures pertaining to the heritage impacts are contained in the construction and operational phase heritage section of the EMPr (Appendix I).

6.1.11 Impacts on Eco-Tourism

The Northern Cape Province is a sparsely populated and relatively isolated semi-desert area of South Africa. The area is therefore considered to be suitable for the establishment of PV power plants.

The Pixley ka Seme District Municipality has highlighted the need for economic and tourism injections by the business sector to the district to facilitate economic growth and employment opportunities. The power station would mostly attract business.

The overall impact of the power station would be positive in this area, as the power station would possibly attract business and therefore bring clients to guesthouses in Douglas, Prieska and their surrounds.

There are no known established tourism facilities in the vicinity of the study area other than the confluence of the Vaal and Orange River systems and the glacial pavements that occur at several locations surrounding Douglas.

All of the land surrounding the substation is privately owned and is currently being used for livestock and game farming purposes.

Mitigation measures are addressed within the EMPr (Appendix I).

6.1.12 Electromagnetic Compatibility

All the electrical components of the PV plant are rated by the European Standards authorities (CE mark) as safe for electromagnetic interference. This means that they are safe to live with and will not interfere with the TV or radio reception. They should thus not interfere with remote navigational systems. In this regard the largest PV plant in the USA is on an Air-force Base. If the PV plant did interfere with navigational systems it would never have been developed on an Air-force Base. (Figure 17)

Products carrying the CE mark comply with the European Directive 2004/108 regarding Electromagnetic Compatibility (EMC). In Europe, this CE mark is a precondition for sale of the device.

The proposed PV power station would mainly consist of PV modules, trackers, inverters and transformers. The CE mark is on the data sheets regarding the PV modules and all the support structure alternatives that were considered.

7. ENVIRONMENTAL IMPACT STATEMENT

Impacts that might potentially be associated with the PV power station include impacts on water resources; soil and agricultural potential (risk of erosion linked to topography of area, land use potential and restriction of land use); ecology and biodiversity (impacts on ecology, flora and fauna, and especially avifauna); social aspects on the macro-, meso- and microlevel; visual quality and aesthetics; economic impacts (mostly positive); traffic impacts (construction, upgrading and decommissioning phases); noise (construction, upgrading and decommissioning phases); air quality; visual and aesthetical impacts; heritage resources; and tourism activities.

Most of the potential impacts identified are anticipated to be site-specific. No environmental fatal flaws were identified and no 'no-go' areas have been identified.

7.1 No-go alternative

If the requested amendment is not granted, it will not be possible to transfer the ownership of the grid connection infrastructure to Eskom, as required by Eskom in terms of the agreements between the Applicant and Eskom. If Eskom's requirements are not met, Eskom may not be able to assume the operation and long-term maintenance of the grid connection infrastructure, which may result in the PV Project being unable to connect to the national grid, in which case the PV Project may not proceed.

Deciding not to proceed with the development would have a negative impact on the socio-economic development of Douglas and Prieska. The job creation and poverty alleviation that would have occurred due to the development, would not take place.

In 2006 South Africa sourced approximately 90% of its energy from fossil fuels (coal, oil, gas). Coal, which is the main contributor to the country's carbon dioxide emissions, is the major primary energy supplier with a contribution of 65.9% to the total primary energy supply in 2006. (Subramoney et. al., 2009) Carbon dioxide is the main greenhouse gas connected with climate change. Hydro and renewable energy supply has seen little change since 2004; hydro supply had an increase of about 0.1% since 2004 while renewable supply declined by 0.4% (Subramoney et. al., 2009).

In order to develop sustainably whilst preparing for growing energy demands, South Africa's future energy supply must therefore be diversified with regard to power generation sources. This is also important in the light of the country's commitment under the Copenhagen Accord to reduce its carbon dioxide emissions by 34% below the "business as usual" level by 2020.

The generation of electricity from renewable energy resources offers many potential socio-economic and environmental benefits for South Africa. It can ensure increased energy security, which is highlighted by the past electricity crisis in South Africa, as well as resource saving, as conventional coal-fired plants are major consumers of water during the cooling process.

The energy demand at the Eskom Greefspan Substation grows at a rate of approximately 419kVA per annum from 2007 to 2010 (Du Plessis, 2010). The development of small-scale, evenly distributed renewable energy supply schemes, such as the one proposed at Eskom Greefspan Substation, is strategically important for the diversification of domestic energy supplies and for avoiding possible energy imports in the future.

Note that should the development not proceed, the identified site would not be impacted on from an environmental perspective and would continue to be utilised for agricultural activities on marginal agricultural land.

The 'do nothing' alternative is not a preferred alternative in this application.

8. RECOMMENDATION OF PRACTITIONER

The requested amendments would not change the scope of the proposed development; nor increase the level or nature of the impact, which impact was initially assessed and considered when application was made for the environmental authorisation dated 6 September 2012, and subsequent amended EA dated 12 March 2013.

The requested amendments would not change the scope of the proposed development; nor decrease the level or nature of the impact, which impact was initially assessed and considered when application was made for the environmental authorisation. The requested amendments will help to ensure that the authorised Greefspan PV Power Plant No. 2 will proceed, and that all of the positive socio-economic benefits associated with the PV Power Plant will be realised.

The information contained in this amended report and the documentation attached hereto is sufficient to enable the competent authority to make a decision in respect of the amendment to the EA applied for.

All recommendations and mitigation measures that should be included in the authorisation is addressed in the Environmental Management Program. Should the amended EIA report and EMPr be accepted and authorised, all aspects that have been discussed within the report and program would be addressed.

It is imperative that the EMPr be implemented during pre-construction, construction and operational phase and continued compliance to it be ensured. This would be possible by stipulating that the EMPr should form part of all contracts with businesses, contractors and sub-contractors, as well as the work force.

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APPENDICES

Appendix A: Site plan(s) - GIS Maps of Greefspan Study Area
- Figure 1: Locality Map
- Figure 2: Status Quo
- Figure 3.1: Regional Topographic Map
- Figure 3.2: Regional Cadastral Map
- Figure 3.3: Regional Land Types Map
- Figure 3.4: Regional Vegetation Map
- Figure 4.1: Digital Elevation Model
- Figure 4.2: Slope Analysis
- Figure 4.3: Visibility Analysis

Appendix B: Site Layout Plan
Site Photographs dated 14 October 2017

Appendix C: Evaluation of Solar Plant Impact on Wildlife – Coetzee – September 2017
Letter Ecotrust – June 2016
Botanical Report – Ecotrust (Van Rooyen) – 5 October 2012
Ecological Report – Ecotrust (Van Rooyen) – 9 October 2012
Localities of Protected Plants – Ecotrust (Van Rooyen) - 2012
ToR Ecology – Erasmus – January 2012
Letter from the Specialist – Erasmus – 9 February 2012
Ecological Impact Assessment: Initial Area – Erasmus – June 2010
Ecological Impact Assessment: Expanded Area – Erasmus - 2010
CV: B.H. Erasmus

Appendix D: Avifauna Review Letter – 30 November 2012
ToR Avifauna and Chiroptera – January 2012
Letter from the Specialist – 2 February 2012
Avifauna and Chiroptera (Zoology) Study – November 2010
CV Beryl Wilson

Appendix E: ToR AIA – January 2012
Letter from the Specialist – 8 March 2012
Phase 1 AIA – June 2010
Phase 1 AIA Expansion – January 2011
Phase 1 AIA Further Expansion – November 2012

Appendix F: Statement Palaeontologist – December 2012
ToR Palaeontology – January 2012
Statement Palaeontologist – February 2012
Palaeontological Desktop Study – July 2010

Appendix G: Letter from VIA Specialist – 23 November 2012
ToR VIA – January 2012
Letter from VIA Specialist – 9 February 2012
Visual Impact Assessment – March 2011
CV Gerhard Griesel

Appendix H: Letter from Agriculture/Soil Specialist – 20 November 2012
ToR Agriculture – January 2012
Letter from the Specialist – 31 January 2012
Agricultural Impact Assessment – March 2011
CV C.R. Lubbe

Appendix I: Environmental Management Program (EMPr)

Appendix J: Licence DAFF (Forestry) Removal of Protected Tree
Permits DENC – Fauna & Flora

Appendix K: Proof of Submission of Shapefiles

Appendix L: Environmental Authorisation & Amendments

Appendix M: Rezoning Authorisation - Siyancuma Local Municipality
Water Use Authorisation – Siyancuma Local Municipality
SACAA Authorisation

Appendix N: SAHRA Final Comment

Appendix O: Title Deed Information

Appendix P: Curriculum Vitae – I.B. van Zyl / Company Profile of Van Zyl Environmental Consultants

Appendix A:
Site Plans
GIS Maps of Greefspan Study Area

- Figure 1: Locality Map
- Figure 2: Status Quo
- Figure 3.1: Regional Topographic Map
- Figure 3.2: Regional Cadastral Map
- Figure 3.3: Regional Land Types Map
- Figure 3.4: Regional Vegetation Map
- Figure 4.1: Digital Elevation Model
- Figure 4.2: Slope Analysis
- Figure 4.3: Visibility Analysis

Appendix B:

Site Layout Plan
Site Photographs dated 14 October 2017

Appendix C:

Fauna & Flora Studies

Evaluation of Solar Plant Impact on Wildlife – Coetzee – September 2017
Letter Ecotrust – June 2016
Botanical Report – Ecotrust (Van Rooyen) – 5 October 2012
Ecological Report – Ecotrust (Van Rooyen) – 9 October 2012
Localities of Protected Plants – Ecotrust (Van Rooyen) - 2012
ToR Ecology – Erasmus – January 2012
Letter from the Specialist – Erasmus – 9 February 2012
Ecological Impact Assessment: Initial Area – Erasmus – June 2010
Ecological Impact Assessment: Expanded Area – Erasmus - 2010
CV: B.H. Erasmus

Appendix D:

Avifauna Study

Avifauna Review Letter – 30 November 2012
ToR Avifauna and Chiroptera – January 2012
Letter from the Specialist – 2 February 2012
Avifauna and Chiroptera (Zoology) Study – November 2010
CV Beryl Wilson

Appendix E:

Archaeological Impact Assessment

ToR AIA – January 2012
Letter from the Specialist – 8 March 2012
Phase 1 AIA – June 2010
Phase 1 AIA Expansion – January 2011
Phase 1 AIA Further Expansion – November 2012

Appendix F:

Palaeontological Impact Assessment

Statement Palaeontologist – December 2012
ToR Palaeontology – January 2012
Statement Palaeontologist – February 2012
Palaeontological Desktop Study – July 2010

Appendix G:

Visual Impact Assessment

Letter from VIA Specialist – 23 November 2012
ToR VIA – January 2012
Letter from VIA Specialist – 9 February 2012
Visual Impact Assessment – March 2011
CV Gerhard Griesel

Appendix H:

Agricultural Impact Assessment

Letter from Agriculture/Soil Specialist – 20 November 2012
ToR Agriculture – January 2012
Letter from the Specialist – 31 January 2012
Agricultural Impact Assessment – March 2011
CV C.R. Lubbe

Appendix I:

Environmental Management Program

Appendix J:

Licence DAFF (Forestry) Removal of Protected Tree Permits DENC – Fauna & Flora

Appendix K:

Proof of Submission of Shapefiles

Appendix L:

Environmental Authorisation & Amendments

Appendix M:

Authorisations

Rezoning Authorisation - Siyancuma Local Municipality
Water Use Authorisation – Siyancuma Local Municipality
SACAA Authorisation

Appendix N:

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Appendix P:

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