



DRAFT MOTIVATIONAL REPORT

11 December 2020

**PART 2 AMENDMENT: AS PART OF THE PROPOSED SONBESIE
SOLAR POWER PLANT NEAR VRYBURG IN THE NORTH WEST
PROVINCE**



PROJECT DETAIL

DEA Reference No. : 14/12/16/3/3/2/915

Project Title : The Sonbesie Photovoltaic (PV) Solar Power Project near Vryburg in the North West Province

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Client : Sonbesie Solar Power Plant(RF) (Pty) Ltd.

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GLOSSARY OF TERMS AND ACRONYMS

BESS	Battery Energy Storage Systems
BMS	Battery Management System
DEFF	Department of Environment, Forestry and Fisheries
DM	District Municipality
DoE	Department of Energy
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
Environmental impact	Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's environmental aspects.
ESS	Energy Storage System
GNR	Government Notice Regulation
I&AP	Interested and affected party
IPP	Independent Power Producer
kV	Kilo Volt
Mitigate	Activities designed to compensate for unavoidable environmental damage.
MW	Megawatt
NEMA	National Environmental Management Act No. 107 of 1998
PPP	Public Participation Process
PV	Photovoltaic
REIPPP	Renewable Energy IPP Procurement Process
RMIPPP	Risk Mitigation Independent Power Producers Procurement Programme

CONTEXT FOR THE DEVELOPMENT

As South Africa's population and economy continue to grow, so does the electricity demand and the strain it places on natural resources. Renewable energy is the fastest-growing electricity source, displacing fossil fuel-electricity which ensures the transition towards more sustainable electricity production. Though solar energy offers low-carbon electricity generation, its utilisation is characterised by two major constraints.

The first constraint is that solar PV is an intermittent electricity-generating resource. This means that solar electricity production is not continuous and is not always available for meeting electricity demand on the grid. Solar electricity generation varies geographically and temporally (by hour, day, and season) with changes in solar irradiance and cloud cover. Not only is solar generation variable, but it is also consistently unavailable in the early mornings and evenings before the sun has risen or after the sun has set. This daily decline in solar electricity production happens to coincide with the daily increase in electricity demand every morning and evening as thousands of electricity customers are home and use their electrical appliances (peak demand). To meet this daily peak demand, South Africa relies on coal-fired power plants, which can quickly dispatch electricity to the grid. The second constraint on solar electricity is the potential for solar power plants to produce more electricity during the day than is needed by customers, causing potential damage to the grid. Given the inflexibility of the grid, Grid operators must always maintain an exact balance between electricity generation and electricity demand on the grid. Thus, challenges with solar intermittency and over-generation may cause serious issues in maintaining the integrity and reliability of the grid.

In recent years, energy storage has taken on new relevance as it supports increasing energy demand, a higher penetration of renewables on the grid, requirements to reduce emissions, and efforts to improve resiliency. While there are many energy storage technologies, electrochemical (battery) energy storage is considered one of the most promising and well-suited options for dealing with intermittent renewables at the utility-scale level. This is due to its rapidly declining costs, high energy density, long lifetime, and high round-trip efficiency compared to other energy storage options. Lithium-ion (Li-ion) batteries have emerged as front runners in this new expansion of the industry, as their high energy density and rapidly decreasing capital costs support their use in applications ranging from portable personal electronics to transportation, grid-scale capacity support, and more.

As battery storage emerges as a potential solution for addressing the constraints caused by the high deployment of renewables, efforts are underway to identify key environmental impacts of large-scale battery energy storage systems (BESS). As with any technology, it is important to understand the technology's range of safety risks and potential mitigation measures. A comprehensive understanding of the environmental impacts of battery storage can help the energy storage industry to develop environmentally friendly energy storage solutions and help decision makers craft sustainable energy storage policies.

EXECUTIVE SUMMARY

Given the ongoing improvement in battery storage technology and the significant advantages of combining battery storage with renewable generation, it is proposed that battery energy storage systems (BESS) be included as part of the Sonbesie Solar Power Plant(SPP). This report motivates the proposed amendment of the environmental authorisation (EA) as part of the Sonbesie SPP near Vryburg, North West Province (DEA Ref: 14/12/16/3/3/2/915). The Environmental Impact Assessment (EIA) process for the Sonbesie Photovoltaic SPP was lodged in February 2016 and the Environmental Authorisation (EA) was granted on 29 November 2016.

Sonbesie Solar Power Plant(RF) (Pty) Ltd. (hereafter referred to as Sonbesie SPP) was issued with an EA for the development of a 115MW photovoltaic solar facility and associated infrastructure on the Remaining Extent of the farm Retreat No. 671, Registration Division IN, North West Province situated within the Naledi Local Municipality area of jurisdiction. The town of Vryburg is located approximately 5km north east of the proposed development. The total footprint of the project is approximately 264 hectares (including supporting infrastructure on site). The following activities were authorised with special reference to the proposed development and are listed in the EIA Regulations:

- Activity 11(i) (GN.R. 983): *“The development of facilities or infrastructure for the transmission and distribution of electricity outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.”*
- Activity 28(ii) (GN.R. 983): *“Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.”*
- Activity 1 (GN.R. 984): *“The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more...”*
- Activity 15 (GN.R. 984): *“The clearance of an area of 20 hectare or more of indigenous vegetation...”*
- Activity 4(e)(i)(ee) (GN.R.985): *“The development of a road wider than 4 metres with a reserve less than 13.5 metres (e) in North West (i) outside urban areas, in (ee) critical biodiversity areas as identified in bioregional plans...”*
- Activity 12(a)(ii) (GN.R.985): *“The clearance of an area of 300 square metres or more of indigenous vegetation...(a) in North West (ii) within critical biodiversity areas identified in bioregional plans.”*

Sonbesie SPP is said to be tendered to the Department of Mineral Resources and Energy (DMRE) in December 2020. The project will add new generation capacity under the Risk Mitigation

Independent Power Producer Procurement Program (RMIPPPP). The IRP 2019 indicates that there is a short-term electricity supply gap of approximately 2 000 MW between 2019 and 2022. The objective of the RMIPPPP is to fill the current short-term supply gap, alleviate the current electricity supply constraints and reduce the extensive utilisation of diesel-based peaking electrical generators. One of the DMRE's conditions to tender the project under the RMIPPPP is that all projects must be able to operate between 05h00 and 21h30 in order to supply the grid during peak hours early in the morning and late afternoon when the sun has set, which can only be done by using a battery storage system. As a result, Sonbesie SPP intends to make provision for the inclusion of a utility-scale battery storage at their PV power plant to increase utilization of solar electricity on the grid. Sonbesie SPP also intends increasing its capacity of 115MWdc to up to 150MWdc with the use of new and advanced technology of PV panels (470W and Bi-facial).

The following amendments are applied in terms of the EIA Regulations, 2014 (as amended in 2017): inclusion of a battery energy storage system (BESS), increasing the height of the panels, the number of inverters, the DC capacity of the plant, the number of modules, the number of inverters and a revised layout plan. Environamics has been appointed as the independent consultant to undertake the Part 2 amendment process on Sonbesie SPP's behalf. This Motivational report is compiled in accordance with the provisions of Regulation 32 (1) of the EIA Regulations 2014, (as amended).

Battery storage facilities are a relatively new technology, particularly in South Africa. Batteries, as with most electrical equipment, can be dangerous and may catch fire, explode or leak dangerous pollutants if damaged, possibly injuring people working at the facility or polluting the environment. The risk level to the health and safety of on-site personnel as well as neighbouring landowners and community is seen to be of a low risk that is unlikely to occur with the proper safety measures taken as mitigation. Provided that the facility is designed and management properly, and the batteries are handled in the manner prescribed by the manufacturer, an incident is unlikely to happen. However, because of the risk we have recommended some special management actions to reduce the risk of an incident and manage an incident should one ever occur. The assessment determined that the potential negative impacts resulting from increasing the height of the panels, the number of inverters, the DC capacity of the plant, the number of modules, the number of inverters and a revised layout plan would remain unchanged. The proposed layout has been refined to incorporate the inclusion of the battery storage system as well as the advanced technology to be used for the panels.

The advantages and disadvantages of the proposed amendment were explored to provide an indication of the potential benefits and drawbacks. Battery storage offers a wide range of advantages to South Africa including renewable energy time shift, renewable capacity firming, electricity supply reliability and quality improvement, voltage regulation, electricity reserve capacity improvement, transmission congestion relief, load following and time of use energy cost management. In essence, this technology allows renewable energy to enter the base load

and peak power generation market and therefore can compete directly with fossil fuel sources of power generation and offer a truly sustainable electricity supply option.

A Public Participation Process (PPP) as required in terms of Chapter 6 of the EIA Regulations, 2014, (as amended) is being conducted in respect of the Part 2 Amendment application. All comments received throughout the amendment process will be included in the Comments and Response Report to be included as part of the Final Motivational Report.

In light of the above, it is concluded that the EA should be amended in line with the specifications as proposed and that potential risks identified can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

1 INTRODUCTION

Utility-scale energy storage (grid energy storage) is a collection of technologies used to store electrical energy on a large scale within an electrical power grid. The recent increase in solar and wind generating capacity has led to a strong push for the development of energy storage technologies. Energy storage involves storing excess electrical energy when electricity production exceeds demand and returning this electricity to the grid at a later time when demand is high. If implemented on a large scale, energy storage could help resolve the intermittency and over-generation issues of solar energy and allow greater penetration of solar energy on the grid. Energy storage systems cannot store electricity itself, but can convert electricity into other forms of energy, which can be stored for later use and then be converted back to electricity when demand is high.

While there are many energy storage technologies, electrochemical (battery) energy storage is considered one of the most promising and well-suited options for dealing with intermittent renewables at the utility-scale level. This is due to its rapidly declining costs, high energy density, long lifetime, and high round-trip efficiency compared to other energy storage options. Battery energy storage systems (BESS) can dispatch renewable energy in a responsive and reliable manner, which is important for grid operators to efficiently manage the power output to the grid. A BESS is comprised of three major components: the battery which is the energy container; the power conversion system (PCS) or inverter, which interfaces the DC battery system to the AC power system; and the power plant controller (PPC) which governs, monitors, and executes the intended functions of the energy storage application.

While there are various battery storage technologies available, this project focused entirely on utility-scale Lithium-ion (Li-ion) battery energy storage. Li-ion batteries have emerged as the leading technology in utility-scale energy storage applications because it offers the best mix of performance specifications, such as high charge and discharge efficiency, low self-discharge, high energy density, and long cycle life (Divya KC et al., 2009).

The following sections will explain the legal mandate and purpose of the report, details of the environmental assessment practitioner, the status of the amendment process and the structure of the report.

1.1 LEGAL MANDATE AND PURPOSE OF THE REPORT

Regulation 31 (GNR 326) determine that: "*An Environmental Authorisation (EA) may be amended by following the process prescribed in this Part if the amendment will result in a change to the scope of a valid EA where such change will result in an increased level or change in the nature of impact where such level or change in nature of impact was not—(a) assessed and included in the initial application for environmental authorisation; or (b) taken into consideration in the initial environmental authorisation; and the change does not, on its own, constitute a listed or specified activity.*"

This report is the Draft Motivational Report to be submitted to the Department of Environment, Forestry and Fisheries (DEFF). In accordance with Regulation 32 all identified and registered I&APs and relevant State Departments will be allowed the opportunity to review the motivational report. The report will be made available to all identified and registered I&APs and all relevant State Departments. They will be requested to provide written comments on the report within 30 days of receiving it. All issues identified during this review period will be documented and compiled into a Comments and Response Report as part of the Final Motivational Report. According to Regulation 32(1) of GNR 326 the objective of the report is to, through a consultative process:

- Assess all impacts related to the proposed change;
- Describe the advantages and disadvantages associated with the proposed change;
- Provide measures to ensure avoidance, management and mitigation of impacts associated with such proposed change; and
- Indicate any changes to the EMPr.

1.2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Environamics was appointed by the applicant as the independent EAP to conduct the Part 2 Amendment process and prepare all required reports. All correspondence to the EAP can be directed to:

Contact person: Carli Otte
Postal Address: PO Box 6484, Baillie Park, 2526
Telephone: 082 220 8651 (Cell) 086 762 8336 (f)
Electronic Mail: carli@environamics.co.za

Regulation 13(1)(a) and (b) determines that an independent and suitably qualified and experienced EAP should conduct the assessment process. In terms of the independent status of the EAP a declaration is attached as part of the amendment application form. The expertise of the EAP responsible for conducting the EIA is also summarised in the curriculum vitae included as part of Appendix A.

1.3 STATUS OF THE AMENDMENT PROCESS

The EIA process is conducted strictly in accordance with the stipulations set out in Regulations 31-33 of Regulation No. 982 (as amended in 2017). Table 1.3 provides a summary of the amendment process and future steps to be taken. It can be confirmed that to date:

- On 6 December 2020 the pre-application meeting request together with the public participation plan was submitted to the DEFF.
- The DEFF approved the public participation plan on 8 December 2020.
- An application for amendment of the EA will be submitted with the Draft Motivational Report on 10 December 2020.
- The Draft Motivational Report will be made available to all identified and registered I&APs and relevant State Departments on 10 December 2020 and they will be requested to provide their comments on the report within 30 days of the notification (by 1 February 2021 which excludes the period between 15 December and 5 January).

It is envisaged that the Part 2 Amendment process should be completed within approximately six months of submission of the Draft Motivational Report, i.e. by May 2021 – see Table 1.1.

Table 1.1: Project schedule

Activity	Prescribed timeframe	Timeframe
Submit public participation plan	-	30 November 2020
Submit Draft Motivational Report	-	11 December 2020
Public participation process	30 Days	12 Dec. – 1 Feb. 2021
Submit Final Motivational Report	90 Days	February 2021
Decision	107 Days	May 2021
Public participation (decision) & submission of appeals	20 Days	May 2021

1.4 STRUCTURE OF THE REPORT

This report is structured in accordance with the prescribed contents stipulated in Regulation 32 of Regulation No.982. It consists of nine sections demonstrating compliance to the specifications of the regulations as illustrated in Table 1.2.

Table 1.2: Structure of the report

Requirements for the contents of a Motivational Report as specified in the Regulations		Section in report
Regulation 32 (1) – The applicant must... submit to the competent authority a report reflecting:		
(i)	an assessment of all impacts related to the proposed change	4
(ii)	advantages and disadvantages associated with the proposed change; and	6
(iii)	measures to ensure avoidance, management and mitigation of impacts associated with such proposed change; and	5
(iv)	any changes to the EMPr;	Appendix E
(iv)	Which report –	7
(aa)	had been subjected to a public participation process, which had been agreed to by the competent authority, and which was appropriate to bring the proposed change to the attention of potential and registered interested and affected parties, including organs of state, which have jurisdiction in respect of any aspect of the relevant activity, and the competent authority, and	
(bb)	reflects the incorporation of comments received, including any comments of the competent authority.	

2 PROJECT OVERVIEW

This section aims to provide background information of the location of the activity, property description, activities authorised, photovoltaic technology and approved layout.

2.1 THE LOCATION OF THE ACTIVITY AND PROPERTY DESCRIPTION

The activity entails the development of a photovoltaic solar facility and associated infrastructure on the Remaining Extent of the farm Retreat No. 671, Registration Division IN, North West Province situated within the Naledi Local Municipality area of jurisdiction. The town of Vryburg is located approximately 5km north east of the proposed development (refer to figure 1.1 for the locality map).

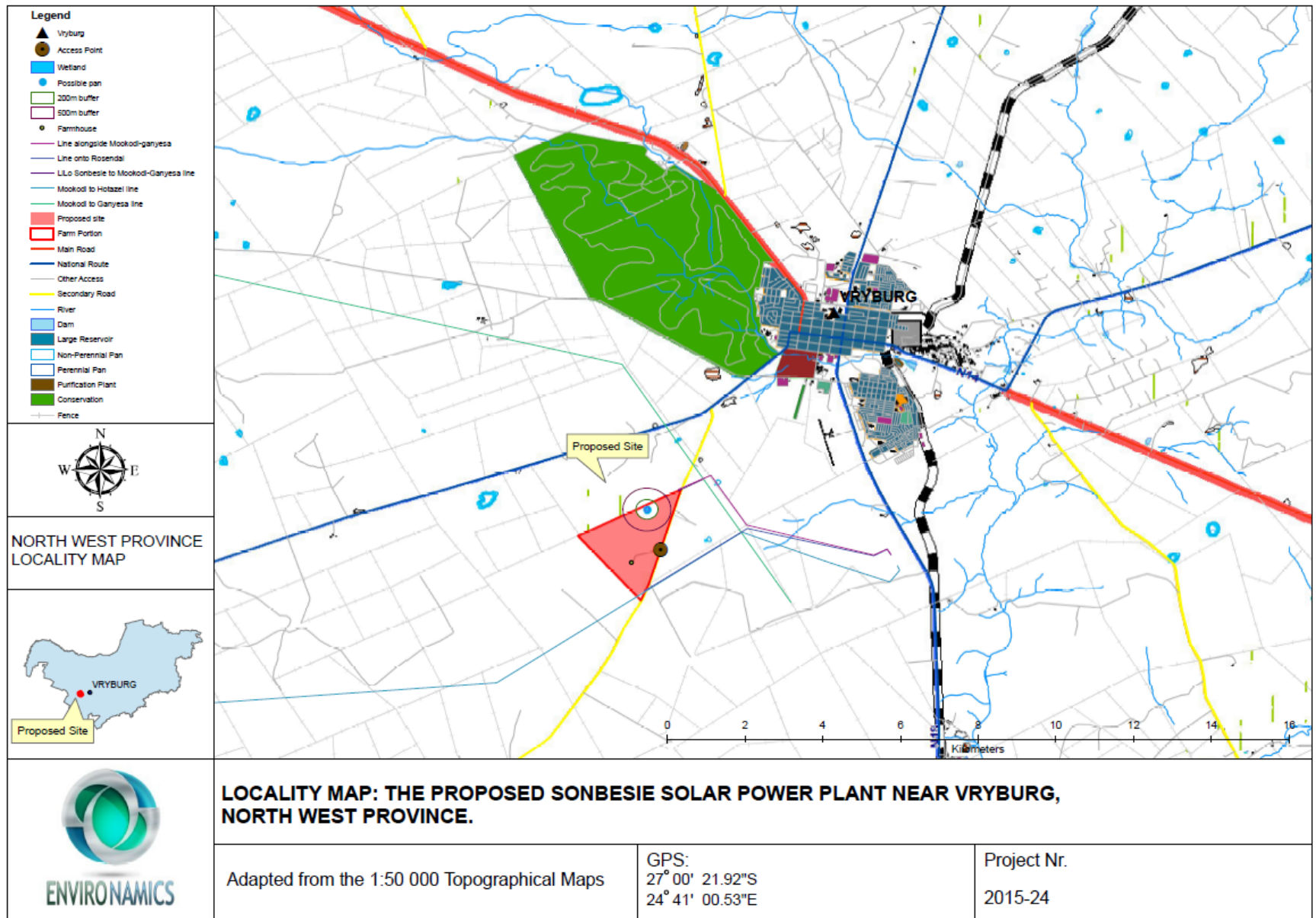


Figure 1.1: Locality Map

The project entails the generation of electrical power through photovoltaic (PV) panels. The total footprint of the project will approximately be 264 hectares (including supporting infrastructure on site) – refer to table 2.1 for general site information for which environmental authorisation were received. The property on which the facility is to be constructed will be leased by Sonbesie Solar Power Plant(RF) (Pty) Ltd. from the property owner, Charmakor Vryburg (Pty) Ltd., for the life span of the project (minimum of 20 years). It is expected that generation from the facility will tie in with the Mookodi Substation, which will also traverse Portion 4 of the farm Klondike. The property owner of Portion 4 Seipelo Farming Projects (Pty).

Table 2.1: General site information

Description of affected farm portion	The Remaining Extent of the farm Retreat No. 671, Registration Division HN, North West
Description of affected farm portion (powerline)	Portion 4 of the farm Klondike No. 670, Registration Division IN, North West
21 Digit Surveyor General codes	T0IN0000000067100000 T0IN0000000067000004
Title Deed(s)	T2676/2009 T3275/2013
Type of technology	Photovoltaic solar facility
Structure Height	Panels ~3.5m, buildings ~ 4m and power lines ~32m
Surface area to be covered	Approximately 264 ha
Structure orientation	The panels will either be fixed to a single-axis horizontal tracking structure where the orientation of the panel varies according to the time of the day, as the sun moves from east to west or tilted at a fixed angle equivalent to the latitude at which the site is located in order to capture the most sun.
Laydown area dimensions	Approximately 264 hectares
Generation capacity	Up to 115MW
Expected production	Up to 300 GWh per annum

2.2 ACTIVITY DESCRIPTION

The development triggered a number of activities in terms of the EIA Regulations, 2014. The following activities were approved as per the EA dated 10 February 2017:

Table 2.2: Listed activities

Relevant notice:	Activity No (s)	Description of each listed activity as per project description:
GNR. 983, 4 December 2014	Activity 11(i)	<ul style="list-style-type: none"> • <i>“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.”</i> • Activity 11(i) is triggered since the proposed photovoltaic solar facility will transmit and distribute electricity of 132 kilovolts outside an urban area.
GNR. 983, 4 December 2014	Activity 28(ii)	<ul style="list-style-type: none"> • <i>“Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture or afforestation on or after 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.”</i> • Activity 28(ii) is triggered since the farm has been previously cultivated and the property will be rezoned to “special” use.
GNR. 984, 4 December 2014	Activity 1	<ul style="list-style-type: none"> • <i>“The development of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.”</i> • Activity 1 is triggered since the proposed photovoltaic solar facility will generate up to 115 megawatts electricity.
GNR. 984, 4 December 2014	Activity 15	<ul style="list-style-type: none"> • <i>“The clearance of an area of 20 hectares or more of indigenous vegetation.”</i> • In terms of vegetation type the site falls within the Ghaap Platau Vaalbosveld vegetation type, which is described by Mucina and Rutherford (2006) as ‘least threatened’. Portions of the site has not been lawfully disturbed during the preceding ten years; therefore, more than 20 hectares of indigenous vegetation will be removed.
GNR. 985, 4 December 2014	Activity 4(e)(i)(ee)	<ul style="list-style-type: none"> • <i>“The development of a road wider than 4 metres with a reserve less than 13.5 metres (e) in North West (i) outside urban areas, in (ee) critical biodiversity areas</i>

		<p><i>as identified in bioregional plans...”</i></p> <ul style="list-style-type: none"> • The site is located in a critical biodiversity area as described in relevant bioregional plans, and will require an internal road network, wider between 5 and metres.
GNR. 985, 4 December 2014	Activity 12(a)(ii)	<ul style="list-style-type: none"> • <i>“The clearance of an area of 300 square metres or more of indigenous vegetation...(a) in North West (ii) within critical biodiversity areas identified in bioregional plans.”</i> • The site is located in a critical biodiversity area as described in relevant bioregional plans. Portions of the site has not been lawfully disturbed during the preceding ten years; therefore, more than 300 square metres of indigenous vegetation will be removed.

It is important to note that the proposed amendments will not result in any changes to the authorised activities and will not trigger any new listed activities.

2.3 PHOTOVOLTAIC TECHNOLOGY

The term photovoltaic describes a solid-state electronic cell that produces direct current electrical energy from the radiant energy of the sun through a process known as the Photovoltaic Effect. This refers to light energy placing electrons into a higher state of energy to create electricity. Each PV cell is made of silicon (i.e. semiconductors), which is positively and negatively charged on either side, with electrical conductors attached to both sides to form a circuit. This circuit captures the released electrons in the form of an electric current (direct current). The key components of the proposed project are described below:

- PV Panel Array - To produce up to 115MW, the proposed facility will require numerous linked cells placed behind a protective glass sheet to form a panel. Multiple modules will be required to form the solar PV array which will comprise the PV facility. The PV modules will either be tilted at a fixed angle, or mounted on trackers tracking from east to west during the day in order to capture the most solar energy.
- Wiring to Central Inverters - Sections of the PV array will be wired to inverters. The inverter is a pulse width mode inverter that converts direct current (DC) electricity to alternating current (AC) electricity at grid frequency.
- Connection to the grid - Connecting the array to the electrical grid requires transformation of the voltage from 480V to 33kV to 132kV. The normal components and dimensions of a distribution rated electrical substation will be required. Output voltage from the inverter is 480V and this is fed into step up transformers to 132kV. An onsite

substation will be required on the site to step the voltage up to 132kV, after which the power will be evacuated into the national grid. Sonbesie Solar Power Plant (RF) (Pty) Ltd. received a cost estimate letter from Eskom where it is agreed that generation from the facility will tie in with the Mookodi Substation. The Project will inject up to 100MW into the Substation. The installed capacity will be up to approximately 115MW.

- Electrical reticulation network – An internal electrical reticulation network will be required and will be laid ~2-4m underground as far as practically possible.
- Supporting Infrastructure – The following auxiliary buildings with basic services including water and electricity will be required on site:
 - Office (~16m x 9.85m);
 - Switch gear and relay room (~25m x 14m);
 - Staff lockers and changing room (~21.7m x 9.85m); and
 - Security control (~11.8m x 5.56m)
- Roads – Access will be obtained via a local gravel road of the N14. An internal site road network will also be required to provide access to the solar field and associated infrastructure. The access road will have a width of ~6m and the internal road/track ~5m.
- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm. Cochrane Clearvu fencing with a height of 2.5 meters will be used.

2.4 LAYOUT DESCRIPTION

The layout plan follows the limitations of the site and aspects such as environmentally sensitive areas, roads, fencing and servitudes on site were considered. The total surface area proposed for layout options include the PV panel arrays spaced to avoid shadowing, access and maintenance roads and associated infrastructure (buildings, power inverters, transmission lines and perimeter fences). Limited features of environmental significance exist apart from non-perennial wetland located on the northern portion of the site. The area around the wetland was however avoided when choosing the preferred development footprint – refer to Appendix H for the environmental sensitivity and the map superimposing the layout plan over the sensitivity map. It should be noted that the layout had to be revised as a result of the proposed amendments. The final layout plan is included as part of the motivational report (refer to Appendix C). Table 2.3 below provides detailed information regarding the layout and the components that were authorised in 2017.

Table 2.3: Technical details for the proposed facility

Component	Description / dimensions
Height of PV panels	3.5 meters
Area of PV Array	264 Hectares
Number of inverters required	Minimum 34
Area occupied by inverter / transformer stations / substations	Inverter Transformer Station: 2.5 x 7.6 meters (19m ²) Substation: 25 x 14 meters (350m ²)
Capacity of on-site substation	132kV
Area occupied by both permanent and construction laydown areas	Permanent Laydown Area: 264 Hectares Construction Laydown Area: 713.11 m ²
Area occupied by buildings	Security Room: 66.74 m ² Office: 157.6 m ² Staff Locker and Changing Room: 213.745 m ²
Length of internal roads	Approximately 13 km
Width of internal roads	Approximately 5 meters
Proximity to grid connection	Approximately 780 meters
Height of fencing	Approximately 2.5 meters
Type of fencing	Cochrane Clearvu

2.5 ASSESSMENT OF ENVIRONMENTAL IMPACTS

As part of the original EIA process for the Sonbesie SPP undertaken in 2016, the following specialist studies were undertaken to investigate potential significant impacts (refer to Appendix F):

- Brief Geotechnical Study;
- Ecological Fauna and Flora Habitat Survey;
- Avifaunal Study;
- Visual Impact Assessment;
- Agricultural and Soils Impact Assessment;
- Heritage Impact Assessment;
- Paleontological Impact Assessment;
- Social Impact Assessment; and
- Traffic Impact assessment.

The findings of the specialist studies and impact assessment undertaken as part of the original environmental authorisation process (refer to Appendix G) are summarised in the table below:

Table 2.4: Original Rating of Impacts during construction of the proposed SPP and associated infrastructure

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING
Geotechnical Study	Impacts of the geology on the proposed development	Negative Low	Negative Low
Ecological Fauna and Flora Habitat Survey	Habitat connectivity and open space	Negative Low	Negative Low
	impacts associated with construction activities	Negative Medium	Negative Low
	Loss of habitat for faunal and floral species	Negative Low	Negative Low
	Destruction of Avifaunal Habitat	Negative Low	Negative Low
	Loss of sensitive species	Negative Low	Negative Low
	Impacts on the sites hydrology	Negative Low	Negative Low
Visual Impact Assessment	Visual intrusion	Negative Medium	Negative Low
Agricultural and Soils Impact Assessment	Loss of topsoil	Negative Low	Negative Low
	Soil erosion	Negative Low	Negative Low
Heritage Impact Assessment	Impacts on heritage objects	Negative High	Negative Low
Social Impact Assessment	Generation of alternative land use income	Positive Low	Positive Low
	Temporary employment and other economic benefits (business opportunities and skills development)	Positive Medium	Positive Medium
	Technical advice for local farmers and municipalities	Positive Low	Positive Low
	Increase in construction vehicle traffic	Negative Low	Negative Low
	Impact of construction workers on local communities	Negative Low	Negative Low

	Influx of job seekers	Negative Low	Negative Low
	Risk to safety, livestock and farm infrastructure	Negative Low	Negative Low
	Increased risk of veld fires	Negative Medium	Negative Low
Other	Temporary noise disturbance	Negative Low	Negative Low
	Generation of waste - general waste, construction waste, sewage and grey water	Negative Medium	Negative Low

Table 2.5: Original Rating of Impacts during operation of the proposed SPP and associated infrastructure

SPECIALIST STUDY	IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING
Avifaunal Study	Impact mortality around the PV site and transmission line for the Red-listed bird groups identified as at risk	Negative Medium	Negative Medium
	Nesting for birds	Positive Low	Negative Medium
Visual Impact Assessment	Visual intrusion	Negative Medium	Negative Low
Agricultural and Soils Impact Assessment	Soil erosion	Negative Low	Negative Low
	Generation of alternative land use income	Positive Low	Positive Low
	Loss of agricultural land use / change in land use	Negative Low	Negative Low
Social Impact Assessment	Permanent employment	Positive Medium	Positive Medium
	Generation of additional electricity	Positive Medium	Positive Medium
	Establishment of a Community Trust	Positive Medium	Positive Medium
	Change in the sense of place	Negative Low	Negative Low
	Potential impact on tourism	Negative & Positive Low	Negative & Positive Low

	Development of infrastructure for the generation of clean, renewable energy	Positive Low	Positive Low
Other	Increase in storm water runoff	Negative Medium	Negative Low
	Increased consumption of water	Negative Medium	Negative Medium
	Generation of waste	Negative Low	Negative Low
	Leakage of hazardous materials	Negative Medium	Negative Low

Table 2.6: Original Rating of Impacts during the decommissioning of the proposed SPP and associated infrastructure

IMPACT	PRE-MITIGATION RATING	POST MITIGATION RATING
Rehabilitation of the physical environment	Positive Low	Positive Low
Generation of waste	Negative Medium	Negative Low
Loss of employment	Negative Medium	Negative Low

3 PROPOSED AMENDMENTS

The Sonbesie SPP is said to be tendered to the Department of Mineral Resources and Energy (DMRE) in December 2020. However, one of the new conditions from the DMRE's Risk Mitigation Independent Power Producer Procurement Program (RMIPPPP) of adding 2000MW to the grid is that all tenders must include the storage of capacity. As a result, Sonbesie SPP is applying for the amendment of the EA (DEA Ref: 14/12/16/3/3/2/915) issued on 29 November 2016 to include (amongst other amendments) a battery storage system. The proposed amendments are discussed in the following sections.

3.1 CHANGES TO AUTHORISED ELEMENTS OF THE PROJECTS

The following amendments are being applied for in terms of the EIA Regulations, 2014 (as amended in 2017):

- Inclusion of a battery storage system

Given the ongoing improvement in battery storage technology and the significant advantages of combining battery storage with renewable generation, it is proposed that battery energy storage systems "BESS" be included for this project in order to meet the

requirements to tender the project for the new generation capacity under the Risk Mitigation Independent Power Producer Procurement Program (RMIPPPP) by the Department of Mineral Resources and Energy (DMRE). One of the DMRE's conditions to tender the project under the RMIPPPP is that all projects must be able to operate between 5h00 and 21h30 in order to supply the grid during peak hours early in the morning and late afternoon when the sun has set, which can only be done by using a battery storage system. The battery storage system will therefore improve the desirability of the proposed project as well as its efficiency.

The capacity of the battery storage facility per project will be kept in standard shipment containers or smaller containers ("blocks") as might be proposed by selected supplier with an area of approximately 6ha (refer to Figure 3.1 for the corner coordinates of the proposed BESS). The battery to be installed will be lithium-ion and no electrolytes will be transported to and handled on site. Battery cells will be assembled at the supplier factory prior to delivery to the sites. The battery storage facility will be located within the already authorized PV plant footprint area. There will be no need for the additional clearance of vegetation for the battery storage facility.

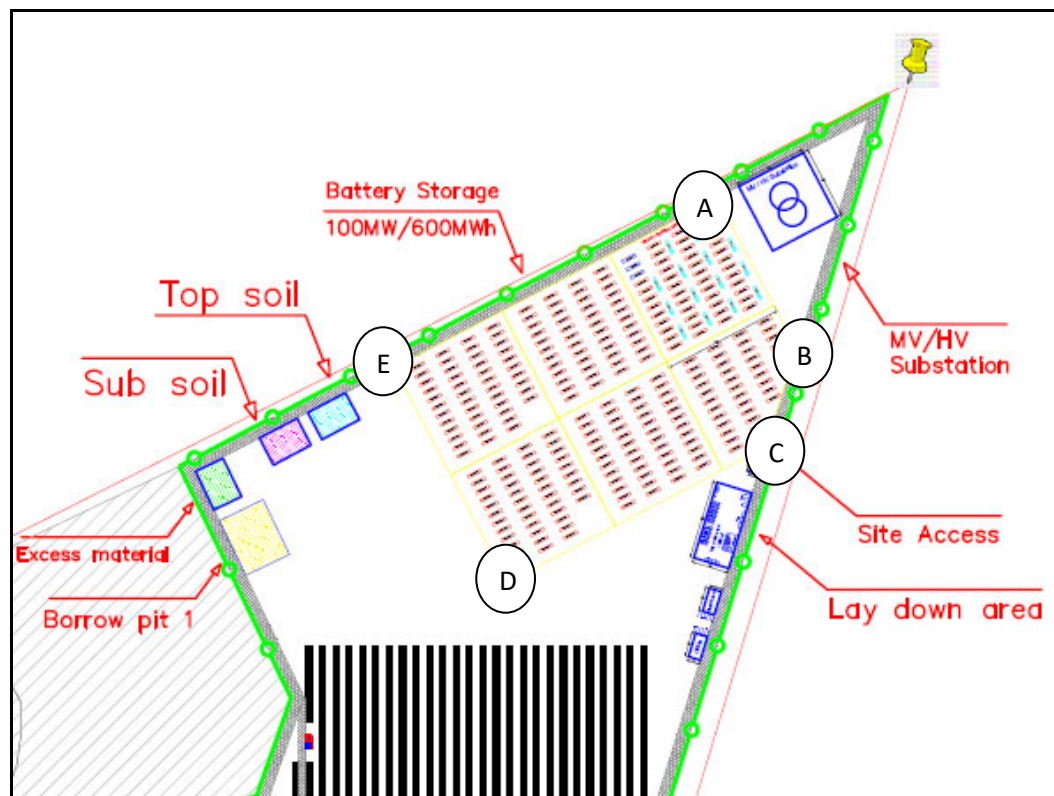


Figure 3.1: Corner coordinates of the proposed Sonbesie BESS

- Increasing capacity of 115MWdc to up to 150MWdc

Due to new and advanced technology of panels (470W and Bi-facial) the same amount of panels may be used as specified previously but will be able to generate more megawatts on the same area. The DMRE no longer caps projects at 75MW under the RMIPPPP, which means that developers may tender for larger capacity (if the grid can accommodate it).

- Increasing the height of the panels

Using new advanced panel technology will result in the increase in the height of the panels to approximately 6 meters.

- Increasing the number of inverters

Due to the increase in MWdc capacity, more inverters are needed to convert the increased DC capacity to AC. The minimum inverters should be amended from 34 to a minimum of 50.

- Amending the number of modules, location of inverters, buildings and internal roads within the development footprint (revised layout)

Due to the increase of capacity (MW), inclusion of battery storage and the spacing between panels, a new layout had to be designed which changed the citing of the infrastructure as well as the sizes of the demarcated areas for the associated infrastructure (the substation, laydown area, office, staff room and security room).

Table 3.1: Technical details for the proposed facility

Associated Infrastructure	Description / dimensions
Number of inverters	~35 each 2.8 MWac
Substation	~3 600m ²
Construction Laydown Area	~2 000m ²
Security Room	~60m ²
Office	~200m ²
Staff Locker and Changing Room	~200m ²
Site access road	Width: 10 – 12 m
Length and width of perimeter road	Width: 7.8 m Total length: 6802 m
Length and width of internal roads	Width: 6 m Total length: 6530 m
Number of modules	274 400 each 415Wp
Area for BESS	~60 000m ²

3.2 DETAILS OF AMENDMENTS BEING APPLIED FOR

In light of the above, it is recommended that the EA dated 29 November 2016 be amended as follow:

Inclusion of a battery storage system within the development footprint

It is proposed that reference should be made to the corner coordinates for the BESS (refer to Table 3.2) and that the following bullets in the EA be amended:

- Page 5: The description of the associated infrastructure for the proposed PV facility should include reference to a battery storage of ~6ha in extent.
- Page 5: Reference should also be included in the table summarising the technical details of the proposed facility. It is proposed that the following be included: Battery storage – of ~6 hectares in extent.

Table 3.2: Corner coordinates for the Sonbesie BESS

Battery Energy Storage System (BESS)	
A	26°59'40.06"S; 24°41'35.33"E
B	26°59'44.19"S; 24°41'37.82"E
C	26°59'46.97"S; 24°41'36.80"E
D	26°59'50.50"S; 24°41'28.58"E
E	26°59'44.41"S; 24°41'25.16"E

Increasing capacity of up to 115MWdc to up to 150MWdc

To increase the capacity of the facility from up to 115MW to up to 150MW, it is proposed that the EA (and its first amendment where applicable) be amended as follows:

- Page 1: The title of the authorisation should be amended from *“The construction of the 115 MW Sonbesie Photovoltaic Solar Energy Facility on the Remaining Extent of Farm Retreat No. 671, Registration Division IN, near Vryburg within the Naledi Local Municipality in the North West Province”* to *“The construction of the 150 MW Sonbesie Photovoltaic Solar Energy Facility on the Remaining Extent of Farm Retreat No. 671, Registration Division IN, near Vryburg within the Naledi Local Municipality in the North West Province.”*

- Page 3: The activity description for activity 1 should be amended from *“The activity is triggered since the proposed solar energy facility will generate up to 115 MW of electricity”* to *“The activity is triggered since the proposed solar energy facility will generate up to 150 MW of electricity.”*
- Page 5: The description following the coordinates for the facility should be amended from *“- for the 115 MW Sonbesie Photovoltaic Solar Energy Facility on the Remaining Extent of Farm Retreat No. 671, Registration Division IN, near Vryburg within the Naledi Local Municipality in the North West Province, hereafter referred to as “the property”* to *“- for the 150 MW Sonbesie Photovoltaic Solar Energy Facility on the Remaining Extent of Farm Retreat No. 671, Registration Division IN, near Vryburg within the Naledi Local Municipality in the North West Province, hereafter referred to as “the property.”*
- Page 6: The table summarising the technical details of the proposed facility should be amended as follow: *“Export capacity – Up to 100 MW (Installed capacity will be up to 115 MW and the export capacity will be up to 100 MW)”* to *“Export capacity – Export capacity – Installed capacity will be up to 150 MW.”*

Increasing the height of the panels

To increase the height of the panels from 3.5 meters to 6 meters, it is proposed that the EA be amended as follows:

- Page 5: The table summarising the technical details of the proposed facility should be amended as follow: *“Height of installed panels from ground level – 3.5 meters”* to *“Height of installed panels from ground level – 6 meters.”*

Increasing the number of inverters

To amend the number of inverters, it is proposed that the EA should make reference to the following:

- Page 5: The table summarising the technical details of the proposed facility should make reference to: *“Number of inverters required – ~50”.*

Amending the number of modules, the location of inverters, buildings and internal roads within the development footprint (revised layout)

It is proposed that reference should be made in the EA to the following areas occupied by associated infrastructure:

- Page 6: The last row in the table describing the details for the facility should be amended as follow: *“Width and length of internal roads: Access road: 6m, length: 27m and secondary internal roads – width: 5m, length: 13.7km”* to *“Width and length of internal roads: Access road: 6m, perimeter road: width: 7.8m and internal roads – width: 6m, length: 9935m.”*

In this regard an amended layout plan is attached to this report – refer to Appendix C. To amend the layout in general, it is proposed that the EA be amended as follow:

- Page 8: Condition 14- *“The final development layout map as submitted with the EIA dated August 2016 is not approved. The preferred layout is located in an area with a high number of camel thorn trees; as such the layout plan must be submitted to the Department of Agriculture, Forestry and Fisheries for comments to determine adequate micro siting of the facility.” to “The development layout plan titled “Sonbesie Solar Power Plant, dated December 2020 is approved”.*

3.3 SUMMARY OF PROPOSED AMENDMENTS

For ease of reference the proposed amendments are summarised in Table 3.4 below.

Table 3.4: Summary of proposed amendments

Component	Description / dimensions	
Battery storage system	-	Battery Storage System with a maximum height of ~8m and ~6 hectares in extent.
Capacity	Up to 115MWdc	Up to 150MWdc
Height of PV panels	3.5 meters	6 meters
Number of inverters	Minimum 34	Approximately 50
Location and demarcated areas for the associated infrastructure (Information only described in the FEIR)	Inverter Transformer Station: 2.5 x 7.6 meters (19m ²) Construction Laydown Area: 713.11 m ²	Inverter Transformer Station: ~20 m ² Construction Laydown Area: 2 000 m ²
Area occupied by buildings (Information only described in the FEIR)	Security Room: 66.74 m ² Office: 157.6 m ² Staff Locker and Changing Room: 213.745 m ²	Security Room: ~60 m ² Office: ~200 m ² Staff Locker and Changing Room: ~200 m ²
Substation footprint	3 000m ²	~3 600m ²

4 IMPACTS/RISKS RELATED TO PROPOSED AMENDMENTS

This section aims to address the following requirements of the regulations:

Regulation 32(1) The applicant must within 90 days of receipt by the competent authority of the application made in terms of regulation 31, submit to the competent authority:

(a) a report, reflecting—

(i) an assessment of all impacts related to the proposed change;

4.1 THE CONCEPT OF “RISK”

Risk is a function of two components: severity (also referred to as consequence or impact) and likelihood (also referred to as probability or frequency) of the event occurring. As illustrated in the following equation: Risk = Severity x Likelihood. Each component is assessed independently and are combined to determine the risk of a situation or scenario. Risk can be defined on several levels, including health and safety (worker injuries or fatalities or impact to the surrounding community), environment, financial impact to an organization, or reputation. The matrix presented in Figure 4.1 is a generic example of a risk matrix. Severity level is shown on the top of the chart, with five categories:

- insignificant - no injury
- minimal - first -aid injury
- moderate - lost - time injury
- severe - one potential fatality onsite
- catastrophic - multiple potential fatalities onsite, potentially reaching offsite

The likelihood level is on the matrix’s left -hand side, in six categories:

- nominal - less than once in 100,000 years
- rare - between once in 10,000 years to once in 100,000 years
- unlikely - between once in 1,000 years to once in 10,000 years
- probable - between once in 100 years to once in 1,000 years
- almost certain - between once in 10 years to once in 100 years
- frequent - more than once in 10 years

		Severity				
		Insignificant	Minimal	Moderate	Severe	Catastrophic
Likelihood	Nominal	Low	Low	Low	Low	Low
	Rare	Low	Low	Medium	Medium	Medium
	Unlikely	Low	Low	Medium	Medium	High
	Probable	Low	Medium	Medium	High	High

Risk Level	
	Low
	Medium
	High

	Almost certain					
	Frequent					

Figure 4.1: Generic risk matrix

Risk matrices illustrate the risk associated with various combinations of severity and likelihood levels. For example, if a scenario is assigned a severity of “severe” and a likelihood of “almost certain,” the risk would be equivalent to “one potential fatality onsite between once in 10 years and once in 100 years.’

4.2 IDENTIFYING AND MANAGING RISKS

When assessing the risk of Li-ion batteries as it affects employees and people in the community, one can use the approach shown in Figure 4.2 below.

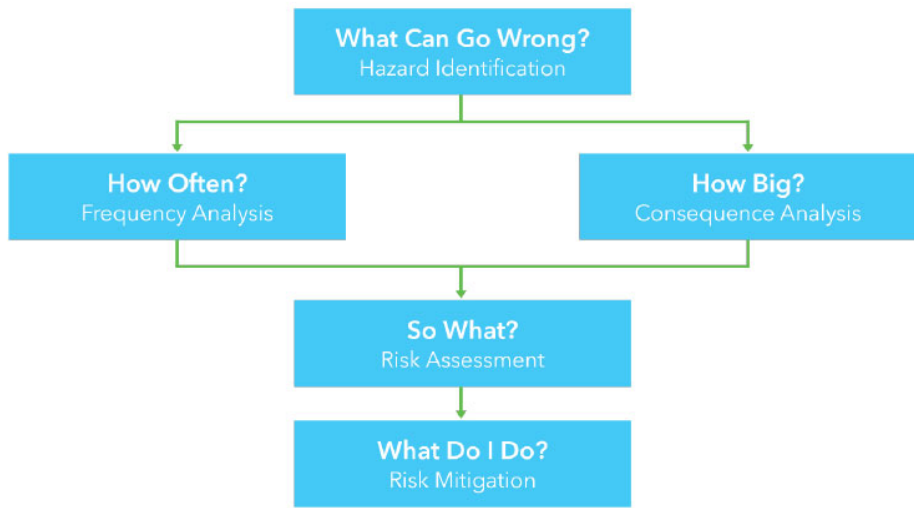


Figure 4.2: Risk Assessment Methodology

4.2.1 Hazard Identification

A process hazards analysis (PHA) is meant to identify hazardous scenarios and specific failure modes of the batteries and equipment. In the PHA process, the consequence (severity) and the frequency (likelihood) are qualitatively or quantitatively assessed to determine the risks of the scenarios. Safeguards or barriers are also identified.

4.2.2 Consequence Analysis

Consequence analysis determines the severity level of scenarios associated with battery failures. The analysis can be conducted qualitatively, with a group of subject matter experts and experienced operations and maintenance personnel, or quantitatively, using a consequence modeling tool.

4.2.3 Frequency analysis

Frequency analysis assesses the likelihood or frequency of an event. It can be conducted qualitatively, based on the experience of a group of subject matter experts in a workshop, or quantitatively, using historical reliability data or incident databases to provide more exact failure rates.

4.2.4 Risk Assessment and Mitigation

The risk is assessed for the scenario first without safeguards or barriers and then with them. This is to help the practitioner identify that an adequate number of safeguards or barriers have been implemented to reduce the risk to an acceptable level, or to develop an action plan if more safeguards or barriers are needed. To reduce the overall risk, the severity and/or likelihood must be reduced by installing safeguards or barriers.

4.3 LI-ION BATTERY FAILURE RISK AND MITIGATION

While hydrogen generation is probably the highest risk associated with lead-acid-batteries, the most feared hazard of lithium-ion-batteries is thermal run-away. Thermal runaway is a situation where the current flowing through the cell or battery on charge or overcharge causes the cell temperature to rise, which increases the current with a further rise in temperature (Culpin, 2009). Li-ion battery fires can have very impactful consequences. However, a high-consequence level is often falsely interpreted to mean that the overall risk level is also high. To understand the full picture of risk, one must consider the likelihood or the frequency of the event occurring in addition to the associated consequences or severity. Standard safeguards and best practices used in Li-ion battery ESS should be included, helping to both reduce the likelihood and severity of failure events.

4.3.1 Common failure scenarios of Li-ion batteries

There are three categories of common Li-ion battery failures: electrical, mechanical, and thermal. The potential hazards associated with them are fire with consequent emission of gas and explosion. The major risks including thermal runaway, difficulty of fighting battery fires, failure of control systems and the sensitivity of Li-ion batteries to mechanical damage and electrical transients are discussed below.

- Thermal runaway

‘Thermal runaway’ – a cycle in which excessive heat keeps creating more heat – is the major risk for Li-ion battery technology. It can be caused by a battery having internal cell defects, mechanical failures/damage or overvoltage. These lead to high temperatures, gas build-up and potential explosive rupture of the battery cell, resulting in fire and/or explosion. Without disconnection, thermal runaway can also spread from one cell to the next, causing further damage.

- Difficulty of fighting battery fires

Battery fires are often very intense and difficult to control. They can take days or even weeks to extinguish properly, and may seem fully extinguished when they are not. They can also be very dangerous to fire fighters and other first responders because, in addition to the immediate fire and electricity risks, they may be dealing with toxic fumes, exposure to hazardous materials and building decontamination issues. Different types of batteries also react differently to fire, so firefighters must be knowledgeable about how they react and how to respond. Otherwise they may decide to contain the fire but leave it to burn itself out leading to great losses.

- Failure of control systems

Another issue can be failure of protection and control systems. For example, a Battery Management System (BMS) failure can lead to overcharging and an inability to monitor the operating environment, such as temperature or cell voltage.

- Sensitivity of Li-ion batteries to mechanical damage and electrical transients

Contrary to existing conventional battery technology, Li-ion batteries are very sensitive to mechanical damage and electrical surges. This type of damage can result in internal battery short circuits which lead to internal battery heating, battery explosions and fires. The loss of an individual battery can rapidly cascade to surrounding batteries, resulting in a larger scale fire.

4.3.2 Consequence Analysis

Existing battery test data provides a list of toxic and flammable chemicals released during battery fires in laboratory settings. Various types of chemicals (including carbon monoxide, hydrogen fluoride, hydrogen cyanide, benzene and others) may be released during battery fires.

4.3.3 Frequency Analysis

Table 4.1 summarises the most common Li-ion battery failures. Existing literature were used as references for assessing frequency of failures for various scenarios.

Failure Category	Failure	Probability of Failure (per year)
Electrical Failure	Overcharge or undercharge based on catastrophic inverter failure	0.01 Inverter vendor literature along with DNV GL Experience
Mechanical Failure	Physical damage onsite due to heavy impact during maintenance (internal short circuit)	0.01 (Human error initiating events, CCPS)
	Physical damage due to impact during transport (internal short circuit)	0.01 (Human error initiating events, CCPS)
	Manufacturing defect (internal short circuit) that affects multiple cells	0.01 (Six Sigma assumption and DNV GL experience with battery designs)
Thermal Failure	Overheating (due to HVAC failure)	0.1 (Process control failure, CCPS)
	Overheating from electrical or mechanical failures referenced in this table (Table 4-1)	
Human Error	Human error during commissioning, installation, repair, or operations activities	0.01 (Human error initiating events, CCPS)

Table 4.1: Common Failure Mechanisms and Frequency of Failure

As shown in Table 4.1, the orders of magnitude of these failures is once in 10 years to once in 100 years, depending on the number of batteries and the electrical equipment (inverters or transformers) that could have an impact on battery performance. It should be noted that these are failure rates of the equipment and not fatality rates associated with the failures.

4.3.4 Risk Assessment

As with any fire or explosion, a potential consequence of Li-ion battery fires is the endangerment of life and property. In the risk analysis, these consequences are assessed based on their severity and likelihood. First, the severity of this consequence changes based on the quantity of cells in a system, as well as the system's proximity to people and property. Therefore, the size and location of the installation should be taken into consideration. For the Sonbesie SPP the location of the ESS and the fact that the area is sparsely populated will reduce the risk associated with toxic chemicals, flammability and overpressure from explosions.

4.3.5 Safeguards and Best Practices

Safeguards incorporated into ESSs (both portable and permanent) reduce the likelihood and severity of events before a battery fire escalates. Table 4.2 lists some of the most commonly used ESS safeguards.

Safeguard Type	Safeguards
Inherent design	UL 1973 Criteria Heating Ventilation and Air Conditioning (Redundant Units)
Basic Controls	Active Cooling/Thermal Management Controls HVAC with failure alarm
Safety Systems	Battery Management Systems which can isolate battery racks Master Controllers which can isolate battery systems and medium voltage equipment external to the ESS
Electrical protection	Fuses and Circuit Breakers
Fire Suppression	Active fire suppression Emergency HVAC
Procedures	Remote monitoring 24/7 and isolation

Table 4.2: Common Safeguards

For the Sonbesie ESS, the following safeguards should be implemented:

- Battery Management Systems;
- Safe distance between containers;
- Heating Ventilation and Air Conditioning;
- Failure alarm with procedure for control room personnel to address; and
- Active fire suppression that meets National requirements and is part of the maintenance and inspection program.

These safeguard will significantly reduce the likelihood of failure leading to health and safety impacts for on-site personnel as well as neighbouring landowners and the local community.

4.3.6 Layers of Protection

While Table 4.2 broadly covers the barriers that minimise potential risks before it escalates to a critical incident, barriers should also be in place to manage the consequences if the event has occurred. These barriers include thermal management of the systems, active monitoring of cell and ambient conditions by the battery management system (BMS), ability of the BMS, when failure is detected, to properly isolate the system, resilience of the cells to electrical and thermal abuse, design considerations within the system to limit or manage propagation among cells, modules, and racks, and fire protection schemes within the system or container.

Once a critical event is reached, such as full involvement of more than one battery rack, multiple barriers should exist to help control and mitigate the failure and potential consumption of the entire system. In many cases, these systems will no longer stop the fire that has occurred but will work to minimize its spread and prevent explosion, thus affecting the severity of the risk. These include the ability of the system to isolate the fire further, gas management (such as ventilation and exhaust), clean agents or initial fire suppression systems, water-based fire suppression systems, and response of the fire service or local first responders. Such barriers help prevent a single or even a multi-cell event from spreading to an unmanageable level.

It is understood that the BESS would be supplied by a vendor who has already mitigated to the maximum extent. The design of the BESS will comply with all the local and international standards to ensure that the risk of fire is minimal. Furthermore, each container has a built-in fire detection and suppression system. This system continually monitors the batteries and in an unlikely event of a fire it suppresses the fire using inert gas. Further mitigation would include building designs, operator training and organisational barriers.

4.3.6 Level of risk associated with the BESS

The findings of the high level risk assessment showed that the initial event frequencies (potentially leading to fires) could occur between once in 10 years and once in 100 years without safeguards in place and without considering the additional on-site mitigating factors. Assuming that the worst credible severity is a fatality from a fire, the level of severity and likelihood would place the scenarios in the “high risk” area of a risk matrix (illustrated as “1” in Figure 4.3). However, multiple safeguards will be put in place. When considering the effect of mitigation measures in reducing the probability of failure to nominal, it would place the events in the low-risk zone of a risk matrix (illustrated as “2” in Figure 4.3).

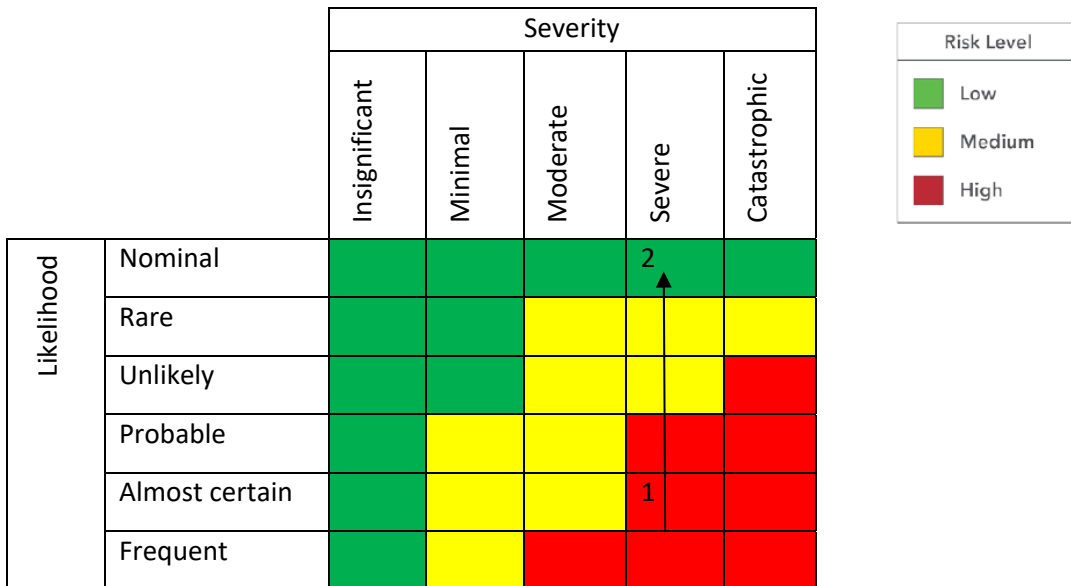


Figure 4.3: Comparison of Risk of ESS Without safeguards in Place (1) and with Safeguards in Place (2)

To ensure the accuracy of this assessment, ESS designers, manufacturers, and installers must move forward transparently to verify that they have developed safe systems with multiple barriers to failure, including quality assurance, testing, training, routine operations and maintenance, and sharing of lessons learned.

4.4 IMPACTS ASSOCIATED WITH RELATED AMENDMENTS

The majority of the proposed amendments discussed in section 3 of this report will only result in changes within the development footprint (layout) that was originally assessed. In light of the above it is argued that the proposed amendments would not require further assessment, since it does not trigger any listed activities and would not result in an increase in the significance of the potential impacts or any new environmental impacts. The main concern was the increase in height of the proposed panels as a result of the new advanced technology to be used. The visual specialist was requested to revise his report accordingly, while the remaining specialists were requested to provide their input on the potential impact of the proposed amendments. They were provided with the simple terms of reference to confirm whether the significance of potential impacts would remain unchanged and whether the mitigation and management measures contained in the environmental management programme (EMPR) will still suffice (refer to Appendix F).

4.4.1 Specialist input

In order to ascertain if further input would be required in relation to the above-mentioned proposed amendments, each of the specialist studies conducted during the EIA phase of the development was investigated in terms of its applicability. The following determinations were made:

Table 4.3: Investigation of EIA phase specialist studies

SPECIALIST STUDY	APPLICABILITY
Geotechnical Study	Not applicable - The proposed amendments are located within the assessed development footprint. The proposed amendments will not have an influence on the significance ratings and will not result in any additional impacts.
Ecological Fauna and Flora Habitat Survey	Potentially applicable - The proposed amendments are located within the assessed development footprint. The proposed amendments will not have an influence on the significance ratings and will not result in any additional impacts. Specialist input will however be obtained.

Avifaunal Study	Potentially applicable - The proposed new technology and increased height of the panels, although very unlikely, may result in additional impacts. Specialist input will be required.
Visual Impact Assessment	Potentially applicable - The proposed new technology and increased height of the panels, although very unlikely, may result in additional impacts. Specialist input will be required.
Agricultural and Soils Impact Assessment	Not applicable - The proposed amendments are located within the wider area that has been assessed. The area has therefore been assessed and the changes will not have an influence on the significance ratings and will not result in any additional impacts. Specialist input will however be obtained.
Heritage Impact Assessment	Not applicable - The proposed amendments are located within the assessed development footprint. The area has therefore been assessed and the changes will not have an influence on the significance ratings and will not result in any additional impacts. Specialist input will however be obtained.
Paleontological Impact Assessment	Not applicable - The proposed amendments are located within the wider area that has been assessed. The area has therefore been assessed and the changes will not have an influence on the significance ratings and will not result in any additional impacts.
Social Impact Assessment	Not applicable - The proposed amendments are located within the wider area that has been assessed. The area has therefore been assessed and the changes will not have an influence on the significance ratings and will not result in any additional impacts.
Traffic Impact Assessment	Not applicable - The proposed amendments are located within the wider area that has been assessed. The area has therefore been assessed and the changes will not have an influence on the significance ratings and will not result in any additional impacts. Specialist input will however be obtained.

Despite numerous specialist studies not being affected, specialist statements were obtained from all specialists that confirmed that the proposed amendments will not result in any additional impacts and will not increase the level or nature of the impact, which was initially assessed and considered when application was made for an EA. The significance ratings will remain unchanged and the proposed mitigation and management measures proposed as part of the EIA process will still suffice (refer to Appendix F for the 2016 specialist studies with the inputs obtained as part of this application).

4.4.2 Summary of changes in Impact Ratings

As mentioned above, specialist inputs were obtained from all specialist to confirm whether the proposed amendments will result in any additional impact or an increase in the significance of any impacts that were previously assessed. Based on their findings. Table 4.4 demonstrate that the proposed amendments will not result in any additional impacts and that the significance ratings of all potential impacts will remain the same.

Table 4.4: Original Rating of Impacts during construction of the proposed SPP and associated infrastructure

SPECIALIST STUDY	IMPACT	ORIGINAL SIGNIFICANCE	NEW SIGNIFICANCE
Geotechnical Study	Impacts of the geology on the proposed development	Negative Low	Negative Low
Ecological Fauna and Flora Habitat Survey	Habitat connectivity and open space	Negative Low	Negative Low
	impacts associated with construction activities	Negative Low	Negative Low
	Loss of habitat for faunal and floral species	Negative Low	Negative Low
	Destruction of Avifaunal Habitat	Negative Low	Negative Low
	Loss of sensitive species	Negative Low	Negative Low
	Impacts on the sites hydrology	Negative Low	Negative Low
Visual Impact Assessment	Visual intrusion	Negative Low	Negative Low
Agricultural and Soils Impact Assessment	Loss of topsoil	Negative Low	Negative Low
	Soil erosion	Negative Low	Negative Low
Heritage Impact Assessment	Impacts on heritage objects	Negative Low	Negative Low
Social Impact Assessment	Generation of alternative land use income	Positive Low	Positive Low
	Temporary employment and other economic benefits (business opportunities and skills development)	Positive Medium	Positive Medium
	Technical advice for local farmers and	Positive Low	Positive Low

	municipalities		
	Increase in construction vehicle traffic	Negative Low	Negative Low
	Impact of construction workers on local communities	Negative Low	Negative Low
	Influx of job seekers	Negative Low	Negative Low
	Risk to safety, livestock and farm infrastructure	Negative Low	Negative Low
	Increased risk of veld fires	Negative Low	Negative Low
Other	Temporary noise disturbance	Negative Low	Negative Low
	Generation of waste - general waste, construction waste, sewage and grey water	Negative Low	Negative Low

Table 4.5: Original Rating of Impacts during operation of the proposed SPP and associated infrastructure

SPECIALIST STUDY	IMPACT	ORIGINAL SIGNIFICANCE	NEW SIGNIFICANCE
Avifaunal Study	Impact mortality around the PV site and transmission line for the Red-listed bird groups identified as at risk	Negative Medium	Negative Medium
	Nesting for birds	Negative Medium	Negative Medium
Visual Impact Assessment	Visual intrusion	Negative Low	Negative Low
Agricultural and Soils Impact Assessment	Soil erosion	Negative Low	Negative Low
	Generation of alternative land use income	Positive Low	Positive Low
	Loss of agricultural land use / change in land use	Negative Low	Negative Low
Social Impact Assessment	Permanent employment	Positive Medium	Positive Medium
	Generation of additional electricity	Positive Medium	Positive Medium
	Establishment of a Community Trust	Positive	Positive

		Medium	Medium
	Change in the sense of place	Negative Low	Negative Low
	Potential impact on tourism	Negative & Positive Low	Negative & Positive Low
	Development of infrastructure for the generation of clean, renewable energy	Positive Low	Positive Low
Other	Increase in storm water runoff	Negative Low	Negative Low
	Increased consumption of water	Negative Medium	Negative Medium
	Generation of waste	Negative Low	Negative Low
	Leakage of hazardous materials	Negative Low	Negative Low

Table 4.6: Original Rating of Impacts during the decommissioning of the proposed SPP and associated infrastructure

SPECIALIST STUDY	IMPACT	ORIGINAL SIGNIFICANCE	NEW SIGNIFICANCE
Other	Rehabilitation of the physical environment	Positive Low	Positive Low
	Generation of waste	Negative Low	Negative Low
	Loss of employment	Negative Low	Negative Low

5 NEW / REVISED MITIGATION MEASURES

This section aims to address the following requirements of the regulations:

Regulation 32(1) The applicant must within 90 days of receipt by the competent authority of the application made in terms of regulation 31, submit to the competent authority:

(a) a report, reflecting—

(iii) measures to ensure avoidance, management and mitigation of impacts associated with such proposed change;

In addition to assessing the risks and impact of the proposed amendments to the Sonbesie SPP, the EAP aimed to provide measures to ensure avoidance, management and mitigation of any impacts associated with the proposed amendments and identify any changes required to the

EMPr. New and/or revised mitigation measures are outlined in Table 5.1 below and have also been included in the revised EMPr – refer to Appendix E.

Table 5.1: New / Revised mitigation measures

POTENTIAL IMPACT/RISK	NEW MITIGATION MEASURES	RELEVANT SECTIONS/ TABLES IN EMPR
Construction Phase		
Chemical soil pollution	Broken or old batteries or components of the PV plant should be stored in a demarcated area in quarantine for the shortest period of time possible until it can be collected and taken to a special chemical waste facility.	Table 2-4: See soils and geology
Use and storage of hazardous materials	<p>Use and or storage of materials, fuel and chemicals which could potentially leak into the ground must be controlled.</p> <p>All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material.</p> <p>Any hazardous substances must be stored at least 30m from any of the water bodies on site.</p> <p>The Contractor (monitored by the Environmental Control or Liaison Officer) should be responsible for ensuring that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry.</p> <p>Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp shall be collected and removed from the site for appropriate disposal at a licensed commercial facility.</p>	Table 2-4: See surface and ground water
Impacts on potential archaeological artifacts	The farmstead and historical rubbish heap must be avoided with a buffer of 10m. Should this not be possible, a permit in terms of section 35 of the National Heritage Resources Act, 1999 (25 of 1999)(NHRA) be applied for in order for test excavations to be conducted by a professional archaeologists.	Table 2-4: See heritage resources

	<p>This must be completed prior to the construction phase;</p> <p>If any evidence of archaeological sites or remains (e.g. remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments, charcoal and ash concentrations), fossils or other categories of heritage resources are found during the proposed development, SAHRA APM Unit (Natasha Higgitt/Phillip Hine 021 462 5402) must be alerted as per section 35(3) of the NHRA.</p> <p>If unmarked human burials are uncovered, the SAHRA Burial Grounds and Graves (BGG) Unit (Thingahangwi Tshivhase/Mimi Seetelo 012 320 8490), must be alerted immediately as per section 36(6) of the NHRA.</p> <p>The following conditions apply with regards to the appointment of specialists: i) If heritage resources are uncovered during the course of the development, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource. If the newly discovered heritage resources prove to be of archaeological or palaeontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.</p>	
Operational Phase		
Maintenance of BESS	Regular inspection of Battery Management System including the inert fire system.	Table 2-5: See operation and maintenance
Gas release, fire, and explosion	The battery management system (BMS) is essential to the safety and performance of the entire ESS system: it has a controlling and monitoring function, hence its specifications and functions need to be checked, tested and validated. Controlling and monitoring the state of charge (SoC) of the battery cell through its parameters (current, voltage, temperature) during charging and discharging is a critical function based on which functional safety for fault protection is designed.	Table 2-5: See risks associated with the BESS
	In order to ensure normal operation, optimum power output and service life, the system will require cooling at high	

	<p>temperatures and heating in cold weather.</p> <p>The BESS should be located well away from critical buildings or equipment. Where spatial separation is not possible, provide exterior protection such as a passive thermal barrier, or active fire protection such as drenchers. An appropriate distance should be maintained between containers to safeguard against propagation.</p> <p>Install battery and battery management systems/electrical switch gear in separate rooms.</p> <p>Put battery and battery management systems/electrical switch gear in separate rooms, with fire resistive construction (two-hour fire rated) to adequately cut-off the room from surrounding exposures.</p> <p>Provide fire-rated compartmentation and adequate separation between battery units.</p> <p>Provide adequate fire doors that are maintained in the closed position and equipped with automatic closure mechanisms. Where insulated metal panels (IMPs) are used, these should contain a mineral wool core and be installed in accordance with the terms of their approval. Only non-combustible IMPs should be installed.</p>	
	<p>Ensure proper management of cable/service penetrations. Cable penetrations should be adequately sealed to meet the fire resistance of the compartment (two-hour fire resistance rating). Heating, ventilation and air conditioning ducts should have fire dampers provided that automatically close on activation of the fire alarm. Establish a permit to access system to manage changes to service or cable penetrations under an audited system.</p> <p>Extensive monitoring of the battery states such as voltage, temperature, current etc. as well as redundant monitoring and control in terms of a fail-safe battery-management-system (BMS) is crucial for a safe operation of BESS. Maintenance and inspection schedules must be set up.</p> <p>The BMS, the inverter control unit and the BESS supervisory control and data acquisition (SCADA) system should closely</p>	

	<p>monitor the BESS. If one of these fails, the BESS needs to be shut down.</p> <p>Automatic fire detection in should be in place, with early warning smoke detection or very early warning highly sensitive smoke detection. The system design should include continuous remote monitoring.</p> <p>Consider automatic fire sprinklers and water mist for active fire protection.</p> <p>To ensure that ESS remain at an acceptable risk level, owners and operators of both permanent or portable ESS must follow design standards and best practices, regularly maintain the system’s equipment (as well as safety systems and related equipment), train personnel, and communicate with local emergency responders on the storage system’s hazards.</p>	
Recycling and litter management	<p>Broken or old batteries or components of the PV plant should be stored in a demarcated area in quarantine for the shortest period of time possible until it can be collected and taken to a special chemical waste facility.</p> <p>Once the batteries become obsolescent, either due to the facility decommissioning or the batteries reaching their useful design life and require replacement, the used batteries will be broken down and recycled as far as possible and unrecoverable wastes disposed of through appropriate channels.</p>	Table 2-5: See Waste Management
Decommissioning Phase		
Decommissioning of the ESS.	A method statement need to be developed to guide the safe decommissioning of Battery storage which will consider appointment of accredited battery recyclers.	Table 2-6: See general site decommissioning considerations

6 ADVANTAGES AND DISADVANTAGES ASSOCIATED WITH THE PROPOSED AMENDMENT

This section aims to address the following requirements of the regulations:

Regulation 32(1) The applicant must within 90 days of receipt by the competent authority of the application made in terms of regulation 31, submit to the competent authority:

(a) a report, reflecting—

(ii) advantages and disadvantages associated with the proposed change;

6.1 ADVANTAGES OF THE PROPOSED CHANGE

The granting of the amendment will result in the following positive environmental impacts:

- Effective semi base load power

Grid level battery storage systems can bridge the divide between supply and demand and allow renewable energy to provide the flexibility associated with most base load facilities, which are typically thermal plants combusting one or other form of fossil fuel.

- Defer the need for additional energy generation as well as transmission and distribution lines

Energy storage can also displace or defer the need to build additional energy generation capacity and transmission and distribution lines, creating financial and environmental benefits (Arbabzadeh, Maryam et al., 2015).

- More reliable electricity grid

Large scale or grid level battery storage systems are finding their way into major electricity grids across the world as they provide system buffers which allow for an easier management of load management (demand vs supply) on large grid systems, reduce power fluctuations and wastage, and make the electricity grid more reliable (Amrouche et al., 2016).

The battery storage will store excess renewable electricity and will also dispatch it onto the grid when renewable energy is unavailable. During the day when power is not being fully utilised, excess power is diverted to the battery storage facility. This power can then be released into the grid on demand, such as during peak demand periods. This option makes renewable power projects effective semi base load power and can be used strategically to reduce the running time of non-renewable energy power plants if used strategically.

The battery storage can also provide ancillary services to support the grid during normal operations and contingency events. This capability increases the benefit for the system.

- Combating climate change

Whilst the battery storage facility under consideration is not likely to bring any significant benefit on its own, from a cumulative perspective this technology is highly significant and could play a significant role in the combating greenhouse gas emissions and climate change.

- Technical benefits

The following technical benefits are associated with battery storage:

- Reduce the variability in generation profile of the facility, resulting in a constant power output;
- Provides the opportunity for energy shifting, to high demand periods;
- Provide ancillary services to support the grid during normal operations and contingency events
- Decongest transmission power lines; and
- Avoid plant curtailment.

- Optimisation of layout

The internal layout and positioning of the panels and associated infrastructure will also be optimised to accommodate the increase in capacity.

Overall, the granting of the amendment will result in the Sonbesie SPP being more desirable and efficient and therefore being more likely to be selected as preferred bidder by the Department of Mineral Resources and Energy.

6.2 DISADVANTAGES OF THE PROPOSED CHANGE

The proposed amendments may result in additional risks associated with the BESS. However, in light of the advantages of including this technology and the low level risk posed, it is argued that the proposed amendment will have an overall positive impact on the environment. Due consideration should be given to the broader cumulative ramifications of this technology and the important role it has to play in global energy market and combating global climate change and its many associated impacts on the environment and society.

7 PUBLIC PARTICIPATION

The following sections provide detailed information on the public participation process to be conducted as part of the amendment process and to address the following requirements of the regulations:

Regulation 32(1) The applicant must within 90 days of receipt by the competent authority of the application made in terms of regulation 31, submit to the competent authority:

(a) a report, reflecting...

(iv) Which report – (aaa) had been subjected to a public participation process, which had been agreed to by the competent authority, and which was appropriate to bring the proposed change to the attention of potential and registered interested and affected parties, including organs of state, which have jurisdiction in respect of any aspect of the relevant activity, and the competent authority, and (bbb) reflects the incorporation of comments received, including any comments of the competent authority.

7.1 INTRODUCTION

In terms of Chapter 6 of the EIA Regulations, 2014, (as amended), a Part 2 Amendment Application requires a 30- day Public Participation Process (PPP). The following three categories of variables are taken into account when deciding the required level of public participation:

- The scale of anticipated impacts;
- The sensitivity of the affected environment and the degree of controversy of the project; and
- The characteristics of the potentially affected parties.

The EIA process conducted in 2016 examined the sensitivity of the affected environment and assessed potential environmental impacts. It was concluded that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources. All negative environmental impacts can further be effectively mitigated through the proposed mitigation measures. The scale of the anticipated impacts associated with the proposed amendments is also not expected to be severe. The proposed project is not controversial and the potentially affected parties generally seem to welcome the proposed development.

Since the scale of anticipated impacts is low, the low environmental sensitivity of the site and the fact that no conflict is foreseen between potentially affected parties, no additional public participation mechanisms were considered. The following steps will be taken as part of the public participation process for the amendment process:

- Newspaper advertisement

Since the proposed development is unlikely to result in any impacts that extend beyond the municipal area where it is located, it was deemed sufficient to advertise in a local newspaper. An advertisement was placed in English in the local newspaper (Stellalander) on Wednesday, 2 December 2020 to notify the public of the EIA process

and requesting Interested and Affected Parties (I&APs) to register with, and submit their comments to Environamics Environmental Consultants. I&APs will be given the opportunity to raise comments by 25 January 2021 of the advertisement. The public were informed that copies of the report will be made available upon request and that these will be sent via Dropbox, email, WhatsApp, registered post or courier services.

- Site notice

A site notice was placed on site on 1 December 2020 (27°5'28"S; 24°45'8"E) in English to inform surrounding communities and immediately adjacent landowners of the proposed development. I&APs will be given the opportunity to raise comments by 25 January 2021. The public were informed that copies of the report will be made available upon request and that these will be sent via Dropbox, email, WhatsApp, registered post or courier services.

- Hard and/or soft copies of report

Hard or soft copies of the report will be made available upon request. Hard copies will be made available for review to any interested and affected party who may not have access to the Internet or email communication. The availability of the report was made known as part of the press advertisement and the site notices. All hard copies of the report will be sanitized prior to it being posted or couriered.

- Direct notification of potential and registered I&APs:

Identified and registered I&APs, including key stakeholders representing various sectors, will be directly informed of the proposed amendment via registered post, telephone calls, WhatsApps and emails. A copy of the draft motivational report will be made available as part of the notification. I&APs will be requested to submit comments on the draft report by 1 February 2021. For a complete list of I&APs with their contact details see Appendix A to this report.

- Direct notification of surrounding land owners and occupiers:

Written notices were also provided via registered post, WhatsApp or email to all surrounding land owners and occupiers – refer to Figure 7.1. The surrounding land owners were given the opportunity to raise comments by 25 January 2021. All letters were sanitized prior to it being posted.

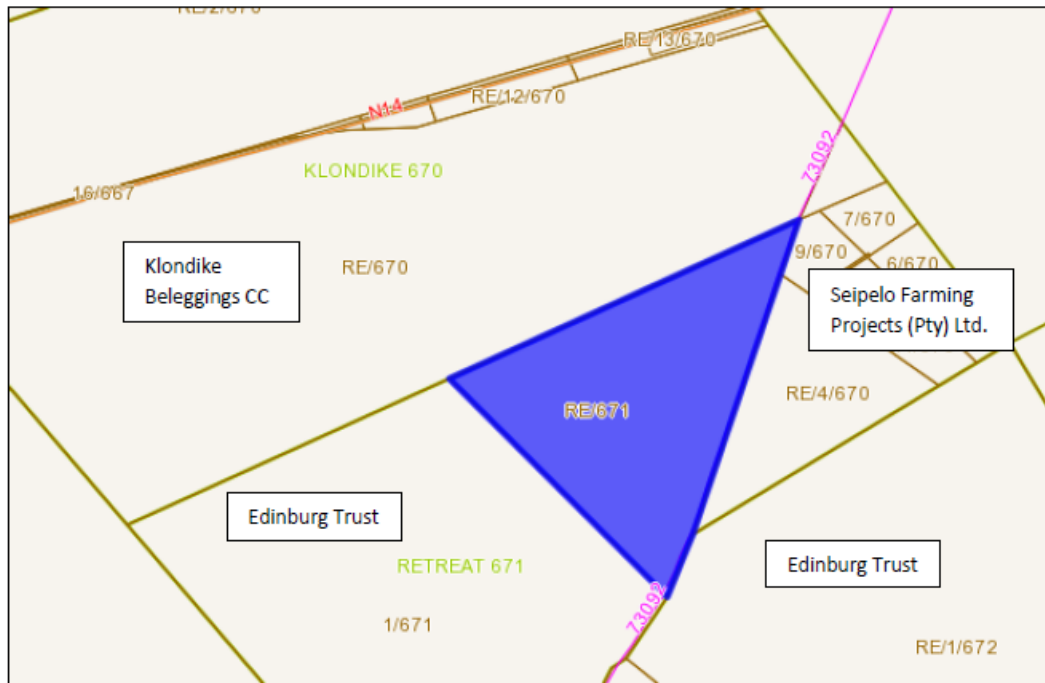


Figure 7.1: Surrounding land owners

- Submission of Draft Motivational Report:

A Draft Motivational Report was submitted electronically to the Department on 10 December 2020 for comments. The EAP declaration was included as part of the application for amendment.

- Circulation of the Draft Motivational Report:

As mentioned above, copies of the draft motivational report will be provided to all I&APs via registered post, WhatsApp, couriers, Dropbox and/or email. They will be requested to provide their comments on the report by 1 February 2021. All issues identified will be documented and compiled into a Comments and Response Report to be included as part of the Final Motivational Report. Hard copies of the report will be sanitized prior to it being posted or couriered.

- Circulation of decision and submission of appeals:

Notice will be given to all identified and registered I&APs of the decision taken by the DEFF. The attention of all registered I&APs will also be drawn to the fact that an appeal may be lodged against the decision in terms of the National Appeals Regulations. In accordance with the provisions of Regulation 4(1) of Government Notice No. 993, an appellant must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered I&APs and any organ of state with interest in the matter within 20 days from the date that the notification of the decision was sent to the applicant by the competent authority.

7.2 STAKEHOLDERS AND I&APS

I&APs, key stakeholder will be identified using email, sms, fax and post notifications to all I&APs key stakeholders on the project database as well as referrals. A comprehensive list of registered I&APs and key stakeholder was compiled and is included in Appendix B. The proof of distribution of the draft report (i.e. email notification) will be included as part of the Final Motivational Report. Comments received from key stakeholders during the commenting and review period will be incorporated into the Final Motivational Report.

8 REVISED LAYOUT

With regards to the battery storage system the attached document (see Appendix D) describes the battery type, preliminary physical design of the BESS, the size, preliminary layout and position of the BESS. The BESS will be located in close proximity to the solar farm substation and will be linked to the substation via 33kV (or less) cables. The system will not require additional office, operation or maintenance infrastructure, since infrastructure proposed as part of the substation and solar farm will be used. In effect, the battery storage system will be extensions of the substation infrastructure and, as per the substation, will be contained within a security fence (refer to the revised layout plan attached as Annexure C). The layout plan also reflects the location of the access road.

9 CONCLUSION AND RECOMMENDATIONS

The Motivational Report provided an assessment of the potential risks and impacts, advantages and disadvantages associated with the proposed amendments, measures to ensure avoidance, management and mitigation of risks and impacts associated with such proposed change and an outline of the public consultation process that will be undertaken. In light of the fact that the proposed amendments would still be within the development footprint already assessed for the SPP, it was determined that the proposed amendments would not trigger any listed activities, result in any additional environmental impacts or a change in the significance of the potential impacts, apart from the new risks associated with the BESS. These risks include fire with consequent emission of gas and explosion.

Mitigation and management measures haven been identified to reduce the level of risk associated with the BESS and the proposed layout has been revised to incorporate the proposed changes in technology to be used. The advantages and disadvantages were explored providing an indication of the potential benefits and drawbacks of the proposed amendments. From the assessment, the advantages outweigh the disadvantages mainly due to the potential broader cumulative ramifications as a result of the use of the new technology and the important role it has to play in global energy market and combating global climate change.

A public participation process will be undertaken to obtain comments from I&APs on the proposed amendments. The public review and comment period will be undertaken from Tuesday, 1 December 2020 to Monday, 1 February 2021 (excluding the period between 15

December and 5 January). Any comments raised and responses to these comments and concerns will be integrated into the Final Motivational Report.

9.1 ENVIRONMENTAL IMPACT STATEMENT

The final recommendation by the EAP considered firstly if the legal requirements for the Amendment process had been met and secondly the validity and reliability of the substance of the information contained in the EIA report. In terms of the legal requirements it is concluded that:

- The Motivational Report complied with the requirements set out in Regulation 32.
- All key consultees will be consulted as required by the 2014 EIA Regulations - approved by the environmental authority as part of the public participation plan.
- The proposed mitigation measures will be sufficient to mitigate the identified impacts and managed identified risks to an acceptable level.
- The EMPR have been revised to reflect the additional mitigation and management measures proposed.

In terms of the contents and substance of the EIA report the EAP is confident that:

- All key environmental issues were identified adequately assessed to provide the environmental authority with sufficient information to allow them to make an informed decision.

The final recommendation of the EAP is that:

The EAP is of the opinion that the significance of the environmental impacts of the proposed amendments are expected to remain the same as those already identified in the original EIA Report. Additional risks associated with the BESS have been identified and new mitigation and management measures have been provided to ensure that these risks are reduced to a low level. The potential risks can be mitigated to acceptable levels provided the additional mitigation measures recommended (see Table 5.1) are implemented.

It is the opinion of the independent EAP that the proposed development will have a net positive impact for the area and will subsequently ensure the optimal utilisation of resources. Based on the contents of the report it is proposed that an environmental authorisation be amended, subject to the implementation of the proposed mitigation measures.

We trust that the department find the report in order and eagerly await your final decision in this regard.

10 REFERENCES

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