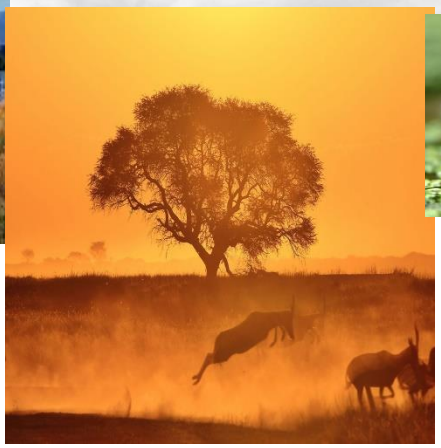

DRAFT MOTIVATIONAL REPORT

8 January 2021

PART 2 AMENDMENT: AS PART OF THE PROPOSED SONNEBLOM PHOTOVOLTAIC ENERGY FACILITY NEAR BLOEMFONTEIN IN THE FREE STATE PROVINCE

ENVIRONAMICS

PROJECT DETAIL

DEA Reference No.	**:**	14/12/16/3/3/2/673
Project Title	:	Proposed Sonneblom Photovoltaic Solar Energy Facility near Bloemfontein, Free State Province
Authors	**:**	Ms. Carli Steenkamp Ms. Christia van Dyk
Client	**:**	Sonneblom Solar Power Plant (Pty) Ltd.
Report Status	**:**	Draft Motivational Report
Submission date	**:**	8 January 2021

When used as a reference this report should be cited as: Environamics (2021) Draft Motivational Report: Part 2 Amendment as part of the Sonneblom Photovoltaic Solar Energy Facility near Bloemfontein, Free State Province.

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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

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 Sonneblom Solar Power Project (SPP). This report motivates the proposed amendment of the environmental authorisation (EA) as part of the Sonneblom SPP near Bloemfontein, Free State Province (DEA Ref: 14/12/16/3/3/2/673). The Environmental Impact Assessment (EIA) process for the Sonneblom Photovoltaic SPP was lodged in 26 March 2014 and the Environmental Authorisation (EA) was granted on 19 June 2015.

Sonneblom Solar Power Plant (RF) (Pty) Ltd. (hereafter referred to as Sonneblom SPP) was issued with an EA for the development of an 84MW photovoltaic solar facility and associated infrastructure on Portion 1 of the farm Blydschap No. 504, Registration Division Bloemfontein, Free State situated within the Mangaung Metropolitan Municipality area of jurisdiction. The town of Bloemfontein is located approximately 16 km north west of the proposed development. The total footprint of the project will approximately be 171 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 10(i) (Regulation 544): *"The construction 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."*
- Activity 11(i), (ii), (v), (vi), (x), & (xi) (Regulation 544) : *"The construction of: (i) canals; (ii) channels; (v) weirs; (vi) bulk storm water outlet structures; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line."*
- Activity 18 (Regulation 544): *"The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock from a watercourse; or the littoral active zone."*
- Activity 1 (Regulation 545): *"The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more.*
- Activity 15 (Regulation 545): *"Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more."*
- Activity 4(a)(i)(ee) (Regulation 546): *"The construction of a road wider than 4 metres with a reserve less than 13,5 metres (a) in the Free State Province (i) outside urban areas, in (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans."*

- Activity 14(a)(i) (Regulation 546): *"The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation-(a) Free State Province (i) All areas outside urban areas."*

Sonneblom SPP is said to be tendered to the Department of Mineral Resources and Energy (DMRE) in 2021. The inclusion of a BESS will enable the plant 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 thereby improving the desirability and efficiency of the proposed project. As a result, Sonneblom 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. Environamics has been appointed as the independent consultant to undertake the Part 2 amendment process on Sonneblom 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 the proposed use of new and advanced technology (PV solar panels) are not significant and that it doesn't increase the significance ratings determined as part of the EIA process. The proposed layout has been refined to incorporate the inclusion of the battery storage system, associated amendments and a new access road.

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). According to Regulation 32 all identified and registered I&APs and relevant State Departments must 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 Steenkamp

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 10 November 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 12 November 2020.
- The Draft Motivational Report was made available to all identified and registered I&APs and relevant State Departments on 8 January 2021 and they were requested to provide their comments on the report by 8 February 2021.

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	-	10 November 2020
Approval of public participation plan	-	12 November 2020
Submit Draft Motivational Report	-	8 January 2021
Public participation process	30 Days	Jan. – Feb. 2021
Submit Final Motivational Report	90 Days	Feb. 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	5

	associated with such proposed change; and	
(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 Portion 1 of the farm Blydschap No. 504, Registration Division Bloemfontein, Free State situated within the Mangaung Metropolitan Municipality area of jurisdiction. The proposed development is located in the Free State Province in the central interior of South-Africa. The town of Bloemfontein is located approximately 16km north west of the proposed development (refer to figure 1.1 for the locality map).

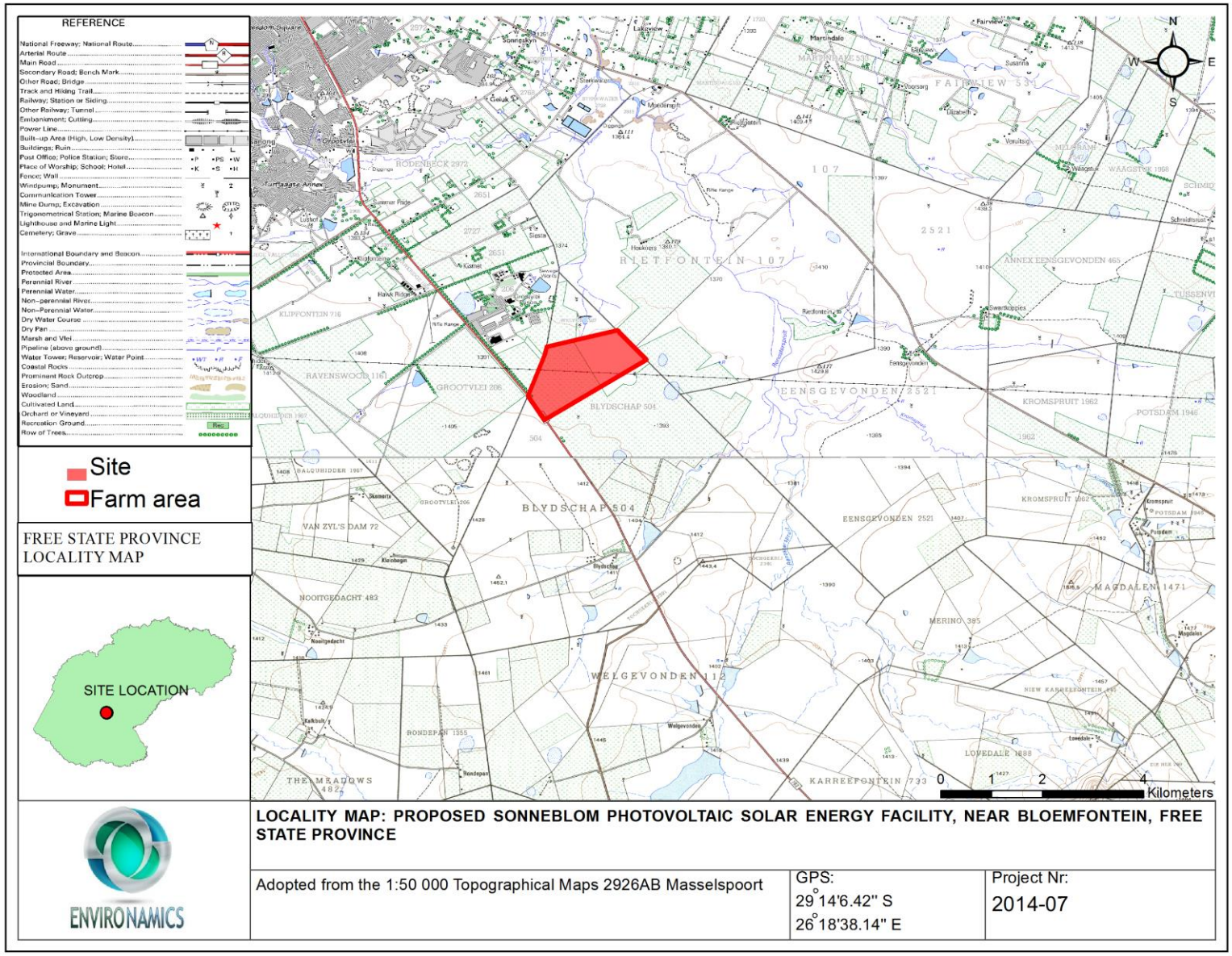

Figure 1.1: Locality Map

The project entails the generation of up to 84MW electrical power through photovoltaic (PV) panels. The total footprint of the project will approximately be 171 hectares (including supporting infrastructure on site) – refer to table 2.1 for general site information. The property on which the facility is to be constructed will be leased by Sonneblom Solar Power Plant (RF) (Pty) Ltd. from the property owner, Mr. Wiese Hendrik Jacobus Rust, for the life span of the project (minimum of 20 years).

Table 2.1: General site information

Description of affected farm portion	Portion 1 of the farm Blydschap 504, Registration Division Bloemfontein, Free State
21 Digit Surveyor General codes	F00300000000050400001
Title Deed(s)	T6089/2001
Type of technology	Photovoltaic solar facility
Structure Height	Panels ~3.5m, buildings ~ 4m and power lines ~32m
Surface area to be covered	Approximately 171 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 171 ha
Generation capacity	Up to 84MW
Expected production	Up to 130 GWh per annum

2.2 ACTIVITY DESRIPTION

The development triggered a number of activities in terms of the EIA Regulations, 2014. The following activities were approved as per the EA dated 19 June 2015:

Table 2.2: Listed activities

Relevant notice:	**Activity No (s)**	**Description of each listed activity as per project description**:
GNR. 544, 18 June 2010	Activity 10(i)	• *"The construction 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."* • *Activity 10(i) is triggered since the proposed photovoltaic solar facility will transmit and distribute electricity of more than 33 kilovolts outside an urban area.*
GNR. 544, 18 June 2010	Activity 11(i), (ii), (v), (vi), (x) & (xi)	• *"The construction of: (i) canals; (ii) channels; (v) weirs; (vi) bulk storm water outlet structures; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line."* • *Activity 11(i), (ii), (v), (vi), (x) & (xi) is triggered since a watercourse (non-perennial streams and pans) is located on or in close proximity to the site and the proposed photovoltaic solar facility may result in the construction of canals, channels, weirs, bulk storm water outlet structures, buildings exceeding 50m² in size or infrastructure or structures covering 50m² or more within 32m of a watercourse.*
GNR. 544, 18 June 2010	Activity 18	• *"The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock from a watercourse; or the littoral active zone."* • *Activity 18 is triggered since a watercourse (nonperennial streams and pans) is located on or in close proximity to the site and the proposed photovoltaic solar facility may result in the infilling or depositing of material of more than 5m³ into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock from a watercourse; or the*

		littoral active zone.
GNR. 545, 18 June 2010	Activity 1	• *"The construction of facilities or infrastructure for the generation of electricity where the electricity output is 20 megawatts or more."* • *Activity 1 is triggered since the proposed photovoltaic solar facility will generate 84 megawatts electricity.*
GNR. 545, 18 June 2010	Activity 15	• *Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more."* • *Activity 15 is triggered since the proposed photovoltaic solar facility is located outside an urban area and will result in the transformation of approximately 171 hectares of undeveloped, vacant or derelict land.*
GNR. 546, 18 June 2010	Activity 4(a)(i)(ee)	• *"The construction of a road wider than 4 metres with a reserve less than 13,5 metres (a) in the Free State Province (i) outside urban areas, in (ee) critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans."* • *A new access point/road will be required from the R702. An internal site road network will also be required to provide access to the solar field and associated infrastructure. All site roads will require a width of approximately 4m. Therefore activity 4(a)(i)(ee) is triggered since the site is located outside an urban area and within a critically biodiversity area.*
GNR. 546, 18 June 2010	Activity 14 (a)(i)	• *"The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation- (a) Free State Province (i) All areas outside urban areas.* • *"In terms of vegetation type the site falls within the Bloemfontein Dry Grassland type, which is identified as a 'vulnerable' ecosystem and is therefore included in the list of threatened ecosystems published on 9 December 2011 (Notice 34809 of 2011). The region is characterised by slightly undulating bottomland Landscape covered with tall,*

		dense grassland alternating with patches of karroid scrub occurring especially over calcrete. The ecological fauna and flora habitat survey (refer to G) confirmed that "a moderate diversity of indigenous plant species and animal species appears to be present at the site proposed for development." • Therefore, the proposed activity will result in the clearance of 5 hectares or more of indigenous vegetation outside an urban area.

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 84MW, 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. Whilst Sonneblom Solar Power Plant has not yet received a cost estimate letter from Eskom, it is expected that generation from the facility will tie in with the Harvard-Sannaspos Rural 86 Section 132.0 [kV] line

traversing the site. Although the generation capacity is 84MW the capacity at the point of connection with Eskom will be a maximum of 75MW.

- Supporting Infrastructure – A control facility with basic services such as water and electricity will be constructed on the site and will have an approximate footprint 400m² or less. Other supporting infrastructure includes voltage and current regulators and protection circuitry.

- Roads - A new access point/road will be required from the R702. An internal site road network will also be required to provide access to the solar field and associated infrastructure. All site roads will require a width of approximately 4m.

- Fencing - For health, safety and security reasons, the facility will be required to be fenced off from the surrounding farm.

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 on site apart from the pan located approximately 250m west of the site (refer to Appendix H1 for the environmental sensitivity map that is superimposed over the layout plan). According to the National Water Act (Act 36 of 1996) construction within 500m radius of a pan/wetland will have to be regulated. The implications of the requirements of DWA were taken into consideration in deciding whether or not to proceed with the development footprint within the 500m buffer zone of the water feature (pan/wetland). It was found that ingress into the 500m buffer zone is necessary from a design point of view for the delivery of an uninterrupted surface solar panel target area. The applicant subsequently decided to decrease the buffer zone surrounding the pan/wetland in order to ensure an economical feasible size of approximately 171 hectares for the proposed development. A water use license may therefore need to be obtained in order to develop within the 500m buffer zones of the water feature. It is envisaged that a full assessment of the application for water use authorisation will only be undertaken in the event that the project proponent has been appointed as a preferred bidder by the Department of Energy.

It should be noted that the layout had to be revised as a result of the proposed amendment (refer to Appendix C) but that the final development layout will be determined during the detailed design phase once the project has been awarded preferred bidder status. Table 2.3 below provides detailed information regarding the layout and the components that were authorised.

Table 2.3: Technical details for the proposed facility

Component	Description / dimensions
Location of the site	Portion 1 of the farm Blydschap 504, Registration Division Bloemfontein, Free State
Area of PV Array	Approximately 171 hectares
SG Codes	F00300000000050400001
Site access	A new access point/road will be required from the R702
Export capacity	84MW
Technology	Photovoltaic solar facility with crystalline silicon panels.
Height of PV panels from ground level	Approximately 3.5m
Width of internal roads	Approximately 4 meters

2.5 ASSESSMENT OF ENVIRONMENTAL IMPACTS

As part of the original EIA process for the Sonneblom SPP undertaken in 2016, the following specialist studies were undertaken to investigate potential significant impacts:

- Brief Geotechnical Study;
- Ecological Fauna and Flora Habitat Survey;
- Visual Impact Assessment;
- Agricultural and Soils Impact Assessment;
- Hydrogeological Assessment Study;
- Palaeontological Impact Assessment;
- Heritage Impact Assessment; and
- Social Impact Assessment.

The findings of the specialist studies and impact assessment undertaken as part of the original environmental authorisation process 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	Impacts of the geology on the	Negative Low	Negative Low

Study	proposed development		
Ecological Fauna and Flora Habitat Survey	Loss or fragmentation of indigenous natural fauna and flora	Negative Low	Negative Low
	Loss or fragmentation of habitats	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 Low	Negative Low
Hydrogeological Assessment Study	Hydrogeological impacts	Negative Low	Negative Low
	Impacts on water quality	Negative Low	Negative Low
Palaeontological Impact Assessment	Impacts on palaeontological resources	Negative Medium	Negative Medium
Social Impact Assessment	Temporary employment and other economic benefits (business opportunities and skills development)	Positive Medium	Positive Medium
	Technical advice for local farmers and municipalities	Negative Low	Positive Medium
	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,	Negative Medium	Negative Low

	sewage and grey water		

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
Visual Impact Assessment	Visual intrusion	Negative Medium	Negative Low
Agricultural and Soils Impact Assessment	Soil erosion	Negative High	Negative Low
	Change in land use	Negative Low	Negative Low
Hydrogeological Assessment Study	Impacts on water quality	Negative Low	Negative Low
	Recharge to groundwater	Negative Low	Negative Low
Social Impact Assessment	Permanent employment	Positive Medium	Positive Medium
	Generation of additional electricity	Positive Medium	Positive Medium
	Generation of alternative land use income	Positive Low	Positive Low
	Change in the sense of place	Negative Low	Negative Low
	Potential impact on tourism	Positive and Negative Low	Positive and Negative Low
	Establishment of a Community Trust	Positive Medium	Positive High
	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

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

3 PROPOSED AMENDMENTS

Sonneblom SPP is applying for the amendment of the EA (DEA Ref: 14/12/16/3/3/2/673) issued on 19 June 2015 to correct the coordinates of corner points of study area, include a battery storage system, associated amendments and the access road. The proposed amendments are described in more detail below.

3.1 CHANGES TO AUTHORISED ELEMENTS OF THE PROJECTS

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

- Correct the coordinates of corner points of study area

  The corner coordinates for the study area should be amended in order to correct the reference to the wrong coordinates in the EA.

- 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. The BESS will enable the plant 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. 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 2ha (refer to Figure 3.2 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 more than 2 ha of vegetation for the development of a new area for the battery storage facility.

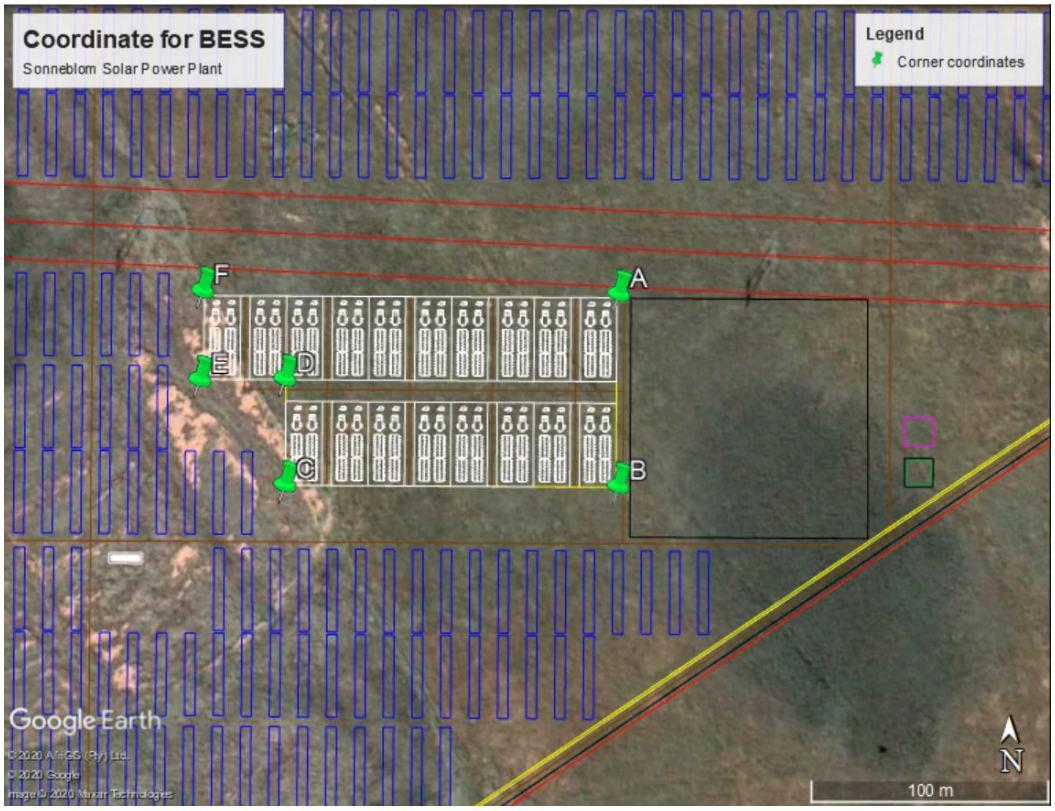

Figure 3.2: Corner coordinates of the proposed Sonneblom BESS

- <u>Increasing capacity of 115MWdc to up to 150MWdc</u>

  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).

- <u>The location of the access road</u>

  Due to the change of the facility layout, it is proposed that the access to the facility be amended. The proposed new route is located on the approved development footprint. It will be approximately 150 meters in length and the width of the road will stay below 8m. The proposed changes therefore do not trigger a listed activity.

- Amending the 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.

3.2 DETAILS OF AMENDMENTS BEING APPLIED FOR

In light of the above, it is recommended that the EA dated 19 June 2015 be amended as follow:

Correct the coordinates of corner points of study area

It is proposed that reference should be made to the following corner coordinates for the study area and that the EA be amended as follow:

From:

Alternative (preferred site)	**Latitude**	**Longitude**
coordinates of corner points of study area	27°38'15.60"S	25°29'35.11"E
	27°38'12.43"S	25°29'43.13"E
	27°38'27.15"S	25°30'26.55"E
	27°39'02.30"S	25°30'48.09"E
	27°39'19.12"S	25°30'11.57"E

To:

Alternative (preferred site)	**Latitude**	**Longitude**
coordinates of corner points of study area	29°13'39.54"S	26°19'5.54"E
	29°13'56.80"S	26°19'22.99"E
	29°14'34.94"S	26°18'18.57"E
	29°14'20.84"S	26°18'8.63"E
	29°13'57.21"S	26°18'19.35"E
	29°13'51.15"S	26°18'20.24"E

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 4: The description of the technical details for the proposed PV facility should include reference to a battery storage of ~2ha in extent.

- Page 5: Reference should also be included in the list of elements the proposed facility will consist of. It is proposed that the following be included: Battery storage – of ~2 hectares in extent.

  Table 3.2: Corner coordinates for the Sonneblom BESS

Battery Energy Storage System (BESS)	
A	29°14'6.51"S; 26°18'56.25"E
B	29°14'9.12"S; 26°18'56.24"E
C	29°14'9.10"S; 26°18'51.05"E
D	29°14'7.66"S; 26°18'51.05"E
E	29°14'7.67"S; 26°18'49.72"E
F	29°14'6.46"S; 26°18'49.76"E

Increasing capacity of up to 84MWdc to up to 115MWdc

To increase the capacity of the facility from up to 84MW to up to 115MW, it is proposed that the EA be amended as follows:

- Page 1: The project description (title) should be amended from "*The 84 MW Sonneblom Photovoltaic Solar Energy Facility and associated infrastructure in Bloemfontein, within the Mangaung Metropolitan Municipality in the Free State Province*" to "The up to 115 MW Sonneblom Photovoltaic Solar Energy Facility and associated infrastructure in Bloemfontein, within the Mangaung Metropolitan Municipality in the Free State Province."

- Page 4: The activity description for activity 1 should amended from "*Activity 1 is triggered since the proposed photovoltaic solar facility will generate 84MW of electricity*" to "Activity 1 is triggered since the proposed photovoltaic solar facility will generate 115MW of electricity."

- Page 5: The table summarising the technical details of the proposed facility should be amended as follow: "*Export capacity – 84 MW*" to "Export capacity – 115 MW."

- Page 5: The project description following the provision of the table summarising the technical details for the proposed development as follow: "*-proposed Sonneblom 84MW photovoltaic Solar Energy Facility and associated infrastructure in Bloemfontein, within the Mangaung Metropolitan Municipality in the Free State Province, hereafter referred to as "the property""* to "-proposed Sonneblom 84MW photovoltaic Solar Energy Facility and associated infrastructure in Bloemfontein, within the Mangaung Metropolitan Municipality in the Free State Province, hereafter referred to as "the property".

- Page 6: Under the condition of the authorisation, condition 1 as follow: "*The proposed Sonneblom 84MW Photovoltaic Solar Energy Facility and associated infrastructure on portion 1 of the farm Blydschap No. 504, Registration Division Bloemfontein, within the Mangaung Metropolitan Municipality in the Free State Province is approved as per the above geographic coordinates*" to "The proposed Sonneblom 115MW Photovoltaic Solar Energy Facility and associated infrastructure on portion 1 of the farm Blydschap No. 504, Registration Division Bloemfontein, within the Mangaung Metropolitan Municipality in the Free State Province is approved as per the above geographic coordinates."

Amending the access road

To amend the location of access road, it is proposed that the layout be amended. The following amendment should be made in the EA:

- Page 7: Condition 12- "*A copy of the final development layout map submitted as part of the EIAr is approved*" to "The development layout plan titled "Sonneblom 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 2.4 below.

Table 3.2: Summary of proposed amendments

Component	Description / dimensions	
Battery storage system	-	Battery Storage System with a maximum height of ~8m and ~2 hectares in extent.
Capacity	Up to 84MWdc	Up to 115MWdc
Access road and layout plan	A copy of the final development layout map submitted as part of the EIAr is approved.	The development layout plan titled Sonneblom Solar Power Plant, dated December 2020 is approved.

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

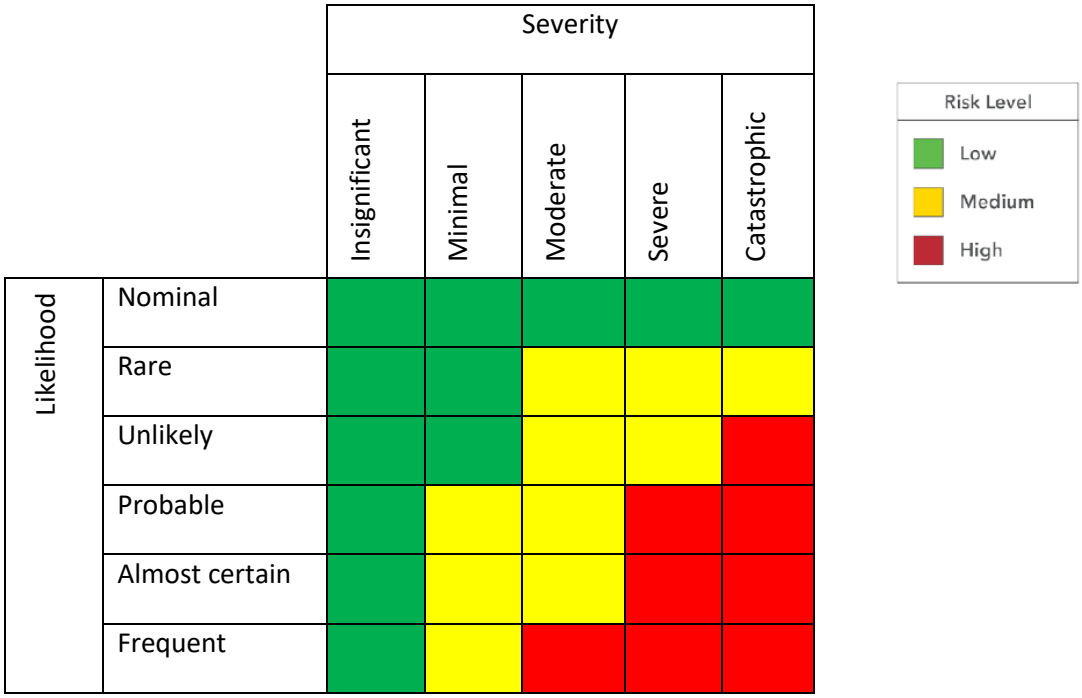

Figure 4.1: Generic risk matrix

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.

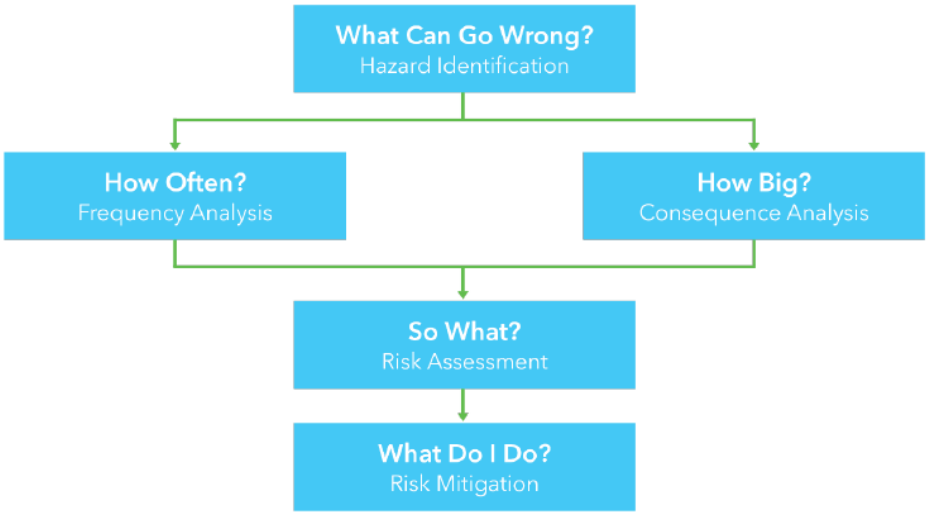

Figure 4.2: Risk Assessment Methodology

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

Sonneblom 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 Sonneblom 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 protect ion 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).

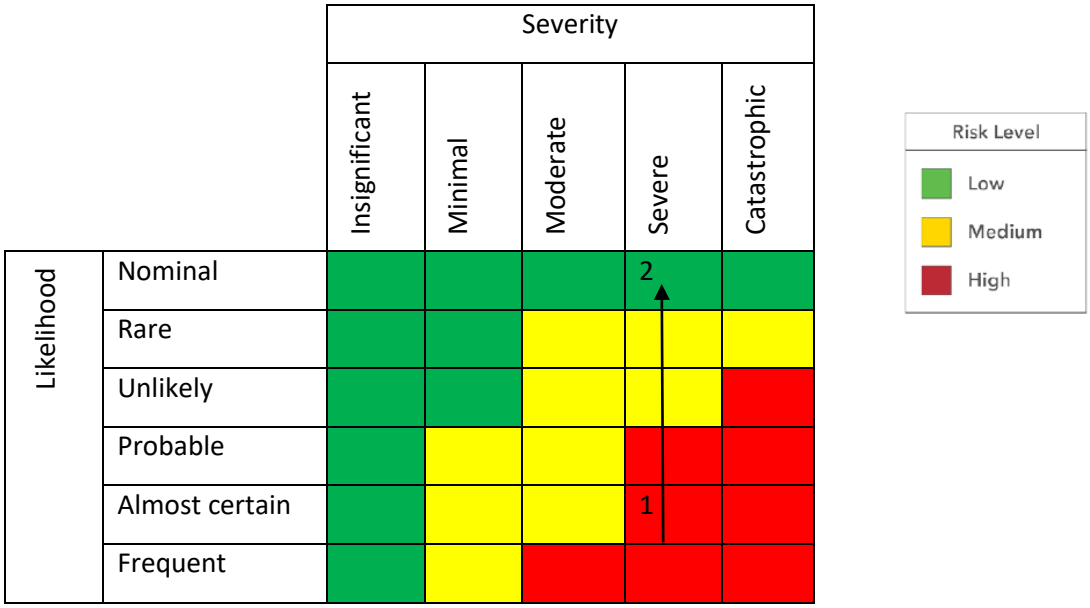

Figure 4.3: Comparison of Risk of ESS Without safeguards in Place (1) and with Safeguards in Place (2)

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 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 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, the new advanced technology to be used and the new power line route. Specialists were consulted to obtain their input on the potential impact of the proposed amendments, 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.

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 new proposed BESS will not have an influence on the significance ratings and will not result in any additional geotechnical impacts.
Ecological Fauna and Flora Habitat Survey	Not applicable - The proposed amendments are located within the wider area that has been assessed. The new proposed BESS will not have an influence on the significance ratings and will not result in any additional impacts.
Visual Impact Assessment	Not applicable - The proposed amendments are located within the development footprint that has been assessed. The new proposed BESS will not have an influence on the significance ratings and will not result in any additional impacts.
Agricultural and Soils Impact Assessment	Not applicable - The proposed amendments are located within the wider area that has been assessed. The new proposed BESS will not have an influence on the significance ratings and will not result in any additional soil or agricultural impacts.
Heritage Impact Assessment	Not applicable - The proposed amendments are located within the wider area that has been assessed. The new proposed BESS will not have an influence on the significance ratings and will not result in any additional heritage impacts.
Hydrogeological Assessment Study	Potentially applicable – The proposed BESS may result in additional impacts. However, due to the location of the proposed BESS it may be argued that the area was assessed as part of the original EIA application Specialist input will be required.
Palaeontological Impact Assessment	Not applicable - The proposed amendments are located within the wider area that has been assessed. The new proposed BESS will not have an influence on the significance ratings and will not result in any additional palaeontological impacts.
Social Impact Assessment	Not applicable - The proposed amendments are located within the wider area that has been assessed. The new proposed BESS will not have an influence on the significance ratings and will not result in any additional impacts.

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).

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	Loss or fragmentation of indigenous natural fauna and flora	Negative Low	Negative Low
	Loss or fragmentation of habitats	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
Hydrogeological Assessment Study	Hydrogeological impacts	Negative Low	Negative Low
	Impacts on water quality	Negative Low	Negative Low
Paleontological Impact Assessment	Impacts on palaeontological resources	Negative Medium	Negative Low

Social Impact Assessment	Temporary employment and other economic benefits (business opportunities and skills development)	Positive Medium	Positive Medium
	Technical advice for local farmers and municipalities	Positive Medium	Positive Medium
	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
Visual Impact Assessment	Visual intrusion	Negative Low	Negative Low
Agricultural and Soils Impact Assessment	Soil erosion	Negative Low	Negative Low
	Change in land use	Negative Low	Negative Low
Hydrogeological Assessment Study	Impacts on water quality	Negative Low	Negative Low
	Recharge to groundwater	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 High	Positive High
	Change in the sense of place	Negative Low	Negative Low
	Potential impact on tourism	Positive and Negative Low	Positive and Negative Low
	Development of infrastructure for the generation of clean, renewable energy	Positive Low	Positive Low
Other	Impacts associated with the surrounding land uses	Negative Low	
	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	Negative Low	Negative 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 Sonneblom 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 12: See soils and geology
Operational Phase		
Operation and maintenance responsibility	Regular inspection of Battery Management System including the inert fire system.	Table 30: 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 31: 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 temperatures and heating in cold weather.	
	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.	
	Install battery and battery management systems/electrical switch gear in separate rooms.	
	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.	
	Provide fire-rated compartmentation and adequate separation between battery units.	
	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.	
	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.	
	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. The BMS, the inverter control unit and the BESS supervisory control and data acquisition (SCADA) system should closely monitor the BESS. If one of these fails, the BESS needs to be shut down.	
	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.	
	Consider automatic fire sprinklers and water mist for active fire protection.	
	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.	
Recycling and litter management	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 36: See Waste Management
	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 will be broken down and recycled as far as possible and unrecoverable wastes disposed of through appropriate channels.	
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 43: 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 Sonneblom SPP being more desirable and efficient and therefore being more likely to be selected as preferred bidder by the Department of 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 were 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
- The characteristics of the potentially affected parties

The EIA process conducted in 2014 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 (and its subsequent amendment) 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 will be placed in English in the local newspaper (Bloemnuus) on 10 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 1 February 2021. The public was 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

  Site notice was placed on site on 1 December 2020 (29°14'27" S; 26°18'14" 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 was 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 8 February 2021. For a complete list of I&APs with their contact details see Appendix A to this report. All letters will be sanitized prior to it being posted.

- Direct notification of surrounding land owners and occupiers:

  Written notices will also be provided via email to all surrounding land owners and occupiers. The surrounding land owners were given the opportunity to raise comments by 8 February 2021.

- Submission of Draft Motivational Report:

  A Draft Motivational Report will be submitted electronically to the Department in January 2021 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 8 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 were 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 proofs of distribution (i.e. email notification) will be included in the Final Motivational Report. Comments received from key stakeholders during the comment and review period will be incorporated into the Final Motivational Report, which will then be submitted to the competent authority (namely the DEFF) for decision-making.

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).

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 to 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 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. 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 is being undertaken to obtain any comments received by I&APs on the proposed amendments. The public review and comment period will be undertaken from Thursday the 7th of January 2021 to Friday the 5th of February 2021, over a 30-day period (excluding public holidays). 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 - already 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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