

## **Badenhorst Dam Solar PV3: 9.99MW Auxiliary Generator**

### **Draft Motivational Report in support of a Part 2 Environmental Amendment Application**

DEFF Ref Nr: 14/12/16/3/3/2/483

**February 2021**

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## CHAPTER 1: PROJECT INFORMATION

### 1.1 Background and Locality

An Environmental Authorisation (EA) was issued for the construction of the **75 MW Badenhorst Dam Solar PV3 Photovoltaic Energy Plant** (“The solar PV project”) on the farm Badenhorst Dam on the Remainder of Portion 1 of the Farm De Aar No 180 in the Emthanjeni Municipality in De Aar, Northern Cape province. The approved site is 252 hectares in extent.

The EA was issued to Badenhorst Dam Solar PV3 (Pty) Ltd on 30 July 2015 with reference number 14/12/16/3/3/2/483. The EA was subsequently amended on 16 April 2018 with reference number 14/12/16/3/3/2/483AM1. The EA is valid until 30 July 2023.

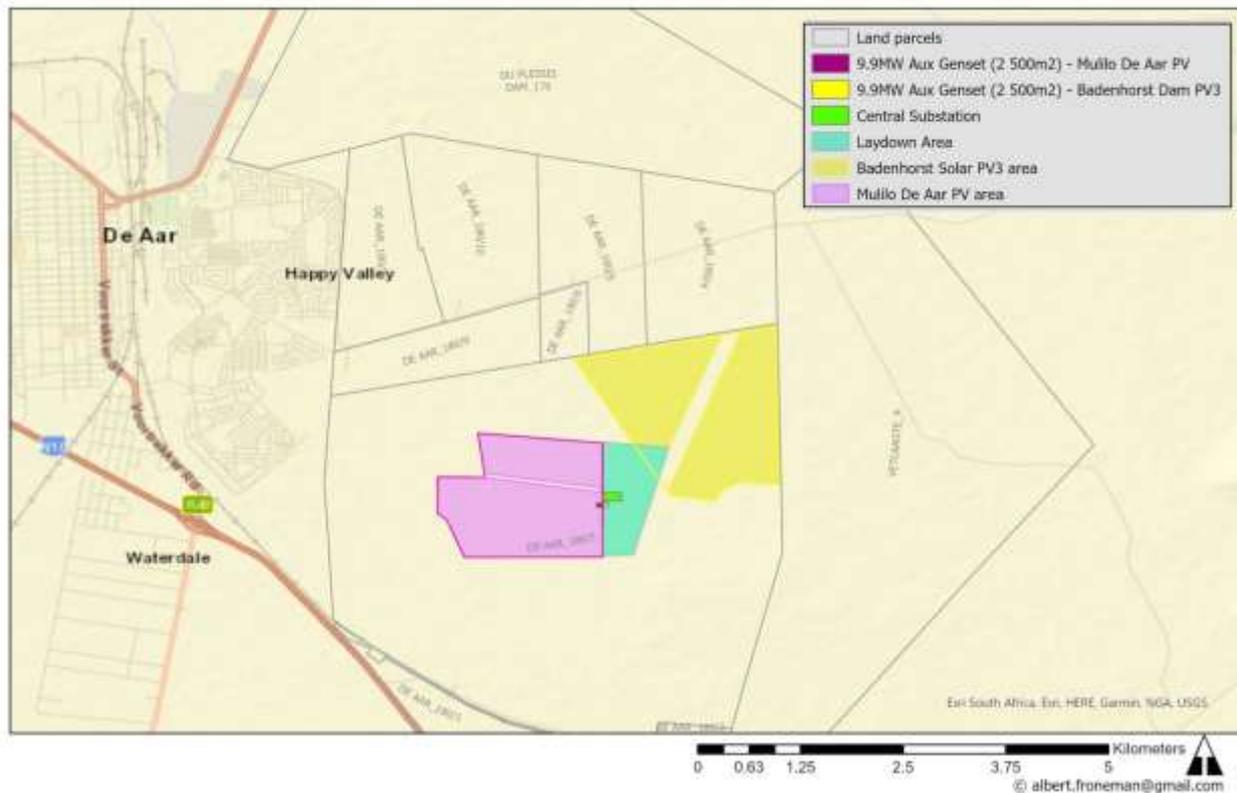
The PV site was recently bid in the Department of Mineral Resources and Energy’s (DMRE) Risk Mitigation Independent Power Producer Procurement (RMIPPP) programme as one of the facilities making up a larger, multi-facility project called “Mulilo Total Hydra Storage”. The applicant and EA holder, proposes to change the details of the EA holder from Badenhorst Dam Solar PV3 (Pty) Ltd, to Mulilo Total Hydra Storage (Pty) Ltd , because it is a requirement of the RMIPP that ultimately all EA’s are in the name of the bidding project company. It is also proposed to amend the project description by adding an **Auxiliary Generator Set (“GenSet”)** with a maximum output of 9.99MW to the approved solar photovoltaic energy plant and this application is therefore for a **Part 2 EA Amendment**. This Motivational Report is in support of the EA Amendment Application Form.

The Department of Environment, Forestry & Fisheries (DEFF) was the Competent Authority (CA) which issued the above-mentioned EA and is therefore also the CA for this application.

The 9.99MW Aux GenSet will be situated within the approved footprint of the solar PV project that was assessed and approved as part of the Environmental Impact Assessment (EIA) process and authorised by the current EA. A similar separate Part 2 application process is being run for the Mulilo De Aar PV project (adjacent to and on the same property as the Badenhorst Dam PV3 project), however two separate EA Amendment Applications are being submitted and this application and motivational report refers only to the **75 MW Badenhorst Dam Solar PV3 Photovoltaic Energy Plant**.

The position of the sites in relation to each other and the town of De Aar can be seen on the map below.

Locality Map:  
Badenhorst Dam Solar PV3 9.9MW Aux Genset and Mullo De Aar Solar PV 9.9MW Aux Genset



## 1.2 Legal requirement

### ***National Environmental Management Act (Act 107 of 1998)***

This application is done in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA) and the Environmental Impact Assessment Regulations published in Government Notice No R982, December 2014, as amended.

Applicable to this EA Amendment application is Section 31 of NEMA, which states that an Environmental Authorisation may be amended if the amendment will result in a change to the scope of a valid environmental authorisation 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.

### ***NEMA Listed Activities***

An EA can only be amended if the proposed development does not trigger any new listed activities, in other words if all applicable NEMA listed activities has been appropriately assessed.

In the case of this project, the following applies:

The EIA commenced under the 2010 Environmental Impact Assessment Regulations but the EA was issued in 2015, in other words after the Regulations were amended in 2014. The following listed activities were authorised:

#### 2010 EIA REGULATIONS

##### Government Notice R544: Listing Notice 1

- Activity Nr 10: Construction of infrastructure for the distribution of electricity with a capacity of 33kV and less than 275kV
- Activity 11: Construction of infrastructure within 32m from a watercourse
- Activity 18: The infilling, depositing or removal of more than 5m<sup>3</sup> from a watercourse

##### Government Notice R545: Listing Notice 2

- Activity 1: The construction of infrastructure for the generation of electricity where the electricity output is 20MW or more
- Activity 15: Physical alternation of vacant land of 20 hectares or more

##### Government Notice R546: Listing Notice 3

- Activity 4: The construction of a road wider than 4m outside urban areas
- Activity 14: Clearance of 5 hectares or more vegetation where 75% or more of vegetation constitutes indigenous vegetation outside urban areas
- Activity 16: Construction of infrastructure of 10m<sup>2</sup> or more within 32m from a watercourse outside urban areas and within CBAs

#### 2014 EIA REGULATIONS

Similar listed activities under the 2014 Regulations (and authorised in the EA) are:

##### Government Notice R983: Listing Notice 1

- Activity 11: Construction of infrastructure for the distribution of electricity with a capacity of 33kV and less than 275kV
- Activity 12: Construction of infrastructure of 100m<sup>2</sup> or more within 32m from a watercourse
- Activity 19: The infilling, depositing or removal or more than 5m<sup>3</sup> from a watercourse
- Activity 27: The clearance of 1 hectare or more of indigenous vegetation
- Activity 28: Industrial developments where the land was used for agricultural purposes

##### Government Notice R984: Listing Notice 2

- Activity 1: The construction of infrastructure for the generation of electricity where the electricity output is 20MW or more
- Activity 15: Clearance of 20 hectares or more of indigenous vegetation

### Government Notice R985: Listing Notice 3

- Activity 4: The construction of a road wider than 4m outside urban areas
- Activity 14: Development of infrastructure of 10m<sup>2</sup> or more within 32m from a watercourse

### 2017 EIA REGULATIONS

The 2014 EIA Regulations were amended in April 2017 and the following activities *could possibly be applicable* to the proposed **9.99MW Aux Genset** development:

### Government Notice R327: Listing Notice 1

- Activity 2:  
The development and related operation of facilities or infrastructure for the generation of electricity from a non-renewable resource where—  
(i) the electricity output is **more** than 10 megawatts but less than 20 megawatts;  
or  
(ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare.  
*(Note: the electricity output will be maximum 9.99MW within an area of no more than 2 500m<sup>2</sup>, in other words less than 10MW in an area smaller than 1 hectare and this activity is therefore **not applicable**)*
- Activity 12: Development of infrastructure within 32m from a watercourse *(Note: the Genset site will not be situated close to any watercourses – this activity is therefore **not applicable**)*
- Activity 27: The clearance of 1 hectare or more of indigenous vegetation *(Note: the site will not exceed 2 500m<sup>2</sup> in size and this activity is therefore **not applicable**)*
- Activity 28: Industrial developments bigger than 1 hectare where the land was used for agricultural purposes *(Note: the site will not exceed 2 500m<sup>2</sup> in size and this activity is therefore **not applicable**)*

### Government Notice R325: Listing Notice 2

- None

### Government Notice R324: Listing Notice 3

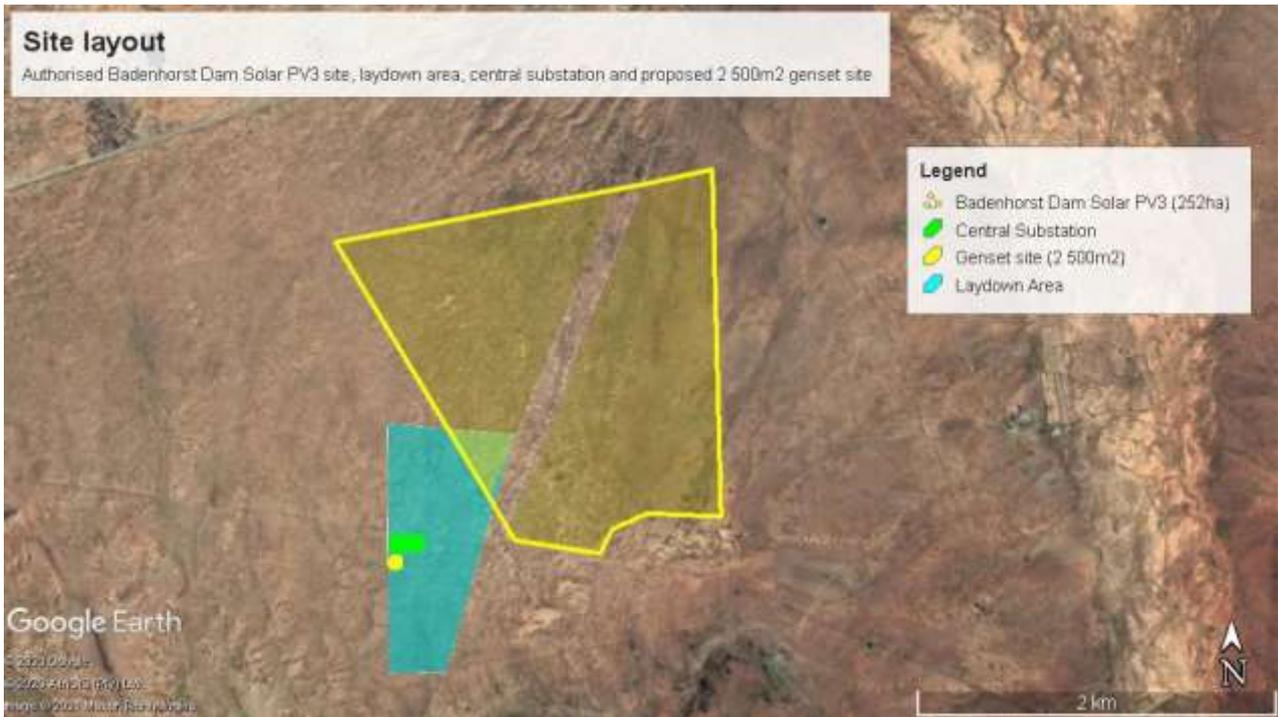
- None  
*The site does not fall within a CBA or endangered/critically endangered ecosystem or any other geographical area as per stipulations in Listing Notice 3. Also refer to the SANBI CBA map below (also attached under Appendix A). The site falls within an Ecological Support Area.*



### 1.3 Proposed 9.99MW Auxiliary GenSet Project Description

#### Site position

The 9.99MW generator set (“GenSet”) facility would be located adjacent to the central substation and within the previously assessed and authorised laydown area. Also refer to Appendix A for maps of the site area.



#### Description

The project will entail the following

<b>GenSet footprint of development site</b>	2 500m <sup>2</sup>
<b>Containers</b>	<p>Each generator is housed in a pre-assembled 20ft ISO container, with dimensions:</p> <ul style="list-style-type: none"> <li>○ Length (6.06m)</li> <li>○ Width (2.44m)</li> <li>○ Height (2.6m)</li> </ul>
<b>Number of containers</b>	<ul style="list-style-type: none"> <li>○ Based on the current design, up to 11x diesel/gas GenSet containers of 20ft each are required along with a 40ft container for supporting services.</li> <li>○ The LV MV switchgear and MV transformer will also be containerised</li> <li>○ There will be a maximum of 16 containers on site</li> </ul>

<b>Stacking of containers</b>	Containers will not be stacked on top of each other
<b>Electrical output per container</b>	The individual generator containers are between 0.8 MW -2.5 MW electrical output each, depending on the specific model and number of containers that will eventually be chosen.
<b>Type of fuel</b>	Fuel will most likely be diesel but Liquefied Natural Gas (LNG) or Liquefied Petroleum Gas (LPG) would be preferable if a supply source can be secured, and are therefore also considered as options.
<b>Fuel storage</b>	Fuel storage tanks of less than 80m <sup>3</sup> will be constructed within the authorised laydown area.

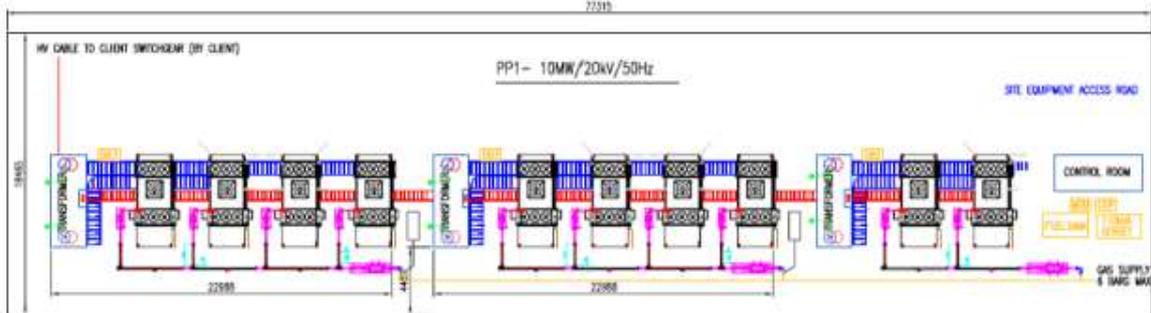
### ***Facility layout and visual presentations***

The layout plans below are indicative designs and cannot be used as a final layout. The final layout will depend on the specific generator model that will be chosen and will be determined at a later stage (in other words after the EA has been amended).

#### **Visual presentation of a typical container type unit in a yard configuration**

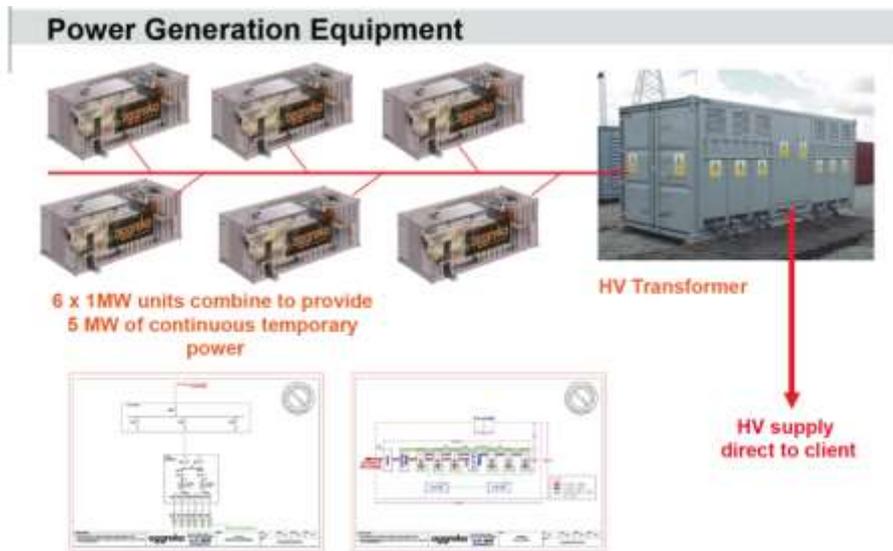


# 1 Examples of a 10MW GenSet layout



Example of 10 MW plant layout

## Containers of a 5MW generator facility



## 10MW GenSet facility in Mosselbay

### South Africa – Wheeling power

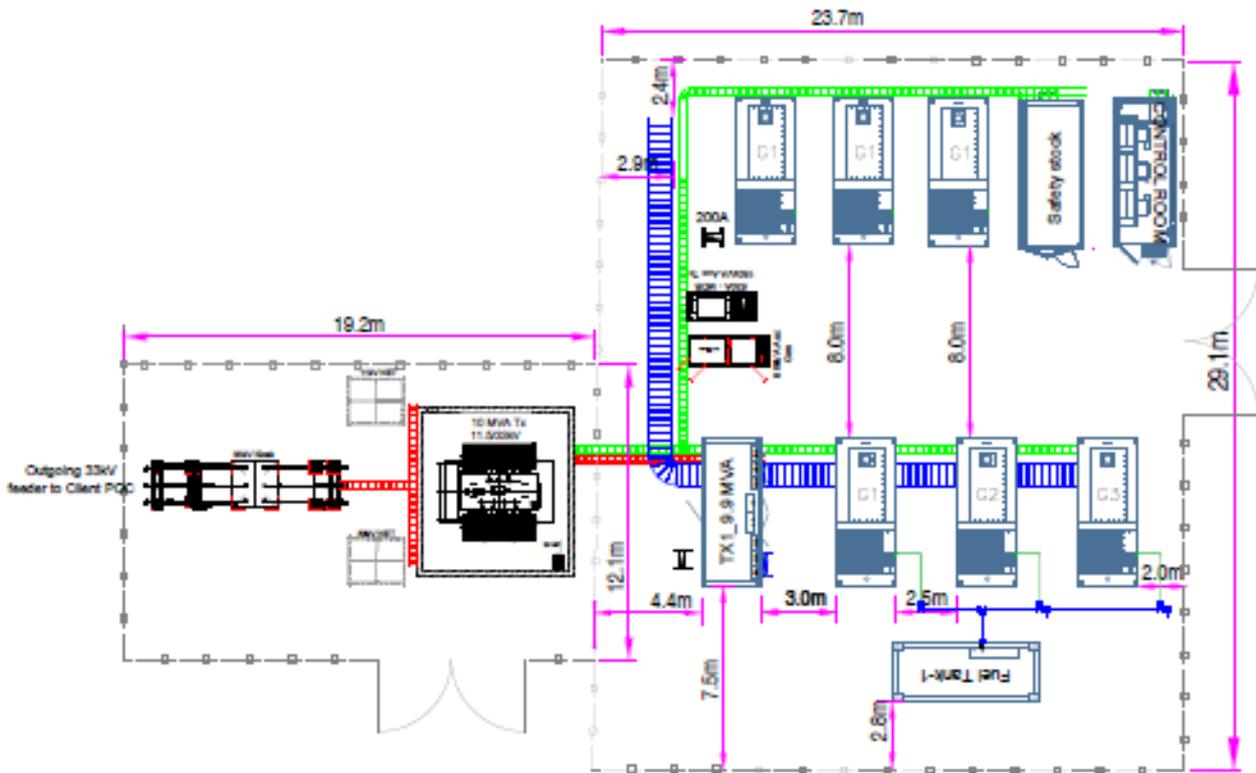
**Situation** – Due to a power crisis in South Africa in 2008, guaranteed power was required for a mine already connected to the grid with no availability.



**Solution** – Aggreko supplied a 10 MW plant at Mossel Bay in a wheeling power agreement. i.e. Aggreko guaranteed the power to the grid who in turn guaranteed it to the mine.

### Typical site layout plan with technical details

<sup>1</sup> The output of the proposed GenSets will be a maximum of 9.99MW



### Technology

A technical data sheet for the ETCG1375 GenSet is attached under Appendix B.

### 1.4 Site Selection Process

Selecting the best site for a development forms an integral part of all EIA processes. In the case of this project, the following is applicable:

#### Authorised areas

The GenSet facility will be situated within the laydown area which was assessed and authorised as part of the Badenhorst Dam Solar PV3 EIA application. An extensive site selection process for the authorised Badenhorst Dam Solar PV3 project was conducted during the EIA process and the best alternative site was authorised. It is logical to place the GenSet facility within the already assessed and approved footprint of the PV project.

The GenSet facility has to be in close proximity to the central substation because of the following:

- The diesel GenSets must connect to the main medium voltage busbar (33KV) in order to inject power into the battery systems for charging.
- The close proximity to the main IPP Substation minimises long MV cable runs which reduces losses and fuel usage.

- The Diesel Generator will require regular maintenance and testing to ensure its availability when needed, this is easier to perform and manage due to the close proximity to the substation control buildings.
- The co-ordination of protection and SCADA systems are easier to design and implemented due to the co-use of the substation control infrastructure.
- The location is central in the solar clusters and away from any built up or sensitive environment to ensure noise is minimised.
- The location is sited within the laydown area's which were assessed as part of the original EIA and therefor does not remove any of the footprint for the solar field.

### **GenSet Site Selection**

The laydown area is an obvious area to use for the GenSet site because:

- it is already authorised and therefore the site already underwent a thorough site selection process;
- it is already authorised and therefore the site already underwent thorough specialist assessment;
- it will not impact on the generation capacity of the PV plant; and
- it is situated in close proximity to the already authorised substation site; thereby addressing the technical requirement in the most effective manner.

The additional specialist studies (air- and noise quality) conducted for this EA amendment application further guided the site selection process. The specialists confirmed that the proposed GenSet site will not cause significant additional impact when situated within the laydown area as proposed. Where required, additional mitigation measures were provided by the noise and air quality specialist and included in the EMPr (no other specialists' mitigation measures were added to the EMPr).

A Part 2 application for the amendment of the EA to include a Battery Energy Storage System (BESS) to the project description for the Badenhorst Dam Solar PV3 project was submitted to DEFF in October 2020. Specialist studies conducted for this BESS EA amendment application concluded that the laydown area is suitable for the BESS development of approximately 20 hectares in size. The BESS development has a much larger footprint than the GenSet development (approximately 20 hectares vs 0.25 hectares) and findings of the 2020 specialist studies are therefore also applicable to this 9.99MW GenSet development, as they assessed the same laydown area with similar containerised type electrical power generation equipment. Concise summaries of their findings are included in Chapter 4 of this report.

### **Conclusion of Site Selection Process**

There are no site specific attributes that should specifically be avoided and no additional mitigation measures are proposed that could influence the position of the proposed site.

## CHAPTER 2: NEED AND DESIRABILITY

### 2.1 Need and Desirability

#### 2.1.1 Need

The need for a backup thermal generation plant is due to the strict qualification and energy availability rules set by the DMRE and Eskom in the Risk Mitigation Independent Power Procurement Program (RMIPPP). As a backup energy supply, the generator would only be called upon to operate during rare periods of extended low irradiance or during annual maintenance and reliability tests prescribed by Eskom. Solar PV would continue to be the dominant source of energy exported from the project.

The need for the project can further be explained by means of the South African **Integrated Resource Plan (IRP)**. The IRP is an electricity roadmap that aims to accurately forecast the country's electricity demand and how this demand will be met in a cost-effective, environmentally sustainable manner whilst facilitating poverty alleviation.

The IRP was gazetted by the Minister of Mineral Resources and Energy, Mr Gwede Mantashe, on 18 October 2019, updating the energy forecast for South Africa from the current period to the year 2030.

In summary, it is an electricity capacity plan which aims to provide an indication of the country's electricity demand, how this demand will be supplied and what it will cost. The IRP 2019 further states the following on renewables and energy storage:

- “South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. The extent of decommissioning of the existing coal fleet due to end of design life, could provide space for a completely different energy mix relative to the current mix. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. “
- “Renewable Energy: Solar PV, and wind present an opportunity to diversify the electricity mix, to produce distributed generation and to provide off-grid electricity. Renewable technologies also present huge potential for the creation of new industries, job creation and localisation across the value chain. “

The PV site was recently bid in the DMRE's Risk Mitigation Independent Power Producer Procurement (RMIPPP) programme as one of the facilities making up a larger, multi-facility project

called “Mulilo Total Hydra Storage”. The applicant requires approval of the amendment to add the GenSets, to meet the requirements of the RMIPPP bid that was submitted, to provide emergency energy greatly needed by Eskom.

### 2.1.2 Desirability

The following tables address further issues as highlighted in the DEFF Need & Desirability Guidelines (2014).

<p>Is this project part of a <b>national programme</b> to address an issue of national concern or importance?</p> <p><i>The development was initially planned to be tendered into the REIPPP but has now been bid in the Risk Mitigation Independent Power Producer Program RMIPPP which has been declared a Strategic Infrastructure Project (SIP).</i></p>
<p>Do location factors favour this land use (associated with the development proposal) at this place? (This relates to the contextualisation of the proposed land use on the proposed site within its broader context.)</p> <p><i>The proposed 9.99MW GenSet development is perfectly situated because</i></p> <ul style="list-style-type: none"> <li>• <i>It is within the authorised laydown area to be cleared for the approved PV project</i></li> <li>• <i>It is directly adjacent to the central substation and</i></li> <li>• <i>The site was thoroughly assessed by applicable specialists during the EIA process for the solar PV farm</i></li> </ul>
<p>Will the development proposal or the land use associated with the development proposal applied for, impact on sensitive natural and cultural areas (built and rural/natural environment)?</p> <p><i>The specialists (air- and noise quality) confirmed that the proposed GenSet site will not cause significant additional impact when situated within the laydown area as proposed. Where required, additional mitigation measures were provided by them.</i></p> <p><i>Specialist studies conducted during the 2014/2015 EIA process assessed the site and concluded that the laydown area is suitable for development and no new mitigation measures are proposed.</i></p> <p><i>It was concluded that all impacts can be mitigated to acceptable levels and that the project could go ahead on condition that the Environmental Management Programme (EMPr) (attached as Appendix E) should be implemented at all times.</i></p>

<p>Will the development impact on people’s health and well-being (e.g., in terms of noise, odours, visual character and ‘sense of place’, etc.)?</p>
<p><i>Dust and noise will be created during the construction phase but mitigation measures are in place to minimise these temporary impacts. The development is situated on rural farm land which lowers the significance of impact associated with noise and dust.</i></p> <p><i>The proposed GenSet facility will alter the visual character and sense of place in a negative way, but when seen in context with the, directly adjacent, authorised 75MW PV plant the additional visual impact of the GenSet facility will be negligible in terms of visual impact.</i></p>
<p>Is the development the best practicable environmental option for this land/site?</p>
<p><i>The, ‘environment’ should be seen as the sum total of one’s surroundings, which include the natural, social and economic environments. Taking all constraints into account, the development as proposed underlines the principles as advocated by the term ‘triple bottom line’ (people, planet, profit) and this development proposal is in support of the goals of economic, social and ecological integration and sustainability.</i></p>
<p>What will the benefits be to society in general and to the local communities?</p>
<p><i>The GenSet project will contribute to, amongst others, energy security and blackout relief, benefiting the entire South Africa. Temporary and permanent employment opportunities will be created and the work force will as far as possible be sourced from the local communities.</i></p>
<p>Will the benefits of the proposed land use/development outweigh the negative impacts of it?</p>
<p><i>Negative impacts associated with the proposed development could be mitigated to levels that will be acceptable within the receiving environment. The positive impact of energy security, blackout relief, increase capacity, reduction in the need to use diesel and other fossil fuels for peaking and baseload power far outweighs the negative impact that this project could have.</i></p>
<p>Describe how the <b>general objectives of Integrated Environmental Management</b> as set out in Section 23 of the NEMA have been taken into account:</p>
<p><i>Current procedures and/or organisational structures are not necessarily achieving integrated decision-making and/or co-operative governance and, as a result, there is a failure to properly achieve the objectives of IEM as set out in Section 23 of NEMA. EIA’s however often focus on the immediate harm a project will cause rather than any benefits it might create in the long term to sustainable development.</i></p> <p><i>The stated objectives of Section 23 are to ensure integrated decision-making and co-operative governance so that NEMA’s principles and the general objectives for integrated environmental</i></p>

management of activities can be achieved. The goals are to

- a) promote the integration of the principles of environmental management set out in section 2 into the making of all decisions which may have a significant effect on the environment;
- b) identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage, the risks and consequences and alternatives and options for mitigation of activities, with a view to minimising negative impacts, maximising benefits, and promoting compliance with the principles of environmental management set out in section 2;
- c) ensure that the effects of activities on the environment receive adequate consideration before actions are taken in connection with them;
- d) ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment;
- e) ensure the consideration of environmental attributes in management and decision-making which may have a significant effect on the environment; and
- f) identify and employ the modes of environmental management best suited to ensuring that a particular activity is pursued in accordance with the principles of environmental management set out in section 2.

For this project the following actions were taken to reach the general objectives of Integrated Environmental Management as set out in Section 23 of NEMA:

- a) Applicable environmental, economic and social aspects have been assessed, thereby ensuring an integrated approach in order to balance the needs of all whom would be affected by this development.
- b) Mitigation measures have been supplied in the EMPr in order to ensure that all identified impacts are mitigated to acceptable levels.
- c) The EA amendment proposal has to be evaluated and approved by DEFF and no construction may commence prior to the issuing of the Environmental Authorisation.
- d) The procedures which are followed during the public participation programme are based on the NEMA EIA Regulations 2014, as amended.
- e) DEFF will take all information as represented in this report into consideration and may request further information should they feel that further studies/information is required before an informed decision can be made.
- f) The project team (inclusive of the specialists) is confident that the mitigation measures as supplied in the EMPr are reasonable and will be the best way to manage anticipated impacts.

Describe how the principles of environmental management as set out in Section 2 of the NEMA have been taken into account

Chapter 2 of NEMA provides a number of principles that decision-makers have to consider when making decisions that may affect the environment, therefore, when a Competent Authority considers granting or refusing environmental authorisation based on an Environmental Impact Assessment, these principles must be taken into account.

*The NEMA principles with which this application conforms are described as follows —*

- 1. Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.*
- 2. Development must be socially, environmentally and economically sustainable.*
- 3. Sustainable development requires the consideration of all relevant factors.*

*The social, economic and environmental impacts of activities, including disadvantages and benefits, were considered, assessed and evaluated, and informed decision-making by the authority is hereby made possible.*

## CHAPTER 3: ADVANTAGES AND DISADVANTAGES

### 3.1 Advantages associated with the 9.99MW GenSet Facility

A backup thermal generation plant is required because of the strict qualification and energy availability rules set by the DMRE and Eskom in the Risk Mitigation Independent Power Procurement Program (RMIPPP). It is imperative that a constant energy supply be generated by this project and, as a backup energy supply, **the generator would only be called upon to operate during rare periods of extended low irradiance or during annual maintenance and reliability tests prescribed by Eskom.**

The generator will therefore ensure that the Badenhorst Dam Solar PV3 project can comply with the rules as set out in the RMIPPP and will therefore make this project able to participate in this programme. As a result, the project will support the country by reducing tariff increases and in pursuing a cleaner energy mix.

### 3.2 Disadvantages / risks associated with the 9.99MW GenSet Facility

#### ***Specialist studies***

From an environmental perspective, the proposed amendment to include the 9.99MW GenSet facility in the project description of the already authorised PV plant will have very few disadvantages/risks. The additional specialists' studies (air and noise quality) that were commissioned have shown that the GenSet facility will not result in any new impacts that cannot be mitigated to acceptable levels.

A Part 2 application for the amendment of the EA to include a Battery Energy Storage System (BESS) to the project description was submitted in October 2020. Input, and mitigation measures, obtained for the BESS development from the following specialists were included in the updated EMPr for the BESS Part 2 EA amendment application:

- Ornithologist
- Aquatic specialist
- Ecologist
- Heritage consultant
- Stormwater engineer

The BESS development has a much larger footprint with more significant impact than the 9.99.MW GenSet development (approximately 20 hectares vs 0.25 hectares). It can therefore be concluded that there would be no additional impact due to the GenSet development that has not been addressed and assessed in the above-mentioned studies.

### **<80m<sup>3</sup> Fuel Storage Tanks**

The addition of <80m<sup>3</sup> fuel storage tanks will pose minimal risk because the design and placement of the above ground storage tanks will be in accordance with industry standards. Guidelines and mitigation measures are however supplied in Chapter 6 of this report as well as in the updated EMPr.

## CHAPTER 4: SPECIALIST INPUT

### 4.1 Specialist studies: Air and Noise

9.99MW generators could cause air and noise pollution and air and noise specialists were therefore appointed to undertake an impact assessment in their respective fields of expertise. The following Terms of Reference was applicable:

- Compile a statement / impact assessment confirming what air impact the 9.99MW generator would have (if any) and if so, provide impact rating tables (if required) and mitigation measures for inclusion in the EMPr.
- Determine the cumulative impact and provide mitigation measures (if required)

#### 4.1.1 Noise Impact Assessment

An Environmental Noise Impact Assessment was undertaken by dbAcoustics (Mr Barend van der Merwe) and is attached as Appendix C1. A summary thereof follows below.

#### MAIN NOISE SOURCES

The main noise sources within and beyond the boundaries of the backup thermal generator/s are:

- Seasonal agricultural activities;
- Traffic noise which can be continuous and/or intermittent at times;
- Railway noise - intermittent;
- Aircraft type noise - intermittent;
- Animal and bird noises; and
- Wind noise.

The topography, ground conditions, prevailing noise sources and prevailing wind direction will be key aspects on the propagation of sound towards the noise receptors in the vicinity of the proposed back up thermal generation plant.



Receptor	Latitude	Longitude	Distance from the GenSet facility in meters	Land use type
A	30°39.280'S	24°1.908'E	4 347	Residential
B	30°38.796'S	24°2.484'E	4 317	Rural
C	30°39.214'S	24°3.682'E	2 894	Rural
D	30°40.345'S	24°6.152'E	3 490	Rural
E	30°42.474'S	24°4.630'E	3 319	Rural
F	30°41.928'S	24°2.927'E	2 763	Rural
G	30°41.436'S	24°1.100'E	4 611	Residential
H	30°39.429'S	24°0.153'E	5 970	Central Business District
I	30°40.164'S	24°1.683'E	3 517	Residential

## BACKGROUND TO NOISE

### **Effects produced by sound**

There are certain effects produced by sound which, if it is not controlled by approved acoustic mitigatory measures, seem to be construed as undesirable by most people and they are:

- Long exposure to high levels of sound, which may damage the hearing or create a temporary threshold shift – in industry or at areas where music is played louder than 95dBA. This will seldom happen in far-field conditions;
- Interference with speech where important information by the receiver cannot be analysed due to loud noises;

- Excessive loudness;
- Annoyance.

The effect of noise (except for long duration, high level noise) on humans is limited to disturbance and/or annoyance and the accompanying emotional reaction. This reaction is very difficult to predict and is influenced by the emotional state of the complainant, his attitude towards the noisemaker, the time of day or night and the day of the week.

### **Types of noise exposure**

Types of noise exposure can be described as follows:

- Continuous exposure to noise – The level is constant and does not vary with time e.g., traffic on freeway and an extractor fan;
- Intermittent exposure to noise – The noise level is not constant and occurs at times e.g., car alarms and sirens;
- Exposure to impact noise – A sharp burst of sound at intermittent intervals e.g., explosions and low frequency sound.

### **Recommended noise levels for different types of districts**

Type of district	Equivalent continuous rating level $L_{Req,T}$ for ambient noise					
	Outdoors			Indoors, with open windows		
	Day-night	Daytime	Night-time	Day-night	Daytime	Night-time
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
d) Urban districts with some workshops, with business premises and with main roads	60	60	50	50	50	40
e) Central business district	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50

The study area falls within an (a) to (b) type districts because of the type of activities such as main roads, gravel roads, little traffic and major traffic which all have an influence on the prevailing ambient noise level for a specific area.

There is therefore a mixture of activities and higher noise levels as per the above recommended continuous rating levels within i.e., residential, agricultural activities (seasonal) and feeder roads in proximity of each other or to a farmhouse. A farmhouse next to the R63 road will experience higher noise levels than the farmhouse/s some distance from roads. The ambient noise level will therefore differ throughout the study area, depending on the location and the measuring position in relation to areas with existing noise sources such as roads.



## Noise intrusion levels at the different noise receptors - projected

NSA	Projected noise level at noise receptor - dBA	Recommended ambient noise level – daytime according to Table 2 of SANS 10103 of 2008	Recommended ambient noise level – night time according to Table 2 of SANS 10103 of 2008	Noise intrusion levels – daytime	Noise intrusion levels –night-time
A	18.0	55.0	45.0	No intrusion	No intrusion
B	14.0	45.0	35.0	No intrusion	No intrusion
C	22.0	45.0	35.0	No intrusion	No intrusion
D	15.0	45.0	35.0	No intrusion	No intrusion
E	15.0	45.0	35.0	No intrusion	No intrusion
F	17.0	45.0	35.0	No intrusion	No intrusion
G	0	55.0	45.0	No intrusion	No intrusion
H	0	65.0	55.0	No intrusion	No intrusion
I	18.0	55.0	45.0	No intrusion	No intrusion

## IMPACT ASSESSMENT AND MITIGATION

The impact assessment and mitigation are discussed in Chapter 6 of this report.

## CONCLUSION ON NOISE

The noise level from the proposed backup thermal generators will be 106.4dBA at a height of 119m. The threshold value of 7.0dBA will not be exceeded during the day and/or night- time periods.

There will be a shift in the prevailing ambient noise level in the immediate vicinity of the backup thermal generators but **at a distance exceeding 500m from the backup thermal generator/s the intrusion level will be minimal and in line with the Northern Cape Noise Control Regulations.** The wind noise (when blowing) will create the predominant ambient noise level in the vicinity of the noise receptors which will mask the noise from the backup thermal generators. People who may work or visit the backup thermal generator/s will experience an increase in the prevailing ambient noise level in the vicinity of the backup thermal generators. **The noise increase at the residential properties will be insignificant.**

The large variations in the meteorological conditions and the geographical relations between the backup thermal generator/s positions and the noise sensitive receptors allow for the decrease in the noise as it propagates from the backup thermal generators.

***The potential noise impact from the backup thermal power plants will be low and authorisation for the development of the Badenhorst PV backup thermal plant may be granted from an environmental noise point of view.***

#### **4.1.2 Air Quality Technical Comment**

A **Technical Comment on the Air Quality** was undertaken by uMoya-NILU Consulting (Pty) Ltd (Dr Mark Zunckel) and is attached as Appendix C2. A summary thereof follows below.

#### **REGULATORY CONSIDERATIONS**

Stationery reciprocating engines using gas or liquid fuels for electricity generation are classed as a Listed Activity in terms of the NEM: AQA if the design capacity is greater than or equal to 10MW heat input per unit<sup>1</sup>. The proposed installation is less than this threshold and is therefore *not* a Listed activity and *does not* require an Atmospheric Emission License (AEL) as part of the Environmental Authorisation (EA).

The storage and handling of petroleum products in permanent storage tanks at a facility is classed as a Listed Activity in terms of the NEM: AQA where the cumulative storage capacity is more than 1 000m<sup>3</sup>. The planned storage of diesel at the Badenhorst Solar PV3 Site is less than 80m<sup>3</sup>. The planned storage capacity is less than the Listed Activity threshold and therefore *does not* require an Atmospheric Emission License (AEL) as part of the Environmental Authorisation (EA).

#### **PREVAILING METEOROLOGY**

Solar radiation and wind are the two meteorological parameters that play a key role in the dispersion potential of an area, i.e. how well pollutants disperse in the atmosphere. The clear skies and solar radiation experienced at De Aar result in intense heating of the earth's surface and strong thermal convection and good vertical dispersion.

There is a relatively high frequency of moderate winds which implies that the horizontal dispersion potential is good. Collectively, the dispersion potential of the area is good.

#### **GENERATOR EMISSIONS**

It is proposed to use diesel for the generator, but LPG or LNG is preferred depending on availability. The combustion of these fuels in reciprocating engines results in emissions of air

pollutants, including sulphur dioxide (SO<sub>2</sub>), oxides of nitrogen (NO<sub>x</sub>) and particulate matter. SO<sub>2</sub> is produced from the combustion of sulphur that is bound in fuel. NO<sub>x</sub> is produced from thermal fixation of atmospheric nitrogen in the combustion flame and from oxidation of nitrogen bound in the fuel. The quantity of NO<sub>x</sub> produced is directly proportional to the temperature of combustion and indirectly proportional to the engine speed. PM arises from incomplete combustion of the fuel. The emission is therefore a function of the fuel.

Diesel is a liquid fuel that is refined from crude oil. It consists primarily of hydrocarbons with smaller amounts of hydrogen, nitrogen, sulphur, and volatile organic compounds. It is refined to have a sulphur content of 500 ppm or less. The combustion of diesel results in emissions of NO<sub>x</sub> and particulates and some SO<sub>2</sub>.

LPG gas comes from oil and gas wells or it may be manufactured in natural gas processing and from crude oil. It comprises a mixture of flammable hydrocarbon gases that include propane, butane, isobutane, and mixtures of the three gases. Natural gas used for energy generation is primarily methane, with low concentrations of other hydrocarbons, water, carbon dioxide, nitrogen, oxygen and some sulphur compounds. Liquefied Natural Gas (LNG) is natural gas which has been cooled below its boiling point of minus 161 °C in a process known as liquefaction. The process of liquefaction involves extracting most of the impurities in raw natural gas. The remaining natural gas is primarily methane with only small amounts of other hydrocarbons and consequently is widely considered a clean fossil fuel.

*LPG and LNG are clean fuels. The SO<sub>2</sub> and particulate emissions are negligible and NO<sub>x</sub> emissions are relatively small.*

As a backup energy supply, the generators will operate during periods of extended low irradiance or during annual maintenance and reliability tests prescribed by Eskom. Hourly emissions rates of SO<sub>2</sub>, NO<sub>x</sub> and particulates from the generators may be estimated by assuming the output of the generator and using emission factors for diesel.

With uncertainty on the generators the total generation capacity of 9.99MW is assumed when estimating the emissions. A diesel consumption rate of 100 litres per hour under full load is assumed and emission factors provided by the US-EPA2 for 500 ppm diesel are applied to estimate the emission rates for the 9.99MW generator set.

***Estimated Uncontrolled and Controlled emission rates for 9.99 MW diesel generators (kg/hr)***

	SO <sub>2</sub>	NO <sub>x</sub>		PM
		Unmitigated	Mitigated	
<b>Generator set (9.9 MW)</b>	0.24	14.9	8.9	0.47

## IMPACT ASSESSMENT AND MITIGATION

The impact assessment and mitigation are discussed in Chapter 6 of this report.

## CONCLUSION

The 9.99MW generator is not Listed Activities in terms of the NEM: AQA and do not require an AEL as part of the environmental authorisation.

**Air quality impacts associated with emissions of SO<sub>2</sub>, NO<sub>x</sub> and particulate matter from the two PV sites will be limited to the sites, will have a very low magnitude and a very low probability of occurrence considering their use for back-up power only. They are therefore insignificant, and the cumulative effects are deemed to be insignificant.**

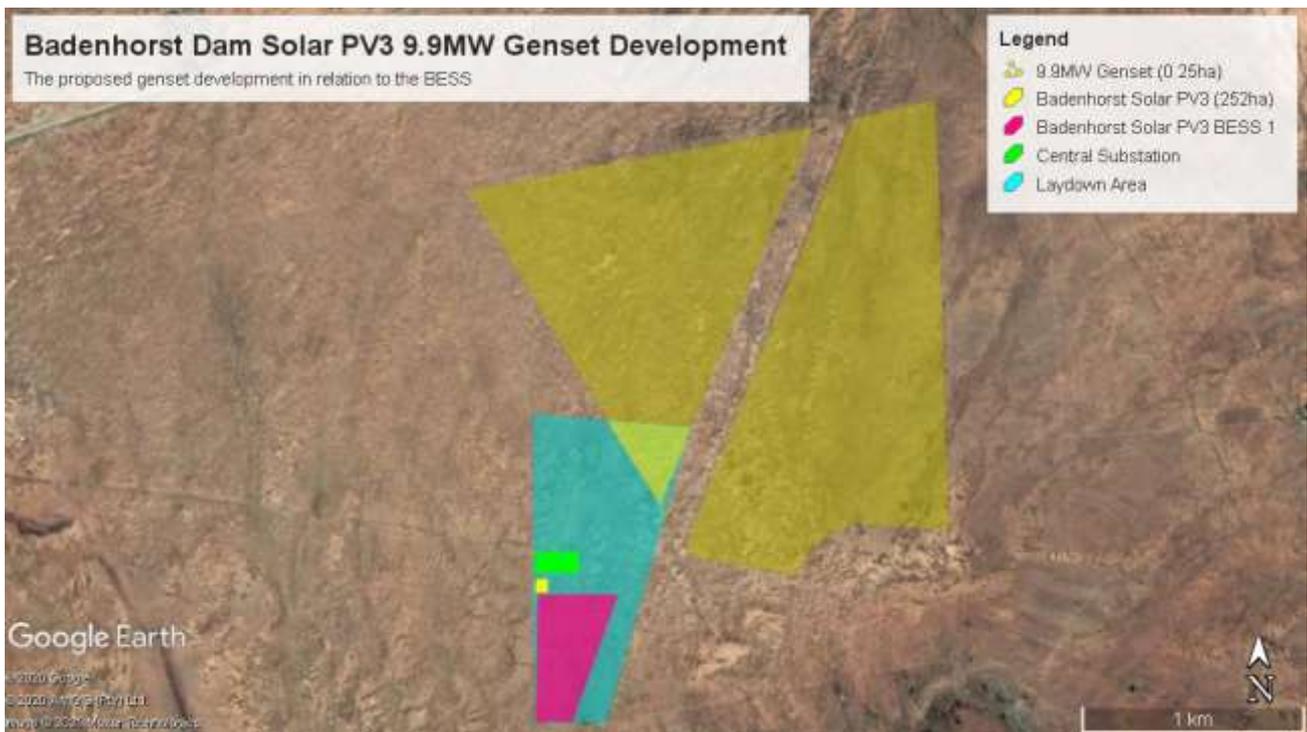
### 4.2 Specialist studies previously conducted

A Part 2 application for the amendment of the EA to include a Battery Energy Storage System (BESS) to the project description was submitted in October 2020. Since the proposed BESS site falls within the authorised laydown area, the specialists were requested to compile amendment letters in order to determine if the status quo changed since their studies were conducted during the 2013/2014 EIA process for the solar PV plant. They were also instructed to determine impacts that the BESS could have on the environment and to provide mitigation measures to minimise those impacts.

The BESS would be housed in shipping containers on a site of approximately 20 hectares. The impact this development may have on the environment would therefore be greater than the proposed 9.99MW GenSet development in an area of 0.25 hectares (2 500m<sup>2</sup>) only.

Please refer to the map on the following page for a map indicating the BESS and GenSet sites in relation to each other.

The information provided in these studies is deemed sufficient to determine the impact that the 9.99MW GenSet could have on the different environmental components.



#### 4.1.1 Avifauna

An amendment letter for the BESS EA amendment application was compiled by Mr Andrew Jenkins from Avisense Consulting and is attached as Appendix C3. A concise summary of the findings follows below.

The inclusion of the BESS equipment on an area of approximately 20 hectares will increase the destructive footprint by about 8% and may add marginally to the disturbance impacts associated with both construction and operation of the plant. However, noting that the final approved development area covered by the existing authorisation is about 35% smaller than the area assessed in the corresponding bird impact study, any changes in the impact profiles of the development are effectively rendered negligible.

In conclusion, there is no need to amend the currently applicable bird impact ratings and there are no additional mitigation requirements to add to the existing EMPr due to the proposed BESS development.

*Note from EAP: The BESS development has a much larger footprint with more significant impact than the 9.99MW GenSet development (approximately 20 hectares vs 0.25 hectares). It can therefore be concluded that there would be no additional impact due to the GenSet development that hasn't been addressed in the previous avifauna studies, as both the GenSet and the BESS are located adjacent within the assessed laydown area. Applicable mitigation measures were included in the Updated EMPr as submitted with the EA amendment application in October 2020 - no new mitigation measures for this GenSet development are being proposed.*

### 4.1.2 Aquatic

An amendment letter for the BESS EA amendment application was compiled by Ms Toni Belcher from BlueScience (Pty) Ltd and is attached as Appendix C4. A concise summary of the findings follows below.

The wider area in which the site is located is considered of 'Very High Aquatic Biodiversity Combined Sensitivity'. This is due to the fact that the area is considered a Strategic Water Source Area for groundwater (De Aar Region). There is however no Freshwater Ecosystem Priority Area Rivers or Wetlands or Critical Biodiversity Areas mapped at the site.

There are also no aquatic features occurring within or adjacent to the site. The closest ephemeral drainage channel is more than 200m to the south of the laydown area and unlikely to be impacted by the proposed activity as runoff at the site is slight and in a northward direction, away from the aquatic features.

The proposed development will be situated within the previously authorised laydown areas which have patches that are devoid of vegetation. Some of these areas have pan-like features but they are too small to be of significance from an aquatic ecosystem point of view. It is however recommended that the final proposed footprints of the development site be ground-truthed before the final layout is being determined to ensure that there are no aquatic features of significance within the final footprint. *Note from EAPs: this stipulation was included in the updated EMPr compiled for the BESS amendment and was updated to include the GenSet site.*

#### **Conclusion**

Due to the fact that the proposed development is located within the footprint of the original proposed laydown area and was assessed and approved, it is not likely to result in any increase in impact (incremental or cumulative) to the adjacent aquatic ecosystems to that already assessed for the original approved PV Energy Facilities on Badenhorst Dam Farm (deemed to be very low). The closest aquatic feature is a minor ephemeral drainage feature more than 200m to the south of the site. Drainage from the site is northwards and away from this ephemeral watercourse.

From an aquatic ecosystem perspective there is no reason why the proposed BESS should not be approved in terms of NEMA. The activities are not likely to pose a risk to adjacent aquatic ecosystems and therefore should not require a water use authorisation.

*Note from EAP: The BESS development has a much larger footprint with more significant impact than the 9.99MW GenSet development (approximately 20 hectares vs 0.25 hectares). It can therefore be concluded that there would be no additional impact due to the GenSet development that hasn't been addressed in the previous aquatic studies, as both the GenSet and the BESS are located adjacent within the assessed laydown area. Applicable mitigation measures were included in the Updated EMPr as submitted with the EA amendment application in October 2020 2020 - no new mitigation measures for this GenSet development are being proposed.*

### 4.1.3 Ecological Assessment

An Ecological Assessment for the BESS development was undertaken by *Botaneek (Mr Nick Helme)* and is attached as Appendix C5. A concise summary of the findings follows below.

#### ***Sensitivity and overview of the vegetation***

The Northern Upper Karoo vegetation type is classified as a **Least Threatened** habitat on a national basis. This vegetation type is one of the most widespread vegetation types in the country and is relatively homogenous throughout its vast range, with a low number of vegetation type endemics and very few plant Species of Conservation Concern. The vegetation unit is thus not considered to be a national conservation priority.

No plant Species of Conservation Concern (SoCC) nor Protected species were recorded on site, and none are likely to be present.

No Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESAs) or Other Natural Areas (ONAs) are mapped in or close to the study area.

The entire site is deemed to be of **Medium Botanical Sensitivity**. Key informants of this assessment include the Least Threatened nature of the vegetation unit, its widespread extent, the intact nature of the vegetation, and the lack of any plant SoCC.

#### ***Terrestrial fauna***

Based on the habitat on site it can be concluded that the vertebrates present on site are likely to be representative of the region in general. Given the relatively small site and the homogenous nature of the habitat few vertebrates are likely to be resident, but various species may cross the site or use it for foraging. There are no permanent wetlands or rocky outcrops – habitats which would notably increase the vertebrate diversity and sensitivity. Two possible threatened mammals may cross the site on occasion – Cape Fox and Black Footed Cat, but these are very unlikely to be resident, and even less likely to be impacted by the proposed BESS as both are highly mobile and will move off when disturbance commences.

Overall terrestrial faunal sensitivity is likely to be **Medium**.

#### ***Impact***

##### *Construction phase impact*

- Permanent loss of all natural vegetation within the site development footprint
- Temporary disturbance (<5 yrs) of natural vegetation adjacent to the building footprints
- Minor populations of certain animals (termites, ants) may be lost within the development footprint, but no vertebrates are likely to be permanently lost within the development footprint.
- Significance of this loss is Low negative before and after mitigation.

- No plant or terrestrial animal Species of Conservation Concern are likely to be impacted or lost.
- No loss of mapped CBAs will occur.
- The extent of the ecological impact is deemed to be local and regional.

#### *Operational phase*

- Habitat fragmentation
  - Disruption and minor loss of current ecological connectivity across the development footprint areas.
  - A secondary operational phase impact is the spread of alien invasive vegetation, facilitated by the soil disturbance caused by construction.
- Loss of ecological connectivity in the study area and associated habitat fragmentation as a result of the proposed development will occur, but is unlikely to be a major ecological issue in the region, as the development footprint is relatively small and very large areas of similar habitat will remain undisturbed in the region and nearby. This impact is likely to be Low negative before and after mitigation.
  - The soil disturbance caused by construction is likely to facilitate the spread of alien invasive vegetation in and around the development areas, but the significance of this is Low negative before mitigation and Very Low negative after mitigation, as the magnitude of the invasion is likely to be low.
  - On balance the likely operational phase impacts of the proposed development are Low negative before and after mitigation.

#### **Mitigation**

*Note from EAP: The mitigation proposed in this ecological assessment has been included in the EMPr during the 2014 EIA process. Additional mitigation measures are not required.*

#### **Conclusion**

The proposed development would have a Low negative botanical and faunal impact before and after mitigation.

*Note from EAP: The BESS development has a much larger footprint with more significant impact than the 9.99MW GenSet development (approximately 20 hectares vs 0.25 hectares). It can therefore be concluded that there would be no additional impact due to the GenSet development that hasn't been addressed in the previous ecological studies, as both the GenSet and the BESS are located adjacent within the assessed laydown area. Applicable mitigation measures were included in the Updated EMPr as submitted with the EA amendment application in October 2020 - no new mitigation measures for this GenSet development are being proposed.*

#### 4.1.4 Heritage

An Amendment Letter for the BESS EA amendment application was compiled by Mr John Gribble from ACO Associates and is attached as Appendix C6. A concise summary of the findings follows below.

The integrated Heritage Impact Assessment (HIA) considered archaeological heritage resources, the historical built environment, cultural landscapes, scenic routes, sense of place and graves.

No heritage resources identified by the HIA are located within the laydown area proposed for the installation of the BESS.

The installation of the BESS at the location proposed will occasion no changes to the identified impacts of the Badenhorst Dam Solar PV3 facilities on heritage resources, provided the mitigation measures recommended in the HIA are implemented. *Note from EAP: Reference is made to the mitigation measures as supplied in the HIA as submitted during the 2014 EIA process.*

From a heritage resources perspective, the proposed amendments to the environmental authorisation are considered acceptable.

*Note from EAP: The BESS development has a much larger destructive footprint than the 9.99MW GenSet development (approximately 20 hectares vs 0.25 hectares). It can therefore be concluded that there would be no additional impact due to the GenSet development that hasn't been addressed in the previous heritage studies, as both the GenSet and the BESS are located adjacent within the assessed laydown area. Applicable mitigation measures were included in the Updated EMPr as submitted with the EA amendment application in October 2020 - no new mitigation measures for this GenSet development are being proposed.*

#### 4.1.5 Palaeontology

An Amendment Letter for the BESS development was compiled by Mr John Almond from Natura Viva and is attached as Appendix C7. The report concluded as follows:

In view of (1) the generally LOW palaeontological heritage sensitivity of the project area near De Aar, and of (2) the small additional footprint of the proposed BESS, it is concluded that:

- the inclusion of a BESS within each of the authorised laydown areas will not change the nature or significance of any of the impacts assessed in the original PIA studies;
- the proposed BESS installations are unlikely to result in any additional direct, indirect or cumulative impacts that were not previously assessed; and
- there are no additional management outcomes or mitigation measures in terms of palaeontological heritage that would be applicable to the proposed BESS.

There are no objections on palaeontological heritage grounds to the proposed amendment of the EAs for the three listed solar PV energy facilities near De Aar.

*Note from EAP: The BESS development has a much larger footprint with more significant impact than the 9.99MW GenSet development (approximately 20 hectares vs 0.25 hectares). It can therefore be concluded that there would be no additional impact due to the GenSet development that hasn't been addressed in the previous palaeontological studies, as both the GenSet and the BESS are located adjacent within the assessed laydown area. Applicable mitigation measures were included in the Updated EMPr as submitted with the EA amendment application in October 2020 - no new mitigation measures for this GenSet development are being proposed.*

#### **4.1.6 Stormwater Management Plan**

An Amendment Letter for the BESS development was compiled by *Zutari (previously Aurecon) (Mr Martin Kleynhans)* and is attached as Appendix C8. A concise summary of the findings follows below.

The 2014 study indicated that there would be increases in runoff due to the proposed solar development. The increased runoff and erosion potential can however be mitigated by using multiple stormwater outlets, energy dissipaters and attenuation (detention) ponds if necessary.

If the BESS platform area is surfaced with compacted gravel or paved, then the runoff coefficient is expected to increase to a value of the order of 0.75. This suggests an increase in the runoff peaks by a factor of about five over the predevelopment state. Thus, a significant increase in runoff peaks compared to the predevelopment state can be expected.

The increased peak runoff could cause erosion, impact dwellings, sensitive ecological areas, road and railway crossings and other infrastructure downstream. But this impact can be fully mitigated to any desired return interval through the inclusion of the measures detailed in the original hydrology reports including attenuation (detention) ponds, the design of which can be undertaken during the detailed design phase and which can be used to reduce the peak runoffs back to the predevelopment levels at the desired flood return interval before they exit the site.

Therefore, the proposed amendment would have a marginal effect on the impact profile from a stormwater runoff perspective, a review of the assessment is deemed to not be required and the proposed amendment would not materially change the impact rating for the development.

*Note from EAP: The BESS development has a much larger footprint with more significant impact than the 9.99MW GenSet development (approximately 20 hectares vs 0.25 hectares). It can therefore be concluded that there would be no additional impact due to the GenSet development*

*that hasn't been addressed in the previous storm water studies, as both the GenSet and the BESS are located adjacent within the assessed laydown area. Applicable mitigation measures were included in the Updated EMPr as submitted with the EA amendment application in October 2020 – no new mitigation measures for the GenSet development are being proposed.*

### **4.3 Conclusion**

Mitigation measures as proposed by the air- and noise specialist studies conducted for this development have been included in the updated EMPr. The air- and noise specialist studies concluded that all potential air and noise impacts have low significance.

Other specialist studies conducted for the BESS EA amendment application all concluded that the impact that the proposed BESS development (approximately 20 hectares in extent) could have on the environment can be mitigated to acceptable levels. The proposed 9.99MW Auxiliary Generator will be constructed within the same laydown area as investigated by the specialists (both during the original EIA and during the Part 2 amendment to add the BESS) and it can therefore be concluded that all mitigation measures have been included in the EMPr and that no further specialist studies are required for this proposed GenSet development.

## CHAPTER 5: PUBLIC PARTICIPATION

### 5.1 Objectives of the Public Participation Programme

The main aim of public participation is to ensure transparency throughout the environmental process. The objectives of public participation are the following:

- To identify all potentially directly and indirectly affected stakeholders, government departments, municipalities and landowners;
- To communicate the proposed project in an objective manner with the aim to obtain informed input;
- To assist the Interested & Affected Parties (IAPs) with the identification of issues of concern, and providing suggestions for enhanced benefits and alternatives;
- To obtain the local knowledge and experience of IAPs;
- To ensure that all reasonable alternatives are identified for assessment.
- To communicate the proceedings and findings of the specialist studies;
- To ensure that informed comment is possible;
- To ensure that all concerns, comment and objections raised are appropriately and satisfactorily documented and addressed.

### 5.2 Public Participation Process Followed

#### Interested & Affected Parties Register

Significant measures were taken to ensure that all stakeholders that could have been affected or have an interest in this project were identified. The IAP Register (attached as Appendix D5) consists of directly and indirectly affected landowners, stakeholders and government departments.

#### Newspaper advertisement

A combined newspaper advertisement advertising the 2x sites as explained in Chapter 1 will be placed in the local newspaper, The Echo/Midland News, advertising the availability of the Draft Motivational Report with a request for public comment. Proof thereof will be provided in the Final Motivational Report.

#### Onsite notices

One notice will be placed at the entrance to the site next to the N10 highway and another notice will be placed in a place in town that is frequent by the public, i.e. the post office. A combined notice had been prepared for both the Badenhorst Dam PV3 and Mulilo De Aar PV projects, because they are situated in close proximity of each other on the same property. Proof of placement thereof will be provided in the Final Motivational Report.

**Distribution of the Draft Motivational Report**

The Draft Motivational Report (this document) will now be distributed to everybody on the IAP Register. Proof thereof will be submitted in the Final Motivational Report.

The EA Amendment Application Form and Motivational Report will be submitted to DEFF for registration of the project and their comment on the project.

**Final Motivational Report**

Comment received on the Draft Motivational Report will be included in the Final Report and submitted to DEFF for their approval and amendment of the Environmental Authorisation. The IAPs will be informed of their right to appeal DEFF's decision.

## CHAPTER 6: IMPACT ASSESSMENT

### 6.1 Specialist studies: additional mitigation not required

The following specialists (refer to Chapter 4) confirmed that the BESS (*and therefore, in the EAP's opinion by default the 9.99MW GenSet development*) as proposed will not create additional impact, after the application of applicable mitigation measures, that was not assessed during the 2014 EIA process.

Proposed mitigation measures for the BESS development were included in the Updated EMPr and no further stipulations for the GenSet development are necessary for inclusion in the EMPr. For ease of reference, the following conclusions apply:

#### **Avifauna**

There is no need to amend the currently applicable bird impact ratings and there are no additional mitigation requirements to add to the existing EMPr.

#### **Aquatic**

The proposed development is not likely to result in any increase in impact (incremental or cumulative) to the adjacent aquatic ecosystems to that already assessed for the original approved solar PV facilities (deemed to be very low).

#### **Ecological Assessment**

The proposed development would have a Low negative botanical and faunal impact before and after mitigation.

#### **Heritage**

The development at the location proposed will occasion no changes to the identified impacts of the Badenhorst Dam Solar PV3 facilities on heritage resources, provided the mitigation measures recommended in the HIA conducted during the EIA process are implemented.

#### **Palaeontology**

There are no specific requirements in terms of palaeontological heritage.

#### **Storm Water**

Therefore, the proposed amendment would have a marginal effect on the impact profile from a stormwater runoff perspective, a review of the assessment is deemed to not be required and the proposed amendment would not materially change the impact rating for the development.

## 6.2 Specialist studies: new mitigation for inclusion in the EMPr

The Noise Impact Assessment and Air Quality study provided impact assessment tables from new studies which had not previously been undertaken. The proposed mitigation measures as detailed below are included in the updated EMPr.

### 6.2.1 Noise Impact Assessment

#### IDENTIFICATION OF IMPACTS

Two aspects are important when considering potential noise impacts of a project namely:

- The increase in the noise level because of the construction and operational phases, and;
- The overall noise level produced by the generators.

The prevailing ambient noise level may change according to the season of the year when farming activities or wind becomes the pre-dominant contributor to the higher ambient noise levels.

#### **Construction Phase**

- Grading and building of new roads and trenches  
Noise may be generated by the construction activities and the use of construction equipment such as Graders, TLB's and Front-end loaders. The use of this equipment will create an increase in noise levels in the immediate vicinity of the construction activities and in some cases at some distance from the activities.
- Preparation of the footprint, digging of trenches, earthworks, and construction of the base of the backup thermal generator/s.  
Noise could be generated by the following activities: earth drilling, generator noise, civil construction and in extreme cases localised blasting.
- Construction of the backup thermal generation plant  
The construction of the backup thermal generation plant could generate localised noise increase the use of cranes and generators during the assembly stage of the infra structure.
- Construction traffic  
Construction traffic to and from the site would create a temporary linear noise source.

#### **Operational Phase**

- Noise generated by the backup thermal generators.  
The exhaust and noise breaks may cause an increased noise level in the vicinity of the generators.

- Backup thermal generators - normal wear and tear, and the lack of preventative maintenance. Noise could be generated through the lack of a cyclic maintenance programme to identify normal wear and tear.
- Traffic  
Traffic noise is created by vehicle movement where mechanical noise, rattles, and road surface play an important role on the noise levels along roads or some distance from roads.
- Sub-station and overhead power lines  
A sub-station can generate noise from the blowers and transformers, and corona noise from the overhead power lines. These noise levels are site specific.
- Maintenance activities  
The regular maintenance activities may give rise to site-specific increase in the noise levels.

## IMPACT ASSESSMENT TABLES

### Construction phase

<i>Impact</i>	<i>Nature</i>	<i>Extent</i>	<i>Duration</i>	<i>Intensity</i>	<i>Reversibility</i>	<i>Impact on Irreplaceable Resources</i>	<i>Consequence</i>	<i>Probability</i>	<i>Significance</i>	<i>Confidence</i>
<b>Impact 1: Grading and building of new roads and trenches:</b>										
Impact Description: Noise generated by construction and earth moving equipment.										
Without Mitigation	Negative	Medium	Low	Medium	Low	Low	Medium	High	Medium	High
Mitigation Description: Construction equipment to comply with the IFCs Health and safety requirements. Safe blasting techniques to be used.										
With Mitigation	Negative	Medium	Low	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

<b>Impact 2: Preparation of the footprint, earthworks, and construction of the backup thermal generation sites</b>										
Impact Description: Noise from activities such as earth drilling, generator noise, civil construction.										
Without Mitigation	Negative	Medium	Low	Medium	Low	Low	Medium	High	Medium	High
Mitigation Description: Construction equipment to comply with the IFCs Health and safety requirements. Safe blasting techniques to be used.										
With Mitigation	Negative	Medium	Low	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

<b>Impact 3: Construction of the generators and infrastructure</b>										
Impact Description: Noise from the construction of the generators and infra-structure because of construction activities such as cranes, people, and generators.										
Without Mitigation	Negative	Medium	Low	Medium	Low	Low	Medium	High	Medium	High
Mitigation Description: Construction equipment to comply with the IFCs Health and safety requirements. Construction of backup thermal generators to take place during permitted hours only.										
With Mitigation	Negative	Medium	Low	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

<b>Impact 4: Construction vehicles</b>										
Impact Description: Noise from traffic to and from the specific sites during the assembling process. Traffic to remain on the roads and at a speed of 40km/h.										
Without Mitigation	Negative	Medium	Low	Medium	Low	Low	Medium	High	Medium	High
Mitigation Description: Internal roads to be kept in a good condition and all potholes to be repaired.										
With Mitigation	Negative	Medium	Low	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

## Operational phase

<i>Impact</i>	<i>Nature</i>	<i>Extent</i>	<i>Duration</i>	<i>Intensity</i>	<i>Reversibility</i>	<i>Impact on Irreplaceable Resources</i>	<i>Consequence</i>	<i>Probability</i>	<i>Significance</i>	<i>Confidence</i>
<b>Impact 1: Noise generated by the backup thermal generators</b>										
Impact Description: Noise breaks and exhaust outlet may create an increased noise level.										
Without Mitigation	Negative	Medium	High	Medium	Low	Low	Medium	High	Medium	High
Mitigation Description: Noise surveys to be carried out.										
With Mitigation	Negative	Low	High	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

<b>Impact 2: Backup thermal generators - normal wear and tear, and the lack of preventative maintenance</b>										
Impact Description: Mechanical noise generated by the lack of maintenance and noise break.										
Without Mitigation	Negative	Medium	Low	Medium	Low	Low	Medium	High	Medium	High
Mitigation Description: Cyclic maintenance programme to be in place to prevent increased noise levels because of wear and tear and to identify high noise levels on a pro-active manner.										
With Mitigation	Negative	Low	High	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

<b>Impact 3: Traffic</b>										
Impact Description: Traffic noise is created by vehicle movement where mechanical noise, rattles, and road surface play an important role on the noise levels along roads or some distance from roads.										
Without Mitigation	Negative	Medium	Low	Medium	Low	Low	Medium	High	Medium	High
Mitigation Description: Roads to be kept in good order at all times..										
With Mitigation	Negative	Low	High	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

<b>Impact 4: Sub-station and overhead powerlines</b>										
Impact Description: Sub-station can generate noise from the blowers and transformers, and corona noise from the overhead power lines. These noise levels are site specific.										
Without Mitigation	Negative	Medium	High	Medium	Medium	Low	Medium	High	Medium	High
Mitigation Description: Routine inspections and noise assessments on a regular basis.										
With Mitigation	Negative	Low	High	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

<b>Impact 5: Maintenance activities</b>										
Impact Description: Noise from regular maintenance activities.										
Without Mitigation	Negative	Medium	Low	Medium	Low	Low	Medium	High	Medium	High
Mitigation Description: All equipment to be in good working order and maintenance activities should only be undertaken during permitted hours.										
With Mitigation	Negative	Medium	Low	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

### Cumulative impacts

<i>Impact</i>	<i>Nature</i>	<i>Extent</i>	<i>Duration</i>	<i>Intensity</i>	<i>Reversibility</i>	<i>Impact on Irreplaceable Resources</i>	<i>Consequence</i>	<i>Probability</i>	<i>Significance</i>	<i>Confidence</i>
<b>Impact 1: Cumulative impact from abutting PV plant</b>										
Impact Description: Noise from generators and the PV Plant.										
Without Mitigation	Negative	Medium	High	Medium	Low	Low	Medium	Low	Medium	High
Mitigation Description: Pro-active identification of noise issues.										
With Mitigation	Neutral	Low	High	Low	Low	Low	Low	Low	Low	High
Cumulative Impact: Low										

## MITIGATION MEASURES

Aspect	Mitigation	Responsible person	Activity
<b>Construction phase</b>			
Grading and building of new internal roads	Construction equipment to comply with the standards for construction vehicles as explained in the IFC's Environmental Health & Safety Regulations.	Site engineer	Environmental audits during the construction phase.
Preparation of the footprint area, earthworks & construction	Construction equipment to comply with the standards for construction vehicles as explained in the IFC's Environmental Health & Safety Regulations.	Site engineer	Environmental audits during the construction phase.
Construction of the backup thermal generator sites	Construction of back up thermal generators to take place during permitted times only.  Construction equipment to comply with the standards for construction vehicles as explained in the IFC's Environmental Health & Safety Regulations.	Site engineer	Environmental audits during the construction phase.
Additional traffic	Roads to be always kept in a good state of repair and all potholes to be repaired.	Site engineer	Environmental audits during the construction phase.

<b>Operational phase</b>			
Noise generated by the backup thermal generators	Acoustic screening measures to be always in place (if required to achieve the sound levels stated in the datasheet)	Site engineer	Site establishment at the time of the site preparation by the site engineer.
Backup thermal generator/s - mechanical noise	Acoustic insulation and/or screening to be in place <i>(if required to achieve the sound levels stated in the datasheet)</i>	Design phase of the turbine – Design engineers	Engineering drawings to be provided and acoustic compliance certificate to be issued.
Backup thermal generator/s – Normal wear and tear, poor component design, lack of preventative maintenance	Cyclic maintenance programme of the backup thermal generators; Withdraw from services should a backup thermal generator/s create excessive noise due to wear and tear or poor maintenance.	Site Engineer; Acoustic noise specialist	Regular noise monitoring to take place to identify noisy backup thermal generators.

Traffic	Vehicles to maintain the speed limit always; Roads to be maintained and pot-holes to be removed.	Site engineer	Environmental audits.
Maintenance of the backup thermal generators and sub-station	Maintenance Equipment to comply with the IFCs Health and safety requirements.	Site engineer	Environmental audits.

Decommissioning phase			
Removal of infrastructure	Construction equipment to comply with the standards as for construction vehicles as explained in the IFC's Environmental Health & Safety Regulations.	Site engineer	Noise monitoring.
Rehabilitation of backup thermal generator/s areas	Construction equipment to comply with the standards as for construction vehicles as explained in the IFC's Environmental Health & Safety Regulations.	Site engineer	Noise monitoring.

Cumulative impact			
Cumulative impact of PV Plant and the backup generation sites.	Environmental noise audit to be carried out once the plant is commissioned.	Site engineer	Environmental audits.

### Noise monitoring programme

The noise monitoring programme will need to be a pro-active programme to manage the noise levels within the boundaries of the backup thermal generator/s boundaries. The monitoring programme must consist out of the following phases:

Pre-construction phase – A noise survey will be required to be done along the footprint boundaries and at the complainant's property when a complaint is received.

Construction phase – A winter and summer period noise survey must be done.

Operational phase – Noise surveys must be done monthly to start off with and as soon as the results are stable a quarterly noise survey to be carried out.

The following noise results must be kept on record:

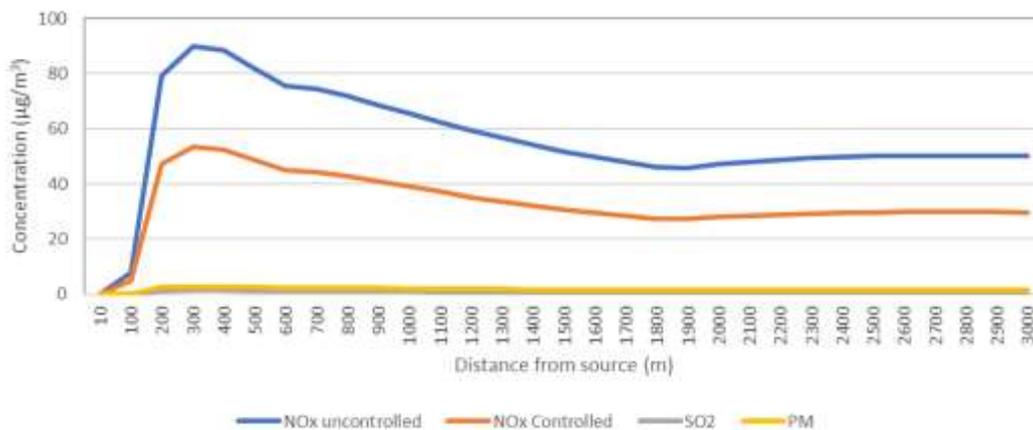
- Leq – values of each measuring point in dBA;
- Spectrum analysis of the results;
- Any physical characteristics in and next to the measuring points which may change the noise regime of the area;
- Any other details such as the instrument, competent person etc. will be compiled and made available.

Note from EAP: These mitigation measures have been included in the Updated EMPr.

### 6.2.2 Air Quality Technical Comment

#### PREDICTED AMBIENT CONCENTRATIONS (IMPACTS)

The predicted maximum ambient SO<sub>2</sub>, NO<sub>x</sub> and PM<sub>10</sub> concentrations from the source to 3000m downwind are shown in the graph below. For all three pollutants, the maximum predicted ambient concentration occurs 300m downwind of the source. It is well below the limit value of the 1-hour NAAQS. The NAAQS are health-based which implies that *it is unlikely that adverse health effects will occur in the event of exposure to ambient concentrations below the limit value.*



**Predicted maximum ambient concentrations in µg/m<sup>3</sup>**

	SO <sub>2</sub>	NO <sub>x</sub>		PM <sub>10</sub>
		Uncontrolled	Controlled	
Max concentration	1.5	90.0	53.5	2.8
NAAQS limit value	350	200	200	75*

\*24-hour limit value

## DISCUSSION ON IMPACTS

The predicted emission rates (refer to the table above) are **very low**. These will however increase ambient concentration of SO<sub>2</sub>, NO<sub>2</sub> and PM<sub>10</sub> downwind of the generators while they are in operation. Due to the very low emission rate and the generally good dispersion potential, the increase is shown to be very low and **the resultant ambient concentrations are highly unlikely to exceed the National Ambient Air Quality Standards (NAAQS)**.

The ambient concentrations resulting from the generator emission will be highest, albeit low relative to the NAAQS, 300m from the generators, and will decrease with increasing distance. **The magnitude of any impact is likely to be very low.**

The PV site is relatively remote with the closest residences in De Aar. It is therefore highly unlikely that individuals will be exposed to harmful ambient concentrations resulting from the generator emissions. The probability of exposure in the ambient environment is further reduced considering that the generator operate in back-up mode only.

**Considering the limited extent, the short duration, the very low magnitude and the very low probability of exposure, air quality impacts are deemed to be insignificant.**

Cumulative effects can be considered as

- (i) the generators at both sites (Badenhorst Dam Solar PV3 and the Mulilo De Aar PV site) operating together, and
- (ii) the added effects of the generator emissions on existing ambient air (i.e. from other sources).

The scenario of generators at both sites operating at the same time is feasible considering they may be used in period of weak irradiance. In this case, **the cumulative impact from the two PV sites will also be insignificant.**

There are no significant sources of SO<sub>2</sub> and NO<sub>x</sub> in the general area, so the current ambient concentrations will be very low. They will remain low with the addition from the generators at the two PV sites. The cumulative impact will therefore be insignificant. Background ambient concentrations of PM<sub>10</sub> may be high relative to the NAAQS because of the arid nature of the area and entrainment of dust into the atmosphere by wind. The added effect of PM<sub>10</sub> from the generator emissions will be insignificant by comparison.

Impact criteria	Badenhorst PV Site	Mulilo De Aar PV site	Cumulative assessment
Extent	Site only	Site only	Site only
Duration	Short periods	Short periods	Short periods
Magnitude	Very low	Very low	Very low
Probability	Low	Low	Low
Significance	Insignificant	Insignificant	Insignificant

**NO<sub>x</sub> mitigation**

For the control of NO<sub>x</sub>, consideration must be to the engine type, i.e. whether they are rich-burn or lean-burn engines. Rich-burn engines have an air-to-fuel ratio operating range that is near stoichiometric resulting in exhaust gas with little or no excess oxygen. A lean-burn engine has an air-to-fuel operating range that is fuel-lean of stoichiometric, therefore the exhaust has medium to high levels of oxygen.

The most common NO<sub>x</sub> control technique for diesel and dual fuel engines focuses on modifying the combustion process. Selective catalytic reduction (SCR) is a post-combustion technique. Combustion modifications include injection timing retard (ITR), preignition chamber combustion (PCC), air-to-fuel ratio, and derating. SCR is an add-on NO<sub>x</sub> control placed in the exhaust stream following the engine and involves injecting ammonia (NH<sub>3</sub>) into the flue gas. The NH<sub>3</sub> reacts with the NO<sub>x</sub> in the presence of a catalyst to form water and nitrogen.

	SO <sub>2</sub>	NO <sub>x</sub>		PM <sub>10</sub>
		Uncontrolled	Controlled	
Max concentration	1.5	90.0	53.5	2.8
NAAQS limit value *24-hour limit value	350	200	200	75*

*Note from EAP: Please note that the NO<sub>x</sub> emissions are way below acceptable thresholds with or without above-mentioned mitigation (Uncontrolled and Controlled in the tables above). The recommended mitigation measures (although not required to be implemented) have however been added to the Updated EMPr.*

**EMPr**

Routine servicing of the generators to the manufacturer’s specifications is recommended for inclusion in the EMPr.

**6.3 Fuel Storage Tanks: Mitigation**

Fuel storage tanks of less than 80m<sup>3</sup> in volume will be constructed to store the fuel for the GenSet development. The following in terms of impact and mitigation are applicable:

**Potential negative impact to be avoided**

- Risk for surface and groundwater pollution

During construction impact is associated with:

- Potential for spillages from construction vehicles and their onsite maintenance

During operation, impact is associated with:

- Spillages resulting from petroleum transfer operations, overflow, etc. could occur).
  - Failure of structures (i.e. tanks, etc.) because of substandard materials and poor construction methods
- *Health considerations*, i.e. in terms of vapour. It is important to ensure protection of personnel involved with filling of tanks, etc.

## **Mitigation**

### DESIGN OF ABOVE GROUND STORAGE TANKS

- The design and placement of tanks will be in accordance with industry standards.
- The latest updated South African National Standards (SANS) pertaining to the design and installation of storage tanks must be implemented.

This can be obtained from the following:

- Standards of South Africa (A Division of the SABS)
- Tel 012 428 7911 / [www.stansa.co.za](http://www.stansa.co.za)

The standards should include the latest version of the South African National Standard SANS 10089-1 – The Petroleum Industry:

- SANS 10089-1: Storage and Distribution of Petroleum Products in above-ground bulk installations;
  - SANS 10089-2: Electrical and other installations in the distribution and marketing sector;
  - SANS 10089-3: The installation, modification, and decommissioning of underground storage tanks, pumps/dispensers and pipework at service stations and consumer installations.
- Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs must take place.
  - All tanks, seals, pipes and fittings are required to
    - be chemically compatible with the hazardous substance being stored in it,
    - be protected from, or resistant to, all forms of internal and external wear, vibration, shock and corrosion;
    - have a stable foundation or support structure suitable for all operating conditions;
    - be protected from fire, heat, vacuum and pressure, which might cause tank failure;
    - be sized to suit process and storage requirements.
  - No pooling of material under a road tanker may occur, thereby preventing the possibility of fire and explosions.
  - Fuel storage tanks should be located on an impermeable surface that is protected from the ingress of storm water.

- Transfer of petroleum product from road tanker to the storage tanks :- Provide for a 200mm thick reinforced concrete spillage containment slab with a slope towards a catch pit connected to an oil/grease separator.

#### CONSTRUCTION OF ABOVE GROUND STORAGE TANKS

- The installation of the above-ground storage tanks must take place in accordance with industry standards.
- To ensure the system is installed as required by the regulatory authorities, on-site works must be supervised at all times by an experienced person.
- It is essential that any protective coating applied to the tanks and pipework is not damaged during installation. The coating must be inspected during and after installation and any damage must be repaired immediately prior to any filling of the tanks.
- Records must be kept of how the tank and pipe system was installed for future reference in case of expansion and/or decommissioning with removal of the equipment. These records must include record and certificates of the suppliers, as well as technical drawings of the installation of the tanks and pipework, their dimensions and the materials used. It is recommended that all records are dated and maintained during the life of the tanks and are kept on-site for future reference (for example, in the event of a leaks or spillage) in a place from where they can be retrieved quickly.

#### OPERATION: MONITORING AND RECTIFICATION

- As part of routine maintenance, the Applicant must undertake regular engineering inspections of the tanks, tank valves and pumps to ensure that there are no leaks.
- The written record that was compiled during the installation of the tank and system that includes the technical drawings of the installation showing the tanks and pipeworks, their dimensions and the materials used (refer to the heading “CONSTRUCTION OF THE ABOVE GROUND STORAGE TANKS”) must be kept on-site for reference in the event of a leak or spillage in a place from where it can be retrieved quickly.
- Any incidents resulting from the storage structure and/or operation that could have a detrimental impact on the environment must immediately be investigated and rectification measures must be implemented and monitored accordingly.
- Measures such as spill kits to contain spills must at all times be available on site.
- All incidents must be reported to the Department of Human Settlement, Water and Sanitation within 24 hours of the occurrence who will advise on emergency procedures to follow.

## OPERATION: HEALTH AND SAFETY

- All staff engaged in operational maintenance duties shall be fully acquainted with the requirements of the safety regulations in terms of the OHS Act, 1993.
- The Applicant must at all times ensure at all times that the safety and operation of the storage tank complies with the requirements for health and safety as prescribed in the Occupational Health and Safety Act (OHS), 1993 (Act Nr 181 of 1993), as amended.
- The following specific safety and protection measures shall be provided (and sufficient training given) in accordance with the OHS :-
  - First aid treatment
  - Medical assistance
  - Emergency treatment
  - Prevention of inhalation of fumes
  - Protective equipment, clothing and footwear
  - Safety goggles and eye shields
- Maintenance and inspection work shall be planned and supervised by responsible members of staff who shall ensure that all relevant precautions are taken.
- Safety signs must be placed in visible areas all over the site.

*Note from EAP: Above-mentioned stipulations have been included in the amended EMPr.*

## 6.4 Conclusion

It is concluded that the additional identified impact that the 9.99MW Auxiliary Generator may have on the environment is **either low, very low, site-specific or insignificant and that all impacts can be mitigated to acceptable levels**. Mitigation measures as proposed by the air and noise specialists have been included in the updated EMPr.

## CHAPTER 7: CONCLUSION

### 7.1 Assumptions, Uncertainties, and Gaps in Knowledge

#### *Assumptions*

It is assumed that all documentation and information obtained from the different stakeholders, professional team members and specialists are accurate, unbiased and valid.

#### *Uncertainties*

The development proposal in relation to its environment was thoroughly investigated by various specialists and professionals and there are therefore no uncertainties with regards to the development as proposed.

#### *Gaps in knowledge*

Relevant specialist and engineering studies were undertaken for this project and it is highly unlikely that any missing information could influence the outcome of this project.

### 7.2 Environmental Impact Statement

A Final Environmental Impact Statement will be provided after the completion of the Public Participation Programme and will be included in the Final Motivational Report.

At this stage, the following however applies:

- Input, and mitigation measures, obtained for the BESS development from the following specialists were included in the updated EMPr for the BESS Part 2 EA amendment application:
  - Ornithologist
  - Aquatic specialist
  - Ecologist
  - Heritage consultant
  - Stormwater engineer

The BESS development *has a much larger footprint with more significant impact* than the 9.99MW GenSet development (approximately 20 hectares vs 0.25 hectares). It can therefore be concluded that there would be no additional impact due to the GenSet development that has not been addressed and assessed in the above-mentioned studies.

Additional air quality and noise impact studies were undertaken, and mitigation measures were provided. **Both studies concluded that all potential impacts would be Low / Very Low after mitigation has been applied.**

### **7.3 Why the Amendment Should, or Should Not be Authorised**

Reasons for authorisation will be provided after the completion of the Public Participation Programme and will be included in the Final Motivational Report.

### **7.4 Recommendation by the Environmental Assessment Practitioner**

Recommendations that should be included in the amended EA will be provided after the completion of the Public Participation Programme and will be included in the Final Motivational Report.

### **7.5 Affirmation by the Environmental Assessment Practitioner**

We, Susanna Nel & Annelize Grobler, herewith affirm the following:

- The information contained in this report is to the best of our knowledge and experience correct.
- All relevant comment and input provided by the stakeholders and IAPs will be included and addressed in the Final Motivation Report.
- Input and recommendations from the specialist reports are provided in and integrated with the Motivation Report.
- All information made available by the EAP to IAPs and any responses thereto as well as comment and input from IAPs will be provided in the Motivation Report.



Susanna Nel  
DATE: 18 February 2020



Annelize Grobler  
DATE: 18 February 2020

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