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RENEWABLES RESOURCE ASSESSMENT AND FINANCIAL MODELLING FOR WIND AND SOLAR PROJECTS AT THE PORTS OF SOUTH AFRICA

Imprint

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Registered offices:
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International PtX Hub
Köthener Str. 2-3
10963 Berlin, Germany
T +49 61 9679-0
F+49 61 96 79 -11 15

E info@ptx-hub.org
I www.ptx-Hub.org

Responsible:
Johannes Arndt (GIZ)

Authors:
Manjunath Basappa Ayanna (CSIR),
Jan-Hendrik Grobler(CSIR),
Dr. Lawrence Pratt (CSIR),
Stefan Karamanski (CSIR),
Christopher Marz (CSIR),
Dr. Kittessa Roro (CSIR),
Dr. Rigardt Coetzee (CSIR),
Thomas Roos (CSIR)

Smart Places
CSIR
PO Box 395
Pretoria 0001, South Africa
T + 27 12 841 2911

E enquiries@csir.co.za
I www.csir.co.za

Reviewers:
Dr. Kittessa Roro (CSIR),
Dr. Rigardt Coetzee (CSIR),
Stefan Karamanski (CSIR)

Project Management:
Dr Rigardt A.M. Coetzee (CSIR)
racoetzee@csir.co.za

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List of Abbreviations

AC	Alternating Current
BT	Backtracking
CAPEX	Capital expenditures
CF	capacity factors
CSIR	Council for Scientific & Industrial Research
DC	Direct Current
DTIC	Department of Trade, Industry, & Competition
FLH	full load hours
GCR	Ground Cover Ratio
GH2	Green hydrogen
LCOE	levelized costs of electricity
MW	Megawatt (1 000 000 W)
NREL	National Renewable Energy Laboratory
OPEX	Operating expenses
PPA	Power Purchase Agreements
PV	Photovoltaic
RE	Renewable Energy
RWY	Reference Wind Year
SAM	System Advisor Model
SAT	Single Axis Tracker
TMY	Typical Meteorological Year
WASA	Wind Atlas for South Africa

Executive Summary

Solar resource assessment

The solar resource assessment includes analysis of previous years satellite based global horizontal irradiance data for the five (5) locations. The modelled 1MWdc solar PV fixed tilt and single axis tracker systems using PVSyst software predict the following:

Boegoebaai

- The predicted annual energy generation is 1 914 – 2 027 MWh for fixed tilt, 2 271 – 2 415 MWh for single axis without back tracking and 2 258 – 2 410 MWh for single axis tracker with backtracking solar PV system.
- The determined capacity factor (DC) is 22% to 23% for a fixed tilt system and 26% to 28% for a single axis without and with back tracking system.
- The modelled plants produce 1 548 - 1 639 MWh/hectare from a fixed-tilt system with ground cover ratio of 37.8% and 1 419 - 1 508 MWh/hectare from a single-axis without backtracking with ground cover ratio of 29.7% and 1 825 – 1948 MWh/hectare with ground cover ratio of 37.5%.

Saldanha Bay

- The predicted annual energy generation is 1 770 – 1 932 MWh for fixed tilt, 2 103 – 2 308 MWh for single axis without back tracking and 2 083 – 2 265 MWh for single axis tracker with backtracking solar PV system.
    1) The determined capacity factor (DC) is 20% to 22% for a fixed tilt and 24% to 26% for a single axis without and with back tracking system.
    2) The modelled plants produce 1 298 - 1 418 MWh/hectare from a fixed-tilt system with ground cover ratio of 34.3% and 1 187 - 1 303 MWh/hectare from a single-axis without backtracking with ground cover ratio of 26.4% and 1 529 – 1680 MWh/hectare with ground cover ratio of 34.3%.

Mossel Bay

- The predicted annual energy generation is 1 609 – 1 892 MWh for fixed tilt, 1 828 – 2 211 MWh for single axis without back tracking and 1 839 – 2 233 MWh for single axis tracker with backtracking solar PV system.
- The determined capacity factor (DC) is 18% to 22% for a fixed tilt and 21% to 25% for a single axis without and with back tracking system.
    3) The modelled plants produce 1 181 - 1 388 MWh/hectare from a fixed-tilt system with ground cover ratio of 34.3% and 1 188 - 1 438 MWh/hectare from a single-axis without backtracking with ground cover ratio of 30.4% and 1 349 – 1638 MWh/hectare with ground cover ratio of 34.3%.

Coega

- The predicted annual energy generation is 1 534 – 1 823 MWh for fixed tilt, 1 718 – 2 077 MWh for single axis without back tracking and 1 753 – 2 128 MWh for single axis tracker with backtracking solar PV system.
- The determined capacity factor (DC) is 18% to 21% for a fixed tilt and 20% to 24% for a single axis without and with back tracking system.
    4) The modelled plants produce 1 240 - 1 474 MWh/hectare from a fixed-tilt system with ground cover ratio of 37.8% and 1 260 - 1 524 MWh/hectare from a single-axis without backtracking with ground cover ratio of 34.3% and 1 417 – 1721 MWh/hectare with ground cover ratio of 37.8%.

Richards Bay

- The predicted annual energy generation is 1 483 – 1 749 MWh for fixed tilt, 1 700 – 2 013 MWh for single axis without back tracking and 1 699 – 2 027 MWh for single axis tracker with backtracking solar PV system.
- The determined capacity factor (DC) is 17% to 20% for a fixed tilt and 19% to 23% for single axis without and with back tracking system.
    5) The modelled plants produce 1 450 - 1 710 MWh/hectare from a fixed-tilt system with ground cover ratio of 45.7% and 1 305 - 1 546 MWh/hectare from a single-axis without backtracking with ground cover ratio of 36.9% and 1 661 – 1 981 MWh/hectare with ground cover ratio of 45.7%.

Boegoebaai location offers the highest potential for solar PV generation. However, Richards Bay excels in energy output per hectare, making it more efficient for land-constrained projects. Single-axis systems with backtracking consistently outperform fixed-tilt systems across all sites, emphasizing the advantage of advanced tracking technologies for maximizing solar energy generation.

The single best site for solar PV generation within each of the five (5) locations is West of Springbok in Boegoebaai, East of Clanwilliam in Saldanha Bay, Leeu Gamka/Prince Albert in Mossel Bay, Hofmeyr in Coega, and Waterbult in Richards Bay.

Wind resource assessment

Comprehensive wind resource assessments were conducted for 25 sites across South Africa, with results analysed to evaluate their energy generation potential. Using meteorological data from the CSAG website and a robust RMY selection methodology, annual time series were developed to represent the typical wind conditions at each site. These time series were combined with data for two turbine models—Vestas V100-1.8 and Enercon E101—to calculate capacity factor time series.

The turbines' speed-power curves were transformed into Gaussian curves through mathematical modelling to better approximate the energy generation capabilities of a wind farm. The analysis was performed at three hub heights: 100 m, 120 m, and 150 m.

Key findings include:

- The Vestas turbine achieves higher capacity factors at 100 m and 120 m compared to the Enercon turbine.
- Despite this, the Enercon turbine generates more electrical energy across all height levels due to its higher overall energy yield.
- The top five locations with the highest energy yields are northeast of Springbok, Hofmeyr, Beaufort West, Richards Bay, and east of Saldanha Bay.

Wind energy generation is strongly influenced by the wind speed magnitude at a given site, as demonstrated by the wind speed statistics. These findings provide critical insights into site selection and turbine performance optimization for wind energy projects in South Africa.

Financial analysis for solar and wind technologies

A financial model was developed to estimate the levelised cost of electricity (LCOE) and net present value (NPV) from wind and solar generators across the 25 sites. A sensitivity study was conducted to quantify the impact of key model inputs on the financial outcomes for both technologies. Over 18,000 simulations were run for solar and wind to quantify the impact of seven variable input parameters: location, tariff structure, escalation rate of tariffs, capital expense, operating expense, loan rate, and the loan period.

Given the assumptions included in the financial model, solar generators generally resulted in lower levelised costs of electricity (LCOE) and higher net present value (NPV) compared to wind projects for the selected areas. Boegoebaai was the best region for solar projects, while Saldanha Bay was the best region for wind projects. However, one site along the coastline of Richard's Bay was the best location for wind compared to all the regions evaluated at a 120m hub height in the study. The LCOE for solar projects ranged from 63.7 to 123.0 R-cents/kWh and from 100.4 to 314.3 R/kWh for wind projects, depending on the inputs. The LCOE was driven primarily by the location for both wind and solar because renewable energy resources are highly dependent on the location selected. The NPV was driven primarily by the tariff structure and the escalation rate, where the escalation rate is defined as the percentage increase in the tariff structure over and above the inflation rate.

The analysis indicates that Saldanha Bay East of Clanwilliam (Site 04) has the lowest combined LCOE for wind and solar co-generation (105 Rc/kWh), averaged across the range of input assumptions. A co-located wind and solar installation has the advantage of extending the electricity generation over 24 hours from wind and lowering the LCOE from the less expensive solar. Seven of the sites evaluated indicate a combined LCOE of between 105 and 110 Rc/kWh, on average. Richards Bay along the coast (Site 01) was identified as the best site for wind generation (116 Rc/kWh). Boegoebaai West of Springbok (Site 03) was identified as the best site for solar (74 Rc/kWh), and three of the five Boegoebaai sites topped the list for solar generation out of the 25 sites evaluated. However, none of the 25 sites was optimal for both solar and wind generators. The correlation coefficient between solar and wind capacity factors is near 0.

1. Background and Overview

The global transition towards a low-carbon economy necessitates a fundamental shift in energy generation and consumption patterns. To align with the objectives of the Paris Agreement and support decarbonization, the development and integration of renewable energy sources have become critical. South Africa, with its abundant solar and wind resources, is uniquely positioned to harness these energy sources for sustainable power generation and Power-to-X (PtX) applications.

The concept of PtX involves converting renewable energy into alternative energy carriers such as green hydrogen (GH2) and its derivatives (e.g., ammonia, synthetic fuels, and hydrocarbons). This approach is particularly relevant for hard-to-abate sectors, including heavy-duty transport, industrial manufacturing, and chemical production, where direct electrification is not feasible. The production of GH2 and PtX products is contingent on the availability of cost-effective and reliable renewable electricity, underscoring the need for comprehensive resource assessments.

As global energy markets transition towards sustainability, the competitiveness of renewable energy technologies in South Africa must be thoroughly evaluated. The variability of solar and wind energy resources necessitates a strategic approach to energy planning, ensuring energy security and affordability while supporting the country's economic growth. Understanding the feasibility of solar and wind energy as independent solutions and in hybrid configurations is essential for optimizing resource utilization and maximizing efficiency.

South Africa's strategic ports—Boegoebaai, Saldanha Bay, Mossel Bay, Coega, and Richards Bay—have been identified as prime locations for renewable energy deployment. This study provides critical insights into energy generation potential at five possible sites of interest of these named locations, enabling informed investment decisions and the development of supportive policies for large-scale renewable energy projects. The findings will play a crucial role in shaping South Africa's renewable energy infrastructure and ensuring sustainable energy solutions for industrial and commercial applications.

This report provides a data-driven approach to optimizing renewable energy site selection, enhancing financial viability, and exploring the integration of hybrid energy solutions. The findings aim to support policymakers, investors, and industry stakeholders in making informed decisions that will drive South Africa’s energy transition and establish the country as a global leader in renewable energy-based PtX production.

2. Study Objectives

The objective of this assessment is to evaluate the solar and wind energy potential across multiple sites for the development of PtX (Power to X - green hydrogen based synthetic products (Power-to-X or PtX) such as ammonia and hydrocarbons) classification (taxonomies) in South Africa, providing a comprehensive resource analysis, financial feasibility study, and comparative analysis of energy production. Specifically, the study reports on the:

1. **Solar and Wind Resource Assessment**
    - Analyze historical satellite-based global horizontal irradiance data and conduct wind speed analysis for 25 sites using meteorological data and RMY selection methodology.
    - Model energy generation using fixed-tilt and single-axis tracker PV systems with PVSyst software, as well as wind energy production for Vestas V100-1.8 and Enercon E101 turbines at hub heights of 100m, 120m, and 150m.
    - Determine capacity factors, energy yield per hectare, and optimal site selection for both solar and wind energy deployment.

2. **Comparative Analysis of Energy Production**
    - Compare the annual energy production (AEP) and energy density of a single-axis PV system with backtracking to a wind system at a 150m hub height using the Enercon E101 turbine.
    - Normalize AEP values to facilitate direct comparison between the two energy technologies, considering differences in plant layout and capacity scaling.
    - Assess site-specific variations in AEP and energy density to determine the relative performance of wind and solar technologies and their spatial efficiency.
    - Highlight the advantages of hybrid renewable energy systems in mitigating intermittency challenges and optimizing energy output.

3. **Financial Analysis**
    - Develop a financial model to estimate the levelized cost of electricity (LCOE) and net present value (NPV) for wind and solar projects.
    - Conduct sensitivity analysis on key financial parameters, including location, tariffs, capital expenditure, operating expenditure, loan terms, and escalation rates.
    - Identify the most cost-effective locations for solar and wind energy generation and assess the economic viability of co-located hybrid systems.

This integrated analysis will provide critical insights for renewable energy investments, optimizing site selection, resource utilization, financial viability, and hybrid energy system development to enhance grid stability and efficiency.

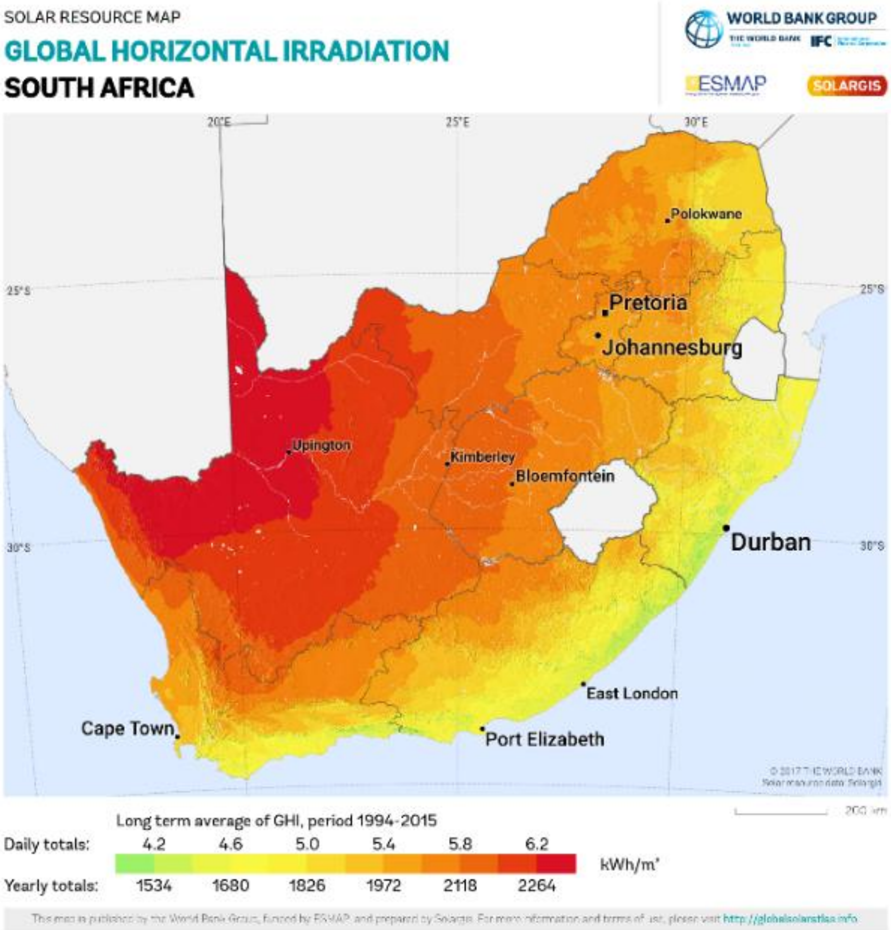
3. Solar Resource Assessment

3.1. Weather data

3.1.1. Global Horizontal Irradiance

The global horizontal irradiance quantifies the solar energy available in the horizontal plane at ground level for a given location. Solar energy, or sunlight, is the fuel for a PV plant, and irradiance quantifies the amount of light energy from the sun that reaches the PV module at an instance in time. Thus, irradiance over time is the single most important parameter to predict AC energy generation from a PV plant. Irradiance is typically measured and reported in a horizontal orientation and a tilted orientation in the same plane as the PV modules, i.e. the Plane of the PV Array. This metric is often referred to as the POA irradiance. The international standard unit of measure for irradiance is W/m2. Insolation is the measure of irradiance over time, and insolation is typically reported in units of kWh/ m2. These units are analogous to the units for electrical power measured in watts (W) and electrical energy measured in kilowatt-hours (kWh). The global horizontal insolation (GHI) quantifies the irradiance collected over one year on a horizontal surface per square meter. The Global Horizontal Irradiance (GHI) is shown in Figure 1 for South Africa.

Figure 1: Global horizontal irradiation (GHI) and estimated PV potential in South Africa (Source: SolarGIS)



3.1.2. TYPICAL METEOROLOGICAL YEAR

The Typical Meteorological Year (TMY) is a dataset of hourly meteorological conditions for a specific location, compiled from historical weather data. This weather file is a key input to a solar PV performance model because it includes an estimate of the amount of sunlight available at a specific location over a year. The hourly TMY and historical years datasets (2005 - 2020) were downloaded on from the European Commission's PVGIS website (https://re.jrc.ec.europa.eu/pvg_tools/en/). The datasets are derived from satellite-based images on a 5km x 5km resolution. TMY is a blend of multiple years of satellite data (2005 – 2020) assembled to represent a 'typical' year. The TMY dataset represents the most likely weather conditions for a specific site meaning the annual insolation will exceed the value derived from the TMY dataset roughly 50% of the years over the lifetime of the PV plant. The available irradiance is a key driver of energy production, as noted above, so the variability in the weather patterns from one year to the next will impact energy production.

3.1.3. Inter annual variability

The weather changes in cycles and is largely variable depending on the location. Therefore, the annual solar radiation in each year can deviate from the long-term average in the range of a few percent. This is expressed by interannual variability, i.e. the magnitude of the year-by-year change. The interannual variability is calculated from the unbiased standard deviation of the yearly values over the available period of years, considering a simplified assumption of normal distribution of the annual sums.

3.2. PV plant performance model technical inputs

This section describes the software used, inputs/assumptions made, and the outcome of the PV plant modelling works. The system performance estimations are based on a representative and easily scalable one (1) MW DC solar PV system configured with a fixed-tilt and single-axis tracking. A 1.1 multiplier for DC nameplate capacity (1000 kW DC) to peak AC inverter output (910 kW AC) is assumed. Given the energy production of these reference systems, energy estimates for any size solar PV system can be reasonably scaled by multiplying with the expected installed capacity.

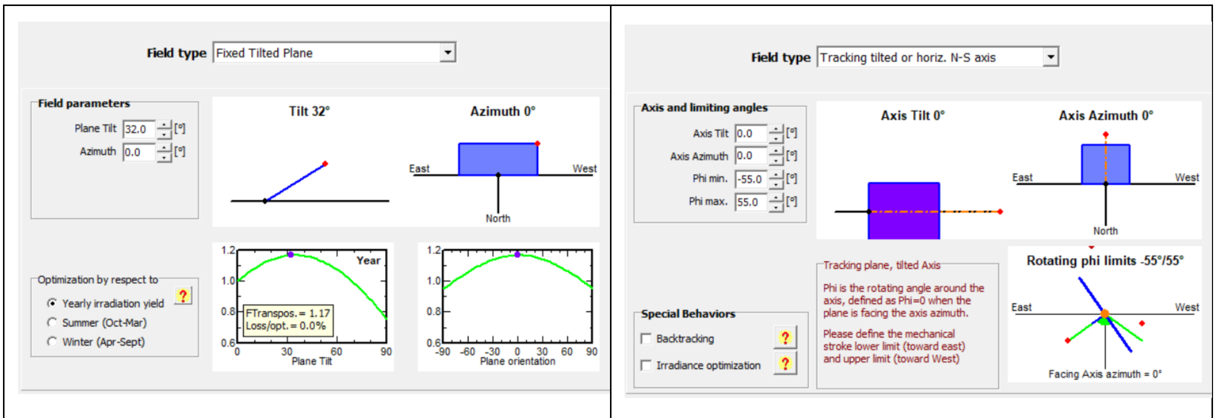
3.2.1. Modelling software

The technical performance analysis is conducted using the PVsyst software (Version 6.84). PVSyst is a common modelling platform within the commercial PV industry for performing bankable feasibility studies. The CSIR Energy Centre has been using this tool to perform solar resource assessment and feasibility related studies since 2016.

3.2.2. Inputs and assumptions

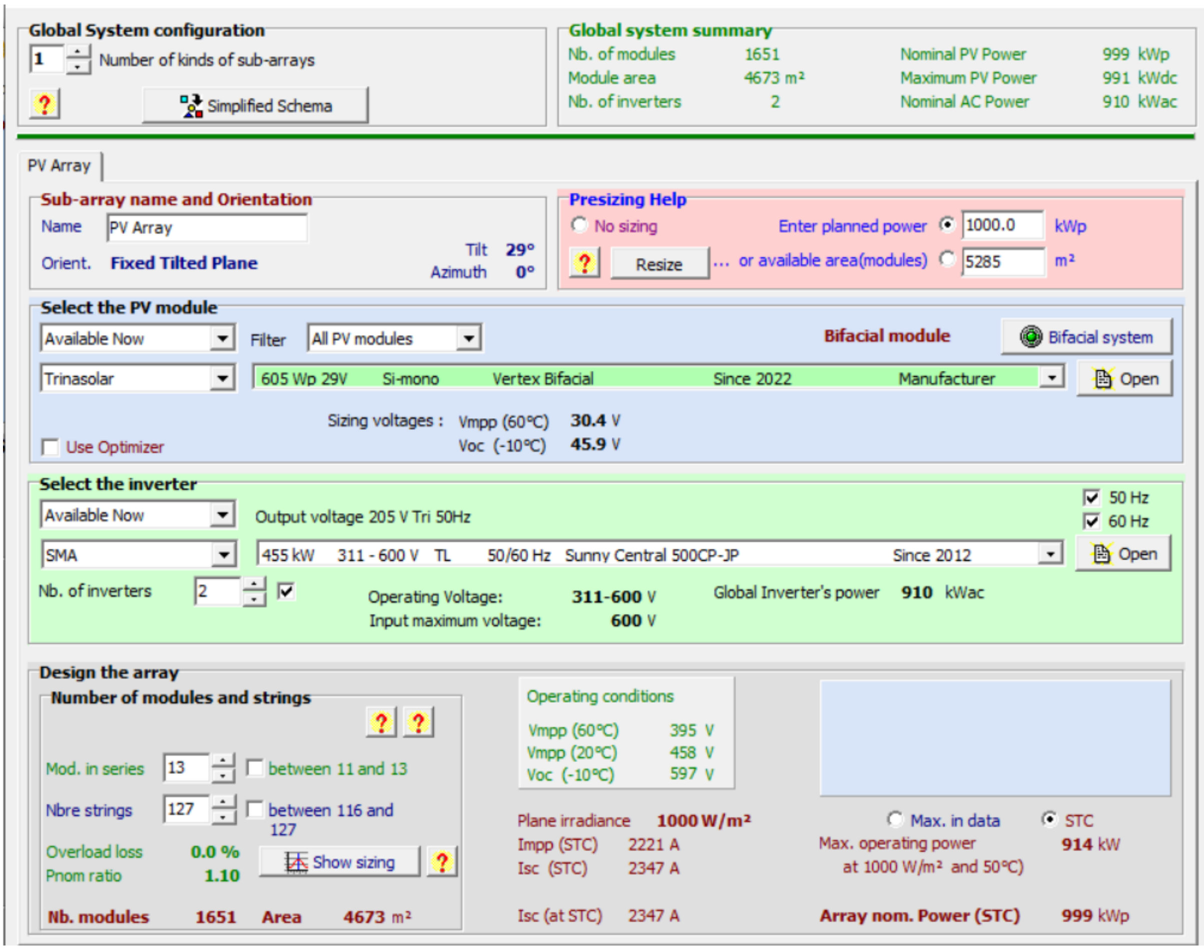
Figure 2 and Figure 3 shows the technical inputs/*assumptions in the modelling.*

Figure 2 : Fixed tilt and single axis tracker tilt and orientation optimisation



Fixed tilt system	Single axis tracker

Figure 3 : Technical inputs into plant modelling



The inputs are organized in tables as defined in the PVsyst software user interface. The TMY weather file used in this assessment is based on the .csv format downloaded from PVGIS platform. The technical inputs, such as the selection of technology, components, design, and inherent optical and electrical losses considered in the modelling, will vary depending on the objectives during the project development stage. The CSIR does not endorse or recommend any specific means or methods or components regarding the PV plant design and construction.

3.2.3. Solar PV array layout

The following system configuration and array layouts are considered in the modelling works:

- *Plant type:*
    - *Fixed tilt*

- *Single Axis Tracker (SAT) With Backtracking (WoBT)*

6) *Single Axis Tracker (SAT) With Backtracking (WBT) - The backtracking option allows less usage of land and recovery of some energy loss owing to row-to-row shading in early morning and late afternoon periods*

- *Tilt angle and Azimuth:*
  - *Fixed tilt: Optimized tilt angle, True north facing orientation*
  - *Single Axis Tracker: East - West tracking, Horizontal North South axis*

Figure 4 and Figure 5 show conceptual 3D sketches of fixed tilt and SAT plant array layouts.

Figure 4 : Representative 1 MW DC fixed tilt system array layout

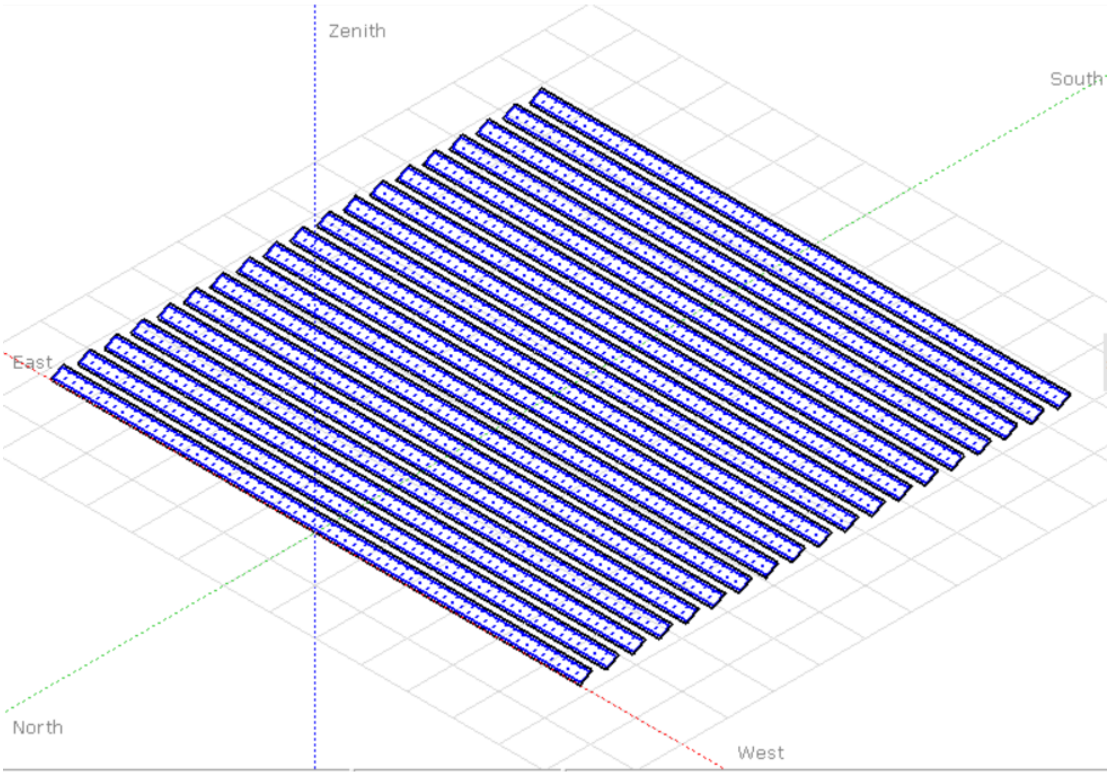
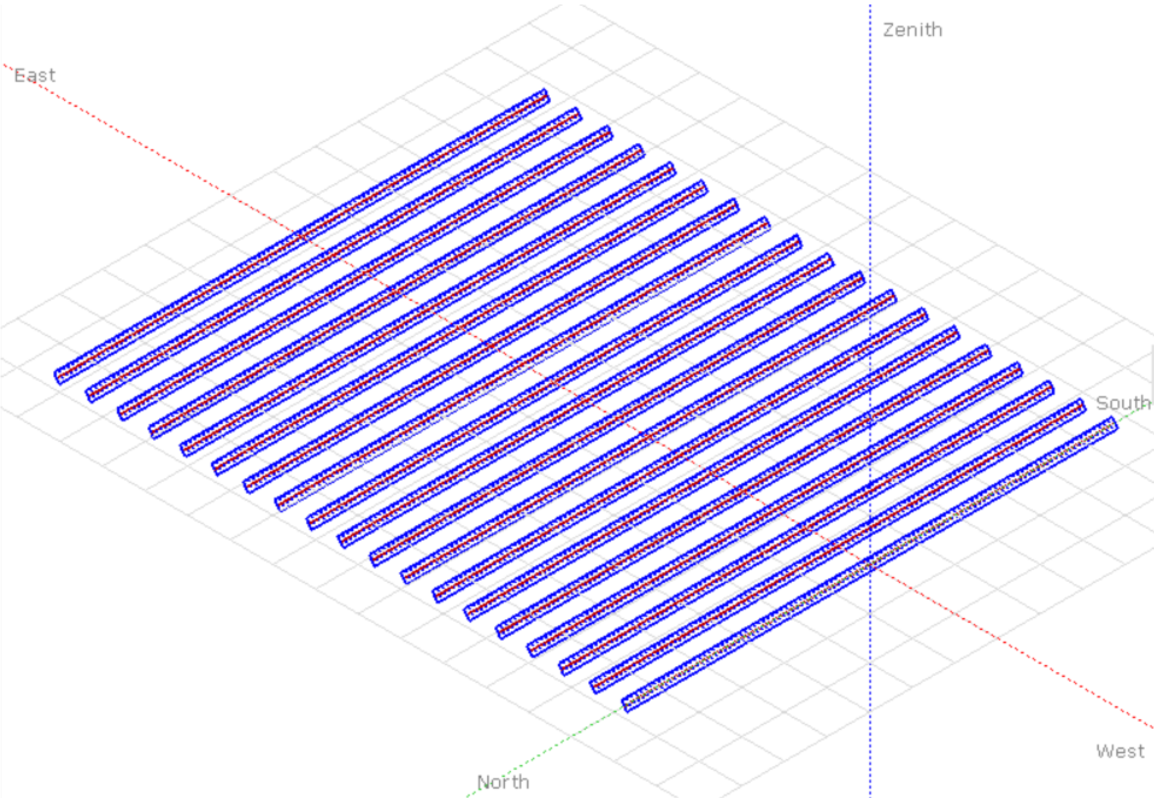


Figure 5 : Representative 1 MW DC single axis tracker array layout



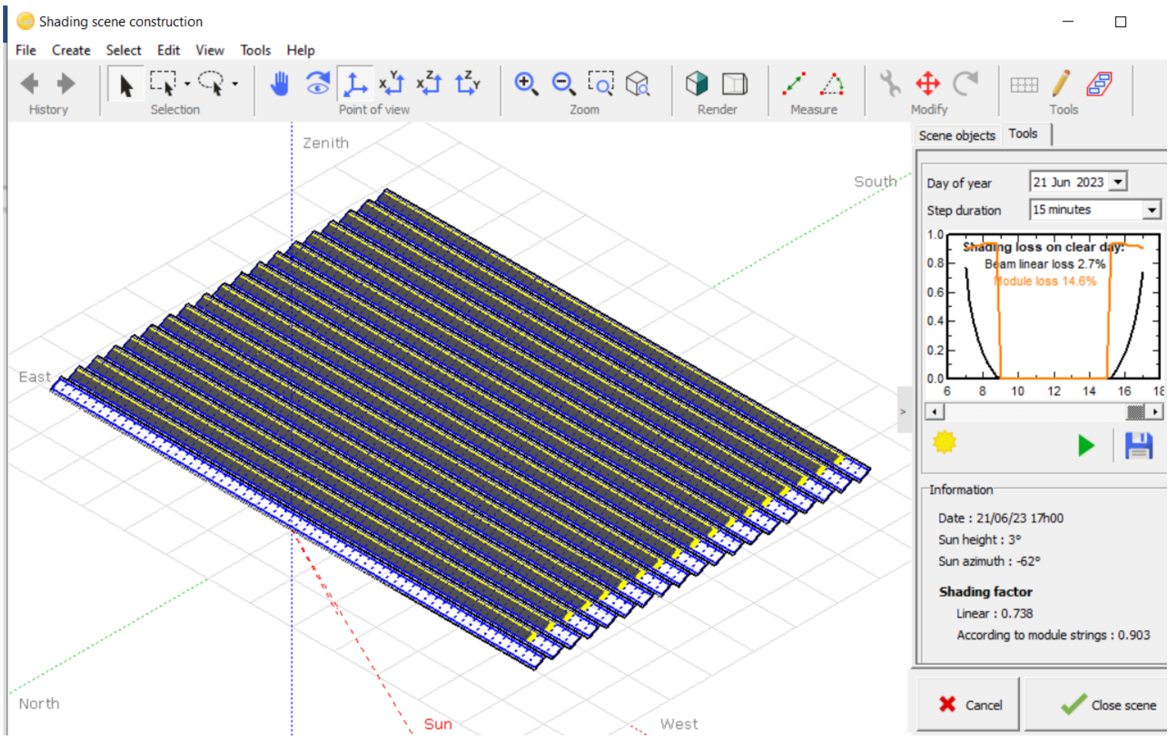
3.2.4. NEAR SHADING LOSS AND DETERMINATION OF GROUND COVER RATIO

Ground Cover Ratio (GCR) is the ratio of the PV module surface area to land area between two rows in the array. A higher GCR means more PV modules can be installed in a given area of land, but a higher GCR also leads to a higher near shading (row to row) and power loss, hence a lower performance ratio (PR). It is general practice to optimise the spacing between arrays where no near shading happens from adjacent arrays between 9:00 to 15:00 HRS and a PR of minimum 75% is attained.

Simulations for a fixed tilt system where no near shading happen between 9:00 to 15:00 HRS were run, and an appropriate pitch between the arrays for each location was determined. Figure *6* shows the representative snippet of near shading animation using PVsyst software. For a site having usable land constraints, the near shading analysis leads to determination of an optimal installable capacity that balances the GCR and power loss emanating from near shading. The conservative and aggressive land usage approach in case of single axis tracker is analysed. Hence, the single axis tracking system is modelled without and with backtracking. The pitch is kept the same as that of the fixed tilt plant for SAT WBT, and the near shading from the adjacent array is totally eliminated as the PV module moves in the opposite direction of the sun as soon as the near shading from the adjacent array happens in the early morning and late afternoon periods. A 5.8

meter pitched array in an SAT with backtracking delivers a similar performance to a 7.5 meter pitched arrays in an SAT without backtracking for the East of Boegoebaai site. Similar animations were conducted for the other four (4) sites, and it was found a 5.8 meter and 7.5 meter pitch was adequate to have no near shading effect between 9:00 to 15:00 HRS. The respective GCR based on the determined appropriate pitch between the arrays per location is used to calculate the power density (MW/hectare) and energy density (MWh/hectare).

Figure 6 : Representative near shading animation using PVsyst software

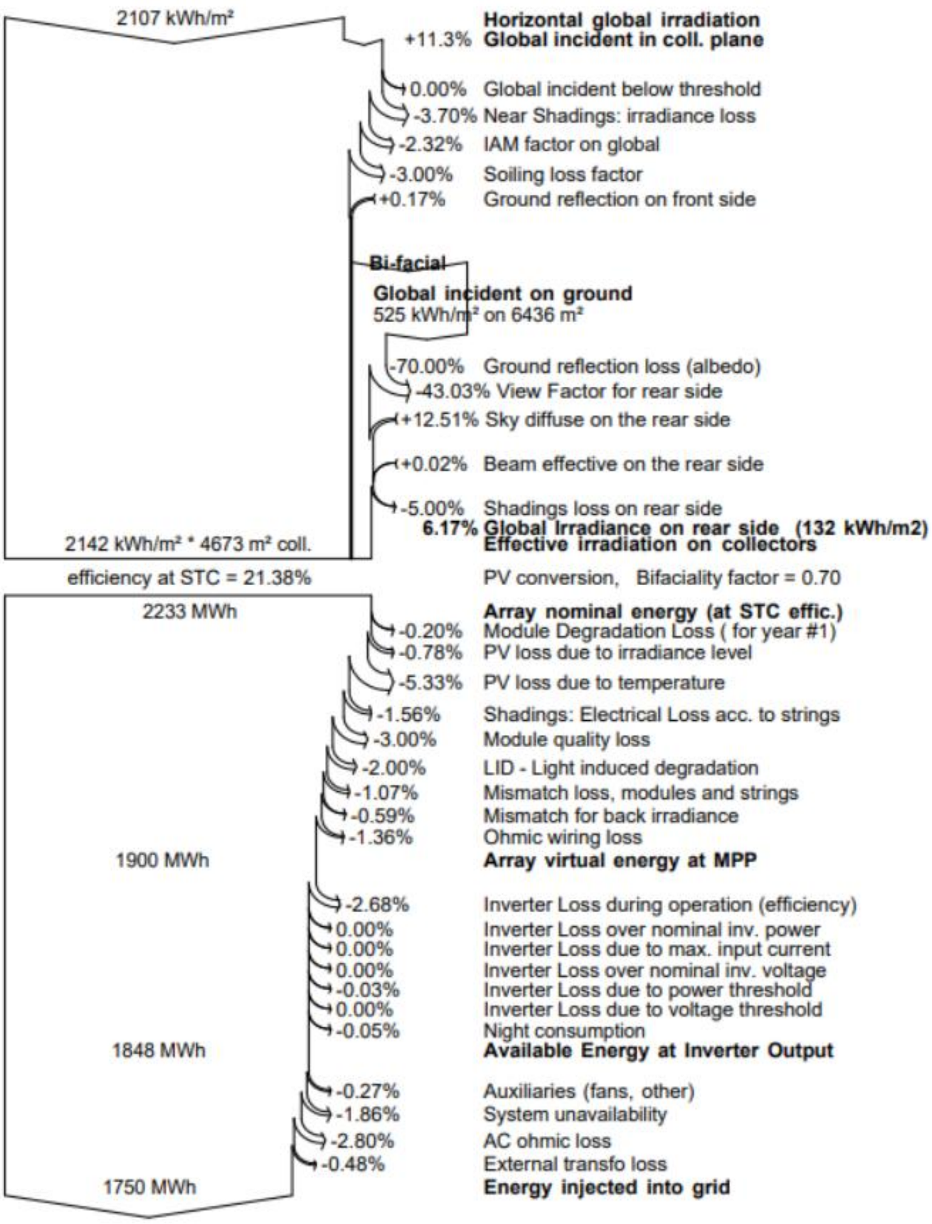


3.2.5. System Losses

Figure 7 shows the representative waterfall gain/loss diagram typical for a modelled 1 MW DC fixed tilt PV plant. The waterfall diagram extracted from PVsyst software summarizes the gains / losses due to array layout, assumptions/inputs that impact the available irradiance, DC and AC losses, operational losses and energy injected into grid at the end of waterfall diagram. Each loss component is applied to the output from the previous step.

The first block summarizes the gains/losses due to layout and other assumptions that impact the available irradiance. The mounting technology, soiling loss, GCR, and bifaciality of modules are included in this section. First, the gain in the POA irradiance is reported. The POA irradiance for a single axis tracker plant will be higher compared to the POA for a fixed tilt plant, which largely explains the additional energy output of single-axis compared to fixed-tilt plants. Next, the decrease in irradiance due to row-to-row shading is reported. Note that this value is not the full impact of row-to-row shading on power generation but rather limited to available irradiance. The decrease in power output is included further down the waterfall under the 'PV loss due to irradiance' line item. Next, the assumed soiling loss of 3% is reported. The soiling loss has a significant impact on the overall system loss because the loss impacts the effective irradiance available at the solar cell P-N junction where photons are converted into electrons. The site may require significant effort to maintain an annual soiling loss of 3% or less.

Figure 7 : Representative waterfall loss diagram of the modelled 1 MWdc fixed tilt PV plant



The second block summarizes the losses on the DC side of the inverters. First, the net DC electrical energy is reported. Roughly 80% of the available energy from the sun is lost at this stage due to the limited efficiency of solar PV modules which range between 15% and 22% in today's market. The modules with 21.4% efficiency are used in the modelling. Site and component specific losses will depend upon selection of module / inverter / cable selection, and electrical layout. These factors should be minimized by a good design and quality components. The losses due to temperature, modules quality and DC cabling are reported. The inverter efficiency losses followed by internal power consumption by auxiliaries, plant unavailability, AC cabling losses and transformer losses are reported in next steps. Finally, the energy injected to grid, i.e., the predicted annual energy generation is reported.

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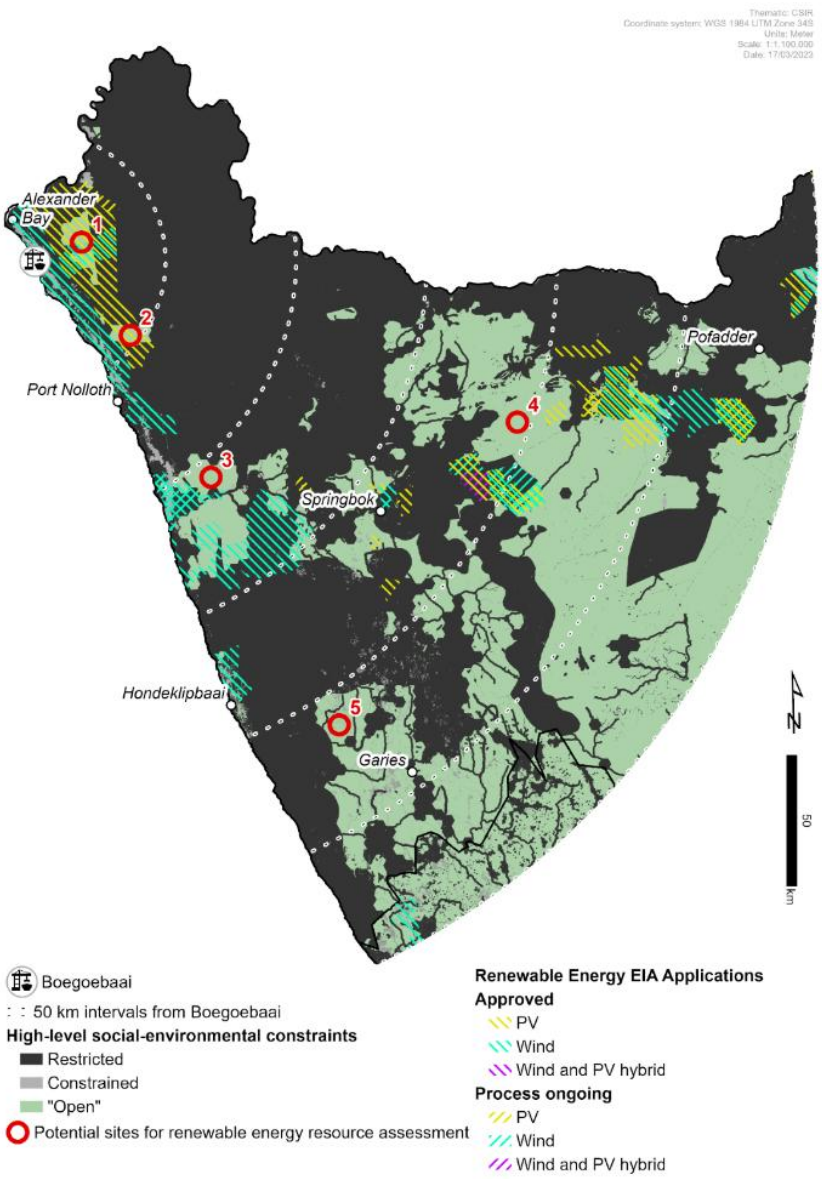
3.3. Solar Resource Potential

3.3.1. BOEGOEBAII

Figure *8* shows the identified five (5) sites in the Saldanha Bay as point of departure for solar resource assessments. The Environmental Screening Study (ESS) report details the procedure followed to identify the sites.

Figure 8 : Geographic location of 5 sites at the Boegoebaai location for renewable plant development, free from environmental or land use conflicts



Source: own creation, for data sources refer to Appendix: Spacial Data Bilbiography in 'High level environmental constraints' report

The identified sites name, its GPS coordinates and the annual global horizontal irradiance (kWh/m2/year) for Boegoebaai is given in Table 1. The West of Springbok site records a high insolation of 2324 kWh/m2/year and the North-west of Garies records low insolation of 2188 kWh/m2/year. The annual GHI at the other four (4) sites compared to West of Springbok site (East of Boegoebaai) varies by -3.0% (East of Boegoebaai), -2.2% (Between Port Nolloth and Boegoebaai), -4.4% (North-east of Springbok) and -6.2% (North-west of Garies).

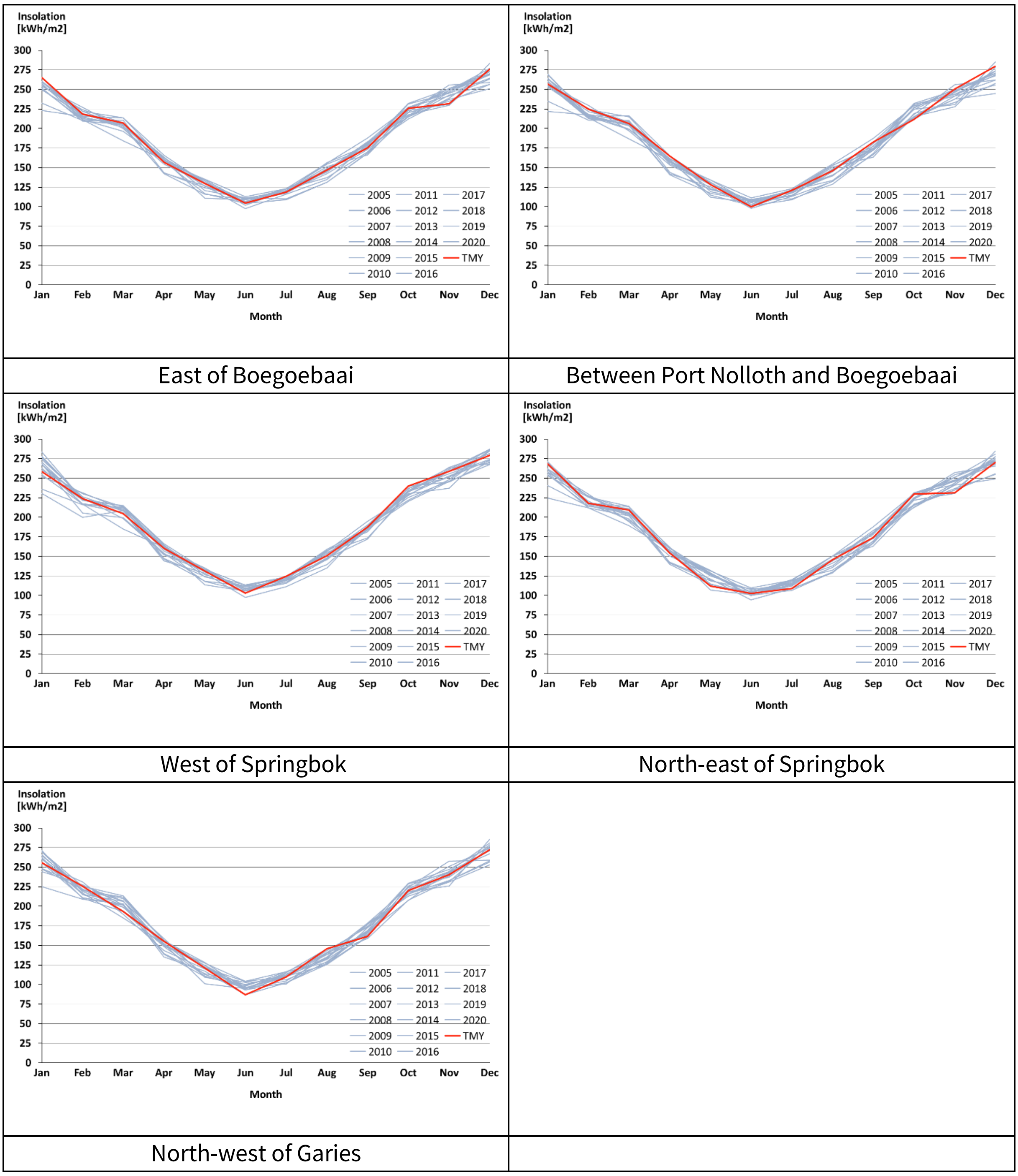
Table 1 : Identified sites GPS coordinates in Boegoebaai

Site no.	Name	Latitude	Longitude	GHI (TMY) (kWh/m2/year)
1	East of Boegoebaai	-28.6989	16.74826	2257
2	Between Port Nolloth and Boegoebaai	-29.027	16.92691	2273
3	West of Springbok	-29.5267	17.22556	2324
4	North-east of Springbok	-29.3648	18.44129	2226
5	North-west of Garies	-30.3968	17.70413	2188

3.3.1.1. Global horizontal irradiance and interannual variability at Boegoebaai sites

Figure *9* shows the monthly GHI variability for the analysed five (5) sites at Boegoebaai location for historical years (2005-2020). The monthly global horizontal insolation trends reveal the seasonality effect with lower irradiance in winter season compared to summer season due to shorter days and lower sun elevation. A high insolation of 270-280 kWh/m2/month and a low insolation of 87-94 kWh/m2/month is observed for Boegoebaai sites. The TMY dataset (red line) used in modelling to predict the PV plant performance overlay on the historical years indicating greater confidence in the modelling outcome.

Figure 9 : Multiple years monthly GHI at each of the 5 sites in Boegoebaai



The interannual variability (defined in clause 3.1.3) for the assessed Boegoebaai sites is provided in Table 2.

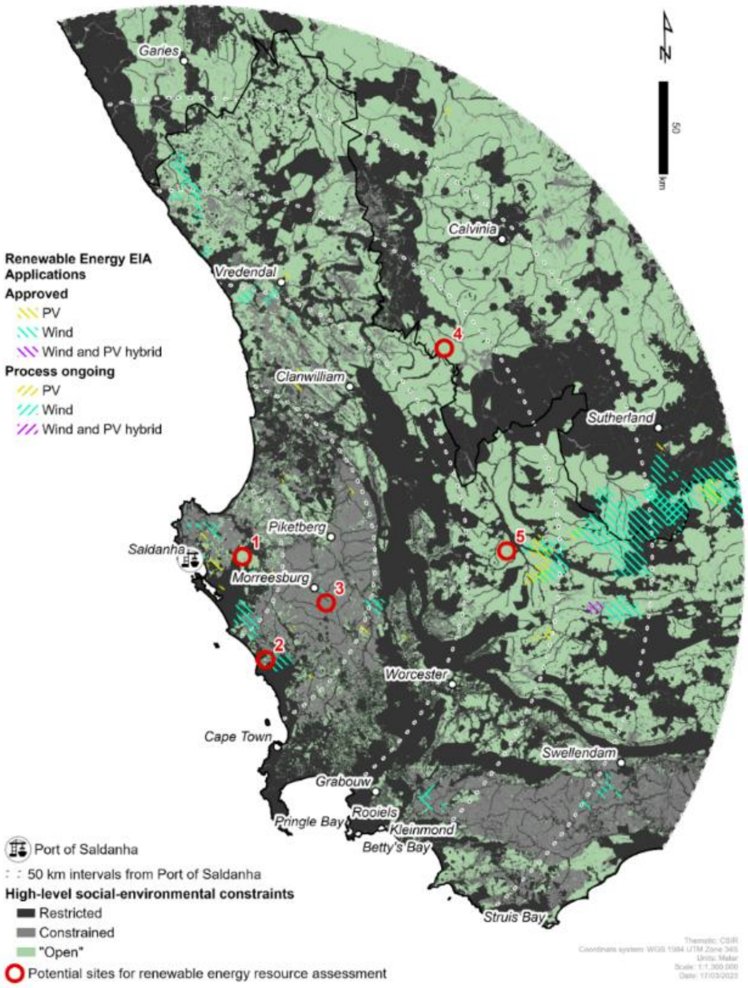
Table 2 : Interannual variability in annual GHI for Boegoebaai sites

Location	Interannual variability [%]
East of Boegoebaai	2.25
Between Port Nolloth and Boegoebaai	2.12
West of Springbok	2.45
North-east of Springbok	2.38
North-west of Garies	2.23

3.3.2. SALDHANHA BAY

Figure 10 shows the identified five (5) sites in the Saldanha Bay as point of departure for solar resource assessments.

Figure 10 : Geographic location of 5 sites at Saldanha Bay with adequate land area for renewable plant development, free from environmental or land use conflicts



Source: own creation, for data sources refer to Appendix: Spacial Data Bilbiography in 'High level environmental constraints' report

The identified sites name, its GPS coordinates and the annual global horizontal irradiance (kWh/m2/year) for Saldanha Bay is given in Table 3. The East of Clanwilliam site records a high insolation of 2177 kWh/m2/year and the North of Cape Town, near Atlantis records low insolation of 1995 kWh/m2/year. The annual GHI at the other four (4) sites compared to East of Clanwilliam site varies by -7.2% (East of Saldanha Bay), -9.2% (North of Cape Town, near Atlantis), -7.6% (Near Morreesburg) and -1.0% (Between Worcester & Sutherland).

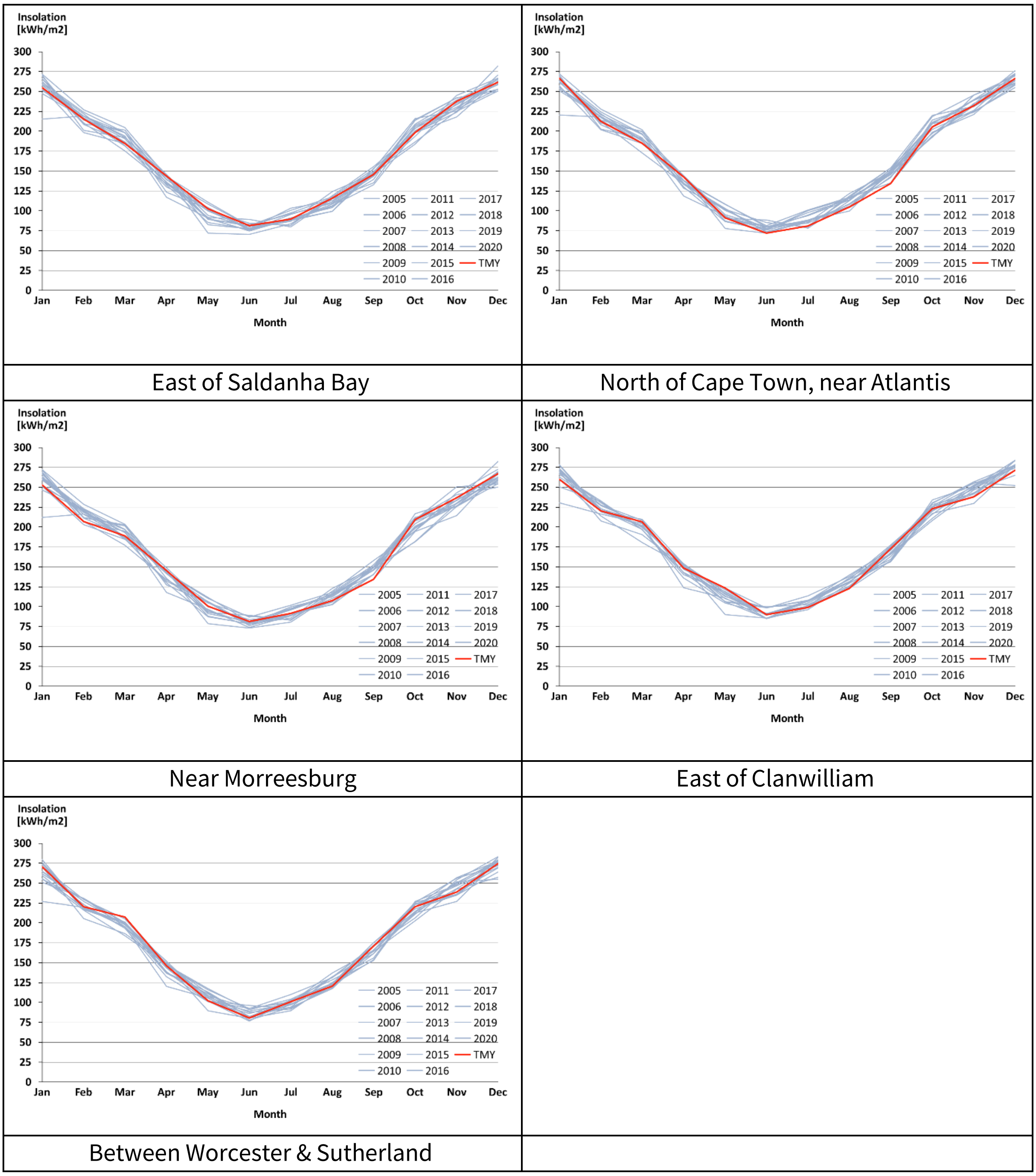
Table 3 : Identified sites GPS coordinates in Saldanha Bay

Site no	Name	Latitude	Longitude	GHI (kWh/m2/year)
1	East of Saldanha Bay	-32.9932	18.24893	2032
2	North of Cape Town, near Atlantis	-33.4990	18.36825	1995
3	Near Morreesburg	-33.2284	18.72773	2024
4	East of Clanwilliam	-31.9965	19.43567	2177
5	Between Worcester & Sutherland	-32.9901	19.78011	2155

3.3.2.2. Global horizontal irradiance and interannual variability at Saldanha bay sites

Figure 11 shows the monthly GHI variability for the analysed five (5) sites at Saldanha Bay for historical years (2005-2020). The monthly global horizontal insolation trend reveals the seasonality effect with lower irradiance in winter season compared to summer season due to shorter days and lower sun elevation. A high insolation of 262-275 kWh/m2/month and a low insolation of 72-90 kWh/m2/month is observed for Saldanha Bay sites. The TMY dataset (red line) used in modelling to predict the PV plant performance overlay on the historical years indicating greater confidence in the modelling outcome.

Figure 11 : Multiple years monthly GHI at each of the 5 sites in Saldanha Bay



The interannual variability (defined in clause 3.1.3) for the assessed Saldanha Bay sites is provided in below Table 4.

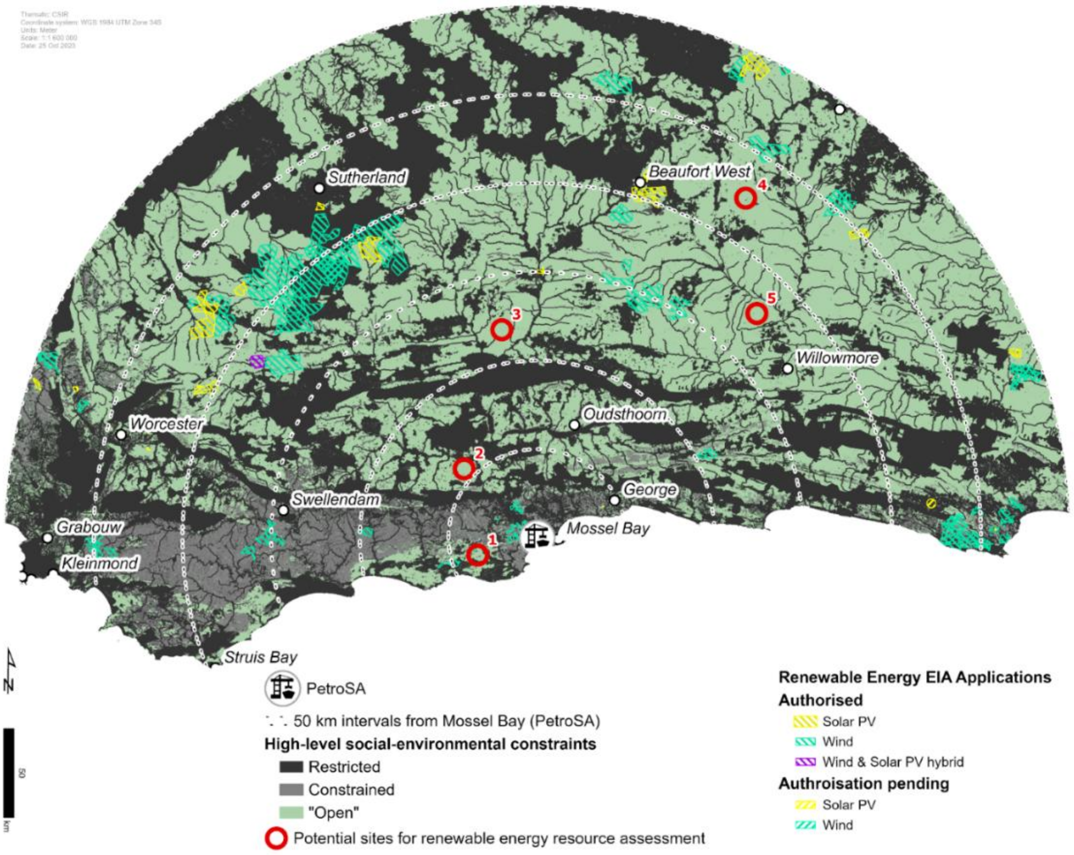
Table 4 : Interannual variability in annual GHI for Saldanha Bay sites

Location	Interannual variability [%]
East of Saldanha Bay	2.32
North of Cape Town, near Atlantis	2.30
Near Morreesburg	2.38
East of Clanwilliam	2.42
Between Worcester & Sutherland	2.27

3.3.3. MOSSEL BAY

Figure 12 shows the identified five (5) sites in the Mossel Bay as point of departure for solar resource assessments.

Figure 12 : Geographic location of 5 sites at Mossel Bay with adequate land area for renewable plant development, free from environmental or land use conflicts



Source: own creation, for data sources refer to Appendix: Spacial Data Bilbiography in 'High level environmental constraints' report

The identified sites name, its GPS coordinates and the annual global horizontal irradiance (kWh/m2/year) for Mossel Bay is given in Table 4. The Leeu Gamka / Prince Albert site records a high insolation of 2130 kWh/m2/year and the Near Albertinia records low insolation of 1765 kWh/m2/year. The annual GHI at the other four (4) sites compared to Leeu Gamka / Prince Albert site varies by -20.6% (Near Albertinia), -7.2% (Near Van Wyksdorp), -6.0% (Beaufort West / Aberdeen) and -7.3% (Willowmore).

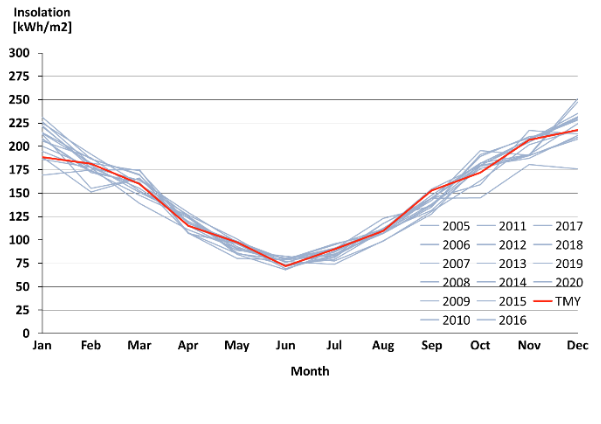
Table 5 : Identified sites GPS coordinates in Mossel Bay

Site no	Name	Latitude	Longitude	GHI (kWh/m2/year)
1	Near Albertinia	-34.2568	21.62363	1765
2	Near Van Wyksdorp	-33.8194	21.53743	1987
3	Leeu Gamka / Prince Albert	-33.1109	21.76026	2130
4	Beaufort West / Aberdeen	-32.425	23.21588	2010
5	Willowmore	-33.0096	23.29772	1985

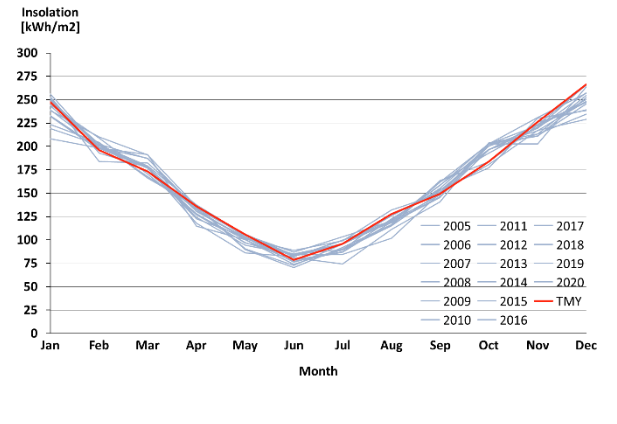
3.3.3.3. Global horizontal irradiance and interannual variability at Mossel bay sites

Figure 13 shows the monthly GHI variability for the analysed five (5) sites at Mossel Bay for historical years (2005-2020). The monthly global horizontal insolation trend reveals the seasonality effect with lower irradiance in winter season compared to summer season due to shorter days and lower sun elevation. A high insolation of 218-269 kWh/m2/month and a low insolation of 72-85 kWh/m2/month is observed for Mossel Bay sites. The TMY dataset (red line) used in modelling to predict the PV plant performance overlay on the historical years indicating greater confidence in the modelling outcome.

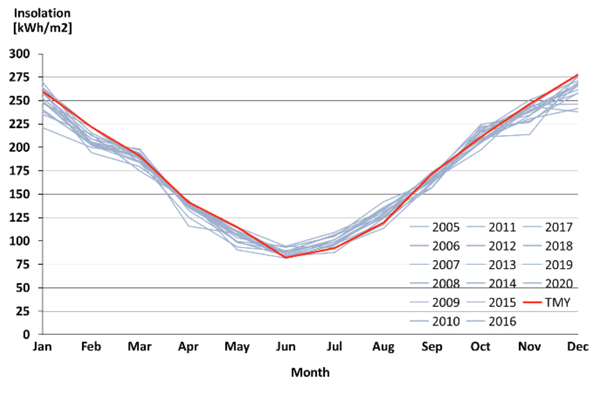
Figure 13 : Multiple years monthly GHI at each of the 5 sites in Mossel Bay



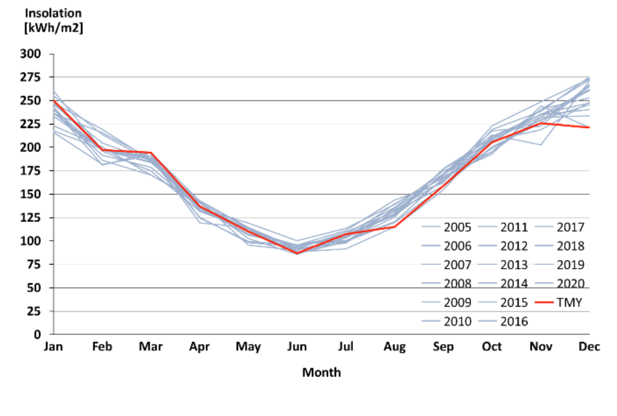
Near Albertinia



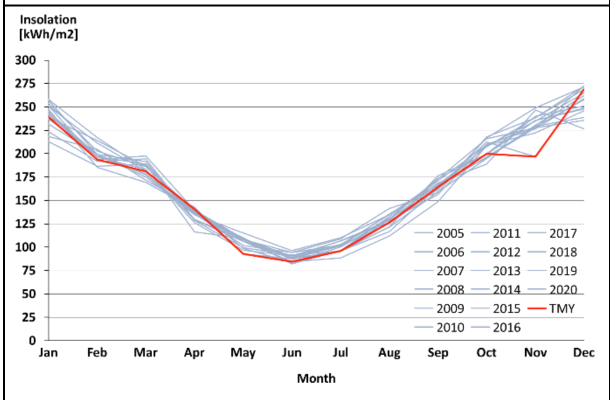
Near Van Wyksdorp



Leeu Gamka / Prince Albert



Beaufort West / Aberdeen



Willowmore

The interannual variability (defined in clause 3.1.3) for the assessed Saldanha Bay sites is provided in below Table 6.

Table 6 : Interannual variability in annual GHI for Mossel Bay sites

Location	Interannual variability [%]
Near Albertinia	2.61
Near Van Wyksdorp	1.88
Leeu Gamka / Prince Albert	2.06
Beaufort West / Aberdeen	2.53
Willowmore	2.33

3.3.4. COEGA

Figure 14 shows the identified five (5) sites in the Coega as point of departure for solar resource assessments.

Figure 14 : Geographic location of 5 sites at Coega with adequate land area for renewable plant development, free from environmental or land use conflicts

Source: own creation, for data sources refer to Appendix: Spacial Data Bilbiography in 'High level environmental constraints' report

The identified sites name, its GPS coordinates and the annual global horizontal irradiance (kWh/m2/year) for Coega is given in Table 7. The Hofmeyr site records a high insolation of 2063 kWh/m2/year and the North of Gqeberha records low insolation of 1734 kWh/m2/year. The annual GHI at the other four (4) sites compared to Hofmeyr site varies by -18.9% (North of Gqeberha), -12.5% (Kleinpoort), -8.0% (Aberdeen) and -2.6% (East of Aberdeen).

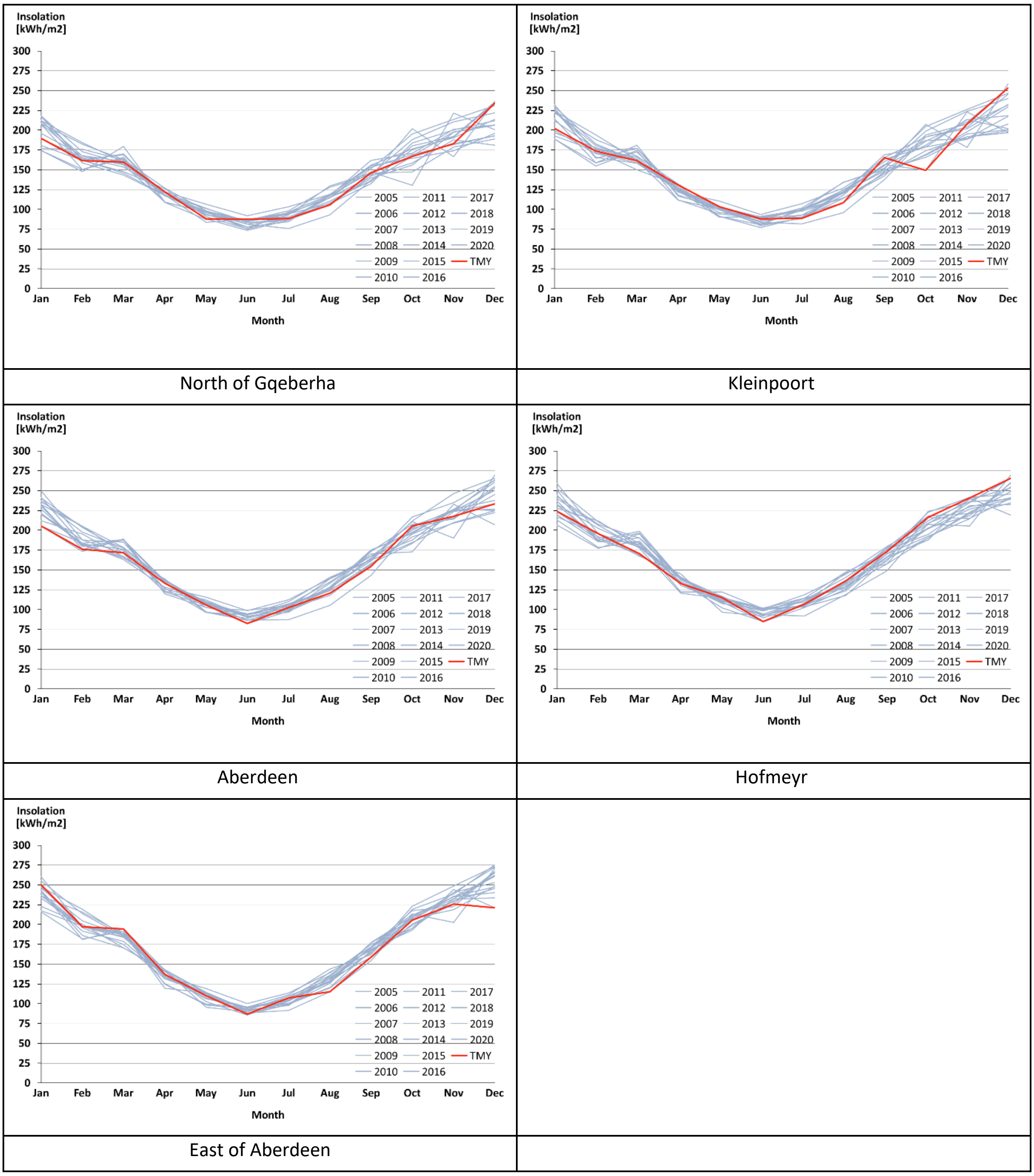
Table 7 : Identified sites GPS coordinates in Coega

Site no	Name	Latitude	Longitude	GHI (kWh/m2/year)
1	North of Gqeberha	-33.5906	25.4833	1734
2	Kleinpoort	-33.3998	24.9339	1834
3	Aberdeen	-32.7274	24.1806	1909
4	Hofmeyr	-31.7535	25.7884	2063
5	East of Aberdeen	-32.4287	23.2242	2010

3.3.4.4. Global horizontal irradiance and interannual variability at Coega sites

Figure 15 shows the monthly GHI variability for the analysed five (5) sites at Coega for historical years (2005-2020). The monthly global horizontal insolation trend reveals the seasonality effect with lower irradiance in winter season compared to summer season due to shorter days and lower sun elevation. A high insolation of 233-266 kWh/m2/month and a low insolation of 83-88 kWh/m2/month is observed for Coega sites. The TMY dataset (red line) used in modelling to predict the PV plant performance overlay on the historical years indicating greater confidence in the modelling outcome.

Figure 15 : Multiple years monthly GHI at each of the 5 sites in Coega



The interannual variability (defined in clause 3.1.3) for the assessed Coega sites is provided in below Table 8.

Table 8 : Interannual variability in annual GHI for Coega sites

Location	Interannual variability [%]
North of Gqeberha	3.48
Kleinpoort	3.65
Aberdeen	2.77
Hofmeyr	2.88
East of Aberdeen	2.53

3.3.5. RICHARDS BAY

Figure 16 shows the identified five (5) sites in the Richards Bay as a point of departure for solar resource assessments.

Figure 16 : Geographic location of 5 sites at Richards Bay with adequate land area for renewable plant development, free from environmental or land use conflicts

Source: own creation, for data sources refer to Appendix: Spacial Data Bilbiography in 'High level environmental constraints' report

The identified sites name, its GPS coordinates and the annual global horizontal irradiance (kWh/m2/year) for Richards Bay is given in Table 9. The Waterbult site records a high insolation of 2004 kWh/m2/year and the Koningskroon records low insolation of 1758 kWh/m2/year. The annual GHI at the other four (4) sites compared to Waterbult site varies by -12.1% (Richards Bay), -12.3% (Koningskroon), -11.0% (Surreyvale) and -8.9% (Kingsley).

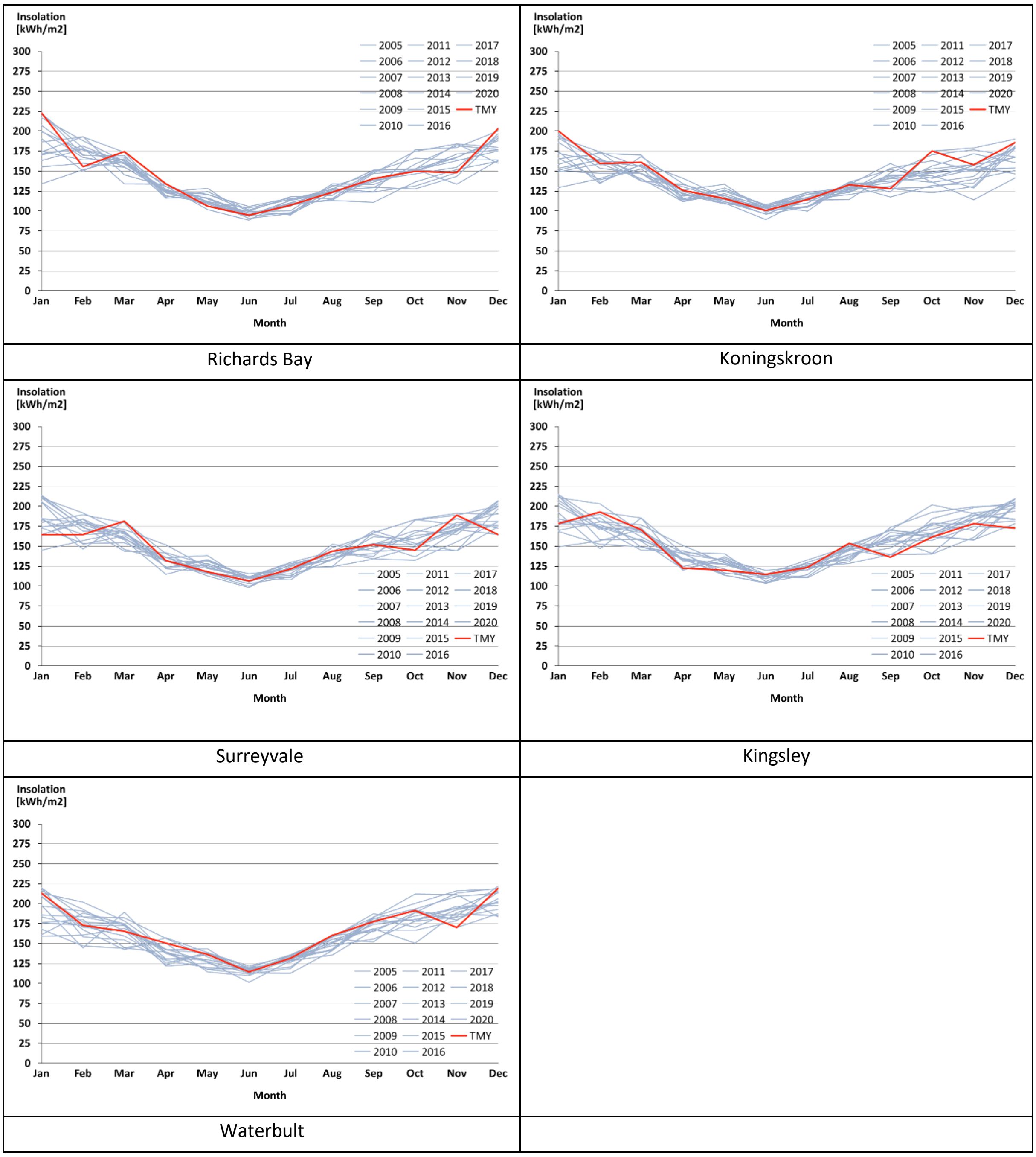
Table 9 : Identified sites GPS coordinates in Richards Bay

Site no	Name	Latitude	Longitude	GHI (kWh/m2/year)
1	Richards Bay	-28.8909	31.8386	1762
2	Koningskroon	-28.4644	31.3505	1758
3	Surreyvale	-28.1022	30.9394	1784
4	Kingsley	-27.9829	30.4942	1825
5	Waterbult	-27.8084	29.4758	2004

3.3.5.5. Global horizontal irradiance and interannual variability at Richards Bay sites

Figure 17 shows the monthly GHI variability for the analysed five (5) sites at Richards Bay for historical years (2005-2020). The monthly global horizontal insolation trend reveals the seasonality effect with lower irradiance in winter season compared to summer season due to shorter days and lower sun elevation. A high insolation of 165-223 kWh/m2/month and a low insolation of 95-106 kWh/m2/month is observed for Richards Bay sites. The TMY dataset (red line) used in modelling to predict the PV plant performance overlay on the historical years indicating greater confidence in the modelling outcome.

Figure 17 : Multiple years monthly GHI at each of the 5 sites in Richards Bay



The interannual variability (defined in clause 3.1.3) for the assessed Richards Bay sites is provided in below Table 10.

Table 10 : Interannual variability in annual GHI for Richards Bay sites

Location	Interannual variability [%]
Richards Bay	3.23
Koningskroon	3.06
Surreyvale	3.33
Kingsley	3.37
Waterbult	3.02

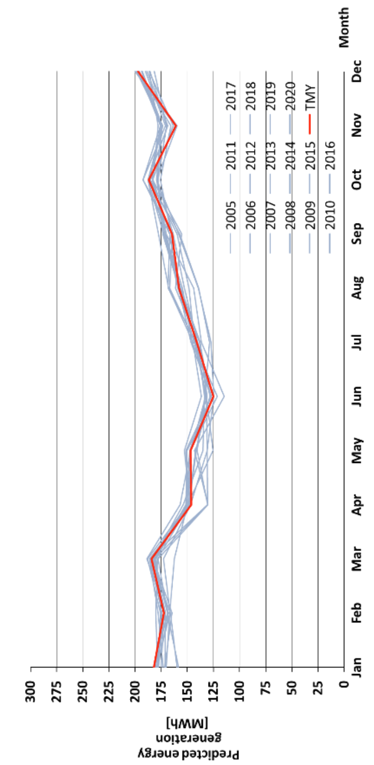
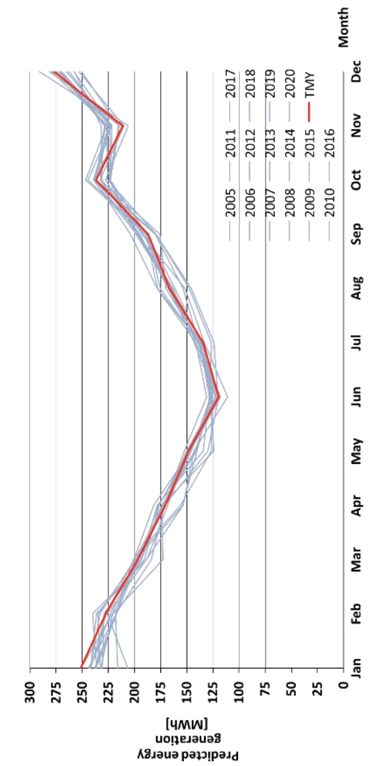
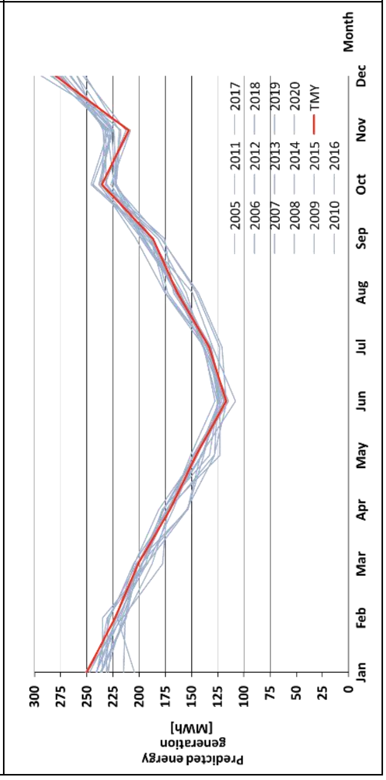
3.4. Modelling Outcome / Predicted AC Energy Generation

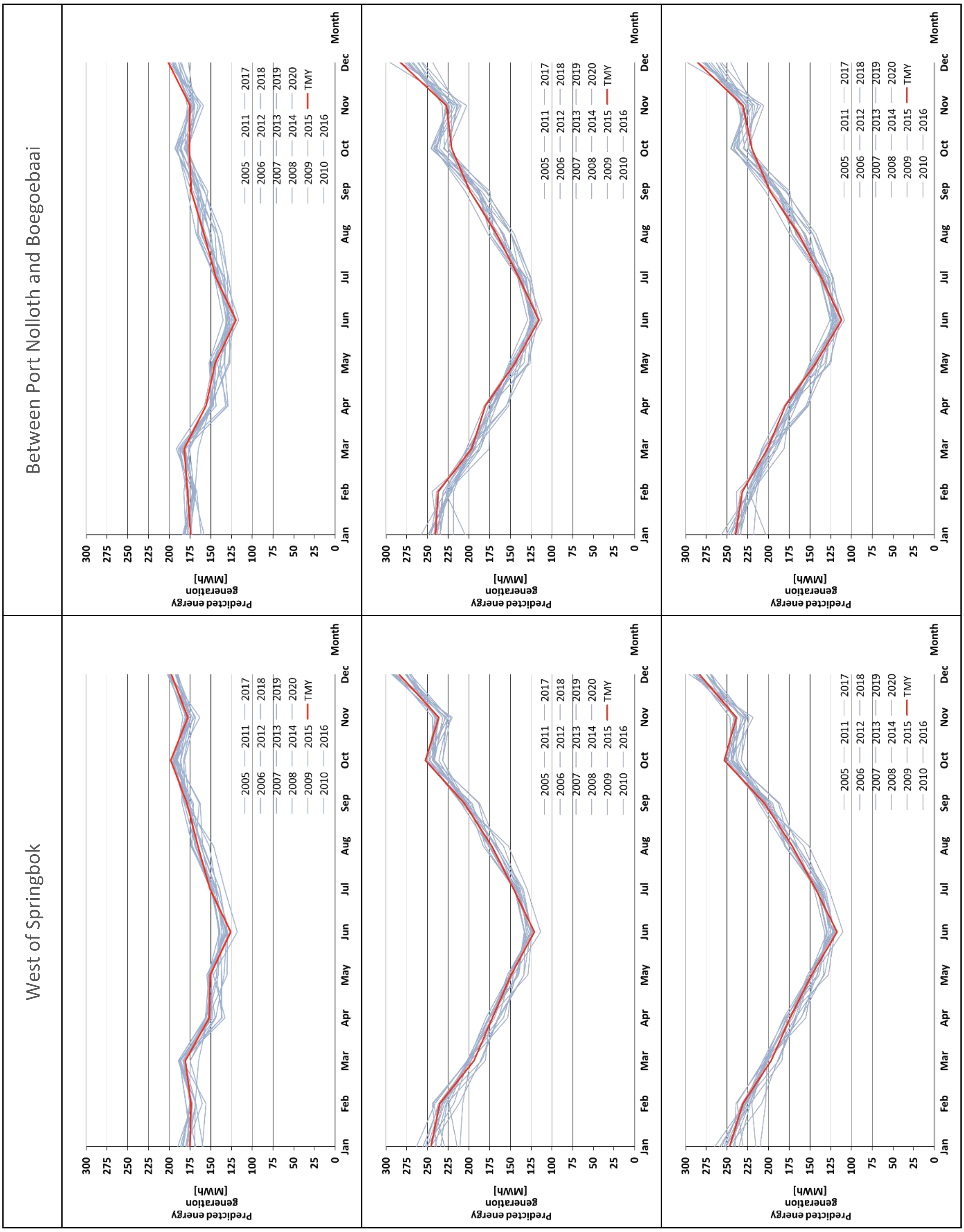
3.4.1. Boegoebaai

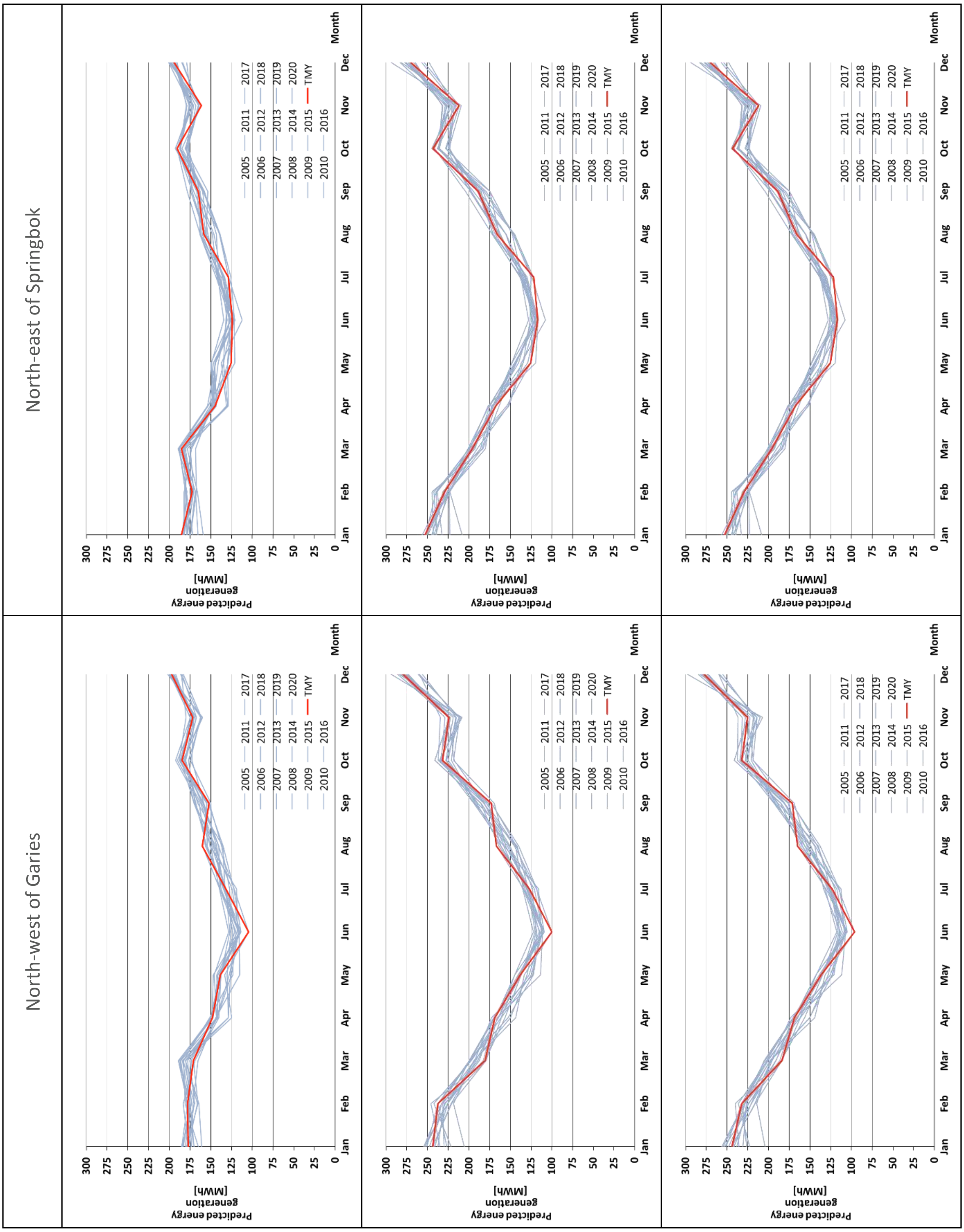
For investment level confidence in prospective solar sites, a measure of the probabilistic likelihood of a certain level of energy generation being exceeded is known as a P-value and is typically expressed at reference points e.g., P50, P90 and P95. These values are the statistical likelihood of energy generation levels for a particular site exceeding 50%, 90% and 95% of the time over a defined period respectively (typically measured and reported annually). TMY based solar irradiance data set used in the modelling represents the most likely conditions for a site i.e., the P50 scenario (for a normal distribution). Hence, at this stage, the predicted energy generation data presented in this report can be P50 level of confidence.

Figure *18* and Tables in Appendix A shows the predicted monthly AC energy generation for the five (5) sites in Boegoebaai for fixed tilt and single axis tracker without and with backtracking plants having a GCR of 37.8%, 29.2% and 37.8%, respectively. This is shown for the historical period of 2005-2020 and TMY weather files. The bluish lines indicate individual years, and the red line indicates the TMY blended across multiple years. The seasonal variability is greater for the single axis tracking system without or with backtracking compared to the fixed tilt system. The monthly production is higher for the single axis tracking system relative to fixed tilt system, except during winter months. The modelled result presented in bold red line for a 1 MW DC PV plant overlap historical years predictions, indicating greater confidence in the predicted energy yield using TMY data.

Figure 18: Monthly predicted AC energy generation under typical annual weather variation (2005-2020) in the Boegoebaai region

Site	1 MWdc fixed tilt plant with GCR 37.8%	1 MWdc single axis tracker plant WoBT with GCR 29.2%	1 MWdc single axis tracker plant WBT with GCR 37.8%
East of Boegoebaai			


West of Springbok
Between Port Nolloth and Boegoebaai
Predicted energy generation [MWh]
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 TMY



North-west of Garies
North-east of Springbok
Predicted energy generation [MWh]
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 TMY

Table 11, Table 12 and Table 15 show the summary statistics of PVSyst simulations for a fixed tilt and single axis tracker WoBT and single axis tracker WBT plants having a GCR of 37.8%, 29.2% and 37.8% respectively. The provided summary statistics for a representative 1 MWdc plant capacity is based on an hourly temporal resolution using TMY weather file. The statistics include GHI, POA, resulting expected annual AC energy production and capacity factor. The capacity factor is calculated in accordance with IEC TS 61724-3:2016 for Photovoltaic system performance – Part 3: Energy evaluation method is a metric commonly applied to power plants and facilitates comparison between PV and other power plants.

Table 12 and

Table 13 shows the single axis tracker WoBT or WBT generating approximately 15 - 16% more energy than the fixed-tilt system for all the locations. The single axis tracking system without or with backtracking shows a clear advantage in terms of specific energy (kWh/kWp) due to the orientation of the PV modules relative to the sun for most of the period. However, the single axis tracking system comes with additional capital expense and maintenance costs. This should be carefully considered when establishing an investment case. Based on the available non-constrained land and the land preparation associated costs, the single axis tracker without or with back tracking technology shall be adopted.

Table 11 : Summary statistics of Boegoebaai location (fixed-tilt, GCR = 37.8%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
East of Boegoebaai	2257	2507	1966	22%
Between Port Nolloth and Boegoebaai	2273	2531	1983	23%
West of Springbok	2324	2604	2027	23%
North-east of Springbok	2226	2475	1936	22%
North-west of Garies	2188	2446	1914	22%

Table 12: Summary statistics of Boegoebaai locations (Single axis WoBT, GCR = 29.2%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
East of Boegoebaai	2257	3043	2328	27%
Between Port Nolloth and Boegoebaai	2273	3069	2351	27%
West of Springbok	2324	3184	2415	28%
North-east of Springbok	2226	3025	2292	26%
North-west of Garies	2188	2959	2271	26%

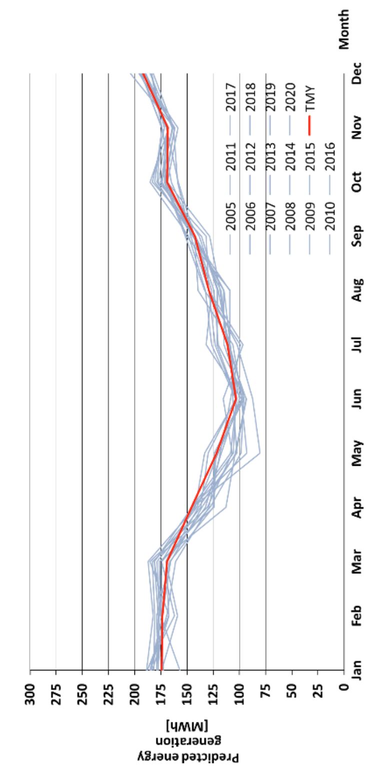
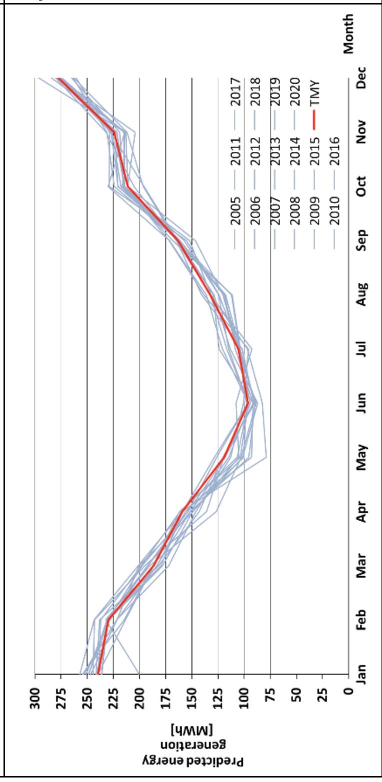
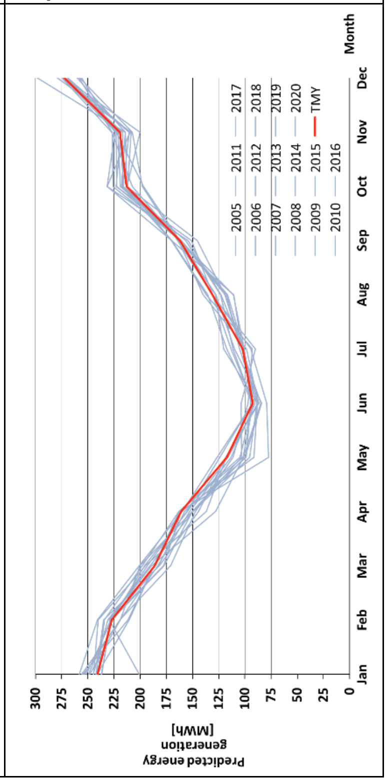
Table 13 : Summary statistics of Boegoebaai location (Single axis WBT, GCR = 37.8%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
East of Boegoebaai	2257	2942	2317	27%
Between Port Nolloth and Boegoebaai	2273	2975	2342	27%
West of Springbok	2324	3078	2410	28%
North-east of Springbok	2226	2918	2287	26%
North-west of Garies	2188	2868	2258	26%

3.4.2. Saldanha Bay

Figure 19 and Tables in Appendix A shows the predicted monthly AC energy generation for the five (5) sites in Saldanha Bay for fixed tilt and single axis tracker without and with backtracking plants having a GCR of 34.3%, 26.4% and 34.3%, respectively. This is shown for the historical period of 2005-2020 and TMY weather files. The bluish lines indicate individual years, and the red line indicates the TMY blended across multiple years. The seasonal variability is greater for the single axis tracking system without or with backtracking compared to the fixed tilt system. The monthly production is higher for the single axis tracking system relative to fixed tilt system, except during winter months. The modelled result presented in bold red line for a 1 MW DC PV plant overlap historical years predictions, indicating greater confidence in the predicted energy yield using TMY data.

Figure 19: Monthly predicted AC energy generation under typical annual weather variation (2005-2020) in the Saldanha Bay Region

Site	1 MWdc fixed tilt plant with GCR 34.3%	1 MWdc single axis tracker plant WoBT with GCR 26.4%	1 MWdc single axis tracker plant WBT with GCR 34.3%
East of Saldanha Bay			

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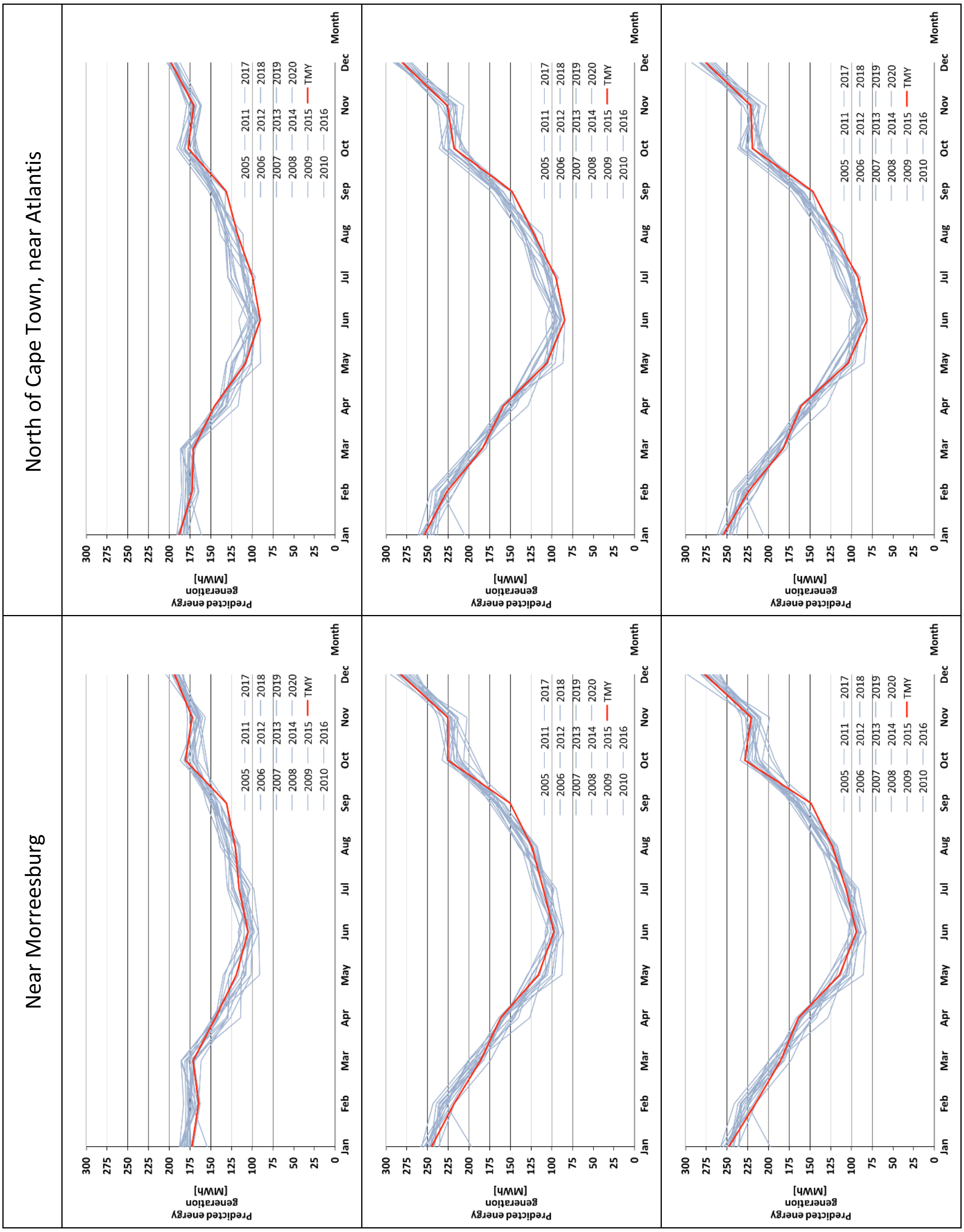
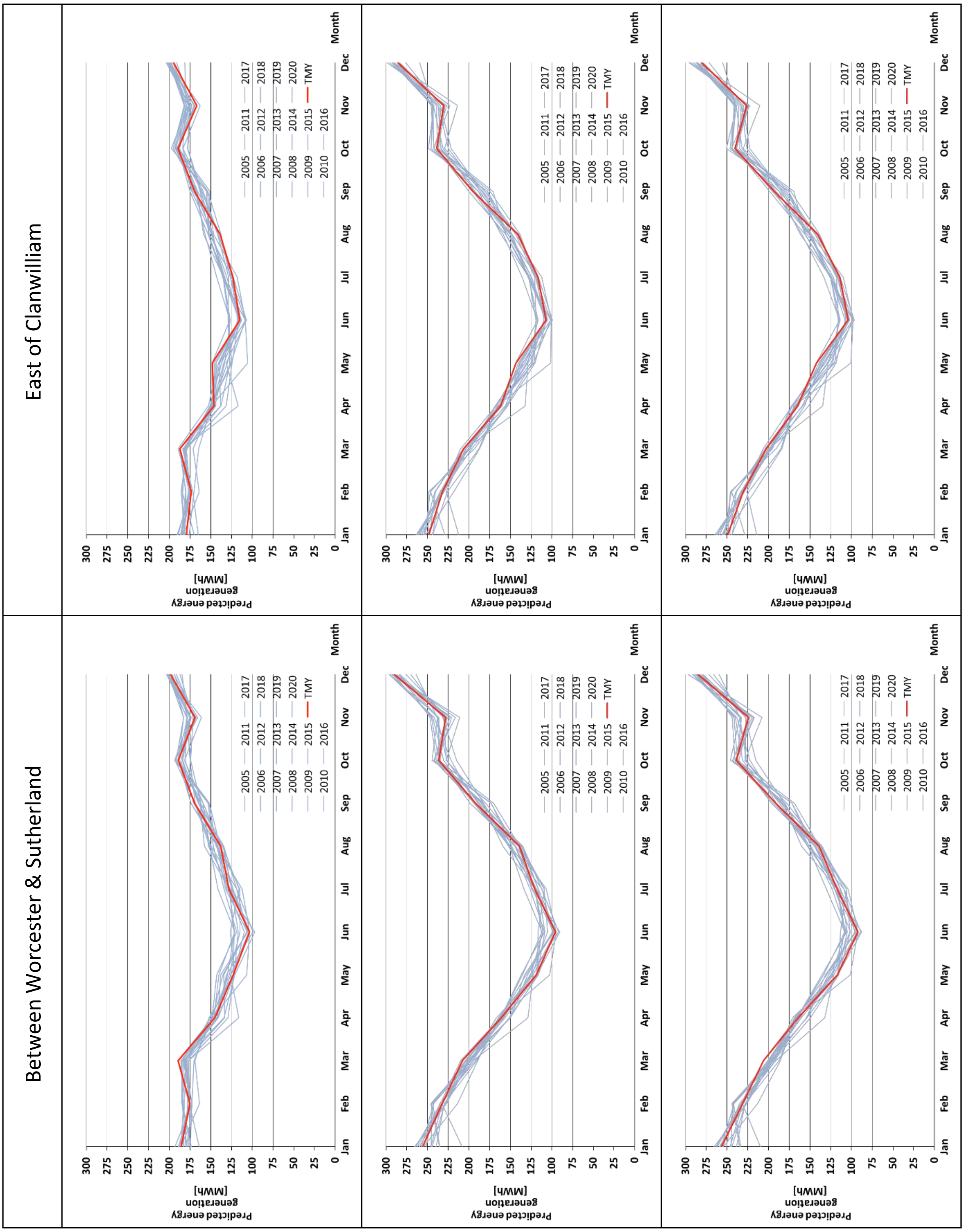


North of Cape Town, near Atlantis
Near Morreesburg
Predicted energy generation [MWh]
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 TMY



Between Worcester & Sutherland
East of Clanwilliam
Predicted energy generation [MWh]
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 25 50 75 100 125 150 175 200 225 250 275 300
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 TMY

Table 14, Table 15 and Table 16 show the summary statistics of PVSyst simulations for a fixed tilt and single axis tracker WoBT and single axis tracker WBT plants having a GCR of 34.3%, 26.4% and 34.3% respectively. The provided summary statistics for a representative 1 MWdc plant capacity is based on an hourly temporal resolution using TMY weather file. The statistics include GHI, POA, resulting expected annual AC energy production and capacity factor. The capacity factor is calculated in accordance with IEC TS 61724-3:2016 for Photovoltaic system performance – Part 3: Energy evaluation method is a metric commonly applied to power plants and facilitates comparison between PV and other power plants.

Table 15 and Table 16 shows the single axis tracker WoBT or WBT generating approximately 15 - 16% more energy than the fixed-tilt system for all the locations. The single axis tracking system without or with backtracking shows a clear advantage in terms of specific energy (kWh/kWp) due to the orientation of the PV modules relative to the sun for most of the period. However, the single axis tracking system comes with additional capital expense and maintenance costs. This should be carefully considered when establishing an investment case. Based on the available non-constrained land and the land preparation associated costs, the single axis tracker without or with back tracking technology shall be adopted.

Table 14: Summary statistics of Saldanha Bay sites (fixed-tilt, GCR = 34.3%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
East of Saldanha Bay	2032	2287	1800	21%
North of Cape Town, near Atlantis	1995	2227	1770	2%
Near Morreesburg	2024	2277	1792	21%
East of Clanwilliam	2177	2464	1932	22%
Between Worcester & Sutherland	2155	2445	1914	22%

Table 15: Summary statistics of Saldanha Bay sites (Single axis WoBT, GCR = 26.4%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
East of Saldanha Bay	2032	2780	2145	25%
North of Cape Town, near Atlantis	1995	2705	2103	24%
Near Morreesburg	2024	2788	2143	25%
East of Clanwilliam	2177	2998	2308	26%
Between Worcester & Sutherland	2155	2985	2279	26%

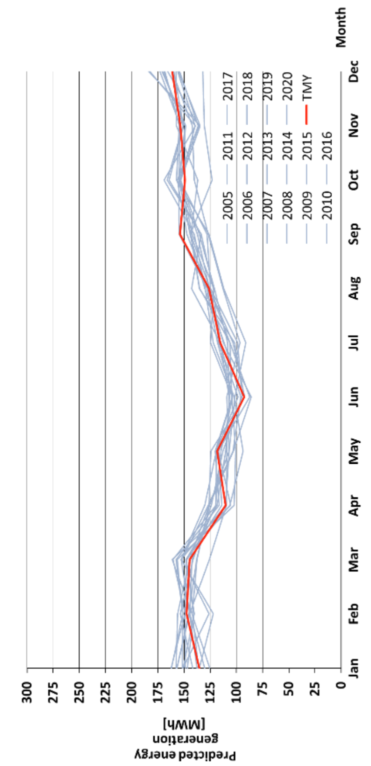
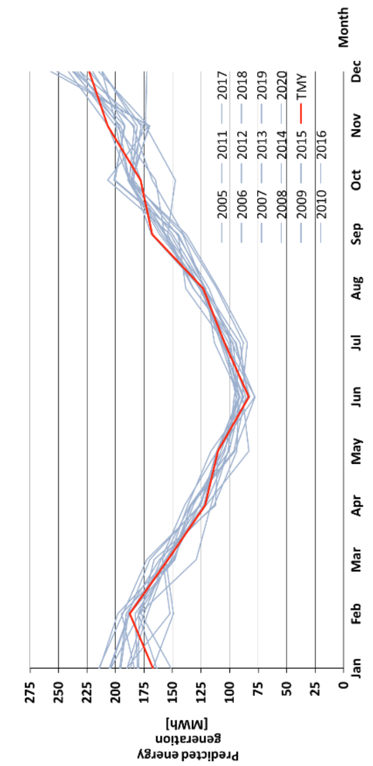
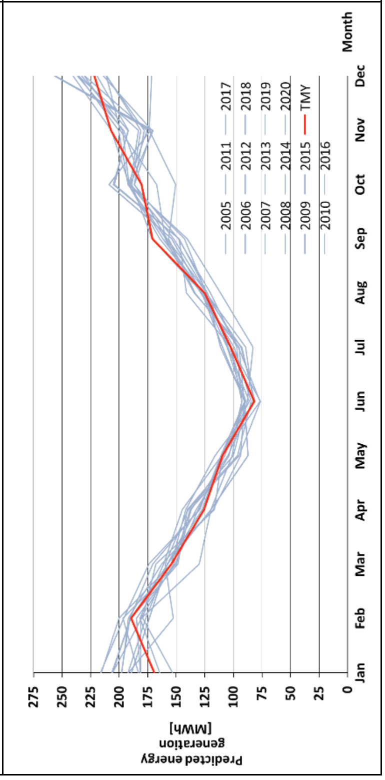
Table 16 : Summary statistics of Saldanha Bay sites (Single axis WBT, GCR = 34.3%)

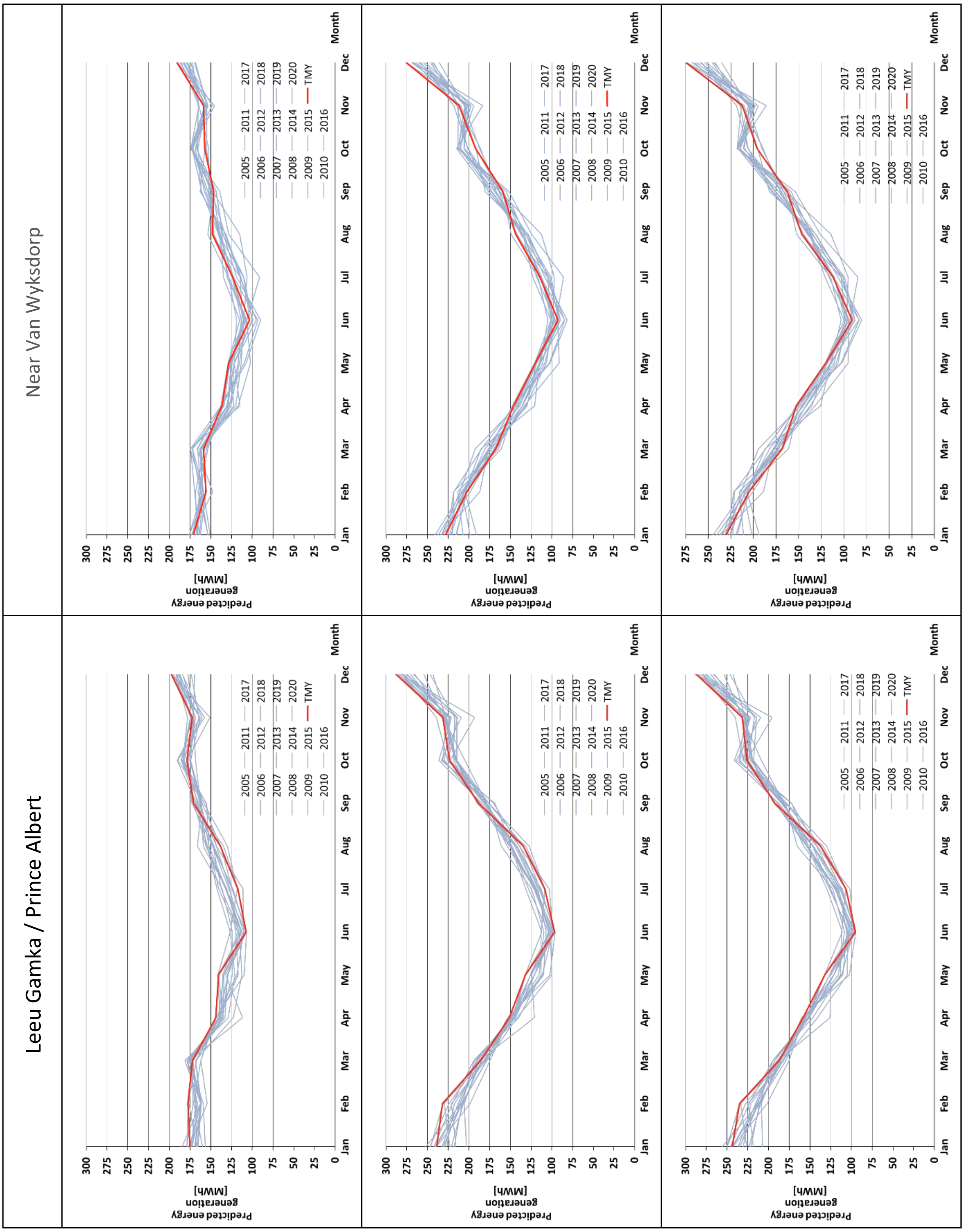
Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
East of Saldanha Bay	2032	2697	2126	24%
North of Cape Town, near Atlantis	1995	2626	2083	24%
Near Morreesburg	2024	2698	2126	24%
East of Clanwilliam	2177	2907	2290	26%
Between Worcester & Sutherland	2155	2888	2265	26%

3.4.3. Mossel Bay

Figure 20 and Tables in Appendix A shows the predicted monthly AC energy generation for the five (5) sites in Saldanha Bay for fixed tilt and single axis tracker without and with backtracking plants having a GCR of 34.3%, 30.4% and 34.3%, respectively. This is shown for the historical period of 2005-2020 and TMY weather files. The bluish lines indicate individual years, and the red line indicates the TMY blended across multiple years. The seasonal variability is greater for the single axis tracking system without or with backtracking compared to the fixed tilt system. The monthly production is higher for the single axis tracking system relative to fixed tilt system, except during winter months. The modelled result presented in bold red line for a 1 MW DC PV plant overlap historical years predictions, indicating greater confidence in the predicted energy yield using TMY data.

Figure 20: Monthly predicted AC energy generation under typical annual weather variation (2005-2020) in the Mossel Bay region

Site	1 MWdc fixed tilt plant with GCR 34.3%	1 MWdc single axis tracker plant WoBT with GCR 30.4%	1 MWdc single axis tracker plant WBT with GCR 34.3%
Near Albertinia			


Leeu Gamka / Prince Albert
Near Van Wyksdorp
Predicted energy generation [MWh]
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 TMY

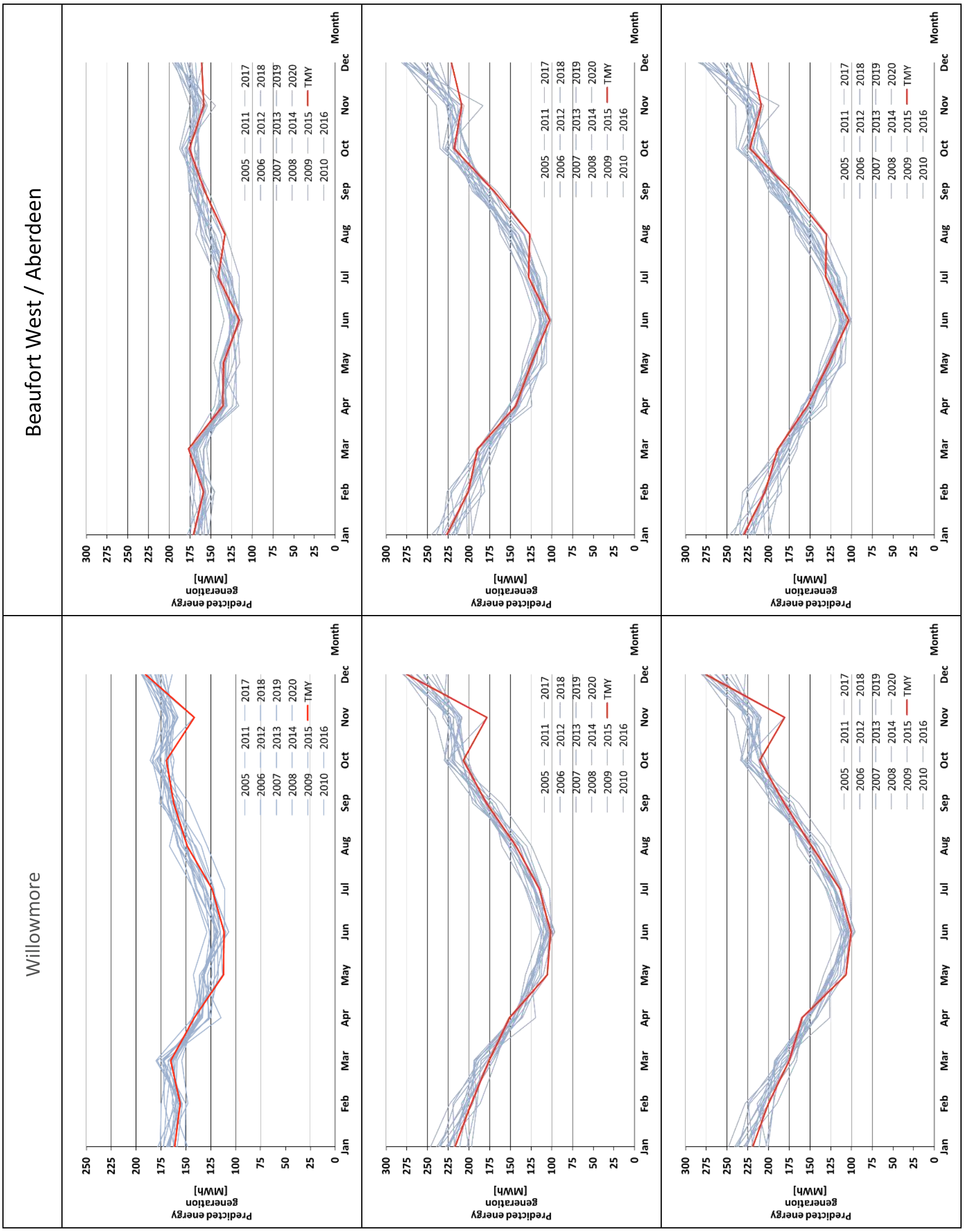

Beaufort West / Aberdeen
Willowmore

Table 17, Table 18 and Table 19 show the summary statistics of PVSyst simulations for a fixed tilt and single axis tracker WoBT and single axis tracker WBT plants having a GCR of 34.3%, 30.4% and 34.3% respectively. The provided summary statistics for a representative 1 MWdc plant capacity is based on an hourly temporal resolution using TMY weather file. The statistics include GHI, POA, resulting expected annual AC energy production and capacity factor. The capacity factor is calculated in accordance with IEC TS 61724-3:2016 for Photovoltaic system performance – Part 3: Energy evaluation method is a metric commonly applied to power plants and facilitates comparison between PV and other power plants.

Table 18 and Table 19 shows the single axis tracker WoBT or WBT generating approximately 13 - 17% more energy than the fixed-tilt system for all the locations. The single axis tracking system without or with backtracking shows a clear advantage in terms of specific energy (kWh/kWp) due to the orientation of the PV modules relative to the sun for most of the period. However, the single axis tracking system comes with additional capital expense and maintenance costs. This should be carefully considered when establishing an investment case. Based on the available non-constrained land and the land preparation associated costs, the single axis tracker without or with back tracking technology shall be adopted.

Table 17: Summary statistics of Mossel Bay sites (fixed-tilt, GCR = 34.3%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
Near Albertinia	1765	2023	1609	18%
Near Van Wyksdorp	1987	2274	1779	20%
Leeu Gamka / Prince Albert	2130	2420	1892	22%
Beaufort West / Aberdeen	2010	2303	1818	21%
Willowmore	1985	2271	1785	20%

Table 18: Summary statistics of Mossel Bay sites (Single axis WoBT, GCR = 30.4%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
Near Albertinia	1765	2332	1828	21%
Near Van Wyksdorp	1987	2710	2054	23%
Leeu Gamka / Prince Albert	2130	2940	2211	25%
Beaufort West / Aberdeen	2010	2727	2060	24%
Willowmore	1985	2705	2045	23%

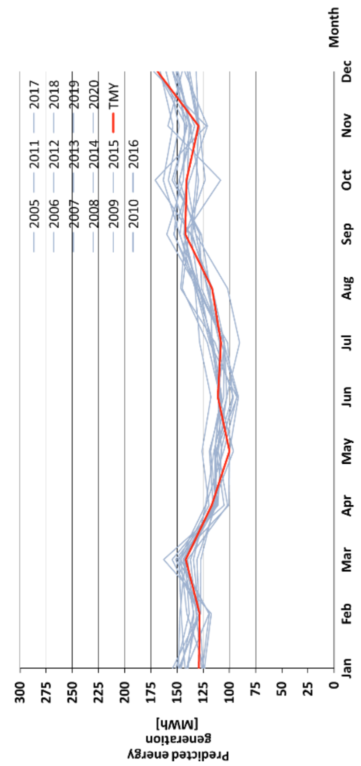
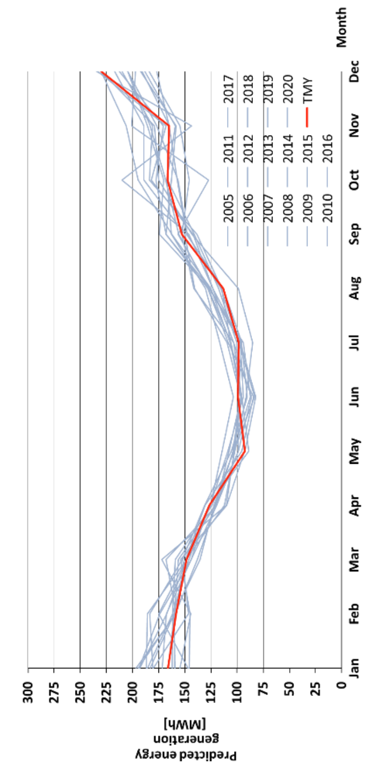
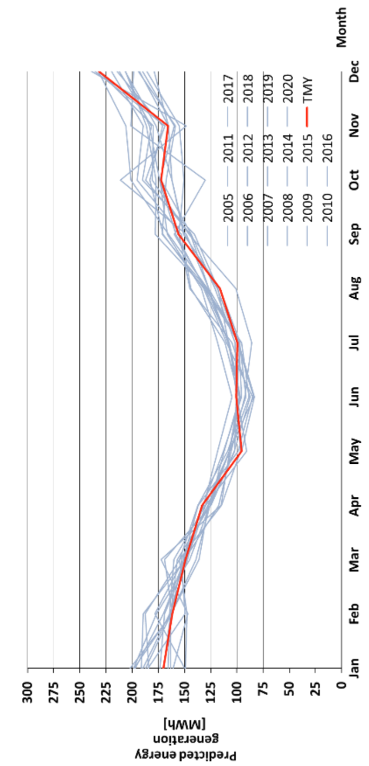
Table 19 : Summary statistics of Mossel Bay sites (Single axis WBT, GCR = 34.3%)

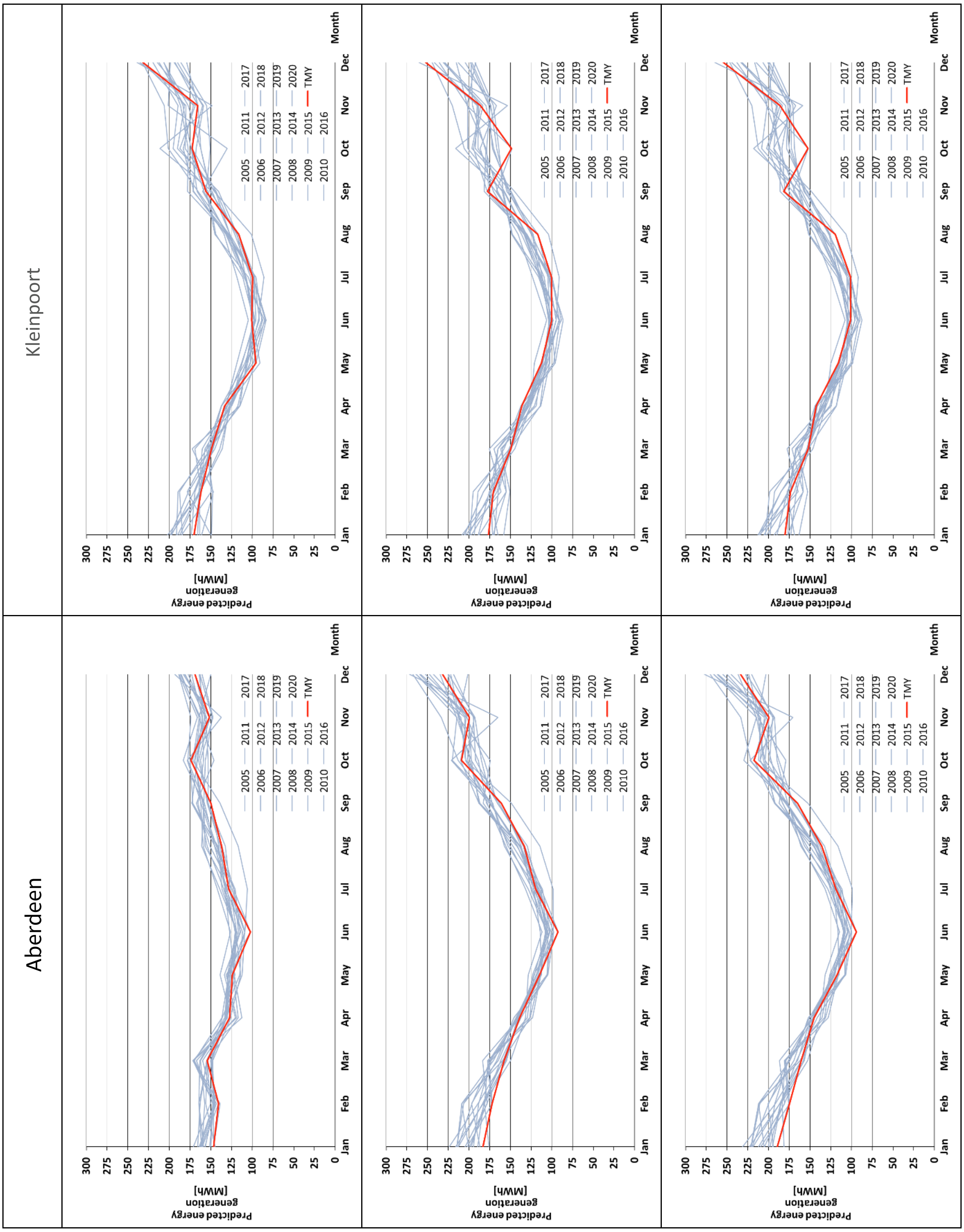
Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
Near Albertinia	1765	2629	1839	21%
Near Van Wyksdorp	1987	2626	2072	24%
Leeu Gamka / Prince Albert	2130	2843	2233	25%
Beaufort West / Aberdeen	2010	2644	2093	24%
Willowmore	1985	2618	2071	24%

3.4.4. Coega

Figure 21 and Tables in Appendix A shows the predicted monthly AC energy generation for the five (5) sites in Saldanha Bay for fixed tilt and single axis tracker without and with backtracking plants having a GCR of 37.8%, 34.3% and 37.8%, respectively. This is shown for the historical period of 2005-2020 and TMY weather files. The bluish lines indicate individual years, and the red line indicates the TMY blended across multiple years. The seasonal variability is greater for the single axis tracking system without or with backtracking compared to the fixed tilt system. The monthly production is higher for the single axis tracking system relative to fixed tilt system, except during winter months. The modelled result presented in bold red line for a 1 MW DC PV plant overlap historical years predictions, indicating greater confidence in the predicted energy yield using TMY data.

Figure 21 **Monthly predicted AC energy generation under typical annual weather variation (2005-2020) in the Coega Bay region**

Site	1 MWdc fixed tilt plant with GCR 37.8%	1 MWdc single axis tracker plant WoBT with GCR 34.3%	1 MWdc single axis tracker plant WBT with GCR 37.8%
North of Gqeberha			



Aberdeen
Kleinpoort
Predicted energy generation [MWh]
Month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
TMY

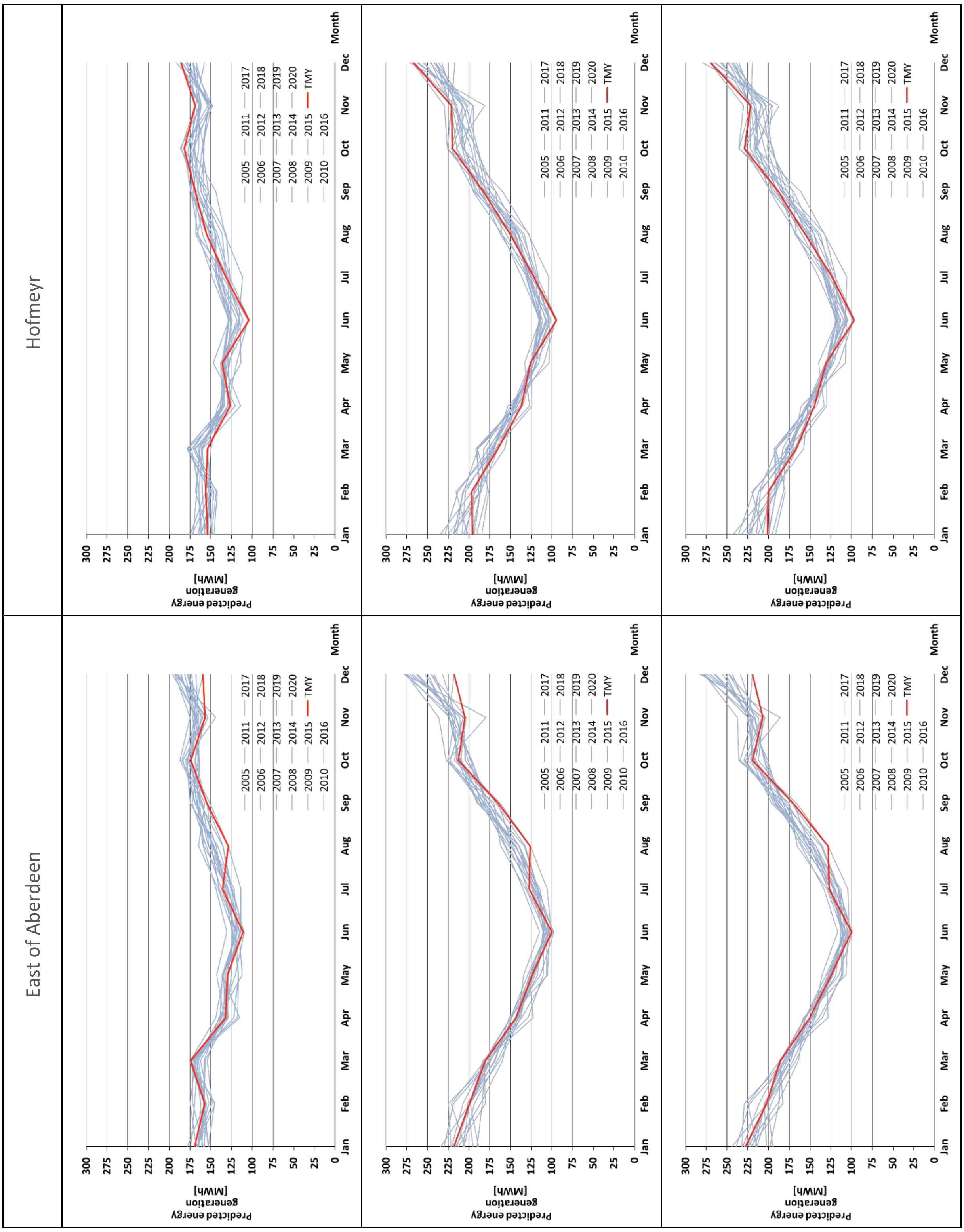

East of Aberdeen
Hofmeyr
Predicted energy generation [MWh]
Month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
TMY

Table 20, Table 21 and Table 22 show the summary statistics of PVSyst simulations for a fixed tilt and single axis tracker WoBT and single axis tracker WBT plants having a GCR of 37.8%, 34.3% and 37.8% respectively. The provided summary statistics for a representative 1 MWdc plant capacity is based on an hourly temporal resolution using TMY weather file. The statistics include GHI, POA, resulting expected annual AC energy production and capacity factor. The capacity factor is calculated in accordance with IEC TS 61724-3:2016 for Photovoltaic system performance – Part 3: Energy evaluation method is a metric commonly applied to power plants and facilitates comparison between PV and other power plants.

Table 21 and Table 22 shows the single axis tracker WoBT or WBT generating approximately 11 - 14% more energy than the fixed-tilt system for all the locations. The single axis tracking system without or with backtracking shows a clear advantage in terms of specific energy (kWh/kWp) due to the orientation of the PV modules relative to the sun for most of the period. However, the single axis tracking system comes with additional capital expense and maintenance costs. This should be carefully considered when establishing an investment case. Based on the available non-constrained land and the land preparation associated costs, the single axis tracker without or with back tracking technology shall be adopted.

Table 20: Summary statistics of Coega sites (fixed-tilt, GCR = 37.8%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
North of Gqeberha	1734	1985	1534	18%
Kleinpoort	1834	2103	1627	19%
Aberdeen	1909	2192	1705	19%
Hofmeyr	2063	2343	1823	21%
East of Aberdeen	2010	2303	1784	20%

Table 21: Summary statistics of Coega sites (Single axis WoBT, GCR = 34.3%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
North of Gqeberha	1734	2292	1718	20%
Kleinpoort	1834	2439	1827	21%
Aberdeen	1909	2553	1913	22%
Hofmeyr	2063	2795	2077	24%
East of Aberdeen	2010	2727	2018	23%

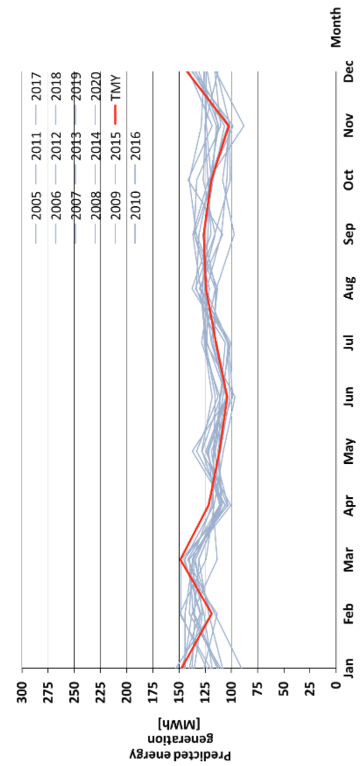
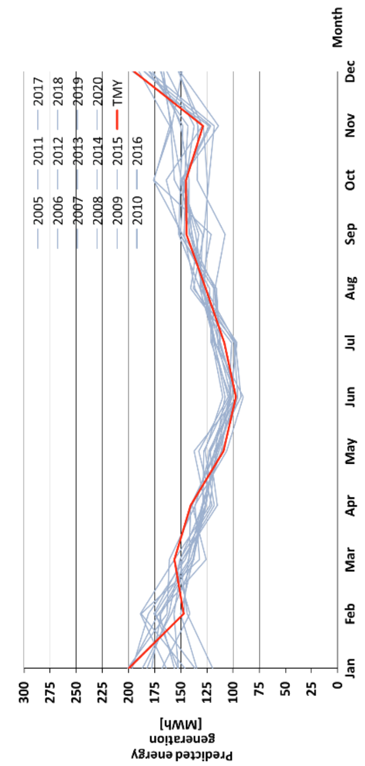
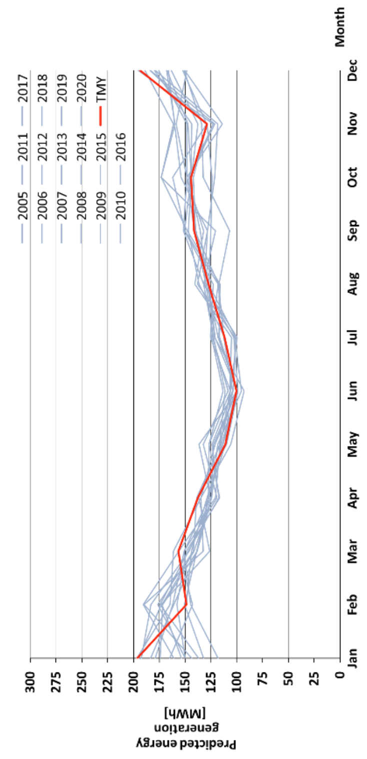
Table 22 : Summary statistics of Coega sites (Single axis WBT, GCR = 37.8%)

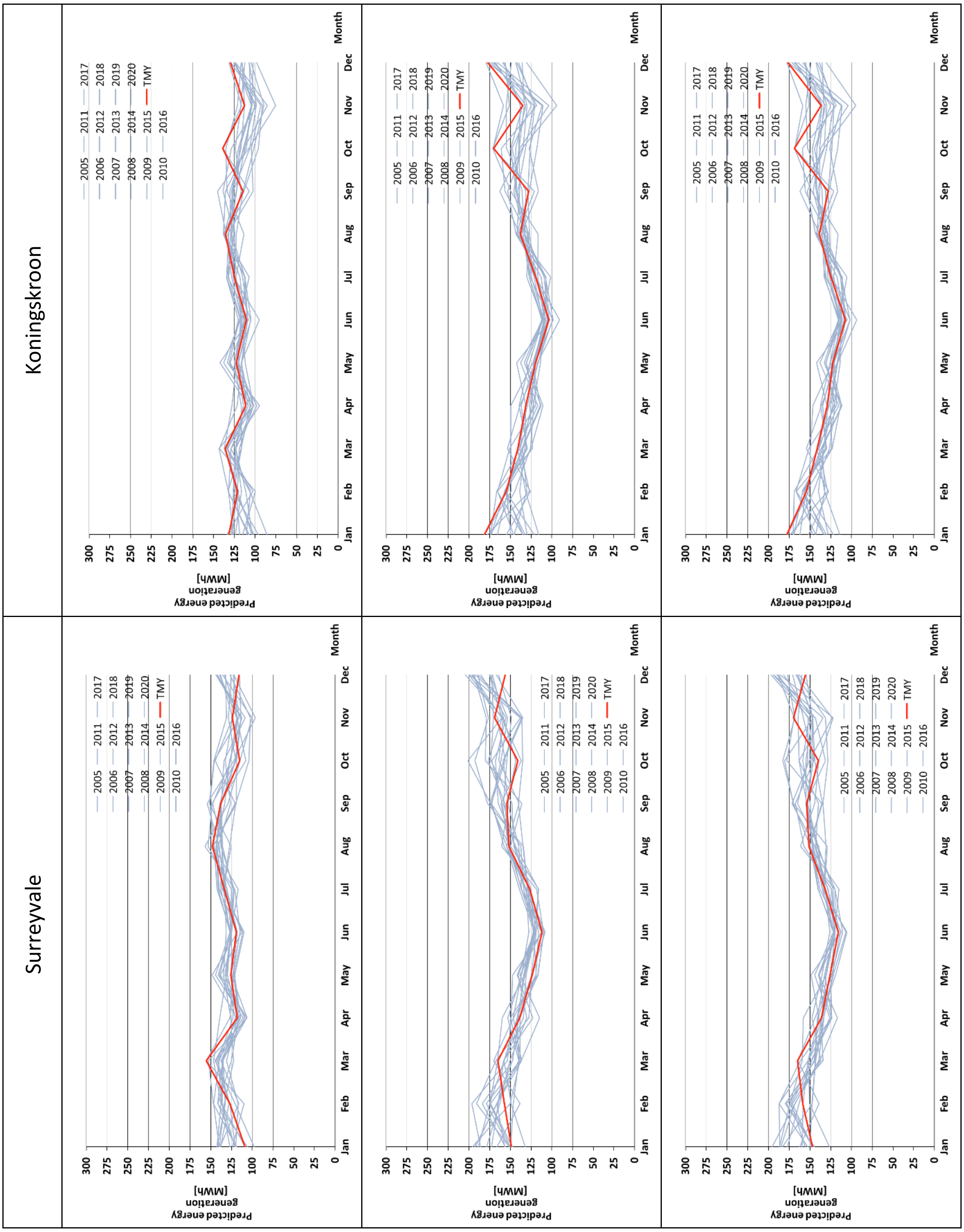
Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
North of Gqeberha	1734	2223	1753	20%
Kleinpoort	1834	2362	1861	21%
Aberdeen	1909	2473	1952	22%
Hofmeyr	2063	2699	2128	24%
East of Aberdeen	2010	2630	2061	24%

3.4.5. Richards Bay

Figure 22 and Tables in Appendix A shows the predicted monthly AC energy generation for the five (5) sites in Richards Bay for fixed tilt and single axis tracker without and with backtracking plants having a GCR of 45.7%, 35.9% and 45.7%, respectively. This is shown for the historical period of 2005-2020 and TMY weather files. The bluish lines indicate individual years, and the red line indicates the TMY blended across multiple years. The seasonal variability is greater for the single axis tracking system without or with backtracking compared to the fixed tilt system. The monthly production is higher for the single axis tracking system relative to fixed tilt system, except during winter months. The modelled result presented in bold red line for a 1 MW DC PV plant overlap historical years predictions, indicating greater confidence in the predicted energy yield using TMY data.

Figure 22: Monthly predicted AC energy generation under typical annual weather variation (2005-2020) in the Richards Bay region

Site	1 MWdc fixed tilt plant with GCR 45.7%	1 MWdc single axis tracker plant WoBT with GCR 35.9%	1 MWdc single axis tracker plant WBT with GCR 45.7%
Richards Bay			



Surreyvale
Koningskroon
Predicted energy generation [MWh]
Month
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 TMY

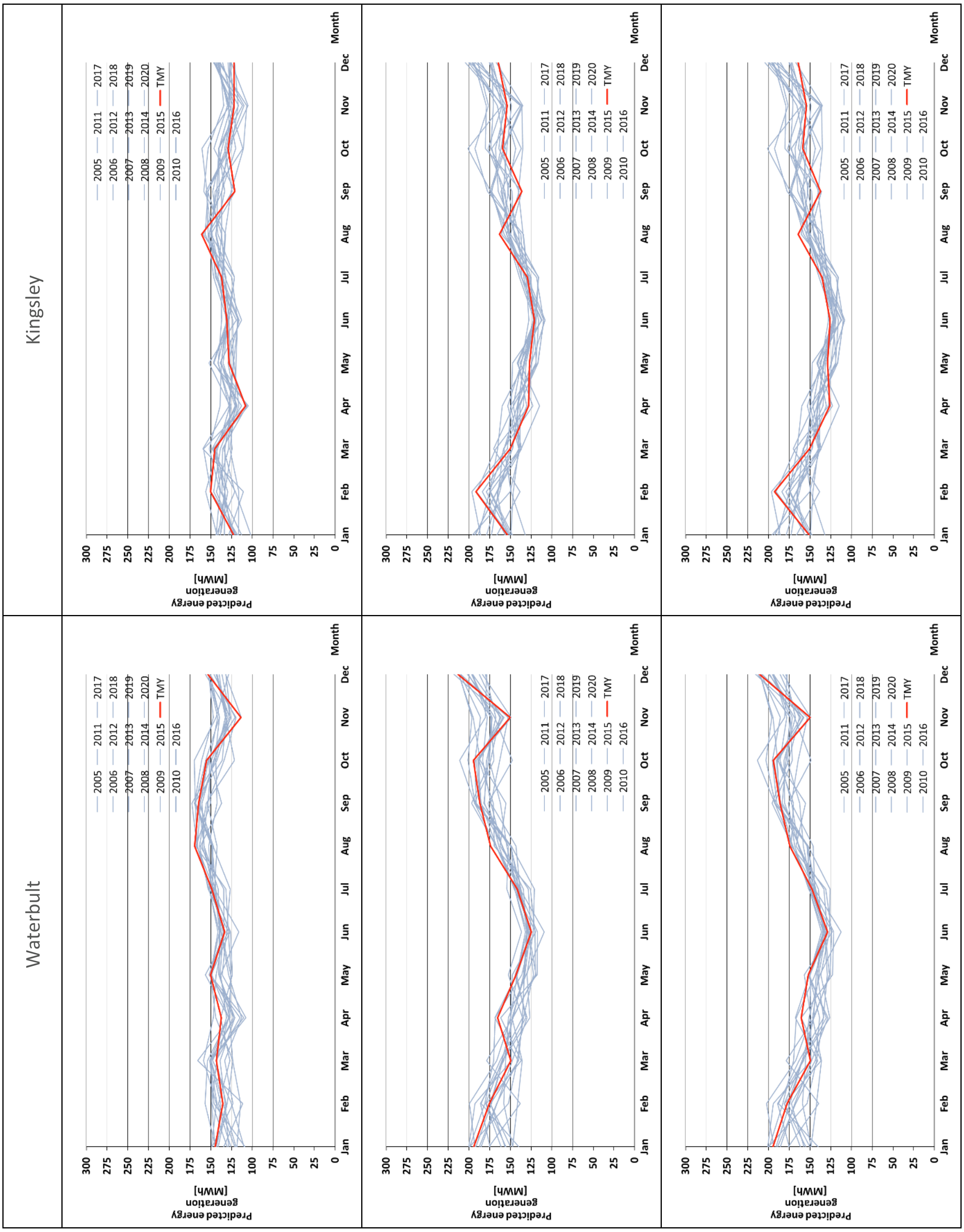

Waterbult
Kingsley
Predicted energy generation [MWh]
Month
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
TMY

Table 23, Table 24 and Table 25 show the summary statistics of PVSyst simulations for a fixed tilt and single axis tracker WoBT and single axis tracker WBT plants having a GCR of 45.7%, 35.9% and 45.7% respectively. The provided summary statistics for a representative 1 MWdc plant capacity is based on an hourly temporal resolution using TMY weather file. The statistics include GHI, POA, resulting expected annual AC energy production and capacity factor. The capacity factor is calculated in accordance with IEC TS 61724-3:2016 for Photovoltaic system performance – Part 3: Energy evaluation method is a metric commonly applied to power plants and facilitates comparison between PV and other power plants.

Table 24 and Table 25 shows the single axis tracker WoBT or WBT generating approximately 11 - 14% more energy than the fixed-tilt system for all the locations. The single axis tracking system without or with backtracking shows a clear advantage in terms of specific energy (kWh/kWp) due to the orientation of the PV modules relative to the sun for most of the period. However, the single axis tracking system comes with additional capital expense and maintenance costs. This should be carefully considered when establishing an investment case. Based on the available non-constrained land and the land preparation associated costs, the single axis tracker without or with back tracking technology shall be adopted.

Table 23: Summary statistics of Richards Bay sites (fixed-tilt, GCR = 45.7%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
Richards Bay	1762	1964	1483	17%
Koningskroon	1758	1972	1493	17%
Surreyvale	1784	2026	1529	17%
Kingsley	1825	2064	1576	18%
Waterbult	2004	2279	1749	20%

Table 24: Summary statistics of Richards Bay sites (Single axis WoBT, GCR = 36.9%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
Richards Bay	1762	2268	1700	19%
Koningskroon	1758	2269	1701	19%
Surreyvale	1784	2295	1744	20%
Kingsley	1825	2357	1779	20%
Waterbult	2004	2659	2013	23%

Table 25 : Summary statistics of Richards Bay sites (Single axis WBT, GCR = 45.7%)

Location	GHI [kWh/m2]	POA [kWh/m2]	Annual Energy [MWh]	Capacity factor
Richards Bay	1762	2182	1699	19%
Koningskroon	1758	2178	1708	19%
Surreyvale	1784	2209	1751	20%
Kingsley	1825	2272	1790	20%
Waterbult	2004	2533	2027	23%

3.5. Power and Energy Density

3.5.1. Boegoebaai

Table 26 shows the energy density for the fixed-tilt and single-axis tracking solar PV plants (1 MWDC). Solar PV modules would cover roughly 4673 m2 based on the module size selected relative to total land requirement (1.24 ha for fixed-tilt and single axis tracker with WBT and 1.60ha for single axis tracker with WoBT). Dividing the module area by the total land area results in the GCR 37.8% for both the fixed-tilt and single axis tracker WBT and GCR 29.7 for single axis tracker WoBT. Additional land is required for access roads, borders, balance of plant installation and related infrastructure. The predicted generation is 1548 - 1639 MWh/ha annually from a fixed-tilt system, 1419 – 1508 MWh/ha from a single-axis tracker WoBT and 1825 – 1948 MWh/ha from a single-axis tracker WBT.

Table 26 : Installable DC capacity and energy density for the screened locations (fixed-tilt, single axis tracker WoBT and single axis tracker WBT)

Location	DC Capacity [MW/hectare]			AC Energy Density [MWh/hectare]		
	FT	SAT WoBT	SAT WBT	FT	SAT WoBT	SAT WBT
East of Boegoebaai	0.81	0.62	0.81	1590	1454	1874
Between Port Nolloth and Boegoebaai	0.81	0.62	0.81	1603	1468	1894
West of Springbok	0.81	0.62	0.81	1639	1508	1948
North-east of Springbok	0.81	0.62	0.81	1565	1431	1849
North-west of Garies	0.81	0.62	0.81	1548	1419	1825

3.5.2. Saldanha Bay

Table *27* shows the energy density for the fixed-tilt and single-axis tracking solar PV plants (1 MWDC). Solar PV modules would cover roughly 4673 m2 based on the module size selected relative to total land requirement (1.36 ha for fixed-tilt and single axis tracker with WBT and 1.77 ha for single axis tracker with WoBT). Dividing the module area by the total land area results in the

GCR 34.3% for both the fixed-tilt and single axis tracker WBT and GCR 26.4% for single axis tracker WoBT. Additional land is required for access roads, borders, balance of plant installation and related infrastructure. The predicted generation is 1298 - 1418 MWh/ha annually from a fixed-tilt system, 1187 – 1303 MWh/ha from a single-axis tracker WoBT and 1529 – 1680 MWh/ha from a single-axis tracker WBT.

Table 27 : Installable DC capacity and energy density for the screened locations (fixed-tilt, single axis tracker WoBT and single axis tracker WBT)

Location	DC Capacity [MW/hectare]			AC Energy Density [MWh/hectare]		
	FT	SAT WoBT	SAT WBT	FT	SAT WoBT	SAT WBT
East of Saldanha Bay	0.73	0.56	0.73	1321	1211	1560
North of Cape Town, near Atlantis	0.73	0.56	0.73	1298	1187	1529
Near Morreesburg	0.73	0.56	0.73	1315	1210	1560
East of Clanwilliam	0.73	0.56	0.73	1418	1303	1680
Between Worcester & Sutherland	0.73	0.56	0.73	1404	1287	1662

3.5.3. Mossel Bay

Table 28 shows the energy density for the fixed-tilt and single-axis tracking solar PV plants (1 MWDC). Solar PV modules would cover roughly 4673 m2 based on the module size selected relative to total land requirement (1.36 ha for fixed-tilt and single axis tracker with WBT and 1.77 ha for single axis tracker with WoBT). Dividing the module area by the total land area results in the GCR 34.3% for both the fixed-tilt and single axis tracker WBT and GCR 30.4% for single axis tracker WoBT. Additional land is required for access roads, borders, balance of plant installation and related infrastructure. The predicted generation is 1181 - 1388 MWh/ha annually from a fixed-tilt system, 1188 – 1438 MWh/ha from a single-axis tracker WoBT and 1349 – 1638 MWh/ha from a single-axis tracker WBT.

Table 28 : Installable DC capacity and energy density for the screened locations (fixed-tilt, single axis tracker WoBT and single axis tracker WBT)

Location	DC Capacity [MW/hectare]			AC Energy Density [MWh/hectare]		
	FT	SAT WoBT	SAT WBT	FT	SAT WoBT	SAT WBT
Near Albertinia	0.73	0.65	0.73	1181	1188	1349
Near Van Wyksdorp	0.73	0.65	0.73	1305	1336	1520
Leeu Gamka / Prince Albert	0.73	0.65	0.73	1388	1438	1638
Beaufort West / Aberdeen	0.73	0.65	0.73	1334	1340	1536
Willowmore	0.73	0.65	0.73	1310	1330	1520

3.5.4. COEGA

Table 29 shows the energy density for the fixed-tilt and single-axis tracking solar PV plants (1 MWDC). Solar PV modules would cover roughly 4673 m2 based on the module size selected relative to total land requirement (1.24 ha for fixed-tilt and single axis tracker with WBT and 1.36 ha for single axis tracker with WoBT). Dividing the module area by the total land area results in the GCR 37.8% for both the fixed-tilt and single axis tracker WBT and GCR 34.3% for single axis tracker WoBT. Additional land is required for access roads, borders, balance of plant installation and related infrastructure. The predicted generation is 1240 - 1474 MWh/ha annually from a fixed-tilt system, 1260 – 1524 MWh/ha from a single-axis tracker WoBT and 1417 – 1721 MWh/ha from a single-axis tracker WBT.

Table 29 : Installable DC capacity and energy density for the screened locations (fixed-tilt, single axis tracker WoBT and single axis tracker WBT)

Location	DC Capacity [MW/hectare]			AC Energy Density [MWh/hectare]		
	FT	SAT WoBT	SAT WBT	FT	SAT WoBT	SAT WBT
North of Gqeberha	0.81	0.73	0.81	1240	1260	1417
Kleinpoort	0.81	0.73	0.81	1315	1340	1505
Aberdeen	0.81	0.73	0.81	1379	1403	1578
Hofmeyr	0.81	0.73	0.81	1474	1524	1721
East of Aberdeen	0.81	0.73	0.81	1442	1480	1667

3.5.5. RICHARDS BAY

Table 30 shows the energy density for the fixed-tilt and single-axis tracking solar PV plants (1 MWDC). Solar PV modules would cover roughly 4673 m2 based on the module size selected relative to total land requirement (1.24 ha for fixed-tilt and single axis tracker with WBT and 1.36 ha for single axis tracker with WoBT). Dividing the module area by the total land area results in the GCR 37.8% for both the fixed-tilt and single axis tracker WBT and GCR 34.3% for single axis tracker WoBT. Additional land is required for access roads, borders, balance of plant installation and related infrastructure. The predicted generation is 1240 - 1474 MWh/ha annually from a fixed-tilt system, 1260 – 1524 MWh/ha from a single-axis tracker WoBT and 1417 – 1721 MWh/ha from a single-axis tracker WBT.

Table 30 : Installable DC capacity and energy density for the screened locations (fixed-tilt, single axis tracker WoBT and single axis tracker WBT)

Location	DC Capacity [MW/hectare]			AC Energy Density [MWh/hectare]		
	FT	SAT WoBT	SAT WBT	FT	SAT WoBT	SAT WBT
Richards Bay	0.98	0.77	0.98	1450	1305	1661
Koningskroon	0.98	0.77	0.98	1459	1306	1669
Surreyvale	0.98	0.77	0.98	1495	1339	1712
Kingsley	0.98	0.77	0.98	1541	1366	1750
Waterbult	0.98	0.77	0.98	1710	1546	1981

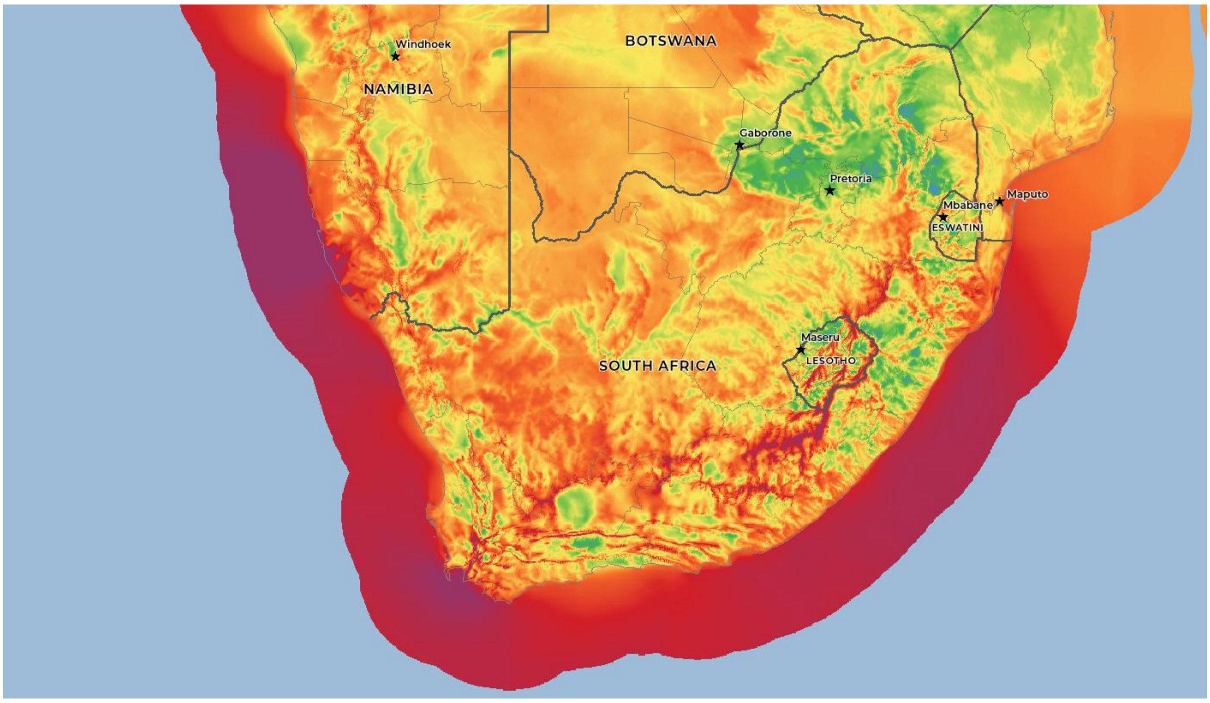
4. Wind Resource Assessment

4.1. Background

The integration of wind energy into South Africa’s energy mix has become a pivotal strategy in transitioning to a more sustainable and environmentally friendly energy system. Globally, wind energy is recognised as a key renewable resource, critical to reducing dependence on fossil fuels. South Africa's significant wind energy potential positions it well for leveraging this clean energy source. Figure 23 illustrates a colour-coded map of wind speeds at 100 meters above sea level, where red represents higher wind speeds, and green indicates lower wind speeds. This visualisation underscores the distribution of wind resources across the country.

Detailed wind resource assessments were carried out in five regions along South Africa’s coastline, with five specific locations evaluated within each region. This effort resulted in the assessment of 25 individual sites. This chapter provides an overview of the wind power assessment methodology and presents the results for each location.

Figure 23: The Global Wind Atlas' (GWA) average annual wind speeds across South Africa at 100 m elevation



Source : https://globalwindatlas.info

One of the primary outputs of the assessment is a time series of capacity factors. These capacity factors reflect the efficiency of energy generation under varying wind conditions. The time series data provide capacity factors, power generation, and wind speeds for each site throughout a representative year at an hourly resolution. The data were stored in a comma-separated values (CSV) file format.

This data was subsequently utilised in a hydrogen modelling exercise, demonstrating the potential synergy between wind energy and hydrogen production as part of South Africa's broader renewable energy strategy.

4.2. Site Selection

Table 31 shows the site and location names as well as their positions in terms of latitude and longitude and Figure 24 graphically represents the site locations.

Table 31 : Sites evaluated in wind resource assessment

Site name	Location name	Latitude	Longitude
Boegoebaai	East of Boegoebaai	-28.6989	16.74826
	Between Port Nolloth and Boegoebaai	-29.0270	16.92691
	West of Springbok	-29.5267	17.22556
	Northeast of Springbok	-29.3648	18.44129
	Northwest of Garies	-30.3968	17.70413
Coega	North of Gqeberha	-33.5906	25.48333
	Kleinpoort	-33.3998	24.9339
	Aberdeen	-32.7274	24.1806
	Hofmeyr	-31.7535	25.78835
	East of Aberdeen	-32.4287	23.22422
Mossel Bay	Near Albertinia	-34.2568	21.62363
	Near Van Wyksdorp	-33.8195	21.53743
	Leeu Gamka	-33.1110	21.76026
	Beaufort West	-32.4251	23.21588
	Willowmore	-33.0097	23.29773
Richards Bay	Richards Bay	-28.8909	31.83867
	Koningskroon	-28.4644	31.35059
	Surreyvale	-28.1023	30.93949
	Kingsley	-27.9829	30.49421
	Waterbult	-27.8084	29.47587
Saldanha Bay	East of Saldanha Bay	-32.9932	18.24893
	North of Cape Town	-33.4990	18.36825
	Near Morreesburg	-33.2284	18.72773
	East of Clanwilliam	-31.9965	19.43567
	Between Worcester and Sutherland	-32.9901	19.78011

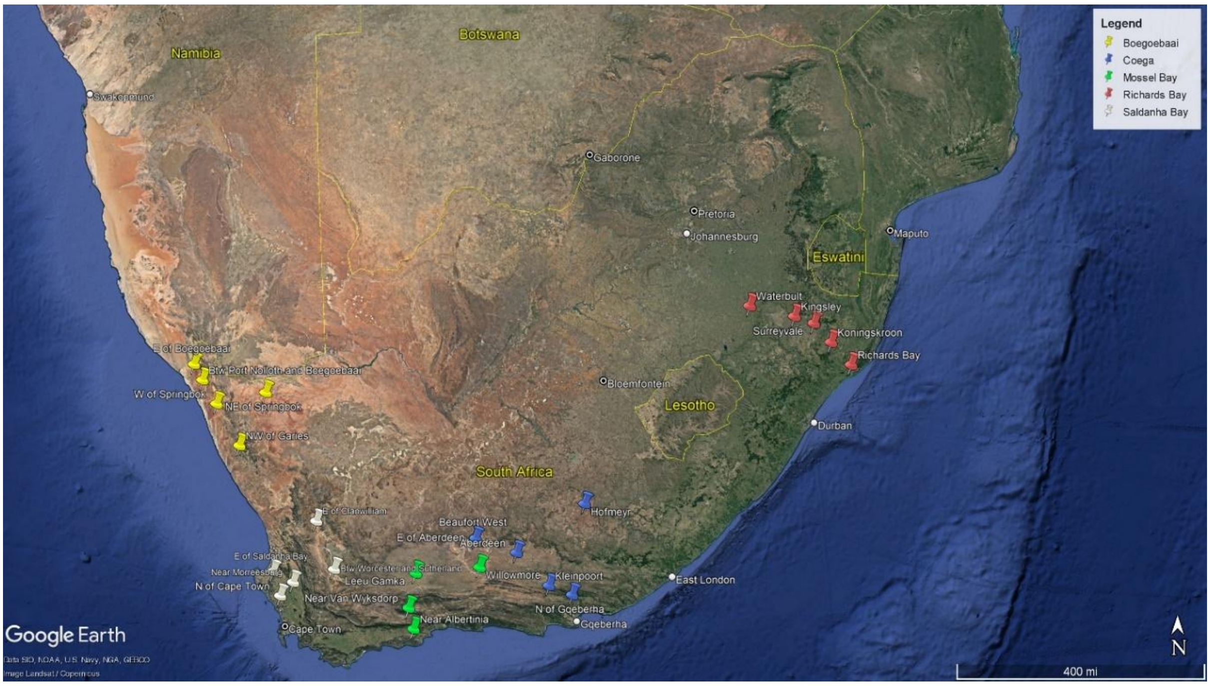
4.3. Methodology

A critical component of wind resource assessment is determining the wind speed conditions at the target location. This requires the development of an annual wind speed time series that accurately represents typical wind conditions for the site. To translate wind speed into capacity factors, it is necessary to calculate the power generated by the wind, which is achieved using the wind speed-to-power performance curve of a wind turbine. This method leverages the strong correlation between wind speed and power generation.

The capacity factor serves as a measure of the efficiency of an electrical generator over a specific time period. It is mathematically defined as the ratio of the actual energy generated by the generator to its maximum possible energy output over the same period. Alternatively, the capacity factor can be expressed as the percentage of time a generator would need to operate at full capacity to produce the same energy output.

Formally, the capacity factor is defined in the International Electrotechnical Commission (IEC) procedure IEC TS 61724-3:2016 as the ratio of actual alternating current (AC) electricity production to the system's AC rating, normalized over the number of hours in the evaluated time interval.

Figure 24: Location of sites evaluated in wind resource assessment



Source: Google Earth

These metrics are essential for assessing the viability and performance of wind energy systems, providing a standardized approach to evaluating efficiency and output.

Therefore, using the correlative relationship between the wind speed and power of a turbine, the wind power can be determined by placing a theoretical turbine at the location of the wind speed. This operation would result in a yearly wind power time series. Lastly, the wind power time series must then be divided by the maximum power of the turbine to finally get the capacity factors. This is general method used to determine capacity factors which also shown graphically in Figure 25. Each of the colour-coded processes in Figure 25 is described in the subsections below.

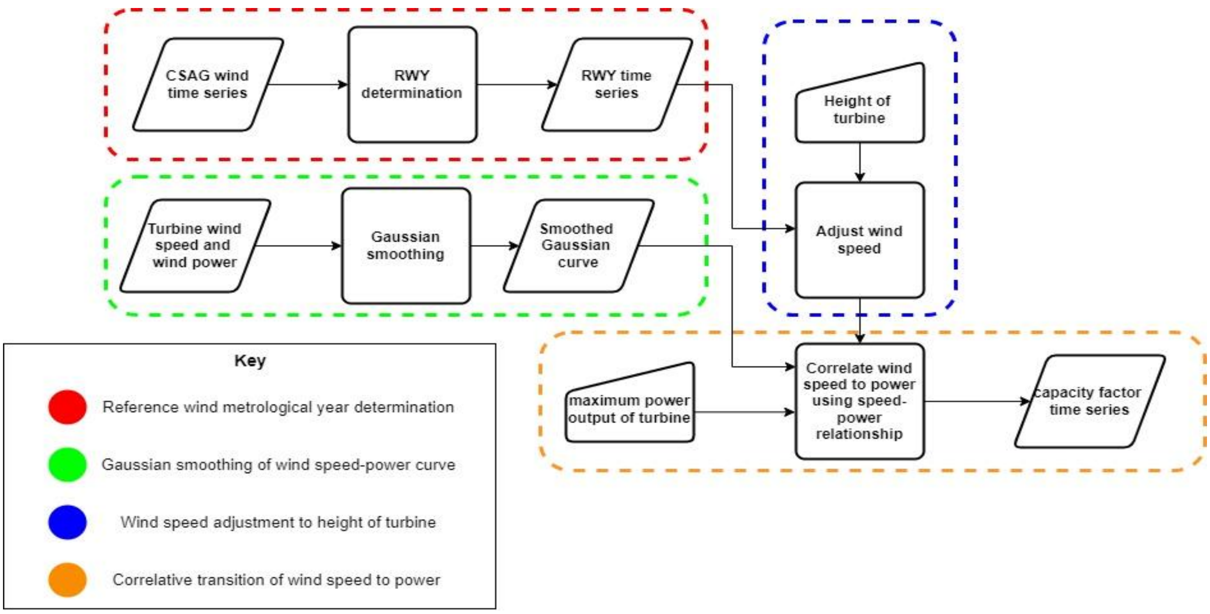
4.3.1. Reference wind metrological year determination

The Reference Wind Year (RWY) is simply a representative set of typical metrological conditions (in this case wind speed) for a full calendar year for a location. It is the most likely wind speeds for a particular location. Determining the RWY involves multi-year metrological datasets with an hourly resolution.

There are multiple processes that can be used to develop the RWY time series. However, to ensure that the RWY consists of the real data (not a theoretical average), the Sandia method is used.

The Sandia method involves selecting a particular year's monthly metrological data for each month of the calendar year. This done by determining how close the long-term cumulative density function (CDF) compares to a short-term CDF for each parameter in the input dataset. The long-term CDF is determined by using the complete dataset (all the years' data) for a particular parameter. The short-term CDF is determined by looking at only one year's data. Using both the short and long-term CDFs for all parameters across all years, an average weighted score can be determined. This is done for each year. Note that each parameter is weighted and applied to the score. The year with the lowest of the scores is selected. This procedure is done 12 times for each month of the year.

Figure 25: Wind Resource Assessment methodology



Data from the Wind Atlas of South Africa (WASA) were used to generate the wind time series. Many partners in South Africa collaborated on the WASA project to create a detailed local atlas. The Climate System Analysis Group (CSAG) of the University of Cape Town (UCT) maintains a web portal where time-series data can be accessed. The information on the web portal has been validated with the aid of 19 wind masts across the country as part of the WASA project. Figure 26 shows the extent of user queries against the WASA data. Each circle indicates a point at which wind resource data were downloaded by a user. For this analysis, the wind speed data at each of the 25 selected sites were downloaded for the period from 2005 to 2019 at an hourly temporal resolution. The WASA time-series dataset is then used to represent the typical weather data and thus serves as the input into the RWY determination process, indicated by the red box in Figure 25. All the years of data (2005-2019) are examined to create a single reference year. Figure 27 gives a visual representation of how the RWY selection process could work for a dataset consisting of 10 years.

When a wind farm is designed, wind turbines are placed very precisely such that they can extract the best wind resources, for example along the crest of a ridge. Such a detailed design is not included in the current scope of the project but could be undertaken once decisions have been made regarding the selection and further development of the analysed wind sites.

4.3.2. Gaussian smoothing of wind speed-power curve for aggregated wind farm

To determine how much energy is realistically available for electricity generation, a wind turbine is modelled. Three (3) heights are examined for this analysis: 100 m, 120 m and 150 m. As mentioned earlier, there is a highly correlative relationship between the wind speed and wind power produced for a wind turbine. This is illustrated the wind speed-power curve which shows the range of speed at which the turbine can operate (on the x-axis) as well as the corresponding power output (on the y-axis). Two (2) turbines are used for this analysis. For heights up to 120 m the Vestas V100-1.8 is used, while the Enercon E101 is used for all the heights. Table 32 shows key technical data of the turbines.
It is important to note that the turbines referenced in this report are representative models of Class II and Class III turbines. Their inclusion is solely for illustrative purposes and should not be interpreted as an endorsement of these specific turbine models. Furthermore, no monetary compensation or incentives have been received from the manufacturers of these turbines for the use of their data in the preparation of this report.

Figure 26: The CSAG web portal landing page

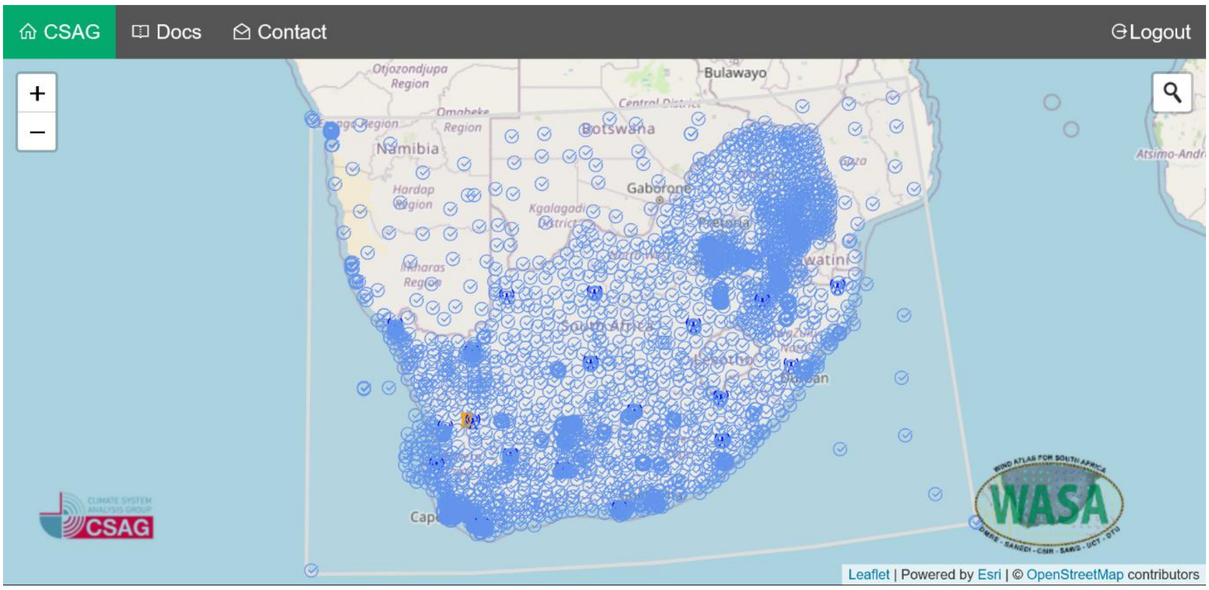


Figure 27: Visual representation of the RWY selection process

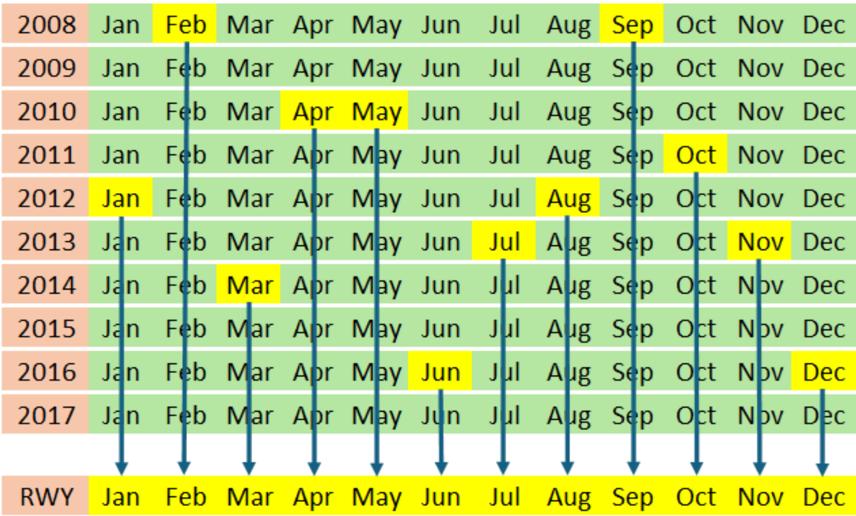


Table 32 : Specifications of wind turbines

Parameter	Description	Vestas V100 1.8	Enercon E101
Rater Power (MW)	Maximum power output that the turbine is capable of	1.8	3.05
Number of turbine blades	The number of turbine blade on rotor	3	3
Rotor diameter (m)	Length of turbine blades (tip to tip)	100	101
Cut-in speed (m/s)	Speed at which turbine starts to produce power	3	2
Rated wind speed (m/s)	Speed at which turbine produces maximum power	12	13
Cut-out wind speed (m/s)	Maximum speed at which turbine stop generate power	20	25
Wind class (IEC)	A categorization by which turbines are designated based on the wind conditions that turbines to are capable of withstanding within the area of interest	IIIa	IIa

Figure 28 and Figure 29 illustrate the power curves for individual turbines. While these curves represent the performance of a single turbine, wind farms typically consist of multiple turbines operating simultaneously, each generating varying amounts of electricity.

This variation arises from the interaction between turbines and the wind. As air passes through the swept area of a turbine's rotor, energy is extracted, causing the wind to slow down. This energy transfer, which occurs as the turbine blades rotate, reduces the speed of the air exiting the turbine's swept area. Additionally, the airflow becomes dispersed or diffused after passing through the rotor, further affecting its velocity.

Subsequent turbines positioned downstream encounter this slower, diffused airflow, resulting in reduced energy extraction compared to the turbines located upstream. This phenomenon, known as wake effect, underscores the importance of strategic turbine placement and spacing within wind farms to maximise overall energy production efficiency.

To accurately reflect the impact of wake effects in wind farms, a speed-power curve must be developed that incorporates this phenomenon. A practical approach is to assume that the energy production of the entire wind farm follows a Gaussian distribution at any given time.

The power curves shown in Figure 28 and Figure 29 are utilised to create a modified curve with a Gaussian distribution. This is achieved by convolving each power curve with a Gaussian kernel using a discrete Fast-Fourier Transformation (FFT). Prior to convolution, the curves are zero-padded at the end to ensure accurate processing. The convolution process is illustrated within the green box in Figure 25.

The resulting Gaussian curves, presented in Figure 30 and Figure 31, serve as the basis for determining the wind farm's output power. These curves are subsequently used to generate the capacity factor time series, enabling a more comprehensive assessment of the wind farm's performance under real-world conditions.
An essential characteristic of the Gaussian curve is that the maximum power output corresponds to the individual power output of a single turbine. This approach assumes that the entire wind farm operates as though it were a single turbine, albeit with a Gaussian distribution of power output.

The total power output of the wind farm is then calculated by multiplying the power output represented by the Gaussian curve by the number of turbines in the farm. This simplification allows for a practical estimation of the wind farm's overall performance while accounting for the variability introduced by wake effects and turbine interactions.

Figure 28: Power curve of the Vestas V100-1.8 wind turbine

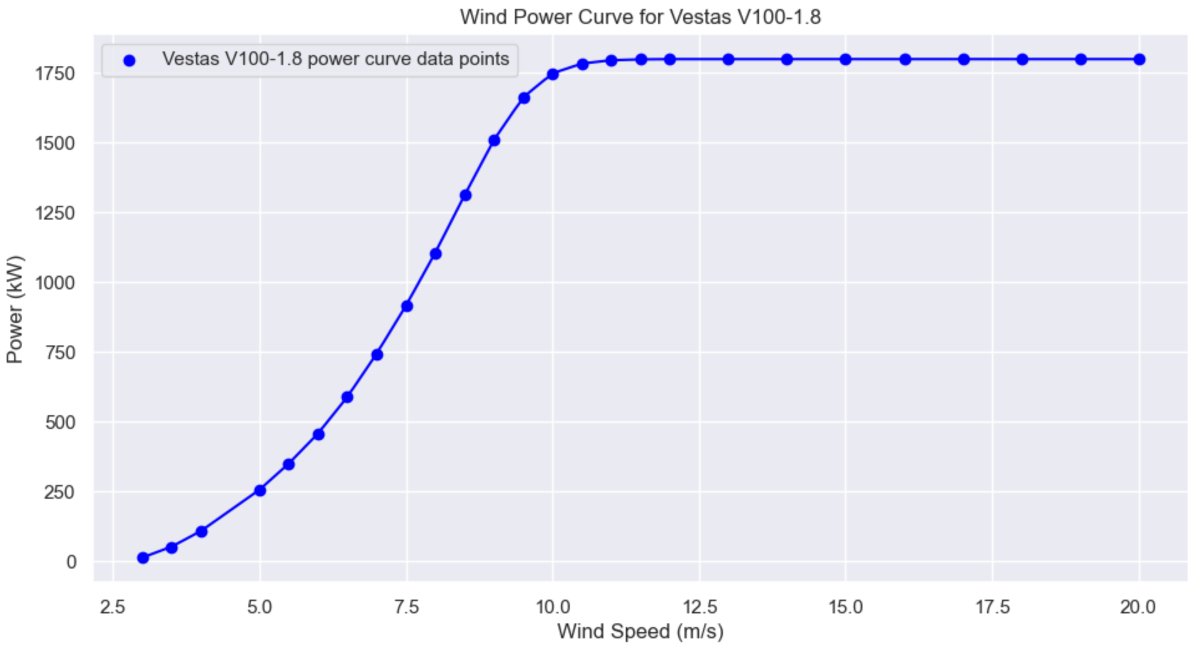


Figure 29: Power curve of the Enercon E-101 wind turbine

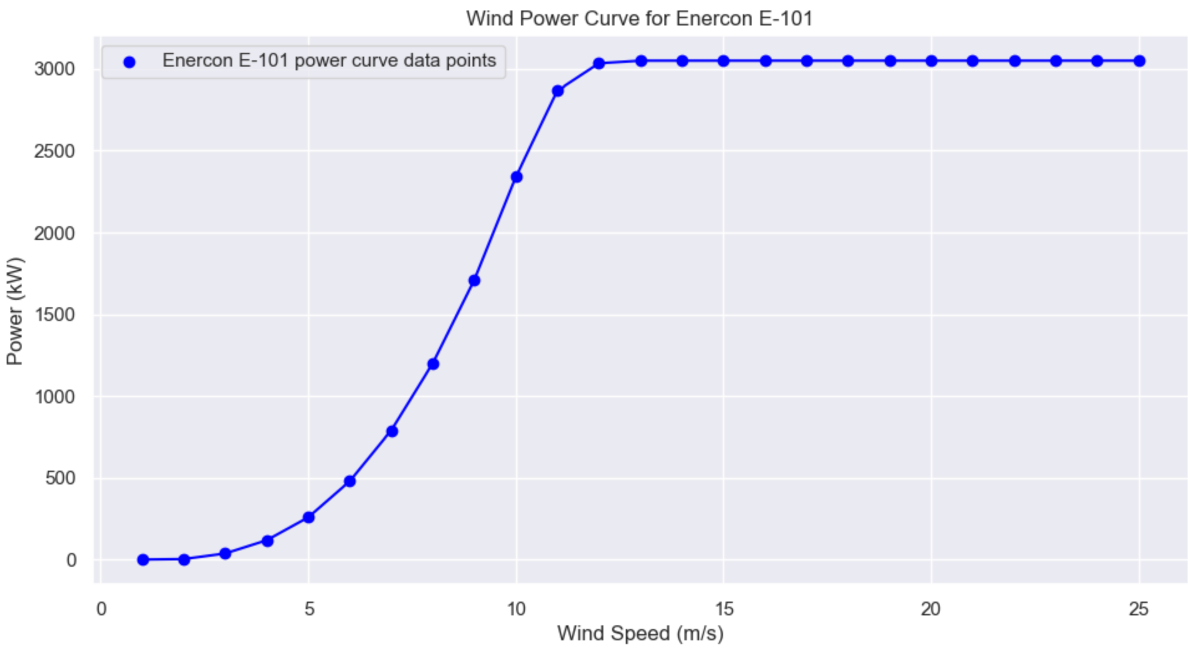


Figure 30: Gaussian curve conversion of Vestas V100-1.8

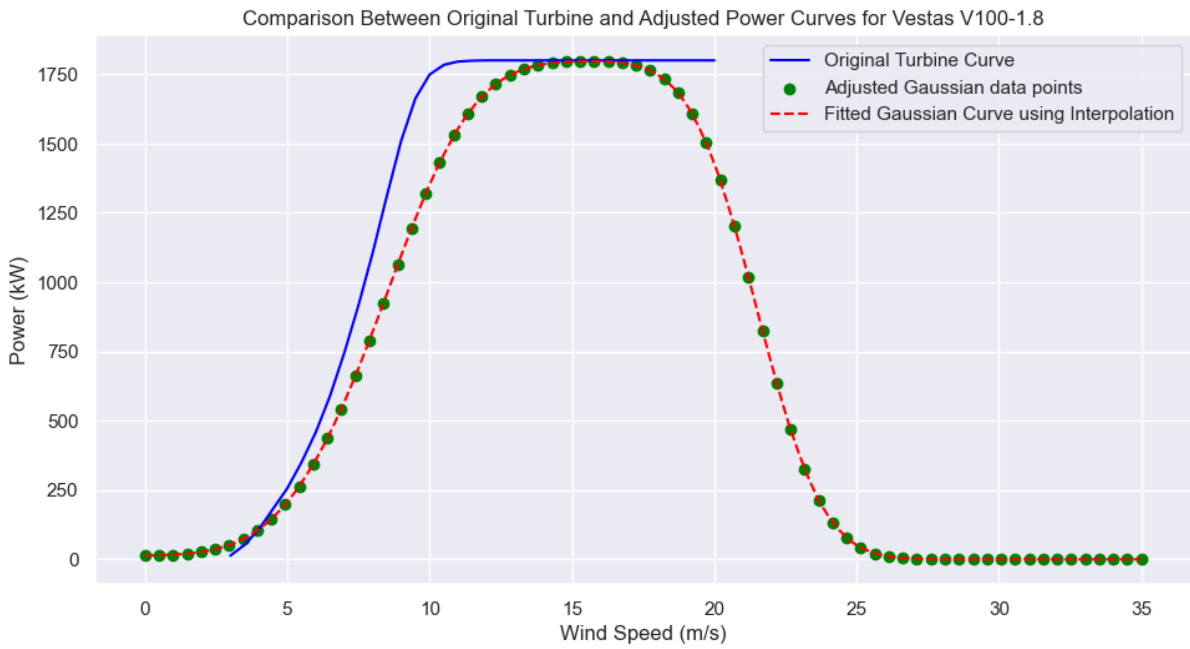
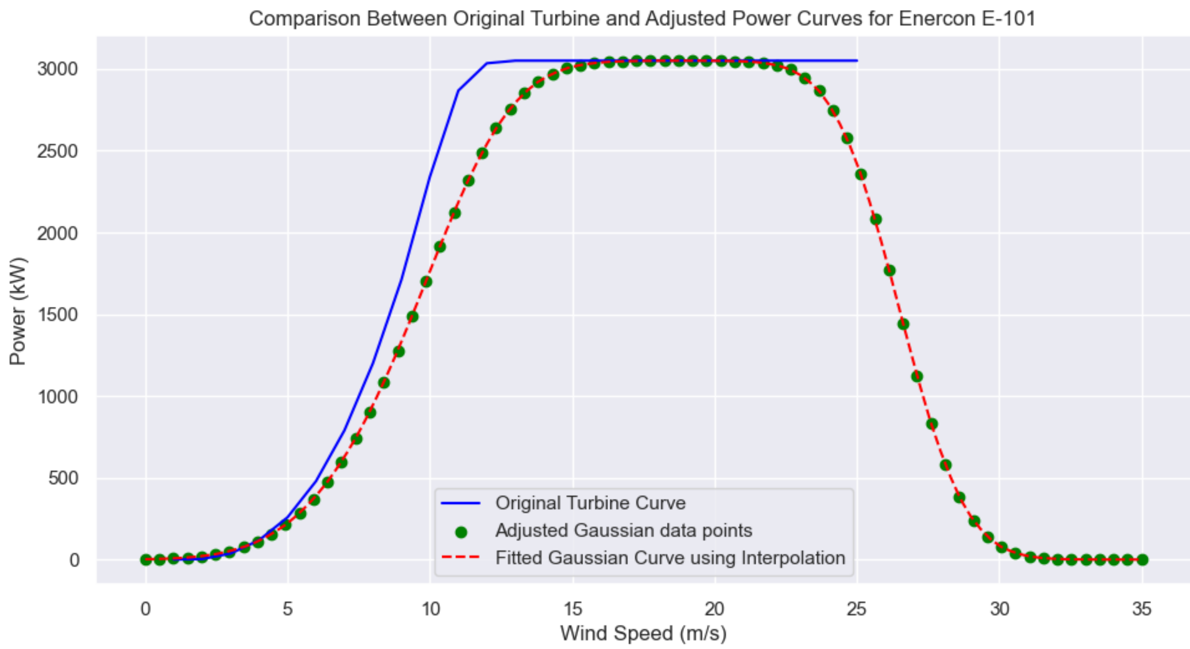


Figure 31: Gaussian curve conversion of Enercon E-101



4.3.3. WIND SPEED ADJUSTMENT TO HEIGHT OF TURBINE

After generating the RWY time series, the wind speed data must be adjusted to the turbine's selected height. This adjusted wind speed time series serves as the basis for calculating the corresponding capacity factor time series. For this analysis, assessments are conducted at three heights: 100 m, 120 m, and 150 m.

The RWY time series provides wind speed data at predefined heights of 20 m, 60 m, 100 m, 120 m, and 160 m. If the selected height matches one of these predefined heights, the corresponding time series is directly used for capacity factor calculations. However, if the selected height lies between two of the predefined heights, interpolation is applied to estimate the wind speed at the selected height based on the values from the adjacent heights. This process is illustrated within the blue box in Figure 25.

The adjustment of wind speed to the desired height is performed using the following formula:

$$adjusted\ wind\ speed = ws_{hl} \times \left(\frac{h_s}{h_l}\right)^{\frac{\log\left(\frac{ws_{hu}}{ws_{hl}}\right)}{\log\left(\frac{h_u}{h_l}\right)}}$$

where:
h_s = selected height (m)
h_l = height lower than the selected height (m)
h_u = height higher than the selected height (m)
ws_{hl} = wind speed at h_l
ws_{hu} = wind speed at h_u

Table 33 shows if height wind speed adjustment is required.

Table 33 : Height wind speed adjustment criteria

Height selected (m)	Height adjustment needed	Parameter selection
Height = 20	No	None
Height = 60	No	None
Height = 100	No	None
Height = 120	No	None
20 < Height < 60	Yes	h_l = 20, h_u = 60
60 < Height < 100	Yes	h_l = 60, h_u = 100
100 < Height < 120	Yes	h_l = 100, h_u = 120
120 < Height < 160	Yes	h_l = 120, h_u = 160

4.3.4. Correlative translation of wind speed to wind power using turbine speed-power curve

This is the last step of the methodology, shown in the orange box in Figure 25. Here, the Gaussian speed-power curve and the wind speed time series created earlier are used to create the capacity factors. Given that the speed-power curve consists of discrete points (corresponding to the green points in Figure 30 and Figure 31), a continuous curve is found by interpolation (the red dashed line in the same figures). This continuous curve allows the input of any speed between 0 m/s and 35 m/s and yields a corresponding wind power value. The red-dashed curve in the figures demonstrates that the interpolation method accurately determines values between the green points. Therefore, using the discrete points, a linear interpolation method is used to accurately find wind power values given the wind speed time series. Mathematically, it this step can be written as follows:

$$wp = wp_0 + \frac{(wp_1 - wp_0)}{(ws_1 - ws_0)} \cdot (ws - ws_0)$$

where:
wp_0 = wind power(y-value) corresponding to point 0, the lower point
ws_0 = wind speed (x-axis) corresponding to point 0, the lower point
wp_1 = wind power(y-value) corresponding to point 1, the upper point
ws_1 = wind speed (x-axis) corresponding to point 1, the upper point
w_s = wind speed between point 0 and point 1 that interpolating for wind power
w_p = interpolated wind power value

There are many losses that decrease the total electrical energy produced by a wind turbine. These losses include electrical losses, availability losses, power curve degradation, and balance of plant losses, amongst others. Thus, not all available wind power is transmitted to the grid. These loss factors are included in the model to create a more realistic output. Therefore, the wind power generated is adjusted by loss factors to account for the lack generation that are as a result of these losses. These loss factors are used to determine the derated generation using the following formula.

$$derated\ wind\ power = wp \cdot \prod_{i}^{n} L_i$$

where:
w_p = wind power from turbine
L = loss factor
n = number of loss factors

Lastly, the capacity factor is found by dividing the wind power produced by the maximum power output of turbine using the formula below:

$$capacity\ factor\ (\%) = \frac{wind\ power\ produced}{maximum\ power\ output\ of\ turbine} \times 100$$

4.4. Results

This section shows and describes the results of the wind resource assessment. It is split into four subsections:

- RWY determination:
  - Years selected for each location
- Wind speed statistics:
  - Wind speed statistics and monthly wind speed comparison at 100m
    - Box and whisker plot and statistics of each location for wind speed
    - Probability Density Function (PDF) plots for wind speed
    - RWY wind speed monthly wind speed comparison
  - RWY Wind speed statistics and monthly wind speed comparison at 120m
    - Box and whisker plot and statistics of each location for wind speed
    - Probability Density Function (PDF) plots for wind speed
    - RWY wind speed monthly wind speed comparison
  - RWY Wind speed statistics and monthly wind speed comparison at 150m
    - Box and whisker plot and statistics of each location for wind speed
    - Probability Density Function (PDF) plots for wind speed
    - RWY wind speed monthly wind speed comparison

7) Capacity factor determination per height and turbine
8) Wind capacity factors statistics for each location at 100m using Vestas V100-1.8:
9) Monthly wind capacity factors for each location
10) Wind capacity factors statistics for each location at 120m using Vestas V100-1.8:
11) Monthly wind capacity factors for each location
12) Wind capacity factors statistics for each location at 100m using Enercon-101:
13) Monthly wind capacity factors for each location
14) Wind capacity factors statistics for each location at 120m using Enercon-101:
15) Monthly wind capacity factors for each location
16) Wind capacity factors statistics for each location at 150m using Enercon-101:
17) Monthly wind capacity factors for each location

- Summary of results

18) Multi-bar charts of annual capacity factors
19) Tables of full load hours and capacity factors
    - Table of total annual electricity produced

4.4.1. Years selected for RWY

The RWY for each location is determined using the metrological time series data from the CSAG website ranging from 2005 to 2019. The table below shows the years selected for each month of the year for each respective location. Data from that particular year's month will be used in the RWY time series. Table 34 and Table 35 shows the selected years for each month that make up the RWY for a location.

Table 34 : Years selected for RWY for each location, format: 20XX where XX range is 05-19

Location name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
East of Boegoebaai	09	10	13	11	08	16	16	13	11	07	19	08
Between Port Nolloth and Boegoebaai	09	10	13	06	08	16	16	09	11	07	06	17
West of Springbok	08	14	13	05	08	16	16	08	11	06	17	17
Northeast of Springbok	18	14	13	11	09	17	07	06	11	08	06	17
Northwest of Garies	07	10	12	05	18	14	16	09	13	07	06	08
North of Gqeberha	05	19	17	09	11	10	17	05	09	07	18	16
Kleinpoort	05	05	07	18	11	19	17	05	10	07	05	09
Aberdeen	14	13	15	05	17	18	10	09	10	10	14	06
Hofmeyr	14	10	12	09	15	10	18	09	10	13	08	06

Table 35 : Years selected for RWY for each location, format: 20XX where XX range is 05-19 (continued)

Location name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
East of Aberdeen	15	12	07	09	17	10	05	09	10	06	08	06
Near Albertinia	09	05	09	09	12	17	13	09	16	12	10	08
Near Van Wyksdorp	15	08	17	06	11	18	16	07	09	10	10	07
Leeu Gamka	10	08	12	18	11	12	07	09	16	10	18	09
Beaufort West	15	12	07	09	17	10	05	09	10	06	08	06
Willowmore	06	06	19	05	11	18	16	08	10	08	10	06
Richards Bay	07	15	15	10	09	07	09	08	16	12	13	07
Koningskroon	15	18	15	14	09	09	10	18	17	15	07	08
Surreyvale	15	07	17	12	14	10	12	19	17	17	12	08
Kingsley	15	14	15	08	14	16	12	14	17	09	08	06

Waterbult	15	13	15	05	08	18	13	17	10	07	08	15
East of Saldanha Bay	18	15	07	06	18	16	13	09	10	08	05	19
North of Cape Town	10	18	05	06	18	16	12	06	14	10	17	08
Near Morreesburg	06	15	05	09	18	16	13	06	14	08	17	07
East of Clanwilliam	18	18	17	10	10	10	13	06	10	06	19	14
Between Worcester and Sutherland	17	18	15	05	06	11	17	11	12	08	14	07

4.4.2. Wind speed statistics

The wind speed statistics are provided below and for each site a box-and-whisker plot, a summary table, the probability density functions of the wind speeds and line graph plots of the annual wind speeds at a monthly resolution are provided. The probability density function (PDF) plot shows a probabilistic measure of a random variable falling withing a particular range. In this case, it shows the likelihood of what the wind speed could be on a random day of the year for each location. The random variable is wind speed on the x-axis and the corresponding probability associated with each wind speed on the y-axis. The Kernel Density Estimation (KDE) method was used to determine the PDF plots.

Figure 32: Box-and-Whisker Plot of Wind Speeds for Boegoebaai Locations at 100 m

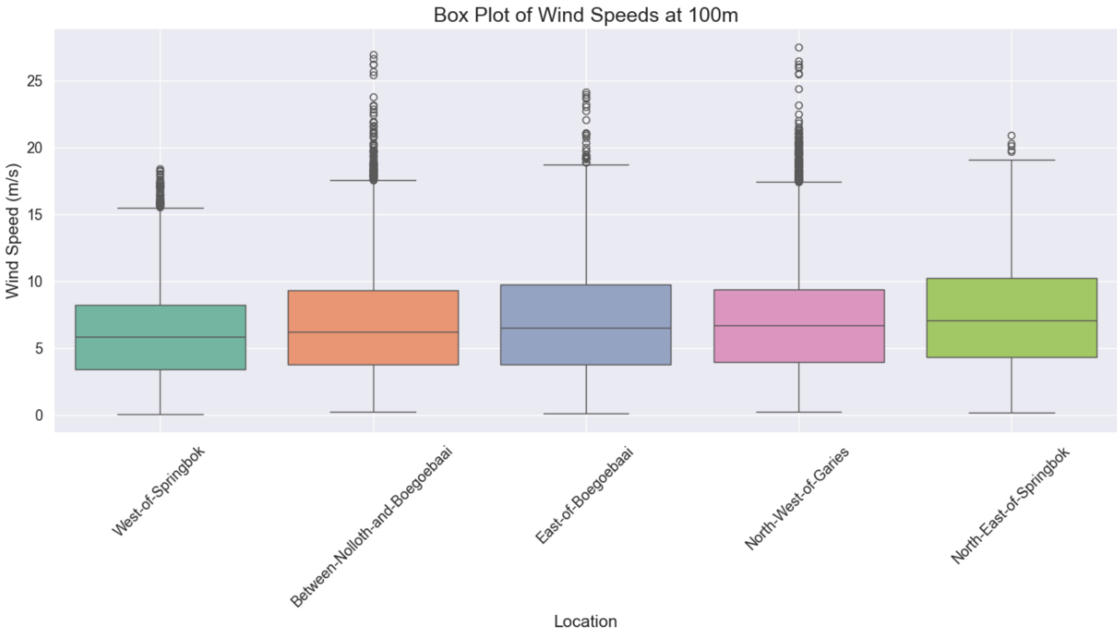


Table 36 : Statistics of Wind Speed (m/s) for Boegoebaai Locations at 100m

Parameter	West of Springbok	Between Port Nolloth and Boegoebaai	East of Boegoebaai	Northwest of Garies	Northeast of Springbok
Min	0.065	0.23	0.125	0.22	0.175
Quantile 1	3.435	3.81	3.765	3.969	4.345
Mean	6.061	6.776	6.949	7.005	7.456
Median	5.865	6.232	6.54	6.695	7.085
Quantile 3	8.265	9.305	9.761	9.365	10.27
Max	18.395	26.97	24.125	27.51	20.915
Standard Deviation	3.274	3.861	3.95	3.907	3.828

Figure 33: Probability Density Functions of Wind Speeds for Boegoebaai Locations at 100m

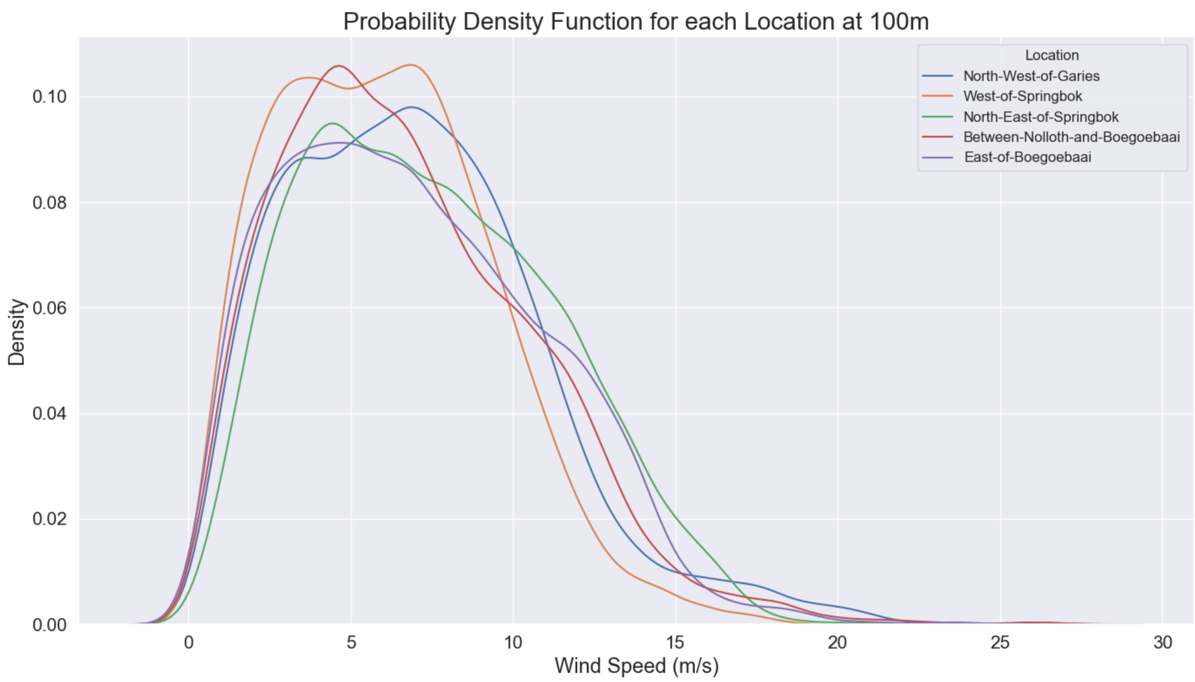


Figure 34: RWY Wind Speeds for Boegoebaai Locations at 100 m

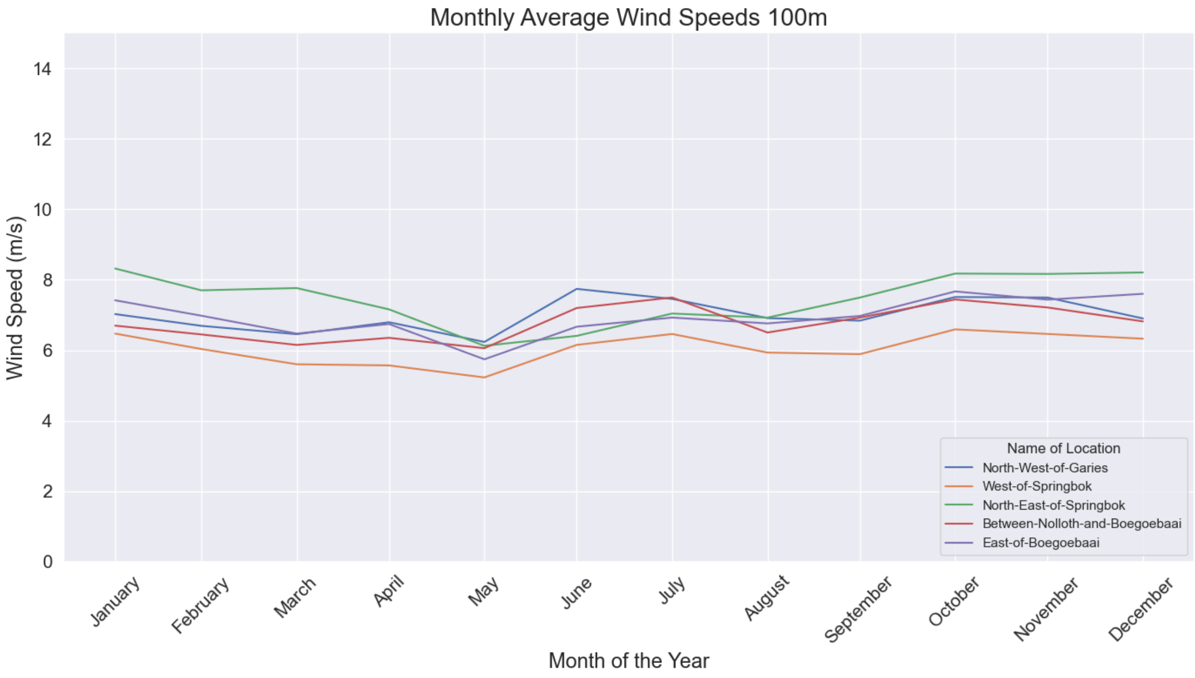


Figure 35: Box-and-Whisker Plot of Wind Speeds for Coega Locations at 100 m

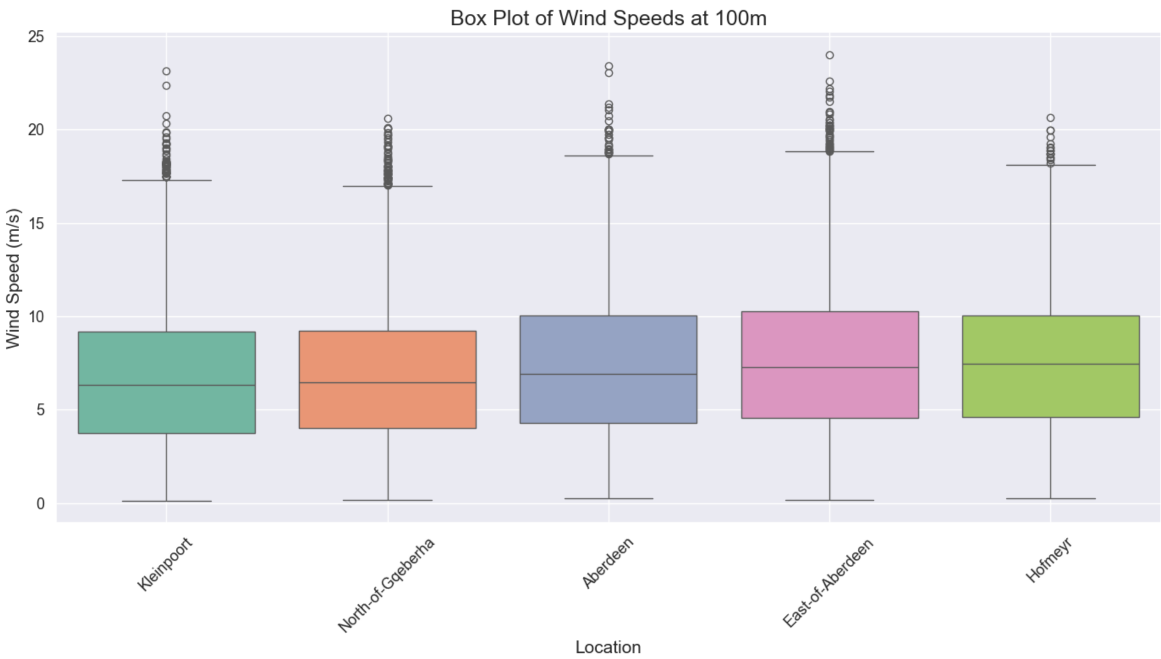


Table 37 : Statistics of Wind Speed (m/s) for Coega Locations at 100 m

Parameter	Kleinpoort	North of Gqeberha	Aberdeen	East of Aberdeen	Hofmeyr
Min	0.125	0.175	0.245	0.165	0.245
Quantile 1	3.759	4.025	4.304	4.565	4.615
Mean	6.723	6.855	7.346	7.573	7.518
Median	6.31	6.485	6.935	7.29	7.478
Quantile 3	9.17	9.226	10.041	10.265	10.031
Max	23.145	20.605	23.395	24.015	20.635
Standard Deviation	3.701	3.657	3.813	3.812	3.671

Figure 36: Probability Density Functions of Wind Speeds for Coega Locations at 100m

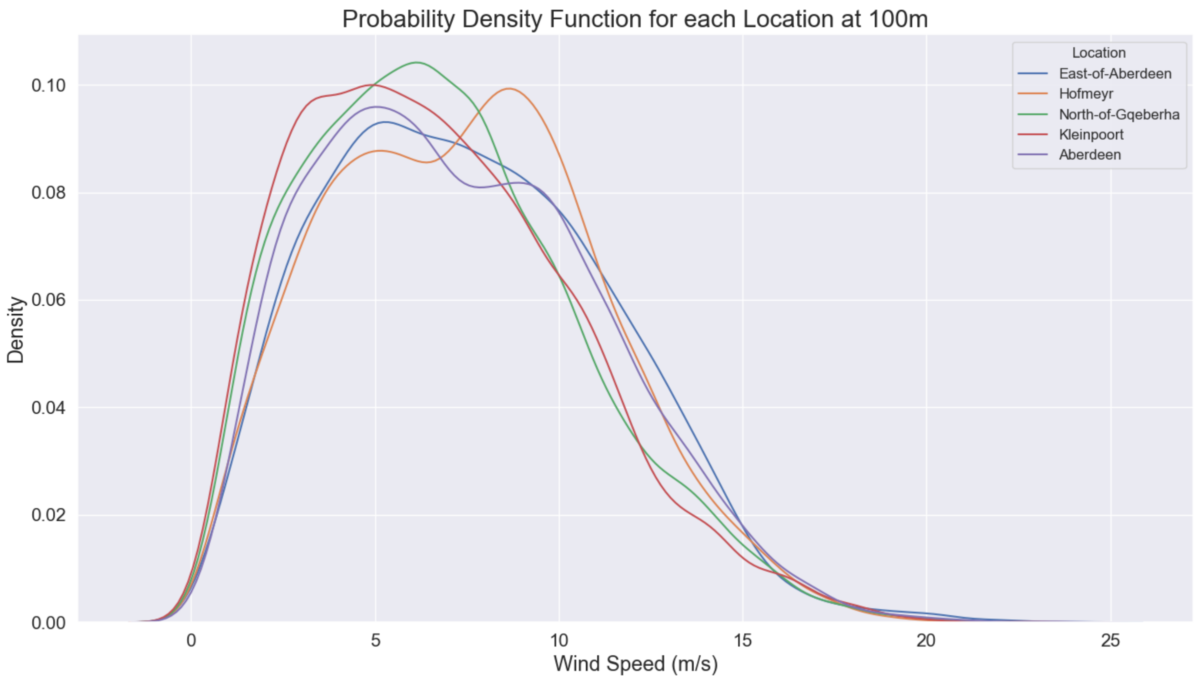


Figure 37: RWY Wind Speeds for Coega Locations at 100 m

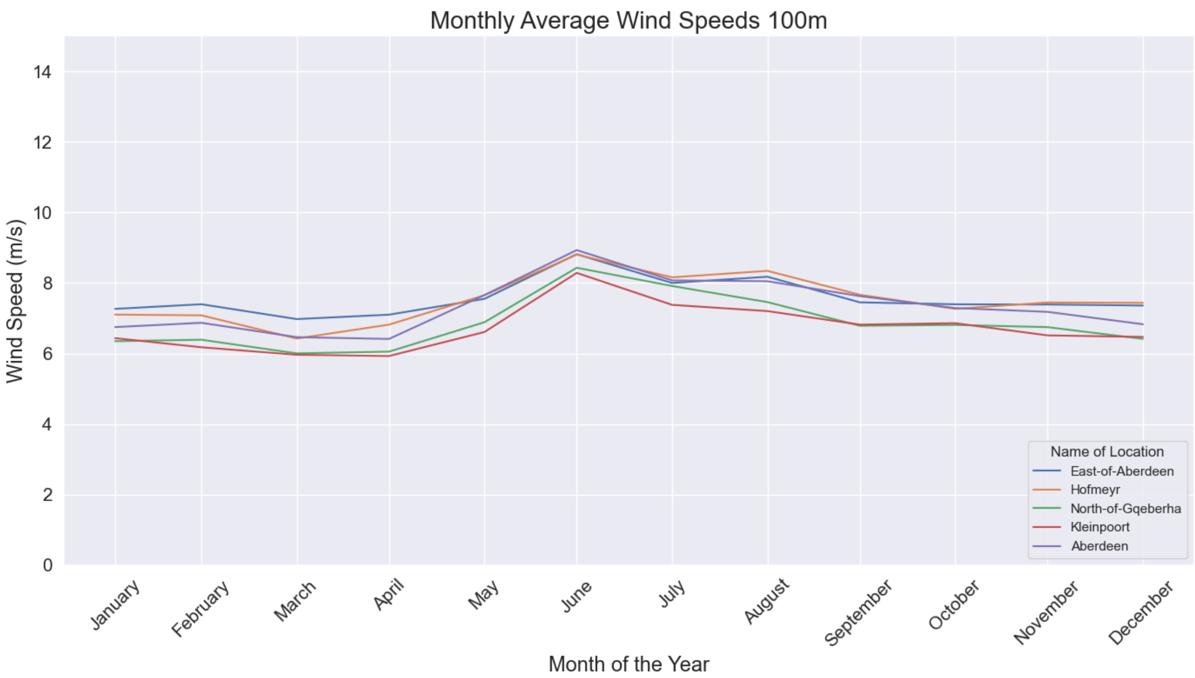


Figure 38: Box-and-Whisker Plot of Wind Speeds for Mossel Bay Locations at 100 m

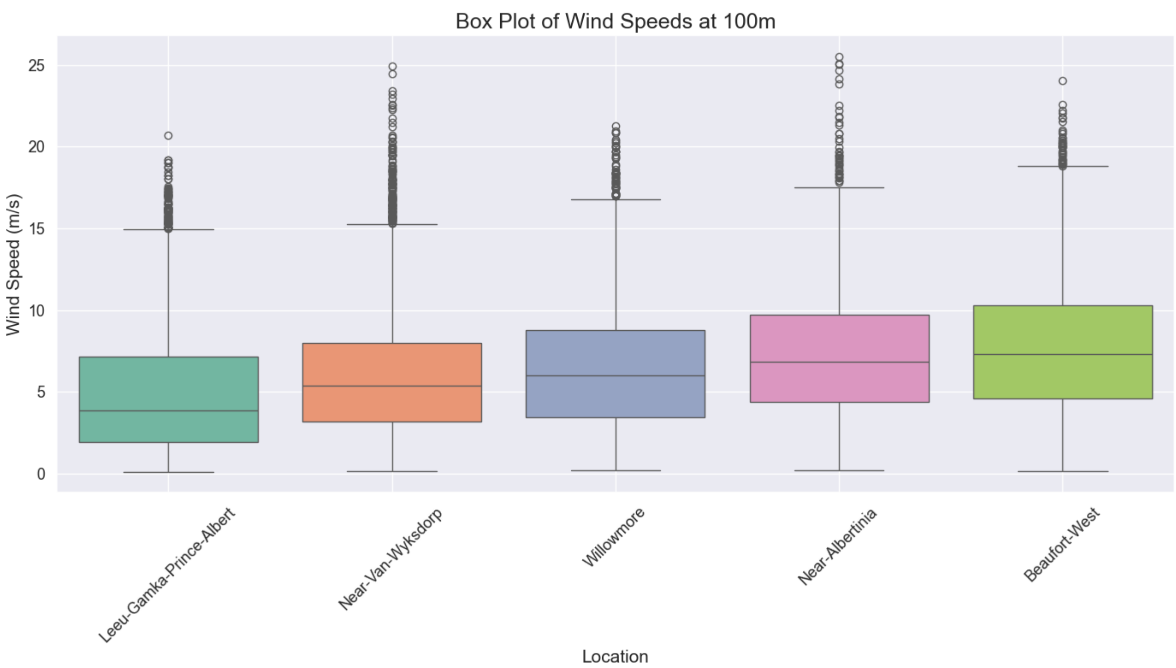


Table 38 : Statistics of Wind Speed (m/s) for Mossel Bay Locations at 100 m

Parameter	Leeu Gamka Prince Albert	Near Van Wyksdorp	Willowmore	Near Albertinia	Beaufort West
Min	0.095	0.165	0.18	0.175	0.165
Quantile 1	1.935	3.17	4.37	3.42	4.565
Mean	4.851	5.856	7.161	6.335	7.573
Median	3.85	5.37	6.828	6.028	7.29
Quantile 3	7.136	8.01	9.706	8.785	10.265
Max	20.68	24.945	25.52	21.265	24.015
Standard Deviation	3.585	3.487	3.653	3.597	3.812

Figure 39: Probability Density Functions of Wind Speeds for Mossel Bay Locations at 100m

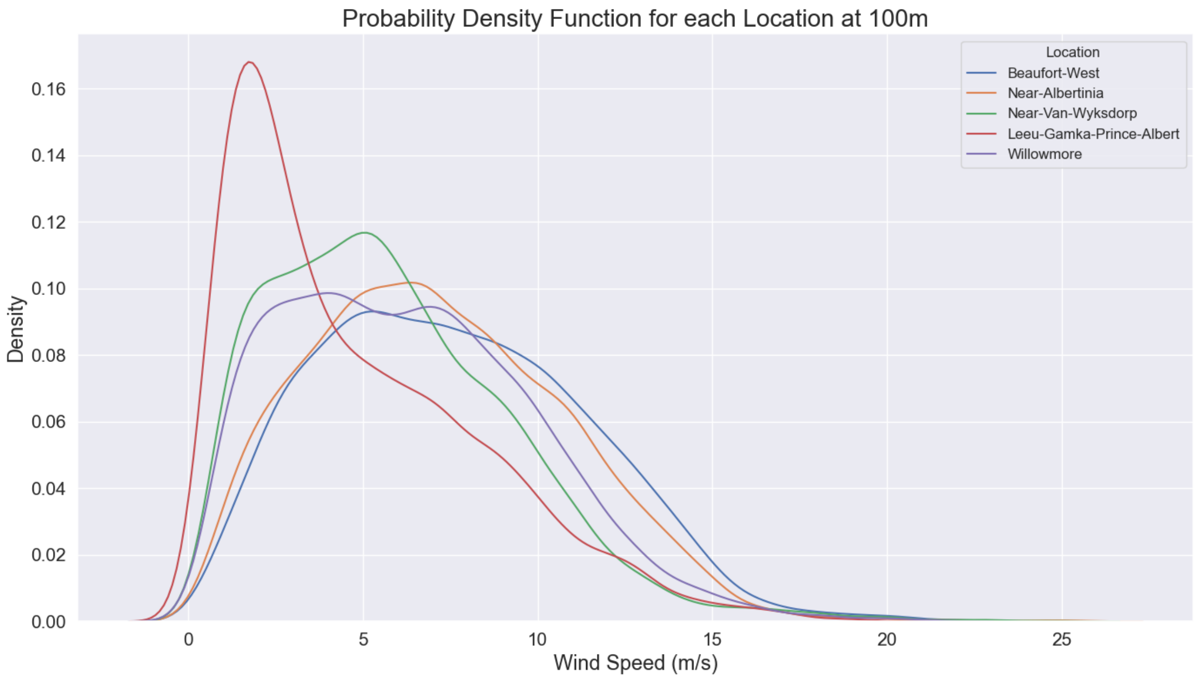


Figure 40: RWY Wind Speeds for Mossel Bay Locations at 100 m

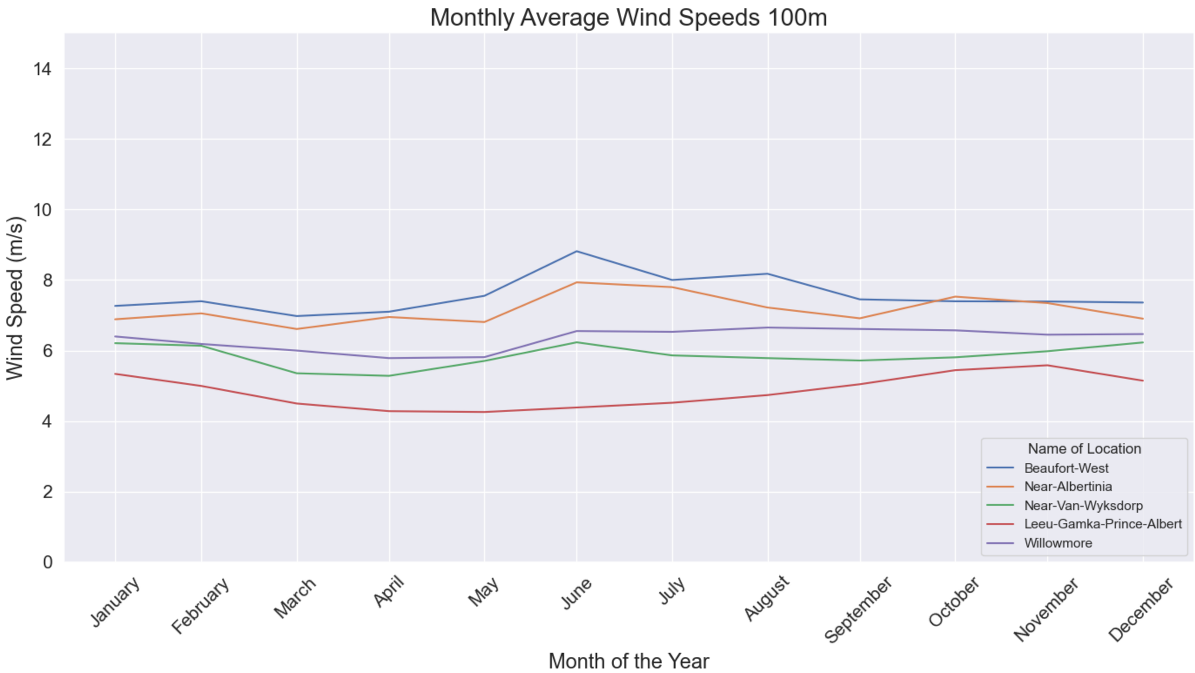


Figure 41: Box-and-Whisker Plot of Wind Speeds for Richards Bay Locations at 100 m

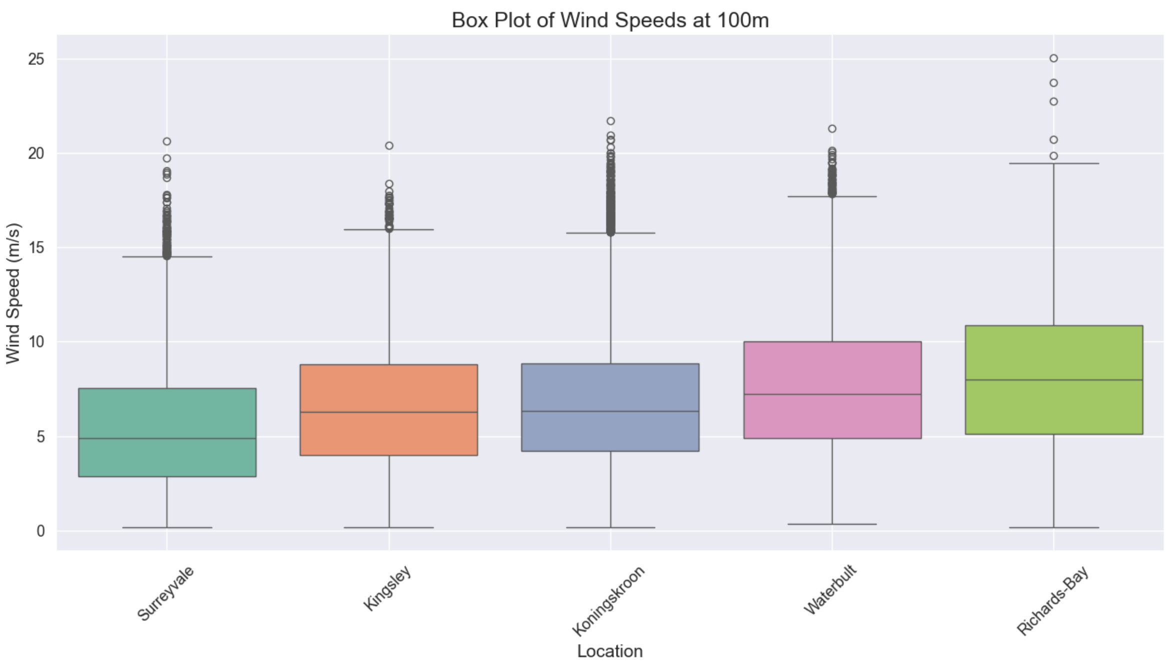


Table 39 : Statistics of Wind Speed (m/s) for Richards Bay Locations at 100 m

Parameter	Surreyvale	Kingsley	Koningskroon	Waterbult	Richards Bay
Min	0.145	0.165	0.18	0.33	0.165
Quantile 1	2.86	4.01	4.195	4.905	5.124
Mean	5.472	6.564	6.873	7.627	8.046
Median	4.89	6.285	6.345	7.215	7.99
Quantile 3	7.535	8.81	8.83	10.041	10.89
Max	20.665	20.425	21.745	21.32	25.06
Standard Deviation	3.297	3.296	3.68	3.604	3.686

Figure 42: Probability Density Functions of Wind Speeds for Richards Bay Locations at 100m

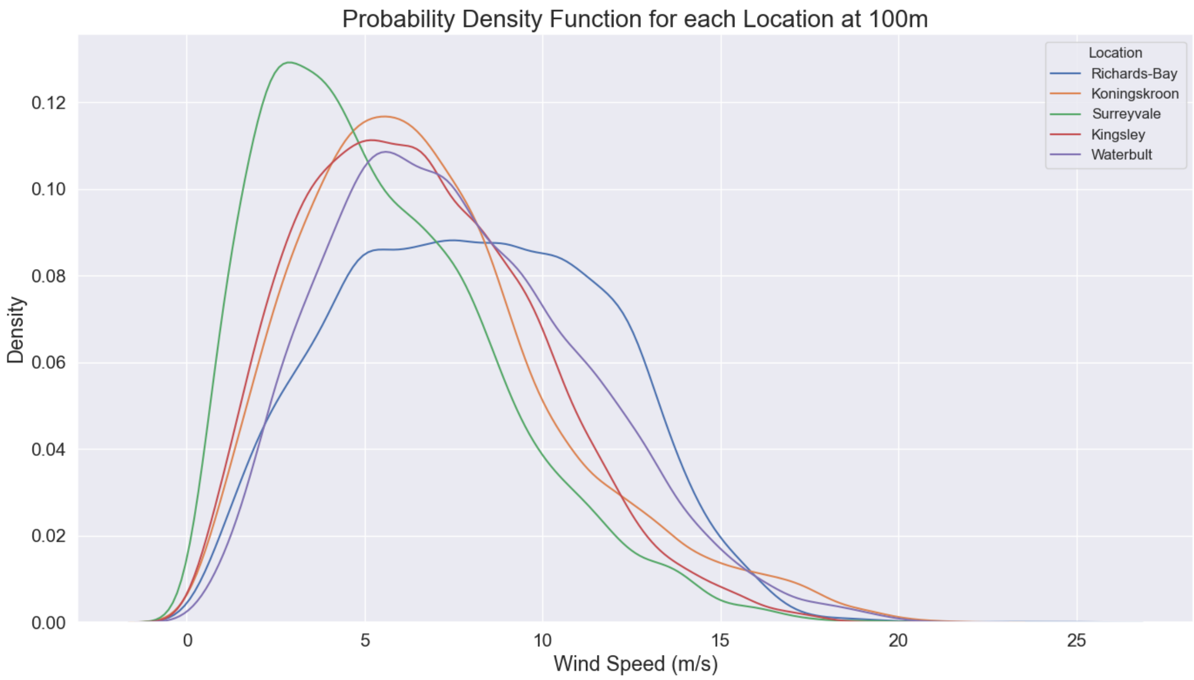


Figure 43: RWY Wind Speeds for Richards Bay Locations at 100 m

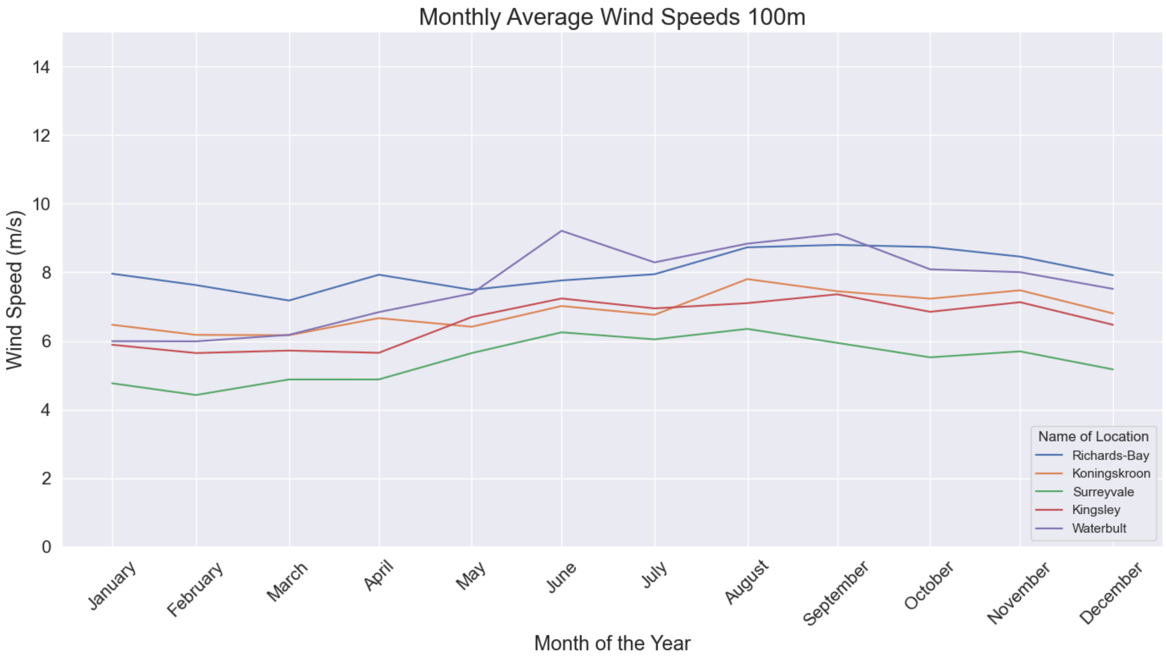


Figure 44: Box-and-Whisker Plot of Wind Speeds for Saldanha Bay Locations at 100 m

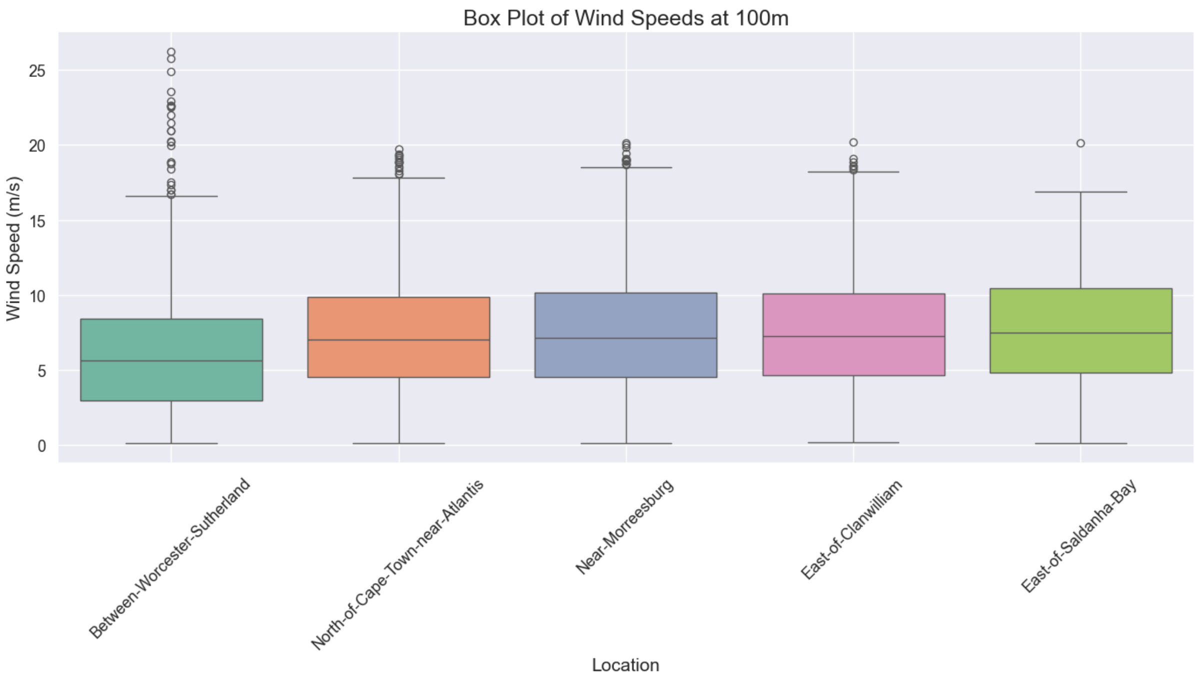


Table 40 : Statistics of Wind Speed (m/s) for Saldanha Bay Locations at 100 m

Parameter	Between Worcester and Sutherland	North of Cape Town Near Atlantis	Near Morreesburg	East of Clanwilliam	East of Saldanha Bay
Min	0.125	0.155	0.125	0.18	0.115
Quantile 1	2.954	4.52	4.55	4.654	4.835
Mean	5.9	7.29	7.53	7.481	7.585
Median	5.675	7.055	7.17	7.295	7.48
Quantile 3	8.436	9.856	10.17	10.085	10.43
Max	26.225	19.725	20.135	20.215	20.135
Standard Deviation	3.435	3.565	3.809	3.617	3.552

Figure 45: Probability Density Functions of Wind Speeds for Saldanha Bay Locations at 100m

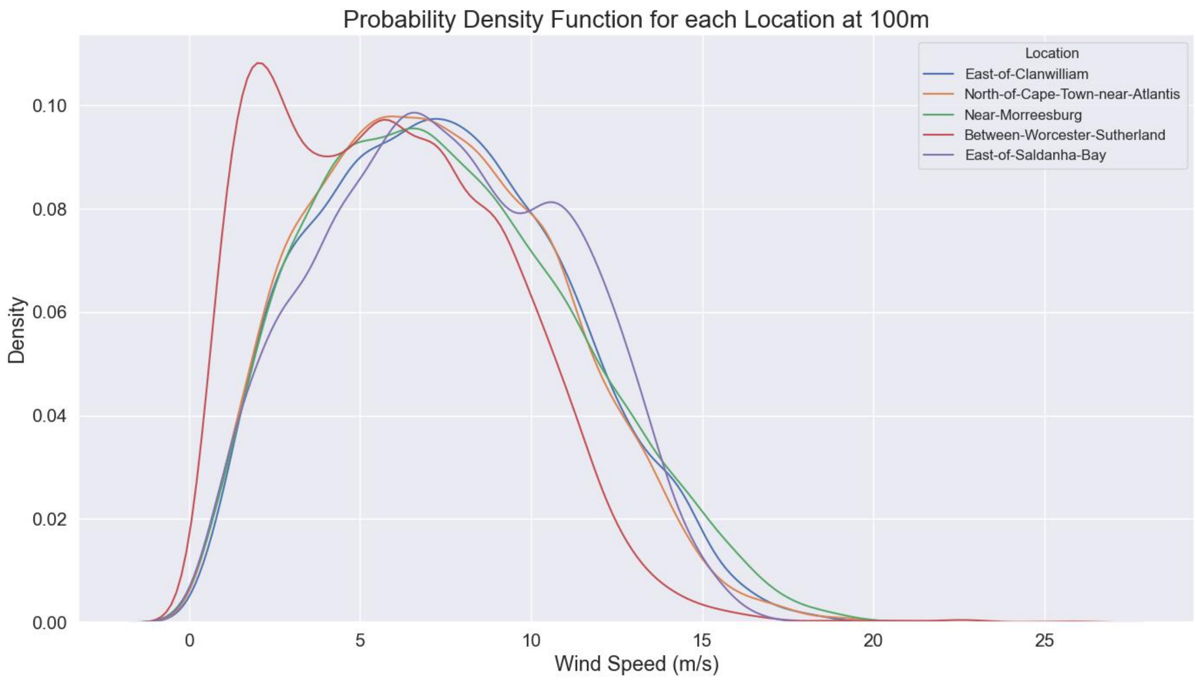


Figure 46: RWY Wind Speeds for Saldanha Bay Locations at 100 m

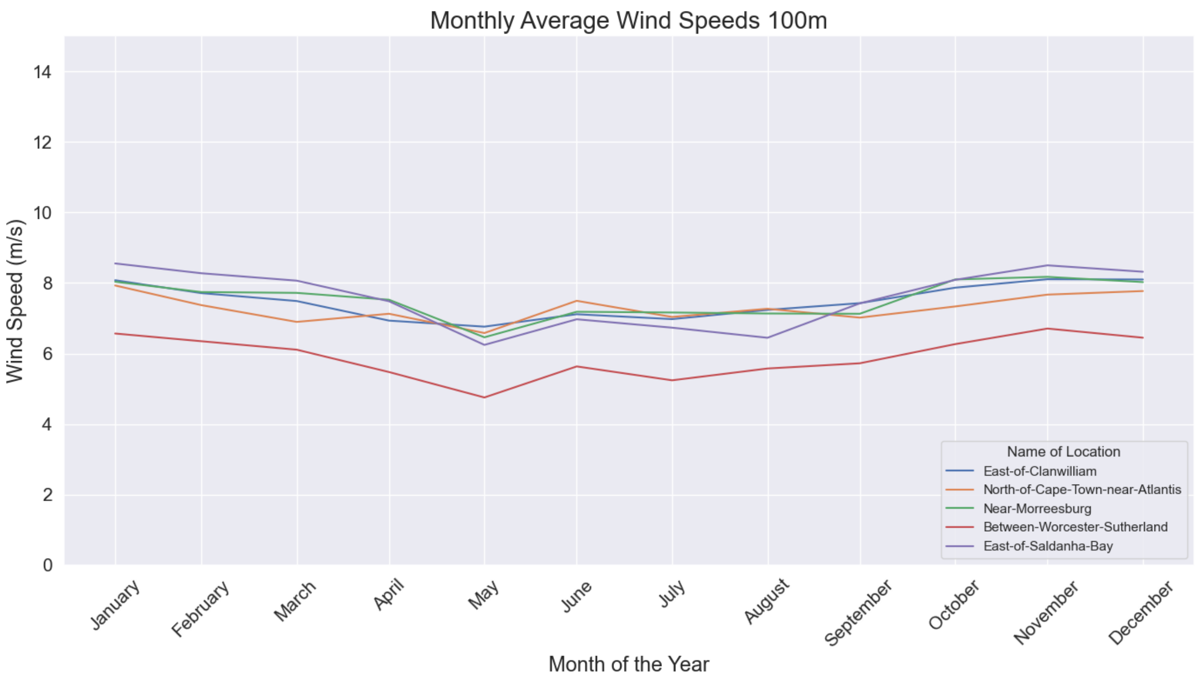


Figure 47: Box-and-Whisker Plot of Wind Speeds for Boegoebaai Locations at 120 m

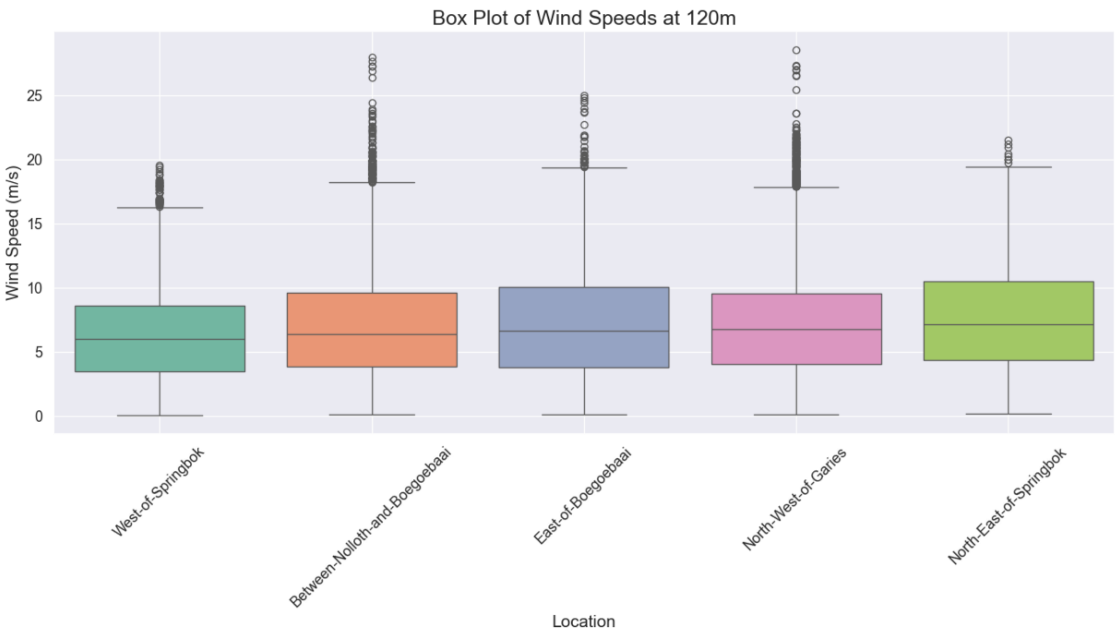


Table 41 : Statistics of Wind Speed (m/s) for Boegoebaai Locations at 120 m

Parameter	West of Springbok	Between Port Nolloth and Boegoebaai	East of Boegoebaai	Northwest of Garies	Northeast of Springbok
Min	0.065	0.135	0.16	0.145	0.165
Quantile 1	3.499	3.85	3.8	4.039	4.38
Mean	6.274	6.959	7.121	7.152	7.607
Median	6.035	6.363	6.652	6.778	7.155
Quantile 3	8.61	9.6	10.04	9.56	10.47
Max	19.53	27.955	24.96	28.52	21.505
Standard Deviation	3.43	4.045	4.097	4.053	3.986

Figure 48: Probability Density Functions of Wind Speeds for Boegoebaai Locations at 120m

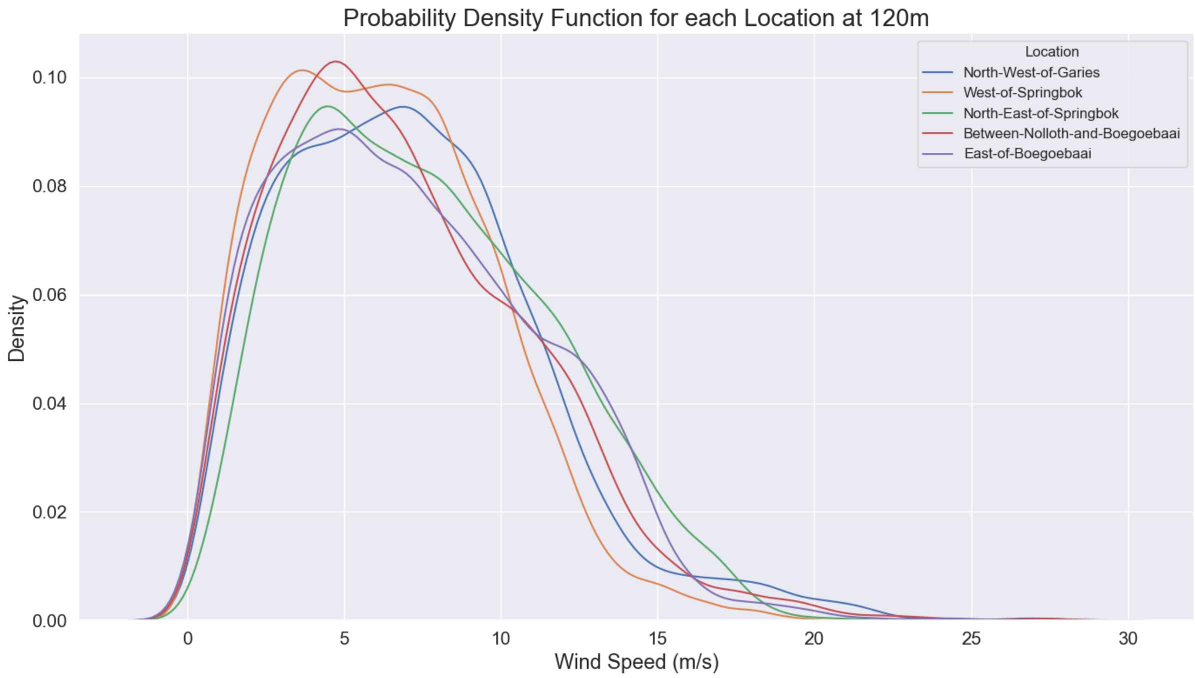


Figure 49: RWY Wind Speeds for Boegoebaai Locations at 120 m

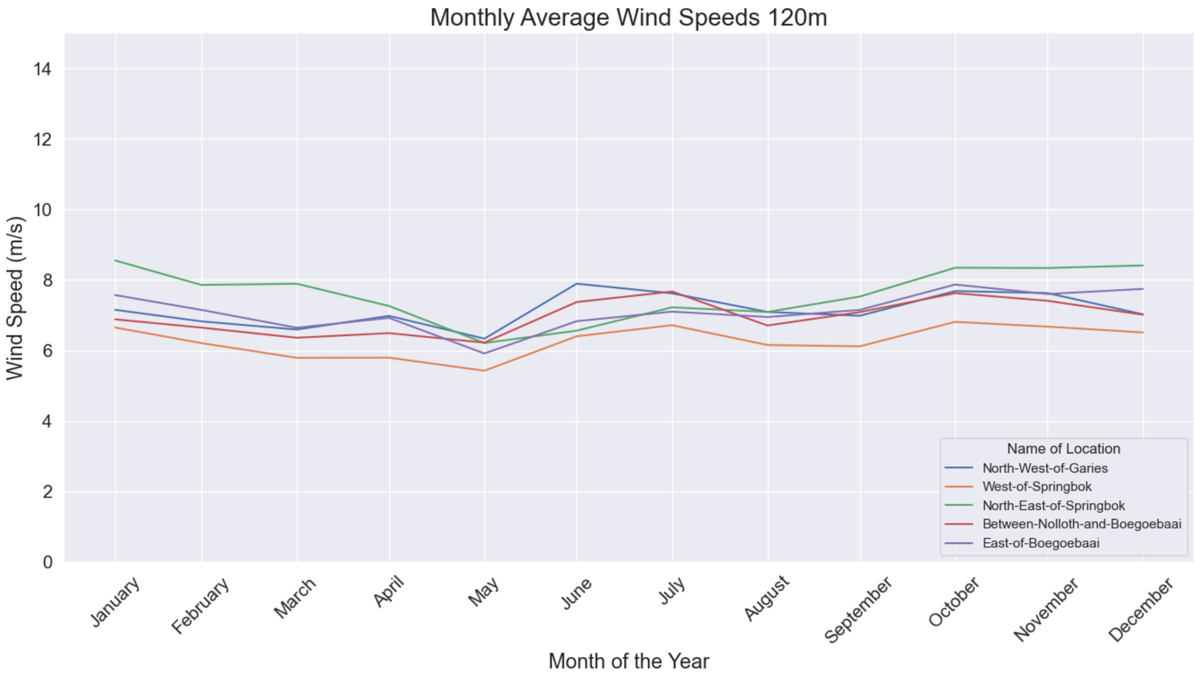


Figure 50: Box-and-Whisker Plot of Wind Speeds for Coega Locations at 120 m

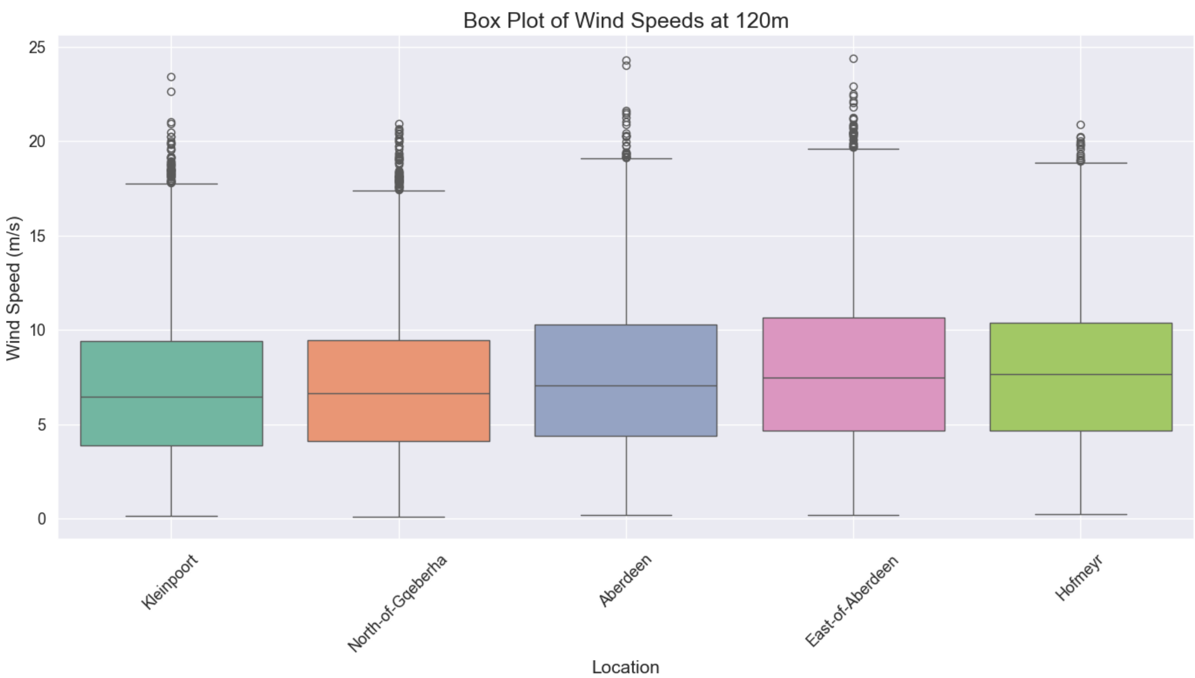


Table 42 : Statistics of Wind Speed (m/s) for Coega Locations **at 120 m**

Parameter	Kleinpoort	North of Gqeberha	Aberdeen	East of Aberdeen	Hofmeyr
Min	0.14	0.11	0.2	0.18	0.23
Quantile 1	3.87	4.114	4.375	4.669	4.689
Mean	6.909	7.042	7.529	7.811	7.721
Median	6.47	6.63	7.07	7.478	7.66
Quantile 3	9.43	9.445	10.286	10.675	10.375
Max	23.435	20.92	24.305	24.41	20.885
Standard Deviation	3.827	3.781	3.952	3.971	3.807

Figure 51: Probability Density Functions of Wind Speeds for Coega Locations at 120m

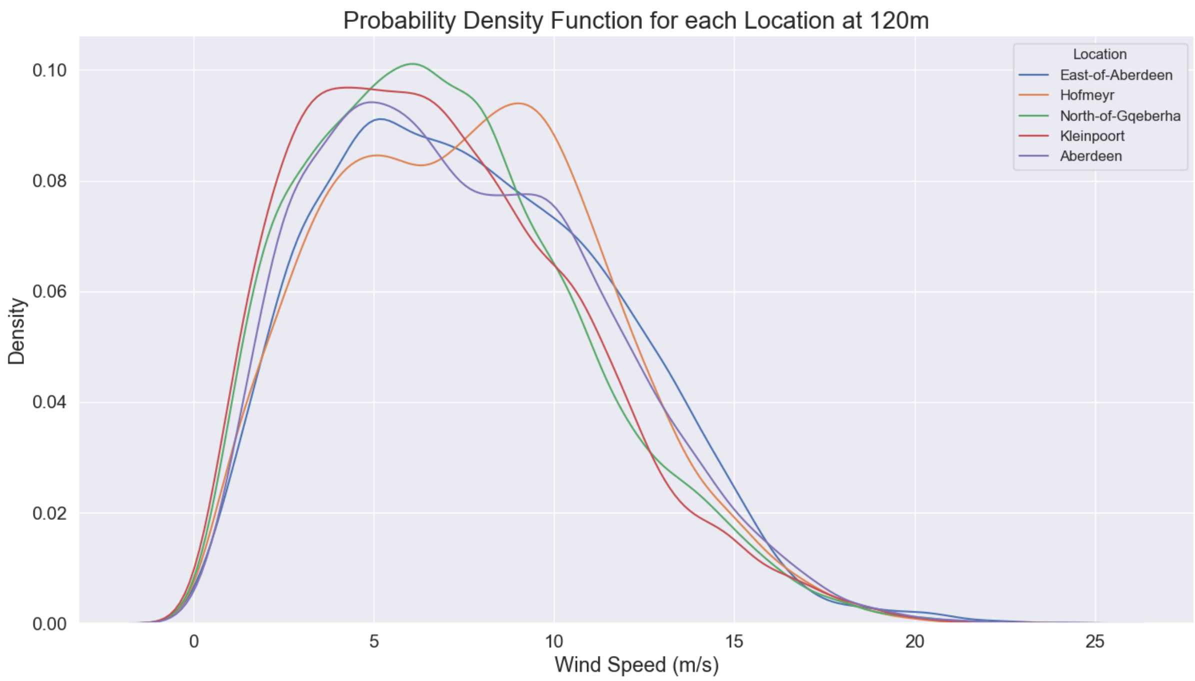


Figure 52: RWY Wind Speeds for Coega Locations at 120 m

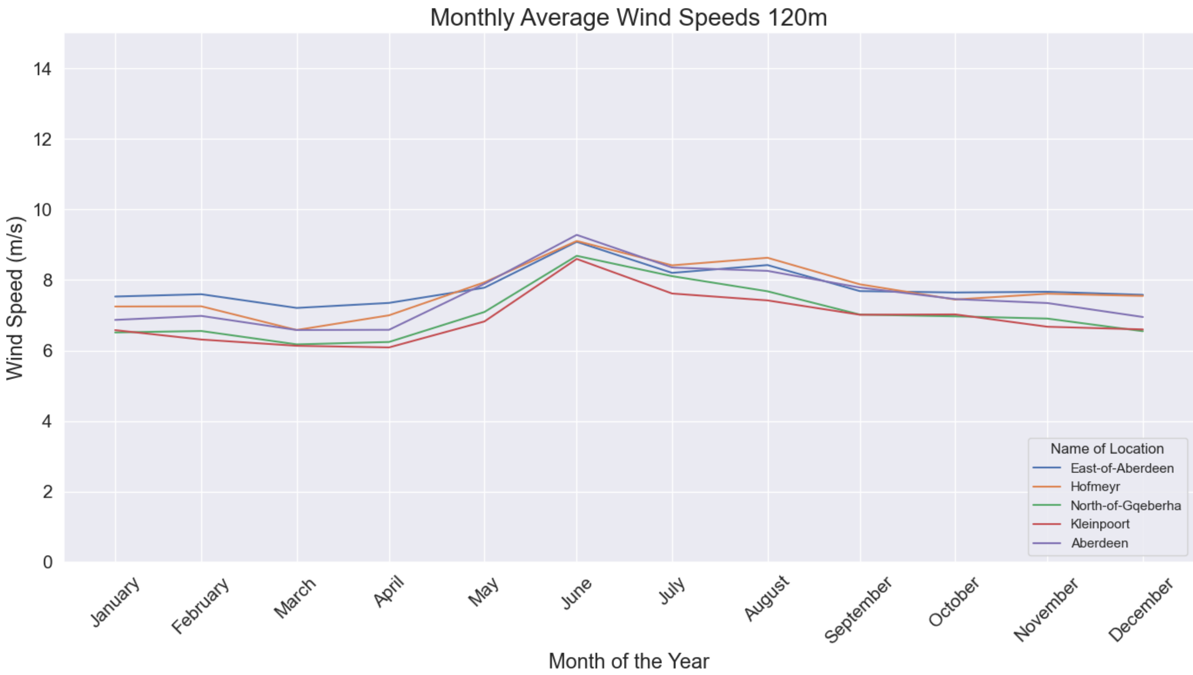


Figure 53: Box-and-Whisker Plot of Wind Speeds for Mossel Bay Locations at 120 m

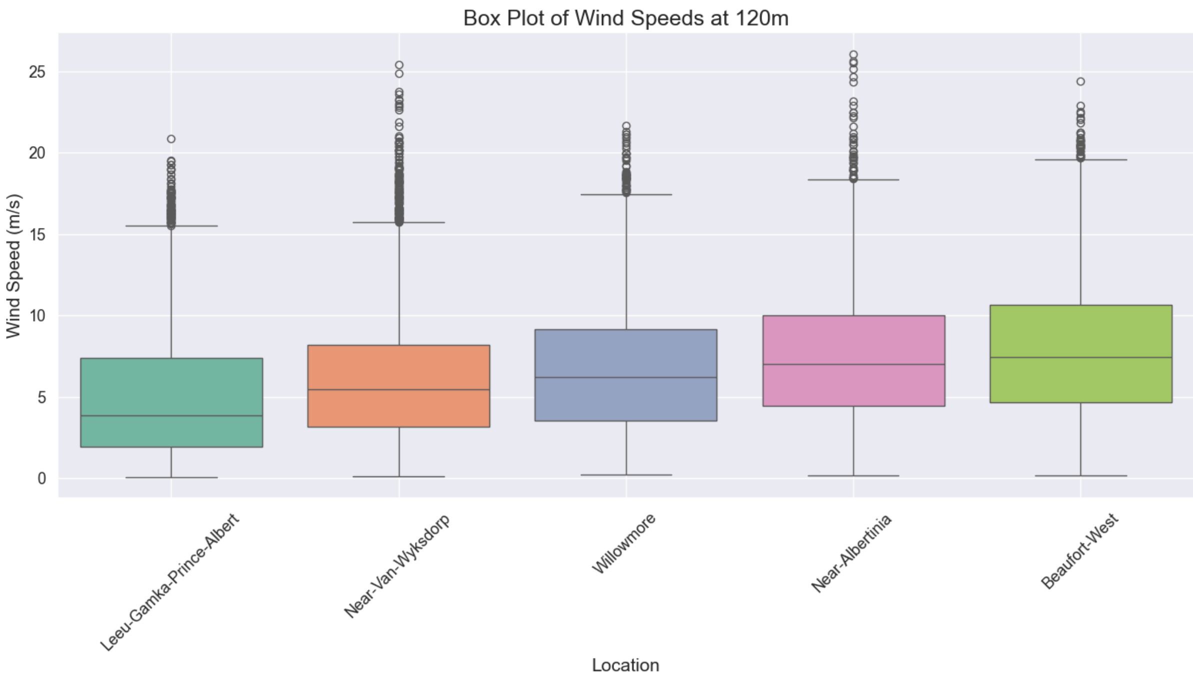


Table 43 : Statistics of Wind Speed (m/s) for Mossel Bay Locations at 120 m

Parameter	Leeu Gamka Prince Albert	Near Van Wyksdorp	Willowmore	Near Albertinia	Beaufort West
Min	0.08	0.155	0.21	0.225	0.18
Quantile 1	1.935	3.18	4.475	3.55	4.669
Mean	4.964	5.978	7.375	6.561	7.811
Median	3.882	5.495	7.01	6.225	7.478
Quantile 3	7.375	8.205	10.03	9.136	10.675
Max	20.87	25.38	26.065	21.68	24.41
Standard Deviation	3.706	3.597	3.808	3.705	3.971

Figure 54: Probability Density Functions of Wind Speeds for Mossel Bay Locations at 120m

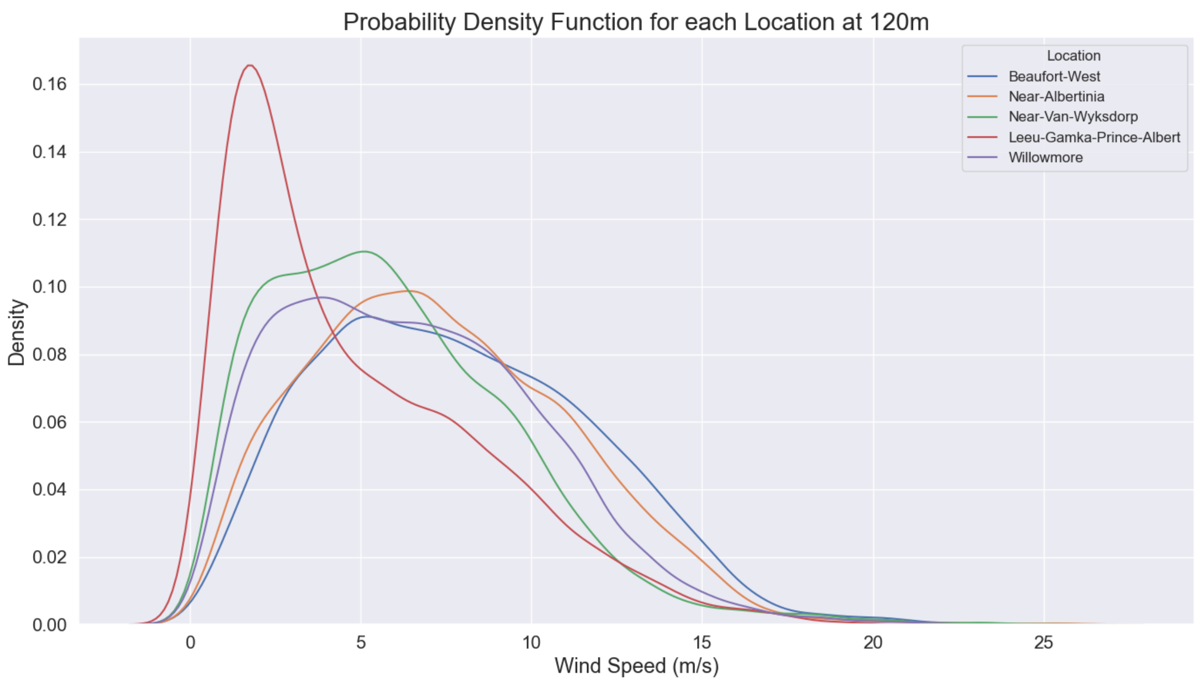


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Figure 55: RWY Wind Speeds for Mossel Bay Locations at 120 m

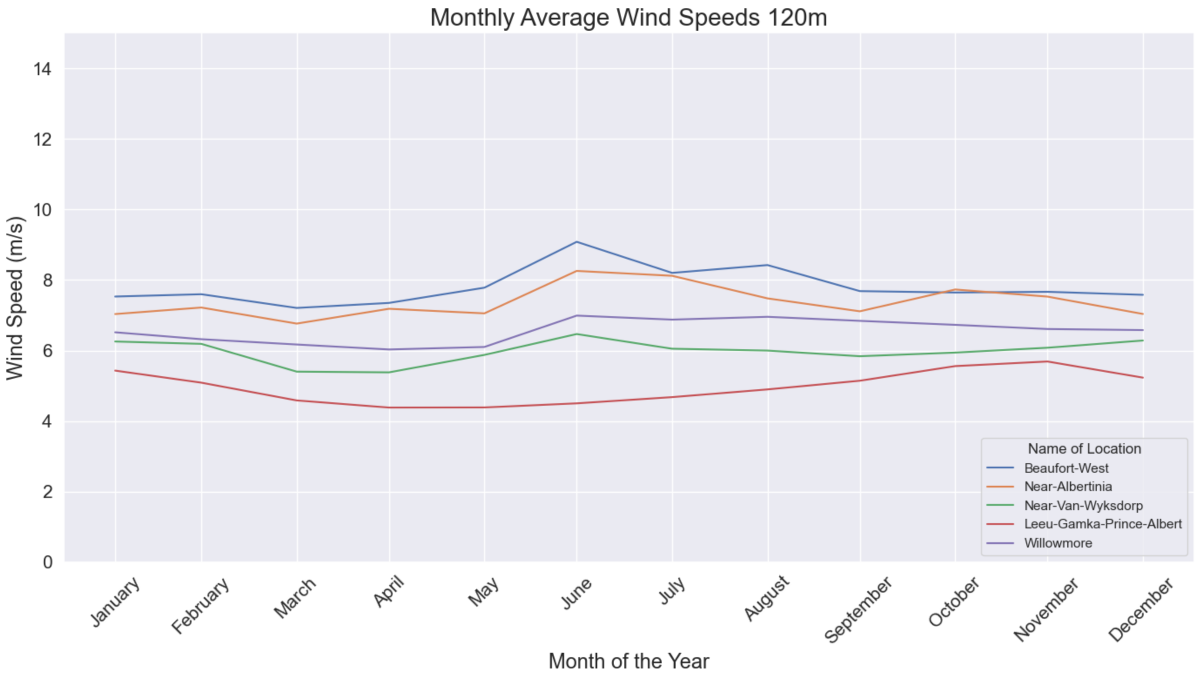


Figure 56: Box-and-Whisker Plot of Wind Speeds for Richards Bay Locations at 120 m

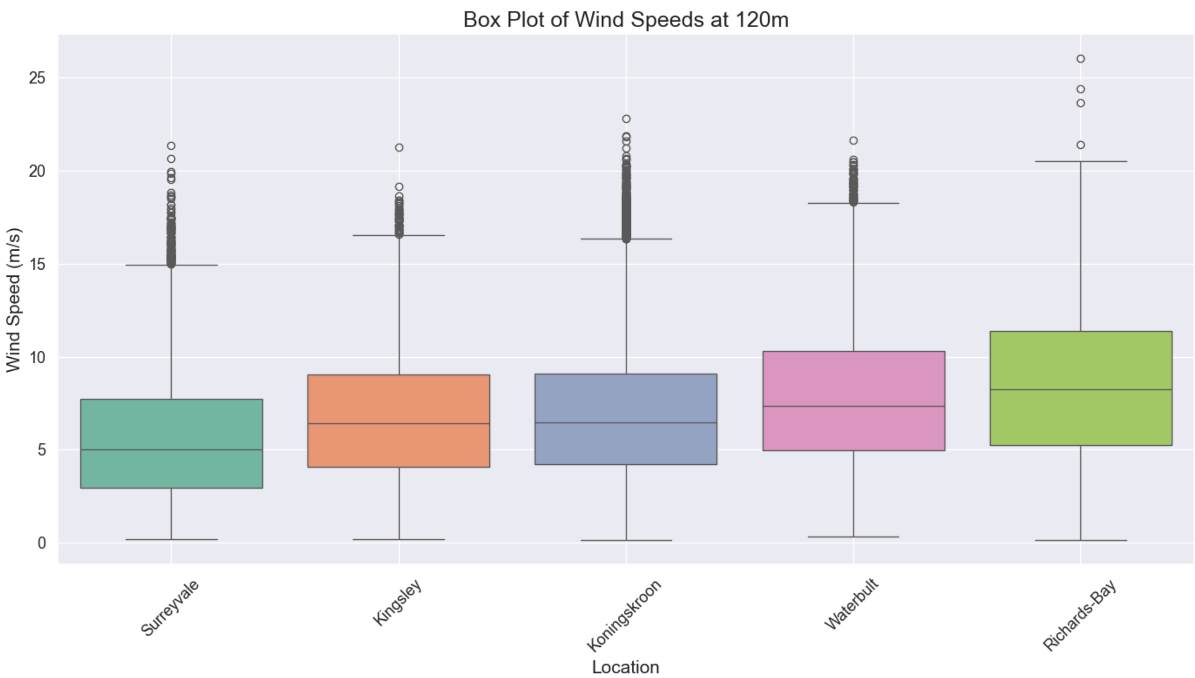


Table 44 : Statistics of Wind Speed for (m/s) Richards Bay Locations at 120 m

Parameter	Surreyvale	Kingsley	Koningskroon	Waterbult	Richards Bay
Min	0.205	0.215	0.14	0.33	0.135
Quantile 1	2.94	4.08	4.24	4.989	5.238
Mean	5.644	6.731	7.06	7.822	8.34
Median	5.025	6.43	6.495	7.375	8.275
Quantile 3	7.74	9.066	9.085	10.306	11.37
Max	21.385	21.255	22.81	21.655	26.045
Standard Deviation	3.446	3.417	3.854	3.756	3.902

Figure 57: Probability Density Functions of Wind Speeds for Richards Bay Locations at 120m

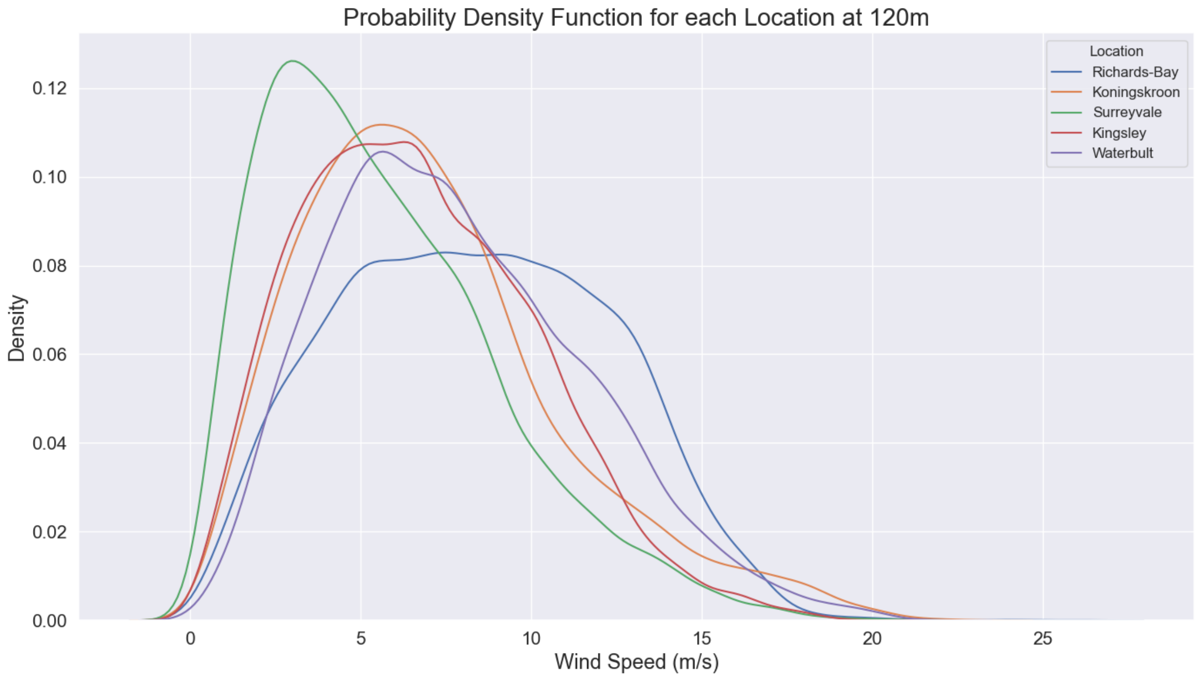


Figure 58: RWY Wind Speeds for Richards Bay Locations at 120 m

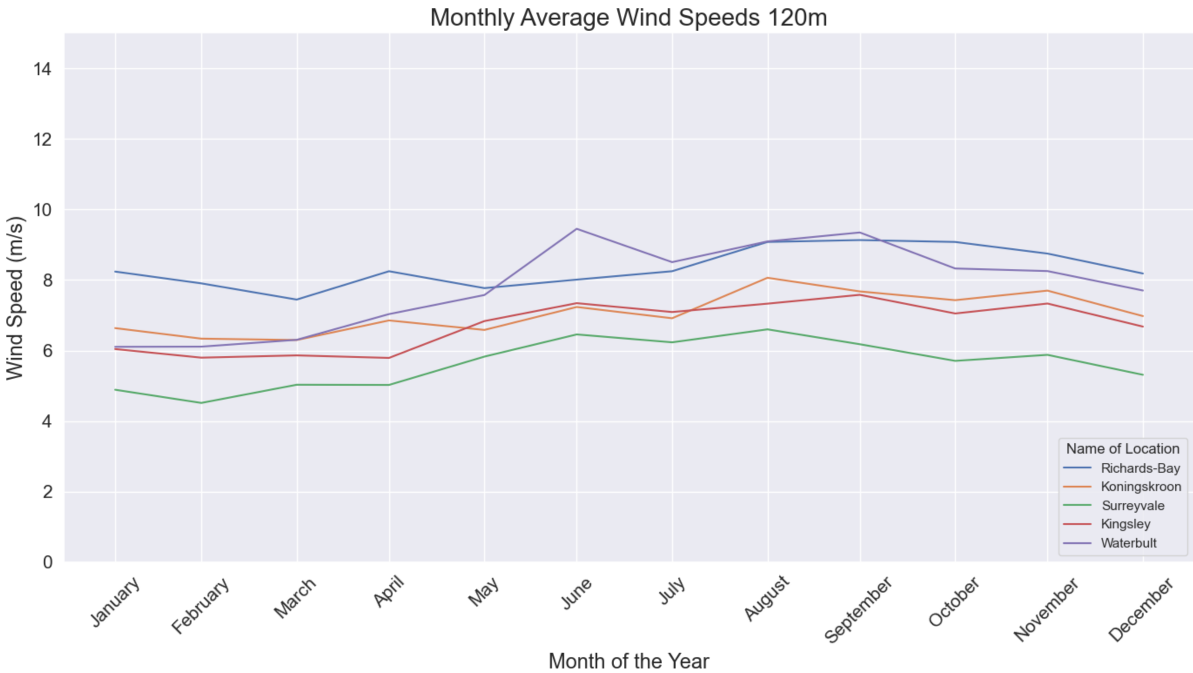


Figure 59: Box-and-Whisker Plot of Wind Speeds for Saldanha Bay Locations at 120 m

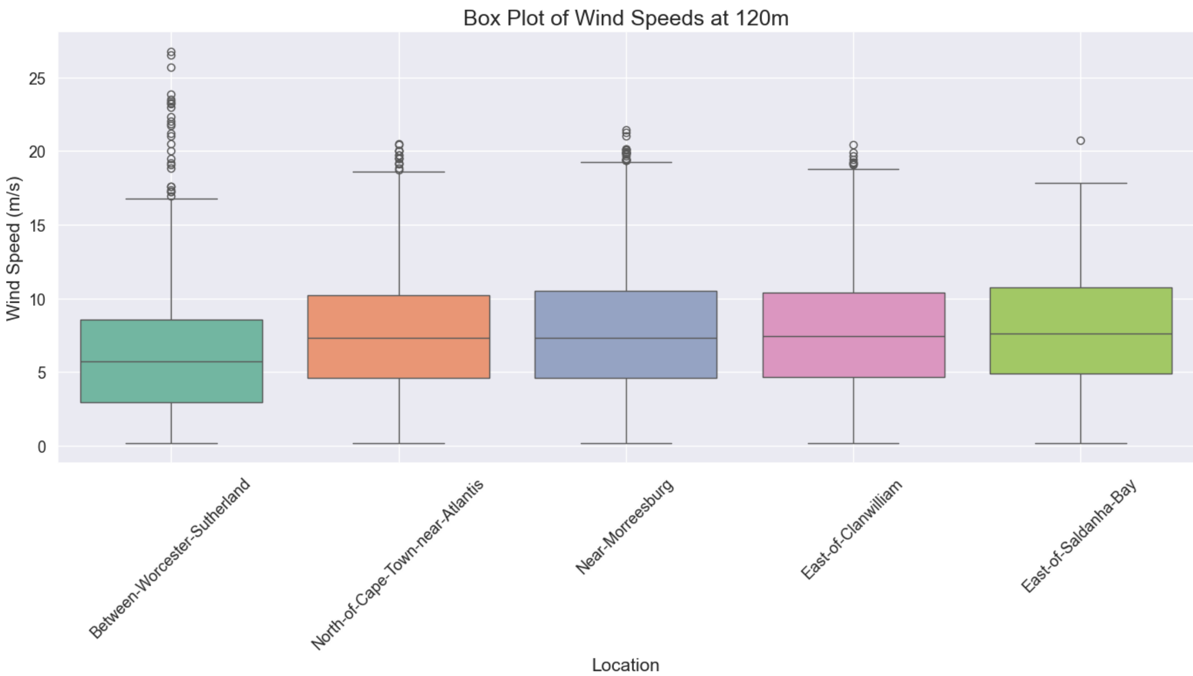


Table 45 : Statistics of Wind Speed (m/s) for Saldanha Bay Locations at 120 m

Parameter	Between Worcester and Sutherland	North of Cape Town Near Atlantis	Near Morreesburg	East of Clanwilliam	East of Saldanha Bay
Min	0.14	0.14	0.155	0.195	0.165
Quantile 1	2.925	4.61	4.595	4.685	4.908
Mean	5.965	7.526	7.725	7.659	7.8
Median	5.735	7.295	7.322	7.425	7.615
Quantile 3	8.535	10.236	10.48	10.36	10.73
Max	26.755	20.465	21.415	20.41	20.695
Standard Deviation	3.527	3.709	4.013	3.8	3.73

Figure 60: Probability Density Functions of Wind Speeds for Saldanha Bay Locations at 120m

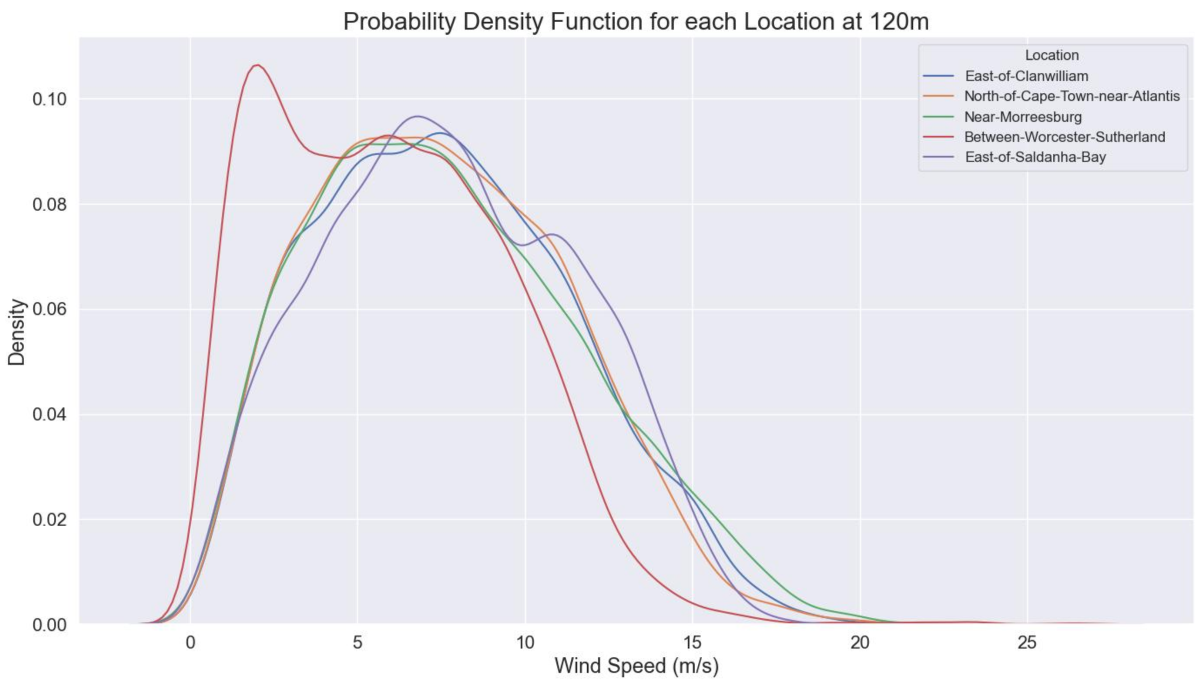


Figure 61: RWY Wind Speeds for Saldanha Bay Locations at 120 m

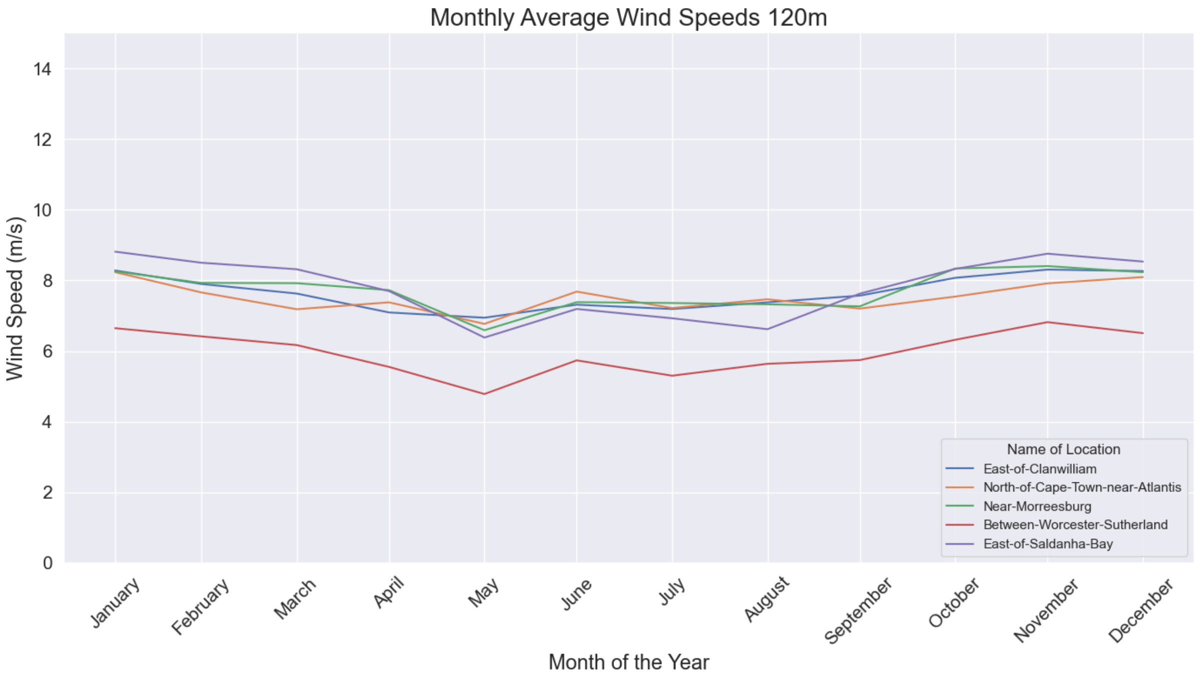


Figure 62: Box-and-Whisker Plot of Wind Speeds for Boegoebaai Locations at 150 m

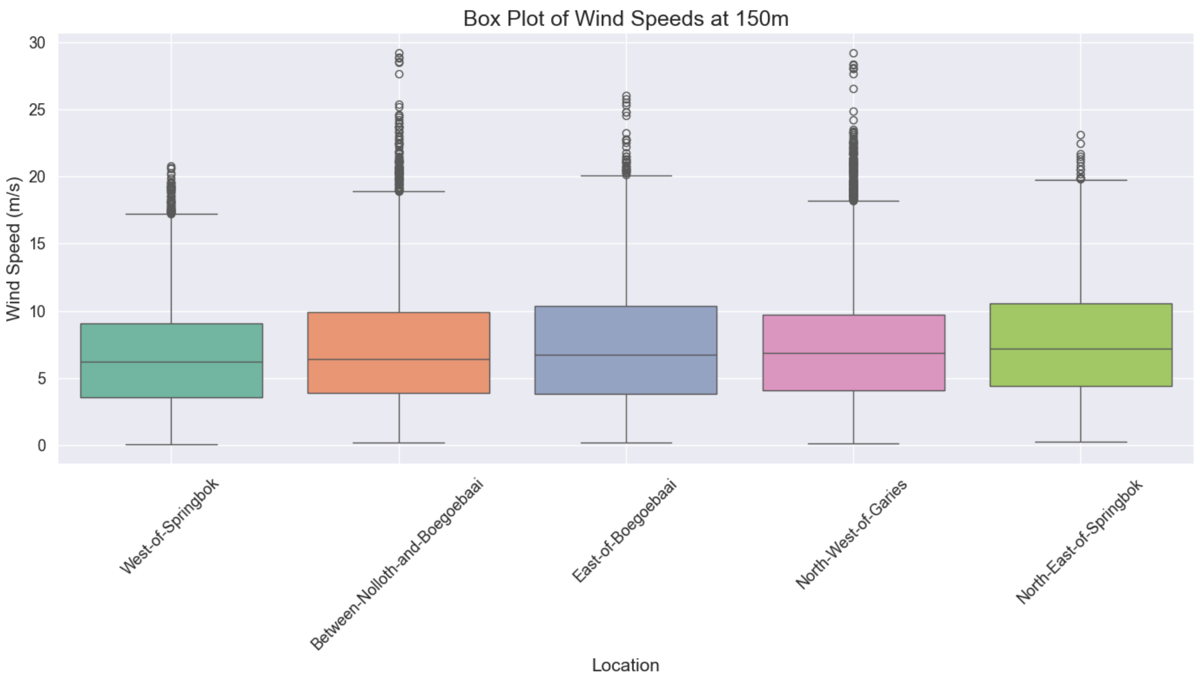


Table 46 : Statistics of Wind Speed (m/s) for Boegoebaai Locations at 150 m

Parameter	West of Springbok	Northwest of Garies	East of Boegoebaai	Between Port Nolloth and Boegoebaai	Northeast of Springbok
Min	0.069	0.147	0.227	0.207	0.271
Quantile 1	3.575	4.098	3.843	3.894	4.408
Mean	6.205	6.872	6.741	6.436	7.187
Median	6.516	7.286	7.306	7.142	7.7
Quantile 3	9.048	9.739	10.342	9.907	10.557
Max	20.794	29.212	26.012	29.219	23.128
Standard Deviation	3.633	4.185	4.27	4.243	4.098

Figure 63: Probability Density Functions of Wind Speeds for Boegoebaai Locations at 150m

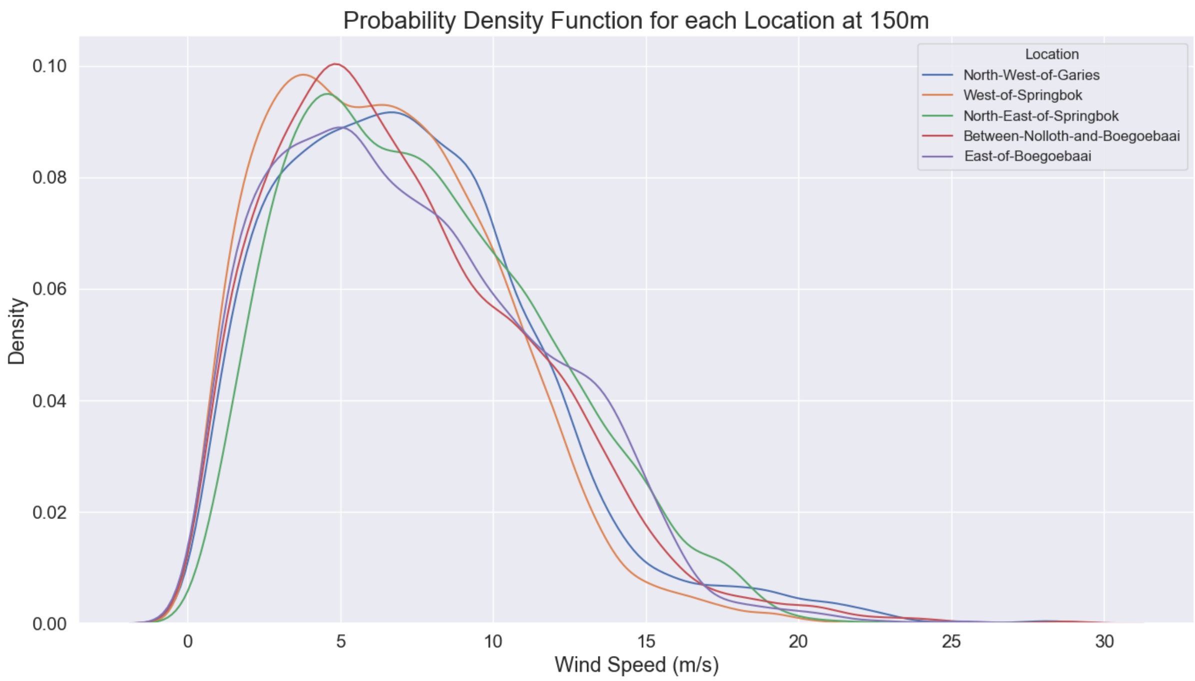


Figure 64: RWY Wind Speeds for Boegoebaai Locations at 150 m

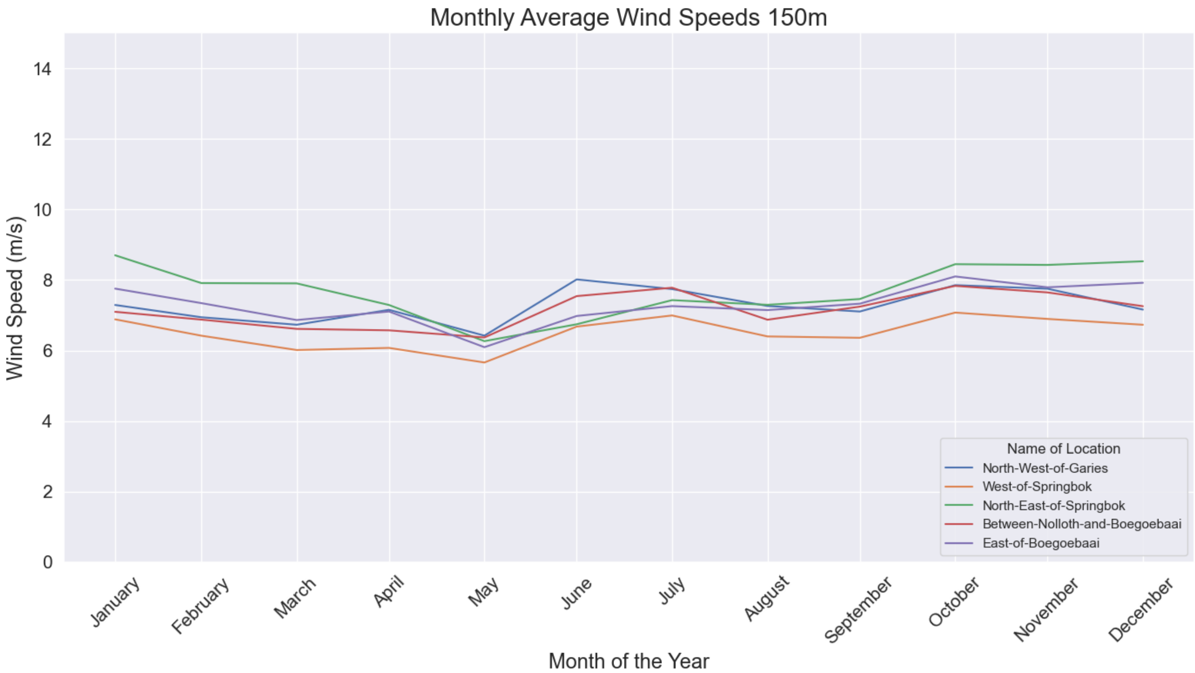


Figure 65: Box-and-Whisker Plot of Wind Speeds for Coega Locations at 150 m

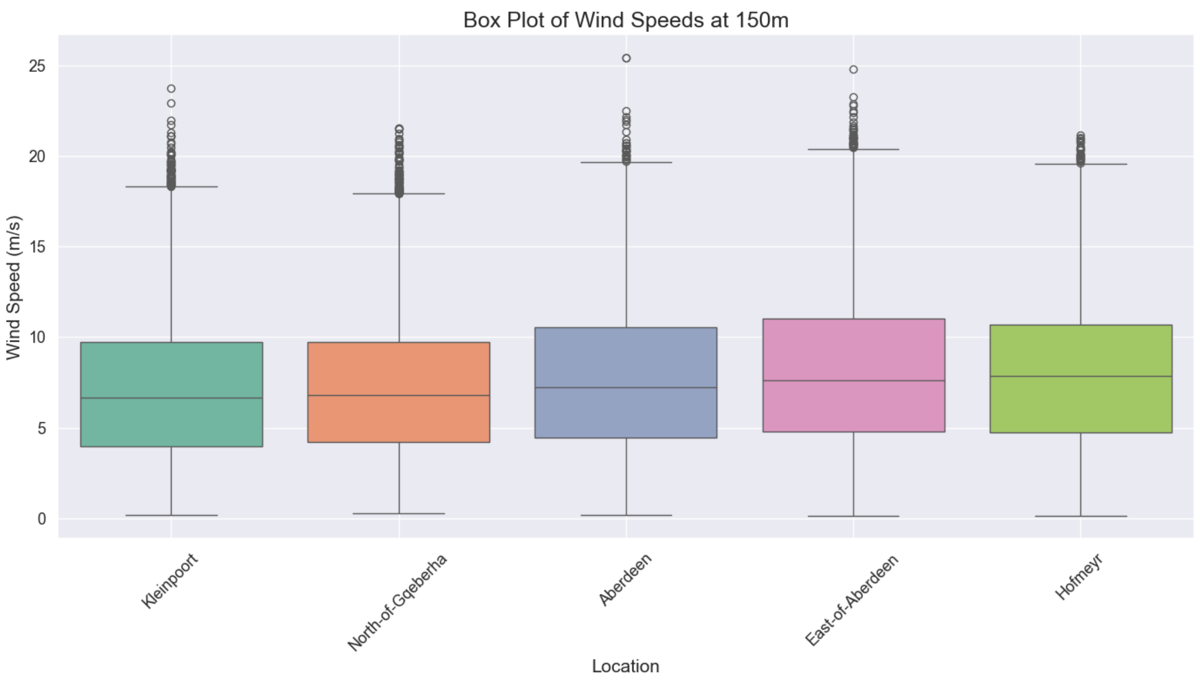


Table 47 : Statistics of Wind Speed (m/s) for Coega Locations at 150 m

Parameter	Kleinpoort	North of Gqeberha	Aberdeen	East of Aberdeen	Hofmeyr
Min	0.185	0.255	0.204	0.148	0.135
Quantile 1	3.979	4.228	4.455	4.771	4.765
Mean	7.12	7.254	7.718	8.054	7.941
Median	6.647	6.805	7.222	7.62	7.849
Quantile 3	9.726	9.716	10.568	11.055	10.702
Max	23.733	21.559	25.449	24.816	21.144
Standard Deviation	3.973	3.929	4.108	4.159	3.974

Figure 66: Probability Density Functions of Wind Speeds for Coega Locations at 150m

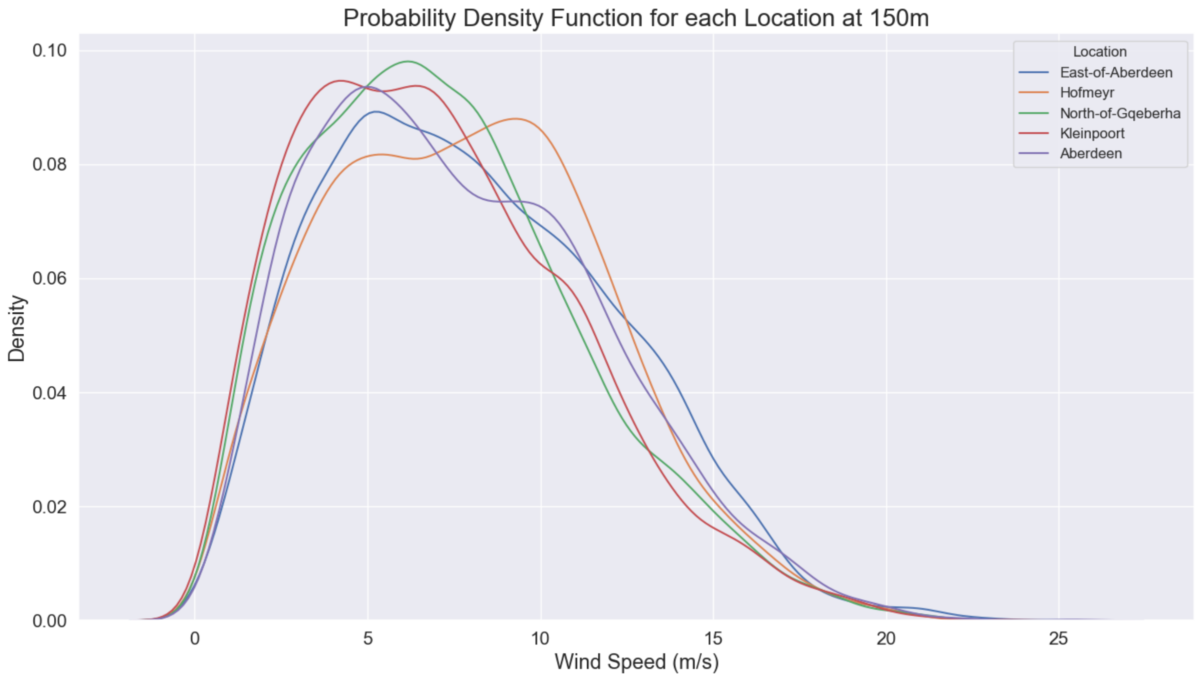


Figure 67: RWY Wind Speeds for Coega Locations at 150 m

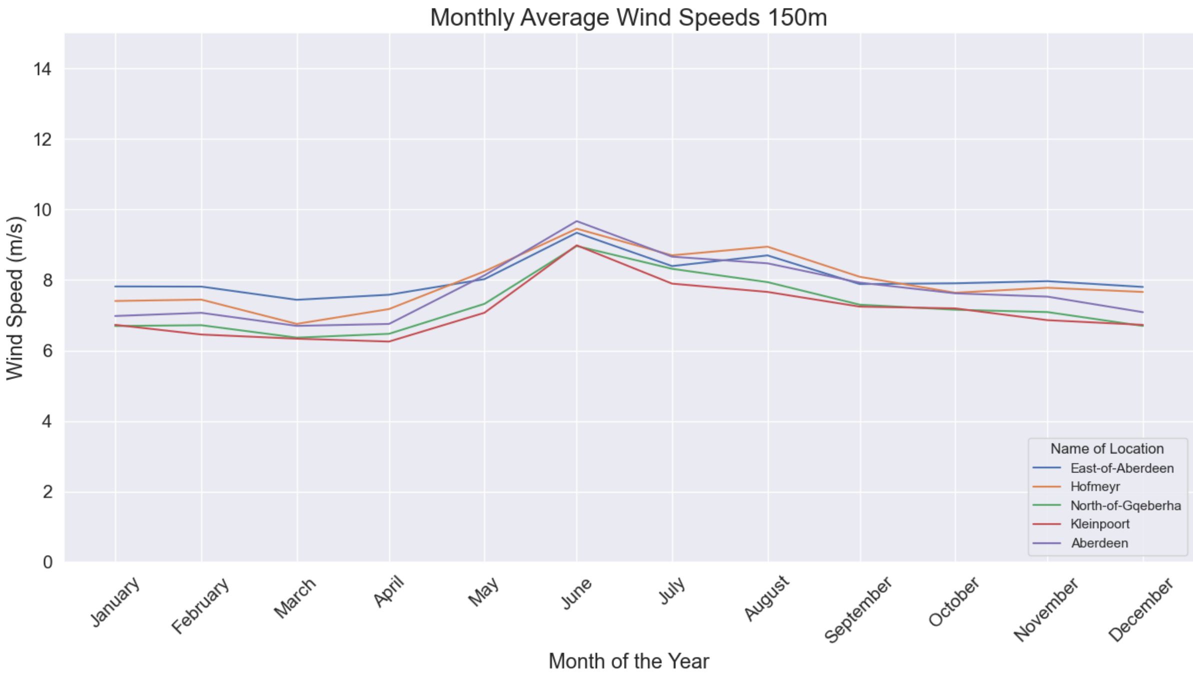


Figure 68: Box-and-Whisker Plot of Wind Speeds for Mossel Bay Locations at 150 m

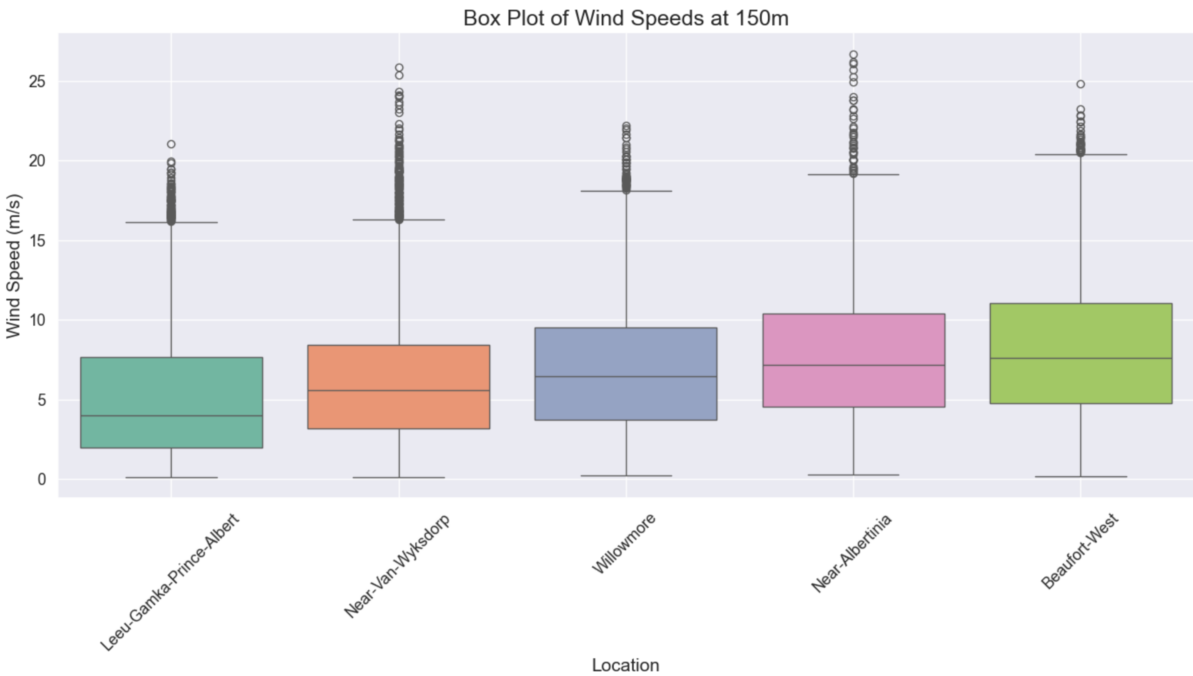


Table 48 : Statistics of Wind Speed (m/s) for Mossel Bay Locations at 150 m

Parameter	Leeu Gamka Prince Albert	Near Van Wyksdorp	Willowmore	Near Albertinia	Beaufort West
Min	0.11	0.108	0.229	0.249	0.148
Quantile 1	1.958	3.194	3.731	4.535	4.771
Mean	5.112	6.126	6.838	7.613	8.054
Median	3.989	5.595	6.458	7.19	7.62
Quantile 3	7.638	8.44	9.499	10.379	11.055
Max	21.06	25.856	22.206	26.707	24.816
Standard Deviation	3.849	3.738	3.831	4.005	4.159

Figure 69: Probability Density Functions of Wind Speeds for Mossel Bay Locations at 150m

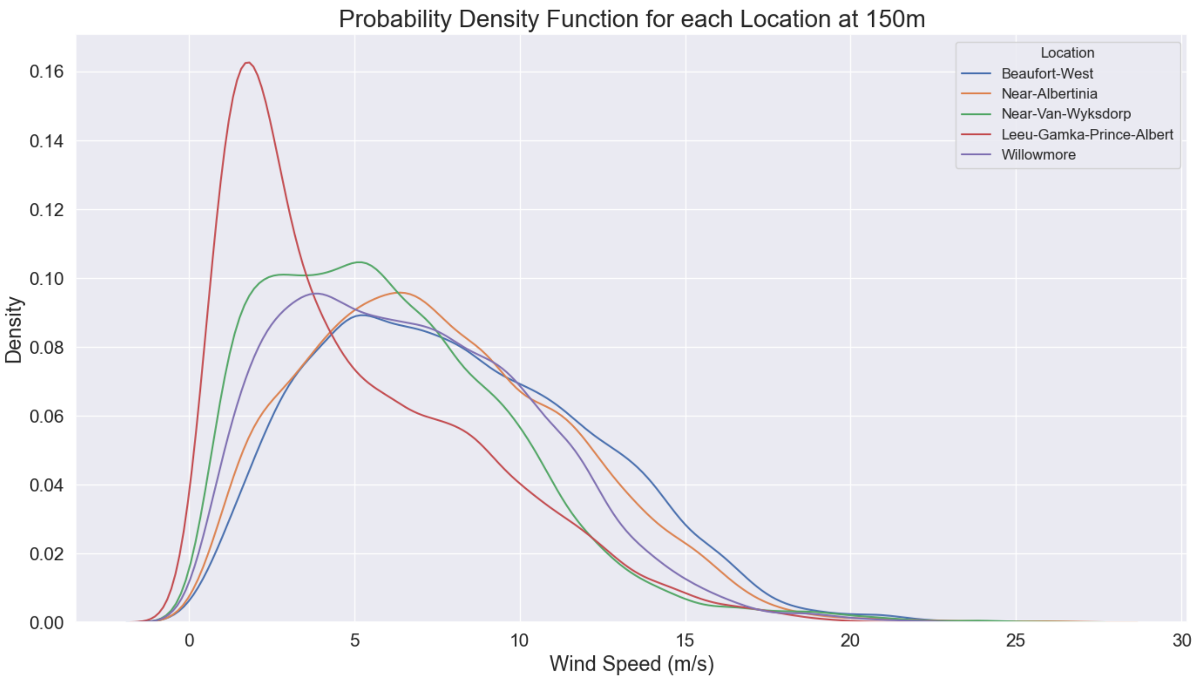


Figure 70: RWY Wind Speeds for Mossel Bay Locations at 150 m

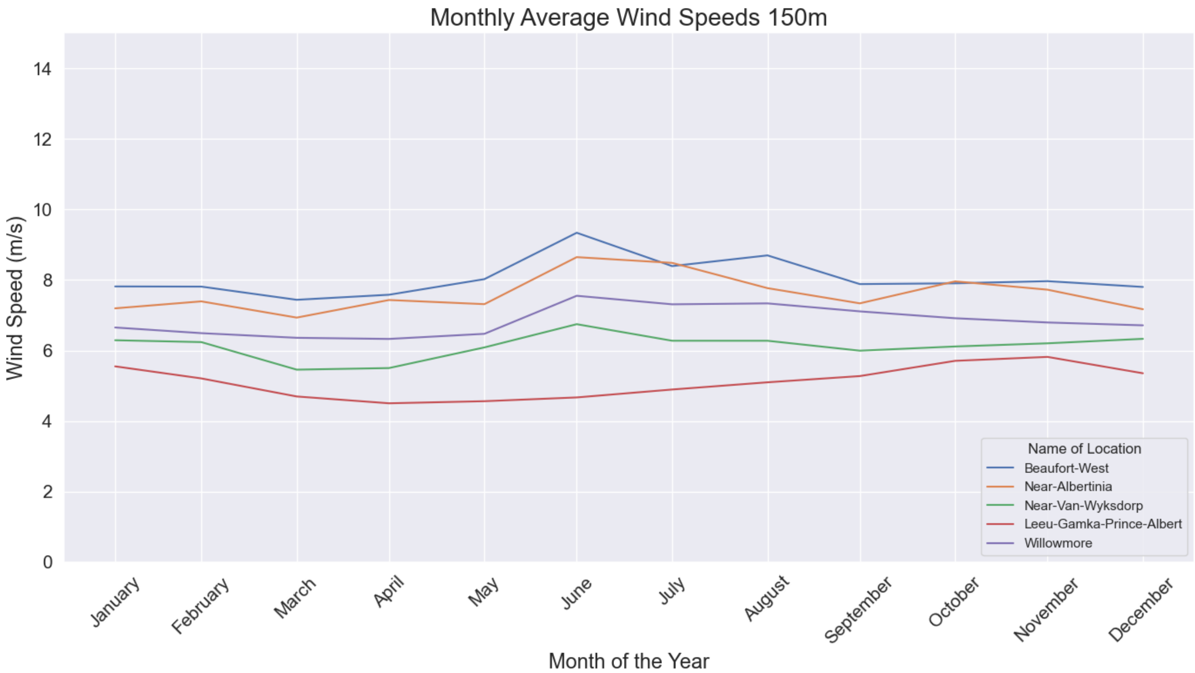


Figure 71: Box-and-Whisker Plot of Wind Speeds for Richard Bay Locations at 150 m

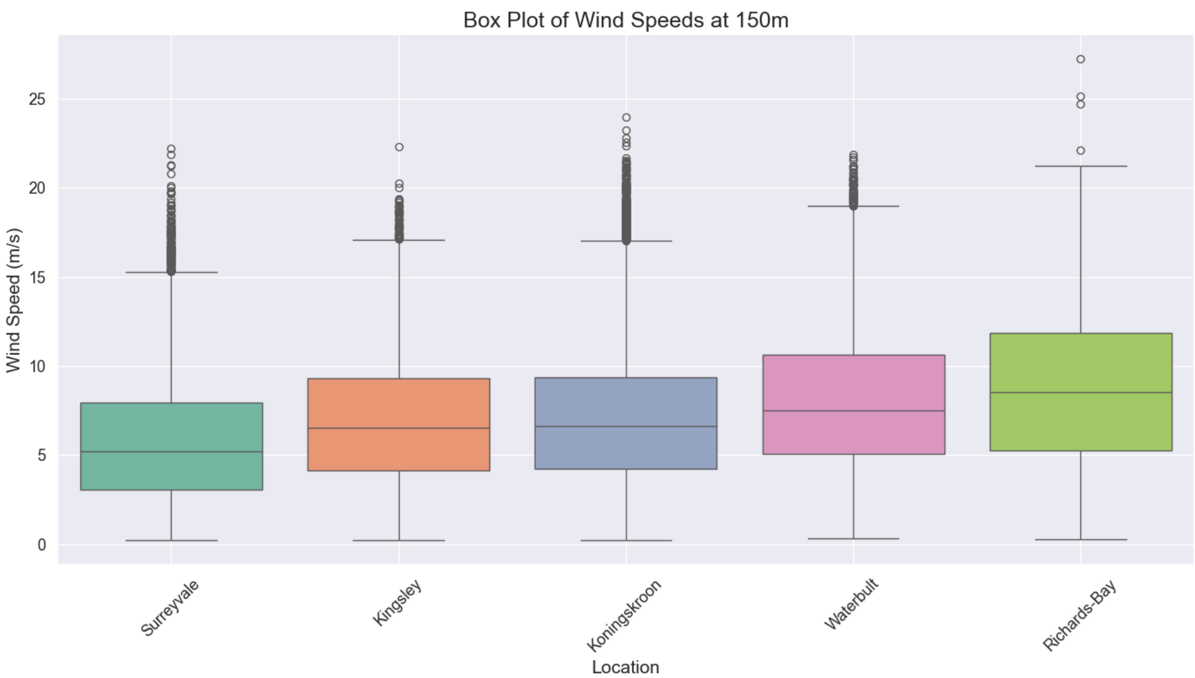


Table 49 : Statistics of Wind Speed (m/s) for Richard Bay Locations at 150 m

Parameter	Surreyvale	Kingsley	Koningskroon	Waterbult	Richards Bay
Min	0.223	0.23	0.216	0.309	0.266
Quantile 1	3.048	4.14	4.256	5.064	5.289
Mean	5.84	6.893	7.249	8.025	8.647
Median	5.2	6.533	6.622	7.523	8.521
Quantile 3	7.951	9.328	9.376	10.633	11.842
Max	22.21	22.333	23.988	21.876	27.251
Standard Deviation	3.607	3.546	4.058	3.935	4.161

Figure 72: Probability Density Functions of Wind Speeds for Richard Bay Locations at 150m

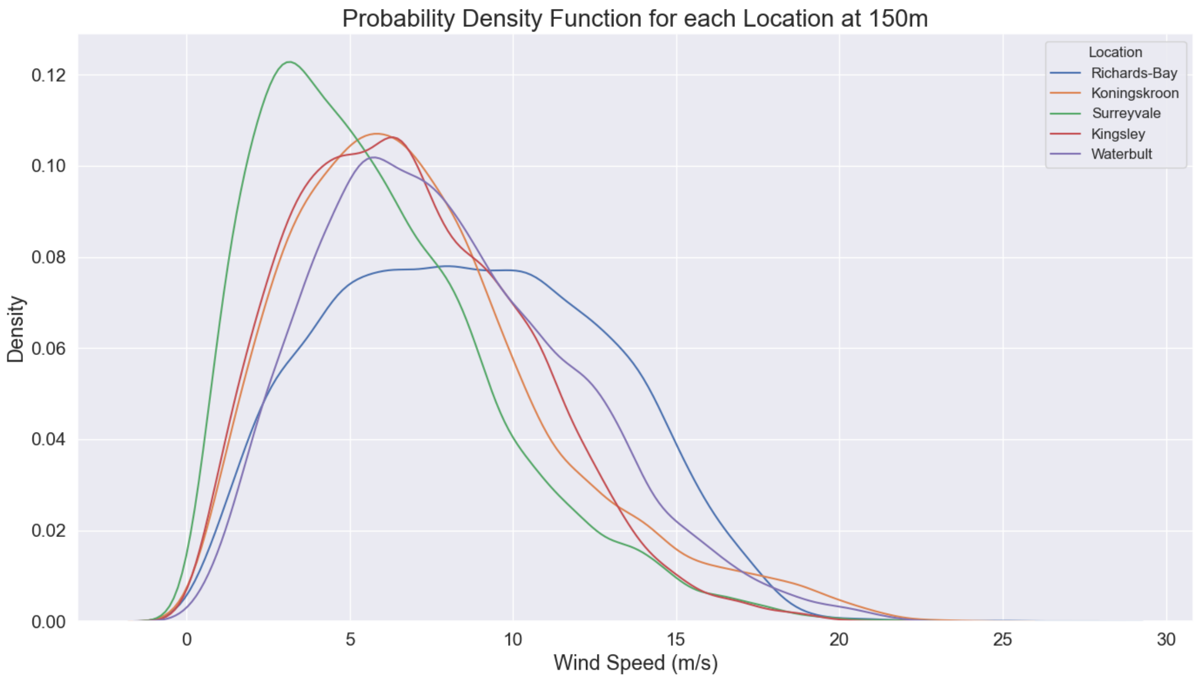


Figure 73: RWY Wind Speeds for Richard Bay Locations at 150 m

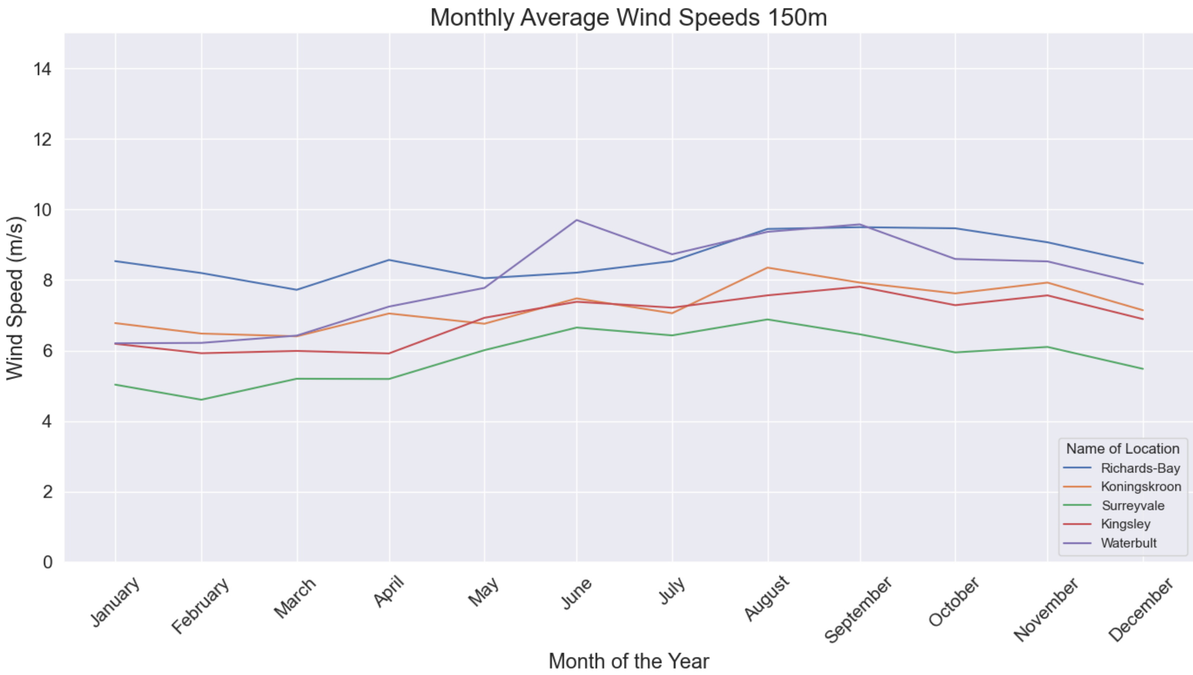


Figure 74: Box-and-Whisker Plot of Wind Speeds for Saldanha Bay Locations at 150 m

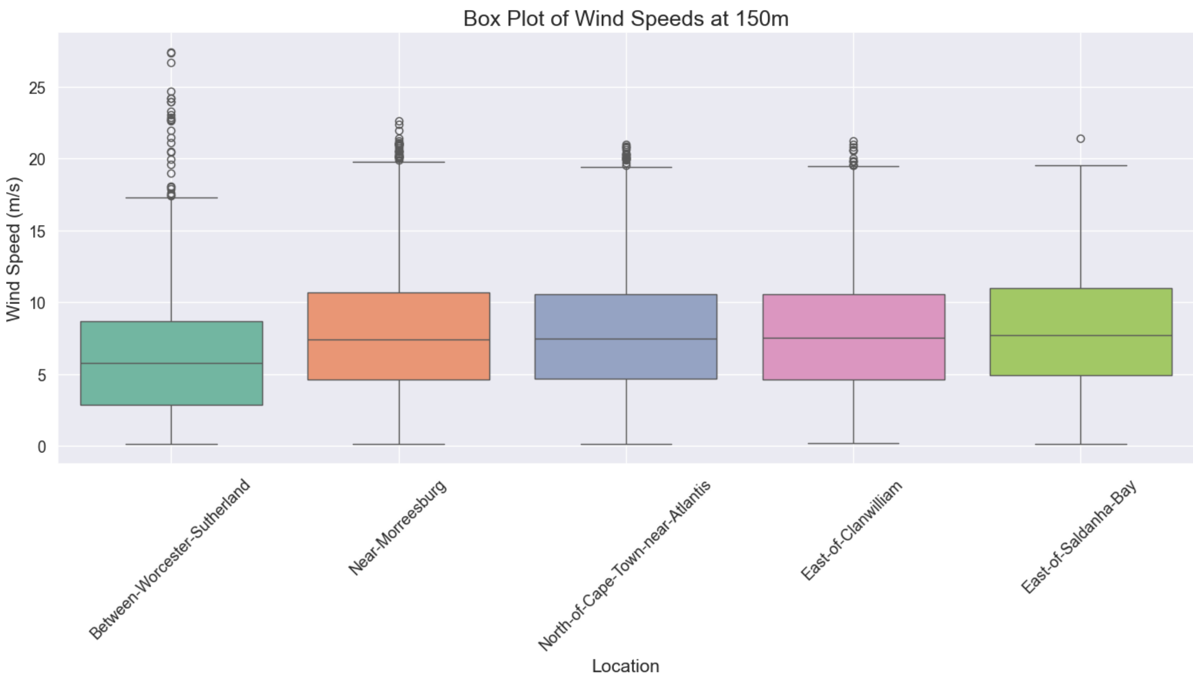


Table 50 : Statistics of Wind Speed (m/s) for Saldanha Bay Locations at 150 m

Parameter	Between Worcester and Sutherland	Near Morreesburg	North of Cape Town	East of Clanwilliam	East of Saldanha Bay
Min	0.122	0.144	0.158	0.212	0.173
Quantile 1	2.9	4.603	4.697	4.652	4.962
Mean	6.033	7.892	7.754	7.812	7.992
Median	5.784	7.409	7.451	7.532	7.713
Quantile 3	8.681	10.715	10.575	10.589	10.964
Max	27.418	22.642	20.965	21.217	21.386
Standard Deviation	3.639	4.233	3.868	4.001	3.923

Figure 75: Probability Density Functions of Wind Speeds for Saldanha Bay Locations at 150m

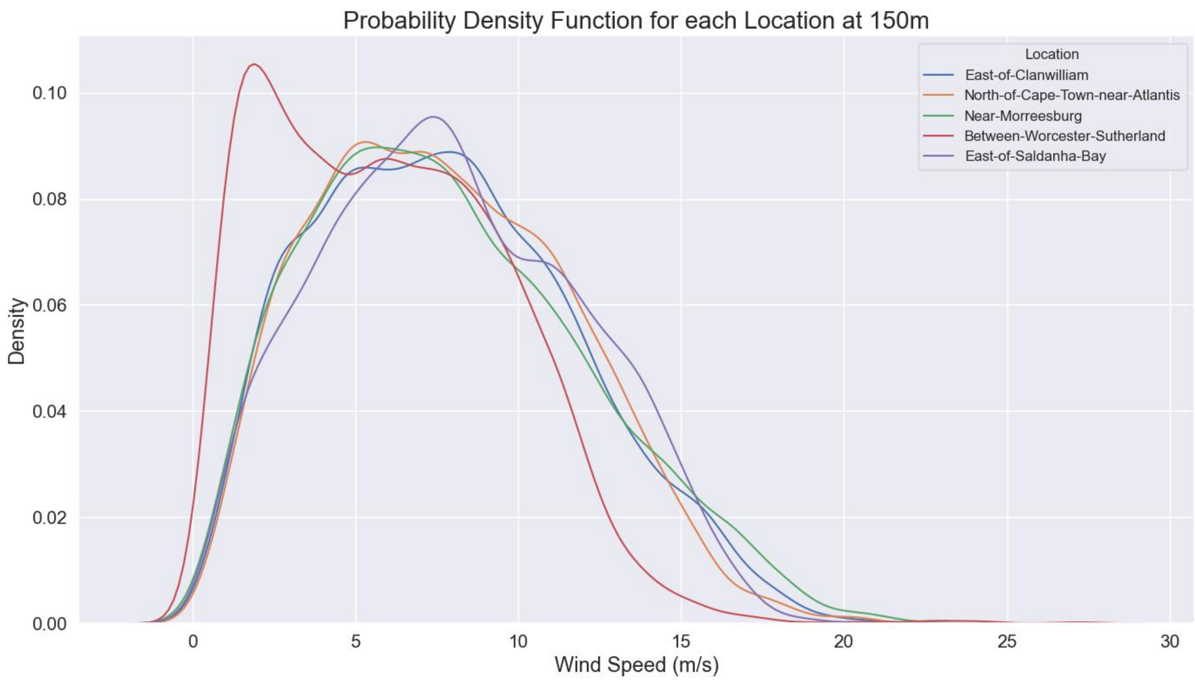
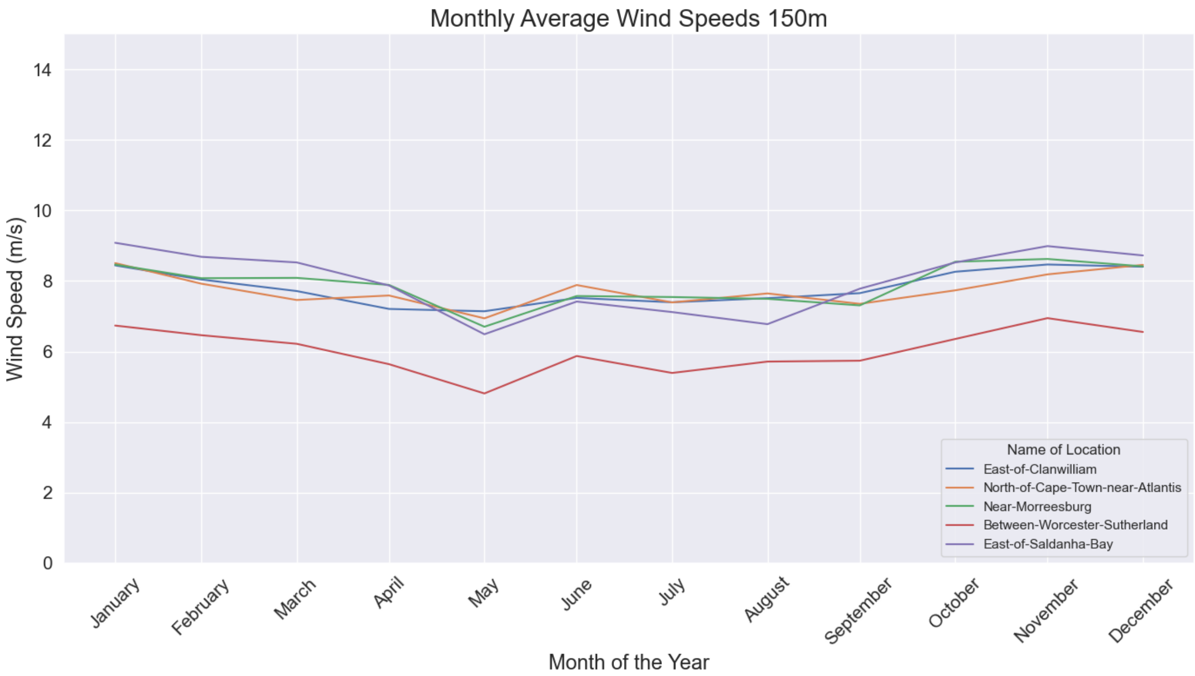


Figure 76: RWY Wind Speeds for Saldanha Bay Locations at 150 m



4.4.1.2. Capacity factor determination per height and turbine

This section shows a comparison of the expected AC monthly capacity factors for each location using both the Vestas V100-1.8 and Enercon E101 turbines for each location and height.

Figure 77: Monthly Average Capacity Factor of Boegoebaai at 100m using Vestas V100

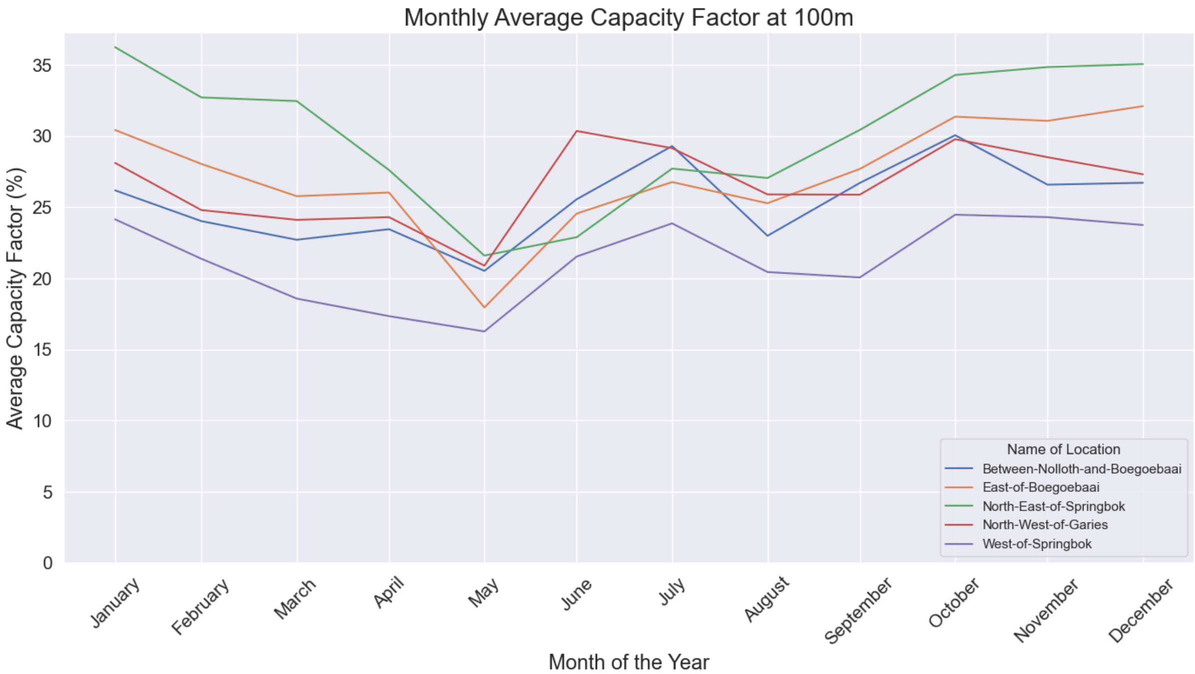


Figure 78: Monthly Average Capacity Factor of Coega at 100m using Vestas V100

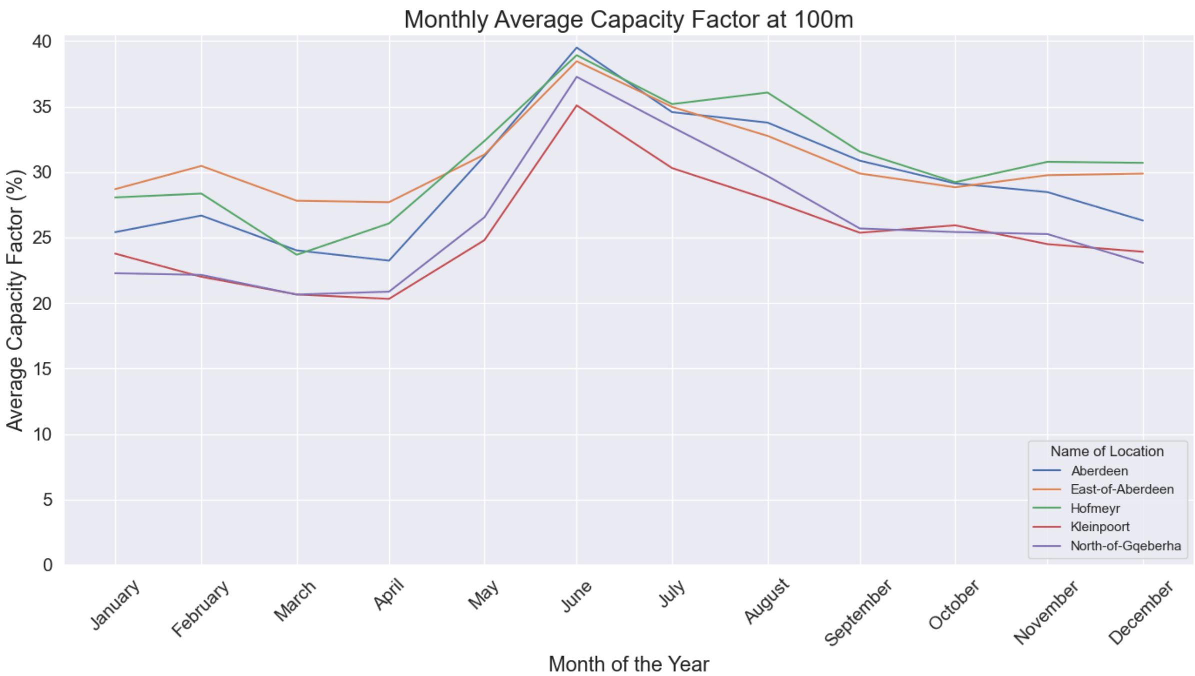


Figure 79: Monthly Average Capacity Factor of Mossel Bay at 100m using Vestas V100

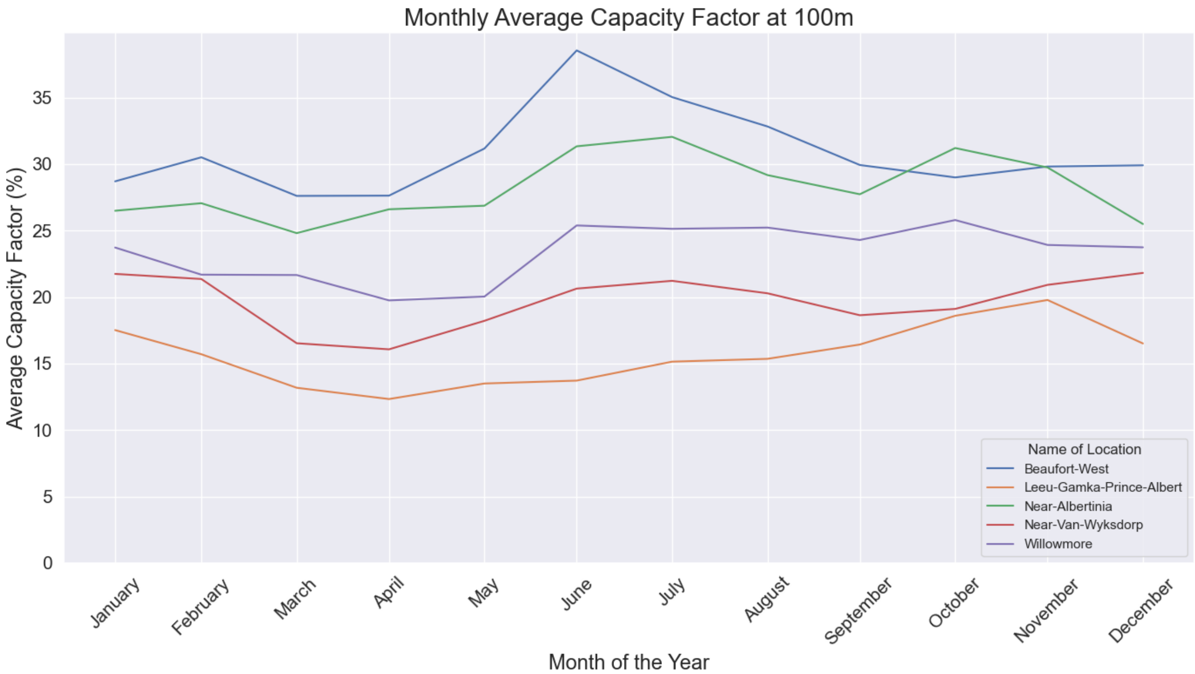


Figure 80: Monthly Average Capacity Factor of Richards Bay at 100m using Vestas V100

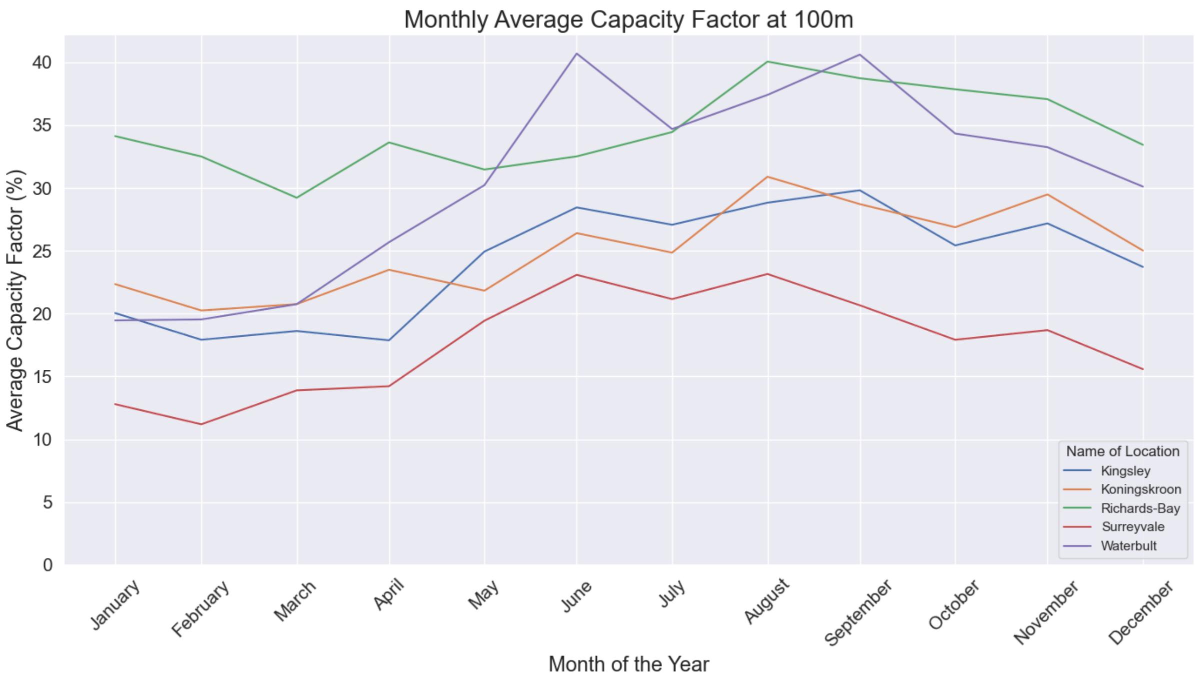


Figure 81: Monthly Average Capacity Factor of Saldanha Bay at 100m using Vestas V100

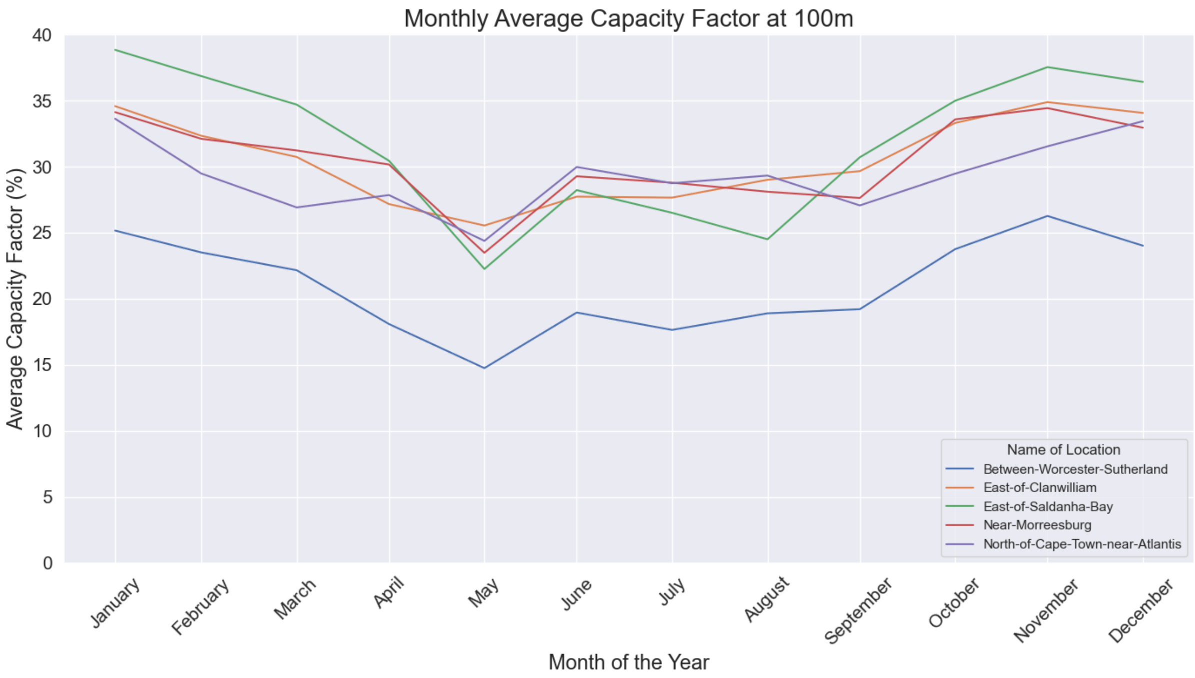


Figure 82: Monthly Average Capacity Factor of Boegoebaai at 120m using Vestas V100

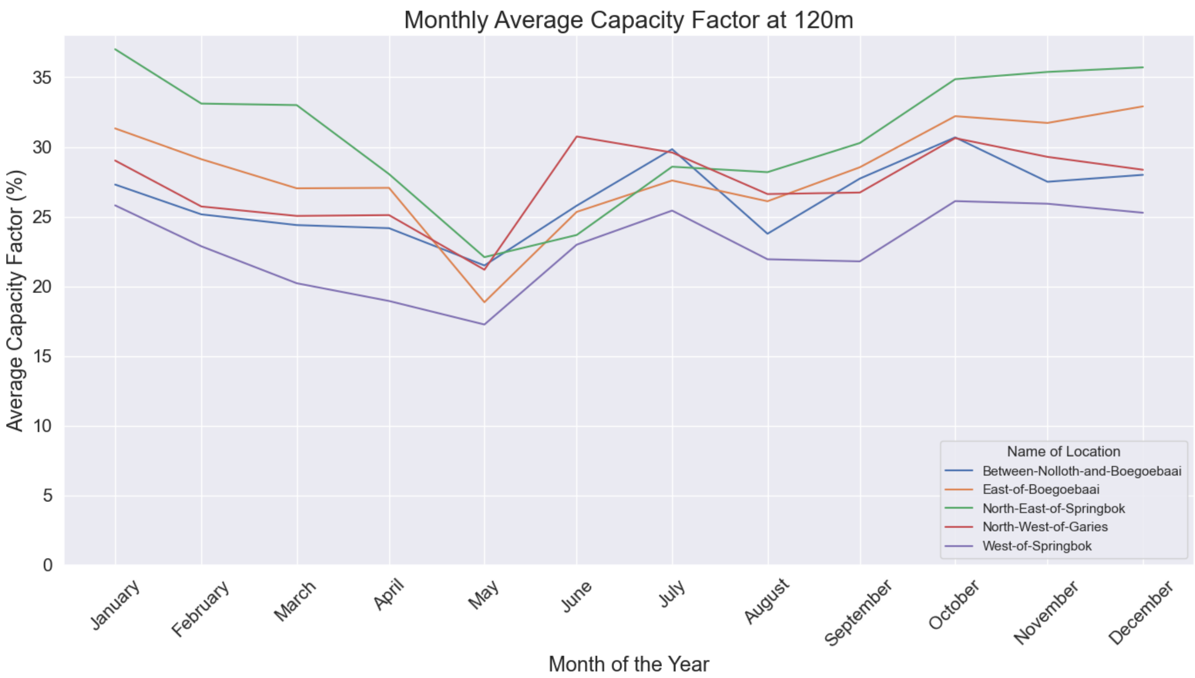


Figure 83: Monthly Average Capacity Factor of Coega at 120m using Vestas V100

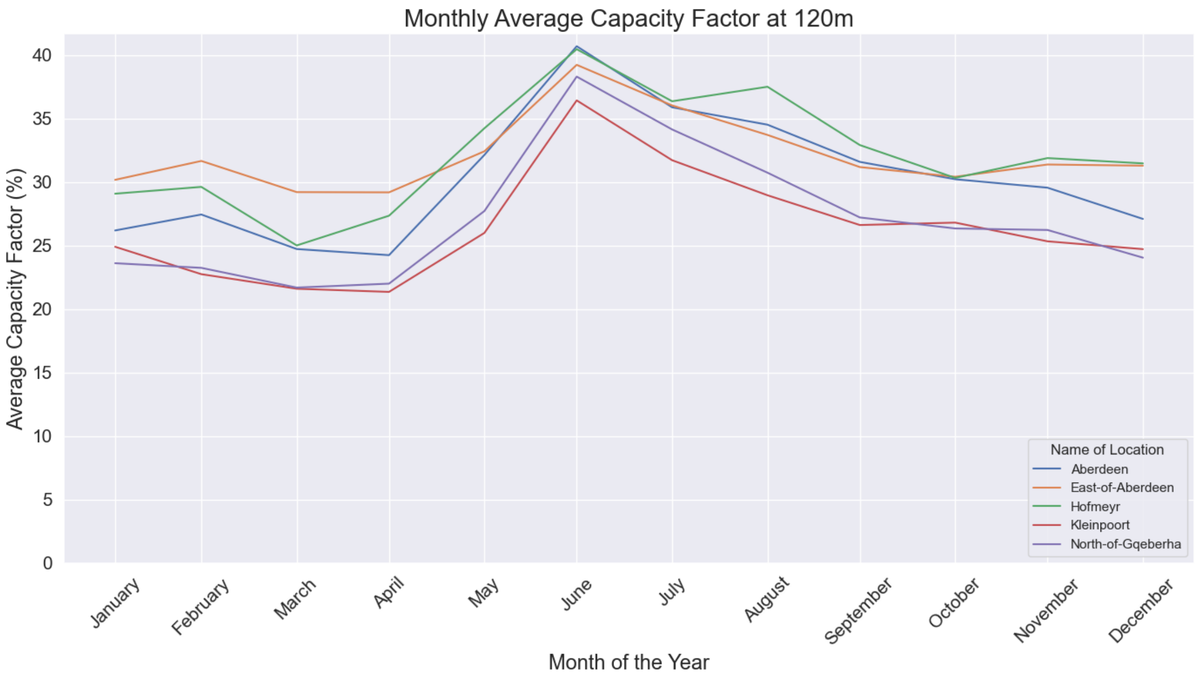


Figure 84: Monthly Average Capacity Factor of Mossel Bay at 120m using Vestas V100

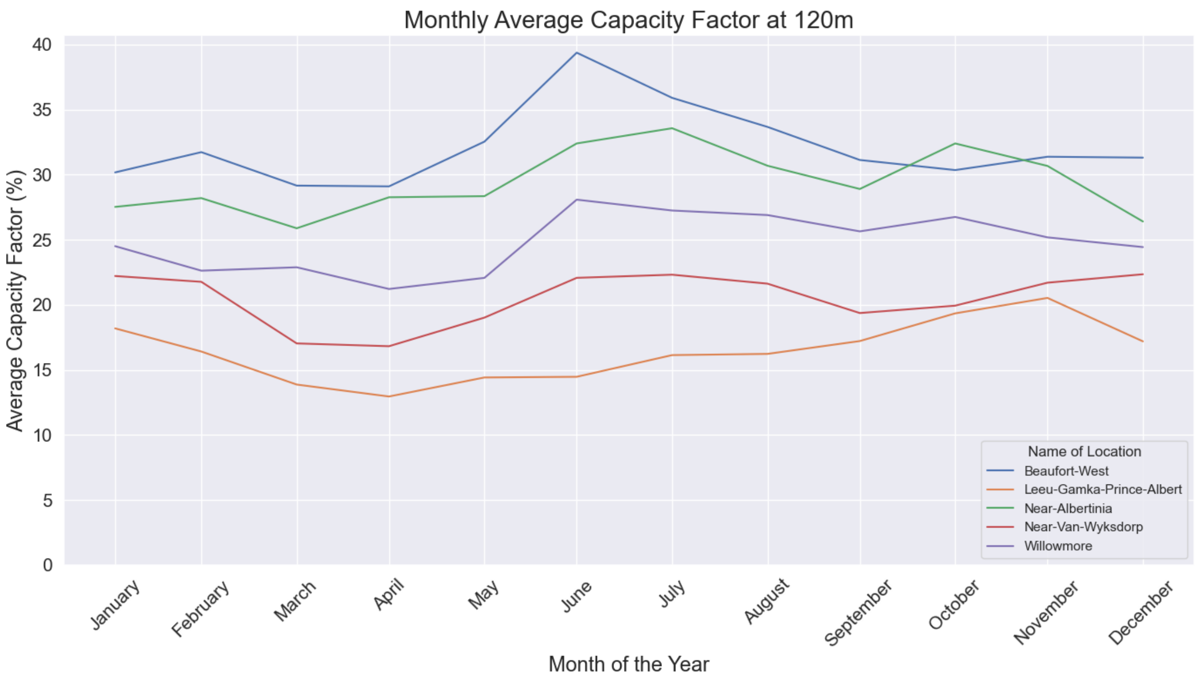


Figure 85: Monthly Average Capacity Factor of Richards Bay at 120m using Vestas V100

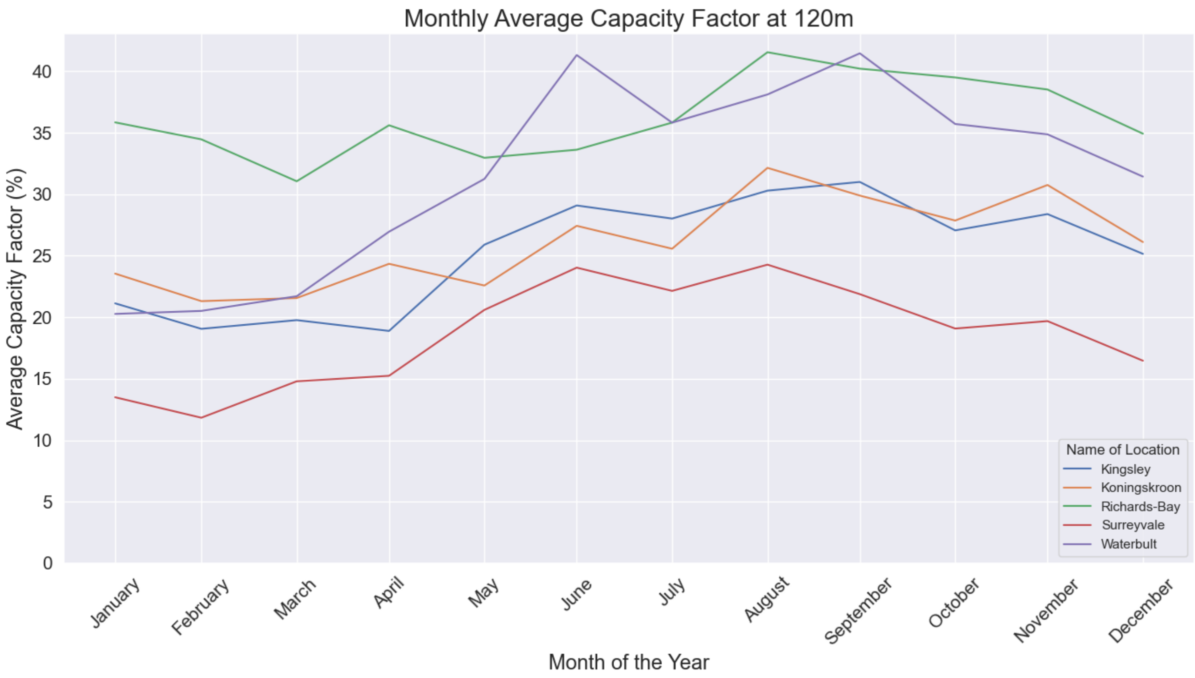


Figure 86: Monthly Average Capacity Factor of Saldanha Bay at 120m using Vestas V100

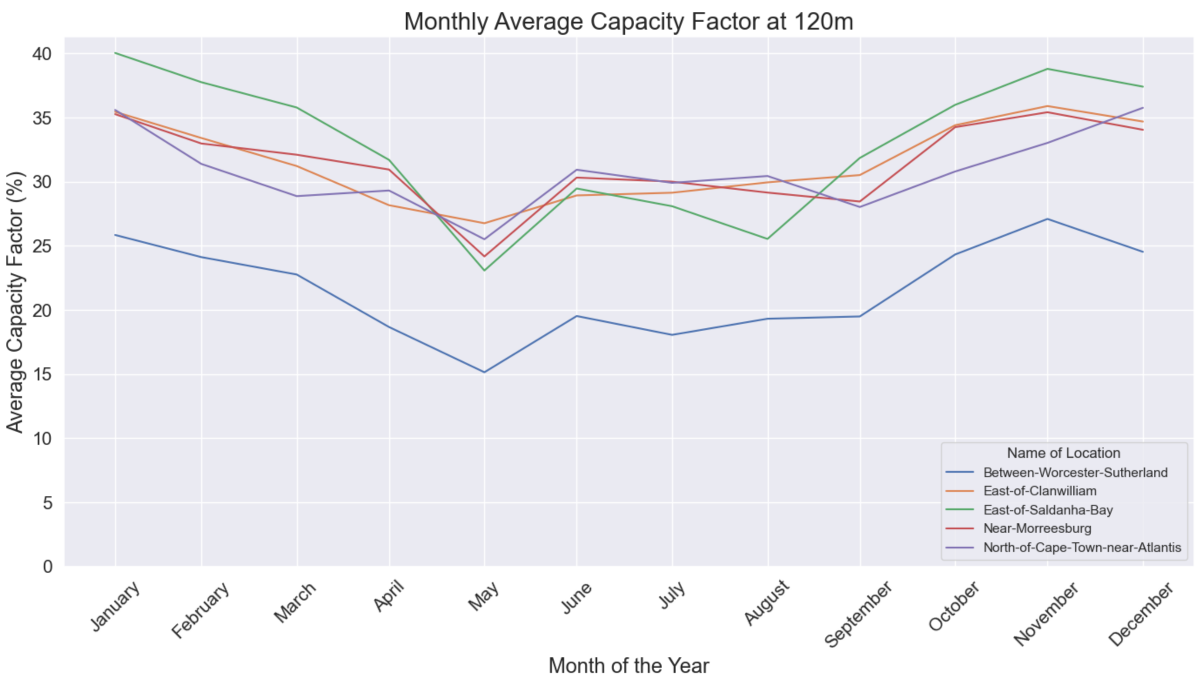


Figure 87: Monthly Average Capacity Factor of Boegoebaai at 100m using Enercon-101

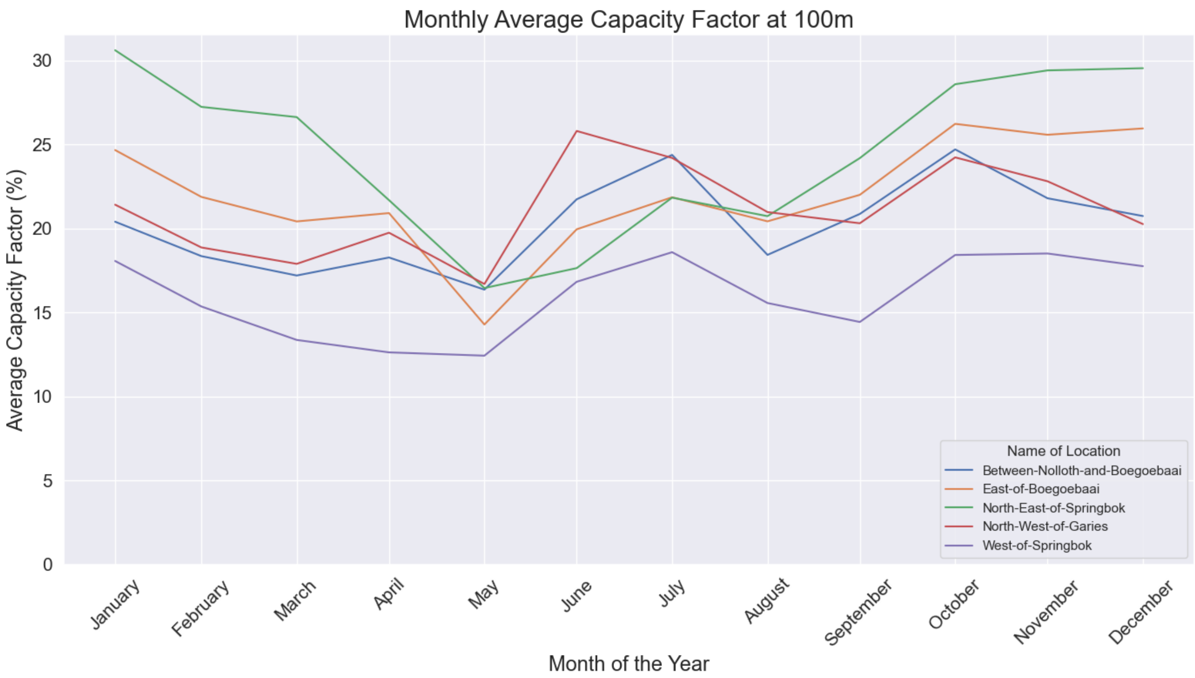


Figure 88: Monthly Average Capacity Factor of Coega at 100m using Enercon-101

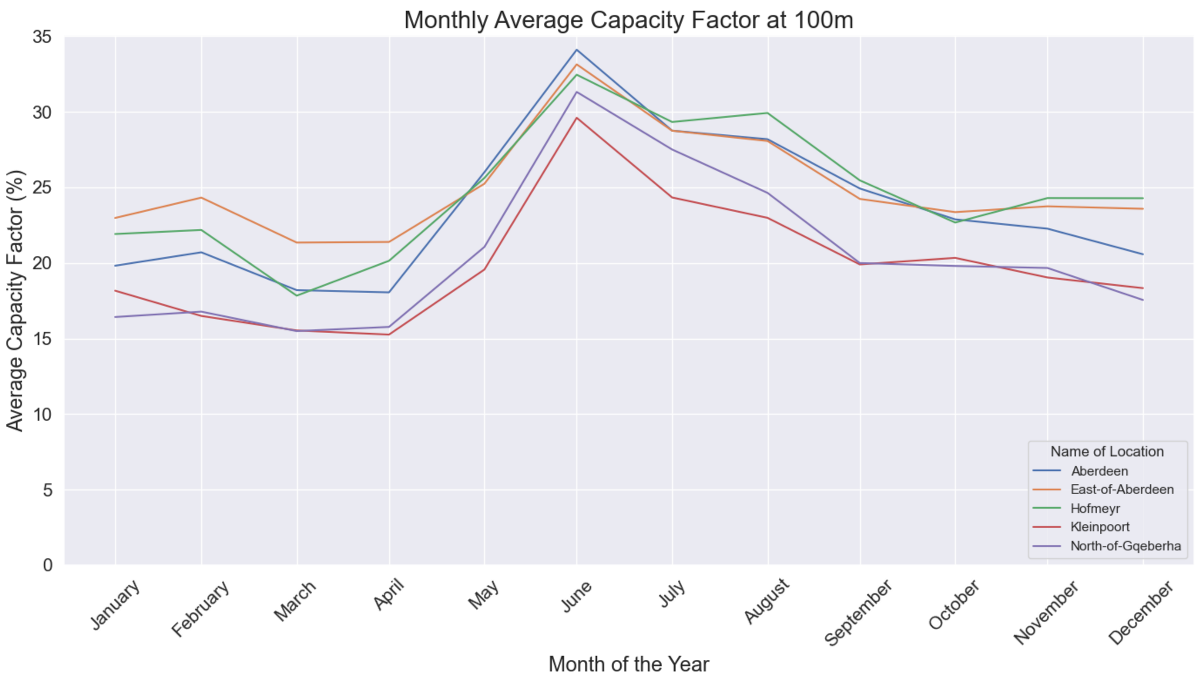


Figure 89: Monthly Average Capacity Factor of Mossel Bay at 100m using Enercon-101

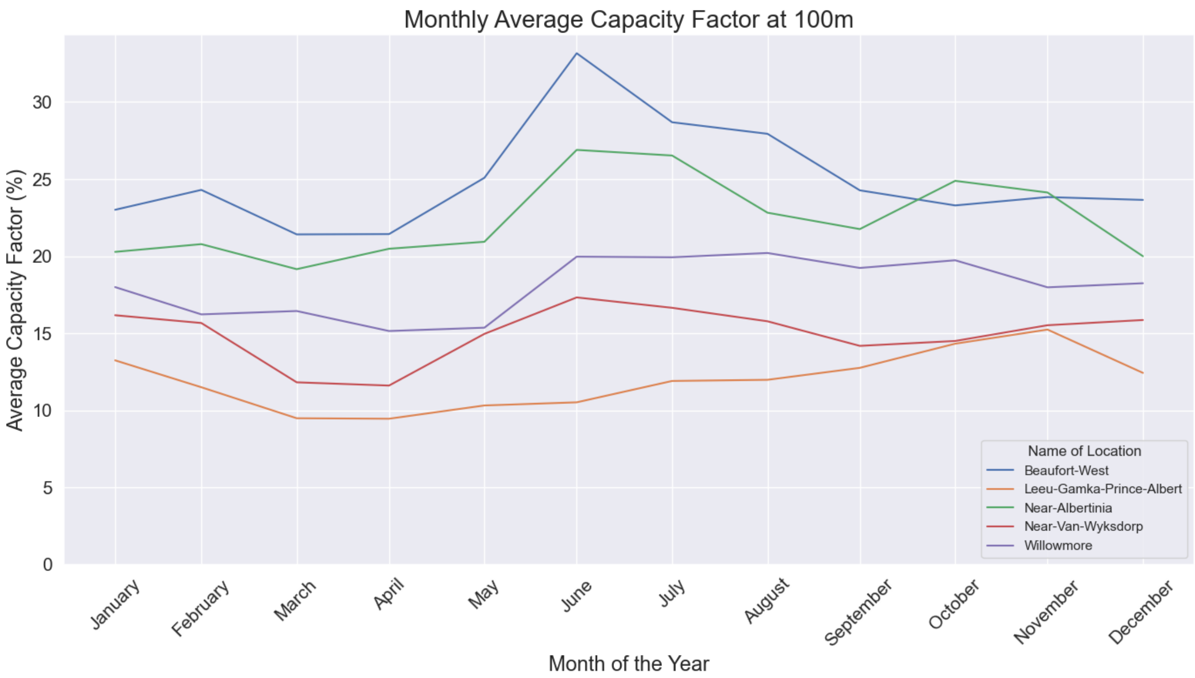


Figure 90: Monthly Average Capacity Factor of Richards Bay at 100m using Enercon-101

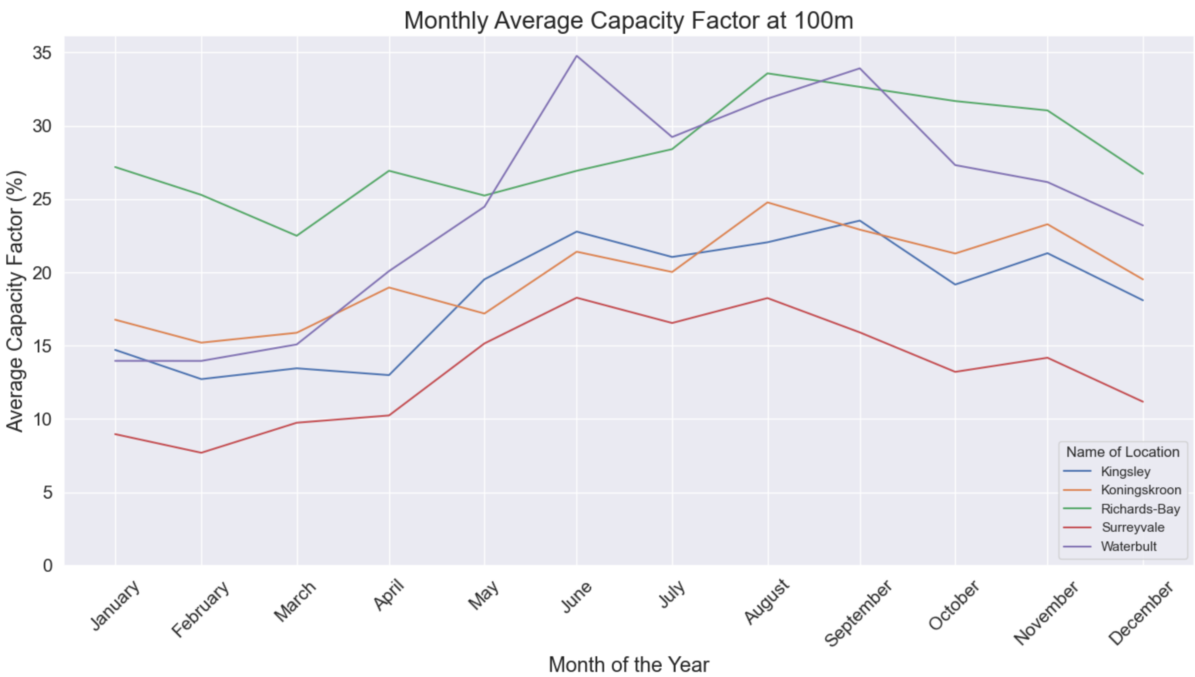


Figure 91: Monthly Average Capacity Factor of Saldanha Bay at 100m using Enercon-101

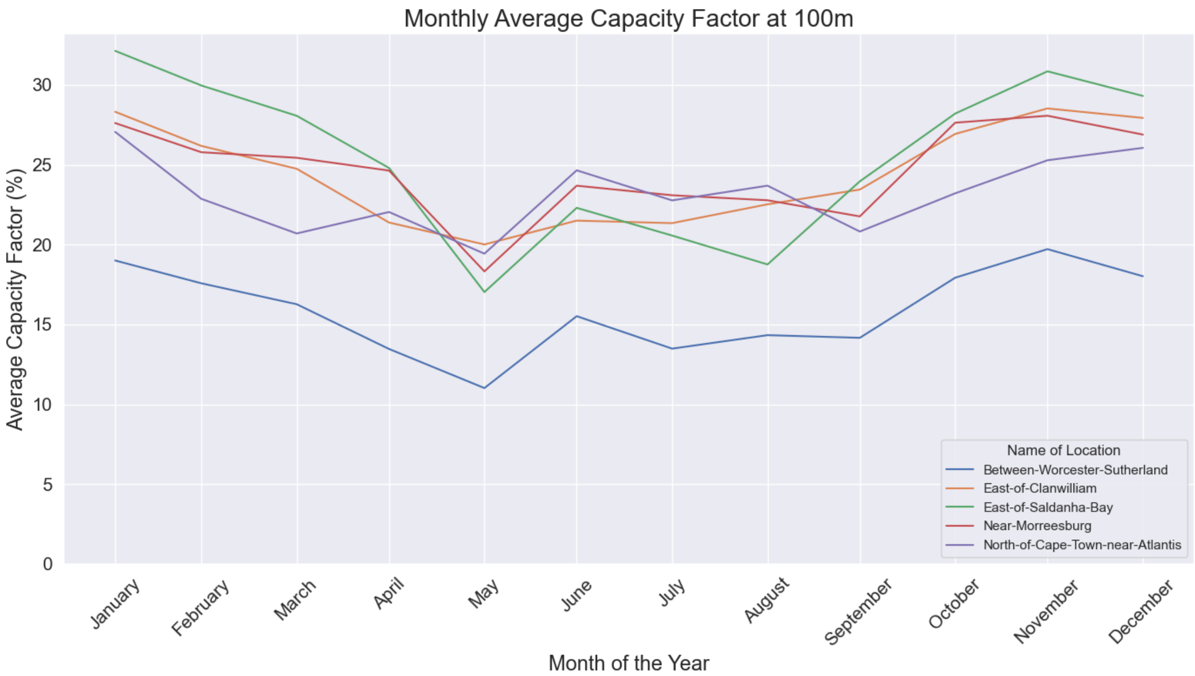


Figure 92: Monthly Average Capacity Factor of Boegoebaai at 120m using Enercon-101

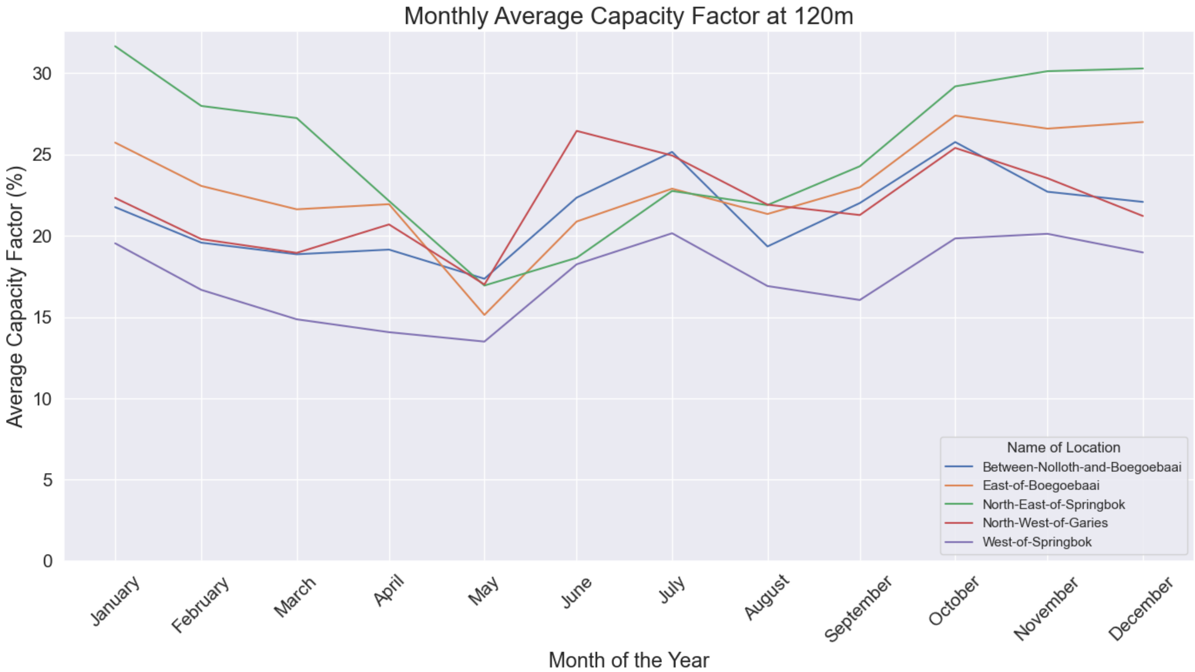


Figure 93: Monthly Average Capacity Factor of Coega at 120m using Enercon-101

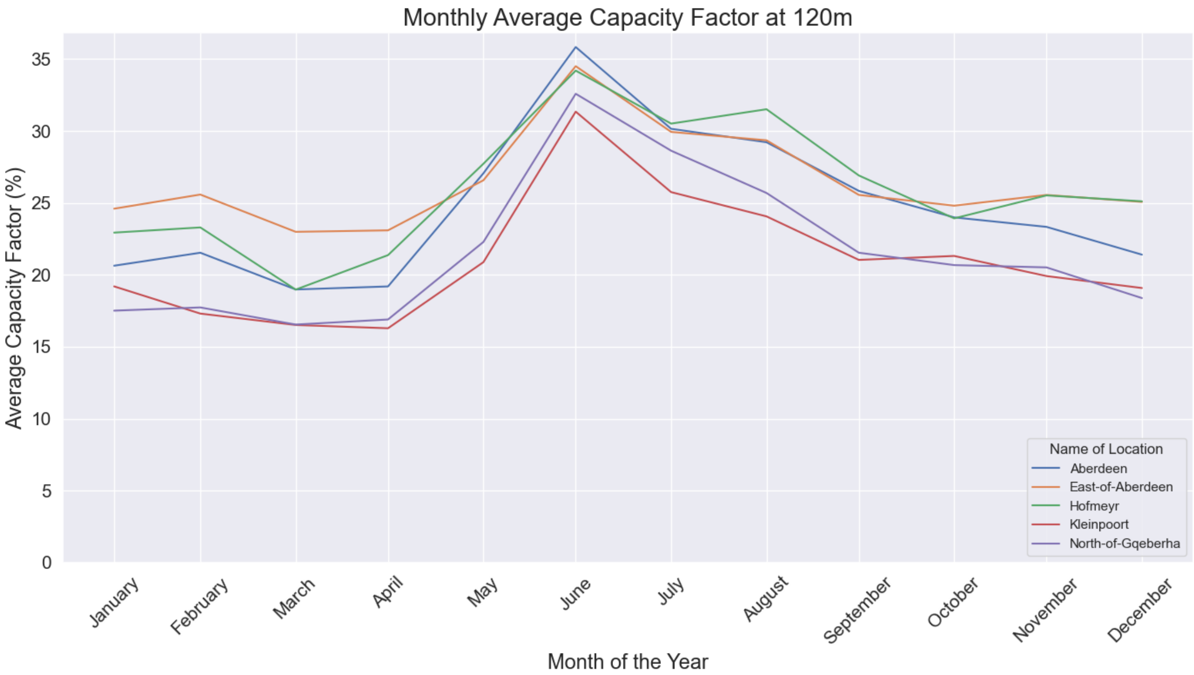


Figure 94: Monthly Average Capacity Factor of Mossel Bay at 120m using Enercon-101

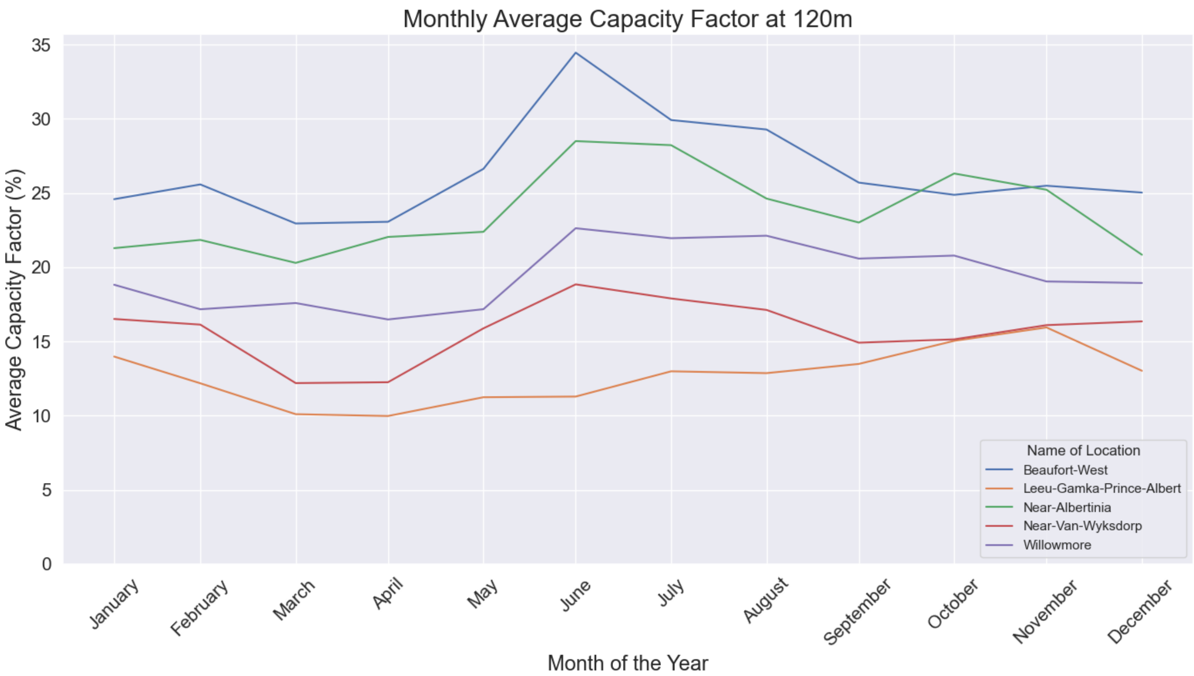


Figure 95: Monthly Average Capacity Factor of Richards Bay at 120m using Enercon-101

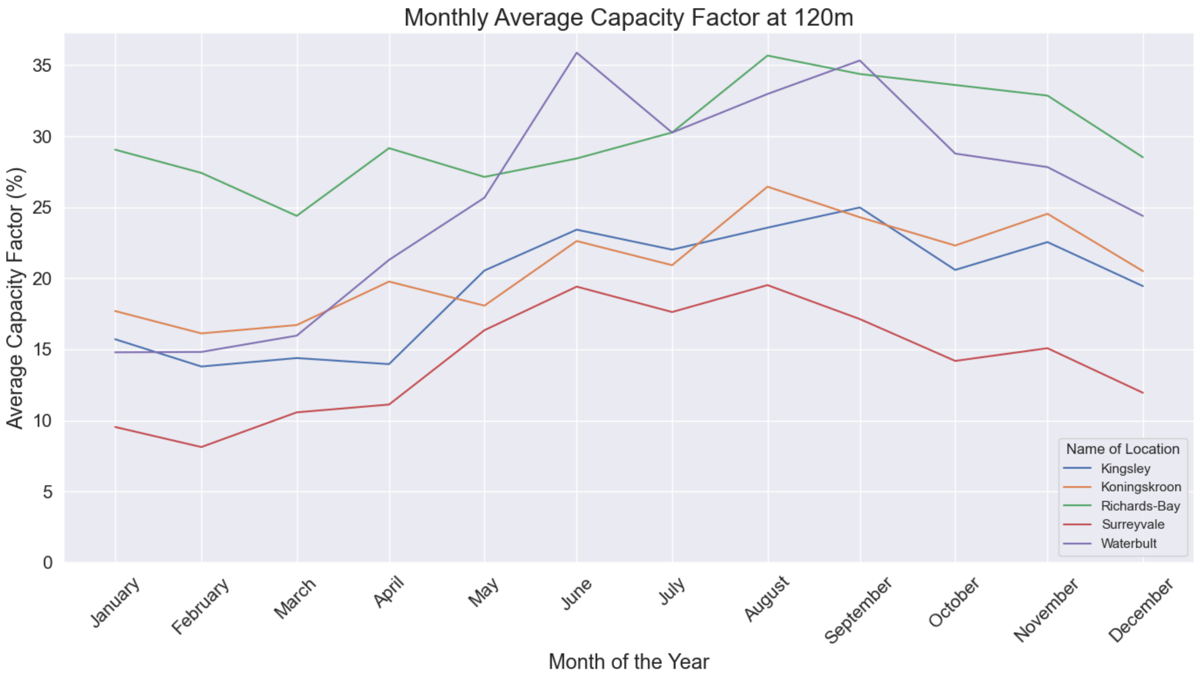


Figure 96: Monthly Average Capacity Factor of Saldanha Bay at 120m using Enercon-101

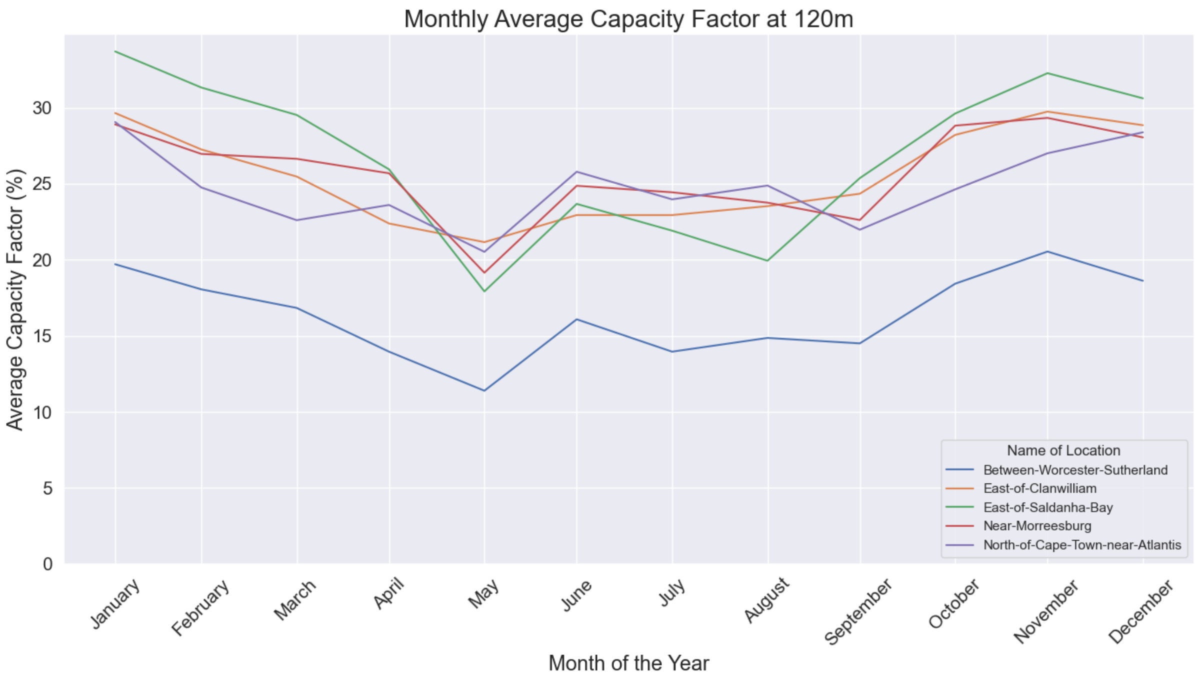


Figure 97: Monthly Average Capacity Factor of Boegoebaai at 150m using Enercon-101

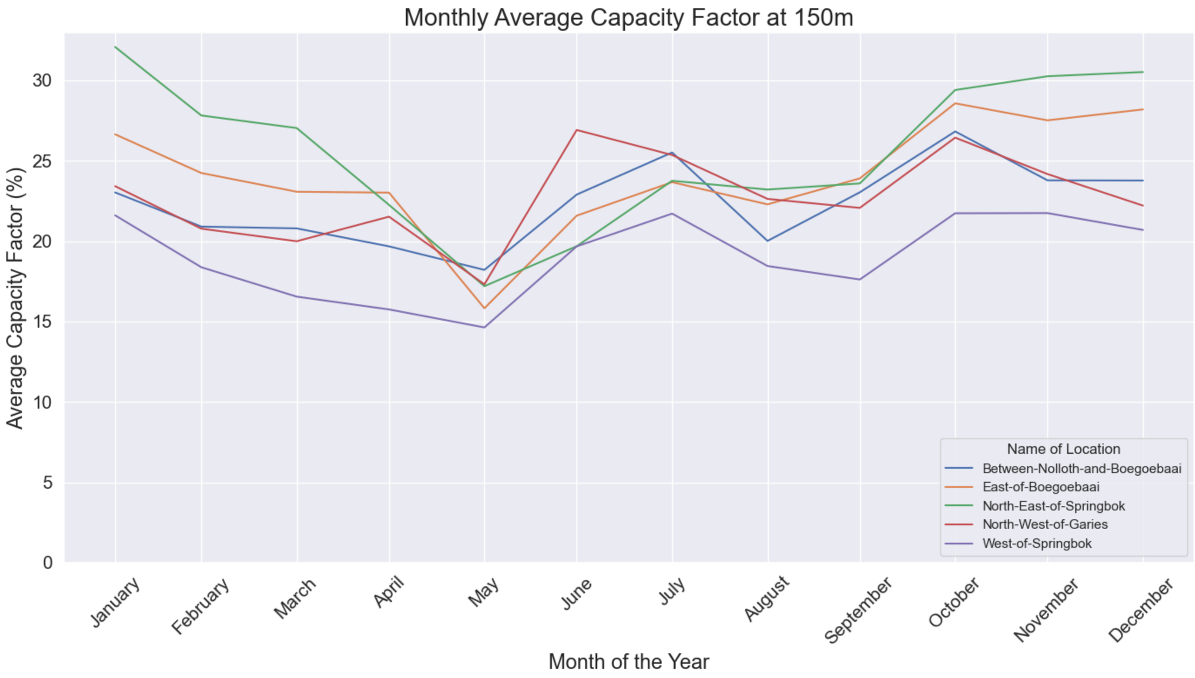


Figure 98: Monthly Average Capacity Factor of Coega at 150m using Enercon-101

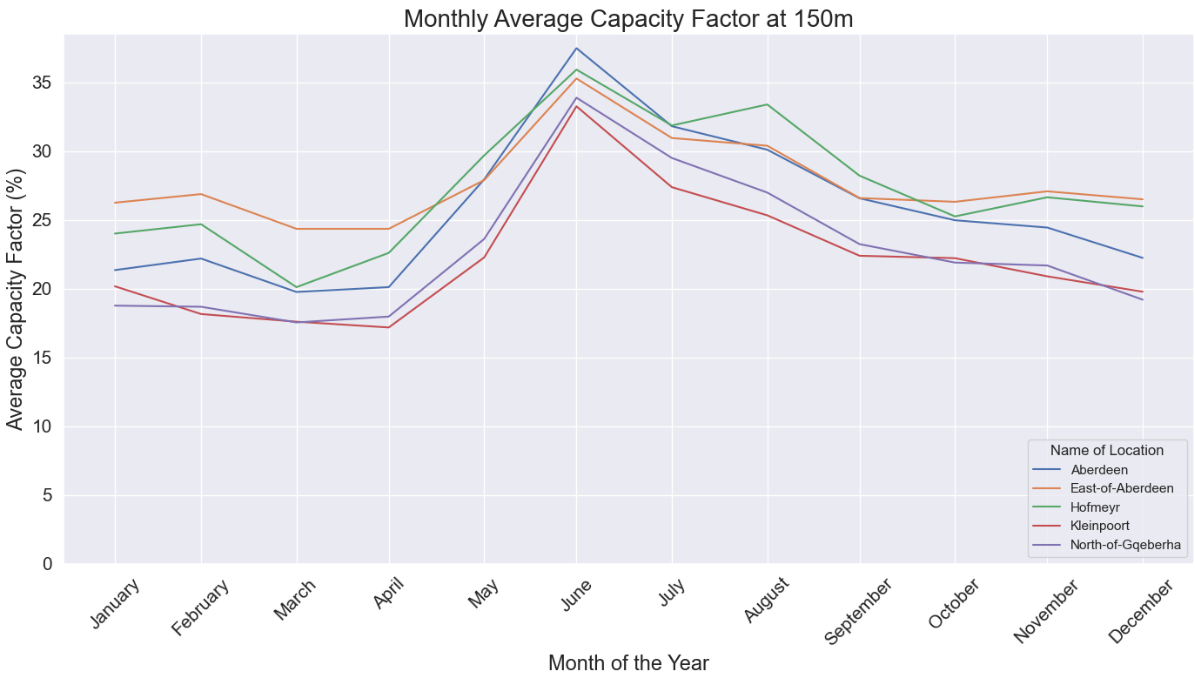


Figure 99: Monthly Average Capacity Factor of Mossel Bay at 150m using Enercon-101

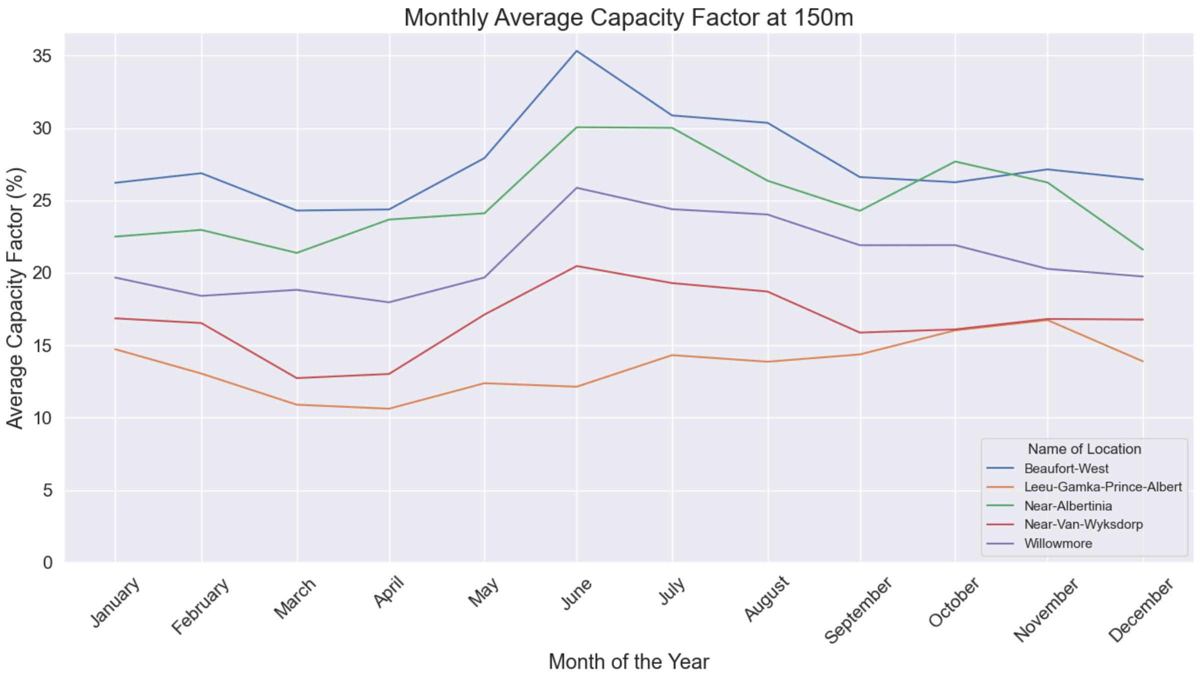


Figure 100: Monthly Average Capacity Factor of Richards Bay at 150m using Enercon-101

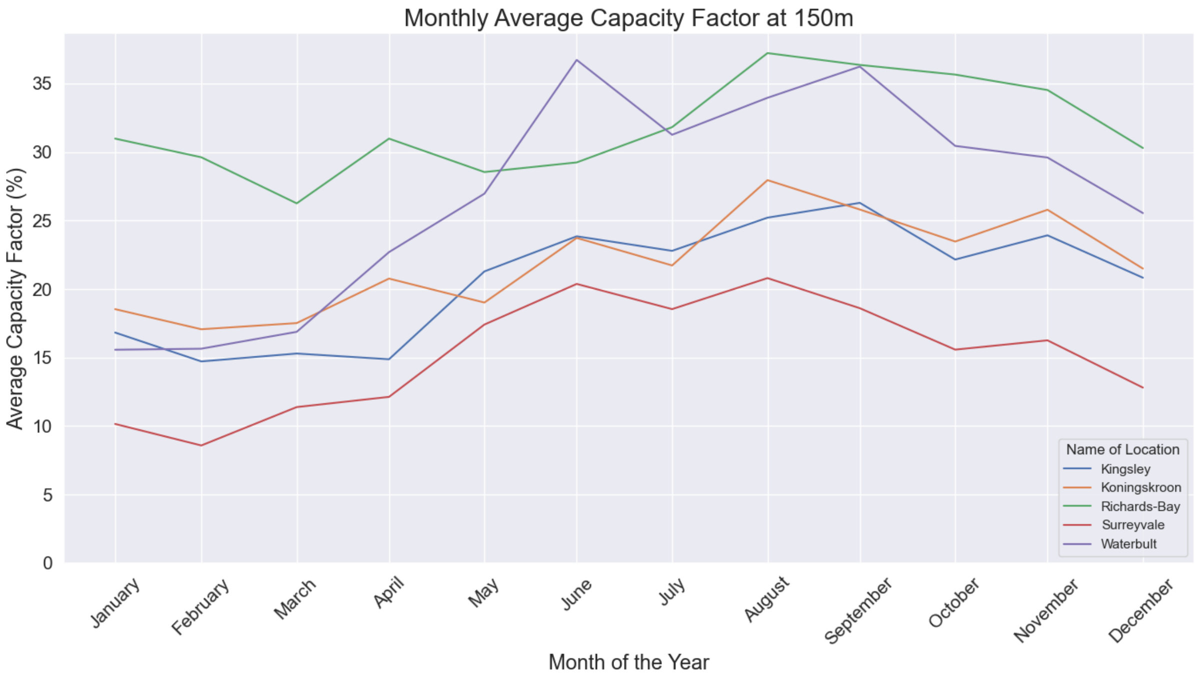
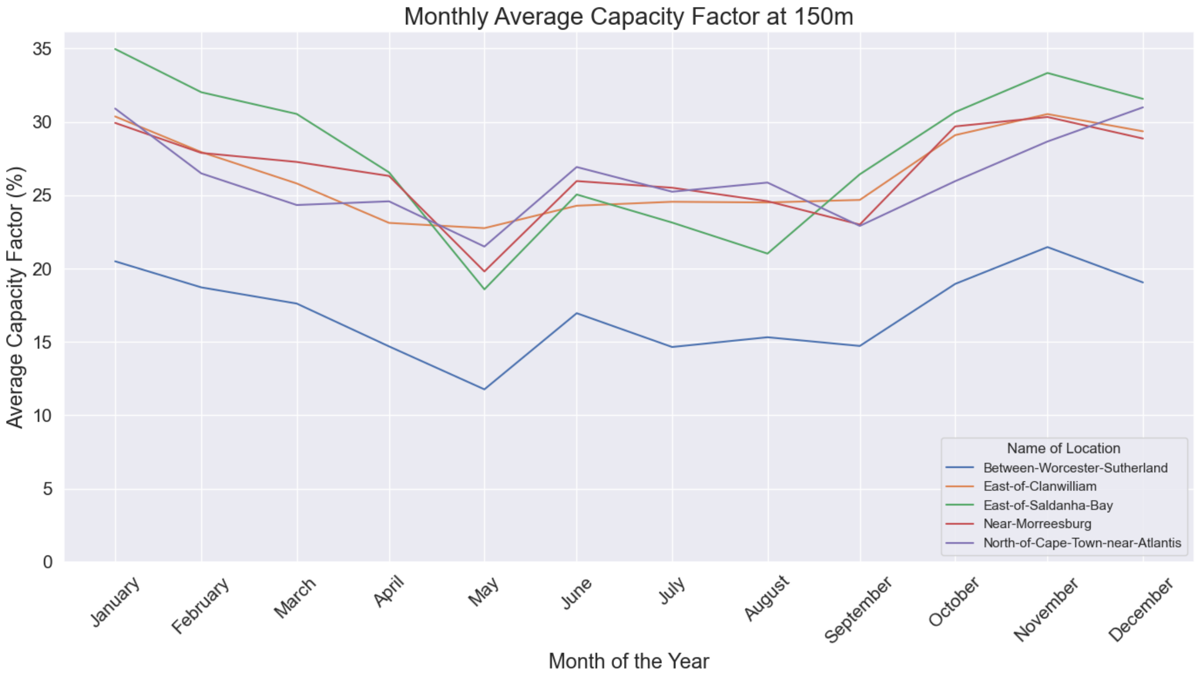


Figure 101: Monthly Average Capacity Factor of Saldanha Bay at 150m using Enercon-101



4.4.2.2. Summary of results

This section shows a synopsis of the resource assessments. The bar plots in show the annual capacity factors for each location per height. The annual capacity is simply added the hourly capacity factor time series together and divided it by the number of hours in a year (8760 hours) or finding the average capacity factor.

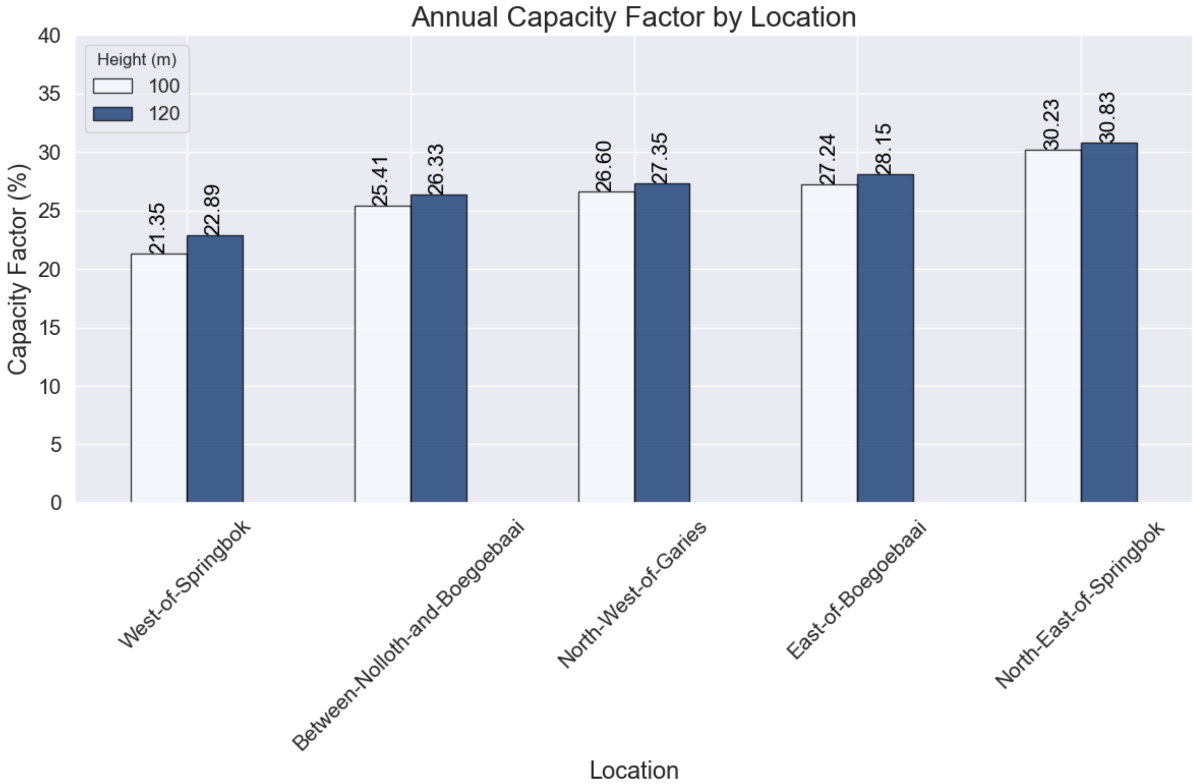


Figure 102: Bar Chart of Annual Capacity Factors for Boegoebaai Locations using Vestas V100

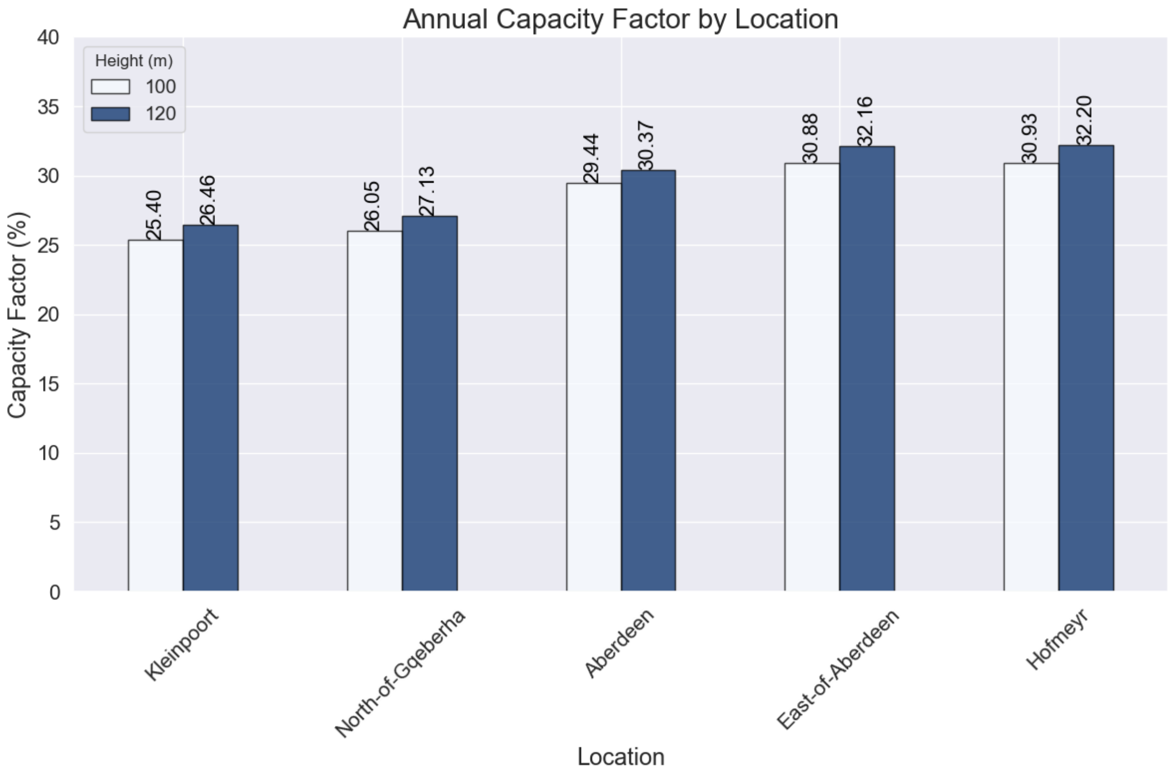


Figure 103: Bar Chart of Annual Capacity Factors for Coega Locations using Vestas V100

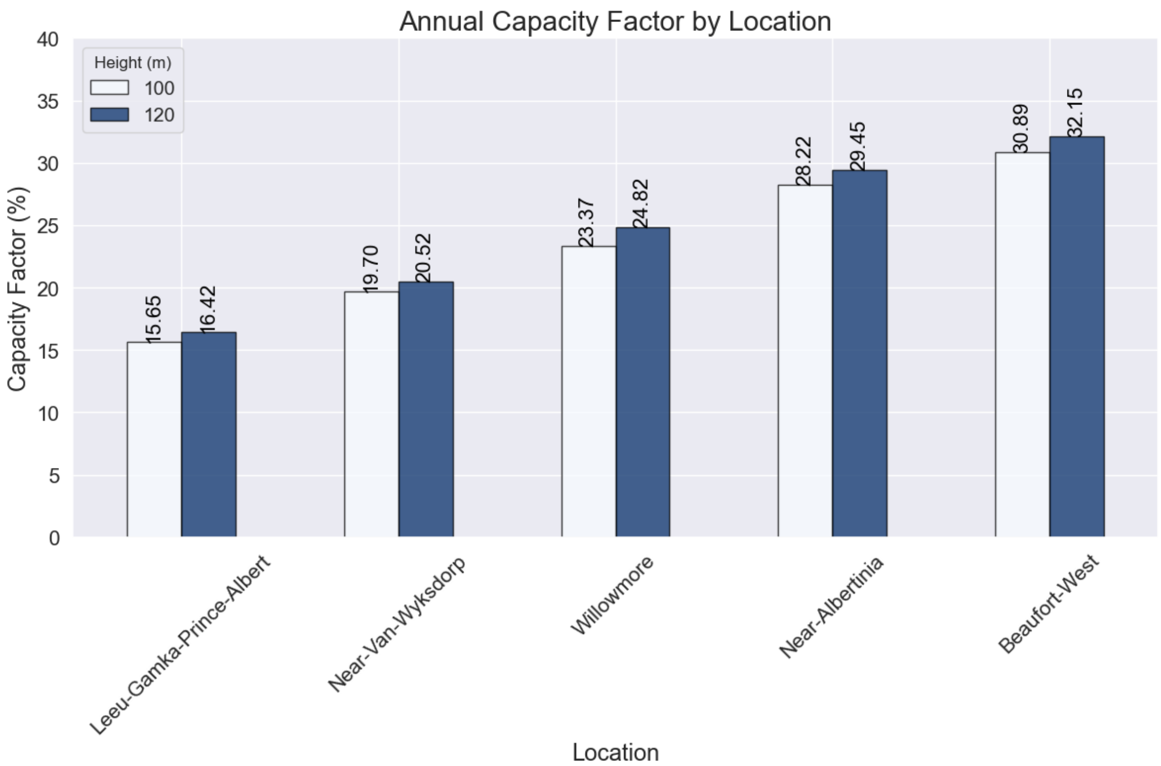


Figure 104: Bar Chart of Annual Capacity Factors for Mossel Bay Locations using Vestas V100

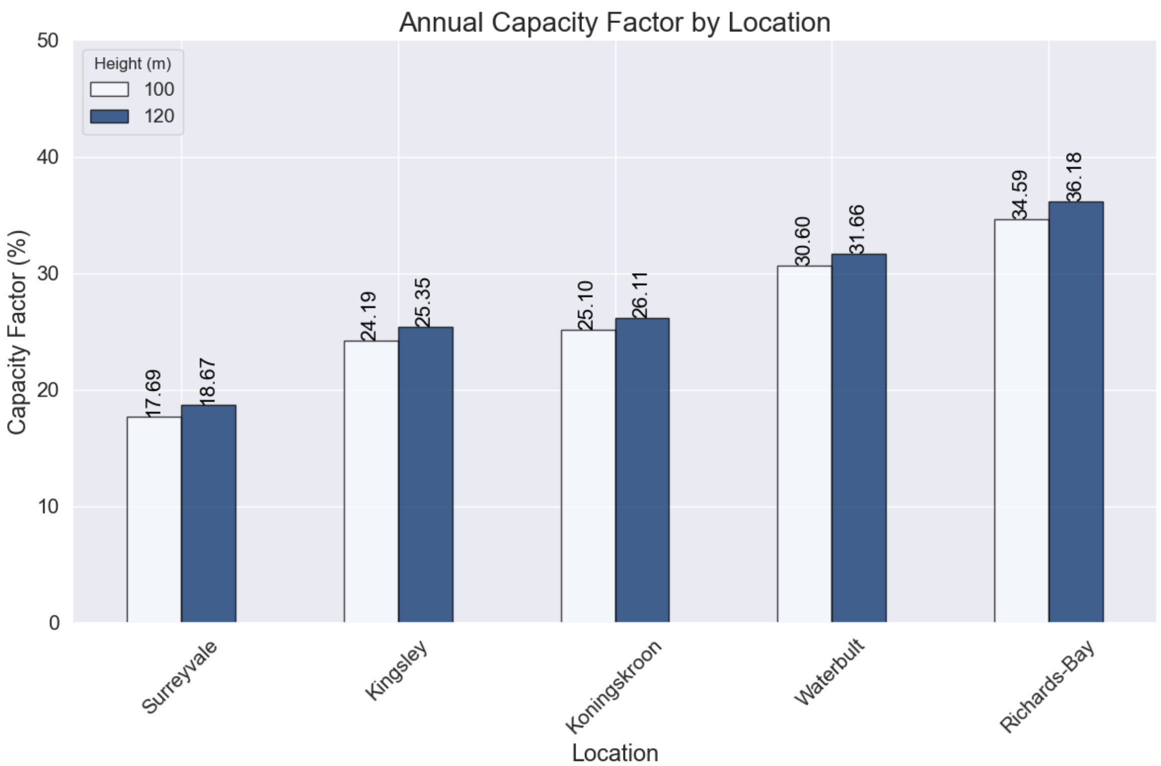


Figure 105: Bar Chart of Annual Capacity Factors for Richards Bay Locations using Vestas V100

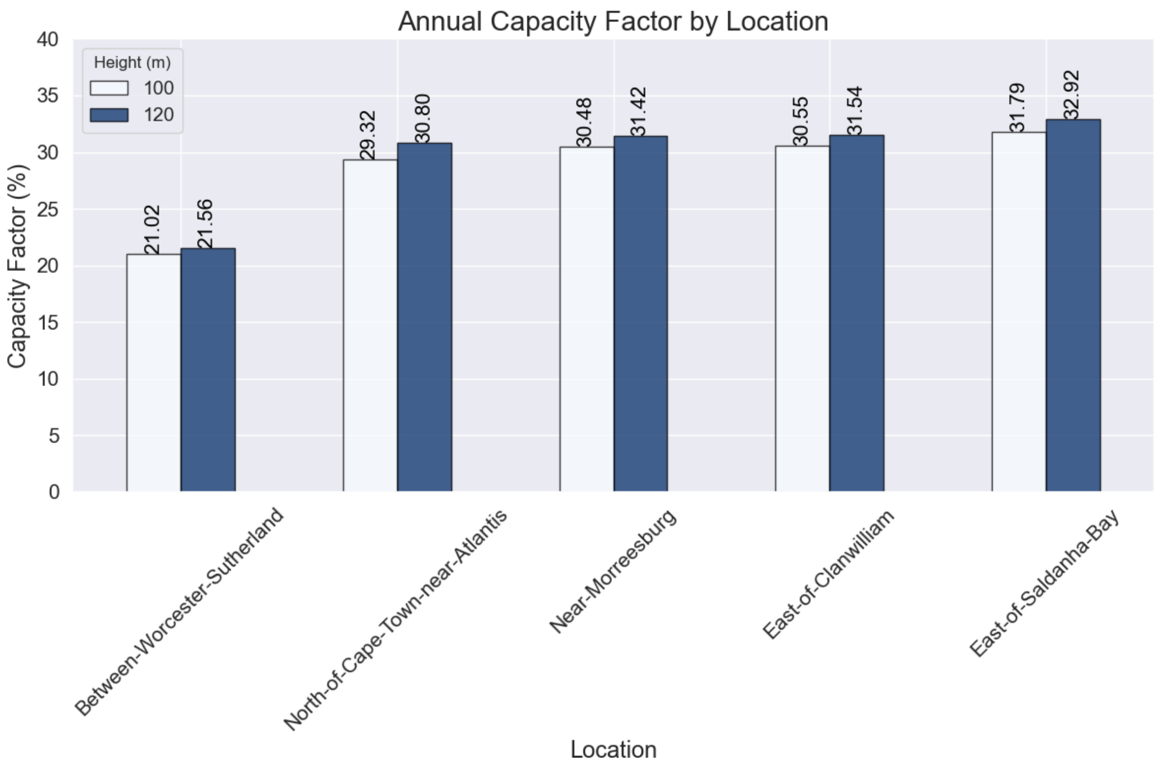


Figure 106: Bar Chart of Annual Capacity Factors for Saldanha Bay Locations using Vestas V100

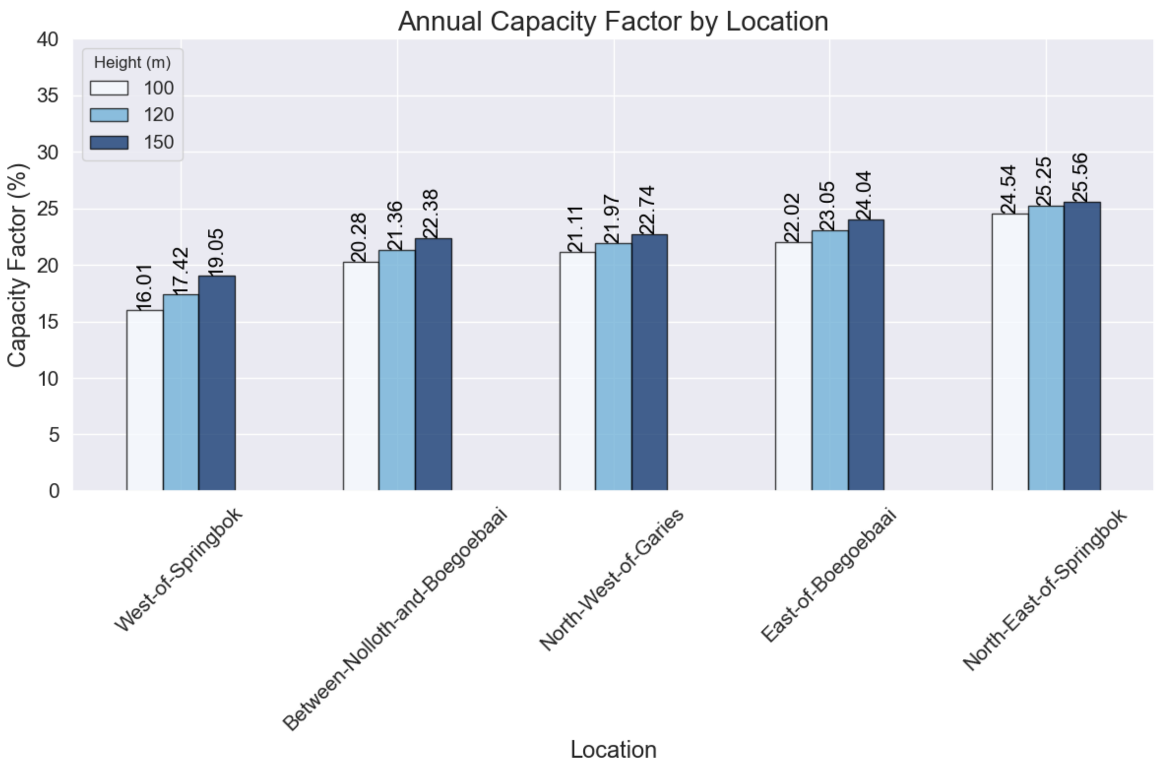


Figure 107: Bar Chart of Annual Capacity Factors for Boegoebaai Locations using Enercon E101

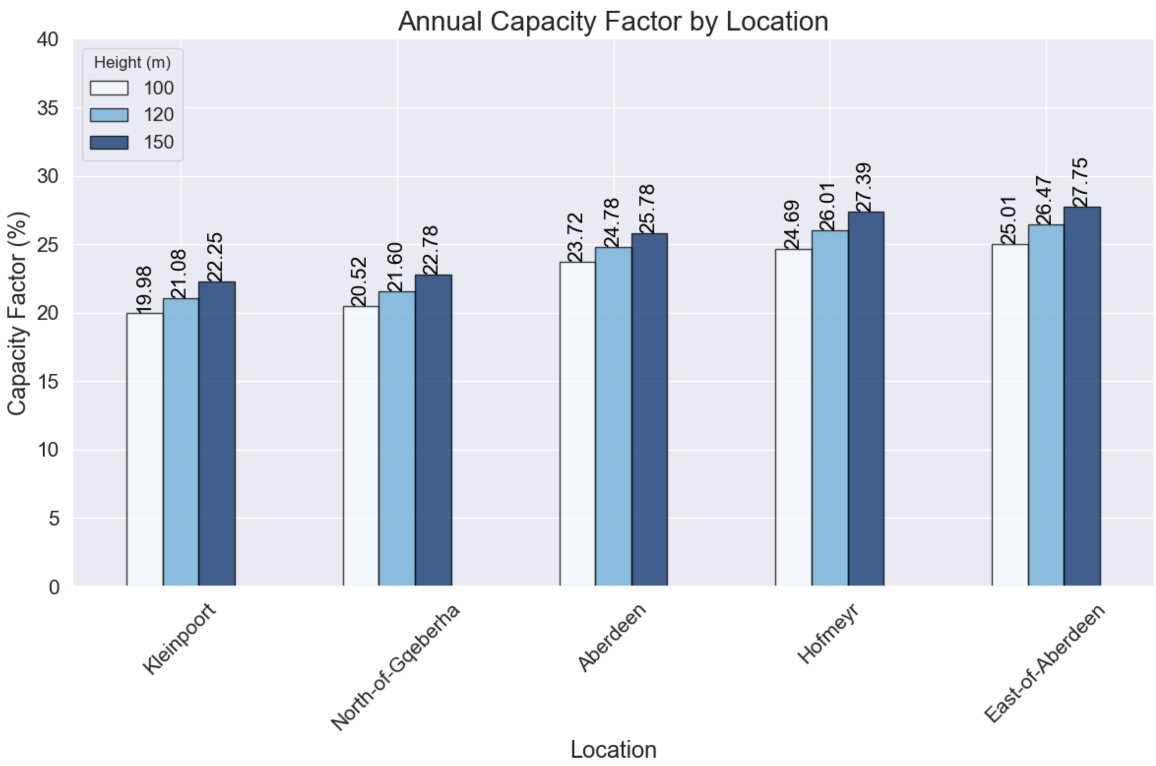


Figure 108: Bar Chart of Annual Capacity Factors for Coega Locations using Enercon E101

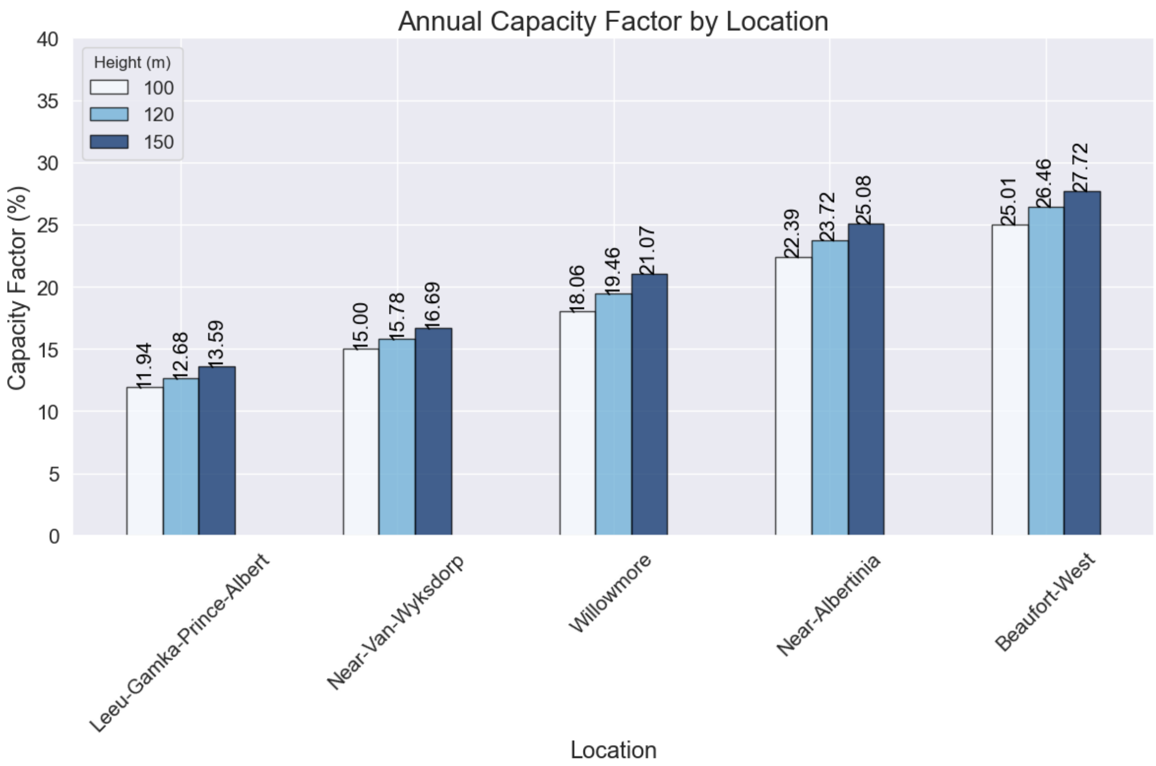


Figure 109: Bar Chart of Annual Capacity Factors for Mossel Bay Locations using Enercon E101

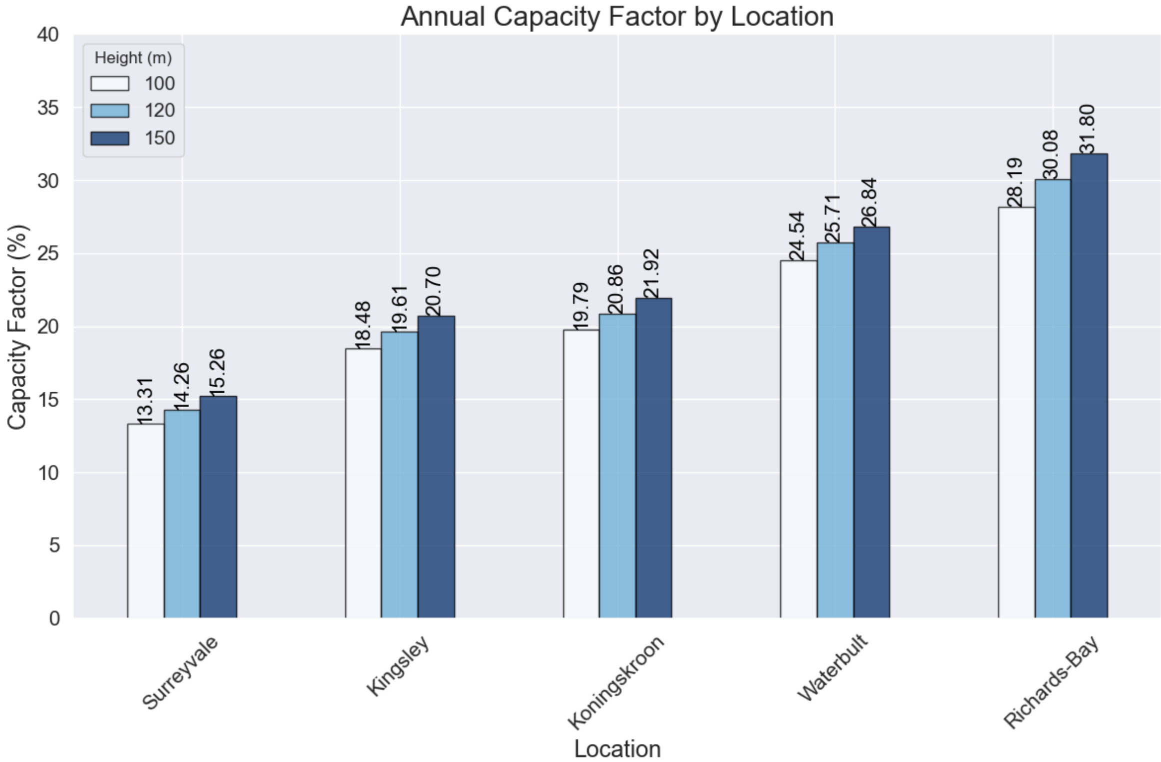


Figure 110: Bar Chart of Annual Capacity Factors for Richards Bay Locations using Enercon E101

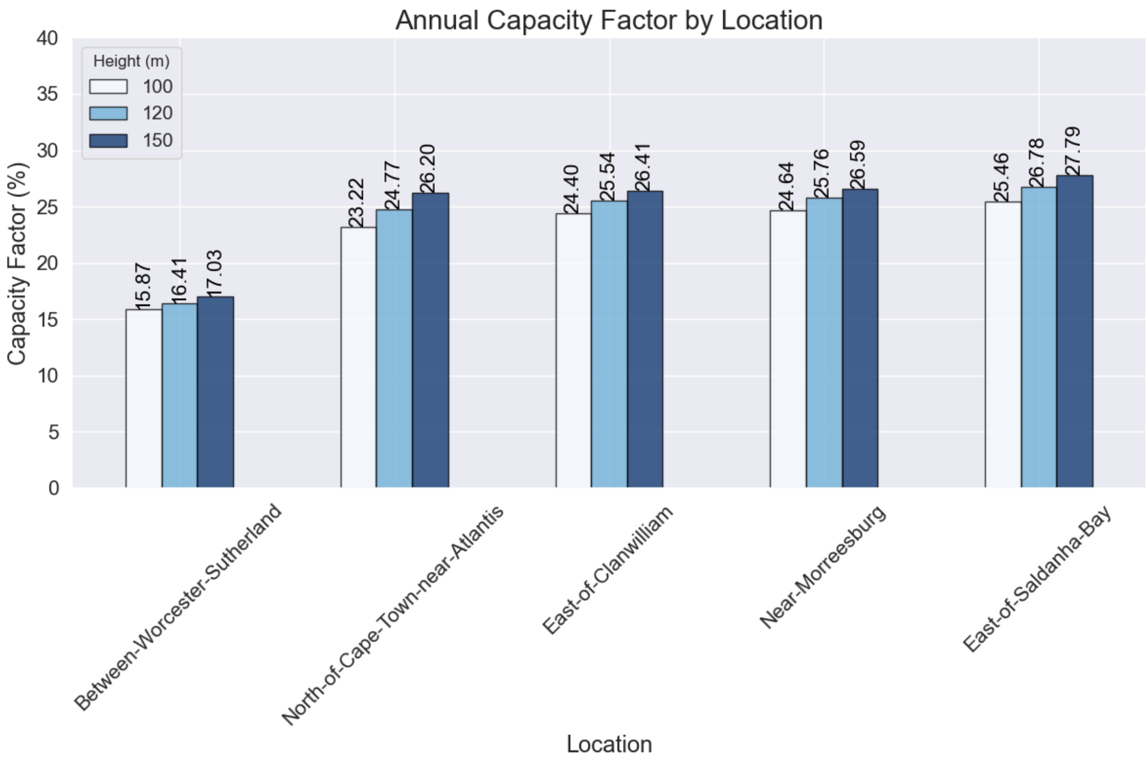


Figure 111: Bar Chart of Annual Capacity Factors for Saldanha Locations using Enercon E101

The tables below show both full load hours (FLH) and corresponding capacity factors (CF) for each turbine and location. Full load hours represent the hypothetical number of hours a generator would need to operate at maximum power to produce the same total energy output as it did over a given period, in this case a year. The capacity factor can be derived from the FLH value by dividing it with 8760, the number of hours in a (non-leap) year.

Table 51 : Full Load Hours and Capacity Factors using Vestas V100

Region	Location	100 m		120 m	
		FLH	CF (%)	FLH	CF (%)
Boegoebaai	Northeast of Springbok	2648.49	30.23	2700.71	30.83
	East of Boegoebaai	2386.55	27.24	2465.66	28.15
	Northwest of Garies	2329.95	26.60	2395.82	27.35
	Between Port Nolloth and Boegoebaai	2225.80	25.41	2306.73	26.33
	West of Springbok	1870.32	21.35	2005.14	22.89
Coega	Hofmeyr	2709.34	30.93	2820.63	32.20
	East of Aberdeen	2705.00	30.88	2817.13	32.16
	Aberdeen	2579.35	29.44	2660.73	30.37
	North of Gqeberha	2281.74	26.05	2376.46	27.13
	Kleinpoort	2225.03	25.40	2317.55	26.46
Mossel Bay	Beaufort West	2705.54	30.89	2816.78	32.15
	Near Albertinia	2471.65	28.22	2579.49	29.45
	Willowmore	2047.65	23.37	2173.82	24.82
	Near Van Wyksdorp	1726.01	19.70	1797.38	20.52
	Leeu Gamka Prince Albert	1370.63	15.65	1438.28	16.42
Richards Bay	Richards Bay	3030.17	34.59	3169.65	36.18
	Waterbult	2680.72	30.60	2773.76	31.66
	Koningskroon	2198.33	25.10	2287.51	26.11
	Surreyvale	1549.42	17.69	1635.22	18.67
	Kingsley	2119.10	24.19	2220.61	25.35
Saldanha Bay	East of Saldanha Bay	2784.85	31.79	2884.09	32.92
	East of Clanwilliam	2676.15	30.55	2762.95	31.54
	Near Morreesburg	2669.70	30.48	2752.34	31.42
	North of Cape Town	2568.39	29.32	2698.35	30.80
	Between Worcester and Sutherland	1841.73	21.02	1889.01	21.56

Table 52 : Full Load Hours and Capacity Factors using Enercon E101

Region	Location	100 m		120 m		150 m	
		FLH	CF (%)	FLH	CF (%)	FLH	CF (%)
Boegoebaai	Northeast of Springbok	2149.65	24.54	2212.29	25.25	2239.40	25.56
	East of Boegoebaai	1928.55	22.02	2019.02	23.05	2105.97	24.04
	Northwest of Garies	1849.21	21.11	1924.24	21.97	1991.95	22.74
	Between Port Nolloth and Boegoebaai	1776.92	20.28	1870.91	21.36	1960.65	22.38
	West of Springbok	1402.39	16.01	1526.26	17.42	1669.03	19.05
Coega	Hofmeyr	2162.67	24.69	2278.41	26.01	2399.35	27.39
	East of Aberdeen	2191.26	25.01	2318.50	26.47	2430.96	27.75
	Aberdeen	2077.88	23.72	2170.44	24.78	2258.07	25.78
	North of Gqeberha	1797.30	20.52	1892.20	21.60	1995.44	22.78
	Kleinpoort	1750.22	19.98	1846.36	21.08	1949.39	22.25
Mossel Bay	Beaufort West	2190.51	25.01	2318.04	26.46	2428.44	27.72
	Near Albertinia	1961.54	22.39	2077.81	23.72	2196.77	25.08
	Willowmore	1581.73	18.06	1704.39	19.46	1846.07	21.07
	Near Van Wyksdorp	1314.41	15.00	1382.29	15.78	1462.48	16.69
	Leeu Gamka Prince Albert	1045.68	11.94	1110.88	12.68	1190.71	13.59
Richards Bay	Richards Bay	2469.67	28.19	2635.39	30.08	2785.60	31.80
	Waterbult	2150.04	24.54	2251.89	25.71	2350.95	26.84
	Koningskroon	1733.49	19.79	1826.92	20.86	1920.45	21.92
	Surreyvale	1166.08	13.31	1248.76	14.26	1336.53	15.26
	Kingsley	1618.88	18.48	1718.20	19.61	1813.71	20.70
Saldanha Bay	East of Saldanha Bay	2230.64	25.46	2346.14	26.78	2434.39	27.79
	East of Clanwilliam	2137.61	24.40	2236.87	25.54	2313.86	26.41
	Near Morreesburg	2158.40	24.64	2256.69	25.76	2329.31	26.59
	North of Cape Town	2034.33	23.22	2169.76	24.77	2295.17	26.20
	Between Worcester and Sutherland	1389.89	15.87	1437.10	16.41	1491.42	17.03

The table below show the energy produced in megawatt-hours (MWh) per site, height and turbine.

Table 53 : Summary Tables of Annual Energy Produced in MWh

Location		Vestas		Enercon		
		100 m	120 m	100 m	120 m	150 m
Boegoebaai	Northeast of Springbok	4767.28	4861.28	6556.43	6747.48	6830.17
	East of Boegoebaai	4295.79	4438.19	5882.08	6158.01	6423.21
	Northwest of Garies	4193.91	4312.48	5640.09	5868.93	6075.45
	Between Port Nolloth and Boegoebaai	4006.44	4152.11	5419.61	5706.28	5979.98
	West of Springbok	3366.58	3609.25	4277.29	4655.09	5090.54
Coega	Hofmeyr	4876.81	5077.13	6596.14	6949.15	7318.02
	East of Aberdeen	4869.00	5070.83	6683.34	7071.43	7414.43
	Aberdeen	4642.83	4789.31	6337.53	6619.84	6887.11
	North of Gqeberha	4107.13	4277.62	5481.77	5771.21	6086.09
	Kleinpoort	4005.05	4171.59	5338.17	5631.40	5945.64
Mossel Bay	Beaufort West	4869.97	5070.20	6681.06	7070.02	7406.74
	Near Albertinia	4448.97	4643.08	5982.7	6337.32	6700.15
	Willowmore	3685.77	3912.88	4824.28	5198.39	5630.51
	Near Van Wyksdorp	3106.82	3235.28	4008.95	4215.98	4460.56
	Leeu Gamka Prince Albert	2467.13	2588.90	3189.32	3388.18	3631.67
Richards Bay	Richards Bay	5454.31	5705.37	7532.49	8037.94	8496.08
	Waterbult	4825.30	4992.77	6557.62	6868.26	7170.40
	Koningskroon	3956.99	4117.52	5287.14	5572.11	5857.37
	Surreyvale	2788.96	2943.40	3556.54	3808.72	4076.42
	Kingsley	3814.38	3997.10	4937.58	5240.51	5531.82
Saldanha Bay	East of Saldanha Bay	5012.73	5191.36	6803.45	7155.73	7424.89
	East of Clanwilliam	4817.07	4973.31	6519.71	6822.45	7057.27
	Near Morreesburg	4805.46	4954.21	6583.12	6882.9	7104.40
	North of Cape Town	4623.10	4857.03	6204.71	6617.77	7000.27
	Between Worcester and Sutherland	3315.11	3400.22	4239.16	4383.16	4548.83

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4.5. Discussion

4.5.1. Wind speed characteristics

The wind speed statistics indicate that wind speed increases with height, as demonstrated by the rise in mean wind speed values at higher elevations. Additionally, the five sites within each location generally exhibit similar wind speed profiles due to their close proximity. This consistency is evident in the box-and-whisker plots and probability density function (PDF) curves, which suggest that all sites at a given location experience comparable wind speeds.

When determining the suitability of a site for wind farm development within a location, two critical factors are the annual maximum capacity output and the distance to the electrical grid. These factors create a trade-off between the costs associated with grid connection and the potential revenue generated by wind energy. For example, some locations may have low energy generation potential, as indicated by the annual capacity factor, but offer minimal grid connection costs. Conversely, other locations may yield high energy generation potential but require significant investment for grid connection. These trade-offs influence financial metrics such as payback period and levelized cost of energy (LCOE).

4.5.2. Comparison of Wind Turbine Performance

The Vestas and Enercon turbines exhibit distinct performance characteristics influenced by their design and operational specifications.

Vestas Turbine

- Outputs less energy per unit wind speed and has a lower rated capacity (1800 kW).
  20) Achieves higher capacity factors due to its lower rated capacity, particularly within its optimal operational wind speed range (3 m/s to 20 m/s).
- Classified as IEC wind class IIIa, tolerating:
  - Average annual hub-height wind speed of 7.5 m/s.
  - Extreme 50-year gust of 52.9 m/s.
  - Turbulence intensity of 18% over 10 minutes.

Enercon Turbine

- Delivers greater energy output with a rated capacity of 3050 kW, 69.44% higher than the Vestas turbine.
- Exhibits lower efficiency but generates more power over a broader range of wind speeds.
- Classified as IEC wind class IIa, tolerating:
  - Average annual hub-height wind speed of 8.5 m/s.
  - Extreme 50-year gust of 59.5 m/s.
  - Turbulence intensity of 18% over 10 minutes.

When compared across all 25 sites, the Vestas turbine shows an average increase in annual capacity factors of 5.54% at 100 m and 5.46% at 120 m relative to the Enercon turbine. However, the Enercon turbine generates significantly more electricity, producing an average of 1439.90 MWh and 1577.43 MWh more than the Vestas turbine at 100 m and 120 m, respectively.

4.5.3. Site Selection for Wind Farm Development

Sites such as the northeast of Springbok, Hofmeyr, Beaufort West, Richards Bay, and east of Saldanha Bay yield the highest annual capacity factors among the assessed locations, as shown in Table 51 and Table 52. Based solely on energy yield and capacity factors, these sites are the most suitable for wind farm installation. Higher capacity factors correlate with greater electricity output.

However, external factors beyond energy yield, such as land availability, environmental impacts, and logistical constraints, may also influence the final decision for wind farm siting. These considerations were not evaluated in this report and warrant further investigation.

4.5.4. Concluding remarks on wind resource assessments

Wind resource assessments were conducted across 25 sites in South Africa using two turbine types analysed at three heights: 100 m, 120 m, and 150 m. The assessment methodology involved converting the original speed-power curves of each turbine into Gaussian curves. These Gaussian curves provide a more accurate representation of a wind farm's collective power output behaviour at a given location by smoothing variations in turbine performance.

Reference Meteorological Year (RMY)
To model wind conditions for each location, a Reference Meteorological Year (RMY) was constructed. The RMY is an hourly annual time series comprising selected hourly data from the period 2005–2019. Using the Sandia method, representative hourly time series for each month were chosen and concatenated to form the final RMY. This dataset serves as the basis for all wind resource modelling and analysis.

Data Analysis and Outputs
The RMY time series was used to generate various statistical outputs, including:

- **Box-and-Whisker Plots**: *Summarize wind speed variability at different heights.*
- **Five-Number Summaries**: *Provide descriptive statistics for wind speeds.*
- **Probability Density Function (PDF) Plots**: *Illustrate wind speed distribution across the sites.*
- **Monthly Wind Speed Graphs**: *Highlight seasonal wind speed patterns.*

These analyses ultimately yield annual capacity factor time series, where capacity factor magnitude is closely correlated with wind speed. Aggregated monthly capacity factors, illustrated in line graphs, provide insight into seasonal trends and variability in turbine performance.

Key Findings

- Turbine Performance Comparison:
  21) The Vestas turbine exhibited higher capacity factors at 100 m and 120 m, indicating greater efficiency in converting wind speed into usable energy at these heights.
    - The Enercon turbine, while achieving lower capacity factors, generated a higher total amount of electricity due to its greater rated capacity.

These results underscore the importance of considering both efficiency (capacity factor) and total energy output when selecting a turbine for a specific site.

5. Financial Analysis for Wind and Solar Technologies

5.1. Purpose

A financial model was developed to estimate the Levelised Cost of Electricity (LCOE) and net present value (NPV) from wind and solar generators across the 25 sites. Estimates for LCEO from the combined wind and solar generation were also generated for each site. A sensitivity study was conducted to quantify the impact of key financial assumptions to the LCOE from both technologies.

5.2. Methodology

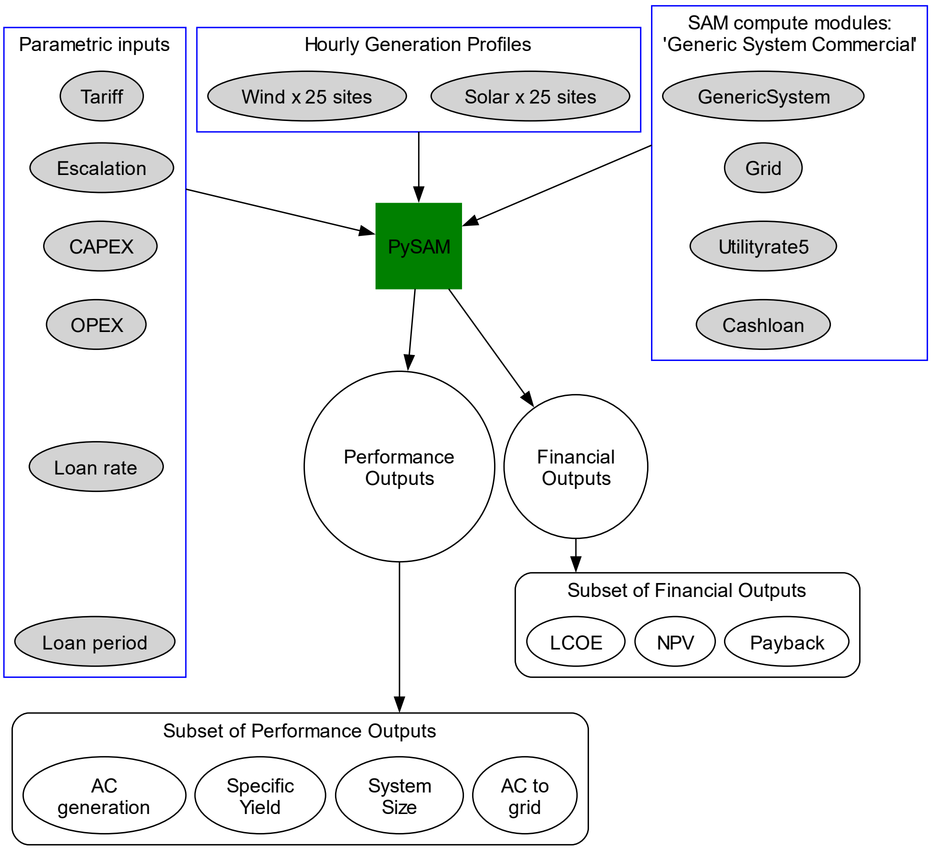
A common financial model and simulation framework were developed to handle both wind and solar to make a fair comparison between the technologies. For simplification, one solar generator and one wind generator technology were selected for the financial model and held constant across all the sites and all the simulation variants. Both renewable energy generation plants were scaled to 10 MW AC capacity. The team selected the System Advisor Model (SAM ver. 2023.12.17) developed and maintained by the National Renewable Energy Lab (NREL) in the United States for the financial modelling. SAM provides a robust framework for performance models and financial analysis, including LCOE, cash flow projections, and incentive modelling. SAM is an open-source tool, which is an advantage for advanced users. The Python API allow users to integrate custom workflows and modify SAM's models for more specific use cases, such as for research or non-standard project types. Despite its sophistication, SAM's interface is well-organized, offering templates for different technologies and project types, making it accessible to both beginners and advanced users. The support team is also very responsive. NREL regularly updates SAM to include the latest advancements in technology and financial modelling. The active user community and detailed documentation are valuable resources for troubleshooting and learning.

SAM supports a wide range of renewable energy technologies, including photovoltaic (PV) systems, concentrated solar power (CSP), wind energy, geothermal, and battery storage. This versatility makes it valuable for modelling a variety of energy systems and hybrid configurations. For this work, the 'Generic System Commercial' configuration was selected, simplifying the performance model to an input file consisting of hourly generation for a full year. The generation profiles were already generated for range of wind and solar generators at all 25 sites.

PySAM (ver. 5.1.0) was used to run a series of simulations to quantify the sensitivity of LCOE and NPV to a range of input parameters. PySAM is a Python library developed by NREL to enable automated analysis and simulations based on the SAM compute modules. The base model was configured in the SAM GUI and then exported to JSON files later imported to PySAM for the sensitivity study. PySAM enables a systematic and fully traceable simulation and records all the selected inputs and outputs for each variant.

Figure 112 provides a flowchart for generating the LCOE, NPV, and Payback period for wind and solar generators across 25 sites.

Figure 112 : Flowchart for generating the LCOE, NPV, and Payback period for wind and solar generators across *25 sites*.



5.3. Inputs and Assumptions

A set of fixed inputs and variable parameters were pre-determined for the simulations. The tables in this section define the fixed inputs common to both models, the variable parameters common to both models, and the technology-specific variable parameters. The variable parameters are used to quantify the sensitivity of the LCOE and NPV to various sets of assumptions given a set of fixed inputs. The range of variable parameters was carefully determined based on available documentation, expert judgement, and professional experience to maintain realism without going to any extremes that might unduly influence the outputs.

Table 54 documents the technology-specific variable parameters for solar and wind financial models. The low CAPEX and OPEX costs were based on inflation-adjusted costs documented in the Meridian 2020 report. The medium and high estimates were based on a 10% and 20% increase, respectively. Based on these costs, the CAPEX for wind is 1.37 times higher compared to solar on a R / kWAC basis. The OPEX for wind is 2.15 times higher compared to solar on a R / kW AC / year basis. For simplification, one solar generator and one wind generator technology as defined in the table were selected for the financial model and held constant across all the sites and all the simulation variants.

Table 54 : Technology-specific variable parameters for the wind and solar financial models

			Solar			Wind		
Parameter	Units	Description	Low	Med	High	Low	Med	High
CAPEX	R / kW AC	The total installed cost is the sum of all of the direct and indirect capital costs and sales tax. It does NOT include financing costs.	12 100	13 310	14 520	16 600	18 260	19 920
OPEX	R / kW AC / yea	Operating costs are annual costs associated with the operation and maintenance of the system over the analysis period. For this model, the OPEX is multiplied by the capacity. Fuels costs and other variable operating costs were set to 0.	430	473	516	925	1 017	1 110
Generation profiles scaled to 10 MW AC	kW AC / hour	Generated by MBA and JHG	Single axis tracking, no back tracking			Enercon, 120m, Gaussian smoothing		

Table 55 documents the financial variable parameters common to both financial models. The tariff structures were based on 1 R/kWh flat rate, 3 R/kWh flat rate, and a Megaflex Time of Use (ToU) schedule. The ToU tariff structure assumed a maximum tariff of 6.24 R/kWh during peak hours of the high demand season and minimum tariff of 0.89 R/kWh during off-peak hours of the low demand season, consistent with the Megaflex Munic tariff structure for 2024gven a 500V to 66kV service and < 300 km transmission zone.

Table 55 : Financial variable parameters common to wind and solar financial models

Parameter	Units	Description	Low	Med	High
Escalation rate	% per year	The escalation rate is an annual percentage increase that applies to the monthly electricity bill in Years 2 and later. Escalation is in addition to the inflation rate.	0	4	8
Loan rate	% per year	The annual nominal interest rate for the loan.	8	10	12
Loan term	years	Number of years required to repay a loan. Note that this value is different than the analysis period.	8	10	15
Tariff structure	R / kWh	One of three structures: Megaflex ToU, fixed 1 R/kWh, fixed 3 R/kWh	1	Megaflex	3

Table 56 shows the common inputs held constant for all variants of the sensitivity study. The Weighted Average Cost of Capital (WACC) is not explicitly specified as an input to SAM, but rather calculated as a function of the nominal discount rate, debt percent, loan rate, and effective tax rate. Given the range in the loan rate variable parameter documented in Table 54, the calculated WACC varies from 8.48% to 11.28%. For projects with no debt financing, the WACC is equal to the nominal discount rate.

Table 56 : Common inputs held constant during all variants

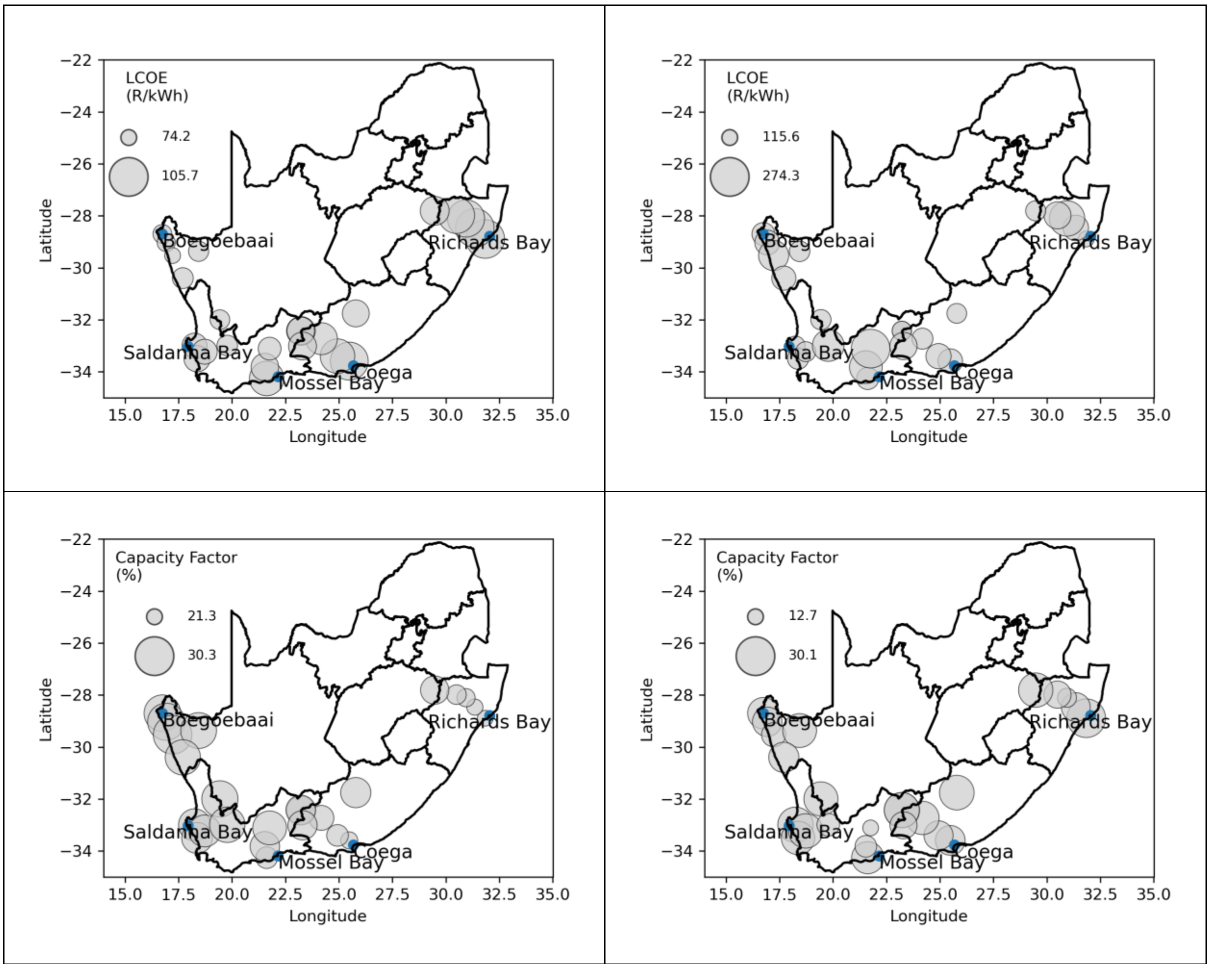
Input	Units	Description	Constant
Inflation rate	%	Annual rate of change of costs, typically based on a price index, expressed as a percentage. SAM uses the inflation rate to calculate the value of costs in years two and later of the project cash flow based on Year One dollar values that you specify on the Operating Costs page, Financial Parameters page, Electricity Rates page, and Incentives page.	3
Real discount rate	%	A measure of the time value of money expressed as an annual percentage. SAM uses the real discount rate to calculate the present value (value in year one) of dollar amounts in the project cash flow over the analysis period and to calculate annualized costs.	6.4
Nominal discount rate	%	SAM calculates the nominal discount based on the values of the real discount rate and the inflation rate: Nominal Discount Rate = [(1 + Real Discount Rate ÷ 100) × (1 + Inflation Rate ÷ 100) - 1] × 100	9.59
Debt percentage	%	Percentage of the net capital cost to be borrowed. The net capital cost is the total installed cost from the Installation Costs page less any direct cash incentives on the Incentives page.	70
Effective tax rate	%	The effective tax rate is a single number that includes both the federal income tax rate and state income tax rate. SAM uses the effective tax rate for several calculations requiring a total income tax value:	0
Sales tax	%	Value added tax	15

The financial model was executed for each unique set of variants for each technology at each site. The six variable parameters with three levels for each generate 729 unique variants. Taking into account 25 sites and two technologies, a total of 36, 450 simulations were run.

5.4. Results

reflects the spatial distributions for the LCOE (R-cents/kWh) and AC capacity factor (%) by region and site for electricity from a solar farm using single-axis trackers and a wind farm using Enercon 120m turbines with Gaussian smoothing. The top row shows the LCOE, and the bottom row shows the capacity factor, while the left half shows the solar generator and the right half shows the wind generator. The small circles represent areas with relatively low LCOE or low capacity factor, and the large circles represent relatively high LCOE or high capacity factor. There is a strong inverse correlation between the two metrics. For example, the left half shows the LCOE from a solar generator averaged across all the remaining variables is low in the Boegoebaai region, and the corresponding AC capacity factor is high. On the other hand, the right half shows that the LCOE for wind along the coast at Richard's Bay is low, and the corresponding AC capacity factor is high. Note that the scales are unique to each subplot to allow for higher spatial resolution within each subplot. The legends indicate the values associated with the smallest and largest circles within each subplot.

Figure 113 : LCOE (R-cents /kWh) (top) and AC capacity factor (%) (bottom) by region and site for electricity from a solar farm using single-axis trackers (left) and a wind farm using Enercon 120m turbines with Gaussian smoothing (right). Small circles correspond to lower LCOE or lower capacity factors.

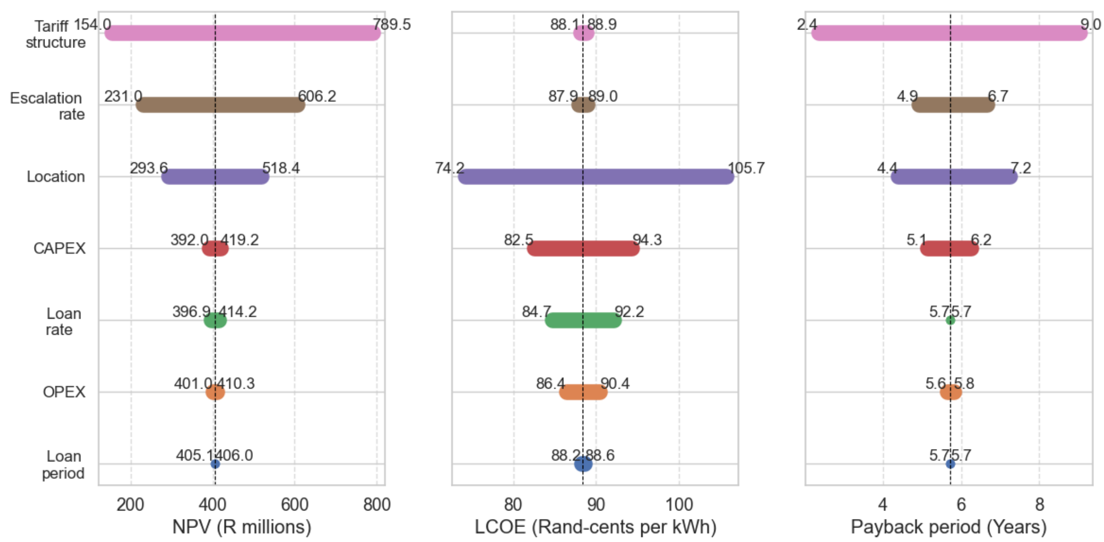


Solar plant using single-axis trackers without backtracking	Wind farm using Enercon 120m turbines with Gaussian smoothing

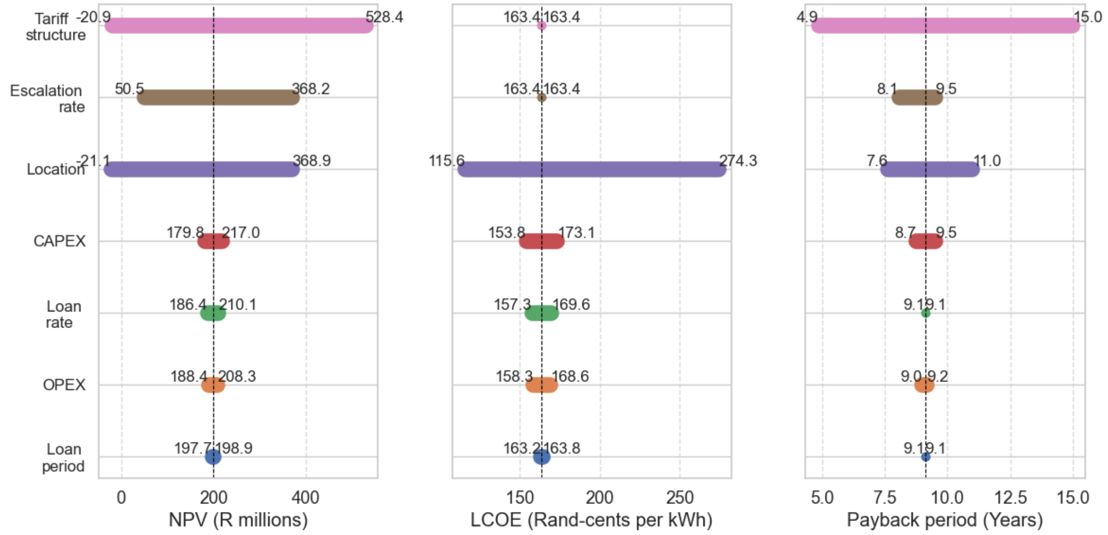
Figure 114 shows the magnitude of the main effects, i.e., the average impact, of the six variable parameters and the location on the NPV, LCOE, and Payback period. NPV is driven primarily by the tariff structure and the escalation rate, with the highest NPV of R 789 million for solar PV correlating with the 3 R/kWh flat rate tariff. The NPV is negative for wind projects under the 1 R/kWh tariff structure due to the limited opportunity for savings from self-generation.

LCOE is driven primarily by the location of both solar and wind projects because the respective renewable energy resources, i.e. the sun and the wind, vary by location, as reflected by the capacity factors mapped out in
. CAPEX, loan rate, and OPEX have a relatively high impact on solar projects compared to wind projects. The tariff structure and escalation rate have a small impact on solar projects but no impact on wind generation because SAM accounts for the cost of electricity from the grid to keep the inverters running at night. Wind turbines do not require AC/DC inverters because the mechanical energy is converted to AC electricity directly. For wind projects, the location impact is also relatively skewed due to the outliers in the selected locations. For example, the highest LCOE for wind corresponds to a location with a capacity factor of 12%. Such a location is not practical for a wind energy project.
The payback period is driven primarily by the tariff structure followed by the location for both wind and solar projects.

Figure 114 : Main effects plot for (a) solar and (b) wind showing the magnitude of the impact from the seven variable parameters on the y-axis versus the NPV, LCOE, and Payback period



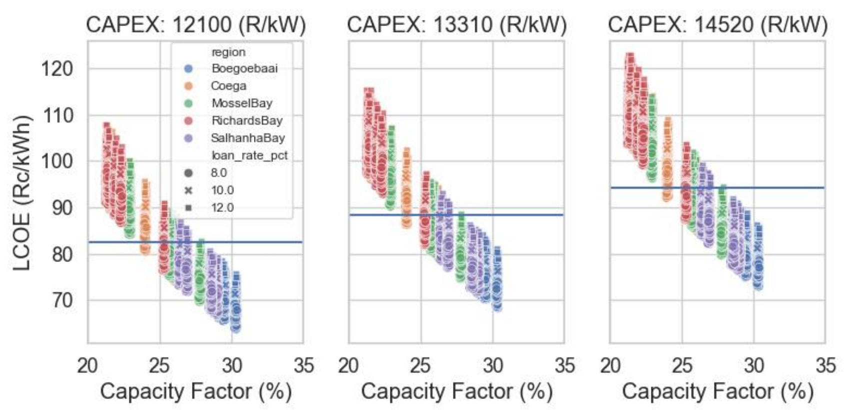
(a) Solar



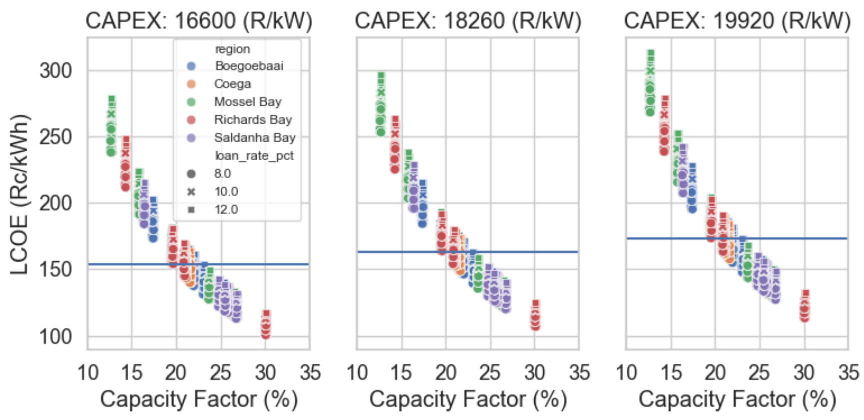
(b) Wind

Figure 115 unpacks the main effects of the variable parameters on LCOE displayed in Figure 114 by combining the most important variable parameters into smaller subgroups. For example, the top half reflects the LCOE for solar projects along the y-axis and the capacity factor along x-axis. The capacity factor is linked to a specific location within a region, and each region is represented by a colour. For example, the Richard's Bay region, represented by the red colour, has the highest LCOE for four out of five locations in every subplot. Each subplot from left to right corresponds to the low, medium, and high CAPEX values, and the horizontal reference line in each subplot reflects the average LCOE for each CAPEX level. The lowest and highest reference lines reflect the same values shown in the main effects subplot for LCOE (82.5 to 94.3) in Figure 114. Clearly the location has a much bigger impact on LCOE than the CAPEX, given the range of variable parameters into the model. Finally, the markers correspond to the loan rate. Within each group defined by a CAPEX level and location, the higher loan rates (square markers) correlate with the highest LCOE. The remaining variability within each loan rate group is the combined impact of the remaining variable parameters. In this case, the remaining variable parameters are OPEX, loan period, tariff structure, and escalation rate. Viewed this way, the relative importance of each combination of variables can be quantified and ranked from largest to smallest impact. The bottom half of Figure 115 show the results for the LCOE from wind projects as a function of the same three main effects.

Figure 115 : Scatterplots show that capacity factor is the most important factor driving the LCOE for solar projects (top) and wind projects (bottom). The capacity factor is strongly correlated to the location.



(a) Solar LCOE (R-cents/kWh) versus Capacity Factor (%)



(b) Wind LCOE (R-cents/kWh) versus Capacity Factor (%)

Figure 116 unpacks the main effects of the variable parameters on NPV displayed in Figure 114 by combining the most important variable parameters into smaller subgroups. This is a similar visual analysis for the NPV as presented in Figure 115 for LCOE, except that the tariff structure replaces the CAPEX and the escalation rate replace the loan rate as the second and third most important variable parameters. All solar projects have a positive NPV, except for Richard's Bay, when assuming a 0% escalation rate in the grid tariff structure, i.e. the tariff rises at the same rate as inflation over time but no more. The three distinct groupings in the subplot on the right correspond to the three levels of escalation rates, as indicated by the symbols. When the tariff rate is assumed to be 3 R/kWh and the tariff escalation rate is 8% above inflation, the NPV exceeds 1.25 billion Rands in a high solar resource region such as Boegoebaai. For wind projects, the NPV is positive for 38% of cases under the r1 R/kWh flat rate tariff, 71% for the ToU tariff, and 99.9% for the 3 R/kWh flat rate assumption. The NPV for the wind project in Richard's Bay along the cost has a positive NPV under all scenarios, except when the tariff structure and escalation rate are both low.

Figure 116 : Critical variable parameters driving the NPV for solar projects (top) and wind projects (bottom)

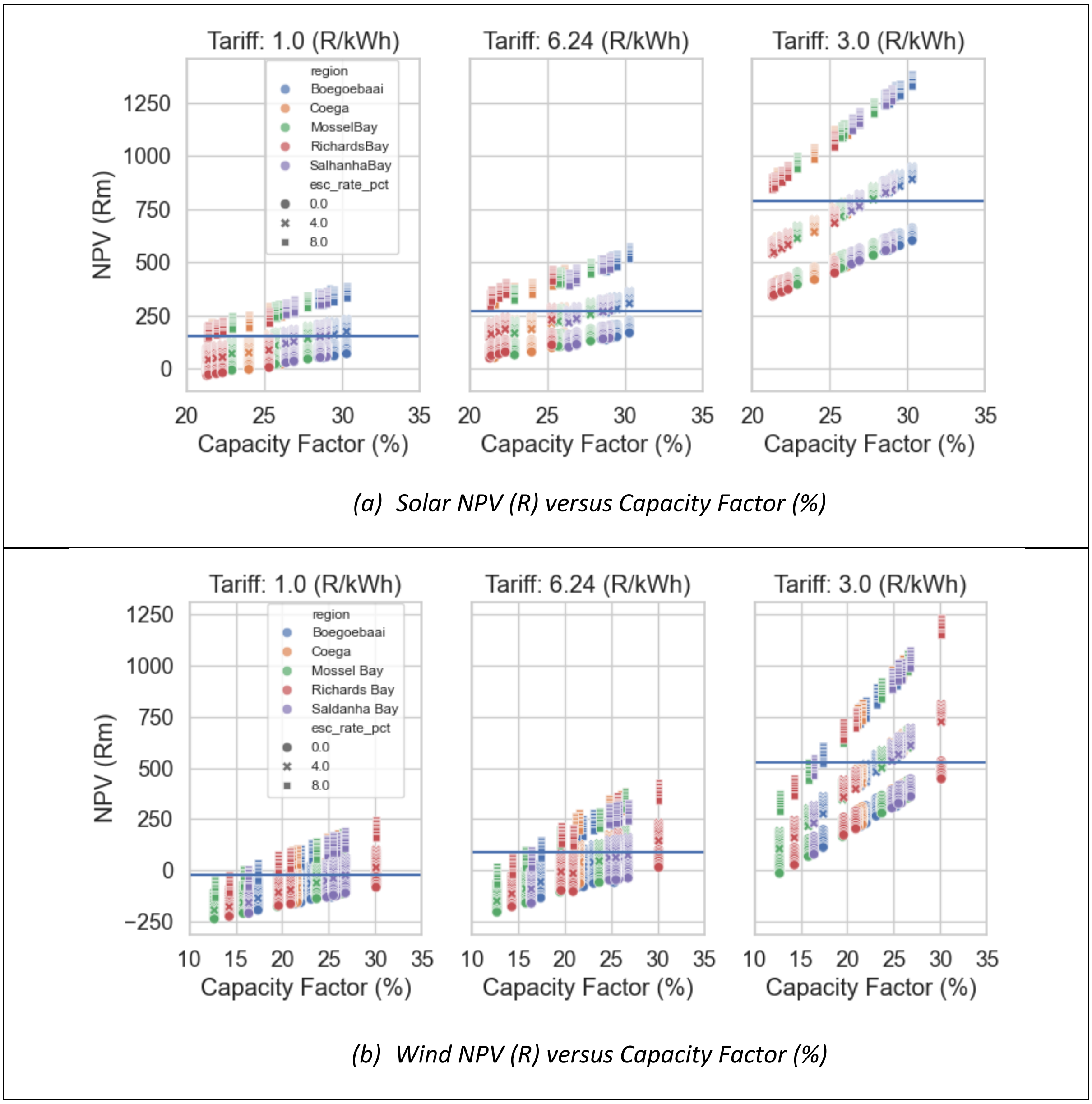


Figure 117 shows scatterplots and a least squares regression line of solar versus wind generators for AC capacity factors and LCOE. Each point represents one of the 25 sites. The subplots highlight the lower LCOEs and higher capacity factors for solar compared to wind. Well-sited wind generators typically have higher capacity factors than solar generators because they can produce electricity day and night, while solar generators are limited to daylight hours only. The conflicting results reported here are based on pre-determined sites that may not be the best choice for a 120m turbine. The graphs also indicate no correlation between wind and solar generators for either metric, i.e. there is no single site that is optimal for both wind and solar. Such a site, if it did exist, would be optimal for generating green hydrogen because the two generators could complement one another to provide a more stable output profile. Rather each site is better for one or the other technology.

Figure 117 : Regression plots show no correlation between wind and solar generators for AC capacity factors (left) and LCOE (right) by site. Each point represents one of the 25 sites.

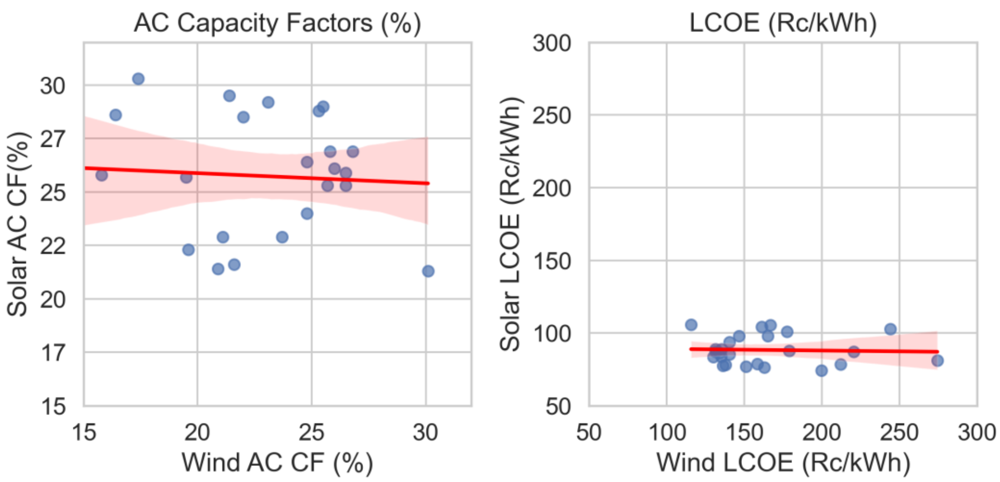


Table 57 shows the combined average LCOE from solar and wind generators weighted by the fraction of overall energy generation by source from a 10 MW AC solar and 10 MW AC wind installation and sorted from lowest to highest. Saldanha Bay East of Clanwilliam (Site 04) has the lowest combined LCOE among the 25 sites analysed, and Richard's Bay Surreyvale (Site 03) has the highest combined LCOE. A co-located wind and solar installation has the advantage of extending the electricity generation over 24 hours from wind and lowering the LCOE from the less expensive solar.

Table 57 : Average LCOE for combined solar and wind generation weighted by fraction of overall energy generation by source from a 10 MW AC solar and 10 MW AC wind installation and sorted from lowest to highest

Region site	Solar (GWh)	Wind (GWh)	Avg. Solar LCOE (Rc/kWh)	Avg. Wind LCOE (Rc/kWh)	Solar fraction	Wind fraction	Weighted LCOE (Rc/kWh)
SB_site_04	25.4	22.4	77.70	136.24	0.53	0.47	105.13
BB_site_04	25.2	22.1	78.19	137.76	0.53	0.47	106.04
SB_site_01	23.6	23.5	83.61	129.90	0.50	0.50	106.69
SB_site_03	23.6	22.6	83.74	135.05	0.51	0.49	108.84
MB_site_04	22.7	23.2	87.06	131.47	0.49	0.51	109.52
BB_site_01	25.6	20.2	76.97	150.95	0.56	0.44	109.59
CO_site_04	22.9	22.8	86.27	133.76	0.50	0.50	109.99
CO_site_05	22.2	23.2	88.86	131.45	0.49	0.51	110.62
RB_site_01	18.7	26.4	105.68	115.64	0.41	0.59	111.51
SB_site_02	23.1	21.7	85.26	140.46	0.52	0.48	111.98
RB_site_05	22.1	22.5	89.08	135.34	0.50	0.50	112.41
BB_site_02	25.9	18.7	76.25	162.89	0.58	0.42	112.63
BB_site_05	25.0	19.3	78.93	158.38	0.56	0.44	113.51
CO_site_03	21.0	21.7	93.78	140.41	0.49	0.51	117.47
BB_site_03	26.6	15.3	74.22	199.68	0.64	0.36	120.01
MB_site_01	20.1	20.8	98.07	146.67	0.49	0.51	122.78
MB_site_05	22.5	17.1	87.65	178.81	0.57	0.43	126.96
SB_site_05	25.1	14.4	78.63	212.07	0.64	0.36	127.27
CO_site_02	20.1	18.5	98.10	165.06	0.52	0.48	130.17
CO_site_01	18.9	18.9	104.35	161.06	0.50	0.50	132.73
RB_site_02	18.7	18.3	105.63	166.82	0.51	0.49	135.87
RB_site_04	19.6	17.2	101.05	177.37	0.53	0.47	136.74
MB_site_02	22.6	13.8	87.20	220.47	0.62	0.38	137.80
MB_site_03	24.3	11.1	81.11	274.34	0.69	0.31	141.71
RB_site_03	19.2	12.5	102.91	244.05	0.61	0.39	158.57

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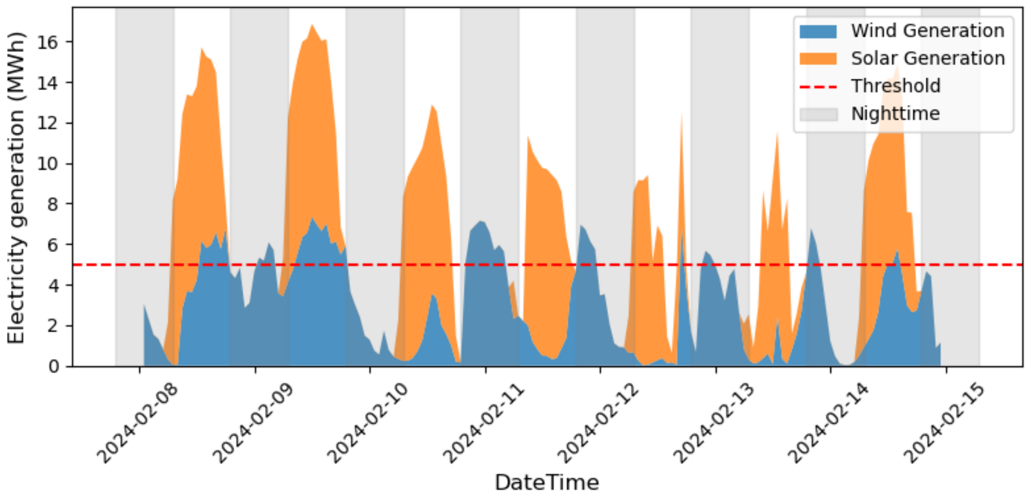
Figure 118 shows a stacked area graph for wind and solar electricity generation over one week in February for Saldanha Bay East of Clanwilliam (Site 04), which has the lowest combined LCOE as listed in Table 57. The nighttime hours are shown in grey colour. When the wind and solar resources are plentiful, the combined output exceeded 16 MW briefly. The output exceeded 5 MW for approximately 55% of the hours over the selected week despite having a combined 20 MW installed capacity.

Figure 118 : Stacked area graphs for wind and solar electricity generation over one week in February with nighttime hours shown in grey



The optimal mix of wind, solar, and battery storage to meet a specified load profile for the electrolyser could be determined using PyPSA or Homer as a next step. Battery storage could store the excess electricity generated during periods of abundant resources and then be discharged to meet the electrolyser when resources are insufficient.

6. Comparative Analysis of Energy Production

The results of the wind and solar resource assessments provide an understanding of how each technology type performs relative to each site. This section describes a brief comparison of the AEP and energy density of each technology type. More specifically, a single-axis PV system with backtracking is compared to a wind system at 150 m hub height, using the Enercon E101 turbine.

For each technology type, the AEP values are considered as normalised for a 1 MW capacity. The prior PV systems' modelling outputs are for 1 MW plant capacities. Consequently, the solar AEP and energy density are taken verbatim from Section 3. The wind systems' modelling outputs are normalised due to the use of a 3.05 MW turbine. The wind system's energy density assumes a 5 by 3 rotor diameter spacing, resulting in 15.3 hectares per Enercon E101 turbine. The results per site are displayed in the figures below.

It should be noted that the energy density values do not capture the differences between the two technology types in terms of supporting infrastructure, such as the balance of plant.

Figure 119: Comparison of the AEP and energy density for the Boegoebaai sites

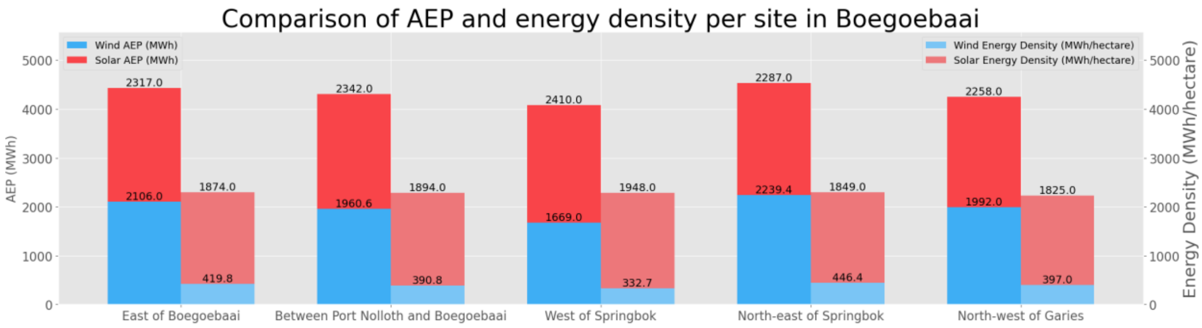


Figure 120: Comparison of the AEP and energy density for the Saldanha Bay sites

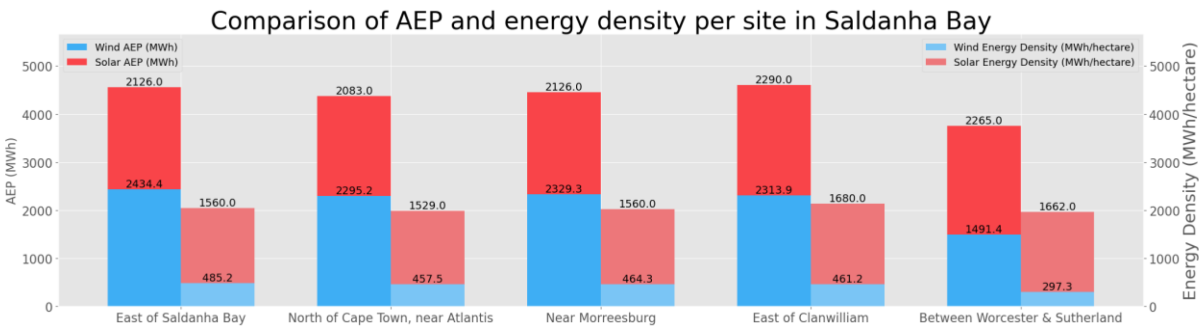


Figure 121: Comparison of the AEP and energy density for the Mossel Bay sites

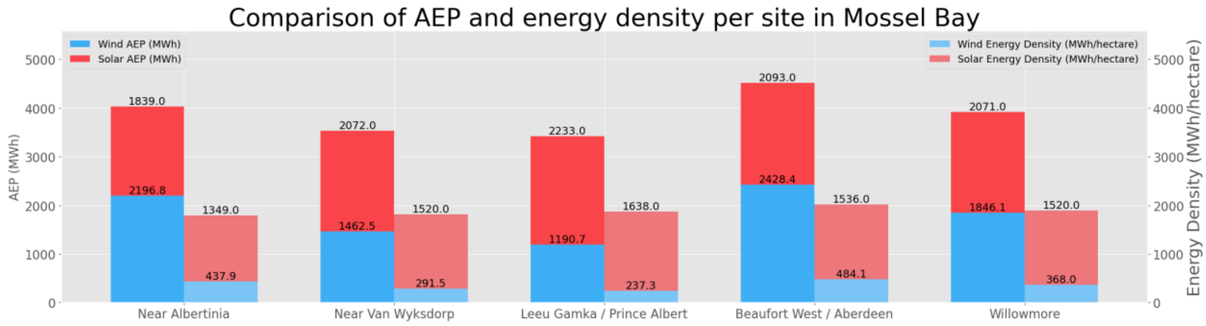


Figure 122: Comparison of the AEP and energy density for the Coega sites

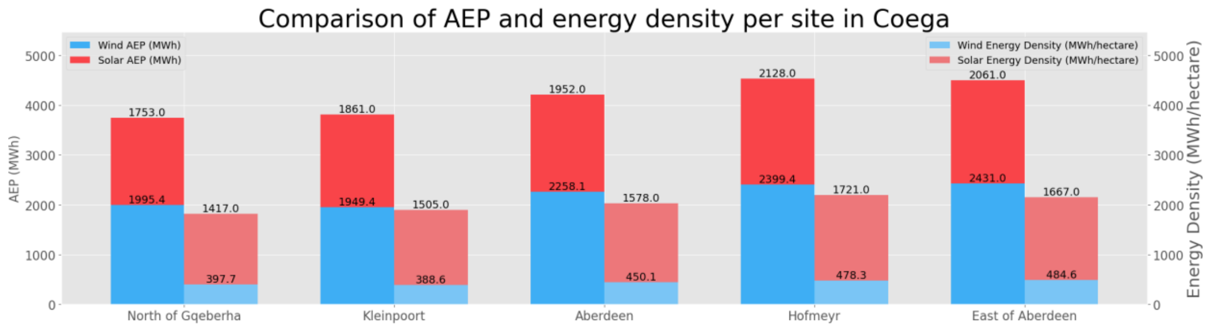
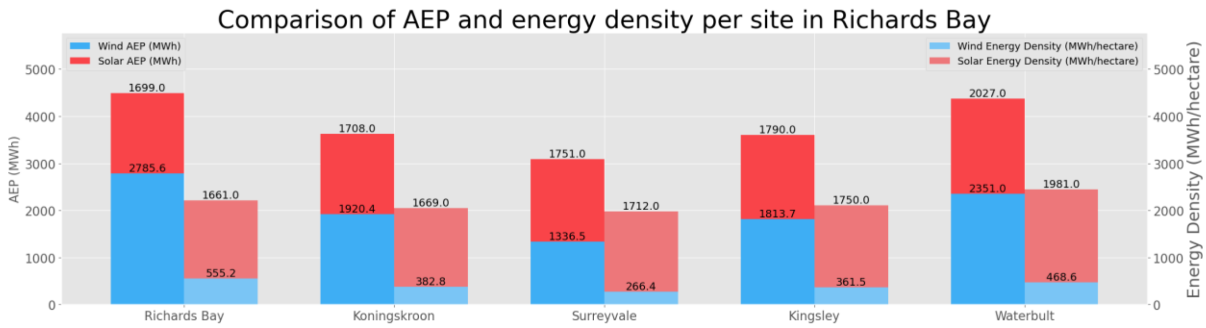


Figure 123: Comparison of the AEP and energy density for the Richards Bay sites



It is evident that that the 1 MW normalised AEP values differ significantly between sites, indicating a substantial difference in available resources. These figures also highlight the benefit of hybrid systems. The figures display total energy output, but do not provide insights into the supply curve of each technology type, which is also important. The combination of these two technology types has the ability to provide a smoother supply curve, potentially negating the severe impact of intermittency of renewables.

The energy density of the solar plants appears to be significantly greater than that of wind plants. This is due to the large space required for wind plant installations. Furthermore, the energy density of wind plants is reliant on considerations such as the severity of wake loss effects. This means that this energy density could vary, depending on the magnitude of such impacts.

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7. Appendix A

Solar Analysis Data Compilation:

Table 58 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for East of Boegoebaai site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	181.1	169.3	181.5	130.6	130.9	131.7	143.1	148.4	159.9	185.3	161.7	200.1
2006	160.0	166.1	186.0	130.7	140.5	133.2	128.9	139.3	157.4	187.0	173.4	198.8
2007	180.6	170.9	188.7	156.9	147.0	121.5	143.6	158.1	173.4	178.4	169.8	181.6
2008	170.3	166.9	162.4	149.8	125.3	131.8	137.8	157.1	172.8	187.7	168.7	188.6
2009	158.3	169.1	177.9	130.2	143.2	114.6	136.8	144.0	170.3	179.7	159.8	198.6
2010	171.2	171.1	182.7	154.1	135.1	133.5	140.4	161.4	155.3	183.0	163.5	186.4
2011	179.5	166.5	172.8	147.1	130.9	124.8	145.6	154.8	171.3	186.2	175.4	194.0
2012	178.4	180.1	178.3	148.5	147.6	127.5	146.4	158.3	167.0	182.7	177.9	186.3
2013	178.5	168.1	182.1	151.3	147.6	125.1	140.3	152.7	163.7	178.9	173.9	193.0
2014	171.7	164.8	182.7	148.8	142.3	128.4	138.2	156.3	172.2	177.9	169.8	185.8
2015	177.6	175.5	179.8	151.3	150.3	124.8	127.4	139.7	158.6	179.7	175.2	193.2
2016	173.3	177.8	186.3	145.7	147.6	131.0	138.5	157.3	165.6	175.8	165.9	197.3
2017	178.5	175.9	188.1	149.4	151.4	126.8	142.8	166.8	164.3	192.5	171.1	190.4
2018	175.1	172.5	180.9	150.1	146.5	132.4	141.1	159.3	170.1	183.6	175.7	193.4
2019	182.2	168.9	182.5	148.4	141.5	132.7	141.8	168.4	166.8	192.3	175.6	196.4
2020	177.7	174.2	185.7	147.3	153.0	136.5	144.7	168.1	177.5	187.6	173.9	196.2
TMY	182.2	172.4	184.4	146.1	147.0	125.2	140.9	158.1	164.6	187.1	161.1	197.3

Table 59 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for East of Boegoebaai site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	244.1	217.6	201.4	156.2	126.6	125.9	138.8	153.7	180.3	239.3	210.6	291.6
2006	216.2	218.3	198.6	153.9	140.1	128.1	126.8	147.8	179.5	236.7	225.3	279.8
2007	252.1	227.7	200.5	181.6	147.0	117.8	139.5	166.0	198.6	224.2	215.4	250.9
2008	232.4	220.8	172.9	174.1	124.4	126.6	135.5	165.5	198.0	239.4	224.0	262.8
2009	206.6	226.2	188.8	153.7	143.2	111.1	133.3	151.7	192.9	227.9	206.1	281.9
2010	230.8	229.5	193.0	178.3	134.4	128.4	137.6	170.2	175.6	233.2	210.3	253.5
2011	238.4	218.1	183.8	171.5	129.9	119.6	141.3	163.2	196.3	237.1	228.8	271.3
2012	236.4	239.9	188.4	168.4	148.1	122.5	142.7	166.9	191.3	231.3	232.1	257.8
2013	242.5	223.3	196.1	176.8	147.0	120.3	136.4	161.3	188.3	223.9	223.6	270.0
2014	236.9	217.2	196.0	174.0	142.4	123.0	135.3	164.3	196.7	223.0	221.8	258.3
2015	241.9	236.3	190.5	176.7	149.1	120.3	124.1	145.9	179.5	225.5	226.9	271.3
2016	232.6	234.9	198.3	170.8	145.9	125.0	135.1	165.9	189.4	223.0	214.5	277.3
2017	242.2	233.1	199.9	172.1	150.4	121.7	138.9	175.6	187.1	244.7	221.8	265.2
2018	236.8	228.3	193.6	172.9	146.4	127.0	137.2	168.2	195.0	232.8	228.3	272.6
2019	251.4	221.3	194.3	172.4	141.2	127.0	138.0	177.9	189.0	246.7	226.9	275.0
2020	242.0	227.3	197.1	171.7	152.3	131.1	141.5	178.2	203.8	238.2	222.5	276.0
TMY	251.5	227.4	196.8	170.8	148.4	119.7	134.4	166.4	186.8	236.9	211.2	277.5

Table 60 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for East of Boegoebaai site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	247.5	219.6	198.1	154.5	128.2	125.5	138.9	155.0	182.1	235.4	208.5	293.9
2006	215.1	213.3	203.1	153.6	138.6	124.8	123.4	145.5	178.8	235.6	227.9	282.7
2007	251.4	222.3	204.5	181.4	145.5	114.6	136.2	163.3	198.4	223.1	219.0	251.8
2008	231.2	215.8	177.7	173.4	122.8	122.9	131.7	163.0	197.6	238.5	226.2	265.3
2009	204.7	220.9	192.7	153.8	141.5	108.0	129.9	149.3	193.2	227.2	208.2	284.8
2010	229.5	223.9	197.1	178.0	132.8	124.7	133.7	167.4	175.7	232.8	212.7	253.9
2011	237.2	213.4	187.7	171.2	128.6	116.4	137.9	160.6	195.9	236.4	232.6	273.6
2012	235.2	234.8	192.2	167.8	146.2	119.1	139.1	164.2	190.8	230.7	234.6	259.6
2013	241.3	218.0	200.9	176.5	145.6	116.9	133.1	158.8	187.8	222.7	226.4	271.1
2014	235.9	212.4	201.3	174.1	140.5	119.7	131.6	161.7	196.3	221.6	224.3	259.2
2015	240.6	230.6	193.9	176.7	147.8	117.0	121.0	143.4	179.0	224.4	230.5	273.9
2016	231.3	229.9	202.3	170.3	144.2	121.5	131.5	163.6	189.2	222.2	217.6	279.9
2017	240.9	227.8	205.2	172.1	148.8	118.4	135.2	172.8	187.0	244.1	225.1	266.2
2018	235.5	223.0	197.6	172.7	144.6	123.5	133.4	165.3	194.5	232.1	231.8	275.2
2019	250.1	216.3	196.9	172.1	139.9	123.5	134.6	175.1	189.0	246.1	229.6	276.6
2020	240.9	221.9	201.8	171.3	150.9	127.6	138.0	175.5	203.3	237.8	225.3	277.6
TMY	250.1	223.1	201.0	170.7	146.0	117.0	133.2	163.4	187.0	235.6	210.3	280.0

Table 61 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Between Port Nolloth and Boegoebaai site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	183.8	171.0	181.4	129.1	133.2	130.6	141.9	144.6	163.7	187.0	162.1	201.6
2006	161.6	166.9	186.3	132.1	138.4	130.5	129.4	136.4	157.6	188.8	175.0	201.2
2007	183.4	171.8	191.6	157.5	147.1	120.8	142.9	157.9	173.6	178.5	170.2	176.9
2008	174.6	169.0	165.2	150.4	126.8	127.3	134.0	159.1	173.4	190.9	170.8	193.1
2009	157.9	170.7	180.5	130.1	142.1	116.1	133.2	141.9	168.7	177.8	158.7	199.8
2010	173.7	171.7	184.8	155.9	133.9	131.9	138.7	161.8	153.6	182.6	162.7	187.1
2011	181.4	170.2	175.4	149.2	128.7	122.0	144.0	149.4	171.4	187.0	174.3	195.5
2012	180.2	182.4	175.7	147.9	146.1	123.9	145.5	151.5	162.6	181.3	178.5	188.8
2013	181.2	169.0	182.4	150.7	148.7	119.6	139.2	151.1	165.6	179.8	173.5	196.6
2014	175.3	167.8	184.2	148.1	138.8	127.4	135.8	156.1	173.4	175.6	169.2	185.4
2015	177.9	177.4	181.8	151.1	149.2	121.5	128.5	141.9	157.4	178.6	175.7	194.5
2016	172.7	179.6	187.6	143.5	147.6	129.6	134.1	157.9	162.9	177.4	165.5	196.1
2017	181.2	178.1	189.5	148.5	151.6	126.3	144.6	166.1	164.5	192.7	169.9	189.2
2018	175.2	172.4	177.2	150.3	144.9	128.1	140.8	160.7	164.9	185.8	175.8	194.6
2019	182.4	169.9	182.3	146.9	143.7	130.8	140.9	164.8	166.6	193.2	175.3	192.9
2020	177.2	176.4	187.1	148.4	152.3	135.2	145.3	167.8	177.8	190.2	172.4	197.0
TMY	174.4	177.9	182.0	155.8	144.8	119.7	144.1	158.1	173.6	175.8	175.1	201.3

Table 62 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Between Port Nolloth and Boegoebaai site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	248.8	220.8	201.5	154.9	128.6	124.9	138.0	148.9	184.5	241.3	211.1	295.7
2006	218.7	218.6	198.3	154.8	137.6	125.3	126.4	144.9	180.0	239.3	227.0	282.9
2007	257.7	228.3	203.3	181.5	146.6	117.0	138.3	166.1	199.0	224.8	214.7	243.7
2008	240.8	225.8	175.9	174.4	126.2	122.7	131.2	167.5	198.6	242.7	224.7	269.3
2009	204.7	228.8	192.4	151.9	141.8	111.8	129.3	148.9	192.1	224.8	202.6	282.5
2010	234.8	231.4	195.4	180.1	133.7	126.8	135.1	170.1	174.8	230.8	209.6	256.1
2011	241.6	223.8	186.2	173.2	128.3	116.6	139.9	157.8	195.6	238.5	226.0	273.1
2012	237.6	244.7	186.2	167.3	145.8	118.9	141.5	159.8	187.0	229.3	232.3	260.8
2013	246.6	224.9	196.3	175.6	148.3	115.4	135.2	159.2	190.1	225.5	224.0	275.0
2014	243.2	222.1	196.9	172.9	139.0	122.1	132.8	163.9	198.3	220.8	221.2	257.2
2015	241.8	239.5	193.3	176.3	148.1	116.8	125.2	148.8	178.3	225.2	226.4	272.4
2016	234.4	237.7	201.1	168.4	145.8	123.2	131.2	166.4	186.7	225.1	213.7	275.0
2017	246.0	237.2	201.7	171.8	150.2	120.6	140.0	174.1	188.0	245.4	219.2	262.3
2018	235.0	226.7	188.5	172.4	144.3	123.5	136.6	169.3	189.1	235.8	228.4	272.9
2019	249.6	221.6	194.2	171.1	143.0	125.1	136.6	174.1	189.1	246.0	223.7	267.4
2020	238.2	231.3	198.9	172.1	151.6	129.4	141.3	177.0	204.5	241.5	216.6	277.4
TMY	240.6	237.2	196.9	180.1	144.4	115.5	139.8	166.5	198.6	221.0	227.2	283.0

Table 63 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Between Port Nolloth and Boegoebaai site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	251.4	223.3	198.6	153.2	130.2	124.2	138.1	150.1	186.8	237.5	209.3	298.2
2006	218.1	213.9	202.9	154.8	136.3	121.7	123.2	142.6	179.6	238.6	230.8	285.6
2007	257.3	223.2	208.2	181.4	145.1	113.6	134.9	163.3	198.7	223.7	218.9	245.6
2008	240.1	220.3	181.5	173.8	124.6	119.0	127.6	165.1	198.2	242.4	227.6	272.1
2009	203.3	223.3	196.5	152.1	140.4	108.5	126.5	146.7	191.8	224.4	205.8	285.5
2010	234.0	225.9	199.8	180.0	132.2	123.0	131.5	167.4	174.5	230.6	212.8	256.9
2011	240.7	218.9	190.2	173.3	126.7	113.3	136.3	155.3	195.6	237.9	230.2	275.9
2012	237.0	238.6	189.8	167.1	144.4	115.4	138.3	157.4	186.2	228.8	236.1	262.9
2013	245.5	219.4	201.4	175.5	146.7	111.8	131.8	156.8	189.8	224.5	226.8	277.4
2014	242.4	217.0	202.4	173.0	137.3	118.6	129.2	161.4	197.7	219.9	224.7	258.9
2015	240.8	234.0	196.9	176.5	146.8	113.5	122.0	146.3	177.8	224.2	230.4	275.1
2016	233.5	231.8	205.4	168.2	144.2	119.6	127.8	164.2	186.4	224.6	216.4	277.8
2017	244.9	231.6	206.3	171.9	148.8	117.1	136.8	171.6	187.3	244.9	223.3	263.3
2018	234.0	221.7	192.5	172.2	142.9	120.0	133.2	166.5	188.5	235.5	232.9	275.8
2019	248.7	216.8	197.1	171.0	141.8	121.5	133.5	171.5	189.2	245.5	226.6	269.2
2020	237.2	226.0	202.5	171.9	150.3	125.7	138.4	174.5	203.4	241.5	220.3	279.6
TMY	239.9	231.7	201.2	180.0	143.0	111.9	136.4	163.5	197.9	220.1	231.0	285.6

Table 64 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for West of Springbok site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	179.5	168.1	182.4	136.9	136.8	139.0	149.8	160.9	176.7	191.3	163.1	200.1
2006	159.4	167.9	188.3	136.3	143.0	136.7	143.1	162.2	173.0	192.1	178.4	202.2
2007	180.1	172.1	189.2	156.5	152.0	131.6	149.5	165.3	178.8	186.2	174.0	189.4
2008	169.4	168.9	164.7	153.6	130.5	130.0	139.6	158.9	181.0	194.6	176.1	192.7
2009	160.1	155.7	183.8	132.8	147.1	118.1	133.2	146.7	180.4	182.9	172.0	201.3
2010	176.5	168.5	186.4	153.4	140.9	138.9	147.9	168.4	164.1	190.4	174.3	192.0
2011	179.3	160.3	175.0	143.9	134.1	130.5	147.3	167.7	178.1	192.9	183.6	199.8
2012	178.7	175.7	174.7	150.2	151.1	125.7	151.1	168.4	182.0	195.8	180.5	189.5
2013	183.3	175.6	182.4	153.2	152.1	127.2	142.9	151.8	176.5	193.0	174.2	191.8
2014	175.2	172.0	186.1	149.3	149.0	134.3	144.2	162.1	176.2	198.2	169.7	190.6
2015	174.6	180.0	187.5	150.5	154.6	130.2	139.1	159.9	163.0	191.1	181.1	190.1
2016	168.1	180.2	187.4	147.3	153.1	132.7	144.6	169.3	175.7	181.7	168.5	199.1
2017	179.0	172.7	187.7	151.9	152.8	130.0	150.7	172.8	171.1	197.5	174.1	200.2
2018	184.7	173.9	183.6	155.3	149.7	134.3	146.4	169.0	175.5	190.7	179.4	202.3
2019	189.7	172.6	189.1	155.3	142.7	140.3	148.5	173.9	174.8	194.0	177.7	197.4
2020	186.5	174.0	181.8	144.7	152.9	139.6	148.2	172.2	184.5	186.4	178.9	198.2
TMY	175.1	173.9	180.6	151.6	150.6	125.7	151.1	165.5	178.9	198.4	177.8	197.5

Table 65 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for West of Springbok site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	251.3	218.4	201.1	163.2	133.7	132.5	144.2	166.9	201.1	247.5	220.2	293.3
2006	214.2	224.2	201.3	158.4	142.8	130.7	138.1	168.9	198.5	244.0	236.1	293.6
2007	250.5	232.7	200.9	179.3	151.3	125.8	144.5	172.2	205.7	236.3	225.1	270.8
2008	234.2	226.6	180.1	175.2	129.0	123.9	136.3	165.9	208.7	247.9	240.7	276.7
2009	210.8	207.5	197.9	153.3	146.6	113.7	129.9	152.4	207.3	231.7	227.0	292.0
2010	241.4	227.6	200.3	175.0	140.0	132.8	143.3	175.0	188.2	241.5	231.5	277.3
2011	246.4	212.1	186.2	165.0	133.6	125.3	142.4	174.8	204.6	244.0	244.0	287.8
2012	245.8	234.6	184.6	164.5	149.7	120.7	146.1	176.2	209.7	250.0	240.3	269.8
2013	252.8	236.8	198.0	175.9	151.5	122.8	138.6	158.2	203.2	243.4	229.1	276.2
2014	246.1	229.6	200.5	171.4	147.3	128.5	139.8	167.9	203.4	252.3	224.4	276.6
2015	239.3	244.1	200.9	171.9	153.7	124.5	134.3	165.9	187.2	242.2	239.5	271.9
2016	229.2	242.9	202.1	169.2	151.8	126.0	140.6	175.8	202.5	232.0	222.2	288.1
2017	246.1	231.6	199.7	171.7	151.1	124.7	145.9	180.1	196.2	251.2	228.0	290.2
2018	255.5	235.3	197.1	176.5	148.5	128.4	141.6	176.5	202.8	241.7	238.2	292.4
2019	255.5	235.3	197.1	176.5	148.5	128.4	141.6	176.5	202.8	241.7	238.2	292.4
2020	263.5	241.0	202.3	176.7	141.3	133.4	145.1	182.7	201.0	243.8	241.3	274.4
TMY	246.1	235.4	193.9	171.6	149.2	121.0	146.2	172.4	205.8	252.5	236.4	284.6

Table 66 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for West of Springbok site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	251.1	222.9	200.9	161.1	133.4	132.5	144.9	166.5	203.9	245.6	218.7	295.9
2006	215.2	220.1	204.4	160.5	141.9	126.9	135.2	168.0	197.7	245.5	237.9	291.3
2007	252.0	228.3	204.3	181.7	150.5	122.1	141.4	171.2	205.0	237.6	227.2	268.9
2008	235.6	221.9	183.8	177.2	127.9	120.4	133.5	165.2	207.9	249.5	242.0	275.4
2009	210.3	203.6	201.5	155.1	145.7	110.5	127.2	151.5	206.4	232.8	228.6	290.2
2010	243.0	223.3	203.6	177.1	138.9	129.0	140.2	174.1	187.8	242.7	233.2	275.4
2011	247.8	208.2	188.9	167.4	132.4	121.7	139.4	173.9	203.7	245.1	246.4	286.2
2012	247.5	229.9	187.9	166.2	148.5	117.1	143.2	175.1	208.9	251.5	241.6	269.4
2013	253.8	232.1	201.3	178.2	150.6	119.1	135.6	157.8	201.7	244.5	230.9	274.4
2014	247.1	225.5	203.7	173.7	146.2	124.7	136.7	167.3	202.4	253.3	226.3	275.1
2015	240.4	239.2	204.1	173.9	152.8	120.8	131.3	164.9	186.6	243.0	241.0	270.4
2016	230.8	238.0	206.1	171.1	150.8	122.4	137.5	175.3	201.6	233.2	223.4	287.2
2017	247.4	227.3	202.8	174.0	150.2	121.1	143.0	179.3	195.1	252.4	229.9	288.0
2018	256.9	230.7	200.3	178.8	147.6	124.7	138.7	175.4	201.8	242.5	240.4	290.5
2019	265.0	228.3	206.7	180.3	141.1	130.2	141.1	180.8	198.7	248.3	238.6	283.1
2020	259.1	227.2	197.7	168.0	150.7	129.2	141.5	179.6	212.0	239.1	238.8	285.5
TMY	247.1	230.8	197.0	173.9	148.1	117.4	143.3	171.4	205.1	253.5	238.7	283.3

Table 67 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for North-east of Springbok site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	185.3	172.6	180.8	128.8	129.9	125.3	140.8	143.4	157.6	184.7	161.7	200.5
2006	165.5	168.5	185.5	129.6	134.8	131.6	128.4	139.4	159.3	187.2	174.8	201.0
2007	182.2	173.1	189.3	153.9	144.2	120.6	140.7	156.2	172.7	176.0	173.0	179.1
2008	174.3	167.2	168.5	149.3	120.9	121.9	133.1	157.5	172.6	190.1	172.4	194.8
2009	159.3	166.2	178.5	130.9	137.4	112.1	128.4	138.6	165.8	178.0	164.2	199.2
2010	178.4	170.4	187.5	153.4	125.6	128.4	135.3	155.5	153.7	180.9	163.8	185.2
2011	183.5	170.8	174.8	146.0	129.4	122.5	142.3	148.0	170.6	186.4	178.7	194.2
2012	182.2	182.2	173.3	146.0	144.7	122.4	140.0	153.5	159.8	187.2	179.4	190.7
2013	183.4	172.6	180.5	148.1	144.9	121.1	136.2	146.3	166.4	179.8	170.7	198.1
2014	174.8	168.8	183.2	146.4	134.7	123.9	134.5	157.3	174.1	179.1	165.2	183.7
2015	175.3	180.1	182.0	150.5	146.8	121.3	125.9	138.9	158.1	186.5	176.1	193.5
2016	171.8	179.3	183.7	143.3	145.1	126.9	134.0	155.6	163.3	176.9	167.9	195.6
2017	184.6	178.6	188.7	147.8	150.0	126.0	143.7	163.1	163.0	193.0	171.7	192.5
2018	179.0	174.2	174.6	149.0	144.3	126.2	139.0	160.2	164.9	187.5	175.7	195.5
2019	185.4	171.4	184.0	147.8	141.2	130.2	137.7	162.2	166.9	192.3	174.4	194.3
2020	178.8	180.5	187.9	145.7	149.1	134.3	141.4	163.0	178.2	190.7	172.2	197.2
TMY	185.4	172.5	185.3	144.7	125.6	124.0	128.7	158.4	165.1	190.7	161.4	194.3

Table 68 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for North-east of Springbok site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	252.2	223.6	199.1	154.3	125.4	120.1	136.3	147.5	174.8	238.4	212.1	294.1
2006	223.2	223.9	197.3	151.9	134.8	126.2	125.0	146.5	181.7	236.1	227.2	283.6
2007	256.4	230.4	201.2	175.8	143.9	116.7	135.8	164.4	197.3	223.1	217.9	248.4
2008	240.2	225.5	180.2	172.7	119.6	116.6	130.0	165.0	197.6	242.5	225.9	272.4
2009	208.4	223.0	190.3	152.3	136.9	107.6	124.1	144.8	188.6	224.2	209.5	281.8
2010	244.9	228.5	199.2	176.8	125.4	122.8	131.2	163.5	174.6	228.2	211.7	254.1
2011	249.6	225.5	184.4	168.2	129.2	117.5	137.7	155.5	194.6	235.6	231.7	272.0
2012	243.1	244.4	183.1	163.7	143.5	117.8	136.4	162.0	183.3	236.4	232.3	265.0
2013	250.8	229.5	194.1	171.8	144.5	116.4	132.5	154.9	190.2	225.1	220.0	277.8
2014	242.3	223.6	196.0	170.1	134.8	118.7	131.2	165.0	198.7	227.2	215.5	257.2
2015	238.9	242.3	192.7	174.7	145.1	116.3	122.2	145.3	179.4	235.6	223.7	270.9
2016	232.8	238.4	197.3	166.8	142.9	120.2	129.9	163.8	187.0	224.4	217.5	276.2
2017	252.2	239.7	200.3	170.2	148.0	119.6	138.6	171.4	185.4	245.0	220.5	267.0
2018	244.5	231.4	186.1	171.2	143.7	120.9	134.4	168.2	189.4	237.3	228.8	273.6
2019	253.0	226.3	195.7	171.2	140.2	123.9	133.1	170.7	189.6	243.3	222.8	270.8
2020	239.4	239.3	199.8	168.1	148.4	127.9	137.4	172.1	204.3	241.7	216.6	276.6
TMY	253.0	229.5	196.3	167.5	125.6	117.1	121.8	166.2	188.6	243.4	212.0	270.6

Table 69 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for North-east of Springbok site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	254.5	226.9	196.8	152.4	126.5	119.4	136.3	147.9	176.8	235.4	210.4	297.1
2006	222.3	218.8	202.0	151.8	133.2	122.1	121.8	144.3	181.2	235.6	231.8	288.3
2007	256.4	225.2	206.0	175.5	142.2	112.9	132.4	161.6	196.9	222.5	222.0	251.7
2008	239.8	220.0	184.7	172.4	118.0	112.9	126.6	162.7	197.1	242.3	230.4	275.6
2009	207.3	217.8	194.8	152.7	135.5	104.1	121.2	142.7	188.4	224.1	213.5	285.1
2010	244.4	223.2	202.7	176.9	123.7	119.0	127.9	160.9	174.4	228.2	215.9	255.6
2011	249.1	220.7	188.2	168.4	127.4	113.7	134.3	153.1	194.2	235.2	236.6	275.1
2012	242.6	238.3	187.3	163.5	141.7	114.0	133.0	159.4	182.7	236.3	236.6	267.1
2013	250.3	224.1	198.0	171.8	143.0	112.5	129.0	152.5	190.2	224.4	224.6	281.4
2014	242.0	218.7	200.7	170.3	133.2	114.9	127.8	162.5	198.4	226.1	219.8	259.9
2015	238.5	236.6	196.2	174.9	143.7	112.6	119.3	142.9	178.9	234.8	229.0	274.4
2016	232.3	232.5	202.2	166.6	141.2	116.4	126.3	161.6	186.9	224.2	221.8	280.6
2017	252.0	234.0	205.0	170.4	146.7	115.9	135.5	168.8	185.0	244.9	225.4	269.8
2018	244.1	226.2	189.8	171.1	142.3	117.1	131.1	165.5	188.9	237.1	234.0	278.1
2019	252.8	221.2	199.0	171.3	138.8	120.0	130.2	168.3	189.1	242.8	226.4	273.7
2020	238.5	233.5	204.2	168.0	146.5	123.8	133.9	169.4	203.8	241.6	220.5	279.7
TMY	252.7	224.0	201.9	167.5	123.7	115.0	121.9	163.3	188.9	242.8	211.8	273.6

Table 70 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for North-west of Garies site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	184.0	174.9	180.1	128.7	126.3	119.7	139.3	140.2	159.5	183.6	159.8	202.2
2006	170.1	174.7	184.3	128.9	130.3	125.7	127.4	137.1	151.8	185.1	175.2	197.8
2007	183.1	174.7	188.5	149.8	139.4	115.9	134.8	154.9	167.9	180.1	167.4	184.7
2008	173.3	171.3	165.5	144.1	115.1	116.0	124.3	146.0	162.2	190.3	169.5	194.3
2009	161.0	164.2	180.4	124.6	133.3	104.4	121.7	140.6	161.1	182.0	161.8	199.2
2010	178.0	169.7	183.2	151.2	123.2	123.8	132.3	148.6	150.1	174.5	162.4	186.5
2011	179.0	165.6	171.1	142.3	125.3	116.7	137.7	144.1	170.2	181.2	169.8	197.0
2012	177.7	183.2	169.1	140.2	137.6	116.3	134.1	143.0	158.3	188.0	180.0	185.5
2013	185.6	169.4	175.5	147.3	138.5	113.8	133.1	135.4	165.7	180.5	167.6	199.1
2014	177.2	166.0	180.6	143.0	127.5	116.8	131.8	146.8	169.0	176.9	161.2	183.2
2015	177.9	176.4	187.4	147.8	141.5	113.6	122.1	135.2	153.3	185.0	171.5	195.2
2016	164.9	180.8	182.7	141.4	142.8	118.1	118.6	150.9	158.5	172.9	170.5	200.3
2017	185.2	178.1	189.0	148.5	147.1	114.7	139.3	159.8	154.8	184.3	170.9	195.1
2018	180.5	175.2	173.6	148.0	139.5	121.0	133.8	154.2	154.9	186.8	173.3	192.6
2019	184.2	173.1	178.0	143.3	138.1	127.1	132.2	156.4	163.8	192.4	174.7	199.3
2020	174.0	179.2	186.3	143.2	145.9	128.3	139.7	150.4	170.2	185.8	171.3	196.5
TMY	177.2	177.9	171.1	147.9	138.4	104.3	131.9	160.3	152.0	184.6	171.6	197.1

Table 71 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for North-west of Garies site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	254.5	225.9	199.6	153.0	122.0	114.2	134.2	144.0	179.1	235.8	208.4	294.1
2006	230.3	231.8	193.5	149.7	130.0	119.0	123.2	142.8	172.4	233.5	229.2	281.3
2007	254.6	233.1	199.8	170.2	138.9	111.1	130.0	161.8	190.5	227.1	212.0	260.2
2008	237.4	229.8	179.0	166.3	113.7	111.0	120.9	151.9	185.5	241.1	223.6	273.8
2009	205.6	218.8	194.2	143.8	133.2	99.8	118.6	145.1	182.0	227.9	209.6	284.1
2010	241.2	225.6	193.2	172.7	123.0	118.0	127.7	155.6	169.6	218.5	211.3	261.5
2011	243.9	221.0	179.6	161.1	124.9	110.9	132.5	150.9	193.3	227.9	219.2	278.6
2012	235.1	245.9	180.6	156.4	136.9	111.1	130.6	150.3	181.9	237.0	234.7	259.8
2013	253.1	225.6	187.5	170.0	138.2	109.4	128.5	141.7	189.6	225.0	216.2	282.8
2014	243.7	221.5	191.7	164.7	127.2	111.6	126.8	153.6	192.3	221.1	215.2	256.5
2015	242.6	236.9	198.2	169.8	140.5	109.3	118.0	139.7	173.4	231.7	222.5	276.4
2016	221.7	242.3	197.3	161.4	139.8	112.7	115.9	157.4	181.4	218.0	224.5	286.4
2017	250.7	237.5	199.6	168.3	144.8	109.3	134.1	166.5	176.3	231.7	222.9	275.0
2018	244.7	233.3	182.9	168.7	138.5	115.1	129.0	161.5	177.0	234.6	225.5	273.4
2019	247.9	228.8	189.3	165.2	136.9	120.1	128.0	163.9	185.7	241.2	224.0	281.7
2020	226.9	237.1	197.5	164.2	144.6	122.1	135.0	158.0	194.4	234.2	212.0	278.2
TMY	243.7	237.5	180.6	168.6	138.2	99.8	126.9	167.1	173.1	232.0	224.1	279.7

Table 72 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for North-west of Garies site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	256.2	229.6	198.1	150.5	123.3	113.3	133.7	144.3	180.7	233.3	207.2	297.8
2006	230.7	227.0	198.3	150.1	128.1	114.9	119.9	141.1	171.3	233.6	231.6	280.4
2007	255.0	228.1	205.4	170.8	137.0	107.2	126.5	159.7	189.6	227.1	214.3	259.1
2008	238.3	224.5	183.1	167.0	111.9	107.0	117.9	150.0	185.1	241.1	225.3	274.0
2009	204.4	214.3	197.9	144.4	131.6	96.3	115.4	143.7	181.5	228.0	210.3	282.5
2010	241.5	220.7	196.7	173.4	120.9	113.8	124.3	153.7	168.9	218.7	213.8	259.9
2011	244.7	216.2	183.9	161.8	122.8	107.0	128.9	149.2	192.7	227.9	222.3	277.9
2012	235.6	240.1	184.6	156.5	134.8	107.1	127.2	148.6	181.4	237.4	236.9	260.0
2013	253.2	220.6	191.1	170.5	136.5	105.5	125.1	140.0	188.7	224.7	218.1	281.5
2014	244.4	216.6	195.7	165.7	125.5	107.8	123.3	152.0	191.5	221.1	217.1	255.3
2015	242.8	231.5	202.3	170.5	138.7	105.3	114.7	137.6	172.5	231.1	225.1	276.2
2016	222.6	236.5	201.8	162.0	137.8	108.9	112.7	156.0	180.7	218.2	225.3	284.9
2017	251.1	232.3	204.1	169.2	143.0	105.7	130.8	164.9	175.1	232.0	224.5	273.1
2018	244.7	228.4	186.4	168.9	136.7	111.1	125.6	159.3	176.5	234.7	227.9	272.8
2019	248.2	223.9	191.4	165.8	135.0	116.1	124.6	162.1	185.3	241.1	225.0	279.7
2020	226.6	231.7	200.6	164.6	142.4	117.7	131.9	156.3	193.5	234.6	214.0	278.4
TMY	244.3	232.3	183.9	168.9	136.5	96.3	123.3	165.2	171.4	232.2	225.2	277.9

Table 73 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for East of Saldanha Bay site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	172.8	174.8	174.5	128.1	98.3	95.9	109.4	108.9	150.7	170.1	162.1	204.4
2006	183.1	167.1	185.2	130.8	106.8	115.7	96.8	129.1	143.4	174.3	168.3	191.8
2007	184.1	173.5	181.3	140.5	120.3	97.1	114.8	115.0	143.8	174.0	164.3	185.4
2008	174.5	159.1	170.3	144.9	80.4	87.4	102.1	129.4	131.9	177.5	168.3	191.1
2009	156.8	175.3	176.6	112.9	104.0	93.7	111.5	118.3	128.4	168.9	158.6	193.6
2010	188.2	161.9	174.3	143.1	105.7	103.2	123.3	129.1	146.4	159.0	162.7	182.5
2011	185.3	173.5	169.0	145.7	93.1	97.9	131.8	126.5	142.9	158.2	169.8	189.6
2012	181.7	181.0	183.2	124.3	122.4	95.6	110.0	120.2	136.1	183.2	171.7	183.8
2013	188.1	167.7	169.5	132.6	117.2	99.9	111.1	117.7	142.0	171.5	161.8	196.0
2014	174.7	173.6	168.7	139.2	102.4	106.1	108.9	114.7	142.2	175.5	163.5	189.7
2015	179.0	177.5	181.3	145.5	108.5	102.6	108.9	109.4	144.9	178.7	174.4	193.9
2016	177.5	179.0	166.7	125.2	124.2	97.8	106.4	139.5	142.8	164.9	174.0	193.9
2017	188.7	182.3	187.1	142.2	133.2	103.0	121.2	121.1	138.6	171.3	161.7	193.6
2018	177.9	173.6	165.8	135.7	103.1	93.2	120.2	124.5	142.2	181.0	173.8	184.4
2019	185.0	169.3	160.8	129.2	118.5	108.4	99.4	133.2	151.9	171.7	168.2	195.3
2020	177.5	176.7	178.8	136.9	130.0	103.5	126.6	132.4	148.6	185.3	167.7	192.7
TMY	172.8	174.8	174.5	128.1	98.3	95.9	109.4	108.9	150.7	170.1	162.1	204.4

Table 74 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for East of Saldanha Bay site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	248.9	228.5	191.9	151.3	95.5	89.6	103.7	111.4	168.4	216.5	214.0	296.6
2006	246.9	221.7	200.5	148.9	105.2	107.8	92.7	132.4	163.1	214.6	223.8	277.7
2007	251.2	229.7	197.5	153.7	117.9	91.5	108.5	118.4	164.0	215.8	218.9	265.2
2008	239.9	213.4	186.4	160.0	78.9	82.4	96.8	131.6	152.1	220.7	223.0	274.8
2009	200.2	232.3	190.0	126.8	102.8	88.5	106.1	120.4	146.5	211.4	204.3	277.8
2010	254.4	214.5	187.3	161.7	103.6	95.7	116.8	132.2	165.2	196.6	211.8	262.9
2011	248.6	231.1	179.4	158.9	92.9	91.6	123.9	129.4	163.6	195.9	227.7	274.5
2012	244.5	243.1	195.0	135.9	119.6	90.1	104.9	124.0	155.1	228.9	228.7	260.8
2013	254.7	221.7	183.7	151.2	114.7	93.9	105.3	119.6	161.4	211.2	213.2	284.6
2014	235.9	230.4	183.3	156.2	100.5	98.2	104.1	117.6	162.0	218.1	226.1	275.2
2015	239.4	237.2	198.5	161.4	106.5	95.9	104.0	112.1	162.8	220.4	227.3	279.1
2016	241.4	238.3	181.9	142.9	120.4	90.7	101.7	140.8	164.6	205.2	232.1	280.4
2017	257.3	243.6	201.3	158.6	128.5	96.3	114.7	124.2	157.4	214.2	214.8	277.2
2018	241.4	229.9	178.0	149.1	101.5	87.2	113.1	128.9	162.8	224.1	231.3	263.7
2019	253.4	222.0	172.0	146.2	113.0	100.7	96.0	138.5	171.6	214.1	221.8	277.5
2020	236.4	231.5	192.4	153.9	126.1	96.4	120.5	136.2	171.3	230.1	214.1	274.5
TMY	248.9	228.5	191.9	151.3	95.5	89.6	103.7	111.4	168.4	216.5	214.0	296.6

Table 75 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for East of Saldanha Bay site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	244.9	231.0	190.7	149.4	95.7	88.4	103.0	110.6	170.0	212.7	214.3	298.5
2006	248.4	219.1	200.2	150.3	103.4	103.7	89.8	131.4	161.4	216.1	219.1	272.5
2007	251.7	227.0	195.9	155.0	116.3	87.9	105.2	117.4	162.4	218.0	214.3	260.4
2008	241.2	210.6	186.8	161.2	77.5	79.2	94.2	130.8	151.0	223.3	218.3	269.7
2009	201.0	229.8	189.2	128.1	101.3	85.0	102.9	119.2	145.3	212.9	200.2	272.7
2010	255.0	211.6	186.7	163.0	101.8	92.2	113.3	131.0	164.3	198.0	207.5	257.9
2011	249.6	228.4	177.7	161.0	91.4	88.0	120.2	128.2	162.2	196.8	222.7	269.2
2012	244.5	240.0	194.9	137.0	117.6	86.6	102.0	123.0	154.2	231.5	224.2	256.0
2013	255.9	219.1	183.2	152.8	113.1	90.3	102.1	118.7	160.9	212.1	208.7	279.2
2014	237.1	227.7	182.4	157.6	98.9	94.5	100.9	116.5	160.7	219.2	221.5	270.1
2015	240.4	234.3	197.9	163.2	104.9	92.3	100.7	110.9	161.6	222.4	223.0	273.7
2016	242.2	235.1	181.6	144.4	118.5	87.3	98.5	139.7	163.4	207.5	227.3	275.1
2017	258.4	240.9	200.9	159.8	126.8	92.7	111.5	123.3	156.4	216.3	210.4	272.2
2018	242.1	227.3	177.2	150.3	100.1	84.0	110.0	127.6	161.9	226.1	226.6	258.7
2019	253.5	219.6	171.1	147.2	111.3	96.9	92.9	137.1	170.4	216.3	217.0	272.6
2020	236.8	228.3	193.0	155.3	124.2	92.8	117.3	135.3	169.9	231.7	209.7	269.4
TMY	244.9	231.0	190.7	149.4	95.7	88.4	103.0	110.6	170.0	212.7	214.3	298.5

Table 76 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for North of Cape Town, near Atlantis site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	177.4	178.4	177.5	126.8	100.5	96.0	109.5	110.9	149.5	171.2	168.8	203.1
2006	188.0	169.5	186.1	130.8	106.8	116.3	96.2	127.0	149.9	182.5	171.5	193.9
2007	187.5	175.4	185.1	135.9	123.4	94.0	110.4	117.7	146.8	181.3	163.0	191.2
2008	178.7	164.2	172.5	145.3	89.9	90.6	99.2	132.8	132.6	185.4	169.7	193.8
2009	161.5	176.5	174.7	116.8	110.1	90.6	109.5	117.3	130.9	171.0	162.2	197.8
2010	189.9	165.5	175.6	144.4	108.2	100.1	120.6	131.7	145.7	170.9	161.2	187.1
2011	187.0	175.7	168.7	145.2	101.5	96.6	129.3	131.6	142.8	167.8	170.8	193.1
2012	185.6	183.2	183.1	132.1	125.0	92.7	108.2	121.1	140.8	180.8	172.4	191.3
2013	190.1	169.4	170.7	132.3	120.7	100.8	111.5	119.5	142.1	169.3	170.3	199.7
2014	179.8	176.1	171.4	142.6	107.3	102.6	104.6	121.2	145.1	182.5	167.0	194.6
2015	183.3	180.1	181.3	145.5	111.4	104.2	110.7	118.0	145.8	177.2	176.5	201.0
2016	181.9	181.0	175.7	130.4	122.9	93.6	106.3	138.7	146.3	165.7	175.8	198.2
2017	191.0	185.1	186.7	140.6	131.5	103.0	119.7	128.6	145.2	175.0	161.7	199.6
2018	182.7	173.9	171.2	138.3	109.7	96.9	125.2	130.1	148.1	187.5	179.1	197.7
2019	182.6	173.7	171.0	138.1	109.6	96.8	125.3	130.2	148.3	187.6	179.2	197.7
2020	179.2	177.7	175.4	136.7	130.8	105.4	129.7	133.1	152.3	190.9	172.9	192.0
TMY	177.4	178.4	177.5	126.8	100.5	96.0	109.5	110.9	149.5	171.2	168.8	203.1

Table 77 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for North of Cape Town, near Atlantis site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	256.9	232.2	194.4	148.0	95.7	89.2	102.9	111.9	167.4	216.0	219.0	291.6
2006	253.9	225.0	199.6	147.5	104.4	107.2	92.2	128.8	168.3	223.4	227.1	274.8
2007	258.9	229.4	199.8	148.8	119.0	88.9	104.2	121.3	166.1	224.4	215.8	269.6
2008	244.1	218.0	188.2	161.2	86.3	84.6	94.6	134.8	149.6	230.2	222.5	278.6
2009	205.4	232.6	185.7	128.7	108.6	84.3	103.6	119.7	147.7	211.7	206.5	281.6
2010	257.7	217.1	188.2	161.2	106.0	93.3	113.0	134.3	164.4	208.7	217.0	269.3
2011	249.9	232.5	179.7	158.2	100.2	90.6	121.2	132.5	162.0	205.6	226.8	278.0
2012	251.0	244.0	194.7	142.8	120.6	87.6	102.7	123.8	158.9	225.1	227.0	272.1
2013	256.0	223.2	184.0	149.5	117.5	94.0	106.1	121.2	159.5	208.2	225.7	287.5
2014	242.3	233.9	184.4	160.3	104.3	96.0	99.6	122.9	164.3	225.4	227.0	279.8
2015	246.0	238.3	198.4	160.2	109.5	96.5	105.4	119.7	163.2	217.9	230.6	289.0
2016	246.3	239.9	191.0	147.0	118.6	87.6	101.1	140.9	166.0	205.1	235.1	286.6
2017	261.0	246.4	199.3	154.2	126.7	95.7	112.7	131.3	163.0	216.5	214.4	286.0
2018	247.1	230.4	183.4	153.3	107.0	90.4	117.2	133.4	167.2	231.3	237.5	280.5
2019	247.0	230.2	183.7	153.2	106.9	90.4	117.3	133.6	167.3	231.5	237.6	280.6
2020	238.2	232.5	190.3	153.1	125.4	97.2	122.2	136.4	173.6	236.0	219.7	272.2
TMY	253.9	226.8	183.8	158.4	106.1	84.5	95.1	121.4	148.1	217.8	226.1	280.8

Table 78 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for North of Cape Town, near Atlantis site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	253.1	234.0	193.3	146.0	95.7	87.6	101.9	111.0	168.9	212.4	219.2	293.2
2006	254.7	222.8	199.5	149.2	102.4	103.0	89.1	127.8	166.8	224.8	222.6	270.1
2007	259.5	226.8	198.6	150.3	117.0	85.1	100.6	120.3	164.6	226.1	211.5	265.0
2008	245.2	215.3	188.4	162.2	84.7	81.1	91.8	133.9	148.1	232.5	217.9	273.6
2009	206.1	230.3	185.3	129.8	106.8	80.9	100.2	118.6	146.4	213.0	202.8	276.6
2010	257.8	214.4	187.4	162.7	104.1	89.6	109.5	133.3	163.4	210.8	212.7	264.4
2011	251.1	230.1	178.3	160.4	98.4	86.9	117.2	131.4	160.5	206.5	222.1	272.9
2012	252.0	241.1	194.6	144.0	118.4	83.9	99.3	122.9	157.7	227.7	222.5	267.3
2013	257.0	220.8	183.5	151.0	115.6	90.2	102.5	120.1	159.1	209.2	221.1	282.4
2014	243.7	231.6	183.4	161.7	102.5	92.1	96.4	121.9	163.0	227.1	222.5	274.9
2015	247.0	235.7	197.5	161.9	107.7	92.6	101.7	118.3	162.1	219.6	226.0	283.8
2016	247.4	237.1	190.5	148.4	116.4	84.0	97.8	139.9	164.9	206.5	230.4	281.4
2017	262.1	243.8	198.7	155.4	124.6	91.7	109.3	130.1	162.4	218.0	210.0	280.8
2018	247.3	227.9	182.6	154.7	105.2	86.8	113.6	132.2	166.3	233.9	232.7	275.7
2019	247.2	227.8	182.5	154.6	105.1	86.8	113.7	132.3	166.4	234.0	232.8	275.7
2020	239.0	229.8	190.0	154.5	123.3	93.4	118.6	135.6	172.4	237.1	215.4	267.4
TMY	254.6	224.5	182.5	160.5	104.2	81.1	92.1	120.4	146.7	219.6	221.4	275.9

Table 79 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Near Morreesburg site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	173.6	176.5	169.0	126.1	101.6	99.5	112.8	114.9	151.2	170.8	167.1	204.1
2006	182.9	168.1	185.5	131.4	109.5	116.9	102.5	131.2	146.5	175.9	164.7	188.1
2007	187.2	171.4	185.7	142.5	127.5	97.9	115.9	120.0	146.1	178.5	163.6	190.2
2008	171.3	162.7	170.4	146.3	90.9	92.0	98.1	129.9	138.3	186.8	166.6	193.3
2009	154.2	172.8	176.2	114.2	113.2	92.5	110.7	124.6	130.8	166.2	156.6	197.0
2010	186.6	165.7	176.4	144.3	107.9	105.2	122.7	130.9	147.9	155.1	163.2	184.5
2011	184.4	174.5	170.3	145.5	101.3	100.0	128.5	127.5	143.1	157.2	165.7	192.9
2012	181.0	179.9	181.3	129.3	128.1	97.4	111.5	119.9	138.6	179.9	178.1	183.9
2013	187.4	169.6	171.7	139.8	119.5	104.4	113.9	114.6	138.7	172.9	167.3	194.8
2014	175.5	176.5	173.0	140.2	108.9	102.7	111.7	117.0	148.2	179.4	162.2	190.2
2015	178.5	176.1	179.4	148.1	116.8	109.6	112.1	120.5	148.2	180.0	172.3	193.9
2016	177.1	177.5	170.2	129.7	128.1	99.5	106.1	138.7	146.5	167.3	171.0	197.2
2017	187.8	182.8	185.6	144.2	134.7	104.7	124.4	130.1	142.2	172.1	160.0	192.7
2018	179.7	173.4	170.5	147.5	111.7	100.3	121.6	129.0	144.2	180.1	173.6	183.3
2019	185.2	164.8	161.8	129.8	124.9	115.1	103.2	135.6	155.3	167.9	171.2	191.8
2020	174.1	178.0	178.2	141.2	132.9	112.8	129.8	134.1	149.6	182.5	167.5	188.9
TMY	172.7	164.8	171.3	144.2	119.3	105.2	115.9	120.6	131.1	180.5	172.4	194.0

Table 80 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Near Morreesburg site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	252.1	231.1	185.9	148.2	97.2	91.6	106.4	117.7	168.0	218.4	221.2	295.2
2006	248.0	225.6	200.3	149.6	107.4	108.2	97.5	133.3	165.6	217.7	222.2	273.3
2007	258.3	227.1	201.3	156.1	123.9	91.8	110.1	123.6	167.0	222.1	216.7	271.2
2008	237.0	217.7	186.8	160.1	87.6	85.8	94.3	132.3	158.1	232.5	224.9	280.5
2009	196.7	228.2	191.5	126.6	111.5	86.7	105.5	126.0	150.0	206.6	202.5	285.9
2010	254.5	220.2	190.3	161.5	105.2	97.4	115.4	133.3	166.9	191.3	215.6	267.9
2011	249.7	232.3	182.6	158.4	99.6	93.5	120.9	129.2	163.9	195.4	220.3	279.2
2012	246.3	239.4	196.3	140.3	124.5	91.9	106.3	123.0	157.8	226.4	237.3	264.1
2013	252.6	224.8	186.5	157.0	116.4	97.1	108.4	118.2	158.6	213.2	221.2	285.0
2014	235.2	234.8	187.9	156.7	107.4	95.7	107.2	120.0	168.9	223.9	223.2	276.5
2015	242.7	235.1	194.5	164.1	114.2	101.6	106.4	122.5	166.6	223.1	225.1	282.3
2016	241.1	236.8	187.0	144.8	123.7	91.9	101.0	140.1	168.3	209.2	231.4	287.2
2017	257.3	243.5	200.4	157.7	129.4	97.0	117.0	131.6	160.7	215.5	213.1	279.8
2018	246.1	230.0	184.6	161.6	109.0	93.6	114.1	131.8	164.8	223.3	231.9	262.9
2019	253.6	217.6	174.4	146.7	120.0	105.8	98.9	138.7	174.7	210.1	226.1	276.8
2020	235.0	235.2	192.6	157.0	128.8	104.0	122.3	137.1	171.6	226.9	213.5	271.6
TMY	245.1	217.8	186.0	161.9	116.3	97.5	110.2	124.2	150.1	225.4	225.6	282.7

Table 81 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Near Morreesburg site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	248.3	233.2	185.5	146.3	97.3	91.0	105.6	117.2	169.8	214.2	221.7	298.1
2006	249.1	223.6	199.7	151.2	105.5	104.1	94.6	132.6	164.0	219.8	217.6	268.2
2007	257.8	224.9	200.3	158.5	122.1	88.3	106.6	122.8	165.7	223.6	212.7	266.5
2008	237.2	215.3	185.9	162.3	86.1	82.6	91.6	132.2	156.3	234.2	220.6	275.5
2009	197.8	226.1	189.8	128.3	109.8	83.4	102.2	125.5	148.5	207.6	198.6	280.7
2010	254.2	217.9	189.1	163.9	103.3	93.9	112.0	132.4	166.0	192.5	211.6	263.0
2011	250.4	230.3	181.1	160.9	97.9	89.9	117.2	128.4	162.7	196.5	216.0	274.0
2012	246.6	236.8	195.2	142.0	122.4	88.3	103.1	122.7	157.0	227.9	232.9	259.4
2013	253.8	222.7	185.5	159.2	114.5	93.3	104.9	116.9	157.8	214.8	216.6	279.8
2014	236.2	232.7	186.0	159.1	105.8	92.1	103.7	119.4	167.6	225.4	218.9	271.6
2015	243.5	232.9	193.4	166.6	112.6	97.8	103.0	121.6	165.2	224.5	220.6	277.1
2016	241.8	234.2	186.3	146.9	121.7	88.6	97.9	139.8	166.9	210.3	227.1	281.9
2017	257.8	241.2	199.2	160.1	127.5	93.4	113.6	131.2	159.8	217.2	209.0	274.8
2018	246.3	227.8	182.6	163.7	107.5	90.2	110.7	131.0	163.7	225.0	227.4	258.1
2019	253.8	215.7	173.3	148.8	118.2	102.2	95.8	138.1	173.4	210.9	221.8	271.8
2020	235.2	232.6	191.5	158.9	126.8	100.4	119.1	137.0	169.9	228.1	209.4	266.6
TMY	247.7	215.7	185.3	163.8	114.4	93.9	106.5	123.3	148.8	228.5	220.8	277.2

Table 82 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for East of Clanwilliam site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	182.8	175.3	179.4	131.2	124.5	116.2	133.1	149.1	172.9	188.5	169.3	201.9
2006	178.7	176.2	187.4	137.6	127.1	129.0	128.3	141.7	160.4	188.7	172.9	199.1
2007	185.0	174.3	189.3	152.8	140.8	115.6	134.5	153.3	175.1	189.3	175.1	195.8
2008	176.2	170.2	164.7	149.3	105.6	108.5	118.2	146.5	154.2	197.7	177.4	199.1
2009	164.9	171.5	184.1	117.1	131.6	106.8	123.0	141.0	159.1	183.7	163.0	200.2
2010	185.3	175.1	181.7	149.8	124.8	128.6	135.1	147.6	161.8	177.5	173.5	191.2
2011	183.3	164.1	171.4	149.6	125.7	108.4	136.0	147.5	169.0	184.0	179.7	200.4
2012	181.5	185.7	178.6	143.9	143.7	115.2	130.7	148.8	167.8	192.0	179.8	181.3
2013	186.4	176.7	180.5	149.7	139.3	108.1	126.5	138.6	165.6	187.8	177.0	198.8
2014	179.5	173.7	182.7	148.3	129.8	117.8	124.6	138.5	171.2	190.9	166.9	194.7
2015	183.7	184.0	179.8	151.1	137.1	115.8	126.3	137.8	153.7	189.4	179.1	199.3
2016	170.0	184.6	179.9	138.1	139.7	113.5	124.6	151.7	162.7	178.1	175.4	202.5
2017	185.6	180.3	187.5	145.9	145.4	115.1	135.4	153.1	150.8	188.7	170.2	198.6
2018	189.3	175.1	183.0	148.0	134.5	112.8	133.7	153.0	155.0	193.5	181.4	197.7
2019	190.5	173.2	183.2	145.2	133.2	126.7	134.9	158.9	166.2	195.5	182.1	200.2
2020	181.7	179.7	187.5	147.4	148.6	127.1	143.0	156.8	168.3	192.9	175.6	204.0
TMY	179.4	173.6	187.3	146.2	147.9	115.2	123.3	138.9	169.3	189.3	167.1	194.8

Table 83 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for East of Clanwilliam site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	257.6	232.2	196.8	153.6	120.4	106.5	124.3	152.7	194.1	242.5	223.0	290.7
2006	244.1	234.4	206.4	155.1	123.7	119.4	120.7	143.5	183.1	237.3	234.0	293.0
2007	261.3	232.6	210.0	167.4	136.8	107.8	126.8	155.9	200.0	239.1	231.3	284.2
2008	244.0	225.9	188.1	165.6	101.6	100.8	112.2	148.0	177.7	249.0	242.2	291.1
2009	212.4	227.6	204.1	132.1	128.9	99.3	116.1	142.2	180.7	229.3	214.0	291.1
2010	254.5	232.6	200.8	167.5	121.3	119.0	127.6	149.8	184.4	221.7	234.7	276.8
2011	252.5	218.3	187.4	164.2	122.2	101.4	128.8	148.2	192.6	231.3	243.2	291.7
2012	249.2	248.5	193.6	153.2	138.9	107.0	124.7	150.2	193.0	242.8	243.3	259.7
2013	259.2	235.1	201.1	167.4	135.0	101.5	119.8	140.6	189.0	233.8	237.1	291.4
2014	249.1	231.9	203.4	164.8	125.5	109.6	118.3	140.0	195.5	239.4	229.7	285.8
2015	253.1	246.8	198.7	168.3	132.6	107.7	119.6	138.4	174.6	238.0	239.4	291.1
2016	229.0	246.4	200.8	156.0	134.8	105.1	117.7	153.0	186.6	225.1	236.7	296.1
2017	255.1	241.1	206.0	159.9	140.2	106.7	128.6	155.5	171.1	236.9	229.0	292.4
2018	262.3	233.4	200.7	163.1	130.2	105.5	126.7	155.5	178.2	242.3	245.7	286.6
2019	263.9	230.2	201.1	162.9	129.0	116.6	128.0	161.2	188.8	245.6	244.3	293.1
2020	247.4	240.4	207.3	162.7	143.8	117.5	136.0	158.9	195.2	242.4	226.7	299.3
TMY	248.7	232.0	206.4	161.7	143.2	107.1	116.5	140.9	195.3	239.1	230.4	286.3

Table 84 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for East of Clanwilliam site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	255.9	233.1	197.4	151.8	118.3	107.8	125.0	151.0	195.5	238.7	223.7	296.4
2006	244.1	233.0	202.7	158.6	122.6	116.0	118.1	144.0	180.9	239.5	230.0	287.8
2007	261.5	231.1	206.5	171.6	135.8	104.8	124.0	156.0	198.5	240.4	227.3	279.4
2008	244.2	224.0	185.0	169.4	100.6	98.0	110.0	148.3	175.9	250.9	238.2	285.9
2009	214.1	226.2	200.5	134.7	127.9	96.6	113.6	142.4	178.7	230.6	210.5	286.1
2010	254.7	231.1	197.4	171.2	120.1	115.7	125.0	149.9	182.9	222.9	230.8	272.1
2011	252.9	216.9	184.0	168.2	121.1	98.6	126.0	148.5	191.4	232.1	239.1	286.6
2012	248.9	246.2	190.9	156.7	137.7	104.0	122.1	150.3	191.0	243.9	239.2	255.3
2013	259.2	233.4	197.6	171.2	134.0	98.5	117.2	140.4	187.2	235.0	233.0	286.4
2014	249.5	230.4	199.2	168.5	124.5	106.6	115.8	140.6	193.6	240.3	225.9	281.0
2015	253.0	245.1	195.5	172.5	131.8	104.6	117.0	138.3	173.3	238.8	235.5	286.1
2016	228.7	244.4	198.0	159.5	133.6	102.2	115.2	153.5	184.5	226.1	232.7	291.0
2017	254.9	239.4	202.5	163.8	139.0	103.7	126.0	155.9	169.5	238.7	225.2	287.3
2018	262.3	231.7	197.3	166.2	129.1	102.5	124.0	156.0	175.7	244.1	241.8	281.7
2019	264.4	228.9	196.9	167.2	128.0	113.7	125.3	161.9	187.4	246.4	240.5	288.0
2020	247.2	238.6	204.1	165.9	142.6	114.4	133.3	160.0	192.5	244.4	222.8	293.9
TMY	249.5	230.5	202.7	165.1	142.1	104.1	113.8	140.7	193.3	240.4	226.3	281.3

Table 85 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Between Worcester & Sutherland site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	181.0	178.1	176.9	129.3	122.1	109.6	129.1	141.8	174.0	189.2	167.5	202.6
2006	179.2	172.6	183.7	134.2	121.2	126.7	116.0	135.8	162.0	188.2	175.0	203.5
2007	188.3	176.3	189.3	147.9	135.5	105.8	132.0	142.5	174.1	186.0	169.9	191.8
2008	174.7	172.6	170.1	147.6	106.8	103.3	112.1	143.5	152.0	193.6	175.5	198.9
2009	164.0	175.6	176.9	116.3	126.2	103.4	123.3	137.8	159.3	181.6	161.5	202.0
2010	189.0	172.7	180.8	151.2	122.8	121.8	128.0	150.5	162.0	174.5	171.2	187.1
2011	186.3	163.5	169.1	152.0	121.2	97.2	130.8	140.1	170.6	184.3	179.0	201.7
2012	178.7	184.5	182.9	141.7	138.2	105.6	124.2	141.6	164.9	180.9	178.4	184.7
2013	187.8	175.0	183.0	142.7	131.1	99.4	118.6	134.2	165.2	183.9	173.9	197.0
2014	176.6	175.0	181.8	141.1	121.7	117.1	124.6	135.0	169.1	193.1	169.1	194.4
2015	182.9	182.1	179.3	149.1	127.7	114.9	115.1	138.6	151.6	189.9	177.8	193.9
2016	173.7	184.2	179.9	133.1	134.5	106.6	118.7	149.5	168.7	174.9	178.7	203.2
2017	186.1	182.7	186.0	148.5	142.9	118.8	134.0	147.0	153.1	193.3	165.9	198.7
2018	188.4	175.9	178.8	146.6	126.0	104.0	126.2	153.0	159.2	191.6	182.7	196.9
2019	193.2	172.5	182.4	141.4	129.7	121.3	127.5	157.7	162.8	188.6	182.8	201.4
2020	173.4	184.6	184.6	146.3	140.4	121.1	141.3	151.3	168.9	189.0	173.7	202.2
TMY	185.9	174.9	189.3	145.1	122.7	103.5	128.2	138.0	169.4	189.1	169.2	198.7

Table 86 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Between Worcester & Sutherland site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	256.1	235.1	192.3	151.3	116.1	97.7	119.7	144.5	193.2	242.4	216.5	290.5
2006	244.6	229.1	201.6	150.3	117.4	116.7	109.0	136.8	185.1	236.2	236.4	296.2
2007	264.0	234.5	210.1	162.2	131.0	97.7	123.8	144.4	198.5	235.0	226.3	276.5
2008	239.8	229.8	190.4	162.6	102.6	94.9	106.5	144.1	173.7	244.7	238.0	289.7
2009	208.2	232.7	194.9	128.6	122.6	95.2	116.1	138.3	180.0	227.7	211.4	292.9
2010	260.0	228.5	198.2	167.0	118.4	112.4	120.4	150.5	182.5	215.0	231.7	270.6
2011	254.9	214.0	189.4	163.5	118.1	90.4	123.2	140.3	194.1	230.4	243.9	293.0
2012	245.7	244.8	197.8	151.1	132.9	98.9	118.3	144.5	189.1	226.7	238.2	264.1
2013	259.7	231.8	203.4	158.1	126.4	91.9	112.2	135.1	187.5	227.1	230.5	287.0
2014	246.2	232.3	199.8	156.6	117.6	108.4	116.3	135.8	193.0	241.7	227.2	283.8
2015	251.7	242.8	197.4	164.3	124.0	105.1	109.1	138.8	170.1	236.5	237.1	284.5
2016	235.7	245.9	200.2	150.0	129.2	99.2	112.0	149.9	192.8	221.7	242.0	296.6
2017	257.4	242.8	204.7	161.7	137.1	109.0	126.4	148.4	173.3	242.4	223.2	289.8
2018	262.4	233.2	195.4	160.1	122.6	96.4	118.5	152.6	182.4	239.5	247.2	284.1
2019	265.7	227.3	199.9	158.8	125.4	110.6	119.9	159.3	183.8	236.5	245.4	291.8
2020	235.2	243.6	202.7	161.2	135.4	111.6	133.5	151.5	193.9	237.8	220.8	294.2
TMY	256.0	232.5	208.1	161.1	118.6	95.4	120.8	139.3	192.2	236.5	228.1	290.3

Table 87 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Between Worcester & Sutherland site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	255.4	235.1	194.0	149.5	115.5	101.3	120.2	142.8	194.4	239.6	218.1	296.9
2006	244.0	228.0	198.2	153.5	116.0	113.1	106.3	137.3	183.0	237.3	232.6	291.6
2007	263.3	233.2	206.1	166.4	129.7	94.7	120.6	144.4	196.4	235.9	222.8	272.2
2008	238.8	228.4	187.3	166.6	101.4	92.1	104.0	144.5	171.9	245.9	234.5	285.3
2009	209.8	231.5	191.2	132.1	121.4	92.4	113.1	138.8	178.1	228.6	208.0	288.4
2010	259.4	227.4	194.7	171.1	116.9	109.0	117.3	150.9	180.9	215.3	227.9	266.3
2011	254.7	213.0	185.6	168.2	116.7	87.7	120.0	141.0	192.2	231.2	240.0	288.4
2012	245.2	242.9	195.0	154.4	131.3	95.7	115.3	144.9	187.0	227.0	234.5	259.9
2013	258.6	230.5	199.2	162.2	125.1	88.9	109.4	135.6	185.2	228.1	227.2	282.7
2014	246.3	231.2	196.6	160.7	116.5	105.0	113.4	136.0	191.1	243.1	223.7	279.5
2015	250.8	241.5	193.8	168.8	122.9	101.9	106.2	138.6	168.8	237.4	233.2	280.0
2016	234.8	244.3	197.2	154.0	127.7	96.0	109.1	150.5	190.5	222.3	238.2	291.9
2017	257.0	241.7	201.1	165.6	135.6	105.8	123.2	148.9	171.9	243.5	219.7	285.4
2018	261.9	231.9	191.9	163.5	121.4	93.5	115.5	153.3	180.1	240.6	243.7	279.7
2019	265.6	226.1	196.0	162.7	124.1	107.5	116.8	160.1	182.3	237.4	241.6	287.2
2020	233.5	242.2	199.5	165.0	133.8	108.2	130.3	152.5	191.4	239.1	217.4	289.5
TMY	256.9	231.4	206.2	164.4	117.1	92.3	117.3	139.2	191.4	239.0	224.1	285.4

Table 88 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) Near Albertinia site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	146.9	140.7	148.5	106.4	93.5	102.2	122.0	129.9	140.2	169.0	139.3	182.6
2006	135.4	122.0	152.8	110.5	107.0	109.2	96.7	112.9	127.1	140.4	142.2	161.2
2007	161.9	151.3	157.5	116.6	120.2	104.1	118.2	127.9	154.6	155.1	136.7	154.3
2008	136.4	142.2	137.9	125.8	102.8	85.9	112.6	127.3	147.2	156.7	135.9	165.6
2009	125.3	142.6	161.4	105.5	117.2	87.4	106.3	126.0	137.3	154.7	148.3	171.1
2010	151.8	151.3	156.6	102.4	100.7	104.4	106.2	135.3	144.0	123.2	130.6	132.3
2011	151.0	126.2	152.0	126.8	103.5	96.0	111.8	130.1	144.2	154.7	149.2	171.0
2012	162.5	149.1	147.2	113.9	117.1	92.7	101.9	135.3	143.6	136.8	157.3	157.7
2013	157.5	156.1	144.8	126.4	124.5	92.4	103.2	125.8	153.6	149.0	149.1	171.0
2014	151.0	140.2	148.0	118.4	110.3	106.5	108.3	120.9	135.4	153.2	134.7	155.5
2015	156.8	145.6	137.9	125.8	106.9	101.6	91.1	112.3	126.3	157.2	154.7	168.5
2016	141.8	153.5	141.4	123.8	113.1	94.7	99.0	124.7	128.2	154.1	134.8	183.8
2017	148.8	149.2	160.8	119.5	119.3	98.6	117.0	122.1	133.7	166.1	151.0	169.6
2018	137.5	144.7	142.6	120.1	114.8	103.6	115.1	125.6	143.6	154.9	153.5	173.1
2019	156.9	144.6	126.0	109.6	109.3	107.0	115.6	142.9	133.5	164.1	150.6	160.0
2020	130.4	144.9	152.7	130.3	119.2	103.9	124.9	121.8	142.3	153.3	139.4	156.2
TMY	135.4	147.7	144.6	110.3	118.5	92.7	115.7	126.1	154.1	149.3	153.6	161.2

Table 89 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Near Albertinia site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	187.2	172.1	154.7	120.9	83.2	88.7	106.1	125.2	152.0	206.8	171.1	251.7
2006	167.2	149.2	156.0	121.6	101.1	95.9	87.8	111.2	140.6	168.0	184.8	223.0
2007	214.6	193.7	172.6	125.1	111.3	91.8	107.8	125.4	168.4	186.0	181.2	211.8
2008	179.8	179.4	151.2	133.6	95.4	77.7	103.8	123.9	161.5	189.2	175.8	231.2
2009	151.3	177.7	166.2	112.4	110.2	78.1	97.7	121.9	149.8	187.8	183.4	236.6
2010	196.5	190.6	161.6	113.5	93.8	92.3	97.0	131.7	154.3	147.4	173.6	172.5
2011	190.4	152.2	158.7	134.8	96.5	85.9	101.2	126.6	157.0	188.2	200.3	236.2
2012	205.5	188.2	156.4	122.7	110.3	83.1	94.4	132.1	156.9	164.9	199.1	212.1
2013	214.2	198.0	153.8	136.7	116.3	82.4	95.1	122.8	168.1	177.8	195.8	237.7
2014	189.8	175.0	156.5	126.8	104.2	94.2	99.0	118.1	146.2	184.2	177.7	212.0
2015	204.8	187.5	147.8	134.8	100.6	89.2	84.6	109.8	138.2	187.8	196.9	231.4
2016	183.4	194.9	148.8	131.9	105.4	84.3	91.0	121.7	141.1	186.8	170.1	257.1
2017	195.3	189.0	169.8	126.1	110.6	87.6	106.7	121.0	144.8	200.3	192.3	233.9
2018	180.7	182.9	150.0	126.5	107.6	90.9	105.0	124.2	159.5	188.3	206.7	241.3
2019	204.3	179.1	129.4	116.2	101.6	94.3	104.5	138.4	145.1	201.4	191.8	220.1
2020	163.8	180.2	160.2	139.5	110.8	91.3	113.3	120.7	156.2	185.1	171.0	215.2
TMY	167.2	187.6	154.2	121.5	110.1	83.3	104.7	123.1	168.0	178.0	206.9	223.1

Table 90 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Near Albertinia site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	189.2	173.8	158.0	119.6	87.2	90.1	109.6	127.6	153.9	209.0	172.6	256.6
2006	189.2	173.8	158.0	119.6	87.2	90.1	109.6	127.6	153.9	209.0	172.6	256.6
2007	216.4	196.1	173.9	129.5	110.9	90.3	105.7	127.2	171.3	189.0	181.2	210.9
2008	181.1	181.2	152.4	138.1	95.1	76.4	101.7	125.8	164.5	191.9	175.8	230.2
2009	153.2	179.6	167.9	116.6	109.7	76.8	95.8	123.4	152.4	190.4	183.3	235.6
2010	197.8	192.1	162.7	117.9	93.6	90.7	95.1	133.8	156.8	150.5	173.6	171.8
2011	191.9	152.8	159.9	139.9	96.4	84.4	99.4	128.5	159.0	192.3	200.3	235.2
2012	206.4	189.9	157.3	127.6	109.9	81.7	92.7	134.3	159.8	167.3	199.1	211.1
2013	215.6	200.2	154.3	141.8	116.0	81.0	93.3	125.0	170.5	180.0	196.1	236.7
2014	192.3	176.8	157.8	132.6	103.7	92.6	97.1	120.2	148.2	186.8	177.9	211.4
2015	206.0	190.0	148.5	140.3	100.1	87.8	82.8	111.2	140.6	191.4	197.0	230.5
2016	183.3	196.8	149.9	137.1	104.9	83.0	89.3	123.9	142.9	190.3	170.2	256.0
2017	198.1	190.7	170.8	130.4	110.2	86.2	104.7	122.8	147.7	204.3	192.3	232.9
2018	181.6	184.7	150.9	130.8	107.5	89.4	102.9	126.0	161.7	191.4	207.1	240.5
2019	206.0	180.4	129.9	119.9	101.3	92.7	102.5	141.1	147.6	205.4	191.9	219.3
2020	164.4	181.6	161.1	144.7	110.3	89.9	111.3	123.5	158.1	186.5	171.3	214.1
TMY	169.2	189.6	154.2	126.0	109.7	81.8	102.6	125.2	170.9	180.3	207.2	221.9

Table 91 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) Near Van Wyksdorp site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	166.5	160.5	162.2	116.8	102.3	106.5	128.5	140.5	160.9	172.6	145.4	190.9
2006	163.7	159.0	163.1	120.0	113.4	110.2	106.2	115.0	147.5	157.0	158.8	174.3
2007	171.3	162.5	172.6	133.9	127.3	108.8	123.8	138.6	157.6	168.7	153.6	170.0
2008	153.3	165.3	154.9	138.0	109.6	93.4	122.7	140.0	153.6	171.5	153.1	179.6
2009	150.8	159.3	175.0	114.7	121.7	95.2	114.9	132.7	149.3	171.7	155.7	187.1
2010	172.7	158.3	172.1	128.8	124.2	112.2	114.5	147.9	149.3	155.1	154.7	168.4
2011	173.4	147.8	166.4	137.1	107.3	90.1	118.8	134.9	162.0	165.4	155.9	182.0
2012	167.5	160.5	162.3	122.0	126.9	102.9	110.5	140.9	152.3	152.3	164.2	171.9
2013	171.0	160.8	160.7	129.7	125.6	99.1	113.6	131.9	162.8	157.1	158.8	191.6
2014	162.6	155.7	158.8	127.6	116.8	113.2	124.0	139.0	147.2	173.8	148.5	178.8
2015	176.2	160.1	163.1	125.9	115.7	106.6	91.1	128.5	139.1	174.5	156.7	183.2
2016	167.1	168.3	157.2	125.9	121.9	100.2	110.1	135.6	143.7	167.3	158.2	190.5
2017	163.8	169.3	174.5	137.6	126.2	107.7	130.3	136.7	143.1	173.1	157.3	179.0
2018	170.2	163.0	153.6	135.0	129.3	110.3	123.3	146.1	150.7	166.0	164.9	178.1
2019	176.3	155.0	163.3	130.7	121.9	119.0	128.3	153.7	146.7	173.9	164.4	185.6
2020	153.4	161.9	165.7	137.9	129.4	115.2	134.6	138.1	156.0	172.2	155.9	183.5
TMY	171.0	155.7	158.7	136.7	128.6	103.2	123.6	148.1	146.7	157.2	158.9	190.6

Table 92 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Near Van Wyksdorp site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	221.7	205.8	169.4	133.4	91.1	92.9	112.3	135.7	176.1	215.1	183.7	268.2
2006	215.0	203.5	169.4	131.6	106.4	98.5	96.8	112.4	162.8	191.8	212.0	246.8
2007	233.1	211.0	192.4	142.4	119.1	95.9	113.3	135.4	172.4	206.0	204.4	244.9
2008	207.2	213.5	164.2	147.2	102.9	84.6	113.4	136.0	169.1	210.2	202.8	260.1
2009	190.9	205.1	185.3	120.5	115.0	84.8	104.9	129.4	163.6	210.4	199.3	269.3
2010	237.2	204.7	180.7	138.9	115.1	100.2	105.2	143.5	163.8	187.4	205.7	236.0
2011	232.9	187.0	176.5	146.6	102.3	81.6	108.6	131.4	176.8	201.8	214.5	258.5
2012	223.6	206.7	174.8	129.8	119.0	92.0	102.5	137.4	167.2	186.0	212.9	243.2
2013	228.4	208.8	172.5	140.4	118.0	89.8	104.8	128.6	180.4	191.6	210.0	275.9
2014	215.6	202.3	167.1	136.0	111.1	100.4	112.7	135.3	159.9	211.7	197.7	252.8
2015	240.8	208.1	176.5	135.4	108.6	94.9	86.1	124.3	151.6	213.4	201.5	264.2
2016	225.5	218.7	167.5	135.9	113.7	89.5	101.0	131.9	159.0	205.8	200.7	275.9
2017	220.1	218.3	184.6	145.5	118.7	95.9	118.3	133.3	155.2	213.1	205.2	255.2
2018	228.8	209.2	160.8	144.1	120.1	97.5	112.8	141.6	167.5	201.5	218.2	258.6
2019	233.9	198.2	170.0	141.1	113.7	104.8	116.7	149.2	159.2	213.5	212.9	266.4
2020	198.9	208.5	175.0	147.9	120.5	101.2	122.8	134.7	173.6	211.1	194.4	260.8
TMY	228.3	202.4	167.7	146.3	119.9	92.4	114.2	143.7	159.3	192.0	212.1	276.0

Table 93 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Near Van Wyksdorp site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	225.1	209.5	172.9	132.1	95.5	94.6	116.2	138.9	178.4	217.2	186.0	274.4
2006	217.8	205.7	172.3	137.4	106.5	96.9	95.3	114.4	164.2	196.0	212.2	245.7
2007	235.5	213.8	194.4	148.4	119.0	94.4	111.2	137.4	175.5	210.0	204.6	244.2
2008	211.0	215.7	167.4	153.5	103.1	83.0	111.4	139.0	172.2	214.7	203.0	258.9
2009	193.7	207.4	187.3	125.9	115.1	83.4	103.2	131.4	166.4	215.0	199.2	268.1
2010	240.3	207.3	182.3	144.9	115.1	98.5	103.3	146.3	167.0	190.7	205.9	235.2
2011	235.8	188.8	178.0	152.3	102.4	80.3	106.6	134.0	180.1	205.8	214.6	257.4
2012	226.3	209.2	176.6	135.4	118.9	90.4	100.9	140.3	170.5	189.1	213.1	242.4
2013	230.2	211.5	173.9	145.8	118.0	88.3	102.9	131.1	182.6	195.5	210.2	274.9
2014	219.4	205.0	168.2	142.2	111.1	98.8	110.8	137.9	162.8	217.0	198.0	251.8
2015	244.5	210.8	178.1	141.3	108.6	93.4	84.5	126.1	154.1	217.4	202.0	263.3
2016	228.7	221.7	169.4	142.2	113.6	88.0	99.3	135.0	161.1	211.2	200.8	274.7
2017	222.9	221.1	186.6	151.5	118.6	94.5	116.4	136.3	158.6	218.0	205.5	254.0
2018	231.5	211.7	161.3	150.1	120.3	96.1	110.7	144.6	169.4	206.3	218.8	257.8
2019	237.0	200.3	171.9	146.4	113.9	103.2	114.6	152.4	162.6	218.0	213.2	265.5
2020	201.7	210.8	176.8	153.3	120.5	99.6	120.8	137.7	176.0	214.7	194.5	259.4
TMY	230.2	205.0	168.2	152.7	120.1	90.8	112.0	146.5	162.7	196.1	212.4	274.9

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Table 94 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Leeu Gamka / Prince Albert site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	169.2	161.2	168.5	122.8	112.5	115.5	137.3	147.4	166.0	178.8	150.9	198.0
2006	166.6	162.0	181.4	128.9	121.0	126.7	118.0	130.0	158.4	182.0	168.7	187.2
2007	173.4	168.5	177.6	134.6	140.5	113.7	132.2	155.9	170.4	178.5	164.5	173.5
2008	159.9	170.6	162.2	144.4	109.5	107.0	124.5	146.3	167.7	190.5	163.3	195.4
2009	156.6	159.1	175.6	111.9	132.1	106.9	123.8	138.2	160.8	174.1	162.8	192.0
2010	175.9	162.3	176.2	135.5	129.1	115.7	130.5	155.3	162.5	168.2	171.2	177.7
2011	176.3	154.5	162.0	143.8	118.6	110.4	128.2	147.8	172.8	177.2	168.4	191.4
2012	167.8	167.6	171.4	138.9	141.7	107.7	131.5	152.2	161.7	175.6	170.8	169.5
2013	179.2	171.3	172.5	135.2	133.9	108.5	116.8	134.5	172.2	174.9	168.7	183.8
2014	169.7	161.8	173.8	139.4	117.0	119.8	126.9	143.2	164.6	184.3	160.6	184.2
2015	178.6	177.4	167.2	140.4	129.1	110.7	111.1	143.3	155.7	183.2	174.3	187.9
2016	166.9	176.4	172.5	132.9	129.8	107.9	123.1	147.7	163.2	174.6	172.1	195.4
2017	172.0	166.0	178.9	137.9	135.6	117.5	140.2	152.4	155.0	189.7	157.8	189.7
2018	175.0	162.2	172.8	141.0	134.3	112.6	131.1	159.1	161.3	183.4	177.9	192.2
2019	184.6	162.5	168.4	137.1	124.0	124.1	136.1	166.1	160.5	185.7	172.4	197.3
2020	165.3	161.2	174.2	138.6	141.4	126.5	142.5	153.9	168.1	185.4	174.8	190.8
TMY	174.9	177.4	172.2	144.1	140.6	107.3	117.2	138.4	170.6	178.8	172.6	197.5

Table 95 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Leeu Gamka / Prince Albert site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	231.3	208.6	178.5	142.1	99.9	101.7	119.7	144.7	181.6	222.8	193.2	282.8
2006	217.9	208.2	193.7	140.1	112.9	113.1	108.4	127.2	176.0	223.0	225.0	271.1
2007	242.2	220.2	194.2	145.7	131.9	101.4	121.5	151.1	188.6	218.9	217.2	247.3
2008	215.7	221.3	179.8	153.5	102.1	96.0	115.2	142.3	184.4	236.4	221.3	285.3
2009	203.3	205.8	187.4	120.9	124.2	96.1	114.0	134.1	176.2	214.5	214.6	280.0
2010	240.8	211.3	188.0	145.3	120.7	103.2	119.4	150.6	178.6	204.8	231.3	254.6
2011	239.6	198.7	174.7	150.8	111.5	98.9	118.4	143.0	190.2	215.8	229.4	280.7
2012	226.8	217.7	182.5	146.1	132.5	96.7	121.4	148.5	178.9	215.6	228.4	243.4
2013	247.0	224.1	187.0	145.9	125.9	97.5	107.9	131.2	189.6	215.1	227.2	265.7
2014	229.7	210.6	191.5	149.3	109.9	107.1	116.7	138.9	181.5	225.3	213.9	267.4
2015	246.5	231.3	180.9	150.1	121.2	98.8	103.1	139.0	170.1	225.6	223.6	275.0
2016	223.2	229.9	188.2	144.1	120.7	96.9	112.8	142.8	180.7	216.8	230.9	284.4
2017	232.8	213.1	190.7	145.1	126.0	104.0	128.0	148.6	168.8	233.6	209.3	276.8
2018	240.0	207.6	184.7	149.5	125.6	100.4	120.7	154.0	179.3	225.6	239.4	280.9
2019	252.2	209.1	178.8	148.3	115.4	109.5	124.3	160.9	176.1	231.5	227.4	287.4
2020	221.1	206.7	185.5	147.8	132.2	112.2	131.5	149.4	186.7	229.8	222.0	279.1
TMY	239.1	232.1	186.0	151.3	131.6	96.7	108.3	134.5	188.4	223.6	231.6	288.1

Table 96 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Leeu Gamka / Prince Albert site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	234.7	211.9	182.8	141.2	105.2	104.6	125.2	147.0	184.4	226.4	195.6	289.4
2006	221.4	211.0	194.9	146.5	113.3	111.7	107.0	130.1	178.5	227.5	225.3	270.1
2007	246.0	223.4	195.1	152.4	132.3	100.1	119.6	154.5	191.9	224.1	217.2	246.7
2008	218.5	224.7	181.7	160.1	102.5	94.8	113.8	145.7	187.9	241.1	221.5	284.2
2009	207.3	208.8	188.3	126.0	124.7	94.8	112.6	137.0	179.2	218.1	214.5	279.1
2010	243.7	214.1	188.9	151.8	121.2	101.9	117.7	154.0	181.5	208.6	231.6	253.9
2011	243.0	201.6	175.3	157.8	111.7	97.7	116.7	146.4	193.4	220.3	229.5	280.0
2012	230.7	221.1	182.9	152.4	132.6	95.5	119.8	152.2	181.4	218.9	228.4	242.6
2013	250.3	227.6	187.4	152.9	126.3	96.3	106.4	134.2	193.0	218.9	227.3	265.1
2014	234.5	213.5	192.2	156.0	110.3	105.8	115.0	142.1	184.7	229.9	214.1	266.7
2015	250.3	234.8	182.4	156.7	121.6	97.6	101.6	141.6	172.6	230.3	223.9	274.6
2016	226.5	233.5	189.6	151.0	121.0	95.7	111.2	146.1	183.2	221.7	231.2	283.5
2017	237.0	215.6	192.5	152.0	126.3	102.8	126.2	152.1	172.2	238.9	209.5	276.1
2018	243.8	210.6	185.2	156.2	126.0	99.2	118.9	157.6	182.0	230.6	240.0	280.1
2019	256.0	212.0	179.2	155.8	116.0	108.4	122.5	165.3	179.4	235.8	227.7	286.9
2020	223.4	209.8	186.6	154.6	132.6	111.0	129.6	153.5	189.1	234.5	222.5	278.4
TMY	243.9	235.1	187.3	158.2	132.2	95.2	106.7	137.3	192.3	226.2	231.6	287.1

Table 97 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Beaufort West / Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	161.2	158.4	171.5	123.8	119.1	123.8	138.4	149.6	170.1	181.2	144.3	193.6
2006	153.2	158.5	176.7	119.2	119.5	126.9	128.1	137.9	164.0	164.2	167.6	181.8
2007	165.7	162.5	170.3	140.3	139.0	122.0	139.1	158.4	173.8	165.9	164.8	168.3
2008	153.1	159.5	158.8	141.9	115.1	118.2	130.8	148.7	170.3	184.2	155.9	189.5
2009	152.8	146.0	174.7	116.3	139.5	112.8	126.9	137.5	156.7	169.5	157.0	190.6
2010	158.0	155.8	171.8	133.0	132.1	117.5	131.3	161.4	165.0	169.7	162.0	177.8
2011	167.5	148.7	155.1	139.6	123.0	111.9	133.2	149.2	175.6	174.4	165.3	178.3
2012	169.8	158.1	157.9	131.5	138.4	112.8	126.1	155.7	166.8	165.0	172.2	159.5
2013	174.6	169.8	166.8	134.1	137.6	121.4	126.6	144.1	176.1	179.3	166.8	173.3
2014	164.9	156.7	174.1	134.1	127.9	127.4	135.5	146.0	162.3	176.7	153.8	178.3
2015	167.3	175.4	169.2	130.5	135.8	116.2	115.4	131.5	152.3	178.3	170.3	185.8
2016	159.5	172.2	173.2	131.5	131.3	120.4	124.0	150.5	168.4	173.6	169.1	192.0
2017	166.8	145.0	175.7	145.5	137.7	121.2	142.2	151.9	155.5	179.8	159.6	189.7
2018	166.0	157.2	168.4	135.5	132.9	124.8	133.5	155.1	161.0	187.7	175.2	193.6
2019	178.3	157.7	166.1	137.9	132.6	125.7	143.4	167.9	158.5	185.5	167.3	196.2
2020	165.6	152.8	163.5	135.6	146.3	133.9	146.1	161.8	167.7	174.9	168.2	186.4
TMY	170.9	158.8	176.8	135.4	134.7	115.7	141.0	132.8	157.4	175.7	158.3	160.8

Table 98 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Beaufort West / Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	218.7	207.4	176.7	139.4	110.1	106.1	119.1	148.6	188.5	227.4	183.1	278.0
2006	195.7	199.8	190.7	130.4	111.9	113.8	117.9	133.9	180.9	202.9	223.8	257.0
2007	232.5	208.6	188.5	151.4	130.5	109.7	127.7	152.7	191.5	203.1	219.0	235.1
2008	202.1	203.4	177.8	152.4	106.1	106.1	121.9	143.7	190.4	229.1	209.7	272.5
2009	196.8	185.0	189.1	123.8	128.8	101.9	117.4	132.7	171.4	210.4	208.5	276.1
2010	216.2	201.3	185.5	143.2	123.3	106.7	121.9	156.2	182.1	204.6	218.1	249.1
2011	226.4	187.1	167.1	151.5	114.6	100.8	122.8	143.4	193.4	216.3	227.5	253.1
2012	227.5	199.9	170.1	138.8	128.2	102.1	117.4	150.5	184.7	201.2	226.1	220.9
2013	239.6	220.3	181.0	143.7	127.8	109.6	117.3	139.8	195.8	219.3	223.3	245.3
2014	224.5	200.9	190.6	143.4	118.3	114.8	124.5	140.1	177.4	216.3	206.0	249.2
2015	232.5	226.4	183.8	140.6	125.9	104.6	106.2	126.6	165.9	219.6	220.2	266.9
2016	214.5	222.0	190.4	141.9	121.7	107.4	114.9	144.8	186.2	218.4	226.6	278.2
2017	221.5	181.0	189.6	152.3	125.9	108.8	130.8	147.2	169.3	224.4	209.4	271.4
2018	230.2	199.8	180.8	145.1	124.1	112.2	123.2	149.2	180.6	235.1	239.3	279.1
2019	245.5	200.1	176.9	150.5	122.5	112.6	132.1	162.2	174.2	231.7	220.7	281.5
2020	215.0	194.4	174.3	141.0	135.2	119.2	135.7	157.2	187.5	213.7	213.6	266.0
TMY	227.0	200.9	189.6	143.7	124.3	102.4	128.0	126.7	169.5	218.0	208.9	221.4

Table 99 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Beaufort West / Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	220.9	206.6	182.3	140.8	111.7	111.2	127.4	149.6	190.7	230.0	187.4	284.9
2006	196.4	203.3	189.4	136.6	113.5	113.3	117.4	138.0	183.7	205.0	224.0	257.7
2007	234.0	213.1	187.1	157.8	132.4	109.2	127.0	157.2	194.3	207.1	219.3	235.9
2008	204.3	207.1	176.4	160.1	107.9	105.6	121.3	148.2	193.4	232.2	210.0	273.2
2009	200.6	188.5	187.8	130.1	130.6	101.4	116.8	136.4	174.2	214.1	208.7	276.8
2010	218.5	205.9	184.2	149.5	125.2	106.2	121.3	161.0	184.9	207.1	218.3	250.0
2011	228.5	190.6	165.7	157.9	116.4	100.3	122.0	147.5	196.3	219.2	227.7	253.9
2012	230.0	203.1	168.8	145.4	130.0	101.5	116.8	155.2	187.7	202.5	226.3	221.1
2013	241.7	224.9	179.8	152.4	130.0	109.0	116.5	144.7	199.1	222.8	223.7	245.6
2014	225.8	204.5	189.2	150.3	120.3	114.2	123.8	144.4	180.1	218.3	206.3	249.8
2015	234.9	231.4	182.6	146.7	127.8	104.0	105.7	129.2	168.0	223.8	220.7	267.8
2016	215.9	226.9	188.9	149.5	123.6	107.0	114.4	149.3	188.3	221.3	227.2	279.6
2017	224.0	184.2	188.2	158.0	128.2	108.3	130.0	152.0	171.7	227.5	209.6	272.8
2018	231.7	203.9	179.3	151.6	126.0	111.7	122.3	153.9	182.8	238.5	239.8	280.7
2019	247.0	203.9	175.8	157.2	124.6	112.0	131.4	167.4	177.2	236.8	221.1	282.6
2020	216.3	198.4	172.9	147.8	137.3	118.5	135.0	162.5	190.5	217.8	213.9	266.9
TMY	229.8	204.2	188.7	153.3	127.4	103.3	131.1	130.3	172.9	222.4	208.8	221.0

Table 100 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Willowmore site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	167.2	157.4	168.1	127.1	117.4	118.7	138.8	148.5	163.1	180.9	141.8	193.7
2006	158.7	153.5	178.7	124.9	121.2	121.7	121.9	134.3	162.1	169.6	168.7	181.3
2007	173.0	161.8	171.9	136.9	132.3	117.5	133.1	158.1	167.7	167.3	162.8	170.4
2008	148.4	163.8	160.3	143.6	113.2	115.4	129.5	144.9	172.9	183.9	160.4	194.2
2009	150.9	150.2	172.4	114.7	134.5	107.1	124.3	141.1	158.1	165.4	161.6	188.5
2010	160.8	157.9	175.3	126.2	131.6	120.1	130.3	157.3	164.3	168.2	163.3	173.8
2011	169.2	148.0	154.2	141.5	119.0	109.9	130.7	151.7	173.9	169.3	166.0	178.3
2012	165.8	160.8	158.9	136.4	136.4	107.1	123.4	154.2	168.0	162.0	174.5	163.8
2013	172.3	169.2	163.9	136.7	132.5	115.4	121.8	140.1	176.7	171.2	167.6	180.0
2014	167.9	157.2	173.2	135.5	123.8	126.5	132.4	144.3	161.1	178.6	157.7	176.8
2015	175.6	175.0	167.1	127.3	128.3	111.4	111.1	128.6	147.0	176.6	171.9	188.8
2016	161.7	171.7	172.5	133.4	131.5	115.8	122.7	148.6	164.9	176.6	169.1	190.8
2017	169.3	154.9	179.9	142.9	133.9	118.3	140.1	149.7	153.9	179.1	158.7	186.6
2018	169.6	154.2	165.6	138.3	132.4	119.4	133.0	152.5	159.7	183.2	175.7	193.5
2019	178.3	159.5	162.3	134.0	131.4	125.4	142.2	166.5	156.0	186.0	168.9	194.8
2020	162.6	159.7	163.4	135.5	142.4	129.0	142.7	157.6	168.8	175.9	169.0	185.2
TMY	161.4	155.8	165.3	141.5	112.4	111.7	123.7	148.5	162.3	169.7	141.6	190.9

Table 101 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Willowmore site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	223.5	204.3	173.2	141.8	105.2	103.4	120.3	146.4	179.9	226.5	178.1	273.4
2006	202.4	191.1	193.6	135.4	112.6	109.8	112.4	130.2	178.0	207.8	224.0	254.3
2007	236.6	206.7	191.1	147.4	123.5	105.3	122.2	151.8	184.9	205.0	213.8	239.6
2008	200.3	209.2	177.9	152.1	105.6	103.7	119.8	139.5	191.5	229.7	217.9	280.1
2009	197.0	190.2	185.4	119.5	125.0	96.2	114.6	136.2	172.7	205.1	211.3	270.3
2010	218.4	204.1	188.1	136.7	122.7	107.0	120.5	152.2	180.7	204.4	216.1	244.7
2011	228.5	186.5	167.2	151.4	110.4	98.9	120.1	145.9	191.0	209.1	227.5	254.8
2012	224.6	202.4	170.6	142.4	126.5	96.8	113.7	149.5	185.0	200.7	231.6	227.3
2013	234.2	217.5	178.3	146.8	123.7	104.2	112.8	135.6	195.5	208.7	223.9	254.6
2014	226.5	199.9	191.7	143.9	114.9	112.9	121.1	139.0	176.4	220.8	208.3	251.6
2015	246.2	223.0	181.6	137.4	118.7	100.5	102.7	124.4	161.1	217.2	218.6	270.0
2016	217.5	219.3	188.2	142.8	120.6	103.1	113.8	142.8	183.7	220.2	222.3	274.2
2017	225.1	195.5	194.1	146.9	122.5	105.9	128.0	144.8	167.5	223.4	209.0	263.8
2018	235.2	195.7	176.4	147.4	123.5	106.2	121.8	146.2	177.9	227.4	240.8	278.4
2019	238.9	204.4	170.5	145.7	121.6	111.2	130.4	160.1	171.6	229.7	223.1	279.6
2020	211.4	201.6	175.8	142.2	131.8	114.0	131.9	152.3	186.9	218.9	211.8	262.6
TMY	217.0	197.1	175.8	151.0	105.4	101.3	115.0	143.1	178.8	206.7	178.3	275.5

Table 102 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Willowmore site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	226.1	205.6	178.4	142.0	108.7	107.5	126.8	148.4	182.8	229.0	181.0	279.4
2006	203.3	193.8	192.2	141.3	113.7	109.0	111.5	134.1	180.7	210.3	224.4	255.2
2007	238.5	210.6	189.6	154.8	124.8	104.6	121.3	155.9	187.4	209.0	214.1	240.0
2008	202.0	213.7	176.6	160.4	106.9	103.0	119.1	143.6	194.5	232.8	218.3	281.2
2009	200.5	193.7	184.1	126.3	126.7	95.6	113.7	140.0	175.2	208.9	211.7	271.1
2010	220.4	208.1	186.6	143.5	124.4	106.2	119.6	156.8	184.0	207.6	216.3	245.7
2011	230.4	189.9	166.0	159.2	112.0	98.2	119.3	149.8	194.5	211.6	228.1	256.4
2012	226.1	206.6	169.5	150.0	127.8	96.1	112.9	154.0	187.8	203.4	232.1	227.9
2013	236.2	222.6	177.1	155.1	125.5	103.6	112.0	140.0	198.9	212.1	224.5	255.2
2014	229.0	203.8	190.3	150.9	116.5	112.2	120.4	143.0	178.8	223.9	208.7	252.2
2015	248.3	228.3	180.4	143.2	120.1	99.8	102.0	126.7	163.1	220.9	219.2	271.1
2016	219.2	224.7	186.7	151.1	122.2	102.5	113.1	147.1	186.0	223.3	222.7	275.2
2017	227.5	199.4	192.6	154.2	124.2	105.1	127.1	149.4	170.2	227.1	209.3	264.9
2018	237.0	199.5	175.1	154.2	125.2	105.5	120.8	150.1	180.9	230.8	241.5	279.6
2019	241.0	208.7	169.4	152.9	123.3	110.5	129.4	165.0	174.6	233.8	223.8	280.8
2020	211.3	205.7	174.3	149.9	133.6	113.3	131.0	157.4	189.8	222.6	212.3	263.6
TMY	219.2	200.3	175.0	159.3	106.7	100.4	113.9	147.9	181.1	210.5	180.8	275.8

Table 103 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for North of Gqeberha site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	139.4	133.8	144.3	116.3	96.3	109.5	117.1	129.0	137.0	170.8	122.3	172.5
2006	126.0	119.2	149.4	100.9	100.1	111.1	104.8	116.3	136.8	131.7	129.5	131.6
2007	140.7	130.9	143.2	114.6	111.2	107.4	115.5	131.7	143.7	140.4	138.6	149.7
2008	124.8	129.1	134.2	122.6	105.6	93.1	118.8	132.3	152.8	147.9	133.2	153.9
2009	124.2	117.5	162.9	105.3	112.5	92.5	107.8	120.2	135.6	129.5	137.4	149.3
2010	129.3	128.4	151.4	110.9	108.0	96.4	113.8	146.5	142.0	123.1	128.7	138.2
2011	126.7	131.7	137.5	116.9	100.1	91.6	105.6	128.9	153.2	137.9	121.1	142.8
2012	148.4	127.8	127.3	114.4	112.8	97.1	101.9	130.6	142.8	108.5	158.7	145.1
2013	148.6	147.5	142.2	115.6	119.2	105.5	105.2	130.6	159.8	144.0	143.0	150.9
2014	154.3	128.6	154.8	111.9	107.3	111.1	109.8	121.3	132.1	140.8	129.5	139.8
2015	146.3	134.2	140.0	101.8	110.5	102.4	90.2	101.9	132.2	147.6	136.3	168.6
2016	142.5	146.1	147.9	122.8	114.9	102.4	104.6	126.6	128.3	152.4	141.4	168.7
2017	141.0	119.5	146.4	113.7	114.2	108.8	116.6	118.4	127.0	154.6	140.2	154.4
2018	147.7	129.1	131.1	112.9	117.9	107.7	117.7	127.9	147.5	163.2	153.8	166.0
2019	151.1	138.5	142.0	112.3	113.5	108.9	120.9	144.9	138.8	158.4	148.1	160.6
2020	123.7	140.5	146.7	119.5	126.2	117.6	128.3	133.0	147.5	140.8	130.4	140.1
TMY	129.3	128.6	141.9	116.9	100.1	111.1	108.1	116.5	142.2	141.0	129.6	168.6

Table 104 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for North of Gqeberha site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	171.7	167.5	143.8	127.0	89.0	95.6	103.3	123.1	146.3	210.1	143.6	234.4
2006	145.9	145.0	153.9	109.9	93.0	99.0	95.4	113.2	148.5	157.2	165.0	177.1
2007	185.6	161.6	159.1	123.8	103.0	95.6	106.0	127.9	155.9	168.4	183.0	204.5
2008	159.6	160.2	149.3	130.8	95.6	84.3	108.4	128.1	168.2	177.7	170.7	212.7
2009	154.7	144.4	171.9	110.3	103.1	83.2	98.4	115.7	147.8	156.6	177.0	204.7
2010	166.0	159.9	156.3	120.1	98.9	86.2	103.5	141.6	152.7	145.8	154.8	184.3
2011	162.1	161.7	146.3	126.6	92.5	82.4	96.8	125.8	167.9	162.9	158.5	192.3
2012	183.1	160.3	135.4	122.0	103.3	87.5	94.2	126.9	156.5	127.4	201.0	197.2
2013	187.0	185.8	148.5	125.8	108.9	94.2	97.1	126.5	174.4	170.3	185.8	204.7
2014	196.9	158.5	168.2	119.6	98.8	99.3	100.4	117.8	141.0	166.4	164.8	191.0
2015	193.2	167.3	149.0	112.1	102.2	91.4	85.0	98.8	143.3	175.1	179.2	230.1
2016	180.7	183.7	152.4	130.9	105.6	90.5	95.8	123.3	142.3	182.1	168.0	233.3
2017	180.3	146.6	152.1	121.5	103.8	96.4	106.3	114.7	138.3	183.9	181.0	210.3
2018	194.6	159.1	138.1	120.3	107.6	96.4	106.6	125.1	162.3	194.6	206.2	230.3
2019	194.0	173.9	144.1	119.7	103.9	96.7	109.6	140.6	149.9	189.1	189.1	217.3
2020	146.8	175.2	148.5	125.6	114.3	103.7	116.7	130.3	162.8	167.2	159.0	188.2
TMY	166.1	158.4	148.2	126.7	92.5	99.3	98.6	113.3	152.7	166.7	164.9	230.2

Table 105 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for North of Gqeberha site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	173.4	169.3	147.6	130.0	90.8	99.8	107.8	127.0	148.6	211.4	148.3	239.2
2006	149.2	147.5	155.2	114.9	96.5	100.3	96.9	116.2	151.2	162.0	165.4	179.2
2007	189.8	164.4	160.2	130.4	106.9	96.8	107.5	130.8	158.5	174.0	183.4	206.5
2008	163.4	163.5	151.5	136.9	98.8	85.3	109.9	131.9	170.6	183.1	170.9	214.7
2009	160.9	147.0	172.6	115.1	106.9	84.1	99.5	118.9	150.2	161.9	177.3	207.0
2010	170.2	163.1	156.9	125.3	102.5	87.2	104.9	145.1	155.6	150.6	155.2	186.2
2011	165.8	163.8	147.1	133.3	95.4	83.4	98.5	129.1	171.3	167.8	158.9	194.4
2012	187.2	162.7	136.2	127.5	107.0	88.6	95.7	129.9	159.7	130.4	201.3	198.9
2013	191.3	189.6	149.4	132.5	112.8	95.5	98.3	130.2	177.9	177.4	186.4	206.4
2014	202.2	161.9	169.3	124.6	102.2	100.7	101.9	121.0	143.5	172.3	165.6	193.3
2015	197.2	170.2	149.9	117.5	105.3	92.5	85.9	101.1	145.7	181.0	179.8	232.0
2016	184.2	187.7	154.8	137.4	109.0	91.4	97.4	127.0	144.2	187.2	168.6	235.6
2017	184.9	149.5	153.3	127.8	107.5	97.5	108.0	118.0	140.5	190.0	181.7	212.5
2018	198.2	162.7	139.1	125.8	112.0	97.5	108.6	128.1	165.3	201.4	206.2	232.4
2019	198.9	177.1	145.2	125.8	107.4	97.9	111.3	144.0	153.3	195.2	189.3	219.6
2020	150.1	178.5	151.1	131.7	118.5	105.0	118.6	134.1	166.4	173.4	159.7	190.2
TMY	170.3	161.8	149.3	133.4	95.5	100.7	99.7	116.3	155.8	172.5	165.6	232.1

Table 106 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Kleinpoort site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	150.6	141.3	150.2	122.5	105.3	116.6	123.3	137.3	146.9	175.5	129.4	187.6
2006	135.7	122.6	157.9	103.9	110.3	113.6	114.6	119.8	142.4	140.6	135.9	145.8
2007	151.3	140.0	148.6	119.1	120.8	116.2	124.5	141.0	152.8	152.9	149.8	146.3
2008	131.8	138.9	137.4	128.1	107.1	100.9	125.0	138.0	163.0	161.6	141.8	167.5
2009	135.1	126.3	163.9	112.3	122.3	99.4	108.5	128.3	142.1	141.9	138.1	166.1
2010	138.9	137.2	159.8	111.2	115.4	102.6	123.1	152.6	145.9	139.4	138.6	144.2
2011	135.2	136.3	142.4	124.5	104.7	96.4	111.0	133.0	161.9	150.4	131.1	150.8
2012	155.5	133.4	141.6	122.6	117.8	101.8	108.0	136.9	152.8	126.2	157.9	142.3
2013	155.7	155.7	144.6	121.3	120.7	111.3	110.3	136.4	167.3	151.3	152.3	159.7
2014	161.7	130.8	161.5	120.9	112.2	117.2	121.7	126.5	141.4	147.1	136.0	143.7
2015	155.4	145.5	145.0	103.8	117.0	106.3	97.8	106.0	133.5	162.5	146.6	176.4
2016	151.3	150.9	152.3	128.1	118.6	107.3	114.0	134.8	143.3	157.3	154.0	180.8
2017	146.4	126.5	154.4	121.5	118.9	114.7	125.4	127.4	138.2	163.5	144.9	168.2
2018	157.0	136.4	145.5	122.6	121.6	111.7	123.2	137.2	152.2	171.8	161.9	177.2
2019	158.0	146.3	144.2	116.0	116.1	111.3	126.8	152.3	148.0	167.6	158.1	173.5
2020	139.7	142.5	148.7	120.2	132.1	120.4	134.9	143.6	155.0	156.4	136.5	158.3
TMY	139.0	137.1	145.0	127.1	121.7	111.7	108.7	120.0	164.0	126.7	145.1	180.9

Table 107 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Kleinpoort site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	188.9	175.2	149.7	132.9	95.8	101.4	109.1	131.2	158.0	216.0	153.7	260.5
2006	158.1	150.6	161.7	113.4	102.5	102.0	104.8	116.7	154.3	166.4	173.5	196.6
2007	200.4	174.0	165.2	129.1	110.8	103.1	113.3	136.6	165.3	180.5	195.8	197.6
2008	171.9	173.2	150.7	136.9	97.6	90.2	114.7	133.6	177.8	194.6	183.3	231.3
2009	170.9	154.9	170.0	118.7	112.6	88.7	99.7	124.6	152.6	170.3	179.4	229.5
2010	176.4	170.6	165.1	120.9	105.6	91.6	112.0	147.6	158.9	163.8	170.7	192.8
2011	169.3	164.7	148.8	134.0	95.7	86.2	101.7	129.8	176.3	178.7	174.3	204.6
2012	196.9	166.0	151.6	128.9	108.9	91.2	99.6	133.0	167.1	148.0	202.5	192.0
2013	198.8	195.2	151.1	131.8	111.7	99.4	102.2	131.6	181.7	179.5	201.9	215.3
2014	203.7	161.3	175.5	127.2	103.1	103.9	111.5	122.4	150.6	171.9	176.1	198.3
2015	205.2	182.3	149.7	114.2	107.7	94.8	91.2	104.0	144.9	192.5	190.0	242.1
2016	193.6	189.3	157.5	137.5	109.0	94.9	103.7	130.7	157.5	189.1	188.8	251.8
2017	187.8	155.1	159.8	127.2	108.3	102.1	114.5	123.8	149.2	196.5	185.7	229.8
2018	208.2	169.3	150.1	130.2	112.0	99.7	112.2	132.9	167.8	205.8	220.1	244.4
2019	205.7	182.5	144.6	125.4	106.4	98.4	115.7	148.3	160.0	201.3	201.5	236.0
2020	164.9	175.5	149.4	125.6	120.9	106.3	123.2	140.8	170.8	186.3	166.8	213.0
TMY	176.5	170.6	149.3	136.2	112.4	99.8	100.3	116.9	177.7	148.6	186.0	252.2

Table 108 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Kleinpoort site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	190.0	177.1	153.5	136.4	98.4	105.3	114.1	135.9	162.4	217.8	158.8	264.8
2006	163.2	153.0	165.0	118.5	105.5	103.6	105.5	119.6	157.4	172.4	173.6	198.8
2007	205.5	176.4	166.3	135.0	113.9	104.4	114.6	139.9	168.2	187.4	196.1	199.6
2008	176.6	176.8	153.5	143.1	100.6	91.2	115.6	137.5	181.3	200.3	183.3	233.5
2009	176.7	158.3	171.8	124.5	116.0	89.5	100.9	127.4	156.1	175.0	179.4	232.0
2010	180.2	173.7	167.2	126.3	109.0	92.8	113.0	151.1	161.8	168.7	170.7	194.5
2011	173.2	166.5	150.9	140.9	98.8	87.3	103.0	132.2	180.1	184.0	174.6	206.7
2012	202.0	168.7	153.8	134.6	112.1	92.4	100.6	136.0	170.2	152.0	202.8	193.7
2013	204.0	198.6	151.8	137.8	115.3	100.8	103.0	135.6	186.2	185.8	202.1	217.0
2014	211.0	164.2	177.5	133.3	106.0	105.4	112.1	125.7	153.9	178.3	176.6	200.9
2015	209.7	185.0	152.0	118.3	110.3	96.0	92.0	106.5	148.2	198.9	190.6	244.4
2016	198.3	192.8	160.2	144.0	112.3	96.0	105.1	134.1	160.0	193.7	189.4	254.4
2017	193.3	157.9	162.5	132.7	112.0	103.4	115.7	126.8	152.7	202.5	186.1	232.2
2018	212.7	172.8	152.3	135.1	115.7	101.1	113.1	135.6	171.0	212.5	220.2	246.7
2019	212.4	185.2	146.6	130.6	109.9	99.7	116.9	151.8	163.8	208.5	201.8	238.4
2020	168.9	177.8	152.8	131.3	124.8	107.7	124.1	144.7	174.9	194.0	167.2	215.1
TMY	180.3	173.7	152.0	142.5	115.8	101.1	101.1	119.7	181.9	152.5	186.2	254.6

Table 109 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	151.5	146.3	159.9	126.1	114.1	119.4	132.4	145.2	161.9	178.5	137.5	193.7
2006	146.4	146.8	171.4	112.5	121.7	118.9	126.7	132.4	153.4	153.4	155.8	169.1
2007	160.5	157.4	162.3	129.9	129.8	119.7	134.5	154.2	165.2	158.9	160.1	163.0
2008	144.7	156.2	154.1	136.1	115.1	112.0	131.4	142.7	171.6	175.2	149.6	181.5
2009	146.7	138.7	171.6	118.7	131.5	102.2	122.4	136.6	153.4	164.7	151.5	183.3
2010	150.0	147.6	167.3	120.1	133.6	114.1	128.2	157.0	158.5	156.5	147.9	163.3
2011	156.9	144.8	148.7	130.9	112.1	109.2	127.8	141.3	172.9	166.3	157.8	163.9
2012	163.8	146.5	149.7	132.1	128.5	108.9	124.5	150.9	167.5	146.4	164.2	149.8
2013	165.9	162.7	155.0	131.9	127.1	116.6	122.3	145.2	172.8	166.6	160.3	173.1
2014	161.4	143.1	171.1	130.8	120.9	127.4	133.0	138.4	154.5	162.4	147.3	160.7
2015	161.4	164.3	153.8	116.8	122.9	108.8	105.7	117.0	138.9	171.8	163.8	185.8
2016	158.8	164.3	163.0	133.4	129.1	114.7	120.7	143.1	159.8	169.5	162.5	187.0
2017	160.3	140.7	169.7	136.7	128.5	118.6	136.5	140.3	149.7	173.6	156.6	181.0
2018	162.9	145.1	150.1	130.9	125.5	120.8	130.1	145.5	157.6	177.6	173.8	188.6
2019	171.1	150.4	154.2	127.3	124.0	118.4	139.1	161.0	158.4	183.1	166.3	188.2
2020	156.6	146.1	147.6	126.0	138.9	126.3	142.2	159.1	162.2	169.0	154.9	177.1
TMY	146.7	140.5	154.2	127.4	124.2	102.3	128.6	136.8	150.0	173.9	151.7	169.1

Table 110 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	197.1	181.3	161.6	137.5	105.2	104.8	117.6	138.4	175.6	221.2	164.9	271.9
2006	175.9	181.2	176.8	123.4	113.3	106.7	116.5	129.7	165.8	181.6	202.6	231.7
2007	213.2	196.4	174.3	139.8	120.9	106.5	123.6	150.4	178.8	188.9	211.5	222.0
2008	186.8	197.0	166.6	145.8	105.8	100.8	121.8	138.5	187.8	210.1	199.1	252.7
2009	182.8	172.7	177.7	126.4	122.0	92.4	113.0	132.7	165.4	197.3	199.6	258.5
2010	194.5	188.5	173.2	129.6	123.4	102.8	118.8	153.0	172.1	185.0	192.9	224.6
2011	199.0	178.4	155.8	141.5	104.7	97.9	116.7	137.7	187.0	198.9	212.9	225.4
2012	212.7	183.7	158.9	139.7	118.9	98.1	115.2	147.1	182.8	174.3	212.8	201.4
2013	214.5	206.6	164.7	142.4	118.2	105.1	113.3	142.1	188.2	197.3	214.8	235.1
2014	204.7	177.9	183.4	139.5	112.7	113.9	121.8	134.2	163.7	192.2	194.8	218.5
2015	214.5	208.5	159.5	126.2	114.0	98.2	98.6	114.4	148.7	204.1	209.7	259.6
2016	200.7	208.5	170.6	143.2	118.2	102.0	111.3	139.2	173.9	204.3	205.1	264.0
2017	202.1	172.2	175.7	141.7	118.5	105.5	125.1	136.8	160.7	209.1	203.6	247.9
2018	216.0	183.0	154.6	140.9	116.4	107.6	120.1	141.5	174.1	213.0	233.6	267.9
2019	223.8	189.1	158.1	138.7	114.3	105.7	128.5	157.3	171.4	220.2	214.6	263.9
2020	189.5	182.2	149.9	131.9	128.3	111.9	131.7	155.6	178.1	202.6	193.6	243.0
TMY	183.1	172.1	157.6	138.9	114.7	92.6	119.4	133.1	161.1	209.1	199.4	231.9

Table 111 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	198.2	185.3	166.1	141.5	107.7	109.2	123.6	145.0	179.6	222.5	170.7	277.4
2006	181.3	183.4	180.0	128.1	115.7	109.0	116.9	132.7	169.8	187.6	202.2	233.7
2007	219.7	199.8	176.0	146.3	123.8	108.4	123.8	153.9	183.2	196.7	211.0	223.8
2008	194.1	200.5	169.4	152.1	108.2	102.7	121.5	141.9	192.7	217.1	198.9	255.2
2009	189.4	175.8	180.8	132.5	125.1	94.1	113.2	135.7	169.3	204.4	199.5	261.1
2010	200.3	192.3	176.1	135.4	126.2	104.7	118.7	156.6	176.8	189.9	192.9	226.7
2011	205.0	181.1	158.1	148.9	107.2	99.6	117.2	141.0	192.2	206.0	212.5	227.4
2012	218.5	186.6	160.5	146.2	122.1	100.0	115.7	150.4	187.1	179.2	212.7	203.1
2013	220.8	210.6	165.2	148.8	121.0	107.2	113.6	145.9	193.0	204.1	214.6	236.7
2014	212.0	180.6	186.9	146.2	115.3	116.3	121.6	137.9	167.6	198.7	195.0	220.7
2015	221.3	211.9	162.2	131.6	116.9	100.2	99.0	116.4	152.7	212.1	209.5	261.9
2016	205.3	212.0	174.3	150.5	121.1	103.8	111.5	142.7	177.7	210.1	205.2	266.5
2017	209.3	174.7	179.0	148.3	121.6	107.5	125.4	140.4	164.7	217.1	203.3	250.2
2018	223.2	186.3	156.8	146.7	119.8	109.6	120.4	144.9	178.2	221.5	233.4	270.5
2019	231.1	191.8	160.6	144.9	117.1	107.7	128.6	161.1	176.5	229.8	214.4	266.1
2020	195.5	185.0	153.0	137.6	131.6	114.2	131.8	159.7	182.8	210.1	193.6	245.3
TMY	189.5	174.6	160.6	145.0	117.2	94.1	118.8	136.0	164.9	217.4	199.6	233.9

Table 112 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Hofmeyr site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	155.0	151.9	165.4	129.4	132.3	124.3	143.5	144.1	168.5	174.5	147.7	191.5
2006	149.5	143.1	169.2	126.7	128.9	126.1	126.9	131.5	159.2	158.7	153.0	177.5
2007	162.9	163.8	173.0	133.3	136.1	118.4	140.1	159.9	170.9	164.8	163.6	167.1
2008	147.5	155.6	154.0	141.4	113.7	114.6	138.9	150.0	174.3	182.1	153.7	180.6
2009	146.1	142.3	177.8	126.3	129.6	103.7	127.4	141.7	166.0	160.5	148.7	184.5
2010	151.2	146.1	171.1	136.8	127.4	114.9	131.0	166.5	152.9	160.1	152.9	168.0
2011	153.6	150.5	153.9	129.7	118.7	105.0	135.5	151.3	172.4	177.1	164.8	171.6
2012	165.9	153.1	149.7	138.4	134.1	111.1	131.5	136.3	162.1	158.0	168.5	157.5
2013	171.3	166.9	163.7	133.7	134.3	127.6	129.4	154.9	174.6	170.4	161.2	171.8
2014	161.7	148.2	178.8	133.8	136.5	128.9	143.8	145.1	152.8	181.9	149.3	171.9
2015	156.9	160.3	161.5	135.9	138.0	116.2	111.8	132.8	144.1	173.4	169.1	178.8
2016	152.8	168.3	163.3	136.8	134.2	115.0	129.7	144.4	161.2	169.4	164.4	186.3
2017	158.0	150.9	178.7	134.7	130.7	124.6	139.3	148.1	164.9	170.2	150.5	184.9
2018	160.8	164.8	159.7	114.2	135.6	127.6	136.7	152.2	156.0	187.0	162.6	186.9
2019	175.0	156.1	160.5	129.2	133.4	128.5	141.4	167.9	167.3	185.9	169.3	174.6
2020	172.7	149.5	168.3	120.3	147.1	128.1	148.2	164.9	174.0	174.6	161.9	171.5
TMY	153.6	156.0	153.9	126.6	136.0	104.1	131.6	154.9	168.8	182.1	168.8	186.3

Table 113 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Hofmeyr site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	204.3	193.6	171.4	143.3	125.9	107.2	125.5	141.0	182.9	215.5	180.8	271.8
2006	191.1	178.3	178.1	138.4	118.3	113.2	116.3	127.1	175.4	189.5	203.4	247.3
2007	219.1	206.5	189.1	143.4	124.8	106.4	128.8	154.6	187.4	197.2	216.6	233.1
2008	194.6	194.2	169.7	152.7	103.1	102.9	127.7	144.7	194.0	221.6	207.6	255.7
2009	184.6	176.1	189.8	135.4	119.6	94.0	117.4	135.7	182.8	194.1	194.8	263.1
2010	193.9	186.3	182.1	149.1	115.8	103.8	120.4	160.4	168.0	192.5	207.2	236.9
2011	196.4	186.1	165.2	141.6	109.5	95.3	124.5	146.6	189.6	214.5	221.9	239.7
2012	217.9	191.9	156.8	145.1	122.3	101.1	121.7	133.3	180.2	189.9	220.7	217.1
2013	229.3	213.1	176.2	145.6	122.7	114.1	120.0	149.7	192.3	204.9	214.6	240.2
2014	220.0	185.5	191.7	143.8	125.0	115.4	131.0	139.9	167.5	220.1	201.5	240.7
2015	208.4	204.1	172.3	147.3	125.9	104.7	103.6	128.1	159.5	207.9	221.0	253.1
2016	201.1	215.7	170.7	146.4	121.6	103.0	118.8	139.9	178.5	206.7	216.3	266.4
2017	206.9	188.3	189.9	145.0	118.6	111.3	128.5	143.6	181.3	206.2	195.5	261.6
2018	214.9	207.5	167.7	124.0	124.3	114.5	125.3	148.3	174.3	226.1	229.8	268.2
2019	235.0	196.6	167.2	141.5	121.7	114.9	129.8	162.0	184.1	226.1	221.4	245.6
2020	225.6	187.0	174.7	127.1	133.0	114.3	136.1	160.0	195.1	207.9	208.4	242.3
TMY	195.6	196.9	165.1	136.7	125.9	94.3	121.9	150.2	182.7	219.7	221.4	267.0

Table 114 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Hofmeyr site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	206.9	198.6	177.0	147.9	126.2	113.1	133.4	144.5	188.0	216.9	187.2	280.1
2006	195.7	182.0	179.4	144.6	123.8	116.7	118.9	132.1	177.9	196.1	203.8	249.9
2007	224.6	211.7	190.3	151.4	130.7	109.7	131.6	159.8	190.4	204.8	217.2	235.6
2008	199.3	198.3	170.5	160.6	107.5	106.0	130.2	150.2	197.1	229.7	208.3	258.4
2009	191.8	179.7	191.4	141.6	125.0	96.5	119.7	140.4	185.1	201.8	195.3	266.0
2010	199.9	190.8	182.8	155.0	121.5	107.0	122.8	166.4	170.9	199.0	207.8	239.5
2011	201.0	190.4	166.3	148.5	114.8	98.1	126.9	152.2	192.9	221.9	222.5	242.1
2012	223.7	195.9	157.8	152.3	127.5	104.3	124.0	137.5	182.8	194.8	221.4	219.3
2013	236.3	218.5	177.7	152.7	128.3	117.5	122.5	155.4	195.6	212.7	215.0	242.6
2014	226.1	190.0	193.2	151.0	130.4	119.0	133.7	145.2	170.0	228.8	202.5	243.0
2015	214.6	209.7	173.7	154.4	131.5	107.7	105.5	132.6	161.4	215.5	221.5	255.6
2016	205.9	220.3	172.5	154.1	127.9	105.8	122.0	145.3	181.2	214.3	217.0	269.6
2017	212.7	192.5	191.0	151.0	123.8	114.7	131.0	149.1	183.8	213.5	196.3	264.4
2018	221.1	211.6	168.8	129.9	130.1	117.5	128.2	153.9	177.4	235.7	230.1	271.3
2019	243.3	200.6	168.2	148.1	127.4	118.2	132.4	167.8	187.2	235.5	221.8	248.3
2020	232.9	191.5	176.5	132.7	139.4	117.4	139.4	166.3	198.5	217.8	208.9	245.3
TMY	201.1	200.7	166.6	144.7	130.6	96.7	123.1	155.6	188.2	229.1	221.8	270.0

Table 115 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for East of Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	160.9	158.0	170.6	122.2	116.5	119.9	133.3	147.4	168.8	180.6	144.1	193.7
2006	153.0	158.1	175.8	117.8	116.5	124.1	126.0	135.4	162.8	163.6	167.4	181.7
2007	165.6	162.1	169.4	138.7	136.1	119.3	136.9	155.4	172.5	165.3	164.5	168.2
2008	152.9	159.1	157.9	140.3	112.2	115.8	128.7	146.0	169.1	183.6	155.7	189.5
2009	152.7	145.6	173.8	115.0	136.6	110.3	124.9	135.0	155.5	168.9	156.7	190.6
2010	157.8	155.4	170.9	131.5	129.1	115.2	129.2	158.5	163.7	169.1	161.7	177.7
2011	167.4	148.3	154.2	138.0	120.2	109.6	131.1	146.3	174.3	173.8	165.0	178.3
2012	169.7	157.6	157.0	130.0	135.2	110.3	124.1	153.0	165.6	164.4	172.0	159.3
2013	174.4	169.4	165.9	132.6	134.6	119.4	124.5	141.4	174.9	178.6	166.5	173.2
2014	164.7	156.3	173.1	132.6	125.1	124.6	133.3	143.7	161.1	176.0	153.5	178.2
2015	167.1	175.0	168.2	128.9	133.0	113.7	113.5	128.8	151.2	177.7	170.0	185.7
2016	159.3	171.8	172.3	129.9	128.5	117.9	122.0	147.9	167.2	173.1	168.9	192.1
2017	166.7	144.6	174.8	143.8	134.5	118.0	139.9	149.0	154.3	179.2	159.4	189.7
2018	165.9	156.9	167.5	133.9	130.0	121.4	131.3	152.2	159.9	187.1	175.1	193.7
2019	178.2	157.2	165.2	136.4	129.9	123.0	141.0	164.7	157.4	184.9	167.1	196.2
2020	165.5	152.3	162.5	134.0	142.9	130.8	143.7	159.0	166.6	174.3	168.0	186.4
TMY	169.5	157.2	174.4	132.3	129.9	111.2	136.0	128.8	154.7	173.8	156.9	159.4

Table 116 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for East of Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	217.8	199.2	175.1	136.5	106.2	105.9	119.1	139.6	185.4	225.6	179.3	277.4
2006	188.2	198.8	183.2	129.0	110.5	109.6	117.2	133.4	177.7	196.4	220.6	253.2
2007	220.8	207.4	180.3	149.4	129.3	106.0	127.0	152.1	186.5	197.9	215.7	232.1
2008	195.2	202.1	168.3	151.6	105.1	102.7	121.2	143.2	184.7	222.7	206.7	268.4
2009	190.3	183.7	180.2	122.5	127.4	98.3	116.7	132.3	167.3	204.5	205.6	271.7
2010	207.2	200.0	176.7	141.8	122.1	102.9	121.2	155.7	177.4	201.2	215.6	245.8
2011	216.5	186.3	159.5	149.3	113.6	97.3	122.1	142.9	188.6	211.0	224.1	249.9
2012	218.1	199.0	162.8	137.8	126.6	98.5	116.6	150.0	180.2	197.0	224.2	218.0
2013	230.2	218.8	174.3	143.5	126.9	106.2	116.5	139.3	189.9	213.9	220.4	242.0
2014	214.7	199.6	182.1	142.0	117.2	110.6	123.8	139.7	172.7	210.1	203.6	245.4
2015	221.5	225.0	174.7	139.4	124.6	100.6	105.6	126.0	162.0	214.9	217.1	263.5
2016	204.9	221.1	180.5	141.0	120.3	104.1	114.2	144.4	181.9	211.5	223.6	274.5
2017	212.8	180.1	181.4	149.8	124.7	104.6	129.9	146.7	165.0	217.5	207.1	268.2
2018	218.6	198.9	173.8	144.0	122.7	107.8	122.3	148.8	175.6	227.7	236.5	276.1
2019	234.3	199.0	169.7	148.4	121.8	108.2	131.4	161.7	170.0	225.6	216.9	278.2
2020	206.1	193.6	165.9	140.3	133.9	114.9	134.9	156.7	182.9	209.0	210.8	262.3
TMY	218.3	199.3	180.2	143.4	123.7	99.8	127.2	126.1	164.5	212.7	204.8	217.8

Table 117 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for East of Aberdeen site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	219.4	204.5	180.3	139.3	110.3	109.8	125.4	147.4	188.8	228.0	185.6	282.5
2006	194.8	201.7	186.9	134.9	112.2	111.5	115.8	136.5	181.6	203.0	221.9	255.4
2007	231.3	211.3	184.8	155.8	130.7	107.6	125.2	155.3	191.9	205.0	217.1	233.9
2008	202.4	205.3	174.0	158.0	106.7	104.0	119.7	146.5	190.9	229.7	208.0	270.4
2009	198.3	187.1	185.2	128.5	129.1	99.8	115.1	134.9	172.2	211.9	206.7	274.0
2010	216.2	204.1	181.9	147.6	123.7	104.5	119.6	159.1	182.6	205.3	216.2	248.0
2011	226.1	189.2	163.8	155.9	115.2	98.8	120.3	145.9	193.9	216.9	225.4	251.6
2012	227.5	201.5	166.7	143.6	128.4	100.0	115.3	153.4	185.4	200.8	224.3	219.4
2013	239.1	222.8	177.7	150.4	128.4	107.2	115.0	143.0	196.5	220.5	221.5	243.4
2014	223.4	202.8	186.8	148.4	119.0	112.4	122.1	142.9	177.8	216.0	204.4	247.5
2015	232.2	229.2	180.1	144.9	126.3	102.4	104.4	128.0	166.3	221.4	218.6	265.1
2016	213.7	224.9	186.3	147.7	122.0	105.3	112.8	147.7	186.2	218.8	224.8	276.7
2017	221.7	182.8	185.8	156.0	126.6	106.7	128.2	150.2	169.8	225.0	207.8	270.3
2018	229.1	202.2	177.2	149.8	124.4	110.0	120.7	152.0	180.7	235.8	237.4	278.0
2019	244.2	202.2	173.7	155.1	123.1	110.2	129.5	165.3	175.1	234.0	218.9	279.8
2020	214.2	196.9	170.7	146.0	135.5	116.6	133.1	160.5	188.3	215.5	212.1	264.3
TMY	227.5	202.3	185.7	150.2	124.5	100.1	127.0	127.9	170.2	219.4	206.7	219.6

Table 118 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Richards Bay site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	113.5	136.8	140.2	104.1	124.4	105.0	115.9	115.0	126.5	119.3	123.9	124.1
2006	108.3	121.9	131.4	109.3	111.7	111.1	128.4	121.1	135.5	118.4	114.6	133.9
2007	144.3	144.2	137.0	106.2	137.3	103.3	119.3	125.4	122.6	120.7	103.6	143.2
2008	120.3	149.4	124.5	116.7	107.8	96.5	124.5	125.4	125.0	121.2	98.4	138.1
2009	90.2	115.7	141.9	111.3	115.6	105.3	117.8	114.2	97.5	108.6	101.5	114.2
2010	112.3	135.6	130.9	110.3	122.9	104.0	114.0	133.5	131.2	120.5	112.8	123.4
2011	123.7	148.5	148.0	103.2	116.5	108.0	102.9	125.2	125.8	117.8	106.5	136.8
2012	148.0	129.9	144.5	116.9	121.9	104.4	123.1	123.6	109.4	104.5	102.6	142.5
2013	110.3	140.3	137.1	119.0	116.8	110.5	105.8	137.7	119.5	122.3	125.4	112.8
2014	145.9	137.7	113.8	117.6	117.1	115.4	124.6	129.6	136.8	122.1	88.3	115.2
2015	135.3	127.9	134.4	110.7	127.9	110.3	100.7	130.5	108.6	141.3	118.5	140.5
2016	137.5	134.6	136.2	111.6	119.1	98.8	102.5	134.4	115.8	101.1	102.0	134.7
2017	126.2	113.5	149.0	122.4	110.6	101.6	103.6	129.2	115.7	127.0	124.7	125.4
2018	153.3	119.1	136.3	109.9	113.0	104.0	119.2	113.3	133.6	140.4	128.8	126.4
2019	118.4	126.1	140.7	100.6	128.6	118.4	126.0	115.4	135.3	133.3	110.3	115.8
2020	140.4	129.3	145.3	105.8	133.2	112.8	125.8	127.3	125.6	120.6	112.1	131.6
TMY	147.7	119.0	148.7	121.9	111.3	104.1	114.7	124.2	126.7	119.3	102.6	142.5

Table 119 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Richards Bay site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	136.5	175.7	148.6	115.0	122.3	101.7	114.8	117.6	142.0	142.1	150.2	169.4
2006	134.6	150.1	138.5	129.4	111.5	102.9	121.1	122.5	150.7	146.6	143.3	180.5
2007	196.7	181.0	145.9	126.5	137.2	96.3	113.6	128.3	135.8	149.1	122.9	196.7
2008	146.2	188.1	132.0	136.7	106.3	90.2	117.1	129.0	139.3	147.9	121.6	185.0
2009	119.7	143.8	150.7	128.8	115.1	97.3	112.0	117.2	107.6	134.2	133.8	152.0
2010	156.3	170.5	140.6	126.3	123.1	97.0	108.1	136.5	147.0	145.0	137.4	163.7
2011	163.9	188.9	156.2	122.3	116.6	100.9	97.8	126.3	139.7	144.7	128.5	185.3
2012	200.9	163.2	161.2	136.2	121.6	97.1	116.8	127.6	124.8	124.9	128.4	194.7
2013	153.0	174.4	142.2	140.7	115.6	103.6	101.5	140.8	133.0	149.5	158.7	148.8
2014	198.6	171.4	125.8	139.0	117.3	107.7	117.8	131.8	152.0	150.4	113.9	151.1
2015	186.9	159.2	137.7	128.6	127.9	103.2	96.2	131.2	121.2	175.8	160.6	190.1
2016	178.0	169.1	138.5	125.9	118.1	92.5	97.8	137.9	128.2	123.2	118.0	180.3
2017	168.2	141.4	156.3	139.5	110.2	95.4	99.2	131.7	129.1	156.1	159.8	166.6
2018	201.1	147.3	143.0	130.0	113.5	97.2	113.0	115.8	148.4	176.1	158.7	168.6
2019	152.5	156.4	148.6	118.0	127.1	110.1	119.8	118.3	151.0	164.1	129.5	152.4
2020	182.4	161.3	151.0	120.2	132.8	104.8	118.6	129.4	140.8	150.3	148.1	176.8
TMY	200.0	147.5	156.3	140.6	109.2	97.4	108.3	126.2	144.8	145.2	129.0	195.1

Table 120 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Richards Bay site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	137.0	174.3	146.8	117.3	124.0	103.9	112.7	117.9	140.7	144.0	147.3	167.7
2006	132.3	150.7	139.0	127.7	111.2	106.2	125.3	122.8	150.7	144.4	143.6	180.0
2007	192.5	183.3	146.3	125.3	136.6	99.5	118.1	128.5	135.4	146.6	122.9	195.6
2008	143.5	190.0	132.6	134.8	106.0	93.1	121.6	128.4	139.5	145.9	121.3	184.1
2009	118.1	144.7	151.0	127.1	114.9	100.0	116.6	117.5	107.1	132.6	133.8	151.1
2010	153.7	172.4	141.4	124.5	122.6	100.3	112.0	136.6	147.0	143.8	137.6	163.6
2011	161.1	190.6	156.3	120.7	116.3	103.8	101.0	127.4	139.9	142.2	128.7	184.3
2012	196.7	164.6	161.3	134.7	121.0	100.1	120.9	127.0	125.2	123.9	128.7	193.8
2013	149.9	176.5	142.1	138.8	115.9	106.8	105.2	140.5	132.2	148.5	158.9	148.5
2014	195.2	173.1	126.1	137.1	116.7	111.6	122.5	132.1	151.8	148.2	114.0	150.6
2015	183.5	160.9	138.3	127.3	127.0	106.4	99.6	132.1	120.8	173.0	161.2	189.2
2016	174.4	171.5	138.4	124.3	118.3	95.7	101.6	138.0	128.3	121.4	118.3	179.2
2017	165.2	142.9	156.8	138.1	109.9	98.9	103.0	131.5	128.4	154.0	160.4	166.0
2018	197.4	148.9	143.9	128.8	113.1	100.4	117.2	116.1	147.9	173.1	159.8	168.0
2019	150.0	157.8	148.7	116.4	126.9	113.2	124.3	118.2	150.2	162.2	129.3	152.4
2020	179.1	162.1	151.2	119.2	132.4	108.4	123.3	129.8	141.1	148.6	148.3	175.8
TMY	196.6	148.9	156.6	137.8	111.1	100.3	112.0	127.2	141.4	144.5	129.0	193.7

Table 121 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Koningskroon site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	103.9	121.4	119.1	102.2	130.4	111.3	126.5	124.8	128.5	117.4	113.0	115.9
2006	103.6	111.5	123.8	111.1	122.0	117.5	132.1	125.7	127.1	120.1	104.8	123.7
2007	126.7	132.1	129.2	108.6	142.3	108.0	132.9	129.6	126.7	106.6	98.7	125.8
2008	107.5	132.7	117.1	106.2	117.0	95.2	125.9	128.7	130.8	113.6	85.6	124.1
2009	85.9	106.7	134.2	111.4	116.3	105.5	124.4	122.8	114.6	101.9	89.6	105.0
2010	101.8	123.7	123.5	98.0	124.9	113.0	118.4	138.5	135.9	110.6	104.7	107.5
2011	108.5	132.5	143.7	101.6	120.0	109.4	115.0	129.8	122.6	118.6	104.1	116.6
2012	131.8	119.9	137.4	128.0	122.6	113.7	125.5	133.4	102.6	104.9	93.3	129.6
2013	96.2	126.5	124.1	114.4	120.8	116.0	112.2	137.5	122.9	112.7	103.9	102.6
2014	128.8	126.4	116.6	116.9	125.1	115.8	128.6	135.3	145.5	107.7	75.7	98.5
2015	124.0	116.7	123.2	102.7	131.3	119.4	107.2	137.6	107.2	139.0	116.5	131.9
2016	118.8	122.8	132.7	108.5	120.7	105.2	112.7	138.4	113.8	96.3	91.6	126.1
2017	115.1	100.1	143.1	121.7	116.7	109.1	112.7	128.5	116.9	124.2	117.5	112.6
2018	134.0	103.0	133.7	102.2	112.2	116.1	123.2	113.7	133.8	135.5	121.4	117.1
2019	110.8	105.8	129.2	94.7	133.6	120.4	134.8	125.5	138.7	128.8	98.3	107.4
2020	127.7	122.3	137.0	104.7	138.0	117.6	134.4	132.0	127.3	114.3	100.6	125.0
TMY	131.9	121.5	136.3	111.5	123.0	110.7	125.1	135.9	114.7	139.3	113.0	129.9

Table 122 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Koningskroon site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	121.3	156.0	125.0	110.8	130.5	110.8	130.2	128.5	143.7	139.9	137.9	158.2
2006	129.8	138.8	132.6	131.2	121.5	109.7	124.6	127.9	143.1	149.7	135.3	168.2
2007	174.0	166.5	138.9	131.5	142.5	102.0	125.9	133.0	141.2	131.8	121.6	173.5
2008	135.2	165.7	123.1	126.9	117.3	90.8	119.3	132.6	145.9	138.8	103.7	165.9
2009	115.7	131.6	141.5	129.5	116.8	99.2	118.8	127.1	128.7	126.1	120.9	140.3
2010	135.0	155.8	136.2	113.9	123.0	105.5	112.9	143.1	153.2	134.6	129.8	143.6
2011	146.2	165.6	151.1	119.6	121.5	104.7	109.3	133.2	135.8	147.9	124.8	159.6
2012	181.3	149.1	149.5	149.4	122.7	107.3	118.7	137.1	116.2	127.3	111.7	177.3
2013	132.6	157.5	130.8	137.1	120.8	108.3	107.0	142.0	139.0	139.6	133.3	135.7
2014	173.0	156.8	129.5	139.4	126.8	110.9	121.3	138.6	162.7	135.8	94.2	130.5
2015	173.8	144.7	125.9	121.9	130.5	111.3	101.5	141.1	121.1	171.1	158.4	179.6
2016	149.5	154.6	134.7	124.7	120.1	98.5	107.9	142.4	127.3	117.9	110.8	171.5
2017	154.6	125.8	153.8	138.4	116.3	103.3	107.3	132.6	131.3	154.8	155.1	148.9
2018	177.5	127.0	138.5	122.6	113.7	109.1	117.1	116.8	149.5	171.2	151.2	156.3
2019	145.4	130.3	135.4	112.9	133.2	112.2	127.3	129.6	156.6	160.9	118.4	142.5
2020	165.7	153.1	141.1	117.0	137.7	111.1	127.3	134.8	142.6	143.7	131.3	169.6
TMY	181.2	155.2	140.9	131.4	119.6	103.6	119.5	138.0	127.9	170.2	135.2	177.7

Table 123 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Koningskroon site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	121.7	154.5	123.3	113.3	131.2	112.8	126.3	128.7	142.6	141.9	135.5	156.7
2006	128.0	139.9	133.3	128.5	122.0	113.3	128.9	128.4	142.5	147.3	135.3	167.4
2007	170.3	169.2	139.6	129.5	142.1	105.0	130.9	133.1	140.7	129.9	121.4	172.0
2008	132.8	166.5	123.6	125.3	116.5	93.8	124.2	132.4	146.2	137.3	104.0	165.0
2009	113.8	132.6	141.3	127.0	117.0	101.6	124.0	126.6	128.2	123.8	121.0	138.9
2010	133.3	157.1	136.5	111.8	125.5	109.0	117.4	143.4	153.1	133.0	129.8	143.0
2011	143.3	166.7	151.5	118.1	120.7	108.2	113.2	133.5	135.6	144.8	125.0	158.9
2012	177.4	151.3	149.6	146.7	123.3	111.2	123.0	136.5	116.7	126.3	112.0	176.4
2013	130.5	159.5	131.0	134.7	121.3	112.2	111.1	141.6	138.1	138.3	133.4	135.4
2014	169.7	158.8	129.8	137.3	125.8	114.6	126.2	138.3	162.0	133.4	94.8	130.5
2015	170.3	145.8	126.5	120.0	130.8	115.1	105.4	140.5	121.4	168.4	158.6	178.1
2016	147.3	156.6	134.5	122.4	120.9	101.8	112.3	142.4	127.3	116.7	111.5	169.7
2017	151.7	127.7	154.4	136.2	117.4	106.8	111.6	131.9	130.9	152.8	155.0	148.7
2018	173.9	128.9	139.3	121.1	113.6	112.6	121.6	116.4	148.0	168.6	151.4	155.2
2019	143.1	132.1	135.3	111.4	133.1	116.0	132.3	129.0	155.8	159.2	118.4	141.9
2020	162.1	155.0	141.4	115.4	138.0	114.9	132.8	135.0	142.3	141.7	131.2	168.3
TMY	178.1	154.5	141.5	129.1	122.6	107.3	124.8	138.9	128.2	168.8	136.6	177.1

Table 124 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Surreyvale site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	121.1	136.2	135.8	106.6	138.3	112.7	132.5	136.7	137.1	120.0	128.8	125.4
2006	120.0	117.0	131.1	117.7	130.0	125.7	138.2	136.0	147.8	125.8	118.9	139.1
2007	140.0	146.7	140.0	118.9	148.5	117.8	139.9	143.1	139.1	107.6	118.6	139.7
2008	119.8	141.5	125.3	116.6	120.9	110.0	136.4	142.4	137.4	134.0	108.5	144.1
2009	97.9	120.6	144.6	116.5	122.5	111.4	135.4	127.2	120.0	104.0	102.4	126.9
2010	108.5	137.3	136.4	109.3	132.8	125.5	125.1	153.4	148.6	119.3	118.6	122.1
2011	119.2	147.0	153.0	106.2	125.0	124.9	122.0	137.6	138.8	126.5	117.8	133.5
2012	142.4	137.8	146.6	139.1	130.9	125.6	130.3	147.0	119.1	119.0	113.8	142.1
2013	106.0	141.8	136.0	120.3	132.3	124.7	123.2	136.0	137.5	120.5	113.6	115.4
2014	139.6	133.7	122.3	125.8	134.8	131.2	133.2	140.0	154.2	122.2	96.2	122.6
2015	142.3	132.4	135.0	114.7	139.5	125.4	117.0	147.0	120.5	144.8	123.6	138.3
2016	126.8	136.7	141.5	123.3	123.6	114.6	121.1	157.0	129.2	114.6	100.3	136.2
2017	124.0	109.9	155.3	127.0	123.2	118.0	130.5	141.0	126.1	132.6	123.8	121.3
2018	138.6	116.1	137.7	114.0	121.4	126.8	134.6	125.4	151.8	146.1	130.9	132.1
2019	120.6	126.8	142.2	106.9	141.0	125.9	142.4	146.0	151.1	145.9	115.8	122.8
2020	138.2	128.1	144.1	111.2	144.3	126.8	141.0	143.8	133.1	127.4	112.6	143.9
TMY	108.8	127.1	155.4	118.0	126.0	119.1	133.7	148.1	138.2	115.3	123.9	115.7

Table 125 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Surreyvale site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	147.8	174.0	137.1	114.8	138.5	112.7	136.6	140.1	153.2	143.6	158.4	171.7
2006	149.5	146.5	139.8	141.6	132.4	119.9	134.1	137.5	173.1	156.0	165.9	196.7
2007	186.0	196.5	153.5	149.0	147.4	111.9	136.9	150.6	161.5	136.9	160.5	195.6
2008	151.5	179.1	138.3	149.8	116.9	109.5	132.1	152.4	160.0	172.3	138.0	199.4
2009	132.3	149.0	157.6	141.9	124.5	108.0	129.5	134.9	140.4	135.0	136.3	189.6
2010	150.0	175.2	157.8	134.3	131.1	119.6	126.3	157.8	172.5	161.5	153.6	174.6
2011	151.5	190.9	167.8	127.7	124.4	118.6	116.1	143.5	164.8	167.8	155.4	185.6
2012	188.7	175.1	165.6	159.9	132.8	121.6	130.5	154.5	139.6	163.9	158.9	204.7
2013	156.1	183.8	147.2	140.7	134.0	122.6	125.2	144.7	158.4	154.2	148.6	164.3
2014	192.5	166.6	139.9	153.3	136.6	127.6	130.9	151.2	174.6	157.9	135.3	167.3
2015	192.8	166.0	136.7	146.5	137.0	121.2	116.0	150.1	136.1	180.1	179.3	194.0
2016	156.8	166.1	147.7	140.1	116.6	110.0	118.4	160.6	152.4	158.9	136.5	192.9
2017	166.1	138.4	170.3	146.3	119.3	115.7	128.2	145.6	148.1	173.7	170.6	172.4
2018	195.7	150.4	138.6	138.3	118.8	121.8	128.8	134.5	177.7	192.8	176.4	189.4
2019	172.9	164.8	158.5	122.9	141.9	121.2	139.0	154.2	174.1	201.2	160.3	175.5
2020	178.6	162.9	150.5	130.3	140.8	119.8	136.6	152.3	156.4	177.1	159.8	200.7
TMY	148.9	157.4	164.9	138.7	123.7	111.9	126.6	151.6	154.5	140.9	169.1	156.0

Table 126 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Surreyvale site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	147.4	171.4	138.3	116.9	139.0	115.0	132.6	140.5	153.0	146.3	158.0	171.1
2006	149.9	147.8	143.8	135.6	130.6	121.2	135.2	139.6	164.9	152.9	152.5	188.4
2007	186.6	187.4	152.3	139.2	148.8	112.5	138.0	146.9	155.2	131.3	143.5	190.1
2008	146.7	178.4	134.2	136.5	119.2	105.7	134.9	145.7	154.1	163.3	134.2	194.4
2009	126.8	150.8	151.6	135.6	122.3	106.7	133.7	130.6	134.2	128.3	131.5	167.1
2010	146.4	174.5	148.9	123.7	132.1	121.2	124.0	157.2	167.8	145.6	146.4	164.7
2011	152.9	187.2	161.6	124.0	125.1	119.6	120.1	141.8	154.8	155.2	147.3	182.1
2012	186.8	174.3	159.4	158.0	130.2	120.4	128.0	150.4	135.0	144.4	146.8	194.7
2013	144.7	180.0	143.9	141.0	132.6	121.2	122.2	140.4	153.4	148.2	147.3	154.8
2014	185.0	168.3	136.9	147.8	135.3	126.0	131.3	144.0	171.9	150.5	123.2	163.0
2015	195.7	167.9	139.7	133.2	138.7	120.3	115.3	150.8	135.7	177.9	169.1	188.7
2016	155.8	172.9	145.2	140.1	123.8	110.7	120.0	161.2	144.2	139.5	122.1	186.5
2017	162.5	139.3	164.8	144.0	123.2	113.2	128.7	143.4	139.9	163.2	164.1	160.0
2018	183.0	147.4	143.1	133.5	121.9	121.2	132.4	129.3	169.8	183.0	168.4	177.2
2019	159.5	158.4	152.5	124.3	140.1	120.7	140.3	149.6	170.1	180.6	146.1	166.1
2020	177.3	163.0	147.9	126.4	144.2	121.9	139.8	147.4	149.9	158.8	151.4	197.3
TMY	146.8	158.9	165.2	136.2	125.7	115.7	131.9	151.5	154.1	140.0	169.7	155.3

Table 127 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Kingsley site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	121.1	136.2	135.8	106.6	138.3	112.7	132.5	136.7	137.1	120.0	128.8	125.4
2006	120.0	117.0	131.1	117.7	130.0	125.7	138.2	136.0	147.8	125.8	118.9	139.1
2007	140.0	146.7	140.0	118.9	148.5	117.8	139.9	143.1	139.1	107.6	118.6	139.7
2008	119.8	141.5	125.3	116.6	120.9	110.0	136.4	142.4	137.4	134.0	108.5	144.1
2009	97.9	120.6	144.6	116.5	122.5	111.4	135.4	127.2	120.0	104.0	102.4	126.9
2010	108.5	137.3	136.4	109.3	132.8	125.5	125.1	153.4	148.6	119.3	118.6	122.1
2011	119.2	147.0	153.0	106.2	125.0	124.9	122.0	137.6	138.8	126.5	117.8	133.5
2012	142.4	137.8	146.6	139.1	130.9	125.6	130.3	147.0	119.1	119.0	113.8	142.1
2013	106.0	141.8	136.0	120.3	132.3	124.7	123.2	136.0	137.5	120.5	113.6	115.4
2014	139.6	133.7	122.3	125.8	134.8	131.2	133.2	140.0	154.2	122.2	96.2	122.6
2015	142.3	132.4	135.0	114.7	139.5	125.4	117.0	147.0	120.5	144.8	123.6	138.3
2016	126.8	136.7	141.5	123.3	123.6	114.6	121.1	157.0	129.2	114.6	100.3	136.2
2017	124.0	109.9	155.3	127.0	123.2	118.0	130.5	141.0	126.1	132.6	123.8	121.3
2018	138.6	116.1	137.7	114.0	121.4	126.8	134.6	125.4	151.8	146.1	130.9	132.1
2019	120.6	126.8	142.2	106.9	141.0	125.9	142.4	146.0	151.1	145.9	115.8	122.8
2020	138.2	128.1	144.1	111.2	144.3	126.8	141.0	143.8	133.1	127.4	112.6	143.9
TMY	108.8	127.1	155.4	118.0	126.0	119.1	133.7	148.1	138.2	115.3	123.9	115.7

Table 128 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Kingsley site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	147.8	174.0	137.1	114.8	138.5	112.7	136.6	140.1	153.2	143.6	158.4	171.7
2006	149.5	146.5	139.8	141.6	132.4	119.9	134.1	137.5	173.1	156.0	165.9	196.7
2007	186.0	196.5	153.5	149.0	147.4	111.9	136.9	150.6	161.5	136.9	160.5	195.6
2008	151.5	179.1	138.3	149.8	116.9	109.5	132.1	152.4	160.0	172.3	138.0	199.4
2009	132.3	149.0	157.6	141.9	124.5	108.0	129.5	134.9	140.4	135.0	136.3	189.6
2010	150.0	175.2	157.8	134.3	131.1	119.6	126.3	157.8	172.5	161.5	153.6	174.6
2011	151.5	190.9	167.8	127.7	124.4	118.6	116.1	143.5	164.8	167.8	155.4	185.6
2012	188.7	175.1	165.6	159.9	132.8	121.6	130.5	154.5	139.6	163.9	158.9	204.7
2013	156.1	183.8	147.2	140.7	134.0	122.6	125.2	144.7	158.4	154.2	148.6	164.3
2014	192.5	166.6	139.9	153.3	136.6	127.6	130.9	151.2	174.6	157.9	135.3	167.3
2015	192.8	166.0	136.7	146.5	137.0	121.2	116.0	150.1	136.1	180.1	179.3	194.0
2016	156.8	166.1	147.7	140.1	116.6	110.0	118.4	160.6	152.4	158.9	136.5	192.9
2017	166.1	138.4	170.3	146.3	119.3	115.7	128.2	145.6	148.1	173.7	170.6	172.4
2018	195.7	150.4	138.6	138.3	118.8	121.8	128.8	134.5	177.7	192.8	176.4	189.4
2019	172.9	164.8	158.5	122.9	141.9	121.2	139.0	154.2	174.1	201.2	160.3	175.5
2020	178.6	162.9	150.5	130.3	140.8	119.8	136.6	152.3	156.4	177.1	159.8	200.7
TMY	153.5	191.7	150.1	128.1	126.8	121.1	129.6	163.4	136.1	159.5	153.8	164.8

Table 129 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Kingsley site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	147.8	174.0	137.1	114.8	138.5	112.7	136.6	140.1	153.2	143.6	158.4	171.7
2006	149.5	146.5	139.8	141.6	132.4	119.9	134.1	137.5	173.1	156.0	165.9	196.7
2007	186.0	196.5	153.5	149.0	147.4	111.9	136.9	150.6	161.5	136.9	160.5	195.6
2008	151.5	179.1	138.3	149.8	116.9	109.5	132.1	152.4	160.0	172.3	138.0	199.4
2009	132.3	149.0	157.6	141.9	124.5	108.0	129.5	134.9	140.4	135.0	136.3	189.6
2010	150.0	175.2	157.8	134.3	131.1	119.6	126.3	157.8	172.5	161.5	153.6	174.6
2011	151.5	190.9	167.8	127.7	124.4	118.6	116.1	143.5	164.8	167.8	155.4	185.6
2012	188.7	175.1	165.6	159.9	132.8	121.6	130.5	154.5	139.6	163.9	158.9	204.7
2013	156.1	183.8	147.2	140.7	134.0	122.6	125.2	144.7	158.4	154.2	148.6	164.3
2014	192.5	166.6	139.9	153.3	136.6	127.6	130.9	151.2	174.6	157.9	135.3	167.3
2015	192.8	166.0	136.7	146.5	137.0	121.2	116.0	150.1	136.1	180.1	179.3	194.0
2016	156.8	166.1	147.7	140.1	116.6	110.0	118.4	160.6	152.4	158.9	136.5	192.9
2017	166.1	138.4	170.3	146.3	119.3	115.7	128.2	145.6	148.1	173.7	170.6	172.4
2018	195.7	150.4	138.6	138.3	118.8	121.8	128.8	134.5	177.7	192.8	176.4	189.4
2019	172.9	164.8	158.5	122.9	141.9	121.2	139.0	154.2	174.1	201.2	160.3	175.5
2020	178.6	162.9	150.5	130.3	140.8	119.8	136.6	152.3	156.4	177.1	159.8	200.7
TMY	151.1	192.9	150.6	126.2	128.8	125.7	135.5	164.4	137.2	158.9	154.3	164.2

Table 130 : Monthly predicted AC energy generation of 1 MWp fixed tilt plant under typical annual weather variation (2005-2020) for Waterbult site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	128.3	133.0	138.7	121.1	149.5	127.0	147.4	147.9	163.2	145.0	139.5	152.8
2006	118.4	113.9	123.5	127.2	138.7	135.0	147.4	148.6	170.0	136.1	131.4	142.5
2007	144.3	157.0	154.0	128.3	156.5	128.7	153.0	163.5	155.3	121.3	132.3	143.1
2008	121.2	140.6	127.0	138.0	124.1	126.1	147.7	158.0	164.8	152.5	125.6	156.7
2009	109.8	125.2	147.5	130.9	137.9	116.1	145.4	142.5	154.1	134.0	119.4	151.1
2010	108.9	146.1	150.9	121.1	140.2	138.8	146.0	166.6	173.0	142.6	126.2	136.5
2011	119.7	135.2	149.5	107.7	136.1	131.1	126.6	147.3	168.4	156.3	139.6	150.7
2012	149.1	143.4	158.9	146.9	143.6	133.1	149.0	152.6	142.5	143.9	132.4	139.7
2013	130.3	148.3	149.7	123.0	140.4	139.4	141.1	158.0	160.7	146.5	126.2	131.6
2014	140.9	130.4	123.3	144.0	150.3	141.4	151.9	146.8	163.9	154.7	113.4	132.3
2015	144.9	148.7	143.0	128.4	148.9	133.9	134.3	162.3	137.0	151.3	141.6	153.1
2016	126.0	142.6	151.5	128.3	125.4	128.9	131.9	168.2	150.4	152.1	127.7	143.6
2017	134.5	111.4	166.0	126.9	125.8	137.3	144.8	160.3	153.7	149.3	129.9	142.6
2018	148.4	123.4	133.1	112.8	128.5	137.8	144.1	148.3	169.5	161.1	147.0	152.6
2019	142.8	138.2	150.3	110.5	150.6	139.5	152.1	166.2	168.9	169.8	143.6	128.3
2020	143.2	131.5	143.7	114.7	152.1	134.5	150.3	166.2	162.4	153.1	120.7	146.1
TMY	144.6	135.5	143.3	137.3	150.1	133.2	148.9	169.4	164.5	155.1	113.7	153.5

Table 131 : Monthly predicted AC energy generation of 1 MWp single axis tracker WoBT plant under typical annual weather variation (2005-2020) for Waterbult site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	156.4	173.9	140.2	135.3	152.5	136.5	154.5	152.4	181.9	176.4	173.3	209.9
2006	147.2	141.3	135.9	148.0	132.5	126.1	139.9	149.0	193.6	169.9	174.1	196.9
2007	192.8	199.5	166.4	150.0	147.8	119.6	145.5	163.8	177.1	147.7	169.0	200.9
2008	155.4	179.0	136.8	161.6	117.6	117.5	140.8	159.4	187.7	187.9	157.8	218.2
2009	147.3	157.9	155.9	152.6	131.0	109.2	138.5	143.2	173.5	162.9	152.7	210.0
2010	140.0	185.6	162.6	135.3	133.4	129.2	138.9	167.4	197.0	174.0	162.9	187.5
2011	149.8	174.4	159.1	126.7	129.9	122.6	120.9	148.8	191.3	192.9	186.3	210.7
2012	199.0	181.1	170.2	168.5	136.1	124.4	142.1	154.3	162.1	175.4	172.0	196.3
2013	174.7	186.3	157.9	146.8	134.0	130.2	134.4	159.9	181.5	178.8	167.6	180.1
2014	187.5	166.3	140.8	168.8	142.5	131.8	144.8	149.0	186.2	191.4	149.3	183.9
2015	200.2	192.9	148.8	149.8	141.6	125.3	128.3	162.6	155.3	186.6	195.0	212.3
2016	161.5	179.8	160.1	146.9	119.8	120.4	125.7	169.5	170.8	188.0	159.0	195.9
2017	175.9	138.1	178.7	147.5	119.1	127.7	138.1	160.1	173.4	183.6	178.1	195.3
2018	199.1	152.4	141.7	134.4	122.2	128.4	137.4	150.0	192.8	201.4	196.4	212.1
2019	191.7	172.7	159.5	131.3	142.5	129.8	144.7	167.1	193.0	211.3	180.2	178.7
2020	185.2	166.0	147.8	129.9	144.4	125.4	143.3	166.9	185.3	189.2	161.3	202.0
TMY	194.1	175.6	149.4	165.6	143.1	124.7	141.8	173.9	186.9	194.8	150.3	213.4

Table 132 : Monthly predicted AC energy generation of 1 MWp single axis tracker WBT plant under typical annual weather variation (2005-2020) for Waterbult site

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	157.4	172.5	143.8	138.5	151.1	131.7	149.6	153.5	183.4	179.2	173.9	212.8
2006	148.7	142.3	136.1	147.0	139.5	130.3	145.4	152.4	192.7	171.3	173.9	195.3
2007	193.8	202.4	167.1	148.7	156.9	123.2	151.7	168.4	176.0	148.9	168.6	198.8
2008	155.0	181.0	136.6	160.4	122.8	121.2	146.7	163.0	186.8	189.3	157.3	215.7
2009	148.8	159.2	155.4	151.3	138.0	112.4	144.3	146.2	172.4	164.3	153.1	207.9
2010	140.2	188.0	163.2	133.5	141.2	133.5	144.5	171.5	195.9	175.7	162.7	186.1
2011	150.4	176.9	159.2	126.3	136.9	126.7	125.8	152.2	190.2	195.4	185.6	208.9
2012	199.0	182.8	170.0	166.7	144.1	128.3	148.0	157.9	162.4	177.6	171.4	194.2
2013	175.1	189.1	157.7	145.3	142.4	134.7	139.9	163.4	180.6	181.3	167.5	179.0
2014	188.9	167.2	140.7	167.6	150.7	136.4	150.9	152.5	185.3	193.7	149.2	182.8
2015	200.8	194.4	148.8	149.1	149.9	129.2	133.4	166.8	155.4	188.9	194.7	210.2
2016	161.8	180.9	159.6	145.8	126.0	124.2	130.9	173.0	170.0	188.3	158.2	194.4
2017	176.1	139.6	178.7	145.0	126.5	131.8	143.7	163.9	172.2	186.2	177.9	193.6
2018	200.0	153.7	142.2	134.0	129.3	132.3	143.2	152.9	192.0	203.3	196.3	210.2
2019	191.0	174.4	159.6	130.1	150.9	134.0	151.0	170.7	192.3	213.5	180.5	177.7
2020	185.8	168.4	148.0	128.5	152.5	129.4	149.7	171.1	185.2	190.6	161.1	199.9
TMY	194.6	177.7	149.4	160.7	152.3	128.8	147.8	174.2	186.2	194.4	149.8	210.9