



REGIONE SICILIANA  
LIBERO CONSORZIO COMUNALE DI TRAPANI  
COMUNI DI CALATAFIMI SEGESTA E GIBELLINA

PROGETTO PER LA REALIZZAZIONE DI UN IMPIANTO EOLICO DI POTENZA PARI A  
 $P_n = 75,4 \text{ MW}$  ( $P_i = 72 \text{ MW}$ ), SU TERRENO SITO NEL COMUNE DI CALATAFIMI SEGESTA (TP)  
 IN CATASTO AI FG. 94 P.LLE 246, 247, 368, 248, 340, 411, AL FG. 99 P.LLE 93, 92, 3, AL FG. 107 P.LLE  
 7, 15, 16, 123, 209, 208, 54, 206, AL FG. 104 P.LLE 4, 49, 33, 156, 157, AL FG. 106 P.LLE 93, 86, 23, 94,  
 AL FG. 107 P.LLA 44, AL FG. 105 P.LLA 128, AL FG. 115 P.LLE 192, 136, 281, 66, 208, AL FG. 117 P.LLE  
 38, 28, E AL FG. 98 P.LLE 468, 463, 469, 470, 471 E ALTRE AFFERENTI ALLE OPERE DI RETE NEI  
 COMUNI DI CALATAFIMI SEGESTA E GIBELLINA (TP)

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## STUDIO ANEMOLOGICO

IDENTIFICAZIONE ELABORATO							
Livello prog.	ID Terna S.p.A.	Tipo Elabor.	N.ro Elabor.	Project ID	NOME FILE	DATA	SCALA
<b>PDef</b>	202100949	Relazione	05	CANICHIDDEUSI	CANICHIDDEUSI Studio Anemologico del 15 12 2022.docx	20.12.2022	-
REVISIONI							
VERSIONE	DATA	DESCRIZIONE			ESEGUITO	VERIFICATO	APPROVATO
Rev.00	20.12.2022	Prima emissione			MI	MTM	VM

<p>IL PROPONENTE</p> <p style="text-align: center;"><b>CANICHIDDEUSI WIND SRL</b></p> <p style="text-align: center;">Sede legale: Corso di Porta Vittoria, 9 - 20122 - Milano          PEC: canichiddeusiwind@mailcertificata.net          P.IVA 12673200965</p>	<p>PROGETTO DI</p> <p style="text-align: center;"><b>CAPITAL ENGINEERING</b></p> <p style="text-align: center;">Capital Engineering S.n.c.          Sede legale: Via Trinacria, 52 - 90144 - Palermo          e-mail: info@capitalengineering.it</p> <p>SU INCARICO DI</p> <p style="text-align: center;"><b>Coolbine</b></p> <p style="text-align: center;">Grounded Clean Ventures</p> <p style="text-align: center;">Coolbine S.r.L.          Sede legale: Via Trinacria, 52 - 90144 - Palermo          e-mail: progettazione@coolbine.it</p>
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Sommario

1. Premessa.....	1
2. Studio anemologico .....	1

## 1. Premessa

Il presente documento descrive lo studio anemologico prodotto dalla ditta Wind Pioneers dell'impianto eolico oggetto del presente progetto definito, nel seguito denominato "Canichiddeusi", proposto dalla società Canichiddeusi Wind S.r.L. e che si svilupperà tra i comuni di Calatafimi Segesta e Gibellina, entrambi in provincia di Trapani.

## 2. Studio anemologico

# Canichiddeusi – Prefeasibility



### Introduction

- The following metrics were analysed by Wind Pioneers in the project:
  - Wind data
  - Terrain
  - Development Constraints
  - Wind Maps
  - Layout Design
  - Net Energy Estimates.



Layout Shared by Client



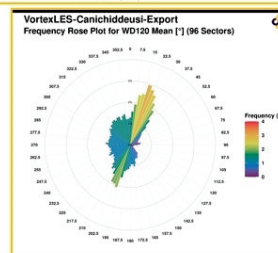
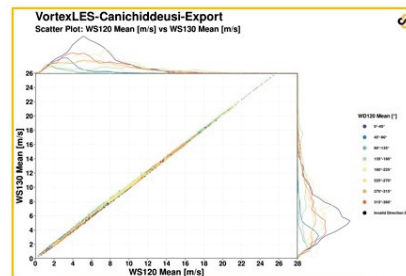
Layout Designed by WP

# Wind Data – Vortex LES



### Vortex LES – What is it?

- Vortex uses Large Eddy Simulation to model the wind resources at a site.
- One full year representative of the long term is estimated by Vortex LES.
- ERA5 data is used to for the long term estimates.
- The representative year chosen by Vortex LES for this location is 10-09-2014 to 10-09-2015.
- The mean wind speed at 120m is 6.478 m/s.
- Looking at the wind rose, there are two wind directions – NE and SW.

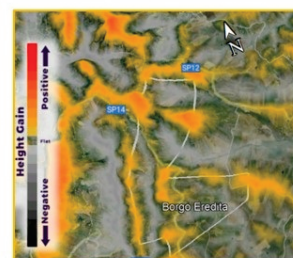
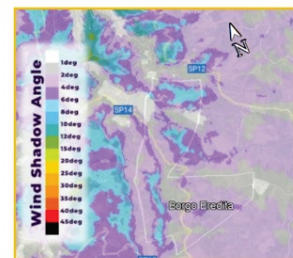
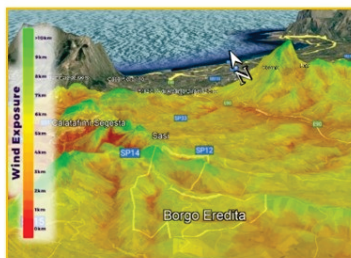


## Terrain Maps



### How does the terrain look like?

- The site area is located in a funnel and is well exposed to winds coming from the northern direction.
- The terrain can be classified as undulating – There are valleys in the site as well as nice ridges with good elevation features.
- There are few areas in the site where the slope exceeds 17 deg.
- Overall, there is limited area available for placement of wind turbines within the site area.



## Wind Maps



### Methodology

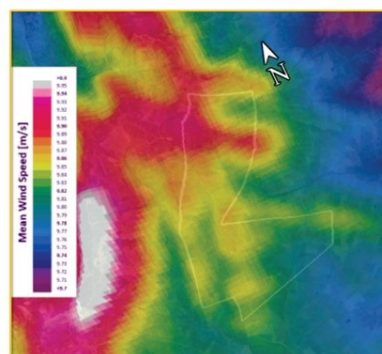
- Two mesoscale maps were used – GWA and Vortex FARM.
- Vortex LES was used to calibrate both maps.
- 50% weightage was given to the uncalibrated and calibrated Vortex FARM maps.
- Two independent models (LES + FARM) to predict the wind resources on site.

Primary Height for Validation

Wind Map Name	Mast Wind Speeds			Measurements on Map	Bias			Absolute Error		
	Min	Max	Average	Count	Min	Max	Average	Min	Max	Average
Measured	6.47	6.47	6.47							
VortexFARM	6.83	6.83	6.83	1	105%	105%	105%	0.35	0.35	0.35
GWA	6.79	6.79	6.79	1	105%	105%	105%	0.31	0.31	0.31

Final Map Blending			
Map	Calibration	Weighting Points	Weighting Percentage
VortexFARM	Uncalibrated	50	50%
VortexFARM	Simple	50	50%

RESULTS OF FINAL MAP Bias @ Measurements Systems		
Min	Max	Average
102%	102%	102%
Absolute Error		
Min	Max	Average
0.16	0.16	0.16



# Net Energy Estimates



## Preliminary Energy Results

- Virtual met mast, wind maps, turbine power curves, wake modelling and loss assumptions have been combined to create a preliminary estimate of energy yield
- Results are high uncertainties and may vary (both up and down) once on-site measurements are available

	Site	Unit	2 Client Layout
Configuration	Turbine	-	Vestas V162-6.0MW - V128-3.4MW
	Hub Height	m	Multiple Heights - from 87m to 166m
	Turbine Rated Power	MW	6.0 - 3.4
	Turbine Locations	-	13
<b>Wind Farm Rated Power</b>			
			<b>MW</b>
			<b>75.4</b>
Gross	Average HH Wind Speed	m/s	6.94
	Gross Output	GWh/a	219.3
	<b>Gross Capacity Factor</b>	<b>%</b>	<b>34.75</b>
Losses	Wakes (Park Efficiency)	%	92.8
	Availability	%	97.0
	Electrical	%	97.0
	Turbine Performance	%	97.0
	Environmental curtailments	%	98.5
	Other	%	100.0
	Total Non-Wake Losses	%	89.9
Net	Net Output (P50)	GWh/a	190.6
	Net Output (Per Turbine)	GWh/a	15.26
	<b>Net Capacity Factor (P50)</b>	<b>%</b>	<b>29.02</b>
Uncertainties	Std Dev % of P50 (1-year)	%	15.78
	P75 Net Yield (1-year)	GWh/a	183.6
	P75 Capacity Factor (1-year)	%	25.93
	P90 Net Yield (1-year)	GWh/a	146.1
	P90 Capacity Factor (1-year)	%	23.15
	P90/P50 Ratio (1-year)	%	79.8
	Std Dev % of P50 (20-years)	%	12.68
	P75 Net Yield (20-years)	GWh/a	167.5
	P75 Capacity Factor (20-years)	%	26.53
P90 Net Yield (20-years)	GWh/a	153.4	
P90 Capacity Factor (20-years)	%	24.30	
P90/P50 Ratio (20-years)	%	83.8	