Regione CALABRIA

Comune di CORIGLIANO-ROSSANO

Comune di TERRANOVA DA SIBARI

Committente:

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Titolo del Progetto:

PARCO EOLICO "TERRANOVA"

Documento:	N° Documento:
Progetto Definitivo	**W-TER-P-AN-RE-01**

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Elaborato:

Studio anemologico

SCALA:		Nome file:	W-TER-P-AN-RE-01_Studio anemologico

Progettazione:

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17.04.2023 19:46:00
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00	APRILE 2023	PRIMA EMISSIONE	GEMSA	GEMSA	PLT RE

REPORT ON SITE SUITABILITY AND WIND RESOURCES OF THE PROPOSED WIND FARM PROJECT AT TERRANOVA, COSENZA, ITALY

1. Site Description

The proposed plot for the project is Terranova, Terranova is a town and comune in the province of Cosenza in the Calabria region of southern Italy. The site is 3 km far away from nearby Terranova and the terrain is found to be undulated as the google earth image.

The general details of the project are given in Table1.

Project Site	Terranova, Province of Cosenza, Italy
Wind farm Capacity	60 MW (10 WTGs x 6 MW)
Model of WTG Proposed	V162-6.0 MW-T119m
Capacity of Individual WTG	6.0 MW
Rotor Diameter	162 m
Hub Height	119 m

Fig1. Proposed wind farm site at Terranova, Province of Cosenza, Italy

2. Wind Resources at Site - GLOBAL WIND ATLAS (WASP LIB)

The Global Wind Atlas (GWA 3.1) is generated by the Wind Energy Department of the Technical University of Denmark (DTU Wind Energy) and the World Bank Group (World Bank & International Finance Corporation). Key input is ERA-5 Reanalysis data along with topographical data. WAsP .lib file is generated for every 3 km using Meso-Micro (WRF-WAsP) combined model. In the present analysis WASP .lib file of nearest point is used for the detailed assessment.

The Wind Speed map (from Global Wind Atlas) of the proposed wind farm regions are given Fig. 2.

Table 2. Details of data

Mesoscale Data set	Global Wind Atlas (WAsP lib)
Height (m)	100 m
Data Period	Jan 2007 to Dec 2017 (10years)
Spatial; Co- ordinates	UTM Zone :33S 619009.59m E 4393525.18m N
Average Wind Speed	5.30 m/s
Airdensity	1.19 kg/m^3

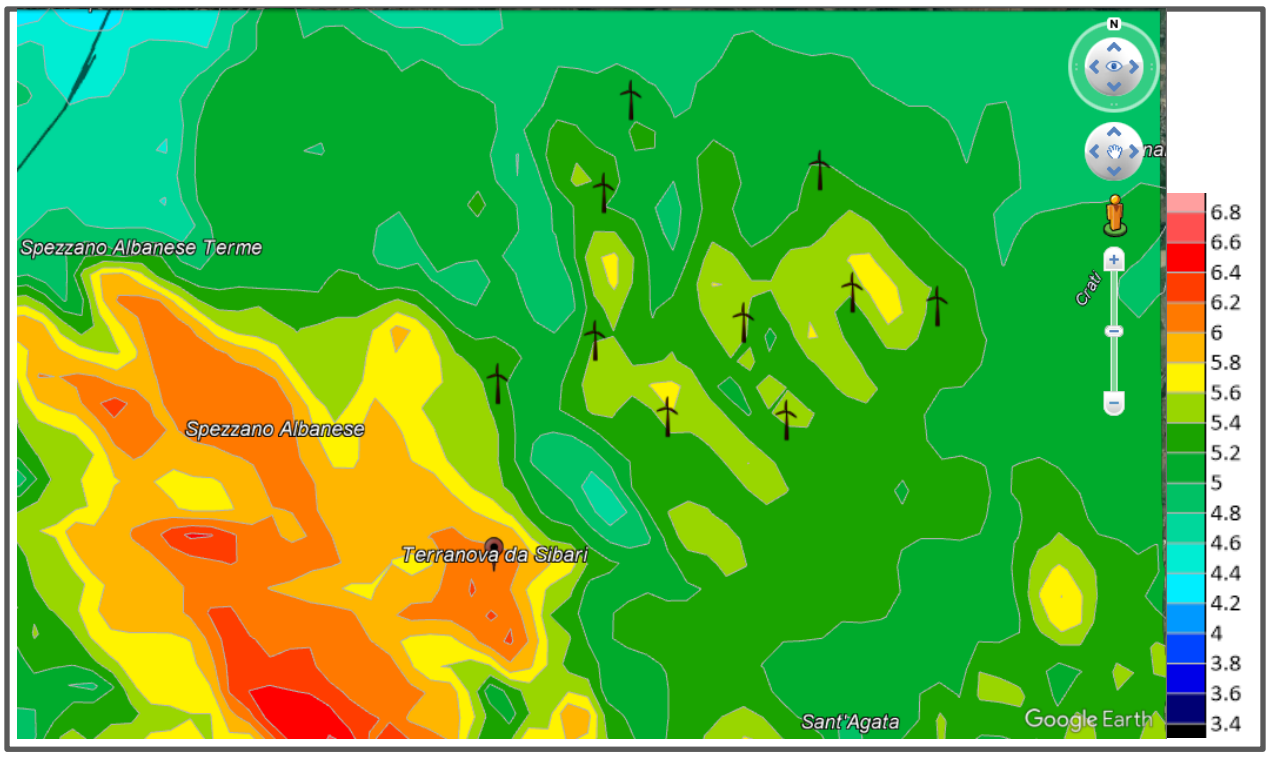


Fig 2. Wind Speed Map of proposed wind farm region at 100 m a.m.s.l

3. Proposed wind farm layout

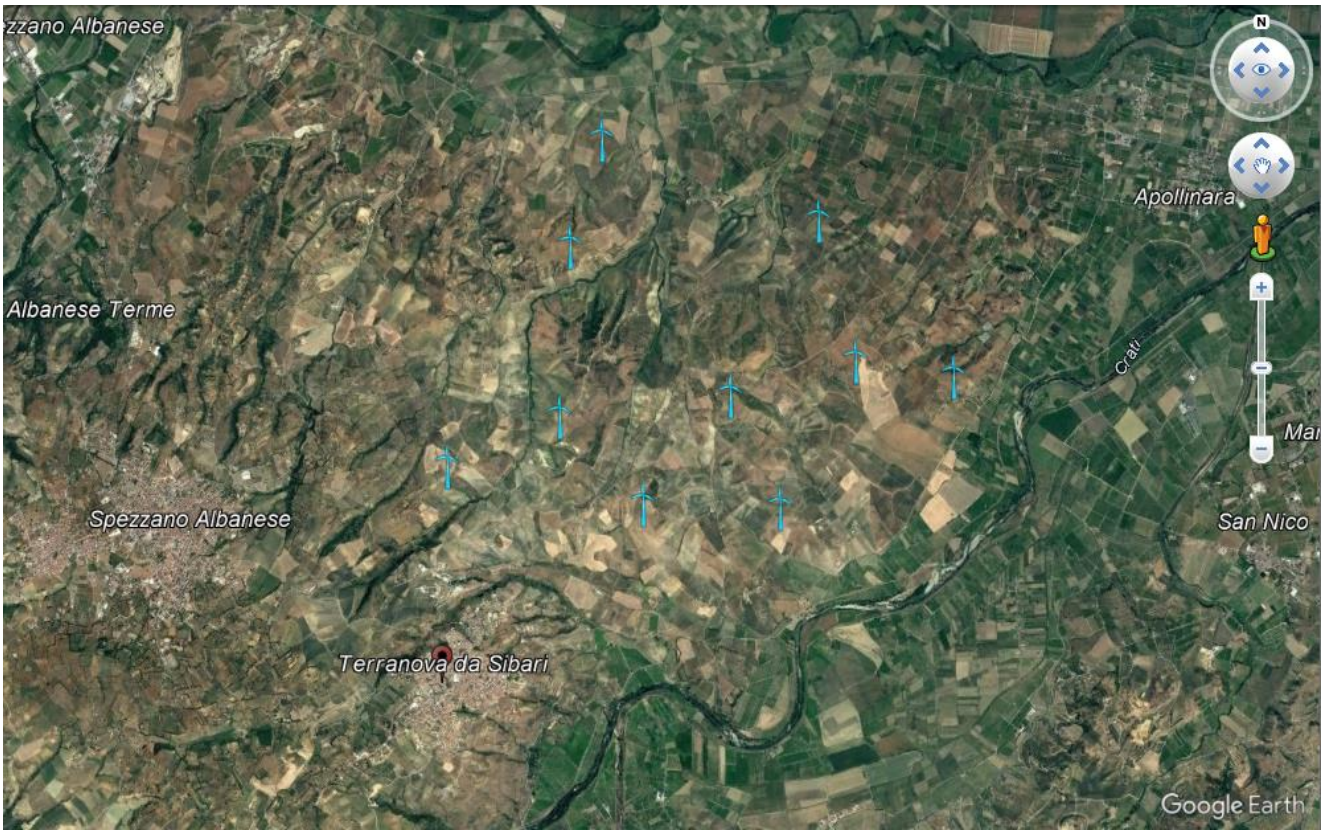


Fig 3. Proposed wind farm layout

Table 3. Location details of the proposed WTGs

Sl. No.	LABEL	UTM Zone : 33S	
		X	Y
1	TRN 01	616272	4395560
2	TRN 02	618352	4394821
3	TRN 03	615985	4394531
4	TRN 04	615911	4392920
5	TRN 05	617530	4393141
6	TRN 06	618714	4393487
7	TRN 07	619661	4393356
8	TRN 08	614858	4392437
9	TRN 09	616715	4392105
10	TRN 10	618023	4392087

4. Estimation of AEP

Table 4. Summary of AEP Results

Terranova Wind Farm - WTG Model: Vestas V162/6MW_RD: 162m HH:119m										
SL. No	Site ID	X [m]	Y [m]	Elevation [m]	WTG Model	Hub Height (m)	Wind Speed [m/s]	Wake Losses %	NET Yield (MWh/yr)	NEH
1	TRN 01	616272	4395560	59.2	V162/6MW	119	5.50	1.03	12889	2148
2	TRN 02	618352	4394821	71.6	V162/6MW	119	5.50	2.47	12688	2115
3	TRN 03	615985	4394531	111.6	V162/6MW	119	5.63	1.40	13141	2190
4	TRN 04	615911	4392920	151.9	V162/6MW	119	5.51	4.57	12452	2075
5	TRN 05	617530	4393141	131.2	V162/6MW	119	5.57	3.45	12691	2115
6	TRN 06	618714	4393487	124.3	V162/6MW	119	5.70	5.12	12714	2119
7	TRN 07	619661	4393356	85.5	V162/6MW	119	5.63	3.28	12800	2133
8	TRN 08	614858	4392437	202.4	V162/6MW	119	5.45	1.73	12592	2099
9	TRN 09	616715	4392105	134.7	V162/6MW	119	5.66	2.11	13019	2170
10	TRN 10	618023	4392087	85.0	V162/6MW	119	5.67	1.50	13122	2187
Average							5.58	2.67	12811	2135
Total Energy Generation									128108	
Estimated Capacity Factor per machine (%)									24.4	

Table 5. Standard loss factors used to calculate the NET Energy value.

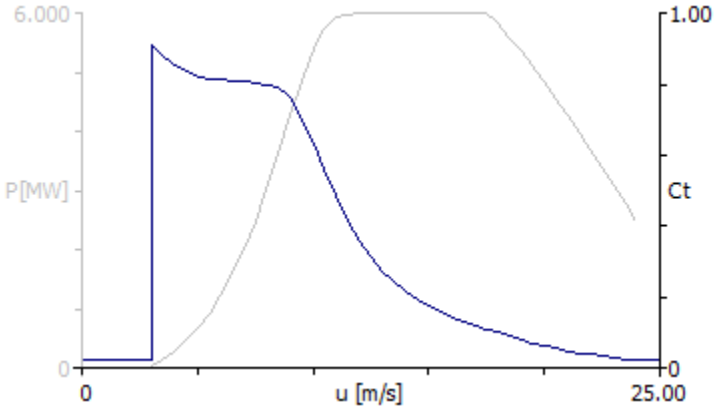
Unavailability	Contract Unavail.	3.00%
	Maintenance Unavail.	0.50%
	Subst.& HVL Unavail.	0.50%
	Untwisting Losses	0.10%
WT Performace	Hysteresis Losses	0.20%
	Drive Train Degradation	0.50%
	Site Specific Power Curve	0.10%
	WT Blockage Effect Losses	1.00%
	Big WF Blockage Effect Losses	
Environmental	Temp. Losses	0.10%
	Ice Losses	0.10%
Curtailment	Shadow Losses	
	Bats Losses	
	Shut down Losses	
Eletrical	Grid Losses	3.00%
	Total Losses	**8.79%**

5. Conclusion / Recommendations

- AEP of the project has been calculated using standard wind analysis software such as WAsP and the input data viz, Global Wind Atlas .lib, topography and turbine data and proper assumptions have been made for arriving final values.
- Since the ERA5 100m Re analysis data is based on the mesoscale method, localized wind flows might not have been predicted precisely. Considering the same it is advised to measure wind characteristics at representative locations within the proposed area with the help of suitable anemometry. Measured data will help better predictions so that project risks can be avoided.
- Location feasibility is not done and micro-siting was carried out based on the land features in Google earth image.

Annexure-1

Power & Thrust Curves
V162-6MW- T119m
Air Density :1.225 kg/m3



Speed [m/s]	Power [MW]	Thrust coefficient
3	32	0.908
3.5	150	0.882
4	292	0.853
4.5	467	0.837
5	676	0.82
5.5	927	0.814
6	1229	0.812
6.5	1584	0.81
7	2000	0.807
7.5	2476	0.804
8	3017	0.8
8.5	3624	0.793
9	4264	0.763
9.5	4859	0.701
10	5380	0.635
10.5	5734	0.559
11	5932	0.484
11.5	5983	0.413
12	5998	0.356
12.5	6000	0.31
13	6000	0.273
13.5	6000	0.242

Speed [m/s]	Power [MW]	Thrust coefficient
14	6000	0.216
14.5	6000	0.193
15	6000	0.174
15.5	6000	0.158
16	6000	0.144
16.5	6000	0.131
17	6000	0.12
17.5	6000	0.111
18	5846	0.1
18.5	5581	0.089
19	5360	0.079
19.5	5128	0.07
20	4844	0.062
20.5	4555	0.055
21	4268	0.048
21.5	3985	0.043
22	3690	0.038
22.5	3383	0.033
23	3102	0.029
23.5	2801	0.025
24	2479	0.022