

**OGTC
PROJECT SURVEY DHES**

Doc. No.

OGTC – SV – 1.0 – 1911

- DIESEL
- SOLAR
- WIND
- BATTERY

**PROJECT SURVEY
FOR
DECENTRAL HYBRID ENERGY SYSTEM**

PROJECT NAME:

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1. PREFACE

This document is meant to provide stakeholders / partners with detailed information of the (local) circumstances for a specific project with a Decentral Hybrid Energy System (DHES).

Each section has to be filled in as detailed as possible in order to determine the configuration of a DHES.

We tried to cover every aspect needed for the installation and future operation of your DHES.

PLEASE FILL IN THE GREY FIELDS.

BY MULTIPLE CHOICE QUESTIONS PLEASE PUT "X" WHERE APPLICABLE

2. GENERAL INFORMATION**DATE OF SURVEY****ORGANISATION**

Project contact person

Address

Postal code

Town

Country

Telephone

Telephone cellular

Fax

E-mail address

SITE NAME

Address

Postal code

Town

Country

LOCAL CONTACT

Address

Postal code

Town

Country

Telephone

Telephone cellular

Fax

E-mail address

3. LOCAL SITUATION (IMAGES)

4. SITE

Provide a detailed map(s) of the site with the North direction and the following locations:

- turbine
- control room / cabinet (door facing turbine)
- grid connection
- cable route
- transformer
- transport route to site
- prevailing wind direction

Attach photos of turbine location in all wind directions

 done

What is terrain roughness (see Appendix 1)

What are the coordinates of the location

Latitude (North/South)

Longitude (East/West)

Describe ease of accessibility by truck and crane of site and route*

**Bridges (max. loads), tunnels and curves when critical.*

What is name of nearest international sea port

What is name of nearest international air port

Is the site critical for noise

 yes no

What is distance to nearest neighboring house

Are problems with shadow casting to be expected

 yes no

Has the foundation been designed by a certified civil engineer.

 yes no

Consult with the crane company and make a hoisting plan.

 done

Is there a GSM/radio tower or radar nearby that could be disturbed by the turbine

 yes no

Distance to the turbine (m)

Is aviation obstruction lighting required

 yes no

5. CLIMATE SOLAR AND WIND

Solar irradiance (Year/Season/Day/hour)

Average wind speed (year, month, day) (m/s)

Is there detailed solar or wind data available?

Wind measured or calculated

 yes no

Solar measured or calculated

 yes no

Additional info Solar

Additional info Wind

Hurricanes / seasonal storms

 yes no

Earthquakes

 yes no

Lightning often

 yes no

What is local temperature range and maximum humidity

Minimum (°C)

Maximum (°C)

Max. humidity (%)

6. LEGAL / FINANCIAL

Planning permission arranged

 yes no

Grid connection permit arranged

 yes no

Special requirements from utility company

Is project finance in place

 yes no

7. GRID CONNECTION

Grid frequency & max. tolerances

 Hz + % - %

Grid voltage at connection point

 V + % - %

Have grid measurements been made?

 yes no

3-phase grid

 yes no

Number of grid failures (power cuts) / year

Maximum permitted higher harmonics

 5^e Hz I_{vmax}/I_{nom} [%]

 7^e Hz I_{vmax}/I_{nom} [%]

 11^e Hz I_{vmax}/I_{nom} [%]

 13^e Hz I_{vmax}/I_{nom} [%]

Maximum permitted reactive current (by utility company)

Import max (kVAr)

Export max (kVAr)

Requirements on Flicker-value

 yes no

TRANSFORMER SPECIFICATIONS

Rated voltage and power of the transformer

 (prim)V

 (sec) V

kVA

Measured output voltage (V)

Rated current (A)

Are voltage adjustment tabs available?

 no

 yes

 adjustment(%)

 Short circuit voltage U_s [%]

400Vac grid connection present

 yes

 no

If not, when

8. SOLAR – WIND - DIESEL HYBRID

FOR EACH DIESEL GENERATOR:

 Manufacturer

 Year of production

 Name plate capacity

 Current capacity

 Diesel consumption
(liter/kWh)

Diesel Control system

Mechanical

Electronic

Type of speed control

Droop

Fixed frequency

Storage of excess electricity

No

Batteries

Water

Ice

 Other, specify

Shutting off certain load (temporarily) possible

yes

no

9. GROUNDING

Is grounding system according to minimal requirements < 5Ω

yes

no

(The grounding for lightning protection of the tower, and the safety ground for the control cabinet must not be interconnected)

10. CONTROL ROOM AND CONTROL CABINET

Control room for control cabinet*

Available

Not available

Actual size (l x w x h)

Is the control room located in a dusty environment

yes

no

Is ventilation sufficient and rain proof*

yes

no

Work light in the control room

yes

no

1\

11. TURBINE CABLES FOR SOLAR / WIND

Standard length cables supplied by wind energy suppliers are calculated to reach the control cabinet if this is placed within 10m from the heart of the tower. If longer cables are necessary, note down total length of the cables. Make sure to specify this on the order.

Standard length will be ordered unless indicated on the order!

a) from solar system to bottom tower wall (m)*

b) from turbine to bottom tower wall (m)*

c) from bottom tower wall (the one furthest away from control room) to wall control room (m)

d) from wall control room to control cabinet (m)

e) connecting length and spare (m)*

12. SUPPLY CABLES

If needed, refer to the Cable Guide on Backpack for an indication of the minimal conductor sizing.

Confirm the conductor size with your cable supplier.

 Cable from control cabinet to grid connection (meters) and conductor size (mm²)

Calculated maximum voltage drop

13. REMOTE MONITORING & CONTROL

Type of connection

- PSTN (telephone line)
- GSM/GPRS (EU) (mobile phone)
- Satellite (Tooway/ASTRA)
- TCP/IP (network/internet)

14. DELIVERY TIME

When is the grid connection in place? (dd/mm/yyyy)

When is the internet connection in place (dd/mm/yyyy)

When is the requested date of installation (dd/mm/yyyy)

15. REMARKS

16. APPENDIX 1

Terrain Roughness

High above ground level, at a height of about 1 kilometer, the wind is hardly influenced by the surface of the earth at all. In the lower layers of the atmosphere, however, wind speeds are affected by the friction against the surface of the earth. In the wind industry one distinguishes between the roughness of the terrain, the influence from obstacles, and the influence from the terrain contours, which is also called the orography of the area.

In general, the more pronounced the roughness of the earth's surface, the more the wind will be slowed down. Forests and large cities obviously slow the wind down considerably, while concrete runways in airports will only slow the wind down a little. Water surfaces are even smoother than concrete runways, and will have even less influence on the wind, while long grass and shrubs and bushes will slow the wind down considerably.

Roughness Classes and Roughness Lengths

In the wind industry, people usually refer to roughness classes or roughness lengths, when they evaluate wind conditions in a landscape. A high roughness class of 3 to 4 refers to landscapes with many trees and buildings, while a sea surface is in roughness class 0.

Concrete runways in airports are in roughness class 0.5. The same applies to the flat, open landscape to the left which has been grazed by sheep.

The proper definition of roughness classes and roughness lengths may be found in the table below. The term roughness length is really the distance above ground level where the wind speed theoretically should be zero.

For further information on turbine siting, visit the Danish Wind Industry Association at <http://www.vindselskab.dk/en/tour.htm>

Roughness Classes and Roughness Length Table

Roughness Class	Roughness Length (m)	Energy Index (%)	Landscape Type
0	0.0002	100	Water surface
0.5	0.0024	73	Completely open terrain with a smooth surface, e.g. concrete runways in airports, mowed grass, etc.
1	0.03	52	Open agricultural area without fences and hedgerows and very scattered buildings. Only softly rounded hills
1.5	0.055	45	Agricultural land with some houses and 8 meter tall sheltering hedgerows with a distance of approx. 1250 metres
2	0.1	39	Agricultural land with some houses and 8 meter tall sheltering hedgerows with a distance of approx. 500 metres
2.5	0.2	31	Agricultural land with many houses, shrubs and plants, or 8 meter tall sheltering hedgerows with a distance of approx. 250 metres
3	0.4	24	Villages, small towns, agricultural land with many or tall sheltering hedgerows, forests and very rough and uneven terrain
3.5	0.8	18	Larger cities with tall buildings
4	1.6	13	Very large cities with tall buildings and skyscrapers

