



Wind to Heat Demonstrator (W2HD)
SPECIFIC SHED, SA13 2BZ
X: 278430, Y: 186965

Design and Access Statement

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Page 1

Table of Contents

1	Document Details.....	3
1.1	Amendment History	3
1.2	Document Identification.....	3
1.3	Authors	3
1.4	Approval / Distribution	3
2	Introduction.....	4
3	Planning Policy and Consultation	5
3.1	Pre-Application Consultation	5
4	Design and Access Considerations	7
4.1	Site Use and Surrounding Area	7
4.2	Site Layout and Design	8
4.3	Size and Scale.....	8
4.4	Use.....	9
4.5	Amount.....	9
4.6	Landscaping.....	10
4.7	Flooding.....	10
4.8	Appearance.....	10
4.9	Access to Development	10
5	Additional Factors.....	11
5.1	Cumulative Impact	11
5.2	Shadow Flicker.....	11
5.3	Noise.....	11
5.4	Aviation	13
5.5	Interference with Communication.....	13
5.6	Ecology and Wildlife Considerations.....	13
5.6.1	Ornithology	13
5.6.2	Bats.....	14
5.6.3	Cultural Heritage.....	14
6	Summary and Conclusions	15
	Appendix 1: W2HD illustrations	16

Figures

Figure 1:	Site Location plan; approximate location of system for evaluation shown by blue dot.....	7
Figure 2:	Approximate location of system for evaluation shown by star	8
Figure 3:	Illustrative Wind to Heat demonstrator with main components highlighted.....	9
Figure 4:	Immission Noise MAP extracted from VWT's Acoustic Performance Test by TUV NEL	12
Figure 5:	Illustration of turbine positioned at the proposed site	16

Tables

Table 1:	Summary of pre-application consultation carried out, responses and mitigation procedures (if any needed) undertaken to appease concerns.....	5
Table 2:	Summary of pre-application consultation carried out with local neighbours.	6
Table 3:	QR6 VAWT derived noise emission and noise emission for a wind speed of 8m/s at the rotor centre height.	12

1 Document Details

1.1 Amendment History

Version	Date	Remarks
1.0	7 December 2022	Reviewed for submission with planning application

1.2 Document Identification

Document Location: Files and archives at Rotaheat Ltd.

Printed: Wednesday 7 December 2022

1.3 Authors

Name	Position/Department
Robert Thompson	Project Manager

1.4 Approval / Distribution

Name	Affiliation	Position	Approval	Date
Dr Robert Sutton	Rotaheat Ltd	Test Manager		

2 Introduction

The scheme being proposed is a new concept based on generating heat energy from the wind. Rotaheat is working with Swansea University's SPECIFIC to evaluate a demonstrator system, in part funded with the support of the Department for Business, Energy & Industrial Strategy (BEIS).

The scheme relates to land immediately adjacent to the Solar Heating Energy Demonstrator (SHED) located at:

Hoel Cefn Gwrgan, Port Talbot, West Glamorgan, SA13 2BZ

X (Easting): 278430, Y (Northing): 186965

The Wind to Heat Demonstrator (W2HD) system will deliver heat with ultra low carbon emissions (less than 0.1% of the emissions associated with combusting natural gas), with the intention that production models will be capable of providing a material impact to society by displacing carbon emissions associated with the demand for heat.

The proposed site is part of a light industrial estate occupied by Swansea University and Gas Turbine Research Centre. Swansea University uses the site for evaluating different low carbon heating technologies.

The Welsh government, as landlord, has provided their support to Rotaheat using the site for the evaluation, subject to planning permission by the local council being granted, by offering a piece of land adjacent to the SHED for the purpose of evaluating the demonstrator system.

This planning application is based on:

- Installing a monopole tower of approximately 15m in height. The monopole tower will be secured to the ground using a foundation system which can be readily removed, enabling the area to quickly be restored to its original state as grassed land.
- A vertical axis wind turbine of approximately 6m in height and 3m in diameter sitting on top of the monopole tower. The turbine will harness prevailing winds from all directions.
- A Rotaheater incorporated within the wind turbine, generating heat.
- Water tanks located at the base of the tower which will be used to store and dissipate heat generated.

The W2HD system is planned to be evaluated over a period of 6 months, with the option of extending the evaluation period to a total of 15 months. The project will be fully completed by March 2024 with the entire structure subsequently removed.

Consideration has been afforded to:

- The site, as an industrial estate, has been selected to minimise any potential disturbance on the natural environment. This combined with the small scale of the proposed scheme will help ensure minimal disturbance.

Prior to this planning application, the following interested parties were contacted as part of the requirements for pre-application consultation, including:

- Swansea University
- Welsh Government
- Neighbouring properties and businesses

To date, no objections have been received.

3 Planning Policy and Consultation

This proposed scheme has been designed to accord with the relevant planning guidelines, in particular Planning Policy Wales (PPW) together with the draft National Development Framework 2020-2040 (NDF) whilst also taking into consideration any local and community planning policy that may be relevant.

The common thread and underlying focus of the PPW is one in favour of sustainable development, as applied to the four identified strands of social, economic, environmental and cultural development.

The NDF should be considered in addition to any Local and Community plans when planning decisions are being made.

Local planning guidance is outlined in the Neath Port Talbot Council Local Development Plan, which was adopted January 2016. Relevant supplementary planning guidance includes Renewable and Low Carbon Energy in New Development (RE2 adopted July 2017).

It is felt this proposal adheres with all national and local planning guidelines, whilst being considerate to ensure and reduce, where possible, any potential negative impacts the proposed development may have on the local and wider vicinity.

3.1 Pre-Application Consultation

Early engagement has the potential to improve the efficiency and effectiveness of the planning application system for all parties involved. Good quality pre-application discussion enables better coordination between public and private resources and improves the outcomes for the community. Table 1 and Table 2 summarise the pre-application consultation that has been carried out prior to this submission. This process is in fulfilment of the requirements stated in section 61Z(1) of the Town and County Planning Act 1990.

Who was contacted and how	Organisation	Date Contacted	Response Received	Mitigation needed
Justin Searle (meetings)	SPECIFIC	June 2022	Support	Nil
Peter Dix (meetings)	Welsh Government	10 November 2022	Support	Nil
Steve Morris (meeting)	Gas Turbine Research Centre	2 December 2022	None	Nil
Cardiff Info (email)	Cardiff Airport	22 June 22	None	Nil

Table 1: Summary of pre-application consultation carried out, responses and mitigation procedures (if any needed) undertaken to appease concerns.

The following local neighbours were also consulted prior to submission:

Who was contacted	Property	Date Contacted	Estimated Distance from Turbine	Response Received
Property Occupier	1 Abbots Mews, SA13 2PT	2 December 2022	150m	None
Property Occupier	2 Abbots Mews, SA13 2PT	2 December 2022	150m	None
Property Occupier	3 Abbots Mews, SA13 2PT	2 December 2022	150m	None
Property Occupier	4 Abbots Mews, SA13 2PT	2 December 2022	150m	None

Rotaheat Ltd: W2HD SHED (SA13 2BZ), Design & Access Statement

Who was contacted	Property	Date Contacted	Estimated Distance from Turbine	Response Received
Property Occupier	5 Abbots Mews, SA13 2PT	2 December 2022	150m	None
Property Occupier	6 Abbots Mews, SA13 2PT	2 December 2022	150m	None
Property Occupier	7 Abbots Mews, SA13 2PT	2 December 2022	160m	None
Property Occupier	8 Abbots Mews, SA13 2PT	2 December 2022	160m	None
Property Occupier	9 Abbots Mews, SA13 2PT	2 December 2022	160m	None
Property Occupier	10 Abbots Mews, SA13 2PT	2 December 2022	160m	None
Property Occupier	11 Abbots Mews, SA13 2PT	2 December 2022	130m	None
Property Occupier	12 Abbots Mews, SA13 2PT	2 December 2022	130m	None
Property Occupier	13 Abbots Mews, SA13 2PT	2 December 2022	130m	None
Property Occupier	14 Abbots Mews, SA13 2PT	2 December 2022	130m	None
Property Occupier	15 Abbots Mews, SA13 2PT	2 December 2022	125m	None
Property Occupier	16 Abbots Mews, SA13 2PT	2 December 2022	125m	None
Property Occupier	17 Abbots Mews, SA13 2PT	2 December 2022	130m	None
Property Occupier	18 Abbots Mews, SA13 2PT	2 December 2022	130m	None
Property Occupier	19 Abbots Mews, SA13 2PT	2 December 2022	130m	None
Property Occupier	20 Abbots Mews, SA13 2PT	2 December 2022	130m	None

Table 2: Summary of pre-application consultation carried out with local neighbours.

From the results in Table 1 and Table 2 it is felt the pre-application consultation has raised no issues that should delay the submission of this planning application.

4 Design and Access Considerations

The principle considerations required for this application will be discussed in this section.

4.1 Site Use and Surrounding Area

The site (see Figure 1) in Margam lies along the eastern flank of the A4241, approximately 600m to the west of the M4.

The site is adjacent to a former Tata Steel workshop, a modern building with space for vehicle parking, used by Swansea University to evaluate alternative low carbon heating technologies.

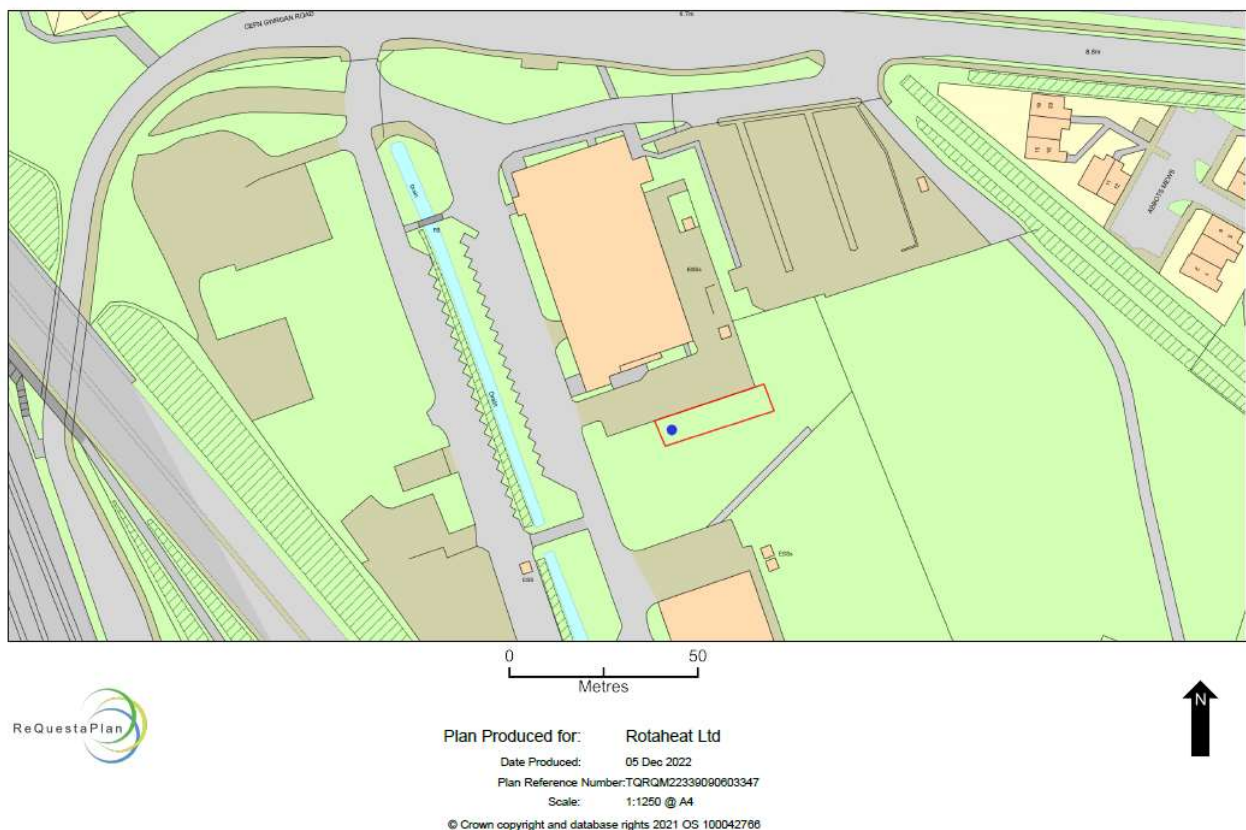


Figure 1: Site Location plan; approximate location of system for evaluation shown by blue dot

The surrounding landscape (depicted in Figure 2) consists of mainly flat open land with two large industrial workshops flanking the proposed site to the North and South, with the A4241 and Swansea-Cardiff train line flanking the site to the west.

The site lies within Settlement Protection Zone (M2/1).



★ Location of proposed temporary system

Figure 2: Approximate location of system for evaluation shown by star

4.2 Site Layout and Design

From an operational point of view, the siting of any wind driven system requires exposure to conditions of unobstructed wind flow in order to achieve the most efficient operation. Care should be taken to ensure the turbine is located a sufficient distance away from any such object to provide the necessary clearance needed to achieve this.

The siting of the W2HD has been chosen taking into account the technical, operational and visual impact at the location (see Figure 2 **Error! Reference source not found.**).

4.3 Size and Scale

The size and scale of this development, in terms of the proposed W2HD height and location, has been considered as part of this design. The proposed System will have a total height of 21m, comprising of a temporary monopole tower of 15m in height and the core W2HD system having a height of 6m and being placed on top of the monopole tower. Wind driven systems, by their nature, are large vertical structures that may be seen from areas in the vicinity of their development and from certain locations further afield.

The scheme being proposed utilises small wind technology, which was selected because wind is an effective source of renewable energy generation readily available across the nation. The system being proposed is of a considerably smaller scale than those used in commercial utility generation, such as at the Mynydd Brombil Wind Farm, minimising any landscape and visual impact whilst reducing/removing any other perceived disturbance to neighbouring properties or visitors. The key components (illustrated in Figure 3) are:

- Rotating blades of approximately 6m in height and 3m in diameter, positioned on a vertical axis.

- Heat generator placed immediately below the rotating blades at a height of approximately 15m above ground level.
- 15m monopole mast / tower secured to the ground.
- The base of the structure will be under 6m in width and length (under 36 sq m). An earth pin foundation system will be used to facilitate the quick installation and removal of the entire system without relying on a traditional concrete and steel foundation structure.

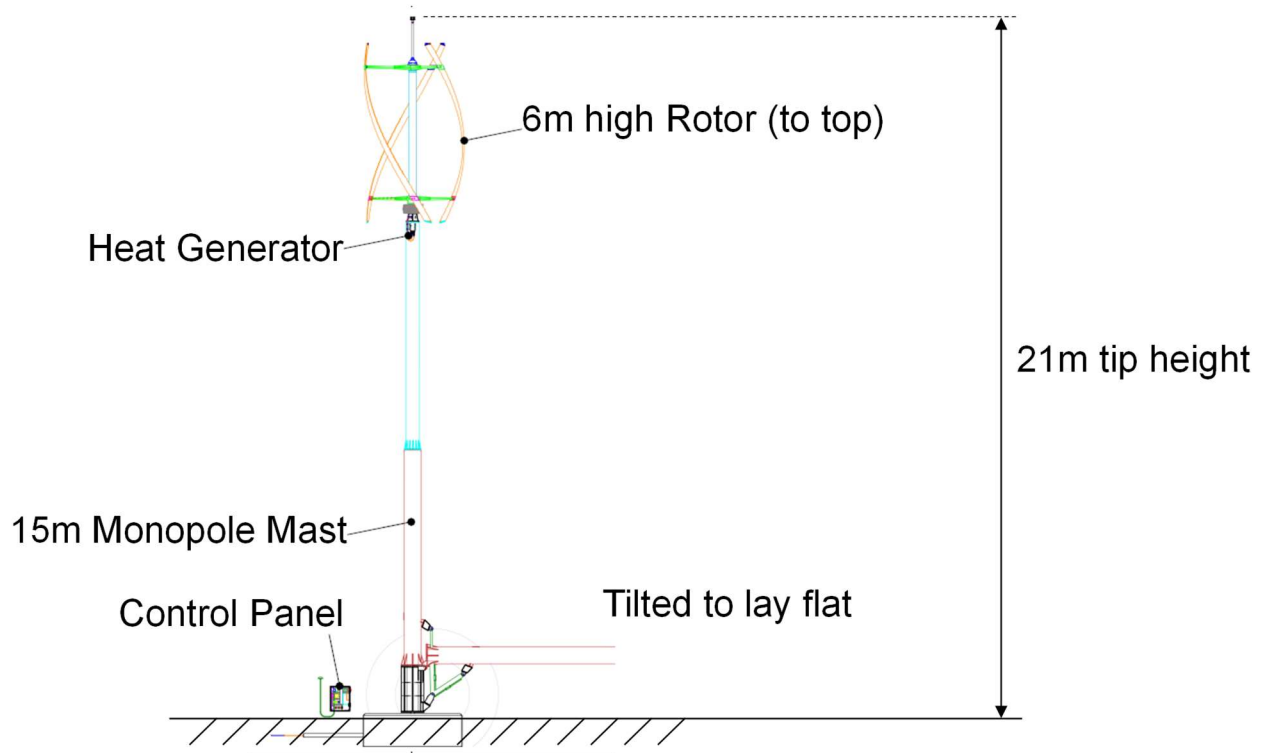


Figure 3: Illustrative Wind to Heat demonstrator with main components highlighted

The size and scale of developments must be considered in order that the visibility of the W2HD does not result in an unacceptable landscape and visual intrusion on the surrounding area. A depiction of the installed turbine can be found in Appendix 1 (see Figure 5).

The 15m high monopole is comparable to the peak height of the adjacent SHED building which has an apex height slightly higher than 15m. The 6m high rotor will sit just above the roof line to reduce the potential shielding effect of the adjacent building on the rotor.

4.4 Use

The principle of this development is to evaluate until March 2024 the operation and performance of the W2HD, associated heat generated and carbon emissions. The scheme is part of an evaluation project, with the heat generated stored in a water storage tank and dissipated to the atmosphere.

By using the kinetic energy in the wind, this system is both a renewable and sustainable method of generating and supplying low emission heat.

The scheme will help to extend the research operations of SPECIFIC and Rotaheat and thus continue to secure local jobs. At the end of the project, the scheme will be fully removed.

4.5 Amount

The proposed development consists of one 21m height W2HD and its associated test infrastructure located at ground level. The total capacity of the system is expected to generate a peak of 10kW of zero emission heat.

Works to be undertaken for the installations are as follows:

- Erection of a temporary monopole tower, using earth pins foundation system;
- Mounting of the W2HD system on the monopole tower and installing control equipment;
- Installation of pipework, heat storage and disposal system, and test equipment;
- Dismantling the entire system following the evaluation period.

4.6 Landscaping

No landscaping is being proposed as part of this planning application. However, all disturbances to the landform, such as new pipework, would be restored to their original form to ensure the existing landscape is maintained.

The current site use will be maintained throughout the operational life of the evaluation period. Any areas that are disturbed will be temporary and fully reinstated during the construction and Decommissioning phases.

4.7 Flooding

The site is located in flood risk zone C2 (without significant flood risk to infrastructure).

The risk level of flooding from rivers is considered Medium, with the area's flood risk currently under review.

The consequences of flooding are not considered to be significant,

- with the entire structure designed to be temporary and intended to be removed,
- with the required period of use under 15 months in duration, and
- in the event of flooding there would be minimal impact on people, property or the natural heritage.

4.8 Appearance

The appearance of any wind driven system is of particular importance in terms of minimising the effects on landscape and visual amenity. The W2HD will be set within an industrial site. Nearby buildings will partially screen the system from the north and south. The site has been selected, in part, due to openness to the coastal winds which would pass over the Tata Steel works and A4241 to the west of the site.

The site has no nearby Public Rights of Way (PRoW).

The nearest residential properties are approximately 130m to the east of the proposed site, with a further cluster of residential properties approximately 160m to the north of the proposed site obscured by the existing SHED. The setting of the W2HD within the industrial site, and its relatively small scale, will reduce any impact on visual amenity.

4.9 Access to Development

The components that make up the W2HD are sufficiently sized so that they can be transported on a vehicle similar in size to those that currently use the road to gain access to the site.

During the construction and decommissioning phases vehicular access to the site will be required. However, the size of this development is of a scale that would need no temporary or permanent access track creation at the site. The development will not affect any PRoW, roads or other routes during the construction, operational or decommission phases. The traffic warranted for routine servicing and maintenance would be small to medium sized vans.

5 Additional Factors

There are a number of additional criteria, which must be considered in relation to any wind turbine development. These are discussed in more detail below.

5.1 Cumulative Impact

At the time of this application there are no other wind turbines or wind driven systems operating within close proximity to this proposal and it is, therefore, considered that cumulative impact will not be an issue. The Mynydd Brombil Wind Farm is approximately 1.5km to the North East of the site

In addition to the short-term use, the single structure, modest scale, distance from roads and PRow and shielding from the local trees and buildings at the site ensures that the proposal will not appear as an overly significant addition to the wider landscape.

5.2 Shadow Flicker

Shadow flicker is an effect caused when the rotating blades of wind systems periodically cast shadows through constrained openings such as the windows of neighbouring properties. It is caused by the blades interrupting the light that is cast from the sun when in the direct line from it. The magnitude of shadow flicker varies both spatially and temporally and depends on a number of environmental conditions coinciding at any particular point in time, including, the position and height of the sun, wind speed, direction, cloudiness, and position of the turbine to a sensitive receptor.

A report published by the Department of Energy and Climate Change in March 2011 states:

- Only properties within 130 degrees either side of north of the turbines can be affected by shadow flicker at UK latitudes; and
- Shadow flicker has been proven to occur only within ten rotor diameters of a turbine position.

As the rotor is approximately 3m in diameter and the nearest residential properties are approximately 130m away, no associated properties at the site fulfil the above criteria and it is, therefore, considered that shadow flicker is not an issue for the proposed development.

5.3 Noise

Noise generated from the mechanical and aerodynamic properties of a wind turbine have been acknowledged as a key concern in planning.

The technology being proposed here substantially eliminates the major creator of mechanical noise associated with wind turbines by:

- Incorporating a heat generator and avoiding the steady operation of an electrical generator, and
- Using a helical Darrieus design with three foils twisted around the rotor shaft. The symmetrical foils result in a smoother torque distribution over an entire revolution of the foils substantially reducing noise.

which together with the distances from non-associated properties and areas will mean the installation will not cause excessive noise,

The noise data provided by the turbine's manufacturer for electrical generating configurations is displayed in Figure 4 and Table 3 for a wind speed of 8m/s at the rotor centre height. The heat generating model is expected to be quieter.

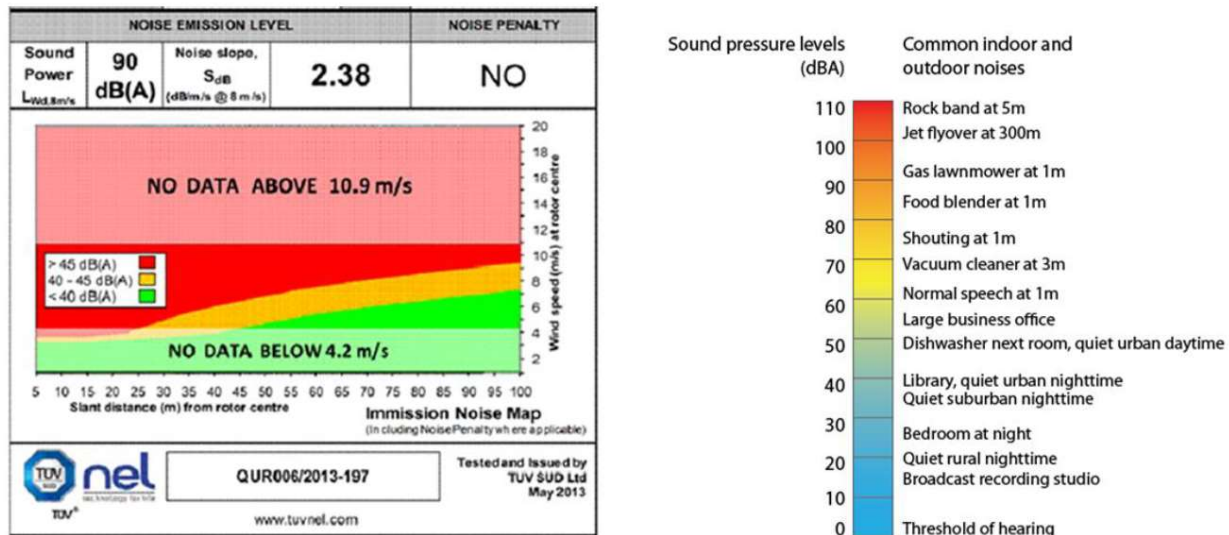


Figure 4: Immission Noise MAP extracted from VWT's Acoustic Performance Test by TUV NEL

PARAMETER	SYMBOL	VALUE
Apparent Emission Sound Power Level (dB(A) re 10^{-12} W)	$L_{Wd,8m/s}$	86.5
Combined Uncertainty (68% confidence level) (dB)	σ	1.9
95% Confidence Limit (dB)	1.645σ	3.1
Noise Slope at 8 m/s (dB/m/s)	S_{dB}	2.38
Declared Apparent Emission Sound Power Level, (dB(A) re 10^{-12} W)	$L_{Wd,8m/s}$	90
Immission Sound Pressure Level at 60 m at 8 m/s (dB(A) re 20 μ Pa)	$L_{p,60m}$	47
Immission Sound Pressure Level at 25 m at 8 m/s (dB(A) re 20 μ Pa)	$L_{p,25m}$	54

Table 3: QR6 VAWT derived noise emission and noise emission for a wind speed of 8m/s at the rotor centre height.

Further data was provided by the turbine's manufacturer which certified the relationship between the noise generated by the VAWT over a range of mean wind speeds during controlled test conditions. The relationship derived shows a linear relationship up to the limit of the test conditions (~11m/s). The derived relationship was then analysed for deviation over the range of results obtained and a declared relationship with 95% confidence level has been provided as below:

$$Y = 2.38 X + 33.92$$

Where Y = Audible noise level (db) and X = Mean Wind Speed at hub height.

The relationship was obtained from noise measurements taken at a slope distance of 32.2 downwind from the turbine.

5.4 Aviation

Wind turbine operation can have an impact on aviation safety; the rotation of a wind systems blades can have a detrimental impact on aviation operations such as radar. The nearest airports are:

- Old Park Farm Airfield which is approximately 3.4km South East of the proposed development site;
- Swansea Airport which is approximately 22km West of the proposed development site; and
- Cardiff Airport which is approximately 34km South East of the proposed development site.

Cardiff Airport have been contacted as part of the pre-application consultation, see Table 1 for details, but so far no response has been received.

The small size of the turbine relative is not expected to present issues to either Swansea or Cardiff Airport given the turbine proposed is substantially smaller than the utility sized models used at the Mynydd Brombil Wind Farm located 1.5km away.

5.5 Interference with Communication

It is important to consider the effect a wind system may have on any kind of electro-magnetic interference. Some large-scale turbines have the potential to 'scatter' analogue signals, but it is not considered relevant for a system of the size proposed here. Furthermore, as the Digital Switchover process has now been completed, any potential impact should be significantly reduced, it should no longer be possible for interference to be caused as digital signals are not subject to this effect. In terms of communications infrastructure, it has been noted that there are no masts or other structures in close proximity to this site.

5.6 Ecology and Wildlife Considerations

Impacts on the local wildlife have been taken into account throughout this design, with separation distances of over 50m from any potential wildlife habitats being adhered to. The proposed turbine location is far enough away from any hedgerows, trees, ponds or other natural features to ensure minimal impacts on the sites ecology.

As the proposed scheme is small and temporary in nature, no Environmental Impact Assessment (EIA) is planned to be conducted.

5.6.1 Ornithology

Potential impacts that wind driven systems, and associated infrastructure, can have on bird species are recognised and divided into three categories:

- Loss or damage to habitat;
- Disturbance leading to displacement or exclusion; and
- Collision risk.

It is considered that due to the small footprint, and close proximity to site buildings, that the proposed W2HD would have a negligible impact on loss of bird habitat. The small swept area of the blades and shrouded within the system, when compared to typical onshore wind turbine sizes, means that the proposed scheme would not cause displacement or exclusion for wintering birds in the area. Whilst the current site use and scale of the W2HD would not pose any significant collision risk to passing birds.

5.6.2 Bats

Good practice guidelines have been published by The Bat Conservation Trust (BCT), which give general advice regarding turbine locations and proximity to areas that could act as roosts, foraging ground or commuting routes for bats. The recommended siting for domestic scale wind turbines is 50m from any such feature, which has been the case for this proposal. Given the location, proximity and size of the proposed wind driven system the potential impact of the development on bats is considered low.

5.6.3 Cultural Heritage

Cultural Heritage is used in the UK to describe a range of geographical components of the historic environment that have been identified as having a significant degree of merit for consideration in planning decisions. These include listed buildings; old buildings that are not listed but still have local historical importance; scheduled monuments; war memorials; historic wreck sites; parks; historic gardens; conservation areas, archaeological sites and so on.

Due to the current “industrial” use of the site and the representative scale of the W2HD being proposed, it is felt that this proposal will not have any detrimental effects on the cultural heritage of the area, when compared to what is present currently.

6 Summary and Conclusions

The proposed scheme aims to demonstrate and evaluate a commercially viable, sustainable low-carbon alternative to the combustion of fossil fuels for the purposes of meeting society's demand for heat.

The key project benefits are summarised as follow:-

- The proposal is for a temporary installation with the complete removal of the system following the evaluation period;
- The proposed scheme complies with all relevant planning policy;
- National and Local Government supports the production of renewable energy via schemes such as this;
- This is an isolated industrial site and there will be no material impact on any residential property or loss of visual or residential amenity;
- The W2HD will be positioned to minimise, as much as possible, the impact on the surrounding landscape;
- The land is part of an existing business operation and therefore development to sustain an existing unit should be supported; and
- There should be no detrimental impact on local ecology including bats and birds and protected species.

The positive benefits of this proposal through its contribution to the sum of renewable energy produced in the UK and the reduction in Carbon Dioxide and other greenhouse gas emissions are considered to outweigh any negative impacts including those related to visual impact and landscape character.

Based on the information provided as part of this application, then it is considered that on balance, this proposal achieves the criteria set out within the draft National Development Framework 2020-2040 (NDF).

This proposal comprises a sustainable development and should therefore be supported by the planning authority. Great consideration has been given to the siting and appearance of the W2HD and the applicant has sought to ensure an acceptable proposal has been put forward, which does not have any material impact on local residents, views and ecological feature.

The proposed system will enable the applicant to evaluate technology that may have widespread relevance to reducing the UK's carbon emissions associated with heating and hot water, mitigating against the rising costs of conventional heating and hot water production. The demonstrator will aim to prove efficient operation is possible and proving that significant economic benefits can be achieved over the period of operation.

Appendix 1: W2HD illustrations



Figure 5: Illustration of turbine positioned at the proposed site