

# **Awel y Môr Offshore Wind Farm**

## **Category 6: Environmental Statement**

### **Volume 4, Annex 10.4: SLVIA Visibility Data**

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## Abbreviations and acronyms

TERM	DEFINITION
AyM	Awel y Môr
ES	Environmental Statement
ETG	Expert Topic Group
GLVIA3	Guidelines for Landscape and Visual Impact Assessment, Third Edition
METAR	Meteorological Terminal Air Report
OWF	Offshore Wind Farm
SLVIA	Seascape, Landscape and Visual Impact Assessment

# Units

UNIT	DEFINITION
m	meter
km	kilometer

# 1 Visibility Frequency

## 1.1 Frequency and likelihood of visual effects – weather conditions

1 The judgements made in the Seascape, Landscape and Visual Impact Assessment (SLVIA) are based on optimum ‘very good’ to ‘excellent’ visibility of the offshore elements of Awel y Môr Offshore Wind Farm (AyM OWF). Visibility is categorised in the SLVIA in accordance with Met Office definitions as follows:

▲	Very Poor	Less than 1,000 metres
▲	Poor	Between 1,001 and 4,000 metres
▲	Medium	Between 4,001 and 10,000 metres
▲	Good	Between 10,001 and 20,000 metres
▲	Very Good	Between 20,001 and 40,000 metres
▲	Excellent	Greater than 40,000 metres

2 This assumption is assessed as the worst-case scenario in the SLVIA, but in reality, the degree and extent of visual effects arising from the offshore elements of AyM will be influenced by the prevailing weather and visibility conditions. Viewing conditions and visibility have been found, during field work, to vary in the study area. The varied clarity or otherwise of the atmosphere will reduce the number of days upon which views of the offshore elements of AyM will be available from the coastline and hinterland, and is likely to inhibit clear views, rendering the wind turbines more visually recessive within the wider seascape. The effects of the offshore elements of AyM will vary according to the weather and prevailing visibility. This means that effects that are assessed to be significant in the SLVIA under very good or excellent visibility conditions, may be not significant under moderate, poor or very poor visibility conditions.

- 3 A description of visibility frequency is provided in the SLVIA, using Meteorological Terminal Air Report (METAR) visibility data from the nearest Met Office station that records visibility (Rhyl Station 2), to highlight potential trends in the visibility conditions of the study area. Both Landscape Institute with the Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3) (8.15) and NatureScot guidance (NatureScot, 2017, para 39) refer to use of this Met Office visibility data to assess typical visibility conditions within an area.
- 4 Visibility sensors measure the meteorological optical range which is defined as the length of atmosphere over which a beam of light travels before its luminous flux is reduced to 5% of its original value. The use of light within the visible spectrum allows the sensor to most accurately simulate human perception of visibility. Reasonably accurate measurements are possible over a range of visibility extending from a few tens of metres to a few tens of kilometres.
- 5 Although there are limitations to how this data can be applied to judgements about wind farm visibility, the 'visibility' data provides some understanding and evidence basis for evaluating the actual visibility of the wind turbines against their background.
- 6 The maximum optical range of visibility was measured every hour over a ten-year period (Jan 2011 to December 2020) at the Rhyl 2 Met Office Station. A chart illustrating the percentage of the frequency of maximum optical range that occurs at different ranges is presented in Figure 1.
- 7 Given that the sensor picks up the maximum distance over a 360-degree swept arc it is likely that the longest distances are picked up over the landward part of the arc where the relative humidity is lower, rather than out to sea. The data is therefore likely to overestimate the range of visibility in a seaward direction due to its generally higher relative humidity.

- 8 Notably the visibility frequency is defined within larger increments at distances of over 30km. Therefore, some of the increased distances from the AyM array area to the viewpoints, that have occurred as part of the SLVIA mitigation, following the Section 42 consultation, have not resulted in any change to the visibility frequency reported in the Environmental Statement (ES) when compared with the Preliminary Environmental Information Report.
- 9 During the SLVIA and Cultural Heritage Expert Topic Group (ETG) Stakeholders noted an interest in the seasonality of the visibility frequency at different ranges. This is shown in Figure 2 and Figure 3.

Figure 1: Frequency of Visibility at Different Ranges as a Percentage.

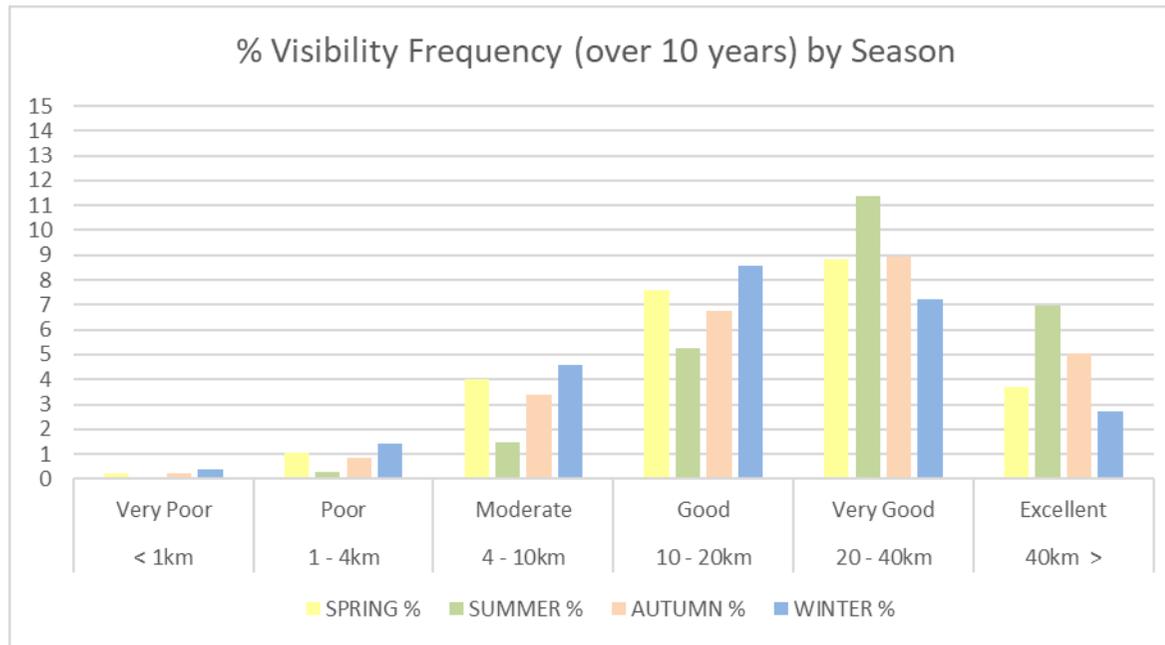
Visibility (km)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ALL	Visibility Range	Visibility Definition	Visibility over 10 years %
0.00 => 0.99	0.26	0.43	0.36	0.40	0.15	0.19	0.21	0.18	0.33	0.10	0.09	0.36	0.25	< 1km	Very Poor	0.25
1.00 => 1.99	0.37	0.57	0.55	0.42	0.18	0.64	0.53	0.51	0.40	0.37	0.37	0.42	0.44	1 - 4km	Poor	2.24
2.00 => 2.99	0.66	0.78	1.09	0.71	0.43	1.04	0.73	0.62	0.92	0.80	0.70	0.74	0.77			
3.00 => 3.99	0.95	1.15	2.35	1.00	0.58	1.11	0.84	0.86	1.03	0.80	0.98	0.74	1.03	4 - 10km	Moderate	9.02
4.00 => 4.99	1.09	1.17	2.70	1.36	0.89	1.50	0.90	0.82	1.28	0.90	1.49	0.97	1.26			
5.00 => 5.99	1.36	1.44	2.38	1.48	0.92	1.17	0.82	0.92	1.80	0.91	1.95	0.89	1.33			
6.00 => 6.99	1.58	1.84	1.99	1.98	0.93	1.43	0.79	0.79	1.60	1.34	2.16	1.12	1.45			
7.00 => 7.99	1.43	1.35	2.09	2.02	1.18	1.14	0.93	1.18	1.93	1.55	2.31	1.20	1.52			
8.00 => 8.99	1.80	2.25	2.72	2.25	1.16	1.31	1.09	1.19	2.20	2.39	2.34	1.06	1.81			
9.00 => 9.99	2.09	2.28	2.11	1.88	1.41	1.29	1.01	1.22	2.05	1.55	1.75	1.21	1.65	10 - 20km	Good	18.10
10.00 => 10.99	1.62	1.72	1.86	1.58	1.14	1.24	1.01	1.10	1.59	1.95	1.62	1.14	1.46			
11.00 => 11.99	2.02	1.56	2.02	1.33	1.39	1.26	1.23	1.33	1.69	1.91	1.71	0.98	1.54			
12.00 => 12.99	1.40	1.78	2.07	1.67	1.29	1.64	1.27	1.55	1.95	1.81	1.72	1.36	1.62			
13.00 => 13.99	2.05	1.65	1.75	1.77	1.48	1.21	1.37	1.33	1.55	2.05	1.70	0.94	1.57			
14.00 => 14.99	1.83	1.75	1.48	1.58	1.39	1.54	1.34	1.34	1.77	2.11	1.80	1.37	1.61			
15.00 => 15.99	2.01	1.86	1.80	1.80	1.39	1.83	1.56	1.51	2.15	2.11	1.65	1.40	1.75			
16.00 => 16.99	1.79	2.23	1.82	1.89	1.49	2.36	1.94	1.85	2.56	2.36	1.55	1.66	1.95			
17.00 => 17.99	2.40	2.11	1.64	2.02	1.87	2.94	2.10	2.47	2.59	2.29	1.80	2.19	2.20			
18.00 => 18.99	2.51	2.28	2.22	2.15	2.19	3.27	2.34	2.18	2.38	2.22	1.84	1.48	2.25			
19.00 => 19.99	2.75	2.20	1.83	2.01	1.71	2.82	2.41	2.08	2.53	2.29	1.80	1.48	2.15	20 - 40km	Very Good	41.69
20.00 => 20.99	2.73	1.89	2.00	2.22	2.26	3.02	2.12	1.85	2.35	2.92	1.81	1.60	2.23			
21.00 => 21.99	2.43	2.29	2.00	2.14	1.83	2.67	2.12	1.79	2.17	2.35	1.62	2.19	2.13			
22.00 => 22.99	2.14	1.89	1.95	1.82	1.94	3.04	1.85	1.84	2.29	2.30	1.49	1.64	2.01			
23.00 => 23.99	2.36	1.84	2.09	1.84	2.02	2.84	2.23	1.92	1.92	2.25	1.52	2.07	2.08			
24.00 => 24.99	2.64	2.20	2.27	1.75	1.94	2.42	2.23	1.64	2.15	2.29	1.62	1.92	2.09			
25.00 => 25.99	2.46	2.52	1.94	1.73	2.03	2.72	2.03	1.74	1.90	2.51	1.94	1.86	2.11			
26.00 => 26.99	2.54	2.53	1.84	2.16	1.95	2.23	2.03	1.93	1.98	2.45	1.61	2.10	2.11			
27.00 => 27.99	2.72	2.55	1.74	1.71	1.95	2.14	1.94	1.74	2.02	2.37	1.72	2.15	2.06			
28.00 => 28.99	2.57	2.58	1.78	1.70	1.84	2.04	2.42	2.19	1.95	2.20	1.95	2.57	2.15			
29.00 => 29.99	2.47	2.31	1.57	2.05	2.13	2.32	2.21	2.08	2.10	2.54	1.65	2.57	2.17	40km >	Excellent	28.69
30.00 => 34.99	12.06	10.56	9.46	9.08	11.43	10.70	10.84	11.12	9.12	10.17	10.22	12.29	10.60			
35.00 => 39.99	9.26	9.57	8.47	9.19	11.05	9.08	9.77	11.06	8.81	9.33	10.76	12.68	9.94			
40.00 => 44.99	6.33	7.48	7.24	9.02	10.99	6.69	8.28	9.70	6.94	7.94	10.13	10.82	8.48			
45.00 => 49.99	4.85	4.98	5.65	7.00	7.98	4.90	6.07	5.80	5.14	4.90	7.40	6.22	5.92			
50.00 => 59.99	8.09	9.22	9.83	12.85	12.16	10.46	15.26	15.58	12.53	9.64	11.14	12.33	11.60			
60.00 => 69.99	1.15	1.53	1.76	1.65	2.18	1.23	2.27	1.38	1.25	1.42	1.08	1.29	1.52	>= 70.00		
>= 70.00	1.21	1.59	1.57	0.78	1.13	0.54	1.95	1.62	1.10	0.61	0.96	0.96	1.17			
ALL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00			

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Figure 2: Chart showing percentage of visibility frequency at different ranges by season.

% VISIBILITY FREQUENCY (10 YEARS)		SPRING	SUMMER	AUTUMN	WINTER
Visibility Range	Visibility Definition	%	%	%	%
< 1km	Very Poor	0.25	0.06	0.24	0.40
1 - 4km	Poor	1.06	0.30	0.87	1.44
4 - 10km	Moderate	4.00	1.47	3.37	4.59
10 - 20km	Good	7.60	5.24	6.77	8.55
20 - 40km	Very Good	8.81	11.36	8.93	7.22
40km >	Excellent	3.72	6.96	5.04	2.72
		<b>25</b>	<b>25</b>	<b>25</b>	<b>25</b>

Figure 3: Graph showing percentage of visibility frequency at different ranges by season.



## 1.2 References

Landscape Institute with the Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment, Third Edition.

NatureScot (2017) Visual Representation of Windfarms. Version 2.2.

<https://www.metoffice.gov.uk/weather/guides/what-does-this-forecast-mean>



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