

Project:
feredrikshavn

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DONG Energy
Kraftværksvej 53
DK-7000 Fredericia
79 23 33 33
Calculated:
01-11-2007 13:07/2.5.7.83

DECIBEL - Main Result

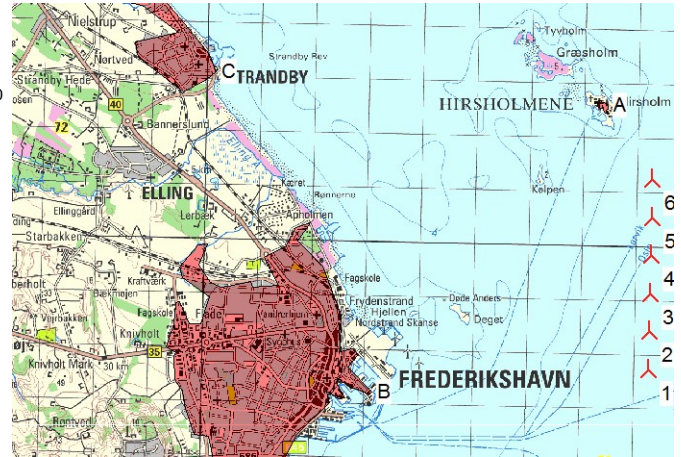
Calculation: Støj beregning for 6X offshore møller i Frederikshavn (En anden støj data, støjkrav 37,39)

DANISH RULES FOR NOISE CALCULATION.

The calculation is based on the "Bekendtgørelse nr. 1518 af 14. dec 2006" from the Danish Environmental Agency.

The noise impact from WTGs are not allowed to exceed the following limits: (Wind speeds in 10 m height)

- 1) At outdoor areas maximum 15 m from neighbor settlements in the open land.
 - a) 44 db(A) at wind speed 8 m/s.
 - b) 42 db(A) at wind speed 6 m/s.
 - 2) At outdoor areas in residential or recreational areas.
 - a) 39 db(A) at wind speed 8 m/s in residential areas.
 - b) 37 db(A) at wind speed 6 m/s in residential areas.
- If a WTG has pure tones in the noise emission, a penalty of 5 dB is added.



Scale 1:140.000
▲ New WTG Noise sensitive area

WTGs

UTM WGS84 Zone: 32			WTG type		Noise data		First	LwaRef	Last	LwaRef	Pure	Octave							
East	North	Z	Valid	Manufact.	Type	Power	Diam.	Height	Creator	Name	Wind speed	[dB(A)]	Wind speed	[dB(A)]	tones	data			
[m]						[kW]	[m]	[m]			[m/s]	[dB(A)]	[m/s]	[dB(A)]					
1	598.282	6.367.728	0,0	Siemens	SWT-3.6-107 3600 107....	Yes	Siemens	SWT-3.6-107	3.600	107,0	80,0	EMD	Level 0 -- SIEMENS Octave bands 106,5/105,2 dB(A)	6,0	105,2	8,0	106,4	No	Yes
2	598.289	6.368.441	0,0	Siemens	SWT-3.6-107 3600 107....	Yes	Siemens	SWT-3.6-107	3.600	107,0	80,0	EMD	Level 0 -- SIEMENS Octave bands 106,5/105,2 dB(A)	6,0	105,2	8,0	106,4	No	Yes
3	598.290	6.369.143	0,0	Siemens	SWT-3.6-107 3600 107....	Yes	Siemens	SWT-3.6-107	3.600	107,0	80,0	EMD	Level 0 -- SIEMENS Octave bands 106,5/105,2 dB(A)	6,0	105,2	8,0	106,4	No	Yes
4	598.285	6.369.844	0,0	Siemens	SWT-3.6-107 3600 107....	Yes	Siemens	SWT-3.6-107	3.600	107,0	80,0	EMD	Level 0 -- SIEMENS Octave bands 106,5/105,2 dB(A)	6,0	105,2	8,0	106,4	No	Yes
5	598.286	6.370.546	0,0	Siemens	SWT-3.6-107 3600 107....	Yes	Siemens	SWT-3.6-107	3.600	107,0	80,0	EMD	Level 0 -- SIEMENS Octave bands 106,5/105,2 dB(A)	6,0	105,2	8,0	106,4	No	Yes
6	598.287	6.371.248	0,0	Siemens	SWT-3.6-107 3600 107....	Yes	Siemens	SWT-3.6-107	3.600	107,0	80,0	EMD	Level 0 -- SIEMENS Octave bands 106,5/105,2 dB(A)	6,0	105,2	8,0	106,4	No	Yes

Calculation Results

Sound Level

No.	Name	UTM WGS84 Zone: 32		Z	Imission height	Wind speed	Demands		Sound Level	Demands fulfilled ?
		East	North				Noise	From WTGs		
				[m]	[m]	[m/s]	[dB(A)]	[dB(A)]	Noise	
A	HirsHolm	597.433	6.372.444	3,8	1,5	6,0	37,0	32,9	Yes	
A						8,0	39,0	34,1	Yes	
B	Frederikshavn	593.160	6.367.209	20,0	1,5	6,0	37,0	21,5	Yes	
B						8,0	39,0	23,1	Yes	
C	Strandby	590.163	6.373.085	1,8	1,5	6,0	37,0	14,8	Yes	
C						8,0	39,0	16,8	Yes	

Distances (m)

WTG	A	B	C
1	4792	5148	9727
2	4093	5274	9359
3	3411	5482	9032
4	2736	5715	8744
5	2081	5989	8511
6	1470	6283	8329

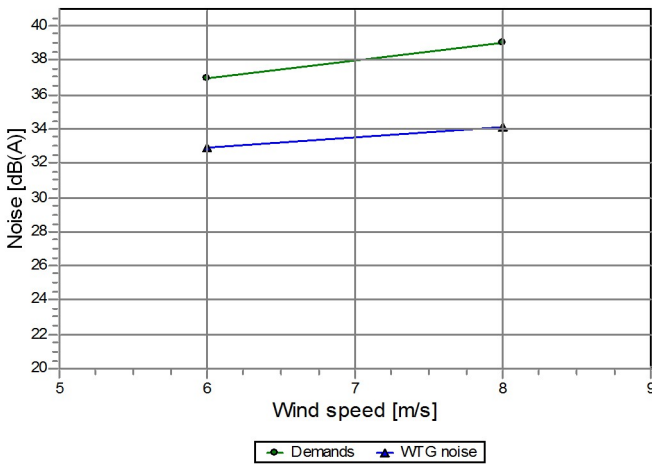
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DECIBEL - Detailed results

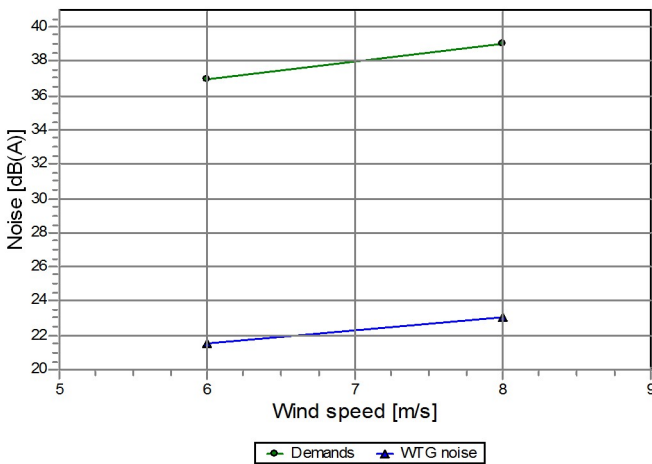
Calculation: Støj beregning for 6X offshore møller i Frederikshavn (En anden støj data, støjkrav 37,39) Noise calculati

Hirsholm (A)



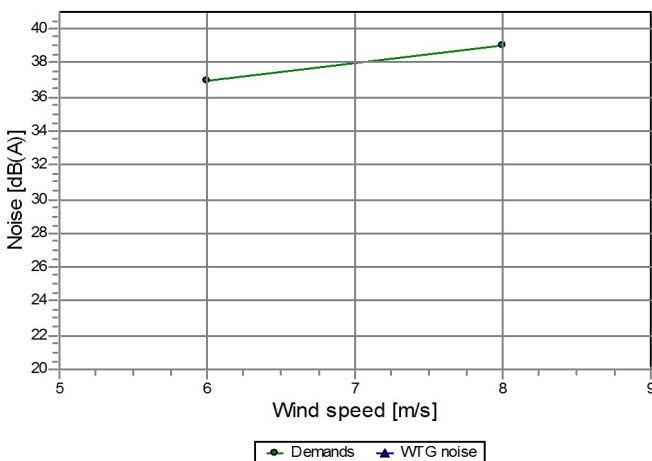
Sound Level			
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
6,0	37,0	32,9	Yes
8,0	39,0	34,1	Yes

Frederikshavn (B)



Sound Level			
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
6,0	37,0	21,5	Yes
8,0	39,0	23,1	Yes

Strandby (C)



Sound Level			
Wind speed [m/s]	Demands [dB(A)]	WTG noise [dB(A)]	Demands fulfilled ?
6,0	37,0	14,8	Yes
8,0	39,0	16,8	Yes

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DECIBEL - Assumptions for noise calculation**Calculation:** Støj beregning for 6X offshore møller i Frederikshavn (En anden støj data, støjkrav 37,39) **Noise calculati****Noise calculation model:**

Danish 2007

Wind speed:

6,0 m/s - 8,0 m/s, step 2,0 m/s

Terrain reduction:

3 dB(A) Offshore

Meteorological coefficient, C0:

0,0 dB

Type of demand in calculation:

1: WTG noise is compared to demand (DK, DE, SE, NL etc.)

Noise values in calculation:

All noise values are mean values (Lwa) (Normal)

Pure tones:

Pure tone penalty are added to demand: 5,0 m/s

Height above ground level, when no value in NSA object:

1,5 m Don't allow override of model height with height from NSA object

Deviation from "official" noise demands. Negative is more restrictive, positive is less restrictive.:

0,0 dB(A)

Octave data required

Air absorption

63	125	250	500	1.000	2.000	4.000	8.000
[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]	[dB/km]
0,1	0,4	1,0	2,0	3,6	8,8	29,0	104,5

WTG: Siemens SWT-3.6-107 3600 107.0 !O!**Noise:** Level 0 - - SIEMENS Octave bands 106,5/105,2 dB(A)

Source Source/Date Creator Edited

Siemens 09-02-2007 EMD 09-02-2007 09:23

Status	Wind speed [m/s]	LwA,ref [dB(A)]	Pure tones	Octave data							
				63 [dB]	125 [dB]	250 [dB]	500 [dB]	1000 [dB]	2000 [dB]	4000 [dB]	8000 [dB]
From Windcat	6,0	105,2	No	85,4	93,4	99,3	99,7	97,6	96,1	94,0	86,2
From Windcat	8,0	106,4	No	87,9	96,2	100,4	99,2	99,7	98,5	94,8	87,8

NSA: HirsHolm-A**Predefined calculation standard**Danish 2007, residential areas**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**

6,0 [m/s] 8,0 [m/s]
 37,0 dB(A) 39,0 dB(A)

Distance demand:0,0 m**NSA:** Frederikshavn-B**Predefined calculation standard**Danish 2007, residential areas**Imission height(a.g.l.):**Use standard value from calculation model**Noise demand:**

6,0 [m/s] 8,0 [m/s]
 37,0 dB(A) 39,0 dB(A)

Distance demand:0,0 m**NSA:** Strandby-C**Predefined calculation standard**Danish 2007, residential areas**Imission height(a.g.l.):**Use standard value from calculation model

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DECIBEL - Assumptions for noise calculation

Calculation: Støj beregning for 6X offshore møller i Frederikshavn (En anden støj data, støjkrav 37,39) **Noise calculati**

Noise demand:

6,0 [m/s] 8,0 [m/s]
37,0 dB(A) 39,0 dB(A)

Distance demand:0,0 m

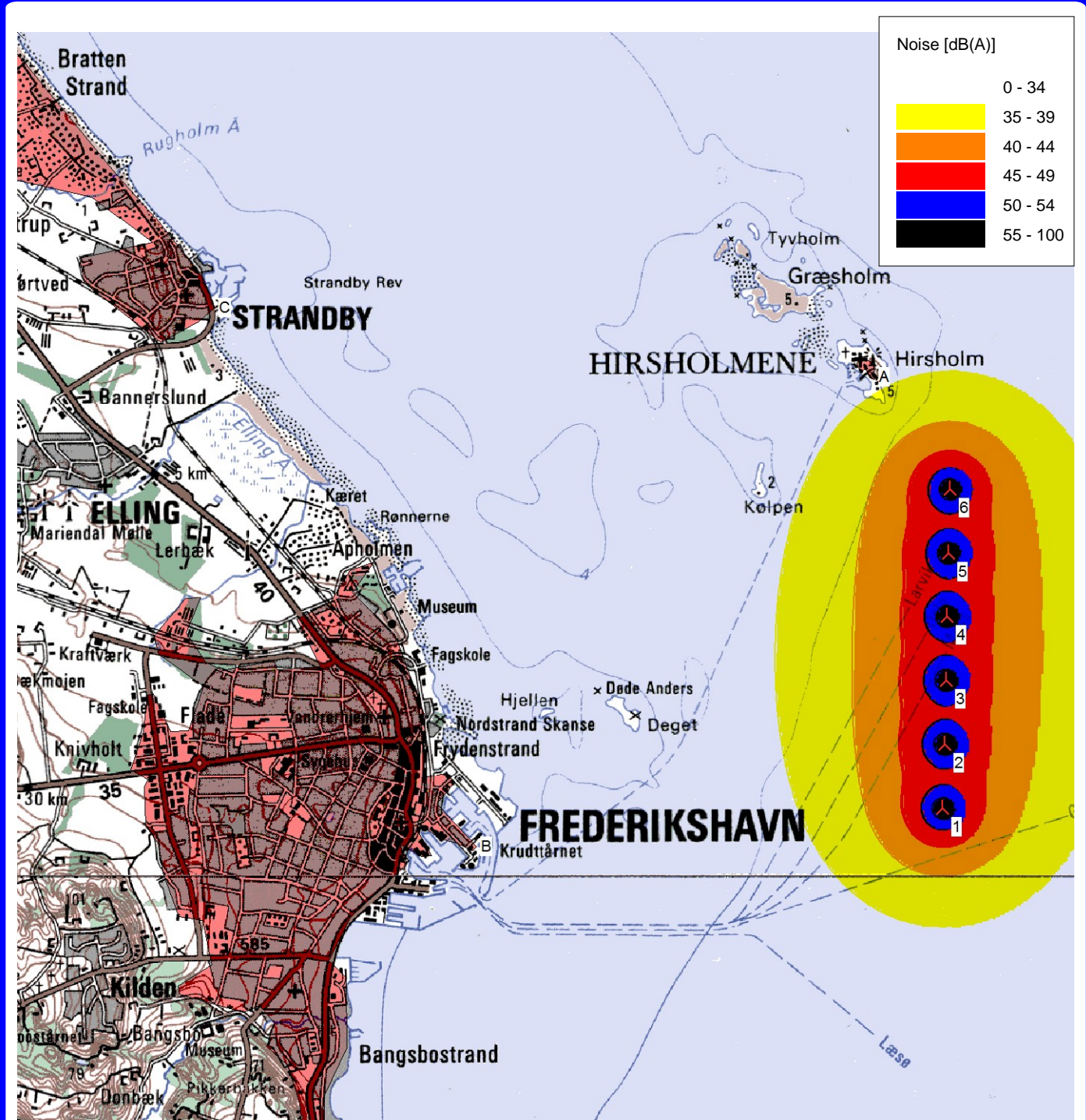
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DECIBEL - KMS map: DISC06_6 Nordjylland.IT

Calculation: Støj beregning for 6X offshore møller i Frederikshavn (En anden støj data, støjkrav 37,39)

File: DISC06_6 Nordjylland.IT



0 1000 2000 3000 4000 m

Map: Skagen 1318, Print scale 1:65.000, Map center UTM WGS 84 Zone: 32 East: 593.743 North: 6.370.074

Noise calculation model: Danish 2007. Wind speed: 8,0 m/s

New WTG

Noise sensitive area

Height above sea level from active line object

35,0 dB(A)

40,0 dB(A)

45,0 dB(A)

50,0 dB(A)

55,0 dB(A)