Energistyrelsen
Amaliegade 44
1256 København K

Att.: Nina Lassen

Harboøre den 14.07.2011

Vedr. Deres J.nr. 2109/1487-0001 Høringssvar på VVM-redegørelse for havvindmøllepark i Nissum Bredning.

Driftsselskabet Rønland Havvindmøllepark I/S er et fælles driftsselskab for de 4 stk. 2,3 MW Siemens vindmøller, som er nærmeste nabo til de planlagte vindmøller øst for sejlrenden i Nissum Bredning.

Driftsselskabet varetager ejernes fælles interesser og præsenterer herved deres bemærkninger og indsigelser i forhold til ovennævnte VVM høring.

Indledningsvis skal vi bemærke, at vi har en positiv holdning til vindmølleudbygningen både on- og off-shore. Vi vil dog anfægte placeringen I Nissum Bredning vest for sejlrenden, da placeringen er så tæt på vore vindmøller, at det vil medføre væsentlige tab i indtjeningen, øge omkostningerne til drift og vedligehold samt forkorte møllernes levetid på grund af øget turbulens og vindskygge fra de planlagte vindmøller.

For at kvantificere produktionstabet har vi bedt Energi og Miljødata beregne tabet. Produktionstabet er beregnet ud fra hver, af de 4 alternativer, som det fremgår af de vedhæftede pdf-filer. Konklusioner er, at tabet kan beregnes til 885 MWh/år for den placering, hvor afstanden mellem møllerne er mindst. Hertil kommer de øgede omkostninger til drift og vedligehold samt levetidsforkortelsen. Det er imidlertid vanskeligt at kapitalisere disse forhold, hvilket vi derfor endnu ikke har gjort.

Med baggrund i ovenstående mener vi, at placeringen så tæt på de eksisterende møller er så problematisk, at den bør opgives. Der er præcedens for, at der ved off-shore udbud fastsættes en friholdelseszone på ikke under 3 km. mellem parker, som ikke opføres under samme udbud. Det må derfor være rimeligt, om Energistyrelsen fastlægger en tilsvarende minimum afstand til de nye møller i Nissum Bredning.

Såfremt Energistyrelsen vælger ikke at tage hensyn til vor indsigelse, må vi forbeholde os at blive holdt skadesløs for vore tab og øgede omkostninger.

For Driftsselskabet Rønland Havvindmøllepark I/S

Knud Vrist
Knud Vrist

Per Lauritsen

Driftsselskabet Rønland Havvindmøllepark I/S, Borgervænget 12, 7673 Harboøre
tlf.: 97 83 45 12, mail: ronland@profibermail.dk

Project: Harboøre_juli-11
Description: Baseret på skalerede møller

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Calculated:
05-07-2011 18:56/2.8.244

PARK - Main Result

Calculation: L1

Wake Model N.O. Jensen (RISØ/EMD)

Calculation Settings

Air density calculation mode	Individual per WTG
Result for WTG at hub altitude	1,235 kg/m³ to 1,241 kg/m³
Air density relative to standard	101,3 %
Hub altitude above sea level (asl)	78,0 m to 130,0 m
Annual mean temperature at hub alt.	8,2 °C to 8,5 °C
Pressure at WTGs	997,4 hPa to 1.003,7 hPa

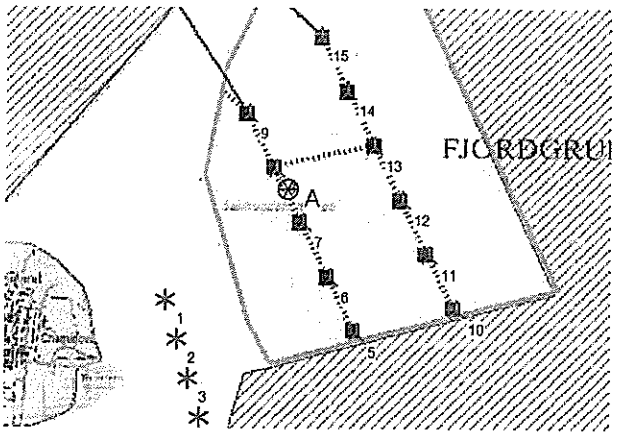
Wake Model Parameters

Wake Decay Constant	0,040 Offshore & Water areas

Wake calculation settings

Angle [°]			Wind speed [m/s]		
start	end	step	start	end	step
0,5	360,0	1,0	0,5	30,5	1,0

Wind statistics	DK DANMARK '07.wws
Regional Correction Factor	1,25
WAsP version	WAsP 10.1 for Windows RVEA0164 1, 9, 5, 0



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New WTG Existing WTG Site Data

Key results for height 80,0 m above ground level

Terrain ETRS 89 Zone: 32

	East	North	Name of wind distribution	Type	Wind energy [kWh/m²]	Mean wind speed [m/s]	Equivalent roughness
A	453.173	6.280.650	Site data 12 sectors; Radius: 28.022 m (1)	WAsP (WAsP 10.1 for Windows RVEA0164 1, 9, 5, 0)	8.409	9,6	-0,8

Calculated Annual Energy for Wind Farm

WTG combination	Result PARK	Result-10,0%	GROSS (no loss)|Free WTGs	Park efficiency	Specific results¤) Capacity factor	Mean WTG result	Full load hours	Mean wind speed|@hub height
	[MWh/y]	[MWh]	[MWh/y]	[%]	[%]	[MWh/y]	[Hours/year]	[m/s]
Wind farm	352.266,4	317.039,8	377.354,5	93,4	48,1	21.136,0	4.216	10,2
New WTGs only	313.884,9	282.496,4	336.908,2	93,2	48,8	25.681,5	4.280	10,5
Existing park WTGs only	38.381,6	34.543,4	40.446,3	94,9	42,8	8.635,9	3.755	9,5
Existing park WTGs without new WTGs	39.214,4	35.292,9	40.446,3	97,0		8.823,2		0,0
Reduction for existing park WTGs caused by new	832,8	749,5						

¤) Based on Result-10,0%

Calculated Annual Energy for each of 11 new WTGs with total 66,0 MW rated power

	WTG type						Power curve		Annual Energy		Park	
Terrain	Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Creator	Name	Result	Result-10,0%	Efficiency	Mean wind speed
				[kW]	[m]	[m]			[MWh]	[MWh]	[%]	[m/s]
5 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	29.160,3	26.244	95,44	10,44
6 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.601,6	25.741	93,49	10,46
7 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.337,7	25.504	92,61	10,46
8 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.314,1	25.483	92,47	10,47
9 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.647,2	25.782	93,52	10,48
10 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.112,0	25.201	93,16	10,45
11 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.396,6	25.557	92,71	10,46
12 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.076,8	25.269	91,60	10,47
13 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.055,3	25.250	91,49	10,48
14 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.295,0	25.466	92,25	10,49
15 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.888,2	25.999	94,16	10,49

*) Included in array losses is influence from 4 WTG(s) in the neighborhood, which has status as "Reference WTGs", see separate report to identify these.

Project:
Harboøre_juli-11

Description:
Baseret på skalerede møller

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Calculated:
05-07-2011 18:56/2.8.244

PARK - Main Result

Calculation: L1

Calculated Annual Energy for each of 4 existing park WTGs with total 9,2 MW rated power

	Terrain	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Power curve Creator	Name	Annual Energy Calculated prod. without new WTGs	After New WTGs	Decrease due to new WTGs	Park Efficiency
					[kW]	[m]	[m]			[MWh]	[MWh]	[MWh %]	[%]
1	A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.739,9	9.481,1	258,8 2,7	93,54
2	A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.738,9	9.519,6	219,3 2,3	94,15
3	A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.785,2	9.590,4	194,8 2,0	94,94
4	A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.950,4	9.790,5	159,9 1,6	96,96

WTG siting

	ETRS 89 Zone: 32 East	North	Z	Row data/Description
	ETRS 89 Zone: 32		[m]	
1 Exist	452.277	6.279.871	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (5)
2 Exist	452.355	6.279.595	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (6)
3 Exist	452.433	6.279.321	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (7)
4 Exist	452.511	6.279.047	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (8)
5 New	453.670	6.279.642	0,0	-27,4°, 428,7 m
6 New	453.477	6.280.024	0,0	
7 New	453.283	6.280.407	0,0	
8 New	453.089	6.280.789	0,0	
9 New	452.895	6.281.172	0,0	
10 New	454.395	6.279.803	0,0	-27,4°, 428,7 m
11 New	454.202	6.280.186	0,0	
12 New	454.008	6.280.568	0,0	
13 New	453.814	6.280.950	0,0	
14 New	453.620	6.281.333	0,0	
15 New	453.426	6.281.715	0,0	

Project: Harboøre_juli-11

Description: Baseret på skalerede nye møller.

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Calculated: 05-07-2011 19:17/2.8.244

PARK - Main Result

Calculation: L2

Wake Model	N.O. Jensen (RISØ/EMD)

Calculation Settings

Air density calculation mode	Individual per WTG
Result for WTG at hub altitude	1,240 kg/m³ to 1,241 kg/m³
Air density relative to standard	101,3 %
Hub altitude above sea level (asl)	78,0 m to 90,0 m
Annual mean temperature at hub alt.	8,4 °C to 8,5 °C
Pressure at WTGs	1.002,3 hPa to 1.003,7 hPa

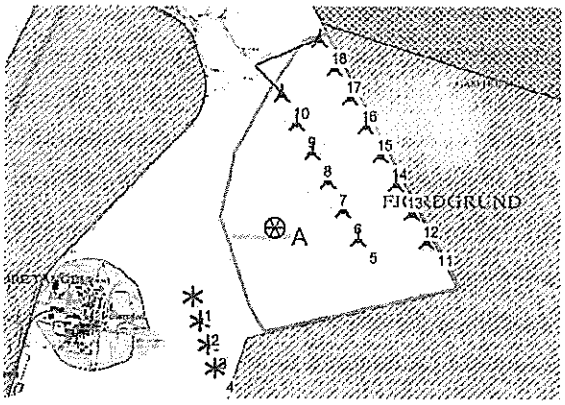
Wake Model Parameters

Wake Decay Constant	0,040 Offshore & Water areas

Wake calculation settings

Angle [°]			Wind speed [m/s]		
start	end	step	start	end	step
0,5	360,0	1,0	0,5	30,5	1,0

Wind statistics	DK DANMARK '07.wws
Regional Correction Factor	1,25
WAsP version	WAsP 10.1 for Windows RVEA0164 1, 9, 5, 0



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New WTG Existing WTG Site Data

Key results for height 50,0 m above ground level

Terrain ETRS 89 Zone: 32

	East	North	Name of wind distribution	Type	Wind energy [kWh/m²]	Mean wind speed [m/s]	Equivalent roughness
A	453.173	6.280.650	Site data 12 sectors; Radius: 28.022 m (1)	WAsP (WAsP 10.1 for Windows RVEA0164 1, 9, 5, 0)	6.757	8,9	-0,5

Calculated Annual Energy for Wind Farm

WTG combination	Result PARK	Result-10,0%	GROSS (no loss)|Free WTGs	Park efficiency	Specific results¤) Capacity factor	Mean WTG result	Full load hours	Mean wind speed@hub height
	[MWh/y]	[MWh]	[MWh/y]	[%]	[%]	[MWh/y]	[Hours/year]	[m/s]
Wind farm	376.746,9	339.072,2	407.569,1	92,4	41,5	18.837,3	3.638	9,7
New WTGs only	337.990,6	304.191,5	367.123,8	92,1	41,3	21.728,0	3.621	9,8
Existing park WTGs only	38.756,3	34.880,7	40.445,4	95,8	43,3	8.720,2	3.791	9,5
Existing park WTGs without new WTGs	39.213,4	35.292,1	40.445,4	97,0		8.823,0		0,0
Reduction for existing park WTGs caused by new	457,1	411,4						

¤) *Based on Result-10,0%*

Calculated Annual Energy for each of 14 new WTGs with total 84,0 MW rated power

	WTG type						Power curve		Annual Energy		Park	
Terrain	Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Creator	Name	Result [MWh]	Result-10,0% [MWh]	Efficiency [%]	Mean wind speed [m/s]
5 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.749,9	22.275	94,58	9,78
6 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.271,9	21.845	92,67	9,79
7 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.092,7	21.683	91,90	9,80
8 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.053,7	21.648	91,73	9,80
9 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.185,0	21.767	92,13	9,81
10 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.490,5	22.041	93,31	9,81
11 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.861,2	22.375	94,92	9,79
12 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.118,9	21.707	92,01	9,80
13 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.697,4	21.328	90,38	9,80
14 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.505,4	21.155	89,63	9,80
15 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.499,5	21.150	89,60	9,80
16 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.648,3	21.283	90,11	9,81
17 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.067,7	21.661	91,68	9,81

To be continued on next page...

*) Included in array losses is influence from 4 WTG(s) in the neighborhood, which has status as "Reference WTGs", see separate report to identify these.

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PARK - Main Result

Calculation: L2

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Terrain	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve Creator	Name	Annual Energy Result [MWh]	Result-10,0% [MWh]	Park Efficiency [%]	Mean wind speed [m/s]
18 A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.748,4	22.274	94,26	9,81

Calculated Annual Energy for each of 4 existing park WTGs with total 9,2 MW rated power

Terrain	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve Creator	Name	Annual Energy Calculated prod. without new WTGs [MWh]	After New WTGs [MWh]	Decrease due to new WTGs [MWh %]	Park Efficiency [%]
1 A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.739,8	9.602,4	137,3 1,4	94,74
2 A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.738,3	9.617,6	120,7 1,2	95,12
3 A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.785,0	9.679,5	105,5 1,1	95,83
4 A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.950,3	9.856,8	93,5 0,9	97,62

WTG siting

	ETRS 89 Zone: 32 East ETRS 89 Zone: 32	North	Z [m]	Row data/Description
1 Exist	452.277	6.279.871	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (5)
2 Exist	452.355	6.279.595	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (6)
3 Exist	452.433	6.279.321	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (7)
4 Exist	452.511	6.279.047	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (8)
5 New	454.079	6.280.515	0,0	-27,0°, 371,3 m
6 New	453.914	6.280.847	0,0	
7 New	453.748	6.281.180	0,0	
8 New	453.583	6.281.512	0,0	
9 New	453.418	6.281.844	0,0	
10 New	453.252	6.282.177	0,0	
11 New	454.826	6.280.474	0,0	-27,0°, 371,3 m
12 New	454.661	6.280.806	0,0	
13 New	454.495	6.281.139	0,0	
14 New	454.330	6.281.471	0,0	
15 New	454.165	6.281.804	0,0	
16 New	453.999	6.282.136	0,0	
17 New	453.834	6.282.468	0,0	
18 New	453.669	6.282.801	0,0	

Project:
Harboøre_juli-11

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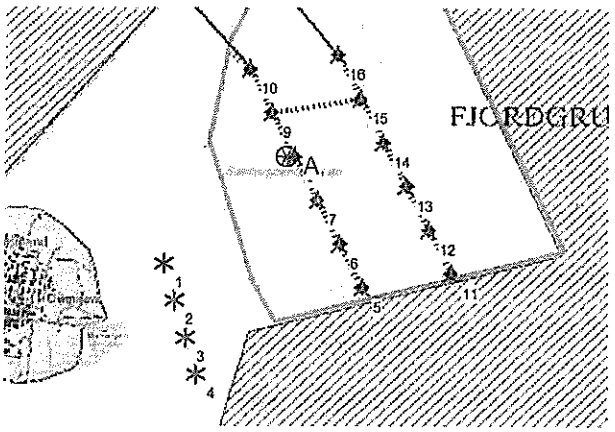
Calculated:
05-07-2011 19:04/2.8.244

PARK - Main Result

Calculation: L3

Wake Model	N.O. Jensen (RISØ/EMD)
Calculation Settings	
Air density calculation mode	Individual per WTG
Result for WTG at hub altitude	1,240 kg/m³ to 1,241 kg/m³
Air density relative to standard	101,3 %
Hub altitude above sea level (asl)	78,0 m to 90,0 m
Annual mean temperature at hub alt.	8,4 °C to 8,5 °C
Pressure at WTGs	1.002,3 hPa to 1.003,7 hPa
Wake Model Parameters	
Wake Decay Constant	0,040 Offshore & Water areas
Wake calculation settings	
Angle [°] start / end / step	0,5 / 360,0 / 1,0
Wind speed [m/s] start / end / step	0,5 / 30,5 / 1,0
Wind statistics	DK DANMARK '07.wws
Regional Correction Factor	1,25
WAsP version	WAsP 10.1 for Windows RVEA0164 1, 9, 5, 0



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New WTG Existing WTG Site Data

Key results for height 50,0 m above ground level

Terrain ETRS 89 Zone: 32

	East	North	Name of wind distribution	Type	Wind energy [kWh/m²]	Mean wind speed [m/s]	Equivalent roughness
A	453.173	6.280.650	Site data 12 sectors; Radius: 28.022 m (1)	WAsP (WAsP 10.1 for Windows RVEA0164 1, 9, 5, 0)	6.757	8,9	-0,5

Calculated Annual Energy for Wind Farm

WTG combination	Result PARK	Result-10,0%	GROSS (no loss)|Free WTGs	Park efficiency	Specific results¤) Capacity factor	Mean WTG result	Full load hours	Mean wind speed|@hub height
	[MWh/y]	[MWh]	[MWh/y]	[%]	[%]	[MWh/y]	[Hours/year]	[m/s]
Wind farm	324.477,7	292.029,9	354.103,9	91,6	41,0	18.251,9	3.596	9,7
New WTGs only	286.148,4	257.533,6	313.657,5	91,2	40,8	21.461,1	3.577	9,8
Existing park WTGs only	38.329,3	34.496,3	40.446,4	94,8	42,8	8.624,1	3.750	9,5
Existing park WTGs without new WTGs	39.214,4	35.293,0	40.446,4	97,0		8.823,2		0,0
Reduction for existing park WTGs caused by new	885,2	796,7						

¤) *Based on Result-10,0%*

Calculated Annual Energy for each of 12 new WTGs with total 72,0 MW rated power

	Terrain	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve Creator	Name	Annual Energy Result [MWh]	Result-10,0% [MWh]	Park Efficiency [%]	Mean wind speed [m/s]
5	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.506,6	22.056	94,24	9,74
6	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.929,4	21.536	91,84	9,75
7	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.673,7	21.306	90,71	9,77
8	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.615,9	21.254	90,36	9,78
9	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.804,8	21.424	90,91	9,80
10	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.269,6	21.843	92,56	9,81
11	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	24.550,1	22.095	94,10	9,76
12	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.773,6	21.396	91,03	9,77
13	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.392,2	21.053	89,42	9,78
14	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.321,0	20.989	89,08	9,79
15	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.438,0	21.094	89,45	9,80
16	A	No	DUMMY	-6.000	6.000	125,0	90,0	USER	Dummy-6MW	23.873,6	21.486	91,10	9,80

*) Included in array losses is influence from 4 WTG(s) in the neighborhood, which has status as "Reference WTGs", see separate report to identify these.

Project:
Harboøre_juli-11

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Calculated:
05-07-2011 19:04/2.8.244

PARK - Main Result

Calculation: L3

Calculated Annual Energy for each of 4 existing park WTGs with total 9,2 MW rated power

	Terrain	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Power curve Creator	Name	Calculated prod. without new WTGs	Annual Energy After New WTGs	Decrease due to new WTGs	Park Efficiency
					[kW]	[m]	[m]			[MWh]	[MWh]	[MWh %]	[%]
1	A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.739,9	9.460,1	279,9 2,9	93,33
2	A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.738,9	9.498,3	240,5 2,5	93,93
3	A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.785,2	9.585,3	199,9 2,0	94,89
4	A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.950,4	9.785,6	164,9 1,7	96,91

WTG siting

		ETRS 89 Zone: 32 East	North	Z	Row data/Description
		ETRS 89 Zone: 32		[m]	
1	Exist	452.277	6.279.871	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (5)
2	Exist	452.355	6.279.595	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (6)
3	Exist	452.433	6.279.321	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (7)
4	Exist	452.511	6.279.047	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (8)
5	New	453.718	6.279.683	0,0	-27,3°, 361,0 m
6	New	453.555	6.280.005	0,0	
7	New	453.393	6.280.327	0,0	
8	New	453.230	6.280.650	0,0	
9	New	453.067	6.280.972	0,0	
10	New	452.905	6.281.294	0,0	
11	New	454.358	6.279.787	0,0	-27,3°, 361,0 m
12	New	454.195	6.280.109	0,0	
13	New	454.033	6.280.432	0,0	
14	New	453.870	6.280.754	0,0	
15	New	453.707	6.281.076	0,0	
16	New	453.545	6.281.398	0,0	

Project: Harboøre_juli-11

Description: Baseret på skalerede møller

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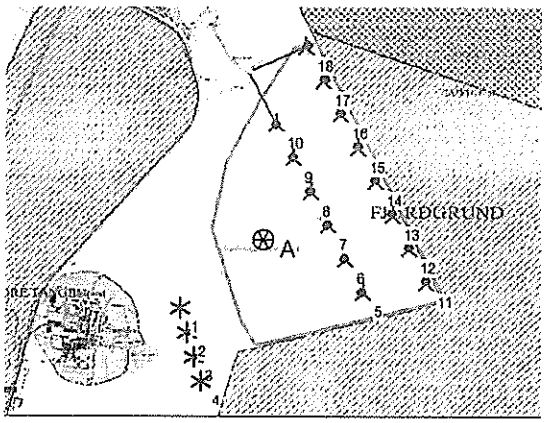
Calculated: 05-07-2011 18:22/2.8.244

PARK - Main Result

Calculation: L0

Wake Model	N.O. Jensen (RISØ/EMD)
Calculation Settings	
Air density calculation mode	Individual per WTG
Result for WTG at hub altitude	1,235 kg/m³ to 1,241 kg/m³
Air density relative to standard	101,3 %
Hub altitude above sea level (asl)	78,0 m to 130,0 m
Annual mean temperature at hub alt.	8,2 °C to 8,5 °C
Pressure at WTGs	997,4 hPa to 1.003,7 hPa
Wake Model Parameters	
Wake Decay Constant	0,040 Offshore & Water areas
Wake calculation settings	
Angle [°] start / end / step	0,5 / 360,0 / 1,0
Wind speed [m/s] start / end / step	0,5 / 30,5 / 1,0
Wind statistics	DK DANMARK '07.wws
Regional Correction Factor	1,25
WAsP version	WAsP 10.1 for Windows RVEA0164 1, 9, 5, 0



Scale 1:75.000

New WTG Existing WTG Site Data

Key results for height 50,0 m above ground level

Terrain ETRS 89 Zone: 32

	East	North	Name of wind distribution	Type	Wind energy [kWh/m²]	Mean wind speed [m/s]	Equivalent roughness
A	453.173	6.280.650	Site data 12 sectors; Radius: 28.022 m (1)	WAsP (WAsP 10.1 for Windows RVEA0164 1, 9, 5, 0)	6.757	8,9	-0,5

Calculated Annual Energy for Wind Farm

WTG combination	Result PARK [MWh/y]	Result-10,0% [MWh]	GROSS (no loss)|Free WTGs [MWh/y]	Park efficiency [%]	Specific results¤) Capacity factor [%]	Mean WTG result [MWh/y]	Full load hours [Hours/year]	Mean wind speed|@hub height [m/s]
Wind farm	438.030,2	394.227,2	469.773,5	93,2	48,3	21.901,5	4.230	10,3
New WTGs only	399.397,0	359.457,3	429.328,2	93,0	48,8	25.675,5	4.279	10,5
Existing park WTGs only	38.633,3	34.769,9	40.445,3	95,5	43,1	8.692,5	3.779	9,5
Existing park WTGs without new WTGs	39.213,3	35.292,0	40.445,3	97,0		8.823,0		0,0
Reduction for existing park WTGs caused by new	580,0	522,0						

¤) Based on Result-10,0%

Calculated Annual Energy for each of 14 new WTGs with total 84,0 MW rated power

Terrain	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve Creator	Name	Annual Energy Result [MWh]	Result-10,0% [MWh]	Park Efficiency [%]	Mean wind speed [m/s]
5 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	29.264,6	26.338	95,56	10,46
6 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.715,9	25.844	93,70	10,47
7 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.464,5	25.618	92,85	10,48
8 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.391,9	25.553	92,58	10,48
9 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.470,3	25.623	92,81	10,49
10 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.755,5	25.880	93,76	10,49
11 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	29.131,4	26.218	95,10	10,46
12 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.390,0	25.551	92,60	10,47
13 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	27.999,4	25.199	91,29	10,48
14 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	27.870,6	25.084	90,84	10,49
15 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	27.909,3	25.118	90,97	10,49
16 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.146,7	25.332	91,71	10,49

To be continued on next page...

*) Included in array losses is influence from 4 WTG(s) in the neighborhood, which has status as "Reference WTGs", see separate report to identify these.

PARK - Main Result

Calculation: L0

...continued from previous page

Terrain	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve Creator	Name	Annual Energy Result [MWh]	Result-10,0% [MWh]	Park Efficiency [%]	Mean wind speed [m/s]
17 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	28.634,2	25.771	93,30	10,49
18 A	No	DUMMY	-6.000	6.000	140,0	130,0	USER	Dummy 140m rotor	29.252,7	26.327	95,34	10,49

Calculated Annual Energy for each of 4 existing park WTGs with total 9,2 MW rated power

Terrain	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Power curve Creator	Name	Annual Energy Calculated prod. without new WTGs [MWh]	After New WTGs [MWh]	Decrease due to new WTGs [MWh %]	Park Efficiency [%]
1 A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.739,8	9.566,4	173,3 1,8	94,38
2 A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.738,3	9.582,7	155,6 1,6	94,77
3 A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.785,0	9.653,1	131,9 1,3	95,56
4 A	No	BONUS	2.3 MW-2.300/400	2.300	82,4	78,8	EMD	Level 0 - Calculated - - 01-2002	9.950,3	9.831,0	119,2 1,2	97,36

WTG siting

	ETRS 89 Zone: 32 East ETRS 89 Zone: 32	North	Z [m]	Row data/Description
1 Exist	452.277	6.279.871	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (5)
2 Exist	452.355	6.279.595	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (6)
3 Exist	452.433	6.279.321	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (7)
4 Exist	452.511	6.279.047	0,0	BONUS 2.3 MW 2300-400 82.4 !O! hub: 78,8 m (8)
5 New	454.271	6.280.072	0,0	-27,6°, 423,9 m
6 New	454.078	6.280.450	0,0	
7 New	453.886	6.280.827	0,0	
8 New	453.693	6.281.205	0,0	
9 New	453.501	6.281.583	0,0	
10 New	453.308	6.281.960	0,0	
11 New	454.977	6.280.193	0,0	-27,6°, 423,9 m
12 New	454.785	6.280.571	0,0	
13 New	454.592	6.280.948	0,0	
14 New	454.400	6.281.326	0,0	
15 New	454.207	6.281.704	0,0	
16 New	454.015	6.282.081	0,0	
17 New	453.822	6.282.459	0,0	
18 New	453.630	6.282.837	0,0	