



VERIFICATION COMMENT SHEET

Project Title: Borssele – Offshore Wind Farm	DNV Project No.: PP118609	VCS Reference: 644235-VCS-09-Rev02	
Reviewed Documents Title / No. / Rev.: /1/ - Site Studies Wind Farm Zone Borssele ‘Wind Resource Assessment’ Report prepared by Ecofys, rev 3 issued 2015-05-26., rev 4 issued 2015-09-17 /2/ Memo ‘0150911_MEM_RVO_Borssele Verification comment sheet_v3_ACr.docx ‘ Prepared by Ecofys, Issued 2015-09-14 Referenced Documents: /A/ -RVO, Site Studies Wind Farm Zone Borssele – Metocean Study for the Borssele Wind Farm Zone Site I, February 2015, reference: 1210467 -OOO-HYE-OO10, version 2 /B/ RVO, Site Studies Wind Farm Zone Borssele – Metocean Study for the Borssele Wind Farm Zone Site II, February 2015, reference: 1210467 -OOO-HYE-OO11, version 2 /C/ RVO, Site Studies Wind Farm Zone Borssele – Metocean Study for the Borssele Wind Farm Zone Site III, February 2015, reference: 1210467 -OOO-HYE-OO12 /D/ RVO, Site Studies Wind Farm Zone Borssele – Metocean Study for the Borssele Wind Farm Zone Site IV, February 2015, reference: 1210467 -OOO-HYE-OO13	Prepared by: EAH	Date: 2015-09-18	Sign:
	Verified by: ERJ	Date: 2015-09-18	Sign:
General: This verification comment sheet (VCS) covers the verification of the documentation listed above as ‘Reviewed Documents’. The documentation listed above as ‘Referenced Documents’ is used as background documentation; this means that this documentation is not part of the verification covered by this VCS unless it is clearly stated.			

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1.	General RVO has also commissioned metocean studies of each Borssele wind farm site, which were performed by Deltares [A] [B] [C] and [D]. The wind distribution, extreme wind speeds etc. are presented in both the Deltares reports as well as in the/1/ DNV GL recommends that it is clearly written which values to be used for which purpose, and that the design values are aligned. This may require that [A] [B] [C] and [D] also have to be re-issued. <i>Please Consider</i> DNV GL 2015-09-15 In the telephone conference organized by RVO.nl, with participants from Deltares, Ecofys and DNV GL it was agreed only to change ref /1/. Further it was agreed that Ecofys should forward a proposal for text changes to be made in /1/. Those changes are described in /2/. Comment Closed	TQ	C
2.	The main conclusion from the study is that ‘the mean wind speed at a hub height of 100 m MSL at the Borssele zone center is 9.6 ± 0.5 m/s. ’ However it is not clear by reading the conclusion, what this means? <i>Please rephrase the conclusion</i> Ecofys Reply 2015-09-14 are given in /2/ 2015-09-15 DNV GL Accepts the suggested changes to be made in /1/ Comment will be Closed	TQ	C



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3.	<p>Section 3.4.3 RVO metocean studies</p> <p>DNV GL has noted that it is written: <i>The mean wind speed at 100 m is found by Deltares to be 9.26 m/s, which is 0.3 m/s lower than the wind speed found in this assessment.</i></p> <p>It shall be noted that in the review of the Deltares reports [A] [B] [C] and [D], DNV GL has considered this extreme wind speed to be too low. This has been formulated in the below two DNV GL comments</p> <p>DNV GL Comment one regarding the extreme wind speed for the Deltares reports</p> <p>DNV GL 2015-01-29: For wind turbine design the alpha values should be presented as function of the wind speed at hub height (say 100 m) instead of as function of the wind speed at 10 m. Furthermore, DNV GL assumes that the 95% fractile will be used for design and suggests to include this in the report.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <thead> <tr> <th>Direction</th> <th>W₁₀</th> <th>W₁₀₀</th> <th>Part.</th> </tr> </thead> <tbody> <tr> <td>0 m/s</td> <td>0.021</td> <td>0.075</td> <td>0.211</td> </tr> <tr> <td>5 m/s</td> <td>0.031</td> <td>0.071</td> <td>0.168</td> </tr> <tr> <td>10 m/s</td> <td>0.044</td> <td>0.067</td> <td>0.106</td> </tr> <tr> <td>15 m/s</td> <td>0.058</td> <td>0.074</td> <td>0.099</td> </tr> <tr> <td>20 m/s</td> <td>0.069</td> <td>0.079</td> <td>0.096</td> </tr> <tr> <td>25 m/s</td> <td>0.077</td> <td>0.079</td> <td>0.092</td> </tr> </tbody> </table> <p><small>Table 3.134 Alpha values obtained for different wind speed directions</small></p> <p>DNV GL Comment two regarding the extreme wind speed for the Deltares reports</p> <p>In the approval letter for Zone Borselle Sites DNV GL has written that 'Upper bounds parameters (conservative parameters) can be applied directly for design without further justification'.</p> <p>Ecofys Reply 2015-09-14 are given in /2/</p> <p>DNV GL 2015-09-15 DNV GL Accepts the suggested changes to be made in /1/. Comment will be Closed when the changes are implemented in /1//</p> <p>DNV GL 2015-09-18 DNV GL: The revised text in /1/ rev 4, accepted, Comment closed.</p>	Direction	W ₁₀	W ₁₀₀	Part.	0 m/s	0.021	0.075	0.211	5 m/s	0.031	0.071	0.168	10 m/s	0.044	0.067	0.106	15 m/s	0.058	0.074	0.099	20 m/s	0.069	0.079	0.096	25 m/s	0.077	0.079	0.092	A	
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4.	<p>Section 3.5 Borssele wind climate.</p> <p>The way uncertainties are added together is not understood.</p> <p>Instrument accuracy 2.0%</p> <p>Instrument mounting 1.5%</p> <p>Data quality 0.5%</p> <p>Data processing 1.0%</p> <p>Vertical extrapolation 0.3%</p> <p>Horizontal extrapolation 3.6%</p> <p>Can be added together given total uncertainly of 4.5 %</p> <p>However the long term variation depends on the period considered. By looking at figure 263.5% seems to be the variation from year to year. During 20 year the uncertainly of the mean wind speed seems only to be 3.5%/sqrt(20)=0.8%</p> <p>Please reconsider.</p> <p>Ecofys Reply 2015-09-14 are given in /2/</p> <p>DNV GL 2015-09-15 Accepts the suggested change to be made in /1/. Comment will be Closed when the change is implemented in /1/</p> <p>DNV GL 2015-09-18 DNV GL: The revised text in /1/ rev 4, accepted, Comment closed.</p>	TQ	C																												
5.	<p>Section 4.6 Figure 28</p>	A																													



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	<p>Figure 28 is not a frequency plot, but a probability plot. When a smooth is used it is not straight forward to figure out what the percentages means The area in a frequency should be 'one' so the unit on the second axis has to be 's/m'</p> <p><i>It is suggested to change the figure in the next revision.</i></p> <p>Ecofys Reply 2015-09-14 are given in /2/ DNV GL 2015-09-15 Accepts the suggested changes to be made in /1/ DNV GL 2015-09-18 DNV GL: The revised text in /1/ rev 4, accepted, Comment closed.</p>		
6.	<p>Section 4.9 Extreme wind Speed</p> <p><i>a) DNV GL has noted that it is written It should be noted that accuracy of the estimates from both data sources is unknown, as both involve assumptions regarding the suitability of off-site or modelled data</i></p> <p><i>b) It not clear from the section what is the 50 year wind speed to be used for design</i></p> <p><i>c) Furthermore DNV GL is aware that other nearby offshore wind farms have been designed for much higher extreme wind speeds than U hub 10 min 50 year 41 m/s.</i></p> <p>DNV GL find 41 m/s to be a too low value extreme wind speed,</p> <p>It shall be noted that In /b/ Table 3.5 the 50 year 1 hour wind speed at 100 m wind speed 36.09m/s central estimate and with the 95% confidence intervals between 29.85m/s and 44.72m/s. In the approval letter for Zone Borselle Site II /B/ DNV GL has written that 'Upper bounds parameters (conservative parameters) can be applied directly for design without further justification'.</p> <p>It shall also be noted that it is confusing that the extreme wind speeds presented in metocean report are different from the extreme wind speed presented in the present report</p> <p><i>Please rewrite section 4.9.</i></p> <p>Ecofys Reply 2015-09-14 are given in /2/ DNV GL 2015-09-15 Accepts the suggested change to be made in /1./ However, DNV GL highly recommends the following sentence is added, so that it is clear that offshore wind turbines cannot be based on the wind alone. <i>In order to obtain a project specific approval it has to be shown that the RNA loads due to wind & wave do not exceed type approved RNA loads</i></p> <p>Comment will be closed when the change is implemented in /1/ DNV GL 2015-09-18 DNV GL: The revised text in /1/ rev 4, accepted, Comment closed.</p>	TQ	C

