

## References

### Wind Energy

<b>Project:</b>	<b>Onshore Wind Turbine 2.0MW Direct Drive</b>
<b>Service:</b>	Technical review and final development
<b>Details:</b>	<ul style="list-style-type: none"> <li>• Advanced load simulation of direct drive turbine with MSCADAMS including integration of external main/pitch-controller and variable wind/operation conditions according to GL 2010</li> <li>• FE-Analysis of mechanical and structural systems including special simulations of generator airgap</li> <li>• Certification support</li> </ul>

<b>Project:</b>	<b>Onshore Wind Turbine 1.5MW High Speed Drive Train</b>
<b>Service:</b>	Design and optimization
<b>Details:</b>	<ul style="list-style-type: none"> <li>• Load simulation with MSCADAMS conditions according to IEC 61400 Ed.3</li> <li>• FE-analyses and CAD-engineering for all main structural components</li> <li>• Certification support</li> </ul>



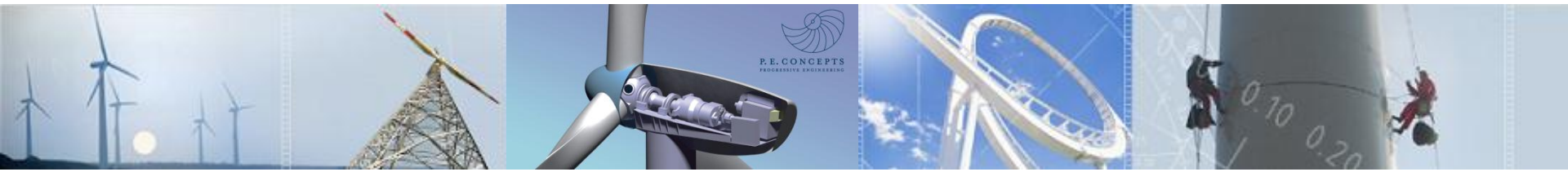


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<b>Project:</b>	<b>Special Analysis of 3.0MW Direct Drive Train</b>
<b>Service:</b>	Detailed analysis of generator airgap
<b>Details:</b>	<ul style="list-style-type: none"> <li>• FE-Model of drive train including detailed nonlinear characteristics of bearings</li> <li>• Analysis of relative generator airgap under extreme and fatigue loads including magnetic forces</li> </ul>
<b>Project:</b>	<b>Tower Design, diverse</b>
<b>Service:</b>	Detailed tower design
<b>Details:</b>	<ul style="list-style-type: none"> <li>• Tubular steel tower for turbines with rated power 0.8 to 7.0 MW, hub height up to 130 m</li> <li>• Hybrid towers (concrete and tubular steel, lattice and tubular steel), hub height up to 160 m</li> <li>• Lattice towers for turbines with rated power up to 2.5 MW, hub height up to 160 m</li> <li>• Bolted steel shell towers for turbines with rated power up to 3.2 MW, hub height up to 140 m</li> <li>• Guy wired towers, hub height up to 100 m</li> </ul>





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<b>Project:</b>	<b>Further Projects</b>
<b>Service:</b>	Concept studies, quality assessment, surveys, research
<b>Details:</b>	<ul style="list-style-type: none"> <li>• Lifetime monitoring system: turbine rated power 2.3 to 2.5 MW, hub height 80 to 100 m</li> <li>• Drive train design studies</li> <li>• Concepts for hydrostatic drive train</li> <li>• Concepts of tower variants and hybrid towers</li> <li>• Concepts of tower interfaces and special adapters</li> <li>• Seismic load calculation: wind turbines rated power 0.85 to 2.0 MW, hub height 49 to 80 m</li> <li>• FE-analysis and analytical calculation pitch bearing: rated power 1.25 to 2.5 MW</li> <li>• FE-analysis and analytical calculation yaw bearing: rated power 0.6 to 2.5 MW</li> <li>• Expert' s report/survey: manufacturing defect weld seams</li> <li>• Expert' s report/survey: welding procedure</li> <li>• Expert' s report/survey: defect ovalisation tower shell</li> </ul>

