



Offshore Wind Energy and related

REFERENCES APRIL 2009



1. **SELECTED REFERENCES**

Site	Project
Denmark Energinet.dk 2009 -	Anholt Environmental Management support of the environmental impact assessment process for Anholt/Djursland offshore windfarm planned for construction in 2010-2012.
Germany EnBW GmbH 2009 -	Baltic 1 Offshore Wind Farm Detailed scour protection design for mono piles installed at approximately 18 m water.
Germany ENOVA 2009 -	Offshore Windpark Riffgat 30 units of 5 MW turbines at 22 m water depth. Planning and tender documents for the detailed and final ("90 % BSH") bathymetric survey and geotechnical investigations. Audits of contractors and laboratories. Elaboration of geotechnical design basis.
UK DONG Energy 2009 -	Gunfleet Offshore Wind Farm Monitoring of WTG installation.
Germany Vattenfall Europe 2008 -	DanTysk Offshore Wind Farm Conceptual design for mono pile and gravity based foundation for 5 MW Turbine. Evaluation of construction and installation methods. Environmental impact. Water depth up to 30 m
Denmark A/S Storebaelt 2008 -	Sprogo Offshore Wind Farm Detailed design of gravity based foundations including sea bed and stone works. Preparation of design basis, metocean report, geotechnical investigations and design reports. Management of tender phase for foundations and wind turbines. Water depth up to 18 m.
Netherlands KEMA/RWE 2008 -	Tromp-Binnen Offshore Wind Farm Conceptual design for mono pile and gravity based foundation structure including design basis for app. 300 MW. Conceptual design for transformer station – overall layout. Preparation of construction and installation plans. Certification. Design depth app. 32 m.
Denmark E.ON Vind Sverige 2008 - AB	Rødsand 2 Offshore Wind Farm Environmental Management of Rødsand 2 Offshore Wind Farm. Project management of permit and environmental issues throughout the development and construction phase

<p>UK Vestas Offshore 2008 -</p>	<p>Robin Rigg Offshore Wind Farm Assessment of installation risk for installation of 60 3.0 MW WTGs on Robin Rigg Wind Farm. The scope comprises assessment of weather windows for the different operations involved in the complete installation as well as hind casting of metocean statistics.</p>
<p>UK DONG Energy 2008 -</p>	<p>Walney Offshore Windfarm Construction phase. Installation management and logistic planning. Interface management and risk evaluation. Consultancy related to design (mono piles and transformer station), geotechnical issues and metocean conditions. Water depth up to 25 m.</p>
<p>UK DONG Energy 2007-</p>	<p>Gunfleet Sands Ltd. Contract Management for a 164 MW offshore wind farm (Round 1: 100 MW and Round 2: 64 MW). The wind farm is situated approx. 7 km of the coast at Clacton-on-Sea, Essex. The scope comprises general contract management for multiple contracts for consultants and services providers, contract for 49 mono pile foundations, cable supply, cable installation, Sub-station platform and 48 wind turbines. Finally an advisory function for the Project Manager.</p>
<p>Denmark DONG Energy 2007-</p>	<p>Horns Rev 2 Offshore Wind Farm Contract management for a 200MW offshore wind park at 8-18 m water depth 30 km from land. The scope comprises general contract management for multiple contracts for consultants and service providers, contract for 92 foundations, cable supply, cable installation, accommodation platform and 91 wind turbines.</p>
<p>Germany Vattenfall Europe/Sellhorn 2007-2008</p>	<p>Dan Tysk Offshore Wind Park QA of tender material for geotechnical investigations and laboratory program, optimisation of site investigations and supervision offshore during drilling campaign. 25 – 30 m water depth. North Sea</p>
<p>UK DONG Energy 2007-</p>	<p>Horns Rev 1 Offshore Wind Farm Repair project - repairs of the 80 platforms. Weather risk analyses with respect to various vessels and installation methods based on site measured wind and wave data.</p>
<p>UK DONG Energy 2007-</p>	<p>Westermost Rough Offshore Wind Farm Feasibility study and Environmental Impact Assessment. Responsible for the assessment of the biological and physical environment. In house consultancy.</p>
<p>Norway Agder Energi Produksjon AS 2007 -</p>	<p>Solund, Aure, Snillfjord and Kvinesdal wind farms Environmental screening of 4 wind farm projects in Norway (Solund, Aure, Snillfjord and Kvinesdal). Assessment of impacts from the 4 wind farm projects on the environment. Defining the environmental impact assessment programme.</p>

<p>UK DONG Energy 2007 -</p>	<p>Barrow Offshore Wind Farm In-house consultancy assistance to BOW project management during execution of outstanding and remedial EPIC works in the transition to Operation and Maintenance Phase, which formally started on 1 January 2007</p>
<p>UK DONG Energy 2007 -</p>	<p>Burbo Offshore Wind Farm Environmental management support. Support for the post construction environmental monitoring programme. Defining of agreeing the environmental monitoring programme with the authorities. Tendering and scoping environmental work. In house consultancy.</p>
<p>Netherlands Eneco Milieu B.V 2006 - 2008</p>	<p>Q7 Offshore Wind Park Consultancy services. Installation of mono piles for 60 WTGs, 1 Met Mast 1 Transformer Station and installation of 60 WTGs 23 km from the coast at water level 20 m. Offshore supervision of installation works.</p>
<p>UK DONG Energy 2006 - 2007</p>	<p>Barrow Offshore Wind Farm Environmental monitoring during and post construction of Barrow Offshore Wind Farm. Analysis of bird monitoring data. Reporting to authorities. Defining scope of work for environmental surveys. In house consultancy.</p>
<p>Denmark 2006 – 2007 Energinet.dk</p>	<p>Roedsand 2 Request for tendering for the Design of the Transformer Station. Preparing of tender comprising Conceptual Design, Basic design and Detailed Design.</p>
<p>Denmark 2006 – 2007 Energinet.dk</p>	<p>Horns Rev 2 Request for tendering for detailed design of the Transformer Station</p>
<p>Sweden PHJV 2005 - 2007</p>	<p>Lillgrund Design basis and detailed design of foundation structures for WTG and transformer station including secondary structures. 48 pcs. 2.3 MW WTG. Fabrication specifications, method statements and risk assessments. Monitoring of seabed preparation for foundation installation in initial construction phase in 2006.</p>
<p>Germany ENOVA Energieanl. / Sellhorn Ingenieures. 2005</p>	<p>Riffgat, North Sea 45 units of 5 MW turbines at 22 m water depth. Planning and tender documents for geotechnical investigations. Audits of contractors and laboratories. Elaboration of geotechnical design basis. 10 % lot.. All certified by Germanischer Lloyd WindEnergie</p>
<p>UK Pihl & Hochtief 2005</p>	<p>Burbo Bank Preliminary design of alternative foundation solutions. Evaluation of the tender design – monopiles. 30 pcs. 3,0 MW WTG</p>

<p>Germany Pihl & Hochtief 2005</p>	<p>Borkum Riffgrund, North Sea Preliminary design of mono piles incl boat landing. Water depth between 24 and 28 metres. 77 pcs. 3.0.MW WTG.</p>
<p>UK Danish Oil and Natural Gas 2004</p>	<p>Walney Offshore Wind Farm. In house environmental management support. Environmental impact assessment of issues related to birds, marine mammals, fish and shellfish, benthos, terrestrial ecology and marine archaeology. Responsibilities include assessment, authority dialogue, management of consultants and input to the Environmental Impact Statement.</p>
<p>UK Danish Oil and Natural Gas 2004 -2006</p>	<p>Walney Offshore Wind Farm Geophysical Survey for a wind farm sited in the East Irish Sea. The survey includes wave and sediment conditions and data management for 102 pcs. of 4,5 MW turbines, substation and offshore cable route. Implementation of geophysical investigations.</p>
<p>UK Danish Oil and Natural Gas 2003</p>	<p>Offshore Wind Farms Feasibility studies for proposed offshore wind farms on selected locations in The East Irish Sea and near the east coast of UK. Preparation of baseline and work programmes for the application for license. Geotechnical, oceanographic, foundation and structural conditions and EIA aspects. A total of 600 MW, substation and offshore cable route on each investigated site.</p>
<p>Denmark Danish Oil and Natural Gas 2003</p>	<p>Baltic Sea Pre-feasibility studies for a proposed offshore wind farm location at Kriegers Flak. Wind and hydrographical conditions. Bathymetry and soil conditions.</p>
<p>UK Danish Oil and Natural Gas 2003-2007</p>	<p>Barrow. Offshore Wind Farm Due-diligence. Data room studies. Evaluation of tenders and evaluation of proposed soil conditions and hydrographical conditions. Evaluation of foundation design and structural design etc. for 30 pcs of 3MW turbines and substation. Assistance in the contract and construction phase. Monitoring of manufacturing and installation phase. Method statements and risk assessments. Assistance with review of draft as-built documentation after completion of installation.</p>
<p>Denmark Samsø Havvind A/S / SEAS 2001 – 2003</p>	<p>Samsøe Offshore Wind Farm 10 pcs. 2.3 MW Bonus turbines Supervision of the works at sea: Mono pile -, tower - and cable installations; evaluation of wind and wave influence; negotiations of contractors claims etc.</p>

<p>Denmark Elsam 2001</p>	<p>Horns Rev 1 Preparation of preliminary design for decommissioning of the Horns Rev 1 offshore wind park in the future. The preliminary design included proposed work procedures, recycling, removal of materials, choice of contractor, health, safety and environmental issues, tentative schedule and economy.</p>
<p>Denmark SEAS 1998 –2001</p>	<p>Offshore Windfarms Roedsand and Omoe Staalgrunde 150 MW: Planning and elaboration of Tender Documents for detailed geotechnical investigations for the two farms, each with 96 turbines. Supervision of the execution. Preliminary design for gravity and mono pile foundation. Supplementary geotechnical investigations for revised locations.</p>
<p>Denmark Danish Ministry of Energy and Environment/ Samsø Energiselskab SEAS 1998 – 2001</p>	<p>Samsøe Offshore Windfarm 10 pcs of approx. 2 MW. Evaluation of geotechnical and environmental design parameters for alternative locations. Preliminary foundation design and cost estimate. Geophysical Survey at Paludans Flak. Hydrodynamic modelling. Geotechnical investigations and detailed foundation design (control) at deep water and soft soil next to the Paludans Flak.</p>
<p>Denmark Danish Ministry of Energy and Environment/SEAS 1999 – 2000</p>	<p>Design Regulations for Offshore Wind Farms Elaboration of the External Conditions (wind, wave, ice, soil etc.) for design, combinations of loads, size of partial factors of safety etc. In a working group headed by the power companies and with RISOE as a major contributor NIRAS is responsible for geotechnical analysis and materials and participate in structural safety analysis.</p>
<p>Denmark Københavns Miljø- og Energikontor/SEAS 1998 – 99</p>	<p>Middelgrunden offshore Wind Farm 20 pcs 1.6 MW turbines placed just outside Copenhagen. Foundation advisor for SEAS. Monopile and alternative design of ballasted steel gravity structures. Detailed project and Tender Documents for the gravity solution. Supervision of geotechnical borings.</p>
<p>Denmark I/S MIDTKRAFT 1994 – 95</p>	<p>Tunø Knob Offshore Wind Farm 10 pcs. of 500 kW VESTAS-turbines. Planning and evaluation of the geotechnical survey, design of alternative foundation concepts, tender documents and supervision at site.</p>
<p>Denmark ELKRAFT Amba 1988 – 90</p>	<p>Vindeby Offshore Wind Ffarm 11 pcs. of 450 kW BONUS-turbines. Preliminary evaluation of wind- and wave energy, planning and evaluation of the geotechnical survey, design of alternative foundation concepts, tender documents and supervision.</p>

2. **ADDITIONAL REFERENCES**

<p>Poland Vestas 2006 -</p>	<p>Northern part of Poland Preparation of general quality documents for construction of turbines onshore.</p>
<p>Denmark Save Middles 2005</p>	<p>Hansholm Near Shore Wind Farm Pre-assessment of environmental impact of a wind farm at 3 locations at Hansholm close to The North Sea. Wind energy assessments and financial evaluation.</p>
<p>Denmark Danish Oil and Natural Gas 2002- 2003</p>	<p>Overgaard Windfarm 8 pcs. 2 MW NEG-Micon turbines. Quality Assurance of project and implementation of piled foundation and tower.</p>
<p>Poland SEAS 2002</p>	<p>Komarovo Windfarm, 35 pcs. 1.3 MW turbines placed in a marshy river delta. Feasibility study including preliminary design of piled foundations, temporary ground water lowering and 6 ha access road.</p>
<p>France Total Fina Elf / LIC Engineering A/S 2001</p>	<p>Dunkerque Wind Farm Preliminary design and cost comparison of alternative foundation structures for five turbines in the range of 2-5 MW.</p>
<p>Germany GEO mbH 2001</p>	<p>Offshore Wind Park SKY 2000, Baltic Sea 100 MW. Elaboration of Specifications and Conditions for preliminary soils investigations (CPTs and vibrocorings). Preparing of contractors contract.</p>
<p>Denmark SEAS Wind Energy Centre. 1998-2001</p>	<p>In-house consultant, SEAS Offshore Windfarm In-house consultant for SEAS in connection with the planning, EIA, baseline survey, authority approval, monitoring of the construction and GIS for three offshore wind farms located at Gedser Reef, Roedby Sand (Nysted Offshore wind farm) and Omoe Stålgunde.</p>

<p>Denmark Danish Ministry of Energy and Environment/SEAS 1998 – 2001</p>	<p>‘Suction as stability factor for the foundations of offshore wind turbines’ Phase 1: Study performed together with Danish Geotechnical Institute and another consultant has shown a considerably cost saving potential. Phase 2: Laboratory - and computer modelling.</p>
<p>Denmark Hydro Soil Services Bladt Industries 2000 – 2001</p>	<p>Offshore Wind Farm Horns Rev 1 82 turbines, 150 MW: Detailed design of mono piles for contractors bid.</p>
<p>India Danida/RISØ 1998 – 2000</p>	<p>National Wind Turbine Test Station, Kayathar Design and specifications for foundations adaptable to various turbines up to 1 MW. Layout and specifications for the electrical connections for the test turbines to the electrical grid; incl. transformers and metering systems. Design of earthing and lightning protection system.</p>
<p>Denmark ELSAMPROJEKT and SEAS Distribution Amba 1999 – 2000</p>	<p>Use for pre-stressed concrete in off shore wind farms Technical investigations and cost analysis concerning use of pre-stressed concrete in the foundation structure and use of pre-stressed concrete in a combined tower and foundation solution.</p>
<p>Denmark The electricity generation company, SEAS A/S. 1999</p>	<p>Environmental Impact Assessment of Offshore Wind Farms in Denmark The EIA was prepared for Omø Staalgrunde and at Rødsand in Denmark. NIRAS was engaged as external consultants. The main task has been to define the overall programme of environmental investigations to be implemented in the period 1999-2000, prior to authorities’ final approval of establishment of the offshore wind farm. The programme included hydraulic, morphological and biological investigations.</p>
<p>Sweden NEG Micon UK Ltd. 1999</p>	<p>Yttre Stengrund Wind Farm Evaluation and cost estimate of gravity based steel foundations of ten 2 MW turbines at 10 m water depth in the Baltic Sea.</p>
<p>Denmark Danish Ministry of Energy and Environment/SEAS 1998</p>	<p>‘Flow conditions around foundations for large offshore wind farms’ Technical input to the computer modelling by Danish Hydraulic Institute of the blocking effect in Femer Belt/Baltic Sea.</p>
<p>Denmark RISØ. Secr. Type Approv. 1997 – 98</p>	<p>Recommandation for foundation of Wind Tubines Participant in a working group for an update of the Recommendations.</p>
<p>Denmark ELKRAFT/SEAS Amba 1996 – 98</p>	<p>‘Cost-optimising of Large-scale Offshore Wind Farms’ EU/JOULE-Supported R&D project conc. Windfarms with more than 100 pcs of 1.5 MW turbines. NIRAS (NNR) in charge of the geotechnical investigations (incl. dynamic/cyclic lab.tests) and the foundation design. Foundation concepts adapted to wind loads from a revised turbine/tower concepts.</p>

<p>Great Britain National Wind Power Ltd. 1997</p>	<p>Offshore Windfarm, Norfolk Modelling of wind and wave load history. Conceptual design of turbine foundation at 15 m tidal water depth.</p>
<p>Denmark Danish Ministry of Energy/ ELSAMPROJEKT 1996 – 97</p>	<p>Foundation of Offshore Wind Farms (Danish). R&D project. Three consulting engineering companies after a general decision on the design basis have optimised each their foundation concept (gravity, monopile, tripod) on various water depths and foundation soils.</p>
<p>Germany WINKRA PROJECT 1996</p>	<p>Jade Offshore Windpark, Wilhelmshaven Evaluation and cost comparison of alternative foundations of 16 turbines of 1.5 MW in a high tide location.</p>
<p>Germany VENTIS GmbH 1994</p>	<p>Foundation Catalogue, V12 Elaboration of standard concrete foundations for 500 kW turbines in different wind zones and foundation soils in Germany.</p>
<p>Germany NORDWIND BVmbh 1993</p>	<p>Windfarm Plauerhagen, Mecklenburg-Vorpommern 3 pcs of 500 kW-turbines. Planning and Tender Documents for foundation design, access road etc.</p>
<p>Denmark Frederikshavn Municipality 1997</p>	<p>Onshore facilities for offshore Wind farms Evaluation of the benefits of the city and harbour of Frederikshavn in the erection of large-scale offshore wind farms.</p>
<p>Denmark Thirteen Municipalities 1993 – 97</p>	<p>Municipality Planning Elaboration of plans for siting of wind turbines considering energy as well as environmental and aesthetical aspects.</p>
<p>Denmark Danish Ministry of Energy and Environment 1993 – 95</p>	<p>"Household Turbines in the Municipality Planning" and "Windturbines in the Municipality Planning" Elaboration of guidelines for the municipalities taking into consideration energy as well as environmental and aesthetical aspects.</p>
<p>Greece EU programme RECITE 1988 – 94</p>	<p>Wind Measurement Evaluation, Crete Evaluation of existing wind power measurements on Crete and determination of revised methods and measurement points.</p>
<p>European Communities Energy Centre Denmark/ EC DGXVII 1992</p>	<p>Promotion of Renewable Energy OPET Action Programme on Renewable Energy. Danish contribution. Potential renewable energy applications, present status, main aspects of local authorities' involvement, proposals for efficient dissemination actions.</p>

Denmark Danish Ministry of Energy 1986 – 92	Wind Energy Mapping in Denmark Mapping of wind energy and the potential resources counties of Bornholm, Ribe, Vejle, South Jutland, Viborg, West Zealand, Storestrøm, Roskilde and Frederiksborg. Elaboration of an overall wind energy map. (1991)
Denmark Var. Counties 1986	Wind Turbine Siting The counties of Århus, Ringkøbing, Northjutland, Copenhagen and Funen. Indication of fields of conflict, elaboration of configuration patterns, and calculation of efficiency/economy of potential sites.

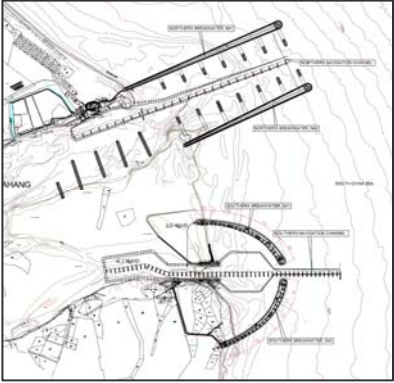

3. **ADDITIONAL RELATED ENVIRONMENTAL REFERENCES**

<p>Denmark Kalundborg Harbour 2006 -</p>	<p>Kalundborg New West Harbour Environmental Impact Assessment of the new harbour in Kalundborg. Responsible for defining the EIA programme in collaboration with authorities, implementing environmental surveys and writing up the EIA. Also responsible for writing the planning application.</p>
<p>Denmark Oresundskonsortiet 1995-2000</p>	<p>Management Responsibilities included information to the public on environmental impacts concerning construction of the bridge and tunnel across Oresund between Denmark and Sweden. The work included elaboration and maintenance of an exhibition at Oresund Exhibition, Kastrup. Preparation of a video and brochures informing about the environmental impacts in Oresund and the Baltic. Production of regular newsletters concerning potential impacts. Day to day contact to local television, newspapers and the public and informing about the project at public meetings in the local community.</p>
<p>Latvia and Lithuania The Danish Ministry of Transport 1999 - 2003</p>	<p>Environmental Impact Assessment of Transport Concepts in Latvia and Lithuania The overall objectives for the project were to define and effectuate the necessary procedures and work programmes concerning the implementation of the Environmental Impact Assessment Process for transport projects and to disseminate this information to the local partners and institutions and Government agencies in Latvia and Lithuania. The project did also ensure that the EIA process was in accordance with EU-directives with respect to preparation for adoption as EU-member countries.</p>
<p>Denmark The Municipality of Hvidovre 2000</p>	<p>Environmental Impact Assessment for deposit of residuals from flue gas cleaning Assessment of the environmental impact assessment for deposit of residuals from flue gas cleaning on AV-miljoe, with the effort on methods of stabilisation and impacts on the environment.</p>
<p>Denmark Port of Horsens 1999</p>	<p>Environmental Impact Assessment for an extension of the depot for sludge from dredging Assessment of the impacts from the deposit of sludge from dredging at the harbour of Horsens on the water flow, flora, fauna, sedimentation, smell and noise.</p>

<p>Denmark Port of Hundested 1999</p>	<p>Environmental Impact Assessment for the extension of the port at Hundested EIA for an approx. 7 ha extension of the port at Hundested established by filling up an area of the sea. As the deposit area is a part of the EU-bird protection area no. 102 and close to the EU-habitat area no. 134 there are increased demands to the EIAs documentation of limited impacts on birds and the sea environment. Assessment of the impacts from the planned extension of the port - hereby birds, sea environment, traffic, noise, visual and hydraulic conditions.</p>
<p>Denmark Port of Copenhagen and The Municipality of Copenhagen 1999</p>	<p>Environmental Impact Assessment for a deposit for contaminated soil EIA for an approx. 40 ha extension of the port at Provestenen in Copenhagen established by filling up with contaminated soil. Assessment of the impacts from the planned deposit - hereby seepage to Oresund, traffic, noise, air pollution, flora and fauna, landscape etc. and the connection with the planned extension of Amager Strandpark.</p>
<p>Denmark Sun Chemical 1999</p>	<p>Environmental Impact Assessment for a site for chemical waste The EIA included an extensive preliminary study and evaluation of a suitable location and design for a waste deposit for waste from chemical industry containing pesticides, heavy metals and organic compounds.</p>
<p>Jamaica IDB In association with COWI. 1997 - 1998</p>	<p>KINGSTON WHARVES, Redevelopment Study. EIA for dredging operation. Preparation of plans for redevelopment of the port of Kingston, Jamaica includes conceptual design, feasibility analysis and environmental impact assessment. The study is financed by IDB. EIA focussed primarily on the required dredging and reclamation of new port areas in the Bay area.</p>
<p>Denmark Billund Airport 1997</p>	<p>Environmental Impact Assessment for extension of Billund Airport EIA for an extension of Billund Airport. Assessment of the impact from the planned extension - hereby noise, contamination to air, flora and fauna, landscape, architecture, historical and cultural heritage, consumption of resources, traffic etc. Carried out in co-operation with Hundsbæk og Henriksen a/s.</p>
<p>Poland NCC/Ericsson 1996</p>	<p>Environmental Impact Assessment of a GSM-system Environmental Impact Assessment in connection with the establishment of a GSM-system in Poland.</p>
<p>Poland Joint venture with Opole Power Plant SA, Poland and NORGIPS A/S 1996</p>	<p>Environmental Impact Assessment for the fabrication Norgips Opole S.P. z.o.o. of gypsum boards Environmental Impact Assessment in connection with building of a plant for fabrication of gypsum boards in Norway Opole, Poland. The counselling included also application for environmental permit as well as permits for building.</p>

<p>Dominican Republic Inter American Development Bank/Nordic Development Fund 1995 - 1996</p>	<p>PUERTO HAINA PORT DEVELOPMENT, Study of existing and new facilities for improving the environment of the port proper and its immediate surroundings. Preparation of environmental impact assessments for new port development in Puerto Haina, including analysis of hazardous waste, wastewater from ships, spill oil and general sewage. Design of treatment facilities for liquid and solid waste.</p>
<p>Denmark Danish Natural Gas A/S 1995</p>	<p>Environmental Impact Assessment for the transmission pipeline for natural gas EIA for a planned supplement, transmission pipeline for natural gas from Nybro to Egtved, a distance of approx. 60 km.</p>
<p>Denmark Frederiksborg County 1992 - 93</p>	<p>Environmental Impact Assessment for a highway in the County of Frederiksborg EIA for a planned extension of the Hillerød highway from Hillerød to Helsingø. Assessment of the impact from the planned extension of the highway - hereby air pollution, noise and pollution of surface- and groundwater.</p>
<p>Germany Marius Pedersen Anklam 1992 - 93</p>	<p>Environmental Impact Assessment for a landfill at Anklam EIA in connection with the establishment of a landfill at Gmbh Standort Dennin, Mecklenburg-Vorpommern, Germany. Assessment of the impacts from the planned landfill on streams and bogs and on the natural flora and fauna in the area.</p>
<p>Lithuania/Latvia/Estonia Nordic Gas Grid 1998</p>	<p>Environmental Impact Assessment Preparation of a report concerning the environmental impact from a Nordic Gas Grid for Denmark and the Baltic States.</p>

4. **HYDROGRAPHICAL SUBJECTS**

<p>England Wave Dragon Ltd 2006-2007</p>	<p>Hydrographical design conditions Definition of the hydrographical conditions (Wind, Tide, Current and Waves) for the wave energy converter Wave Dragon to be deployed off the coast at Milford Haven in Wales.</p>
<p>Malaysia Malaysia Resources Corporation Berhad (MRCB) 2005-2007</p>	<p>Kuala Pahang, River mouth improvement Preliminary design , conceptual design and final design for optimizing of a river mouth structure with respect to mooring, navigation, river sediment transport and longshore sediment transport. Intensive numerical morphological modelling to obtain the final layout.</p> 
<p>Nicaragua Danida. 2000 – 2006</p>	<p>Feasibility Study and supervision of Closing the Gap at El Bluff Due to a very strong hurricane in 1988, the coast has breached at the El Bluff Peninsula at the Caribbean Sea, causing increased tidal water exchange and sedimentation in the Bluefields Bay. The project has comprised preparation of proposals, an EIA based on numerical modelling, together with an evaluation of the economic feasibility of closing the gap. The gap was closed as suggested by a local contractor in 2006 under supervision by NIRAS.</p> 

<p>Denmark/Sweden Oresundskonsortiet. 1992 - 2000</p>	<p>In-house consultant for Øresundsbron, the fixed link across Øresund Definition of the environmental strategy and investigation for the fixed link, Requirements to the environmental impacts based on negotiations with the authorities in Denmark and Sweden, A environmental monitoring programme, Dredging instruction including spill monitoring done by the dredging contractor, seasonal variable spill criteria depending on biological variables, etc, Design and implementation of the GIS and database system, EAGLE. An online GIS system install at the relevant authorities, contractors, etc. in both Denmark and Sweden. The system was updated on daily basis with dredging amount, sediment spill, biological monitoring parameters, etc. all check against the criteria, and PR management according to the environmental impacts.</p>
<p>Denmark The Great Belt Link Ltd 1988-2000</p>	<p>In-house consultant for The Great Belt Link Ltd Environmental consultant and project manager for the environmental investigation, Definition of the environmental strategy and investigation for the fixed link, Requirements to the environmental impacts based on negotiations with the authorities in Denmark, A environmental monitoring programme, Dredging instructions, Spill monitoring and set up of a dredging and spill database, and Supervision of external consultants.</p>
<p>Denmark Ekofisk Cessation Project Ekofisk 2003</p>	<p>Feasibility study for cover of contaminated sediments Member of a project group undertaking a study to define and select appropriate technologies and materials to construct a cover of contaminated sediments in the annuli of the central tank structure at 80 m of water depth as part of the decommissioning of the oil field. The study involves several technical disciplines, analysis of contaminants, hydraulic conditions, structural analysis, evaluation of appropriate offshore construction methods, analysis of short term and long term environmental impacts.</p>
<p>Denmark Drogden, 2001</p>	<p>Extension of navigation channel Project management for an interdisciplinary feasibility study of a scheme for improvement of the main navigation route through Øresund to the Baltic Sea (from 8 to 10 m of navigation depth). The study involved disciplines such as assessment of inflow of salt to the Baltic Sea, traffic forecasts, navigation safety, utilisation of dredged materials and evaluation of economic and environmental feasibility of the scheme.</p>
<p>Libya Azzawiya Oil Refining Company 1996 –2001</p>	<p>Planning and design of a new oil export terminal Planning and design of all marine components of a major expansion of oil exporting facilities. The design includes 1000 m of new exposed rubble mound breakwater at 10 20 m of natural water depth, three tanker berths for vessels up to 150 000 DWT, dolphins and bridges.</p>

<p>Denmark National Navigation Authority, 1992 – 2000</p>	<p>Planning and design of offshore foundation structures for navigation lights Project management, conceptual and detailed design and construction supervision in connection with the development of new type light-house foundation structures in 8 to 20 m of water depth as aids for navigation through the straits of Denmark. Concrete caissons as well as steel structures on piles have been implemented. The schemes implied different risk levels of damage to vessels in case of collision in comparison with the existing facilities.</p>
<p>Denmark Great Belt Link 1997 – 98</p>	<p>Planning and design of protective islands Member of a project group that carried out planning, conceptual and detailed design and project follow up of works involving dredging of approx. 2.0 mio. m³ of marine hard clay and reclamation of dredged materials for construction of streamlined protective islands around the most exposed bridge piers close to the international navigation route under the bridge.</p>

5. **GEOTECHNICAL REFERENCES**

<p>Sweden Vattenfall 2005 - 2006</p>	<p>Lillgrund, Oresund 48 WTG and 1 Transformer Station foundations. Preparation of Scope of Work for additional geotechnical borings. Geotechnical design Basis incl. update and preparation of alternative foundation. Certification by Det Norske Veritas.</p>
<p>Germany ENOVA Energieanl. / Sellhorn Ingenieures. 2005</p>	<p>Riffgat, North Sea 45 units of 5 MW turbines at 22 m water depth. Planning and tender documents for geotechnical investigations. Audits of contractors and laboratories. Elaboration of geotechnical design basis. All certified by Germanischer Lloyd WindEnergie</p>
<p>UK Danish Oil and Natural Gas 2004 - 2006</p>	<p>Walney Offshore Wind Farm Geophysical Survey for a wind farm sited in the East Irish Sea. The survey includes wave and sediment conditions and data management for 102 pcs. of 4,5 MW turbines, substation and offshore cable route. Implementation of geophysical investigations. Preparation of foundation concepts (tripod, mono pile and gravity structures) for various WTG sizes.</p>
<p>UK Danish Oil and Natural Gas 2003-</p>	<p>Barrow. Offshore Wind Farm 48 WTG and 1 Transformer Station foundations. Preparation of Tender and Scope of Work for geotechnical investigations for the wind farm area and the 18 km cable alignment to shore. CPTs, Vibrocors and deep Borings. Preparation of the technical part of the contract. Offshore monitoring of the investigations. Evaluation of laboratory investigation programme. Design check of mono piles and driveability analyses.</p>

<p>Denmark SEAS 1998 –2001</p>	<p>Offshore Windfarms Rødsand and Omø Staalgrunde 150 MW: Planning and elaboration of Tender Documents for detailed geotechnical investigations for the two farms, each with 96 turbines. Supervision of the execution. Preliminary design for gravity and mono pile foundation. Supplementary geotechnical investigations for revised locations. CPTs and Borings. Planning of geotechnical laboratory programme.</p>
<p>Denmark Danish Ministry of Energy and Environment/ Samsø Energiselskab SEAS 1998 – 2001</p>	<p>Samsø Offshore Windfarm 10 pcs of approx. 2 MW. Evaluation of geotechnical and environmental design parameters for alternative locations. Preliminary foundation design and cost estimate. Geophysical Survey at Paludans Flak comprising WTGs and cable alignment to shore. Preparation of geotechnical investigation programme (CPTs and Borings) and detailed foundation design check. Offshore installation monitoring.</p>
<p>Germany GEO mbH 2001</p>	<p>Offshore Wind Park SKY 2000, Baltic Sea 100 MW. Elaboration of Specifications and Conditions for preliminary soils investigations (CPTs and vibrocorings). Preparing of contractors contract.</p>
<p>Denmark Københavns Miljø- og Energikontor/SEAS 1998 – 99</p>	<p>Middelgrunden offshore Windfarm 20 pcs 1.6 MW turbines placed just outside Copenhagen. Foundation advisor for SEAS. Monopile and alternative design of ballasted steel gravity structures. Supervision of geotechnical borings and offshore monitoring.</p>
<p>Denmark ELKRAFT/SEAS Amba 1996 – 98</p>	<p>‘Cost-optimising of Large-scale Offshore Wind Farms’ EU/JOULE-Supported R&D project conc. Windfarms with more than 100 pcs of 1.5 MW turbines. NIRAS (NNR) in charge of the geotechnical investigations (incl. dynamic/cyclic lab.tests) and the foundation design. Foundation concepts adapted to wind loads from a revised turbine/tower conc.</p>
<p>Denmark I/S MIDTKRAFT 1994 – 95</p>	<p>Tunø Knob Offshore Windfarm 10 pcs. of 500 kW VESTAS-turbines. Planning and evaluation of the geotechnical survey, design of alternative foundation concepts, tender documents and supervision at site.</p>

Denmark ELKRAFT Amba 1988 – 90	Vindeby Offshore Windfarm 11 pcs. of 450 kW BONUS-turbines. Evaluation of the geotechnical survey, design of alternative foundation concepts, tender documents and supervision.
---------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

6. PAPERS

Papers

Samsø offshore windfarm – From idea to realization.

Claus Gormsen et al. Paper to EWEC Madrid, June 2003.

Design of prestressed gravity foundation for offshore wind turbines.

Mogens Bergholdt et al. Proc. European Wind Energy Conference, Copenhagen, July 2001.

Poster and company exhibition as well.

Design regulations for offshore wind farms. Specification for concrete and steel structures.

Ole Viggo Andersen. Proc. European eminar OWEMES, Sicilly, April 2000.

Recent developments in offshore foundation design.

C.Birck & C.Gormsen. Proc. European Wind Energy Conference, Nice, March 1999.

Offshore foundation in practice.

C.Birck & C.Gormsen. Proc. European seminar OWEMES, La Maddelena, April 1997.

Cost-efficient foundation structures for large offshore wind farms.

C.Birck, C.Gormsen et al. European seminar OWEMES, La Maddelena, April 1997.

Offshore foundation on soft soil (In Danish)

C.Birck & C.Gormsen. Proc. XII Nordic Geotechnical Conference, Reykjavik, June 1996.