Offshore Wind

Expert environmental and engineering consultancy services

Realising the potential for offshore wind through experience and expertise

We provide multi-disciplinary environmental and engineering consultancy services to developers, investors and governments looking to realise the potential of offshore wind.

30 years of experience
NIRAS' experience with offshore wind dates back to the very first steps the emerging wind industry made into the sea at Vindeby in Denmark in 1989, where we provided geotechnical advice for the design of the foundations for that pioneering project. Since then we have followed our clients into new and exciting markets internationally and worked with them to realise some of the largest and most complex projects yet delivered. We have lost count of the MW of projects we have advised upon on in one capacity or another but it is certainly more than 50 GW and increasing all the time.

We are multi-disciplinary
Our team comprises internationally recognised specialists in engineering and the environment. Working closely together, we advise clients on the identification and evaluation of potential sites and the development of technically and commercially feasible design concepts. We identify and obtain all necessary licences and permits and undertake environmental impact assessment and associated technical studies required to obtain them. Once consented, we work with clients to develop detailed designs and assist with, or manage on their behalf, the construction and installation process. We have developed innovative approaches to the monitoring of operational wind farms

We value a close and trusting relationship with our clients highly and the solutions we develop are based on our core values: we listen, we learn and we deliver.

and at the end of their lifespan we advise on decommissioning. We also advise on the design and construction of ancillary infrastructure including ports and harbour facilities

We are expert
Many of our specialists are leading experts in their fields, providing trusted bespoke advice to clients, including governments, land/rights owners, developers and other stakeholders.

We continuously invest in developing our experts and their expertise so that they can keep pace with the rapid development of the industry and deliver the most modern and futureproof solutions. Combined with an extensive network of independent specialists, companies and local experts, we can provide the skills required for the projects we undertake.

We are international
NIRAS is an international consultancy with strong Scandinavian roots that undertakes projects globally. We have an extensive network of offices throughout northern Europe, Scandinavia, Asia and Africa. Our wind services are delivered from key centres of expertise in the UK, Denmark and Taiwan.

Our world of offshore wind

NIRAS delivers offshore wind services internationally through our network of regional offices

United Kingdom

Asia Pacific

Scandinavia

Offshore Wind Experts

We support clients to realise the potential of offshore wind though multi-disciplinary environmental and engineering consultancy services.

Policy / strategic advice
Advice to governments, developers and industry bodies on offshore wind planning and development

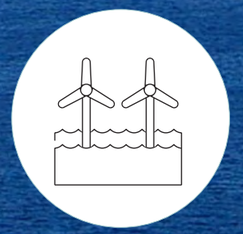
Site selection / feasibility
Identification of regions and sites suitable for OWF development, analysis of constraints, opportunities and likely costs

Concept design
Conceptual wind farm design and associated costs and development requirements

Expert technical consultancy
In-house expert competence in marine physical and biological environment, including MetOcean, geotechnical, marine ecology, ornithology

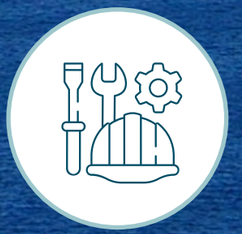
Development consent / EIA
Management of consent and licensing applications and environmental impact assessment processes

Owners' Engineer
Management of engineering contracts and contractors, including design, construction and installation



Wind farm monitoring
Design, implementation and interpretation of the monitoring of operational wind farms including structural health and environmental impacts

Lenders advice / due diligence
Technical due diligence and the management of the technical due diligence process for lenders and buyers of offshore wind farms and associated infrastructure



Decommissioning
Planning for the end of life of an offshore wind farm, including development of decommissioning plans and the technical studies these rely on

OFFSHORE WIND

Project Development Services

NIRAS offers a complete range of services throughout the full lifecircle of offshore wind projects. We provide full range of services from Site Selection & Feasibility, Concept & Design Basis, to Design & Tendering, and from Manufacturing & Installation to Operation, and Decommissioning.

SITE SELECTION & FEASIBILITY

- Applications for development rights
- Technical Due Diligence
- Demonstration of concept feasibility
- Business Plan review and assessment
- Preliminary assessment of site condition
- High level and detailed site selection studies

CONCEPT & DESIGN BASIS

- Development of concept design
- Permitting and Consenting (EIA, engagement with authorities etc.)
- Design de-risking and refininement
- CAPEX, OPEX and ABEX estimates
- Grid connection feasibility
- Geophysical surveys and interpetation

DESIGN & TENDERING

- FEED
- Tendering for execution phase contracts e.g. EPCI
- Re-iterations of CAPEX, OPEX and ABEX estimates and
- synergies
- O&M strategy development
- Port logistics and improvements
- Employer's requirements

MANUFACTURING & INSTALLATION

- Planning and implementation
- Surveillance and audit to ensure technical compliance
- Contractual / commercial compliance
- Pre-commission O&M
- Owner's engineer
- Package management
- HSE advice and training

OPERATION

- O&M strategy execution
- In-Service asset management
- Operational monitoring
- Environmental monitoring
- Updating or amending operating licence conditions

DECOMMISSIONING

- Life time extension
- Re-powering
- Planning for partial or total decommissioning
- Environmental monitoring and compliance

Project Development

We can advise and support our clients through each development phase of their project from the identification of suitable sites and securing development rights for those sites, through concept, design and installation, during operation and eventually to the facilitation of sustainable decommissioning.

Experienced project managers
We are experienced project managers with expertise in the development and management of budgets and work plans for both discrete work packages and larger programmes involving multiple, inter-related activities and their associated consultants and contractors.

Risk management lies at the heart of our approach and we use our experience and in-house procedures to identify, evaluate and manage risks to project delivery, the environment and, crucially, the health and safety of those involved in the project.

Extensive technical capability
Where required we can draw on an extensive in-house technical capability which includes expertise in:

- Wind resource assessment
- MetOcean analysis
- Seabed conditions
- Environmental characterisation and constraints analysis
- Consents and licensing
- Stakeholder management
- Environmental Impact Assessment
- Transportation and access
- Geotechnical investigation
- Civil and structural engineering
- Electrical system requirements
- Design and implementation of monitoring programmes
- Decommissioning planning

REFERENCE

Changfang and Xidao Offshore Windfarms

CLIENT: Changfang and Xidao Offshore Windfarms
COUNTRY: Taiwan
PERIOD: 2017 - ongoing

NIRAS has provided support on the two projects with combined capacity of 600 MW since its initiation in 2017. NIRAS supports the project from the project development phase to project execution phase.

Key works include:
- General environmental consultancy
- Support in project development including preparation for government selection/grid allocation
- Permits and consenting support
- Environmental and Social Impact Assessment in alignment with IFC Performance Standards
- Technical environmental consultancy, including:
  a. Ornithology
  b. Marine Mammals
  c. Fisheries
  d. Underwater noise modelling
  e. Electromagnetic fields from offshore cables
- O&M harbour layout and conceptual 3Dmodelling
- Support for tender and contracts for onshore substation package
- Support in management of design of foundations
- Support in fabrication management

OFFSHORE WIND

Environmental Services

NIRAS is a market leader in the provision of environmental services to the offshore wind industry. We have decades of experience and unrivaled within the industry.

DATA ACQUISITION

- Design, implementation and management of survey campaigns
- In-house marine survey capability
- Use of innovative designs
- Geophysical surveys
- Marine ecology surveys
- LiDAR, drone, radar technologies

ANAYSIS & MODELLING

- Statistical analysis
- Spatial (GIS) analysis and prioritisation
- Laboratory analysis and identification of marine samples
- Geophysical survey analysis and interpretation

RISK & IMPACT ASSESSMENT

- Collision risk modelling
- Critical habitats assessment
- Ecological impact assessment
- Habitats Regulations Assessment
- Mitigation plans

MONITORING

- Design of survey programmes
- Innovative technologies (radar, cameras)
- Discharge of licence conditions

PHYSICAL ENVIRONMENT

- Hydrography
- Sediment conditions and distribution
- Coastal morphology
- MetOcean
- Sediment chemistry and composition
- Underwater noise modelling & assessment

BIOLOGICAL ENVIRONMENT

- Ornithology
- Marine mammals
- Benthic ecology
- Fish and fisheries
- Bats

HUMAN ENVIRONMENT

- Shipping and navigation
- Marine archaeology
- Landscape and visual impact
- Subsea noise
- Socio-economics
- Emissions
- Air traffic
- Other sea users

Environmental expertise

Our team of in-house experts has extensive experience in all environmental aspects associated with the development of offshore wind farms. Together with associates and specialist subcontractors we can obtain, analyse and interpret relevant environmental information to inform the design, consenting and operating licence conditions of offshore wind farms.

REFERENCE

Habitats Regulations Assessment (HRA) for UK future offshore wind

CLIENT: The Crown Estate
COUNTRY: United Kingdom
PERIOD: 2018- ongoing

Plan-level HRA
NIRAS has been advising The Crown Estate on plan-level HRA of its plans for future offshore wind since 2018, including the Extensions projects announced in 2017 and Round 4.

Our support has included:
- Production of technical documents and assessment reports
- Development of a web-based GIS tool to facilitate screening of protected sites
- Engagement with statutory nature conservation bodies and other stakeholders
- Development of mitigation options

REFERENCE

ORJIP - Bird Collision Avoidance Study

CLIENT: The Carbon Trust
COUNTRY: United Kingdom
PERIOD: 2014 - 2018

Offshore Renewables Joint Industry Programme Bird Collision Avoidance study
NIRAS coordinated the delivery of the Offshore Renewables Joint Industry Programme Bird Collision Avoidance Study (ORJIP BCA) in collaboration with DHI, with technical support from BTO. Financed by a consortium of major UK offshore wind developers (including Vattenfall), together with The Crown Estate and Marine Scotland, this £1.6 million study was set up in 2014 to improve the evidence base for bird collision and avoidance rates around offshore wind farms.

Multiple sensor monitoring system
The study deployed a multiple sensor monitoring system, including radars, integrated camera equipment and laser rangefinders operated by experienced seabird observers, at four turbine platforms within Vattenfall's Thanet Offshore Wind Farm. The project quantified avoidance behaviours of key seabird species at offshore wind farms (specifically gannet, lesser black-backed gull, herring gull, great black-backed gull and kittiwake) and is to date the largest study of its kind ever undertaken worldwide.

www.carbontrust.com/resources/bird-collision-avoidance-study.

OFFSHORE WIND

Permitting and Consenting Services

NIRAS has been supporting the permitting and consenting of offshore wind farms since the birth of the industry in Denmark in the 1990's. We have a deep understanding of the legal and regulatory framework within which offshore wind is planned and consented. Our in-house team of experts has unrivaled experience of advising on, and supporting, applications for permits and consents of offshore wind projects in all major international markets.

DEFINITION OF THE PROCESS MAPPING

- Review of relevant legislation and regulations
- Understand relevant policy and guidance
- Define process
- Mapping and definition of the consents process
- Identify and map key consultees and stakeholders
- Define the project and its key components
- Programme and budgeting
- Identify application fees applicable

FORMAL & INFORMAL CONSULTATION

- Engagement with key consultees and stakeholders
- Development of project description materials
- Public meetings
- Meetings with relevant authorities
- Identification of issues and concerns
- Risk assessment and plan for management

ENVIRONMENTAL APPRAISAL & ASSESSMENT

- Screening and scoping of supporting information required for applications
- Design and management of required surveys
- Production of environmental appraisals and/or impact assessments required
- Development of mitigation plans

APPLICATION & EXAMINATION

- Production and submission of application documents
- Response to questions and representations
- Attendance at public hearings and inquiries
- Expert witness
- Production of technical submissions
- Review of licences and licence conditions
- Discharge of licence conditions

Permitting and Consenting

Obtaining the necessary permits and consents to construct and operate offshore wind farms can be a complex and time consuming task. In some jurisdictions the permits and consents required may be unclear, particularly in places without established offshore industries. Furthermore, the process of obtaining the necessary permits, consents and licences to operate may be ill-defined. NIRAS has decades of experience in defining and obtaining the permits, consents required to construct and operate offshore wind farms and their associated infrastructure.

Worldwide permits and consents
Although the legal requirements for the permits and consents required may differ from place to place, we follow established procedures to define the relevant processes and applications required, to undertake consultations, prepare supporting documentation and to prepare and submit applications on behalf of our clients. Throughout to the process we monitor and manage risks to the programme and budget and maintain an active dialogue with the wider project team.

Working closely with clients
We work closely with clients to ensure that any mitigation and conditions attached to permits and consents are as reasonable, proportionate and relevant as possible.

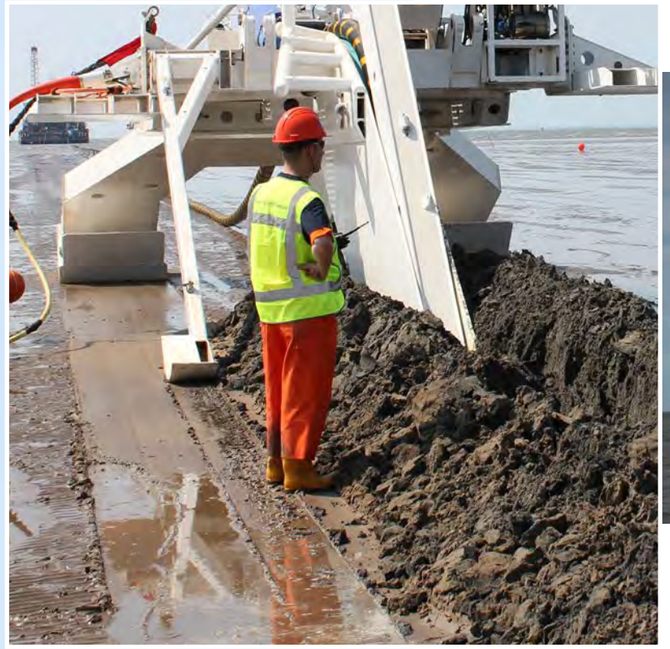
Once the necessary permits and consents have been obtained we assist our clients to discharge any conditions, including monitoring requirements effectively and efficiently.

REFERENCE

Subsea cables

CLIENT: Various
COUNTRY: UK, Denmark, Europe & Asia

NIRAS has supported the planning, permitting and consenting of numerous subsea power and telecommunications cables. We have worked with offshore wind farm export cables, interconnector systems and subsea optic fibre systems. Our in-house team manages all aspects of the application process, which often involves submissions made across multiple jurisdictions.



REFERENCE

Hornsea Zone Round 3 offshore wind farm projects

CLIENT: Ørsted (DONG Energy)
COUNTRY: United Kingdom
PERIOD: 2011 – present

NIRAS has been working on projects within the former Hornsea Zone since 2011, assisting both SMart Wind and Ørsted (DONG Energy) across the project lifecycle.

Due diligence on behalf of Ørsted
We carried out due diligence on behalf of Ørsted for the acquisition of the development rights to the zone. We have subsequently provided extensive support to the individual projects brought forward for consent with this zone. Our support has included provision of in-house support and topic leads, preparation of technical studies and reports for environmental impact assessment and Habitats Regulations Assessment, expert technical advice, stakeholder consultation and provision of expert witnesses for public examinations.

Once consented we have prepared monitoring plans and reports, including the development and implementation of novel ornithological monitoring techniques.

OFFSHORE WIND

Environmental Impact Assessment Services

NIRAS has pioneered impact assessment for offshore wind and has decades of experience of the management of EIA, ESIA and the technical works required to support these processes.

SCREENING

- Identification and confirmation of requirements for impact assessment
- Definition and mapping of the process
- Identification and preliminary discussions with competent authorities
- Project description and identification of key project components

SCOPING

- Identification and description of potential impact pathways and pressures
- Identification of potential receptors and their sensitivity
- Consultation and agreement of the scope of impact assessment and appropriate methods
- Development of web-based GIS tools to facilitate scoping and consultation

BASELINE DATA COLLECTION

- Literature reviews and research
- Design and management of survey campaigns
- Procurement and management of specialist contractors
- Analysis, modelling and interpretation of data
- Preparation of baseline characterisations

IMPACT ASSESSMENT

- Impact assessment in accordance with relevant standards and guidance
- Systematic description and assessment of potential impacts
- Assessment of cumulative and in-combination impacts
- Consultation and agreement of impact assessment conclusions

MITIGATION & COMPENSATION

- Identification of potential impacts requiring mitigation
- Development and agreement of appropriate mitigation measures
- Documentation of mitigation plans
- Assessment of residual impacts
- Negotiation of compensatory measures

ENVIRONMENTAL STATEMENT

- Prepare and submit documentation in appropriate format
- Production of technical and non-technical materials
- Expert witness and representation at public hearings and inquiries

Environmental Impact Assessment

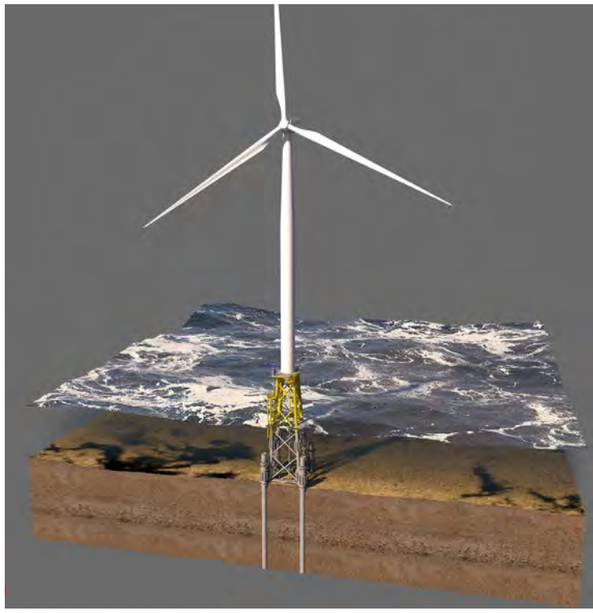
NIRAS has international experience in EIA and ESIA management. Our technical experts also support clients who are managing EIA/ESIA themselves. We have an exceptional track record of success in EIA and have led or contributed to the assessment of some of the largest projects yet brought forward.

Throughout the EIA/ESIA process we monitor and manage risks to the programme and budget and maintain an active dialogue with the wider project team, including technical specialists.

Mitigation and monitoring plans
We work closely with clients to ensure that any mitigation proposed is relevant, proportionate and that is technically and commercially feasible.

Once the application is approved we assist our clients to develop and implement detailed mitigation and monitoring plans effectively and efficiently.

EIA/ESIA in new and emerging markets
For projects being delivered in new and emerging markets there may be a requirement to go beyond the EIA requirements of the local consenting regime. Lenders or funders of projects may have additional requirements and NIRAS is experienced in ESIA required to satisfy international standards such as IFC. We have experience of both strategic, plan-level and project-level assessment.



REFERENCE

Optimised Seagreen Offshore Wind Farms

CLIENT: SSE
COUNTRY: United Kingdom
PERIOD: 2018

As well as earlier contributions on the environmental aspects of Seagreen e.g. HRA and marine ecology, NIRAS supported SSE in their application to Marine Scotland for Section 36 consents and Marine Licences for the optimised Seagreen Alpha and Seagreen Bravo offshore wind farms.

NIRAS managed and coordinated the EIA including:
- Technical lead on ornithology, fish and shellfish ecology and marine mammals assessments
- Technical lead on habitats regulations appraisal (HRA)
- Management of sub-consultants contributing to the EIA
- Liaison with marine scotland, statutory consultees and other stakeholders throughout the EIA process and Management of public exhibitions.

REFERENCE

Kriegers Flak Offshore Wind Farm

CLIENT: Energinet. dk
COUNTRY: Denmark
PERIOD: 2012-2016

NIRAS led the preparation of the EIA for this wind farm bringing together in-house resources and a range of external specialists. Key technical studies conducted included characterisation of metocean conditions, seabed and sediment characterisation, physical processes, ornithology, benthic ecology, fish and fisheries, marine mammals, shipping and navigation, marine archaeology, landscape and visual impact, noise, socio-economics and civil aviation.

Commissioning, management, review, and overall EIA report
NIRAS was responsible for the commissioning, management, review and integration of these technical studies into an overall EIA report which considered impacts during construction, operation and decommissioning phases.

Where required mitigation measures were identified and agreed with the client. Consultation with stakeholders was undertaken, including with neighbouring states under the ESPOO agreement. The project received approval from the Danish Energy Agency in 2020.

Engineering Servcies

NIRAS offers engineering expertise and design consultancy from the early conceptual phase through to final detailed design. Our approach combines extensive in-house expertise in hydrodynamics, geotechnics and structural engineering. Using our extensive experience and innovative approaches we can identify the best foundation type for a specific locations and purposes. We use in-house engineering design software which we continuously develop and test.

Innovative NIRAS projects
Examples of innovative projects that NIRAS has participated in include:

- Detailed design of foundations for an offshore wind farm in the Taiwan Strait where conditions are extreme. The strait is frequently affected by typhoons, earthquakes and liquefaction of soil. Heavy rain transports sand from the mountains into the sea, constantly changing the seabed.

- In connection with the Carbon Trust project, NIRAS introduced a damping system in order to reduce fatigue and increase the life span of steel monopoles.

- Design of monopiles with bolted connections between monopile and transition piece as well as integrated monopiles, where the transition piece is omitted. Both designs are combined with an optimised installation and operation procedure.

- A parametric study of various floater concepts has been performed in connection with a 10 MW turbine. The knowledge obtained in the project can be used to consider different floater concepts in early design phase where choice of concept has significant impact on the cost.

- NIRAS has been among the very first to provide hydrodynamic loads to a detailed concrete foundation design based on CFD calculations, certified by a leading certification company. The challenge of this task focused on verification of the model, extracting only relevant results and inclusion of influence of the irregularity of the waves.

REFERENCE

Northwind Offshore Wind Farm detailed foundation design

CLIENT: NORTHWIND NV
COUNTRY: Belgium
PERIOD: 2011 - 2015

Northwind Offshore Wind Farm (at Bank Zonder Naam) consists of seventy-two 3.0 MW Wind Tower Generators (WTG) and one Offshore High Voltage Station (OHVS). The wind farm is positioned on "zonder nam" Bank approximately 38km off the Belgian coast, in Belgium's exclusive economic zone in the North Sea. NIRAS developed Design Basis, including design briefs, and performed detailed design which included:

- Geotechnical data interpretation and design profiles per foundation locations
- Natural Frequency of WTG systems and OHVS system
- Extreme Events
- Fatigue (Installation and operational)
- FEM analysis of grouted connection
- Corrosion protection (surface protection, cathodic protection)
- Scour protection
- Ship impact
- Design of primary structures
- Design of secondary structures
- Design of provisional structures
- Design of elastomeric bearing system (Provisional solution in case the vertical bearing capacity of the grouted connection should fail)
- Installation
- Dismantling
- Fabrication
- Operation & Maintenance
- Quality control (Fabrication and Installation)

OFFSHORE WIND

Construction and Installation Management Services

NIRAS has been delivering construction and installation management services since the early days of the offshore wind industry in Denmark. During the decades we have built on our experience and honed our methodology, making us one the world's most experienced and skilled consultancy companies within the offshore wind industry.

CONTRACT MANAGEMENT

- Construction and installation planning
- Development of detailed budgets and programmes
- Procurement of contractors, including preparation of tender documents
- Contract management
- Financial and legal management

PLANNING & LOGISTICS

- Procurement and construction strategy
- Construction management
- Installation methodology/ logistics
- Risk management
- Interface management
- Project planning and documentation
- Site supervision for both offshore and onshore construction and installations

QHSE

- HSE planning and execution
- Certification
- 3rd party inspection (QA/QC)
- Development and delivery of training plans

OFFSHORE WIND

Construction and installation management

Planning, commissioning and delivering the construction and installation of offshore wind farms is complex and requires careful, experienced management. NIRAS provides technical advisory services and supervision during installation.

We provide contract and package management services for our clients as well as technical on-site supervision during cable, foundation and WTG installation and commissioning phases.

Full technical assistance
Our experienced engineers provide technical assistance in areas such as quality management, document review, interface management, health and safety and environmental management.

For each project, we prepare plans regarding time-schedule, procurement, interface, construction, risk-management, implementation, QA and HSE. All plans, standards and regulations are prepared and agreed with the client to ensure successful implementation.

REFERENCE

TPC Changhua Phase 1

CLIENT: Taiwan Power Company, Sinotech Engineering Consultants
COUNTRY: Taiwan
PERIOD: 2016 – ongoing

The large national utility company Taiwan Power Company (TPC) is one of three developers awarded by the government to develop a demonstration offshore wind farm project. TPC has in contrast to the other developers chosen to go with an EPCI-contract strategy and all turbines in the 100 MW+ off-shore wind farm.

NIRAS acts as Owners Engineer in collaboration with their local JV partner Sinotech, covering FEED studies, general project management, design review and design assurance of both tender design and EPCI contractors design, fabrication assurance and monitoring, Installation assurance and monitoring, commissioning.

REFERENCE

West of Duddon Sands

CLIENT: Ørsted (DONG Energy)
COUNTRY: United Kingdom
PERIOD: 2010 – 2015

NIRAS provided project management services through construction, installation and operation. The project comprises 108 monopiles situated near Barrow-in-Furness and electricity export cables running to an onshore connection point at Heysham. Total installed capacity is almost 400MW.

Our contribution to the management of the construction of this project included the planning and implementation of:

- Construction site manuals
- Harbour assessment, design, construction Staffing plans for the construction site office
- Budget for construction, including manning, equipment and maintenance of the site
- Identification and management of interfaces
- Contracts for crew, port assessment and preparation of port lease contracts
- Development of logistics plan for installation vessels, crew boats and helicopters
- Supervision of cable contractors' work including burial assessment and cable crossings

Operation and Maintenance

During the productive life time of a wind farm there will be a requirement to meet operational licence conditions, which typically include monitoring requirements. Ensuring that the wind farm operates optimally also requires information about its status and performance. Ensuring the safety of personnel involved in operations and maintenance activities in offshore situations requires careful planning and appropriate training.

State of the art monitoring solutions

NIRAS provides state of the art monitoring solutions for offshore wind farms. We have expertise in the measurement of:

- Structural integrity
- Fatigue status of structures
- Environmental conditions, including
- Marine ecological surveys
- Ornithological monitoring
- Execution and evaluation of geophysical surveys

Optimising the operation of wind farms requires accurate information and interpretation of performance. NIRAS has experience in the evaluation of operational data and its interpretation, including production verification (e.g. power curves).

Safe operations

Our expert team advises on planning and execution of safe operations. In addition to advising on, and preparing, HSE plans, we also have experience of planning crew transfer and accommodation logistics. NIRAS prepares and delivers HSE training covering all aspects of wind farm operations and maintenance, including in relation to onshore port and harbour facilities.

REFERENCE

Hornsea Offshore Wind Farms Accommodation vessel feasibility analysis

CLIENT: Ørsted (DONG Energy)
COUNTRY: United Kingdom
PERIOD: 2014

NIRAS has investigated the logistics for the next phase of offshore wind farms located further offshore extending the travel distance and shortening the effective working day. Longer travel distance requires longer weather windows with wind and waves less than a certain limit which reduce the probability to access the wind farm. Several different combinations of accommodation and crew transfer methods have been evaluated due to weather and cost.

REFERENCE

Trianel Wind Farm, Borkum Evaluation and improvement of existing scour protection

CLIENT: Trianel Windkraftwerk Borkum GmbH
COUNTRY: Germany
PERIOD: 2019

Evaluation of the existing scour protection and design of new improved scour protection concept for the substructure at the Trianel offshore wind farm. Scope of work for the delivered services by NIRAS was divided into three steps whereof the two first where followed up by a gate meeting to discuss and make decision for the final phase.

The scope

The Scope included but not limited to:

- Site specific data review
- Analysing of historic data
- Setup of 3D CFD model
- Simulation and Computation Fluid Dynamic (CFD) calculation
- Basic design of the scour protection concept
- Scour protection installation and technical specification

Best scour protection concept for the site

To find the best scour protection concept for the site in the fastest and most reliable way, NIRAS undertake the meticulous CFD-modelling, using the actual, up-to-date data from the site. Due to the wind farm having functioned since 2011, information about the actual current, waves and weather could be used to simulate closely how the scouring happens under different circumstances, at different times of year and in different weather.

Based on these simulations, NIRAS proposed a plan for design of a scour protection involving a wide graded single layer of rocks of a specific sizes.

Due to the complex design of the structure NIRAS used the CFD analysis to determine the ideal properties of the rocks. The ideal rock material consisted of several rocks sizes where the biggest was heavy enough to stay at the seabed and at the smallest small enough to prevent winnowing.

OFFSHORE WIND

Port and Harbour Facilities Services

NIRAS has several decades of experience building ports, marine and habour facilities worldwide - from the Arctic regions to Europe, South America, Africa, and Asia.

We use this inhouse expertise to deliver complete port and harbour facilities services to our clients worldwide.

REFERENCE

Rønne Harbour, Denmark

CLIENT: Rønne Havn A/S
COUNTRY: Denmark
PERIOD: 2014-2017

As an important part of securing a continuous supply to the community of Bornholm, Port of Rønne plans to expand in order future-proof the port facilities to accommodate port calls from the increasing ship sizes. Almost 98 % of all passenger and transportation of goods to and from Bornholm takes place through the Port of Rønne.

Phase 1 of the expansion comprises a multipurpose quay and heavy duty load off quay both prepared for a future water depth of 13 meters and approximately 15 ha of land fill. The reclaimed land will be protected from south by a revetment, and for the overall protection of the new harbour basin, a new breakwater shall be constructed.

Key features of the development include:

- Breakwater and rock fill approx. 1,200 m (420,000 m^3)
- Dredging 750,000 m^3
- Reclamation 1,100,000 m^3
- 300 m Multipurpose quay, prepared for 13 m water depth
- 200 m Heavy duty quay, prepared for 13 m water depth
- Ro-ro ramp
- 15 hectares of land fill including pavement (crushed stone) and utilities

FEASIBILITY AND PLANNING

- Facilities masterplanning
- Port operations planning
- Supporting environmental consents process
- Existing shore facility
- Structual assessment/analysis
- Feasibility studies
- Viability studies
- Land and marine geotechnical site investigation
- Topographic and bathymetric survey

PROJECT DEVELOPMENT

- CDM Pricipal Designer service
- Front End Engineering Design FEED
- Detailed Design
- Technical Specifications
- Activity scheduling and quantities
- Civil engineering contract documents
- Procurement and selection assistance
- Consultation with authorities
- 3D technology

CONSTRUCTION SUPERVISION

- Project management
- Site supervision
- Quality control of works
- Cost control of works
- Defects management
- Testing and certification
- Maintenance period management

INSPECTION AND MAINTENANCE

- Site inspection onshore and nearshore
- General visual inspection
- Detailed visual inspection
- Intrusive investigation (coring, sampling, lab testing)
- Design of repairs
- Design of stregthening

Port and Harbour Facilities

NIRAS has a team dedicated to maritime and onshore structures comprising experts in the master-planning, design and construction of general port and harbour facilities.

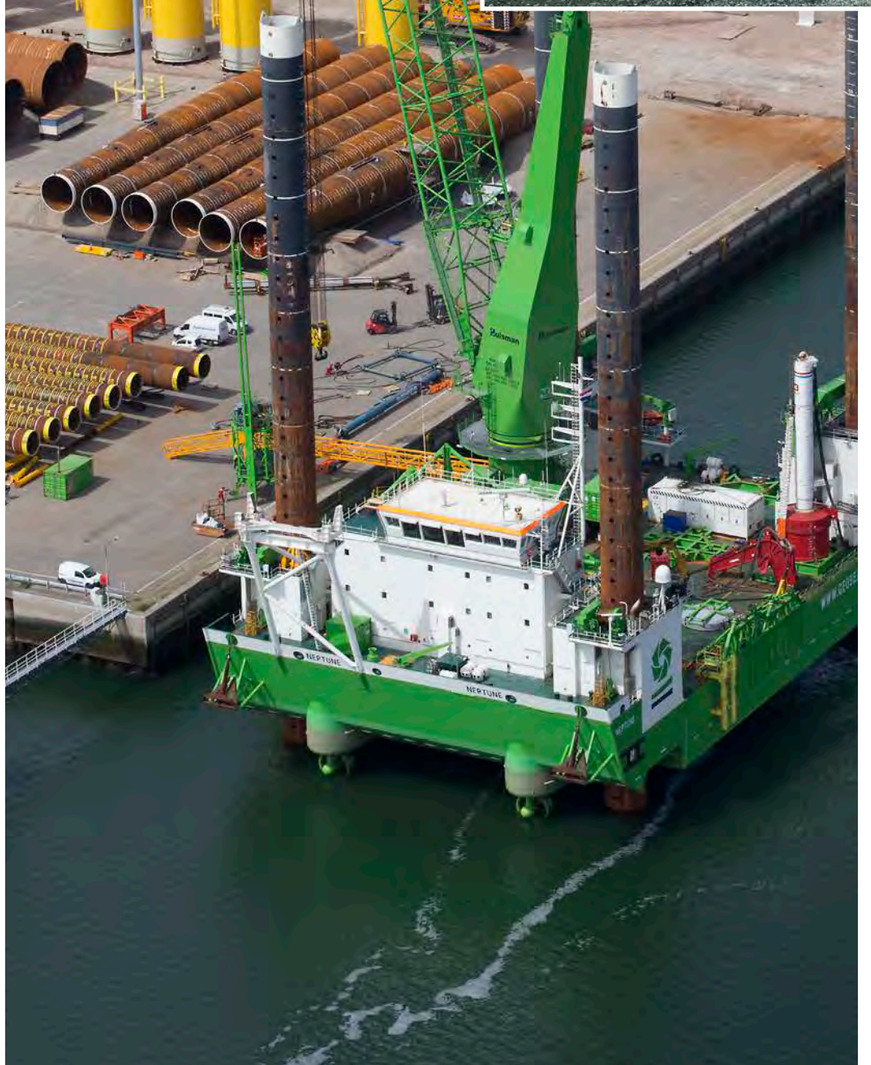
Offshore wind

Ports and harbours are also a key component of the offshore wind supply chain providing the facilities necessary for construction deployment and shore based O&M support to the field, and so we also provide services bespoke to this aspect of renewable energy. We have the capability to assess and design these facilities, and also to extend this to nearshore energy installations. We have in-house experience and knowledge of port operations that we can draw upon to assist clients in developing their on-shore and near-shore requirements.

Scope of services

In particular we provide the following scope of services:

- **Construction and O&M facilities** - Assessing, master-planning, design and delivery including operational analysis
- **Shore-based deployment** - Planning, developed and detailed design of quayside facilities for OSW, including berths, back-up areas, sea-bed capacity for large jack-ups, sea access and dredging
- **Transiting large/heavy renewable energy components (on or offshore) through ports/harbours** - Quayside loadings, sweep paths, route risk assessment, engineering route modifications, permissions
- **Harbour/jetty/quayside modifications/strengthening** - to accommodate renewables installations and/or materials handling
- **Nearshore OSW foundation inspection and maintenance** - utilising divers, laser survey, ROV technologies as required



REFERENCE

Able Marine Energy Park (AMEP)

CLIENT: ABLE UK
COUNTRY: United Kingdom
PERIOD: 2015 - ongoing

NIRAS carried out preliminary and detailed design for a 1.3 km long quay with a UDL of 20 t/m^2 and dredge depth of -17 m CD as well as 20 ha of land reclamation, channel dredging and associated quayside utilities. The estimated construction value of this key energy facility is £165 m.

The quay comprises a combi wall of 2.5 m diameter tubular piles and AZ 38-700N sheet piles supported by a 2.5 m diameter anchor wall.

Preliminary and detailed design

The work consisted of preliminary and detailed design of the following elements:

- Discharge of DCO conditions related to the quay and pumping station;
- Preparation of Tender documents and Tender assessment; and
- Site supervision.

The quay is designed to serve the North Sea offshore energy market for deployment, operation and maintenance.

Decommissioning

At the end of their operational life offshore wind farms will need to be decommissioned and this is typically a condition on their licence to operate. Decommissioning is, however, a complex process requiring specialist deconstruction techniques, environmental protection procedures and waste disposal. Recognising the complexity of decommissioning, NIRAS has developed processes and tools to assist operators faced with this challenge.

Readying wind farms for decommissioning starts with their design. Considering decommissioning methods and including provision for these in the design of key wind farm structures (including turbine foundations and transition pieces, for example) can significantly aid the works required for their safe removal at the end of their operational life.

Development of decommissioning plans
We advise on the development of decommissioning plans and the technical studies on which these rely. Our experts analyse and advise on appropriate methods and their associated costs. It is important to understand the regulatory framework in which decommissioning and subsequent waste disposal will take place and we can facilitate discussions with regulators and authorities to define environmental requirements and objectives as well as other constraints on deconstruction activities. We can advise on and assist in the procurement of specialist contractors to undertake necessary works that comply with these requirements.

ODIN-Wind
We have developed our own in-house tool (ODIN-Wind) to provide a structured process for analysing, planning and managing decommissioning projects, including in relation to:

- Waste management
- Mapping hazardous materials
- Feasibility studies
- Cost estimation
- Health and Safety
- Risk assessment
- Legal requirements
- Environmental Impact Assessment
- Tender management
- Contractor management

REFERENCE

Vindeby Offshore Wind Farm

CLIENT: Ørsted (DONG Energy)
COUNTRY: Denmark
PERIOD: 2014-2017

Supporting Ørsted (DONG Energy) NIRAS contributed in the decommissioning of Vindeby, the world's first wind farm.

NIRAS provided a precise cost estimation of the full decommissioning including all sub-processes. NIRAS investigated hazardous materials at the site and worked out a waste management plan. A comparative study of the decommissioning methods was undertaken, using our first-hand knowledge obtained from the design, construction and commissioning of the wind farm.

During tendering phase, NIRAS assisted by evaluating contractors' offers and their technical proposals.

REFERENCE

Les 'Eoliennes en Mer Services (LEMS)

CLIENT: Tractebel Engineering S.A.
COUNTRY: France
PERIOD: 2016

Decommissioning plans and cost estimation for comparative studies of 2 offshore wind farms during the pre-FEED design stage. Conceptual designs include WTG, jackets, OHVS topside and sea cables. The decommissioning plans include an overview of conceivable decommissioning methods and sequence, lift studies, vessel and port requirements, time schedule together with suitability surveys of vessels for preferred methods.
The decommissioning plan included a review of relevant laws and regulations and within this context, consideration and assessment of waste, environment and health and safety. Key outcomes include:

- Decommissioning conceptual design of several possible designs, cost calculation and modelling inputs to pre-FEED studies
- Technical input to full conceptual design process to determine the optimal design
- Decommissioning included as part of the basis of decision

Due diligence and lenders' advice

As decarbonisation of the world's electricity generation infrastructure has gathered pace there has been significant investment in offshore wind and this is projected to continue to grow. Investors need to understand the risk associated with projects and NIRAS provides reliable and independent expert technical and financial advisory services throughout the transaction process to identify and manage those risks.

Our advice draws on decades of experience in offshore wind and a deep understanding of the technical issues associated with the design, permitting, construction and efficient operation for projects in developed and developing markets. We have a track-record of advising developers, investors and financial institutions to successfully navigate transactions.

Development of business plans and technical analysis
We assist developers to optimise their projects and to prepare them for sale or inward investment, including with respect to:

- The development of business plans, including technical analysis of wind resources and yield analyses
- DEVEX/CAPEX/OPEX/ABEX modelling, optimisation and benchmarking
- Permitting and ensuring that supporting impact assessments (EIA/ESIA) meet local, and where relevant, appropriate international standards (e.g. IFC Performance Standards)
- Certifications
- Wind resources and energy yield assessments

Financial risk assessments
For investors and financial institutions we undertake risk assessments including:

- Technical due diligence
- Environmental, social and governance (ESG) due diligence
- Research and analysis of ESG requirements, including with respect to environmental performance, protection of biodiversity, social impacts, supply chain safeguards and other governance issues
- Compliance with international investor principles and performance standards

NIRAS has developed a suite of in-house tools to facilitate a structured and systematic approach to due diligence and objective, transparent appraisal of ESG and sustainability issues.

REFERENCE

Acquisition of Hornsea Zone development rights

CLIENT: Ørsted (DONG Energy)
COUNTRY: United Kingdom
PERIOD: 2011

NIRAS assisted and advised DONG Energy (now Ørsted) with technical due diligence during its acquisition of the 4GW of offshore development rights associated with Zone 4 (Hornsea) of Round 3 of the UK's offshore wind programme.

The focus of the due diligence exercise was on environmental, regulatory matters and permits for offshore and onshore components.

The transaction was successfully completed and NIRAS subsequently assisted with consent applications for the projects brought forward within this zone.

REFERENCE

ESIA document to support due diligence

CLIENT: Copenhagen Infrastructure Partners
COUNTRY: Taiwan
PERIOD: 2019

NIRAS was commissioned to support CIP achieve financial closure for their Chang Fang and Xidao. The lender's due diligence report into the purchase highlighted areas of uncertainty in the local environmental assessment process and a requirement to align with recognized international standards. NIRAS produce a suite of documents drawing on the International Finance Corporation's (IFC) suite of Performance Standards on Environmental and Social Sustainability and associated guidance.

REFERENCE

ESG due diligence

CLIENT: Confidential
COUNTRY: Netherlands
PERIOD: 2020

NIRAS assisted and advised a significant international investor with ESG matters in support of due diligence of a proposed transaction relating to the purchase of a significant shareholding in an operational offshore wind farm in the Netherlands.

Realising your sustainable potential

QHSE

Each of our projects is organised and delivered to the highest standards of quality, health and safety and environmental performance.

Our management systems are developed in accordance with relevant international standards: BS ISO 9001:2015, BS ISO14001:2015, and BS OHSAS 18001:2007. Each component of this system is certified by Alcumus ISOQAR, an independent IAF/UKAS accredited certification body.

Ethics and integrity

The NIRAS Group operates at the highest standards of business ethics and integrity. We have a zero-tolerance policy towards corruption, tax evasion, fraud, modern slavery and human trafficking. We strive to create a workplace that is free of all forms of discrimination and harassment.

NIRAS is linked to the UN Global Compact and to International Federation of Consulting Engineers (FIDIC) and we have developed a Business Integrity Management System which is applied systematically as a tool to prevent any kind of corruption and bribery. Our policy in this area is fully in accordance with OECD and FIDIC recommendations.

Further details to be found here:
niras.com/about-niras/corporate-social-responsibility

Sustainable development goals

As a global company, NIRAS contributes to the solution of a range of significant current challenges. Our goal is to supply sustainable solutions in the many projects we handle for our clients. This way, NIRAS makes a dedicated effort to reach the 17 sustainable development goals created by the UN in 2015.

At the same time we emphasise responsible and sustainable actions in our own work.

Find out more:
niras.com/about-niras/sdg-tools-create-sustainable-projects

Contact

Tim Norman
Director, UK and Global
E: tno@niras.com

Christoffer Truelsen
Vice President, Engineering, Scandinavia
E: ctru@niras.dk

Betina Heron
Vice President, Environment, Scandinavia and USA
E: bhh@niras.dk

Raoul Kubitschek
Managing Director, Asia-Pacific
E: rak@niras.com

NIRAS Headquarters Sortemosevej 19 DK-3450 Allerød Denmark +45 4810 4200 niras@niras.com www.niras.com/wind