



# **WIND ENERGY**

**ONSHORE AND OFFSHORE CAPABILITY**



# WIND ENERGY

## ONSHORE AND OFFSHORE CAPABILITY

### EXECUTIVE SUMMARY

Whether investing in an existing wind farm or developing a completely new one, owners, operators, investors, insurance companies and developers have to understand and mitigate all the risks before deciding to proceed with a project. Project risks which might affect the project's profitability in the short, medium and long term usually originate during the initial stages of development.

Independent technical advisors such as SGS can evaluate the technical feasibility of the project through a **technical due diligence** during which the risks

probability of occurrence and their potential impact on the project will be detected. The goal is to firstly ensure that the technical feasibility of the project is such that the investment is sound, and secondly to ensure the quality. This is accomplished by way of a thorough review of all the assets and/or the data available to reveal the potential areas of concern for the investor.

In addition to the due diligence during the development and operation phases, SGS supports the customers during the entire life cycle of the project with tender

support, construction and operations monitoring, and providing technical consultancy tailored to the client's needs.

This applies for both onshore and offshore wind farms with no geographic restriction.

### LIST OF ACRONYMS

<b>BOP</b>	<b>BALANCE OF PLANT</b>
<b>CC</b>	<b>COMPETENCE CENTRE</b>
<b>CDM</b>	<b>CONSTRUCTION DESIGN AND MANAGEMENT</b>
<b>EPC</b>	<b>ENGINEERING, PROCUREMENT AND CONSTRUCTION</b>
<b>ESIA</b>	<b>ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT</b>
<b>FIDIC</b>	<b>INTERNATIONAL FEDERATION OF CONSULTING ENGINEERS</b>
<b>HSE</b>	<b>HEALTH, SAFETY AND ENVIRONMENT</b>
<b>ISO</b>	<b>INTERNATIONAL ORGANISATION FOR STANDARDISATION</b>
<b>NDT</b>	<b>NON-DESTRUCTIVE TESTING</b>
<b>QA/QC</b>	<b>QUALITY ASSURANCE/QUALITY CONTROL</b>
<b>QHSSE</b>	<b>QUALITY HEALTH SAFETY SECURITY AND ENVIRONMENT</b>
<b>TDD</b>	<b>TECHNICAL DUE DILIGENCE</b>



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# 1 SGS GROUP

## 1.1 COMPANY PROFILE

SGS is the world's leading inspection, verification, testing and certification company. SGS is recognised as the global benchmark for quality and integrity. With more than 80 000 employees, SGS operates a network of over 1 600 offices and laboratories around the world.

Market capitalisation of CHF 16 052 million (SWX:SGSN).

Revenue 2013: CHF 5.8 billion.

The company, with headquarters in Geneva, was founded in 1878. This long history has assisted SGS to establish a reputation for independence, integrity, professionalism and experience. The policy of SGS is not to engage in any manufacturing, trading and financial activities which might compromise its independence and neutrality.

SGS is involved in the following business lines

- Industrial Services
- Oil, Gas and Chemicals
- Governments and Institutions
- Minerals
- Environment
- Automotive
- Systems & Services Certification
- Agriculture
- Consumer Testing
- Life Science



SGS HAS SIGNIFICANT EXPERIENCE WITH DELIVERING EXPERTISE TO BANKS (SUCH AS WORLD BANK, EBRD, ING, BNP, CITIGROUP, WEST LB, BBVA, INVESTCREDIT, EIB, JBIC, ETC.).



## 1.2 QUALITY SYSTEM

Being the world's leading inspection, verification, testing and certification Company, SGS is recognised as the global benchmark for **quality** and integrity. The SGS Group has a compliance programme, based on its Code of Integrity and Professional Conduct, to ensure that the highest standards of integrity are applied to all its activities worldwide in accordance with international best practice.



## 1.3 FIDIC CONDITIONS

SGS, with its worldwide network, has extensive practical experience with the FIDIC Conditions of Contract, based on various international projects. SGS highly trained experts contribute to the successful execution of engineering construction contracts worldwide in accordance with the FIDIC regulations.

SGS staff has handled successful contracts under FIDIC conditions including for Rymanów Wind Farm in Poland preparing and verifying the contracts according to the yellow book.

## 1.4 ENVIRONMENT AND SUSTAINABILITY POLICIES

At SGS we believe it is vital to embrace sustainability as a positive challenge; a source of continuous enquiry, innovation and improvement. We contribute to environmental sustainability in many ways through our range of services. Our own business activities also impact on the environment, so one of our priorities is to continuously improve our own environmental performance. Our environmental policy encourages us to minimise our impact on the environment and the communities where we work and live. It also requires our suppliers and business partners to make similar efforts.

The ISO 14001:2004 Environmental Management Systems (EMS) certification enables our clients to demonstrate their commitment to the environment. The standard provides guidance on how to manage the environmental aspects of your business activities more effectively, while taking into consideration environmental protection, pollution prevention and socio-economic needs.



## 1.5 WIND ENERGY SERVICES

SGS has significant practical experience related to delivering services for power and **wind energy** projects. These services to lender and sponsors comprise feasibility studies, technical advice, technical and environmental due diligence and project monitoring to mention but a few.

For the particular needs of a project SGS is able to dedicate wind experts from its Renewable Energy Support Office (RESO) based in Hamburg which employs globally 120 experts.

SGS supports its clients at a local level with its global affiliates being able to mobilise rapidly additional experts in different locations, should the need arise.

SGS experts have the combined experience and detailed understanding of every aspect of the energy sector, with particular focus on renewable energy, including wind.

SGS offers solutions throughout the wind value chain to answer the critical questions.



# 2 ONSHORE WIND ENERGY

## 2.1 TECHNICAL CONSULTANCY

As a market leader in inspection, verification and testing, SGS has a wide deep knowledge in several areas applicable to wind energy and a multi-disciplinary labour force located worldwide allowing SGS to tailor, and deliver efficiently all required services to meet client's requirements from the development to the operation phases of a wind project.

SGS provides technical consultancy with its world class advisors and engineers in different areas of expertise on the technical and commercial parts of the projects.

## 2.2 FEASIBILITY STUDIES

To support the development of a wind farm project, **feasibility studies** are realised to allow lenders, sponsors, owners and its shareholders to assess accurately the economic feasibility of the project and to identify next steps for its implementation and risks associated with those steps.

The feasibility studies will assess the

- Project site
- Project construction design, costs and scheduling
- Meteorological conditions
- Environmental and social impact
- Terrain and soil conditions
- Regulatory compliance
- Energy production
- Economics

### CASE STUDY | LENDER'S ENGINEER



A development bank awarded SGS the contract to assume the Lender's Engineer role for the construction of two wind farms in Romania.

The works started with a due diligence in February 2012 and will continue with the construction and operations monitoring of the wind farms until the end of warranty which is expected to be in 2015.

Services provided

- Lender's Engineer
- Technical Due Diligence
- Project Monitoring
- Operations Monitoring

### CASE STUDY | FEASIBILITY STUDY & SITE ASSESSMENT



The Dakar Port Authority (DPA) has initiated a policy to reduce its energy costs. This policy is in the frame of the one initiated by the government of Senegal who launched a broad programme of energy efficiency, reducing electricity costs and promotion of renewable energy (including tax exemption as incentives).

The DPA wants to take this opportunity to explore the possibilities available to invest in clean energy and benefit funding through the Clean Development

Mechanism. To this end, the Port wants SGS as consultant to conduct a study starting in 2011.

SGS will analyse the actual energy consumption and power supply scheme and study both renewable alternatives (wind and solar power supply).

Services provided

- Consultancy services on Renewable Energy
- Energy efficiency audit of the actual assets and buildings
- Alternative renewable power (solar and wind) feasibility study
- Wind site assessment
- Solar site assessment
- Financial evaluation of the alternative renewable solutions
- CDM evaluation: Project Identification
- Technical feasibility study and procurement support for the final option





### 2.3 SITE & WIND RESOURCE ASSESSMENT

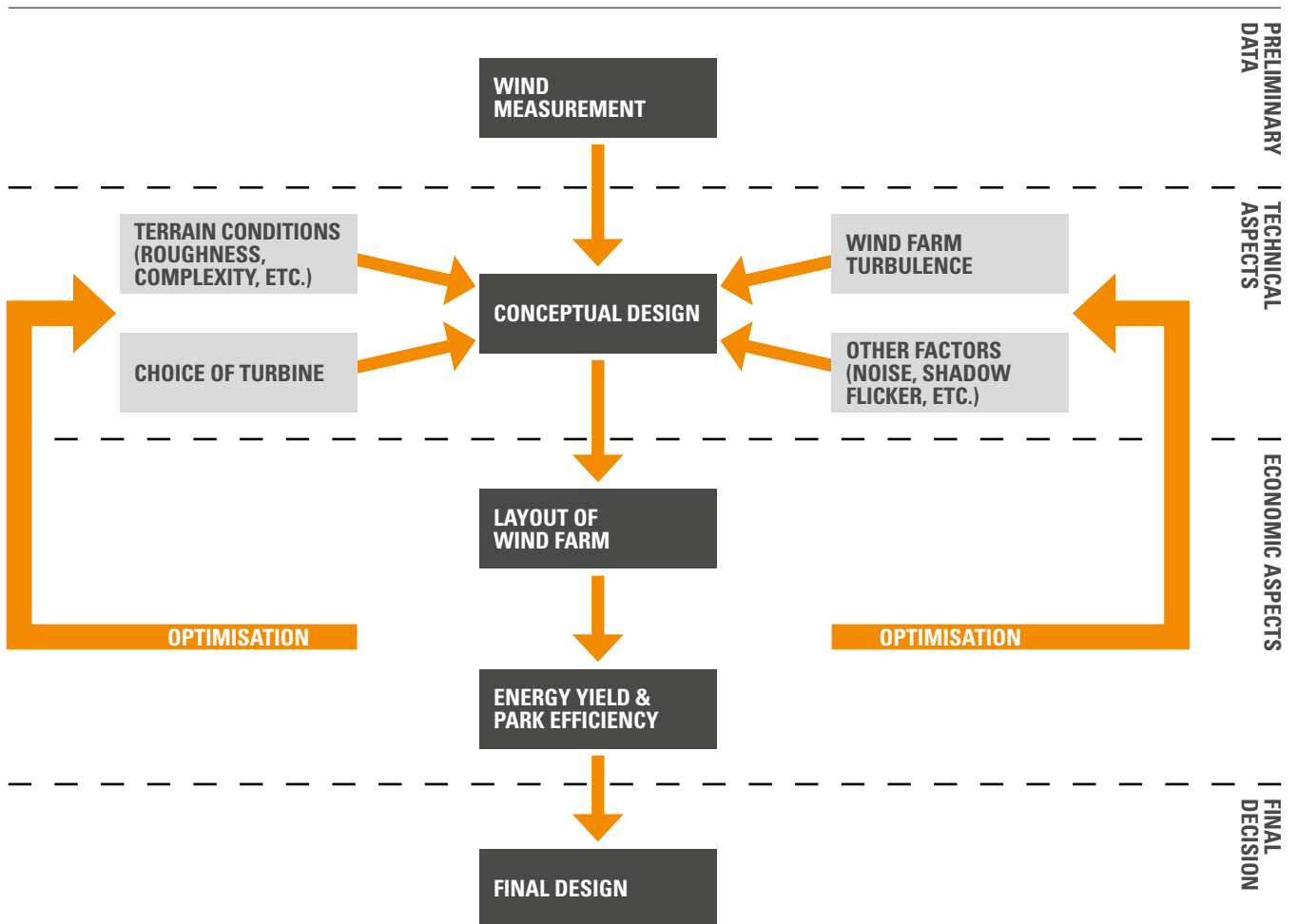
The key to realising successful wind energy project lies in making the correct strategic decisions in the early stages of project development. In parallel with the ever increasing scale of wind projects, in terms of turbine size and turbine number,

the need for reliable and accurate evaluations and calculations of site-specific issues is becoming more acute. **SGS Site Assessment Services** aim to assist our clients in efficiently developing their projects in a reliable and financially sound manner.

The ultimate objective of Site Assessment is to facilitate overall project development

by ensuring the viability, economical soundness and site optimisation of the undertaking.

SGS offers a comprehensive range of project development services, including the optimisation of technical and financial parameters. The following flow chart illustrates SGS's general approach to site assessment services.







## 2.4 ENVIRONMENTAL AND SOCIAL IMPACT AND PERMITTING

SGS conducts environmental and social impact assessments to determine how your business activities are affecting your local community and on the wider environment. We check your compliance with regulations in place to protect the environment, verify your activities and equipment, permits and documentation.

For a detailed assessment of your environmental performance, you can benefit from our state-of-the-art laboratory and monitoring facilities. Our accredited, experienced technicians have the experience to offer innovative solutions to any challenges facing your organisation. We offer you guidance and assistance in complying with environmental regulations and in reducing your impact on the environment.

We can help you to prepare the necessary documentation for permit and license applications. We can also provide verification of your paperwork to show regulators your compliance and stakeholders your commitment to environmental protection.

Key elements included are

- Biodiversity and ecosystems (birds, bats, mammals, plankton, etc.)
- Hydrology and geological constraints
- Safety, visual and noise impact
- Shadow flicker
- Land use and tenure
- Social analysis
- Historic and cultural heritage
- Permits

### CASE STUDY | ENVIRONMENTAL IMPACT ASSESSMENT



Between 2008 and 2011 SGS conducted a sort of environmental and site studies for the Wallonia state in Belgium.

Services provided

- Environmental Pre-Feasibility Study
- GIS Mapping (location searching and decision support)
- Environmental Impact Assessment (birds, bats, landscape, territory setting)

## 2.5 ELECTRICAL DESIGN AND GRID INTERCONNECTION

SGS assesses the technical and practical considerations required for a wind power grid connection, reviews the electrical design of wind farm projects and identifies the least cost point of connection assessing the impact of the proposed power connection cable route.

The assessments undertaken cover the complete range of system integration issues, including

- Voltage profiles and quality
- Thermal and fault ratings
- Harmonic and transient performance
- Generation and system constraints stakeholders your commitment to environmental protection.

## 2.6 RISK MANAGEMENT

Through its Risk Management consultancy service, SGS offers complete Risk Management for wind farm projects. SGS risk specialists support the project management team in risk identification, risk qualification and risk handling, which entails both risk mitigation and capitalisation of opportunities. Once the necessary data has been collected, quantitative risk analyses and data simulations using specialised software are performed in an effort to predict the outcome of risk management and the results of risks, including pre- and post-risk handling, the potential impact of risk handling plans and the implications of residual risks.

The **SGS Risk Management** consultancy service seeks to assist project teams in their decision-making process in order to ultimately ensure that the project is executed with minimal risk impact. Specifically, SGS's Risk Management process aims to achieve the following

- Meet project objectives in terms of cost, schedule and performance
- Improve cost estimates by managing realistic and relevant contingencies
- Achieve identifiable schedule milestones and key performance indicators, including occupational health and safety and environmental targets
- Increase planning reliability
- Assure greater certainty in financial planning and project execution manage complexity of interfaces at the project level

### CASE STUDY | LENDER'S ENGINEER



Raiffeisen Bank Polska S.A. awarded SGS the contract to assume the Lender's Engineer role for the construction of Krzecin Wind Farm in Poland.

As Lender's Engineer, SGS provides services from the development phase to the operation phase of the project.

Services provided

- Lender's Engineer
- Technical Due Diligence
- Project Monitoring

## 2.7 OWNER'S/LENDER'S ENGINEER

SGS's Owner's/Lender's Engineer service brings together a variety of skills and expertise with the objective of aiding our clients to successfully realise the transport, installation and commissioning phases of their renewable energy projects. In an industry plagued by a lack of qualified professionals, SGS excels in bringing expert knowledge and experienced personnel to the project team to successfully and proficiently undertake such management throughout the realisation of a project.

SGS thereby ensures that our client's projects progress from a green field site to a fully-commissioned wind farm in a safe and efficient manner while meeting cost, schedule and quality targets.

SGS delivers individual or package of services within all the activities such as procurement, engineering, environment, legal, permitting and financing for

- Tender Support
- Construction Monitoring
- Commissioning Survey

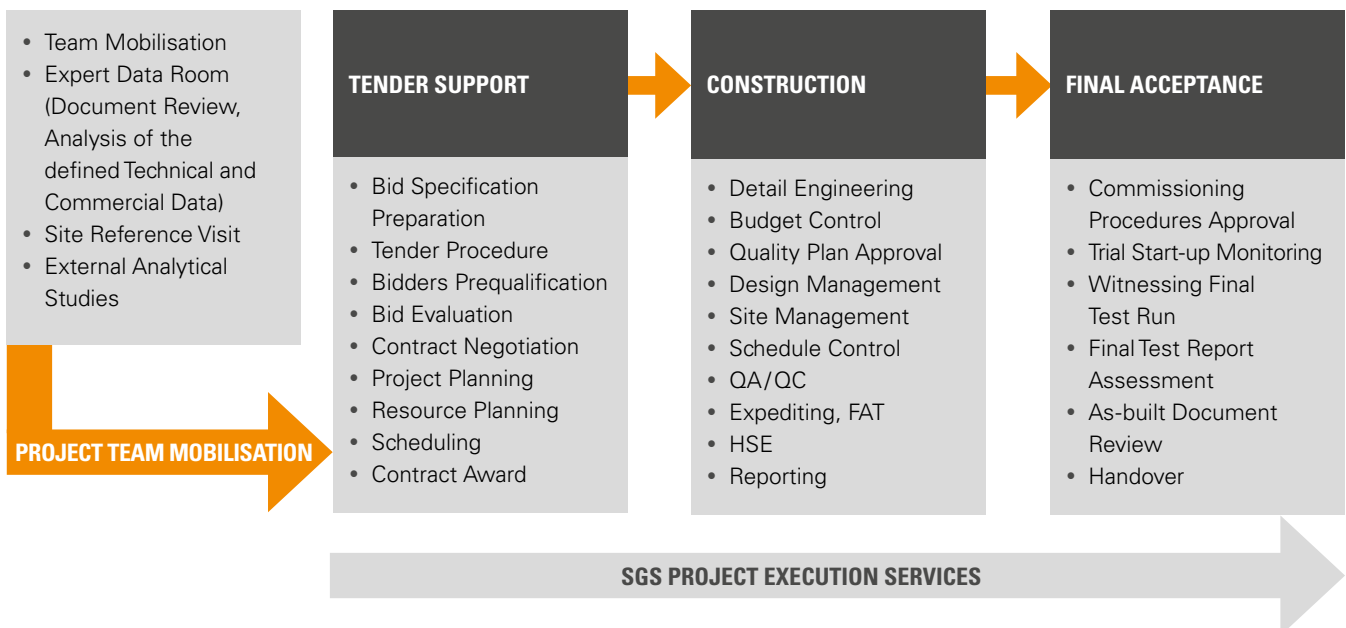
### CASE STUDY | OWNER'S ENGINEER



In 2012, Contino Wind Group selected SGS to provide owner's engineer services for the construction of a wind farm in West Pomerania voivodeship in Poland.

SGS owner's engineer specialists provided professional management supporting project leaders

- Benefit from a comprehensive range of owner's engineer services
- Ensure that agreements with main contractors met all mandatory and agreed conditions
- Benefit from independent monitoring of the project schedule to deliver the required quality and technical specifications
- Ensure that installations, materials, equipment facilities and projects met all quality and performance requirements, whether regulatory, voluntary, legal, or customer-based
- Remain focused on their core business by limiting company employee participation in the project





## 2.8 OPERATIONS MONITORING

Minimising down-time is essential for ensuring the profitable operation of a wind farm. Damage must be recognised early so that appropriate measures can be promptly taken. Doing so can prevent consequential damages and allows maintenance-related shut-downs to be planned well ahead of time.

SGS will review and opine on all the maintenance and operations record documents and procedures during the operation of a wind farm and carry out end of warranty inspections to determine the current status of the wind turbine, detect and identify possible initiation of damage and to help avoid secondary damages.

To ensure that, SGS provides **in-service inspections** carried out in accordance with the standard guidelines in force which comprise the following activities

- Inspection of the rotor and rotor blades
- Testing of the safety functions and devices
- Inspection of the machinery and electrical components
- Inspection of tower and foundation
- Vibration analysis of the drive train
- Analysis of the gear oil
- Inspection of the gearbox's bearings by video endoscopy
- Inspection to the lightning protection system
- Inspection of the general condition of the wind turbine

### CASE STUDY | END OF WARRANTY INSPECTIONS



John Deer awarded SGS to perform end of warranty inspections in two wind farms in the United States. Sunray in Texas and Brewster in Minnesota.

The services provided were

- In-service Inspections
- Inspection of the rotor blades
- Test of the safety functions and devices
- Inspection of the machinery and electrical components
- Inspection of tower and foundation
- Inspection of the general condition of the wind turbine
- Vibration analysis of the drive train (main bearings, main gearbox and generator bearings)
- Oil analysis of the gear oil
- Video-endoscope inspection of the gearboxes
- Lightning protection

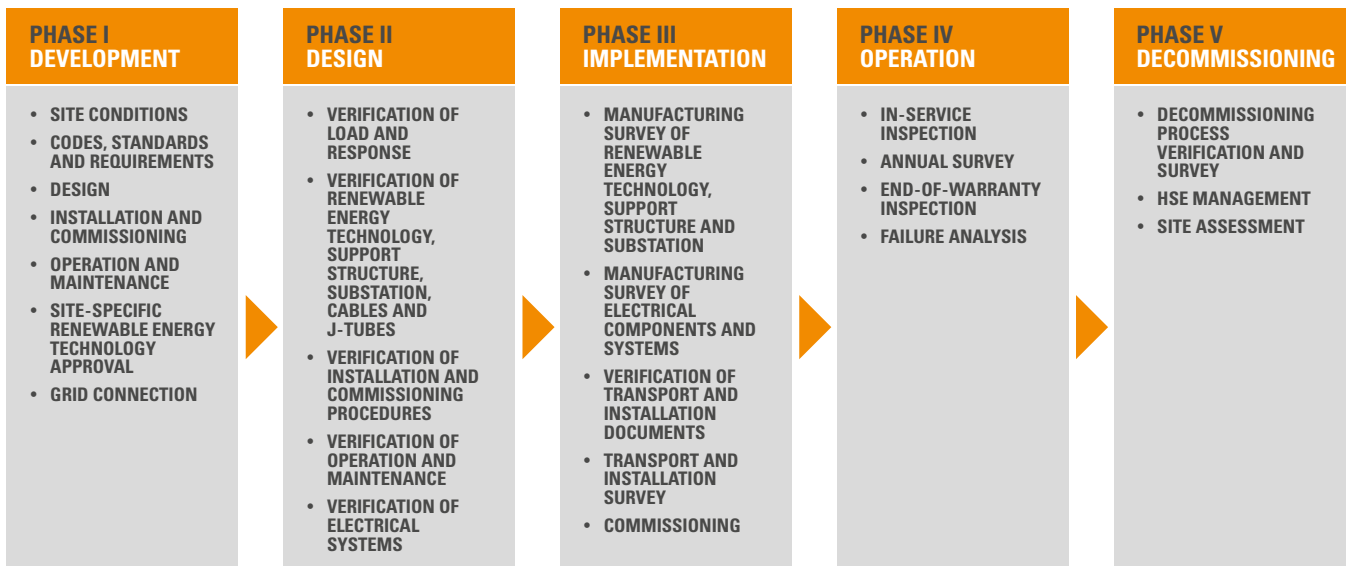
# 3 OFFSHORE WIND ENERGY

## 3.1 PROJECT CERTIFICATION

Project Certification is the ultimate process to assure the required Quality of an Offshore Renewable Energy Project throughout the project life cycle. Based on the German Federal Maritime and Hydrographical Agency (Bundesamt

für Seeschifffahrt und Hydrographie – BSH) standards ref. /4/ and ref. /5/, this procedure verifies that the project complies with the project specification and other requirements defined by the proponent monitoring the project development, construction and operation phases.

The **Project Certification** process is divided in phases and covers the wind turbine, the support structure and the offshore substation, cables and J-tube.



### CASE STUDY | PROJECT CERTIFICATION



Global Tech I is one of the first commercial offshore wind farms in the German North Sea. With a total of 400 MW of power installation Global Tech I was awarded as the “Wind Deal of the Year 2011” by the renowned magazine Project Finance International.

SGS was assigned to undertake the project certification under the BSH standards from Phase II up to phase V. The works started in 2009 and still ongoing.

- Phase II Design Verification
- Phase III Implementation survey
- Phase IV Operation survey
- Phase V Decommissioning survey





### 3.2 TECHNICAL CONSULTANCY

The offshore environment is a demanding one for wind farm projects, increasing the value of technical and commercial consultancy services in every stage and area of the project.

SGS technical knowledge in a variety of areas combined with the understanding of key financial and commercial concerns brings experience dealing with regulatory, permitting, environment, construction and operation issues which are necessary to achieve connection, operation and revenue for a wind farm.

### 3.3 FEASIBILITY STUDIES

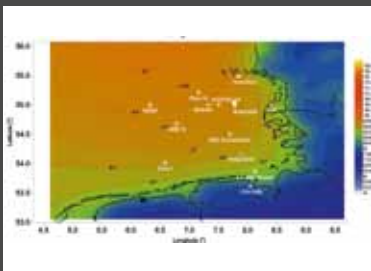
To support the development of a wind farm project, feasibility studies are realised to allow lenders, sponsors, owners and its shareholders to assess accurately the economic feasibility of the project and to identify next steps for its implementation and risks associated with those steps.

In particular, for offshore projects, SGS will also look at the marine processes assessing all marine impacts on shipping activities and fisheries as well conduct the necessary marine surveys required for projects viability.

The feasibility studies will assess the

- Project site
- Meteorological conditions
- Environmental and social impact
- Seabed conditions
- Regulatory compliance
- Project construction design, costs and scheduling
- Energy production
- Marine surveys (warranty, hydrographical, geotechnical, etc.)
- Marine impact assessment

#### CASE STUDY | TECHNICAL DUE DILIGENCE



The Maguerite Fund awarded in 2011 SGS the contract to perform a technical due diligence to the Butendiek Offshore Wind Farm in Germany.

SGS conducted a full documents review to permits, contracts, wind resource measurements, energy yield calculations, wind turbine design, electrical design, substation design, foundations design, CAPEX, OPEX, O&M procedures, project scheduling, Environmental aspects, etc.

Services provided

- Technical Due Diligence

#### CASE STUDY | QHSSE MANAGEMENT



The Belwind Wind Farm is located on Bligh Bank, 46 km (29 mi) from the Belgian port of Zeebrugge. Bligh Bank is the first stage of what is planned to be a 330 MW project.

SGS was awarded a contract to provide Quality, Health, Safety, Security and Environmental (QHSSE) services that included inspections and marine warranty surveys. The key objective of QHSSE Management was to optimise the revenue generated by any wind farm project over its life span, by assuring high quality standards and safe project execution during the development and realisation phase.

Services provided

- QHSSE
- Quality control for all works
- Schedule control
- Commissioning inspection
- Marine Warranty surveys



### 3.4 SITE & WIND RESOURCE ASSESSMENT

For offshore projects an accurate estimate of the projects future energy yield is required to support investment and financing decisions.

With the site assessment and wind resource services offered by SGS, investors, owners and developers will be sure of the site characteristics, the suitability of the chosen wind turbines including optimisation of technical and financial parameters. Defined in SGS' approach for onshore projects the assessment covers

- Site and wind data analysis
- Wind flow modelling
- Energy yield calculations
- Uncertainty analysis
- Wind turbine assessment
- Layout optimisation

### 3.5 ENVIRONMENT AND SOCIAL IMPACT, AND PERMITTING

SGS conducts environmental and social impact assessments to determine how your business activities are affecting your local community and the wider environment. We also check your compliance with regulations in place to protect the environment, and verify your activities, equipment, permits and documentation.

We can help you to prepare the necessary documentation for permit and license applications. We can also provide verification of your paperwork to show regulators your compliance and stakeholders your commitment to environmental protection.

### CASE STUDY | TECHNICAL DUE DILIGENCE



At the end of 2011, wpd AG approached SGS to perform technical due diligence services for the Butendiek Offshore Wind Farm Project in order to secure financing. The Butendiek project is currently in the late design stage and construction is scheduled to begin in 2014. Upon completion, Butendiek will consist of 80 Siemens (SWT 3.6-120) 3.6MW turbines producing a total capacity of 288 MW.

SGS assisted Butendiek project leaders and potential investors in following services

- Understanding and mitigating a variety of technical, legal and socio-environmental risks before valuable time and resources were committed to the project
- Ensuring the technical feasibility of the project made for sound investment
- Ensuring that all factors had been taken into account in the development process

### 3.6 ELECTRICAL DESIGN AND GRID INTERCONNECTION

SGS provides electrical design and grid system integration analyses on a technical and economic point of view including reviewing and supporting the client on all the on-offshore electrical systems aspects, interconnection agreements and handling issues like

- Downstream reinforcement
- Electrical protection
- System control
- Interfaces and technical standards
- Harmonics
- Payment and other commercial arrangements





### 3.7 RISK MANAGEMENT

As in any project, including offshore renewable energy projects, SGS Risk Management consultancy service seeks to assist project teams in their decision-making process in order to ultimately ensure that the project is executed with minimal risk impact supporting the project management team in risk identification, risk qualification and risk handling, which entails both risk mitigation and capitalisation of opportunities.

This includes

- Meet project objectives in terms of cost, schedule and performance
- Improve cost estimates by managing realistic and relevant contingencies
- Achieve identifiable schedule milestones and key performance indicators, including occupational health and safety and environmental targets
- Increase planning reliability
- Assure greater certainty in financial planning and project execution manage complexity of interfaces at the project level
- Energy yield estimates based on resource assessments

#### CASE STUDY | RISK MANAGEMENT



The Lincs Wind Farm, sponsored by Centrica Renewable Energy and two other joint-venture partners, is a proposed 270 MW wind farm being

built 8 kilometres (5.0 mi) off Skegness on the east coast of England. The project, due to be operational in 2012 and is construction started in March 2011.

SGS is providing Risk Management services including the following

- Risk Management procedures and guidelines
- Quantitative risk analysis
- Technical risk management reports for specific phases
- HSE management
- Loss of production risk analysis
- CAPEX risk analysis
- Contingency forecast



### 3.8 QHSE

In order for our clients to comply with the H&S construction regulations worldwide (in UE, the European legislation Directive 1992/57/EEC about Minimum health and safety requirements at temporary or mobile construction sites), SGS provides a strong QHSE service within the Wind Energy sector. H&S construction regulations are designed to control and coordinate the implementation of safety systems throughout the entire product/project life cycle. The QHSE platform has proved itself on many European projects to be the very best model for a holistic approach to health and safety on any project regardless of geography or the home country of key duty holders and many owner/operators insist on its application on all European Projects.

SGS services include

- Notifying the relevant H&S authorities (prior notice – only in UE countries)
- H&S training and supervision of the designers in the production of the Design Risk Register
- Reviewing Intention to Tender (ITT) H&S packages
- Ensuring that all H&S reports regarding Pre-Construction Information (PCI) are complete
- Reviewing final PCI for inclusion in the ITT Packages to Principal
- Reviewing principal contractors for H&S competency
- H&S coordinator on site
- Drafting H&S plan
- Reviewing the construction phase H&S plan during execution
- H&S ongoing communication with authorities (incidents, accidents)
- H&S training on site (induction, refresh)
- Formulating the Health and Safety File (HSF) for the client requirement
- Establishing and controlling H&S Key Indicators Performance (incidents rates, meetings, closing times, type of incidences, risk areas values, etc.)
- Ensuring that the project documentation system collects “as built” information for the HSF
- Reviewing the Decommissioning Plan for inclusion in the HSF
- Interfacing with the operational and maintenance function during installation and commissioning
- Ensuring that all certification and compliance H&S documents are with the client prior to handover of the assets
- H&S audit visit during operation and maintenance works
- Perform H&S procedures “step by step” during operation and maintenance works
- H&S specific training (fall arrest systems, work at height, confined space)
- Consultancy and advisory in fall arrest system in work at height



### 3.9 APPLIED H&S CONSTRUCTION REGULATIONS

While clients and developers meet the challenges of working on and offshore, they are encountering changing and complex legislation mainly because of the BP incident in the Gulf of Mexico. SGS delivers solid solutions to clients who want to be sure of the highest standard.

#### THE SGS APPLIED SOLUTION FOR LICENCES

Usually, when the client applies for a licensing body, local authorities and/or banks are presented with a complicated set of pro-formas that must be submitted. When completed, these forms must illustrate the client's specific plans and arrangements for health and safety management competency relevant to the project in question and their ability to satisfy important third parties that these goals will be reached during construction.

SGS readymade solutions guarantee success by guiding you through this complicated process using our experience of past successes.

#### THE SGS APPLIED SOLUTION FOR H&S CONSTRUCTION REGULATIONS

Once the required licenses are obtained project managers will encounter the rigid mandate of the CDM process. H&S construction regulations provide a clear framework to hold project health and safety aspects which together serve the client business risk model well.

The most significant issue for all duty holders is competency. All duty holders must be able to clearly illustrate competency based on hard evidence. Because of this, clients taking advantage of SGS support are required to prepare detailed control documentation addressing existing and potential issues to be submitted upon the signing of each contract.

Critical documents are

- Design Risk Analysis
- Site Reports
- Pre-Construction Information
- Construction Phase Health and Safety Plans
- Health and Safety Files
- Risk Registers

Three regulation aspects to be considered upon commencement of construction works

#### 1. Controlling Documentation

Today, most clients will have an extranet facility or FTP site, such as 4 Projects or Think Projects. SGS protected IT documentation solutions are in place.

#### 2. Managing Change

Designers are encouraged to use Requests for Information (RFI) and Technical Queries (TQs) at early stages to minimise any lack of clarity and achieve good and sound design according to client specification. SGS experts manage this important process.

#### 3. Documenting "as built"

Final documentation of information vital to complete Health and Safety Files (HSF) is uploaded onto the extranet and collected in the CDM container. This point is worth emphasising as the "as built" and O/Ms are very often difficult to pursue after principal contractors or contractors move on. These important documents are necessary in order to transfer assets. SGS supports each client in the procurement of this vital information from the conception of works through to delivery and sign off.



### **THE SGS APPLIED SOLUTION TO PROTOTYPE TESTING AND CONTRACT COMPLEXITY**

A number of issues can cause problems for duty holders during CDM work. These issues are usually handled at the early stages of the project in the form of a CDM strategy document. These issues include

- Non-disclosure agreements (NDAs)
- Deployment of prototypes
- Complex duty holders arrangements
- Consortiums
- Sale of assets

#### **NDAS**

Designers must provide drawings and specifications clearly illustrating design safety and risk reduction mitigations. SGS fully understands the importance of NDA regulations being in place from the start of all such projects.

### **DEPLOYMENT OF PROTOTYPES**

Usually deployment means carrying out trials at sea or at another marine research establishments or university. Complete devices or component parts or sub-assemblies may be deployed. This experimental stage requires particular scrutiny for procedures, risk assessments and method statements (RAMS). Tests can simulate destruction or catastrophic failure and identify any extra precautions which may be required.

#### **COMPLEX DUTY HOLDER ARRANGEMENTS**

An integral part of the SGS Project strategy document would be to detail various duty holder responsibilities and to ensure that those details are clearly expressed in contract arrangements.

#### **CONSORTIUMS**

Some projects include consortium arrangements. However, best practice requires a clear agreement within consortiums that only one member act as client in order to ensure effective and clear management of mandated client duties. Other members of the consortium providing design or construction facilities would be registered as duty holders in those capacities. SGS manages consortium processes as required by the client.

### **SALE OF ASSETS**

Any sale of assets may have implications for the health and safety arrangements of the project. For example, when only part of an array is sold to a third party individual health and safety files are required for that part of the asset. This would include clear instruction for the operation and maintenance of the asset part and a coordination and cooperation management arrangements for the safe operation of any particular asset site. In this situation, SGS would appoint a Coordinator to be deployed to manage HSF arrangements.

### **THE SGS APPLIED SOLUTION TO MAKING CLIENTS LEGAL DUTIES COMPLIANT**

In order to deem legal duties compliant, the key legislative framework within which the project will be developed and operated must be respected and followed. This framework is normally determined at the beginning of the project and issued with the ITT documents (tenders).

# 4 THE TEAM

## 4.1 KEY WIND TEAM MEMBERS

SGS is able to dedicate wind experts from its Power and Utilities Team based around the world and employs globally 120 wind power experts. SGS supports its clients at a local level with its global affiliates being able to mobilise rapidly additional experts in different locations, should the need arise.

SGS experts have the combined experience and detailed understanding of every aspect of the wind sector.

POSITION	
<b>REGIONAL MANAGER RENEWABLE ENERGY</b>	<ul style="list-style-type: none"> <li>• 35 years of professional experience</li> <li>• Business development, due diligence, project management, technical evaluation and research to assess technical feasibility, practicality of development, commercial viability/profitability and market need</li> <li>• A former Royal Naval Officer, Rank Lieutenant RN with an exceptional depth and breadth of technical expertise spanning on-offshore wind, marine and solar renewable technology</li> <li>• Edinburgh University studied Msc Advanced Processing Post Graduate Course – Aerodynamics/Transmission and drive train/Electrical Generation; B.Eng (Hons) – Electrical, Mechanical Engineering and Aerodynamics</li> </ul>
<b>REGIONAL SBU MANAGER OIL &amp; GAS AND RENEWABLE ENERGY</b>	<ul style="list-style-type: none"> <li>• Over 13 years of professional experience</li> <li>• Power and energy projects in the following industry sectors: upstream oil &amp; gas, onshore/offshore wind, water, solar</li> <li>• Experience in design engineering, technical consultancy, project management, project certification, technical due diligence, (in-service) inspection and technical expertise, procurement, marketing/sales</li> <li>• Civil/Structural Engineering at the Technical University of Braunschweig (TUBS) with specialisation in Hydromechanics and Coastal Engineering, Hydraulic Engineering, Soil Mechanics/Foundation Engineering; Business Administration at the Hamburg University of Applied Sciences (HFH) with specialisation in marketing</li> </ul>
<b>REGIONAL HEAD OF WIND ENERGY DEPARTMENT</b>	<ul style="list-style-type: none"> <li>• Over 10 years of experience in construction including 5 years in wind energy industry</li> <li>• Project Coordinator, Contract Manager, Technical Advisor, EPC contracts (civil and electrical)</li> <li>• Head of the wind energy section and associate INDIV branch director at SGS Poland. Experienced Project Manager working in wind farms on pre-construction and construction phase as owner's engineer, project director, tendering support for developers and working in the technical due diligence for lenders and investors</li> <li>• Master of Science in Geodesy and Real Estate Valuation, University of Warmia and Mazury in Olsztyn, Poland; Postgraduate specialisation in wind farms, The Technical Science University of Bydgoszcz, Poland</li> </ul>
<b>GLOBAL OPERATIONS MANAGER FOR PROJECT FINANCE SERVICES</b>	<ul style="list-style-type: none"> <li>• Over 18 years of professional experience</li> <li>• Global management of consulting services to lenders and owners in the conventional and renewable power sector</li> <li>• Project and programme manager in private and public organisations in the hydropower, energy, water &amp; wastewater, and infrastructure sectors. Management of teams for consultancy assignments, feasibility studies, design studies, works supervision, procurement of goods, works and services (tender documentation preparation, bid analysis and contract negotiation), policy dialog</li> <li>• Graduate Civil Engineer, Ecole Polytechnique Fédérale de Lausanne, Switzerland; Master of Science (MSc) in Civil and Environmental Engineering (Project Finance and Geotechnical Engineering), Massachusetts Institute of Technology (MIT), USA</li> </ul>
<b>PROJECT FINANCE BUSINESS DEVELOPMENT MANAGER</b>	<ul style="list-style-type: none"> <li>• 20 years of professional experience</li> <li>• Specialist in structuring of PPP projects, member of the commission of PPP "Foro" a spanish institution that include all the actors in PPP (banks, engineer firms, consultancy and law firms), feasibility studies to fundraise and finance programmes, financial due diligence to lenders and equity investors, financial assistance to developers and sponsors, tender documentation, bid preparation and negotiation</li> <li>• Project management and management of teams in renewables, utilities, transport, real estate &amp; telecoms sectors.</li> <li>• Bachelor in Economics, 1990; Master in Business Administration, 1991; Masters in Financial Management, 1999; Masters in Futures &amp; Derivatives, 2003</li> </ul>
<b>RISK ANALYSIS EXPERT</b>	<ul style="list-style-type: none"> <li>• Over 12 years of professional experience</li> <li>• Project Risk Expert with experience in offshore and capital intensive projects with a proficient knowledge of project risks (currency and execution) and optimisation plans, also has acted as Project Manager of technical due diligence projects, with in depth analysis of business plans (including commercial feasibility) but also the coordination of the analysis from the technical experts</li> <li>• In addition, has significant experience in budget &amp; forecasting, financial valuations, consolidation of financial &amp; risks data at project and business unit level</li> <li>• MSc Decision Sciences, London School of Economics (LSE); BA Business Administration and Finance, FGV Sao Paulo, Brazil; BSc – Civil Engineering, UFG, Goiania, Brazil</li> </ul>
<b>INDUSTRIAL ENGINEER/ PROJECT DIRECTOR</b>	<ul style="list-style-type: none"> <li>• 24 years of professional experience</li> <li>• Technical due diligence to lenders and equity investors, technical assistance to developers and sponsors</li> <li>• Business development, project management and management of teams for consultancy assignments, technical assistance, feasibility studies, design studies, cost control, planning control &amp; quality supervision</li> <li>• Industrial Engineer (mechanical specialty), Superior Technical School of Industrial Engineering Polytechnic University of Madrid; Master in Construction Companies &amp; Real Estate, Professor of Project Management subject in the Building Master of the Cantabria University, Spain</li> </ul>
<b>GLOBAL PROJECT MANAGER</b>	<ul style="list-style-type: none"> <li>• Over 11 years of professional experience within the aerospace and wind energy sectors</li> <li>• Project management, technical due diligence, procurement management</li> <li>• Contract negotiations and management</li> <li>• MEng Aeronautical Engineering, Universidade da Beira Interior, Portugal; Post graduation, Renewable Energy Physics, Universidade de Aveiro, Portugal</li> </ul>
<b>PROJECT MANAGER/ SUPERVISOR FOR CONSTRUCTION</b>	<ul style="list-style-type: none"> <li>• Over 27 years of professional experience</li> <li>• Experience in wind farm projects for lenders, investors, governmental organisations and project developers in wind technical due diligences, construction monitoring assignments and technical advice services with a focus in Romania, environmental due diligence coordination for construction projects, project management and management of teams for planning control, works supervision and quality examination</li> <li>• Procurement and production management with strong experience in product certification and local regulations, quality, environment and H&amp;S management in the construction field ensuring regulatory compliance</li> <li>• Diploma as Chemistry Engineer at the Bucharest Polytechnic Institute with specialisation silicate compounds</li> </ul>



<b>INDUSTRIAL PROJECT MANAGER</b>	<ul style="list-style-type: none"> <li>• Over 30 years of professional experience</li> <li>• Technical assistance and quality consultancy to clients, fabrication inspection and supplier evaluation (quality audits)</li> <li>• Skilled in full management of international industrial projects</li> <li>• Master in Environmental Engineering (EOI), 1987; Master in Total Quality Management (TQM) (Madrid Polytechnic University), 1989; Six Sigma Black Belt, 2003</li> </ul>
<b>INDUSTRIAL PROJECT MANAGER</b>	<ul style="list-style-type: none"> <li>• 10 years of professional experience</li> <li>• Renewable energy project management, due diligence, business development</li> <li>• Project management and delivery of technical review and due diligence on renewable energy projects (onshore and offshore wind, wave and tidal, solar) and technologies advising developers, investors and lenders, business development (due diligence services), technical focus on performance assessment, technology, operation and maintenance, contractual review, costs review and compliance</li> <li>• PhD in Science (Astrophysics and Spatial Technologies), University of Paris VII Denis Diderot</li> </ul>
<b>INDUSTRIAL PROJECT MANAGER</b>	<ul style="list-style-type: none"> <li>• 5 years of professional experience</li> <li>• Technical due diligence, project management</li> <li>• Specialist in renewable energy projects with a good understanding of renewable energy technologies such as onshore and offshore wind, solar, biogas and marine with an understanding of energy economics and national energy policies. Experience in wind farm projects for lenders, investors, governmental organisations and project developers in wind and solar due diligences, construction monitoring assignments and technical advice services with a focus in eastern european countries</li> <li>• Diploma as Industrial Engineer (with specialisation on energy and environmental management), University of Flensburg, Germany</li> </ul>
<b>PROJECT MANAGER DUE DILIGENCE RENEWABLES</b>	<ul style="list-style-type: none"> <li>• Over 10 years of professional experience</li> <li>• Technical due diligence, project management</li> <li>• Due diligence, business valuation, management consulting, external and internal reporting, financial audits in various industrial sectors</li> <li>• PhD in Economic Sciences and Diploma in Physics from University of Hamburg</li> </ul>
<b>PROJECT MANAGER</b>	<ul style="list-style-type: none"> <li>• 10 years experience in naval, marine and offshore engineering</li> <li>• Project management, project certification, expert for marine transportation and offshore installation</li> <li>• Design of offshore installations for the oil and gas industry, development of life saving appliances for harsh marine environments, assessment of maneuverability for new built vessels, design of lifting appliances for heavy lifts, engineering for load-out and sea transport of heavy goods</li> <li>• International Degree at the Bremen University of Applied Science (FH), Naval Architecture and Ocean Engineering</li> </ul>
<b>PROJECT SERVICES TECHNICAL EXPERT</b>	<ul style="list-style-type: none"> <li>• Over 11 years of professional experience</li> <li>• Technical due diligence, energy yield calculation, offshore wind turbine inspections and gearbox endoscopy, site suitability, site design, layout optimisation, feasibility studies, GIS, O&amp;M, Site Assessment Expert with project management skills and experience in on-offshore projects</li> <li>• Master of Science (MSc) in Renewable Energy Systems Technology from Loughborough University, UK; Bachelor of Science in Environmental Science and Policy from Liverpool John Moores University, UK</li> </ul>
<b>TECHNICAL WIND ENERGY EXPERT</b>	<ul style="list-style-type: none"> <li>• Over 12 years of professional experience</li> <li>• Project certification for the design, construction and execution phase of the machine foundation and substation, technical due diligence, condition monitoring, quality assurance, supervision of geotechnical engineering and construction, owner's representative</li> <li>• Planning, design and construction of turnkey wind farms, wind turbines technology, procurement and O&amp;M, construction supervision, technical management, maintenance and maintenance inspections, vibration analysis, insurance management, quality assurance and control of services including maintenance and repair, evaluation of investment data, end-of-warranty survey, damage and root cause analysis, performance and assistance in vibration measurements of mechanical and electrical components, wind turbine inspections and final acceptance, site assessment</li> <li>• Degree at the Hamburg University of Applied Science (FH) Hamburg, Environmental Engineering</li> </ul>
<b>ENERGY POWER ENGINEER</b>	<ul style="list-style-type: none"> <li>• Over 15 years of professional experience</li> <li>• Project Manager/Supervisor on power engineering projects/analysis of electrical installations</li> <li>• Experience in various areas of electrical installation, execution and supervision</li> <li>• University Constantin Brâncuși Energy – thermal power stations</li> </ul>
<b>MECHANICAL ENGINEER</b>	<ul style="list-style-type: none"> <li>• 3 years of professional experience</li> <li>• QA/QC inspections, mechanical works supervision, construction supervision</li> <li>• Inspector specialised in NDT and quality assurance and control with extensive experience in wind farm projects including construction supervision, expediting, QA/QC inspections, acceptance tests, welding and mechanical works supervision and technical due diligences</li> <li>• MEng Studies in quality engineering and road traffic engineering, Technical University of Szczecin, Poland</li> </ul>
<b>SENIOR WIND TURBINE INSPECTOR ON- AND OFFSHORE</b>	<ul style="list-style-type: none"> <li>• 10 years of professional experience</li> <li>• Technical due diligence, end-of-warranty inspections, condition monitoring, blades, tower and machinery inspections (mechanical and electrical), rope access technique (IRATA level 3), video-endoscope, offline vibration measurement of drive train and thermography of electrical components, manufacturing supervision as part of project certification for offshore wind farms</li> <li>• Inspections on-site, evaluation of data and measurements as well as reporting</li> <li>• Mechanical Engineering at the University of Applied Science Lübeck, Germany</li> </ul>
<b>WIND TURBINE INSPECTION MANAGER</b>	<ul style="list-style-type: none"> <li>• 3 years of professional experience</li> <li>• Wind turbine inspection, technical consultancy, business development</li> <li>• Experienced wind turbine inspector, including in-service inspection, periodic monitoring, end-of-warranty inspections, commissioning inspections, inspection for condition based maintenance, blade inspections, vibration measurements and endoscopic gearbox inspections, damage investigation</li> <li>• MSc in Renewable Energy Engineering (Distinction), accredited by ImechE, Kingston University, London</li> </ul>
<b>INSPECTOR</b>	<ul style="list-style-type: none"> <li>• Over 36 years of professional experience</li> <li>• Inspections, technical consultancy</li> <li>• Specialised in NDT and quality assurance and control with extensive experience in wind farm projects including construction supervision, expediting, QA/QC inspections, acceptance tests, welding and mechanical works supervision and technical due diligences</li> <li>• MS Mechanical Engineering, Warsaw University of Technology, Warsaw, Poland</li> </ul>
<b>ARCHITECT</b>	<ul style="list-style-type: none"> <li>• Over 26 years of professional experience</li> <li>• Consultancy &amp; site supervision of projects, technical evaluation and due diligence of projects</li> <li>• Technical due diligence and inspection of wind farm projects</li> <li>• Architect Bachelor Degree, Bucharest Institute of Architecture</li> </ul>

## CONTACT

**POWER@SGS.COM, WWW.SGS.COM/POWER**

# A SELECTED WIND PROJECTS

CLIENT PROJECT	POWER (MW)	LOCATION	YEAR	SERVICES
<b>CENTRICA RENEWABLE ENERGY</b> Lincs Offshore Wind Farm	270	UK	2010–...	Risk management (ongoing), HSE management
<b>PLAMBECK NEUE ENERGIEN AG</b> Gode Wind II & III Offshore Wind Farms	320	Germany	2008–...	Project certification – design, basis & site assessment, site specific design of wind turbine and foundation
<b>DEVELOPMENT BANK</b> Two Onshore Wind Farms	70	Romania	2012–2014	Lender's engineer, technical due diligence, construction monitoring, operations monitoring
<b>BORUSAN ENBW ENERGY</b>	3	Turkey	2012	End-of-warranty inspections
<b>PORT OF DAKAR</b>	-----	Senegal	2012	Consultancy services on renewable energy, energy efficiency audit of the actual assets and buildings, alternative renewable power (solar and wind) feasibility study, wind site assessment, solar site assessment, financial evaluation of the alternative renewable solutions, CDM evaluation: Project identification (handled by EDEN), technical feasibility study and procurement support
<b>CHINA RESOURCES NEW ENERGY GROUP CO., LTD. (CRNE)</b>	2	China	2011	End-of-warranty inspections
<b>IBERDROLA RENOVABLES</b>	-----	Spain	2011	Thermographic inspection
<b>MAGUERITE FUND</b> Butendiek Offshore Wind Farm	-----	Germany	2011	Technical due diligence
<b>PLAMBECK EMIRATES</b> Gode Wind II Offshore Wind Farm	-----	Germany	2011	Technical due diligence
<b>RWE RENEWABLES POLSKA SP. Z O.O.</b>	-----	Poland	2011	Owner's representative, tender support, construction supervision, QA/QC management and inspection, manufacturing supervision, final acceptance inspection
<b>SANY GROUP</b>	-----	China	2011	Manufacturing supervision, QA/QC
<b>EKO ENERGY SP. ZOO.</b> Kobylnica Onshore Wind Farm	41.4	Poland	2010–2011	Owner's engineer, construction supervision
<b>PARK WIATROWY TYCHOWO</b> (Owner RWE Renewables Polska Sp. z o.o.)	2:3	Poland	2010–2011	Owner's representative, tender support, construction supervision, QA/QC management and inspection, manufacturing supervision, final acceptance inspection
<b>SINOVEL WINDTEC</b> Huaneng Weihai, Jilin Tongyu, Beifang Longyuan, Heilongjiang Fujin, Ningxia Ningdong, State Electric Power Xingxeng, Datang Dali Onshore Wind Farms	-----	China	2007-2011	QA inspections, NDT and welding supervision, dimensional check for towers
<b>GAMESA</b>	-----	China	2010	Supply chain services, installation quality inspection, NDT
<b>GREEN POWER POLSKA SP. Z O.O.</b>	-----	Poland	2010	Owner's representative, tender support, construction supervision, QA/QC management and inspection, manufacturing supervision, final acceptance inspection
<b>GUODIAN UPC</b>	-----	China	2010	Manufacturing supervision, QA/QC management and inspection
<b>CEZ ROMANIA</b> Onshore Wind Farm	252	Romania	2009–2010	Technical due diligence and inspections
<b>BELWIND OFFSHORE</b>	165	Belgium	2009–2010	QHSE, works quality control, schedule control, commissioning inspection
<b>FLUOR LIMITED</b>	-----	China	2008–2010	NDT, manufacturing supervision, QA/QC management and inspection
<b>NN</b> Onshore Wind Farm	-----	Germany	2008–2010	In-service inspections, NDT to blades
<b>WINWIND POWER</b> Onshore Wind Farms	-----	India, Germany	2008–2010	Tower assembly inspection, foundations design verification
<b>REPOWER</b> Onshore Wind Farms	-----	Germany, Italy, China	2007–2010	QA inspections, construction supervision, H&S coordination
<b>VESTAS</b> Onshore Wind Farms	-----	China, India, Spain, Germany	2006–2010	HSE management and inspection, NDT inspections, manufacturing supervision, construction supervision
<b>NORDEX</b> Helashan & Changdao Onshore Wind Farms	-----	China	2006–2010	QA inspections, dimensional checks, foundation supervision
<b>NORDEX</b> Onshore Wind Farms	-----	China, Germany, Portugal, Denmark, Spain	2001–2010	Owner's representative, supplier audits, expediting, assembly supervision, NDT, QA inspections, final acceptance inspections



CLIENT PROJECT	POWER (MW)	LOCATION	YEAR	SERVICES
<b>EDP RENOVÁVEIS</b> Onshore Wind Farm	-----	Spain	2009	HSE management
<b>ENOVA</b> Delta II Offshore Wind Farm	-----	Germany	2009	Project certification
<b>FUHLÄNDER AG</b>	-----	Germany	2009	Loading and unloading supervision, visual inspection
<b>GLOBAL TECH I OFFSHORE WIND GMBH</b> Global Tech I Offshore Wind Farm	-----	Germany	2009	Project certification
<b>NN</b>	2	Korea	2009	Technical due diligence, turbine inspection, wind turbine blade inspection, vibration measurement of drive train, video-endoscope inspection of gearbox, thermography inspection of electrical components and oil analysis
<b>NORTHERN ENERGY</b> Gaia II, Gaia III, Gaia IV, Global Tech II, Global Tech III, Sea Storm I, Sea Storm II, Sea Wind III, Sea Wind IV	-----	Germany	2009	Project certification
<b>PIONEER WINCON</b>	-----	India	2009	Manufacturing supervision, quality audit/approval of manufacturers
<b>RWE</b> Rhyl Flat and other Offshore Wind Farms	-----	UK, Germany	2009	QHSE consultancy, HSE audits and management
<b>RWE</b> San Basilio Onshore Wind Farm	-----	Italy	2009	QA/QC management and inspection
<b>SENER NOVEM</b> Egmond aan Zee Offshore Wind Farm	-----	Netherlands	2009	Manufacturing inspections
<b>SIEMENS WINDPOWER</b>	-----	Denmark	2009	Loading and unloading supervision, QA/QC management and inspection
<b>CHINA LIGHT &amp; POWER</b>	-----	India	2008–2009	Inspection
<b>LCO NATURE C/O EVELOP GERMANY</b> Albatros & OWP West Offshore Wind Farms	-----	Germany	2008–2009	Project certification
<b>VATTENFALL</b> Kriegers Flak Offshore Wind Farm	-----	Sweden	2006–2009	Owners representation, assembly supervision, construction supervision, design assessment, final inspection, NDT magnetic particle, NDT ultrasonic, QA of material & equipment, verification/certification
<b>PEP – POLISH ENERGY PARTNERS</b> Puck, Suwalki, Tychowo, Modlikowice and Lukaszow Onshore Wind Farms	-----	Poland	2005–2009	Owner's engineer, technical due diligence, tender support, QHSE management, vendor assessment, manufacturing inspection, construction supervision, final acceptance inspection
<b>ENEL</b> Onshore Wind Farms	-----	Brazil, Spain, Italy	2003–2009	Technical due diligence, QA/QC management and inspection
<b>EDISON MISSION ENERGY</b> Buffalo Bear and Elkhorn Ridge Onshore Wind Farms	-----	USA	2008	Construction supervision, final acceptance inspections, commissioning survey
<b>ENBW ENERGIE</b> 4 Offshore Wind Farms	-----	Germany	2008	Technical due diligence
<b>GAMESA</b>	-----	Korea	2008	Manufacturing inspection
<b>JOHN DEERE WIND ENERGY</b>	-----	USA	2008	End-of-warranty inspections, QHSE consultancy, in-service inspections
<b>LEHMAN BROTHERS INC.</b>	-----	Germany	2008	Technical due diligence
<b>LONGYUAN</b>	-----	China	2008	Manufacturing supervision, QA/QC management and inspection
<b>NN</b>	-----	Germany	2008	Blade inspection and NDT
<b>PROKON NORD ENERGIE</b> Cote d'Albatre & MEG Offshore Wind Farms	-----	France, Germany	2008	Project certification, manufacturing inspection
<b>TRIANEL</b> Borkum West II	-----	Germany	2008	Project certification
<b>RAIFFEISEN BANK POLSKA S.A.</b> Krzecin Onshore Wind Farm	14	Poland	2008	Lender's engineer, technical due diligence, construction supervision
<b>WE ENERGIES</b> Blue Sky Green Field Onshore Wind Farm	-----	USA	2008	Technical due diligence, owner's representation, final inspection, commissioning and startup survey

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WHEN YOU NEED TO BE SURE

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