

Bladed Software Training

The five day course is designed for new users of Bladed. It includes hands-on guided use of the software complemented by tutorials on key topics of wind turbine technology.

By the end of the course you will:

- Understand the basic principles of a wind turbine.
- Be able to build a complete wind turbine model.
- Perform load calculations.
- Have an understanding of control concepts.
- Have an overview of site specific load calculations.

Areas of Bladed covered within the course:

- Introduction to Bladed
- Building a wind turbine model
- Rotor aerodynamics
- Structural dynamics
- Control and safety systems
- Modelling the environment
- Running steady calculations
- Running Simulations
- Post-processing and reporting
- The role of standards and certification
- Offshore wind climate and wave loading
- Offshore structures and foundations
- Site specific load calculations
- Seismic loading

Financing Your Wind Farm

A one day course providing a detailed overview of the finance technical due diligence process. This course allows the attendees to benefit from GL Garrad Hassan's extensive experience of project due diligence and avoid common mistakes, delays and misconceptions.

Course Background

GL Garrad Hassan has acted as the technical adviser for more than 21,000MW of operational wind projects, and assessed the energy yield of approximately 80,000MW. In undertaking these tasks, GL Garrad Hassan has advised on more wind farm developments than any other company in the world.

Due diligence is a necessary step in the path to project finance, and one which can be unnecessarily complicated by lack of preparation. This course allows the attendees to benefit from our extensive experience of project due diligence, and avoid common mistakes, delays and misconceptions.

Awareness of due diligence requirements at the start of a project may reduce both timelines and costs at the financing stage. The course's detailed information on proposal preparation and knowledge of financier's expectations is therefore intended to ease the path to finance.

Who should attend?

- Developers, lenders and other professionals who wish to benefit from our technical and commercial knowledge of the due diligence process.
- Course Outline
- Introduction
- Energy yield
- Turbine issues
- Electrical works
- Civil works
- Financing structure
- Capital costs
- Revenue
- Operating costs
- Sensitivities
- Financial model

Introduction to WindFarmer

Introduction to WindFarmer

A one day course giving beginners a basic understanding of the software; its functionality, main calculation abilities, and usability. This is achieved through a day of hands-on guided use of the software, incorporating example cases. It builds on the Wind Farm Design course the day before, taking the methodologies discussed and applying them. It can also stand alone as a day of training introducing the user to WindFarmer.

At the end of the day you will be able to:

- Clean, plot, and correlate wind data to produce frequency distribution and wind roses for site and long-term data
- Design a wind farm and maximise the energy yield
- Take into account noise and visual constraints
- Export your results and generate reports

Areas of WindFarmer covered in this course:

- MCP+ Module
- Use of measured wind data, Measure Correlate Predict
- Base Module
- Energy calculation
- Turbine representation
- Noise modelling
- Optimisation
- Report generation
- Visualisation Module
- Basic visualisation and animation
- ZVI - Zones of visual influence

Equipment:

Please bring a laptop computer for the course. At the start of the day we will show you how to install WindFarmer

Introduction to Meteorology

A one day course for industry professionals who wish to acquire a comprehensive overview of the subject and have the meteorological basics, weather systems, and atmospheric modelling clearly explained. Wind power meteorology, the atmospheric structure and scales are also covered.

Course background

GL Garrad Hassan has acted as the technical adviser for more than 21,000MW of operational wind projects, and assessed the energy yield of over 80,000MW. In undertaking these tasks, GL Garrad Hassan has advised on more wind farm developments than any other company in the world.

This course offers an introduction to meteorology, with application to wind energy in mind. The course will cover a description of the atmospheric circulation, the structure of the atmosphere, and its various scales. Typical large systems as the low pressure system, monsoons and hurricanes will then be described. In the afternoon the modelling of the atmosphere will be discussed, and finally, the most important aspects of wind power meteorology will be described, these include: local effects, variations on different scales, “strange animals in the micro-scale zoo” like complex terrain, forestry, wind profiles, and thermally-driven winds. A questions and answers session will close the day.

Who should attend?

Wind resource analysts, Project managers, developers, civil and structural designers, lenders, turbine designers and other professionals who wish to benefit from GL Garrad Hassan’s technical and commercial knowledge of the meteorological aspects of wind power developments. GL Garrad Hassan has assumed that attendees will have a technical background, but no specific meteorological knowledge is required.

Course Outline

- Why does the wind blow?
- Structure of the atmosphere: the atmospheric engine, escape velocity, the layers of the atmosphere, the greenhouse effect, albedo
- Atmospheric Scales: global, synoptic, meso, micro
- The low-pressure system
- The monsoons, tropical cyclones, hurricanes
- Atmospheric Variables: velocity (wind), pressure, temperature, humidity, density, stability
- Modelling the atmosphere: global circulation models, numerical weather prediction, chaos, ensemble
- Climate change
- Wind power meteorology
- Q&A session

Introduction to Wave and Tidal Energy Conversion

A one day course for professionals who wish to increase their knowledge of the key issues associated with wave and tidal energy conversion technologies. A detailed overview of the fundamental principles behind the main technological solutions to convert wave and tidal energy into electricity will be given, along with the key methodologies to evaluate the energy resource, device site suitability and device data.

In addition, hydrodynamic modelling techniques (both numerical and experimental), details of several power conversion mechanisms and an account of full-scale real seas experience to date will also be covered.

The course will provide a unique account of R&D and field experience in the wave and tidal energy sector, which can be used as a starting point for those who are new to the field or who wish to define a development strategy for their concept/company.

Course background

GL Garrad Hassan has been providing independent technical advice to the renewable energy sector for more than 20 years and has actively participated in the evolution of both onshore and offshore wind. The Marine Renewables team, formed in 2005, built on the accumulated in-house experience, tools and methodologies, offers services to the marine renewables sector which span from technical due diligence (owner's or bank's engineer) to resource assessment, and include numerical modelling, support to experimental test rounds, and strategic studies.

Joao Cruz (wave) & Mat Thomson (tidal) will lead the training. Joao and Mat have five years experience in this field, in both technology development and resource assessment and design tools; they head up GL Garrad Hassan's Wave and Tidal Energy teams, respectively.

Who should attend?

Project developers, device developers, lenders, network operators and regulators, R&D institutions, leading test centres and other professionals who wish to benefit from GL Garrad Hassan's technical and commercial knowledge of the field.

Introduction to Wind Turbine Technology

Wind power is now the fastest growing sector of the world's electrical power industries. This one day course explains the wind turbine technology behind that success.

The basics of wind energy conversion, the evolution of today's giant wind turbines and many key decisions about the design concepts (number of blades, upwind or downwind etc.) are explained. Rotor design, direct drive and the increasing diversity of drive train options are examined. Permanent magnet generators and general electrical design issues are addressed. The evolution of larger wind turbines and the challenges of further upscaling especially in the context of the expanding offshore market are also discussed. The design process, the importance of accurate design loads prediction and effective control of the wind turbine are highlighted. How design options may affect cost of energy is illustrated and future trends are reviewed.

The course offers a significant depth of understanding of the technology background but does not assume any prior knowledge of wind energy.

Who should attend?

- Industry professionals wishing to broaden their knowledge
- Individuals or companies involved in wind farm or turbine development
- Professionals of any discipline entering the industry and seeking specific skills:
 - Project managers
 - Developers
 - Civil and structural designers
 - Turbine designers



Offshore Wind Energy

A one day course for industry professionals who wish to acquire a comprehensive overview of the subject and have the latest technology and issues clearly explained. Offshore wind resource, wind turbine and support structure technology, electrical issues and administrative processes are covered.

Course Background

GL Garrad Hassan has been involved in offshore wind since the company's inception in 1984 and has had a dedicated offshore wind team since 2000. This team has grown steadily in size and experience and now has a total of 80 man-years of experience in the field, encompassing most of the technical disciplines involved in offshore wind farms: wind turbine technology; layout design; wind / energy analysis; marine civils; electrical engineering; installation; and operation and maintenance. To date, GL Garrad Hassan's offshore experience includes: 190+ commissioned contracts; 160,000 engineering hours; 8,000 MW of energy yield studies; 6,000 MW of O&M (Operation and Maintenance) analyses; 1000 MW of full due diligence analysis; and 1,500 MW of FEED (Front End Engineering Design) studies. GL Garrad Hassan will bring to the course the knowledge and understanding gained through this unique exposure of developing offshore wind technology and delivering support service for project development.

Who should attend?

Developers, lenders, network operators and regulators, turbine suppliers, Balance of Plant contractors and other professionals who wish to benefit from GL Garrad Hassan's technical and commercial knowledge of the field. GL Garrad Hassan assumes that attendees will have a technical background, but no specific offshore wind engineering knowledge is required.

Offshore Wind Farm Electrical Systems

A one day course for industry professionals who wish to acquire a comprehensive overview of the subject and have the latest technology and issues clearly explained. Grid connections, technical issues and administrative processes are covered, including grid code compliance.

Course Background

For several years GL Garrad Hassan has been running training courses on Wind Farm Electrical Systems. This year GL Garrad Hassan is launching its first Offshore focused version of this course to tie in with the BWEA Offshore Wind conference in Liverpool.

Building upon the existing course, and drawing upon GL Garrad Hassan's extensive involvement in the electrical design of offshore wind farms across Europe, this course will provide a solid foundation to help developers and operators understand the electrical issues for offshore wind farms.

GL Garrad Hassan has acted as the technical advisor for more than 21,000 MW of operational wind projects worldwide, both onshore and offshore, including all aspects of electrical engineering. These services include a wide range of expertise from the wind farm project level, operating as Banks and Owners Engineer and advising and assisting with grid connection applications, to the wind turbine level, advising and assisting with the design of turbine electrical drives and systems, to the regulatory level (grid codes and standards).

Electrical issues for wind farms, in particular regulatory and related issues such as grid codes, are critical for wind projects but are not well understood by many in the industry. In addition, the situation changes rapidly and there are significant differences between countries. This course aims to distil the knowledge gained from years of consulting experience to present all the important issues and aspects which are associated with electrical systems related to wind power engineering, both onshore and offshore.

Who should attend?

Developers, lenders, network operators and regulators, turbine suppliers, Balance of Plant contractors, consultants and other professionals who wish to benefit from GL Garrad Hassan's technical and commercial knowledge of the electrical aspects of wind power engineering. GL Garrad Hassan has assumed that attendees will have a technical background, but no specific electrical engineering knowledge is required.

Wind Farm Design

A one day course that Introduces industry professionals to the principles of wind farm design, giving a detailed overview of the design process. Starting from the principles of wind flow, turbulence, wake effects and ending with optimised energy production and environmental analysis. Investment in an understanding of wind farm design can reduce timelines and costs at the development stages of a project. The course introduces the WindFarmer software as a leading tool and attendees will receive a demonstration copy for follow up use.

Who should attend?

Developers, engineers and planners wishing to gain a clear understanding of practical wind farm design.

Course Outline

- Introduction
- Principles of wind flow
- Wind speed monitoring
- Analysis and interpretation of wind speed data
- Uses of WAsP with WindFarmer
- Wake models and wake model verification
- Calculation of predicted wind farm output
- WindFarmer environmental analysis
- Optimising wind farm layout
- Further features and conclusions

Wind Farm Development

A two day course for industry professionals who wish to acquire a comprehensive overview of the subject and have the latest technology clearly explained. The presentations provide up to date graphics and concise notes, which are reinforced by practical worked examples and live demonstrations using the latest software. The course will also include ample opportunity for individual discussions.

Who should attend?

Industry professionals wishing to broaden their knowledge; individuals or companies involved in wind farm or turbine development; and professionals of any discipline entering the industry and seeking specific skills:

- Project managers
- Developers
- Civil and structural designers
- Lenders
- Turbine designers

Day 1

- History of Wind Energy
- Who's Who in the Industry
- Anatomy of a Wind Farm
- How Do Turbines Work
- General Wind Flow Principles
- Wind Speed Monitoring
- Analysis and Interpretation of Wind Speed Data
- Calculation of Predicted Wind Farm Output and Optimising Layout
- Introduction to WindFarmer

Day 2

- Construction; O & M Agreements
- Operation & Maintenance
- Monitoring and Performance Optimisation
- Power Sales (Renewable Obligation Certificates, etc)
- Onshore Civil Works
- Effects of Wind Generation on Large Electricity Systems
- Electrical Systems and Network Connections
- Early Stages in the Development of a Wind Farm
- Planning Permission: Application and Consent
- Forecasting

Wind Farm Electrical Systems

This one day course provides an overview of the subject that clearly explains the latest technology and issues. Grid connections, technical issues and administrative processes are covered, including grid code compliance.

Course Background

GL Garrad Hassan has acted as the technical advisor for more than 21,000 MW of operational wind projects worldwide, both onshore and offshore, including all aspects of electrical engineering. These services include a wide range of expertise from the wind farm project level, operating as Banks and Owners Engineer and advising and assisting with grid connection applications, to the wind turbine level, advising and assisting with the design of turbine electrical drives and systems, to the regulatory level (grid codes and standards).

Electrical issues for wind farms, in particular regulatory and related issues such as grid codes, are critical for wind projects but are not well understood by many in the industry. In addition, the situation changes rapidly and there are significant differences between countries. This course aims to distil the knowledge gained from years of consulting experience to present all the important issues and aspects which are associated with electrical systems related to wind power engineering, both onshore and offshore.

Who should attend?

Developers, lenders, network operators and regulators, turbine suppliers, Balance of Plant contractors, consultants and other professionals who wish to benefit from GL Garrad Hassan's technical and commercial knowledge of the electrical aspects of wind power engineering. GL Garrad Hassan has assumed that attendees will have a technical background, but no specific electrical engineering knowledge is required.

Course Outline

- Introduction
- Wind Turbine Technology
- Wind Farm Electrical Systems
- Grid Network Connections
- Effects of Wind Generation on Large Electricity Systems
- Specific Grid Code Issues
- Q & A session



Wind Farm Performance Verification and Optimisation

A one day course for industry professionals wishing to learn more about the verification and optimisation of the performance of a wind farm. The presentations are supported by concise notes, practical examples and group discussions.

Course Background

GL Garrad Hassan has acted as the technical adviser for more than 21,000MW of operational wind projects, and assessed the energy yield of approximately 80,000MW. In undertaking these tasks, GL Garrad Hassan has advised on more wind farm developments than any other company in the world.

Performance Verification procedures and power curve warranties have to be defined and negotiated before the financial close of a wind farm project in order to minimise financial risk. The uncertainties of the power curve warranted by the manufacturer in relation to the wind farm site have to be quantified. During operation the verification test procedure has to prove that the turbines are within the acceptance levels. To compliment the warranties, the wind farm performance may be optimised and tracked through regular monitoring using tools that interrogate the SCADA data continuously recorded by each turbine and met mast on the wind farm. The course allows the attendees to benefit from GL Garrad Hassan's extensive experience of project due diligence and avoid common mistakes and misconceptions.

Who should attend?

Developers, operators, lenders and other professionals who wish to benefit from GL Garrad Hassan's technical and commercial knowledge of the wind farm design and performance verification process.



Wind Farm Safety

The focus of this one-day course will be to provide information on the requirements of UK health & safety legislation and practical guidance on wind farm safety management.

This course will provide attendees with a comprehensive introduction to the legal requirements of UK safety legislation in the context of wind farm construction, operation and maintenance. The morning session will focus on the requirements of the construction regulations including duties, competence assessment and appointment of the CDM Co-ordinator and Principal Contractor. The afternoon sessions will focus on the most significant hazards on wind farms including electrical safety, working at heights and offshore hazards.