sgurr energy

Sustainable Engineering Worldwide

Onshore wind energy consultancy
Services and track record

About us

SgurrEnergy is a leading independent engineering consultancy specialising in renewable energy projects worldwide. Our highly qualified team of over 100 consultants and engineers have a significant track record in the wind energy sector. Trusted by world leading utilities, developers, independent power producers and financiers we provide full project life cycle engineering services for wind energy development. We deliver at every phase of a project from feasibility, planning and development stages through pre-construction and implementation into operations and maintenance consultancy.

Quality Assurance

FS 85385

EMS 85386

OHS 538996

SgurrEnergy is committed to delivering the highest standards of Quality, Environmental, and Health and Safety Assurance, demonstrated by our triple certification to British Standard ISO 9001, ISO 14001 and OHSAS 18001.

Successful projects delivered through:

- **Experience** gained in direct involvement in over 45 GW of wind power projects, with proven client confidence;
- **Expert** team dedicated to each assignment;
- **Extensive global knowledge** in over 30 countries of developing large scale renewable energy projects on behalf of major players providing a formidable depth of knowledge;
- **Proven track record** in delivering high quality and focused services to utilities, wind farm developers, lenders and investors for project development, finance and acquisitions;
- **Multi-lingual** staff including French, German, Italian, Polish, Hindi, Spanish, Mandarin, Greek and Cantonese;
- **Highly responsive culture.** We pride ourselves on being one of the most proactive consultancies in the industry and completing challenging assignments within demanding time frames.

Our team

- Environmental Impact Assessment specialists
- Noise and vibration consultants and engineers
- Met mast installation and decommissioning team
- Lidar deployment, data analysis and servicing team
- Resource analysts
- GIS specialists
- CFD modellers and analysts
- Electrical engineering team
- Civil engineering team
- Mechanical engineering team
- Project managers and engineers
- Health and safety consultants
- Operation and maintenance consultants and engineers
- Due Diligence including Owner's Engineer and Lender's Engineer

Feasibility and development

From site identification and screening through to Environmental Impact Assessment (EIA) management and planning submission, our team identifies opportunities and risks associated with a proposed wind farm site at the earliest possible stage. This capacity gives developers accurate and timely information allowing projects to proceed with minimum delay.

Site identification and screening studies

SgurrEnergy construct GIS-based regional site search tools to highlight promising areas and focus the search for potential wind farm sites.

Pre-feasibility studies

- Initial wind resource assessment
- Initial investigation of key technical, grid, environmental and planning constraints (including noise constraints)
- Construction of GIS-based constraints map
- Identification of possible turbine choices and initial layout design
- Initial financial modelling
- Advice on possible “show stoppers” and further recommended work

Detailed feasibility studies

- Site visit
- Detailed assessment of site energy resource
- Further assessment of technical, environmental and planning constraints
- Consultation with relevant environmental and planning stakeholders
- Grid connection assessment
- Project design and layout optimisation
- Further financial modelling

Development support

- Resource assessment - Complete mast and lidar service
- Energy yield and wind regime analysis
- Management of grid connection application
- Managing tendering and procurement

Environmental Impact Assessment (EIA) and planning support

- Screening and scoping process
- In-house capability and strategic partnerships for all elements of the EIA process
- Management of EIA process
- Preparation and submission of planning documentation
- Expert Witness services
- Proven track record in obtaining consent for developments
- Noise Impact Assessment for construction and operational projects
- Visual impact studies

Unparalleled wealth of knowledge in wind energy

Wind monitoring services

SgurrEnergy's Wind Monitoring team has significant experience in wind data logging and management using cutting edge lidar technology and traditional meteorological mast methods to capture wind data at prospective wind farm sites. From planning application support, mast or lidar commissioning, data collection and decommissioning to wind analysis services for energy yield prediction, project layout and design services.

Our significant experience in wind monitoring is based on a track record in wind data capture which includes our current portfolio managing 80+ guyed masts in the UK and a further 30 overseas in China, Canada, Pakistan, Korea, Philippines and Russia.

Mast and lidar wind monitoring

SgurrEnergy provides a custom wind resource campaign package of services for monitoring masts ranging in height from 10m to 90m including the following services:

- Site visit for mast siting
- Planning application for mast siting (not required for lidar)
- Equipment specification and procurement
- Project management interaction with client, landowner and contractor
- Health & Safety requirements, risk assessments and method statements
- Installation and commissioning
- Lidar set up and configuration
- Data recovery three times per week
- Monthly reporting
- Daily, weekly or monthly dial up if requested
- Maintenance and mast health check
- Decommissioning

Galion deployed on a Spanish site

Galion, second generation laser anemometry

Galion is a remote sensing device that uses a laser beam to measure wind speed and direction.

It has a unique steerable beam that allows high resolution data capture up to 2km at multiple turbine locations, it is a complementary technology to traditional mast methods of data capture with significant capacity to increase understanding of wind flow mapping for proposed sites and for existing wind farms through full site visualisation.

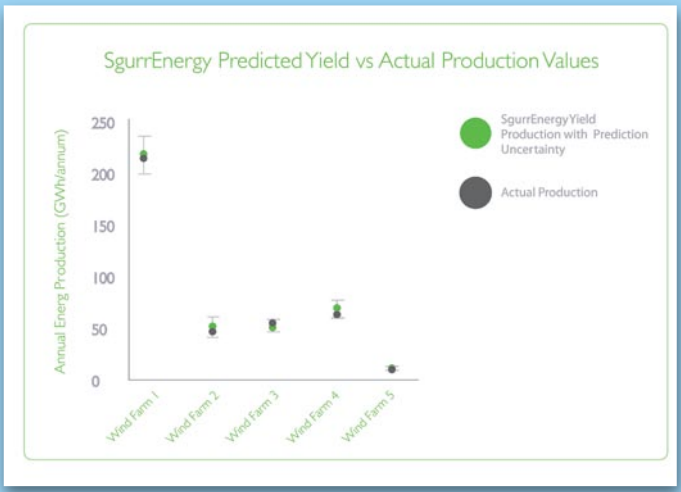
Contact us for more details or a field demonstration.

Temporary met mast at Beinn an Tuirc

Wind analysis

Having worked for leading developers, lenders and investors on some of the world's largest and most challenging wind farm sites, SgurrEnergy's Wind Analysis team holds world class knowledge. This expertise in accurate wind energy yield prediction and wind regime analysis is fundamental for project economics. In addition, wind regime analysis is necessary to select the appropriate wind turbine for the site considered.

To support projects from initial wind assessment through to bankable energy yield prediction, SgurrEnergy's highly qualified consultants provide a comprehensive package of independent services that typically deliver wind farm energy yield predictions within 5% of the operational performance.



Predicted Yield vs Actual Production Values

Wind data analysis

- Data quality assessment
- Data calibration
- Long term prediction using standard Measure Correlate Predict (MCP) method where applicable
- Recommendation for potential wind measurement improvement where applicable

Energy yield assessment

Using state of the art software and modelling techniques, our expert team create long-term wind distributions and wind flow models in order to produce a wind energy density map across the proposed wind farm site. This in turn allows us to predict the annual energy yield from a proposed wind turbine layout, and also to quantify the turbulence and extreme wind characteristics of the site. This information will inform the decision on turbine type and allow us to optimise the turbine layout to produce maximum energy yield without reducing turbine life.

SgurrEnergy offers a customised service of energy yield assessment based on the following:

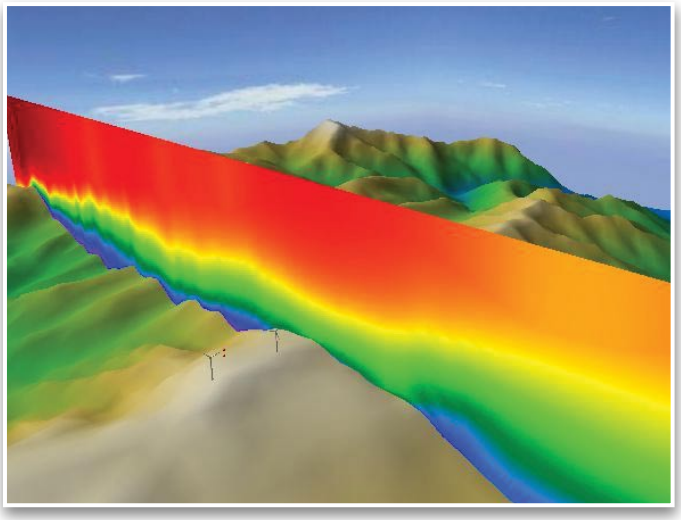
- Modelling using standard wind industry software: WAsP and WindPRO
- Computational Flow Dynamic (CFD) modelling
- Forestry scenario modelling (felling and regrowth in commercial plantations)
- Application of system losses based on SgurrEnergy's extensive experience
- Calculation of uncertainties using in-house tools

Wind regime analysis

- Predict the extreme wind speed at the site (this is the 50 year 3 second gust) using site data and an ESDU/Fisher Tippet based method.
- Analyse site wind shear. Wind speed increases with height above ground level. If the rate of increase is too high this can have a detrimental effect on wind turbine components.
- Analyse site turbulence intensity. Turbulence intensity describes the 'gustiness' of a site and is used to determine the fatigue life of wind turbine system components.
- Extrapolation of wind shear, turbulence intensity and extreme wind speeds parameters at each turbine location using WAsP Engineering and CFD.
- Wake induced turbulence assessment. To accurately predict the local wind regime the effects of wakes must be added to the predicted ambient wind regime.

Computational Fluid Dynamics (CFD) flow modelling

Based on an experienced track record of CFD application in wind farm projects, SgurrEnergy utilises flow modelling to understand the influence of complex terrain and forestry on the wind regime. As more wind farms are proposed and built in regions of complex topography and forestry, increased site complexity affects the wind farm energy yield, uncertainties and the load on the wind turbines. This in turn can influence the revenues and maintenance costs related to an operational wind farm at that site.



Wind variation across complex topography

SgurrEnergy's highly qualified Wind Analysis team provides a detailed understanding of the effect of the complex site surroundings on the wind regime. This can take the form of creating various wind flow models to simulate the changing nature of the forestry over the lifetime of the wind farm site. Verification of all SgurrEnergy computational models is an integral part of every analysis process and is used to ascertain the quality of the model and estimate model error.

SgurrEnergy has extensive experience in dealing with forestry influenced wind regimes having assessed over 1000 MW of wind farm developments in such environments providing technical advice to developers and lenders worldwide. Utilising cutting edge Galion lidar technology, our team offer the powerful combination of lidar wind monitoring and CFD wind flow modelling to provide a methodology that is able to fully examine even the most complex wind farm surroundings:

- Complex topography
- Forested sites
- Wake analysis to optimise wind farm layout

Wind turbine reviews

Through our due diligence and project development experience, SgurrEnergy has amassed considerable knowledge and experience of WTG design, manufacture, erection, testing and operation for both onshore and offshore projects, in a wide range of different locations and environments, including complex terrain where turbulence and spacing can be an issue, to extremes of heat and cold.

Summarised below are some of the main turbine models covered by our recent wind turbine technology review assignments on behalf of major project lenders and investors:

WTG Models

- Vestas V90 (1.8, 2.0, 3.0) and Vestas V80
- Clipper Liberty turbines
- Repower 5M, 6M, MM82 and MD70
- Nordex N80, N90 and N100
- Multibrid M5000
- Suzlon S64, S82 and S88
- Siemens SWT 1.3, 2.3 (93 and 101), and 3.6
- Enercon E70-E4
- Bard VM
- Goldwind S50, G77 and G82
- WinWinD3MW
- Guodian United Power UP77 and UP82
- Sinovel SLI500, SL77 and SL82
- Hanwei HV1500
- Dongfang FD77, FD82
- Windey WD50
- Gamesa G87
- GE 1.5
- Nordex S70 and S77

The table below is a summary of some of our wind farm development experience including early stages, wind monitoring, energy yield protection, wind analysis and Power Performance Assessment.

Development		Early stages	Wind monitoring	Energy yield prediction	Wind analysis	Power Performance Assessment
Geography	**Project Name**					
UK	Whitelee (322 MW)	•	•	•	•	•
	Black Law (97 MW)		•	•	•	•
	Portfolio of 10 BT sites (250 MW)	•	•	•	•	
	Minsca (36.8 MW)					•
	Harestanes (213 MW)	•	•	•		
	Dalswinton (30 MW)			•	•	
	A'Chruach (42.5 MW)		•	•	•	
	Beinn Tharsuinn (30 MW)	•	•			•
	Beinn an Tuirc (30 MW)	•	•			•
	Cruach Mhor (29.8 MW)	•	•			•
	Glenkerie (22 MW)	•	•	•	•	•
	Ridgewind portfolio				•	
	Arecleoch (150 MW)	•	•	•	•	
Ireland	Long Mountain (35 MW)			•		
	Garves (15 MW)			•	•	
China	Bailingmiao (50 MW)	•	•	•	•	•
	Xiwu (50 MW)	•	•	•	•	
	Xichange (50 MW)	•	•	•	•	
	Guyang (50 MW)	•	•	•	•	
	Rudong (100 MW)	•				
	Airtricity Inner Mongolia sites (49.5 MW)	•				
	Shandong Taipingshan (49.3 MW)			•	•	
	Fujian Dehua Xueweijian	•				
	Fujian Guangze Jinshan	•				
South Korea	Yangshan (12 MW)	•	•			
Europe	Havsnas, Sweden (95 MW)			•		
Pakistan	Confidential (50 MW)			•	•	
	Sapphire (50 MW)	•	•	•	•	
North America	Haida Gwaii (5 MW)	•				
	Eagle Power (5 MW)	•				
Global portfolios	Airtricity Europe and China (9000 MW)			•		

Pre-construction and implementation

Advisory services and due diligence

SgurrEnergy offers an impartial, proactive assessment of any renewable energy project irrespective of the stage of development. Our independent technical and financial due diligence services include:

- Technical advisor and owner's engineer
- Bank's engineer
- Lender's engineer
- Mergers and acquisitions

As a trusted advisor in the energy industry, SgurrEnergy prides itself on its track record of extracting essential information that can be appropriately employed within the tight timescales demanded by the financial sector. SgurrEnergy fully understands the risks of investing in a renewable energy project. Our robust approach to uncertainty assessment and mitigation measures enables us to provide reliable predictions of annual energy yields and corresponding uncertainties. Post investment appraisal confirms our predictions lie within the quoted uncertainty limits. Indeed, predicted production is typically within 5% of actual for a well managed project.

Through our expert due diligence team, we have acted in the role of lender's engineer and carried out detailed due diligence for almost all the major project finance banks active in the onshore and offshore wind energy market. Based on an extensive track record on many high profile investment and acquisition deals, from individual projects and portfolio purchases our team is capable of addressing the full lender's engineer scope of work, assessing the risks and mitigants present within a project's design, construction and operation including the following:

- Key project agreements, including engineer, procure construct (EPC) contracts and operations and maintenance (O&M) agreements, grid connection, power purchase agreements (PPA), credit and subsidy schemes
- Energy yield prediction and reviews, including assessment of the suitability of candidate turbines and wind farm layout design for site wind regime
- Review of Sponsor energy yield predictions, including quality of data, levels of uncertainty and calculation of losses

Foundations being poured at Havnäs wind farm, Sweden

- Market studies
- Technical assessments on wind turbines, models and their manufacturers/suppliers
- Performance guarantees and warranties, including adequacy of liquated damages and limits of liability
- Expert reports on established and emerging technologies
- Supply chain and supplier analysis
- Environmental and permit requirements, planning, PPA, grid connection and future regulatory and market developments
- Contract structure
- Project life-cycle assessment, including O&M contracts and costs, and compliance with planning permits
- Issues relating to the potential expansion or repowering of a site in the future
- Project Sponsor, supplier and contractor experience and capability
- Grid connection and electrical design
- Ground risk and foundation design
- Technology risk
- Full multi-discipline engineering expertise

Technical advisor and construction management

Our highly responsive team of project managers and engineers has considerable experience delivering turnkey renewable and non-renewable projects. This has involved extensive multi-disciplinary consultancy work including; design, procurement, fabrication, installation, commissioning and testing on a variety of developments. SgurrEnergy's multidisciplinary Engineering Team, which works closely with our electrical, control and instrumentation, civil and mechanical teams and carries out a wide range of technical advisory services including:

- Wind turbine and other technology assessments
- SCADA systems and integration, electrical and control systems expertise
  - Grid connection, electrical and communications infrastructure specification and review
  - Grid code compliance, review, submission of grid connection application, management of UDL (User Data Library) submission.
  - Electrical design studies, generate procurement specifications and lists of materials
- Civil and structural engineering expertise
  - Civil infrastructure specification and review
  - Geotechnical investigations
  - Transport assessments including swept path analysis
- Mechanical engineering expertise
  - Witnessing turbine installation and commissioning
  - Turbine supply contract specification and review
  - Power performance assessment
- Balance of plant contract specification and review
- Tender assessment support
- Design and documentation reviews
- Quality Assurance (QA) inspections and factory acceptance tests
- Project and site management including health and safety
- Construction management and site supervision
- Technical audit

WTG installation at Bailingmiao, Inner Mongolia.

Contract negotiation

SgurrEnergy has led or participated in contract negotiations for onshore and offshore wind farms for clients on major projects across Europe, Asia and the Americas. Our experienced multi-discipline team lead and support tender assessments and contract negotiations for full turnkey contracts and also for individual balance of plant packages including ongoing tender assessment, tender scoring, monthly client progress reports and recommendations for short listing and contract awards and in-depth contract negotiation meetings with tendering firms.

Operation and maintenance (O&M) advice

Our O&M team have years of experience in advising clients in the safe operation and maintenance of various technologies of generation plant at all stages of the life cycle and with strict adherence to health, safety, environmental and industry regulations. From commissioning and handover through to decommissioning or repowering, we can maximise revenue through plant performance optimisation, minimising downtime and prolonging operational lifetime by intelligent proactive maintenance regimes.

Core O&M services include:

Asset management:

- Commissioning
- Site inspection and audit (defect identification) pre take-over
- End-of-warranty inspection
- Creation and operation of a permit-to-work scheme
- Provision of a Senior Authorised Person to operate the client's permit-to-work system

Compliance:

- Health and safety management and safety rules training
- Risk assessment and method statement review
- Safety rules training

Analysis:

- Incident, fault and failure analysis/investigation and reporting
- Component performance, supply and purchase options
- Supply chain management
- Supply, operation and management of third-party SCADA systems
- SCADA management and auditing
- Noise and vibration analysis
- Supply, operation and maintenance of a plant condition monitoring system to identify failing components such that replacement components are procured before failure to ensure power production is maximised

Site resource and review:

- Refurbishment and repowering options
- Weather and energy forecasting
- Technology and market reviews
- Due diligence of operational sites

Performance optimisation:

SgurrEnergy's experience of reviewing the performance of wind farms suggests that improvements of 1% to 3% in revenue are readily attainable.

Using an in-house suite of powerful performance enhancement software tools, our experienced analysts provide a monthly review of a wind farm's performance, and concrete guidance on how to improve it. Known as SgurrTrend, this suite of software tools uses existing SCADA data to quickly and efficiently evaluate the historical performance of a wind farm. Turbines and specific periods during which performance was affected by some factor can be quickly identified, allowing the focussing of expertise where it is of most benefit.

SgurrTrend offers the following key benefits:

- Rapidly identify where performance shortfalls occur;
- Associate those shortfalls with errors and alerts;
- Quantify those shortfalls to target the efficient use of O&M resources
- Schedule inspection and maintenance intelligently
- Ensure the best performance from each individual turbine
- Improve wind farm revenues

This service has no initial capital cost, no down-time for installation, and no risk for the client.

An operational wind farm in China

The table below is a summary of some of our preconstruction implementation and operational experience.

Preconstruction and implementation		Technical due diligence	Contract Negotiation	Technical Advisor mechanical, electrical, civils	Lenders Engineer
Geography	**Project Name**				
UK	Whitelee (322 MW)		•	•	
	Black Law (97 MW)		•	•	
	Zephyr portfolio (400 MW)	•		•	
	Braes of Doune (72 MW)		•	•	
	Minsca (36.8 MW)		•	•	
	Dalswinton (30 MW)		•	•	
	Glenkerie (22 MW)		•	•	
	RES Hunters Hill (25 MW)	•			
	Viridian (Northern Ireland portfolio)				•
Ireland	Lee Strand (14 MW)	•			•
	Castledockrell (41.4 MW)	•			•
	Ballycadden(26 MW)	•			
	Eco Wind Power portfolio (54 MW)	•			•
	Coomacheo (41.4 MW)			•	
China	Inner Mongolia portfolio (Multi MW)		•	•	
	Rudong (100 MW)	•			
	Jilin Baicheng (200 MW)				•
	Longjiang portfolio (550 MW)				•
Sri Lanka	Mampuri (10 MW)				•
India	Revangaon (33 MW)				•
Europe	Havsnas, Sweden (95 MW)			•	•
	French wind farm reviews for Fortis Investment			•	
	Col de la Fageole (15 MW)	•			
	Nass & Wind French portfolio	•			
	Confidential site in Estonia (75 MW)				•
Pakistan	Sapphire (50 MW)		•	•	
North America	Airtricity portfolio (6000 MW)	•			
	Everpower (800 MW)				•
South America	Galapagos Islands	•			
Global portfolios	Airtricity Europe and China (9000 MW)	•			
	CapGen (10,500 MW)				•
	Babcock and Brown portfolio, France and USA	•			

Operational		Post investment appraisal	O&M
Geography	**Project Name**		
UK	Black Law (97 MW)	•	
	Zephyr portfolio (400 MW)	•	
	Beinn Tharsuinn (30 MW)	•	
	Beinn an Tuirc (30 MW)	•	
	Cruach Mhor (29.8 MW)	•	
	Blaen Bowi (3.9 MW)		•
China	Bailingmiao (50 MW)	•	•
Global portfolios	Airtricity Europe and China (9000 MW)		•

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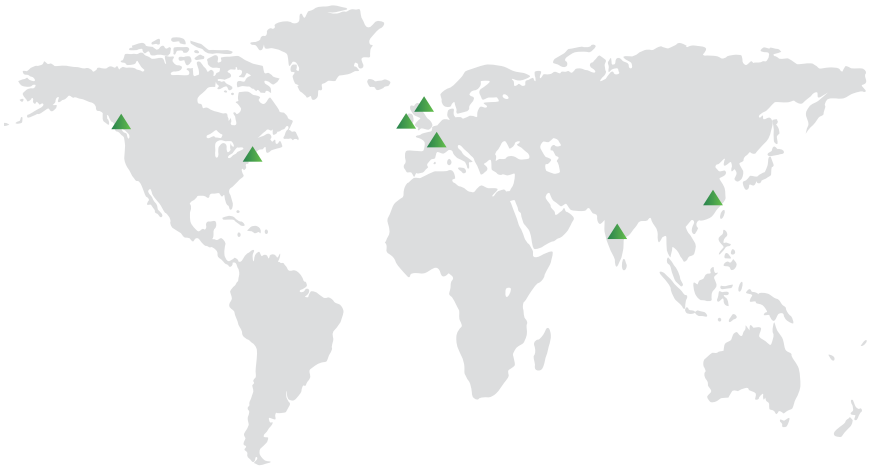

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