



Clean Energy Expo Asia 2010

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Wind Portfolio Investments, Risks & Mitigation
in China

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Sustainable Engineering Worldwide

Introduction

- Overview of SgurrEnergy
- SgurrEnergy's regional experience
- Typical completion risks
- Typical operational risks
- The benefits of operating a wind portfolio
- Portfolio uncertainty reduction
- General risks and mitigation
- Case study #1: HSBC/AEI: Baicheng project
- Case study #2: Major Chinese investor on Inner Mongolia project
- Conclusions

SgurrEnergy today

- Leading independent engineering consultancy
- Global network of offices
- Glasgow (Head Office)
- Beijing (China)
- Pune (India)
- Wexford (Ireland)
- Vancouver (Canada)
- Paris (France)
- Portland (USA)



- Experienced
 - Over 100 responsive engineers and consultants



FS 85385



EMS 85386



OHS 538996

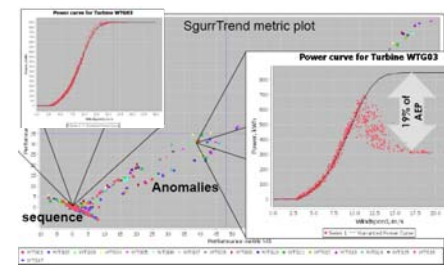
What do we do?

SgurrEnergy personnel hold unparalleled knowledge to ensure successful renewable project delivery.



Products

SgurrTrend™



Galion™



Wind

Offshore Wind

Wave & Tidal

Solar

Bio-energy

Hydro



Leading position by experience

We have consulted on over 50,000 MW of renewable energy projects in over 30 countries covering project development, due diligence and operational support

Europe

- Belgium
- Bulgaria
- Estonia
- France
- Germany
- Greece
- Ireland
- Italy
- Malta
- The Netherlands
- Poland
- Portugal
- Romania
- Russia
- Spain
- Slovakia
- Sweden
- UK

Asia

- China
- India
- Korea
- Pakistan
- Philippines
- Turkey
- Vietnam

Africa

- Angola
- Kenya
- South Africa

Oceania

- New Zealand

North America

- Canada
- USA

South America

- Brazil
- Chile
- Galapagos Islands



Why SgurrEnergy?

- Fully independent
- Impartial, proactive assessment of any stage of a project
- A trusted advisor to:
 - leading utilities
 - project finance banks
 - global investment and infrastructure funds
- Expert team, covering all major/leading renewable energy technologies
- Innovative solutions and products
- Proven track record
 - Over 50GW of wind energy worldwide
 - Involvement in over 7GW wind energy development in Asia



SgurrEnergy's regional experience

INDIA

- Wind assessment and energy yield for two 45MW wind farms located at central India
- Due diligence on a 33MW wind farm in Revangaon, Maharashtra

PAKISTAN

- Technical advisor for Sapphire wind farm
- Technical advisor for Lucky Energy wind farm

SRI LANKA

- Provide technical service as Lender's Engineer for 20MW wind farm
- On behalf of Ceylon bank, act as Lender's Engineer to perform wind farm assessment

THE PHILLIPPINES

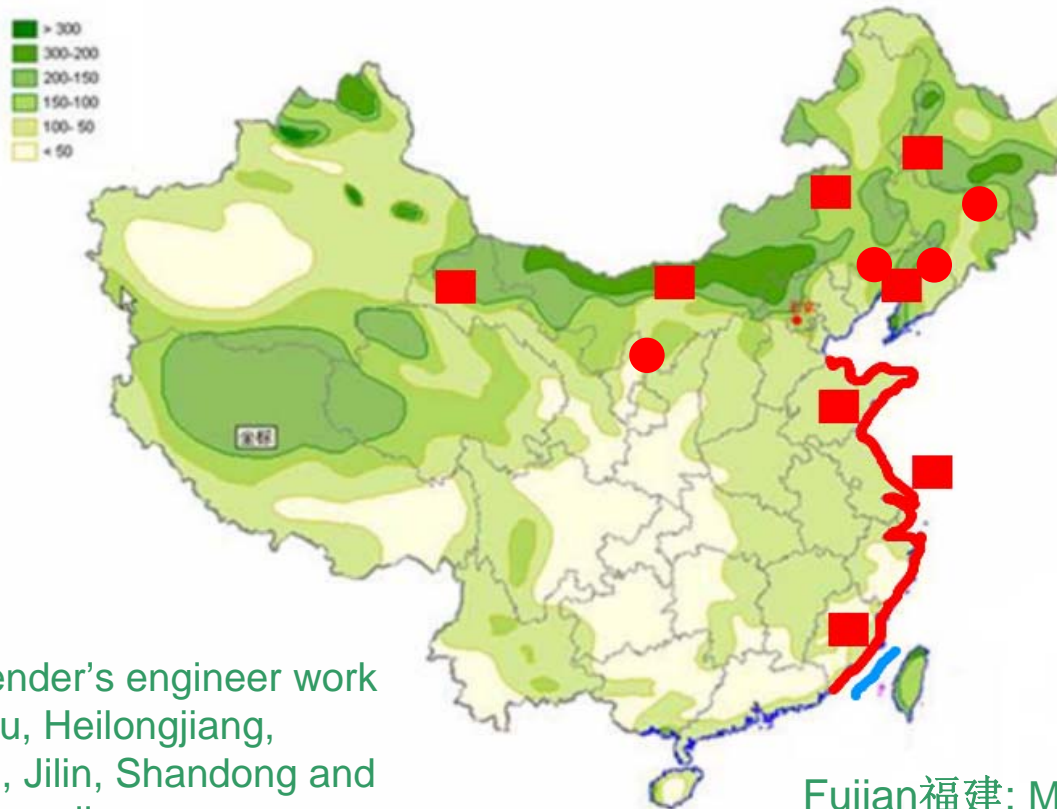
- Owner's Engineer on a 300MW wind farm
- Wind monitoring management for a 150MW wind farm

SOUTH KOREA

- As the Owner's Engineer to work on the Yangshan wind farm

SgurrEnergy Projects in China

- China's outlying and coastal regions provide significant natural resources in renewable energy, particularly wind.



As the lender's engineer work in: Gansu, Heilongjiang, Liaoning, Jilin, Shandong and Inner Mongolia

Inner Mongolia 内蒙: Designer & Technical advisor for 200 MW+ wind farm (expandable to 2000 MW); wind power forecast analyzer- over 1000MW wind assets

Southeast coastal provinces 东南沿海: Assess resource and potential for exploiting offshore wind farm development along 10,000km+ of shoreline

Fujian 福建: Methodology and implementation plan for offshore wind farm development in Fujian Province

The risks, what affects confidence?

Technical risks can be split into two broad categories:

- **Completion risks**
 - Issues that could affect project milestones, specifically energisation, power export and revenue generation
- **Operational risks**
 - Issues that could affect project revenue generation and profitability over the debt term or life of the project

Completion risks

- Capabilities and resources of key project participants
- The site:
 - Permits
 - Site characterisation
 - Ground risk
- Commercial issues:
 - Contract structure
 - Supply chain
- Grid connection

Operational risks

- Capability and experience of the project operators
- Site characterisation
 - Technology Selection
 - Energy Yield Prediction
 - Design Life
- Technology risks
- Availability
- Grid curtailment

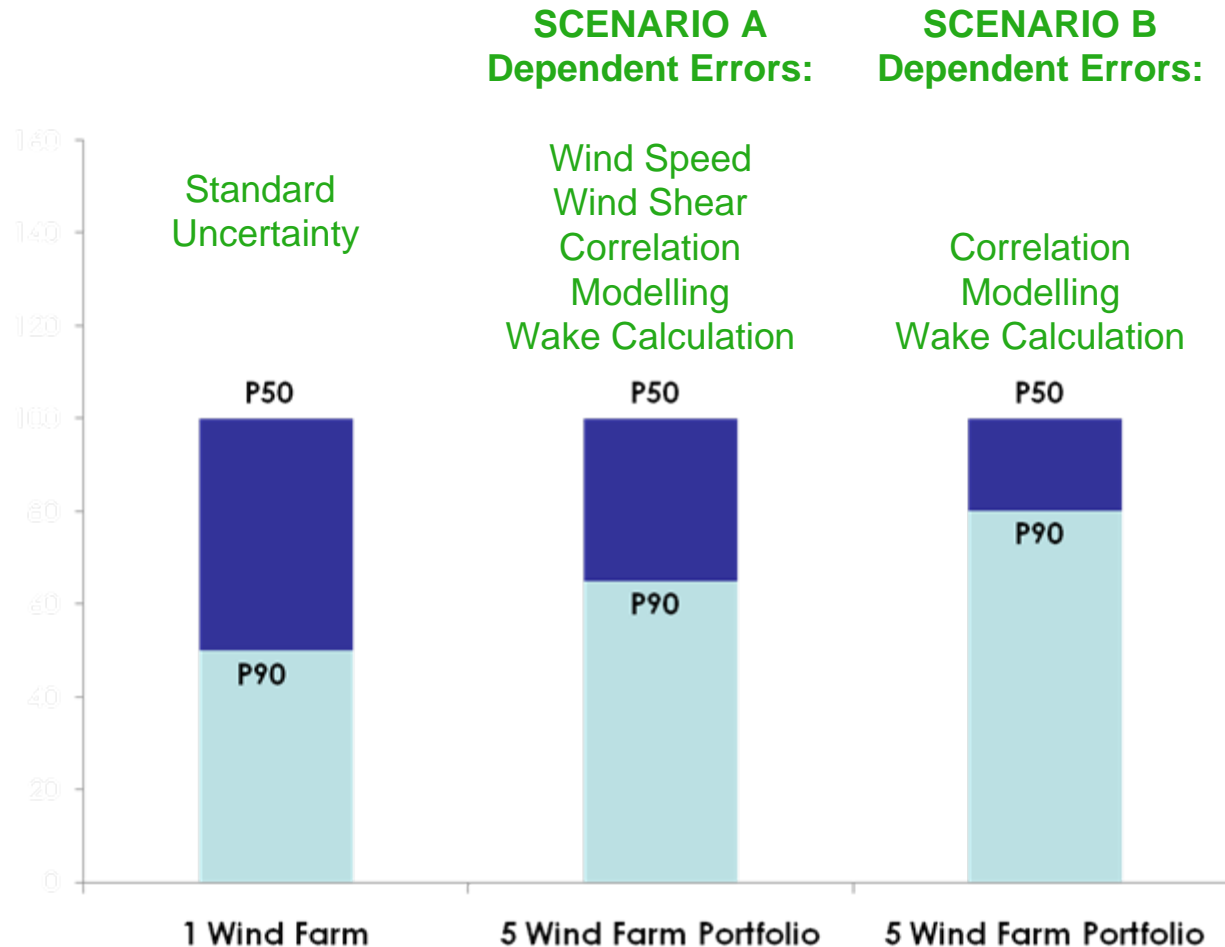
The benefits of operating a portfolio

- **Wind resource and character**
 - Geographic separation mitigates production risk, climate change risk and extreme event risk
- **Technology**
 - Technology diversification mitigates serial defect risk
- **Grid**
 - Connection to different grids mitigates curtailment risk
- **Regulatory**
 - Operations in different regulatory regimes mitigates the risk of detrimental changes to legislation

Portfolio uncertainty reduction

Scenario A
5 wind farm portfolio in
close geographic
positioning

Scenario B
5 wind farm portfolio
with widespread
geographic positioning



Typical Mitigation: LDs, Warranties & Guarantees

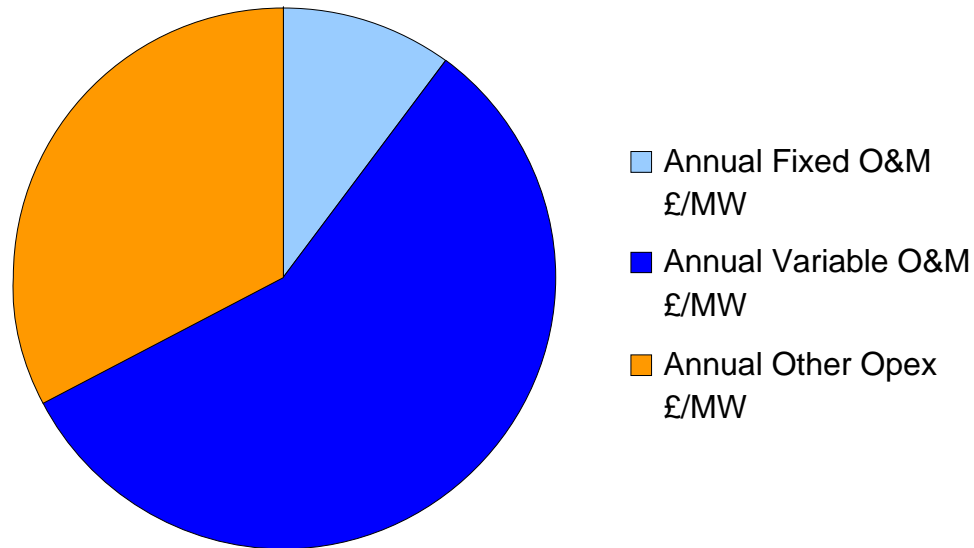
	Delay LDs ¹	Warranty Term	Availability Guarantee	Power Curve Guarantee	LD Cap ²
Industry Standard	£650	2 – 5 years	95%	95%	10%
Maximum	£1500	7 years	97%	100%	20%
Minimum	£200	2 years	90%	90%	3%

¹ Delay LD's are per WTG per day

² Presented as a percentage of WTG Supply & Installation Agreement

Portfolio Operational Expenditure

- This example shows that the variable O&M cost can be the most significant cost component of the total OPEX.



Details from a multi-MW portfolio; comprising several wind farms with diverse age, capacity, WTG size & manufacturer

What are the risks? How to mitigate?

Some common issues we find in Chinese projects -

- The Participant
 - The capabilities and resources of project participants is one of the biggest risk areas in many projects:
 - Insufficient resources
 - Extended timescales, slow progress, likely to find more issues in documentation
 - Lack of understanding of project finance process
 - Lack of experience in developing, building and/or operating wind energy projects
 - Unrealistic timescales, capex and/or opex budgets
 - Simplistic approach to technical risks; under-estimating complexity of technology and site-specific conditions

- The Grid
 - Grid availability not necessarily something to take for granted
 - Grid code compliance
 - Still complex but appears to be less of a barrier
 - Grid curtailment due to technology unable to meet requirements of grid operator
 - Grid curtailment
 - This can occur when the right technology is selected is the grid is inherently weak (can be exacerbated in winter where there is reliance on waste heat from thermal power stations for space heating)
 - Only real mitigation is guarantees from the grid companies regarding grid reinforcement and interconnection

- Site Characterisation

- Failure to adequately characterise the site can lead to performance issues:
 - Underperformance due to overestimating wind resource
 - Underperformance due to power curve response to off design wind shear, veer or turbulence intensity characteristics
- Premature failure of critical turbine components due to off design wind shear, veer or turbulence intensity characteristics
- Other parameters equally as important: temperature, humidity, icing, dust

- The Site

- Permits are not a “tick in the box” item
 - Conditions fully understood and built into project?
 - Conditions fully complied with? Some sites have lost permits...
- Wind regime must be understood at an early stage
 - Impacts on design and operation, not just on calculating a P50
- Sometimes no evidence that a contractor’s “standard” design has been fully checked as compliant with site conditions

Case Study #1

Baicheng Wind Farm 49.5MW, China

- This is the first non-recourse project financing deal closed in China under the framework of Chinese Renewable Energy Law.
- SgurrEnergy undertook comprehensive technical due diligence on behalf of HSBC covering reviews of:
 - WTG supply and maintenance contracts
 - Long-term maintenance budgets and availability assumptions
 - WTG suitability for the specific site location
 - And recommended a series of ongoing inspections during the construction phase of the project
- Post financial close, SgurrEnergy continues to be the lender's technical advisor.

Location: Baicheng,
Jilin Province

Project Size: 49.5MW

Turbine model:
Suzlon S82 (1.5MW)

No. of WTGs: 33



Case Study #2

Multi-MW Wind Farm Inner Mongolia, China

- On behalf of the investor, SgurrEnergy has carried out a series of technical due diligence service including:
 - Wind farm performance assessment
 - Independent energy yield assessment
 - WTG technology and suitability
 - Review of contracts, permits and financial model technical inputs
 - Investigation on the grid curtailment issues

Location: Baotou,
Inner Mongolia

Project Size: Multi-MW

No. of WTG: 132

Investor: a Major
Chinese Investment Co.



Conclusions

- SgurrEnergy has considerable direct and relevant regional experience in renewable energy project financing
- Completion and operational risks are straightforward to identify, yet risk quantification and mitigation remains an issue
- A well designed wind farm portfolio can mitigate completion and operational risks but this will not resolve issues at a project level
- Detailed and meticulous site characterisation is the key to risk quantification and mitigation, which underpins overall project design and ultimately the contracts designed to implement a project

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