



# Wind Power Development

NEW

PDUs to be awarded by Professional Engineers Board, Singapore

**Date** : 17 April 2012

**Time** : 9.00 am to 5.00 pm

**Venue** : M Hotel  
81 Anson Road  
Singapore 079908

With the rising demand for energy and diminishing fossil fuel resources, more countries are looking towards renewable energy to meet their growing energy needs as well as to reduce their carbon footprints. One of the emerging types of renewable energy in Asia Pacific is wind energy. While the wind market in Asia is still in the early stages of development there is considerable potential for wind in the Asia Pacific region.

Wind turbines generate electricity from the wind without any fuel costs and without the release of harmful emissions that are released when producing electricity with fossil fuels. Many areas in Asia Pacific have limitations for widespread wind development due to limited land area and low wind speeds. However, with the right combination of turbine technology, feed-in tariffs, government grants, and tax policies many projects may be both technically and economically feasible.

With increasing support for renewable energy from regional governments, the number of investors interested in developing and financing wind projects in the region is on the rise. New entrants to the wind industry often lack the technical knowledge required to develop or invest in successful wind projects. To help bridge the knowledge gap, two experienced wind industry professionals will provide this one day course which focuses on the technical building blocks required for successful wind project development.

## Objectives

This training will provide an introduction to wind project development including wind turbine technology, site selection, wind resource and energy assessment, and project due diligence. Participants will benefit by gaining a better understanding of wind project development, technical methods employed by industry, and keys to successful wind resource assessment. Topics covered will include:

- Historical overview
- Utility scale wind turbine technology
- Key stages of the wind project development lifecycle and identifying the risks involved in each stage
- Wind Resource
- Components of an effective measurement campaign
- Wind resources and energy assessment techniques
- Project example case study

## Target Audience

- Project Developers • Finance Community • Utilities
- Engineers • Researchers • Academia

## Programme Outline

### 1. Wind Energy Overview

- Historical perspective on wind energy
- Current wind turbine design
- Key components: foundation, tower, nacelle, rotor, gearbox, generator, blades, etc.
- Rotor dynamics
- Control strategies and systems: fixed versus variable speed, pitch control, yaw control
- Power electronics
- Power and thrust curves

### 2. Wind Project Development and Risk Mitigation

- Key stages of the project lifecycle:
- Feasibility study and early development
- Measurement
- Energy assessment and technical due diligence
- Construction
- Commissioning
- Operation and maintenance

### 3. Principles of the Wind Resource

- Topographic effects
- Roughness effects
- Wind shear
- Seasonal and diurnal wind characteristics
- Turbulence intensity
- Extreme wind characteristics

### 4. Components of an Effective Measurement Campaign

- Importance of measurement

- Tower types: pros and cons
- Configuration and instrument
- Data collection and handling
- Reliability and accuracy
- Commissioning and decommissioning
- Remote sensing technologies and best practices

### 5. Principles of Wind Resource and Energy Assessment

- Data validation methods
- Shear extrapolation
- Long term correction
- Wind flow and wake modeling
- Energy production and losses
- Uncertainty analysis

### 6. Case Study

- Discuss development considerations and identify potential risks for an example project:
- Site selection: terrain, transmission, environmental impacts (visual impact, noise assessment, shadow flicker)
- Turbine layout: wind resource, number of turbines, access, wake, future development
- Turbine selection: turbine size, turbine class, power curve, guarantees/warranties, serial issues
- Energy analysis: technical losses and uncertainties
- Grid connectivity, export capacity, potential dispatch issues

Organised by:



Supported by:



Sustainable Energy Association of Singapore (SEAS)

2 Bukit Merah Central #18-02 SPRING Building Singapore 159835 Tel: (65) 63388578 Fax: (65) 62764257 www.seas.org.sg

## About SEAS

Sustainable Energy Association of Singapore (SEAS) an industry association launched in 2006, today has 160 members in the area of Energy Efficiency, Solar, Wind, Biomass, Carbon and Clean Energy Financing. SEAS aims to be the voice of sustainable energy industry and promote the business of its member companies.

Today, SEAS is also specializing in running trainings, courses and conferences only in the area of sustainable energy. SEAS aims to be the one stop, information and training provider, in the area of sustainable energy. Our trainers and lectures are not only highly qualified academic professionals but also industry specialists and professionals that are successful and sought after practitioners in the area of Sustainable Energy. Majority of Key Qualified Personnel (KQP) and Accredited Energy Services Companies are members of SEAS. They have, as a group successfully executed a multitude of energy projects with varying complexities both locally and regionally.

## About the Trainer

**Kelvin Tan** has over 10 years of experience in the engineering and research field in power and renewable technologies, including his role as an electrical engineering lecturer at the Curtin University of Technology in Perth, Western Australia where he supervised Master and PhD students undertaking their final year research on power electronics, renewable and wind energy. He was actively involved in research in the wind / solar renewable energy field, inverter control technique, passive/active/hybrid filter, remote area power supply (RAPS) system, power quality and harmonic mitigation techniques. At DNV, he is a renewable energy advisor where he provides consulting services to the wind and solar industries. His work includes site identification, feasibility studies, energy assessments. During his professional career he has worked on wind and solar farm projects in Australia, China, Philippines, Thailand and India.

**Soren Karkov** has more than 30 years of experience as a power project manager, engineer, consultant, and organization manager. He has extensive experience in international project feasibility analysis, resource assessment, and technical and economic due diligence. He has vast experience in tender evaluation both technical and commercial. Prior to joining DNV he was Vice President of Field Operations with Vestas Americas. At Vestas he was responsible for managing all aspect of construction and commissioning of large Wind Farms. Soren has also worked for ABB and Alstom Power.

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## Registration Form

- Yes! I would like to register for this programme.  
 I am unable to attend but please put me on your mailing list.

	Early Bird (Registration with payment made on/before 19 March 2012)	Normal Fee (Closing date: 10 April 2012)	Group Fee (Closing date: 10 April 2012)	No. of Delegates	Fee Payable
<input type="checkbox"/> SEAS Member	S\$374.50	S\$502.90	-		
<input type="checkbox"/> Non Member	S\$502.90	S\$642.00	S\$428.00		

- \* Fees are inclusive of GST.
- \* Fees include refreshments, lunch and programme collateral.
- \* Enjoy group discount for 4 or more delegates registered at the same time from the same organization and same billing source.
- \* Only one type of discount scheme is applicable at any one time.
- \* Please print and complete additional sheets where necessary.
- \* Important: Walk-in delegates will only be admitted on the basis of space availability and with full payment made on site.

### Participant's Details

- 1 Name (\*Dr/Mr/Mrs/Ms): ..... NRIC:.....  
 Designation:..... HP No:..... Email:.....
- 2 Name (\*Dr/Mr/Mrs/Ms): ..... NRIC:.....  
 Designation:..... HP No:..... Email:.....
- 3 Name (\*Dr/Mr/Mrs/Ms): ..... NRIC:.....  
 Designation:..... HP No:..... Email:.....

\*Please delete accordingly

### Organization's Details

- Company Name: .....
- Company Address: .....  
 ..... Postal:.....
- Contact Person's Name : (\*Dr/Mr/Mrs/Ms) .....
- Tel: ..... Fax: .....
- Email: .....

### Administrative Information

#### Registration and Payment

Please complete the enclosed registration form and forward it together with your **cheque at least 7 days** before the commencement of the programme to

**Sustainable Energy  
Association of Singapore**  
**2 Bukit Merah Central**  
**#18-02, Spring Building Singapore**  
**Singapore 159835**

Crossed cheque should be made payable to  
**"Sustainable Energy  
Association of Singapore"**  
 Application will close on **10 April 2012**.

#### Cancellation

SEAS reserves the right to change programme venue, cancel or reschedule the programme if necessary or warranted by circumstances beyond our control.

There will be no refund of fees for withdrawal. However, if the registration participant is unable to attend, a representative may be allowed to attend at no extra cost. Please inform us of the changes by fax or via email 3 days before the commencement of the programme.

#### Confirmation of Registration

Confirmation of registration will be given 5 working days before the commencement date via email. Registration is confirmed only upon receipt of payment.

If you do not hear from us  
**Please contact Ms Queenie Heng at:**  
**Tel: 63388578**  
**Email: training@seas.org.sg**  
**Fax your registration form to 62764257**