

16<sup>th</sup> **Successful Run** in Asia!

# INTRODUCTION TO **POWER SYSTEMS**

For non-technical persons needing to increase their understanding of the power system, system operations and the power market

27 FEBRUARY – 03 MARCH 2017, SINGAPORE

## PAST TESTIMONIALS

*"The course was very beneficial to me.*

*Recommended for new comers who never had any "Power" background"*

– Senior Executive, CEO Office, Sarawak Energy Berhad

*"Good knowledge for non-technical*

*professionals to understand various aspects of the power & utility industry & business"*

– Senior Financial Analyst, Sarawak Energy Berhad

*"Engineering made easy for Non-Engineers"-- Energy Market Authority Singapore*

*"The videos. The good thing about the course is that the whole power industry was presented in a concise manner giving us better picture"*

- Geologist, PetroEnergy Resources Corporation

## Expert Course Faculty Leader



### **Vukan Polimac**

Chartered Engineer MIET CIGRE SMEIT SAIEE  
Fellow of IET, IEEE, CIGRE  
Consultant in Polimac Ltd



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## About This Training Course

A comprehensive & interactive course on Power Systems, incorporating issues on supply, generation, transmission, distribution, supply reliability, economics, demand management and renewable energy in the grid & “Smart Grids”.

Non-technical professionals, support professionals or new engineering entrants into the Power industry must grasp the language and technology of Power systems in order to proactively understand its key business activities. A confident understanding of the technical jargon used and a visual understanding of the various aspects of technology, facilities and equipment provides an overall appreciation of the “big picture” of the Power industry. This serves as an excellent foundation for smooth communication and increased efficiency in inter-department project team efforts and related engagements with the Power industry.

## Learning Outcomes

This training course will be valuable to participants who either work in the power industry or deal with it externally. Those who need a fundamental understanding of the Power systems, or how it operates will find this course applicable. Beginning with the basic terms and concepts, the instructor will lead participants through lectures and multimedia presentations of the power generation technologies and power delivery systems. Participants will learn about issues such as reliability, performance and potential bottlenecks or limits on the system that can impact trading. They will gain an understanding of key power marketing fundamentals such as pricing and scheduling.

- Basic design, operation and components of electrical supply systems
- The integrated electrical grid – generation, transmission and distribution
- Constraints and limitations of Power supply – voltage regulation, supply quality, reliability and efficiency and economics
- The environment, renewable energy and the electrical regulatory regimes
- The smart grid: What does it mean? How will it improve electrical supply?

## Who Should Attend

This course is targeted for non-technical persons needing to increase their understanding of the power system, system operations and the power market, including:

- Financiers • Power traders • Power project developers • Support professionals in non-technical functions • Professionals in other energy industries. • Electric utility personnel who are new or have new job responsibilities.

**This training course has a limited attendance for up to 20 participants only.**

Sessions commence at 9am on all days, with short intervals at 10.30am and 3.30pm respectively.

Refreshments will be provided in the short intervals.

Lunch will be provided at 12:30pm for 1 hour. Sessions will end at 5pm on all days.

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## 5 Day Course Outline

### Energy Outlook Overview

#### Power Fundamentals

- Basic terminology and concepts.
- Types of current.
- Energy and power.

#### Generation Fundamentals

- Basic elements of a power system.
- What is a power plant?
- Heat rate and efficiency.
- Gas turbines.
- Steam turbines.
- Generators.
- Hydro generation.
- Power plant subsystems.
- Power plant economics.

#### Power Delivery Fundamentals

- Transmission problems/limits/losses.
- HVDC transmission.
- Power delivery components.
- Delivery issues.
- Reliability and performance.
- Regulatory drivers.
- The consumer.

#### Integrated System Operations

- Operation of the transmission grid.
- Interconnection economics.
- Congestion management.

#### Power Market Fundamentals

- Energy and capacity.
- Ancillary services.
- Transmission.
- Regulatory overview.

#### Power System development and operation

- Demand forecast
- Generation planning
- T&D network planning
- Power System design criteria
- PQ requirements and equipment

### PS modelling and analysis

- Software for PS analysis
- Model input/output data
- Planning Criteria
- Technical Analysis
- Least Cost Development Analysis

### Substation Design

- Power primary equipment
- Control and Protection
- Distributed Control System
- Earthing
- SCADA
- Standards and Code of practise

### Reliability & Asset Management

- Reliability Indices
- Reliability Analysis
- Reliability Models
- Life expectancy, performance and reliability

### Power Economics

- Cost of energy and pricing
- Losses of energy due inefficiency
- Optimisation of design, models/programmes

### Renewable energy generation and Dispersed Generation

- RG and DG definition and issues
- Embedded generation
- Islanded operation
- Reactive power control

### Smart Grid Technology

- Smart Grid drivers
- Reliability and Quality of Supply
- Carbon Footprint reduction
- Productivity Improvement
- SG approach to System Operation and Management

## **Your Expert Faculty**

### **Vukan Polimac**

In his 30 years working experience he provided highest quality services in system planning and analysis to major transmission and distribution and transportation companies including London Underground, National Grid Company (UK), MTRC Metro in Hong Kong, West Coast Main Line connection to NG, Scottish Power, ESB-Ireland, ESKOM-South Africa, Mauritius CEB, Balkan countries - grids of Romania and former Yugoslavia, HV network ISA-Colombia, Western Power Distribution-UK, etc.

Vukan's technical expertise includes most aspects of power systems analysis, electrical asset management and railway connections to power networks where he provides solutions to technical problems and supports other field's experts in complex assignments. He has project management skills in technical and environmental projects as well as experience in short and long-strategic term planning, maintenance and asset management, power quality analysis of transmission and generation systems, distribution, transportation and other power networks. Experienced in generation and network integration, electrical component of energy master plans as well as strategic asset replacement, he was also involved in load- forecast analysis and generation dispatching. Published papers on asset management based on projects and experience in working for distribution companies in Africa and Europe.

Vukan is very experienced in design, procurement, commissioning, erection and refurbishment of major projects in transmission and distribution substations up to 420 kV and hydro and thermal power plants. Served as project manager on several major projects as well as head of the Engineering Group, Vukan was responsible for final design, equipment specifications, layouts tender evaluation and commissioning. He has carried out conceptual development of protection and control philosophy for various projects as well as reviewed and approved project drawings and documents. He has applied the latest IEC standards, various codes of practice and engineering recommendations. He has also specific experience in conceptual design of power supply for transportation and traction railway systems, defining the design principles and technical specifications for future design and privatisation process. He has analysed quality of power supply for connection of AC and DC unbalanced load to power network and published papers on practical implementation. Vukan carried out feasibility studies on reactive compensation (SVC and MSC) focusing on voltage variation and harmonic distortion issues.

Vukan has performed technical and economic evaluations, cost benefit net present value analysis, of various transmission and distribution schemes and electrical equipment. He carried out a number of asset evaluation analysis on electrical equipment and published papers on asset management, reliability and maintenance. He has performed equipment assessment and residual life prediction as part of strategic asset management analysis for a major underground transportation company in Asia. His duties have also included equipment arrangement optimisation in particular reliability aspect in terms of failure rate and financial consequences as non-supplied energy to the consumers.

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## OTHER AVAILABLE COURSES

- [4 Pillars of Transformer Condition](#)
- [Advanced Project Finance for Power](#)
- [Advanced Technical Report Writing & Presentation Skills](#)
- [Advanced Turnaround Shutdown & Outage Management](#)
- [Ancillary Services in Competitive Electricity](#)
- [Asset Management for the Power Industry](#)
- [Best Practice Renewable Energy Capital & Project Management](#)
- [Biomass Power Generation](#)
- [CFB Combustion for Boiler Operations](#)
- [Clean Development Mechanism and Carbon Markets](#)
- [Coal Contracts](#)
- [Combined Cycle Power Plants Operation](#)
- [Combined Heat & Power \(CHP\) and Co-Generation Plant Operations](#)
- [Competency Management System for the Power Industry](#)
- [Design & Operations of Circulating Fluidized Bed Boiler](#)
- [Developing & Structuring Public-Private Partnership \(PPP\) for Infrastructure](#)
- [Effective Tender Process Management for Power & Utilities](#)
- [Electrical Hazop \(eHazop\) Studies for the Power Industry](#)
- [Electricity Demand-Side Management](#)
- [Electricity Industry Design](#)
- [Electricity Network Planning](#)
- [Electricity Retail Contracts](#)
- [Electricity Theft](#)
- [Electricity Trading Essentials](#)
- [Energy Efficiency](#)
- [EPC Contract Management for Power & Utilities](#)
- [Essentials of Coal Markets and Trading](#)
- [Essentials of Power Trading](#)
- [Excitation Systems](#)
- [Feed-In Tariffs for PV Systems](#)
- [Finance for Non-Finance Professionals in Power & Utilities](#)
- [Financial Modelling for Project Finance in Power & Utilities](#)
- [Fitness-For-Service AP1 579 & High Energy Piping Life Management](#)
- [Fundamentals of Geothermal Energy](#)
- [Fundamentals of Power Generation](#)
- [Gas & LNG Contract Negotiation](#)
- [Gas Turbine Generator Selection, Operation & Maintenance](#)
- [Gas Turbine Hot Gas Paths, Rotors & Failure Analysis](#)
- [Gas Turbine Major Inspection & Overhaul](#)
- [GE Gas Turbine Operations Simulation Based](#)
- [HRSG Design, Operations & Understanding, Controlling of HRSG Damage Mechanisms](#)
- [HV Substation Design & Construction](#)
- [IEC for Utilities](#)
- [Integration of Distributed Generation](#)
- [Introduction to Carbon Capture & Storage](#)
- [Introduction to Clean Coal Technology](#)
- [Introduction to Power Systems](#)
- [Keeping Electrical Switchgear Safe](#)
- [Leadership & Team Dynamics for Power & Utilities](#)
- [LNG Fundamentals](#)
- [LNG Markets & SPOT Trading](#)
- [Maintenance Planning & Scheduling](#)
- [Making IPP & Renewable Energy Projects Contract Frameworks Bankable](#)
- [Managing Complex Projects for Power and Utilities Professionals](#)
- [Medium Voltage & High Voltage Switchgear Metallurgy for Engineers](#)
- [Mechanical Engineering for Non-Mechanical Engineers](#)
- [Mini Hydro Project Analysis](#)
- [MKV Speedtronic Control System](#)
- [MK VI Speedtronic Control System](#)
- [Nuclear Energy Project Planning & Economics](#)
- [Nuclear Power](#)
- [Offshore Platforms Electrical Systems Design & Illustrations](#)
- [Operations of Coal Fired Power Plants](#)
- [Power Generation Commissioning, Operations & Maintenance](#)
- [Power Generation Operation, Protection & Excitation Control](#)
- [Power Plant Chemistry for Chemist & Chemical Engineers](#)
- [Power Purchase Agreements](#)
- [Process Control Methods](#)
- [Programmatic CDM](#)
- [Project Management for Power and Utilities](#)
- [Relay Protection in Power Systems](#)
- [Reliability Centered Maintenance Masterclass](#)
- [Reliability Engineering](#)
- [Renewable Energy Development & Investment](#)
- [Renewable Energy Integration](#)
- [Risk Based Inspection](#)
- [Risk Management in Power Markets](#)
- [Root Cause Analysis](#)
- [Rotating Equipment Maintenance & Reliability Excellence](#)
- [SCADA & Power Systems](#)
- [Smart Grid](#)
- [Solar Energy & Photovoltaic Power](#)
- [Spare Parts Optimisation](#)
- [Supercritical and Ultra-Supercritical Coal-Fired Power Plant](#)
- [Technical Report Writing & Presentation Skills for Power & Utilities Professionals](#)
- [Ultra Low NOx Gas Turbine Combustion](#)
- [Uninterruptible Power Supply](#)
- [Vibration Analysis & Condition Monitoring](#)
- [Waste to Energy Plant Operations](#)
- [Water Treatment and Corrosion Control for Steam Generation and Power Production](#)
- [Writing Effective Standard Operating Procedures \(SOP\) for Power & Utilities Professionals & Engineers](#)

## Frequently Asked Questions (FAQs)

**1. Does PowerEdge have other programmes than those listed?**

We have more than 200 programmes that we are capable of running. All we need is for you to contact us and request for the preferred programme and we will be able to develop it.

**2. Where is PowerEdge based?**

PowerEDGE is headquartered in Singapore but we run our training programmes in different venues around Asia.

**3. What does PowerEdge do?**

We are a Power & Utilities Training Specialist.

**4. Can this course be done in our city?**

It absolutely can. Get in touch with us to request for a training programme to be carried out in your city.

**5. Can you reduce the price of our preferred course?**

While our price has been reduced before it is even launched, we are always happy to help you with further discounts.

**6. Can you change the dates of the course?**

If you have a special requested date, let us know and we will arrange another session for you.

**7. Who are the companies that will be participating?**

This varies from a diversity of Power Operators, Regulators, Financiers, to Vendors in the Power & Utilities industry.

**8. Where is the venue for the course?**

We usually engage a 4 to 5 star hotel meeting room to ensure the comfort of our participants.

**9. How many delegates should we expect for each course?**

This varies from 15 to 20 participants. Class sizes are kept small to allow trainers to focus better on each participant.

**10. What are the different payment modes?**

We accept Visa/MasterCard, cheques, bank transfers and cash on site.

**11. Is accommodation included when I sign up for a course?**

Accommodation is not included in the course fee but we are always happy to advise on available accommodations.

**12. Can I get a cheaper accommodation through PowerEdge?**

We will be pleased to help you negotiate a better rate with hotels.

**13. Is lunch provided during the course?**

We provide lunch and 2 tea breaks every day during our training programmes.

**14. Are the training materials included once I have signed up for a course?**

Yes, training and course materials are included in the course fee.

**15. Will there be a certificate for the course?**

Yes, there will be a certificate of participation upon completion of a course.

**16. Who are PowerEdge trainers?**

They are expert consultants and practitioners with many years of experience in the subject matter that they deliver on.

**17. Are PowerEdge trainers competent?**

We have received numerous favourable feedbacks on our trainers from past participants.

**18. Can PowerEdge assist with Visa travel applications?**

We can assist in advising you on the relevant procedure(s) and embassies/consulates that provide Visa for travel purposes.

**19. Can we purchase training materials without attending a course?**

Unfortunately this option is not available as training materials are specially developed for courses.

**20. Can course content be tweaked to cater to our needs?**

Of course! Just let us know your request and we will get the trainer to assist in carrying it out.

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|                 | PER PARTICIPANT                                  | 2 PARTICIPANTS OR MORE                           | INHOUSE TRAINING                           |
|-----------------|--------------------------------------------------|--------------------------------------------------|--------------------------------------------|
| 5 Day Programme | SGD 3,300<br>Per Participant                     | SGD 3,100<br>Per Participant                     | Guaranteed Minimum 40% off<br>Normal Price |
|                 | *SGD 3,531<br>Per Participant<br>(GST Inclusive) | *SGD 3,317<br>Per Participant<br>(GST Inclusive) |                                            |

\*GST FOR SINGAPORE REGISTERED COMPANIES

### ATTENDEE DETAILS

Name ..... Job title .....

Tel ..... Department ..... Email .....

Name ..... Job title .....

Tel ..... Department ..... Email .....

Name ..... Job title .....

Tel ..... Department ..... Email .....

Name ..... Job title .....

Tel ..... Department ..... Email .....

Name ..... Job title .....

Tel ..... Department ..... Email .....

### COMPANY DETAILS

Organisation name ..... Industry.....

Address .....

Postcode..... Country.....

Tel ..... Fax.....

### PAYMENT METHODS

By Cheque/ Bank Draft: Make Payable to PowerEdge Pte Ltd.

By Telegraphic Transfer: Please quote AE1 with the remittance advise

Account Name: PowerEdge Pte. Ltd.

Bank Code: 7339 Branch code: 686 Account Number: 686-253386-001 Swift Code: OCBCSGSG

Bank Address: 65 Chulia Street OCBC Centre, Singapore 049513

All bank charges and payment in Singapore dollars (SGD) to be borne by payer. Please ensure that PowerEdge Pte Ltd receive the full invoiced amount.

### PAYMENT POLICY

Payment is due in full at the time of registration. Full payment is mandatory for event attendance. I agree to PowerEdge Pte Ltd. payment terms

\* GST- Exclusive price is only applicable for overseas corporate customers subject to qualifying conditions.

### CANCELLATIONS & SUBSTITUTIONS

You may substitute delegates at any time. POWEREDGE PTE LTD does not provide refunds for cancellations. For cancellations received in writing more than seven (7) days prior to the training course you will receive a 100% credit to be used at another POWEREDGE PTE LTD training course for up to one year from the date of issuance. For cancellations received seven (7) days or less prior to an event (including day 7), no credits will be issued. In the event that POWEREDGE PTE LTD cancels an event, delegate payments at the date of cancellation will be credited to a future POWEREDGE PTE LTD event. This credit will be available for up to one year from the date of issuance. In the event that POWEREDGE PTE LTD postpones an event, delegate payments at the postponement date will be credited towards the rescheduled date. If the delegate is unable to attend the rescheduled event, the delegate will receive a 100% credit

### REGISTER

[Online Web Registration](#)

info@poweredgeasia.com

(65) 6741 9927

(65) 67478737

### RELATED TRAINING

✓ [Keeping Electrical Switchgear Safe](#)

✓ [Introduction to Power Systems](#)

✓ [Excitation Systems](#)

✓ [Fundamentals of Power Generation](#)

### ON SITE TRAINING

Can't make it for the Course?  
We'll make the course come to you!!

Simply let us know your preferred time and dates and we will meet you at your schedule and venue.

With a host of highly trained experts, we will be happy to customize your programme with your needs 100% fulfilled.

Contact us today at

info@poweredgeasia.com

(65) 6741 9927

