

# Power Purchase Agreement (PPA) - Structure and Economics

Hilton Barbados Resort, Bridgetown, Barbados  
30<sup>th</sup> September – 2<sup>nd</sup> October 2024



\* Photo courtesy of third parties

## Led by a World Class Expert

### Mr. Edward Bodmer

- Formulated significant government electricity policies, advised on purchase of electricity generation and distribution, evaluated energy purchasing decisions for many corporations
- Author of textbook “Corporate and Project Finance Modelling, Theory and Practice”
- Former Vice President, First National Bank of Chicago, where he directed analysis of power projects, energy loans and created financial modelling techniques used in advisory projects

## What Makes this Course Unique

The course covers a unique combination of theory and practical exercises and case studies involving electricity economics that provide the foundation for PPA analysis. This includes exercises where you measure the cost and benefits of specific PPA provisions; you work through real PPA contract provisions and understand why different PPAs have different contract structures; you work with real financial models and understand how the PPA affects debt sizing, debt repayment and ultimately the return to investors. Participants in the course also learn how to work with a set of resources that include financial models, databases, excel utilities, energy and finance books, contract examples, banking analysis and many other items.

This PPA course combines theoretical analysis of PPA provisions and structure with industry trends to provide an understanding of Corporate PPAs that are sourced from renewable energy. The course begins with deep analysis of PPAs with government or utility off-takers that evaluate issues such as how the level of liquidated damages should be established in different types of contracts. Before addressing specific issues in corporate PPAs, the economics of renewable energy that affect PPA contracts are addressed. As corporate PPAs generally incorporate some level of merchant price exposure, forward and spot markets are reviewed. The course culminates with discussion of corporate PPAs that can include merchant price risk, basis risk, shape risk and other factors. The course is unique in that actual examples of contracts are used together with financial models that illustrate risks and returns.

## Pre-Course Questionnaire

Mr. Bodmer would like to customize the class based on your specific learning needs. Pre-Course Questionnaire will be sent to you prior to the course to complete. Mr. Bodmer will analyze them in advance and address your raised points during the course.

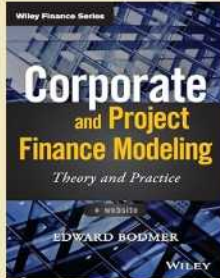
A Collaborative Product of



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## About Your Expert Trainer



### Mr. Edward Bodmer

Mr. Edward Bodmer provides financial and economic consulting services to a variety of clients, and teaches professional development courses in an assortment of modelling topics (project finance, M&A, and energy). Many of the unique analytical concepts and modelling techniques he has developed have arisen from discussion with his clients and course participants. Mr. Bodmer's consulting activities include developing complex project finance, corporate and simulation models, providing expert testimony on financial and economic issues before energy regulatory agencies, and advisory services to support merger and acquisition projects. Mr. Bodmer has taught customized courses for MIT's Sloan Business School, Bank Paribas, Shell Oil, Society General, General Electric, HSBC, GDF Suez, Citibank, CIMB, Lind Lagers, HSBC, Saudi Aramco and many other finance, energy and industrial clients.

Mr. Bodmer has written a textbook titled "Corporate and Project Finance Modelling, Theory and Practice" published by Wiley Finance. The book introduces unique modelling techniques that address many complex issues that are not typically used by even the most experienced financial analysts. For example, it describes how to build user-defined functions to solve circular logic without cumbersome copy and paste macros; how to write function that derives the ratio of EV/EBITDA accounting for asset life, historical growth, taxes, return on investment, and cost of capital; and how to efficiently solve many project finance issues related to debt structuring.

Over the course of his career Mr. Bodmer has been involved in formulating significant government policy related to electricity deregulation; he has prepared models and analyses for many clients around the world; he has evaluated energy purchasing decisions for many corporations; and, he has provided advice on corporate strategies. Mr. Bodmer's projects include development of a biomass plant, analysis and advisory work for purchase of electricity generation, distribution and transmission assets by the City of Chicago, formulation of rate policy for major metro systems and street lighting networks, advocacy testimony on behalf of low-income consumers, risk analysis for toll roads, and evaluation of solar and wind projects. He has constructed many advisory analyses for project finance and merger and acquisition transactions.

Mr. Bodmer was formerly Vice President at the First National Bank of Chicago where he directed analysis of energy loans and also created financial modelling techniques used in advisory projects. He received an MBA specializing in econometrics (with honours) from the University of Chicago and a BSc in Finance from the University of Illinois (with highest university honours). Mr Bodmer was born in Manchester, England, he lived in Switzerland as a child, and currently resides in Chicago.

## Certificate of Achievement

Upon the successful completion of this course, you will receive a Certificate of Achievement bearing the signatures from both Mr. Bodmer and the Course Organizer. This Certificate will testify your endeavor and serve towards your professional advancement.

## Overview

The objective of this course is to provide participants with a foundation in thinking about the underlying theory behind structuring and analysing different kinds of PPA agreements. The course will cover PPA contracts ranging from utility company off-takers to corporate PPAs that provide renewable electricity for data centres, etc. Issues addressed range from what should be the level of liquidated damages for various problems to how other contracts (e.g. O&M contracts) are mirrored to the PPA. Explanation of how merchant prices and resource risk affects corporate PPAs will also be covered.

The course covers the risk allocation in alternative contracts and underlying policy objectives; PPAs for renewable energy plants as contrast to fixed price contracts and background for Corporate PPAs; PPAs in the context of merchant power, and Corporate PPA contracts for renewable energy with partial merchant risk.

Actual PPA contracts will provide the basis for case studies in the course. The contracts will be used together with financial models that illustrate risks inherent in different PPA structures. The case studies include reviewing contracts associated with the PPA such as the financing contracts. The PPA risks together with the EPC, O&M and financing contracts are evaluated with completed financial models (participants will not be forced to construct model equations in excel).

## Course Format

This course is in interactive and participative workshop format where participants will be encouraged to share their experience, and compare it with recognised best practice or other participants'. Real projects and case studies will form an important part of the workshop. Participants will have the opportunities to discuss and reflect on their own practices and ways to improve them.

### PROGRAM SCHEDULE (DAY 1 TO DAY 3)

08:10	Registration & Tea
08:30	<b>Morning Session Begins</b>
10:10 -10:30	Refreshments & Networking
12:00	Lunch
13:15	Afternoon Session Begins
14:40-15:00	Tea Break
16:30	<b>Finish of Day/Course</b>

## In-House Training (Save up to 35%)

This course can be presented exclusively for your organisation at a place and time of your convenience. We have successfully conducted in-house training for MEEI Trinidad, PPGPL, Jamalco, Puerto Rico Electric Power Authority, RWE Dea AG, BG India, and Petronas Carigali, etc to name a few.

To discuss how we can work together to achieve your learning requirements please contact:

**Hayat**  
Senior Corporate Learning Specialist  
Email: [hayat@neo-edge.com](mailto:hayat@neo-edge.com)

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## Course Outline (3-day)

### Module 1: Risk Allocation and Case Study of PPAs

- PPAs in the context of alternative policy frameworks including cost plus and merchant power
  - History of IPPs and problems with Cost Plus Framework
  - Merchant Power Pros and Cons
  - Price Volatility to consumers and investors
- Policy arguments for alternative PPA contracts
  - Acceptance of Fuel Price Risk
  - Inflation in capacity payments
  - Plant Dispatch and Target Heat Rates
- Risk Allocation concepts between Off-taker and Investor
  - Notion of risk that Investors can control
  - Cost of imposing risks on investors that they cannot control
  - Risk Allocation Exercise – Thermal Power Plant
    - Construction Costs
    - Efficiency Targets
    - Capacity Factor
    - Inflation
    - Fuel Costs
    - Capacity Payment and Multi-part tariff
  - Risk Allocation Exercise – Renewable Energy
- Project diagram and mirroring of construction and operating to the PPA
  - Proper layout of contract diagram showing Off-taker at the top and money inflow and outflow
  - Investor risks in PPA
  - Transfer of risks to EPC provider
  - Transfer of risks to O&M contractor or equipment supplier
  - Left-over Risk to lender and Debt Sizing
  - Cost of transferring risk to Investor
  - Political Risk and cost increase
- Financing contracts that incorporate risk allocation in PPA contracts including target debt size and debt service coverage
  - Project finance theory in the context of PPA projects
  - Off-taker risks and Financing Constraints
  - DSCR, LLCR and PLCR to measure credit risks in PPA Contracts
- Financial model (completed) to evaluate risks in PPA contracts together with alternative financing from investor and bidding perspective
  - Effect of DSCR on investor returns from project with PPA contract in completed financial model
  - Illustration of risks in natural gas project with different gas prices and heat rate targets in PPA contract
  - Availability targets in PPA contracts
  - Real and nominal returns from PPA contracts with different inflation provisions

### Module 2: Case Study of Alternative Contract Structures by Working Through PPA Provisions

- Background on dispatchable and renewable energy PPA contracts for different types of plants through review of contracts
  - Introduction to Contract Database
  - Classic PPA with heat rate targets for natural gas plant
  - PPA structures for other conventional plants
  - PPA for different types of renewable energy plants
- Risk allocation of resource risk and reasons for different pricing structure for projects that have non-dispatchable energy
  - Multi-part tariffs and single price tariffs
  - Incentives for renewable energy projects for efficient location and energy production
  - Implications of taking output risk and using single price PPA contracts
- Resource risks in wind and solar from resource and controllable risks
  - Resource assessment studies
  - P50, P90, P95 estimates in resource studies
  - Use of alternative resource estimates in contracts
- Examples of PPA contracts with performance ratio issues and power curve issues.
  - Analogy of performance ratio with target heat rate
  - Issues in measuring performance ratio
  - Arguments for including performance ratio target in PPA contract
  - Arguments for including performance ratio in contracts associated with PPA
- Mirroring contracts with equipment suppliers
  - Equipment suppliers and output guarantees
  - Availability guarantees and Heat Rate guarantees
  - Difficulty of verifying output
  - Power curve guarantee for wind projects
  - Difficulty in verifying power curve
  - Credit quality of equipment suppliers
- Implied penalties for availability and maintenance in renewable single price contracts
  - Off-taker costs as drivers of penalties
  - Implied penalty for output with high feed-in tariffs
  - Implied penalty for delay in single price PPA contracts
  - Environmental penalties in PPA contracts
  - Implied penalties in low price PPA contracts
- Structure of financing contracts that support renewable energy and differences between financing used for standard contracts
- Financial model to illustrate the effects of different PPA terms and associated financing on investors and bid prices

### Module 3: PPA Contracts and Electricity Economic Analysis

- Review of marginal cost concepts and merchant prices in different markets including effects of gas prices and renewable energy production
  - Analysis of marginal cost from supply and demand analysis with Implications for PPA contracts

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## Module 3 (Cont'd)

- Screening Analysis
- Long-term Marginal Cost
- Valuation of Renewable Energy in the Context of Short-term and Long-term Marginal Cost
- Transmission Analysis and Marginal Cost of Generation
- Case Studies of problems with PPA contracts and Merchant Price Markets
- Marginal cost curves and of different merchant prices
- Merchant prices and wind production – case study of Denmark
- Potential for low merchant prices in high renewable energy production periods
- Case of UK merchant financial failures
- Potential financing of merchant plants
- Forward energy prices in merchant markets and forward natural gas contracts
  - Forward prices in NYMEX
  - Use of forward prices as alternative to PPA
  - Forward price brokers and off-taker risk
- Why swap contracts do not apply in merchant markets and the difference between contract for difference contracts and swap contracts
  - Swap contracts and volatile prices
  - Swap contracts for natural gas
  - Problem of notional quantities in renewable energy
  - Contracts for differences versus swap contracts
- Quantity to use in forward price contracts
  - Use of P99 or P90 contracts to set quantity
  - Merchant price exposure of P50 versus P90
  - Merchant prices in high renewable production periods
  - Issues with ancillary services from renewable energy
- Length of forward price contracts
  - Liquidity in NYMEX contracts
  - Length of Natural Gas contracts
  - Problem of Natural Gas and forward price contracts
- Forward price risk for renewable energy relative to natural gas projects and natural hedge
  - Market heat rates in merchant markets
  - Sensitivity of natural gas projects to changes in gas price
  - Sensitivity of renewable energy projects to natural prices
- Merchant Prices and Implications for PPA Analysis
  - Why the study of Merchant Markets is important for analysis of PPA Contracts
  - Survey of Merchant Markets around the world
  - PPA Contracts in Merchant Markets
  - Different Merchant Markets and Drivers of Prices
  - Theory of locational prices
  - PPA risk allocation and basis price risk
  - Example of locational price differences
- Simple forecasts of merchant prices after forward price hedge
  - Classic hockey stick forecast
  - Natural gas as marginal plant
  - Inconsistent logic with profits of future projects

## Module 4: Structure of Corporate PPAs

- Alternative structures of PPA contracts in the context of merchant markets and renewable energy
  - Revenue swap with no revenue risk
  - Standard fixed price PPA contracts with resource risk and no merchant risk
  - Use of forward contracts at hub price with allocation of basis risk to investor
  - Use of forward contracts with alternative amounts of hedge using P50 or P90 or P99
  - Other contract structures
- Issues with credit quality of off-taker and use of brokers in corporate PPA's
  - Examples of intermediaries for forward contracts
  - Cost of allocation of credit risk
  - Examples of hedge prices
- Case study of alternative language in Corporate PPA including use of contracts for differences, shape profiling and defining the hub price location
  - Mechanics and contract language
  - Tracking accounts and settlements
  - Examples of settlement mechanics
  - Risk associated with settlement accounts
- Financing structure of corporate PPA's given merchant risks
  - Tax equity structures in U.S.
  - Back leverage DSCR targets
  - DSCRs during merchant period
  - Resulting leverage
  - Credit Spreads
- Financial model to illustrate risks and investor returns in projects with corporate PPAs
  - Incorporation of merchant power prices during PPA period
  - Locational basis differentials – history and volatility
  - Resource uncertainty
  - Forward electricity markets after the PPA term
- Evaluation of risks to debt and equity investors with financial model to evaluate basis risks, merchant risks after PPA term and resource risk

## Wrap-up of the 3-day Course

### Who Shall Attend

Professionals who can benefit from this course include (not limited to):

- Potential project off-takers (e.g., owners of Datacenters)
- Project developers
- Project sponsors
- Lawyers working on Corporate PPAs
- Bankers – Credit Analysts
- Bankers – Relationship Managers
- Financial Modelers
- Equity Analysts of energy companies
- Government officers

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**R E G I S T E R   N O W !**

## Sales Contract

To confirm your position, kindly complete this form, email it to the contact person in the Registration box.

## Delegate Details

### Delegate 1

Name	<input type="text"/>
Position	<input type="text"/>
Email	<input type="text"/>

### Delegate 2

Name	<input type="text"/>
Position	<input type="text"/>
Email	<input type="text"/>

### Delegate 3

Name	<input type="text"/>
Position	<input type="text"/>
Email	<input type="text"/>

### Delegate 4

Name	<input type="text"/>
Position	<input type="text"/>
Email	<input type="text"/>

## Organization Details

Company Name	<input type="text"/>
Telephone	<input type="text"/>
Address	<input type="text"/>

## Authorization

This contract is not valid without a signature

Name	<input type="text"/>
Position	<input type="text"/>
Email	<input type="text"/>
Signature	<input type="text"/>

## Payment (Please tick your option)

- Wire Transfer**
- Credit Cards** (Secure payment via Stripe. 3.9% of transaction value will be added to offset part of Stripe process fee.)

## Attendance Substitute

Should you be unable to attend, a substitute is always welcomed anytime before the event at no additional cost. Alternatively, a credit voucher equivalent to the full amount will be issued for you to attend any Neoedge events for up to 24 months.

## Registration & enquiries

**Neoedge Pte Ltd**  
76 Playfair Road, #03-02  
Singapore 367996

**Contact: Hayat**  
Main: +65 6980 8567  
WhatsApp: +65 9366 1601  
Email: [hayat@neo-edge.com](mailto:hayat@neo-edge.com)  
Web: [www.neo-edge.com](http://www.neo-edge.com)

## Your Investment Outlay

- USD 2,755** for Non-BREA\* Member
- USD 2,575** for BREA\* Member

\* *BREA: Barbados Renewable Energy Association*

The investment comes with lunches, refreshments, full set of Course Material and Certificate but does not include hotel guest room.

## Group Registration

Group of three participants or more from one same organisation will enjoy 10% off Investment Outlay (All participants need to register and pay together).

## Venue Information

The training will be hold at the hotel stated below. The above fee does not include accommodation or travel costs.

**Hilton Barbados Resort**  
Needham's Point St Michael,  
Bridgetown, 11000,  
Barbados  
Tel: +1 246-426-0200  
Email: [bgih\\_hotel@hilton.com](mailto:bgih_hotel@hilton.com)

Event Code: T2409PPA