

Economic and Financial Analysis of Hydrogen



- Highly Interactive Hands-on Course with Strict Limit on Participants
- All Modules are Live Stream with Your Participation (No Videos)
- You Work on Models During Five Sessions and Course Customized According to Your Pre-Course Question Responses
- Includes Strategy Evaluation of Upstream Hydrogen, Downstream Costs and Mobility Costs
- Learn How to Be a Creative and Innovative Modeller without the Typical Blah Blah Blah

COURSE OVERVIEW

Economic and Financial Analysis of Hydrogen is a digital class that demonstrates how to perform analysis of different hydrogen technologies that includes levelised cost analysis of hydrogen, potential financing, downstream analysis and comparative mobility cost. The course will be hands-on where participants take turns sharing the screen and demonstrate how you can evaluate hydrogen business strategies. The course put emphasis on practical techniques with current data. The outline below is separated into XXX different on-line sessions.

Objectives

- Evaluate the economics of Green versus Blue versus Grey upstream hydrogen production with alternative assumptions.
- Learn practical tools to analyse hydrogen energy including efficient tools to work with total cost of operation for hydrogen versus electric versus internal combustion engines.



- Understand the implications of potential project finance structures in the context of hydrogen (sculpting, debt funding, debt size, DSCR, DSRA, debt tenor, re-financing) on costs and equity returns from renewable energy.
- Develop efficient ways to quickly compute the total cost of operation for different strategies using carrying charge factors and alternative financial models.

SESSION 1: INTRODUCTION TO ECONOMIC AND BUSINESS STRATEGY ISSUES WITH HYDROGEN PRODUCTION

- General Theme: Use of Economic Analysis to Evaluate Different Business Strategies and Policy
- Current Dichotomy Between Observed Costs and Theoretical Costs
- Cost of Hydrogen produced from Natural Gas and From Electricity in Theory with Emissions Cost
- Notion that Hydrogen has Low Efficiency because of Losses Compared to Battery versus Measuring Effectiveness with Levelised Cost.
- Problem of Transport of Any Gas – Compression, Volume and Cost of Liquefaction and Re-gasification. Can the Economies of Scale in Production of Hydrogen and Modularisation
- Ultimate Storage Question – Can Effectively Store Solar and Wind in Hydrogen Tanks for a Long Time versus Storing Electricity in Car Batteries or Centralised Batteries
- Cost of Mobility with Fuel Cells Versus Batteries in the Long-Run. Fuel Cell per kW and Battery Cost per kWh
- Hydrogen and Ammonia – Air Separator and Use of Ammonia as Fuel or Fertilizer
- Energy Value of Hydrogen and Ammonia Compared to Natural Gas, Oil and Coal in terms of Density
- Natural Gas Cost and Electricity and Use of Merchant Prices to Pay for Electrolyzer

SECTION 2: LEVELISED COST OF UPSTREAM HYDROGEN PRODUCTION

- Importance of Understanding Levelised Cost Drivers including Capital Cost, Lifetime of Equipment, Inflation, Cost of Capital, Degradation and Efficiency
- Difference Between LCOH and Renewable LCOE – Importance of Efficiency in Conversion of Natural Gas or Electricity
- Challenges – Degradation on Energy Used and Different Lifetime of Stack Versus Other Equipment
- Levelised Cost Comparison of SMR and Electrolyzer Including Compression
- Modelling the Cost of Alternative Strategies Including Only Running Electrolyzer During Solar Production Periods
- Case Studies with Different Merchant Markets where Purchase Energy at Low Prices

SECTION 3: DOWNSTREAM COST OF HYDROGEN INCLUDING COMPRESSION, STORAGE, DISTRIBUTION AND DISPENSING

- Added Costs of Hydrogen – Compression, Storage, Transport, and Dispensing

- Hydrogen Compared to Downstream Cost of Petrol and Diesel with and Without Refining Margins
- Hydrogen Compared to Natural Gas Distribution, Transmission and Liquification Costs
- Evaluation of the Costs of Hydrogen Downstream Items Using Different Drivers Including Distance, Time of Storage, Pressure for Compression and Speed of Dispensing
- Distribution Strategies and Revised Comparison of Electrolyzer with SMR Using Alternative Storage and Distribution Strategies
- Methods of Summing Costs

SESSION 4: TOTAL COST OF OWNERSHIP (LEVELISED COST) OF ALTERNATIVE TRANSPORT

- Case of Trucks and Buses – Accounting for Efficiency, Life and Use
- Illustration of Battery Versus Internal Combustion
- Evaluation of Fundamental Cost Differences Between Battery Vehicle Cost and Hydrogen Cost Including Fuel Cell Versus Battery, Cost of Hydrogen Versus Cost of Electricity
- Computing the Total Cost of Operation Including Alternative Petrol Costs, Battery Lives and Hydrogen Costs
- Calculation of Required Premium of Hydrogen Relative to Other Transport to Make Hydrogen Economic

SESSION 5: PRODUCING AND USING AMMONIA

- Including the Cost of Nitrogen with Air Separator
- Energy Characteristics of Ammonia versus Hydrogen and Natural Gas
- Transport of Ammonia Versus Natural Gas and Hydrogen
- Production of Energy for Shipping with Ammonia and Break-even with Electricity