

Green Hydrogen Specialist:

Project Development and Economics

Online programme overview



COURSE OVERVIEW & ENROLLMENT INFORMATION



INTRODUCTION

This training programme provides project developers and representatives from finance institutions with the necessary knowledge and skills to navigate the emerging field of green hydrogen economics and project development.

THIS PROGRAM IS SUITABLE FOR THOSE WHO:

- Develop projects with cutting-edge technologies, such as hydrogen production using electrolyzers
- Bank employees, insurance companies, or financial institutions evaluating the financial aspects of green hydrogen, green ammonia, and fuel cell power stations
- Company employees making decisions on opportunities in green hydrogen, ammonia production, hydrogen/ammonia transport, and energy generation via fuel cells

LEARNING OBJECTIVES

- Apply basic principles of project development for green hydrogen (electrolysis), green ammonia, and small fuel cell plants
- Evaluate and integrate sustainability in project planning and operations
- Assess economic viability and identify project risks
- Explain markets and transport options for green hydrogen and ammonia
- Explain hydrogen fundamentals as an energy carrier and its applications
- Assess investment opportunities in the green hydrogen economy

SCHEDULE & ORGANISATION

STARTING DATES	Spring I Fall semester each year Start date: 1 April / 1 October
ESTIMATED WORKLOAD	• 150 hours in total • 5 - 10 hours study time per week • 4 Live webinars • 3 Assignments
FEES	€ 2,500.00 Payment methods: VISA, MasterCard, American Express, PayPal, Invoice
DISCOUNTS	Early Bird 10%, Alumni 10%, Group 5% (min. 2 courses)
REGISTRATION	You can register online: Shop - RENAC

DEADLINES

Early bird deadline:
20 August / 20 February

Registration deadline:
30 September / 31 March

LEARNING OBJECTIVES & CONTENT OF THE COURSES



INTRODUCTION COURSES

Introduction to energy

Upon completion of this course, participants will be able to

- explain the role of energy in markets and decision-making
- distinguish between energy and power, use SI units and energy-unit conversions, and describe energy supply chains, forms of energy and KPIs
- recognise and avoid common mistakes in energy-related communication

Content

- Energy markets in decision making
- Physical basics of energy (concepts behind performance and efficiency)
- Common mistakes

Introduction to hydrogen

After completion of this course, participants will be able to:

- Explain the basic components of a hydrogen-based energy system and infrastructure
- Describe the current uses of hydrogen, its production methods, and value chains
- Describe the opportunities and limitations of hydrogen as a future energy carrier and in developing a sustainable energy future
- Understand the current status of hydrogen policies in the international arena

Content

- The element hydrogen (H)
- Energy related properties of hydrogen
- Types of hydrogen applications
- Hydrogen generation and fuel cells
- Hydrogen infrastructure
- System integration/sector coupling (Power-to-X) ptX
- The cost of hydrogen
- International hydrogen strategies and roadmaps

LEARNING OBJECTIVES & CONTENT OF THE COURSES



INTRODUCTION COURSES

Introduction to ammonia

After completion of this course, participants will be able to:

- Describe the physical-chemical characteristics of ammonia
- Explore the novel applications of ammonia, its production methods, and value chains
- Understand different ammonia production technologies
- Differentiate the colours of ammonia and the environmental impact associated

Content

- Physical-chemical characteristics of ammonia
- Energy related properties of ammonia
- The global uses and demand for ammonia
- Developing fields of use for ammonia
- Ammonia production technology overview
- Nitrogen production technology overview
- Colours of ammonia

Power-to-X applications and cost developments

After completion of this course, participants will be able to:

- Explain the purpose of the concept of sector coupling as well as opportunities and challenges associated with the concept
- Compare the status quo of available technologies for sector coupling in the heating/cooling sector and in the transport sector, as well as generally expected future developments regarding technology options and costs

Content

- Introduction to sector coupling
- Direct electrification in the heating and cooling sector
- Direct electrification in the transport sector
- Indirect use of electricity
- Renewable hydrogen in steel production
- Renewable methanol
- Regulatory framework
- Power-to-X supply chain examples

LEARNING OBJECTIVES & CONTENT OF THE COURSES



MAIN COURSES

Green Hydrogen Production by Electrolysis: Project Development and Financial Evaluation

After completion of this course, participants will be able to:

- Describe the main technologies used in green hydrogen electrolysis
- Successfully apply the basics of project planning and system sizing
- Apply important sustainability aspects in the planning, design and operation of hydrogen projects
- Assess the economic viability of green hydrogen plants

Content

- Sizing fundamentals of key onshore electrolyser plant components
- Impact of variable wind and photovoltaics on plant design and component sizing
- Simple design and sizing tool for important plant components (Excel tool for basic engineering)
- Main plant components
- Filling stations for hydrogen transport
- International standards
- Sustainability
- Operation and safety
- Requirements for bankable business cases for green hydrogen with electricity from onshore wind and/or photovoltaics
- Hydrogen business case inputs for electrolyser plants using electricity from onshore wind and/or photovoltaics
- Financial evaluation of business cases for hydrogen generation using electricity from onshore wind and/or photovoltaics
- Preparing the financial evaluation
- Checklists
- Offshore wind to hydrogen electrolysis

LEARNING OBJECTIVES & CONTENT OF THE COURSES



MAIN COURSES

Green Ammonia Production – Project Development and Financial Evaluation

After completion of this course, participants will be able to:

- Describe the main technologies used in green ammonia production
- Understand basic project planning and sizing.
- Apply safety and sustainability considerations in the planning and operation of green ammonia projects
- Understand important factors that impact the economic viability of plants for green ammonia

Content

- Fundamentals of sizing important plant components
- Impact of variable wind and photovoltaics on plant design and component sizing
- Simple design and sizing tool for important plant components (Excel tool for basic engineering)
- Main plant components
- Filling stations for transport
- Sustainability
- Operation and safety
- Economic viability
- Calculation tool for financial evaluation
- Financial evaluation of business cases
- Checklists

Fuel cell electric power generation

After completion of this course, participants will be able to:

- Describe the main technologies in fuel cell power generation
- Understand the basics of planning and sizing a fuel cell power plant
- Consider important aspects of sustainability in the planning and operation of fuel cell projects
- Assess the conditions for economic viability of electricity from fuel cells

Content

- Fundamentals of important plant components
- Main plant components
- Operation & Safety
- Sustainability
- Evaluation of business cases
- Economic viability

LEARNING OBJECTIVES & CONTENT OF THE COURSES



MAIN COURSES

Green Hydrogen and Ammonia Transport – Overview

After completion of this course, participants will be able to:

- Describe transport options (road, train, ship, pipeline) for hydrogen and ammonia
- Recognise the capacity and scale of transport infrastructure needed to achieve climate goals
- Understand advantages and limitations of various transport alternatives
- Describe the challenges of using ammonia as a hydrogen carrier
- Discuss matters of energy efficiency and economic viability as they are impacted by hydrogen transport

Content

- Transport options (road, train, ship, pipeline)
- Typical capacities of transport options
- From hydrogen blending in natural gas networks to a 100% hydrogen pipeline infrastructure
- Recovering hydrogen from ammonia
- Sustainability, risks, and risk mitigation
- Economic viability

Markets for Hydrogen and Its Derivatives

After completion of this course, participants will be able to:

- Describe various use cases for hydrogen and products derived using hydrogen
- Address the challenges in advancing from the current situation, taking into account the high ambitions reflected in announced projects and sector projections
- Evaluate broader financing and market openings that hold the potential for a more impactful hydrogen sector

Content

- Current market and outlook for centralised and decentralised applications – Industry
- Current market and outlook for centralised and decentralised applications – Transport
- Current market and outlook for centralised and decentralised applications - Power and heat
- Prioritising market actions
- Guarantees of origin and certification of green hydrogen and its derivatives
- Economics and cost development

LEARNING OBJECTIVES & CONTENT OF THE COURSES



CALCULATION TOOL

The **Green Hydrogen Generation Cost Calculation Training Tool (GH2GCC)** helps learners understand how the levelised cost of hydrogen (LCOH₂) is calculated, using a hypothetical power supply with up to three renewable energy sources.

Main value chain

The tool covers 7 components:

- Onshore wind energy
- Offshore wind energy
- Photovoltaic (solar)
- Hydrogen electrolysis
- Short-term hydrogen storage
- Hydrogen transport via pipeline
- Entire system

The tool treats these components as sequential units in a value chain: each unit produces the output that the next unit needs, until hydrogen is produced and transported by pipeline to where it is needed. The only inputs are water and power from sunlight and wind. If supply does not match hydrogen demand, the tool can buy or sell hydrogen on an imaginary market.

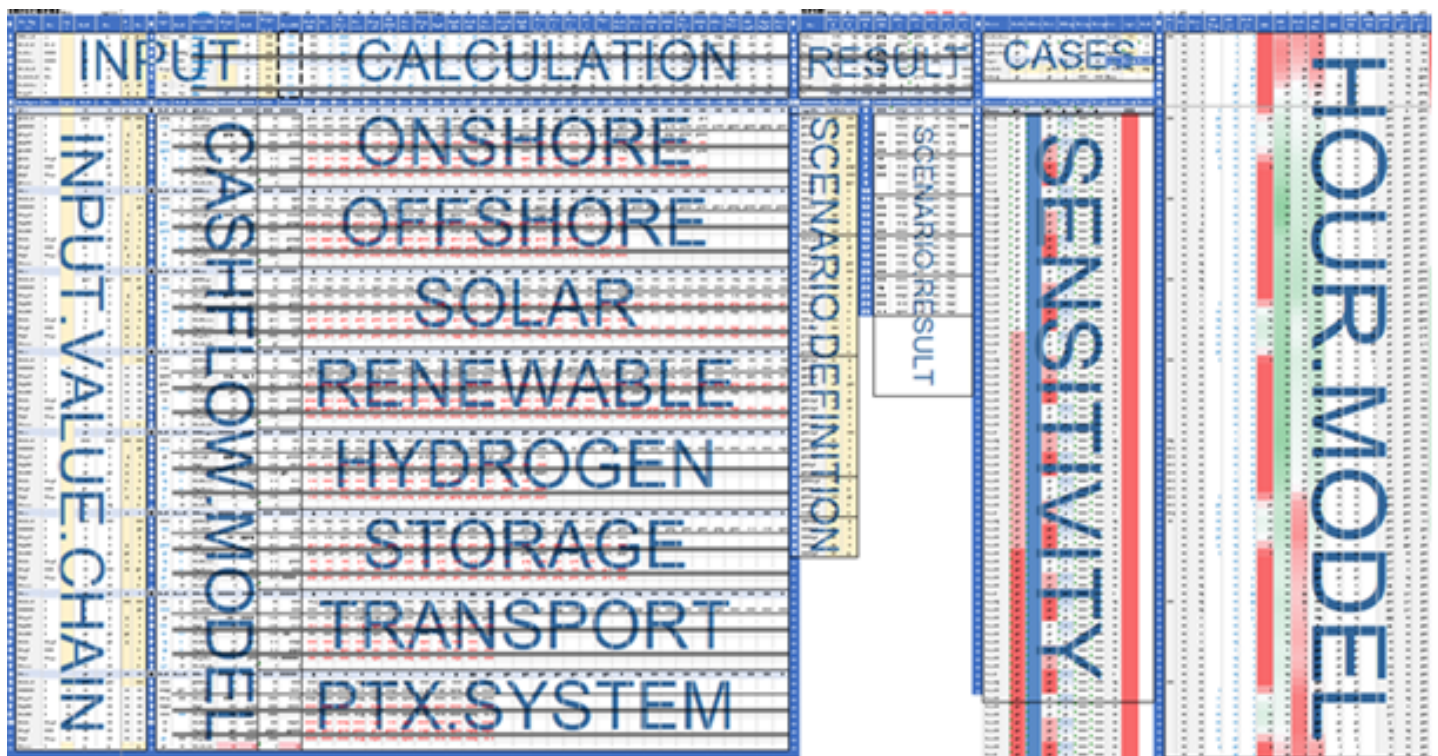


Figure: GH2GCC Excel model map with main sub-areas such as general input, input value chain for assets, cash flow model for assets (onshore wind, offshore wind, solar, alle renewables, hydrogen electrolysis, short term storage, transport and entire PtX system, results on LCOH, scenario definition, scenario results, cases for sensitivity analysis and hourly model for wind/solar resources and assets)

LEARNING OBJECTIVES & CONTENT OF THE COURSES



CALCULATION TOOL

Main purpose

The tool helps users understand the key interdependencies in a hydrogen value chain through a stylised breakdown of its main cost components, including:

- Basic cost components: CAPEX, OPEX, and capital cost (CC)
- The hydrogen value chain and how its components link together through technical system efficiencies
- Output price and quantity (electricity or H₂) as given or controllable parameters

Main task

The installed capacity of each component is a key variable that users can set, and it directly influences the levelised cost of hydrogen. If the user does not define a project, the tool runs with a default set of values. The tool accounts for external constraints such as:

A) **Natural resources** wind and sunlight supply at the plant location, based on 8,760 hours of hourly data for wind and solar.

B) **Cost ranges** CAPEX, OPEX, and CC based on market conditions.

C) **System efficiencies and losses** determined by the technology used.

D) **Demand profiles** set by industrial consumers, typically a flat 24/7 profile or a pay-as-produced profile.

In practice, some of these parameters are negotiable, but most are set externally and allow only limited adjustment. The tool lets users enter parameters to match a specific project.

Main outputs

User shall minimise costs of hydrogen production. Users do this by matching and rescaling the capacity of individual components so they fit together as optimally as possible, avoiding expensive over- or undercapacity. The tool's purpose is to build understanding of costs, dependencies, asset capacity, supply, and demand. The outputs are:

1. LCOE [\$/MWh] and LCOH₂ [\$/kg], net present value (NPV), and internal rate of return (IRR) for the system.
2. The individual cost contribution of each component.
3. Scenarios for different installed capacities of the 4 subsystems (onshore wind, offshore wind, solar PV, and electrolysis).



LEARNING METHODS & ONLINE PLATFORM FEATURES



IMPORTANT FEATURES

- Interactive learning platform
- Multilanguage platform
- Forum for participants
- Integrated Glossary
- Feedback questionnaires
- Stream/Download videos
- Live lectures
- Self-quizzes/Online exams
- Certificates

EARN YOUR CERTIFICATE

- Digital Certificate of Completion
(final grade 70% or above)
- Digital Certificate of Attendance
(final grade below 70%)

DEMO COURSE

For a first impression of our online platform, have a look at our demo course: [Demo Course](#)

For an introduction to the programme: [watch here](#)

Contact

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Renewables Academy (RENAC) AG

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TECHNICAL REQUIREMENTS

- An e-mail address, which is regularly checked
- A stable internet connection (at least 2 Mbit/s)
- We use Zoom for webinars
- Headset or speakers are required to participate on webinars



Programme certified by ZFU (German Central Office for Distance Learning – official quality standard for distance learning in Germany)

Scan to start your
learning journey

