

# Fundamentals of the Hydrogen Industry

## Developing Technologies and Growing Market Segments

### Introduction

The world's population and energy consumption are growing at the fastest rates ever recorded. These two elements have put the world and life in danger, together with steadily rising urbanization rates at very high levels. This circumstance has spurred a sustainable society to adopt the imaginative and inventive circular restorative economy notion. Only by ushering in a new energy period where hydrogen and renewable energies play a major role could such a vision be realized. Using hydrogen and hydrogen-containing compounds to create and provide electricity for all practical purposes with great energy efficiency, significant benefits to the environment and society, and economic competitiveness is known as hydrogen energy.

The exploitation of existing technology is necessary for the broad adoption of hydrogen energy. This article evaluates and presents the market, commercialization, and deployment in relation to understanding the total owner cost of hydrogen. By using hydrogen as fuel, heat engines, turbines, and motors may forgo the sequential and wasteful conversion of energy forms in favour of a direct, exclusive, and very efficient electrochemical energy conversion of the fuel's chemical energy into electric energy and heat, which creates water. Many roadmaps related to fuel cell and hydrogen technology are provided for major global economies, including the UK, USA, Australia, China, Japan, and Australia, as well as the cost of technologies.

### Objectives

**Following this training session, the participants will be qualified to:**

- Recognize hydrogen as a relatively pure energy source that produces just water as a byproduct. Hydrogen is an emerging power.
- Examine how the majority of the world's hydrogen generation comes from the reforming of methane gas, a fossil fuel, and has for many years.
- Ascertain that the existing method of producing green hydrogen through electrolysis is expensive.
- Designed to deliver flexible, high-density power while addressing the constraints of the present system.
- Determine how to create a decarbonized, robust, and safe energy system.

### Training Methodology

The Course N Carry Fundamentals of the Hydrogen Industry training course will make use of a number of tried-and-true adult learning strategies to guarantee that the material is understood, comprehended, and retained to the greatest extent possible. There will be a lot of interaction and participation in the daily workshops. This course at the Energy Training Centre mixes engaging practical exercises with PowerPoint presentations, bolstered by business case studies, group discussion activities, and films.

## Organizational impacts

- Employers who send staff members to this Fundamentals of Hydrogen Industry training program will acquire a wider variety of skills that participants may use in the workplace to directly improve their own businesses.
- It provides a more comprehensive managerial viewpoint on the world energy industry.
- Draws attention to the elements that make each of the many company models successful.
- Explains how advancements in energy technology contribute to global economic growth, employment creation, and rising living standards.
- Explains how we can fulfill these objectives and yet provide value to the stockholders.
- Instils in the company culture the ability to handle the fundamental problems, strategies, and ideas needed to manage the energy industry profitably.

## Personal Impact

- Each participant will immediately profit from the advancement of his or her career by increasing technical knowledge and business skills related to the petrochemical industry.
- Learn the fundamentals of hydrogen energy technology.
- Learn the strategies that increase capital productivity and operational efficiency to hone your business acumen.
- Recognize value chain optimization in the energy sector and implement it at work to increase shareholder value.
- Understand the many success elements of the energy industry, including the relative advantages and disadvantages of the oil and gas, refining and petrochemical, and renewables sectors.

## Who should attend?

**A wide range of professionals can profit from this Fundamentals of Hydrogen Industry training course, however the following are the main advantages:**

- Experts in Business Development for the Energy Sector
- Directors of Oil and Gas Companies, Investment Analysts, and Corporate Planners who would value an overview of a comprehensive energy research program
- Senior Oil & Gas executives are becoming more interested in clean energy ideas. They want to use their resources to manufacture hydrogen and further the energy industry's transition.
- For the oil and gas industry's managers, engineers, geologists, financial analysts, accountants, attorneys, IT specialists, and lawyers to completely comprehend the next

- Project managers, engineers, professionals in supply planning and scheduling, traders, and sales staff.
- Professionals in the fields of auditing, compliance, equity analysis, banking, joint ventures, negotiations, and contracting are all changing with the sector.

## Course Outline

### Day 1

#### Overview of Energy Derived from Hydrogen

- Sustainable Hydrogen Generation
- Production of Blue Hydrogen
- Production of Grey Hydrogen
- The Oil and Gas Industry Today and Alternative Energy Sources
- Parts of the Energy Industry
- The Oil and Gas Sector
- Enhanced Product Sector
- The Petrochemical Sector
- The Petroleum Industry's Future Course
- Renewably Sourced Energy

### Day 2

#### Methods for Producing Hydrogen

- What does Hydrogen Energy entail?
- Use of Hydrogen Energy
- Fuel cells: a method of producing power from chemical energy
- Overview of Fuel Cells
- Fuel Cell using Polymer Electrolyte Membrane
- Fuel Cells using Solid Oxides
- Possibility of Producing Hydrogen from Biomass
- Production of Hydrogen from Biomass
- Biological Process for Producing Hydrogen from Biomass
- Expansion of the Biohydrogen Production System
- Material and Energy Evaluation of the Production Process for Biohydrogen
- Enhancement of Energy Recovery using Two-Stage Methods

### Day 3

## **Applications for Hydrogen: Utilizing Hydrogen from Extra Renewable Electricity for Energy Storage: Renewable Energy, Volatility, and Storage**

- Producing Hydrogen with Electrolysis
- Engineering Applications and Products for Hydrogen Energy
- Technologies for Transporting and Storing Hydrogen
- Using Ammonia and Organic Hydrides to Store and Transport Hydrogen
- Application of Hydrogen Energy
- Utilizing Hydrogen Combustion to Produce Electrical and Mechanical Power
- Utilizing Hydrogen to Apply Carbon Dioxide and Hydrogen Chemical Reactions
- Utilizing Alloys for Storing Hydrogen

## **Day 4**

### **Regulation Structure and Mapping in Areas**

- Safety, Efficiency, and Sustainability of Hydrogen Energy:
- Regulatory Framework, Safety Aspects, and Social Acceptance
- Regulations, codes, and standards, together with best practices
- Important Organizations for the Development of Global Standards
- Risk, Safety, and Public Perception
- A Few Useful Instances
- In brief
- Road mapping: The Order of Tasks
- How to Use Hydrogen and What Is a Roadmap?
- What Makes a Roadmap Up?
- Public Policy: The Significance
- HFC Roadmap Examples
- Roadmaps by country or region: China, the USA, Japan, Australia, the UK,

## **Day 5**

### **Pricing, Markets, Economics, and Commercialization of Hydrogen**

- Market, Commercialization, and Implementation: Understanding the Total Owner Cost of Supply-Demand Hydrogen Pricing
- Governments encourage a decrease in the price of hydrogen.
- Using renewable energy to cut expenses
- Americas' Markets for Hydrogen
- European Markets for Hydrogen
- Asia's Hydrogen Markets
- Total Cost of Ownership for Hydrogen Technologies: CAPEX vs. OPEX
- Hydrogen's Potential for Future Commercialization: Developing Business Cases