Hydrogen for Power Generation Training Course

Professional Development Training Course Outline

Category	Renewable Energy	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Introduction

Hydrogen for Power Generation Training Course provides a practical, industry-focused understanding of how hydrogen and hydrogen-derived fuels can contribute to the evolving power-generation landscape. Participants explore the hydrogen value chain, green hydrogen, low-emissions hydrogen, electrolysis, hydrogen storage, transportation, fuel cells, gas turbines, combined-cycle generation, hydrogen co-firing, power-to-hydrogen, and Power-to-X applications. The course reflects current industry developments: the IEA reports that global hydrogen demand surpassed 100 Mt in 2025, while low-emissions hydrogen demand increased by about 20%; however, hydrogen use in the power sector remains at an early stage and is concentrated particularly in Japan and Korea.

Designed for professionals seeking to understand the energy transition, decarbonisation, grid flexibility, and emerging hydrogen-power technologies, the course connects technical concepts with project development, techno-economic assessment, safety, regulation, sustainability, and investment decision-making. Participants examine real-world demonstrations, including the Hyflexpower demonstration of renewable hydrogen in a 12 MW gas turbine and current hydrogen/ammonia power-development trends. The IEA indicates that existing plants and announced projects could bring hydrogen- and ammonia-fired power capacity to approximately 7.5 GW by 2030, illustrating the importance of building informed technical and commercial capabilities now.

Programme Curriculum

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Course Objectives

By the end of the course, participants will be able to:

1. Explain the hydrogen economy, hydrogen value chain, and role of hydrogen in the global energy transition.
2. Differentiate green, low-carbon, renewable, and low-emissions hydrogen production pathways.
3. Evaluate electrolysis technologies, renewable-power integration, and hydrogen production fundamentals.
4. Assess hydrogen storage, compression, transportation, and infrastructure requirements.
5. Explain hydrogen applications in gas turbines, combined-cycle power plants, engines, and fuel cells.
6. Evaluate hydrogen blending and co-firing strategies for power-generation assets.
7. Assess fuel-cell power generation and distributed-energy applications.
8. Apply techno-economic analysis (TEA) to hydrogen power-generation projects.
9. Understand levelised cost of electricity (LCOE), hydrogen cost, CAPEX, OPEX, and project-finance considerations.
10. Identify hydrogen safety, risk management, standards, codes, and operational requirements.
11. Evaluate decarbonisation, lifecycle emissions, carbon intensity, and sustainability implications.
12. Develop strategies for grid flexibility, energy storage, renewable integration, and energy security using hydrogen.
13. Assess emerging hydrogen-power projects, market trends, policy frameworks, investment risks, and commercialisation pathways.

Target Audience

1. Power-generation engineers and technical professionals
2. Renewable-energy and energy-transition specialists
3. Hydrogen project developers and project managers
4. Utilities, IPPs, EPC contractors, and O&M professionals
5. Energy consultants and sustainability professionals
6. Government, regulatory, and policy professionals
7. Investment, finance, and infrastructure professionals
8. Researchers, academics, and clean-energy technology specialists

Course Modules

Module 1: Hydrogen Energy Fundamentals and the Energy Transition

- Hydrogen properties, characteristics, applications, and energy-system fundamentals
- **Hydrogen economy**, energy transition, and decarbonisation pathways
- Green, blue, renewable, low-carbon, and **low-emissions hydrogen**
- Hydrogen demand, supply chains, infrastructure, and emerging markets
- **Case Study:** Global hydrogen-power development trends and lessons from early projects

Module 2: Hydrogen Production and Electrolysis Technologies

- Water electrolysis fundamentals and **renewable hydrogen** production
- Alkaline, PEM, and solid-oxide electrolyser technologies
- Renewable-power integration and variable electricity management
- Electrolyser efficiency, capacity factor, degradation, and performance
- **Case Study:** Large-scale electrolyser deployment and challenges affecting project economics

Module 3: Hydrogen Storage, Transportation, and Infrastructure

- Compressed hydrogen, liquid hydrogen, and alternative storage approaches
- Hydrogen pipelines, distribution networks, and transportation logistics
- Storage requirements for **power-system flexibility** and seasonal energy
- Infrastructure planning, hydrogen hubs, and integrated energy systems
- **Case Study:** Hydrogen infrastructure development and lessons from emerging hydrogen hubs

Module 4: Hydrogen Combustion and Gas-Turbine Power Generation

- Hydrogen combustion fundamentals and turbine operating considerations
- Hydrogen blending, co-firing, and dedicated hydrogen combustion
- NOx management, flame characteristics, efficiency, and emissions
- Gas turbines and **combined-cycle power generation**
- **Case Study:** Hyflexpower's demonstration using renewable hydrogen in a 12 MW gas turbine

Module 5: Fuel Cells and Distributed Hydrogen Power

- Fuel-cell fundamentals and major fuel-cell technology families
- Stationary power, backup power, microgrids, and distributed generation
- Efficiency, reliability, modularity, and operational characteristics
- Integration with renewables, batteries, and smart-energy systems
- **Case Study:** Hydrogen fuel-cell systems for resilient and distributed power applications

Module 6: Hydrogen, Ammonia, and Flexible Power Systems

- Hydrogen-derived fuels and the role of **ammonia** in power generation
- Co-firing strategies and thermal-power-plant integration
- Hydrogen for **grid balancing**, renewable integration, and energy security
- Power-to-hydrogen and hydrogen-to-power system configurations
- **Case Study:** JERA's demonstration of 20% ammonia co-firing at the Hekinan coal-fired power plant

Module 7: Project Development, Economics, Safety, and Sustainability

- **Techno-economic assessment**, CAPEX, OPEX, LCOE, and hydrogen cost drivers

- Project feasibility, offtake agreements, financing, and investment risk
- Hydrogen safety, hazard identification, emergency planning, and operational controls
- Lifecycle assessment, carbon intensity, sustainability, and certification
- **Case Study:** Analysis of why hydrogen projects can face delays, cancellations, infrastructure constraints, and uncertain offtake

Module 8: Future Trends, Commercialisation, and Strategic Roadmaps

- Hydrogen-power market outlook and emerging commercial business models
- **Net-zero**, energy security, grid resilience, and industrial decarbonisation
- Policy, regulation, certification, incentives, and demand-creation mechanisms
- Technology innovation, scaling, cost reduction, and investment opportunities
- **Case Study:** Hydrogen- and ammonia-fired power projects and the projected pathway toward approximately 7.5 GW of announced/operational capacity by 2030

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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