AMERICAN GLOBAL INSTITUTE
FOR PRIVATE TRAINING

External Training Course

Developing Clean Energy and Hydrogen Economy from Sustainable Ammonia Production

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From 01 Dec. To 05 Dec. 2025

Concorde Hotel Doha, Qatar

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External Training Course:

Developing Clean Energy and Hydrogen Economy from Sustainable Ammonia Production

From 01 Dec. To 05 Dec. 2025 **Fees: 1750 KD**

Course Overview

This advanced 5-day training course provides an in-depth exploration of the interconnection between clean energy, hydrogen technologies, and sustainable ammonia production. Participants will gain a deep technical understanding of how ammonia serves as both a clean energy vector and a hydrogen carrier for industrial and power generation applications. The course examines the full value chain — from renewable feedstocks to production, transportation, storage, and end-use — while covering global market dynamics, policies, and innovation trends driving the hydrogen economy. Key Focus Areas:

- The energy transition and decarbonization landscape.
- Role of hydrogen and ammonia in achieving net-zero targets.
- Comparative review of conventional and sustainable ammonia pathways.
- Integration of renewable energy into ammonia synthesis.
- Cross-sectoral applications in power, industry, and transport.
- Emerging technologies and innovations in ammonia utilization.
- Challenges, opportunities, and investment perspectives in the hydrogen economy.

Course Objectives

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

- Understand the fundamentals and strategic importance of the hydrogen economy.
- Explain the technical processes of ammonia synthesis and its link to hydrogen.
- Identify renewable feedstocks and clean energy inputs for ammonia production.
- Assess green, blue, and turquoise ammonia production technologies.
- Evaluate carbon capture, storage, and utilization techniques in ammonia plants.
- Analyze hydrogen production, transportation, and storage technologies.
- Examine the role of ammonia as a hydrogen carrier and energy fuel.
- Apply lifecycle and techno-economic assessments to energy projects.
- Interpret international policies, safety codes, and sustainability standards.
- Design project roadmaps integrating hydrogen and ammonia systems.
- Recommend investment, innovation, and technology adoption strategies.

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Target Audience

This course is ideal for professionals across the energy, industrial, and sustainability sectors, including:

- Process, chemical, and energy engineers involved in hydrogen or ammonia operations.
- Technical managers responsible for clean energy transition projects.
- Environmental and sustainability officers overseeing carbon reduction programs.
- Policy makers and government regulators developing renewable energy strategies.
- Researchers and consultants specializing in hydrogen and ammonia systems.
- Business development executives and investors in green technologies.
- Oil, gas, and petrochemical professionals seeking diversification to cleaner fuels.
- Academic and R&D professionals studying energy systems and renewable chemistry.
- Utility planners, project financiers, and technology licensors.

Training Methodology

Comprehensive instructor-led sessions combining theory and practical applications.
Technical presentations supported by detailed process flow diagrams and data.
Interactive workshops focused on real-world clean ammonia projects.
Team-based problem-solving and group case discussions.
Collaborative exercises on project design and technical evaluation.
Group discussions on policy frameworks and technology innovations.
Case studies of successful global hydrogen and ammonia projects.
End-of-course project roadmap presentation and peer review.
Digital course materials, handouts, and practical reference guides.

Organizational Impact

Participating organizations will benefit from:

- Enhanced internal expertise in hydrogen and sustainable ammonia value chains.
- Improved capacity to evaluate and manage decarbonization projects.
- Strengthened alignment with ESG and sustainability commitments.
- Adoption of innovative energy solutions to reduce operational emissions.
- Improved technical and financial decision-making for clean energy investments.
- Ability to identify partnerships, suppliers, and technologies in the hydrogen sector.
- Development of internal roadmaps for energy transition and carbon neutrality.
- Increased competitiveness through early adoption of low-carbon solutions.
- Strengthened risk management and compliance with environmental regulations.

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Personal Impact

Participants will gain:

- A holistic understanding of ammonia's role in the future hydrogen economy.
- Advanced technical knowledge of clean production and conversion systems.
- Analytical tools for feasibility studies and project assessments.
- Confidence in communicating and leading clean energy initiatives.
- Broader insight into international market and policy trends.
- Practical skills for integrating sustainability into technical operations.
- Professional development through exposure to cutting-edge technologies.
- Recognition as a knowledgeable contributor to energy transition projects.
- Career advancement in renewable and hydrogen-related sectors.

Course Content & Agenda

Day 1 – Foundations of Clean Energy and Hydrogen Economy

- Overview of the global energy transition and climate commitments.
- Hydrogen's role in decarbonization across sectors.
- Ammonia as a clean fuel and hydrogen carrier: chemistry and applications.
- Historical evolution of ammonia and industrial production systems.
- Global hydrogen economy – value chain and strategic trends.
- Policy frameworks and international initiatives for hydrogen deployment.
- Comparative analysis of hydrogen vs. ammonia as energy vectors.
- Challenges in hydrogen storage, transport, and distribution.
- Case study: Global leaders in clean ammonia projects (Japan, Saudi Arabia, Norway).

Day 2 – Sustainable Ammonia Production Technologies and Processes

- Fundamentals of the Haber–Bosch process and its energy footprint.
- Transition from gray to blue and green ammonia production.
- Electrolysis technologies: PEM, alkaline, and solid oxide electrolyzers.
- Renewable integration – wind, solar, and hydro-based ammonia synthesis.
- Carbon capture, utilization, and storage (CCUS) in ammonia plants.
- Catalysts and process innovations for efficiency improvement.
- Biomass and waste-based feedstocks for sustainable ammonia.
- Process control, automation, and optimization in modern ammonia plants.
- Environmental performance, water management, and emission minimization.
- Case study: Implementation of world's first industrial-scale green ammonia plant.

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Day 3 – Hydrogen Generation, Storage, and Transportation Systems

- Hydrogen production pathways: SMR, ATR, pyrolysis, and electrolysis comparison.
- Ammonia as a hydrogen vector: decomposition and cracking technologies.
- Hydrogen compression, liquefaction, and pipeline transport.
- Safety aspects of hydrogen and ammonia handling and storage.
- Infrastructure requirements for large-scale hydrogen logistics.
- Comparative economics of hydrogen carriers: ammonia, LOHCs, and methanol.
- Design of integrated hydrogen-ammonia supply chains.
- Role of ports, terminals, and bunkering facilities in hydrogen logistics.
- Technical and environmental challenges in hydrogen export/import systems.
- Global best practices and safety case studies.

Day 4 – Energy Applications and System Integration

- Ammonia combustion technologies in power generation and turbines.
- Hydrogen and ammonia co-firing with coal and natural gas.
- Ammonia as maritime fuel: opportunities and safety challenges.
- Fuel cell technologies using ammonia-derived hydrogen.
- Industrial decarbonization using hydrogen and ammonia feedstocks.
- Integration of ammonia-to-power systems into microgrids and hybrid systems.
- Role of digitalization and smart grids in ammonia energy systems.
- Environmental, safety, and lifecycle assessment of ammonia energy applications.
- Case study: Japan’s national ammonia fuel initiative and power co-firing strategy.

Day 5 – Economics, Policy Frameworks, and Future Prospects

- Global market outlook for hydrogen and ammonia fuels.
- Techno-economic modeling and cost breakdown for green ammonia production.
- Financing mechanisms and incentives for clean energy projects.
- Risk assessment and management in hydrogen-ammonia ventures.
- Policy, standards, and certification schemes for clean ammonia.
- Regional initiatives: EU Hydrogen Strategy, Asian Clean Fuel Roadmaps.
- Role of public-private partnerships in developing hydrogen infrastructure.
- Innovation landscape: next-generation catalysts and modular reactors.
- Future trends: AI, digital twins, and automation in energy production.
- Final group workshop: Designing a sustainable ammonia-hydrogen project roadmap.

Course Agenda:

(1st Day) Agenda

8.30	9.00	Opening Remarks (30 Min.).
9.00	11.30	Discuss Course Major Points: • Foundations of Clean Energy and Hydrogen Economy. • Sustainable Ammonia Production Technologies and Processes. • Hydrogen Generation, Storage, and Transportation Systems. • Energy Applications and System Integration. • Economics, Policy Frameworks, and Future Prospects.
11.30	12.00	Coffee Break
12.00	14.00	Foundations of Clean Energy and Hydrogen Economy: • Overview of the global energy transition and climate commitments. • Hydrogen's role in decarbonization across sectors. • Ammonia as a clean fuel and hydrogen carrier: chemistry and applications. • Historical evolution of ammonia and industrial production systems. • Global hydrogen economy – value chain and strategic trends. • Policy frameworks and international initiatives for hydrogen deployment. • Comparative analysis of hydrogen vs. ammonia as energy vectors. • Challenges in hydrogen storage, transport, and distribution. • Case study: Global leaders in clean ammonia projects (Japan, Saudi Arabia, Norway).
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(2nd Day) Agenda

9.00	11.30	Sustainable Ammonia Production Technologies and Processes: • Fundamentals of the Haber–Bosch process and its energy footprint. • Transition from gray to blue and green ammonia production. • Electrolysis technologies: PEM, alkaline, and solid oxide electrolyzers. • Renewable integration – wind, solar, and hydro-based ammonia synthesis. • Carbon capture, utilization, and storage (CCUS) in ammonia plants.
11.30	12.00	Coffee Break
12.00	14.00	Sustainable Ammonia Production Technologies and Processes: • Catalysts and process innovations for efficiency improvement. • Biomass and waste-based feedstocks for sustainable ammonia. • Process control, automation, and optimization in modern ammonia plants. • Environmental performance, water management, and emission minimization. • Case study: Implementation of world's first industrial-scale green ammonia plant.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(3rd Day) Agenda

9.00	11.30	Hydrogen Generation, Storage, and Transportation Systems: • Hydrogen production pathways: SMR, ATR, pyrolysis, and electrolysis comparison. • Ammonia as a hydrogen vector: decomposition and cracking technologies. • Hydrogen compression, liquefaction, and pipeline transport. • Safety aspects of hydrogen and ammonia handling and storage. • Infrastructure requirements for large-scale hydrogen logistics.
11.30	12.00	Coffee Break
12.00	14.00	Hydrogen Generation, Storage, and Transportation Systems: • Comparative economics of hydrogen carriers: ammonia, LOHCs, and methanol. • Design of integrated hydrogen-ammonia supply chains. • Role of ports, terminals, and bunkering facilities in hydrogen logistics. • Technical and environmental challenges in hydrogen export/import systems. • Global best practices and safety case studies.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(4th Day) Agenda

9.00	11.30	Energy Applications and System Integration: • Ammonia combustion technologies in power generation and turbines. • Hydrogen and ammonia co-firing with coal and natural gas. • Ammonia as maritime fuel: opportunities and safety challenges. • Fuel cell technologies using ammonia-derived hydrogen. • Industrial decarbonization using hydrogen and ammonia feedstocks.
11.30	12.00	Coffee Break
12.00	14.00	Energy Applications and System Integration: • Integration of ammonia-to-power systems into microgrids and hybrid systems. • Role of digitalization and smart grids in ammonia energy systems. • Environmental, safety, and lifecycle assessment of ammonia energy applications. • Case study: Japan's national ammonia fuel initiative and power co-firing strategy
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(5th Day) Agenda

9.00	11.30	Economics, Policy Frameworks, and Future Prospects: • Global market outlook for hydrogen and ammonia fuels. • Techno-economic modeling and cost breakdown for green ammonia production. • Financing mechanisms and incentives for clean energy projects. • Risk assessment and management in hydrogen-ammonia ventures. • Policy, standards, and certification schemes for clean ammonia.
11.30	12.00	Coffee Break
12.00	14.00	Economics, Policy Frameworks, and Future Prospects: • Regional initiatives: EU Hydrogen Strategy, Asian Clean Fuel Roadmaps. • Role of public-private partnerships in developing hydrogen infrastructure. • Innovation landscape: next-generation catalysts and modular reactors. • Future trends: AI, digital twins, and automation in energy production. • Final group workshop: Designing a sustainable ammonia-hydrogen project roadmap.
14.00	14.30	Questions, Discussion & Conclusion Training Course.
14.30		Buffet Lunch