

**Title:** Hydrogen: a sector-coupling enabler

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## **ABSTRACT:**

Hydrogen is smallest and lightest molecule, yet it makes stars shining... and drives technological innovation on Earth! In recent times hydrogen is gaining a pivotal role, not only for the transition of energy systems but for the entire economy. The establishment of a collective decarbonized energy paradigm based on hydrogen envisages technological advancement in many sectors, including hydrogen production, storage, distribution, and end-user applications (power, transport, and industrial sectors). This series of lectures aims at providing a full overview on the hydrogen technology and value chain, understanding the basic principles of hydrogen technologies and the use of hydrogen as decarbonized energy carrier, finding synergies among scientific disciplines to address the major challenges.

## **PROGRAM:**

### Unit 1: A roadmap to hydrogen

- Hydrogen: an energy and value carrier
- The principles behind the hydrogen paradigm
- Technologic pillars: power generation, heating, industry and transport

### Unit 2: Hydrogen Production

- State-of-the art
- Electrochemical processes
- Hydrogen harvesting
- Research frontiers

### Unit 3: Power generation

- Fuel cells
- Hydrogen in combustion
- CHP application
- Research frontiers

### Unit 4: Power-to-Gas and Gas-to-Power

- Renewable power source-to-hydrogen:
- Hydrogen Storage and distribution
- Cross-sectoral integration with other energy/non-energy fields

### Unit 5: The Hydrogen community model

- The economic value of hydrogen
- The "Valley" concept
- *Workshop: Synergies among scientific disciplines*