

Electric Energy Systems University Enterprise Training Partnership <u>www.ees-uetp.com</u>

EES-UETP Course- The role of renewable hydrogen in the energy transition and its interactions with the power system Madrid, 5-6 June 2025

Organized by Universidad Pontificia Comillas

Organizing Committee

Dr. Rafael Cossent Dr. Luis Rouco Eng. Santiago Serna Zuluaga

Description of the course

In recent years, hydrogen, oftentimes labeled "green" or "renewable," has gained considerable relevance in the energy transition debate. As an example of how quickly the ambition regarding hydrogen is growing, suffice it to mention that the European Hydrogen Roadmap published in July 2020 estimated a hydrogen demand of 5Mt by 2030 in the EU. Less than two years later, amidst growing concerns around energy security, the RePowerEU plan presented by the European Commission in May 2022 raised this target to 20Mt, half of which would be produced within the Union. A similar process is being observed worldwide.

According to data from the International Energy Agency, global hydrogen consumption exceeded 97Mt in 2023, most of it used as raw material in refining, fertilizer production, the chemical industry, or steelmaking. However, the vast majority of this hydrogen is produced from fossil fuels at the same premises where it is consumed.

To meet the commitments stemming from the Paris Agreement goal, many countries aim to reach net-zero emissions around the year 2050. Undoubtedly, this calls for an extensive electrification of final energy demand and the rapid expansion of low-emission generation, most notably intermittent renewable generation capacity. However, the so-called hard-to-abate sectors in heavy industry and heavy-duty transport will still require some form of renewable fuel for their decarbonization. These include biofuels, biomethane, renewable hydrogen, and derivatives such as ammonia, methanol, or synthetic fuels. In the European regulatory jargon, assuming certain conditions are met, hydrogen and its derivatives are referred to as renewable fuels of non-biological origin fuel or RFNBOs.

The implications are manifold. First, we need to transform how we produce hydrogen and expand its use to additional sectors. Second, renewable power generation needs to grow to meet both the increasing final electricity demand and the consumption from the electrolyzers, which may represent a considerable added load for power systems. At the same time,

electrolyzers may also act as a flexible demand and long-term energy storage to support the integration of massive shares of intermittent generation. Lastly, as hydrogen production may take place far from where new demands are located, we must also develop the necessary infrastructure to transport and store hydrogen.

All this needs to happen at the same time that the required technologies across the hydrogen supply chain are (hopefully) brought to market maturity, intensive and uncertain investment decisions are made, and the rules of the game are written in the corresponding regulations. Given the depth of the transformation and the little time left, the challenge is not minor.

This course will allow you to gain a wide knowledge of the role of renewable hydrogen in the energy transition, the current status of the technologies and regulations in Europe across the supply chain, and the interactions between hydrogen and power systems.

Intended audience

The course is aimed at academics and industry professionals in the energy sector who are interested in understanding the role of renewable hydrogen in the energy transition, its potential uses, and the technologies involved in the different segments of the hydrogen supply chain. Additionally, the course will address the key policy instruments to unlock the development of the hydrogen sector and will identify the technical, economic, and regulatory barriers faced by this energy vector and chemical feedstock. This is also a great opportunity to meet and exchange ideas with experts and colleagues in this field.

Day 1	Session	Speaker	Institution	
9:30-10:00	Registration			
10:00-	Hydrogen in the Energy	Rafael Cossent	Comillas	
11:30	transition: drivers,			
11.30-				
12:00	Coffee break			
12:00:	Bidding strategies of	Lesia Mitridati	DTU	
13:30	electrolysis plants in			
	short-term electricity			
12.20	markets			
13:30-	Lunch			
15:00			11/500 750	
15:00-	Green H2 seasonal	Joao Peças Lopes	INESC-TEC	
16:30	storage - Portugal 2030			
	and 2040. Participation			
	of electrolysers in			
	frequency control (FCR			
	and aFRR)			
16.30-				
17:00	Break			

Program

17:00-	Energy conversion, and	<mark>Luis Rouco (TBC)</mark>	<mark>Comillas (TBC)</mark>	
18:30	<mark>connection to the</mark>			
	power grid			
16:30-	Course dinner			
18:00	course diffiel			

Day 2				
8:30-10:00	Industrial applications	Tobias Fleiter (remote)	Fraunhofer ISI	
	of hydrogen			
10:00-	Coffee breek			
10:30	Conee break			
10:30-	Hydrogen and its	Rafael Cossent	Comillas	
12:00	derivatives as transport			
	fuels			
12:00:	Proof			
12:30	Break			
12:30-	Hydrogen transport and	Timo Gerres	Enagás	
14:00	storage			
14:00-	Lunch			
15:30	LUIICII			
15:30-	Opportunities and	Ernesto Parrilla	Pavilion Energy	
17:00	challenges moving			
	forward			

Venue

Universidad Pontificia Comillas Alberto Aguilera, nº 23, 28015 Madrid, Spain Aula García Polavieja

Registration fees

The course fees include lecture attendance, documentation, coffee breaks, lunches, and course dinner.

- University members of the EES-UETP: 245 EUR
- Industry members of the EES-UETP: 500 EUR
- University non-members of the EES-UETP: 600 EUR
- Industry non-members of the EES-UETP: 1000 EUR

Discounts are available for non-member organizations registering several students. The discount for a second student of a non-member organization is 5%; the discount for a third student of a non-member organization is 10% and so on up to a maximum discount of 50%.

Registration

Those interested in taking the course should get in contact with Ms. Belén Sánchez (bsancheza@comillas.edu).

Lecturers

- Dr. Rafael Cossent, Universidad Pontificia Comillas
- Dr. Lesia Mitridati, DTU
- Dr. João Peças Lopes, INESC-TEC
- Dr. Luis Rouco, Universidad Pontificia Comillas
- Dr. Tobias Fleiter, Fraunhofer ISI
- Dr. Timo Gerres, Enagas
- Dr. Ernesto Parrilla, Pavilion Energy