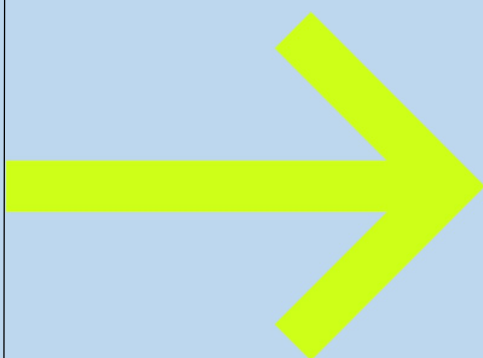
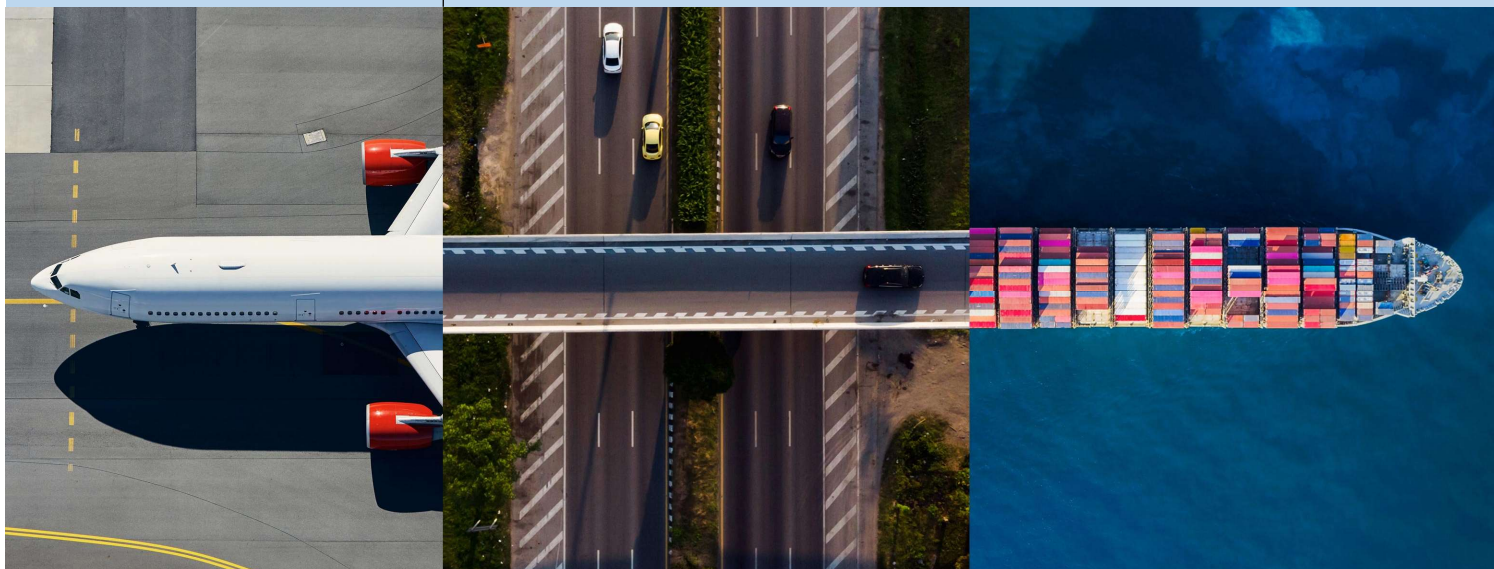


# Power-to-X



August 25-26, 2022

Munkerupgaard

**TOPSOE**

## Topsoe Catalysis Forum

# Power-to-X

The Topsoe Catalysis Forum is organized as a two-day topical meeting. The first day is devoted to overview lectures which set the scene and form the basis for the subsequent discussions. On the second day, discussions and exchange of views will take place in three groups, each organized around a specific subtopic.

Participation is by invitation only. Besides the presenters, representatives from industrial collaboration partners are invited, but the majority of the participants are Topsoe staff. On the first day of the meeting, up to 70 participants will be present whereas around 60 will take part in the discussions on the second day. The meeting is held on a non-confidential basis.

## Thursday, August 25

09:00-09:10 Welcome address, Jesper Nerlov, Topsoe

**PLENARY MORNING SESSION** - chairman: Kim Grøn Knudsen, Topsoe

09:10-10:00 **The role of hydrogen and hydrogen-based fuels in the IEA Net-Zero Emissions 2050 scenario**  
Ilkka Hannula, International Energy Agency

10:00-10:50 **The role of Power to X in Europe (EU) as seen from a TSO perspective**  
Anders Bavnhøj Hansen, ENERGINET

### Coffee break

11:10-12:00 **Role of Carbon Capture in a sustainable energy system**  
Mai Bui, Imperial College London

### Lunch

**PLENARY AFTERNOON SESSION** - chairman: Kurt Agerbæk Christensen, Topsoe

13:30-14:20 **Zero Carbon Shipping**  
Torben Nørgaard, Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping

14:20-15:10 **The transformation of the steel industry in the light of the energy transition, circular economy and Power-to-X**  
Wim Van der Stricht, ArcelorMittal

### Coffee break

15:40-16:30 **Green Cement and Mission Zero**  
Burçin Temel McKenna, FLSmidth

19:00 **Conference dinner**

## Friday, August 26

08:45-09:00 Introduction to group discussions, Poul Georg Moses, Topsoe

09:00-12:00 **GROUP DISCUSSIONS**

### GRP. 1: PROCESS INTEGRATION WITH POWER-TO-X

- chairman: Per Aggerholm Sørensen, Topsoe

- **Process integration opportunities in Power-to-X plants**  
Jan van Herle, École Polytechnique Fédérale de Lausanne
- **Impact of Renewable Energy Intermittency on Plant Sizing and Levelized Cost of Ammonia**  
Richard M. Nayak-Luke, University College London
- **Role of Haber-Bosch Ammonia in a Carbon-Free Energy Landscape**  
Laura Torrente Murciano, University of Cambridge

### GRP. 2: TRENDS IN ELECTROLYSIS WITHIN POWER-TO-X

- chairman: John Bøgild Hansen, Topsoe

- **Advanced materials for high temperature electrolysis and catalysis**  
John Irvine, University of St Andrews
- **Anion exchange membrane electrolysis**  
Benjamin Britton, Ionomr
- **The role and status of alkaline and PEM electrolyzers for Power-to-X deployment**  
Jens Oluf Jensen, Technical University of Denmark

### GRP. 3: CARBON AND ELECTRICITY SOURCE INTEGRATION WITH POWER-TO-X

- chairman: Søren Dahl, Topsoe

- **Integration of biomass conversion and Power-to-X**  
Lasse Røngaard Clausen, Technical University of Denmark
- **From wind to molecules**  
Finn Daugaard Madsen, Siemens Gamesa Renewable Energy A/S
- **Renewable Carbon is the key to a sustainable chemical industry**  
Michael Carus, nova-institut

### Lunch

### CLOSING SESSION - Realization of Power-to-X projects

- chairman: Sundus Cordelia Ramli, Topsoe

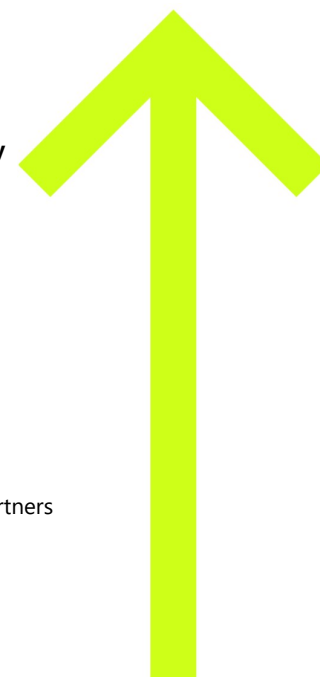
### The role of Power-to-X from an investor perspective

13:00-13:35 Karsten Uhd Plauborg, Copenhagen Infrastructure Partners

13:35-14:10 Anders Christian Nordstrøm, Ørsted

14:10-15:15 Discussions

15:15-15:30 Closing remarks, Jesper Nerlov, Topsoe



# Background

The TOPSOE CATALYSIS FORUM was created as a framework for an open exchange of views on catalysis in the fields of interest to Topsoe. The forum is conceived as a platform for discussions of new reactions and new principles of catalysis in an attempt to jointly look beyond the horizon. The Forum is held on a non-confidential basis to facilitate an open debate and to enable all participants to make use of the information received during the meetings in their future work. The TOPSOE CATALYSIS FORUM works through individual contacts and annual meetings focusing on a single topic. The topic of the 15th TOPSOE CATALYSIS FORUM is:

# Power-to-X

Substantial reductions in global greenhouse gas emissions are needed to limit the global temperature increase to 2°C in this century. In this respect, it is positive progress that production of electricity by wind turbines and solar panels has advanced massively over recent decades, and also that the price of renewable power is competitive with that of power based on fossil fuels.

Unfortunately, not all processes required by modern society can run directly on electricity. These hard-to-abate sectors are long-distance transport and many industrial processes. Therefore, processes to convert electricity to fuels and chemicals must be developed and matured, Power-to-X covers all these processes.

Topsoe is determined to lead the way in Power-to-X because Topsoe is one of very few companies that possesses both the expertise and the technologies needed in this field. Therefore, the topic of the 2022 Topsoe Catalysis Forum is Power-to-X, and important aspects of this topic will be covered in depth:

- Why is Power-to-X a good solution?
- What are the requirements of the sectors that rely on Power-to-X to lower their carbon footprint?
- What is the status and prospects of the different electrolysis technologies?
- Where will we get the carbon from for carbon-based fuels and chemicals?

## Scientific committee

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