Workshop summary and outlook

Exploring Flexibility from Renewable Hydrogen and Bioenergy in Energy System Modelling

Joint workshop between IEA Bioenergy TCP and IEA ETSAP TCP

IEA Bioenergy: Task 44: 17 11 2023
ITP Synergies of green hydrogen and bio-based value chains deployment
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Summary

The workshop titled 'Exploring Flexibility from Renewable Hydrogen and Bioenergy in Energy System Modelling' was held in Turin on November 17, 2023. It was organized collaboratively by IEA Bioenergy and IEA ETSAP, its objective was to share modelling experiences and perspectives on flexibility and renewable hydrogen within energy systems.

Session A explored the current state of flexibility in energy system models and the possible role of renewable hydrogen in future energy systems. Discussions highlighted the undervaluation of flexibility in models and the importance of biomass storage. The session examined bioenergy's integration with industrial sectors and the impact of fluctuating biomass availability. Hydrogen's versatility and cost challenges were also emphasized, particularly its applications across various sectors. There are already TIMES models where hydrogen from biomass production pathways is considered.

Session B included a presentation on the IEA Net Zero Roadmap with a focus on Hydrogen Production Pathways by 2030 and initiated further collaboration, focusing on flexibility and renewable hydrogen impact assessment between the two Technology Collaboration Programmes.

Key takeaways

Flexible bioenergy and renewable hydrogen are vital for future energy systems, including but not limited to the electricity grid. Yet, current models often undervalue their flexibility contribution. There is a need to better address uncertainties and regional policy differences in energy system modelling; advanced techniques are needed to accurately represent the complexities, role and potential of flexible bioenergy and renewable hydrogen. Therefore, the inherent benefits of the versatility in bioenergy pathways and feedstocks, sector integration, multi-sector, and multi-goal coupling must be reflected and quantified in the models, including improvements in overall system flexibility.

- Energy system modelling looking beyond electricity, including for example also high-temperature heat (industry), are the most promising candidates for valuing flexibility.
- Flexible bioenergy supports variable renewable energy production and provides essential seasonal storage solutions.
- Biomass storage emerges as a cost-effective and readily available resource for flexibility, to balance short-term fluctuations, as well as long-term seasonal scarcities in renewable electricity.
- Future research should focus on optimizing the use of biomass, considering both energy and material applications to maximize its value in decarbonization efforts.
- Renewable hydrogen's versatility across various sectors is significant, though production costs from renewable sources remain high.
- IEA Bioenergy could contribute data and research questions on different biomass pathways and feedstocks to the ETSAP modelling efforts.

Participants

In Turin: Fabian Schipfer (TU Wien/AT), Paul Dodds (UCL/UK), Jana Fakhreddine (UCL/UK), Anna Krook-Riekola (LTU/SE), Kari Espegren(IFE/NO), George Giannakidis (MRC/GR), Markus Blesl (IER/DE), Pacifique Koshikwinja Matabishi (UCB/CD), Amro M. Farid (SIT/US), Kathleen Vaillancourt (ESMIA/CA), Pernille Seljom (IFE/NO), Qiuyu Ding (UCL/UK), Till ben Brahim (Energy Modelling Lab/DK), Juan Correa (VITO/BE), Maria Cristina Pinto (RSE/IT), Pieter Lodewijks (VITO/BE), Marie Pied (ESMIA/CA), + other ETSAP members

Online: Tiia Kanto (VTT/FI), Christiane Hennig (DBFZ/DE), Tiina Koljonen (VTT/FI), Uwe Remme (IEA/FR), Aman Agrawal (TERI/IN), Ahmadi Farzin, Akram Sandvall (IVL/SE), Alessandro Giocoli (ENEA/IT), Alessia Elia (E4SMA/IT), Audrey Dobbins (IER/DE), Carlos Mantilla, Carmelina Cosmi (CNR/IT), Eva Rosenberg (IFE/NO), Anne Gonocruzruth (GZR/JP), Hossein Enayatizadeh (LUT/FI), Jaakko Hyypiä (LUT/FI), Jose Jithin (IER/DE), Kristina Haaskjold (IFE/NO), Antti Lehtila (VTT/FI), Biljana Kulisic (EC/BE), Matthias Jordan (UFZ/DE), Vincenzo Motola (ENEA/IT), Miia Nevander (VTT/FI), Nicola Pierro (ENEA/IT), Nora Lange (DBFZ/DE), Li Pei-Hao (UCL/UK), Luca Rajteri (Polito/IT), Tina Händler (DBFZ/DE), Ugur Halden (IFE/NO)

Interested, but could not participate: Martin Scheepers (TNO/NL), Elisabeth Wetterlund (LTU/SE)

Outlook

Collaborative efforts and expert involvement: The workshop proposed to involve experts from other TCPs and institutions, focusing on disaster risk reduction, sector coupling, and bio-based economies to broaden discussions.

- ➔ The Task 44 activities in 2024 broadened towards collaboration in the TCP coordination group on Energy System Flexibility, with experts from TCPs on the industry, buildings, energy efficient end-use, electric motor systems, efficient end-users, hydropower, concentrated solar, gasification, wind, energy storage and smart grids. Task 44 will proactively involve ETSAP.

Focus on bioenergy's and renewable hydrogen's role in the energy systems: Future discussions will examine bioenergy's and hydrogen's production and application in electricity markets, transport, heating, chemical industry, continuing the debate on optimal biomass use.

- ➔ A follow-up workshop with ETSAP and potentially also other TCPs is planned for the upcoming Triennium (2025-2027).

Enhanced integration of data and models: The workshop emphasized the need for improved data integration in energy system models, aiming to refine models for better representation of bioenergy and renewable hydrogen from biomass, addressing uncertainties, and enhancing predictive accuracy.

- ➔ As a primary objective of ETSAP seeking collaboration with IEA Bioenergy other TCPs.

The Turin workshop set a strong foundation for future collaboration and research, refining energy system models and advancing understanding of bioenergy and renewable hydrogen in the transition to a low-carbon future.

Links and Slides

Winter 2023 - Semi-annual ETSAP meeting homepage:

https://www.iea-etsap.org/index.php/etsap-meeting/10-home