

EUROPEAN ENERGY SECURITY: FORMATION OF E-FUEL CONTRACTS ALLOWING MARKET ESTABLISHMENT VIA SELLER-BUYER DIALOGUE.

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Extended Abstract

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Abstract Summary

This paper, authored by Tommaso Bonini and Prof. Svetlana Ikonnikova (TUM School of Management), investigates the financial and contractual conditions necessary for the establishment of an electro-fuel (e-fuel) market within the European energy transition framework, with particular focus on the aviation and maritime shipping sectors.

The authors contextualise the study by observing that, despite meaningful aggregate reductions in European CO₂ emissions since 2001, aviation and shipping have registered emission increases of approximately 10% over the same period. Recent EU regulatory instruments — notably ReFuelEU Aviation and FuelEU Maritime — have begun to address this structural underperformance. E-fuels, defined as synthetic hydrocarbons produced from green hydrogen and captured CO₂, are identified as a scalable, technology-neutral complement to biofuels, compatible with existing engine infrastructure.

The paper's central contribution lies in reorienting the analytical lens from techno-economic cost minimisation — which dominates the existing literature — toward a market-formation perspective grounded in financial modelling and contractual design. The authors argue that pricing formation alone is insufficient: the establishment of an e-fuel market fundamentally depends on contractual provisions that structure the seller-buyer dialogue, align incentives across the supply chain, and ensure the financial solvency of project developers without exceeding buyer willingness to pay. Such provisions must account for market-relevant financial parameters — including WACC, debt-financing ratios, CO₂ policy-driven costs, and variable financing timelines — that classical techno-economic assessments systematically overlook.

Methodologically, the study employs a discounted cash flow model spanning 2026–2050, with sensitivity analyses conducted across three CO₂ price scenarios. Results demonstrate that e-fuel breakeven prices currently exceed buyer willingness to pay under most configurations, confirming that market creation cannot occur without coordinated contractual frameworks — encompassing flexible pricing formulas, risk-sharing

mechanisms, and regulatory clarity (e.g., non-compliance penalties under ReFuelEU Aviation) — negotiated collaboratively among all relevant stakeholders.

Presenting Author Biography



Prof. Svetlana Ikonnikova

Prof. Ikonnikova is the Associate Professor for Resource Economics at the TUM School of Management. She also holds the position of Senior Energy Economist at the Center for Energy Economics, the University of Texas at Austin, working on the questions of global energy supply capabilities and international energy trade.



Tommaso Bonini

Tommaso is passionate about clean hydrogen, working in both industry and academia.

He is external PhD students at the TUM in Munich, Germany, and Principal Offtake Originator for Fortescue Energy in Europe.

His dream is to fulfill the European decarbonization through MENA large-scale, green molecules.