IEA Bioenergy

Margin potential for a long-term sustainable wood pellet supply chain

Summary

Summary Series

IEA Bioenergy: Task 40: 06 2019

Authors: Uwe R. Fritsche (IINAS), Patrick Lamers (INL) & Christiane Henning (DBFZ)

The global wood pellet market is one of the most dynamic across all bioenergy commodities evaluated by the IEA Bioenergy Task 40 over the last 15 years[1]. By 2015, global trade reached 220 PJ, with expanding cumulative production capacity and increasing plant sizes being symbols of the maturation of this industry. At the same time, increasing competition has reduced the margins in wood pellet supply chains: Established **industrial** (large-scale) use for co-firing with coal or standalone bio-powerplants is under price pressure to become competitive to other low-carbon electricity technologies. Furthermore, coal is being phased out increasingly in Europe and North America due to countries' activities to meet their climate change mitigation ambitions under the Paris Agreement. The **residential** use markets faces increasing competition from e.g., district heating, heat pumps as well as fossil fuels (e.g., natural gas or heating oil) which are still cheap due to the lack of a carbon tax. Furthermore, biogas and biomethane, as well as renewables gases of non-biogenic origin (e.g. power-to-gas) could compete with pellets in residential and commercial heat supply. On the other hand, pellets can play an increasing role in district heating which avoids, compared to pellet stoves, air pollution concerns in cities.

The long-term viability of the wood pellet supply chain and the potential market flexibility are key issues to keep operating. Without long-term viability, individual actors may go bankrupt or mothball their production plants, thus reducing the likelihood of wood pellets becoming a long-term supply option for the future bioeconomy (e.g., for biorefineries), and could imply problems for bioenergy applications which may be needed to achieve net-negative greenhouse gas (GHG) emissions, especially Bioenergy with Carbon Capture and Storage (BECCS), and Bioenergy with Carbon Capture and Use (BECCU). This would not only mean a loss of rural jobs and economic revenue, it could also have wider consequences, such as a delay in the commercialization of advanced biofuel technologies due to the lack of a commodity-type feedstock, and respective transport and trade infrastructures.

This study[2] evaluates the future market prospects of wood pellets in industrial low- and high-temperature heat, industrial processes (e.g. steelmaking), and BECCS/BECCU. It presents a cost baseline summarizing the current market outlook for pellets and respective supply chain "hot spots" in Section 2. Section 3 analyzes potential supply cost reductions. Section 4 details the market prospects, and Section 5 summarizes the key findings and conclusions of this study.

---

[1] Junginger, Martin et al. (2019) The future of biomass and bioenergy deployment and trade: a synthesis of 15 years IEA Bioenergy Task 40 on sustainable bioenergy trade. Biofuels, Bioproducts and Biorefining 13: 247-266 https://doi.org/10.1002/bbb.1993

[2] http://task40.ieabioenergy.com/wp-content/uploads/2019/05/Fritsche-et-al-2019-IEA-Bio-T40-Margin-Pellet-Study.pdf

BEYOND THE BASELINE: IMPROVED PELLETS

This report has shown that wood pellets are a well-established supply chain for residential heat and large-scale industrial (power) markets, and that existing supply "hot spots" can deliver wood pellets at reasonable prices. It indicated that further technology development can **reduce wood pellet costs** along (international) supply chains significantly, and can **broaden the feedstock base to low-cost material** such as bagasse, other herbaceous biomass, and wood wastes – subject to adequate sustainability requirements. Torrefaction could, compared to traditional white pellets, improve energy, GHG and cost performance of long-distance supply, allowing for additional and widespread applications due to its favorable fuel properties. Yet, given the competition with other renewable energy sources (solar, wind) and energy efficiency in the longer-term (buildings), current wood pellet markets are under price pressure, and actually could shrink in the near future, especially for co-firing in the electricity sector.

CASE STUDIES ON FUTURE PELLET MARKETS

Industrial Heat	Industrial Processes	BECCS/U
High-temperature heat (for cement, ceramics, chemicals etc.) offers little options for wood pellets as a renewable fuel substitute, mainly due to competition with biomethane. Yet, bio-based renewable gases could be derived from wood pellets also. In specific cases pellets have advantages over renewable gases. For those, creating properties of pellets similar to coal (via pre-treatment) to smoothly blend into existing industrial processes is yet a challenge, but torrefaction is an interesting opportunity.	The case study on **steelmaking** identified some potential for wood pellets, but in the longer-term, direct reduction by (renewable) hydrogen may well be superior. For many **existing** iron and steel plants especially in **China and India**, wood pellets may well be suitable to reduce GHG emissions, though.	If large-scale BECCS/U is deployed, then wood pellets (or torrefied material) would be a suitable supply option, with attractive economic potential for CO_2 prices above 100 $/t. With that, current infrastructure for large-scale international pellet trade could become a necessary asset, and (traded) high-density solid biomass as well as biomethane and bio-SNG should be seen as **key enablers of a new bioenergy role** in the longer-term future.

THE CRITICAL ISSUE: SUSTAINABILITY GOVERNANCE

Recent results from global modeling underlined that bioenergy is crucial for achieving the Paris Agreement. International trade of wood pellets could help in fulfilling that, but only if sustainability concerns of biomass supply – and for BECCS/U: social acceptance - are sufficiently addressed. Various research indicated that to achieve not only the Paris Agreement, but the overarching Sustainable Development Goals (SDG) as well, bioenergy **can contribute positively**. For this, cross-sector and cross-border **sustainability governance of the bioeconomy** is required, as currently, there are uncertainties around regulatory policies on and overall governance of sustainable biomass, including wood pellets.

IEA Bioenergy collaborates with many partners towards sustainability governance – and started new intertask projects on bioenergy for high-temperature industrial heat, renewable gases, potential BECCS/U deployment, and the future role of bioenergy in a "well-below 2 °C/SDG" world.

IEA Bioenergy, also known as the Technology Collaboration Programme (TCP) for a Programme of Research, Development and Demonstration on Bioenergy, functions within a Framework created by the International Energy Agency (IEA). Views, findings and publications of IEA Bioenergy do not necessarily represent the views or policies of the IEA Secretariat or of its individual Member countries.