"Energy Hubs" – the paper industry potential as a renewable energy producer

Cepi is the Confederation of European Paper Industries

INTRODUCTION:

A new study commissioned by Cepi to AFRY, a Scandinavian firm supplying engineering and advisory services, shows the untapped further potential for paper mills to function as renewable energy hubs. The pulp and paper industry could increase its on-site renewable electricity and heat production and, through a 'swing capacity effect', sell any excess energy production to the grid, nearby neighbourhoods and other industries.

The European pulp and paper industry is already the largest industrial prosumer of clean energies, with over 60% renewables in its primary energy consumption. Proportionally to its size, it is a major industrial investor into the decarbonisation of its processes, notably via on-site renewable energy generation. It is one of the success stories of the European emission trading scheme (EU ETS), which provides incentives for such investments. The European pulp and paper industry has reduced its CO2 emissions by 34% since 2005 but must meet a very ambitious goal of 62% reduction by 2030.

Advancing the prosumer model

The authors of the study conclude that by 2030 the pulp and paper industry has the potential to increase its renewable on-site electricity and heat production to generate almost 31 TWh. This corresponds to 30% of electricity and almost 6% of heat generated on-site in 2020. But mobilising necessary investments would require predictable EU regulation and expeditious permitting procedures to be put into place.

This new study offers an indication of where some of our industry's next investments could be made. The energy transition in which we are already well engaged is also an occasion for us and for policymakers to rethink what a paper mill is and could be: a renewable energy hub and a biorefinery where substitutes for fossil-intensive materials and products are created.

The study also offers an estimate of the space available in different types of paper mills to install solar panels or wind turbines, in addition to other solutions identified by the authors. The energy production capacities outlined in the new report cannot however be implemented rapidly enough to be a solution to the current energy crisis. But widely shared analysis shows that energy costs in Europe are likely to stay high at least for the foreseeable future, and investments in fossil free energy will eventually offer the industry a chance to adapt to a radically changed energy landscape.

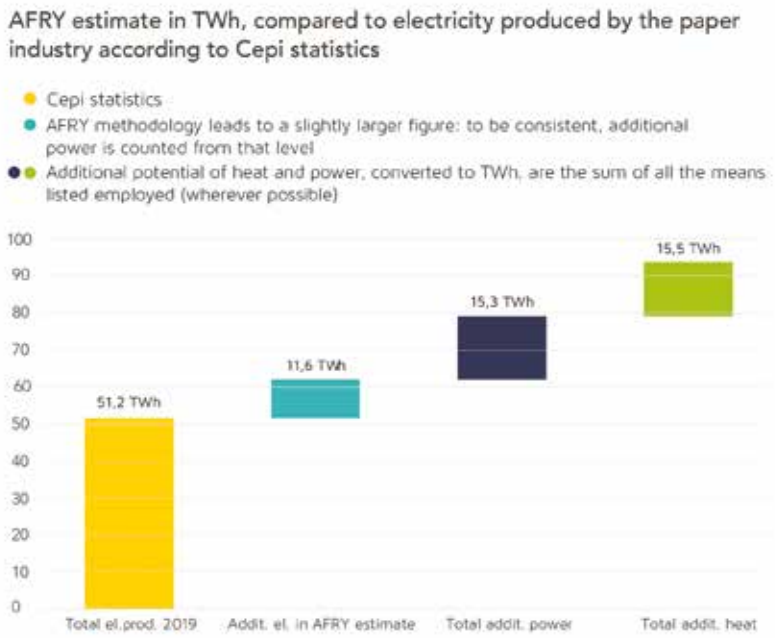

Figure 1: AFRY estimate in TWh, compared to electricity produced by the paper industry according to Cepi statistics

Swinging between producing energy and material

The study also explored the possibility for the paper industry to reduce its own consumption and increase the share of renewable energy it provides to the grid, nearby neighbourhoods and possibly other industries. The authors estimate that this 'swing capacity' could regularly reach 10% to 20% for an average paper mill.

From a wider perspective, the same effect of optimising between material production and energy generation could also apply to the biomass residues resulting from production. The development of new product applications is already well-advanced. As renewable energy becomes increasingly available and its cost declines in the future, the production of secondary bio-based products and materials is expected to further drive the industry's transformation. New opportunities will present themselves as the industry becomes increasingly energy-efficient and affordable fossil-free energy becomes more available.

The European paper industry could be a global champion and promoter of a new bio-based and circular economy, something for which it is already well–positioned. We have an opportunity for significant, systemic change.

Paper mill sites already produce energy and can be seen as "energy hubs". This means that a paper mill can use all available means that make sense, including e.g. solar and wind power, to optimise renewable energy on-site potential. The AFRY report shows that our industry could increase the amount of generated heat and electricity in many cases. One solution does not fit all sites but becoming less dependent on external energy factors is crucial.

How much more renewable energy could be generated at Cepi mill sites?

The paper industry is very heterogeneous. Some mills produce a large surplus of energy, others consume a large deficit of energy. The AFRY report estimates that across Europe about 31 TWh of additional energy (power and heat) could be produced onsite using a mix of renewable energy sources. This corresponds to:

- Almost 10% of Cepi mills' energy consumption in 2020,
- 30% of electricity produced on-site in 2020,
- Almost 6% of heat generated on-site in 2020,
- About 0.8 % of European overall natural gas use before the 2022 energy crisis.

In reality, this will depend on the mill's individual characteristics such as their own history, shape, layout and equipment. To realise this potential, paper mills would need to make new investments which will not happen overnight.

How the additional potential can be used?

In a business model of "swing" between competing end uses, the additional potential can be used in many ways:

- Space: could be used for additional production capacity or energy production
- Water: could be recirculated, or an energy source
- Gases: are energy for the mill, but could also be sold
- Sludges: could become materials, energy, or sold as is for further treatment
- Lignin: is already an energy source – it can also be valorised as materials and chemicals apart from fuels

In the AFRY report, double counting has been avoided by using typical mills, with size space and other properties, and using its resources efficiently – but only once.

How the additional potential can be realised?

The European policy can support the paper industry in contributing to decrease Europe's dependency on fossil energy. The transition to greater energy on-site production requires a policy framework that:

- Promotes, supports and rewords investments in renewable energy generation on-site,
- Supports new business models which leverage the on-site renewable energy potential,
- Facilitates connecting industrial sites into industrial symbiosis networks,
- Accelerates permitting processes for new renewable energy installations on-site.

Readers can download the Executive Summary for Cepi's Energy Hubs report at https://www.cepi.org.

Cepi is the Confederation of the European paper industry, based in Brussels, Belgium.

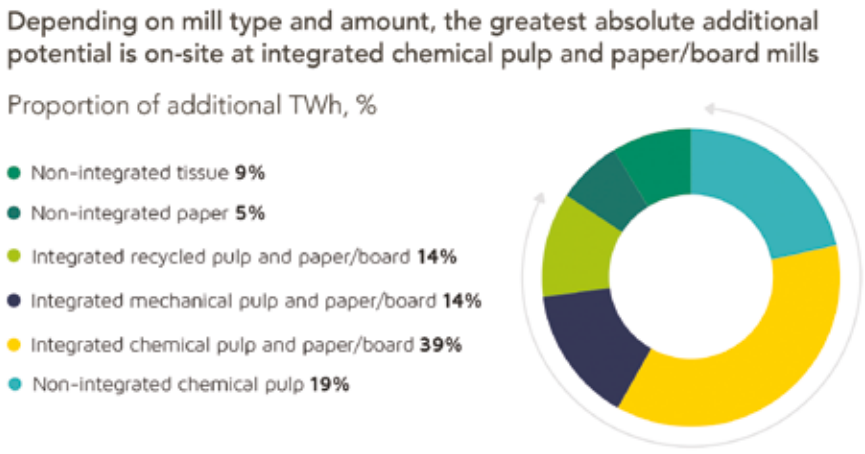

Figure 2: Depending on mill type and amount, the greatest absolute additional potential is on-site at integrated chemical pulp and paper/board mills