Deep decarbonisation pathways in the European forest fibre and paper industry

Nicola Rega
Climate Change and Energy Director, CEPI

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Our membership brings together the best of Europe

- 18 national member associations gathering over 500 companies
- Through 900 mills our industry makes
  - 23% of the world paper production
  - €90 billion of annual turnover
  - €20 billion annually added to European GDP
- and the jobs of 180,000 people (60% in rural areas)
A few starting points: who is the paper industry...

4th largest industrial energy user in Europe

<1% of total EU GHG emissions

-27% CO₂ emission reduction since 2005

€5bn investments / year
...and where is the paper industry heading

the forest fibre and paper industry in 2050

roadmap

pulp

paper

bio-based products

added-value

carbon emissions
Unfolding our future...
The first 2050 Roadmap (2011)
The challenge

50% more value, 80% less fossil CO2,
40 years to go
(in two investment cycles)
In a broad sector scope – the forest fibre sector
-80% carbon – How?

The exploration shows that a reduction of 50 to 60% of CO₂ emissions is possible given the right circumstances. To achieve a minus 80% reduction, however, the sector will need breakthrough technologies.
Tackling the unknown

Breakthrough technologies for the 2050 world

Deep Eutectic Solvents

A ground-breaking discovery: Deep Eutectic Solvents (DES), produced by plants, open the way to produce pulp at low temperatures and at atmospheric pressure. Using DES, any type of biomass could be disintegrated into lignin, cellulose and hemicellulose with minimal energy, emissions and residues. They could also be used to recover cellulose from waste and dissolve ink residuals in recovered paper.

Flash condensing with Steam

Waterless paper production? Very nearly! Largely dry fibres would be blasted into a forming zone with agitated steam and condensed into a web using one-thousandth the volume of water used today.

Steam

Using more energy to save less? You need it right. Using the full power of pure steam for superheated steam drying would save energy as most heat could be recovered and recycled. Steam will then be used as a fibre carrier for making and forming paper.

DryPulp for cure-formed paper

Imagine a papermaking process that uses no water. This is it. Fibres are treated to protect them from shear, and they suspended in a viscous solution at up to 40% concentration. The solution in then pressed out and the thin sheet cured with a choice of additives to deliver the end-product required.

Supercritical CO₂

Neither gas nor liquid but somewhere in between, Supercritical CO₂ (scCO₂) is widely used in many applications, to dry vegetables, fruits and flowers, extract essential oils or options. Suppliers for NIKE, Adidas and IKEA use it to dye textiles. Coffee and tea have been decaffinated with scCO₂ since the early 80s. We could use it to dry pulp and paper without the need for heat and labour, and why not dye paper or remove contaminants too, while we’re at it?

100% electricity

Shifting pulp and paper production to energy-efficient technologies using electricity rather than fossil fuel power to generate heat will cut all CO₂ emissions as the power sector shifts to renewable energy. The sector would also provide a buffer and storage capacity for the grid, storing energy as hydrogen or pulp.

Functional Surface

The key to unlocking greater added value from fewer resources depends on a shift to producing more lightweight products, and selling surface area and functionality rather than weight. Advances in sheet formation and new cocktails of raw materials will lead the way to the lightweight future.

The Toolbox to replicate

What about the great ideas that never made it? Put together a combination of processes, material and equipment innovations as a toolbox of shipping stores to 2050 and the pathway becomes clearer, boosting sector and investor confidence.
Exploring new markets where creating added value

Fibre from everywhere
Fibre takes on plastic
Fibre on a mission
Designer fibre
Fibre for creativity
Sci-fibre
Fibre for everyday
Key questions leading to a review of the 2050 roadmap

• Where are we in our journey?

• Can we still deliver -80% carbon & +50% added-value?

• What is the financing needed to drive the transformation in our industry?
A renewed path to 2050

1990
60 million tonnes CO₂

2015
49 million tonnes CO₂

2050
12 million tonnes CO₂

- Transport
- Direct emissions
- Purchased electricity
Lessons learnt from the second roadmap

• We’re 10 years ahead on our carbon emission reduction trajectory

• From breakthrough to emerging technologies:
  > the “unknown territory” has reduced
  > Our work was a source of inspiration for new R&D projects

• Costs for decarbonisation and value-added creation are still substantial: additional 44 bn € over the next 30 years
  > Need to aligning of R&D programmes, policies, financing
New challenges ahead

• What role for our industry in a net-zero EU economy by 2050?

• How far can we go in reducing carbon emissions?

• Can we ultimately go to zero carbon emissions by 2050???
Ongoing CEPI 2050 activities
Addressing the “big elephant in the room”

Fuel mix in the pulp and paper industry (2017 figures)

- Biomass: 58%
- Natural gas is 87% of total fossil fuels & about 75% of total CO₂ emissions

Legend:
- Biomass
- Electricity (Net bought)
- Other (WoW)
- Coal
- Gas
- Fuel oil
- Other Fossil Fuels
Production of recycled paper and natural gas in the industry’s energy mix

<table>
<thead>
<tr>
<th></th>
<th>Share of Natural Gas in fuel used for paper making in each country</th>
<th>Share of Paper for Recycling in domestic raw material input for paper making</th>
<th>Share of Paper for Recycling utilisation in Europe</th>
<th>Cumulative share of Paper for Recycling utilisation in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>100%</td>
<td>93%</td>
<td>11%</td>
<td>11%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>92%</td>
<td>96%</td>
<td>5%</td>
<td>16%</td>
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<tr>
<td>Spain</td>
<td>70%</td>
<td>79%</td>
<td>11%</td>
<td>27%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>68%</td>
<td>93%</td>
<td>7%</td>
<td>33%</td>
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<tr>
<td>Germany</td>
<td>56%</td>
<td>89%</td>
<td>37%</td>
<td>70%</td>
</tr>
<tr>
<td>France</td>
<td>38%</td>
<td>83%</td>
<td>12%</td>
<td>81%</td>
</tr>
<tr>
<td>Austria</td>
<td>33%</td>
<td>64%</td>
<td>5%</td>
<td>86%</td>
</tr>
<tr>
<td>Belgium</td>
<td>28%</td>
<td>81%</td>
<td>3%</td>
<td>89%</td>
</tr>
<tr>
<td>Portugal</td>
<td>24%</td>
<td>22%</td>
<td>1%</td>
<td>90%</td>
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</table>

For these countries with high share of natural gas, paper for recycling is by far the main source of domestic raw material used for paper making.
We’ve looked at different options...

<table>
<thead>
<tr>
<th>OBSTACLES</th>
<th>High CAPEX</th>
<th>High OPEX</th>
<th>Local / Geographical condition</th>
<th>Social / Political resistance</th>
<th>Additional infrastructures</th>
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</thead>
<tbody>
<tr>
<td><strong>OPTIONS</strong></td>
<td></td>
<td></td>
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<tr>
<td>On-site RES</td>
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<tr>
<td>- Bioenergy from solid streams</td>
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<td></td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>- Heat Pumps</td>
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<tr>
<td>- Geothermal</td>
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<tr>
<td>- Solar &amp; Wind</td>
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<td></td>
<td>X</td>
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<tr>
<td>Decarbonised natural gas</td>
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<td>X</td>
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<td></td>
<td>X</td>
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<tr>
<td>Switch to full electrification</td>
<td>X</td>
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<td>X</td>
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<tr>
<td>Switch to solid biomass</td>
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<td>CCS</td>
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... but, for one reason or another, none of them seems to deliver, on its own, a definitive solution to the problem.

Source: [http://www.cepi.org/decarbonising Whilst pioneering in recycling](http://www.cepi.org/decarbonising Whilst pioneering in recycling)
A ‘no regrets’ option: primary energy reduction in heat production
Moving forward

• Our industry will continue working to:
  • Identify, develop and deploy innovative decarbonisation solutions for industrial processes, with a particular focus on energy efficiency and on-site renewable energy sources
  • Work with other stakeholders to find solutions on the energy demand (energy companies, energy manufacturing suppliers, pulp and paper manufacturing suppliers, research centres & universities…)

• ... but we need support to address the energy supply side
  • Establishing a **European Clean Energy Master Plan**, with clear milestones, for a cost-efficient energy transition that would deliver, in particular:
    • Cost-competitive climate-neutral fuels for industry (be it biogas, hydrogen, synthetic gas or others), using existing infrastructures
    • Large-scale roll-out of cost-competitive climate neutral electricity generation
    • Effective sector integration, by adequately recognising and valorising energy system benefits from distributed industrial generation, such as CHP facilities.
The journey continues
Thank you