



RE INVEST 2050

ADVANCING LOW-CARBON
INNOVATION IN THE FOREST
FIBRE AND PAPER INDUSTRY



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Executive summary

Cepi publishes the third edition of REINVEST2050 in unprecedented times. For months our private lives and business decisions have been affected by the coronavirus pandemic. Despite these circumstances, we present 16 projects to reduce our carbon emissions that have been successfully finalised over the past two years.

Just a few weeks ago the European decision-makers agreed to increase the 2030 GHG emission reduction target paving the way to climate neutrality by 2050. Now proposals for updating the climate and energy regulatory framework are about to be put forward. To keep our industry internationally competitive, the “Fit for 55” package will be essential.



Towards 2050

Reaching a climate-neutral Europe by 2050 will require simultaneously deploying various solutions in different regions. We aim to increase our product portfolio to boost the competitiveness of several industrial sectors by significantly improving their environmental performance.

But a fair and sustainable transition needs to safeguard and enhance our industry's competitiveness. This will require a substantial commitment from all players, industry sectors, society and each of the Member States.

Today's new investments

The project REINVEST2050 is a commitment of the forest fibre and paper industry to demonstrate how the industry is actively taking responsibility for reducing its carbon emissions, as well as playing a leading role in providing bio-based alternatives to more carbon-intensive products.

As a biannual commitment, the third edition of REINVEST2050 gathers 16 case studies from 8 EU countries, involving 13 companies representing a diverse array of projects carried out over the past two years despite the strong effects of the coronavirus pandemic.

By improving energy efficiency and switching to renewable energy sources as the main tool to reduce our carbon emissions, our industry contributes to meeting climate change and energy goals.

In addition, our innovative products help society shift from fossil-based to sustainable, renewable and recyclable products and solutions thus playing a pivotal role in the transition towards a low-carbon economy.

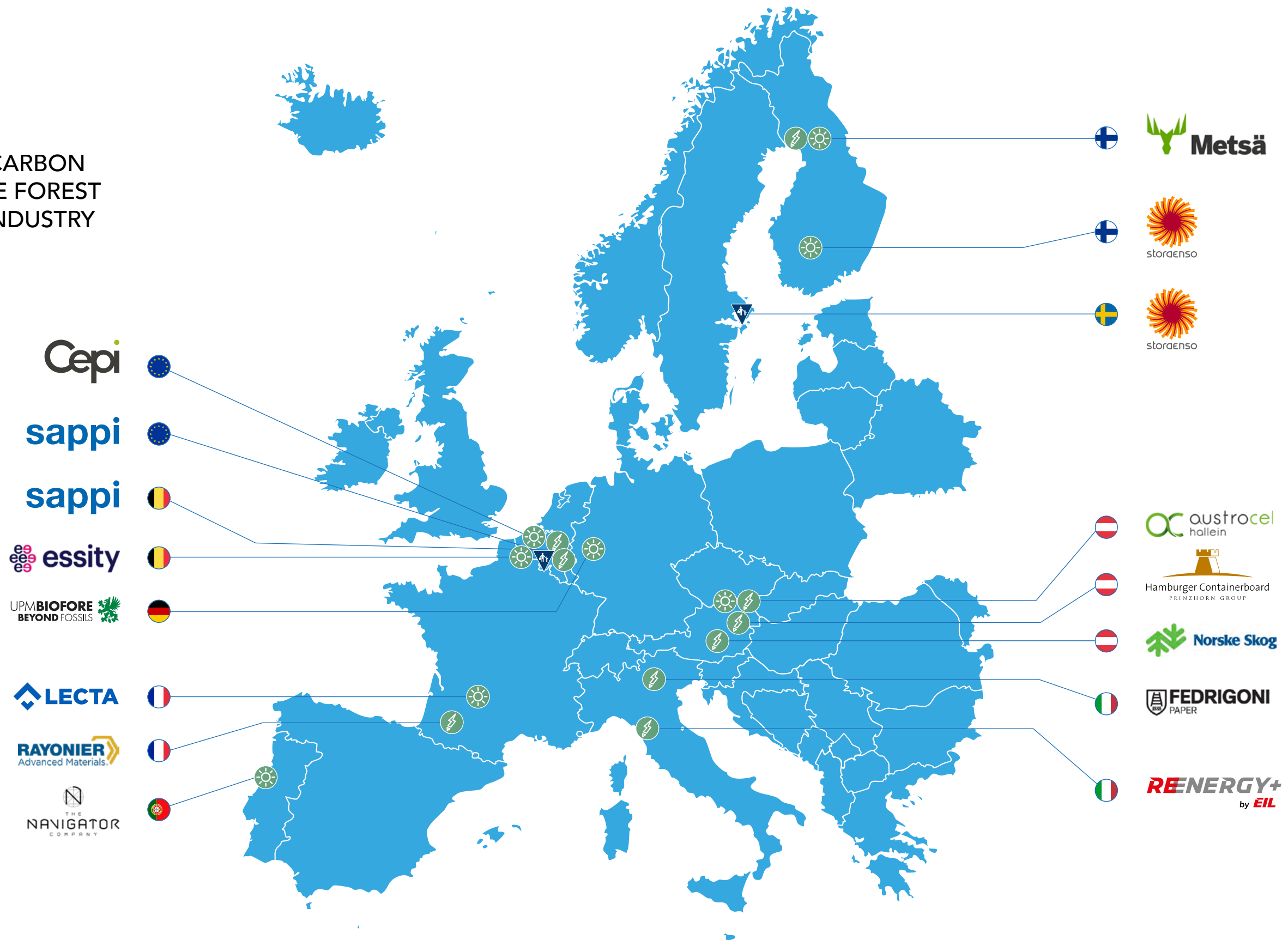
Way forward

Our vision is to advance the industrial transition in Europe, coupling value creation and decarbonisation in a wide range of European value chains through product innovation, enhanced productivity and process efficiency.

The pulp and paper sector industry is in a key position to support the EU in becoming fit for 2050. To keep our industry internationally competitive and to promote carbon-saving solutions, the following measures are essential:

- A regulatory framework that promotes, de-risks, supports and rewards investments in energy efficiency, CO₂ avoidance and renewable energy
- Availability of affordable climate-neutral energy sources – such as electricity, biogas or hydrogen – without sectoral restrictions
- Supporting the phasing out of fossil fuel combustion
- Securing effective protection for our sector against the risk of carbon leakage

In the meantime, Cepi continues to inspire the development and implementation of innovative technologies, solutions and concepts in our industry. A year after the launch of the Energy Solutions Forum, we step up our efforts to further support knowledge sharing within our industry and demonstrating new technologies by developers and suppliers.



Energy efficiency



Renewable energy



Communities & Bio-products



JOERG HARBRING
CEO

What were the main arguments that convinced your stakeholders to approve the investment into this bio-ethanol plant?

CEO Joerg Harbring:

Our experts developed a very detailed and sound technical concept over the last couple of years. The REDII Directive in 2018 also helped a lot, and in the end we were able to agree on a long-term off-take contract with OMV. Therefore, financing was not an issue anymore.

What is unique about your project?

Project Manager Franz Dieterich:

We are talking about the world's largest bio-ethanol plant based on wood. The fermentation process for the sulphite brown liquor is the trickiest part. Our R&D experts developed a tailor-made yeast for this kind of environment. We make use of a cellulosic residual stream of our Pulp Mill, meaning we don't need to bring in raw material from external suppliers. In addition, all transport of ethanol is done by rail.

Main features:

- **CO₂ Emissions saved (tCO₂)**
Up to 50,000 tonnes annually
- **Investment**
€40 Million
- **Partnerships**
Austrian oil company OMV

Green AustroCel Completes World's Largest Wood-Based Bio-Ethanol Plant

▲ Project Description

AustroCel recently completed the world's largest wood-based bioethanol plant. The €40 million production plant for advanced bio-ethanol fuel uses brown liquor, a by-product from the Sulphite Pulp Mill in Hallein, Austria, and has annual capacity of up to 35 million litres. Austrian oil company OMV blends the material into petrol, helping reduce CO₂ emissions in the transport sector by up to 50,000 tons a year. This project was commenced following the launch of the REDII Directive in 2018, requiring fuel companies to add a certain portion of advanced biofuel to their products. Our majority stakeholder, the financial investor TowerBrook, and other private investors have supported the development of bio-ethanol from the very beginning, in 2018. The project was further supported by the Austrian central government and the Land of Salzburg, which granted about €3 million of subsidies.

▲ Project Purpose

The main reason for this project is to derive the maximum resource efficiency from our main raw material, spruce wood (residual wood from sawmills). Brown liquor is a waste residual from our pulp production and would normally be incinerated, so by producing bio-ethanol, we add significant value to this residual side stream (+10% revenues), meaning we have improved our global competitiveness in the dissolving pulp industry. Moreover, we have finally reached our strategic objective of being a true bio-refinery, creating the Green AustroCel.

▲ Project Evaluation

The bio-ethanol project was started up in late 2020, and is currently producing high-quality advanced biofuel at a rate of 25 million litres per annum (full capacity 35 million litres). The first deliveries have been made to OMV and successfully blended into petrol. The project was completed on time despite COVID, and within the budget. The payback for this strategic project is five years, which could be shortened as capacity can still be increased. A further benefit is that the concept of manufacturing bio-ethanol from brown liquor might also be used by other pulp mills in Europe which have similar production processes as AustroCel.



austrocel
hallein



MARTIN STEER

Head of Energy, Waste water treatment
& Environment

Our goal is to make the circular economy as sustainable as possible. With the commissioning of the new steam storage facility, we have made significant progress on this issue. The steam accumulator installation enables us to buffer the thermal energy we generate in a sensible way, and at the same time save on fossil fuels. As a result, we achieve an annual CO₂ saving of 9,600 tonnes and thus make a significant contribution to climate protection. The steam storage is an important step towards decarbonising our paper mill and contributes significantly to achieving the goals of our long term energy strategy.

Main features:

- **CO₂ Emissions saved (tCO₂)**
Reduction of 9,600 tonnes of CO₂
- **Investment**
€2.7 million invested

Steam accumulator in the paper industry: an innovation of the energy supply system

▲ Project Description

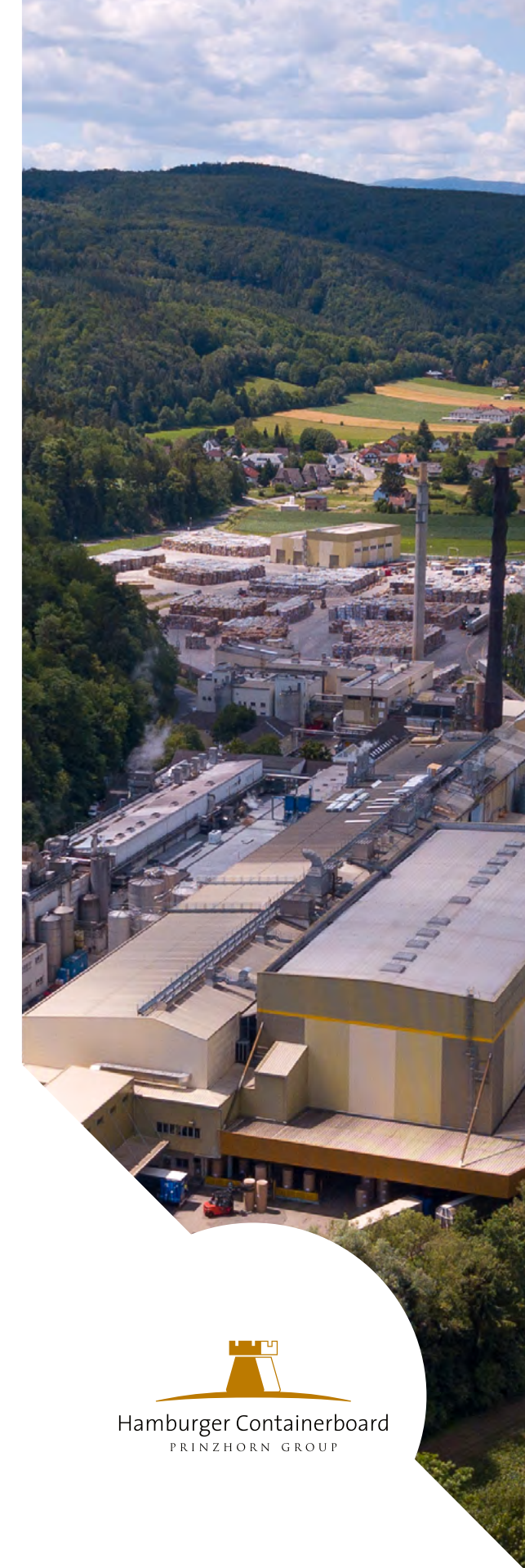
Hamburger Containerboard is investing in state-of-the-art technology for energy- and resource-saving paper production in our Pitten mill. With the commissioning of a state-of-the-art steam storage facility at the site at the end of 2020, Hamburger is taking a further step towards energy efficiency and saving resources in our production. If web breaks occur, excess steam can now be stored temporarily in the steam accumulator as valuable heat energy, and thus fully utilised for the first time. One of the main challenges was the transport and placement of the cylindrical steam storage tank, with a diameter of 4 m, a length of 15 m and a weight of 85 tonnes – all in one piece. Furthermore, a new, complex load balancing and controlling concept had to be created in order to be able to use the steam accumulator most efficiently. The stakeholders were regional suppliers, as well as long-term partners who could be relied upon even during the COVID-19 pandemic.

▲ Project Purpose

By adding a steam accumulator (boiling water storage tank) as a buffer installation, we can prevent valuable steam from being lost during web breaks on the paper machines. In addition, loss times and reject quantities can be significantly reduced because of the faster availability of process steam from the steam accumulator. One positive side effect is that energy appliances at a low thermal level (e.g. building heating) can be supplied via the steam accumulator instead of consuming expensive primary energy.

▲ Project Evaluation

The more efficient use of energy also reduced the amount of primary fuel required for steam generation in the form of hard coal by more than 3,500 tonnes. Annual emissions of fossil CO₂ from the paper mill were thus reduced by 9,600 tonnes. The precise load control concept improves the boilers' fuel efficiency, and thus indirectly saves even more fuel. Hamburger has invested more than €2.7 million in the new installation.





ENZO ZADRA

Managing Director Norske Skog Bruck

“This energy project is a perfect fit for several reasons,” says Enzo Zadra, managing director of Norske Skog Bruck. “It replaces fossil gas with energy produced from regional refuse-derived fuels (RDF) material, and hence represents a significant energy saving and improved carbon footprint. It creates new, diversified revenues for Norske Skog, while supporting the EU’s ambition of reducing material going to landfill. Locally, the new energy plant will create around 20 jobs at the mill, but more importantly it represents a step-change in our mill’s long-term competitiveness, which is important for Norske Skog Bruck and all the stakeholders around us. I’m pleased to see that the project is progressing very well towards launch – safely, on time and on budget.”

Main features:

- **CO₂ Emissions saved (tCO₂)**
Fossil CO₂ emission reduced by 150,000 tonnes.
- **Investment**
Investment of €72 million
Creates around 20 new permanent jobs
- **Partnerships**
Strong local sourcing profile with around 90% of the boiler’s fuel sourced from within 200 km.

Norske Skog investing in new sustainable energy boiler in Austria: Green diversification and increased competitiveness

▲ Project Description

Norske Skog is investing €72 million in a new waste-to-energy boiler at its paper mill in Bruck (Austria). The new boiler will replace the steam production of existing natural-gas-fired boilers used for paper operations, reducing fossil CO₂ emissions by about 150,000 tonnes per year. In addition to supplying heat to the paper mill, the boiler will also provide steam to the district heating network in the city of Bruck. With an annual capacity of 160,000 tonnes of waste, the boiler will meet the increasing incineration demand within the EU and Austria for refuse-derived fuels (RDF) and sludge, and reduce the amount of material going to landfill.

The boiler starts up in the first half of 2022 with an annual positive profitability effect of around €19 million, coming from revenue from incineration fees, energy savings and reduced CO₂ emissions.

▲ Project Purpose

The boiler increases Norske Skog Bruck’s long-term competitiveness through energy saving, reduces its carbon footprint and diversifies its revenues by generating revenue from the combustion of RDF, rejects and sludge from the Austrian pulp & paper industry.

The boiler will provide Norske Skog Bruck’s industrial operations with cost-efficient and sustainable steam, and is an important stepping stone for further strategic and green investments at the Bruck site.

▲ Project Evaluation

The investment decision of €72 million for the waste-to-energy boiler was taken by Norske Skog in June 2019. Construction of the boiler and related infrastructure are currently ongoing, all on budget, with start-up planned for the first half of 2022. The boiler operations will have a strong regional sourcing concept, with around 90% of RDF and sludge being sourced within 200km.





FEDERICO RIZZA

Essity Belgium SA/NV Energy Manager.

In a paper machine the Yankee cylinder is the core of the drying process. It represents more than 50% of the thermal energy used in the paper production and it is an equipment with a very long lifetime (up to 40 years). The choice of the right technology has definitely an impact on the energy consumption for the next decades. This is the reason why we have chosen an energy efficient Steel Yankee dryer, giving a huge contribution to our decarbonisation journey.

Main features:

- **Investment**
several million euros

New steel yankee dryer: energy and CO₂ reduction

▲ Project Description

Essity is a leading global hygiene and health company. We are dedicated to improving well-being through our products and services. At our Belgium site, Essity produces toilet paper and facial products, with an integrated cycle that starts from virgin pulp.

For many years, we have been introducing comprehensive measures to reduce CO₂ emissions and to increase overall energy efficiency. To reach these ambitious goals, we have created an energy and material saving program (the ME-Save Program) with the aim of optimising energy consumption and reducing material waste, in full compliance with the circular economy philosophy. One of our main projects, recently completed, is the installation of a new dryer cylinder on our paper machine number 2, which makes toilet paper. Essity Belgium chose to install a new-generation dryer cylinder: the Steel Yankee Dryer (TT SYD). The SYD transmits the heat to the paper sheet more efficiently than the old cast-iron cylinders, reducing the loss of energy in the steam loop.

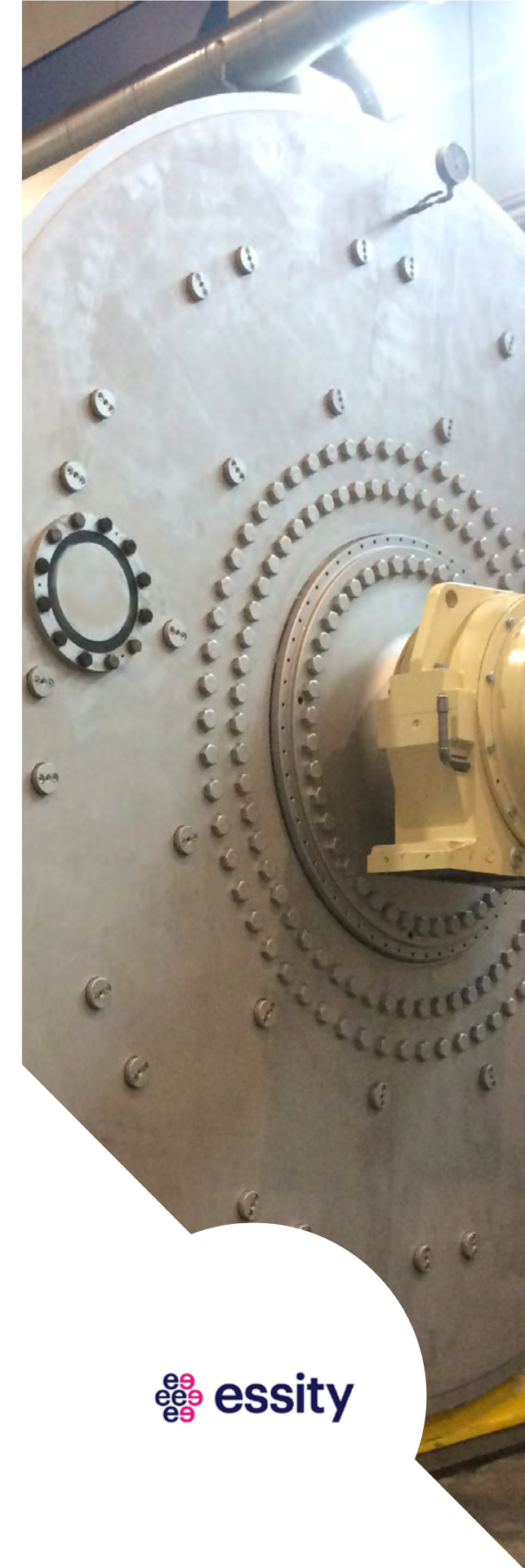
Thanks to this new technology, Essity has reduced the amount of natural gas used for heating the air in the hoods, reducing the machine's CO₂ emissions by 25%.

▲ Project Purpose

Increase the paper machine's efficiency, reducing the environmental impact of toilet paper production.

▲ Project Evaluation

The implementation of SYD has increased the paper machine's efficiency, reducing energy consumption by 6%. Furthermore, thanks to this project, Essity cut the entire mill's annual CO₂ emissions by 5%.





ERIC RAEDTS

Director of the Sappi Lanaken mill

“Since we got the PM8 in 1986, it has been a producer of mechanical coated paper,” Eric Raedts explains. “So we are converting from a mechanical coated paper machine to a low-grammage wood-free coated paper machine, which can produce sheets at a bulky quality level, but at the same grammage.”

During the shutdown, those who work with the PM8 have been kept busy. Eric says, “80 people are normally involved in PM8. For the first four weeks of the shutdown, they had intensive training from our own engineers, and for the last four weeks they got to see how PM8 was being rebuilt and test out their training ahead of the start-up of the machine.” Since 12 June 2019, PM8 has been able to produce saleable paper again. He concludes: “A major milestone has been reached.”

Main features:

- **CO₂ Emissions saved (tCO₂)**
23,500 tCO₂/year
- **Investment**
130,000 k€, of which more than 29,000 k€ for energy savings
- **Partnerships**
Valmet as main supplier for the rebuild

Project Horse Sappi Lanaken mill

▲ Project Description

In 2019, Project Horse converted Lanaken’s PM8 into a world-class machine for coated fine papers in the light grammage ranges (from 70 to 115 g/m²), thus securing its future. In addition to a rebuild needed to improve quality, a great deal of attention was paid to reducing primary energy consumption, thus shrinking Sappi’s CO₂ footprint. All this is in line with Sappi Europe’s strategic target to reduce the footprint by 25% by 2025.

▲ Project Purpose

For PM8 to have a future, state-of-the-art equipment had to be implemented in various positions. A new shoe press was installed, next to a new suction roll in the wire section (a Valmet FormMaster), and an online calendar. Where possible, frequency drives were implemented, and great attention was paid to relighting. A completely new concept of the drying application in the coating section resulted in great energy savings.

▲ Project Evaluation

PM8 was shut down completely during April/May in 2019; by mid-June it was already producing good quality paper. The major investment was showing good results not only in new quality but also in reduced energy usage. The new elements made it possible to reduce primary energy consumption by 8.4%, continuing our long-time efforts in various voluntary agreements with the Flemish Government (Benchmarking Covenant in the past, and EBO at present).



sappi



ANNITA WESTENBROEK

Energy Innovations Manager, Cepi

In the Energy Solutions Forum information and expertise is shared on solutions and conditions for realising the challenging objective of a carbon neutral pulp and paper industry in Europe. This is not about our traditional innovations and gradual improvements, but about a big leap forward. A leap that cannot be taken without sectoral cooperation and support.

The forum assists the industry to keep track on the exponential technological progress and the available support tools. The involved technology developers become aware of the required (breakthrough) technologies and the sector's willingness to change, support and invest in it. And the forum helps Cepi to identify the non-technological hurdles that requiring advocacy on European level.



Cepi Energy Solutions Forum

▲ Project Description

Cepi launched the Energy Solutions Forum (ESF) in January 2020. It is an informal multi-stakeholder industry platform which focuses on finding and communicating about solutions to reach zero fossil emissions in the paper industry while remaining globally competitive. This is done through: Facilitating the exchange of knowledge and expertise; identify the relevant technologies to be developed and integrated; ensuring the crucial R&D&I topics are included in European R&D calls; to assist technology developers and suppliers in demonstrating innovative technologies and to accelerate their implementation; and to create a stimulating environment by remove any non-technological hurdles in policy and legislations.

▲ Project Purpose

The pulp and paper industry aims to reach the 2030 carbon reduction goal and European carbon neutrality in 2050. This requires the development and implementation of energy-efficient technologies and carbon-neutral energy sources in our production processes.

Which technologies are possible? Where in the process can the largest savings be made? How can these innovations be implemented, while at the same time remaining financially healthy and competitive? The ESF supports the industry in answering these questions.

▲ Project Evaluation

The ESF discussions have led to Cepi dedicated competition guidelines on innovation facilitating the exchange of knowledge in the regular ESF Platform meetings. ESF Toolkit meetings are organised monthly to educate about existing tools and technologies. Other ESF meetings are dedicated to experience and technology sharing of specific innovative energy-saving or carbon saving technologies and concepts. Any stakeholder in the paper industry value-chain willing to offer its expertise to help the sector moving forward is welcomed.





MARCO EIKELENBOOM
CEO of Sappi

At Sappi we contribute to a thriving world by unlocking the power of renewable resources. With creativity and ingenuity, we're engineering new bio-based products to support the circular economy our world needs. We work to make the most out of every tree, to reduce waste and emissions, and to provide purposeful products that enhance people's everyday lives with sustainability at the core. I am excited to see how our product innovations are helping brand owners meet their sustainability commitments and fulfil the promises they have made to reduce or eliminate fossil-based packaging, transition to a circular economy and deliver on greenhouse gas emission reductions. To meet these growing demands, we are scaling up our capacity by introducing a new barrier coating technology for functional paper packaging at our speciality mill in Alfeld, Germany. Through this initiative Sappi will continue to challenge conventional packaging with new ideas and solutions, making it easier for the world to shift to a circular economy.

Main features:

- **CO₂ Emissions saved (tCO₂)**

Recent studies find that this type of innovative paper-based packaging is able to reduce CO₂ by more than 75% when compared to the incumbent material. As the technology further develops, there is potential for reductions by as much as 90%.

Revolutionising fibre-based packaging: Sappi's innovative barrier papers provide cutting-edge solutions

▲ Project Description

Sappi's product innovation focuses on providing the market with fibre-based packaging solutions for applications that have traditionally relied on films, aluminium and multi-layer laminates.

Our expanding range of functional papers supports the shift away from fossil-based materials towards renewable, paper-based packaging solutions. The papers deliver barriers to oxygen, water vapour, grease, aromas and mineral oil, which radically expands the scope for paper-based packaging applications and offers a viable replacement for fossil-based and non-recyclable materials.

While fibre-based packaging is not new per se, what is new in Sappi's development is incorporating new functionalities within the paper structure. Providing a barrier that fully delivers the protective function of packaging is essential if paper is to replace films or multi-layer laminate structures. Developing the innovation required to deliver heat sealability within functional papers also eliminates the need to add further sealing coatings or layers.

Moreover, it's essential that the paper can run at high speeds and on existing machines without cracking or other damage. This is made possible by Sappi's close partnership with OEMs, during which packaging machines are individually adapted to the properties of the barrier papers.

▲ Project Purpose

By developing functional papers, Sappi strives to deliver fibre-based packaging solutions that provide exceptional product protection, run on existing packaging technology and contribute to a circular economy by being recyclable in the paper waste stream.

▲ Project Evaluation

In collaboration with leading brand owners, Sappi's functional papers have been launched in a number of applications, particularly in the areas of confectionary and tea.



sappi



ISMO NOUSIAINEN
CEO of Metsä Fibre

The Kemi bioproduct mill will be a global frontrunner in environmental, energy and material efficiency. No fossil fuels will be needed in production, and the mill's environmental impact will be minimized. The mill will be built using the best available technology, and the technological level meets and even exceeds the EU BREF requirements. The mill will also create the basis for development of a local industrial ecosystem with new bioproducts and partnerships, as has been the case with our bioproduct mill in Äänekoski. Demand for Nordic softwood pulp continues to grow globally, and we are responding to that with sustainably and responsibly produced pulp.

Main features:

- **CO₂ Emissions saved (tCO₂)**

Altogether these projects decrease fossil CO₂ emissions by 150,000 tons and significantly increase the production of biobased products and energy.

- **Investment**

Kemi bioproduct mill €1.6 billion; Rauma sawmill €200 million

- **Partnerships**

It creates a platform for an ecosystem where new partnerships can be formed and new bioproducts can be produced.

New Kemi bioproduct mill

▲ Project Description

Metsä Fibre, part of Metsä Group, is using a unique bioproduct concept to build a new fossil-free bioproduct mill in Kemi, Finland. The value of the investment is €1.6 billion, and the new mill will create an industrial ecosystem for new biobased products manufacturing, while generating about 2.5% of the country's electricity. The mill uses best available technology, including artificial intelligence, digitalisation and electrification.

In addition to the fossil-free Kemi bioproduct mill, Metsä Fibre is currently building the world's most modern sawmill in Rauma, Finland. The new pine sawmill enables both the Rauma sawmill and the pulp mill to operate without any fossil fuels. With these investments, Metsä Group meets the needs of forest owners and our customers even better than before, across the entire forest industry value chain, and will play a significant role in combating climate change.

During these projects there has been an active, positive dialogue with stakeholders including the national government, parliament and NGOs, as well as local authorities and citizens. These investments are also a significant step towards Metsä Group's 2030 sustainability targets.

▲ Project Purpose

The Kemi bioproduct mill will produce 1.5 million tonnes of softwood and hardwood pulp per year, as well as many other bioproducts. It will also produce 2.0 TWh of renewable electricity per year, about 2.5% of Finland's total electricity production.

▲ Project Evaluation

The Kemi mill will increase the annual value of Finland's exports by €500 million, and the positive annual income effect in Finland will be at about the same level. The new mill will secure the current 250 jobs at the Kemi pulp mill for decades to come, and the mill will create 1,500 new jobs along its entire direct value chain in Finland. All in all, about 2,500 people in Finland will work in the direct value chain.





MIKAEL SILLFORS

Development Manager at Heinola Mill

The pilot plant processes 16,000 tonnes of biowaste per year. The resulting biofuel is used in the mill's power boiler and to heat the nearby town of Heinola, with about 20,000 inhabitants. Heinola Mill has been providing district heat to the city and its residents since the 1980s.

"The treatment of biosludge produced at our mill offers opportunities for a bio-based circular economy, which supports Stora Enso's environmental goals. With this technology, we can both save the environment and reduce our costs," says Mikael Sillfors, Development Manager at Heinola Mill.

Main features:

- **CO₂ Emissions saved (tCO₂)**
Reduced need to use supporting fossil fuel
- **Partnerships**
C-Green Technology AB

Heinola HTC

▲ Project Description

Sludge is a by-product of processes in industry and agriculture. It is very wet, so disposing of it is difficult. A pilot project at Stora Enso's Heinola Mill in Finland addresses this challenge in the spirit of the bio-based circular economy. The mill used to burn biosludge at its power station for thermal power, but because it is so wet, a fossil-based fuel was needed to support the burning process – an obstacle to the mill's long-term goal of achieving carbon neutrality.

In 2019, an industrial-scale pilot plant was built at the mill, using a technology developed and patented by the Swedish company C-Green Technology AB. For the first time, bio-sludge is dried in an energy-efficient way with pressure and heat, making it a clean and odourless biofuel. It can then be burned without additional fossil-based fuel. Alternatively, there is a possibility to use it as a growth medium.

▲ Project Purpose

With the pilot plant, Stora Enso is investigating how much CO₂ emissions can be reduced with the treatment of bio sludge. Stora Enso's goal is to reduce the use of fossil fuels and get as close to zero levels of CO₂ emissions as is commercially feasible. A high proportion of biomass is already used in internal energy production at most of our mills.

▲ Project Evaluation

The dried biosludge offers many possibilities. For instance, it promotes the circular economy by providing an opportunity to reuse the nutrients it contains. For example, this can be realized by using the final product as a growth medium. The HTC plant can also accept other sludges from outside the Heinola mill, contributing on a larger scale.





STÉPHANE DE GELIS

Condat director

What is exceptional about the project?

We consider sustainability to be a key driver for innovation.

This solar thermal plant is a great challenge, which positively influences the climate. This project is exceptional because of the combination of an innovative start-up - is focused on solar energy- and a century-old heavy industry, supported by ADEME, the French agency for energy transition.

Can this project be a successful model for the future?

Solar energy is free and available wherever we are. Our eco-responsible approach is a key contribution to protecting the planet. Taking advantage of this free energy requires available land and a consumer located nearby. However, it is obvious to develop new solar thermal plants for paper industry, and every organisation which needs heat, e.g. for district heating.

Is the project part of a bigger scheme towards decarbonisation?

The solar thermal plant takes a significant step forward towards our decarbonisation goals in Condat - LECTA. Several actions and projects have been completed or are in progress: electricity from the renewable production plant, and a refuse-derived fuel (RDF) boiler to provide low-carbon steam based on circular economy.

Main features:

- **CO₂ Emissions saved (tCO₂)**
1,000 T CO₂/year
- **Investment**
€2.2 million
- **Partnerships**
3.9 GWh/year

Solar thermal integration project in Condat paper mill

Project Description

Condat is part of the LECTA Group, a leading European maker and distributor of special papers for labels and flexible packaging, coated and uncoated paper for publishing and commercial printing, and other high added value printing media. Condat has developed a decarbonisation project with the company : building a plant that produces heat from solar energy, supplying the paper mill with hot water for its paper production process and reducing the consumption of fossil energy. This project is the first step in our energy transition to a low-carbon site.

The project is innovative not only from a technical point of view, but also commercially, as the solar thermal plant is built, owned and operated by the company. This project also made it possible to rehabilitate an area previously used for the storage of carbonated sludge. It integrates state-of-the-art technologies from suppliers such as Savosolar, which makes flat plate collectors used in large-scale solar thermal applications, and Exosun, a supplier of solar tracking technology. The project was promoted by LECTA management both internally and externally and was also supported by local authorities.

Project Purpose

The decarbonisation project consisted in building a greenfield solar thermal plant featuring 4,211 m² of solar panels with a peak heating capacity of 3.4 MW.

The solar thermal plant aims at reducing natural gas consumption through the supply of renewable hot water to the Condat paper mill. Overall, this project has also improved energy efficiency and reduced operating costs.

Project Evaluation

Main features of this project are i) a production of about 3,900 MWh/ year of renewable heat, ii) a decrease of fossil use in steam boilers (equivalent to a reduction of carbon emissions of 1,000 t/year) and iii) an improvement of steam management at the paper mill thanks to higher flexibility of steam production facilities.

This solar thermal plant is the largest installation in France and also the first of its kind in the world through the use of solar tracking systems. This project has become a benchmark for the production of solar heat, and similar projects may be developed in the company and elsewhere in France and Europe.





STÉPHANE, MARQUERIE
Industrial Manager

Rayonier AM Tartas pulp mill is moving to high efficiency biorefinery process since 20 years. The first step has been to move from paper and fluff pulp to specialties chemical application to produce **bio-materials**. The other challenge achieved during the same period was to reduce Environmental impact by producing add value **bio-gas** and **bio-fuel** from COD. The last step recently launched is to improve energy efficiency and carbon foot print by recovering fatal energy (from water and gas emissions) to **bio-electricity**. All this ambitious and efficient program brought the mill to one of the most efficient sulfite mill in the world with 78% of energy efficiency and less than 5% of fossil fuel consumption. The next step will be to produce bioéthanol with the lowest foot print carbon of the world and achieve zero energy impact.

Main features:

- **CO₂ Emissions saved (tCO₂)**
12,000 TEqCO₂/Year
- **Investment**
€25 million

Increasing renewable electricity production
by 20 GWh/year from Fatal Energy

“High added value” combined heat and power project

▲ Project Description

Rayonier Advance Material, is one of the world's largest producers of specialty cellulose pulp, manufacturing high added value products with multiple applications (food, inks, paints, varnishes, concrete...), also used by the pharmaceutical and cosmetics industries. Rayonier carried out a decarbonation project in its biorefinery located in Tartas (France), consisting in the implementation of a new a “high added value” combined heat and power system to i) better valorise by-products of cellulose pulp, ii) improve low temperature heat recovery iii) improve overall energy efficiency of the process dedicated to the production of bio-based products and bio-fuels (also reducing the share of fossil fuels) and iv) modernise the site in preparation of further transformation projects. This decarbonation project was promoted by Rayonier AM Management both internally and externally and was also supported by the Ministry. Rayonier AM was granted feed tariff for the production of renewable electricity and received subvention from the Region.

▲ Project Purpose

The decarbonation project consisted in i) installing a steam turbine to increase renewable electricity production and ii) implementing a low temperature heat recovery system on biomass boiler fumes.

Main impacts of this project were i) an increase in the efficiency of biomass boilers, ii) a drying of solid biomass (used as a fuel) from low temperature heat, iii) a reduction of fossil energy consumption and iv) an increase of electricity generation.

Overall, this decarbonation project performed in the biorefinery has reduced carbon emissions and environmental impact, while improving energy efficiency and reducing operating costs.

▲ Project Evaluation

The project will increase energy efficiency of the biorefinery by 8%:

- Recovering 185 Gwh/year of low temperature heat;
- Reducing water consumption by 850,000 m³/year;
- Increasing renewable electricity production by 20 GWh/year;
- Reducing fossil energy consumption by 5% of the overall site energy consumption

The implementation of the project has been efficient regarding cost control (no cost overruns with regard forecasted investment of €24 million), and deadlines (sale of electricity on time).

The biomass dryer installed at Rayonier AM is the largest in Europe and has become a reference for optimising the energy efficiency of all solid biomass heaters.



RAYONIER
Advanced Materials



RAINER HÄRING

Director for energy in UPM
Communication Papers

What is exceptional about the project?

The project has been initiated by UPM in Germany and planned in partnership with the utility operating the powerplant with a view to supplying other local businesses. In this case, a cross-company effort establishes a renewable energy generation facility in the middle of an industrial region shaped by lignite extraction and lignite based energy generation.

Is the project part of a bigger scheme towards decarbonisation?

It is in so far as it supports the German energy transition. The increasing share of renewable power generation is a key to reducing CO₂ emissions. To ensure a consistent supply and system stability availability of climate friendly conventional power generation is indispensable. Green power generation concepts at the scale of the Hürth Bioboiler are a vital element of the new German energy infrastructure.

Main features:

- **CO₂ Emissions saved (tCO₂)**
annual reduction of 300.000 tonnes of CO₂
- **Partnerships**
German utility E.ON

Green Steam Hürth

Project Description

UPM Hürth is the world's most modern newsprint mill, with annual production capacity of 330,000 tonnes of newsprint-grade paper made entirely from recycled fibre. The mill is located in an industrial park near Cologne, Germany, in a region that is today shaped by industrial scale lignite extraction and related industries. Lignite has also been the fuel used to provide steam and electricity for a number of companies, including UPM Hürth.

Project Purpose

Together with German utility E.ON, UPM initiated a project to establish a green power source to provide process heat for paper production at the mill and green power for a large number of surrounding companies. E.ON is building a wood-fired biomass plant with a total generation capacity of 20MW of electricity and 87MW thermal generation capacity. Upon ramp-up in 2022, this power plant will replace the current lignite-based generation, contributing to an annual reduction of Scope 1 CO₂ emissions of 300,000 tonnes for UPM alone.

Project Evaluation

This project supports UPM's ambitious climate targets of a net emission reduction of 65% by 2030 and the company's long-term pledge to achieve carbon neutrality by 2040. What's more, it is also an enabler for the transition of the German power system away from fossil power generation by providing a stable and sustainable power generation, which is needed to support efficient use of the increasing capacity of fluctuating renewable power generation sources in Germany. Thus, UPM Green Steam Hürth is a cross-stakeholder project that enables a positive contribution of the pulp and paper industries to solving the global climate crisis.



UPM **BIOFORE**
BEYOND FOSSILS



POLESCHI ANDREA

Vice President

The Reenergy+ is dedicated to the battle against climate change and to preserve the world's energy resources. To put this dedication into action, our goal is to provide:

- The best approach to new energy solutions
- Techniques that transform untapped energy into electricity
- Products that help reduce carbon emissions
- Production that minimizes the load on the environment
- We use all our resources efficiently
- We use high-quality raw materials
- We provide end-of-life treatment recommendations for our products
- Supply chain that is willing to act in a responsible way

We comply with legislation and are constantly challenging ourselves. We are committed to continual environmental improvement and sustainable development.

Main features:

- **CO2 Emissions saved (tCO2)**
6,110 tonnes/year
- **Investment**
4 million €

REENERGY+ SYSTEM

▲ Project Description

Reenergy+ inaugurates an autonomously controlled, integrated production model especially dedicated to paper mills and tissue companies, capable of guaranteeing important improvements in production efficiency and environmental sustainability.

Thanks to an innovative system that integrates the gas turbine inside the hood, Reenergy+ is the only plant that allows the recovery of exhaust fumes, reinserting them into the production cycle to use them for the paper drying phase. Reenergy+ is an autonomously guided, completely integrated system controlled by innovative software, managed by a team of specialised technicians who guarantee continuous 24h assistance anywhere in the world. Our system reduces emissions into the atmosphere by 80%. The basic project was created in 2014, and we promoted our system during an international exhibition.

▲ Project Purpose

The paper producer will generate electricity for free without increasing gas consumption, saving a proportional quantity of CO₂.

▲ Project Evaluation

The Reenergy+ control system is capable of collecting all available energy data. The customer can check its efficiency status at any time.

The cost is proportional to daily production, and the payback period depends on local energy costs; indicatively it pays for itself within three years without any subsidies. It can be installed anywhere in the world and is already designed to work with hydrogen-powered turbines.



REENERGY+
by **EIL**



ANGELO COLUCCI

Mill Director

What makes your project innovative relatively to decarbonisation?

This project significantly reduces gas consumption and CO₂ emissions (Scope I + Scope II) by ~3.350 tons per year. More importantly, the turbine could be powered in the future with a mix of methane plus hydrogen with an additional benefit on the CO₂ emissions and carbon footprint.

What challenges did you face and overcome along the way?

It was very challenging to complete the project in only 10 months and start up the new system without stop production, also considering the pandemic.

Main features:

- **CO₂ Emissions saved (tCO₂)**

Today we can confirm the reduction of about 3,350 tons of CO₂ a year; using 50% hydrogen, the reduction would reach 30,000 tonnes / year.

- **Investment**

€7.3 million

- **Partnerships**

Solar Turbines, Termo-tecnica Industriale, TESI
Austrian oil company OMV

New CHP: Gas Turbine and Steam Boiler, Arco Paper Mill

▲ Project Description

The project consisted of replacing a gas turbine (7 MW electric), a boiler and a diathermic oil boiler with a new, state-of-the-art gas turbine.

Arco paper mill (Fedrigoni Group) produces coated fine papers for global markets. Electrical energy is distributed in the plant at medium and low voltage, and thermal energy is distributed through steam and used to dry the paper. A cogeneration system is installed to reduce the cost of steam and electrical energy. The gas turbine is connected to the main gas distribution at 21bar.

The new system has an 8MW gas turbine generator, which sends its exhaust fumes (at about 500° C) to a recovery/post-combustion boiler. It is also equipped with fresh air. The new cogeneration system reduces gas consumption and CO₂ emissions. It was launched in November 2020 and will run 356 days/year (~8,500 hours / year).

▲ Project Purpose

This project significantly reduces gas consumption, and cuts CO₂ emissions (Scope I + Scope II) by ~3,350 tons per year.

More importantly, the turbine could be powered in the future by a mix of methane and hydrogen, delivering additional benefits on CO₂ emissions. The stakeholders are Provincia Autonoma di Trento, Comune di Arco (TN) and APPA di Trento, who were involved from the design phase to start-up. It was very challenging to complete the project in only 10 months and start up the new system without halting production, particularly considering the pandemic. Internally the Fedrigoni Group Board, CEO, COO, Energy Manager, Purchasing Department, Plant Manager and Maintenance were involved; external consultants and the community participated through a workplace platform.

▲ Project Evaluation

The exceptional part of this project is the technology of the new turbine compared with the old one, as well as the ability to use a mix of methane and hydrogen. This investment is part of a larger corporate decarbonisation plan, and using a mixture of methane and green hydrogen would fit with the Group's target of reducing CO₂ emissions by 2030.





FREDERICO MIGUEL CLARO PISCO

Corporate Energy Manager

The project is the first key step of the Navigator's Roadmap to a Carbon Neutral Company, with the goal to achieve carbon neutrality at its industrial sites in 2035, representing 86% reduction in CO₂ emissions versus 2018 values.

The Roadmap involves a total investment of 158 million €, between 2018 and 2035. With this ambitious plan for investment in its industrial facilities, Navigator is one of the first Portuguese companies to bring forward compliance with national and European decarbonisation targets by 15 years.

The new biomass boiler represents an investment of 55M€ and will replace not only the existing boiler but also the natural gas combined cycle power plant of Figueira da Foz mill, with electricity and heat produced entirely from renewable sources.

Main features:

- **CO₂ Emissions saved (tCO₂)**
150.000 – 200.000 tCO₂
- **Investment**
Investment 55 M€
- **Partnerships**
Andritz as the biomass boiler supplier and Raumaster as the biomass handling supplier

Biomass boiler and decarbonisation

▲ Project Description

The Navigator Company recently inaugurated a new biomass boiler at its Figueira da Foz industrial complex, in an overall investment totalling €55 million. This investment will allow the company to cut its fossil carbon dioxide emissions at this complex by around 150,000 to 200,000 tonnes CO₂ per year.

The new biomass boiler will phase out the consumption of fossil fuels for steam generation needed for the pulp and paper production process in Figueira da Foz, and thus replacing the capacity previously assured by the natural gas combined cycle power plant and old biomass and natural gas boilers.

Around 400,000 tonnes of biomass will be consumed each year to operate this new biomass boiler. Half of this is comprised of bark and sawdust, residues from wood handling operations (debarking and screening), coupled with 200,000 tonnes of residual forest biomass acquired from abroad from operations involving forest management and the cleaning of rural areas.

This investment is part of the decarbonisation strategy of the company, who decided in 2019 to meet

European targets early and achieve carbon neutrality at all of its industrial complexes by 2035, achieving an 86% reduction in its CO₂ emissions by this date.

▲ Project Purpose

Using residual forest biomass, the new boiler will generate thermal energy for the company's production processes, making power generation significantly more renewable based and efficient, using co-generation technology.

The new biomass boiler will have a higher capacity and much more rigorous environmental performance, as a result of The Navigator Company's investment in the best technology currently available for this purpose.

▲ Project Evaluation

The Figueira da Foz mill will be the first of the group with electricity and heat produced entirely from renewable sources. Navigator's remaining mills will trend towards producing 100% of the electricity they consume from renewable sources, reducing fossil CO₂ emissions using new technologies, decreasing specific energy consumption and, finally, offsetting the remaining CO₂ emissions.





ANNICA RASCH

Sales and Marketing Director of Formed Fiber products at Stora Enso

“The vast majority of takeaway packaging is still made of plastics, but some food companies want to give up all plastics, and others want to reduce their use. Either way, sustainable packaging will be essential for their future businesses,” says Annica Rasch, Sales and Marketing Director of Formed Fiber products at Stora Enso. According to Rasch, PureFiber™ products have already proven recyclable and biodegradable. That means clean products can be recycled with cardboard. As to biodegradability, the key questions are how long it will take for the material to decompose, and whether it will require an industrial composting facility.

Stora Enso sells its formed fibre products directly to brand owners and wholesalers. In the Nordic countries Stora Enso works with wholesaler Tingstad, which sells PureFiber™ food bowls directly to customers in the fast-food industry.

Main features:

- **CO₂ Emissions saved (tCO₂)**
23,500 tCO₂/year
- **Investment**
€5 million
- **Partnerships**
Tingstad and HS Manufacturing Group

PureFiber™ by Stora Enso

▲ Project Description

Eco-friendly consumers and tightening legislation are pushing takeaway food companies to consider alternatives to plastic containers. The EU is banning single-use plastic products starting with the most typical marine litter, such as straws and cutlery, in 2021. Member states will also have to find ways to reduce the use of plastic food containers and drinks cups. Various countries all over the world are planning to impose taxes on single-use plastics.

▲ Project Purpose

During 2020, Stora Enso started production in Sweden of ready-made formed fibre single-use packages. The products are produced directly from pulp using a thermoforming technology where pulp is pressed directly into its final shape. The raw material used is wood pulp from sustainably managed forests in Scandinavia. PureFiber™ by Stora Enso is Stora Enso's next generation of formed fibre eco-products. The products can be made in almost any shape where today conventional PE, PET and other plastics are used. That means PureFiber™ can be used in a wide range of applications including single-use food packaging items such as plastic-free cups, bowls, clamshells, plates and coffee cup lids.

▲ Project Evaluation

These products promote food safety by having a transparent supply chain, offering plastic-free and PFAS-free products. They are produced in Sweden with 100% fossil-free electricity, using local sourcing of raw material, short transport routes of raw material and creation of job opportunities in Europe. Stora Enso's PureFiber™ products can either be recycled or composted after use. A critically reviewed LCA study shows that the PureFiber™ product line enables an approximately 75% lower CO₂ footprint compared to alternative packaging materials such as plastic or bagasse.



Participating companies



AustroCel

AustroCel Hallein GmbH currently has more than 280 employees and is the market leader in China for textile pulp from coniferous wood, with total revenue of around EUR 130 Million. It produces up to 155,000 metric tons of viscose pulp in its bio-refinery in Hallein, Austria, as well as 100 GWh district heating and 100 GWh green power. This allows the Hallein-based high-tech firm not only to power its own manufacturing operation with cleaner energy, but also to provide green electricity to 25,000 households and district heating to 10,000 homes. With the world's largest bio-ethanol plant based on wood, AustroCel will produce up to 35 M litres of second-generation bioethanol every year.



Cepi

Cepi is the European association representing the paper industry. We offer a wide range of renewable and recyclable wood-based fibre solutions to EU citizens: from packaging to textile, hygiene and tissue products, printing and graphic papers as well as speciality papers, but also bio-chemicals for food and pharmaceuticals, bio-composites and bioenergy. We are a responsible industry: 92% of our raw materials are sourced in Europe and certified as sustainable, 91% of the water we use is returned to the environment, in good condition. We are the world champion in recycling at the rate of 72%. At the forefront of the decarbonisation and industrial transformation of our economy, we embrace digitalisation and bring 20 billion value addition to the European economy and €5.5 billion investments annually



Essity

Essity is a leading global hygiene and health company. We are dedicated to improving well-being through our products and services. Sales are conducted in approximately 150 countries under the leading global brands TENA and Tork, and other strong brands, such as JOBST, Leukoplast, Libero, Libresse, Lotus, Nosotras, Saba, Tempo, Vinda and Zewa. Essity has about 46,000 employees. Net sales in 2020 amounted to approximately SEK 122bn (EUR 11.6bn). The company's headquarters is located in Stockholm, Sweden, and Essity is listed on Nasdaq Stockholm. Essity breaks barriers to well-being and contributes to a healthy, sustainable and circular society. More information at www.essity.com.



Fedrigoni

The Fedrigoni Group is one of the main players in the world and the European leader for production and sales of special papers for graphic use and self-adhesive products for labels. In particular, it is the global leader in the production of self-adhesive labels for the wine sector.

Participating companies



Hamburger Austria

As a member of Hamburger Containerboard, part of the Austrian Prinzhorn Group, W.Hamburger GmbH is one of the leading producers of high-quality corrugated base paper in Europe. At the Pitten (Austria) site, approximately 450,000 tonnes of corrugated base paper are produced annually on the PM3 and PM4. Hamburger Pitten employs about 280 people. As an energy-intensive company, Hamburger Pitten maintains a certified energy management system in accordance with EN ISO 50001:2018.



LECTA Condat

Condat is part of the LECTA Group, a leading European group in the manufacture and distribution of special papers, and coated and uncoated paper. With an extensive international presence and a wide range of innovative products, LECTA is a leading global supplier of paper solutions. The CONDAT paper mill produces coated paper, with a paper machine dedicated to specialty paper starting in 2021 (annual production capacity of 340,000 tonnes).



Metsä Fibre

Metsä Fibre, part of Metsä Group, is a leading producer of bioproducts, biochemicals and bioenergy. The company is the world's largest producer of softwood market pulp and a globally significant manufacturer of sawn timber. There is a growing demand for Metsä Fibre's high-quality products, as renewable wood provides a responsible alternative to fossil-based materials. Annual sales is EUR 2.2 billion, and the company has 1,300 employees.



The Navigator Company

The Navigator Company is an integrated forest producer, whose end products are pulp & paper, tissue and energy. Its operations are based at modern, large scale industrial units that use state-of-the-art technology and are a benchmark for quality in the sector.

The Navigator Company produces pulp and paper from forests which are planted exclusively for this purpose. Every year, 12 million young plants start their lives in our nurseries. These nurseries are the largest in Europe, and produce 135 different species of trees and shrubs, most of which are not economically viable but are funded by Navigator in order to maintain diversity and ensure the species' continuity.

Participating companies



Norske Skog

Norske Skog is a world leading producer of publication paper with strong market positions in Europe and Australasia. The Norske Skog Group operates four mills in Europe and two paper mills and a wood pellets facility in Australasia. The Group has approximately 2,300 employees in five countries, is headquartered in Norway and listed on the Oslo Stock Exchange.



Rayonier

Rayonier Advanced Materials is the leading global supplier of high purity cellulose specialties products, a natural polymer for the chemical industry. Working closely with its customers, the company engineers natural polymeric chemical chains to create dozens of customized high purity performance fibers at its plants in the US, Canada and France. The company's facilities can produce over 1 million metric tons of high purity cellulose products for use in a wide range of industrial and consumer products.



Reenergy+ by EIL

The power of Reenergy+ stems from the strength of Eil and its experience in the design and production of plants specific for the paper industries.

Through its specialised staff, Eil provides customers with a turnkey service focused on efficiency and delivered through a capillary network of technicians, active 365 days a year, 24/7, with minimal intervention times.



Sappi Lanaken Mill

Lanaken Mill, situated on the Albert Canal in north-eastern Belgium, is an integrated mill that produces chemical, thermic and mechanical pulp (CTMP) on the basis of sawmill waste and tree prunings from durable forest maintenance. That way the mill is over 60% self-sufficient in the needs of fibre. Lanaken Mill has a unique position within Sappi Europe - it's the only integrated pulp and paper mill that produces various kinds of fine coated papers for HSWO-print (HSWO-printing: heat-set web offset).

Participating companies



Stora Enso

Part of the bioeconomy, Stora Enso is a leading global provider of renewable solutions in packaging, biomaterials, wooden construction and paper. We employ some 25 000 people in more than 30 countries and our shares are listed on the Helsinki (STEAV, STERV) and Stockholm (STE A, STE R) stock exchanges.



UPM

We deliver renewable and responsible solutions and innovate for a future beyond fossils across six business areas: UPM Biorefining, UPM Energy, UPM Raflatac, UPM Specialty Papers, UPM Communication Papers and UPM Plywood. As the industry leader in responsibility we are committed to the UN Business Ambition for 1.5°C and the science-based targets to mitigate climate change. We employ 18,000 people worldwide and our annual sales are approximately EUR 8.6 billion. Our shares are listed on Nasdaq Helsinki Ltd. UPM Biofore – Beyond fossils. www.upm.com





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