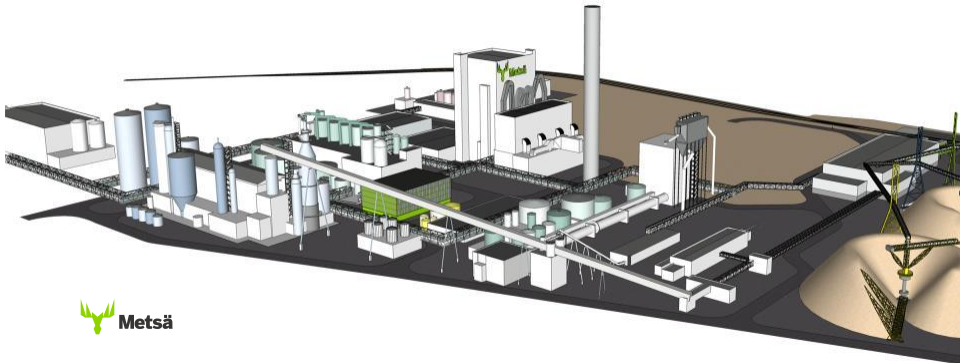
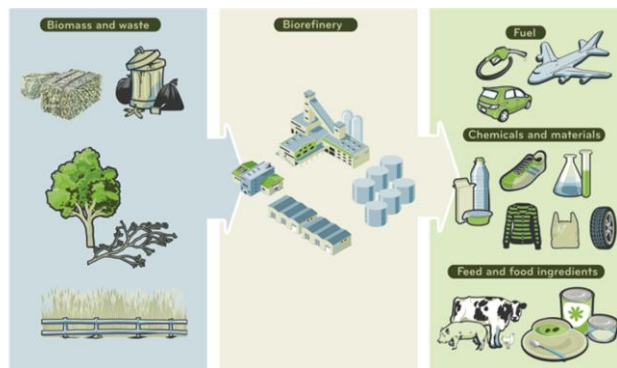


Metsä Group's Bioproduct Mill

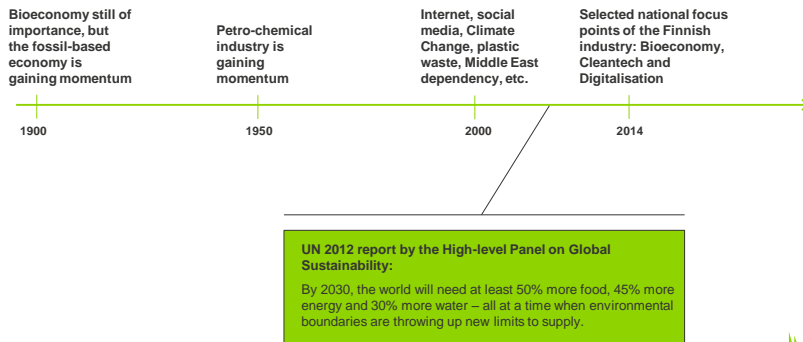
Dr. Niklas von Weymarn – VP for Research, Metsä Fibre



The bioeconomy (or the bio-based economy)



Increasing importance of the bioeconomy opens up for **new business opportunities**



3



Implication of current megatrends on capital-intensive industries

Three winning strategies moving forward..

- A. Make current production processes more efficient (and more environmentally sustainable)
- B. Enhance recycling and replace current raw materials by new, more sustainable raw materials
- C. Develop new industrial ecosystems / business models



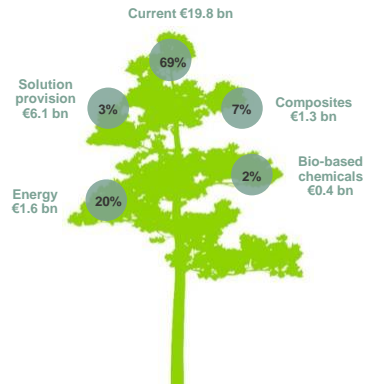
4



2020 ClusterTech scenario for the Finnish forest-based sector

By 2020:

- Value of current product sales down to 70% of the 2010 level
- Nevertheless, a total increase to 122% compared to the 2010 level is achievable thanks to growth in 'evolving products'
- Growth is achievable within the limits of sustainable wood availability in Finland; and
- meeting the national bioenergy targets for 2020

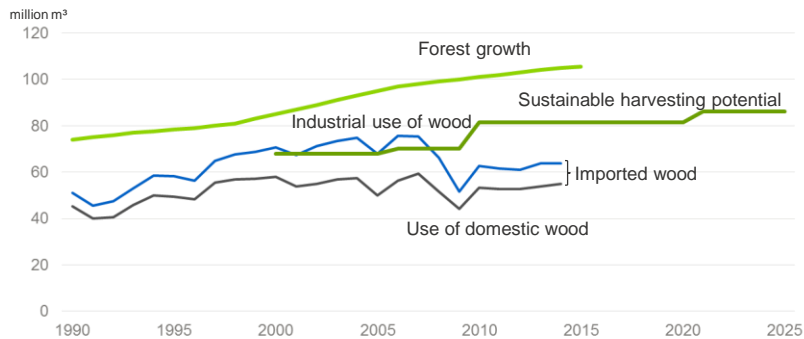


5

Source: ClusterTech II project by esp, Pöyry and VTT, 2011



Finland: The use of domestic wood can be increased sustainably somewhat



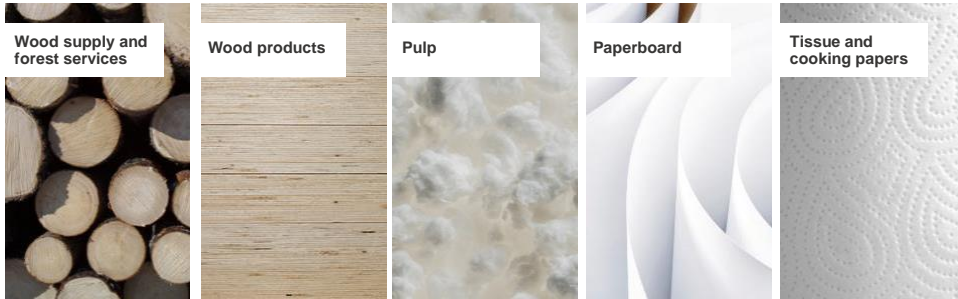
6

Source: Natural Resources Institute Finland, 2015

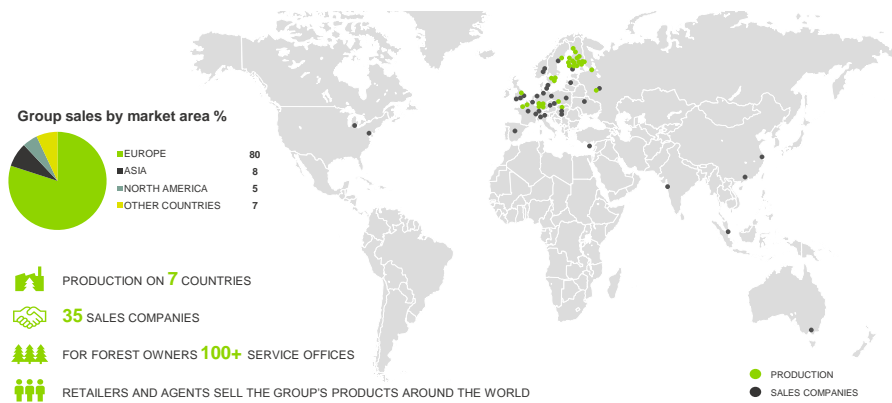


Metsä Group – Leading player in selected businesses

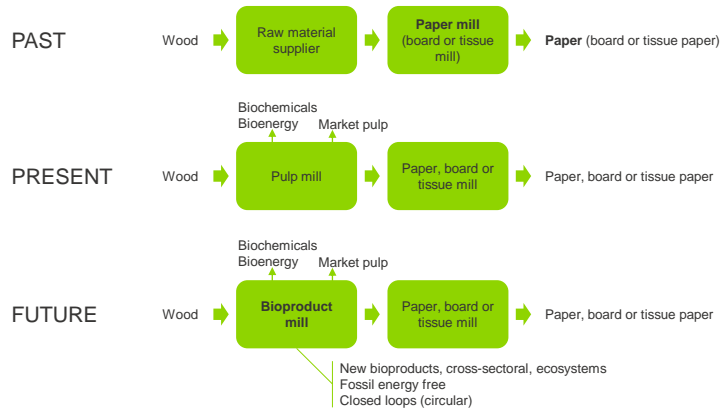
We focus on products and services with promising growth prospects and in which we have strong competence and a competitive edge



International and developing



Role of pulp production is evolving: Case Finland



9



Metsä Fibre pulp mills

JOUTSENO

- 690,000 t softwood pulp
- 3,5 million m³ of wood
- 135 employees



KEMI

- 600,000 t softwood and birch pulp
- 2,9 million m³ of wood
- 169 employees



RAUMA

- 650,000 t softwood pulp
- 3,4 million m³ of wood
- 120 employees



ÄÄNEKOSKI

- 530,000 t softwood and birch pulp
- 2,4 million m³ of wood
- 171 employees



Bioproduct mill concept

Layer A:
A highly efficient
Kraft pulp mill forms
the core

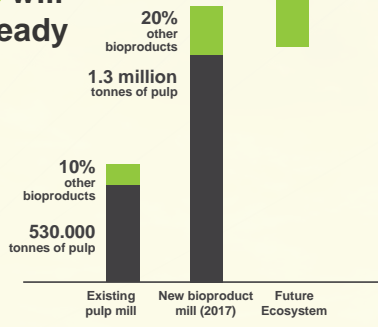


The biggest forest industry investment in Finland

- €1.2 bn investment, decision made in April 2015
- Annual pulp production: 1.3 million metric tons
- Annual wood use: 6.5 million m³
- Main markets for pulp: Europe and Asia
- Other default products: Tall oil, turpentine and bioenergy in various forms
 - Bio-electricity generation 1.8 TWh/a
 - Electricity self-sufficiency 240% (current Metsä Fibre average ~150%)
 - Use of fresh water ~10 m³/t pulp (current Äänekoski mill ~20 m³/t)
- Start-up in Q3/2017



Share of other bioproducts will increase already at the start

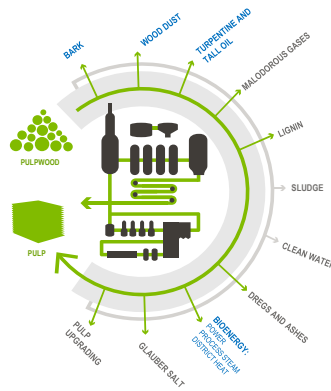


Bioproduct mill concept

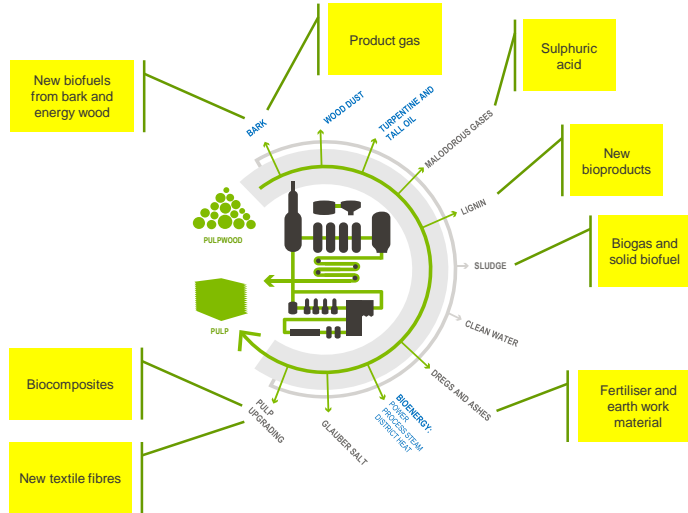
Layer B:
New bioproducts to meet the demand of a post-fossil society



Over 50% of the wood dry mass ends up in the mill's side-streams



Public R&D pathways towards new bioproducts, January 2015

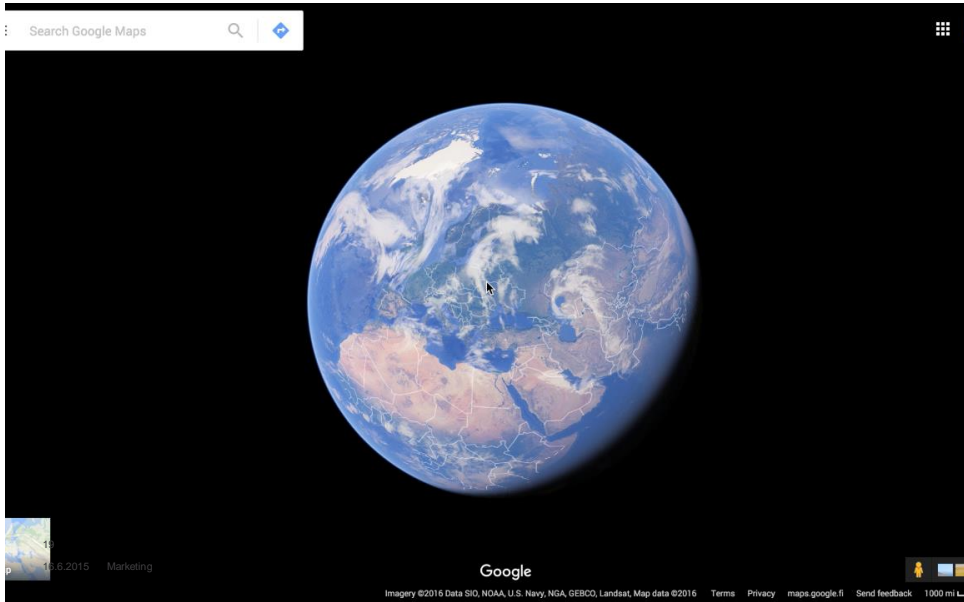


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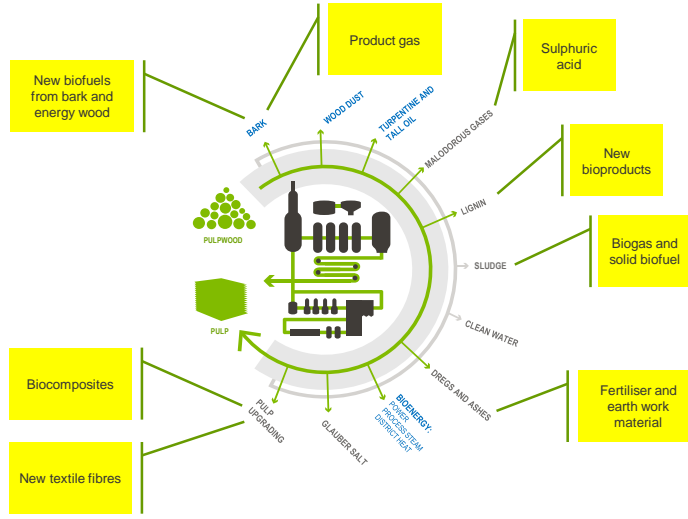


Bioproduct mill concept

Layer C: Interaction with the surrounding business ecosystem



Public R&D pathways towards new bioproducts, January 2015

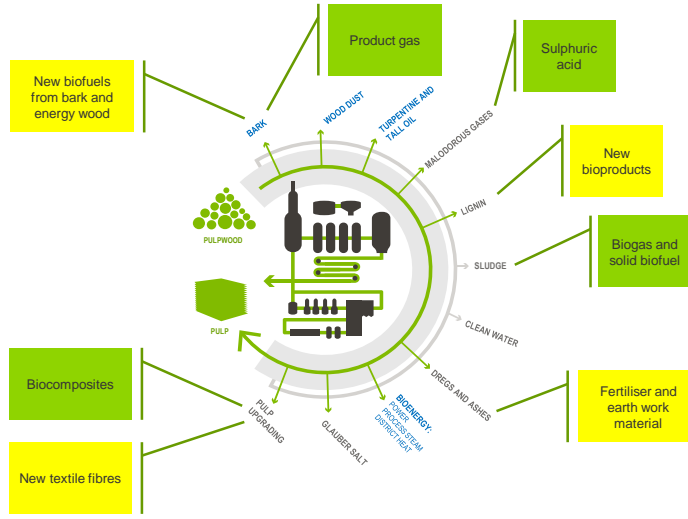


21

Metsä Fibre



Green = Decision to go to commercial phase made, situation May 2016



22

Metsä Fibre



Product gas by bark gasification

- Makes the bioproduct mill fully free of fossil energy
- Globally unique size, but similar technology is used on a smaller scale, for instance, at our Joutseno mill since 2012
- Capacity: 90 MW product gas
- Start up at the bioproduct mill: Q3/2017

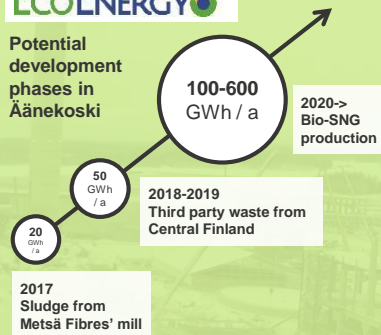


Biogas production at the wastewater plant

- Investment by a SME, EcoEnergy SF
- First-of-its-kind concept globally (i.e. use of pulp mill sludge)
- First stage capacity: 20 GWh biogas/a
- Increased capacity would enable conversion to liquefied biogas
- Start-up at the bioproduct mill: Q2/2017

EcoENERGY^{SF}

Potential development phases in Äänekoski



New biocomposite provides exciting new alternatives for plastics

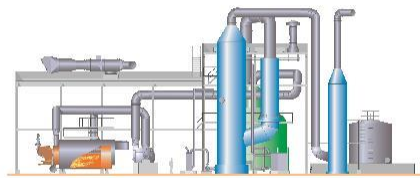
- Compound comprising wood pulp and fossil polymers
- Novel propriety technology licensed by SME Elastopoli
- Investment by another SME, Aqvacomp
- First plant in operation at Metsä Fibre's Rauma mill in 2017
- Bioproduct mill considered in a later stage (scale-up)



Metsä

Sulphuric acid from sulphur-rich waste gases

- Based on well-known catalytic conversion. However, first-of-its-kind concept globally (i.e. integrated to a pulp mill)
- First stage capacity: 35 t acid/d, which is about half of the demand of the bioproduct mill
- Decision to double the capacity is done later
- Start-up at the bioproduct mill: Q3/2017



Metsä

New textile fibres to meet the cellulose gap of the future

- Market for cellulose-based textile fibres today is about 5 million tons, growth ~5% /a
- Opportunity to supplement cotton-based fibres, where the market size today is ~30 million tons
- Proprietary production technology based on novel ionic liquids
- Still in laboratory



A unique ecosystem in development – Decisions to move to commercial phase already made

Starting point:

- Five companies technically integrated to Metsä Fibre's mill

Decisions since 4/2015:

- Product gas from bark; Investment and operation by Metsä Fibre
- Oxygen; Investment and operation by AGA
- Wood yard logistics;

Operation by Mantsinen Group

- Biogas from sludge; Investment and operation by EcoEnergy SF
- Biocomposite from pulp; Investment and operation by Aqvacomp
- Products from sandy bark and other similar side-streams; Agreement with Ekokem and Kekkilä
- Sulphuric acid from

sulphur-rich waste gas; Investment and operation by Metsä Fibre

- Äänekosken Energia to feed sludge to EcoEnergy SF's plant

- Development works continues..





Visit the web site of bioproduct mill
www.bioproductmill.com

Make the most of Metsä Fibre

