The Biofore Company UPM

European Biofuels Technology Platform

4th Stakeholder Plenary Meeting

15th September 2011

Brussels

Content of Presentation

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- Introduction to UPM
  - UPM Corporate
  - Energy & Pulp
  - Environment
- Current status of forestry feedstock
  - Supply Demand balance
  - Feedstock types
  - Harvesting systems
- Path to Improvement
  - Mobilising more fibre

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UPM – THE BIOFORE COMPANY

2011

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UPM Corporate +

Energy & Pulp Business

UPM today

- 24,500 employees
- Sales exceed 10 billion euros in 2010
  - Production in 16 countries, worldwide sales network
  - Listed in the NASDAQ OMX Helsinki stock exchange
  - Recent Myllykoski acquisition, increases USA footprint

Energy and pulp 4,000 employees	Paper 14,500 employees	Engineered materials 6,000 employees
▪ Hydro, nuclear and condensing power ▪ Biofuels development ▪ Pulp mills ▪ Plantation operations in Uruguay ▪ Timber ▪ Forestry services ▪ Wood & biomass sourcing	▪ Magazine papers ▪ Fine papers ▪ Newsprint ▪ Speciality papers	▪ Label ▪ Plywood ▪ RFID tags and inlays ▪ UPM ProFi composites

UPM has long experience with biomass energy

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Areas of UPM experience	Description
Investing in Energy	• Owns ~1040 MW_e biomass generation capacity, ~2,500 MW_e total generation capacity - 2nd largest biomass plant owner in Europe, larger than any utility • Has constructed 21 biomass plants, operates 19 plants (>1000 MW capacity) • 400 FTEs in power plants
Biomass fuel sourcing and multi-fuel operations	• A variety of fuels used, e.g., bark, forest residues, saw dust, sludge, black liquor, RCW; total biomass fuel use ~19 TWh pa. - Bark, saw dust and shavings burned since 1940s - Stumps and forest residues burned since the 1990s • 2000 FTEs in biomass sourcing • UPM's own *forest residue* biomass sourcing was 3.4TWh[1] in 2008
Project development	• UPM personnel have led 20 biomass projects of 6-265MW_e size • Long-term CAPEX optimization experience • JV experience

1 Primary energy

Biofuels fit well to UPM's businesses

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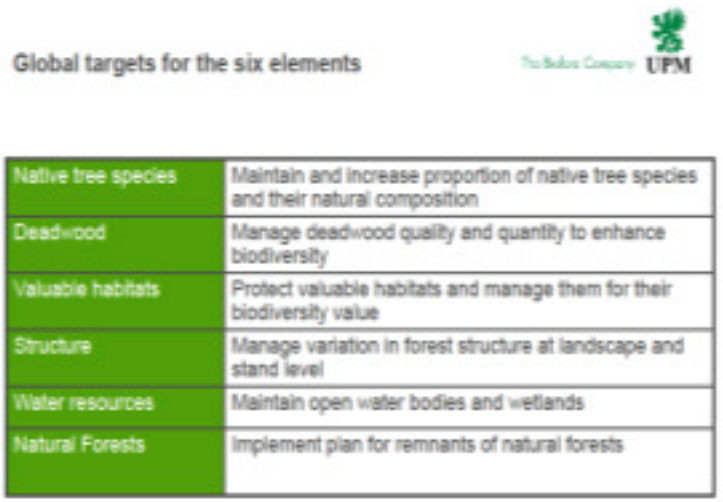
- Biofuels are an essential part of the new Biofore Company.
- Only non-food raw materials are used as feedstock.
- UPM has long experience in sourcing of energy wood
  - raw material will be sourced using sustainable forestry principles.
- Integration to existing pulp or paper mill will increase efficiency.
- UPM has two possible BTL bio-refinery locations: Rauma and Stracel mill sites

Environment and Sustainability

- UPM is one of WWF main partners in 2011 – UN's International Year of Forests
- UPM & WWF cooperate internationally on a wide variety of projects including the New Generation Plantation Project
- UPM has a global biodiversity programme for its forests



"UPM show how companies and organisations are able to promote biodiversity as part of forest management."
Jari Luukkonen, WWF Finland, Director, Protection, 24 March 2011

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Current Status of Feedstock

Example –
UK Supply/Demand Profile to 2020

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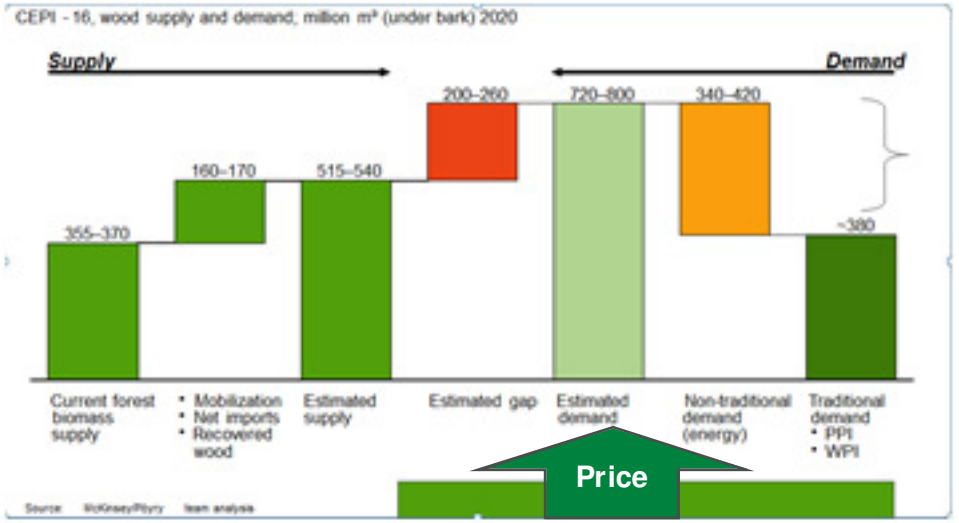
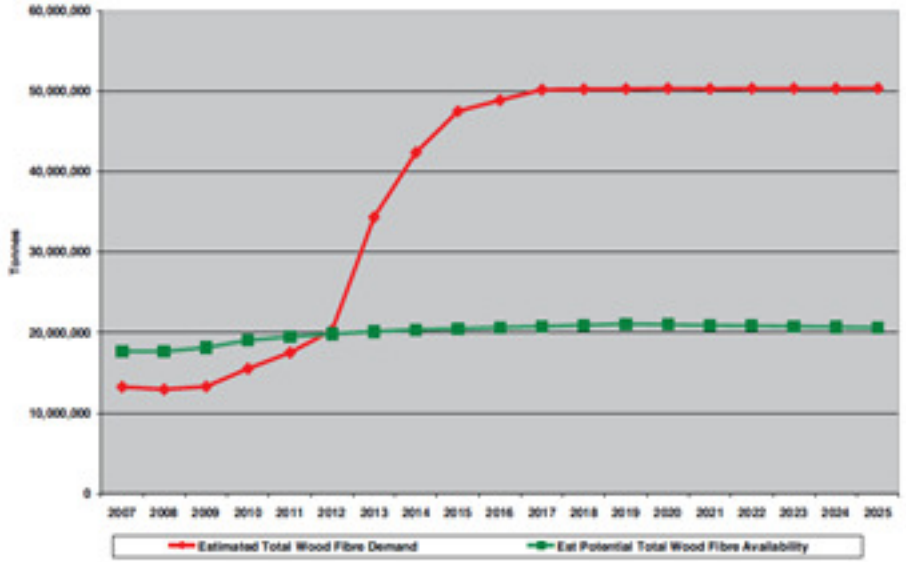
The context of supply and demand is reflected in the research work undertaken by UPM for biomass availability to 2020.

The European imbalance represents a potential of 200-260Mm3 undersupply.

This also reflected in the UK supply/demand balance work undertaken by an independent researcher in 2010 (Cleggs)





The UK supply/ demand balance also skewed by the impact of renewable energy potential.

This UK demand side can only be met with A significant volume of imported material and utilisation of RCW and other fuel sources such as SRF/RDF.

This outlook is driving demand and prices upward.

What Biomass do we have ?

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Forest Derived Fibre

- **Forest Residues** – Brash, tops, fuelwood, stumps
- **Thinning's –** Early thinning's for crop improvement
- **Neglected Woodland –** Opportunity to bring undermanaged areas back to life
- **SRF/SRC** – Short rotation woody biomass; Willow, Eucs, others?
- **Imports –** Pellets and woodchip from sustainably managed sources

Other sources….

RCW – Recovered "waste" wood

Arboricultural Arisings – Trees surgery, site clearance

Wood industry co-products – sawmill chips, sawdust etc

(Energy Plantations – Miscanthus)

Forest Harvesting Operations

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UK

Poor quality 30 yr old stemwood being clearfelled

- Low quality industrial wood and fuelwood markets
- Much of UK forest ground is too steep or unstable to recover brash and stumps
- Site will be restocked with productive good timber quality species.

Finland

Biomass is recovered from thinnings of 25 – 40 year old forests

Method

- The best stems are left to grow
- Residues and small stems are collected for energy use

Collecting stumps from final fellings

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Used in spruce dominated forests

Method

- The excavator lifts and splits the stumps
- Makes the mounding for the new seedlings
- The stumps are stored over one summer to clean and to dry the material

Collecting logging residues from final fellings

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Used in spruce dominated final felling sites with rich soil

Methods

- Bundles
- Loose residues
- Chipping at roadside

UPM in UK “Utility arboriculture”

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Network Rail - Trackside veg clearance
Also
Power Transmission line clearance

Recovered Wood & Solid Recovered Fuel

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- Some potential for increasing quantities of low quality energy grade biomass from RCW.
- But additional opportunity limited by availability and waste heirarchy.

- Good opportunity to develop high biomass content SRF
- Limited competition for alternative markets – as yet

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Path to Improvement

Drive for Fibre - So what's the options ?

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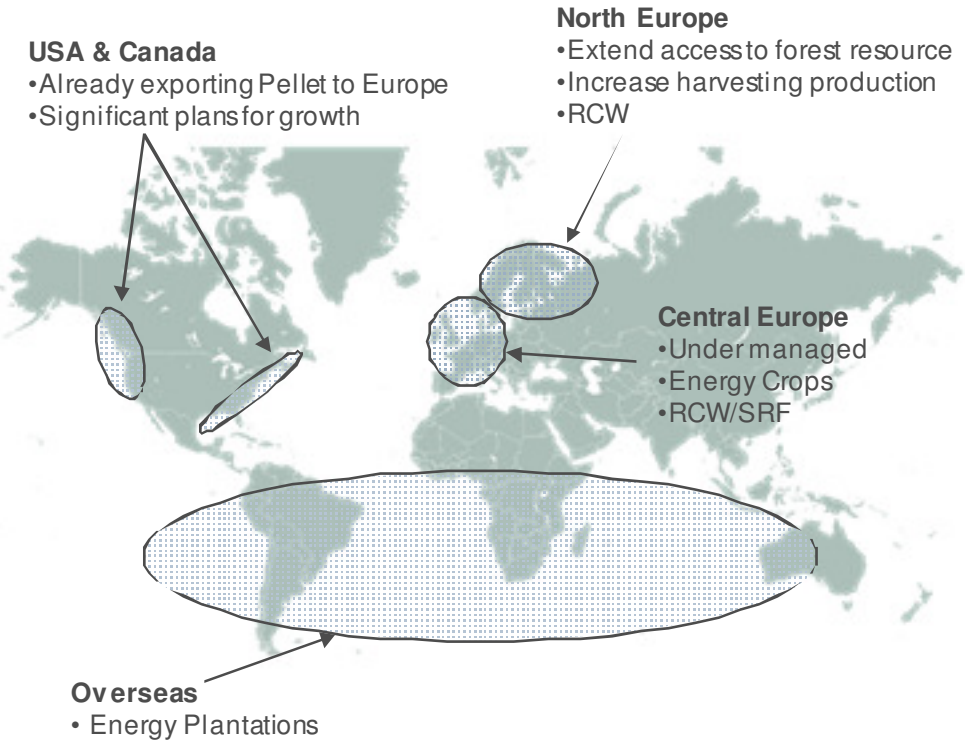
- Develop Overseas wood energy sourcing
  - Energy Plantations eg High density Eucalyptus? – SA
  - Rubberwood – Redundant plantation? - Africa
  - Eastern seaboard USA – Pellet, chip
- Capture wood fibre from distressed forest regions
  - Citrus wood USA
  - Mountain Pine in BC
- Extent forest harvesting footprint into Eastern Europe
  - Develop logistics to extend catchment area
- Bring into management "undermanaged" woodland in Europe
  - Eg England is reported as having 2million m3
  - Finland fall well short of harvesting total annual volume increment
- Short Rotation Forestry/Coppice
  - Eucs 30m3/annum increment, harvest in 10 - 12yrs
  - Willow coppice, Yield over 50yrs - 400ODT harvest every 4yrs.
- Recover more wood fibre from Arboricultural Clearance
  - Railway
- Increase capture of RCW
- Develop Solid Recovered Fuel technology



What can be achieved….

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- 11yr old Eucalyptus – Uruguay

- 18yr old Eucalyptus – UK
- 8yr old Willow coppice – UK


WWF
WORKING
WITH UPM TO
PROTECT OUR
FORESTS
UPM FORESTS. FULL OF LIFE.