Waste, Residues and Advanced Biofuels Policies in Finland

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Kati Koponen, Ilkka Hannula & Nils-Olof Nylund
Key points

- Ambitious targets for emissions cuts → the role of biofuels in Finland
- Key technological solutions
- Residual raw materials from forestry and forest industry an important resource
- Sustainable use of resources
Targets in the Finnish energy policy by the current government (May 2015)

Finland’s long-term objective is to be a carbon-neutral society
- 80-95% reduction of greenhouse gas emissions from 1990 level by 2050

Government targets by 2030:
- Renewable energy > 50 %
- Self-sufficiency > 55 %
- Stop the energy use of coal
- Cut the use of fossil oil by 50 %
- Share of renewable transport fuels to 40 % (with double-counting)
European 2030 targets for CO₂ emission reductions in the effort sharing sector (compared to 2005)

39% target for Finland
Finnish Energy and Climate Strategy 2030 (November 2016)

Transport sector

- 50 % reduction in emissions by 2030 (compared to 2005)

- 30 % target for renewable fuels (physical share)
  - Low level blending and drop-in type fuels compatible with legacy vehicles and new vehicles

- 250 000 electric vehicles
  - some 10 % of the fleet and 30 % of new car sales

- Energy efficiency improvements on the vehicle and system level
Share of biofuels in transport fuel consumption in Finland

Source: Ministry of Transport and Communications
Current biofuels used in Finland:

- HVO renewable diesel (0-100% blend): vegetable oils, vegetable oil residues, waste oils from food industry, and tall oil from pulp industry
- Ethanol (E10 and E85): food industry and saw mill residues
- Biogas: waste water and biowaste treatment
- Import of ethanol, FAME etc.
How to reach the biofuel targets?
Priority on drop-in products and high blend gasoline/diesel

- New investments in Finland / import
  - Additional HVO, ethanol and biogas capacity (raw material limit?)
  - New technology demonstrations:
    - Co-feed at oil refinery
    - BTL - Pulp and saw mill residues
    - Biogas - MSW and agroindustry
    - New renewable fuels, power-to-gas / power-to-liquid

Renewable energy in Finland 2015


A new 2030 biofuels assessment will be published by the end of 2018.
Wood flows in Finland 2013

- Forest growth: 104.4 Mm³
- Total drain: 76.2 Mm³
- Round wood use: 73.9 Mm³
- Mechanical wood industry: 26.2 Mm³
- Wood board and other wood products: 1.8 Mm³

Sources:
- Luke, VTT, Forest Association, Customs of Finland, Confederation of Finnish Forest Industries, and Paperinlaitos
Sustainable forest biomass use

- Priority on the use of residual forest biomasses for energy
  - E.g. use of stem wood for long-lived wood products

- Search for forest management strategies, where both forest carbon sink and biomass production are maximised

(Pingoud et al. 2018
Use of hydrogen enhancement to increase the efficiency of biomass use (→ power-to-fuel + biofuel)

In the base case excess CO₂ is vented out from the synthetic fuel processes

Hydrogen from external source added to improve the efficiency of biomass use

2.6–3-fold increase in the biofuel output with the same biomass input

Low carbon electricity required for hydrogen production!

Source:
Hannula 2016. https://doi.org/10.1016/j.energy.2016.03.119; Koponen & Hannula 2017 https://doi.org/10.1016/j.apenergy.2017.05.014