



# Waste, Residues and Advanced Biofuels Policies in Finland

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## 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)

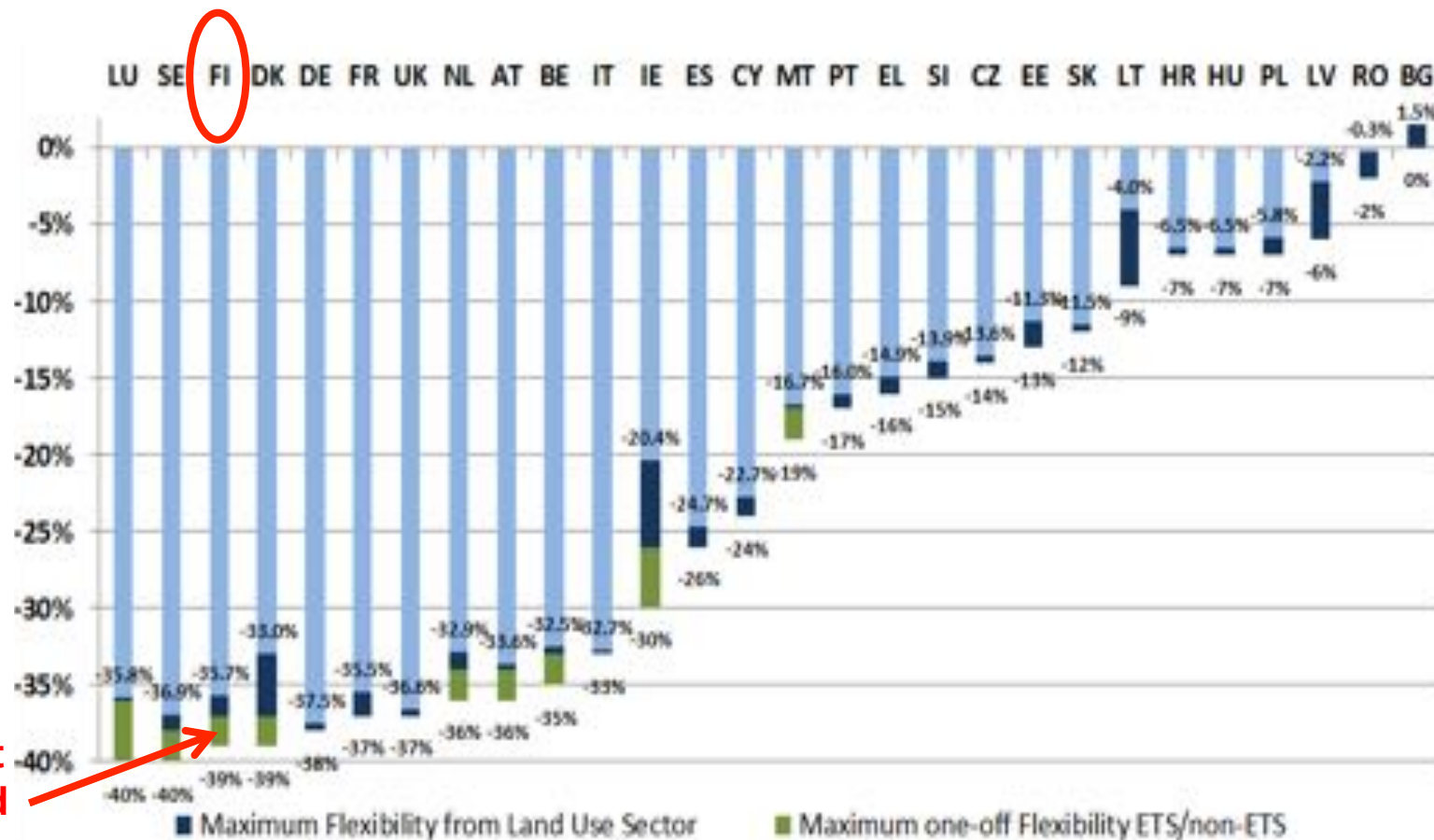
**Finland's long-term objective** is to be a **carbon-neutral society**

- 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 CO<sub>2</sub> emission reductions in the effort sharing sector (compared to 2005)



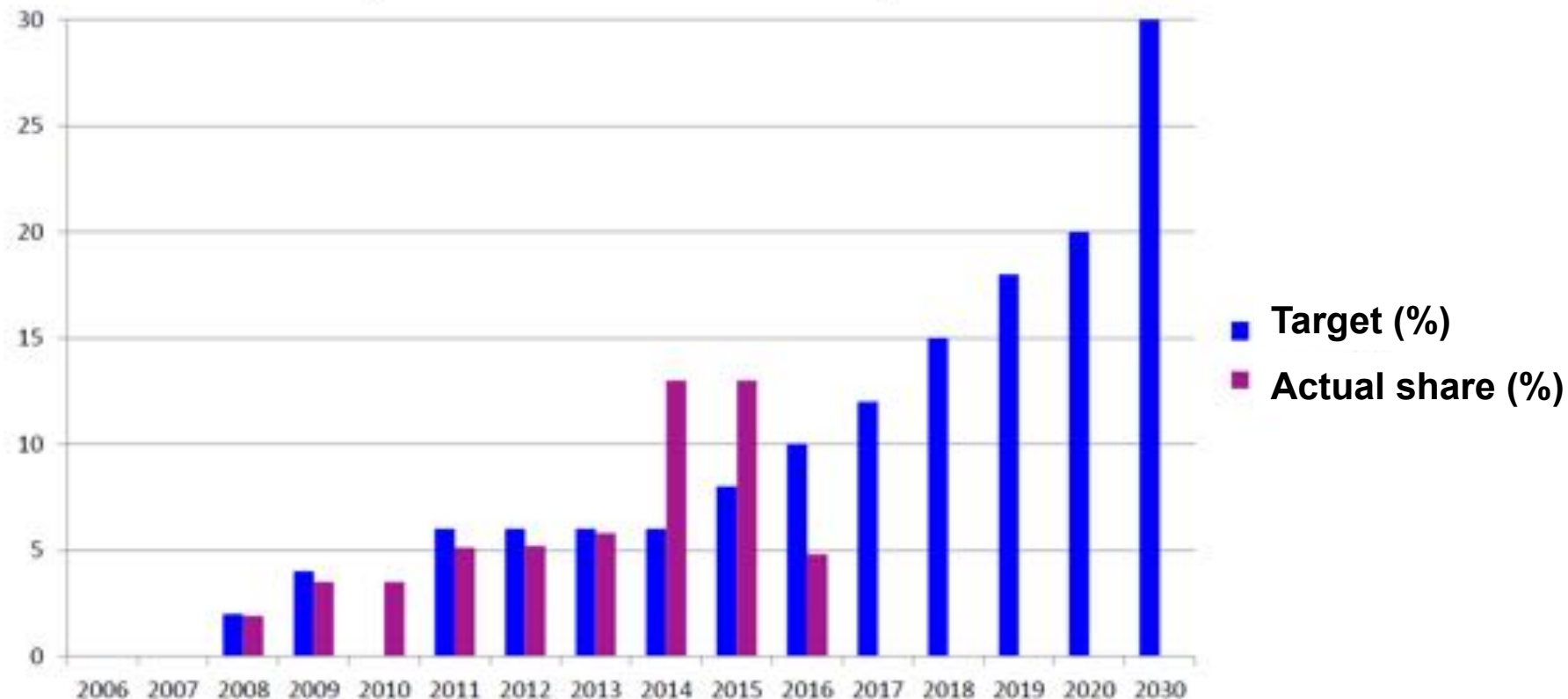
39% target for Finland

# 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



# Advanced biofuel technologies in Finland



The Biofore Company UPM

UPM Biofuels | What's new | Contacts

Ecological bio-oil is produced

fortum

## Investment in bio-based diesel

The UPM Lappeenranta Bio-diesel from forestry residue, bio-refinery, located on the saw mill, will help meet increasing demand for renewable diesel.

- Total UPM investment: EUR 100 million
- Annual renewable diesel production: 100,000 tonnes / 120 million litres
- Total persons employed: 200
- Based on UPM innovation

### NEXBTL renewable diesel

HVO Product Handbook

NEXBTL renewable diesel

NEXBTL renewable diesel

Study on greenhouse gas and energy intensity of product chain

Using NEXBTL renewable diesel produced from 100% renewable inputs can achieve a 40-90% reduction in greenhouse gas emissions compared to fossil diesel. NEXBTL renewable diesel can also reduce levels of local emissions that have a negative impact on urban air quality. Thanks to the positive contribution that NEXBTL diesel makes to improving urban air quality, it represents an excellent alternative for powering city buses, for example.

## 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.

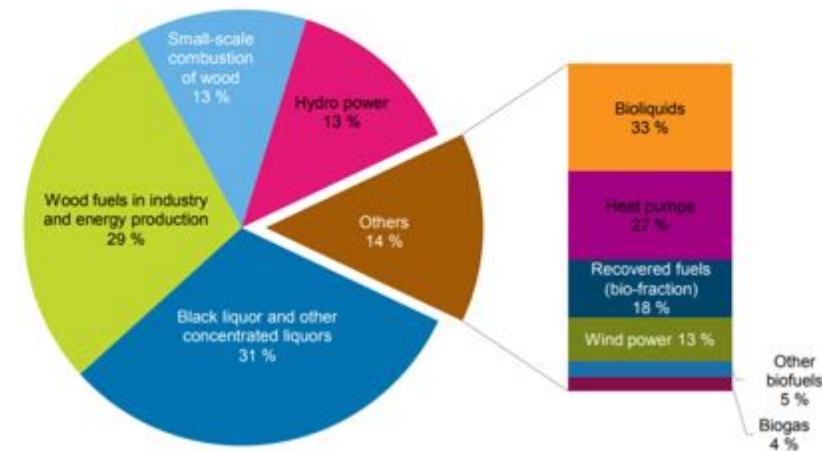
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# How to reach the biofuel targets?

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



Source: Statistics Finland. Energy 2016 table service.

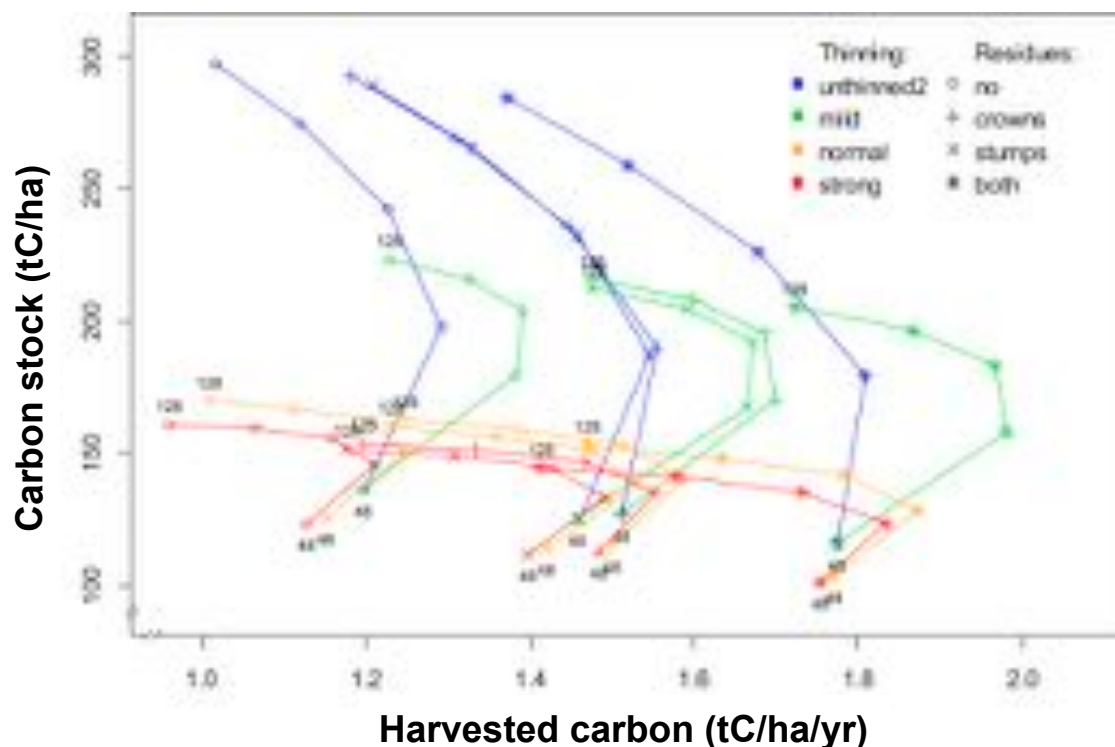
**A new 2030 biofuels assessment will be published by the end of 2018.**





## Sustainable forest biomass use

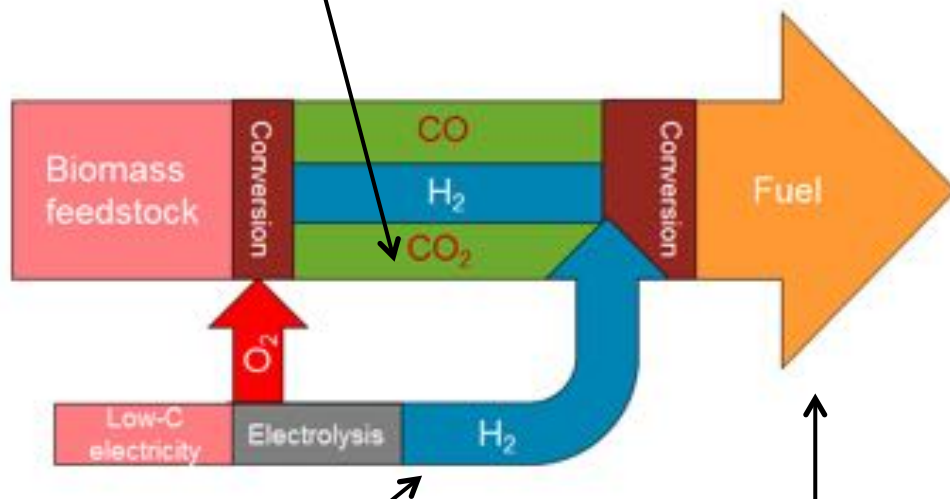
- Priority on the use of residual forest biomasses for energy
  - E.g. use of stem wood for long-lived wood products
- Search for forest management strategies, where both forest carbon sink and biomass production are maximised



(Pingoud et al. 2018  
<https://doi.org/10.1016/j.jenvman.2017.12.076>)

# Use of hydrogen enhancement to increase the efficiency of biomass use (→ power-to-fuel + biofuel)

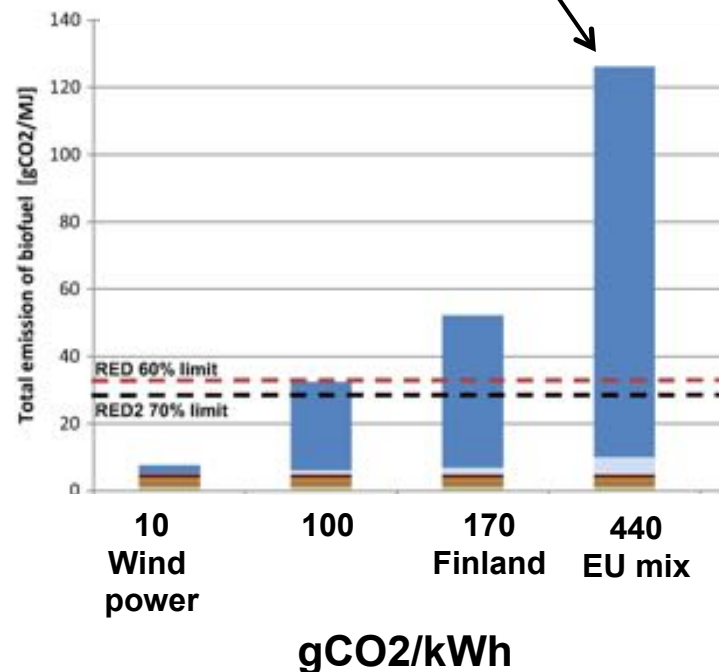
In the base case excess CO<sub>2</sub> is vented out from the synthetic fuel processes



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>



# TECHNOLOGY FOR BUSINESS

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