



The Biofore Company **UPM**

# CREATING PROFITABLE NEW BUSINESS IN BIOFUELS

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## Four megatrends drive demand for biofuels



### Energy security

Biofuels are an effective way to increase energy security, reduce dependency on oil imports



### Climate change

Together with improving fuel efficiency, biofuels are the most important low-cost way of reducing CO2 emissions in the transport sector



### Rural development

Biofuels can create new sources of income for rural areas. Increased competition for arable land has raised awareness of sustainability issues

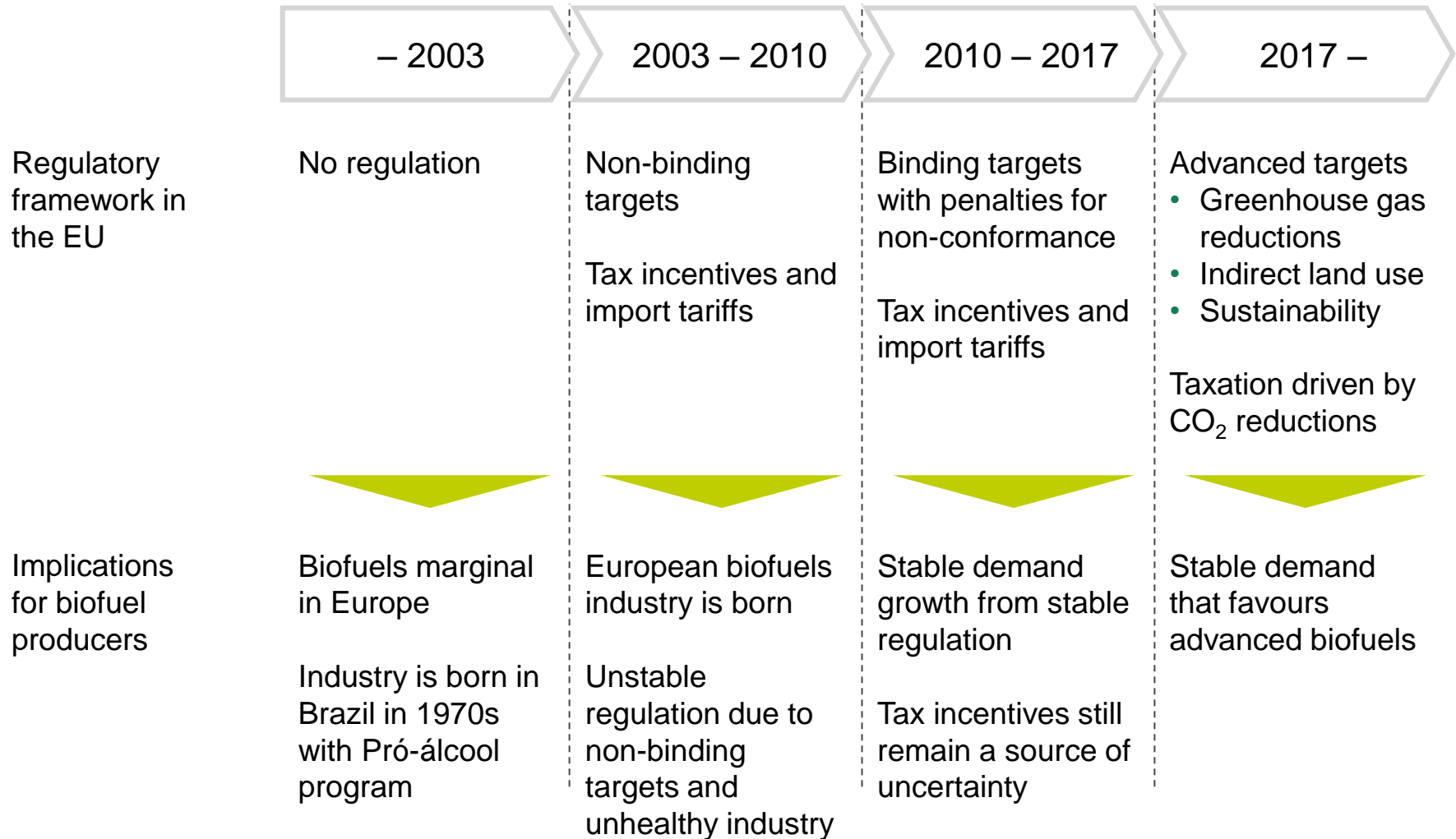


### Higher energy prices

Increasing cost for the marginal barrel of oil (ultra deep water drilling, oil sand etc.) supports demand for substitutes including biofuels

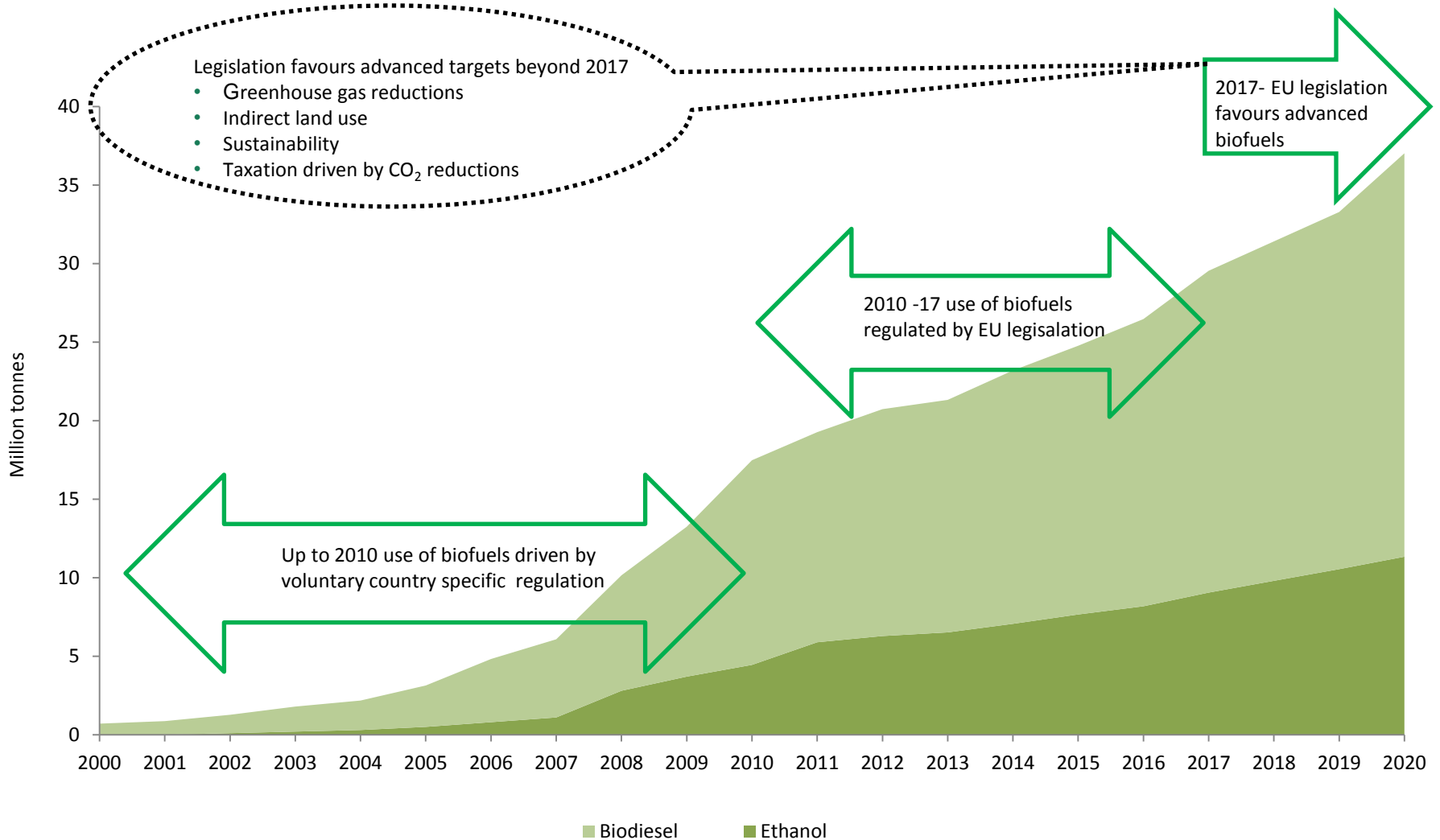
# BIOFUELS

## Regulation is stabilizing and will favour advanced biofuels



# BIOFUELS

## Use of transportation biofuels in the EU(\*)

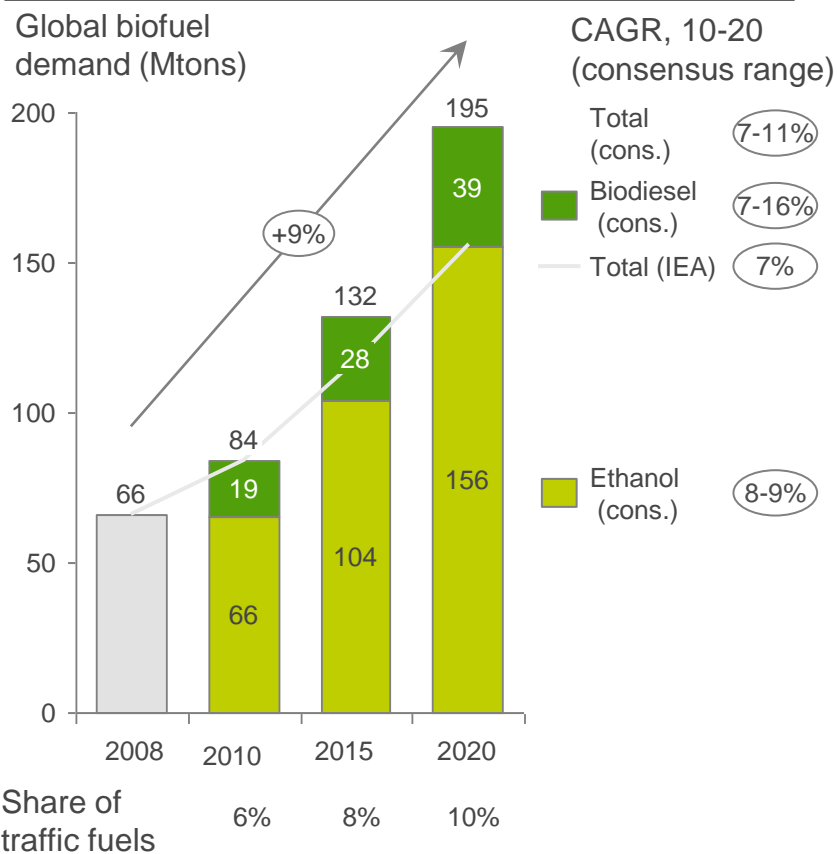


4 \*) Future demand is based on existing legislation, figures from National Action Plans

# BIOFUELS

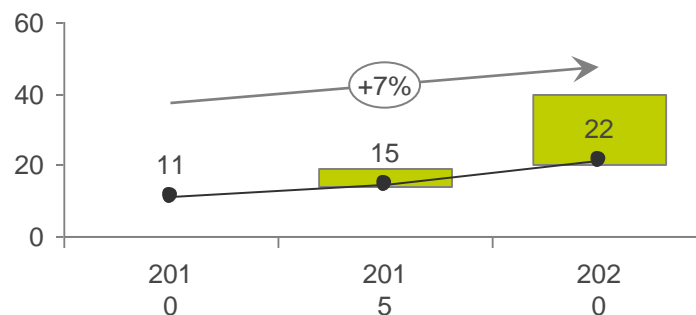
## Demand for biofuels expected to grow

### Global biofuel demand is expected to grow by 9% annually over next 10 years

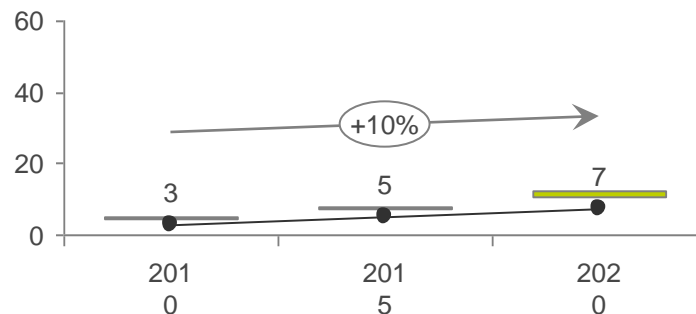


### European market is driven by biodiesel – robust growth expected

#### Biodiesel demand, EU-27 (Mtons)

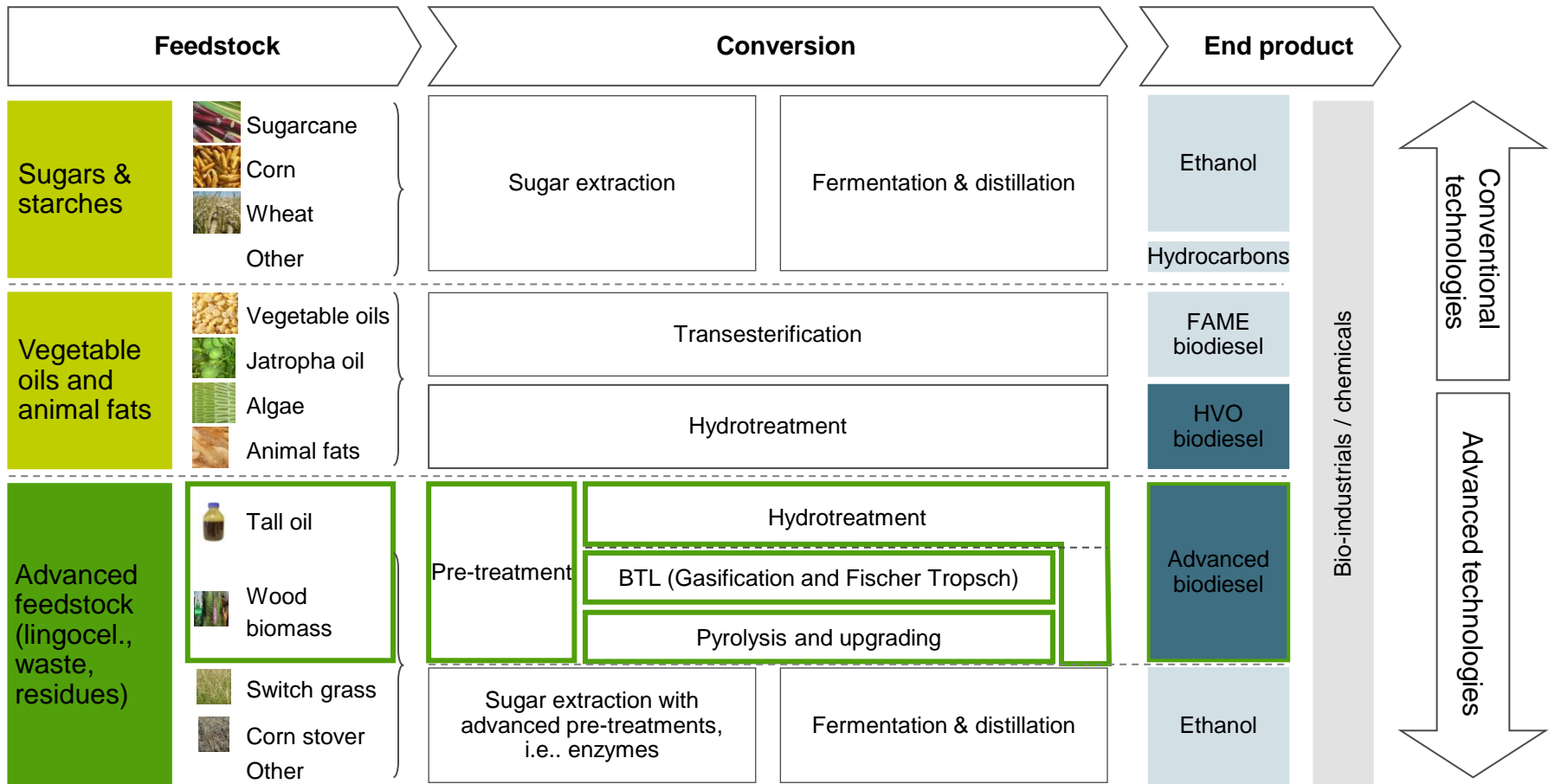


#### Ethanol demand, EU-27 (Mtons)





■ Consensus range ● National action plans (NREAPs)

# Several paths from feedstock to biofuels



 UPM focus

 Fuels with inferior properties to conventional oil products

 Fuels with comparable or better properties to conv. oil products

## BIOFUELS

# UPM with clear competitive edge in biofuels

### Substitution from ethanol



### Competition against 1G FAME biodiesel



### Direct competition in hydrotreated biodiesel



- Ethanol is the most cost efficient way to produce biofuels. However, ethanol can only be blended to gasoline and only up to 10% of gasoline volumes
- Advanced biodiesel is highly competitive against 1G FAME biodiesel due to lower cost, better product quality and higher sustainability. In addition, the blending of FAME is limited to 7 %
- Tall oil as a low-cost non-food feedstock is a competitive solution for advanced biodiesel. The blending limit of the biodiesel is >50%
- UPM is in a unique position in tall oil based biodiesel due to its technology IPR and secured access to low cost feedstock

## UPM invests in wood-based biodiesel

- UPM invests in the world's first advanced wood-based biodiesel production in Lappeenranta, Finland
- Main product is advanced, 2<sup>nd</sup> generation biodiesel
- Commercial scale industrial investment
  - Total investment of approximately EUR 150m
  - Production 100,000 tonnes/a of advanced biodiesel
  - Production starts in 2014
- Raw material is sustainably produced crude tall oil, a residue from pulp production
- Technology is based on UPM's innovations and long term development work
- Potential for UPM to triple capacity by 2020





# BIOFUELS

## Incentive for distributors to pay a premium for UPM's biofuel over reference product



### 1st generation biofuels

- Expensive raw material
- + Expensive end product

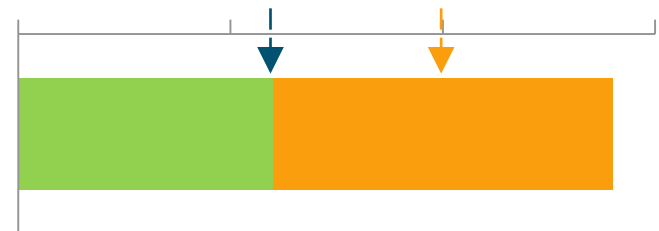
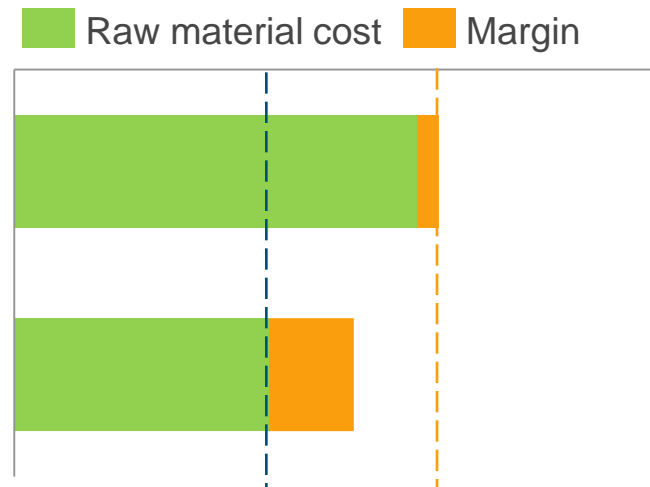
### CTO (crude tall oil) fractionation

- + Low-cost raw material
- Cheap end products



### UPM Biofuels

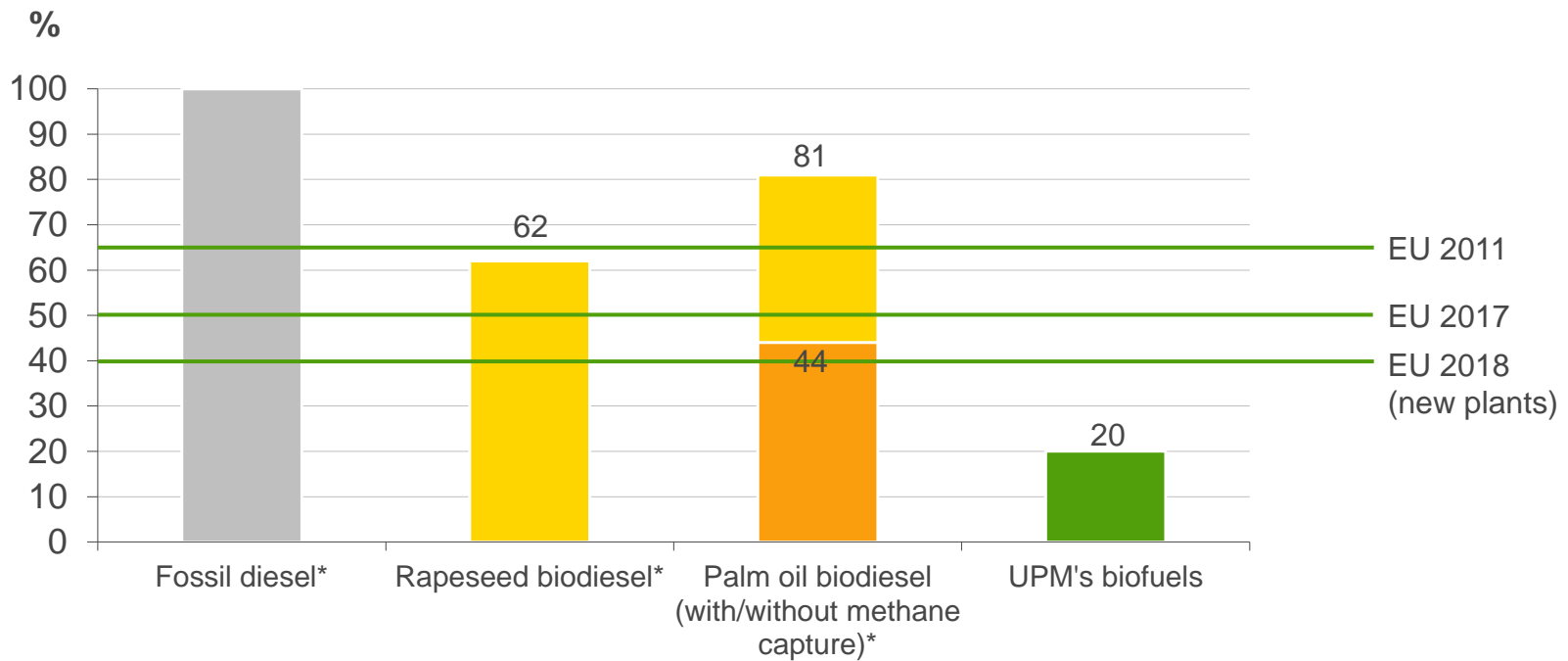
- + Low-cost raw material
- ++ Valuable end product<sup>(\*)</sup>



<sup>(\*)</sup> Deserves a premium on reference product (from tax advantage & product properties) to get the same value for the distributor.

## BIOFUELS

# UPM's biofuels significantly reduce GHG emissions compared to fossil fuels



\*Source: Directive of the European Parliament and of the Council on the Promotion of the Use of Energy from Renewable Sources

## Achievement in key targets

1

### Vision and business plan in place

- Major player in advanced biofuels in Europe
- Produce advanced biofuels with premium value at competitive costs



2

### Own process technologies in place

- Hydrotreatment of crude tall oil
- BTL (Gasification and Fischer Tropsch) from energy wood



3

### Investing into first biorefinery

- EUR 150m investment to produce advanced biodiesel from crude tall oil, start-up mid-2014
- Raw material sourcing and distribution partnerships



4

### New technologies and broader feedstock

- Develop a concept to produce transportation fuels through pyrolysis and by upgrading of pyrolysis oil
  - Potentially cost competitive against fossil oil products
- Process development to operate with broader feedstock





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