

EVALUATION OF TORREFACTION + PELLETIZATION PROCESS TO TRANSFORM BIOMASS IN A BIOFUEL SUITABLE FOR CO-COMBUSTION

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Objective

To evaluate a torrefaction+pelletization process and compare it with traditional alternatives the supply of biomass to co-combustion plants.

This proposed thermochemical process increases the calorific value of the biofuel and improves other characteristics as energy density, homogeneity, friability and hydrophobicity.

Methodology

Biofuels evaluated: bundled forest residue, conventional pellets, pellets of torrefied forest residue, baled straw and pellets of torrefied straw.

Evaluation according to: costs, CO₂ emissions and primary energy balance.

Whole supply chain evaluated: (1) collection, (2) transport to the pretreatment plant (if apply), (3) pretreatment (if apply): drying, chipping, torrefaction, milling, pelletization, (4) transport to the power plant, (5) conditioning for co-combustion (drying if required and milling).

Scenario:

- Plant capacity: 28.000 (t torrefied pellets)/year or equivalent
- <500 km distance from pre-treatment plant to power plant

Background

Spanish Government's Renewable Energy Plan (PER 2005-2010) has establish and objective of a 722 MWe production based on biomass co-combustion.

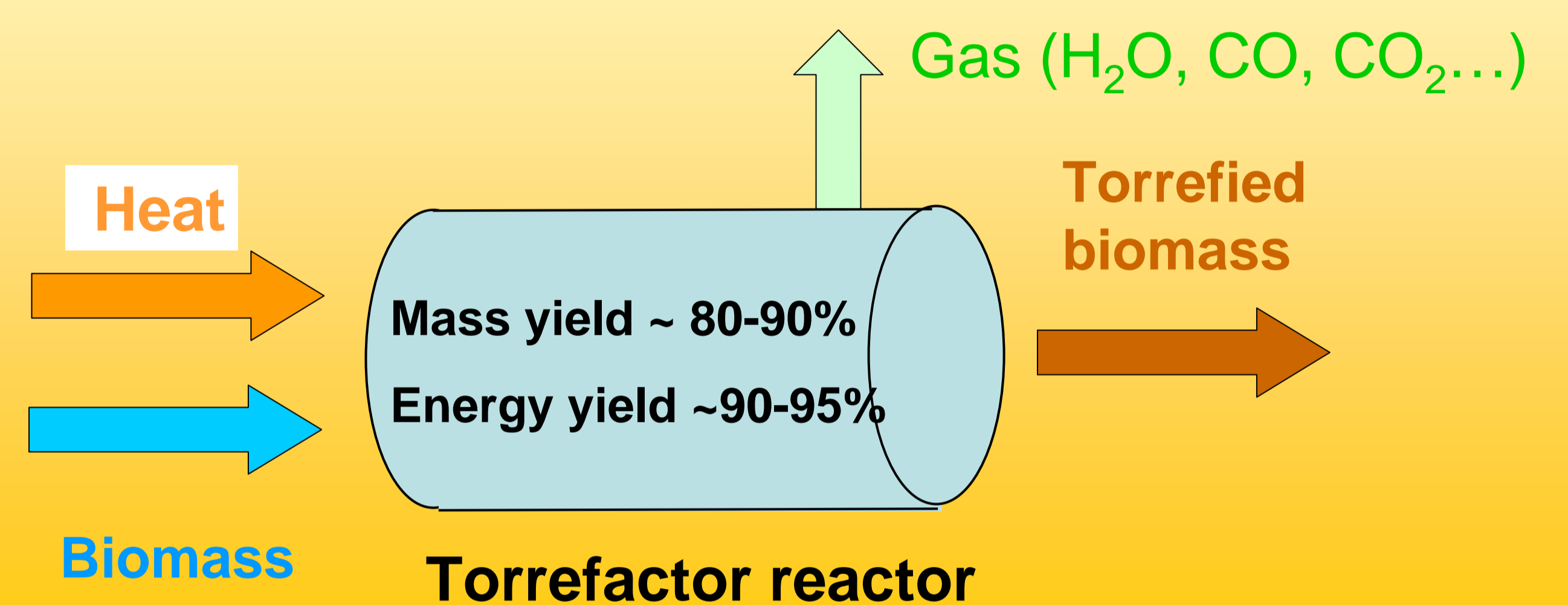
Power plants will require important amounts of biomass with long transport distances which could increase biomass supply costs.

Besides, co-combustion of biomass requires a previous conditioning before feeding biomass to the power plant.

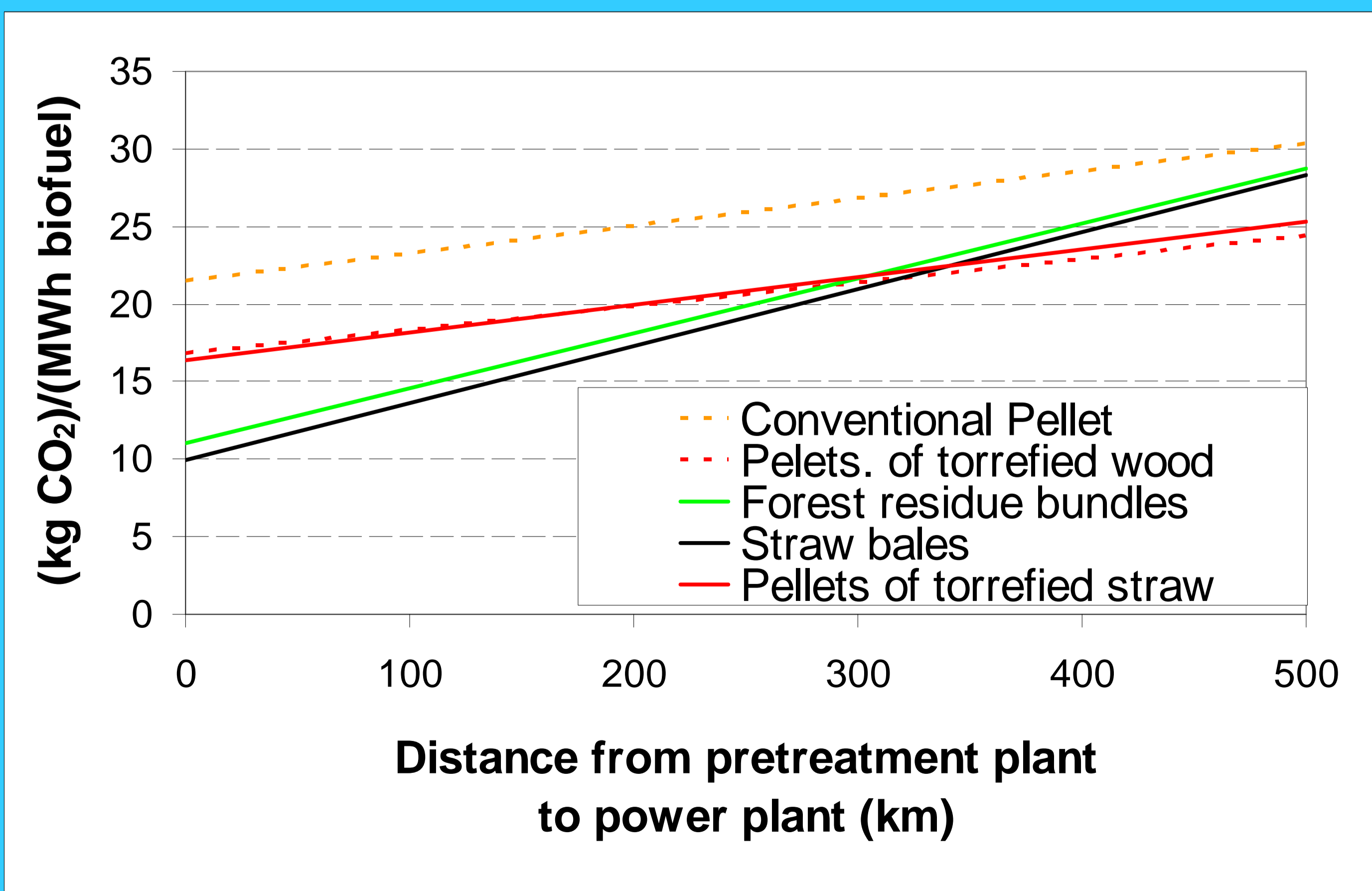
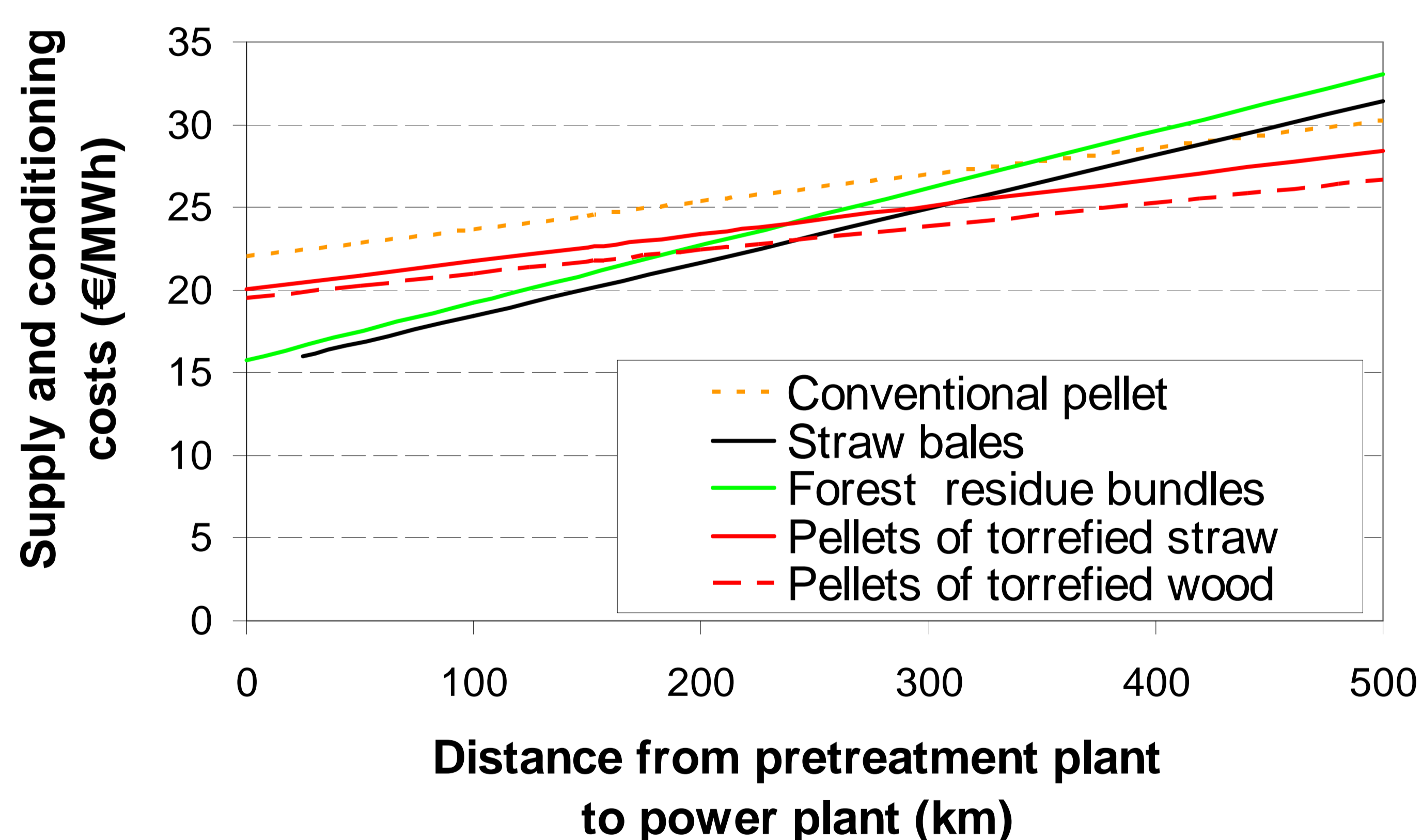
To reduce biomass supply cost a torrefaction + pelletization process is proposed.

Torrefaction

Torrefaction is a thermochemical process in which biomass is slowly heated up to 250-300 °C in a free-oxygen atmosphere and kept at this temperature about 10-40 min.



CONCLUSIONS



For transport distances longer than ~ 200-300 km, cost associated with the supply of torrefied pellets (including collection, transformation, transport to the power plant and conditioning) are lower than other alternatives (straw bales, forest residue bundles and conventional pellets) .

In a similar way ,CO₂ emissions and primary energy consumption (considering the whole supply change) are lower than other alternatives .

Next steps

Biomass pretreatment plant by Cener.

Capacity: 500 kg/h,

Physical treatment: available June 2008

Torrefaction process: available March 2009



Sample of torrefied straw

Sample of torrefied wood chips

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