MAIN TARGETS
- Widen the knowledge of biorefineries and explore new applications
- Create 2nd generation biofuels and new bioproducts
- Energy effectiveness
- Develop new business opportunities, new technologies and products
- Estimate the profitability of the BiSe biorefinery concept
- Improve the competitiveness and economic profitability of domestic mills

PROJECT PARTNERS AND SUBPROJECTS
- Hydrolysis of hemicelluloses (LUT, TKK, JU)
- Separation technology for lignocellulose hydrolysates (LUT)
- LoSulfur cooking and the separation of lignin (LUT, TKK, JU)
- Low power bleaching plant (LUT)
- Overall design and modeling of the biorefinery (LUT, TBRC)

RESULTS
Hydrolysis of hemicelluloses
- Water prehydrolysis is an efficient method for the extraction of hemicelluloses prior to cooking
- The prehydrolysis results in a rather heterogeneous hydrolysate
- Further processing of the hydrolysate is challenging

Preliminary cooking trials with prehydrolysed chips
- The cooking of prehydrolysed chips requires a lower H-factor compared to the reference (normal kraft cooking without pretreatment)
- Prehydrolysed pulps respond better to oxygen delignification than the reference pulps. Cooking can be stopped at higher kappa numbers
- Sulphidity can be reduced by adding 0.1 % AQ to the cooking liquor

Low power bleaching plant
- Bleaching consumes a considerable amount of power in pulp mills. To reduce the power consumption of pulp mills, low power bleaching has been studied. This has been done by analyzing a reference pulp mill (case mill). The mill has a two-stage oxygen delignification and a four-stage bleaching sequence
- Case mill calculation results:
  - 35 % of the power consumed by the equipment
  - 65 % by the production of bleaching chemicals
  - The share of chlorine dioxide is almost 80 % of bleaching chemicals power consumption
- It is possible to reduce over 30 % of power when first bleaching stages are replaced with hypochlorous acid-oxygen stages
- There may be some compromise with pulp properties

Overall design and modeling of the biorefinery
- A simulation model of pulp and ethanol producing biorefinery has been created
- Preliminary simulation results illustrate significant benefits of integrating an ethanol process to a pulp mill:
  - Secondary steam from black liquor evaporation can be used in hydrolysate evaporation
  - Existing boilers can be used in the burning of the organic residue from the ethanol process
- Integration would affect pulp mill operation by increasing the load on the recovery boiler and evaporation plant
- The simulation model will be developed further as more laboratory data is available
- Based on the model, a profitability of the BiSe biorefinery approach will be assessed
- Life-cycle analysis of the biofuels produced will also be carried out