

Main advancements in the HeatToFuel project

Prof. David Chiaramonti - *RE-CORD, Politecnico di Torino*

Hydrothermal Liquefaction (HTL) in the green energy transition

28 January 2021

Session 1

Virtual Workshop | 28th January 2021
13:30 - 17:30 CET

**Hydrothermal Liquefaction (HTL)
in the Green Energy Transition**

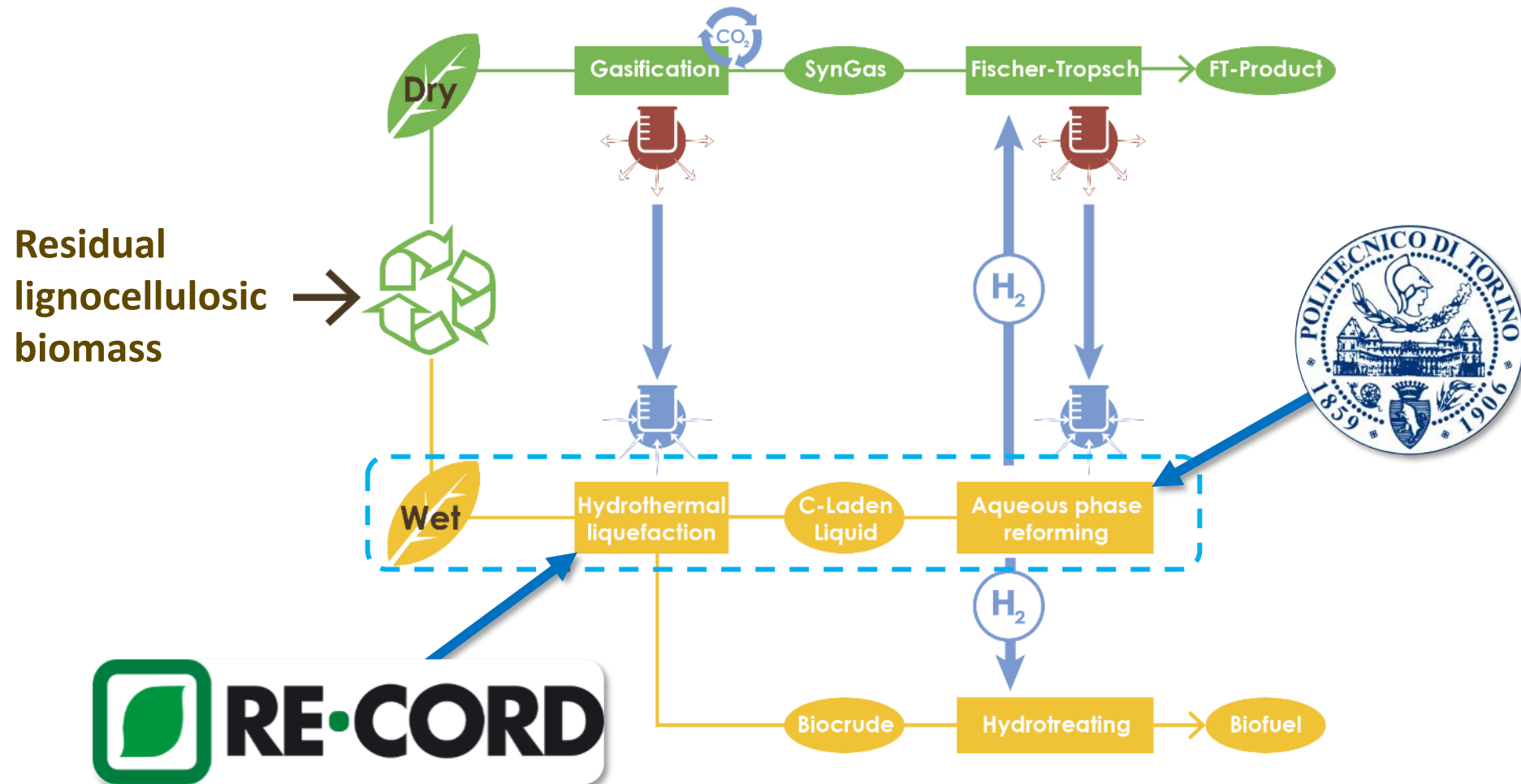
Research Updates - State of the Art and
Market Potential in a 2050 Outlook



- The HeatToFuel project
- RE-CORD continuous HTL unit
- Coupling HTL with aqueous phase reforming (APR)
- APR of HTL-derived aqueous phase

Heat to Fuel concept at a glance

- Dry route: Gasification + Fischer-Tropsch
- Wet route: Hydrothermal liquefaction + Aqueous phase reforming

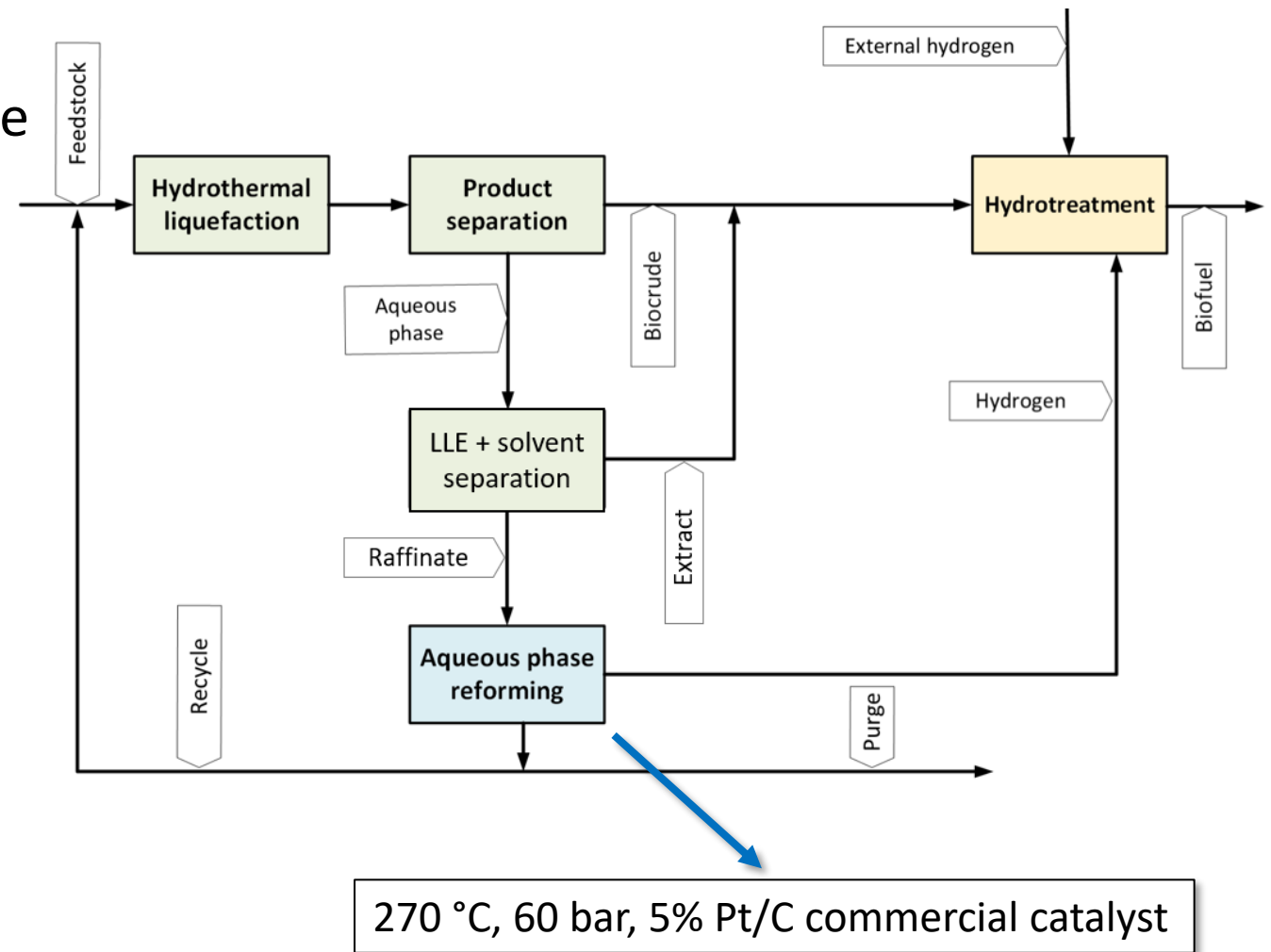




- Up to 2 l/h
- High pressure piston pump (200 bar)
- Tubular reactor (350°C)
- Double-piston letdown system
- Time on stream \approx 8 h
(lignin from cellulosic ethanol)
- Upgrading to supercritical operation in progress

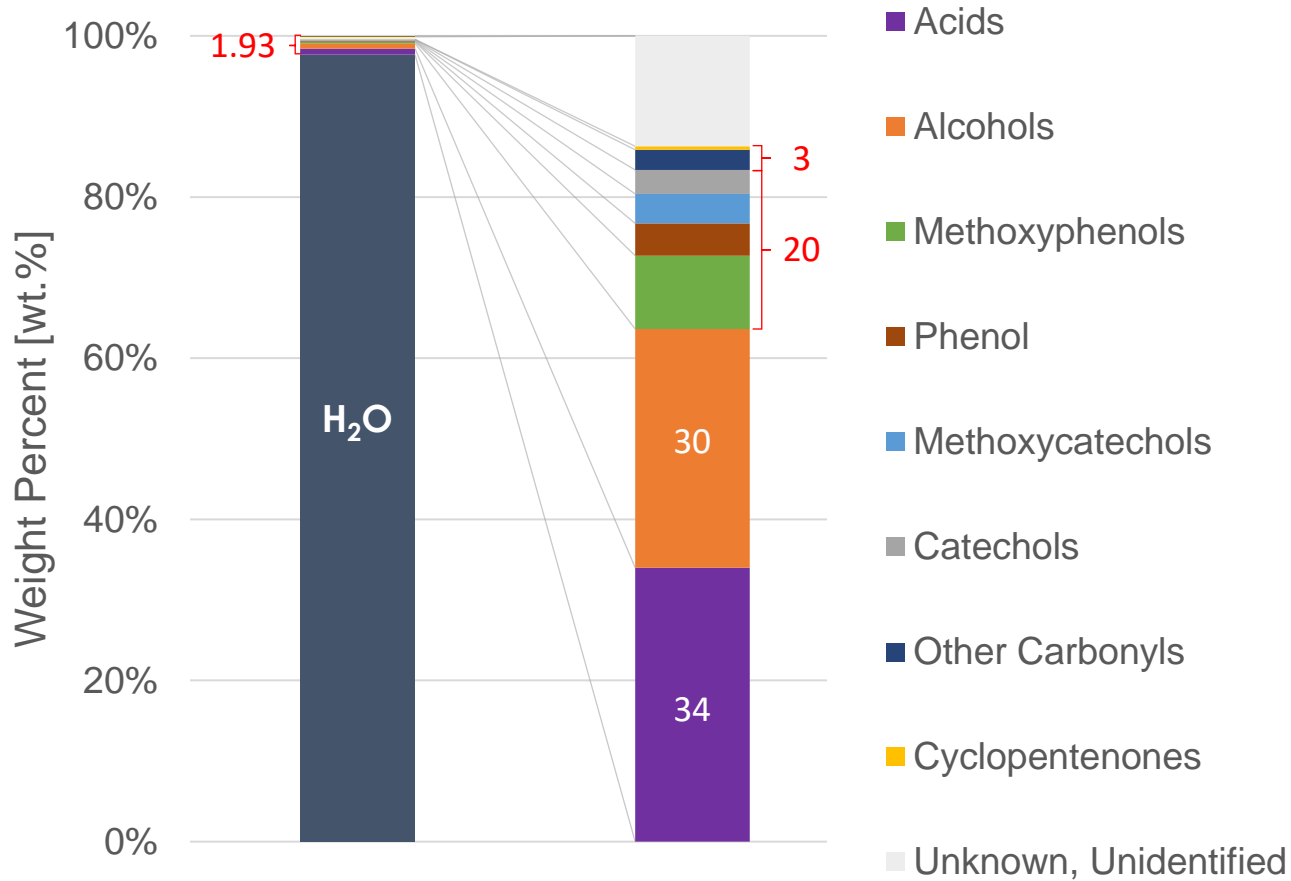
Coupling HTL with aqueous phase reforming

- Light organics in HTL aqueous phase are **converted to H₂** via APR
- **LLE** of aqueous phase dissolved phenolics before APR to increase biocrude yield and improve H₂ production
- **Recycle** of the aqueous phase to HTL after APR
- APR-produced H₂ to partially fulfil biocrude hydrotreatment needs (*35% theoretically*)



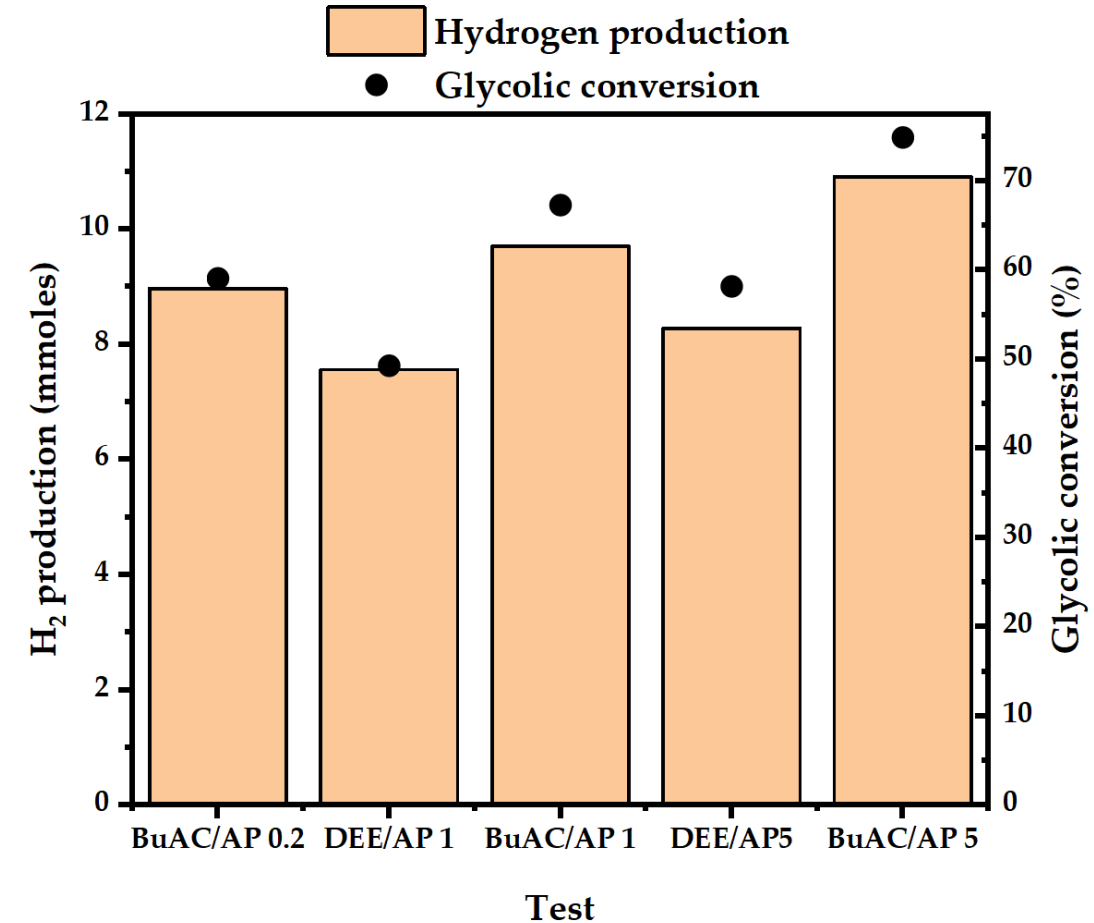
APR of HTL-derived aqueous phase

Lignin-derived HTL aqueous phase characterization



Organic mass balance closure: **83-86 %**

Influence of LLE on hydrogen production



Selection of solvent and solvent/AP ratio for H₂ production optimization

- RE-CORD is launching an open *request for proposals* for the hydrotreating (HT) of HTL oil samples from lignin-rich residues, to produce a **slate of hydrocarbons**, aiming at the road transportation sector.
- Scope of work will entail:
 - batch HT screening-tests in autoclave (200 ml);
 - formulation of 2 catalysts;
 - continuous HT test at the selected combination of catalyst and process conditions.
- **RFP and TOR** for the tender will be made available to interested parties and published on RE-CORD's website



Thank you!

Prof. David Chiaramonti - *RE-CORD, Politecnico di Torino*

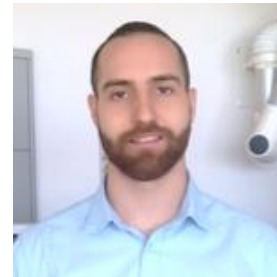
Hydrothermal Liquefaction (HTL) in the green energy transition

28 January 2021

Session 1



HTL team



For inquiries on the work of RE-CORD in Heat-to-Fuel: Andrea Maria Rizzo, andreamaria.rizzo@re-cord.org