ADVANCED BIOREFINERIES DEPLOYMENT

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**Summary**

- **1953 – 1979**: Packaging Manufacturing
- **1979 – 2000**: Chemical Specialty
- **2000 – 2006**: PET expansion phase
- **2006 – ….**: Renewables
In last 20 yrs transport emissions increased by 20% while all other sectors’ emissions decreased by around 15-20%
EU to promote biofuels as key to decarbonize the transport sector

Italy leads advanced biofuels policy framework

EUROPE

• Renewable Energy Directive (2020 targets):
  • 10% renewable energy (sustainable biofuels).
  • food-based biofuels capped at 7% and no support post-2020
  • Non binding 0,5% min national targets for advanced (highly sustainable) biofuels

• Energy Union Package:
  • EU target -40% GHG emissions by 2030
  • 27% Renewable energy

ITALY

• Complementary to the EU directive, Italy set binding mandates for advanced biofuels starting 2018 (initial target 0,6% -about 160ktoe/y-, increasing up to 1% -about 300ktoe/y-)
Biochemtex pioneered cellulosic bioethanol with PROESA® technology: first advanced biofuel at scale

The cellulosic biorefinery today ....

Non food lignocellulosic biomass

PROESA® Technology

Fermentation

Fermentable Sugars

Lignin

Separation

Ethanol

Energy Production

Steam & Power generation

CRESCENTINO PLANT

Capacity: up to 40kt/y ethanol
Feedstock: NON FOOD biomass (primarily residues)
GHG saving: -85% or more
Innovative technology – «first of its kind» plant in the world
Technology platform for green chemistry development
Brazil’s first commercial cellulosic ethanol plant: an example of integrated solutions

With a production capacity of 65,000 metric tons per year, the plant uses PROESA® technology to deliver ethanol while using locally sourced sugarcane straw and bagasse as feedstock. In addition, the plant generates its own power by using the lignin produced as a byproduct of the PROESA process.
Single production will hardly compete: an integrated biorefinery approach is needed

Multiple bioenergy and biochemical productions maximize economic viability
Minimize waste (circular economy approach) and environmental impact
Balanced bioenergy and biochemical production mitigate off-take risk
The Biorefinery opportunity

The cellulosic biorefinery tomorrow

Biomass → PROESA® Technology → Fermentable Sugars → Chemical & Biological Conversion Platform → Heat and power → Lignin → Separation → Fuel/Chemicals (EtOH, iso-BuOH, JetFuel) → Aromatics (BTX, PTA) → Conversion/Separation → Materials (Fatty Alcohols, Polyols, n-BuOH) → Lactic acid, Acrylic acid, Succinic acid, Adipic acid → Plastics & Polymers Market

The Biorefinery opportunity
The bioeconomy potential

- Reduce dependence on imports with locally sourced and produced goods and products

- Create over 1 million jobs within 2030 mainly in rural areas

- A global biobased market estimated at €200 billion by 2020

- Derived biobased products can achieve an average GHG emissions reduction potential of least 50% compared to fossil alternatives

Sources:
* McKinsey / World Economic Forum
** Bloomberg New Energy Finance
*** European Commission
**** BBI 2020 Strategic Innovation and Research Agenda
What’s needed to make advanced biorefineries truly materialize?

Advanced biorefineries projects still have main issues to be addressed

**Regulatory uncertainty:** what happens after 2020?  
*A stable long-term EU policy framework is needed*

**Market uncertainty:** high off-take risk at current oil price (and subsidies) and with current regulatory framework in place  
*Investors call for binding targets at EU level*

**High capex:** advanced biorefinery projects (typical investment 100-400M€/plant) mostly funded by companies themselves. Not easily bankable.  
*Robust financial support to reduce first/second of a kind investment*

**Supply chain issues:** competing use of biomasses, complexity of certification schemes, etc  
*Simplified procedures are needed*

Technical risks: some technologies yet to be fully scaled-up at commercial scale and/or to be optimized all along the supply chain  
*Continuous R&D&I efforts needed to reduce cost*
Concluding remarks

- Cellulosic ethanol technology is ready at industrial scale
- Allows substantial GHG emissions reduction
- Helps mitigate oil import bill
- Creates green jobs
- Provides best LUC performance (Globiom report)
- Helps rural economy
- May mobilise substantial investments
- Cellulosic ethanol is JUST A FIRST STEP of the green-chemistry deployment

- Biorefineries deployment in Europe NEED COORDINATED APPROACH BETWEEN STAKEHOLDERS AND FIRM, CLEAR AND LONG TERM POLICY FRAMEWORK TO TURN INTO REALITY

A huge opportunity for Europe towards a truly sustainable future!