Upgraded scenarios FOR integration of biofuel value chains into REFINERY processes

• Presenter: Silje Fosse Håkonsen, SINTEF
Background

- RED II proposal: transition from first generation biofuels to advanced biofuels

- Advanced biofuels have the potential to help achieve the EU climate and energy goals
- Flexibility in feedstock utilization and conversion technology application is an advantage
- To achieve the climate goals, significant investments in advanced biofuels capacity are needed
- R&I can drive down costs, but can also create knock-on effects
4Refinery Strategy

Diversity of Biomass
- wood
- straw
- eucalyptus

Diversity of technologies
- Pyrolysis
- HTL

Integration with refinery

4refinery - Scenarios for integration of bio-liquids in existing REFINERY processes
European Union’s Horizon 2020 research and innovation programme, GA No. 727531
4Refinery Scheme

Representative Feedstock
Northern Europe – Eastern Europe – Coastal Southern Europe

- Pyrolysis
  - Stabilisation
    - BTG, VTT

- HTL
  - AAU

- Crude oil derivatives
- Renewable oils

- Co-FCC
  - REPSOL, CNRS

- Co-HT
  - BTG, MOL, CNRS, SINTEF

- Co-HDO
  - BTG, MOL, CNRS, SINTEF

- HT
  - AAU, BTG

Green Gasoline  Green Diesel

4Refinery - Scenarios for integration of bio-liquids in existing REFINERY processes
European Union’s Horizon 2020 research and innovation programme, GA No. 727531
Integration of bio-liquids in refinery

▪ The approach of 4REFINERY allows to evaluate the viability of integration of upgraded bio-liquids in standard refining conversion processes, technical and economical feasibility: TEA and LCA analysis, impact in yields, process conditions in existing processes, consumption of utilities, catalyst cycle length, etc.

▪ The integration of bio-liquids in refinery take advantage of:
  ▪ Available throughput in refining units
  ▪ Similar catalysts to conventional processes
  ▪ Similar operating conditions
  ▪ No changes in materials of existing infrastructure
  ▪ Minor modifications and investments in the existing refineries
4Refinery Vision

Primary Conversion technologies ⇒ Upgrading efficiency

Pyrolysis
HTL

Diversifying Upgrading technologies ⇒ Alternatives for upgrading conversion efficiency

Co-FCC
Co-HT
Co-HDO
HT

Scenarios for integration into existing (Bio)refineries
Toolbox – Business models – Interface to refinery models

Energy Efficiency – Process Design – Scale-up – Low capital costs

Health & Safety – Environment – Societal Acceptance

Representative Biomass Feedstocks

Green Gasoline
Green Diesel

4refinery - Scenarios for integration of bio-liquids in existing REFINERY processes
European Union’s Horizon 2020 research and innovation programme, GA No. 727531
Business case development

- **TRL assessment** - Aims to systematically assess the maturity of the technologies
- **Supply chain and market assessment** - Aims to characterise a reliable supply chain with a robust route to market for the product(s)
- **Risk assessment and identification of mitigation measures** - Aims to provide insight into project risks, relative importance of each and means of handling risks
- **Identification of outputs and exploitation** - Exploitation plan identifying exploitable results by each partner, type of exploitation and most suitable platform for action
4REFINERY KPIs

- Increase overall carbon yield: > 45%
- GHG savings: > 80%
- Minimum Fuel Selling Price:
  - Diesel: < 0.9 €/L
  - Gasoline: < 1.0 €/L
- Residual oxygen content in product: < 0.5 wt%
Thank you for your attention!