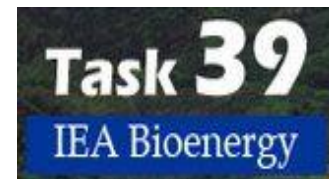




IEA Bioenergy
Technology Collaboration Programme



Opportunities for advanced biofuels: Supply chain analysis & CAPEX/OPEX reduction

Project Outline

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Technology Collaboration Programme

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- Biomass availability specific to Indian feedstock
- Biomass supply chain approaches prevalent in India
- Different type of pretreatment technologies and process schemes by 2G ethanol technology developers in India
- Life cycle analysis & environmental impact assessment

Deliverables

- The report shall include data from India, USA, Brazil & Germany
- Biomass availability, supply chain & 2G ethanol plants data from USA, Brazil & Germany shall be required by **Feb-March 2021**
- Target Date for draft report completion for circulation- **June 2021**

Biomass availability

- Agricultural residues (wheat straw, rice straw, corn stover & cobs, sugarcane bagasse & tops, cotton stalk), forest residues, wood chips available in surplus
- **Non-food & non-fodder** biomass will be in focus of this study.
- Because of its limited application, these are usually left as such or get burnt in the fields in order to make farms ready for the round of crop thus leading to air pollution.
- The composition of biomass varies according to the type, species, origin, age and location of biomass.
- Survey of the composition and the availability of surplus feedstock available in India will be carried out

❑ Inputs/Data from USA, Brazil & Germany will be incorporated

Biomass supply chain approaches

- Biomass type, selection and optimal supply chain management are critical for the success and cost-effectiveness of any 2G ethanol commercial plant.
 - Supply chain models for collection, storage and transport are almost non-existent in India.
 - Indian biomass feedstocks typically available at farm sites have **low bulk densities**, creating challenges in storage and transport.
 - Specific technologies for **densification of biomass at source** will improve the economics and logistics of biomass collection, transportation, and storage.
 - A “supply chain” approach across the feedstock-to-biofuel will **identify ways to reduce both capital and operating costs** of producing advanced biofuels.
 - It will also help us to better understand how much financial/policy support will be required and identify the future policy needs to promote the development of sustainable advanced biofuels.
- ☐ This report shall provide details of supply chain approaches and challenges (economic, social, policy & regulatory, plans & strategies) prevalent in India.
- ☐ Inputs/Data from USA, Brazil & Germany will be incorporated

Plans & Strategies

- **Storage & transportation** has been identified as the **main barrier** of biomass supply chain, which could be **resolved by on-site energy production**.
- Government & other policy and decision-making departments should **survey, assess & critically manage the biomass resources availability** in the region & on this basis the decision of plant-size for bioenergy should be taken
- Government should **remove the investment barrier** to promote the R&D, technology-transfer, equipments for this technology to prosper
- **Direct purchasing between plant owners & farmers** could directly reduce the feedstock price

Community participation & awareness

- Promotional campaigns about the benefits of renewable energy will bring investments & improve the participation among different stakeholders
- The role of internal & social media is very important here to improve the public awareness about waste management & environmental pollution

Pretreatment technologies and process schemes in India

- Pretreatment is considered as the high CAPEX (capital expenditure) and energy intensive step and it might represent up to 20-30% of the ethanol costs
- This project will provide an update of the current status of the pretreatment process scaled-up at pilot, demonstration, and commercial levels in India.
- Different pretreatment approaches might vary depending upon the mechanism of biomass disintegration, primarily on the basis of lignin or hemicelluloses removal or hydrolysis.
- Although, plethora of pretreatment approaches based upon mechanical, physical, chemical processes are available but only a few selected have been demonstrated at demonstration and commercial scale while many of them are still in infancy or proof of concept levels. This is mainly due to the poor economics and process complexity challenges.
- The currently proposed study, will evaluate the salient features of the pretreatment process over different parameters such as CAPEX/OPEX, raw material/substrate tested, solid loadings, complexity of the pretreatment process, physio-chemical conditions, biomass digestibility, inhibitor generation etc.

☐ Inputs/Data from USA, Brazil & Germany will be incorporated

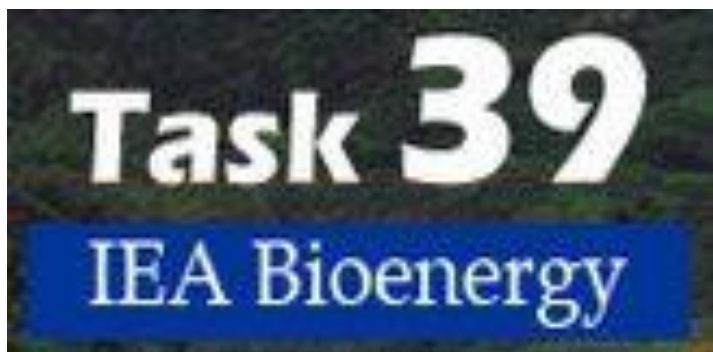
Life cycle analysis & environmental impact assessment

- The details of system boundary, mass and energy input/output of the process, data processing scheme, process assumptions, sensitivity analysis will be discussed in context to process/biomass being focused or targeted by Indian sub-continent
- The life cycle analysis and the environmental impact assessment will be reviewed to identify the **GHG emissions and energy consumption hotspots** during the lignocellulosic bioethanol production process.

☐ Inputs/Data from USA, Brazil & Germany will be incorporated

Thank you

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