

# BioMates

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Technical risk management report

*Version 01*

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| Submitting party:                                    | CERTH  |
| Responsible author:                                  | Stella Bezergianni   |
| Co- author(s):                                       | Rocio Diaz-Chavez, Volker Heil, David Kubička  |
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## 1. Introducing BioMates

### 1.1. The BioMates Project

The BioMates project aspires in combining innovative 2<sup>nd</sup> generation biomass conversion technologies for the cost-effective production of *bio*-based intermediates (BioMates) that can be further upgraded in existing oil refineries as renewable and reliable co-feedstocks. The resulting approach will allow minimisation of fossil energy requirements and therefore operating expense, minimization of capital expense as it will partially rely on underlying refinery conversion capacity, and increased bio-content of final transportation fuels.

The BioMates approach encompasses innovative non-food/non-feed biomass conversion technologies, including **ablative fast pyrolysis (AFP)** and single-stage **mild catalytic hydroprocessing (mild-HDT)** as main processes. Fast pyrolysis in-line-catalysis and fine-tuning of BioMates-properties are additional innovative steps that improve the conversion efficiency and cost of BioMates technology, as well as its quality, reliability and competitiveness. Incorporating **electrochemical H<sub>2</sub>-compression** and the state-of-the-art **renewable H<sub>2</sub>-production** technology as well as **optimal energy integration** completes the sustainable technical approach leading to improved sustainability and decreased fossil energy dependency. The overall BioMates-Concept is illustrated in Figure 1.

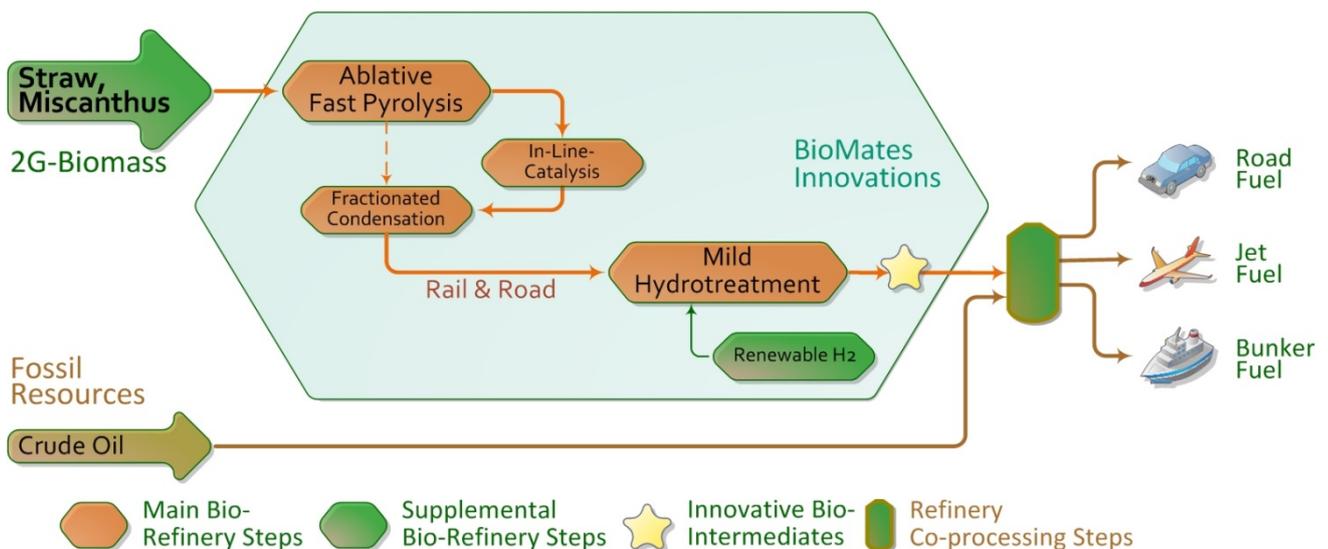


Figure 1: The BioMates-concept

The proposed technology aims to effectively convert residues and non-food/feed plants or commonly referred to as 2<sup>nd</sup> Generation (straw and short rotating coppice like miscanthus) biomass into high-quality bio-based intermediates (BioMates), of compatible characteristics with conventional refinery conversion units, allowing their direct and risk-free integration to any refinery towards the production of hybrid fuels.

### 1.2. European Commission support

The current framework strategy for a Resilient Energy European Union demands energy security and solidarity, a decarbonized economy and a fully-integrated and competitive pan-European energy market, intending to meet the ambitious 2020 and 2030 energy and climate targets /EC-2014a/ EC-2014b/. Towards this goal, the European Commission is supporting the BioMates project for validating the proposed innovative technological pathway, in line with the objectives of the LCE-08-2016-2017 call /EC-2015/. This

project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727463.

### 1.3. The BioMates team

The BioMates team comprises eight partners from industry, academia and research centres:

- Fraunhofer Institute for Environmental, Safety, and Energy Technology UMSICHT, Germany (Project Coordination) - [www.umsicht.fraunhofer.de](http://www.umsicht.fraunhofer.de)
- Centre for Research & Technology Hellas / CERTH - Chemical Process & Energy Resources Institute / CPERI, Greece - <http://www.cperi.certh.gr/>
- University of Chemistry and Technology Prague, Czech Republic - <http://www.vscht.cz>
- Imperial College London, United Kingdom  
[www.imperial.ac.uk](http://www.imperial.ac.uk)
- Institut für Energie und Umweltforschung Heidelberg GmbH / ifeu, Germany - [www.ifeu.de](http://www.ifeu.de)
- Hydrogen Efficiency Technologies B.V. / HyET, Netherlands - [www.hyet.nl](http://www.hyet.nl)
- RANIDO, s.r.o., Czech Republic  
<http://www.ranido.cz/>
- BP Europa SE, Germany  
[www.bp.com/en/bp-europa-se.html](http://www.bp.com/en/bp-europa-se.html)

For additional information and contact details, please visit [www.biomates.eu](http://www.biomates.eu).

## 2. Preface

The technical risk management report (D5.1) under BioMates project provides an overview of the identification and management of the internal risks that arise from within the project as part of Task 5.1. “Mm Technical/health risks & prod. Quality”. These internal risks include technical risks, health risks and product quality issues. A brief introduction of the technical/health risks management and process streams quality monitoring targets is initially provided in section 3. In section 4, the registry of the technical risks associated with the project is provided, as a tool of monitoring the technical actions. The health risks management related with the project is presented in section 5. Finally, the process streams (feedstocks, products, catalysts) quality monitoring approach is presented in section 6.

## 3. Introduction

BioMates project involves several innovative processes and streams, as described in section 1, that are strongly interlinked, rendering essential to define a comprehensive and consistent approach to monitor the technical activities while minimizing the likelihood of problems during the different stages of project execution. The technical assessment is continuously performed as presented in the D8.3 “1<sup>st</sup> Technical Assessment report” submitted in September 2017. However, the risk management involving technical and health internal risks during project execution and streams quality monitoring will be presented in this Technical risk management report.

## 4. Technical risks

The BioMates project encompasses two main innovative non-food/feed biomass conversion technologies, ablative fast pyrolysis (AFP) and single-stage mild catalytic hydrotreatment (mild-HDT). Each of these main biomass conversion technologies have individual innovative components such as in-line catalysis and fractionation condensation integrated with AFP, and tailor-made catalyst development and electrochemical hydrogen compressor and pumping integrated with mild-HDT. All the aforementioned technologies, that are combined to develop in TRL3 and to validate in an industrially relevant environment TRL5 a new biomass-to-biofuel production pathway, are strongly interlinked and as a result thus render certain technical risks related with the well-defined project actions.

Identification of technical risks enables project monitoring of the technical actions by tracking their progress and providing appropriate level of contingency planning to address any risks associated with them. The technical risks, the likelihood of their occurrence and severity are juxtaposed with the actions for mitigating them. It should be noted that the list of technical risks is reviewed by the technical manager and the WP1, 2 and 3 leaders every six months, based on the progress of the technical actions of the project.

## 5. Health risks management

There is a general typology of risk assessment including Human Health Risk Assessment, Ecological Risk Assessment and Applied Industrial Risk Assessment (EEA, 2016). The Applied industrial applications look at real situations and tend to include engineering risk assessments as part of the overall environmental risk assessments with an integrated approach to human and environmental risks (EEA, 2016). This is more related to risk management decisions intended to protect humans and the environment (and the company) within defined spatial boundaries. The health risk assessment in this project will have this focus on the risk management according to the risks identified and the end product and involves risk analysis, risk assessment and risk control practices (EEA, 2016).

The Health assessment in the BioMates project will involve the handling of the products and their potential impact on humans as well as the process that are taken place within the project. These will be aligned with the D 9.1: EPQ - Requirement No. 1 pa BSI - British Standard Institutions, Occupational health and safety management systems — Guide, BS 8800, 2004, particularly on the transport and handling of the pyrolysis bio-oil. It also includes the Health and Safety measures and policies at each one of the institutions partners of the project. Therefore this includes the risk for workers and occupational hazards.

For the general public the health assessment risk is centred on the handling and transport of the Bio-oil.

The health risk assessment will identify criteria on health following the three main steps of risk management: risk analysis, risk assessment and risk evaluation.

## 6. Process streams quality monitoring

The BioMates project incorporates several feedstocks, products and other auxiliary streams such as catalysts, the quality and consistency of which is of outmost importance for the project execution and risk minimization. As a result, the consortium of BioMates project has agreed upon the analytical methods for characterizing the process streams, based on which some standards are starting to be developed.

Firstly, the quality of the raw materials used, i.e. the non-food/feed biomass should be defined, as it affects the downstream processing via AFP. Moreover, it is essential to define an analytical basis for the product of

AFP (bio-oil) and for the final product of upgrading bio-oil via mild-HDT (BioMates). This analytical basis is employed for evaluating the efficiency of the mild-HDT conversion step as well as the project main product (BioMates).

## 7. Disclaimer

This Deliverable report reflects only the authors' view; the European Commission and its responsible executive agency INEA are not responsible for any use that may be made of the information it contains.

## 8. Literature

- EC-2014a European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - A policy framework for climate and energy in the period from 2020 to 2030, COM(2014) 15 final, Brussels, 22.1.2014, [http://www.europarl.europa.eu/meetdocs/2009\\_2014/documents/nest/dv/depa\\_20140212\\_06/depa\\_20140212\\_06en.pdf](http://www.europarl.europa.eu/meetdocs/2009_2014/documents/nest/dv/depa_20140212_06/depa_20140212_06en.pdf); <http://bit.ly/1LUcJKL>
- EC-2014b European Commission, Energy Union Package - Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions and the European Investment Bank - A Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy, COM(2015) 80 final, Brussels, 22.1.2014, [http://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC\\_1&format=PDF](http://eur-lex.europa.eu/resource.html?uri=cellar:1bd46c90-bdd4-11e4-bbe1-01aa75ed71a1.0001.03/DOC_1&format=PDF), <http://bit.ly/198SAUf>
- EC-2015 European Commission, LCE-08-2016-2017 "Development of next generation biofuel technologies", Publication date: 14 October 2015, <https://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/lce-08-2016-2017.html>, <http://bit.ly/2ndtvPc>