ETIP Bioenergy
European Technology and Innovation Platform

12th Stakeholder Plenary Meeting

BIOCTANE project:

Integration of biotechnology and thermocatalytic processes for the conversion of organic waste to jet-fuel

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BIOCTANE

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Acronym:	**BIOCTANE**
Title:	Synergetic integration of **BIO**te**C**hnology and thermochemical **C**a**T**alysis for the c**A**scade co**N**v**E**rsion of organic waste to jet-fuel
Grant Agreement Nr.:	101084336
Call identifier:	HORIZON-CL5-2021-D3-03
Topic:	Hybrid catalytic conversion of renewable energy to carbon-neutral fuels
Budget:	Total: 3.638.121,25 € EC contribution: 2.951.958 €
Timing:	4 years
Starting date:	November 1st 2022

OBJECTIVES

Main Objective

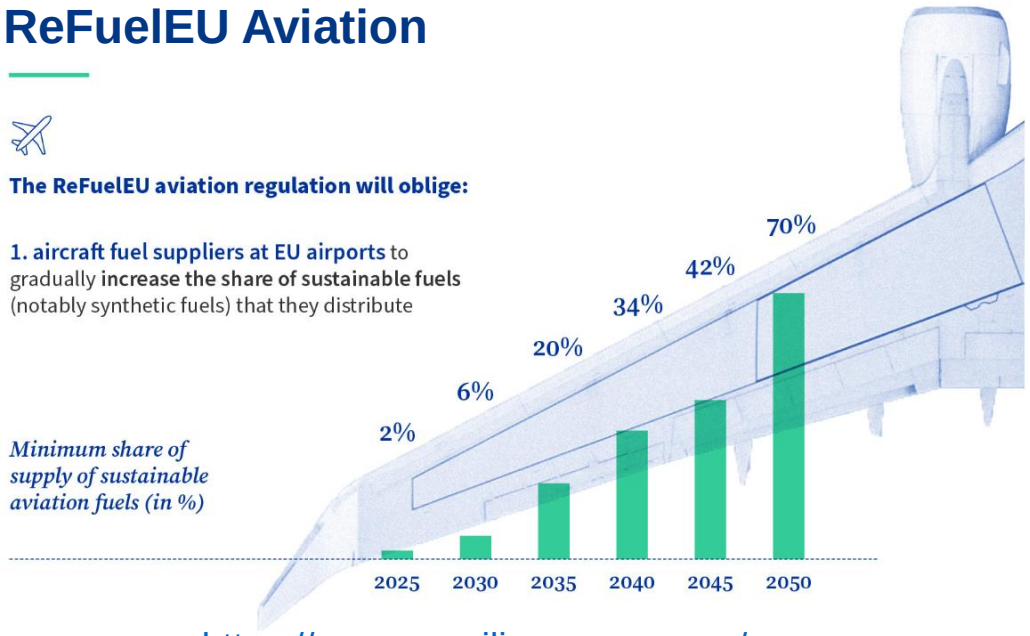
Sustainable conversion of organic waste streams (from agriculture, industry and municipalities) via integration of smart biotechnological and thermochemical conversion steps to market-ready renewable jet-fuel.

Impact

Contribute to achieving the EU's quota of ReFuelEU in the aviation fuel mixture by 2050.

Expected outcomes

- Synergetic coupling of biotechnological, catalytic and thermochemical routes …. maximizing the recovery of chemical energy and use of organic matter.
- BIOCTANE figures intend to outperform those of other routes for the production of alternative Sustainable Aviation Fuels (SAFs)



https://www.consilium.europa.eu/

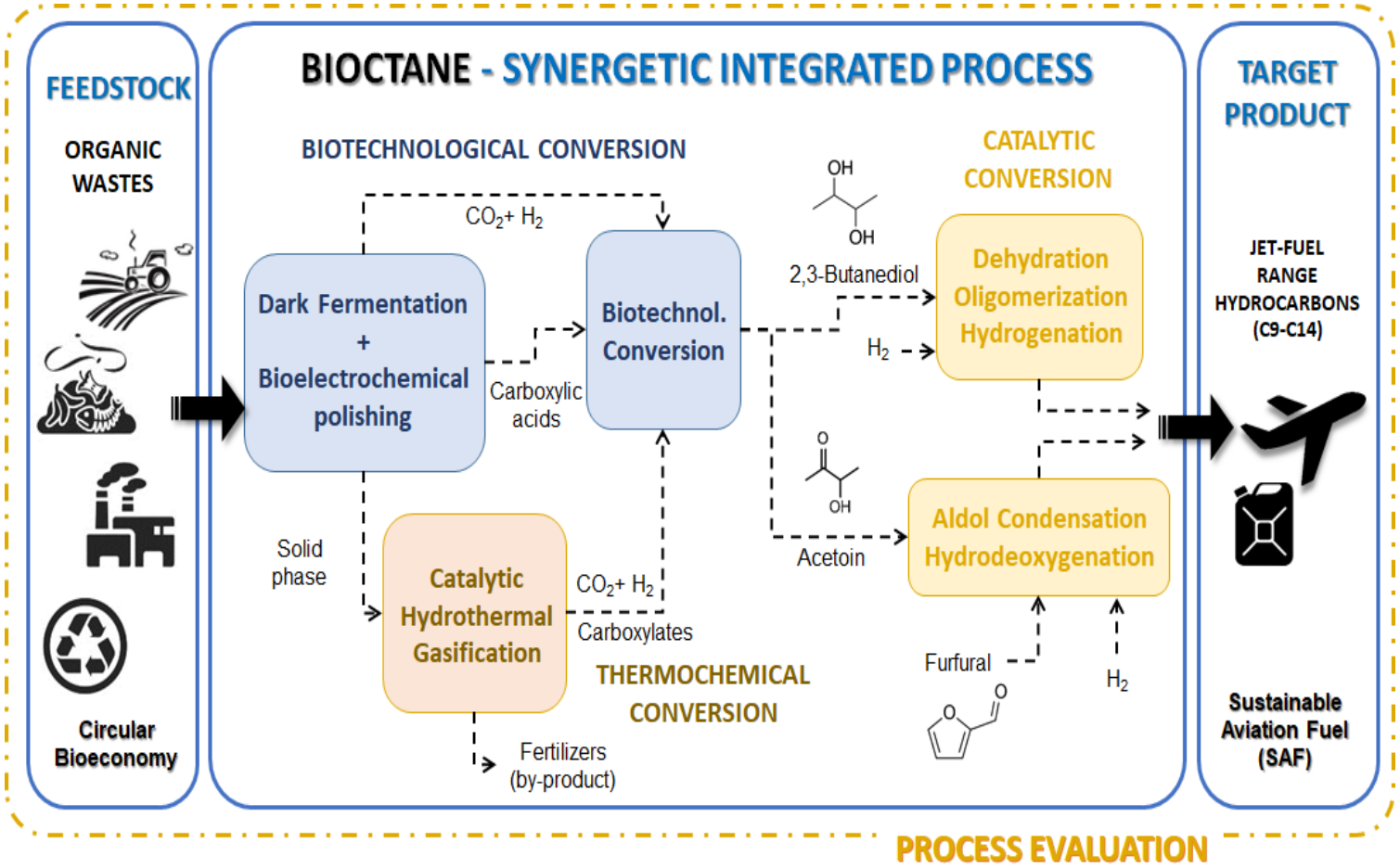
THE APPROACH

NOVELTY

Integration of catalytic conversion processes not been connected before and not been analyzed for efficiency improvement and scalability within this specific context.

CHALLENGES

- **New strategies** for eco-engineering the conversion of complex organic waste streams.
- **Improved** mixotrophic strain for the **continuous production of platform chemicals** to be used for further processing into fuel components.
- **New or improved catalysts** to allow high H_2 selectivity (hydrothermal gasification) and the integration of chemical routes (catalytic conversion of platform molecules into jet-fuel).
- A full process that allows **elucidating the techno-economic requirements** for full market integration.
- Reach TRL 4



PARTNERS

IMDEA Energy Foundation (IME), Spain-Coordinator

Hamburg University of Technology (TUHH), Germany

- Institute for Technical Microbiology (TUHH-TMI)
- Institute of Environmental Technology and Energy Economics (TUHH-IUE)

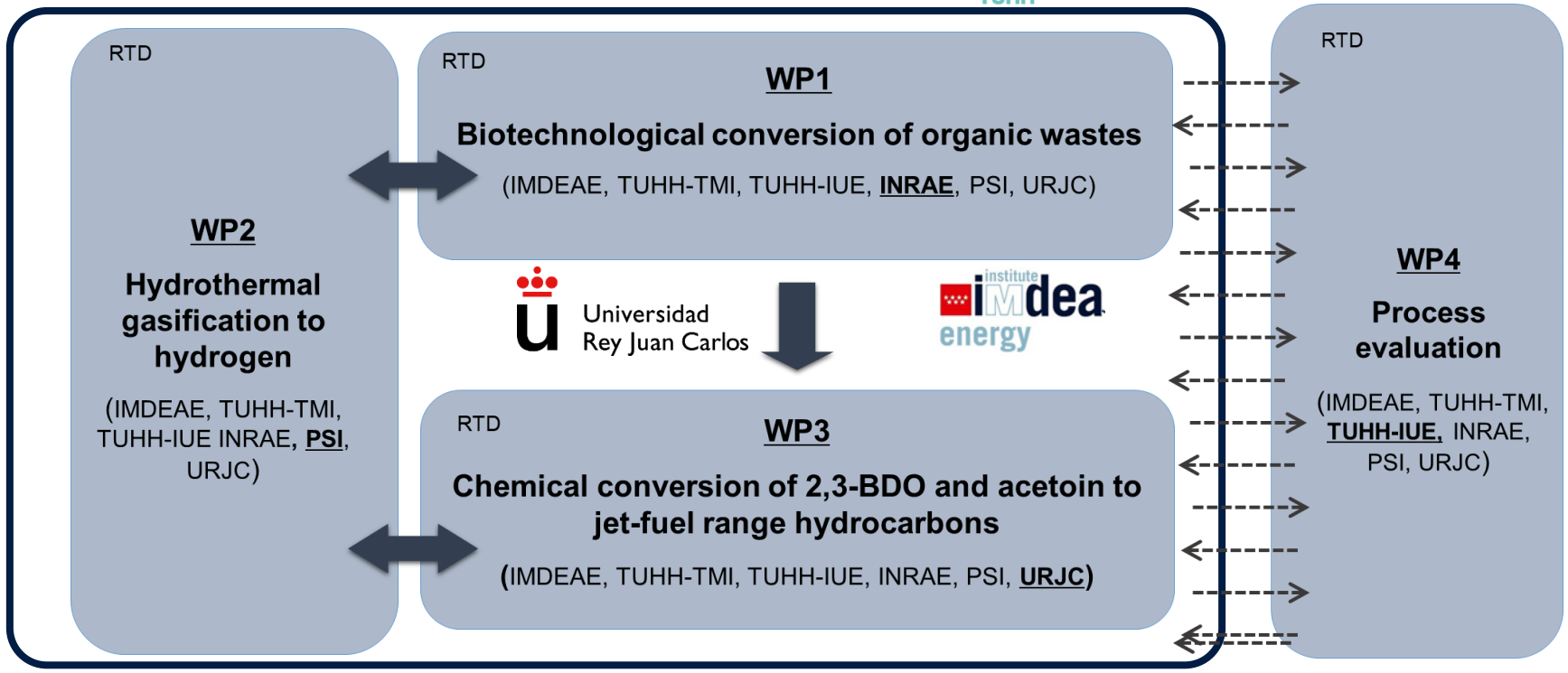
National Research Institute for Agriculture, Food and Environment (INRAE), France

Paul Scherrer Institute (PSI), Switzerland

Rey Juan Carlos University (URJC), Spain

Aviation Initiative for Renewable Energy in Germany (aireg)

WorkPackages



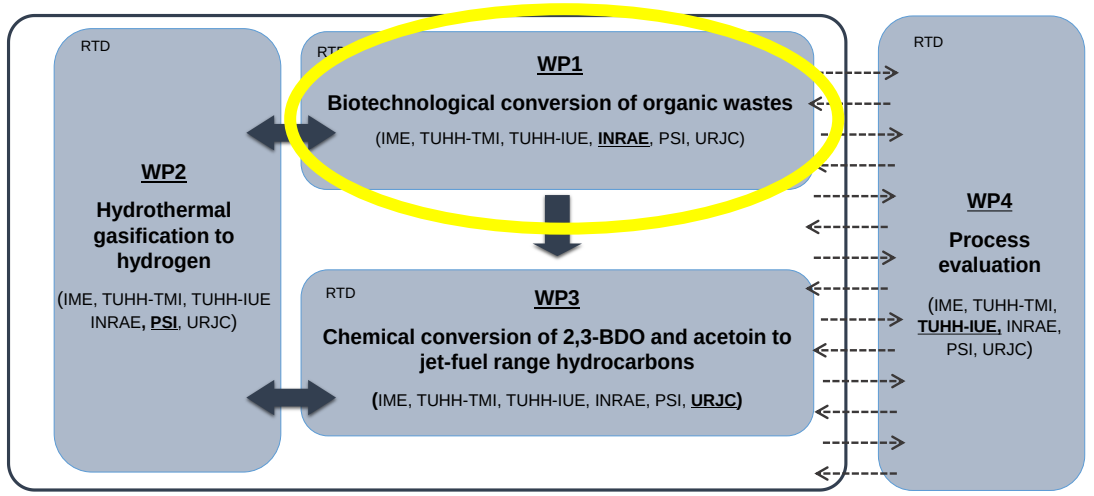
WorkPackages

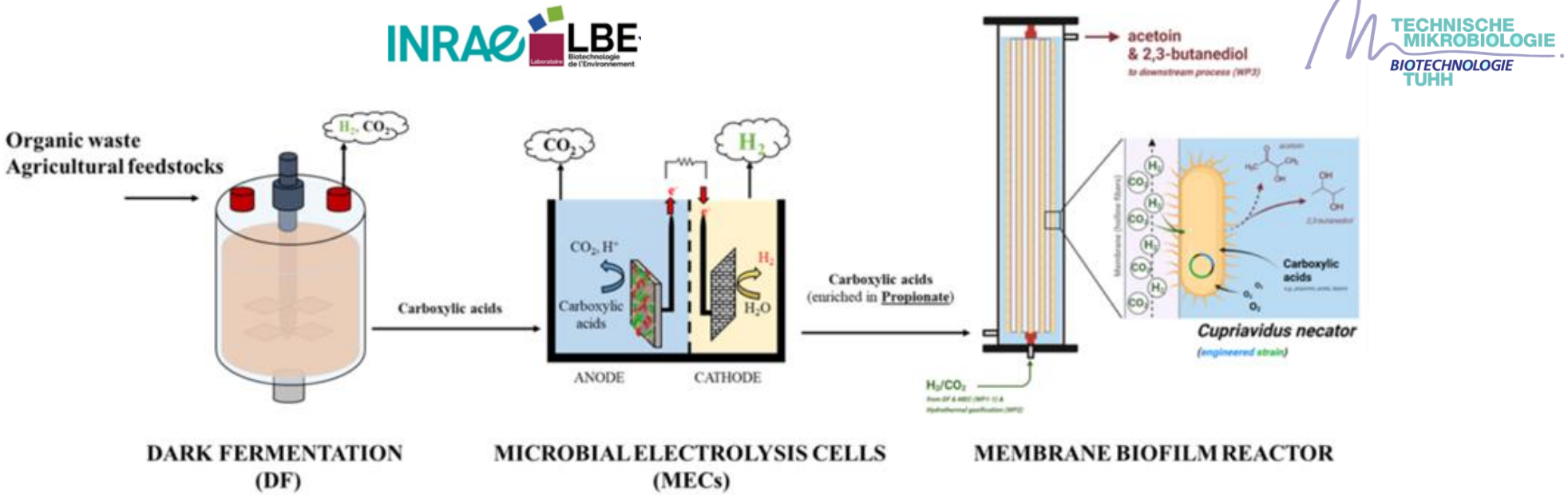
WP1: Biotechnological conversion of organic wastes

Objective: To develop a set of biological processes that maximize the conversion of complex organic matter to 2,3-butanediol (2,3-BDO) and acetoin.

Challenge: Optimize the stability and robustness of biological systems to ensure high conversion efficiency and consistent productivity.

The residual solids will be sent to WP2 for thermochemical conversion.





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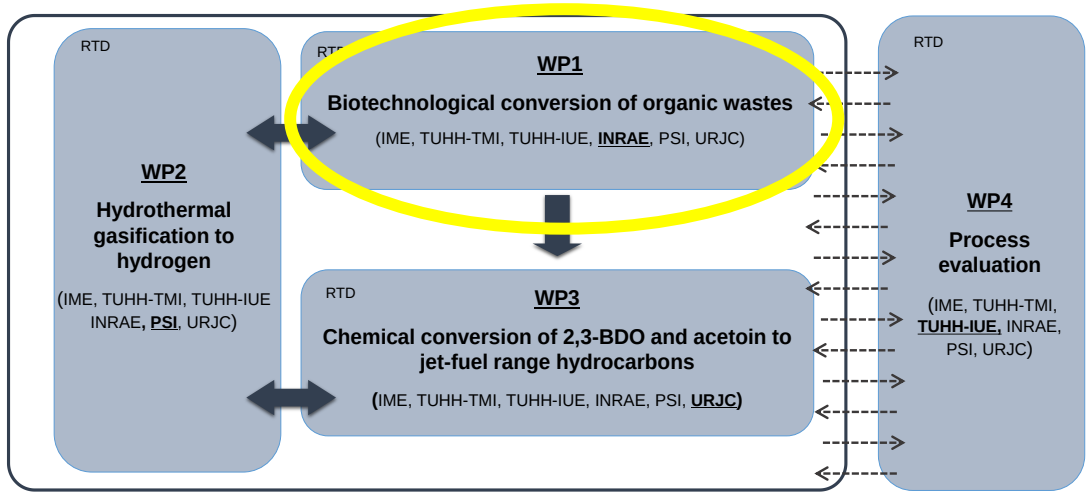


Level of approach to the objective:

- The most suitable substrate has been experimentally identified, together with the operating conditions and biotic parameters in dark fermentation to convert efficiently food waste to organic acids.
- First attempts to couple dark fermentation and microbial electrolysis cells show not only a polishing effect and concomitant production of H_2, but also a significant enrichment in propionic acid.

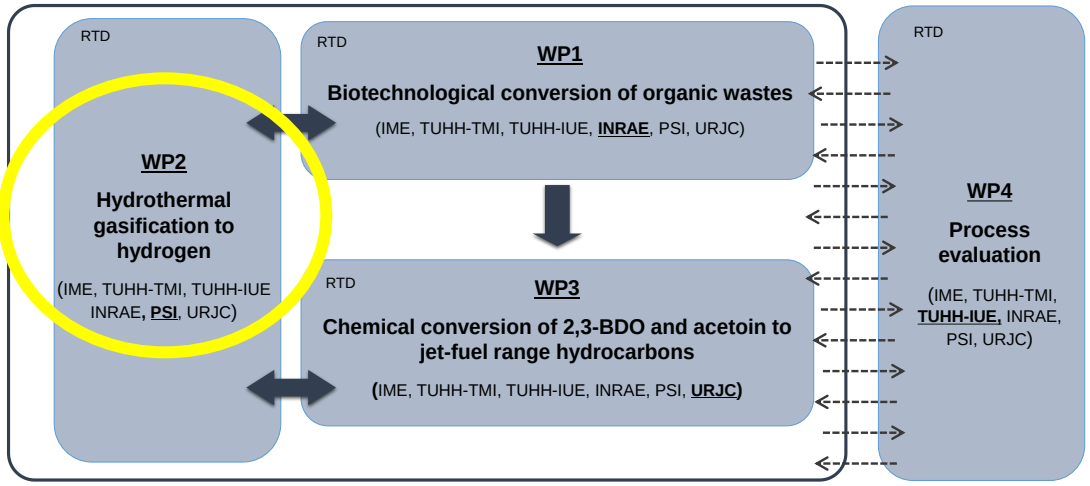
WorkPackages

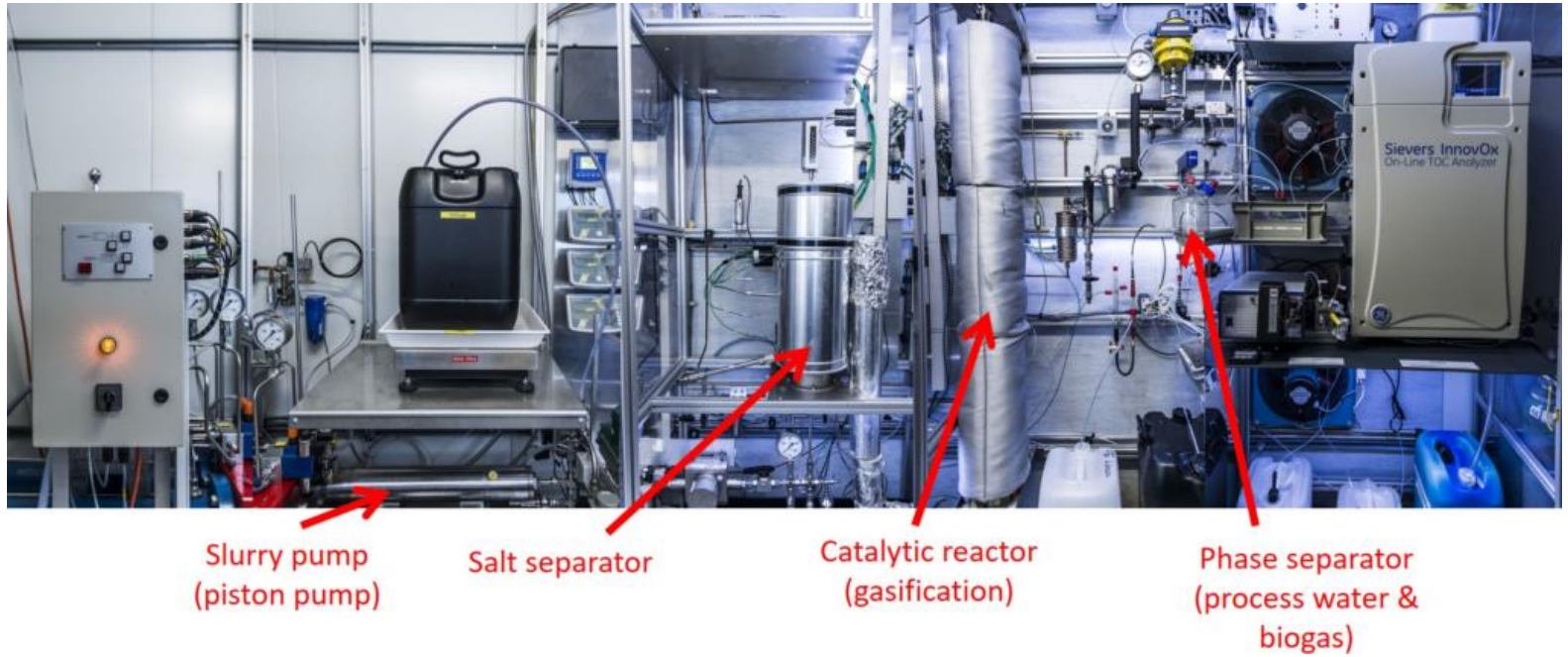
WP2: Hydrothermal gasification to hydrogen

Objective: production of hydrogen from aqueous fermentation residues (WP1), under hydrothermal conditions at moderate temperatures (300 to 450 °C).

Evaluate the potential for valorization of brine effluent as fertilizers (K, P).

Challenge: development of a selective and stable catalyst.





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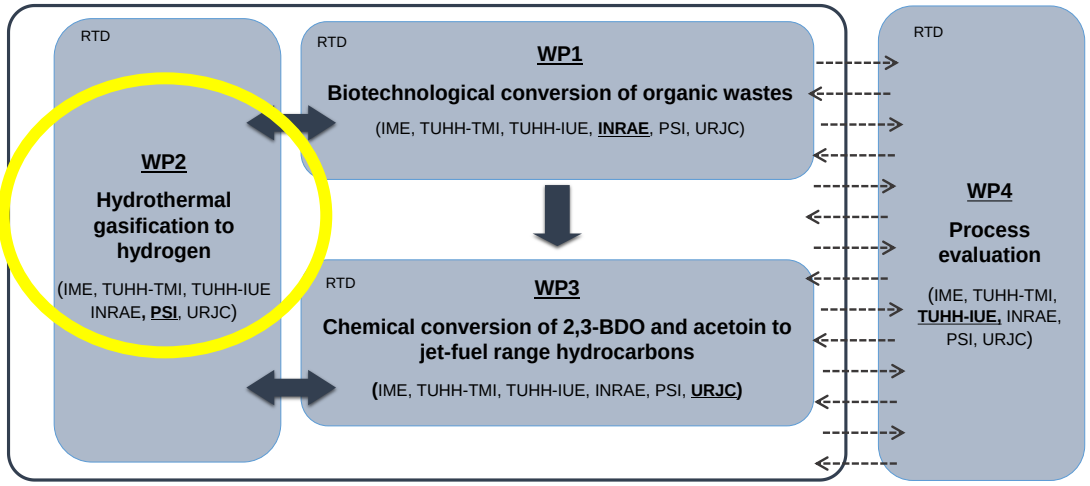


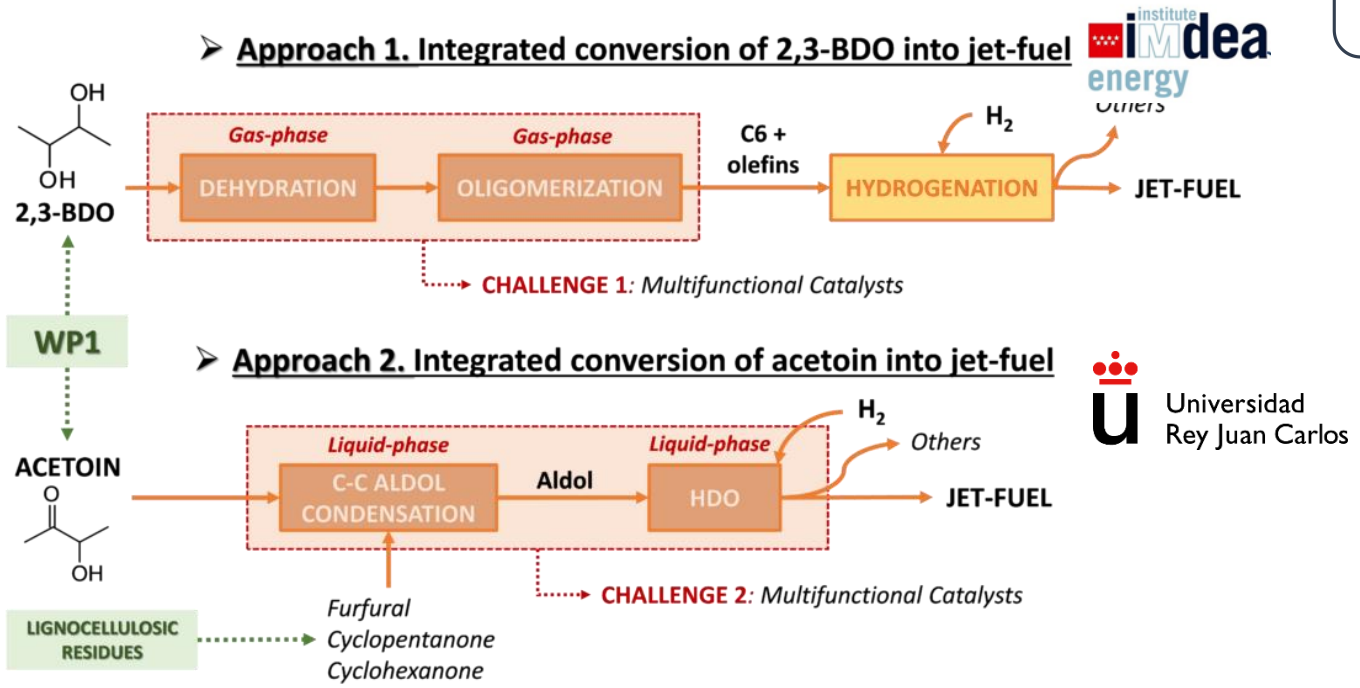
Level of approach to the objective:

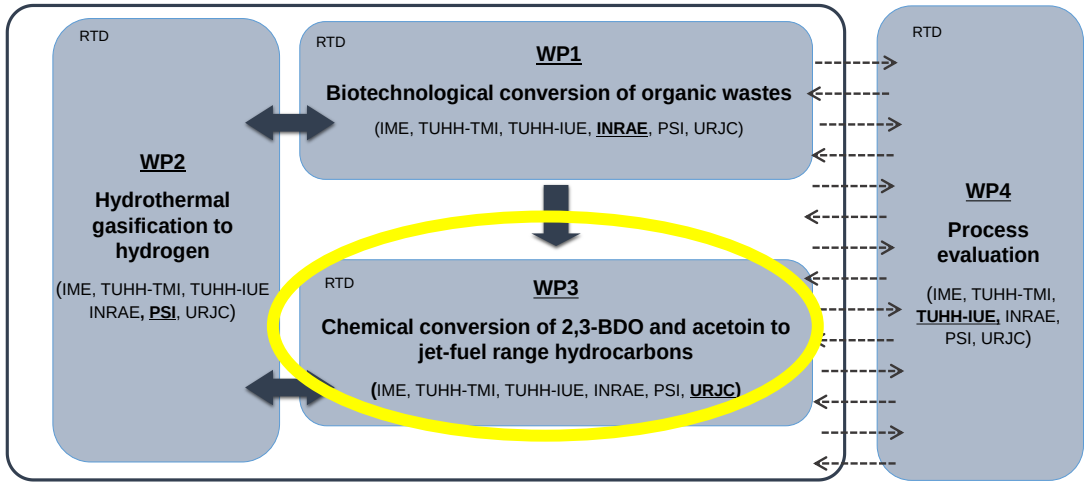
- Two supports have been identified with suitable stability to the severe conditions they will be subjected.
- The catalysts will be tested using a model compound and the process conditions optimized for H_2 production.

WorkPackages

WP3: Chemical conversion of 2,3-BDO and acetoin to jet-fuel range hydrocarbons

Objective: conversion of platform molecules generated in WP1 (2,3-butanediol (2,3-BDO) and acetoin) into HCs compatible with jet-fuel formulations.





Challenges:

Simplify the process by integrating catalytic stages into a single reactor.

Development of active, selective and stable multifunctional catalysts.

WorkPackages

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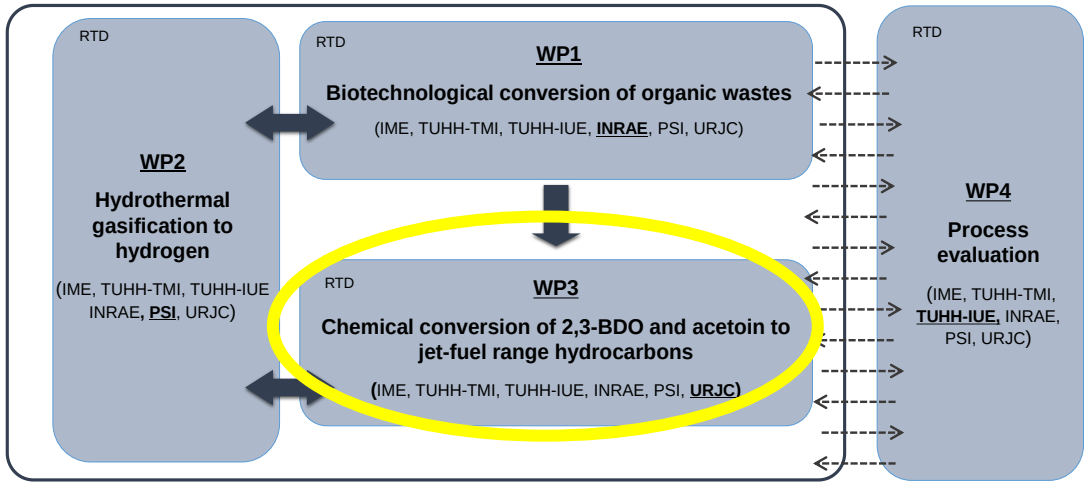


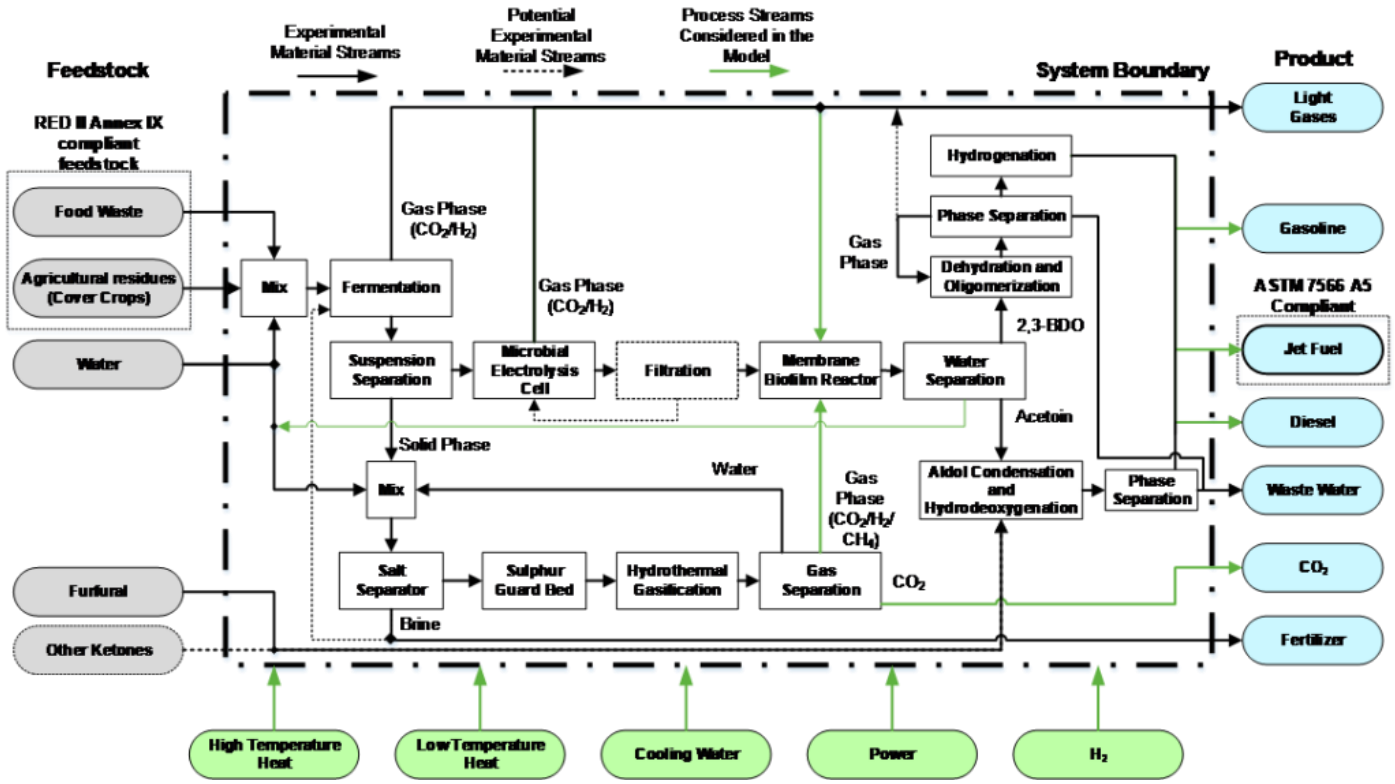
Level of approach to the objective:

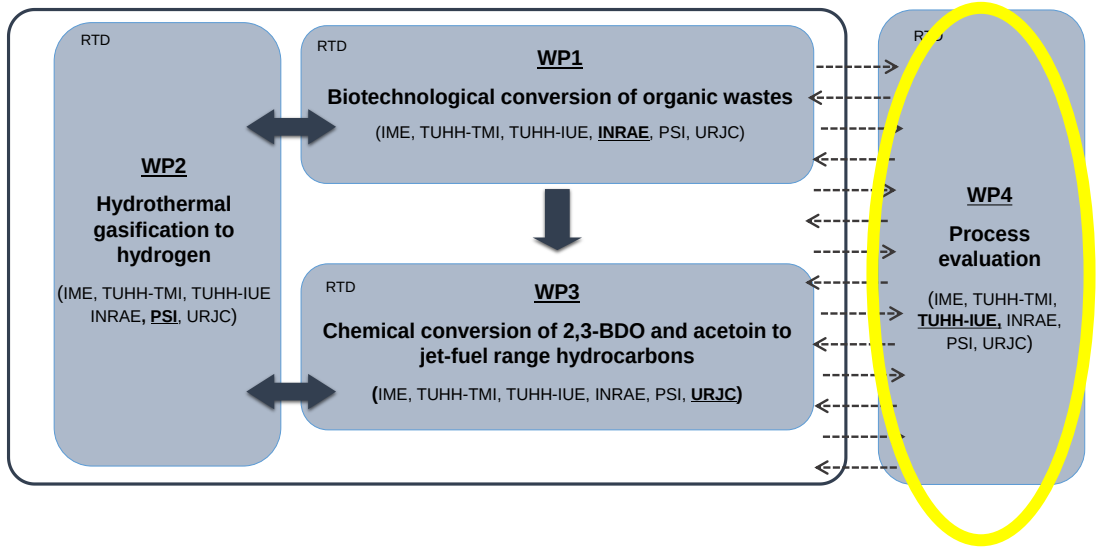
- Success in the C-C coupling of pure acetoin with 2-methylfuran and beginning of the HDO study.
- Pure 2,3-BDO is fully dehydrated to C4 olefins that will be converted into oligomers with a tandem catalytic system in the same reactor.

WorkPackages

WP4: Process evaluation

Objective: Techno-economic and environmental evaluation of the process, comparing it with reference processes with which it can compete.





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WorkPackages

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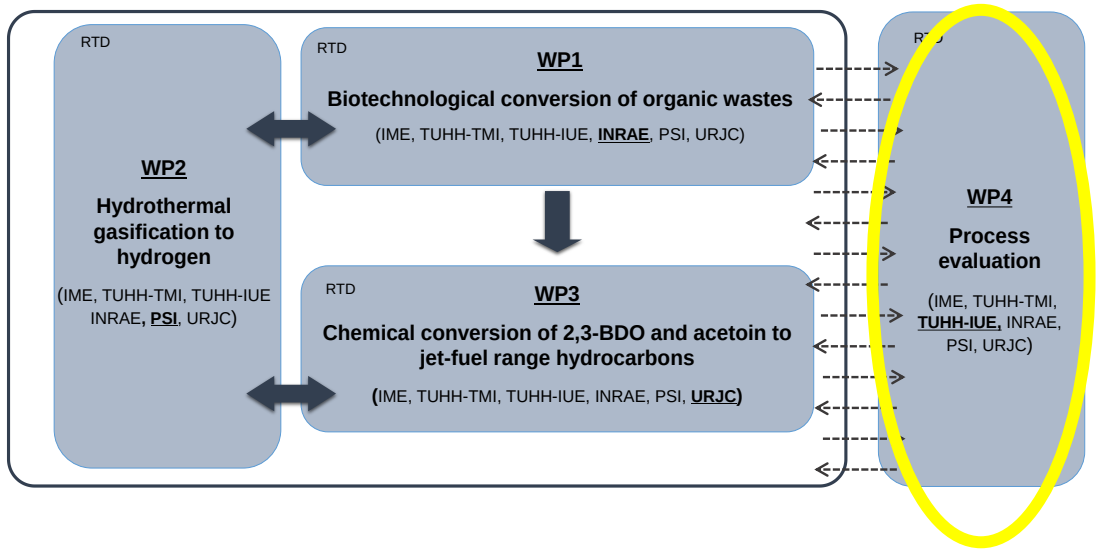


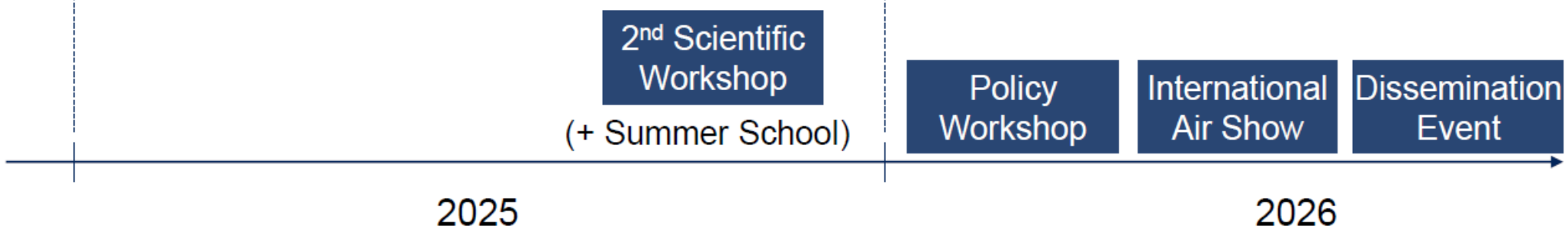
Level of approach to the objective:

- System boundaries and the most important assumptions were defined.
- Research was carried out into the raw material potential and competing processes

  (M. Kaltschmitt et al., Fuel Communications 17 (2023) 100093)
- Process modelling of the first process steps was started using the software Aspen Plus.

DECO ACTIONS

Task	Start	End	M26 Dez 24	M27 Jan 25	M28 Feb 25	M29 Mrz 25	M30 Apr 25	M31 Mai 25	M32 Jun 25	M33 Jul 25	M34 Aug 25	M35 Sep 25	M36 Okt 25	M37 Nov 25	M38 Dez 25	M39 Jan 26	M40 Feb 26	M41 Mrz 26	M42 Apr 26	M43 Mai 26	M44 Jun 26	M45 Jul 26	M46 Aug 26	M47 Sep 26	M48 Okt 26
International Air Show	36	42				X	X	X					X	X	X	X	X	X	X	X	X	X	X	X	X
Workshop 2	33	36	X								X	X	X												
Policy Workshop	36	42		X	X											X	X	X	X						
Dissemination Event	44	47								X	X	X								X	X	X	X	X	



SCIENTIFIC WORKSHOP & SUMMER SCHOOL 2025

- TOPIC: Bio-chemical conversion of biogenic waste to jet fuel
- Target audience: summer school attendant, BIOCTANE GA, interested people
- Advertisement via LinkedIn
- Dates: 6-10 October
- Location: TUHH (Hamburg)

	Monday	Tuesday	Wednesday	Thursday
Morning	Workshop	GA +ExBo	Summer School	Summer School
	Lunchbreak			
Afternoon	Workshop	Summer School	Summer School	Summer School

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