# EXPERT WORKSHOP

## Potential of Hydrothermal Liquefaction (HTL) routes for biofuel production

**19th November 2019 – Brussels**

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## Potential of Hydrothermal Liquefaction (HTL) routes for biofuel production

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Five European H2020 projects and the Norwegian National Centre Bio4Fuels invite jointly to their Expert Workshop

Moderated by Sonja van Renssen, Energy journalist

These projects have received funding from the European Union's Horizon 2020 research and innovation programme under grant agreements No 764734 (HyflexFuel), No 818120 (WASTE2ROAD), No 818413 (NextGenRoadFuels), No 727531 (4REFINERY), No 764675 (Heat to Fuel).

# 19 November 2019

SINTEF, Brussels, Rue Guimard 9 – Belgium

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| **09:00** | **Registration and coffee** |
| **09:20** | **Welcome –** Judit Sandquist and Sonja van Renssen |
| **09:30** | **Presentations from the European research projects** |
| | 4Refinery – Silje Fosse Håkonsen |
| | Heat to Fuel – David Chiaramonti |
| | HyFlexFuel – Valentin Batteiger |
| | NextGenRoadFuels – Lasse Rosendahl |
| | Waste2Road – Duncan Akporiaye |
| | Bio4Fuels – Duncan Akporiaye |
| **10:30** | ***Coffee break*** |
| **11:10** | **European R&I policy –** Maria Georgiadou, *Senior expert, European Commission DG RTD* |
| **11:30** | **Forest-residues-to-biojet fuel (ATM Project): HTL results –** Jack Saddler, *Professor, University of British Columbia* |
| **11:40** | **Development of HTL and Global Commercialization Possibilities –** Douglas C. Elliott, *Laboratory fellow (retired), PNNL* |
| **12:00** | ***Lunch*** |
| **13:00** | **Industrial status and developments of HTL** |
| **13:00** | Hydrofaction®: a leading technology for the efficient conversion of sustainable biomass into renewable transportation fuels – Perry Toms, *CEO, Steeper Energy* |
| **13:15** | Eni Waste to Fuel Technology - Industrial Deployment Plan – Roberto Marchini, *Vice President, ENI Syndial* |
| **13:30** | Building a reliable process – Steve Mahon, *CEO and Co-Founder, Armstrong* |
| **13:45** | RCAT-HTL: Sustainable Pathway for Drop-in Biofuels – Ramesh Bhujade, *Vice president - R&D, Reliance* |
| **14:00** | Scaling up hydrothermal liquefaction technology - trials & tribulations – David Lewis, *HTL Project Engineer, Southern Oil Refining Pty Ltd* |
| **14:15** | **Panel discussion with the speakers: Industrial status and market situation** |
| **14:45** | ***Tea/coffee break*** |
| **15:15** | **Panel discussion: Challenges on the pathway towards commercialization of HTL** |
| **15:45** | **Panel discussion: Next steps – cooperation possibilities – building a platform** |
| **16:15** | Workshop summary |
| **16:30** | Closure |

# Invited speakers

## Dr. Steve Mahon

CEO and Co-Founder, Armstrong, UK.

## Perry Toms

CEO, Steeper Energy Aps, Denmark.

## Ramesh Bhujade

Vice president, R&D, Reliance, India.

## Roberto Marchini

Vice President, ENI Syndial, Italy.

## Dr. David Lewis

HTL Project Engineer, Southern Oil Refining Pty Ltd, Australia.

## Dr. Maria Georgiadou

Senior expert, European Commission DG RTD, Belgium.

## Dr. Douglas C. Elliott

Laboratory fellow (retired), PNNL, USA.

## Dr. Jack Saddler

Professor, University of British Columbia, Canada.

# HyFlexFuel

The HyFlexFuel project works on advancing the complete production chain for sustainable drop-in fuel on the basis of hydrothermal liquefaction (HTL) as key conversion technology. HTL offers the possibility to convert essentially any type of biogenic material into liquid fuels without the requirement of prior energy-intensive drying. Specifically, the HyFlexFuel partners will:

- Demonstrate compatibility of HTL-based fuels production with a diverse biomass feedstock portfolio, including algae and waste streams, such as sewage sludge;
- Increase energy and carbon efficiency of HTL through improved heat integration and product recovery;
- Valorise organic and inorganic components in residual process streams;
- Upgrade biocrude from HTL conversion by catalytic hydrotreatment into fuel products and demonstrate their drop-in capability;
- Assess technical, socio-economic and environmental performance potentials.

**WEBSITE**
https://www.hyflexfuel.eu

# NextGen RoadFuels

NextGenRoadFuels aims at developing a novel European technology platform for sustainable liquid fuel production technologies. The project will prove that the Hydrothermal Liquefaction (HTL) pathway is able to produce high-volume, cost-competitive drop-in synthetic gasoline and diesel fuels, as well as other hydrocarbon compounds. Based on a circular economy approach in urban areas, it will provide a cost-effective, scalable technology and valorisation pathway for multiple low-value urban waste streams by combining thermo-, electro- and biochemical technologies. The process will be flexible, cost-competitive and resource-efficient as it will benefit of available pilot facilities in 2 main scenarios: a standalone model where a full production pathway can be managed at a central facility; a hub-and-spoke model, with several HTL plants serving a single upgrading facility.

**WEBSITE**
http://www.nextgenroadfuels.eu

# Bio4Fuels

Bio4Fuels is a Norwegian national FME (environmental friendly energy) centre, financed by the The Research Council of Norway, private industry and regional public partners. The centre has an eight years duration from January 2017 and an annual budget of approximately 3.4 MEuro. The Main Objectives of the Centre is to develop innovative technology and support industries to realize economic and sustainable conversion of biomass to transportation fuels along with added value chemicals. To achieve the goal of sustainable production of biofuels and bioenergy, a variety of technologies will be explored, including carbohydrate processing and thermochemical approaches. In the HTL value chain, our aim is to increase feedstock flexibility, reduce costs and climate impact associated with HTL as well as eliminate processing issues.

**WEBSITE**
https://www.nmbu.no/en/services/centers/bio4fuels

# Our project speakers

## Dr. Valentin Batteiger

European H2020 project coordinator (HyFlexFuel) and Lead Alternative Fuels at Bauhaus Luftfahrt e. V., Germany.

## Dr. Lasse Rosendahl

European H2020 project coordinator (NextGenRoadFuels). Professor, head of Advanced Biofuels Program at the Department of Energy Technology, Aalborg University, Denmark.

## Dr. David Chiaramonti

Leader project management in European H2020 project Heat to Fuel and Professor of Bioenergy Conversion Processes and Technologies, Italy.

## Dr. Silje Fosse Håkonsen

Leader project management in European H2020 project 4REFINERY and Research Scientist at SINTEF Industry, Norway.

## Dr. Duncan Akporiaye

European H2020 project coordinator (WASTE2ROAD), Bio4Fuel lead and Research Director of Process Technology Dept. at SINTEF Industry, Norway.

# Heat-to-Fuel

Heat-to-Fuel is a Horizon 2020 EU-funded project carried out by 14 partners from across Europe that aims to deliver the next generation of biofuel production technologies supporting the de-carbonisation of the transportation sector.

In numbers, Heat-to-fuel aims to:

- Deliver cost-competitive technologies achieving biofuel prices below €1 per litre. This is achieved by a 20% cost reduction in the biofuel production processes;
- Increase the quality of the biofuel resulting in 5% life-cycle green-house gases emissions reduction;
- Contribute to delivering goals of EU's energy security by increasing the share of local resources used for producing energy, and thus reducing EU's dependency of energy's imports.

At the end of the project, the know-how adquired will allow the scalability at a demonstration level of a fully integrated system representative of the next generation of sustainable biofuel technologies

**WEBSITE**
https://www.heattofuel.eu

# 4REFINERY

The 4REFINERY EU project aims at developing and demonstrating the production of next generation biofuels from fast pyrolysis and hydrothermal liquefaction integrated with mineral hydrocarbon refining processes. The project will make efforts to advance the primary liquefaction routes with the goal of providing an overall carbon yield of minimum 45%. Studying the entire value chain from biomass feedstock to blended fuel will provide deeper and much needed knowledge about the effect of different biomass pre-processing pathways on the final product characteristics. Project results will include a comprehensive toolbox for business case evaluations of the most promising value chains based on process deployment into existing refineries.

**WEBSITE**
https://www.sintef.no/projectweb/4refinery

# WASTE2 ROAD

WASTE2ROAD aims to develop a new generation of cost-effective biofuels from a selected range of low cost and abundant biogenic residues and waste fractions, aiming to achieve high overall carbon yields > 45% while reducing greenhouse gases emissions (GHG) by > 80% compared to fossil fuels. The consortium covers the full value chain from waste collection and recycling, to bio-conversion (liquefaction) and co-refining, through to validation of the biofuels for the use of road transport. The project will deploy risk-mitigation pathways to realise industrial implementation, with primary processing at European waste recycling sites and co-processing within European refineries, achieving pilot testing at TRL 5.

**WEBSITE**
https://www.sintef.no/waste2road