F-CUBED aims to develop an advanced process concept for the hydrothermal conversion of a broad range of biogenic residues to intermediate bioenergy carriers with fuel characteristics, suitable for balancing the power grid.

The F-CUBED approach enables overall validation of a feedstock flexible process, able to deal with variable feed characteristics, such as size, composition and pumpability. F-CUBED targets residues that do not compete with land intended for food or feed production.

F-CUBED will contribute to advancing the state-of-the-art in TORWASH[®] hydrothermal treatment (TRL5), mechanical dewatering of biogenic suspensions, N-P-K recovery via acid leaching and precipitation, anaerobic treatment of organic effluents, pelleting for combustion and gasification and briquetting for iron making.



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F-CUBED H2020



FUTURE FEEDSTOCK FLEXIBLE CARBON UPGRADING TO BIO ENERGY DISPATCHABLE CARRIERS

COORDINATOR - TNO (The Netherlands) EC CONTRIBUTION - \notin 4.059.128,75 CALL - H2020-EU.3.3.2 TOPIC - LC-SC3-RES-16-2019 FUNDING SCHEME - RIA DURATION - 05/01/2020-4/30/2023



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MAIN TARGETS OF THE RESEARCH

PERFORMANCE - Increasing energy density (at least to 5.5 GJ/m³) and fuel characteristics (complying with ISO/TS 17225-8:2016-TA3 specifications) of biogenic residues through hydrothermal processing with an energy yield of 50%.

SCALING-UP - Making a minimum of 100 kg (dry matter) of intermediate bioenergy carriers in a relevant industrial environment, for power generation and syngas production for biomass-to-liquids conversion processes.

EFFICIENCY - Showing at least a 30% improvement on residue processing costs, while obtaining GHG emission savings of at least 60% in using the intermediate bioenergy carriers for heat and power generation.

HETEROGENEOUS STREAMS - Validating experimentally the core process by using continuous hydrothermal reactor (20 kg/hr) and dewatering pilots, in a relevant industrial environment on 3 representative side streams, at Smurfit Kappa Piteå (Sweden, paper sludge), Delafruit (Spain, fruit and vegetable wastes) and APPO (Italy, waste olive pomace).

RECOVERY - Validating the parallel recovery of specific value-added products for each industrial case (nitrogen, phosphorus and potassium, terpenes and olive pomace oil recovery).

The F-CUBED process converts low quality biogenic residues to superior intermediate bioenergy carriers, increasing the flexibility of a renewable energy system. Intermittent Power F-CUBED ENERGY CONVERSION PROCESS **Biological and Lignocellulosic** Intermediate Dispatchable Transportation Industrial **Biogenic Residues Bioenergy Carriers** Power Fuels Energy Applications > 131 MTOE (8% EU-28 Consumption) Consortium members and their contribution to the value chain of bio-energy carriers production. Fertilizer Heat & CHP Power Project Nutrient TEE LCA TNO innovation Management Recovery 🔁 Smurfit Kappa NUI Galway OE Gaillimh TNO innovation for life DÉ Gaillimh UNIVERSITY OF HOHENHEIM 🔆 HEAT SYSTEMS ž 💽 TNO innovation for life Pelleting / Solids **Bio-pellet** Briquetting SWERIM **Hvdrothermal** Biogenic Bio-slurry Dewatering SWERIM TNO innovation for life residues Treatment **TORWASH®** Delafruit **ELIQUO** limburg Filter APPO V OÊ Gaillimh 📧 Smurfit Kappa Effluent Biogas Effluent TNO innovatio Digester PAQUES Nutrient Recovery **Communication &** UNIVERSITY OF HOHENHEIM Dissemination V Kneia Fertilizer