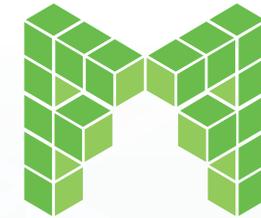


F-CUBED aims to develop an advanced process concept for the hydrothermal conversion of a broad range of biogenic residues to intermediate bioenergy carriers with fuel characteristics, suitable for balancing the power grid.

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.



# F-CUBED

**FUTURE FEEDSTOCK FLEXIBLE  
CARBON UPGRADING TO BIO  
ENERGY DISPATCHABLE CARRIERS**



<https://www.f-cubed.eu/>



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F-CUBED\_H2020

**COORDINATOR** - TNO (The Netherlands)  
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**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

**1 PERFORMANCE** - Increasing energy density (at least to 5.5 GJ/m<sup>3</sup>) and fuel characteristics (complying with ISO/TS 17225-8:2016-TA3 specifications) of biogenic residues through hydrothermal processing with an energy yield of 50%.

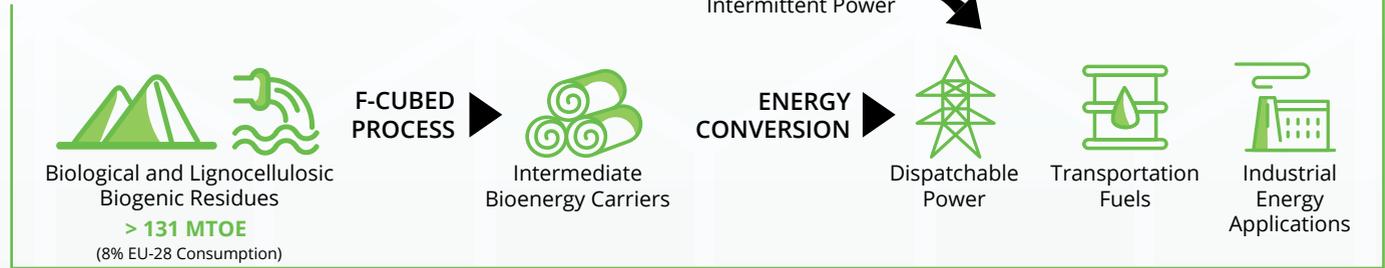
**2 SCALING-UP** - Making a minimum of 100 kg (dry matter) of intermediate bioenergy carriers in a relevant industrial environment, for power generation and syngas production for biomass-to-liquids conversion processes.

**3 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.

**4 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).

**5 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.



Consortium members and their contribution to the value chain of bio-energy carriers production.

