



SOCAR Türkiye
Research & Development
and Innovation Co.





PETKİM
RES

STAR
RAFİNERİ

PETKİM

**TÜRKİYE'S FIRST
SPECIAL INDUSTRIAL
REGION**

SOCAR
TERMINAL

SOCAR
DEPOLAMA

Vision

Support holding companies with technology solutions that ensure operational efficiency as part of the strategic objectives of SOCAR Global and the 2035 vision of SOCAR Türkiye

SOCAR Türkiye

Research & Development and Innovation Co.



Mission

Create world-class innovative skills to develop and enhance new sustainable, eco-friendly, and market-oriented processes, products, catalysts, and digital technologies across the entire value chain, with the aim of achieving self-sufficiency



SOCAR GLOBAL

Digitalization

Increasing the efficiency of operations with the application of **high-level digitalization** in all segments of SOCAR's value chain

Efficiency and optimization:

To create value by applying the latest technological and innovative solutions to SOCAR's operations and activities

Business Sustainability

Providing new sources of income through investments in innovation and venture

Energy Transition

Contribute to global sustainability through low carbon emissions, circular economy and development of environmentally friendly operations.

SOCAR TURKEY

Support for process Improvements by digital solutions, modelling projects

New product development, grade diversification, product improvement

Creation of long term competitive material, applications

SOCAR R&D

Operational Efficiency
(Catalyst & Digitalization)

Product & Application

Energy Transition & Circular
Economy & Environmental
Solutions



Strategic Alignment with SOCAR 2035 Vision

**R&D Centre established on
1.200 m² area including**



Pilot Plant



Offices



Laboratories

Laboratories

- Rheology Laboratory
- Catalyst Laboratory
- Polymer Characterization Laboratory
- Environment & Biotechnology Laboratory
- Chemical Analysis Laboratory
- Chromatography Laboratory

Location



Aliaga
R&D Center,
İzmir

Vadistanbul
SOCAR Plaza,
İstanbul



R&D Facilities and Capacities

SOCAR
AR-GE

Universities



BOĞAZIÇI
ÜNİVERSİTESİ



İZMİR
YÜKSEK TEKNOLOJİ
ENSTİTÜSÜ



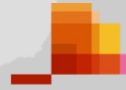
Industries (Technology Suppliers & Research Centres)



SIEMENS



Honeywell



pwc



Group Companies



Countries



Azerbaijan



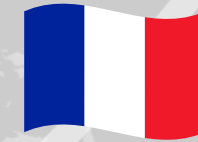
Germany



Italy



United States
of America



France



Belgium



Spain



Collaborations & Partnerships in 2023



H2020 & HEUROPE



CARMOF (H2020)

Tailormade 3D Printed Structures Based On CNT and MOF for Efficient CO₂ Capture

CO₂ FOKUS (H2020)

CO₂ Utilisation Focused on Market Relevant Dimethyl Ether Production via 3D Printed Reactor and Solid Oxide Cell Based Technologies

NEFERTITI (H2020)

Innovative Photocatalysts Integrated in Flow Photoreactor Systems for Direct CO₂ and H₂O Conversion into Solar Fuels

LOUISE (H2020)

Low-Cost CO₂ Capture by Chemical Looping Combustion of Waste-Derived Fuels

CIRCULAR TwAIIn (HEUROPE)

AI Platform for Integrated Sustainable and Circular Manufacturing

ALGAESOL (HEUROPE)

Sustainable aviation and shipping fuels from microalgae and direct solar BES Technologies



H2020 & HEUROPE





Additive Manufacturing - SAYEM

Development of Novel Material, Production and Bench Technologies for Additive Manufacturing

BIOLINK

Sustainable Bioplastic Production from Agricultural Food Wastes

4 NEW MEMBERSHIPS



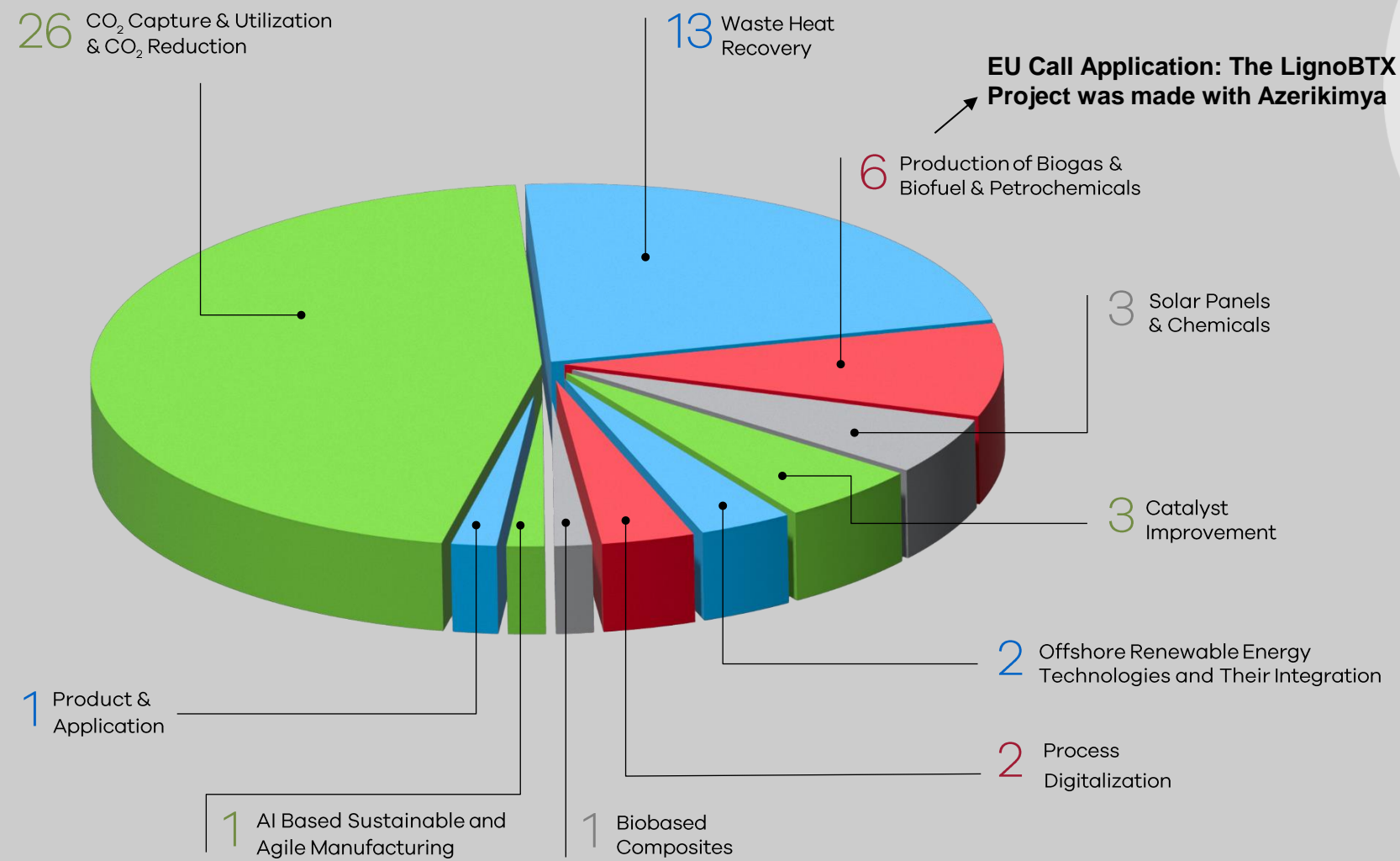
European Clean
Hydrogen Alliance



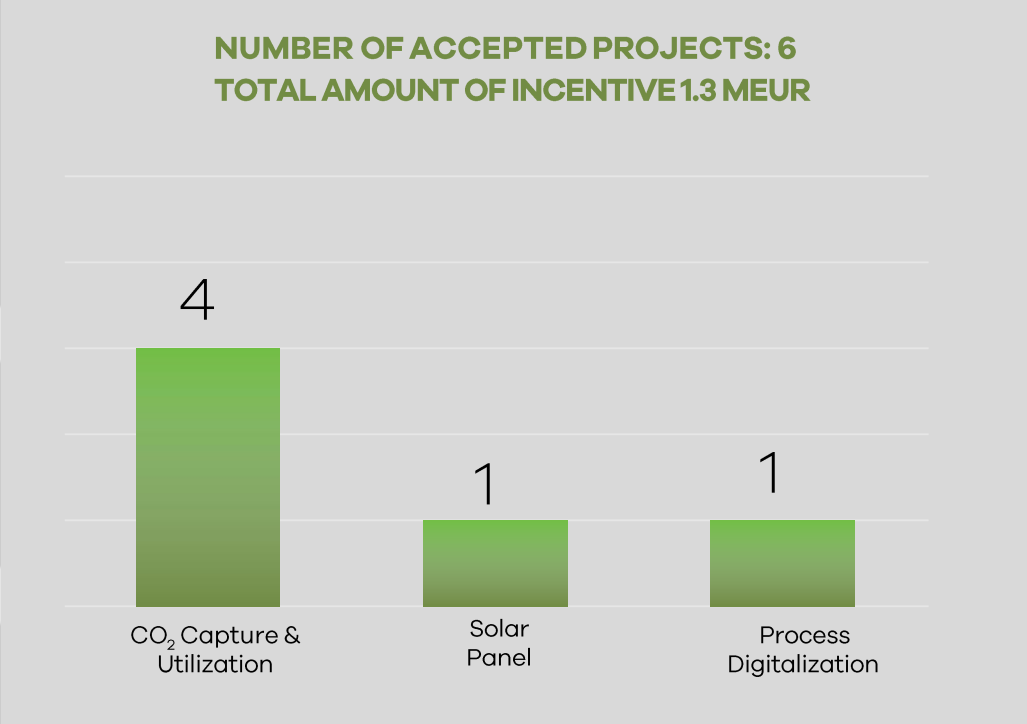
Bio-based Industries
Consortium



TOTAL NUMBER OF APPLICATIONS: 69



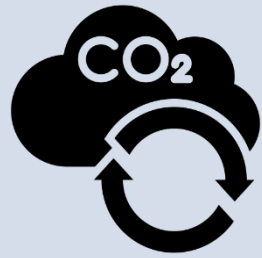
EU Call Application: The LignoBTX Project was made with Azerikimya



Grant Applications



TOPICS WITHIN OUR INTEREST



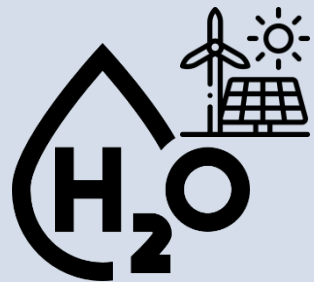
CO₂ Capture and Utilization

CO₂ utilization into value added fuels and chemicals, catalyst development, process design and demonstration



Alternative / Renewable / Synthetic Fuels

Processes for the production of sustainable aviation fuels, biofuels and e-fuels, catalyst development, process design, demonstration, fuel upgrading and fuel characterization tests



Green Hydrogen Production and Integration to Industry

Development of electrocatalysts for green hydrogen production, detailed catalyst characterization, membrane preparation, electrocatalytic activity tests, electrochemical synthesis



Grant Applications

TOPICS WITHIN OUR INTEREST



Recycle and Recovery

Plastic recycling, recycling waste materials that are formed from refinery processes, recovery of critical metals/minerals from spent industrial catalysts and other wastes, material synthesis and characterization



Waste Water Treatment

Development of specific bacteria for treatment of industrial waste water, recovery of valuable metals and chemicals from waste water



Biopolymers and Functional Polymers

Production of sustainable bioplastics from different sources, thermoplastics for use in 3D printers, innovative applications for functional and specialized industries



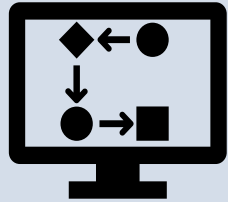
Grant Applications

TOPICS WITHIN OUR INTEREST



Drone Applications

Drone applications for inspection, monitoring, and maintenance. algorithm development, image processing



Modelling and Optimization

Modeling and optimization of transportation systems for efficiency and reduced environmental impact, optimization of manufacturing processes for increased efficiency and reduced waste.



Energy Efficiency

Implementation of advanced heat integration methods to recover and reuse waste heat, adoption of energy-efficient technologies and equipment in refining and petrochemical facilities, development of next-generation catalysts and materials to improve reaction efficiency and reduce energy consumption.



Grant Applications

CAPABILITIES & KNOW-HOW

Catalyst Design & Synthesis

Solid catalysts such as zeolites, mixed oxides, MOFs, mesoporous materials, supported metals...etc. might be synthesized via several methods such as sol-gel, hydrothermal synthesis, impregnation, co-precipitation...etc.

Catalyst & Adsorbent Characterization

Detailed characterizations for the determination of textural, chemical and morphological specifics of the catalysts and solid materials

CO₂ Utilization

Catalyst and process design for the synthesis of alternative fuels and valuable chemicals from CO₂

Plastic Recycling

Chemical plastic recycling, upcycling of waste olefins into naphtha

Biopolymers and Polymers for 3D Printing

Biopolymer synthesis using bacteria, thermoplastic materials for SLS-3D printing applications



Capabilities & Know-How



Waste Water Treatment

Mix bacterial cultures: specially developed for wastewater treatment, recovery of valuable metals and chemicals

UAV Services & Drone Applications

Outdoor inspection indoor inspection 3D mapping, air quality control and mapping thickness measurement leakage determination, custom algorithm development detailed reporting services

Fuel Characterization

Characterization of fuels by GC analysis, PIONA analysis (reformulyzer), sulfur analysis (total sulphur and nitrogen analyzer) and organic and inorganic elemental analysis in fuels

Material Characterization

Material characterization such as XRD, XRF, FT-IR, BET, TGA and chemisorption analysis

Modelling & Digitalization

Modelling and simulation studies, algorithm and soft sensor development



Capabilities & Know-How



Our Projects



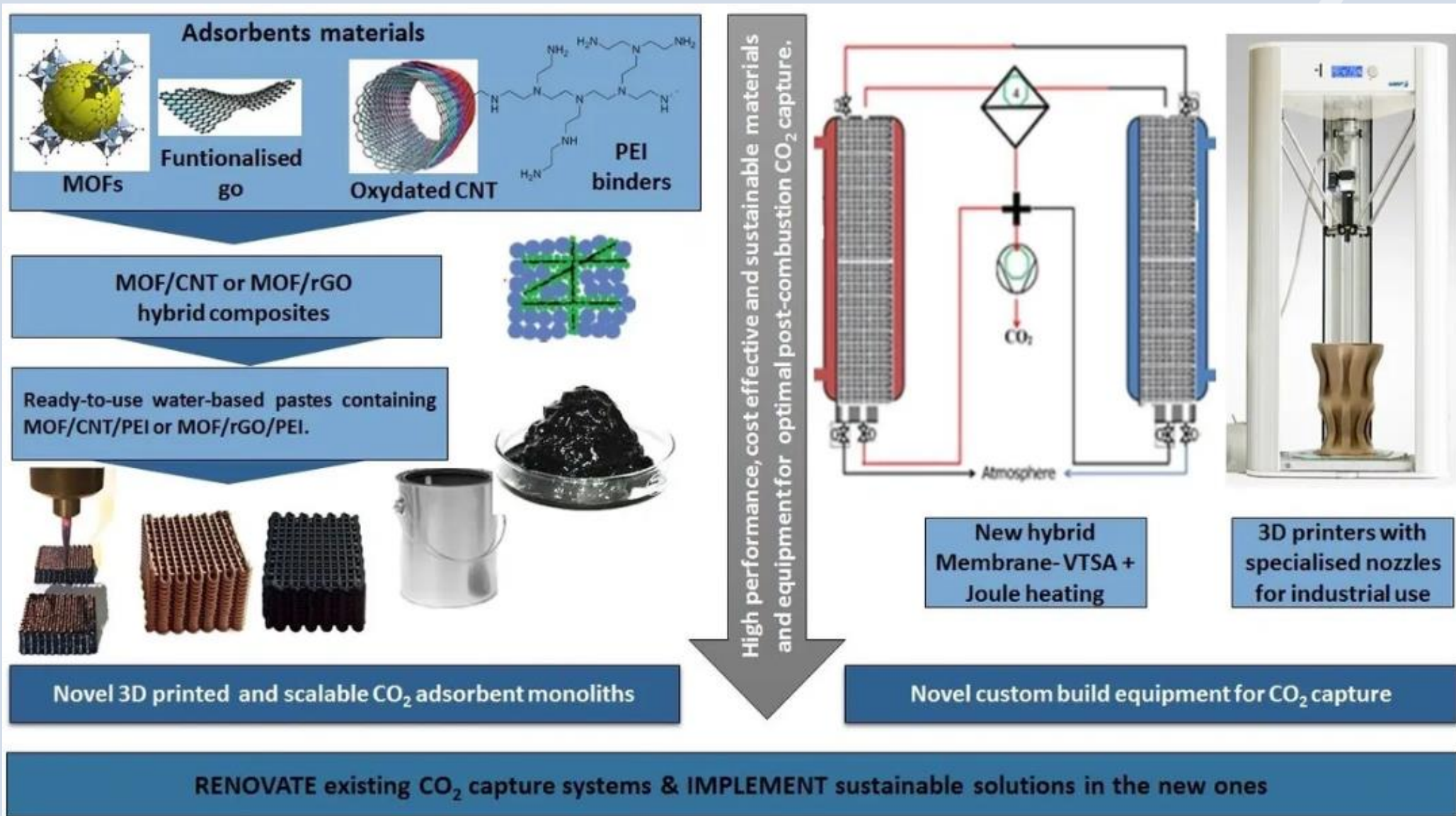
The background of the slide features a photograph of an industrial facility, likely a refinery or chemical plant, with several large, circular storage tanks in the foreground and a complex network of pipes and structures in the background. The entire image is overlaid with a semi-transparent red filter. A prominent white, wavy, flame-like line graphic curves across the right side of the image. Below the title 'Our Projects', there is a short, solid green horizontal line.

Dimethyl ether, Methanol and Jet Fuel production from CO ₂ and H ₂	Energy transition Sustainability
Chemical recycling of the waste polyolefins to Petchem feedstock	Circular economy Sustainability
Biotechnology Products with long shelf life for the treatment of the petrochemical and refinery waste water	Sustainability Bioproducts
Algae derived biofuel production from CO ₂	Energy transition Bioproducts



SOCAR Türkiye R&D and Innovation Co.
Major Sustainability and Decarbonization Projects





Horizon 2020

Topic: NMBP-20-2017

Call: H2020-NMBP-2016-2017

CALL FOR NANOTECHNOLOGIES,
ADVANCED MATERIALS,
BIOTECHNOLOGY AND PRODUCTION
Type of action: Innovation action



**TAILOR-MADE 3D PRINTED STRUCTURES BASED ON CNTS AND MOFS
MATERIALS FOR EFFICIENT CO₂ CAPTURE**





12 PARTNERS from 8 COUNTRIES



DME CAN BE



A clean energy source with **high combustion quality** and low toxicity



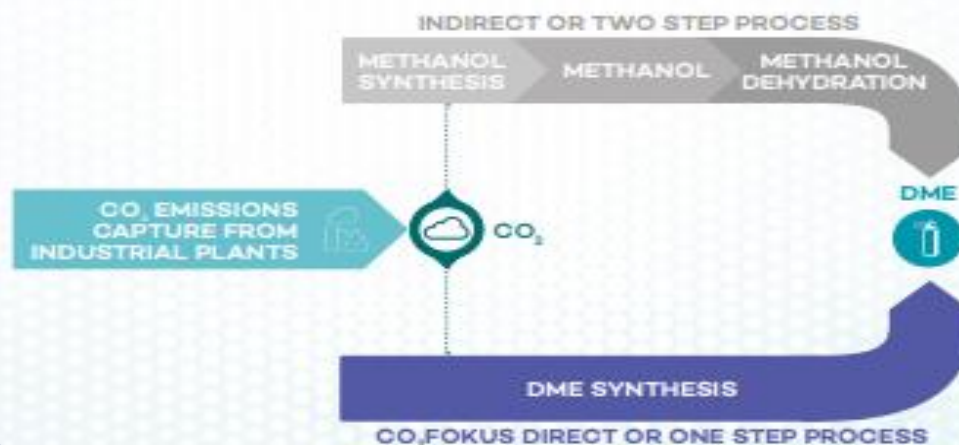
An intermediate for the **synthesis** of several value-added products (petrol, aromatics and olefins)



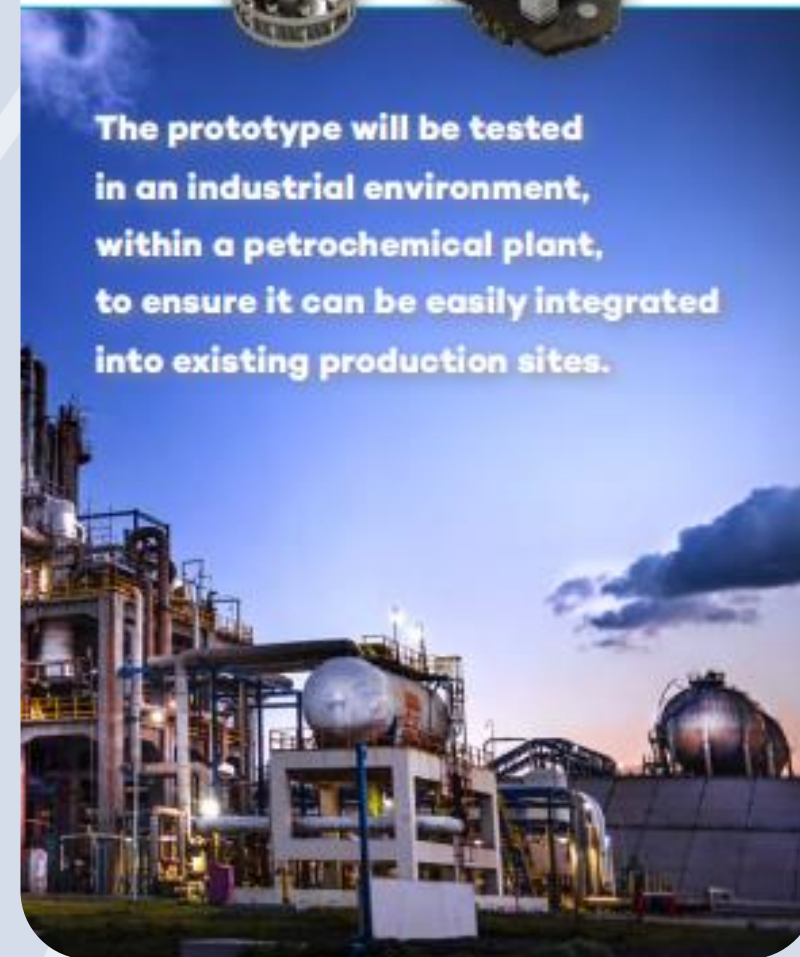
An ether used as **chemical feedstock**

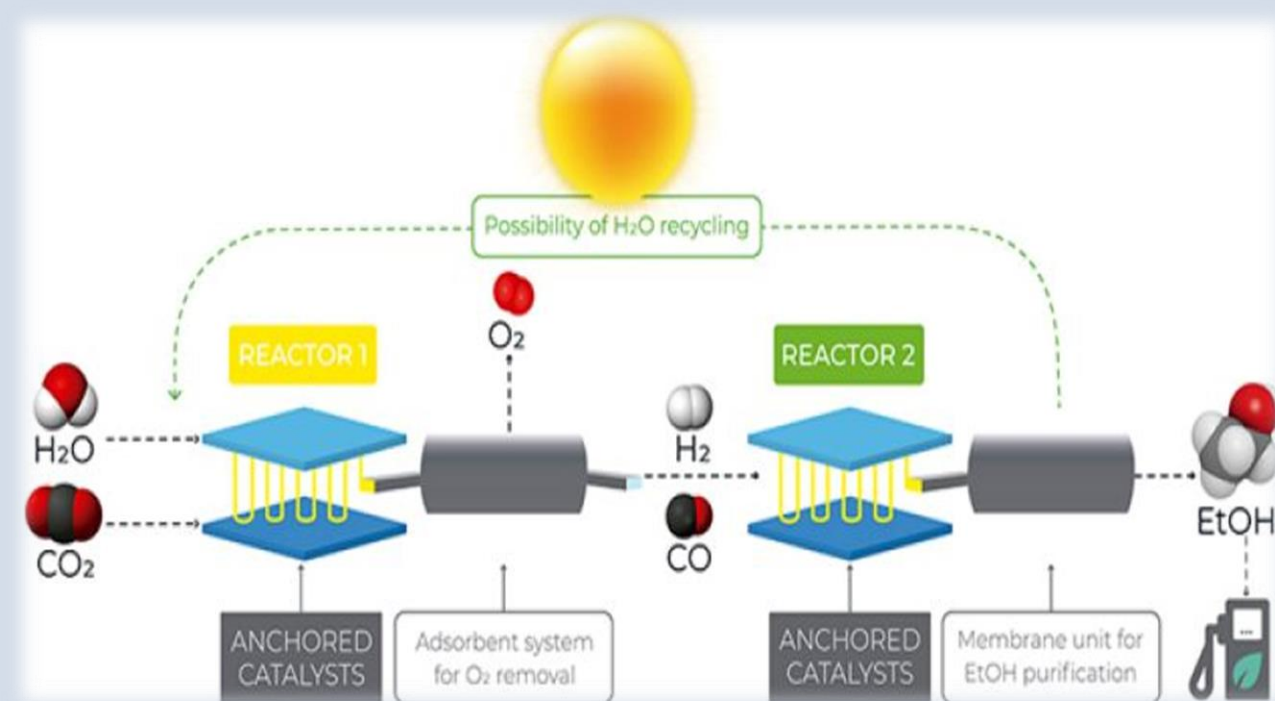
At present, DME is mainly obtained through an indirect process involving the use of fossil fuels such as natural gas or coal.

CO₂Fokus aims to develop a direct and more efficient DME production process, reducing both energy consumption and the use of fossil fuels.



The prototype will be tested in an industrial environment, within a petrochemical plant, to ensure it can be easily integrated into existing production sites.



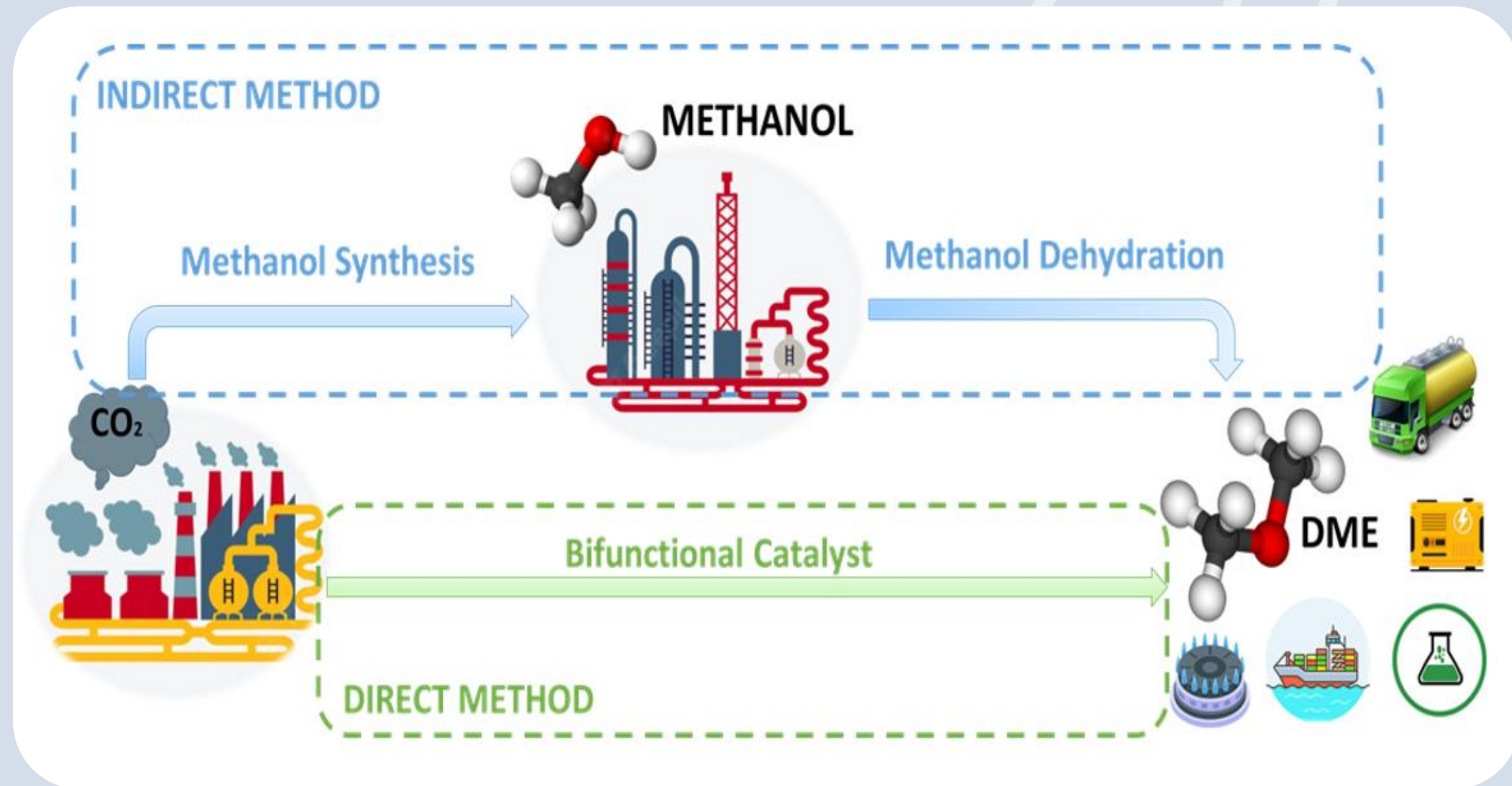


Innovative high-efficiency photocatalytic system that will allow a simultaneous conversion of CO₂ and H₂O in solar fuels (ethanol and alcohols with a longer chain such as isopropanol) and thus provide an innovative alternative to transform CO₂ into valuable products for the energy and transportation.



**INNOVATIVE PHOTOCATALYSTS INTEGRATED IN FLOW
PHOTOREACTOR SYSTEMS FOR DIRECT CO₂ AND H₂O
CONVERSION INTO SOLAR FUELS**





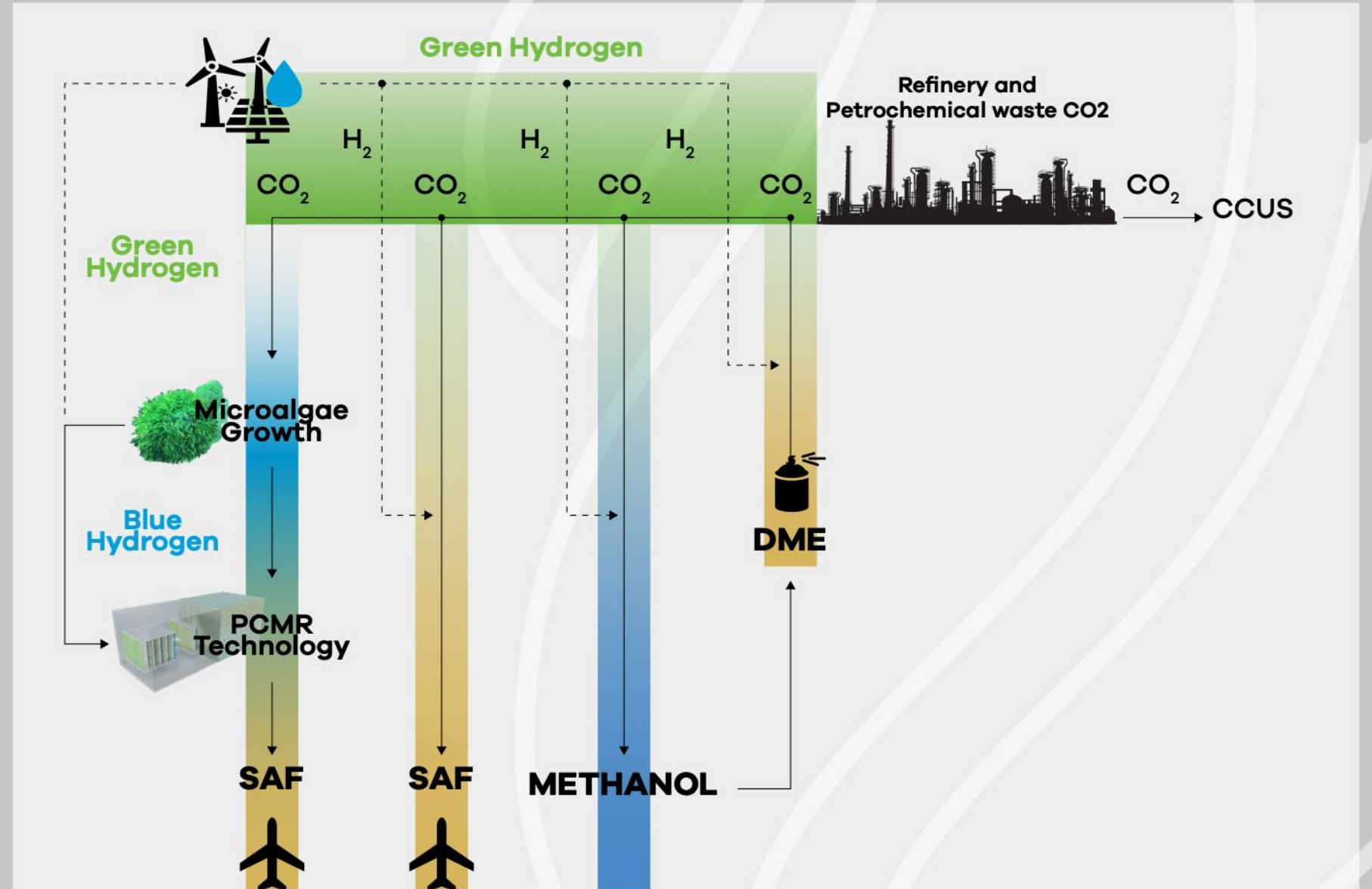
SOCAR Turkey R&D is performing in-house developed projects to utilize waste CO₂ into value-added products and is open to new collaborations

TRL levels of the projects are varying and consisting of;

- Catalyst Development
- Process Design and simulation
- Novel technology development
- Lab and pilot scale demonstrations

Open to joint development opportunities, and EU Horizon calls

CO₂ utilization studies in SOCAR Turkey R&D



CO₂ Utilization Approach

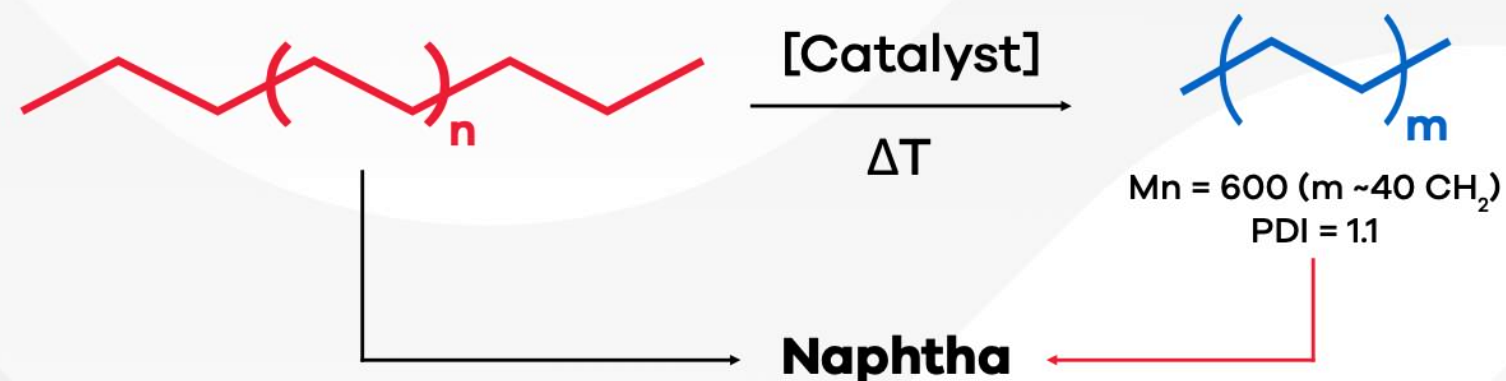
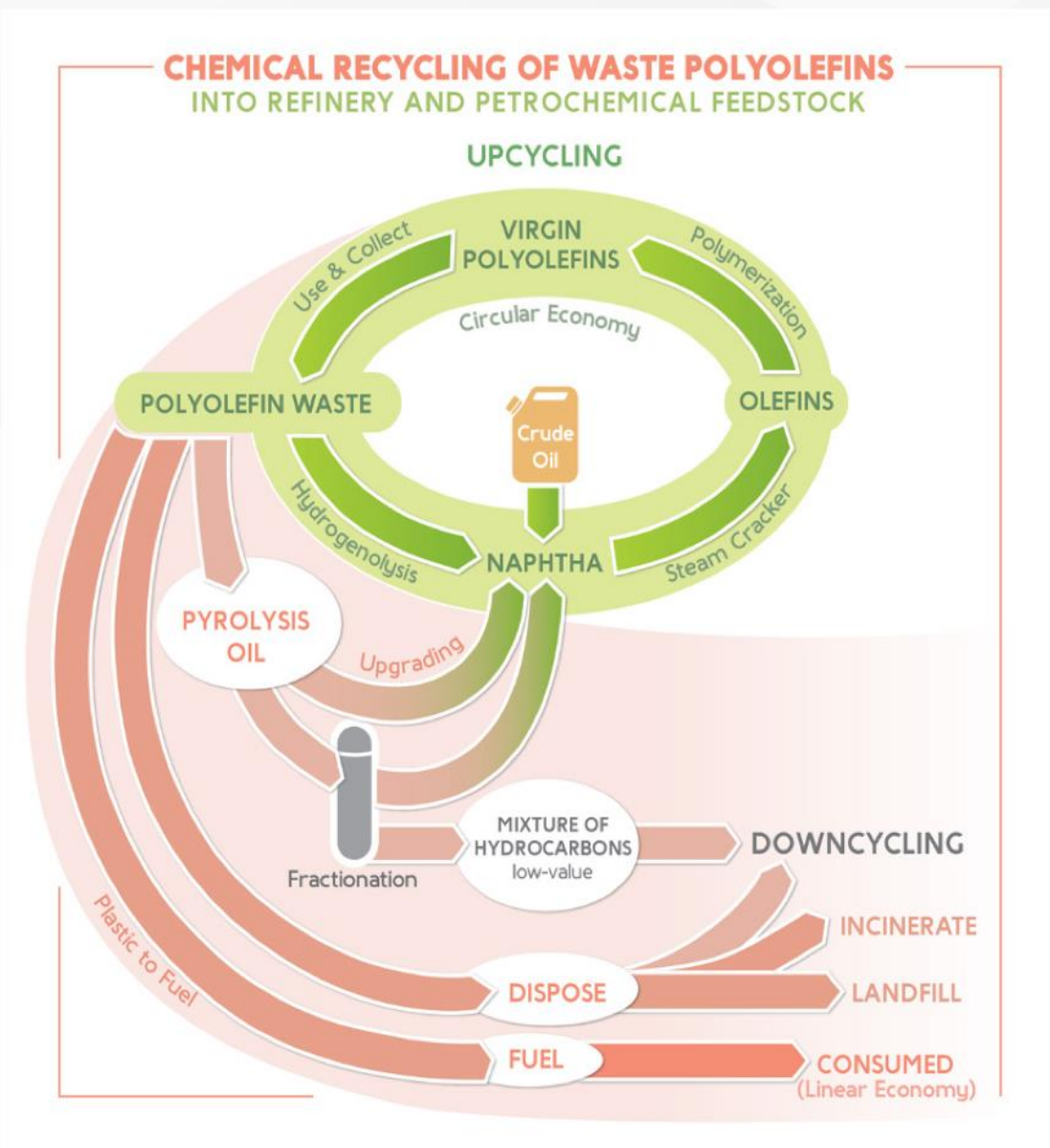
3 Different SAF production process from different raw materials

- Direct Algae-to-SAF: PCMR New catalyst and reactor technology development
- ALGAESOL - Sustainable Aviation and Shipping Fuels from Microalgae and Direct Solar BES Technologies Catalyst Development in the laboratory
- Synthetic SAF production with CO₂ hydrogenation: New catalyst and reactor technology development

- Reduction of the CO₂ emission
- Development of a new catalyst and technology
- Reduction of the crude oil consumption
- Utilization of CO₂ instead of sequestration



A new Project application which will be coordinated by SOCAR R&D is completed for 2.7 million Euro fund for PCMR technology demosite.



Benefits of Upcycling with Catalyst

- Diverting waste from landfills
- Reducing the use of petroleum resources
- Repurposing former plastics from urban areas

Paths forward for Naphtha Production

- Hydrogenolysis
- Pyrolysis
- Pyrolysis + Hydrogenolysis

- High quality liquids such as naphtha are produced at high yields.
- Catalyst selection allows tuning of the composition of the resulting oil.
- Lab scale studies are completed.



**Chemical Recycling of Waste Plastics into Petrochemical
Feedstock Proprietary Catalytic Process Development**





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