eFuels in Scale

a pathway towards commercialization of Power-to-X

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aireg | Webinar: Die nächsten Konversionsrouten

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- Neste in Brief
- What is required?
- Growth beyond waste oil and fats - Innovation to accelerate new raw material sources
- Power-to-X Business Platform - developing initiatives in scale
- Project: eFuel small-scale pilot

Neste is a global leader in circular & renewable solutions

We are

#1

Producer of Sustainable Aviation Fuel & Renewable Diesel with production capacity increasing from 3.2 Mt to 5.5 Mt in 2023

In 2022, our customers reduced

11.1 Mt

greenhouse gas emissions with our renewable products

In 2022, we reached

3,537 m€

comparable EBITDA

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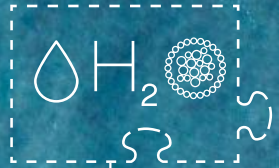
The world is set to reach the 1.5 degree level within the next two decades.
Rapid decarbonization is required to close the gap.

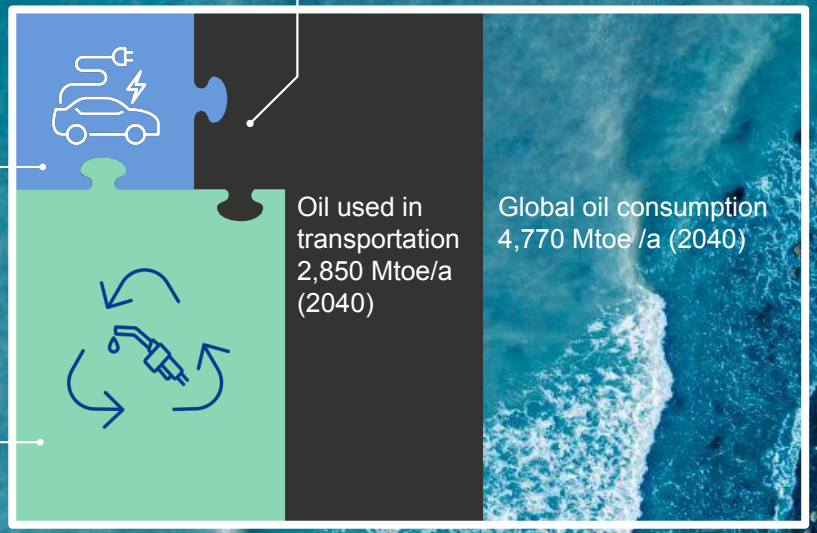
Why do we need sustainable fuels when we have electrification?

Sustainable transport requires <u>all</u> low-carbon solutions

Power-to-X, hydrogen, and algae hold **significant potential** for fossil-fuel displacement in transport in the long term.



There could be 600m electric passenger cars by 2040, replacing around **360 Mtoe** of fossil transport fuels.



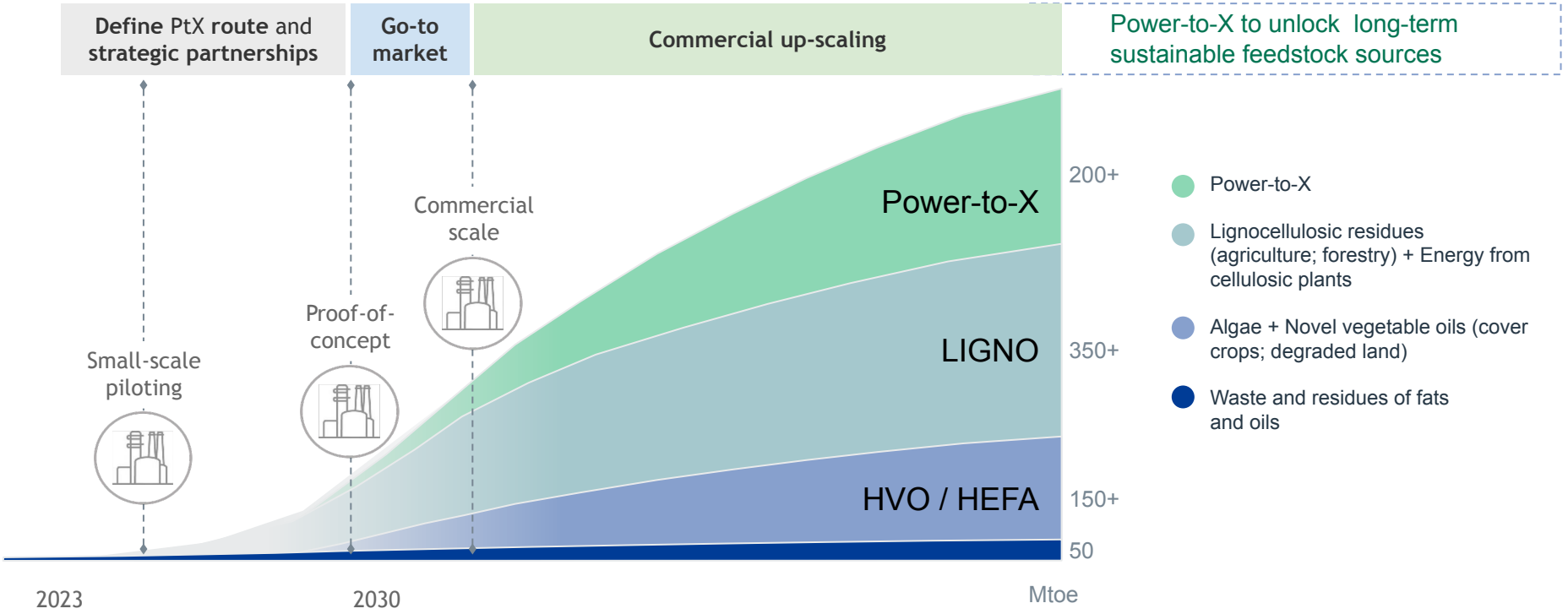
Biofuels have the potential to replace up to **1,000 Mtoe** of fossil transport fuels

Source: Neste based on IEA (2020) World Energy Outlook, Stated Policies Scenario; WEF Clean Skies for Tomorrow (2020) and other sources

EVs and renewable fuels can substitute more than 50% of crude oil in transportation.

Innovation to accelerate new raw material sources and emission reduction technologies in the transportation sector

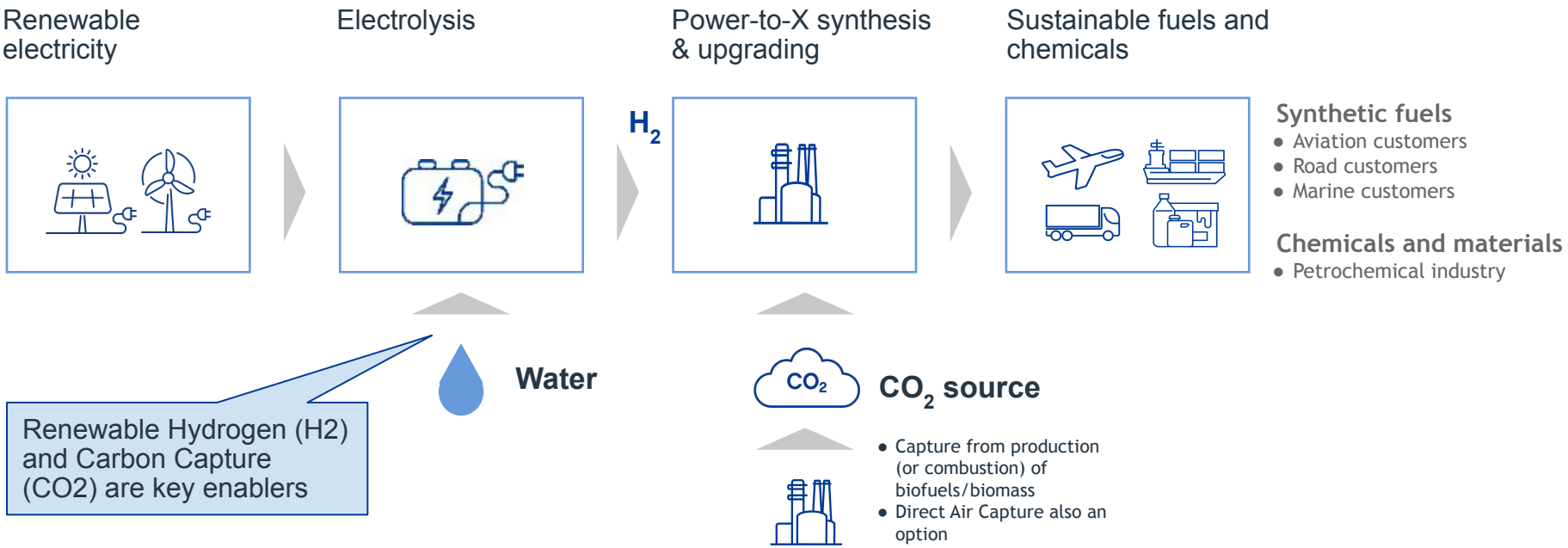
Growth beyond waste oil and fats - future feedstocks are scalable



Source: Neste analysis based on WEF Clean Skies for Tomorrow and other sources. Biomass potential converted to fuel potential, using a conversion efficiency of about 85 % (weight-based) for fats and oils and novel vegetable oils; efficiency of about 85% (weight-based) for fats and oils and novel vegetable oils; about 25% efficiency for lignocellulosic biomass and municipal solid waste.
*80 % organic waste and 20 % non-recyclable, non-separable plastic waste.

Power-to-X Business Platform

Power-to-X converts renewable electricity into synthetic fuels (eFuels or electrofuels) and synthetic chemicals materials (eFeedstock)



Power-to-X: Potential technology pathways

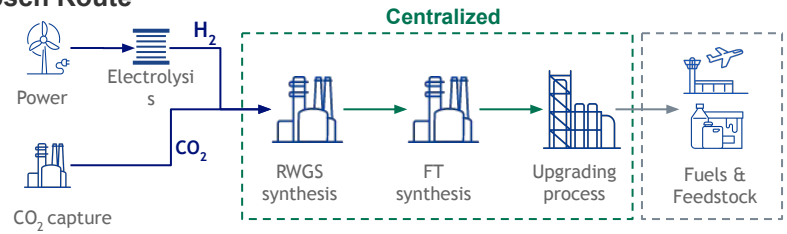
Basis for project development and partner selection

Fischer Tropsch vs. Methanol-to-Jet
Which fits the best for the project portfolio?

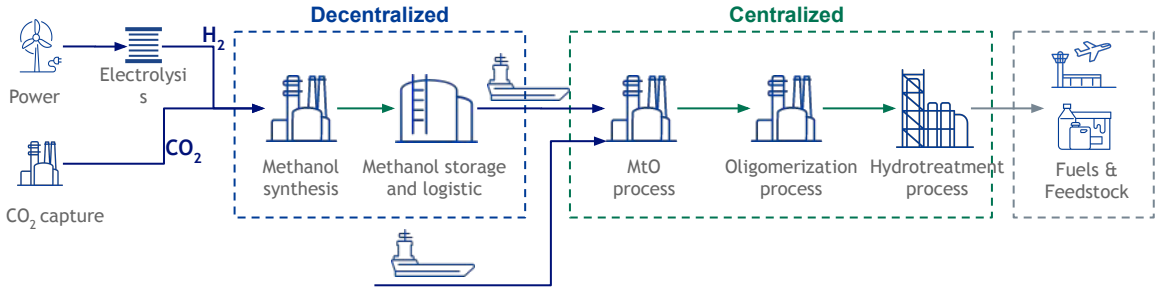
to be selected

Growing Project Portfolio

Fischer-Tropsch Route

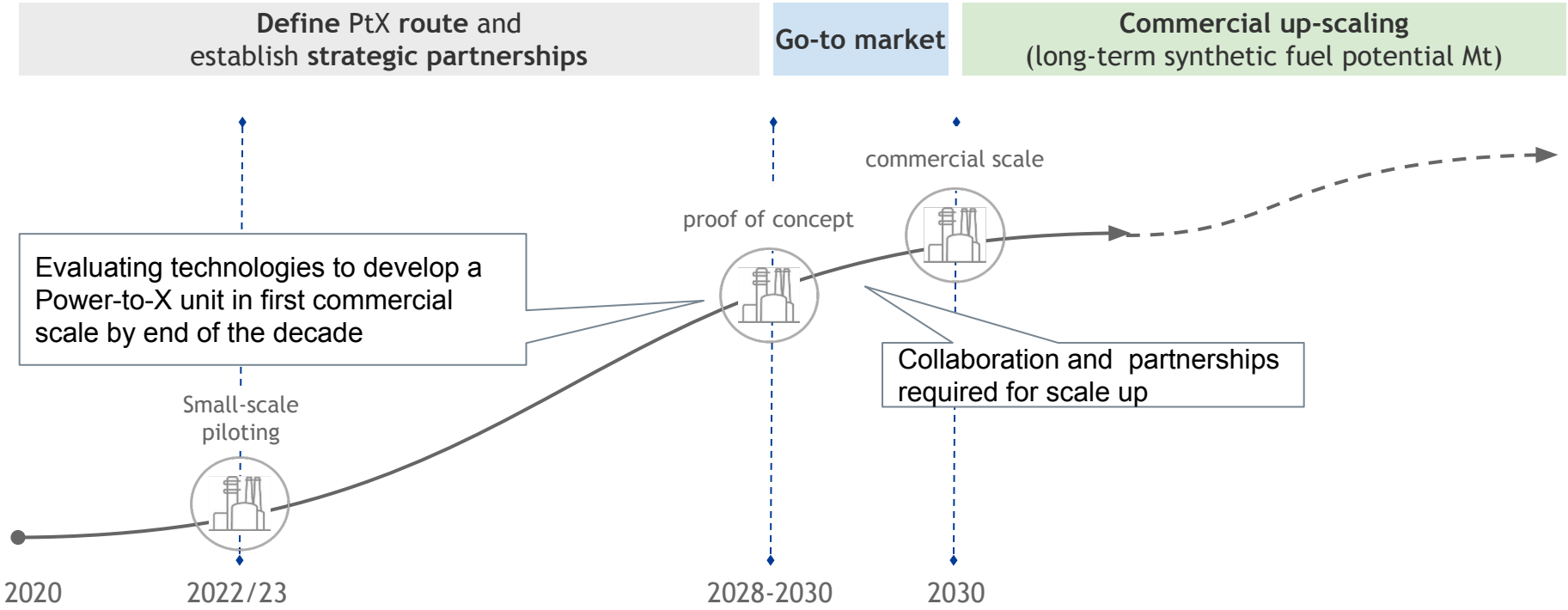


Methanol route



OPERATIONAL FLEXIBILITY	TECHNICAL CHALLENGES
PROCESS COMPLEXITY	
COMPETITIVE ADVANTAGE	• Intermittent renewable electricity supply. • Source adequate volume of RFNBO-eligible electricity in an economic attractive way • Utilizing existing infrastructure • CO2 availability • Upgrading of the feedstocks to the final end products • etc.
FLEXIBILITY OF BUSINESS MODEL	
SCALABILITY	
FINANCIAL PERFORMANCE	

Rapid deployment of PtX technology platforms and feedstock mobilization required to supply sustainable fuel volumes 2030+



Neste is developing Power-to-X projects with global view

Short-term focus

Mid and long term focus

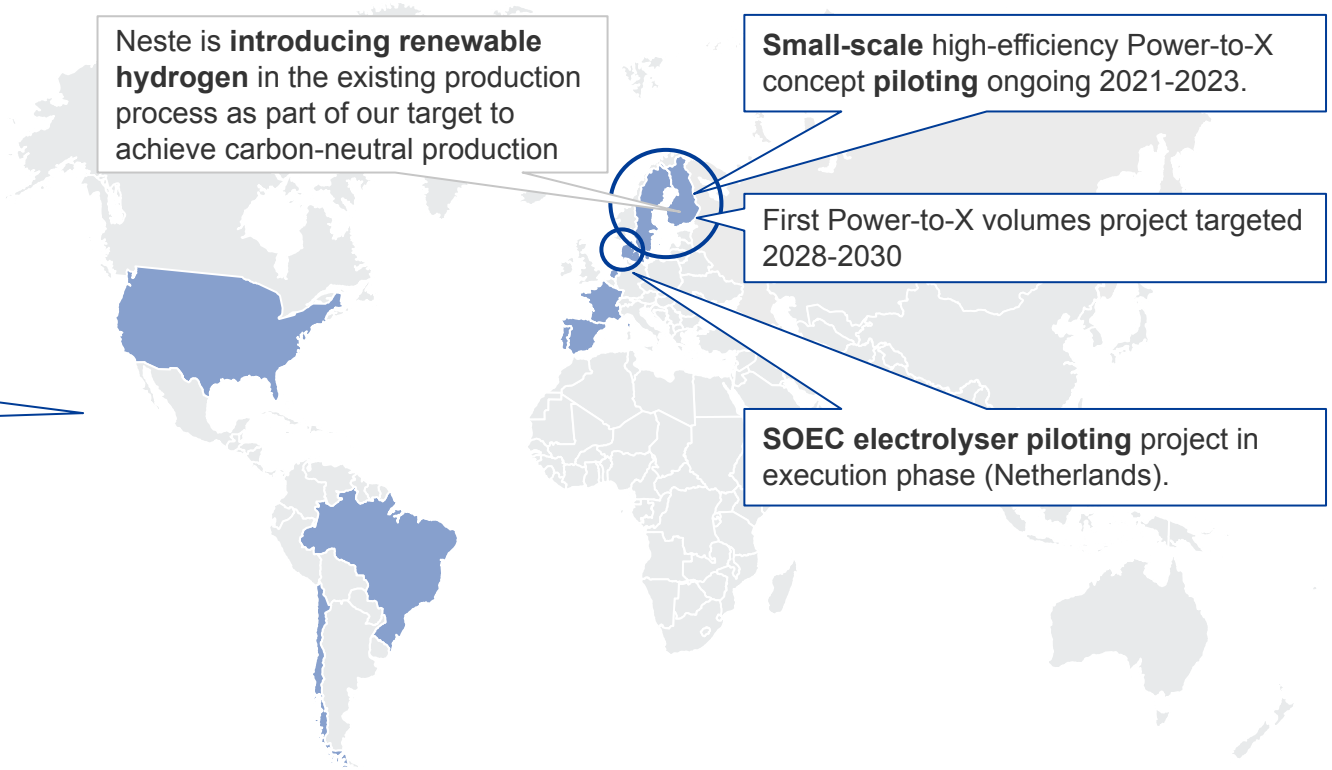
Neste is **introducing renewable hydrogen** in the existing production process as part of our target to achieve carbon-neutral production

Small-scale high-efficiency Power-to-X concept **piloting** ongoing 2021-2023.

First Power-to-X volumes project targeted 2028-2030

SOEC electrolyser piloting project in execution phase (Netherlands).

Global view for project development for 2030+



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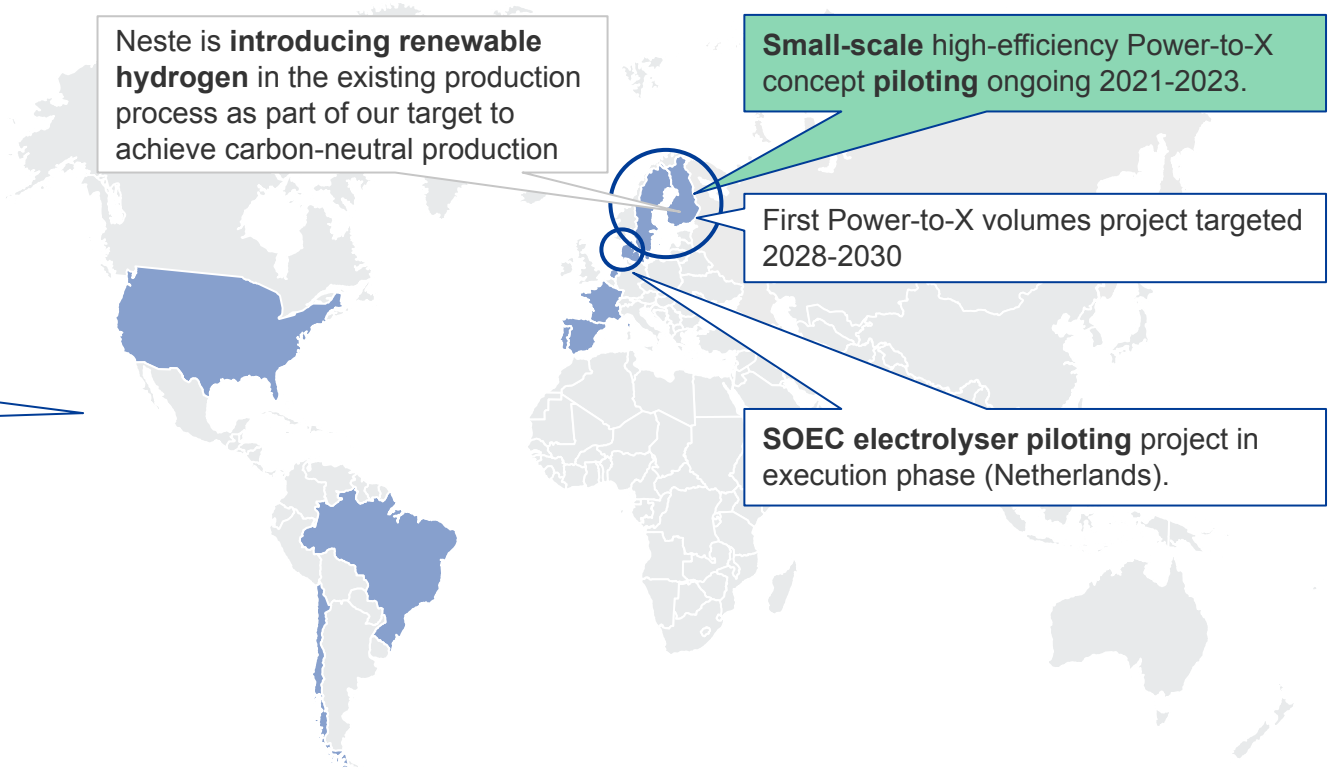

Project: eFuel small-scale pilot

Conversion of captured CO_2 to fuels and chemicals

Basics and some numbers

- Business Finland's **co-innovation project** with VTT as research company and 13 companies from Finnish value chain
- Duration **3 years** (01.01.2021-31.12.2023)
- Total **budget ~ 7 M EUR**
- Small-scale piloting of high-efficiency, cost-effective power-to-liquids production

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CASE

NESTE | VTT

E-fuel - R&D collaboration within Neste Veturi program

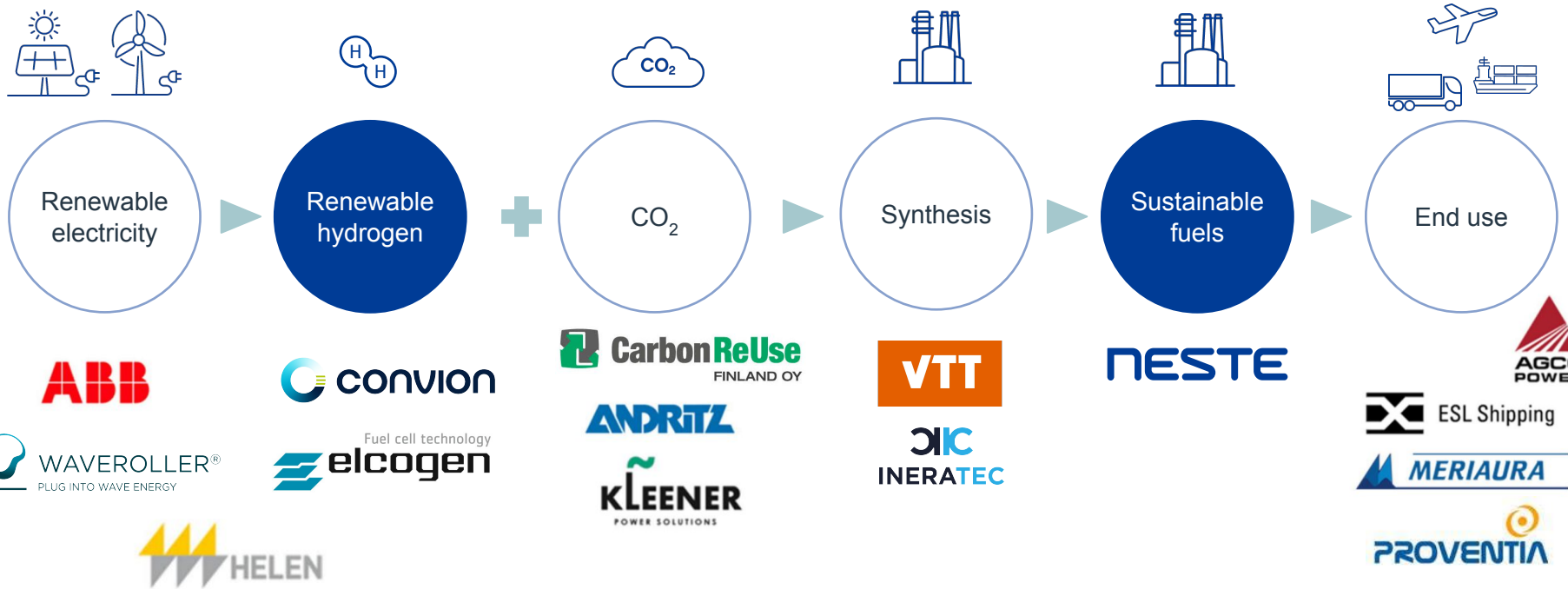
E-fuel is a power-to-liquid fuels' production technology development project f**ocusing on high-efficiency electrolysis (SOEC)** and **cost-effective synthesis** solutions.

The projects aim to validate a proof-of-concept Power-to-Liquid (PTL) system by piloting it in an industrial setting, in order to be ready for scale-up.

AW-ENERGY OY
CarbonReUse
convion FUEL CELL SYSTEMS
Fuel cell technology elcogen
KLEENER POWER SOLUTIONS
HELEN
INERATEC
AGCO POWER
ANDRITZ
ABB
ESL Shipping
MERIAURA

Project eFuel Power-to-X concept

eFuel targets a proof-of-concept for large-scale production and commercialisation of eFuels

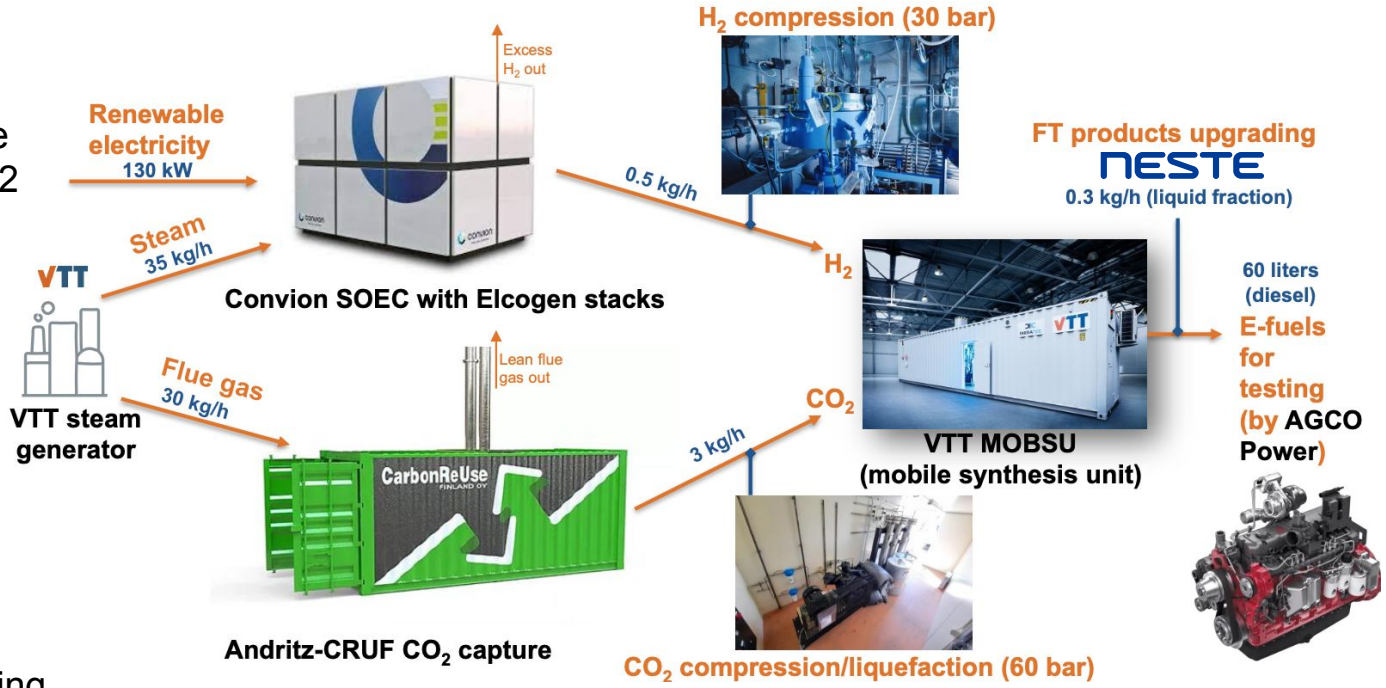


Small scale PTX pilot

Integration of 6 units

Objectives

- Planning and prepare the integration of SOEC, CO2 capture and Mobsu units
- Demonstration of integrated operation at least 1.000 hrs
- Gather data for the development of an optimized commercial concept
- Produce at least 300 kg hydrocarbons for upgrading



Small scale PTX pilot at VTT

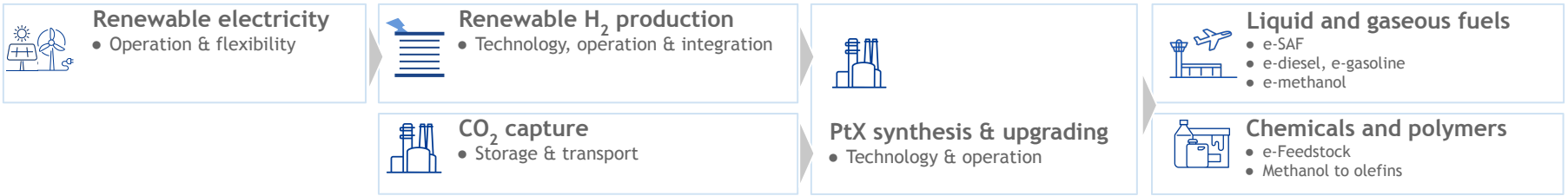
Mobile unit and VTT Bioruukki demo site

Container modules:

- MOBSU
- ELECTROLYSIS
- H_2 COMPRESSION
- GAS CONTAINER
- CO_2 SEPARATION
- CO_2 COMPRESSION
- STEAM/FLUE GAS

Collaboration is required for scale-up

Strengthening partnership and networks across the value chain in Power-to-X



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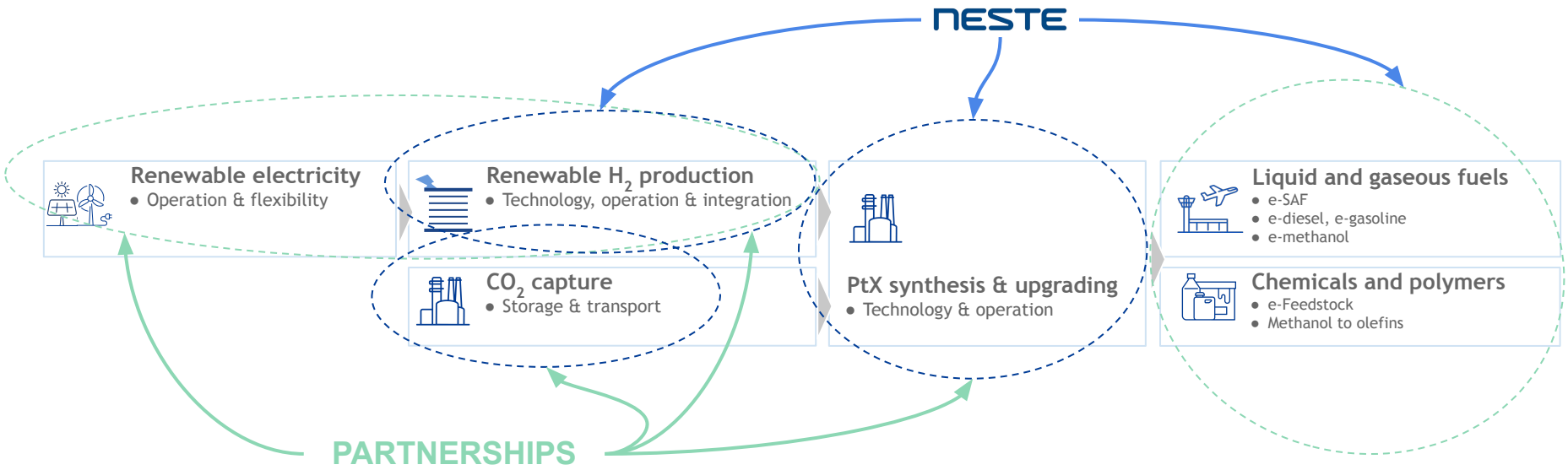

Neste is active in various consortia for the production of eFuels

This is a journey together with partners

Neste aim to be among the first companies brining eFuels to the market

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