



Energy Systems
and Technology
Prof. Dr.-Ing. B. Epple



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

ACT Knowledge Sharing Workshop

9 June 2022

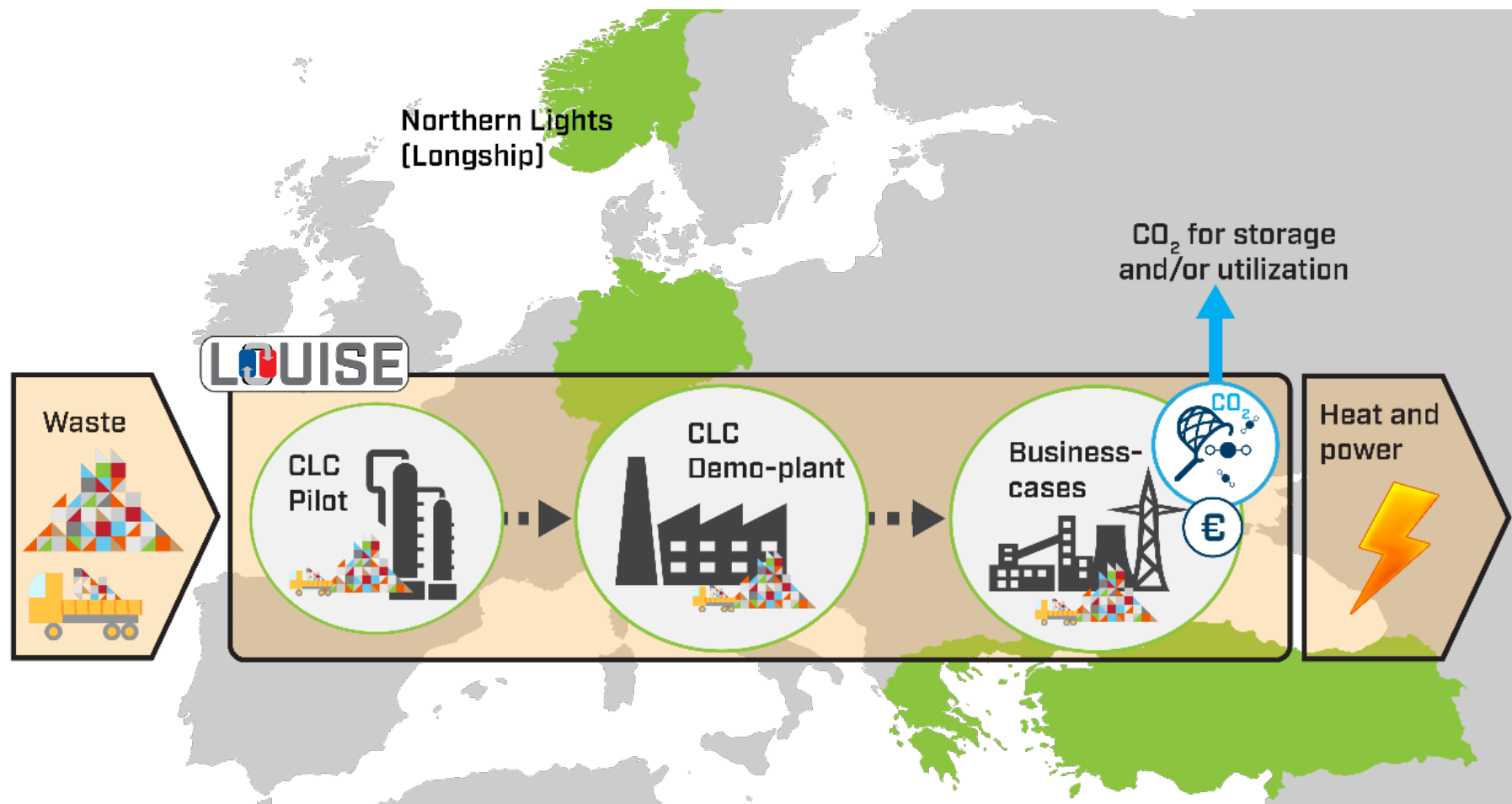


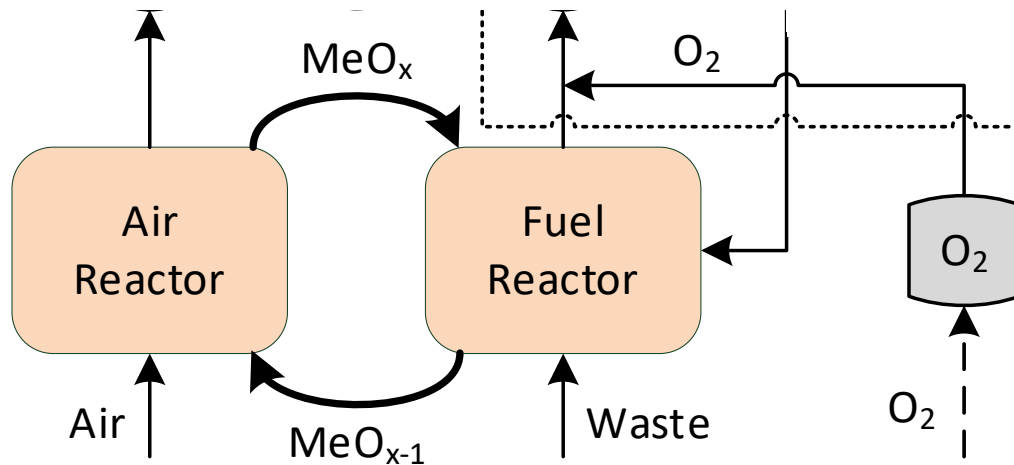
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Overall Aim

Prepare for pre-commercial demonstration of Chemical Looping Combustion (CLC) of solid waste-derived fuels

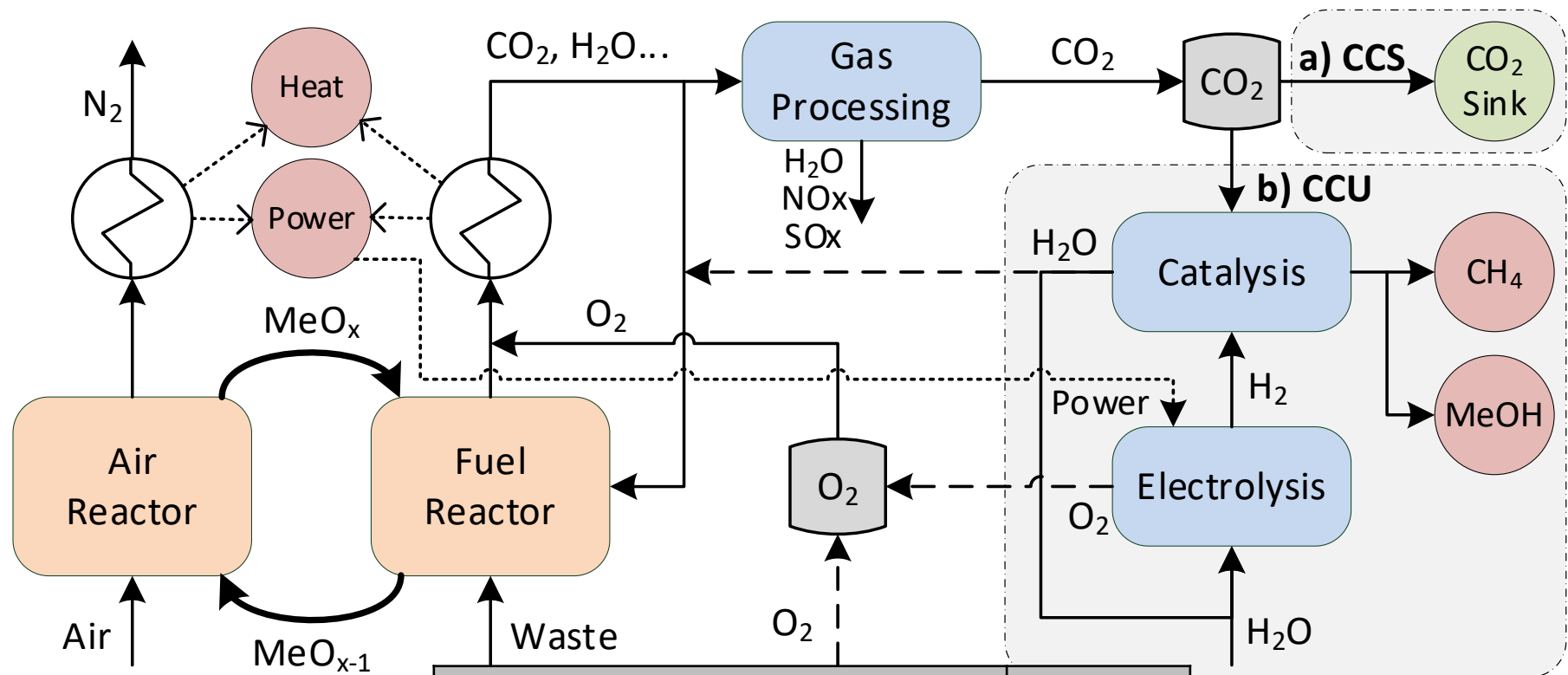
10/2021 – 09/2024





- Inherent CO₂ separation → **low cost**
- MeO_x as an oxygen buffer → **high boiler efficiency**
- Problematic substances in fuel reactor → **high electrical efficiency**
- MeO_x re-use → **synergies with mineral and metal processing industries**

CLC Process Concept

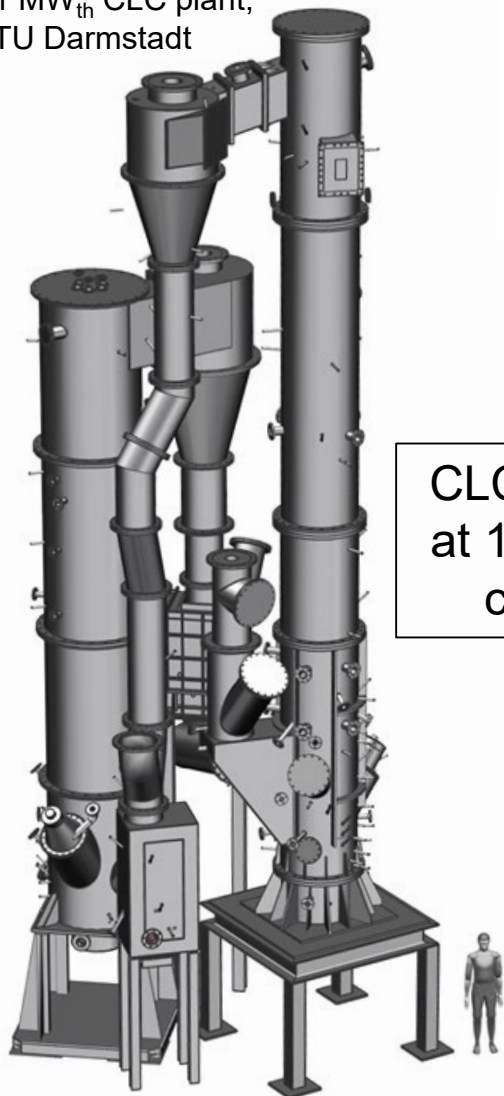


KPI	Target
CO ₂ capture efficiency	> 90 %
Fuel reactor CO ₂ concentration	> 90 %
Net electrical efficiency	> 35 %
CO ₂ avoidance costs	< 25 €/t
Net CO ₂ emissions	< 0
Utilization of spent material	> 90 %

State of the Art

1 MW_{th} CLC plant,
TU Darmstadt

Source: Infraseriv



CLC demonstrated
at 1 MW_{th} scale for
coal, biomass

Fluidized bed
combustion of waste:
commercial technology

LOUISE
CLC of waste

- 1) **Demonstrate CLC** of solid **waste**-derived fuels in realistic environment (TRL 6)
 - pilot unit testing at 150 kW_{th} and 1 MW_{th} scale
 - ilmenite as the oxygen carrier

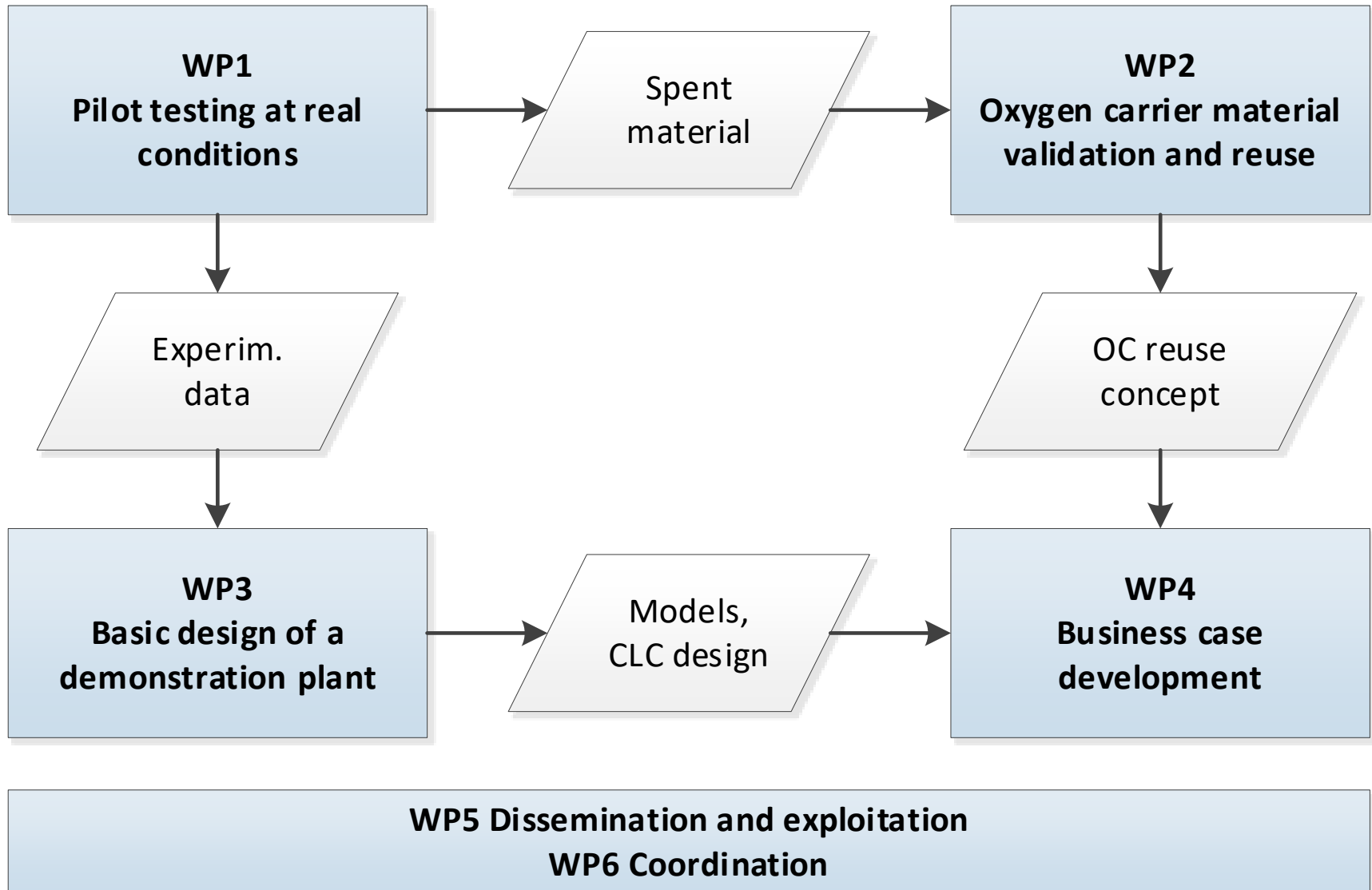
- 2) **Basic design** of 10 MW_{th} **CLC demo plant** (TRL 7) for waste-derived fuels
 - including flue gas cleaning + CO₂ processing steps

- 3) **Reduce CO₂ avoidance costs** by > 7 %,
 - synergies with other industries
 - re-use > 90 % of the spent OC materials in metal processing industry

- 4) **Provide business cases** for WtE plants applying CLC technology
 - Cases in 4 countries



*National consortium leader



WP1 – Pilot Testing



Tests in 150 kW_{th} pilot plant
→ First CLC of SRF realized

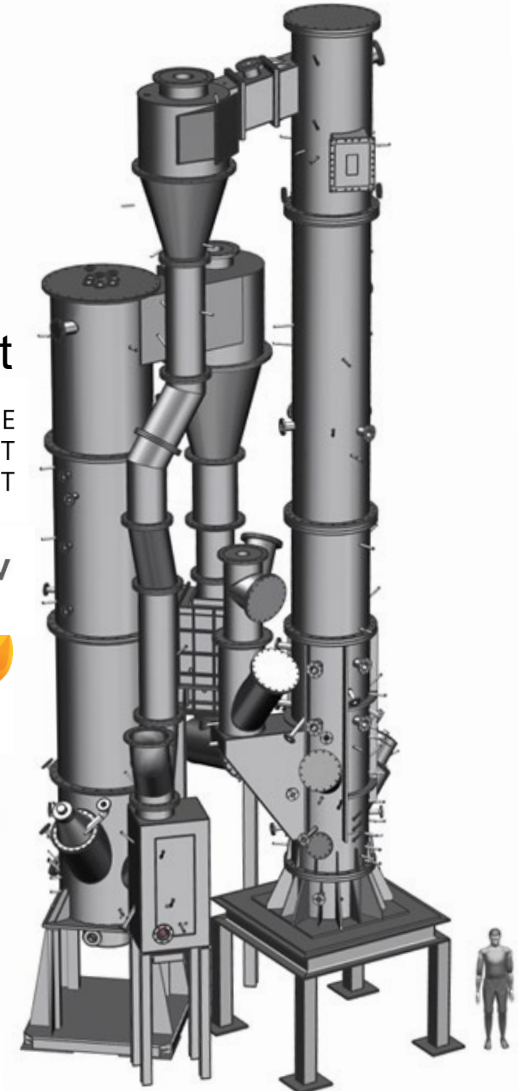
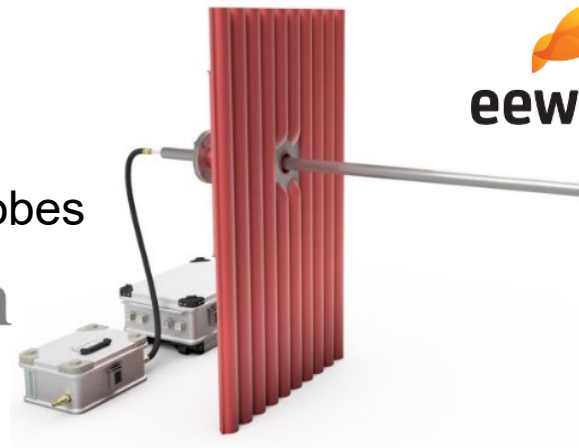


Tests in 1 MW_{th} pilot plant



Fouling and
corrosion probes

CheMin



- Evaluation of Turkish oxygen carrier materials

- Iron ores
- By-products from steel industry



- Oxygen carrier validation and interaction with waste

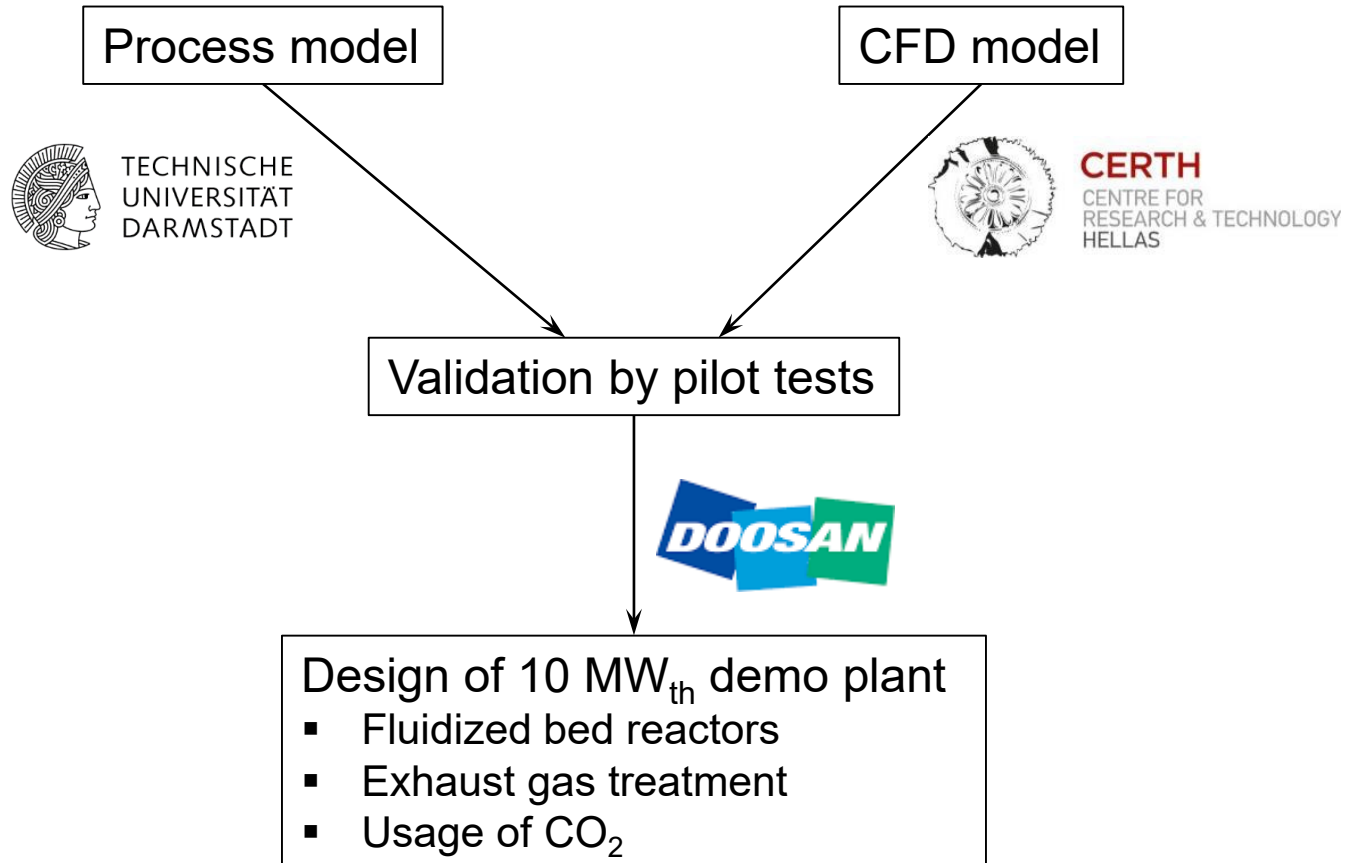
- SRF
- Waste from refinery



- Re-use of spent oxygen carrier materials

- TiO₂ production
- Steel industry





Definition of case studies

Location	Operator	Use	Type	Fuel
Frankfurt, Germany	ISH	Power, heat	Internally circulating FB	SRF from municipal & industrial solid waste, sewage sludge
Fredrikstad, Norway	BIO-EL	Power, heat, steam	CFB	Waste-derived fuel (SRF)
Petkim site, Turkey	SOCAR	Heat	Rotary kiln	Refinery waste, municipal & industrial solid waste
Attiki/Thessaloniki, Greece	HELECTOR	Power	CFB	Waste-derived fuel (SRF)



- Concept development, process simulations



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- Life cycle assessment



- Business cases



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WP5 – Dissemination & Exploitation



The screenshot shows the LOUISE website homepage. At the top is the LOUISE logo with the tagline "LOW-COST CO₂ CAPTURE BY CHEMICAL LOOPING COMBUSTION OF WASTE-DERIVED FUELS". Below the logo is a navigation bar with links for HOME, ABOUT, RESEARCH, PARTNERS, NEWS, and RELATED PROJECTS. The main content area is divided into two columns. The left column contains the text "What is LOUISE?" followed by a paragraph about the project's goals and a section titled "The objectives" with another paragraph. Below this is a diagram showing the process flow: Waste → CLC Pilot → CLC Demo plant → Business cases → CO₂ for storage or utilization → Heat and power. The right column features a "LATEST NEWS" section with three news items: "Introducing NORSUS", "First ACT LOUISE General Assembly Meeting Held in Darmstadt", and "SINTEF Visits Pilot Plant at Technische Universität Darmstadt". Below the news is a "Stay updated" section with a form to subscribe to the newsletter, including an email address field and a "Subscribe" button. At the bottom of the page, there is a footer with copyright information, the logo for "Accelerating CCS Technologies", and a list of funding partners.

Website:
www.act-louise.eu

LOUISE

Low-cost CO₂ capture by chemical looping combustion of waste-derived fuels

Hi everyone,

Welcome to ACT LOUISE's first project newsletter!

We are six months into the project, and both happy and proud to start sharing updates and developments with you. Our intention is to produce one newsletter every six months containing news and blog posts from the project. We hope that you'll find it interesting, whether you're from research, industry, the general public – or somewhere "in between".

ACT LOUISE aims to reduce the cost of carbon dioxide (CO₂) capture from solid waste-derived fuels by separating the CO₂ using Chemical Looping Combustion (CLC). The CO₂ can then either be stored – which reduces CO₂ emissions – or used in other processes – for example, to produce power or heat.

"Within the worldwide efforts to mitigate climate change, the LOUISE project will target CO₂ emissions from waste incineration," said Jochen Ströhle, the project administrator. "We hope that our research will pave the way for future broad applications of zero-emission waste treatment."

We hope you'll join us on this journey!

All the best,
LOUISE

Newsletter
(6-monthly)

Thank you for your attention.

LOUISE



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