



DRIVING SUSTAINABLE SEMICONDUCTOR MANUFACTURING: CEA-LETI'S DRIVING ROLES

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GENESIS and FAMES are EU programs supported by CHIPS JU and its associated members states. In addition, GENESIS Swiss partners are supported by the Swiss state secretariat (SERI)



Summary

1. Introduction
2. Partnership & engagement toward a more sustainable ICT manufacturing
3. Conclusions

The 3 pillars of sustainability



ICs & AI for the benefit of our society



Health



Automotive

Industry



AI
Application fields

Smart cities

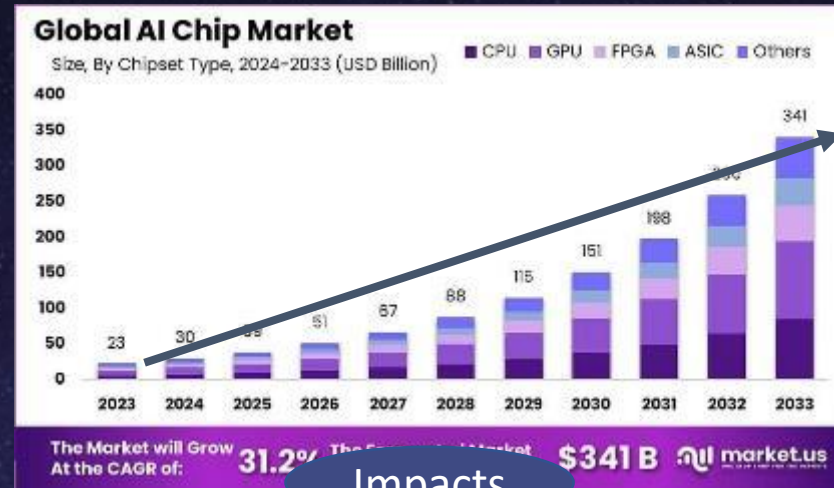


Energy management



Agriculture

AI & ICT GROWTH impact concerns

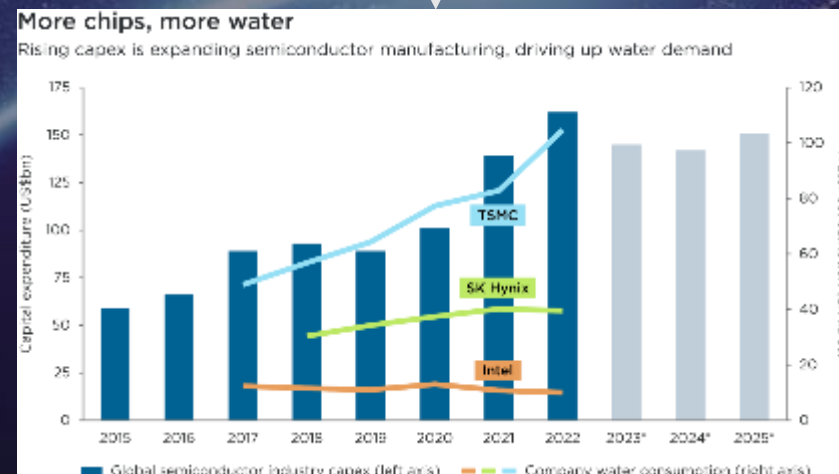
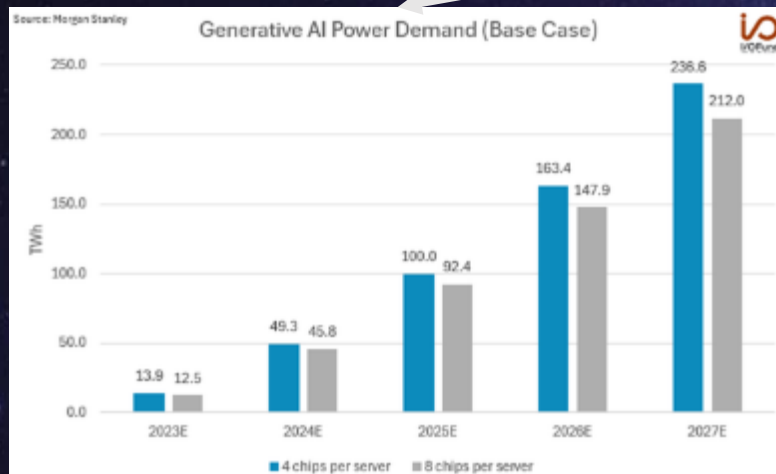


Impacts

Energy

Resource

Wastes



63 Mton of e-waste in 2030



0.4-2.5 from data centres Due to generative AI

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CEA-LETI ENGAGEMENT TOWARD A MORE SUSTAINABLE ICT INDUSTRY MANUFACTURING FOCUS



JU Chips FAMES CEA-Leti FDSOI 10/7nm Pilot line WP Sustainability

Methodology & impact scoring
Pilot line impact reduction
Eco-design

Take program benefit to reduce
CEA-Leti pilot line environmental footprint

GREEN project
(internal)
Improve Fab
performance

Understand environmental impact

Dynamic LCA solutions

1

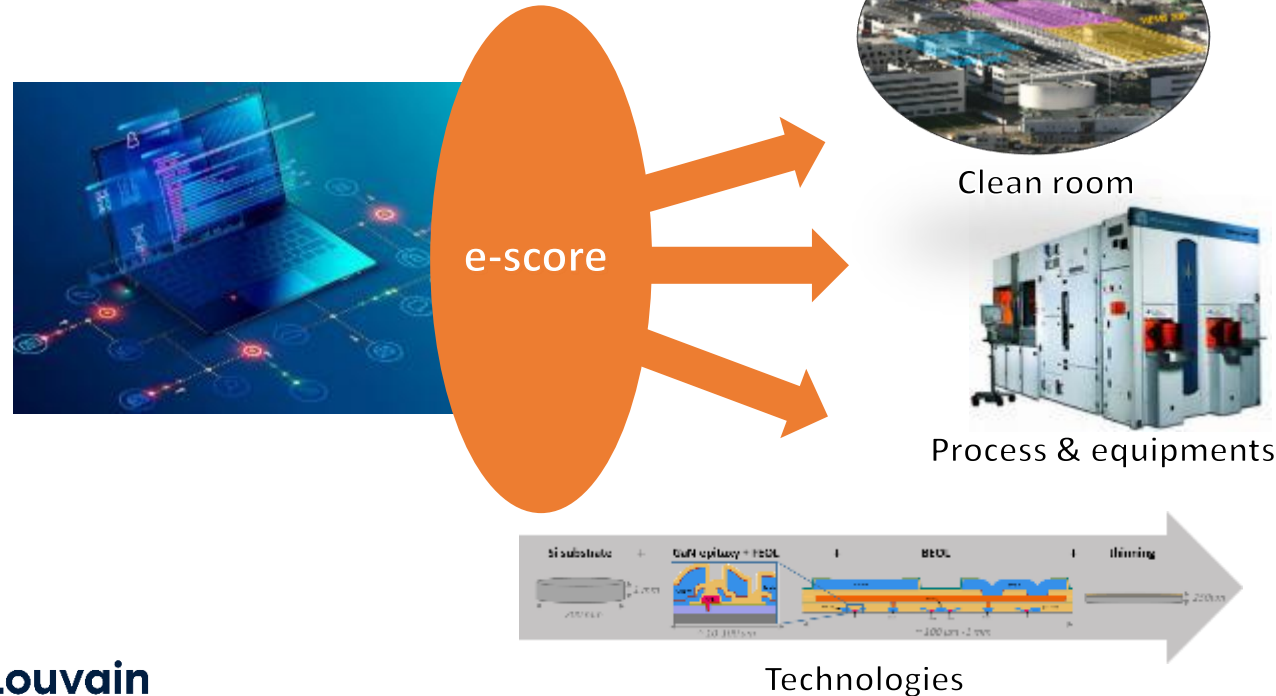
LCA methods
comparative, absolute

16 environmental footprint impacts



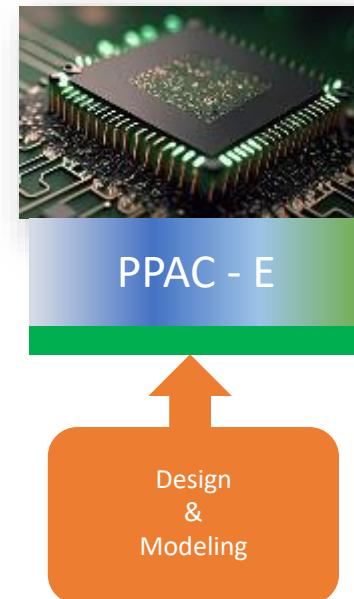
2

Dynamic e-score LCA SW platform



3

Eco design solution



Joint work with : **imec** **UCLouvain**

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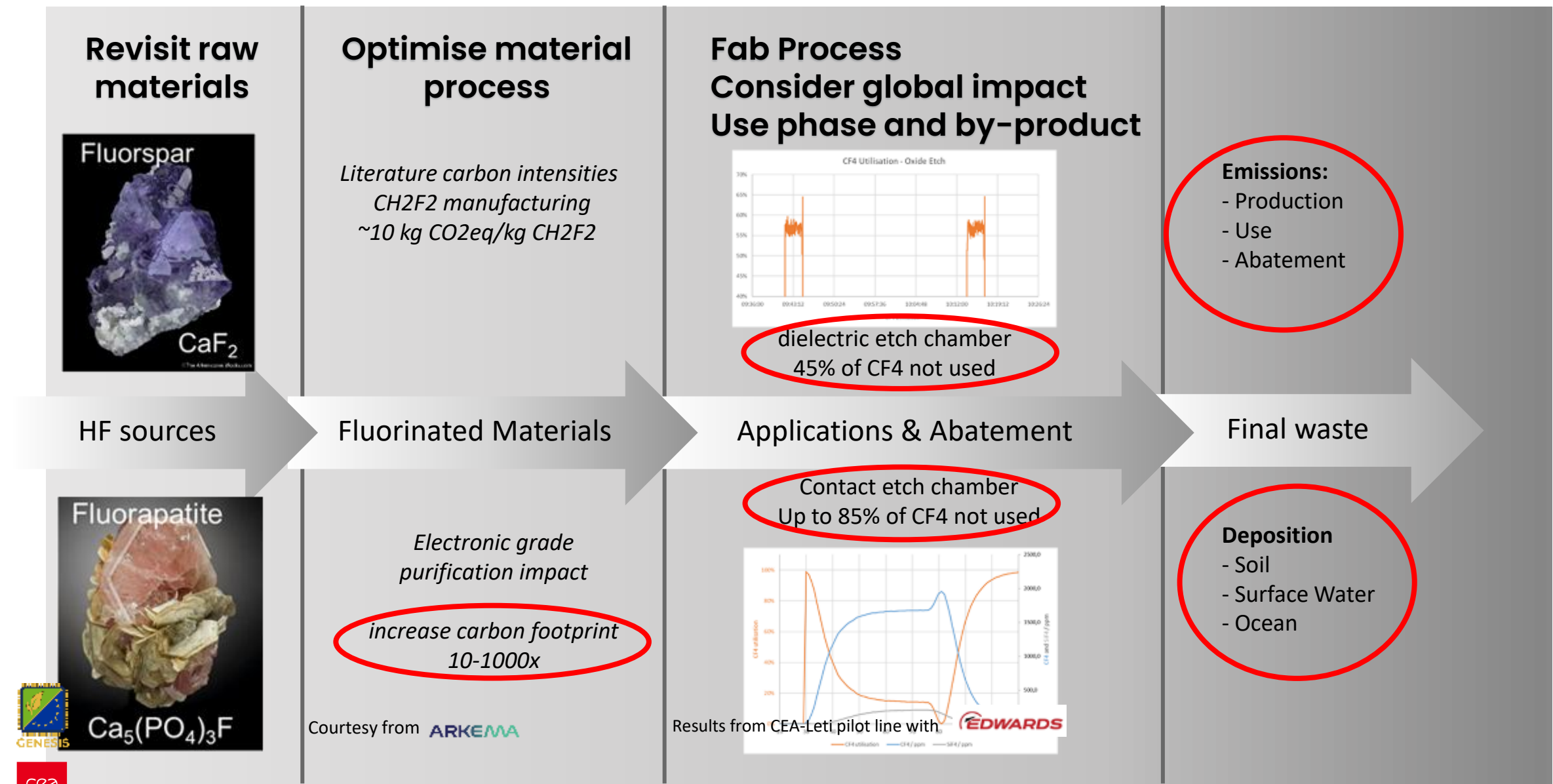
JU Chips GENESIS
Develop & qualify solution to improve ICT manufacturing sustainability
(TRL 3 → 6)

Take program benefit to reduce
CEA-Leti pilot line environmental footprint

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The challenge for a more sustainable IC industry

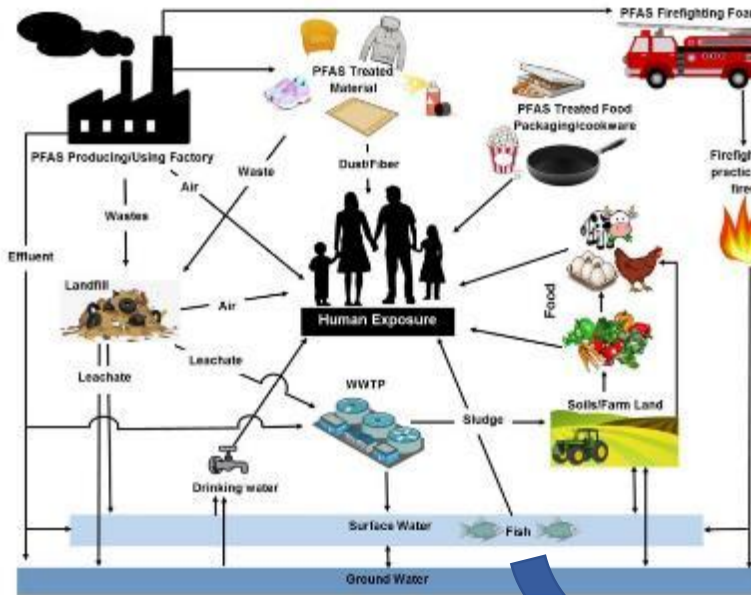
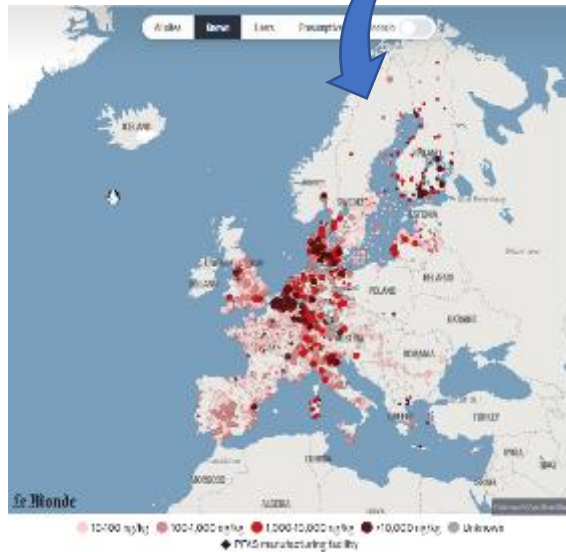
Etch gas process example



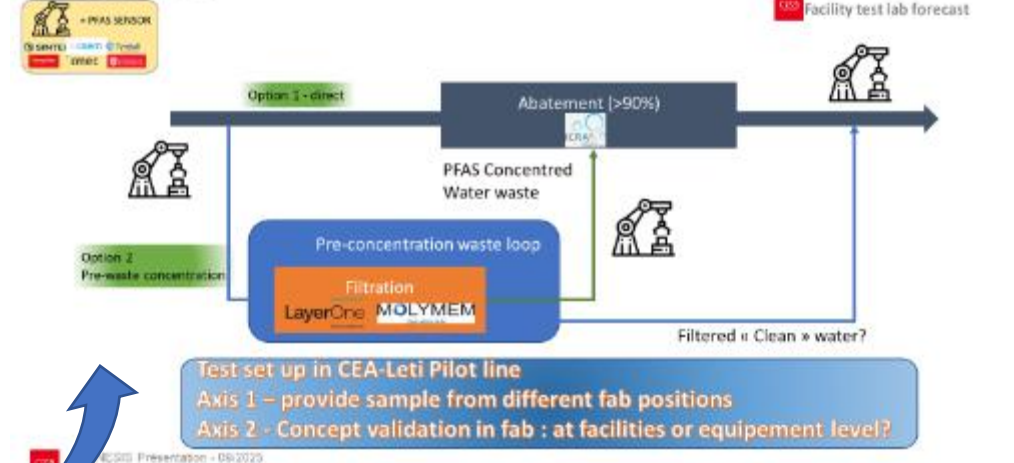
The challenge for a more sustainable IC industry

PFAS example

- Key concerns:
 - Long life time stability
 - High recognized toxicity

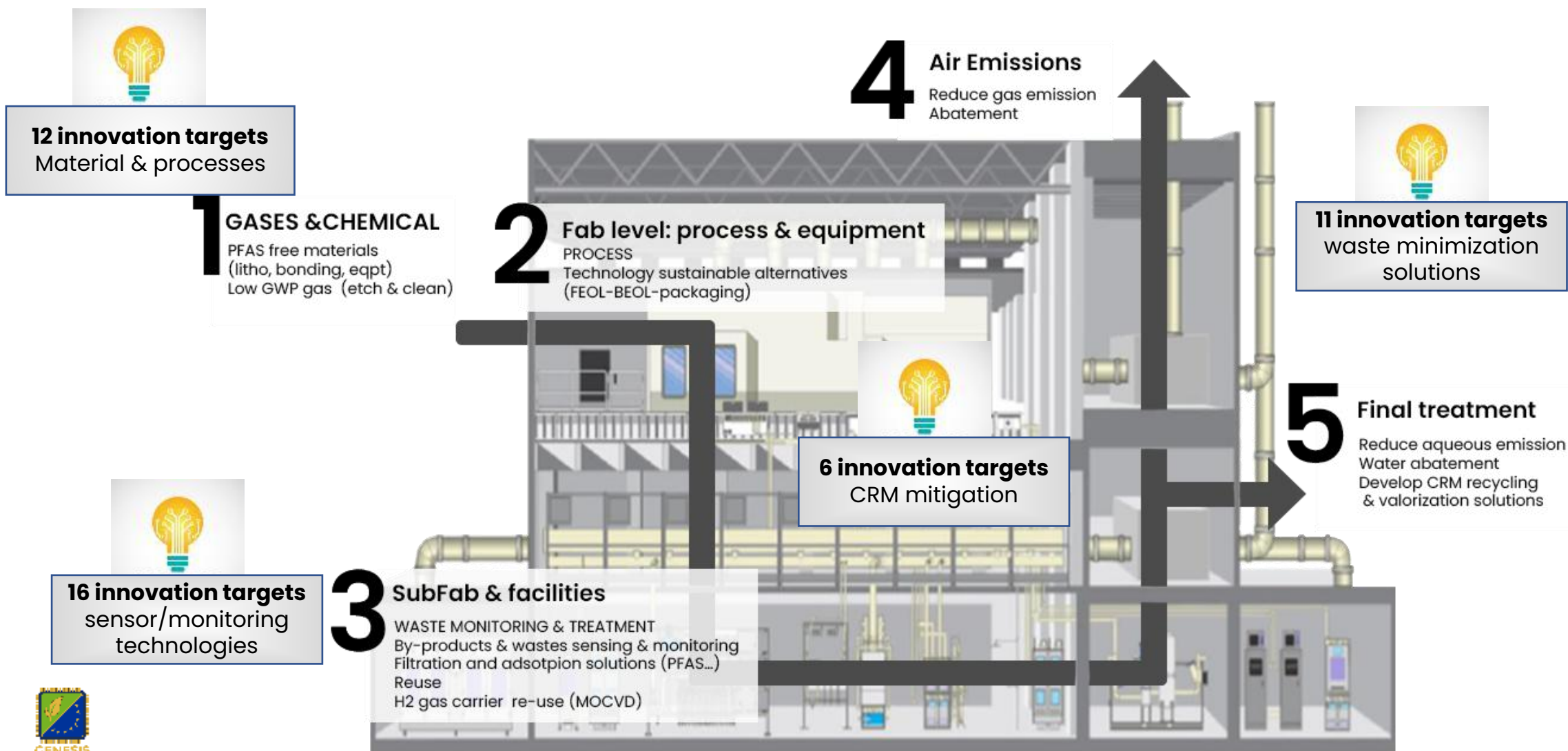


GENESIS work on PFAS waste treatment at CEA-leti



GENESIS objectives

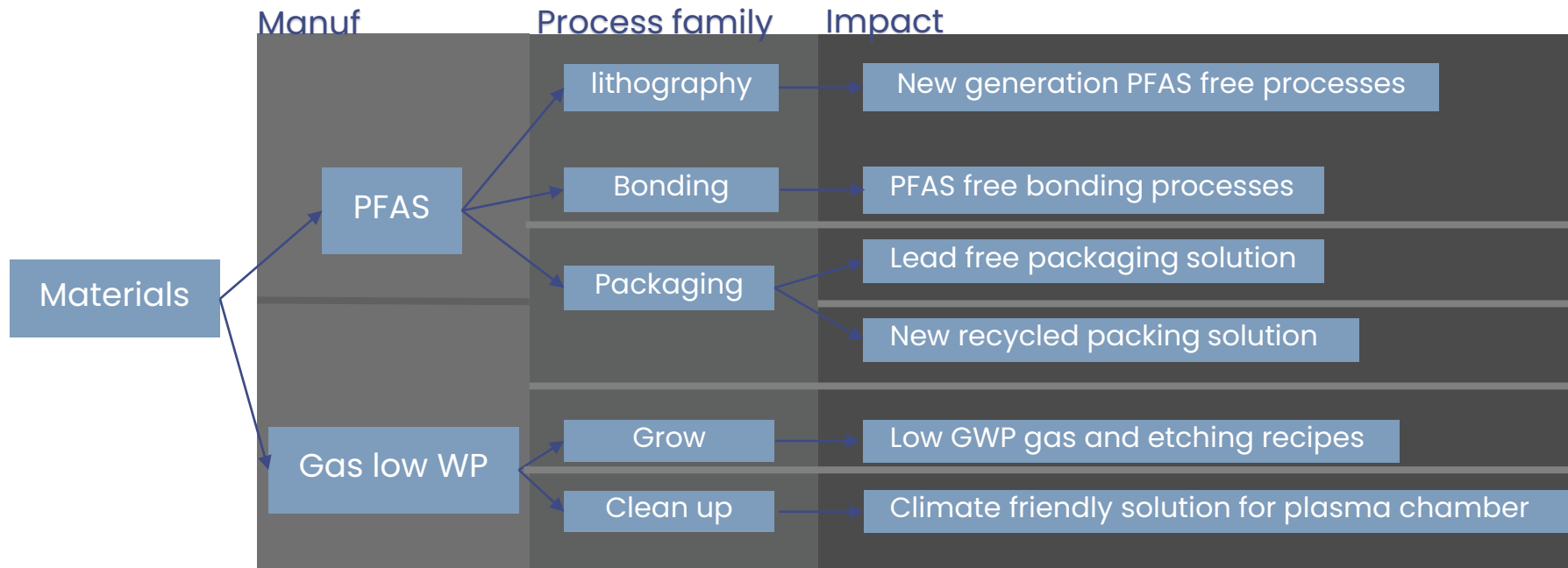
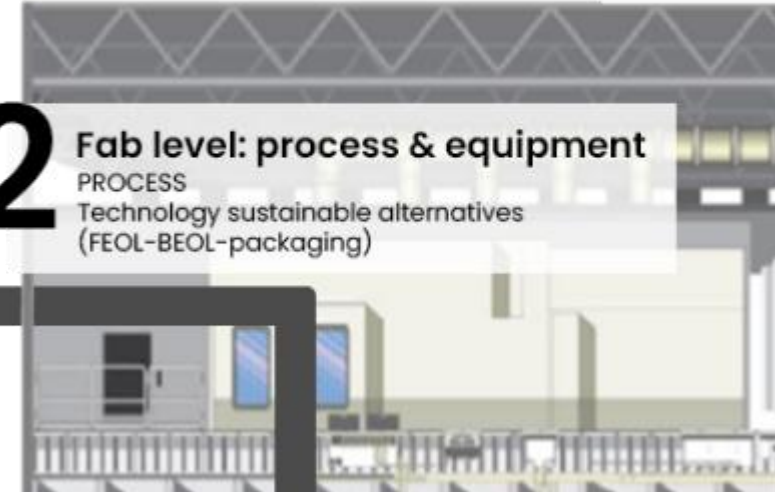
→ Improve the entire manufacturing sustainability chain value



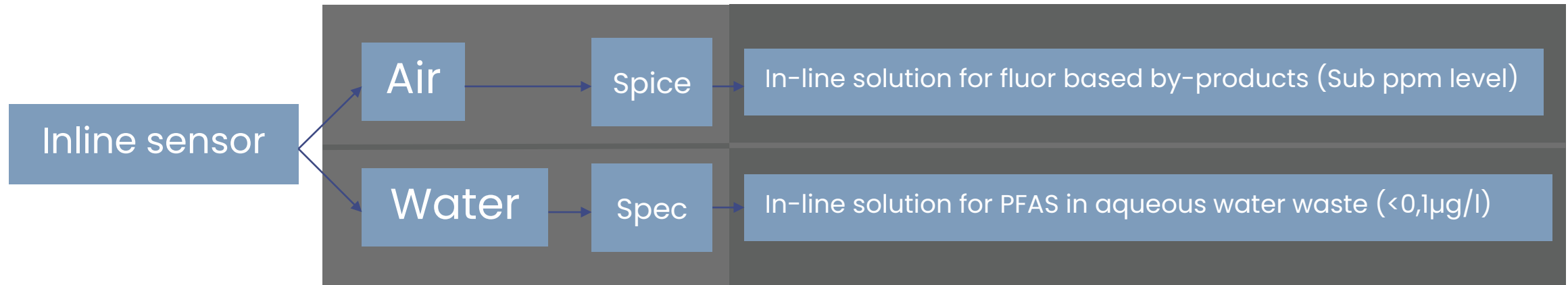
GENESIS – Impacts Fab

1 GASES & CHEMICAL
PFAS free materials
(litho, bonding, eqpt)
Low GWP gas (etch & clean)

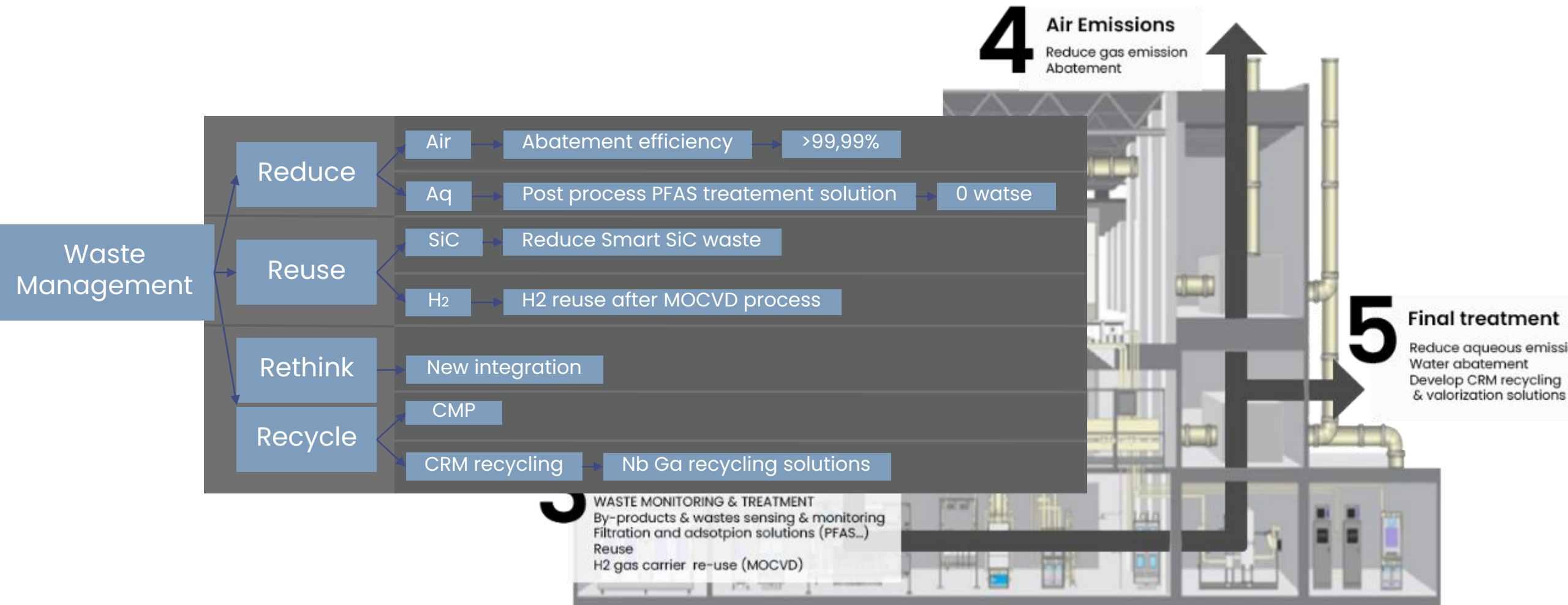
2 Fab level: process & equipment
PROCESS
Technology sustainable alternatives
(FEOL-BEOL-packaging)



GENESIS – Impacts Monitoring



GENESIS – Impacts Sub Fab



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SUBFAB

(Program frame work : Affiliate & institutional)
Scale up solution to boost technologies & sustainability
improvement in SUBFAB environment
(TRL>5)

JU Chips GENESIS

Develop & qualify solution to improve ICT
manufacturing sustainability
(TRL 3 → 6)

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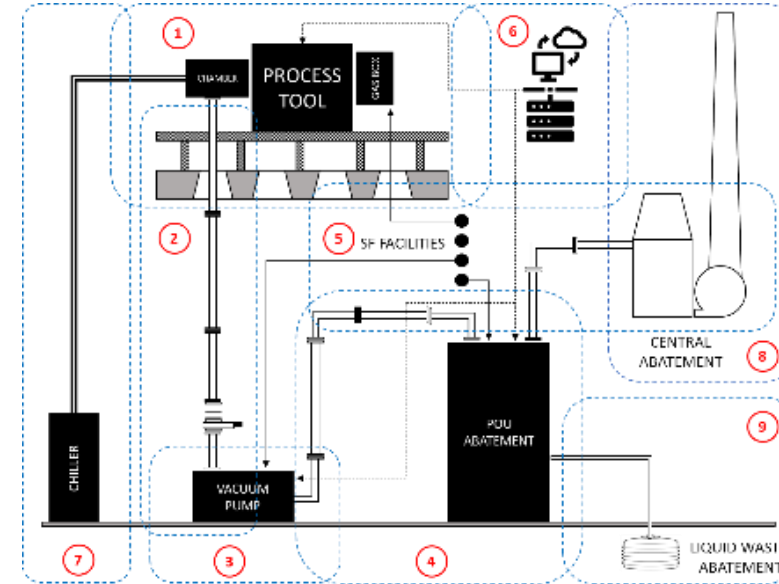
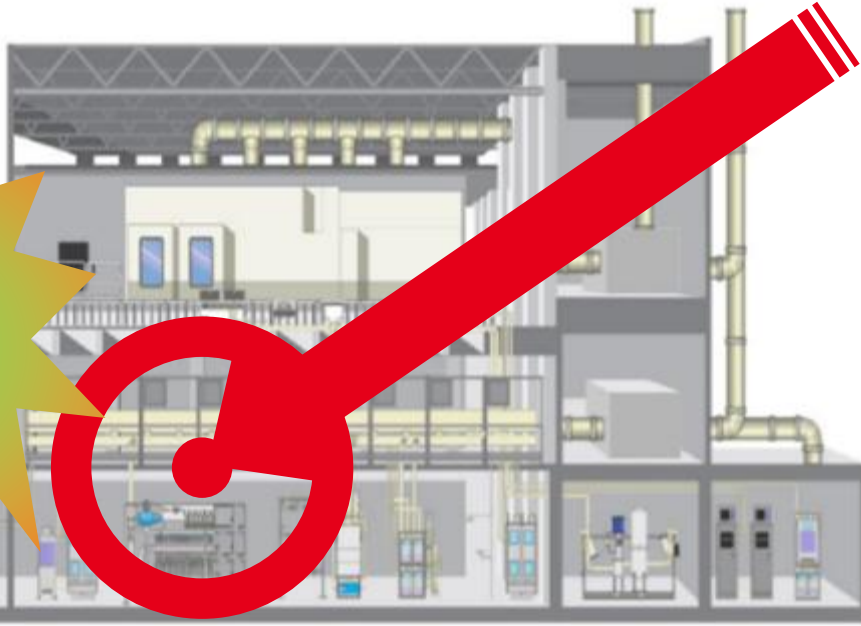
GREEN project

(internal)
Improve Fab
performance

SUBFAB LABS AMBITION

A dedicated environment to RETHINK SUBFAB

HVM-like
working
operations
24/24



Program
Co-driven with



→ Objectives :

- Improve material and Hardware use, waste management policy (sensing, circularity, waste treatment...)
- Qualify new solutions in « certified prod- like condition mode »
- Fab modelling data to evaluate economical and sustainability impacts

→ An environment open tailored for partners to :

- Evaluate new Hardware (pumps, abatement...) in intensive mode
- Qualify new materials (Low GWP gas, PFAS free resist..)
- Mature new breakthrough solutions on process, sensing strategy, waste management incl. minimization, recycling/re-use, data handling

ACKNOWLEDGMENTS



- **GENESIS and FAMES are EU programs supported by CHIPS JU and its associated members state. In addition, GENESIS Swiss partners are supported by the Swiss state secretariat (SERI)**
- **Special thanks to ARKEMA, MOLYMEM and ICRA for their support**