



2nd INITIATE WORKSHOP

CCU modelling approach from micro to macro assessment

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September 26, 2022



The INITIATE project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958318.

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PUBLIC

INITIATE project concept and vision



Concept

Industrial symbiosis between **iron and steel** sector and **ammonia/urea** production



Demonstrate operational reliability for commercialization



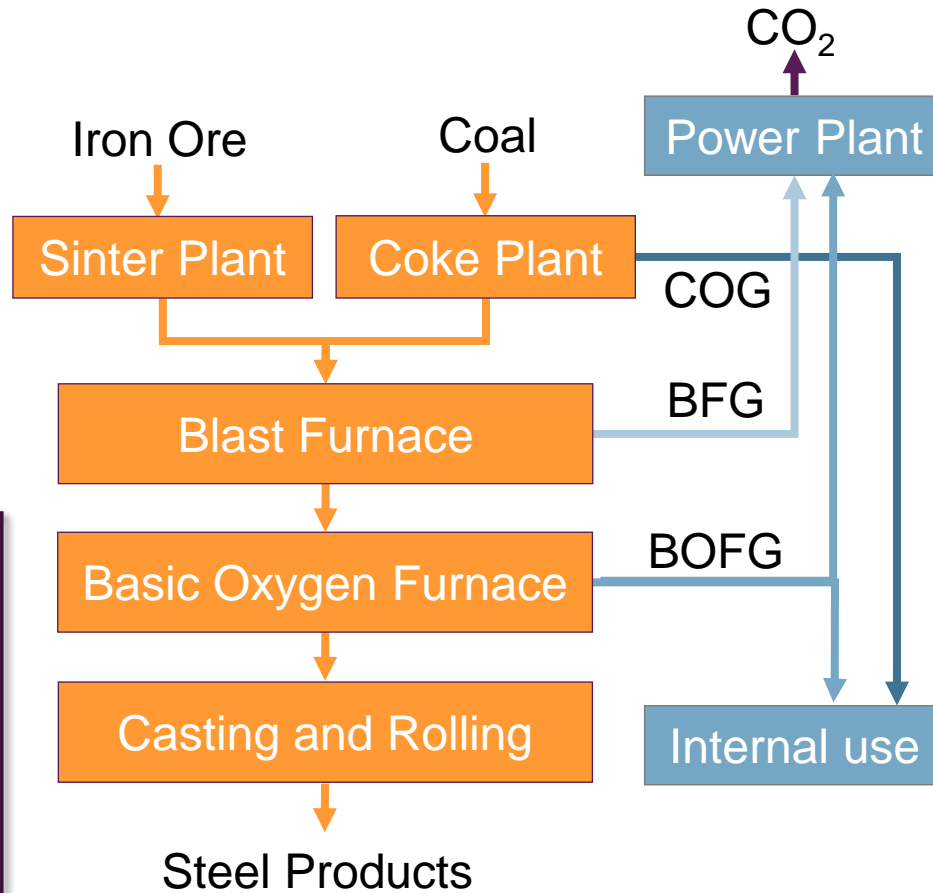
Demonstrate continuous production of 5 t/d of NH₃ from steel gases



Confirm positive business case (target IRR > 15%)

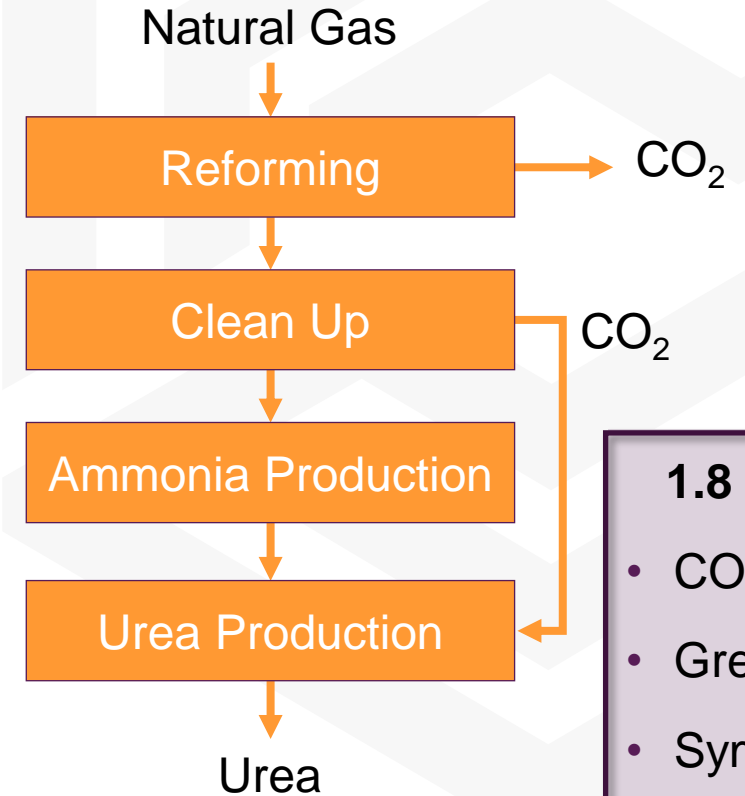


Multiple routes to CO₂ neutrality



2 t_{CO2}/t_{HRC}

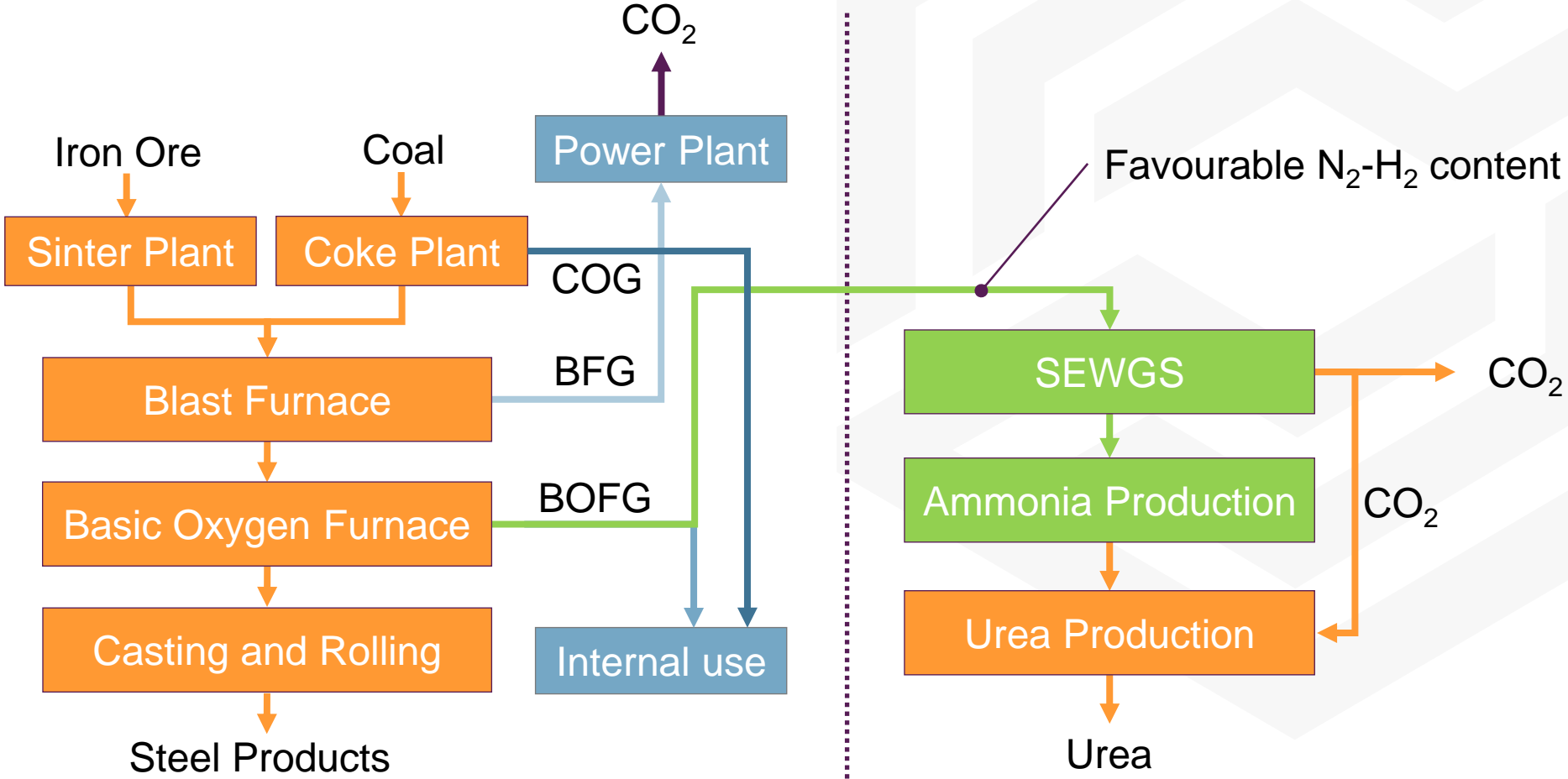
- Coal → NG, H₂
- CO₂ capture
- More scrap
- Efficiency



1.8 t_{CO2}/t_{NH3}

- CO₂ capture
- Green H₂
- Symbiosis?

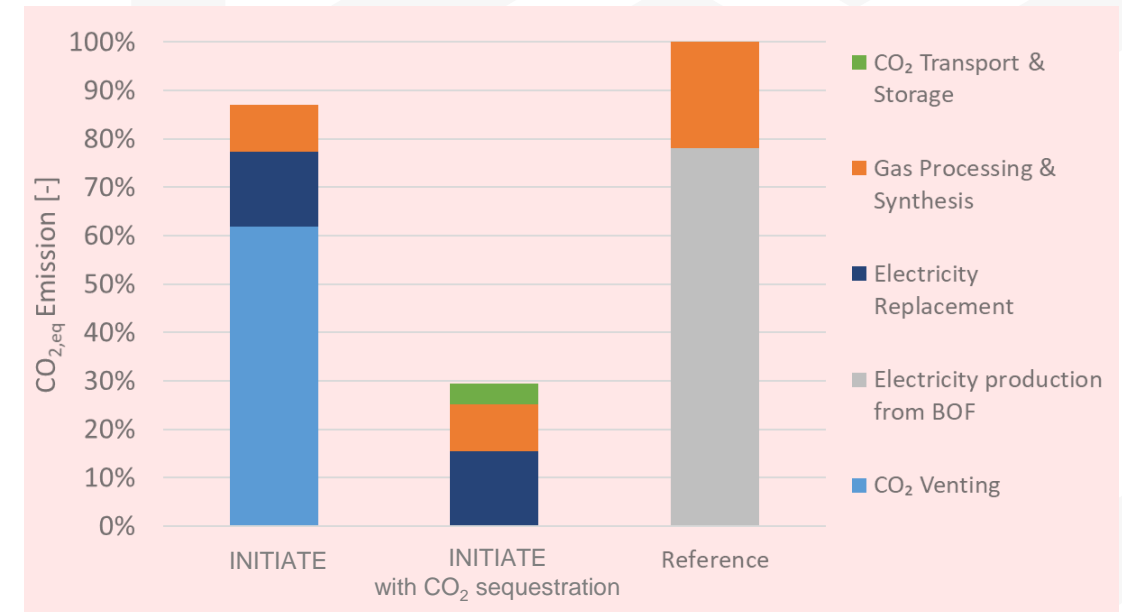
INITIATE Industrial symbiosis



Technical, economical, environmental feasibility

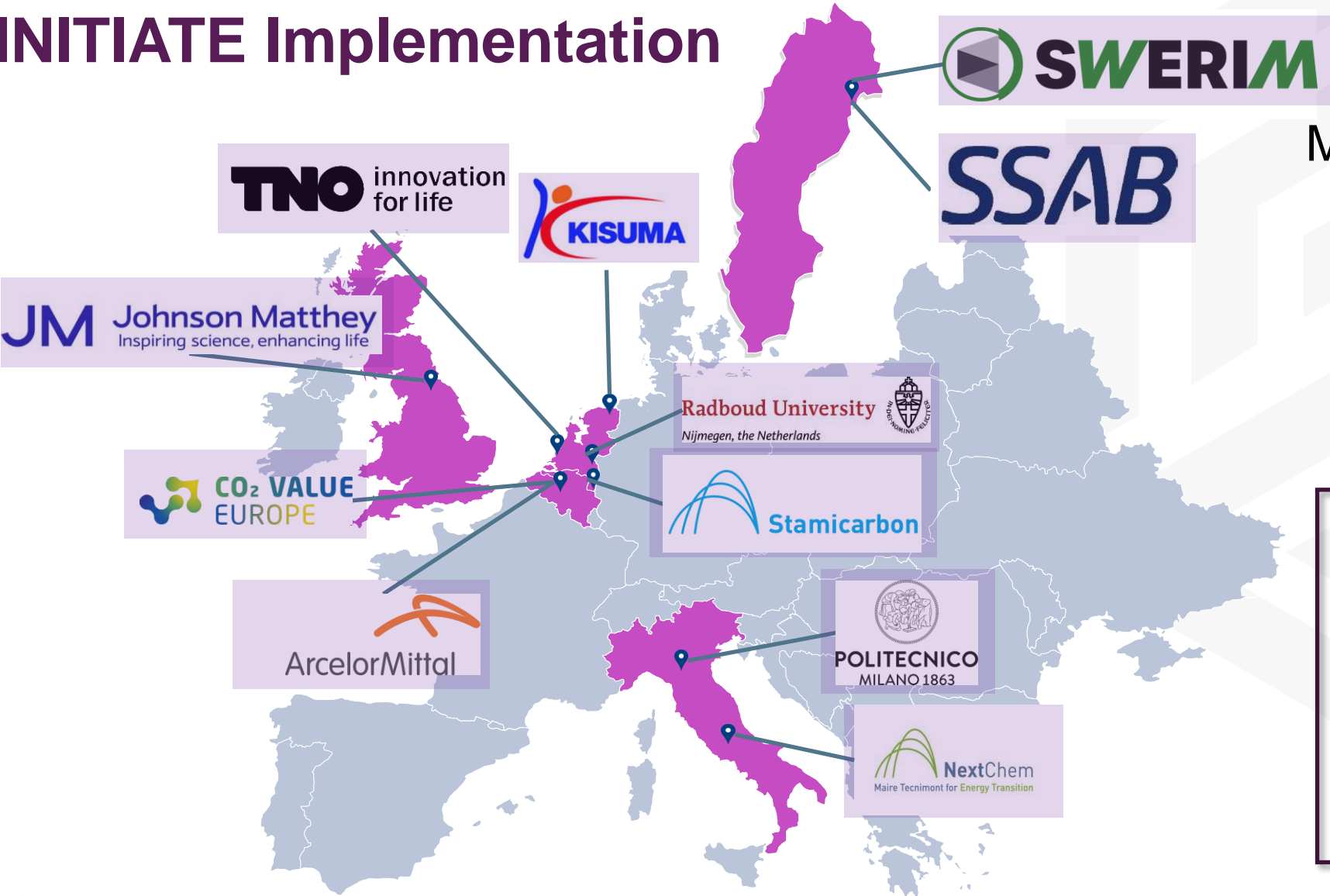
TEA and LCA pre-study

- Technical feasibility
 - TNO SEWGS CO₂ removal
 - NextChem NH₃ synthesis at H₂/N₂<3
- Economical feasibility
 - Positive business case for urea derivative
 - Site locations of BOF availability and urea demand
- Environmental benefits
- Strong consortium



Demonstrate, validate, and FOAK preparation

INITIATE Implementation



Materials and equipment
 Technology licensors
 End-users
 Knowledge support

5 years
 Nov. 2020 – Nov. 2025

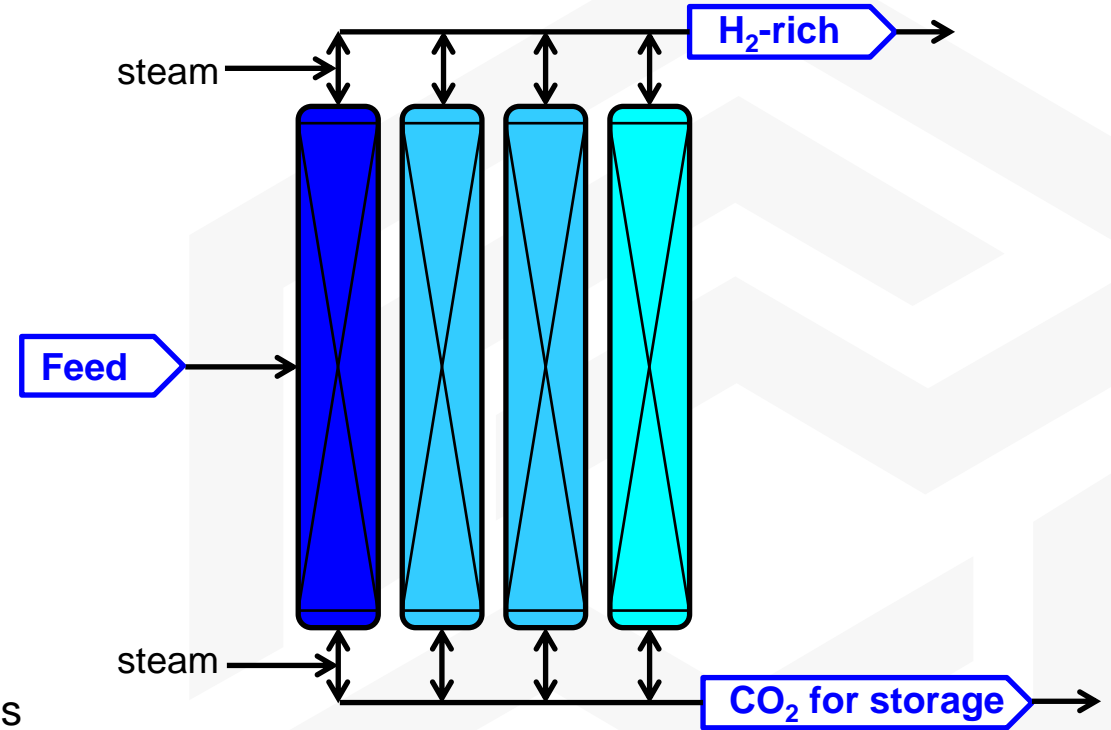
21.3 M€ EU funding

958318
 H2020-LCCI-2020-EASME
 A.SPIRE

Enabling technology

STEPWISE technology - SEWGS

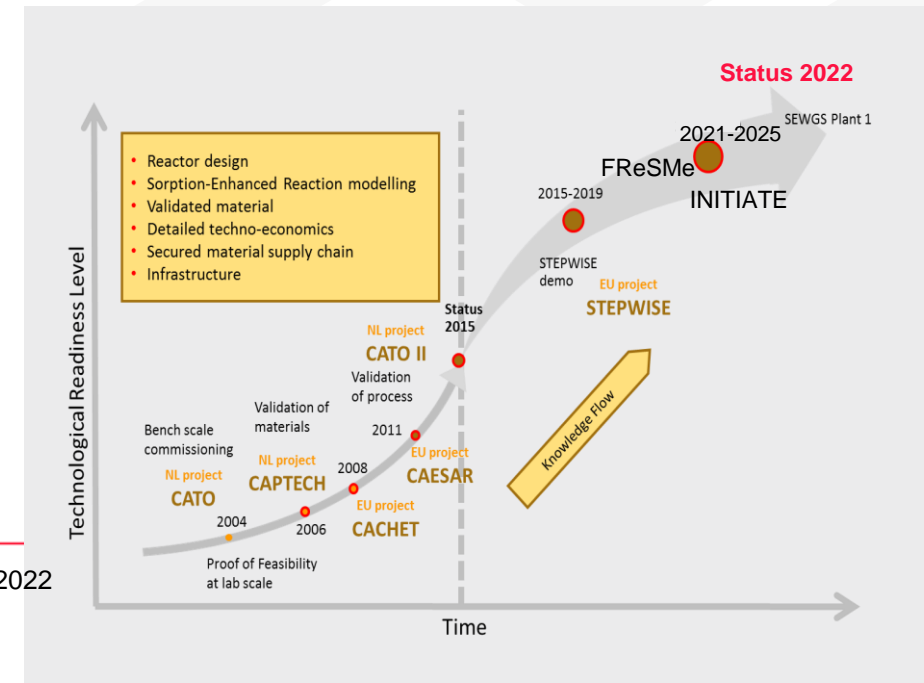
- TNO development
- Industrially sourced solid adsorbent
- Combining CO₂ separation with WGS reaction
- Optimizing N₂/N₂ while removing CO₂
- STEPWISE & FReSMe TRL-6 demonstration with steel gas
- INITIATE is TRL-7 demonstration with steel gas



DEVELOPMENT PATH:

CATO	Lab-scale
CACHET	Bench Scale (SEWGS1)
CAPTECH	Materials
CAESAR	Low Steam Use
CATO-II	Process
STEPWISE	TRL6 Single Column Demo
FReSMe	TRL6 Single Column Demo for Methanol
INITIATE	TRL7 Multi Column Demo for Ammonia

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Towards a first of a kind plant

Demonstrate NH₃ from BOFG at TRL-7

Gas pipeline



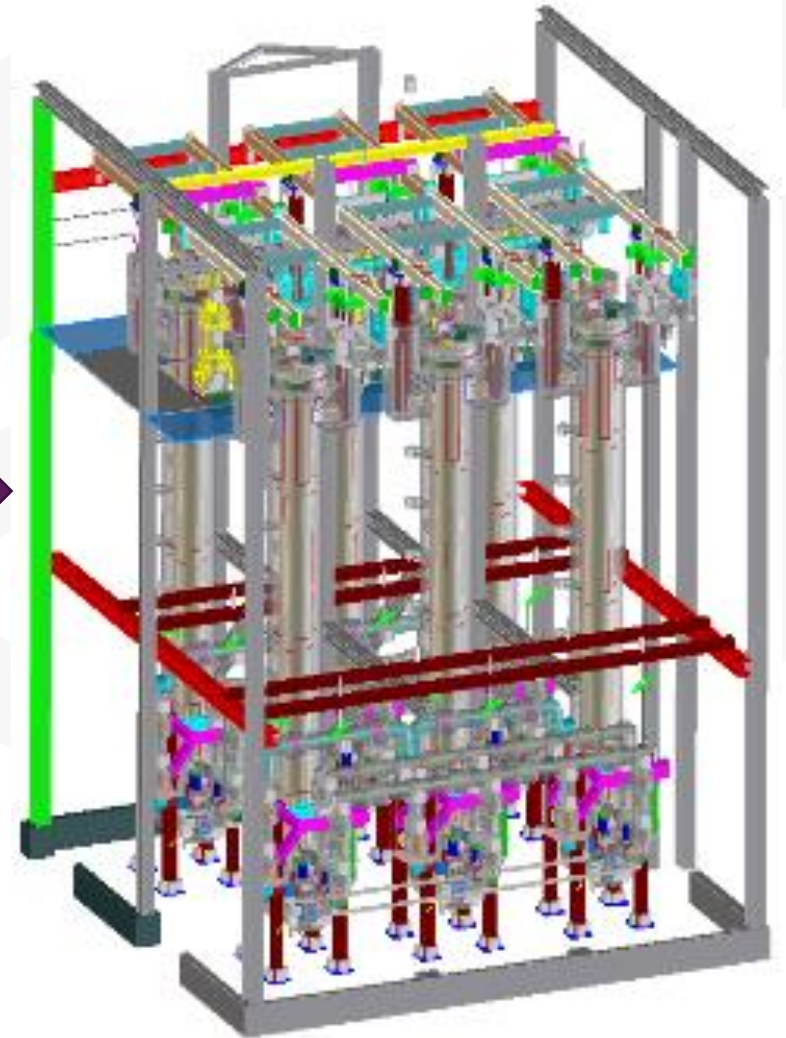
Compressor



Pre-Shift



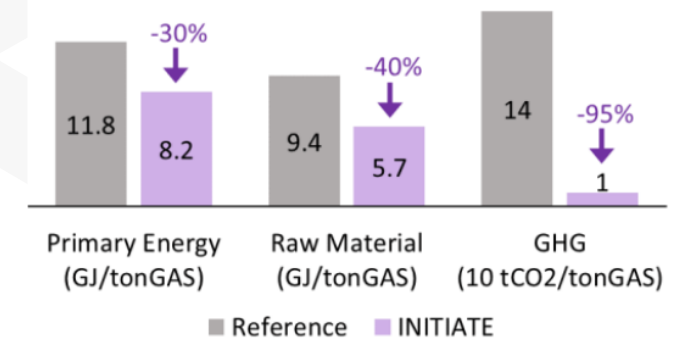
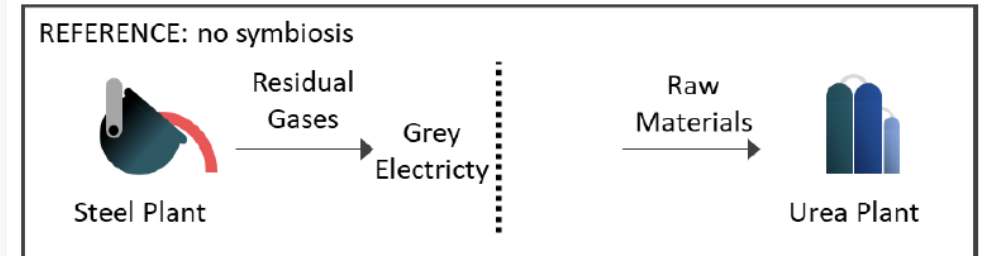
SEWGS – Single Column



Towards a first of a kind plant

Beyond demonstration

- Value engineering and integration to reduce cost
- Pre-FEED for a bankable, first-of-a-kind plant at selected location
- AI based control for BOFG dynamics
- Quantify social, economic and environmental impact of industrial symbiosis in Europe

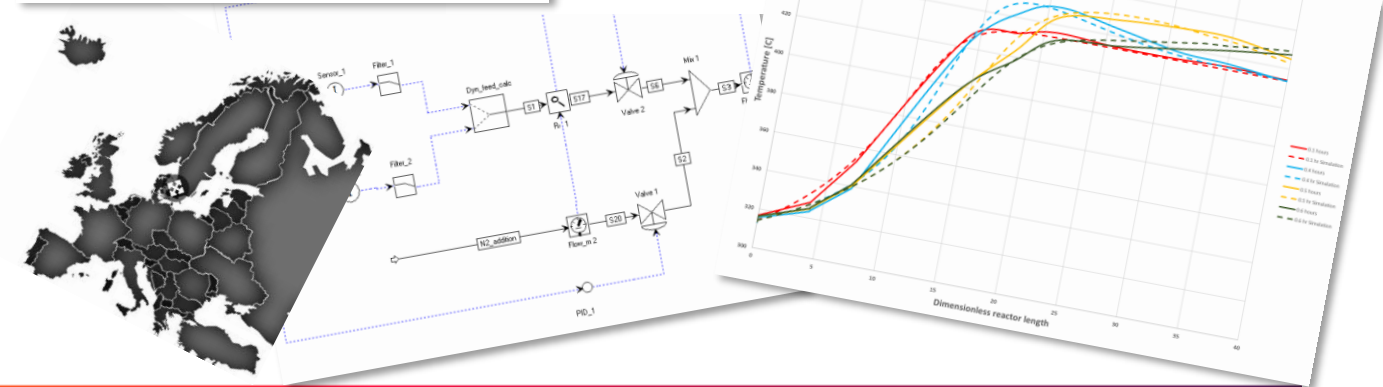
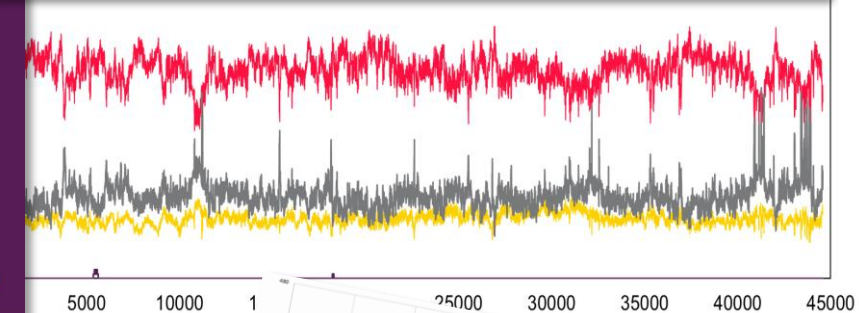
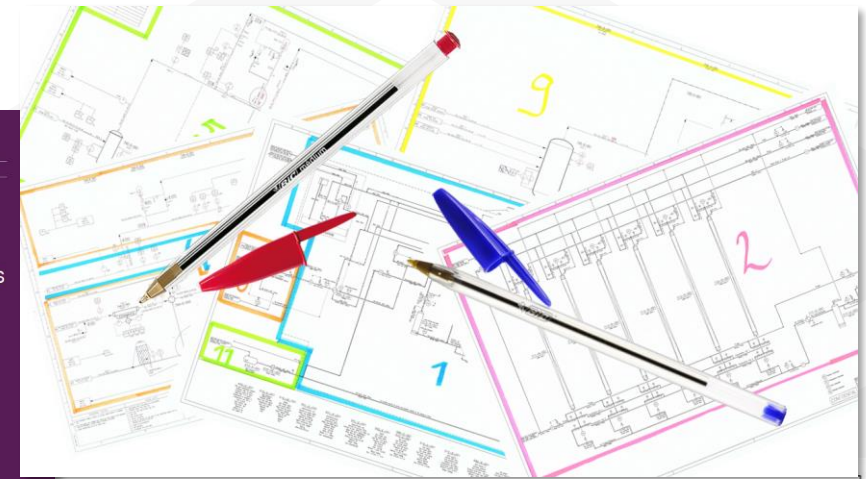
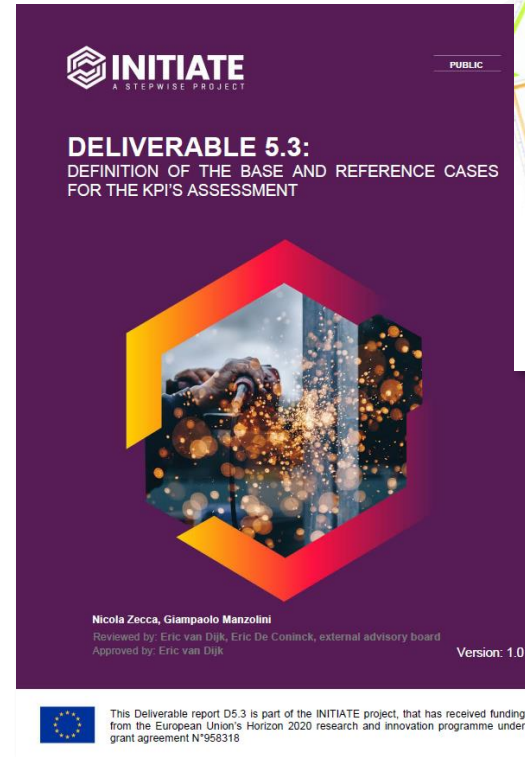


Intensity values per ton of residual steel gas

STATUS OF INITIATE

M20 / M54

- Detailed engineering and procurement of the pilot
 - Lay-out and functional materials fixed
 - Control architecture in development
- **Multi-scale modeling**
 - **Dynamic models for plant control**
 - **TEA, LCA and symbiosis basis established**





Thank you !

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