

Fossil-based energy

Green energy

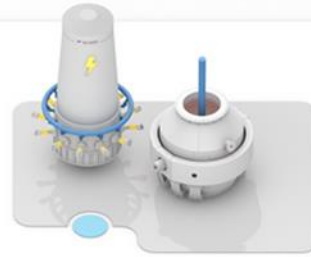


Status Quo

Conventional Blast Furnace



Blue Blast Furnace



EASyMelt



+CCS/CCU

+carbon substitute

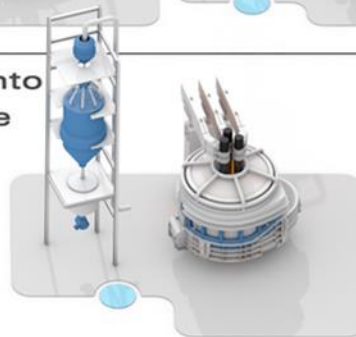


Direct Reduction into Open Bath Furnace



+CCS/CCU

+carbon substitute



Direct Reduction into Electric Arc Furnace



+carbon substitute

# DECARBONIZATION PATHWAYS FOR INTEGRATED STEEL PLANTS

EFFICIENCY THROUGH DIGITALIZATION

100%

CO<sub>2</sub>e EMISSIONS

SCOPE 1 + 2 (Low-emission electricity mix 80g CO<sub>2</sub>e/KWh)

75%

50%

25%

CLIMATE NEUTRAL

SMS  group



# Paul Wurth EASyMelt

Most flexible and cost-efficient decarbonization solution

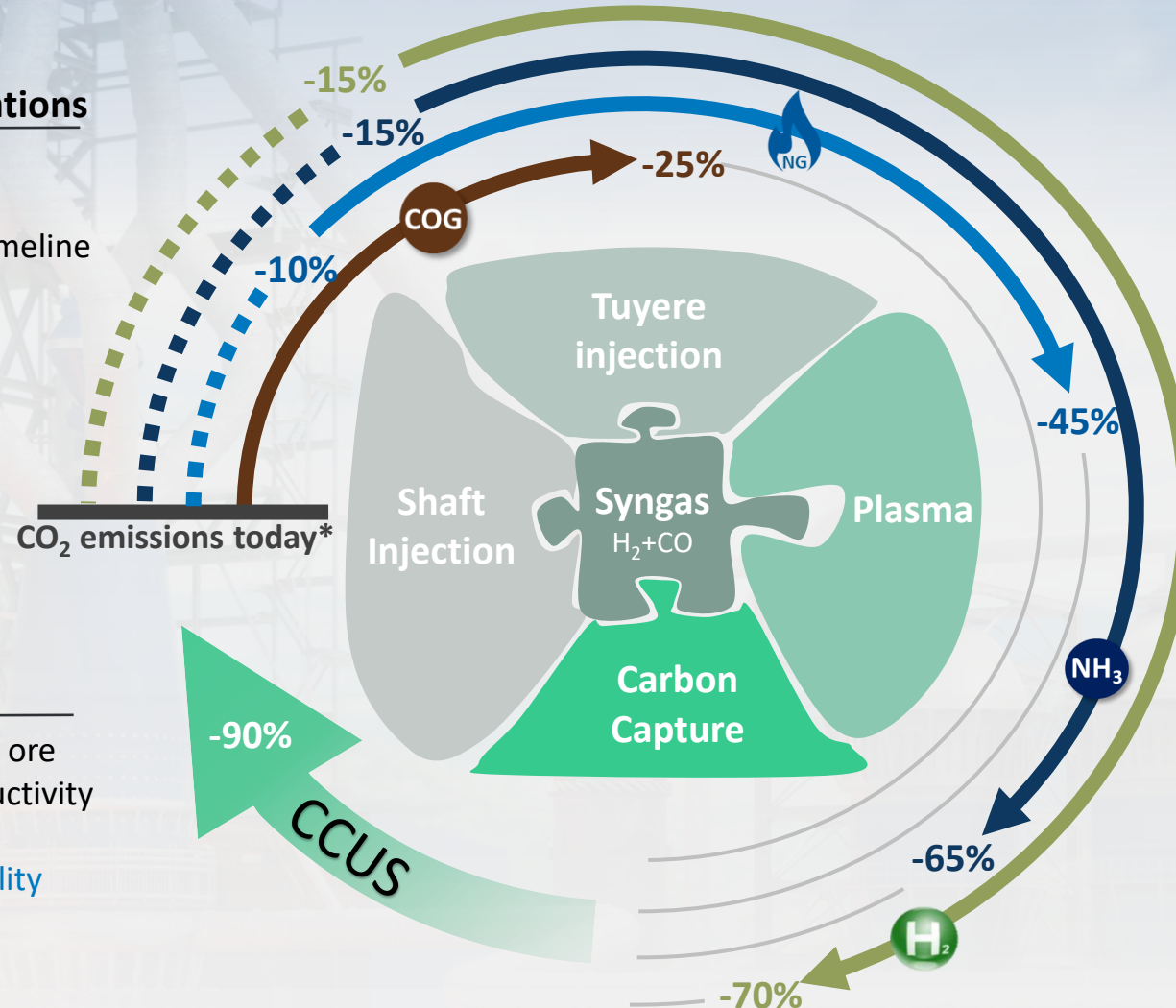


# The EASyMelt Ecosystem

Stay flexible to succeed in every possible situation

## Flexible technology configurations

- Leverage existing assets
  - Adapt to your plant layout
  - Customizable investment timeline
- Minimize CAPEX and risk



## Flexible production

- High quality hot metal from ore
  - Possibility to increase productivity
  - Fulfil orders efficiently
- Maximize income and reliability

## Flexible energy inputs

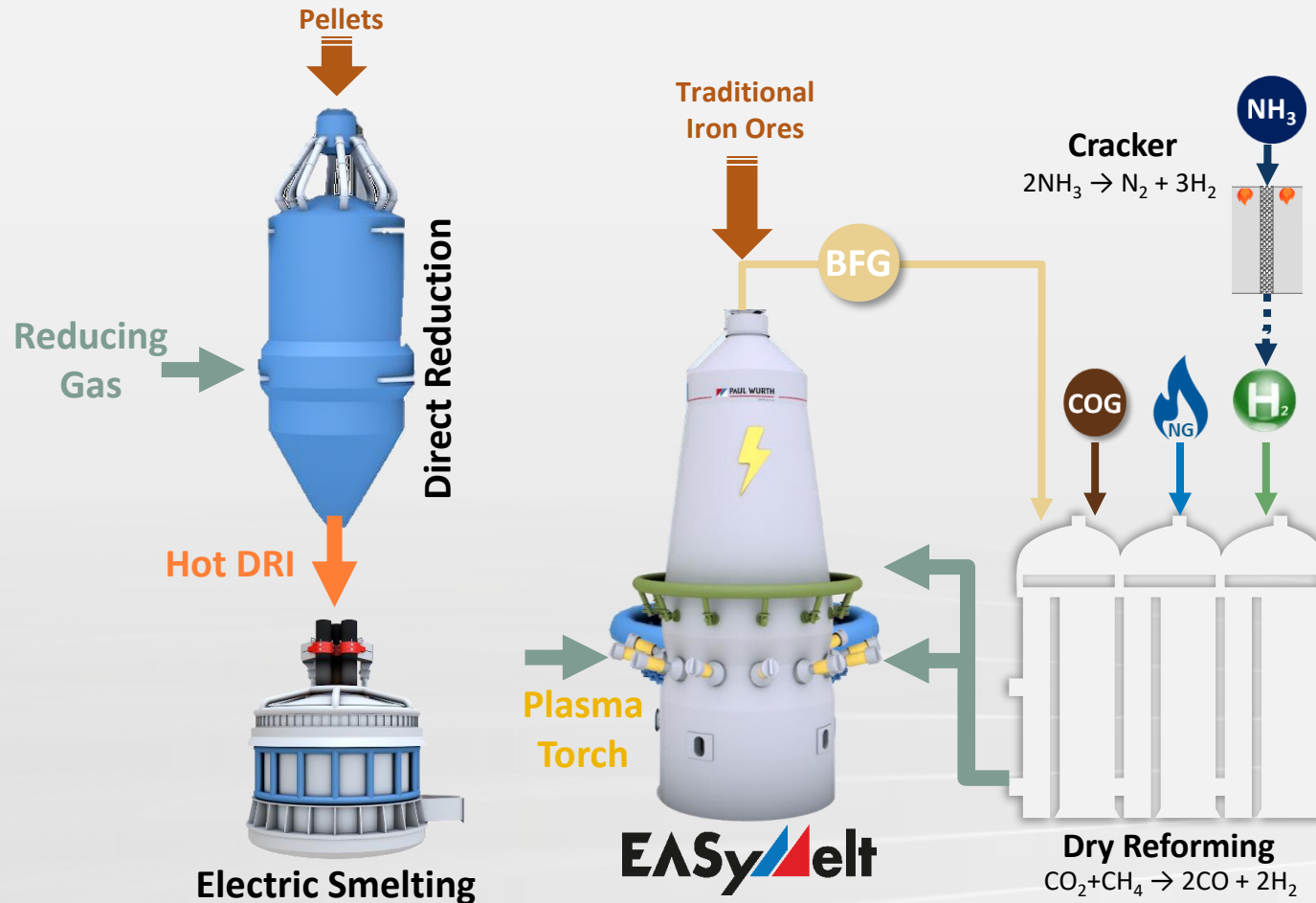
- Minimize your energy costs
  - Stay resilient against price volatility
  - Optimize decarbonization timeline
- Minimize OPEX and risk

## Flexible iron ore inputs

- Minimize iron ore costs
  - Maintain existing ore supply chain
  - Adaptable to any other ore supply
- Minimize OPEX and risk

\*Scope 1+2 assuming 80gCO<sub>2</sub>/kWh<sub>electric</sub> (OECD EU-28 target 2050)

# EASyMelt – Technical concept



## Technical features:

- ✓ No blast, only small amount of cold oxygen
- ✓ No PCI, nor auxiliary fuel injection at tuyere
- ✓ **Topgas** recycling = high efficiency
- ✓ Reducing gas production with **dry reforming**
- ✓ Reducing gas injection at tuyere and/or shaft = decrease coke consumption
- ✓ Tuyere gas heated to ~2000°C with **plasma**
- ✓ Flexible addition of H<sub>2</sub> or NH<sub>3</sub> when available

# EASyLooper - Dry reforming

Carbon recycling through non-catalytic reforming

## Pilot plant in operation (Dillingen)

Dry reforming (1200-1500°C)



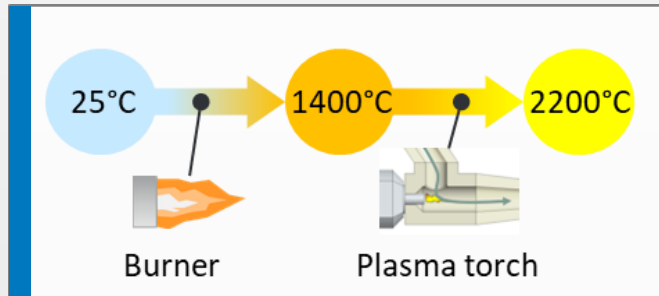
- › Validated gas quality:  $\frac{H_2+CO}{H_2O+CO_2} > 30$
- › High temperature: 1200~1400°C
- › No catalyst = No catalyst fouling  
(*Sulphur, Tar, Dust, ...*)
- › Testing since 2021



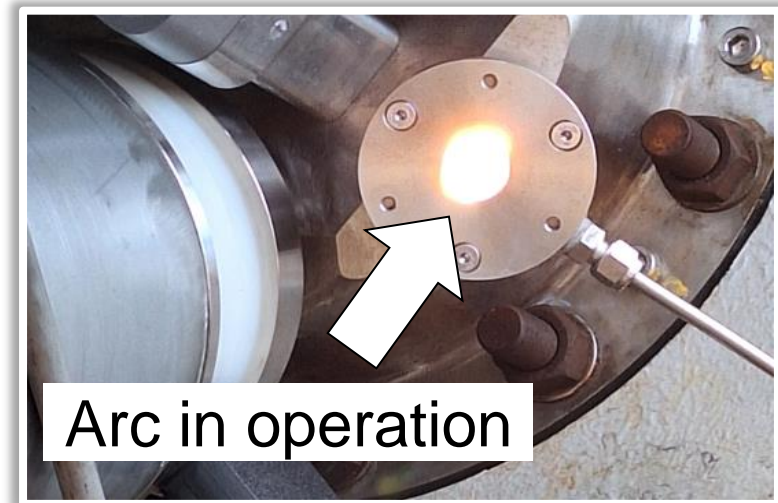
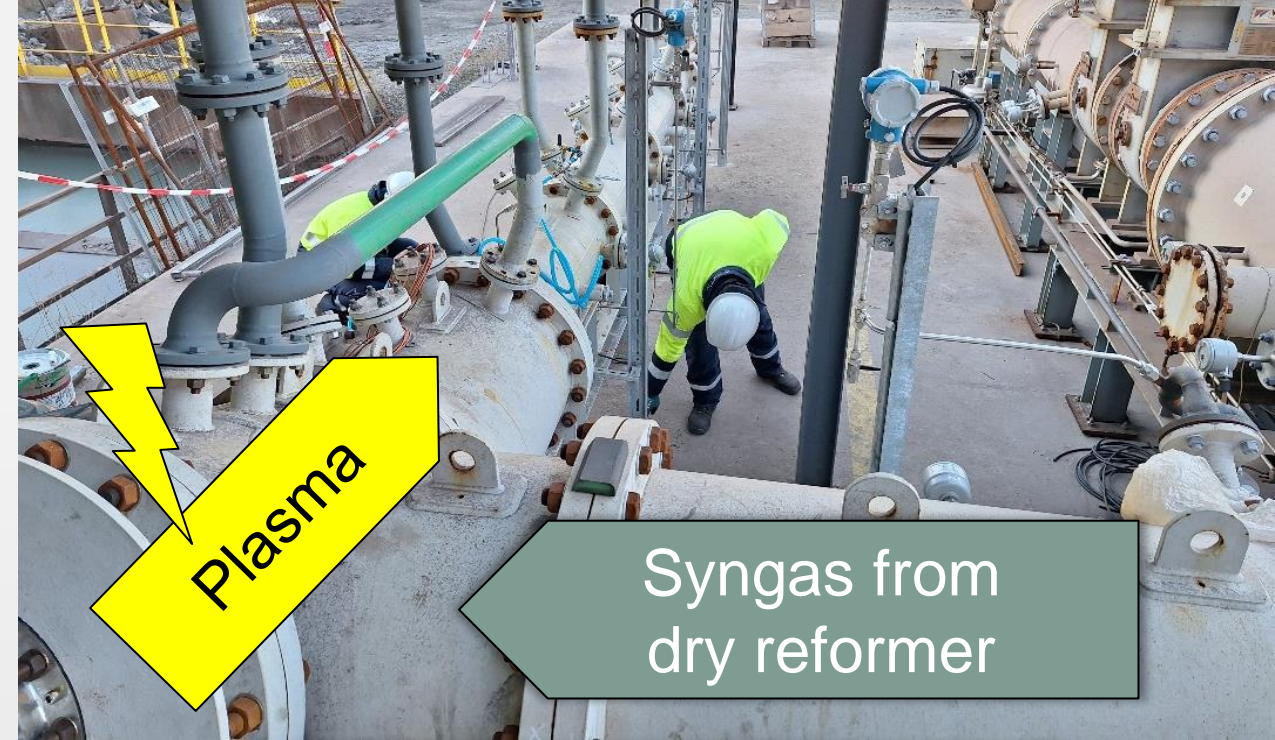
# EASyPlasma – Plasma torch

Efficient direct electrification

## Pilot plant in operation (Dillingen)



- › Heat syngas to  $>2000^{\circ}\text{C}$
- › High efficiency  $>80\%$
- › Compact design
- › High availability
- › Testing since 2025



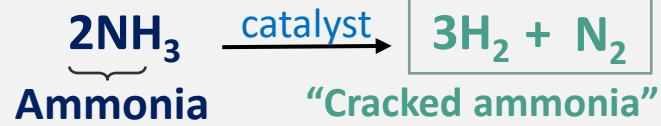
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# EASyMelt - Ammonia Cracking

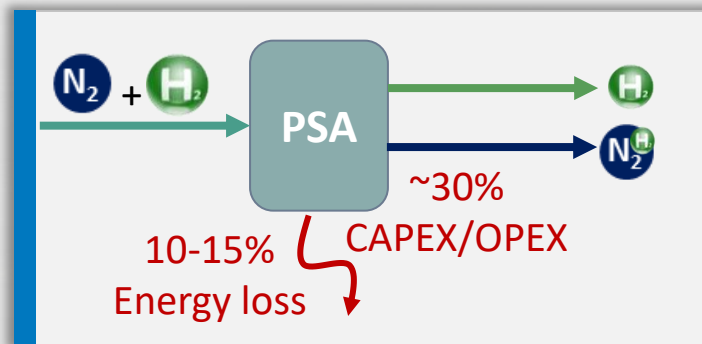
Transportable & Storable H<sub>2</sub>

Ammonia cracker (TRL 9 < 0,5t/h ; scale-up ongoing)

Ammonia cracking (500-950°C)



- › Global H<sub>2</sub> supply → **Best price: 2-5 €/kgH<sub>2</sub>\***
- › Storable in 50 000t NH<sub>3</sub> tanks → **Available 24/7**  
= 160x world largest battery\*\*
- › No PSA in EASyMelt → **save -30% costs!**

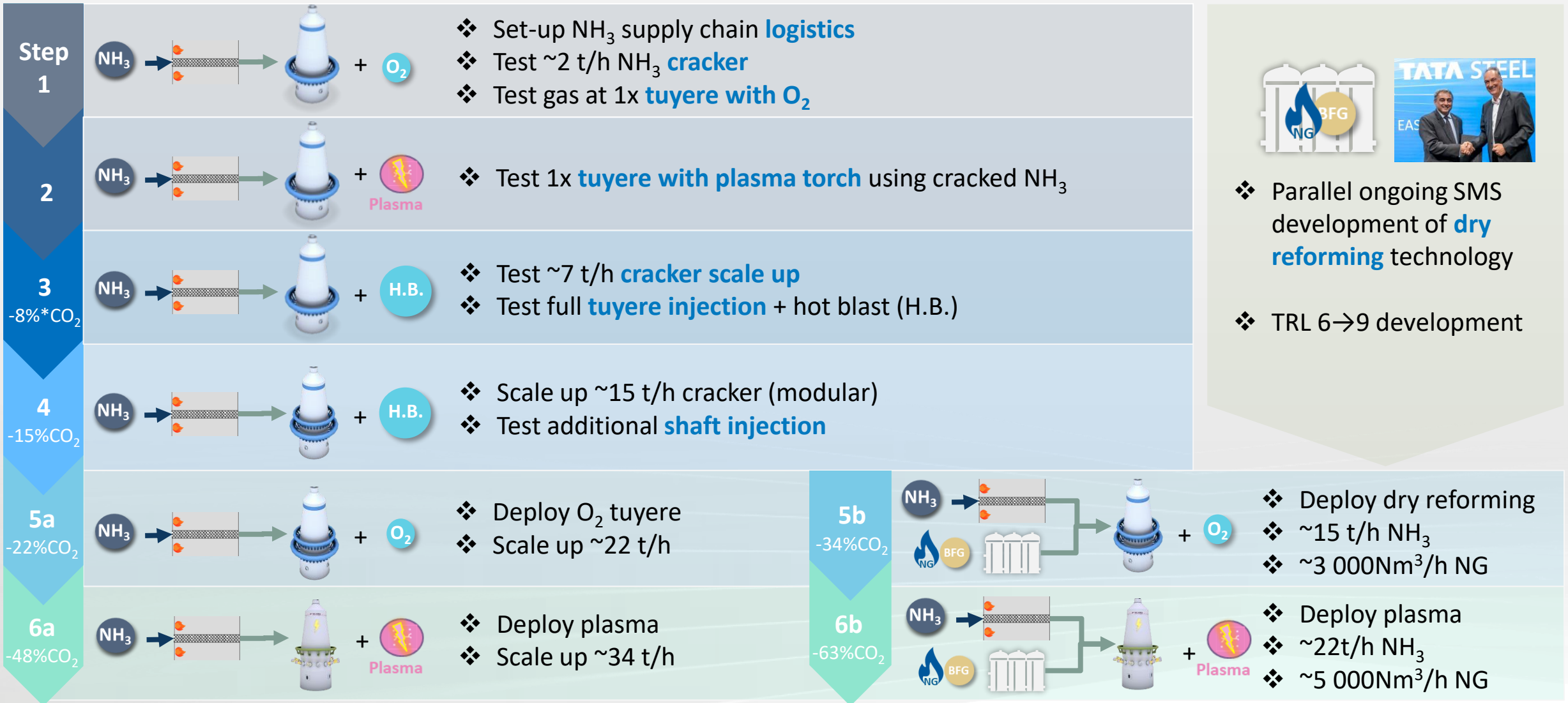


\* Price of H<sub>2</sub> delivered as NH<sub>3</sub>, various sources: IEA, IRENA, H2Europe, BNEF, SMS

\*\*260 GWh = 160 x 1,6GWh (Moss Landing BESS, USA)



# Stepwise NH<sub>3</sub> EASyMelt development (assuming 100t/h HM)



\*Based on scope 1 CO<sub>2</sub> reduction with pellet reference

\*Further CO<sub>2</sub> reduction possible by changing ore (Sinter→Pellets, HBI,...)

# MOVING METALLURGY FORWARD

#turningmetalsgreen

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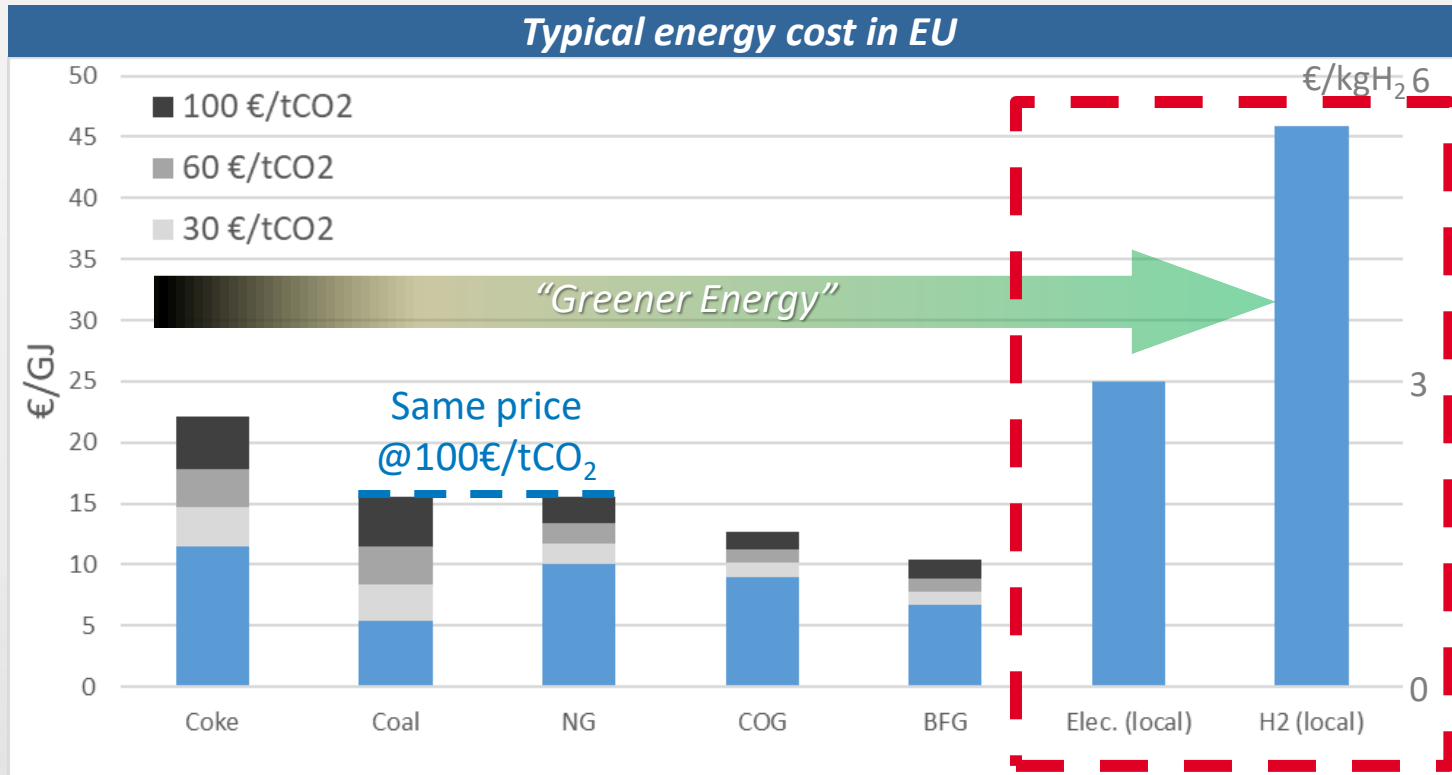
#turningmetalsgreen



# Ammonia

The best way to get H<sub>2</sub>

# Cost efficient energy for green steel



**?How to solve?**  
 We need cheap green energy!



**Solution:**  
**Import!**

...in other units

Coke	€/GJ	11	€/t	350
Coal	€/GJ	5	€/t	160
NG	€/GJ	10	€/Nm <sup>3</sup>	0,40
Elec. local	€/GJ	28	€/MWh	90

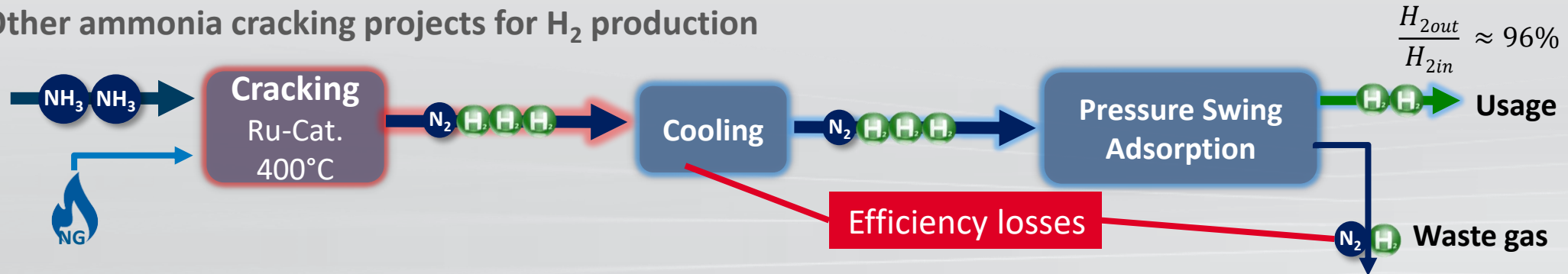
# Ammonia cracking – in EASyMelt – vs – in ports

## EASyMelt direct ammonia usage

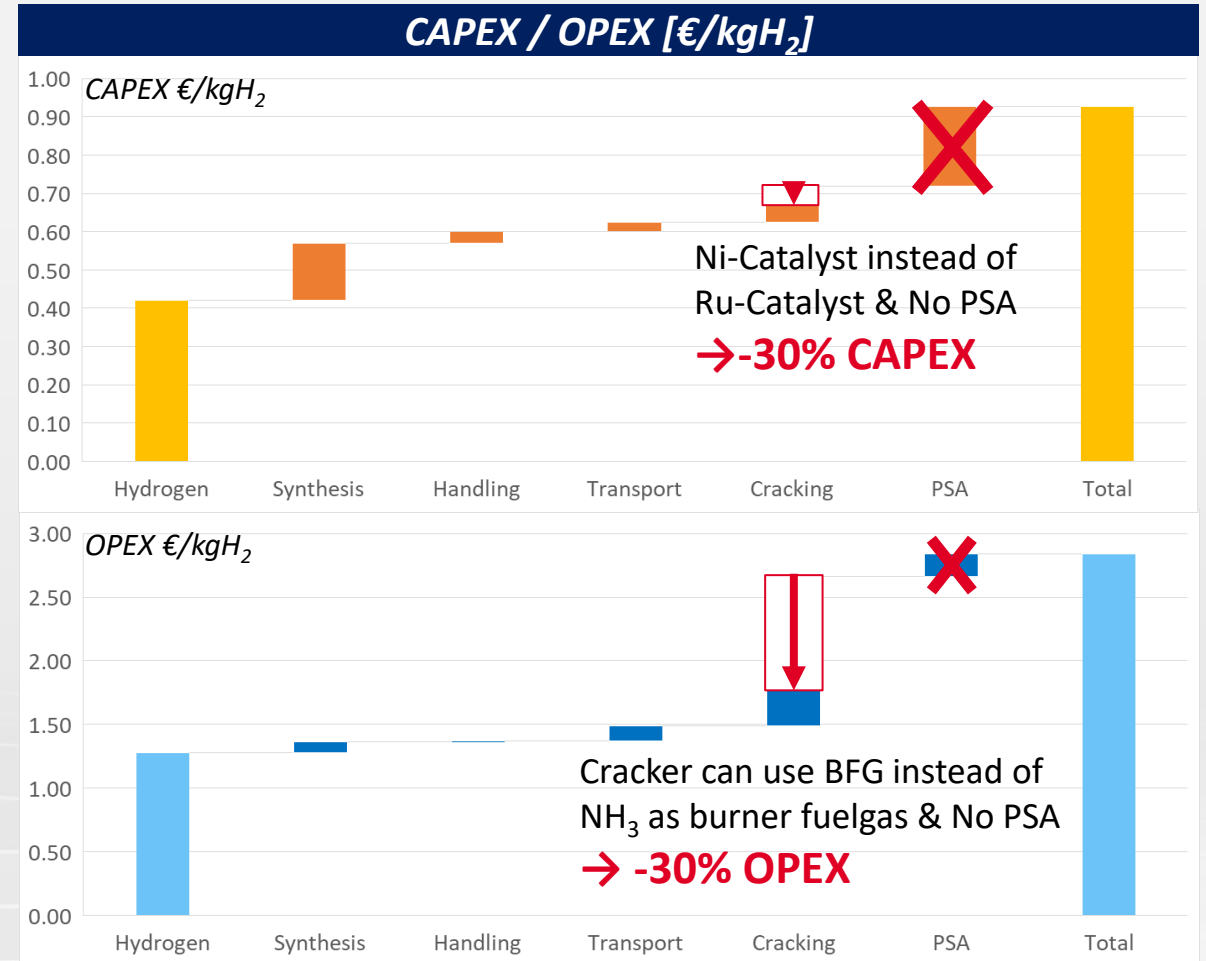
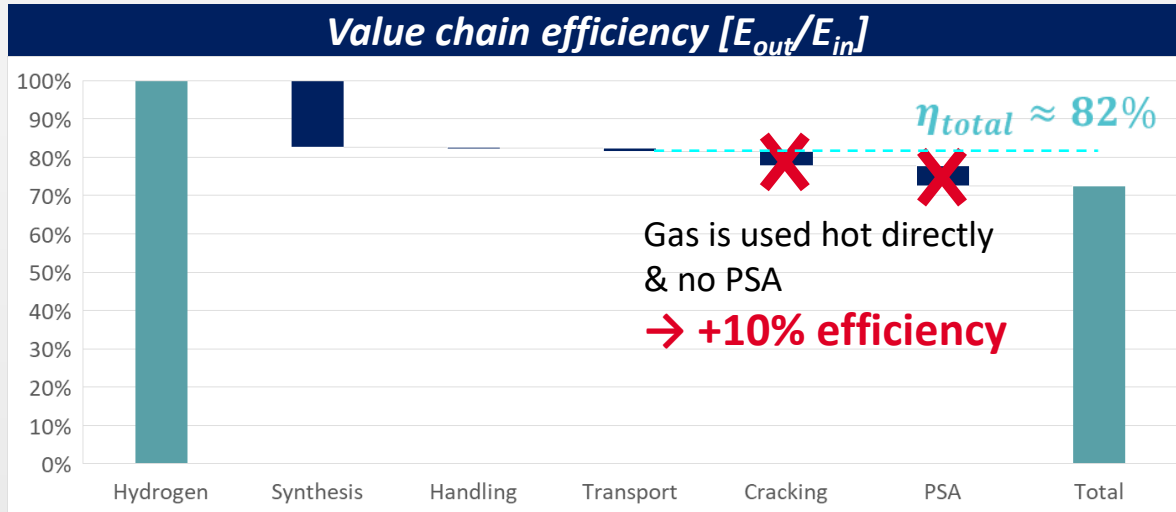


- ✓ Usage of sensible heat  
→ no cooling required, high thermal efficiency
- ✓ No separation & purification process  
→ simplified process set-up

## Other ammonia cracking projects for $\text{H}_2$ production



# EASyMelt ammonia integration benefits

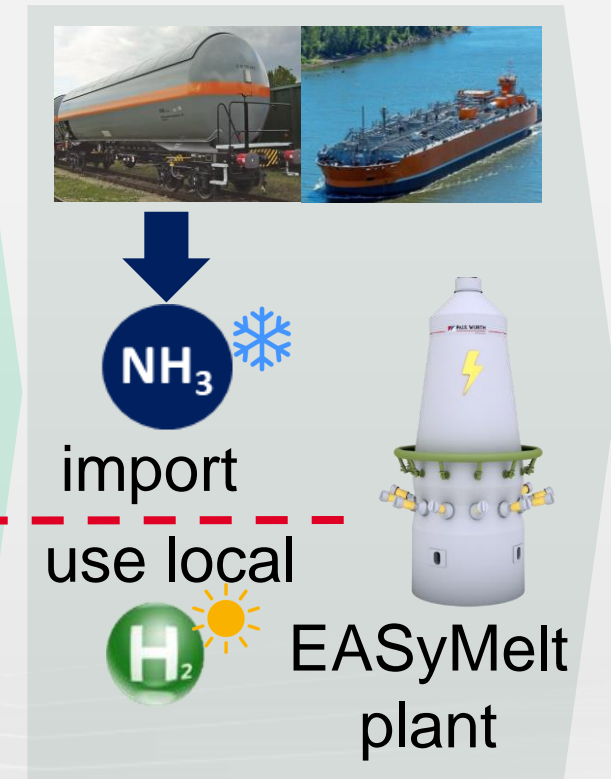
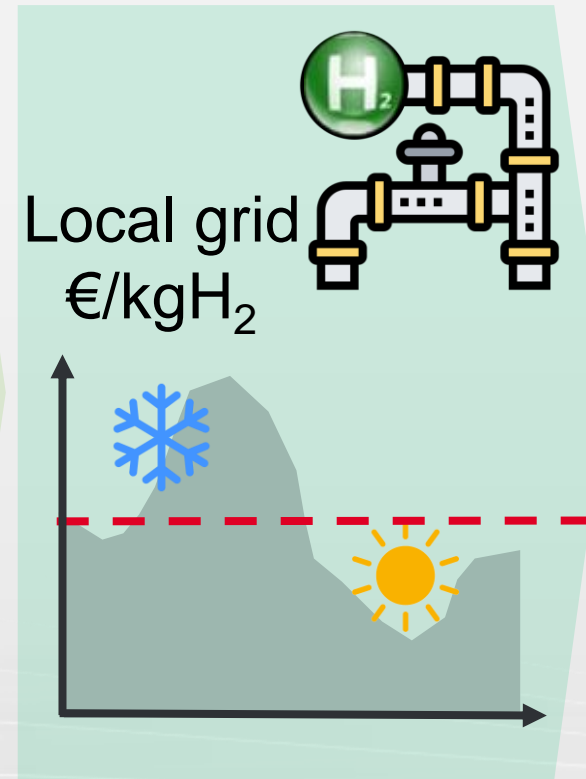
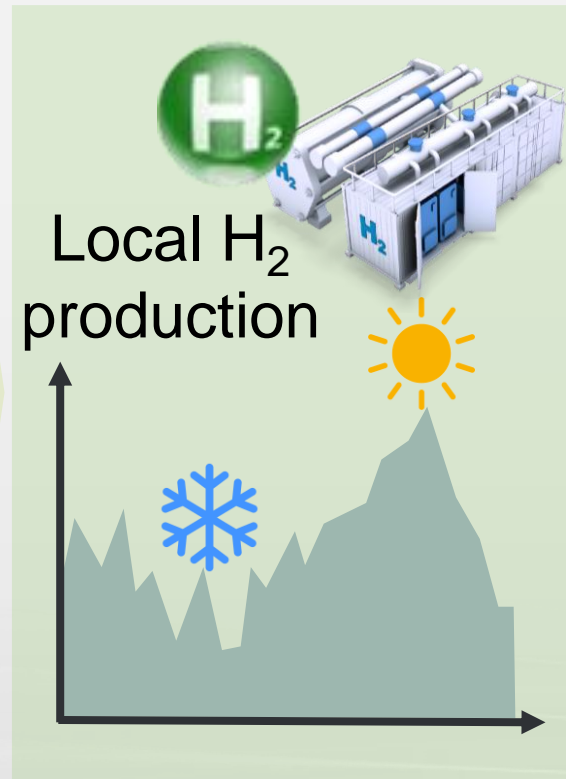
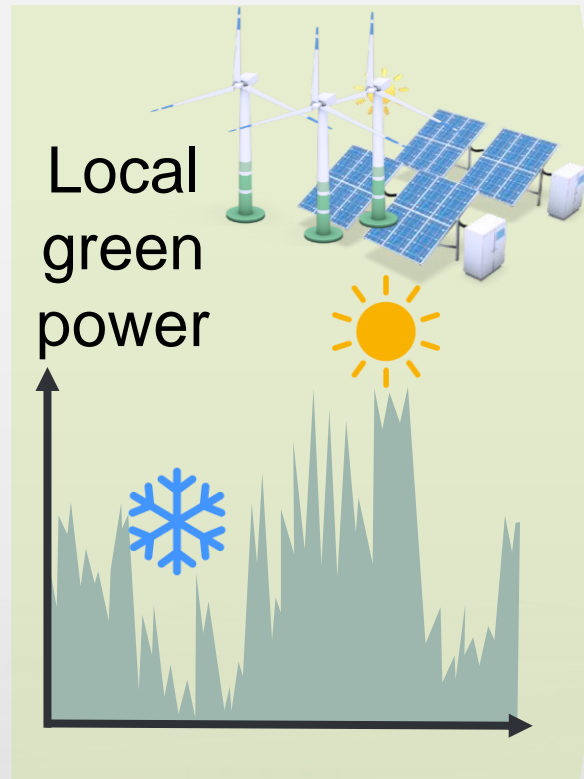


EASyMelt gives NH<sub>3</sub> utilisation **+10% efficiency** and **-30% cost** considering the full supply chain

Simulation basis for all cases:

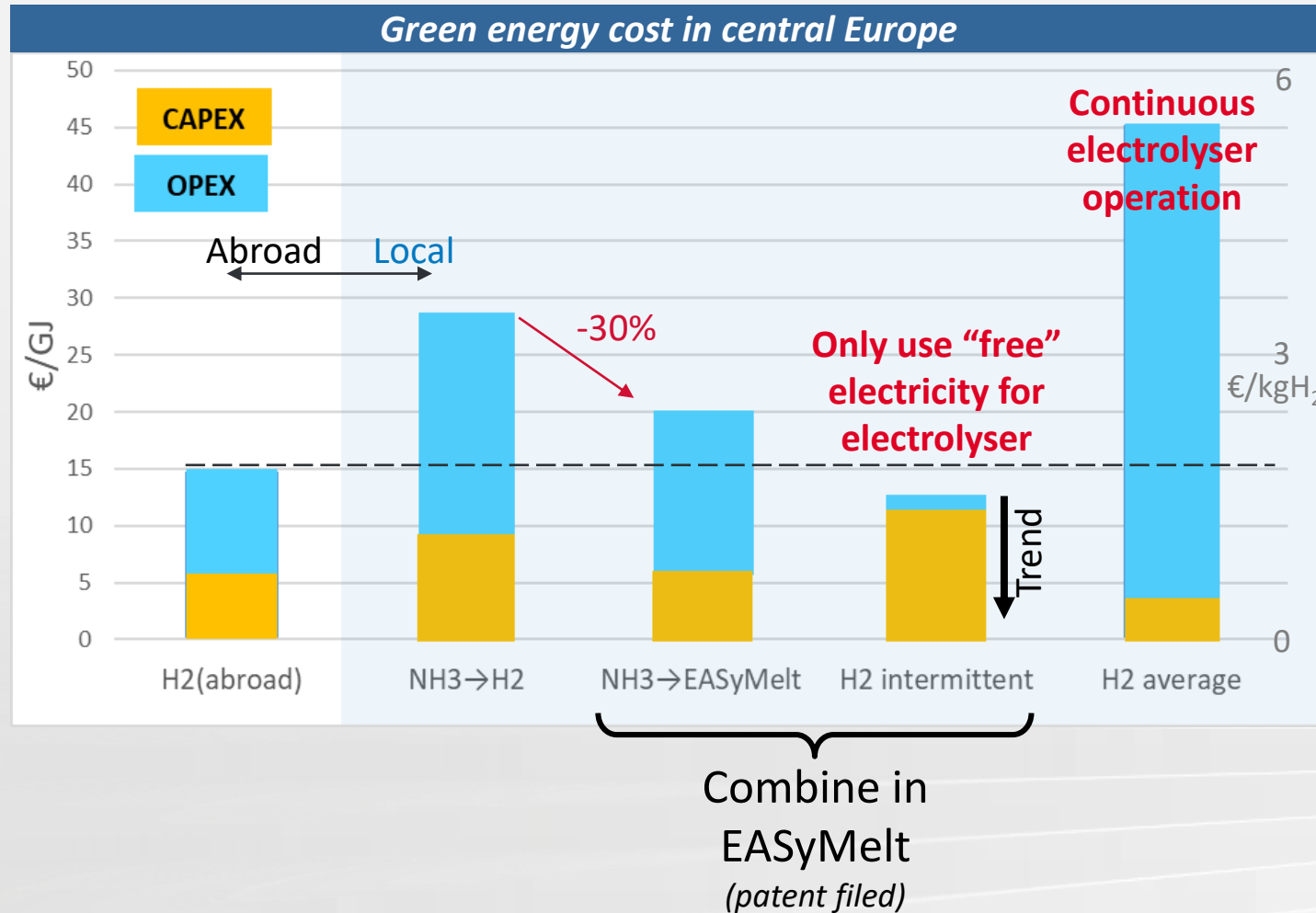
Elec. abroad	€/MWh	20
Elec. local	€/MWh	90
Cracking fuel @port	€/GJ	30
Cracking fuel BFG	€/GJ	7
CAPEX amortisation	years	15

# EASyMelt – Intermittence balancing



- ✓ Reduce grid overcapacity & storage
- ✓ Benefit from local cheap electricity during favourable periods

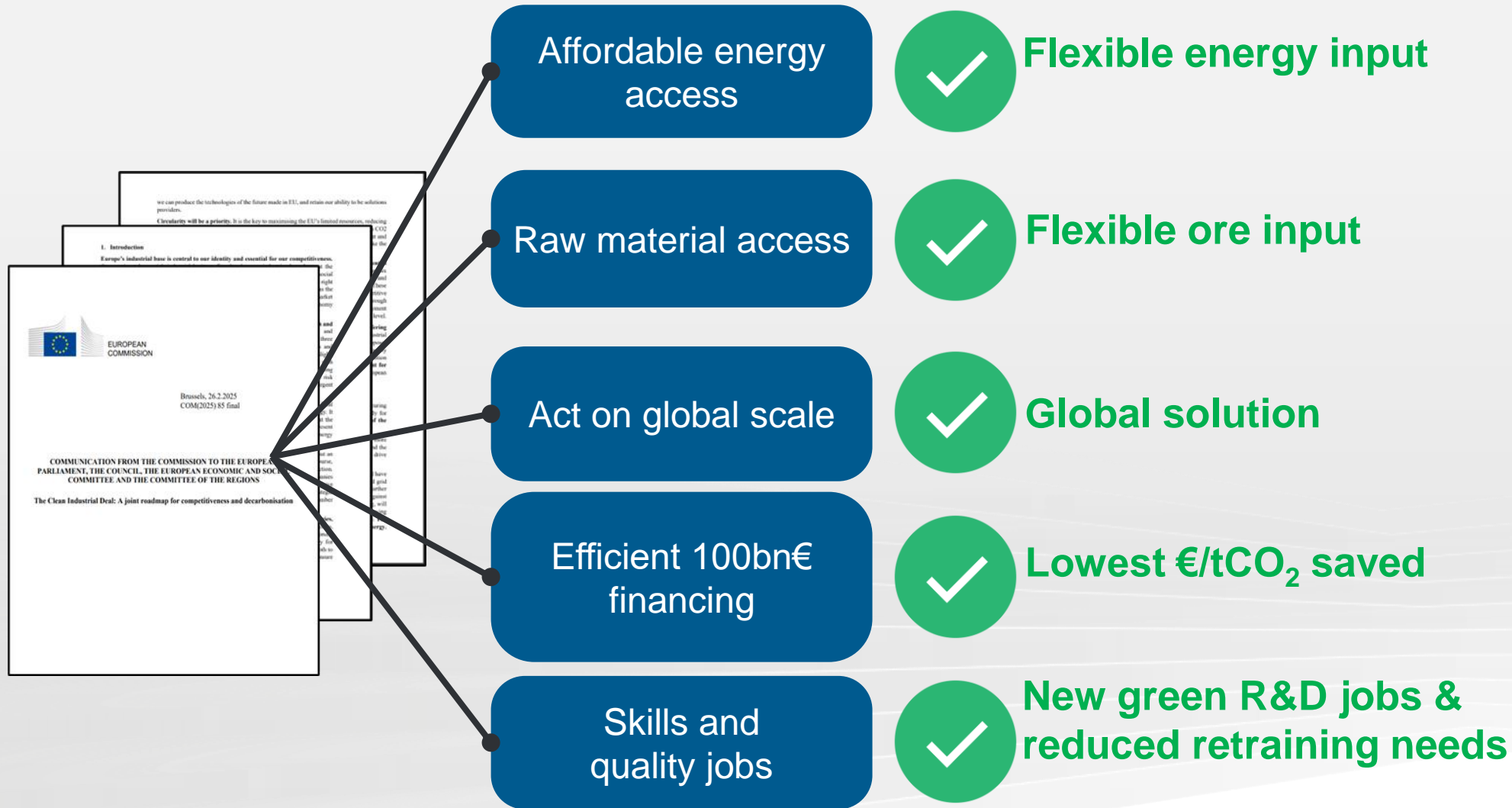
# Green steel cost breakthrough: Intermittent H<sub>2</sub> + stored NH<sub>3</sub>



% share of intermittent elec. with price of 0			28%	
Elec. local avg.	€/GJ	28	€/MWh	90
Elec. abroad avg.	€/GJ	5,5	€/MWh	20
Inflation	local	2%	abroad	5%
Interest rate	local	5%	abroad	10%
Tax rate	local	20%	abroad	20%
Amort. Time	years	15		

**In Europe!**  
 Similar green energy cost as in Chile, Morocco or Saudi Arabia!!!  
 +  
 Benefit from local assets, infrastructure, labour, financing,...  
 =  
**LOWEST GREEN STEEL COST!**  
*(with minimum CAPEX risk)*

# The clean industrial deal EASyMelt solution



# How can EU support?

- › Foster innovation and collaboration
  - ✓ Platforms such as **INCITE**
- › Boost **funding supports**
  - Higher funding schemes for TRL scale-up
- › Public role in **Risk-sharing**
- › **Stable** regulatory environment
- › Leave **technology choice** to the market

