Webinar: Decarbonization Through Green H2: Industry, Steel & Transport

Mohamed Attari
Senior Manager – Business Development

ACWA Power at a glance

We **develop** large power and desalinated water plants

We **invest** in and **operate** these projects

34
GW Power *

5.9
Mm^3 per day desalinated water *

59
Assets *

12
Countries

$48.8bn
USD of Assets*

26%
Portfolio in Renewable Energy based on share of project cost

3,500+
Employees

30+
Nationalities

~60%
Local Employment in projects

ACWA Power at a glance

World's Largest

Thermal storage CSP parabolic trough plant

Bokpoort CSP IPP - 50 MW, 2012, South Africa

CSP solar power plant with storage

Ouarzazate CSP IPP - 150 MW, 2015, Morocco

Combined cycle gas-fired power plant

Qurayyah IPP - 3927 MW, 2011, Saudi Arabia

Power and desalination plant

Marafiq IWPP - 2744 MW and 800,000 m3/day, 2005, Saudi Arabia

Barge-mounted desalination plant

Bowarege IWP - 50 MW, 2007, Saudi Arabia

World's Lowest

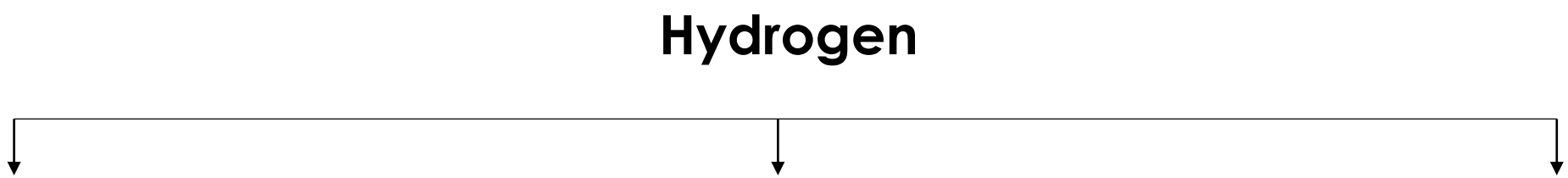
Tariff for utility scale solar power generation

Shuaa Energy 1 IPP – 200 MW PV (2015) – levelized tariff: 5.61 US Cents per kWh
DEWA Phase V Solar IPP – 900 MW PV (2020) - levelized tariff: 1.695 US cents /per kWh

Tariff for water desalination

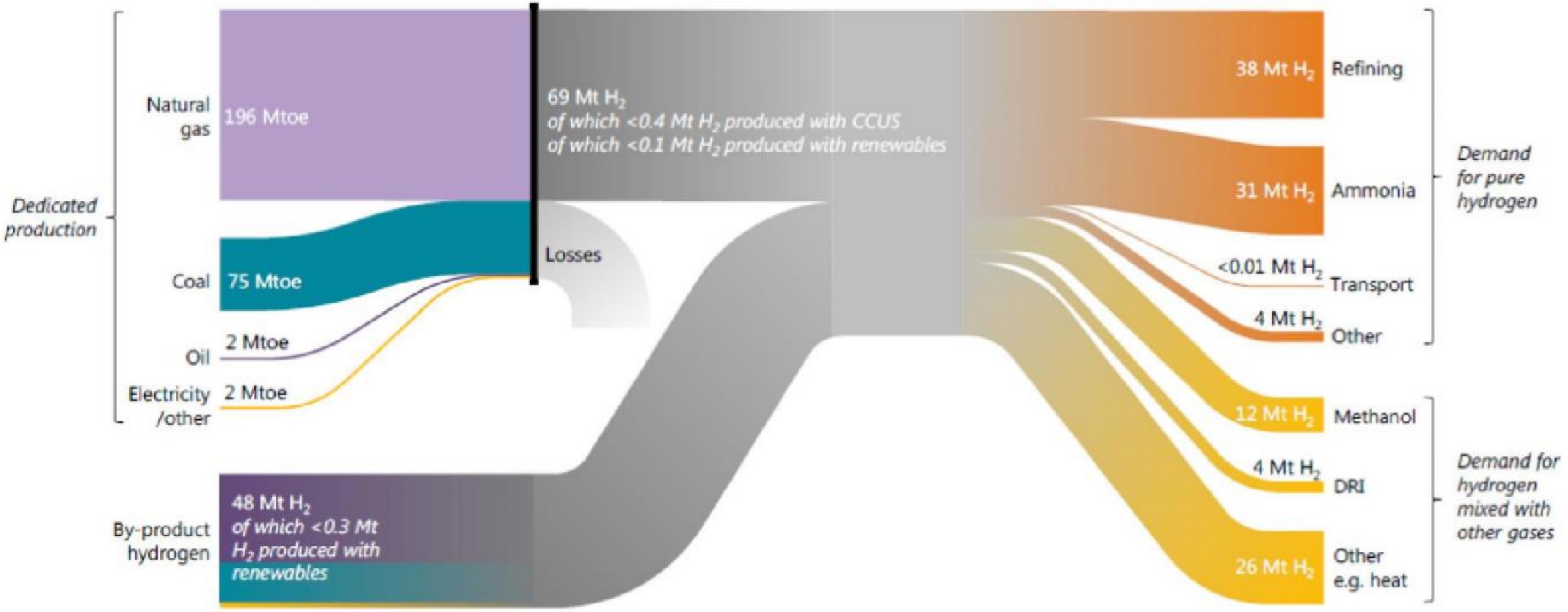
Jubail3A IWP - 600,000 m3/day SWRO (2020) – levelized tariff: $0.413 per m3

Hydrogen: back to basics



Fuel for	Heat for	Feedstock for
Mobility	Industry (Steel, Cement, Paper, Food, Aluminum…)	*Chemicals (Fertilizers, refineries, plastics…)*
Power (Electricity peaking plants)	Buildings	*Products (Metallurgy, Food, Steel, Glass…)*

Hydrogen: back to basics



Ammonia: leading the transition

ASU *(Air Separation Units)* to obtain pure N2

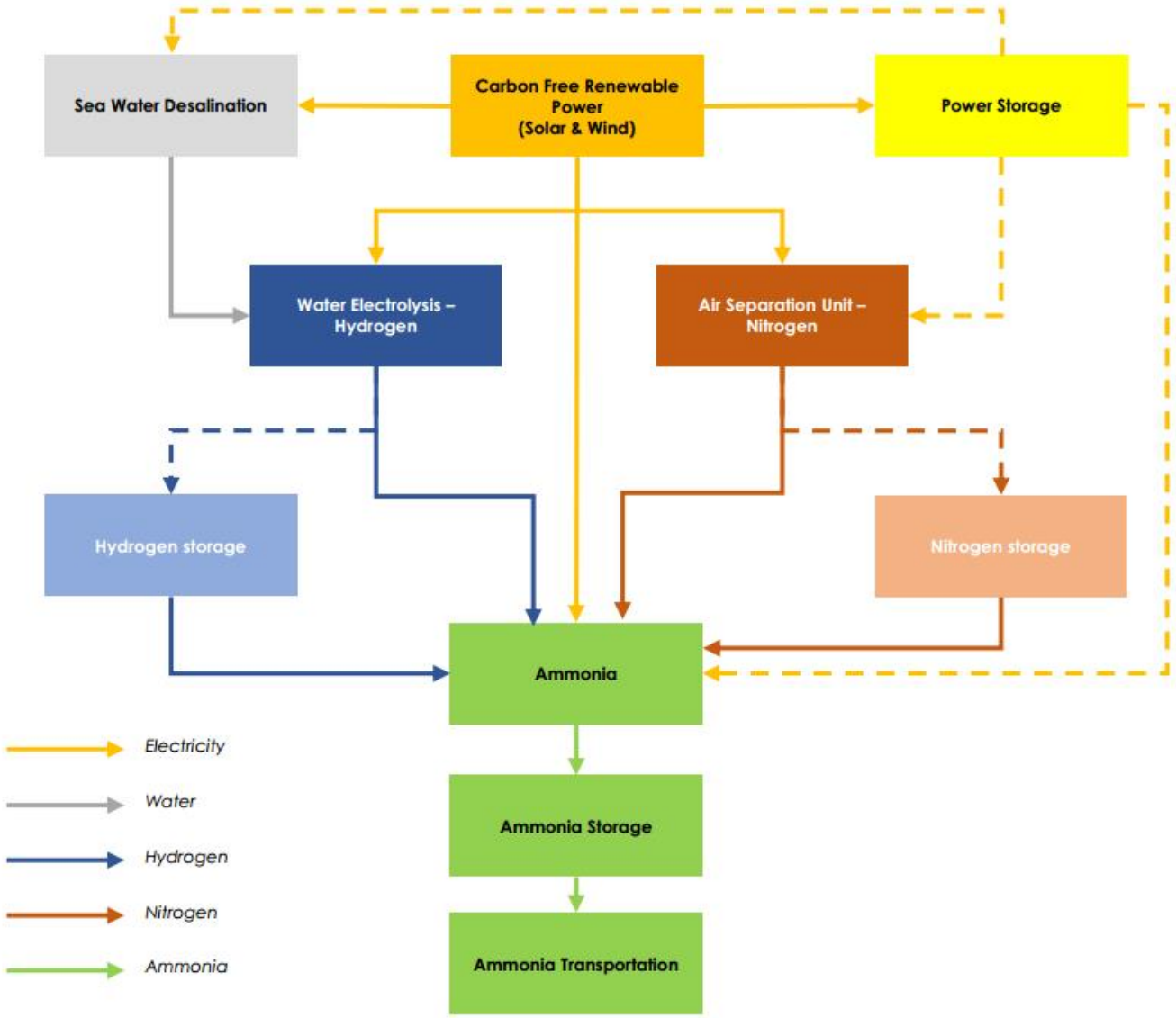
Shipping in LPG-carriers *(~1,200 globally available)*

Lack of technical maturity & unfavorable economics

$3H_2 + N_2 \rightarrow 2NH_3$

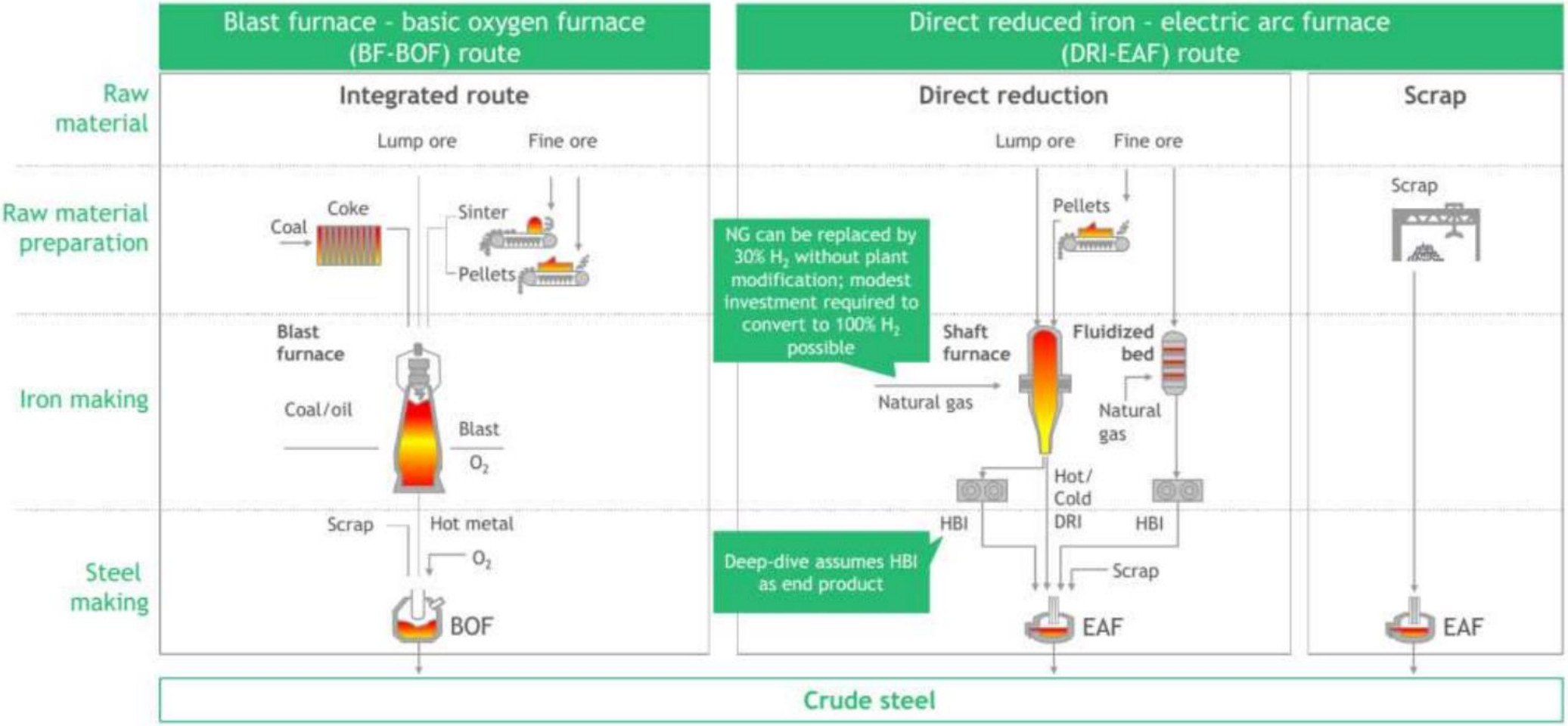
(Haber-Bosch synthesis)

(Green) Ammonia

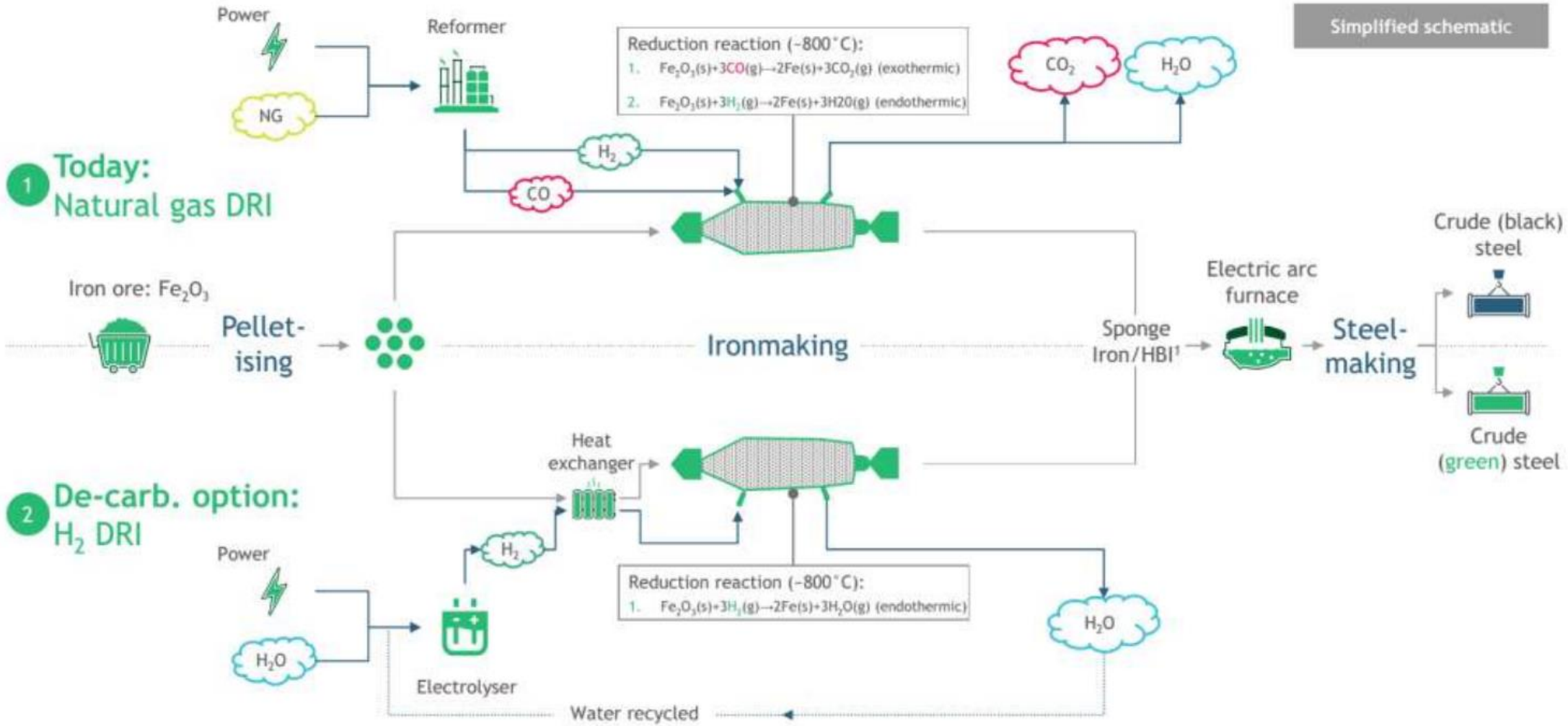


Steel production

Global steel industry is responsible for 8% of the global emissions – decarbonizing steel production is a fast track route to climate neutrality, enabled by the emergence of competitive green hydrogen.



(Green) Steel production



(Green) Steel production

6 international steel players have shown interest in producing green steel

Company	HQ	Cap. (Mtpa)	Targets	Green steel initiatives
ArcelorMittal		96	• 30% CO2 reduction by 2030 (from 2018 levels) • Carbon neutral by 2050	• Hamburg trial: Invested 65 EURm in H-DRI trial with Midrex • Various other decarb. projects ongoing incl. CCS, bio-coal, syngas
thyssenkrupp		13	• 30% CO2 reduction by 2030 (from 2018 levels) • 80% reduction by 2050	• Replacing coal in DRI with H_2 for for H-DRI • Carbon2Chem: CCU tech. converting CO2 to chemicals, scale up by 2030
SALZGITTER AG		7	• 85% CO2 reduction by 2050 (from 2018 levels)	• Overarching initiative to decarbonize steel production through stage-wise shift from BF - NG-DRI to H-DRI, GrInHy2.0: Project on green steel/H_2
voestalpine		7	• 80% CO2 reduction by 2050 (from 2018 levels)	• H2Future: Pilot at Linz to produce green H_2 for steelmaking • SuSteel: Tech. developed to produce steel from iron ore using H_2 plasma
TATA STEEL		28	• Aim to be a carbon neutral steelmaker by 2050	• Tata steel, Nouryon and Port of Rotterdam pilot project for H_2 based green steel production in NL (H-DRI)
NIPPON STEEL & SUMITOMO METAL CORPORATION		36	• No concrete targets • Aim to "reduce carbon intensity of steelmaking"	• Conducted tests aimed at reducing CO2 emissions by hydrogen reduction within a blast-furnace

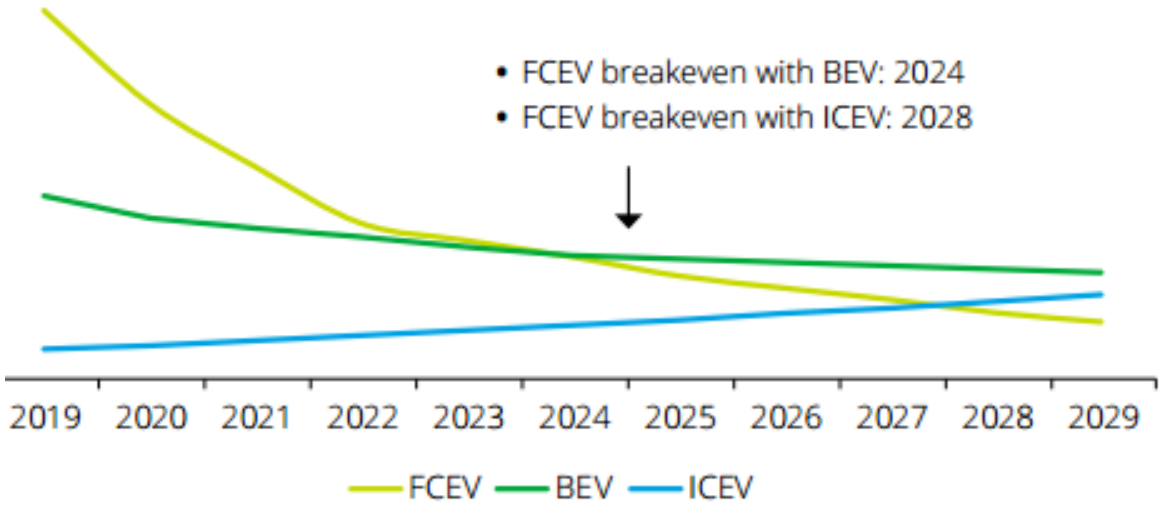
Mobility – FCEVs vs BEVs

Range:
500km vs **200km**

Torque:
247 lb-ft vs **187 lb-ft**

Charging time:
3 minutes vs **4-10 hours**

Lifetime:
15 years vs **7-10 years**



- No existing **mass market** applications for fuel cells, therefore in order to reduce costs, FCEV sales have to increase, as opposed to batteries.

- Lack of existing hydrogen refueling **infrastructure**, as opposed to BEVs that can connect to grid.

- **Price** of H2 at the pump relatively still expensive

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