



Green Industrial Hydrogen for future green steelmaking

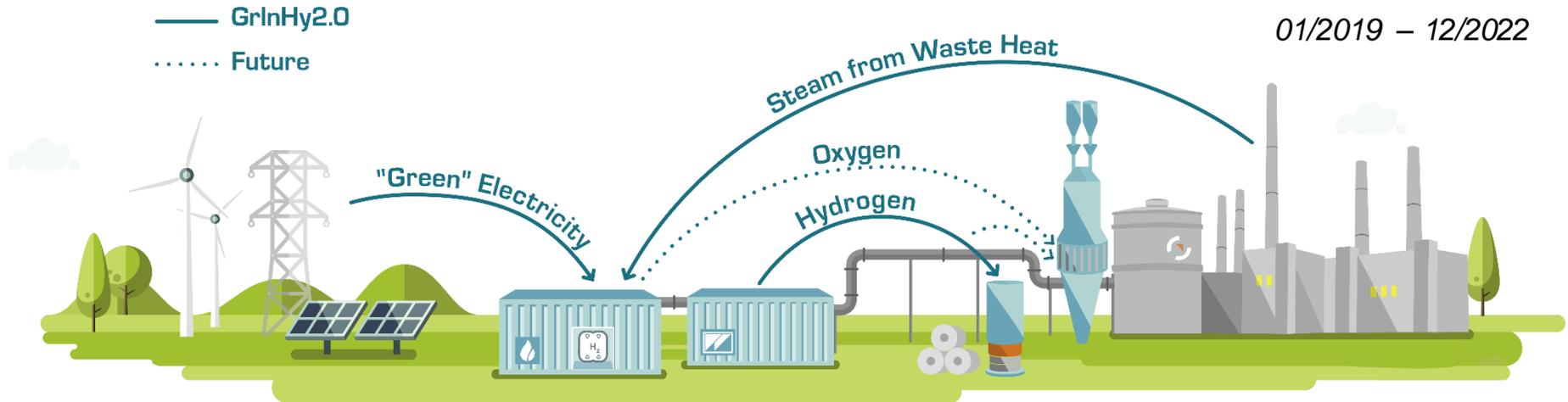
Clean Steel

Simon Kroop, Salzgitter Mannesmann Forschung, 2021-10-18

This project has received funding under grant
agreement No 826350.

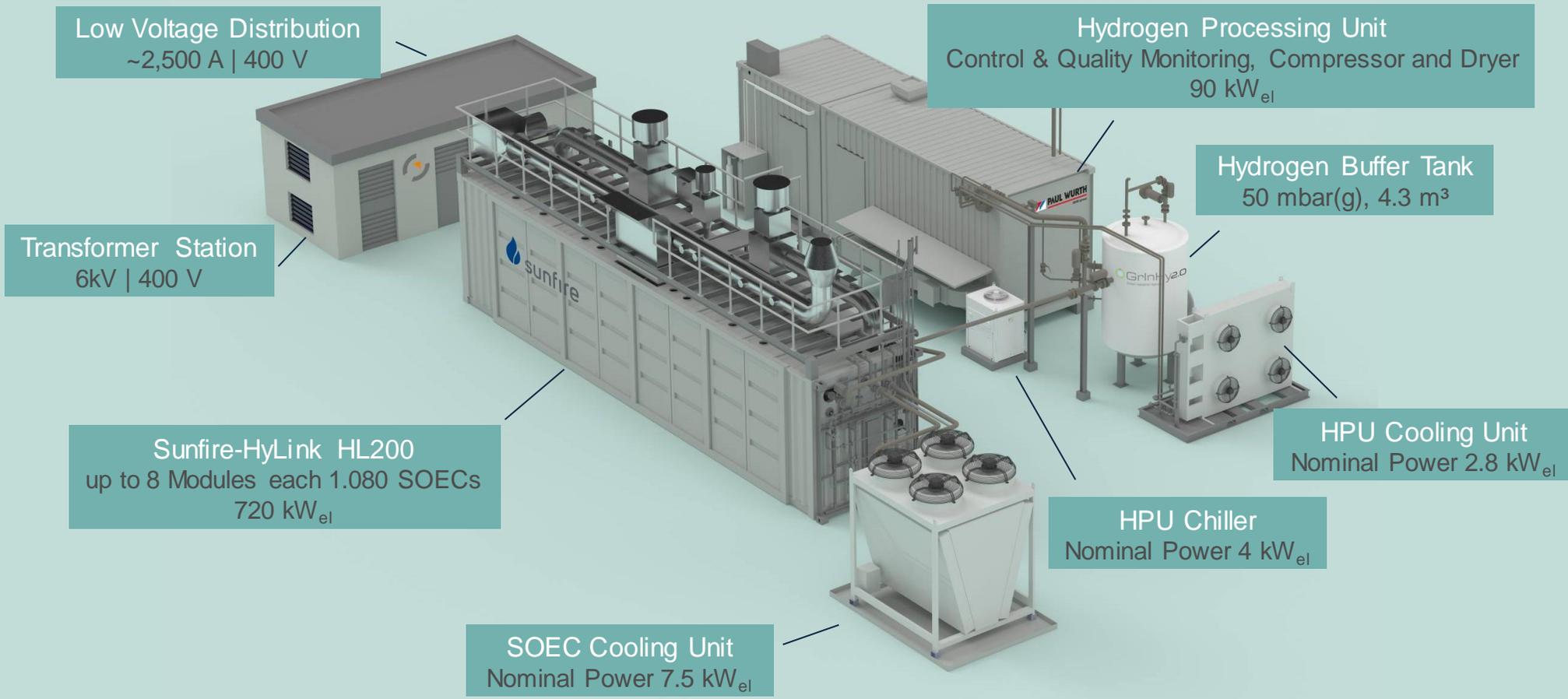


The GrInHy2.0 prototype in a Nutshell

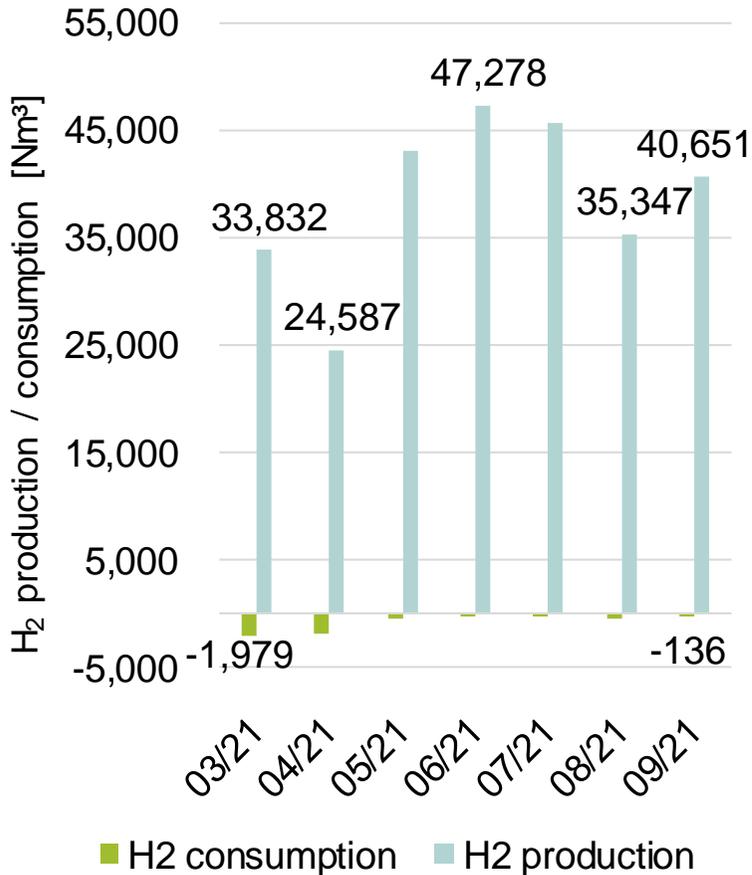


- First High Temperature Electrolyser in megawatt scale:
 $720 \text{ kW}_{\text{el,AC}}$ producing $200 \text{ Nm}^3/\text{h}$ (18 kg/h)
- Full integration into the existing infrastructure and management energy control system:
>13,000 operating hours while producing at least 100 t hydrogen
- Hydrogen based on green electricity and industrial steam from waste heat of steel production:
Electrical electrolyser efficiency up to $84 \%_{\text{el,LHV}}$ (< $40 \text{ kWh}_{\text{el,AC}}/\text{kg}$)

GrInHy2.0 Design



GrInHy2.0 – Status

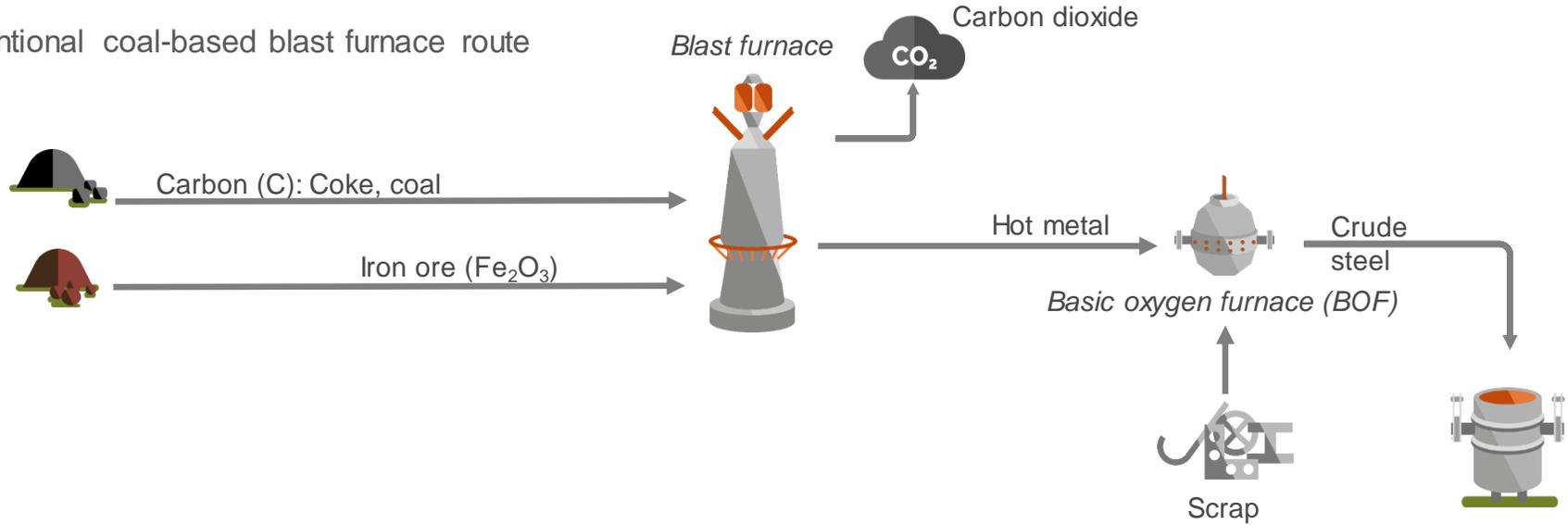


- Since March: ~270,000 Nm³ H₂ injected (24.3 t_{H2})
- Actual Capacity: 100 Nm³/h (200 Nm³/h by end of 2021)
- Since May: ~80 % availability (time)
- El. Efficiency: 84 %_{LHV} (HTE incl. BoP)



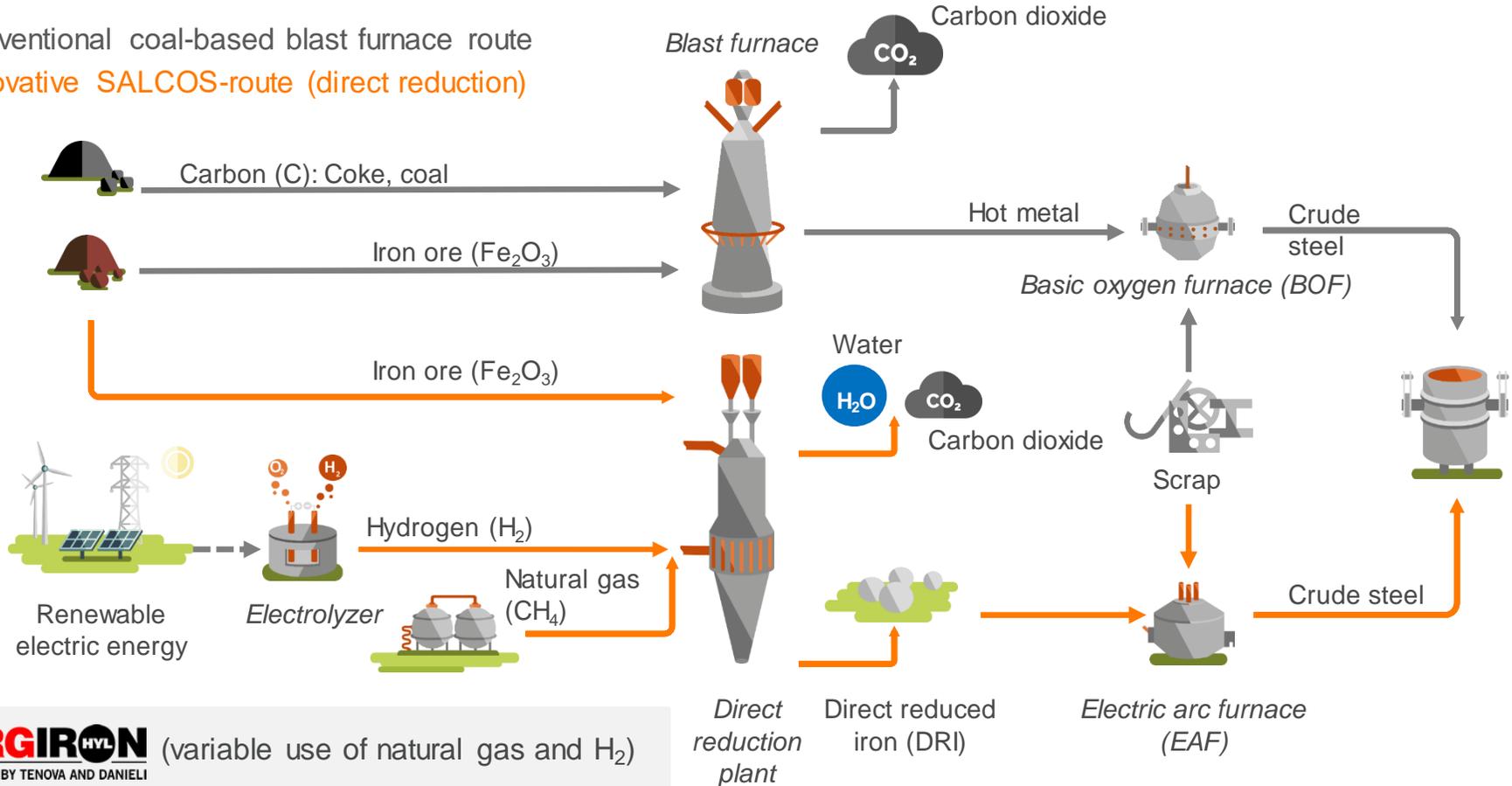
SALCOS® – Flexible hydrogen-based direct reduction

→ conventional coal-based blast furnace route



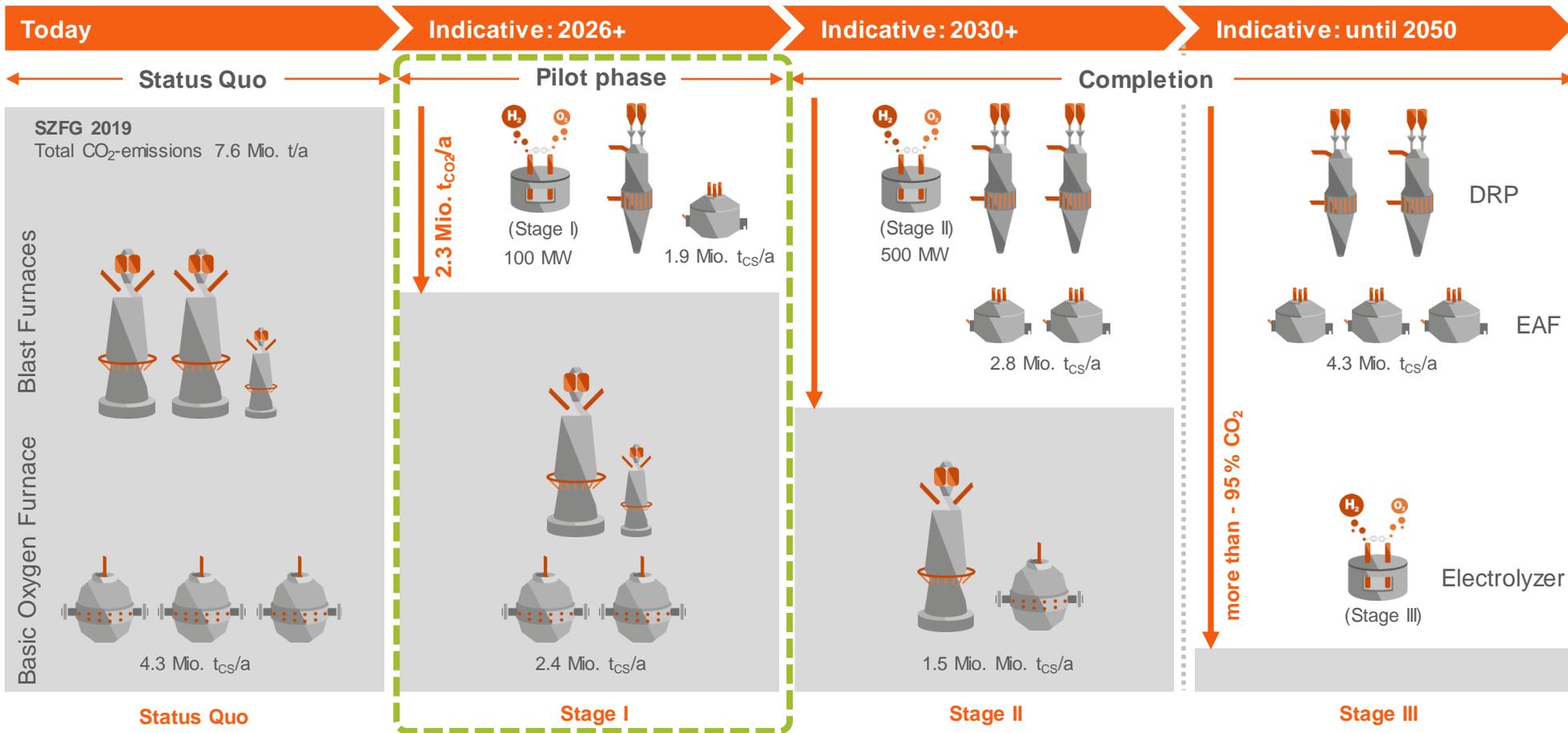
SALCOS® – Flexible hydrogen-based direct reduction

→ conventional coal-based blast furnace route
 → innovative SALCOS-route (direct reduction)



ENERGIRON^{HVL} (variable use of natural gas and H₂)
 DRI TECHNOLOGY BY TENOVA AND DANIELI

Transformation of integrated steelmaking in Salzgitter to H₂ enhanced DRP/EAF-based steelmaking in three stages





GrInHy2.0

Green Industrial Hydrogen



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