Process Modelling Study on Decarbonization of Steel Production by Integrating High-Temperature Electrolysis

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The road to a sustainable steel industry

8% of energy related **CO_2 emissions**

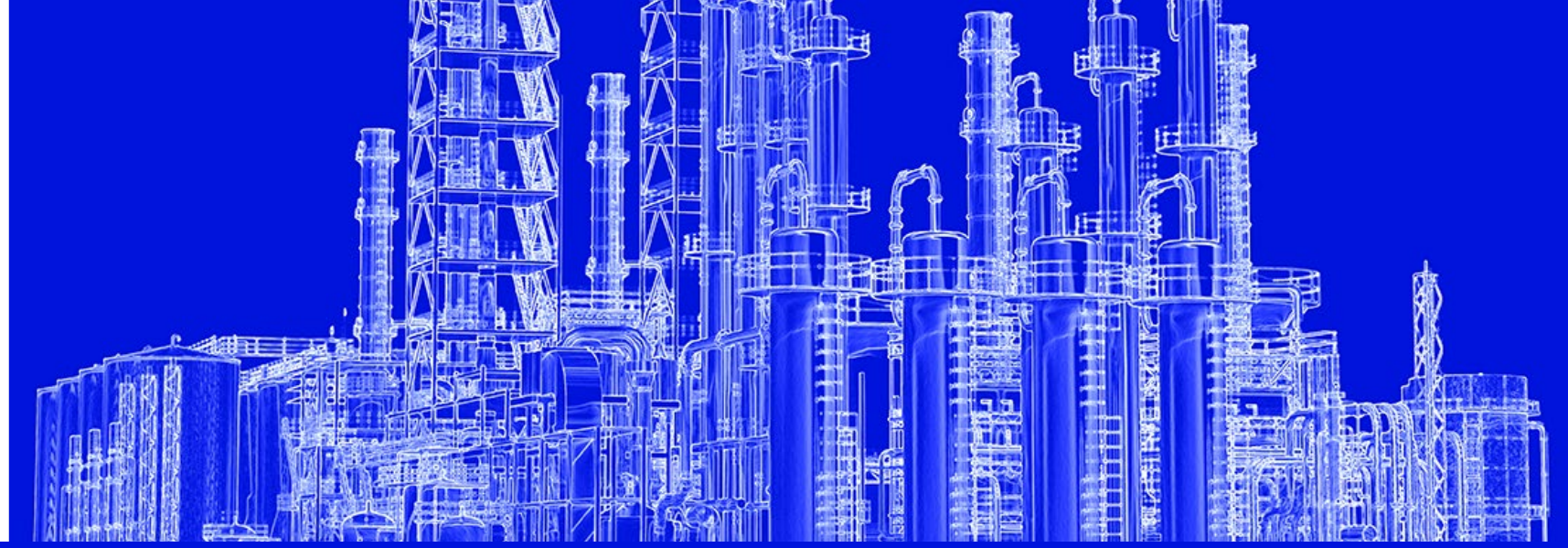
Steel makers are **committed** to **decarbonize**

Technology and **innovation** is essential

Genvia

Company	Public private partnership
Technology	High efficiency solid oxide electrolyzer
Applications	Industrial use cases where excess process heat is available

Is Genvia Solid Oxide technology suited to decarbonize steel?



SLB Process modelling capabilities are the answer

01

Build process models of existing industrial plants

02

Integrate Solid Oxide Electrolyzer with heat recovery and hydrogen delivery unit

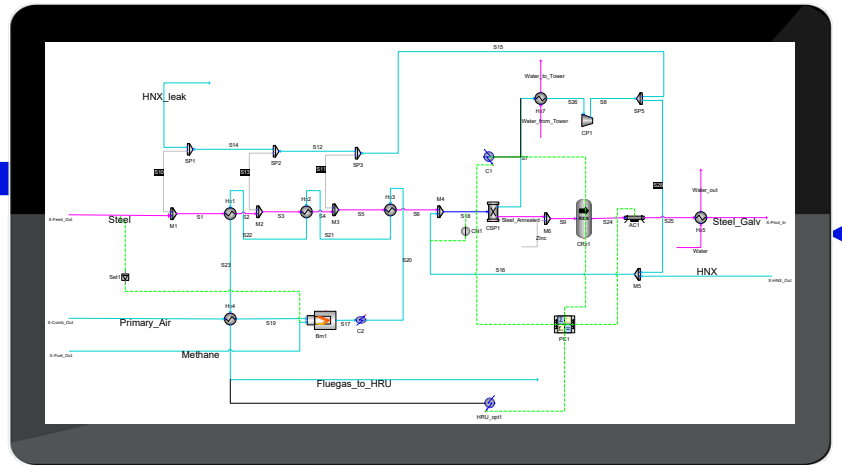
03

Assessment of multiple hydrogen applications as fuel, as reactant, as reducing agent

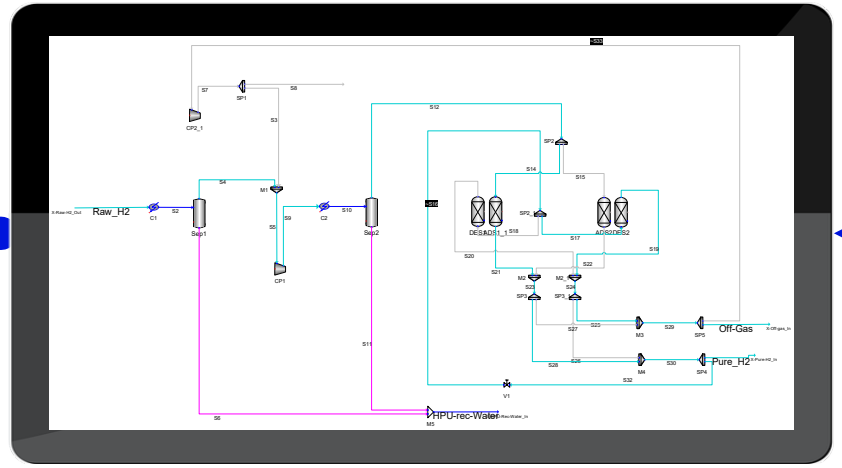
Process Modeling of Decarbonized Steel Plant

GENVIA

Steel Annealing & Galvanizing Process



Hydrogen Processing Unit

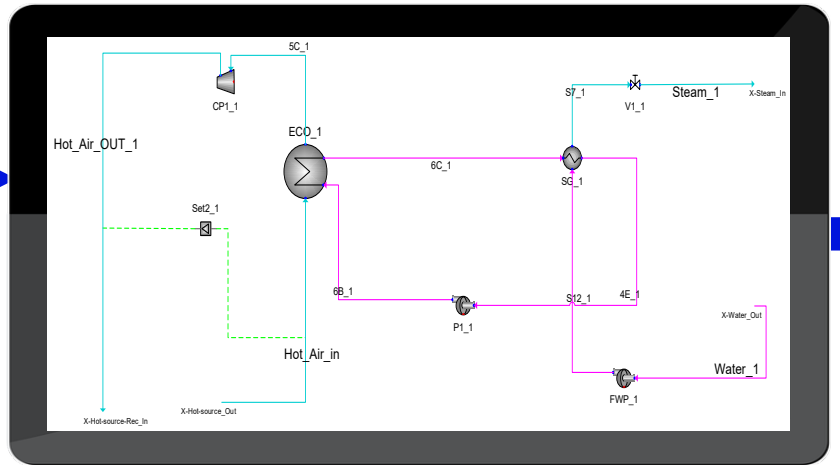


H_2

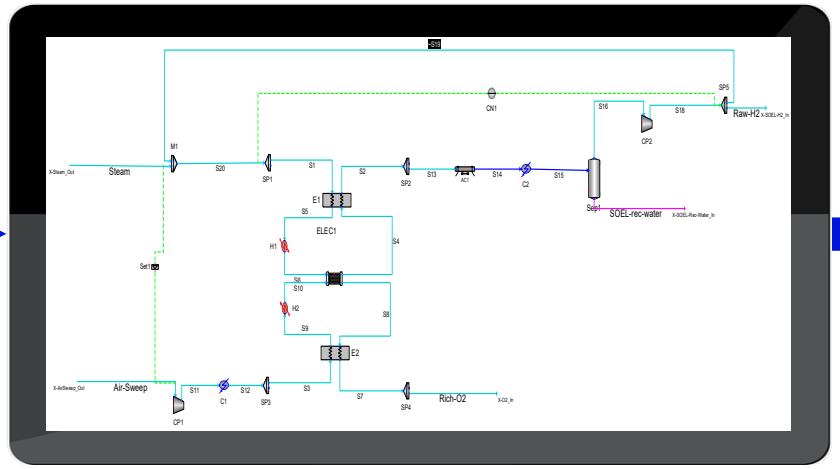
Heat

Raw H_2

Heat Recovery Unit

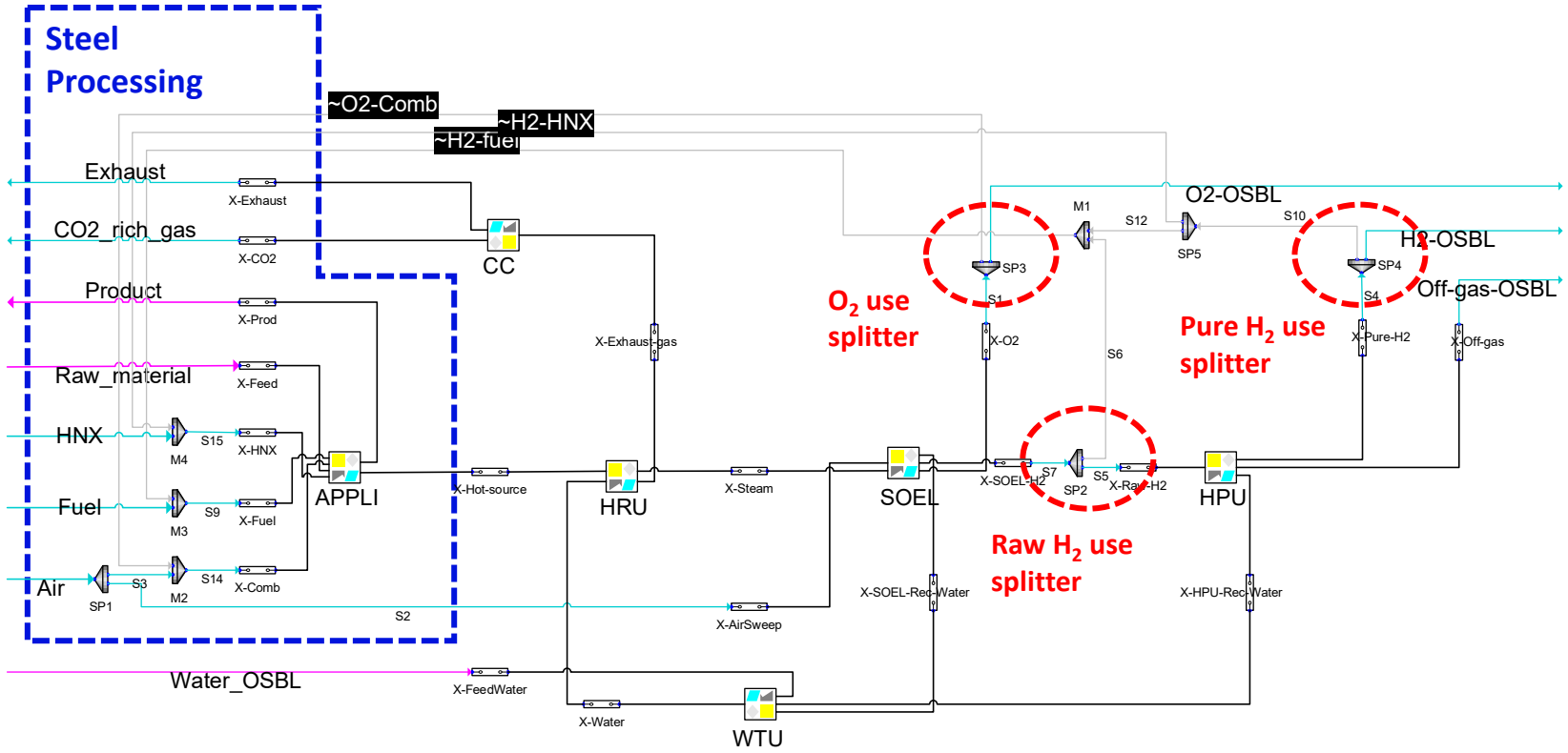


Solid-Oxide Electrolyzer



Steam

Genvia SOEL Integration and Use Case Scenarios



→ H2 as fuel:
- Bypass of HPU
- Raw H2 to Steel process

→ H2 as reducing agent:
- Required HPU
- Pure H2 for HNX mix

→ O2 as comburant:
- For oxycombustion
- For H2 oxycombustion

Simulation of Scenarios and Results

GENVIA

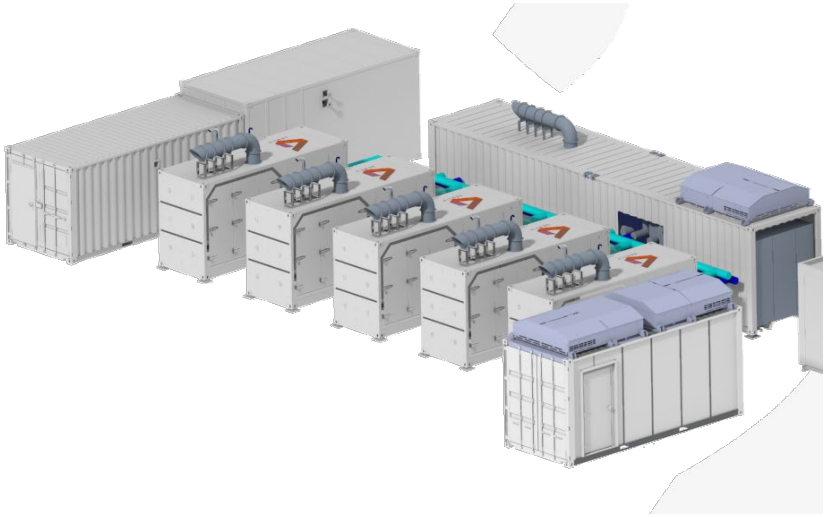
N°	Description / Process Coupling	CO_2 Direct Emission (kg/ton^{steel})	Heat Recovery at fluegas (kWh/ton^{steel})	Additional Electricity (kWh/ton^{steel})	Feed Water (kg/ton^{steel})	H_2 at OSBL (kg/ton^{steel})	O_2-rich gas at OSBL (kg/ton^{steel})
1	Reference Plant	30	-	-	-	-	-
2	Ref. + HRU + SOEL + HPU: *H2 for sales*	30	-19	81	18	2.0	29
3	Ref. + HRU + SOEL + HPU: *H2 as reducing agent*	29	-19	81	18	1.9	29
4	Ref. + HRU + SOEL: *H2 as fuel*	17	-18	76	17	-	28
5	Ref. + HRU + SOEL: *H2 as reducing agent & H2 as fuel & O2 as comburant*	14	-22	90	21	-	-

slb

HRU: Heat Recovery Unit
SOEL: Solid Oxide Electrolyzer
HPU: Hydrogen Processing Unit

For use case of 50 t/h plant capacity

Key takeaways



- → H2 use cases investigations by mean of process modeling using SLB's Symmetry processing simulation software supports
- → Validation of new alternatives for steel industry decarbonization

Keys metrics from the study

-50% CO_2 emitted → For H_2 use as fuel

~20 kWh/ton^{steel} → Heat Recovery

~80 kWh/ton^{steel} → Electricity Needs

~2 kg^{H2}/ton^{steel} → H_2 production

Learn more about SLB driving energy innovation **for a balanced planet.**

Learn more about Genvia new alternatives to **decarbonize industry**.

Thank you

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