worldsteel ASSOCIATION

Steel and CO_2 – a global perspective

Presentation to IEA side event, COP24

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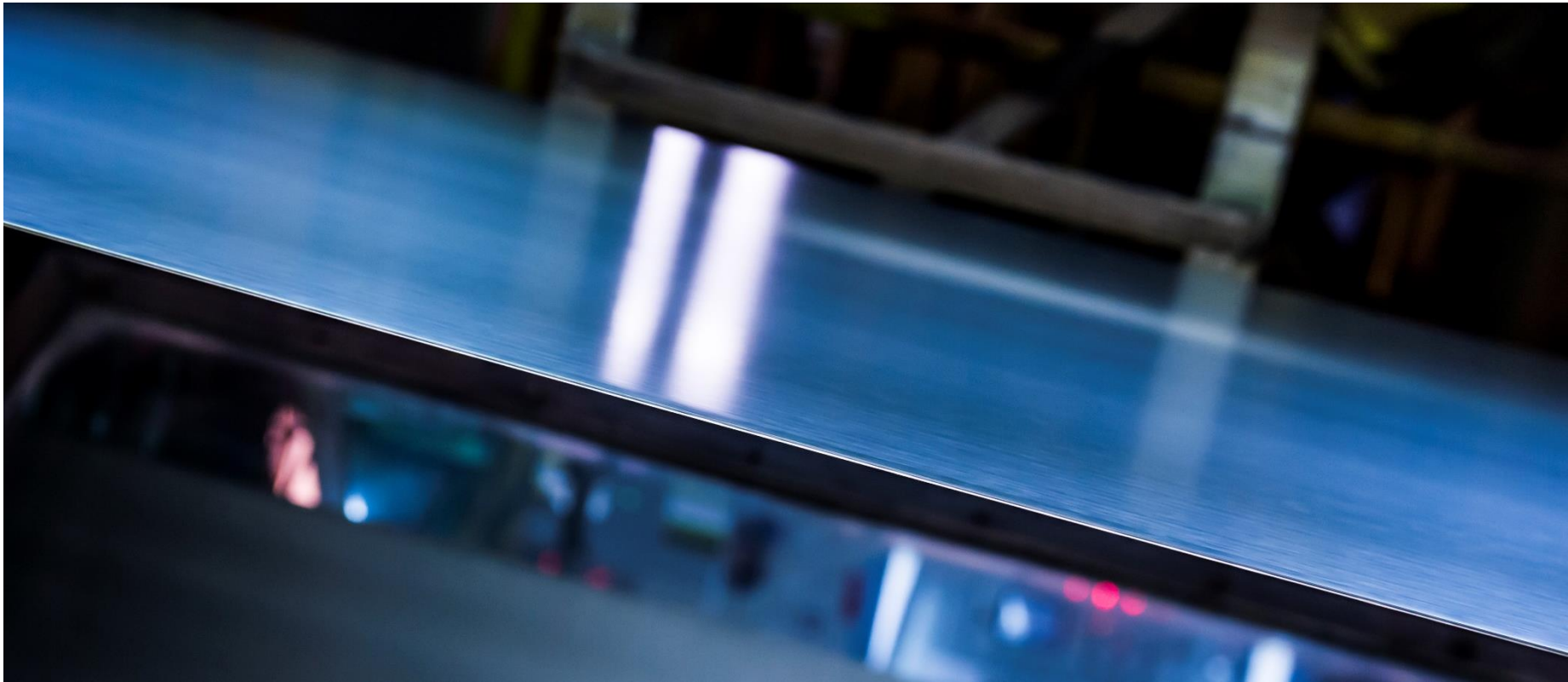
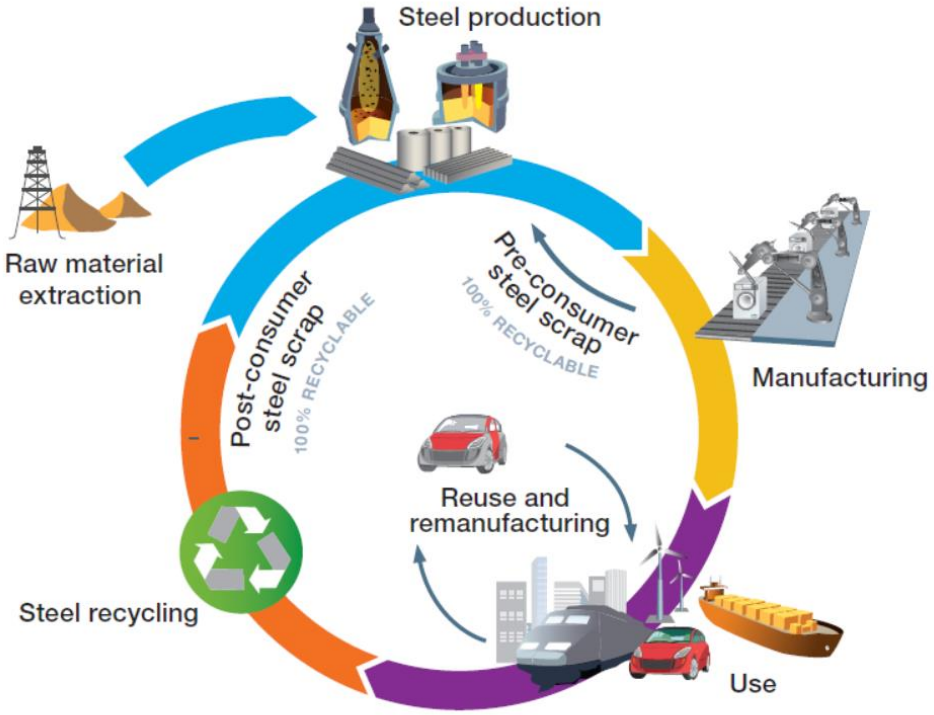


Steel in use

- Steel is the worlds most recycled material and also uniquely positioned to contribute to the transition to the circular economy



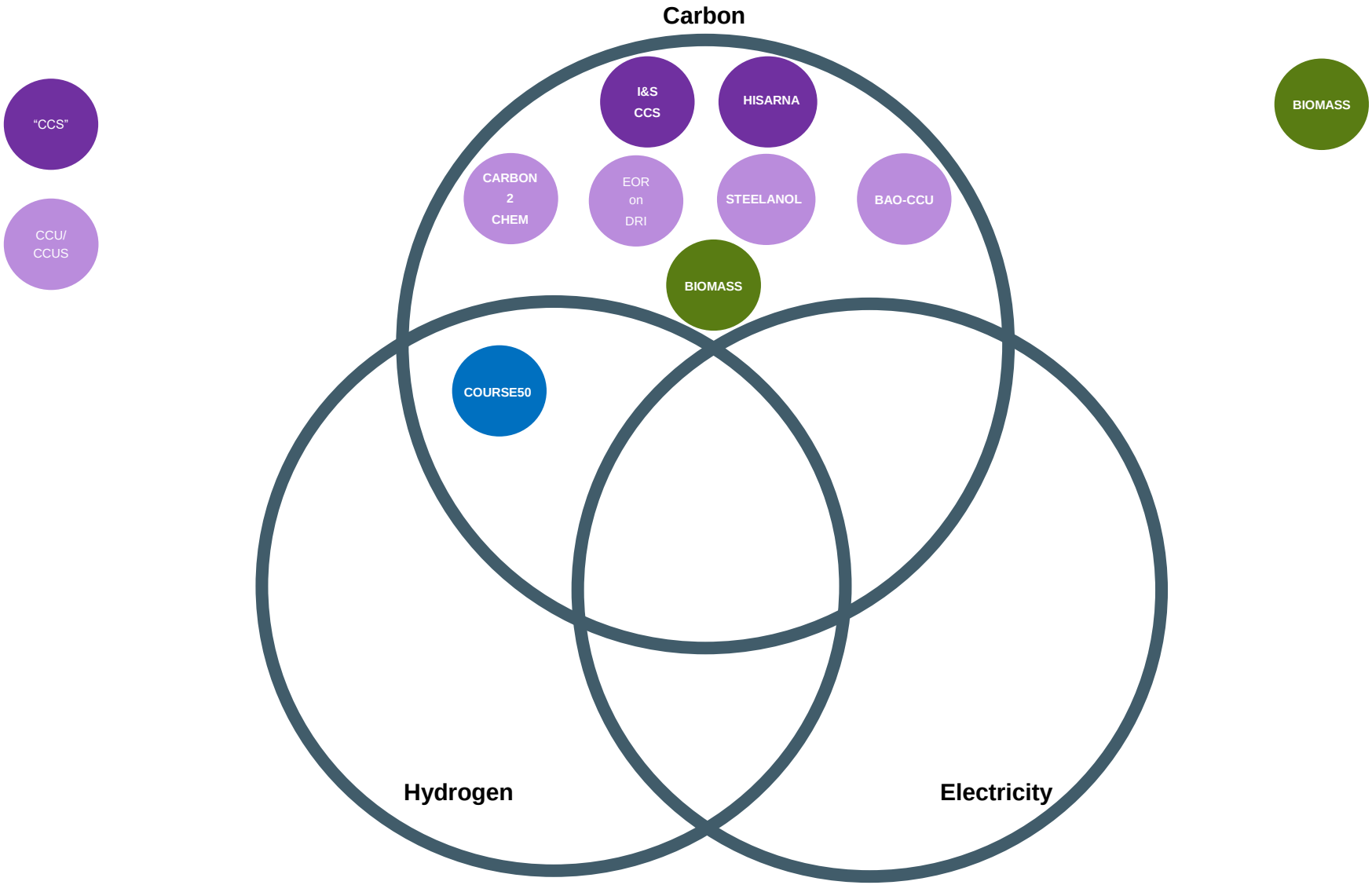
Steel enables mitigation

Almost every GHG mitigation technology **relies on steel**

Thermal and renewable energy, electrification, mass transport, smart cities, shipping, CCS, hydrogen…

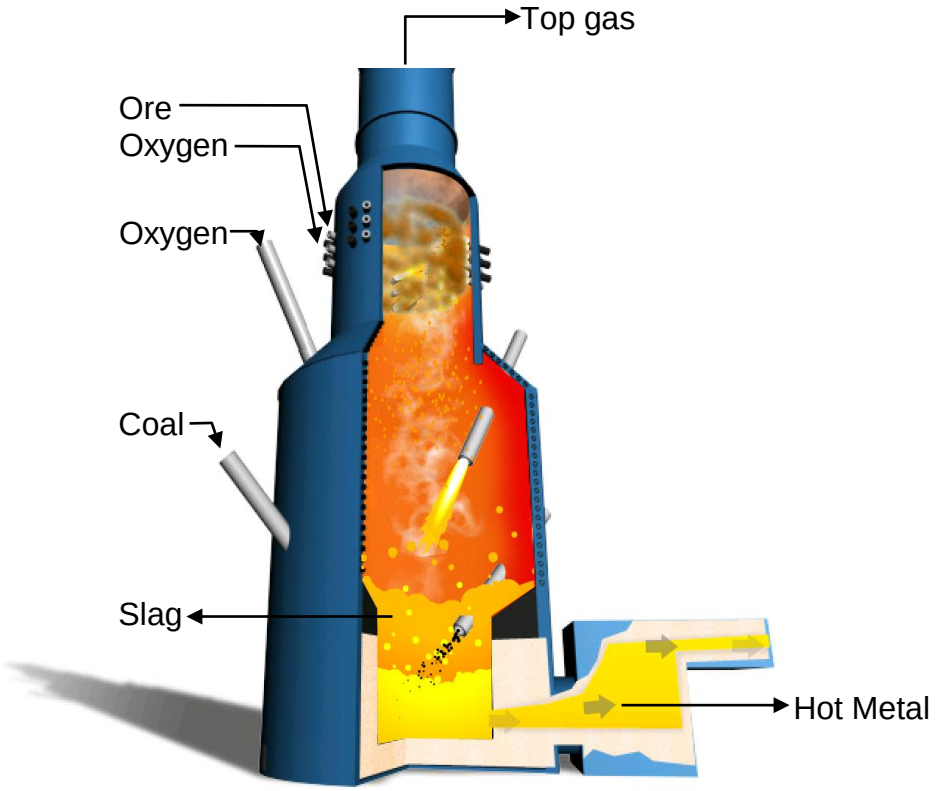
The goals of the Paris agreement cannot be met without Steel

What could steelmaking without CO2 look like?



HIsarna

- A direct reduced iron process in which iron ore is processed almost directly into liquid iron
- The process combines two process units, the Cyclone Converter Furnace (CCF) for ore melting and pre-reduction and a Smelting Reduction Vessel (SRV) where the final reduction stage to liquid iron takes place
- The process does not require the manufacturing of iron ore agglomerates such as pellets and sinter, nor the production of coke
- The process is able to utilise lower grade iron ores and low cost coals and has a lower Capex
- HIsarna can achieve at least a 20% CO_2 reduction, 80% CO_2 reduction with CCS
- It also reduces emissions of dust, NOx and Sox
- Long-term trial since November 2017 running continuously using the hot metal in downstream processes
- Conceptual engineering for the first industrial scale plant, 0.5 to 1.0 M t/y, has started.



EOR on DRI

- Abu Dhabi CCS involves the capture of CO_2 from the Emirates Steel Factory in Abu Dhabi and its transportation to the ADNOC reservoirs for the purpose of enhanced oil recovery (EOR).
- The DRI process employed at ESI produces a pure stream of CO_2 (greater than 98 per cent)
- Launched in November 2016, the compression facility has a capture capacity of 0.8 Mtpa.

حديد الإمارات
emirates steel

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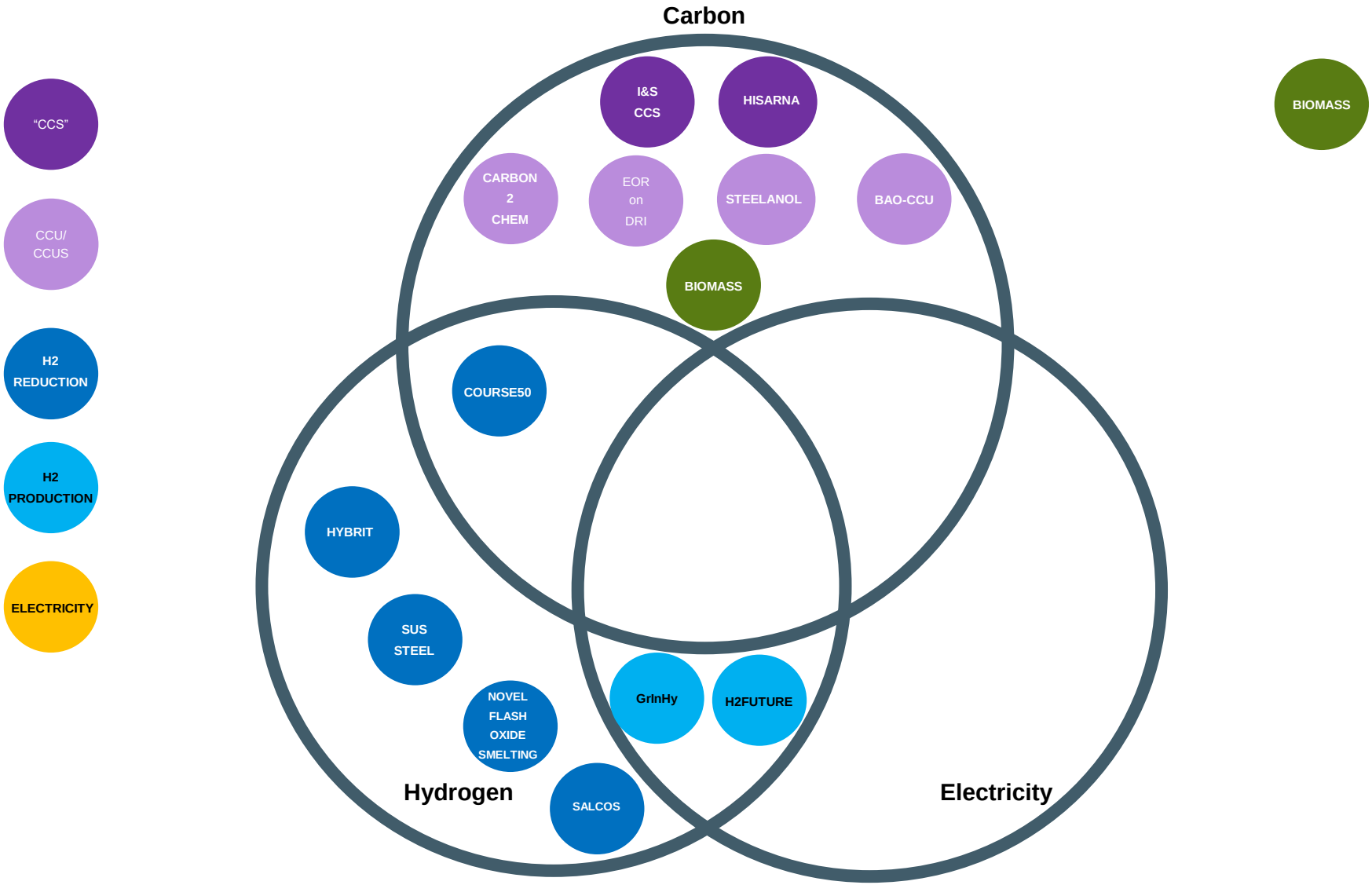
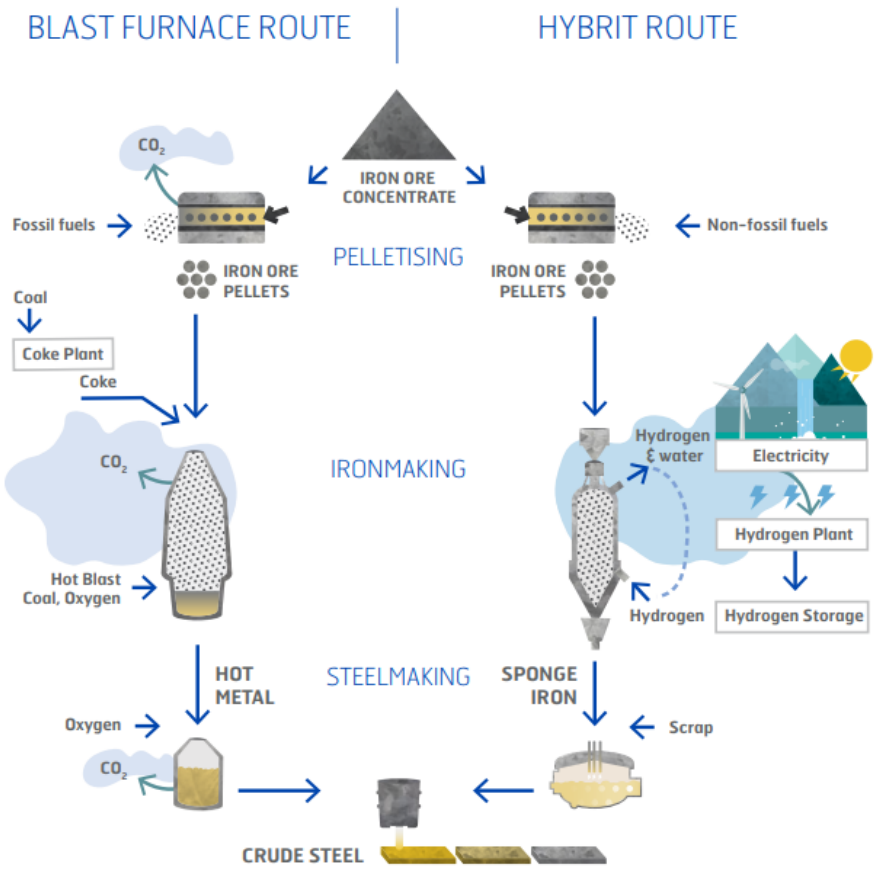
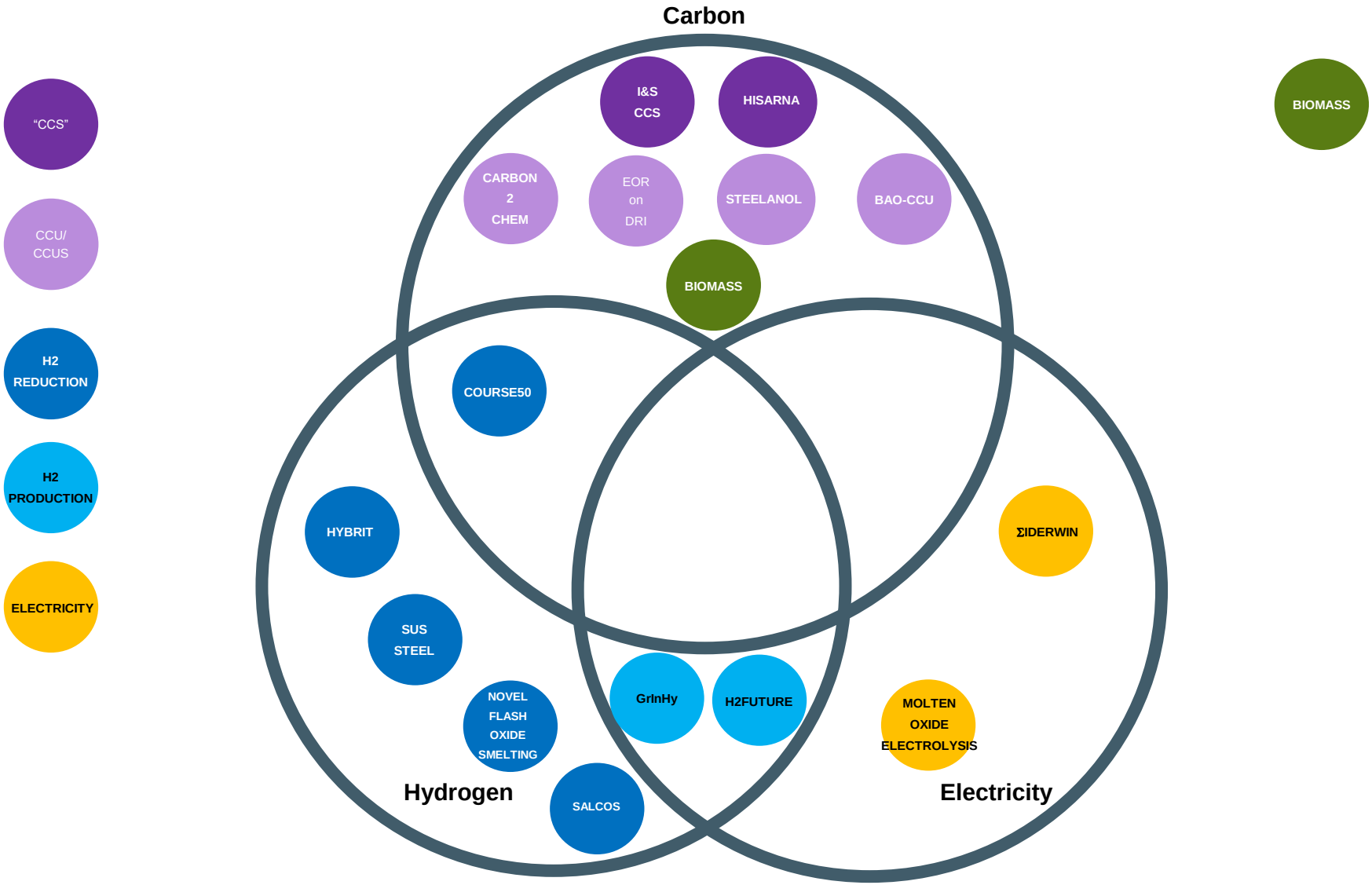


HYBRIT - Hydrogen Breakthrough Ironmaking Technology

- HYBRIT is a joint venture between SSAB, LKAB and Vattenfall, aiming to replace coal with hydrogen in the steelmaking process
- 4MT production would require 15TWh of clean electricity (10% of Sweden's current production)
- The by-product from iron ore reduction would be water
- The Pre-Feasibility Study Concluded in February 2018 with financial support from Swedish Energy Agency (50%)
- Pilot phase: 2018-2024
- Demonstration plant trials: 2025-2035



What could steelmaking without CO_2 look like?



What could steelmaking without CO_2 look like?

- For our industry there is no decarbonisation silver bullet
- Like in the power sector, all options will be needed, implementation will depend on local circumstances such as availability of electricity, CO_2 storage and policy support
- A portfolio of tools are being developed
  - CCUS is likely to play a role
  - Evidence of increased focus on the use of hydrogen – main focus currently on electrolysis
  - Integrated solutions involving other industries and utility companies

What could steelmaking without CO_2 look like?

- All options are dependent on large amounts of carbon free electricity, hydrogen, or CO_2 infrastructure & storage
- Progress in breakthrough technology development in steelmaking and implementation must be maintained or accelerated requiring the financial burden to be shared.

Thank you for your attention.

For further information contact:

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