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## Carbon Capture Pilot at Eramet Norway Sauda

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### We are part of the highly competitive Norwegian process industry





SALG AV MANGANLEGERINGER 480 103 tonn 60 % raffinerte legeringer

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SALG AV BIPRODUKTER 20 248 tonn MOR-støv 27 011 tonn Silica Green Stone 80 GWh gjenvunnet elektrisk energi 617 GWh gjenvunnet termisk energi





## The Manganese industry footprint





The main direct sources for greenhouse gases in the manganese ferroalloy production field are:

- Reducing coke used for the processing of manganese ore
- Emissions from consumables (electrodes) and reagents (fluxes)
- Electricity generation for the furnace

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Feed material and finished product handling

## Amongst the lowest footprint within manganese alloys production

#### Energibalanse 2023



Assessment of the global and regional carbon footprint from the production of ferroalloys

#### 2019 Scope 1+2 R FeMn emissions curve at production



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## We must deliver our ambitious decarbonization roadmap





## **Problem Statement**

#### CCS

#### 1. Technical

- Tailor a solution that is sensitive to gas quality and consistency, for a variable process
  - · Gaseous impurities, especially NOx and metals
  - · Particle size and composition of fines
  - CO<sub>2</sub> partial pressure variations in the flue gas
- Retrofit the carbon capture and CO<sub>2</sub> loading operations into a brownfield operation while lowering energy footprint

#### 2. Supply chain and integration

- Bottleneck developing on the storage end
- There is only one offering for transport and storage as a service today
- Lack of regulation framework and accounting guidelines
- High economic risk for supplier and users (large investments without clear payback)

## BioCarbon

#### 1. Technical

- Replace metallurgical coke, a product that has been used over 100 years +, and tailored towards our process
- Properties are inferior to those of metallurgical coke
  - Reactivity
  - Strength
  - Chemical composition

#### 2. Supply chain

- No biocarbon available commercially today with the proper quality: must be developed
- Qualification of biocarbon requires volumes that are not available today
- High techno-economic risk for supplier and users (large investments for the suppliers, high potential process upset for the users)

Clear financial incentives are needed for the industry to take the investment decisions





## **Energy Recovery at Eramet Norway Sauda**

#### **Energy Recovery in details**

#### Situation before the project:

 Most of the CO-rich furnace off gas is **burned**

#### Situation with project completed:

- 7 gas engines implemented to burn furnace off gas to produce electricity, hot combusted gases and hot water.
- Up to 83% energy to be recovered from available furnace off gas in total.





## Vi er godt i gang!



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Energy recovery plant in Sauda From Pilot to Full-Scale

**G** KRLMAR





AMETUN TEANSPORT



## **Carbon Capture: Why a pilot ?**

- · CCS has been used in the oil and gas industry since the 1970s
- · Langskip demonstration in Norway: Proof of concept in waste to energi and cement industries
- CCS is also actively investigated for the metallurgical sector

We will focus on:

Feed gas characteristics and stability	Capture reagent selectivity and ageing	Process Optimization
<ul> <li>Feed gas conditioning to meet stringent</li></ul>	<ul> <li>Typical furnace gas impurities are detrimental</li></ul>	<ul> <li>Optimize carbon capture operating</li></ul>
capture technology requirements <li>Furnace stability, downtime and feedstock</li>	to reagent performance (SOx, NOx, dust) <li>Reagent selectivity for FeMn furnace offgas</li>	parameters towards lowest possible footprint <li>Inform full scale modelling and capture</li>
variation management	blends has not been proven	predictabilitity

#### Piloting Pressure Swing Adsorption in 2024-2025...

#### With ambition to upscale by 2029...

#### .. and enable transport and storage



## Vi er godt i gang!

Sauda: piping installations for the Carbon Capture pilot

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Sauda: piping installations for the Carbon Capture pilot





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