



# Hydro Decarbonization – ambitions and strategy

# Global reach – local presence



32,000 people in more than 140 locations in 40 countries

## The aluminium and energy company

- High-quality bauxite and alumina production in Brazil
- Primary production in Norway, Germany, Qatar, Slovakia, Brazil, Canada, Australia
- 9.4 TWh captive hydropower production (operating 13.4 TWh renewables production)
- World leader in aluminium extruded profiles and precision tubing
- Remelting in the U.S., European recycling network
- Unparalleled technology and R&D organization



### Americas

Argentina  
Brazil  
Canada  
Mexico  
USA

### Europe

Austria  
Belgium  
Czech Republic  
Denmark  
Estonia  
Finland

France  
Germany  
Hungary  
Italy  
Lithuania  
Luxembourg  
Netherlands  
Norway

Poland  
Portugal  
Slovakia  
Spain  
Sweden  
Switzerland  
Turkey  
United Kingdom

### Asia and Oceania

Australia  
Bahrain  
Brunei  
China

India  
Japan  
Qatar  
Singapore  
South Korea  
Turkey  
United Arab Emirates

# Climate: Solutions for eliminating emissions from our products, our operations and society

## Net-zero products



Deliver net-zero carbon aluminium products and solutions to customers by 2050 or earlier

Circular and primary pathways defined to reach net zero

Near-zero aluminium products commercially available from 2022

## Net-zero Hydro



Remove emissions from our own operations

Emission reduction target 30% by 2030

Net zero Scope 1 and 2 carbon emissions by 2050 or earlier

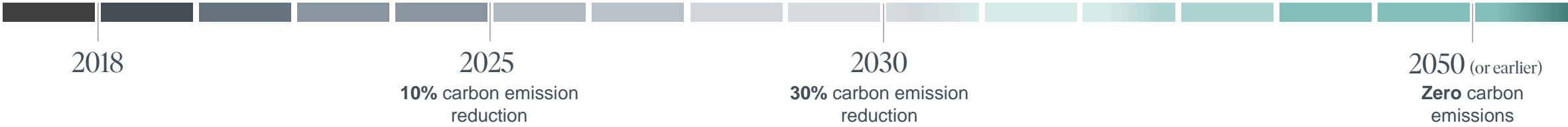
## Net-zero society



Reduce and avoid emissions in society through climate-friendly solutions

Key enablers: Increased renewables production, energy storage solutions and replacing fossil fuels by green hydrogen

# Executing on ambitious decarbonization roadmap



## Alunorte fuel switch

- On March 12, Alunorte started the production of alumina using gas, an important milestone on reaching 30% by 2030



## Partnering for decarbonization of calcination

- Partnering with the research center HILT CRC\* to further leverage projects and technology for decarbonization of the calcination process of producing low-carbon alumina



## HalZero and CCS

- On track with both HalZero and CCS towards industrial pilot
- Stage 2 HalZero test facility in Herøya under construction and on plan



## Emission-free plasma and bio-methane in casting

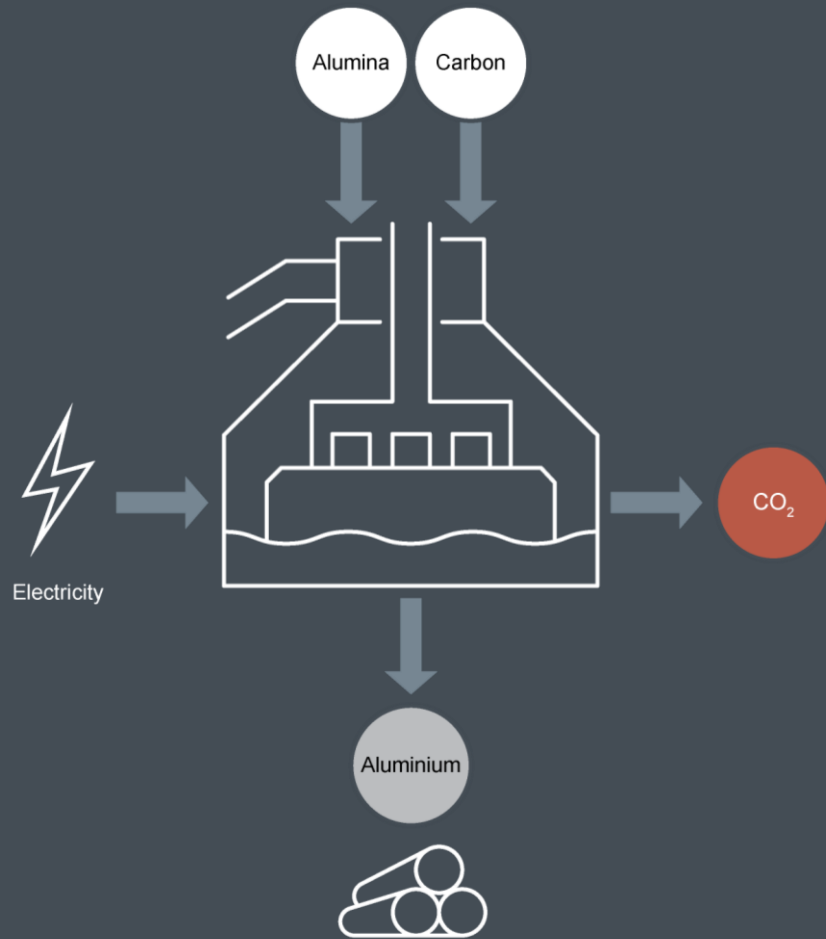
- Emission-free plasma pilot with global potential at Sunndal
- Introduced bio-methane replacing 70% on natural gas at Sunndal.



Founded on renewable energy

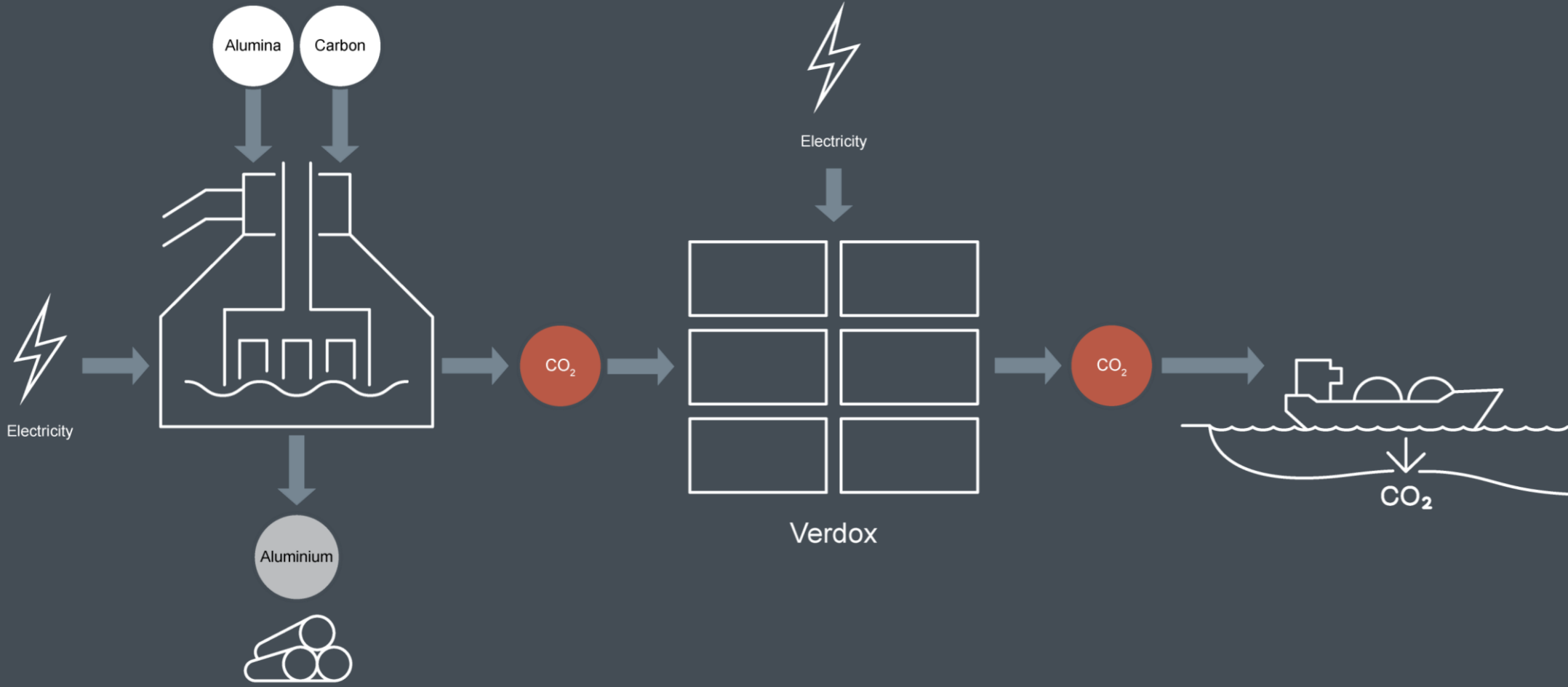
\*HILT CRC = Heavy Industry Low-carbon Transition Cooperative Research Centre

# Smelting – Present and near future



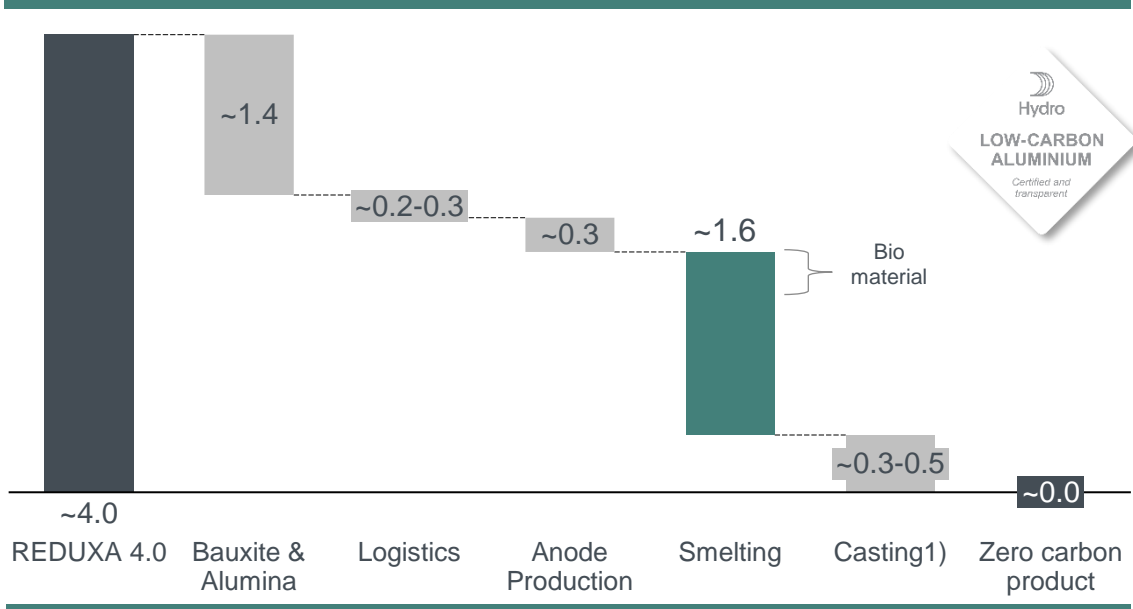
- Today we use Hall-Hérault process to create aluminium
- This is a **150 year old** technology and harms the environment with a lot of climate gas emissions
- However, the last three years Hydro has cut **55% CO<sub>2</sub>** emissions from the production process
- In the near future, Hydro will also start with **carbon capture and storage**

# Current technology with carbon capture and storage

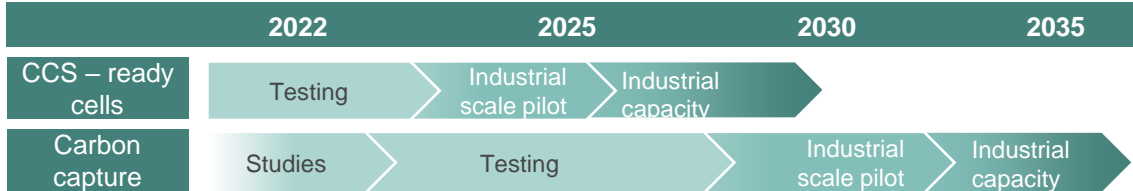


# Electrolysis decarbonization on track – carbon capture

CO<sub>2</sub>e emissions kgCO<sub>2</sub>/kgAl

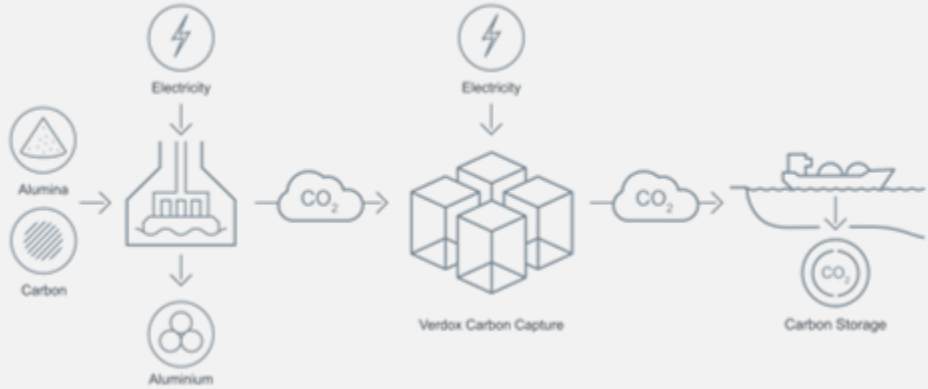


## Timeline



1) Casting includes cold metal remelting

## Technology shift for existing aluminium smelters



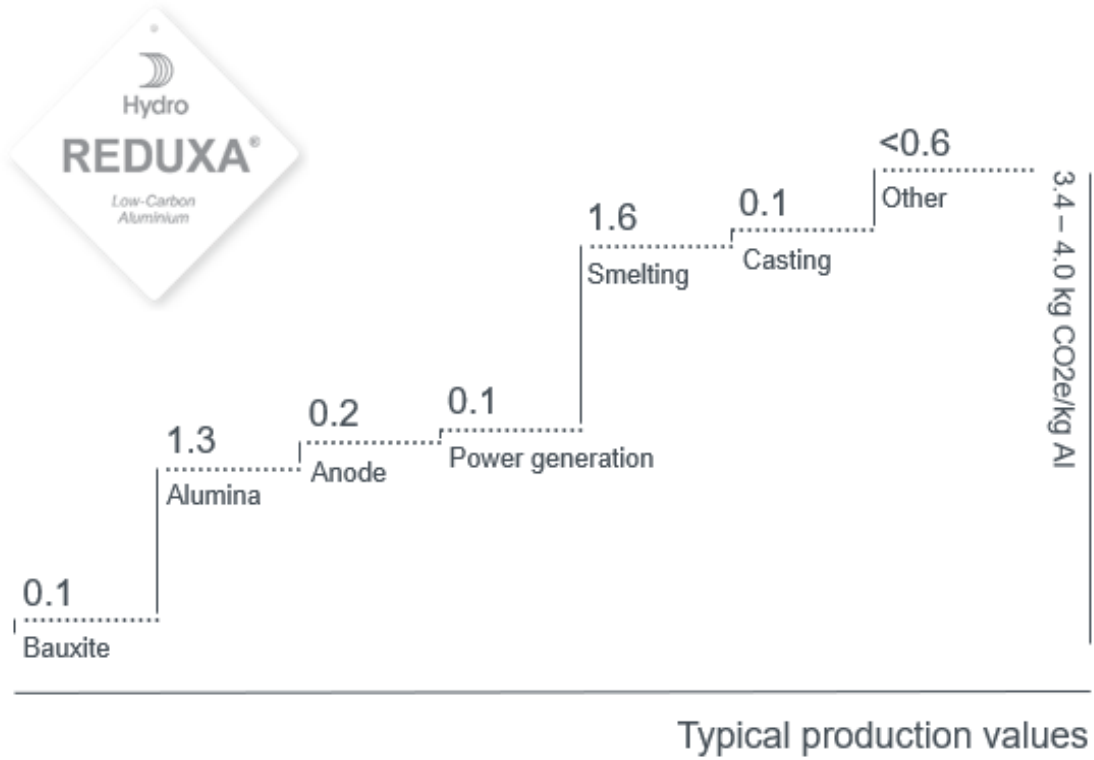
- Testing of Verdox technology ongoing at Sunddal
- Installing capture ready cells as part of ongoing relining process
- On track to deliver first CO<sub>2</sub> capture in 2024 and industrial scale pilot volumes by 2030



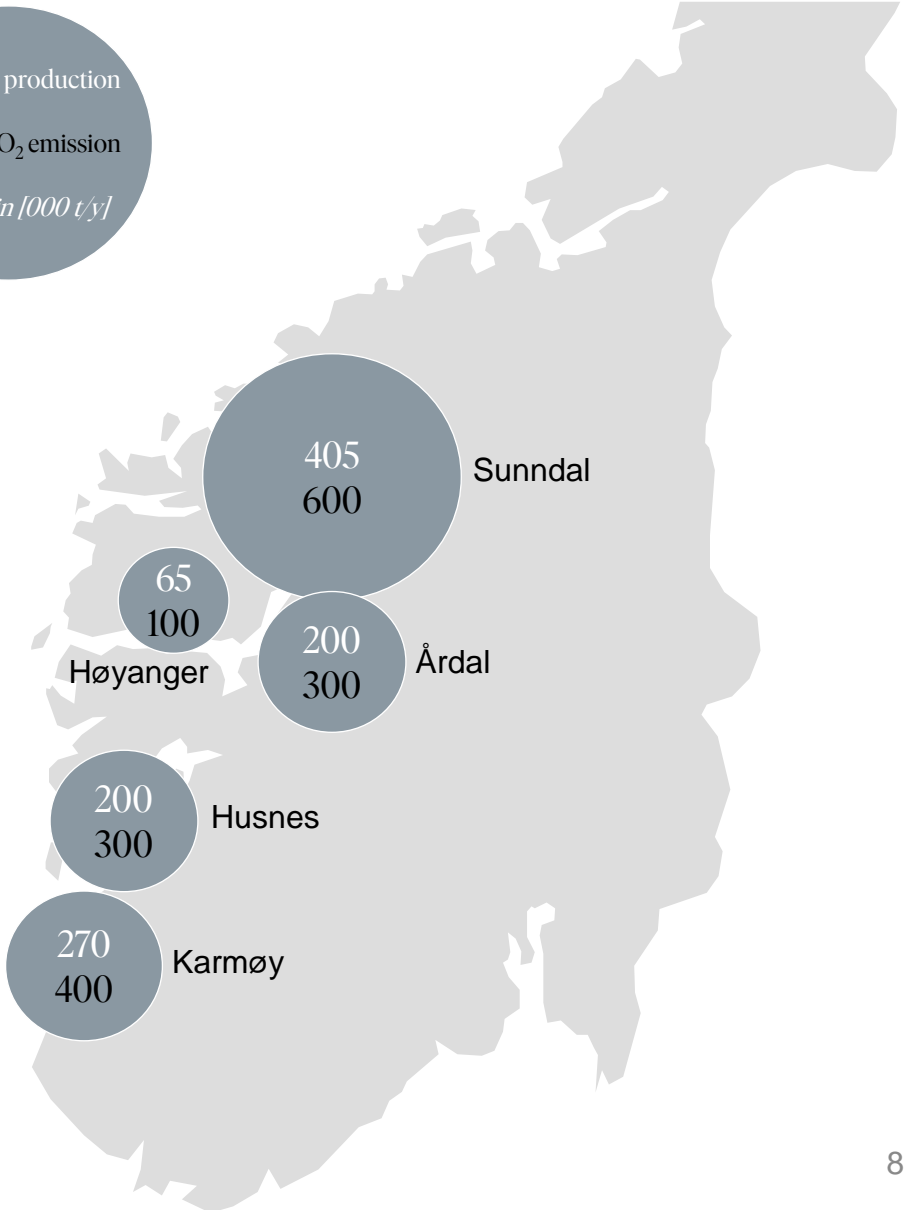
# Decarbonizing the Norwegian Smelter Portfolio



With process emission volumes



Annual Al production  
Annual CO<sub>2</sub> emission  
*Figures in [000 t/y]*





# Transport and Storage options for CCS

Hydro has not made decisions on transport and storage of our CO<sub>2</sub> – evaluating options

## **Important to secure access to the most cost-efficient solutions for CO<sub>2</sub> storage for our portfolio**

- Approach:
  - Understand the emerging market for CO<sub>2</sub> storage
  - Build relationships with relevant suppliers developing storage infrastructure
  - Explore and develop optimized transportation and infrastructure solutions to access the most attractive storage locations
- Engaging in cross-industry collaborations at Haugalandet (CCS Haugalandet) and Mid-Norway (CCUS Midt-Norge)
  - There is substantial merit in common infrastructure for CO<sub>2</sub> transport
  - Common infrastructure will also add complexity, pros/cons need to be consciously balanced:
    - Given these potential synergies other emitters are expected to be motivated to invest in and operate common infrastructure
    - Business models for common infrastructure will take time to mature
    - Committing to common infrastructure will increase complexity in decision processes

**Need to engage both suppliers, policy makers and other stakeholders to shape future framework conditions**



**Hydro**

**ALUMINIUM**