



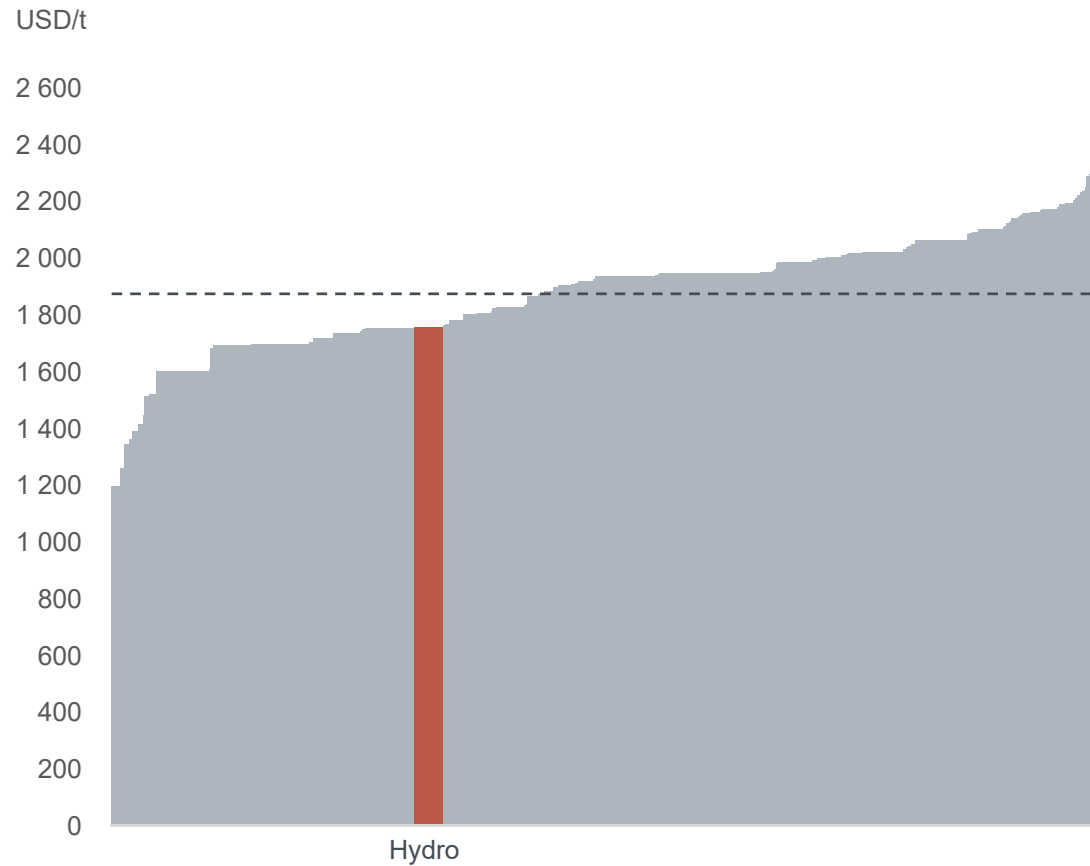
# Primary Metal – staying focused through challenging times

Hilde Merete Aasheim, EVP Primary Metal

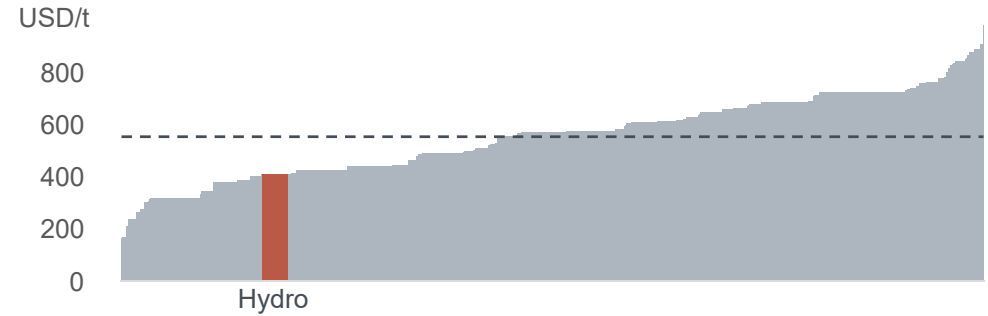
# Working on influenceable parameters to improve robustness and profitability



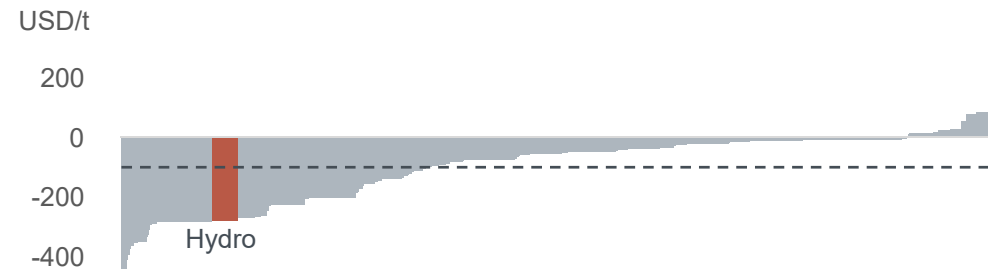
### Total Business Operating Costs



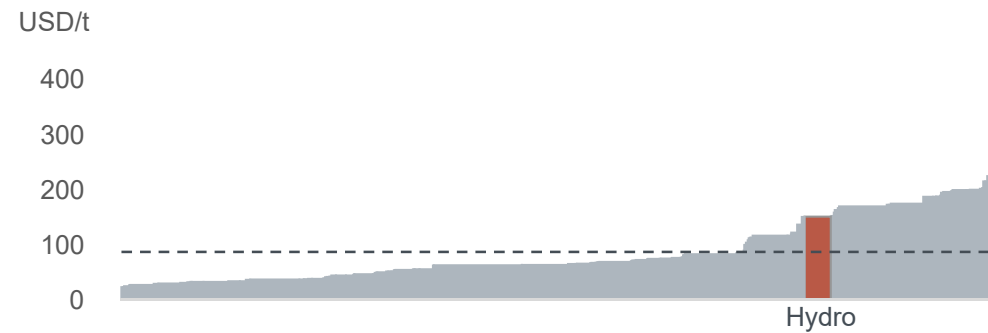
### Smelter Power Costs



### Net Realization Costs



### Smelter Labor Costs



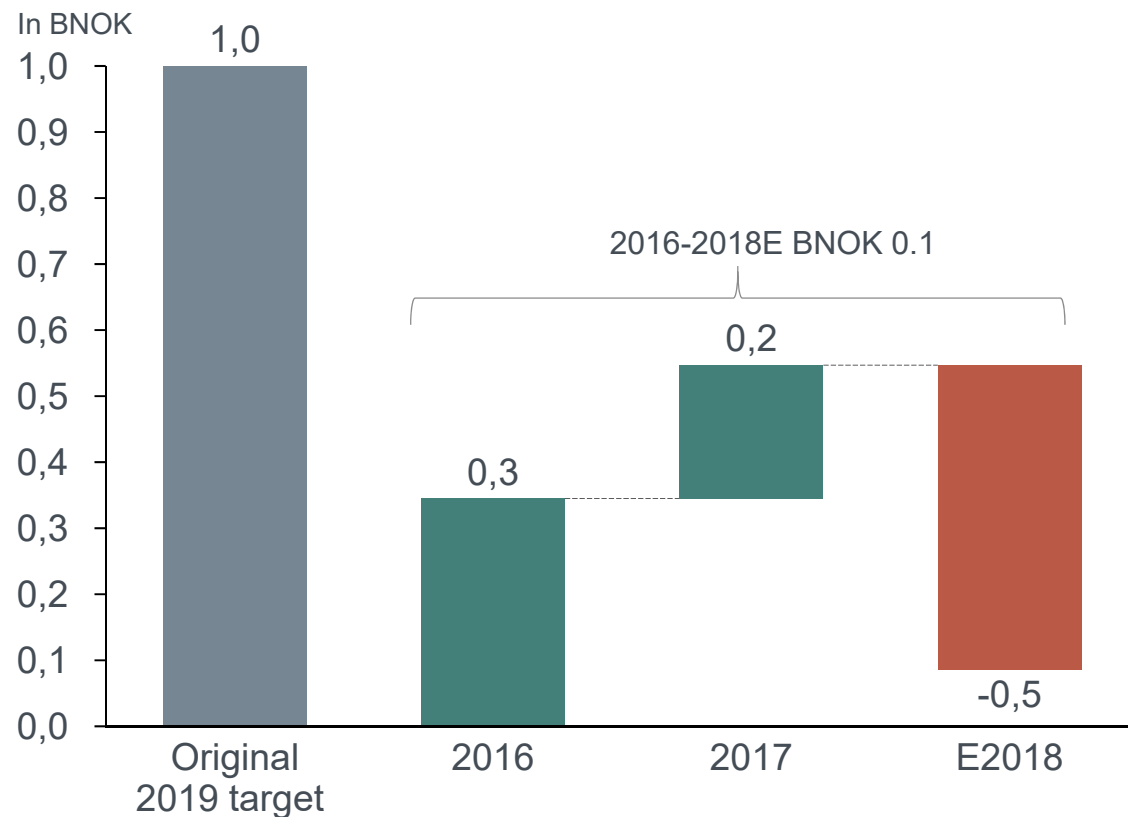
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# Improvement program in 2018 impacted by Alunorte situation



Primary Metal keeps focus on continuous improvements

## Primary Metal *Better* program progress



## 2018 Improvement program influenced by:

- 50% curtailment of Albras
- Operational instability due to different alumina sources

## 2019 improvement speed will be significantly impacted by timing of Alunorte restart, due to:

- Uncertain duration of Albras curtailment
- Different alumina sources impacting operational parameters

## Improvements focus will continue:

- Operational excellence inclusive spin-offs from the Karmøy technology pilot
- Industry 4.0 as enabler
- Continue to high grade the product portfolio

# On track with verifying world's most climate and energy efficient electrolysis technology



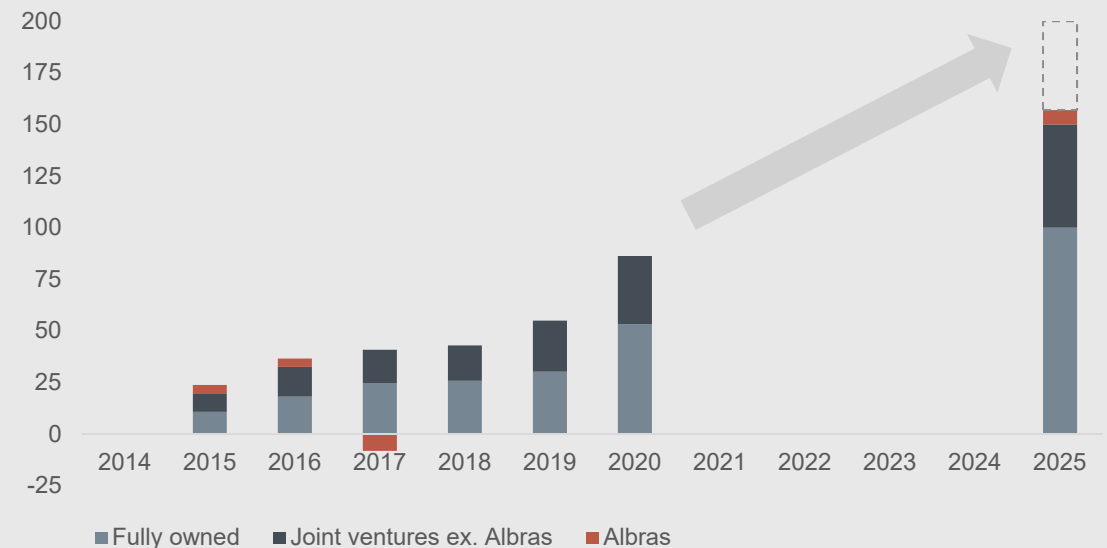
- Karmøy technology pilot
  - 48 HAL4e cells, 12.3 kWh/kg
  - 12 HAL4e Ultra cells, < 11.8 kWh/kg
- All 60 cells in normal operation
- Fine tuning of process parameters, pot tending equipment, and operational practice
- Best 1/3 of cells already performing at 94.7% CE and 12.4 kWh/kg Al
- Performance tests scheduled for 2020

# Spin-off implementation from Karmøy technology pilot started

- Spin off elements are an integral part of improvement programs at all plants
- Business cases carefully considered for each improvement step
  - Volume vs. energy consumption improvements part of the business case evaluations
- Energy consumption and current efficiency improvement potentials are strengthened
  - Spin offs from Karmøy Technology Pilot control platform
  - Digital twin for process control in the electrolysis being rolled out, starting in Sunndal



Creep ambition, in 1000 tonnes



Volumetric increases dependent on positive business cases

# Husnes restart with spin-off effects

From 3rd to 2nd quartile on CRU cost curve

- Attractive business case with robust rate of return and solid annual cash contribution
- Technology spin-offs from the Karmøy technology pilot
  - Potline B capacity increased by 13 000 tonne/year compared to pre-curtailment levels, and further potential identified
- Cost position solidified by long-term competitive renewable energy contracts
- Value-add production contributing to further high-grading of product portfolio



# Unlocking new improvements through Industry 4.0 initiatives



40 ongoing projects



Robotics & Automation projects



Trusted Data Layer Casthouse



Soft Sensor incl. Trusted Data Layer



Mobile Maintenance Worker



Trusted Data Layer Carbon + Analytics workbench improvements



Bring Your Own Device

Digital Foundation including Cyber Security

Organization Foundation including Primary Metal Digital Academy

# Significant value creation through value added products

## Strategy to sustain and develop portfolio

### European Premium above ingot development\*

Indexed. 2003=100



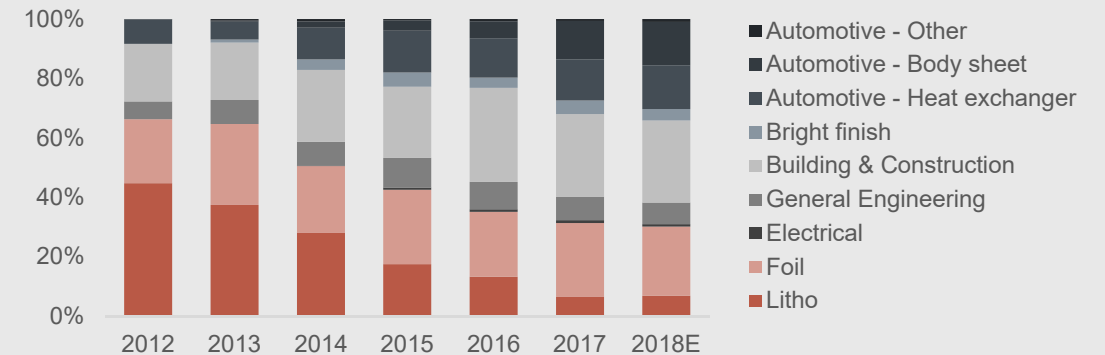
Source: MB, Hydro

\* includes fully-owned primary plants + Svalco

\*\* Low pressure casting

## Sheet Ingot Adjustable Flexible Mould investment enabled enhanced product portfolio and shift to automotive sector products

In % of total sheet ingot sales



## Implementing next generation casting technology (LPC\*) at Karmøy to target new market segments



### Precision Tubing – 1xxx/3xxx alloys

- New casting and filter technology enabling support to Extruded Solutions for thinner walled Multi Port Extrusions to meet customer expectations



### High gloss applications

- New filter technology enabling “inclusion free” billets for high gloss applications



### High strength alloys for automotive

- New casting technology capable of producing special 6082 and other high strength alloys





# Recycling delivers robust returns

Focus on post-consumer and difficult scrap

World-leading technology increases scrap sources

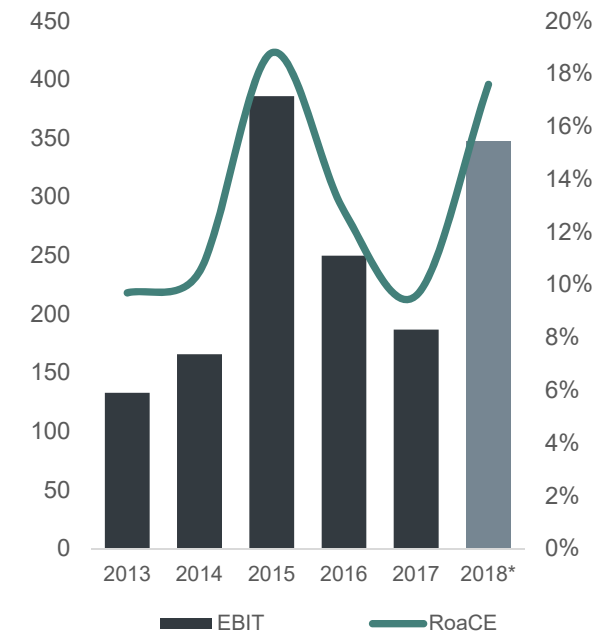
Scrap costs reduction (% pts of LME)\*



Average recycling RoaCE last five years at 12%

UEBIT (MNOK)

URoaCE (%)



Source: Hydro  
\* YTD Q3 2018 annualized

# Market-driven expansion in recycling

Developing and investing in capacity and solutions



## Azuqueca expansion

- Specifically set up to handle post-consumer scrap
- Total capacity increases by 10,000 tonnes to 90,000 tonnes from 2020
- Capacity to produce 75R increases to 25,000 tonnes
- Builds on Clervaux upgrade



## Lucé remelter upgrade

- Total capacity increases by 5,000 tonnes to 61,000 tonnes from 2019
- Enables handling of post-consumer scrap
- Builds on Clervaux upgrade



## Remelter at Slovalco

- Helps maintain position as preferred partner for conversion services in Central Europe
- Coming capacity will be 54,000 tonnes process scrap



## Hydro 75R

- Lowest industry carbon footprint, competing with PVC and wood
- Contract with Extruded Solutions on full production until 2020 from Clervaux plant in Luxembourg



## Primary Metal key focus areas

- Safe and stable operations
- Prepare Albras and Husnes restart
- Sustain and improve competitive position