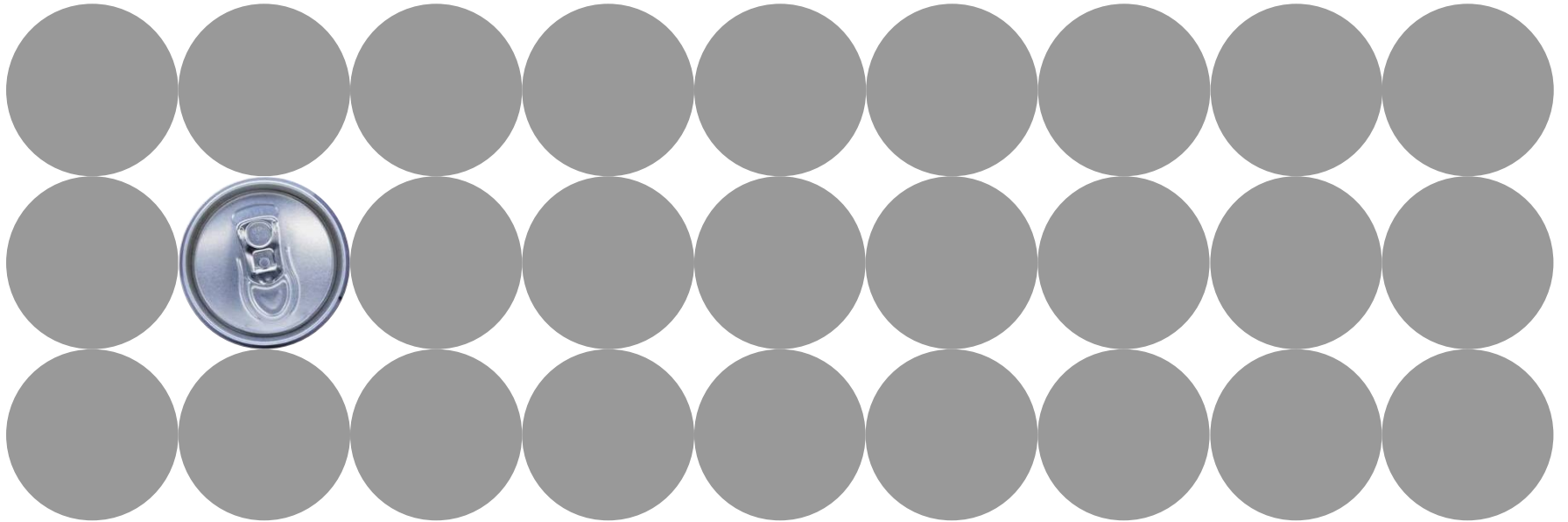


# Aluminium Metal



Jan Arve Haugan, Senior Vice President and Acting Head of Aluminium Metal  
September 25, 2008

---

# Key messages

## We focus on a strong performance culture

- Leading health, safety and environmental performance
- Increasing output from existing facilities
- Aluminium Metal Production System ensures continuous improvements
- Facing the industry-wide cost pressure

## We develop our business

- Alunorte expansion 3 completed before time and on budget
- New alumina refinery with Vale – CAP
- Qatalum progressing according to plan
- Next generation smelter technology in test phase – key for further growth in aluminium

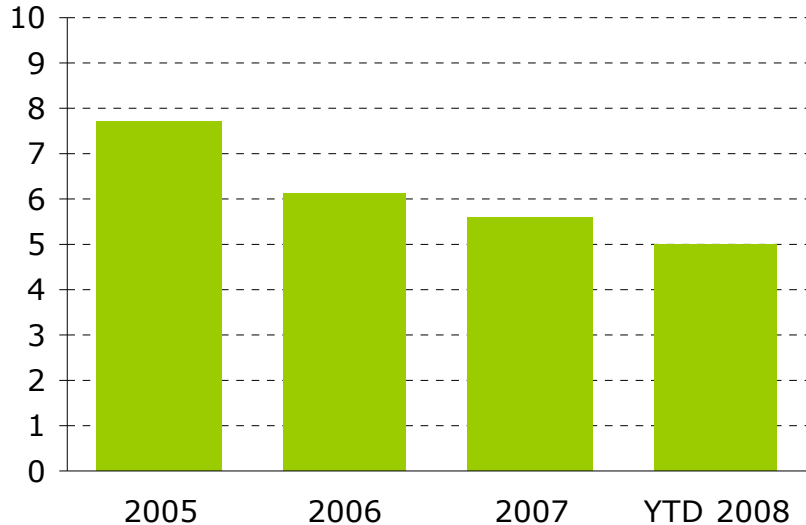
1

**We focus on a strong  
performance culture**

# Strong performance culture

## Continuous safety improvement

TRI per million hours work

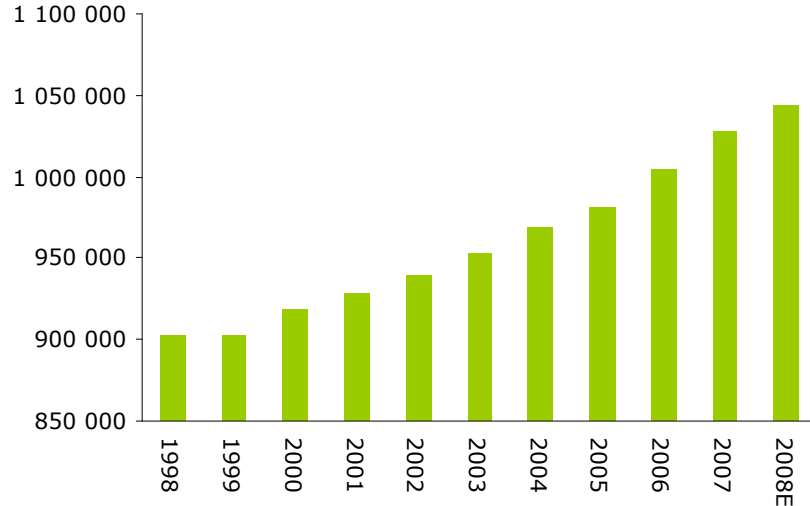


- Well below average in Europe
- Drive improvement in work environment and environment
- Leading Safety Program at each plant
- Increased focus on proactive response – better risk awareness
- Report routines and accountability standardized

# Strong performance culture

## Increased production

Electrolysis output in tonnes\*



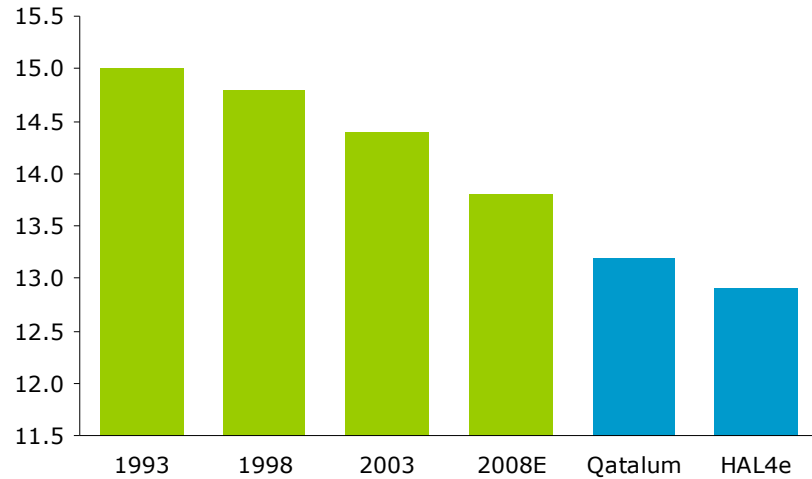
\* Volume development for fully owned lines in operation from 1998 to 2007, excluding closing and start up of new lines during this period.

- Amperage increase in all lines
- A major contributor to improvement in productivity
- By continued technological and operational improvements
  - Low cost creep – low capital expenditures and operating costs

# Strong performance culture

## Reduced specific energy consumption

kwh / Kg aluminium\*



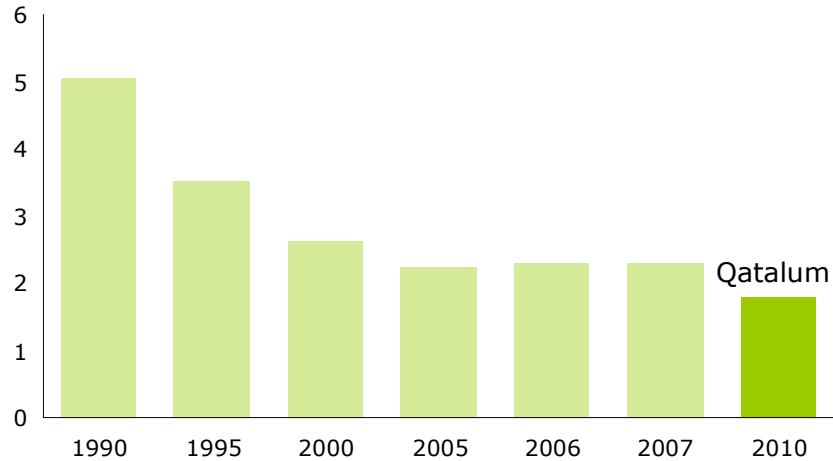
- Specific energy consumption per kilo aluminium significantly reduced
- Further reduction in energy targeted
  - New cell technology
  - Optimized process control
  - Improved operational stability

\* Average specific energy consumption from 100%-owned Norwegian smelters

# Strong performance culture

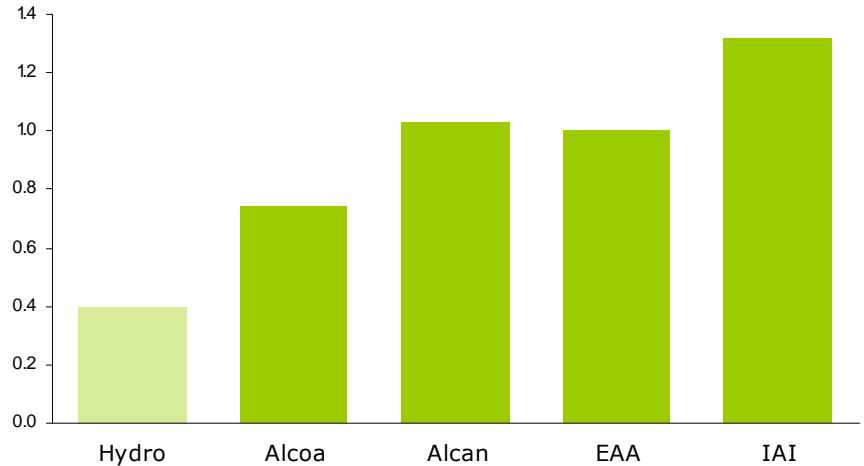
## Reduced specific emissions

Kg CO<sub>2</sub>e / kg aluminium\*



\* Average specific emissions from 100%-owned Norwegian smelters

Specific emissions kg fluorine / tonne aluminium\*\*



\*\* Hydro majority-owned smelters

Source: Hydro (2007), Alcan Sustainability Report 2007 (2006), Alcoa Sustainability Report 2007 (2006), IAI 2008 (2007), EAA 2008 (2005)

# Aluminium Metal Production System

AMPS is not a project – it's a way of operating!



Standardized work processes



Defined customer and supplier relationships



Optimized flow



Dedicated teams



Visible leadership

A systemized method for development of operational excellence and continuous improvements

- Product quality
- Cost
- Safety

Positive results

- Process stability in operations
- Product quality towards customers
- Increased output



# AMPS implementation



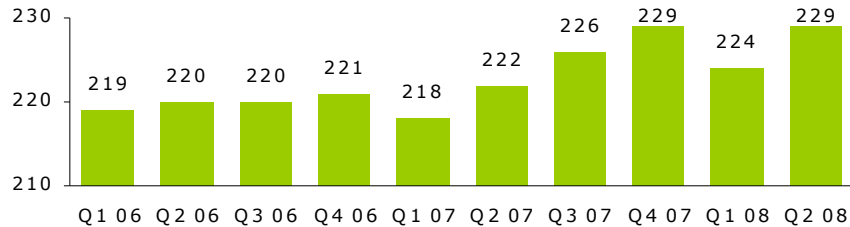
## Progress according to plan

- Implementation in Norwegian plants started in 2007
- Implementation outside Norway starts October 2008
- To be implemented in Qatalum

# AMPS – continuous improvements

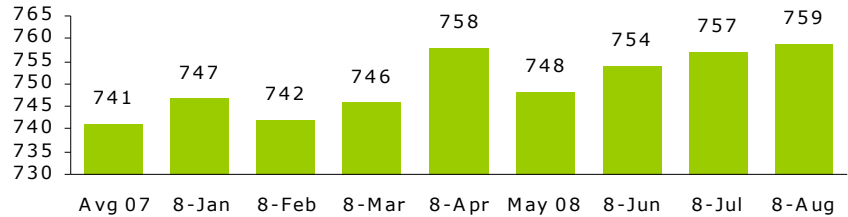
## Low-cost creep

1 000 mt, excluding closed capacity, 100%-owned lines in Norway



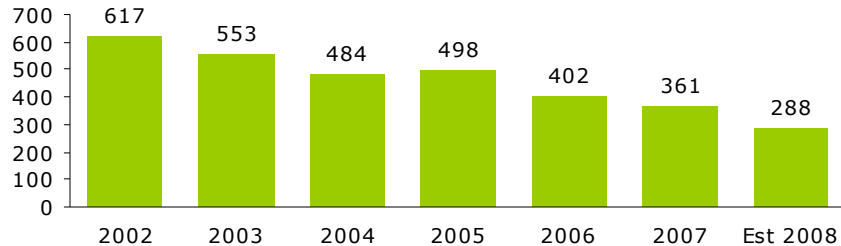
## Increased production

Sunddal SU 4 average production mt/day



## Reduced emissions

1 000 mt, Karmøy Søderberg mt CO2e per year



## Improved quality

Claims and complaints per 10 000 mt sold volume, 100%-owned lines

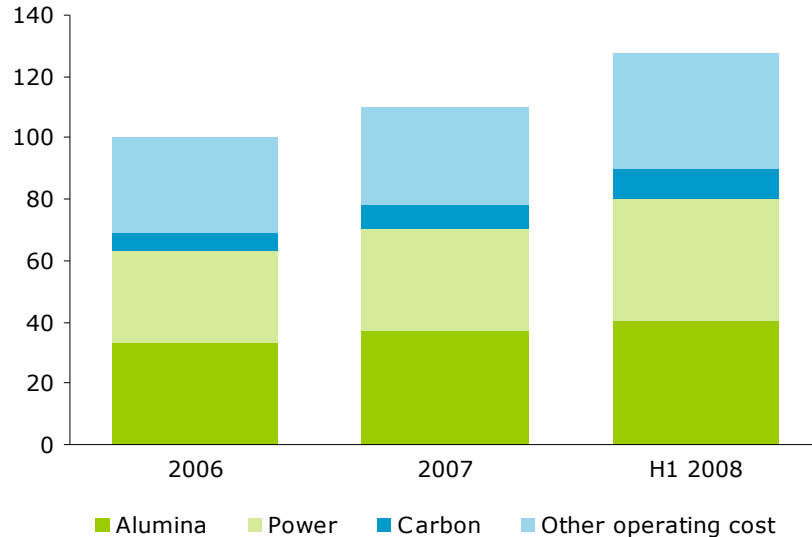


\* 100%-owned smelters

# Addressing the cost challenge

## Smelting production cost

Costs in USD per tonne indexed, 2006=100 \*



\*100%-owned smelters

### Alumina

- Equity and LME-based contracts

### Power

- Long-term contract portfolio and equity supply

### Carbon

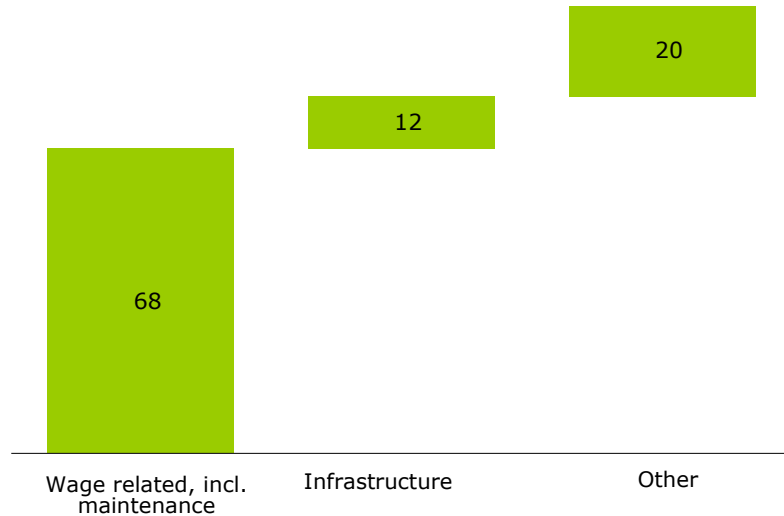
- Stronger focus on procurement
- Change supply portfolio focusing on cost efficiency

### Other operating cost

- Continued focus on efficiencies and scale effects

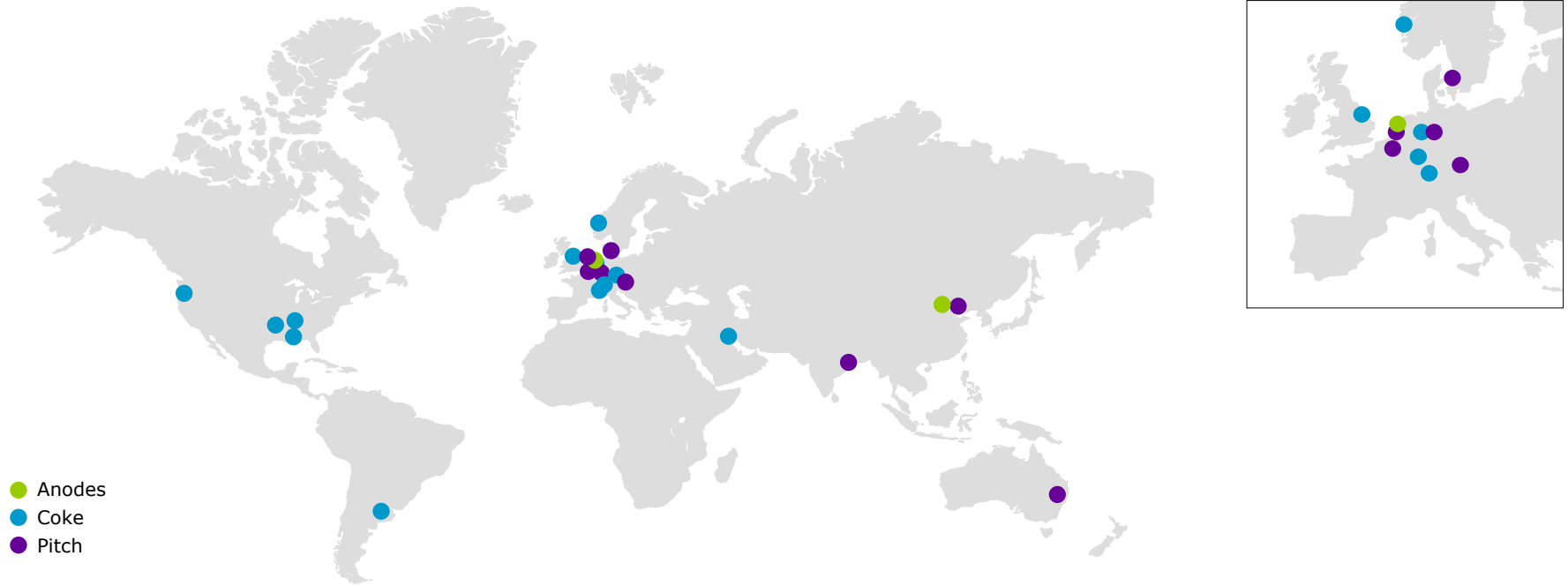
# Other operating cost

Continued focus on efficiencies



- Productivity – tonnage “creep” without adding capacity cost
- Organisational development – AMPS
- Maintenance planning – preventive maintenance

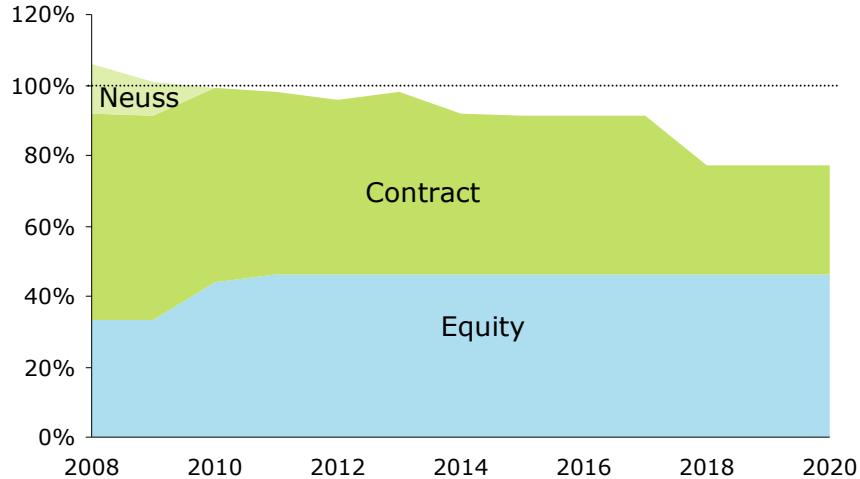
# Global carbon sourcing



# Solid power portfolio going forward

## Power coverage through 2020

Percent



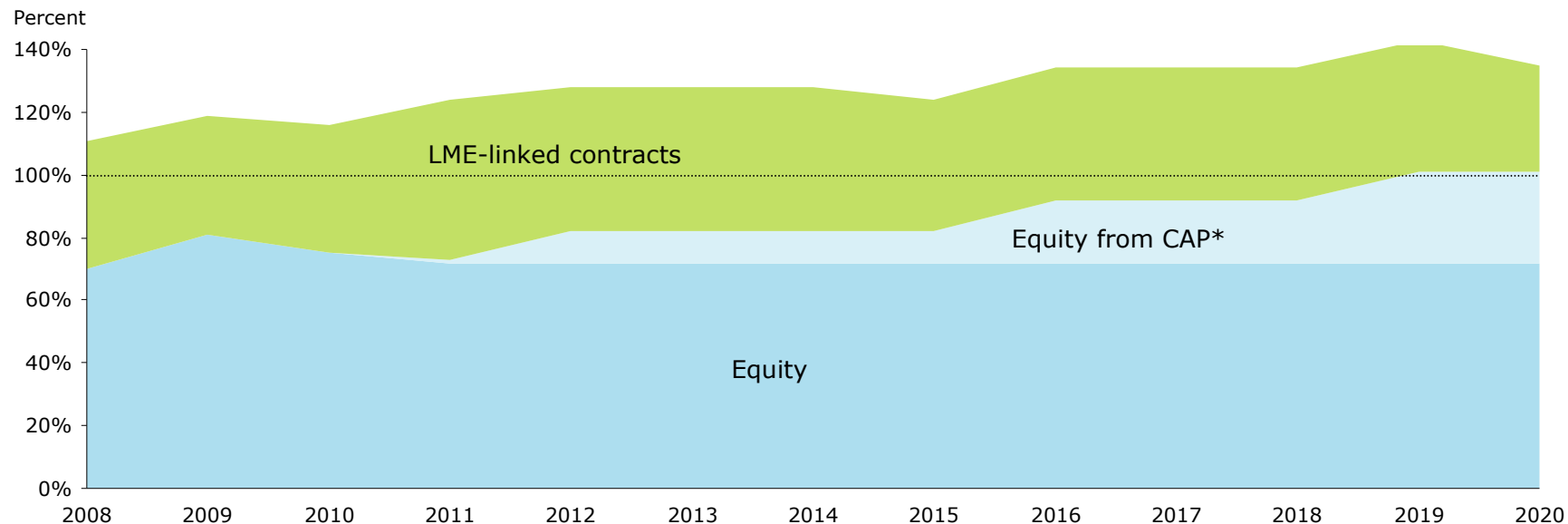
- Long term power coverage
- Equity power and competitive contract prices
- Neuss on cash basis

Based on existing smelter capacity and decided smelter projects/closures  
Norwegian equity power production included at normal level (9.4 TWh)

# Well covered with alumina

## CAP positions Hydro for further growth in metal

Alumina coverage



\*CAP is illustrated with the first stage plus two expansions. Only the first stage has been decided.

2

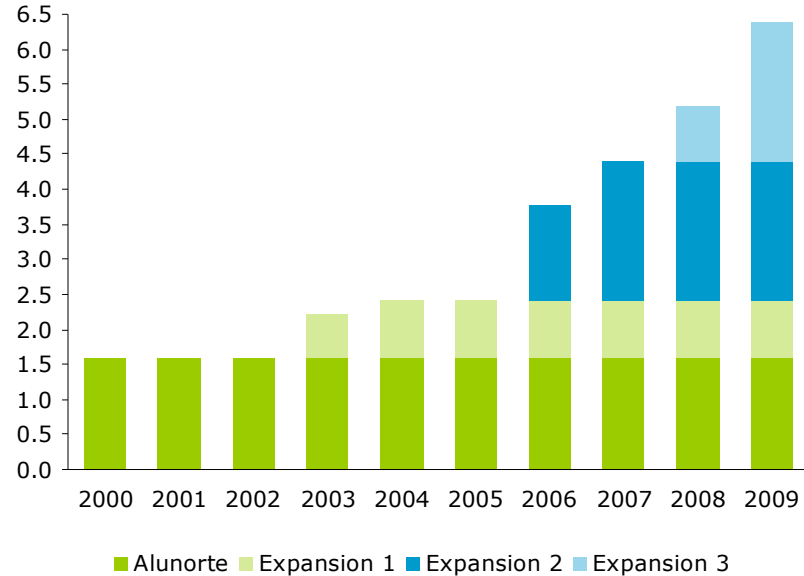
**We develop  
our business**



# Alunorte – world's leading alumina refinery

## Highly competitive cash cost

Production development in million tonnes



## EXPANSION 3



Expansion 3 from 4.4 million tonnes to 6.3 million tonnes. The world's largest alumina refinery.



Completed before time. Construction start Q2 2006. Start up July 2008.



Completed on budget in Reais.

# CAP – new world class alumina refinery



- Important step to further expand equity alumina production
- The new plant will have an initial capacity of 1.86 million tonnes per year
  - Significant expansion potential which could bring the final output up to 7.4 million tonnes per year
- Investment estimate first stage USD 2.2 billion (100%)
  - Hydro share 20%
- Production start-up scheduled 2011
  - Construction start in 2008

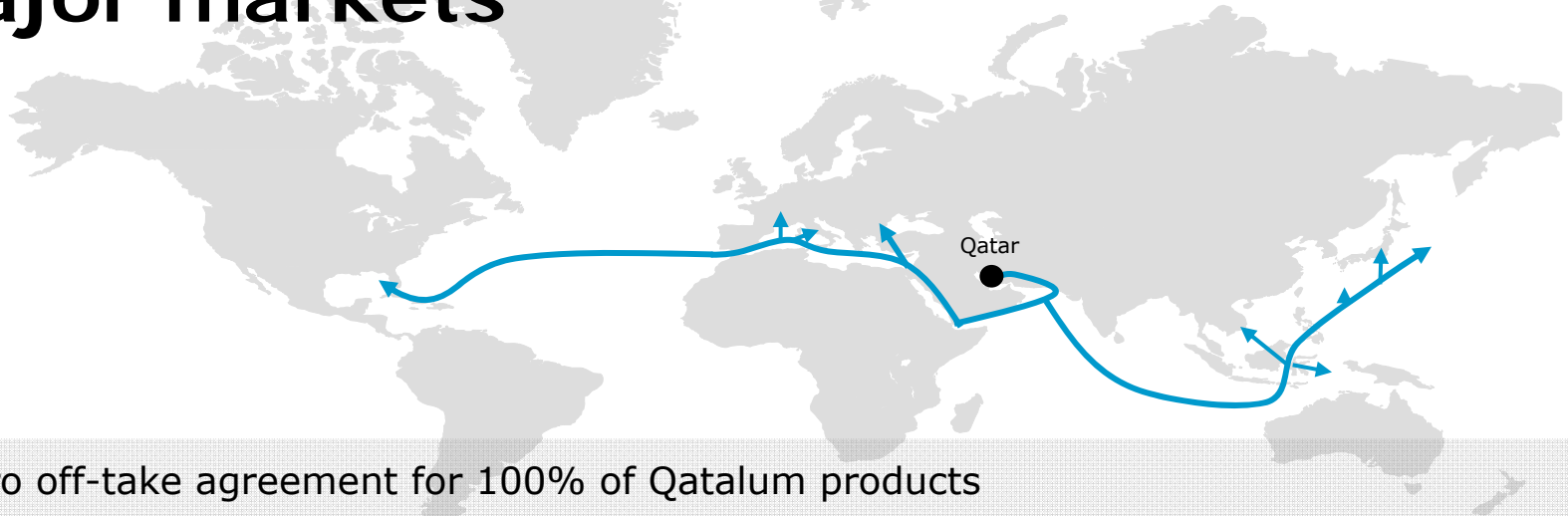


# Qatalum – according to plan

Large-scale organizational build-up

- Multi-national organization
- Recruitment and organization development
- Operational preparedness

# Qatalum: well positioned to serve all major markets



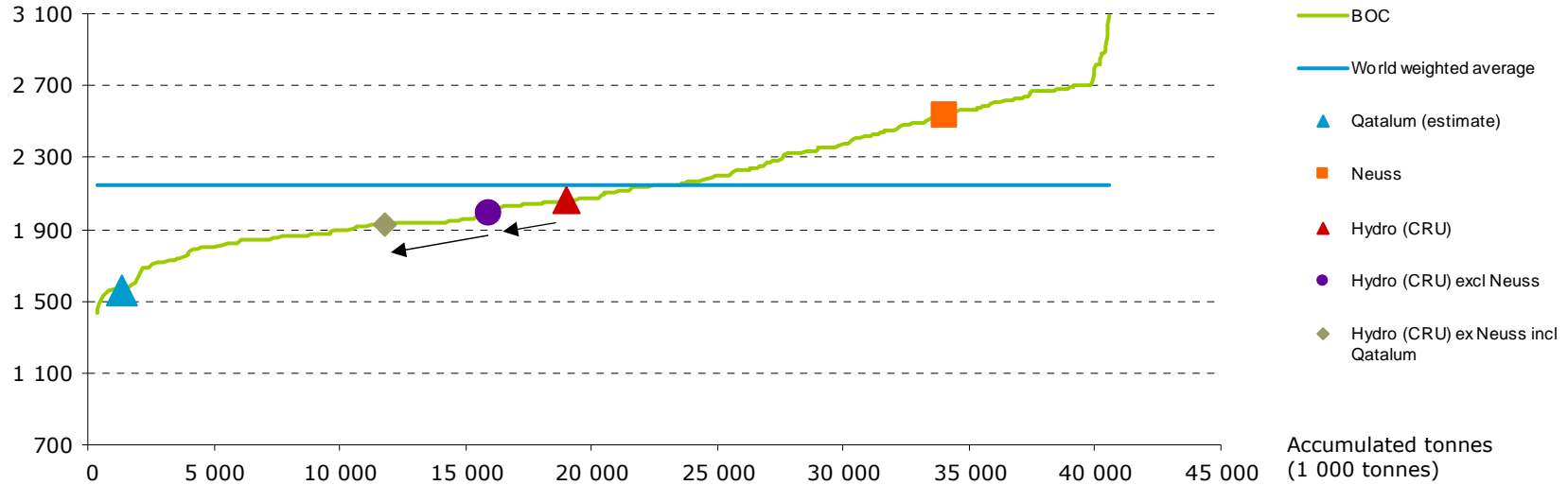
Hydro off-take agreement for 100% of Qatalum products

- First metal by end of 2009
- Building up to a sales volume to ~600 000 tonnes per year through 2010
- Targeting markets in Asia, Europe and the U.S.
- Product focus: extrusion ingot, primary foundry alloys and standard ingot

# Hydro cost position better than average

## Qatalum will improve average position – Neuss runs on cash basis

USD/tonne



Source: CRU, 2008. Business operating cost definition. Assumptions 3 month LME 2 943 USD/tonne and 3 month LME lagged 1Q 2 833 USD/tonne. Alumina spot 352 USD/tonne. NOK/USD 5.16

# Develop technology to fulfill ambitions



2007

## HAL300 technology

- Low diffuse emissions
- Good working environment
- SU4, Qatalum



2009

## HAL4e technology

- Improved energy efficiency
- Benchmark GHG
- Prepared for CO<sub>2</sub> concentration



2020

## Beyond HAL4e

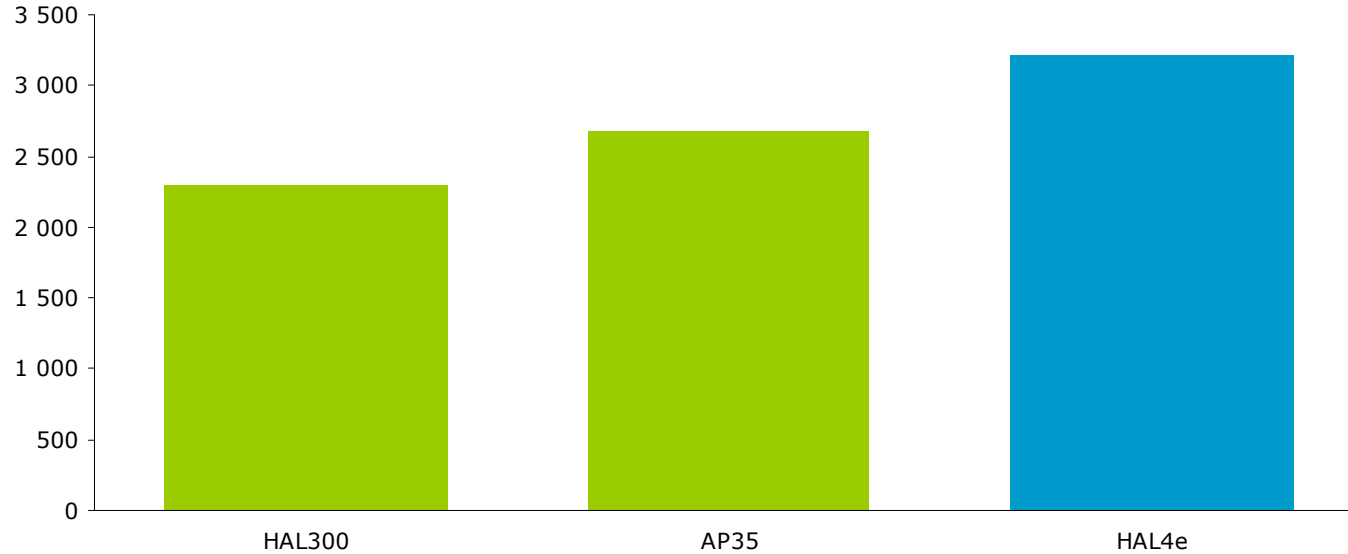
- Zero PFC concept
- Simpler CO<sub>2</sub> capture
- New materials and cell design
- Smelter layouts

# HAL4e technology



# Production increase: 40% per cell

Kg aluminium/cell/day





# Novel smelter concepts



- Concentrate and separate CO<sub>2</sub> from process gas
- Energy recovery
- Next generation process control
- Anode production technologies
- Automation
  - Cranes
  - AGV
  - Material transportation

# Technological leadership

– entry to partnership



- Technology as entry-ticket to joint venture partnerships
- ...and to supplier relations
- Low specific investment cost
- Leading health, safety and environmental performance
- Technical knowhow and operational excellence

# Key messages

## **We focus on a strong performance culture**

- Leading health, safety and environmental performance
- Increasing output from existing facilities
- Aluminium Metal Production System ensures continuous improvements
- Facing the industry wide cost pressure

## **We develop our business**

- Alunorte expansion 3 completed before time and on budget
- New alumina refinery with Vale – CAP
- Qatalum progressing according to plan
- Next generation smelter technology in test phase – key for further growth in aluminium



[www.hydro.com](http://www.hydro.com)