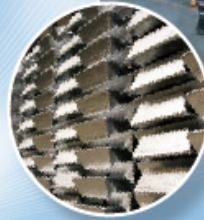**nyrstar**
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Analyst Site Visit
Nyrstar Budel

25 November 2009

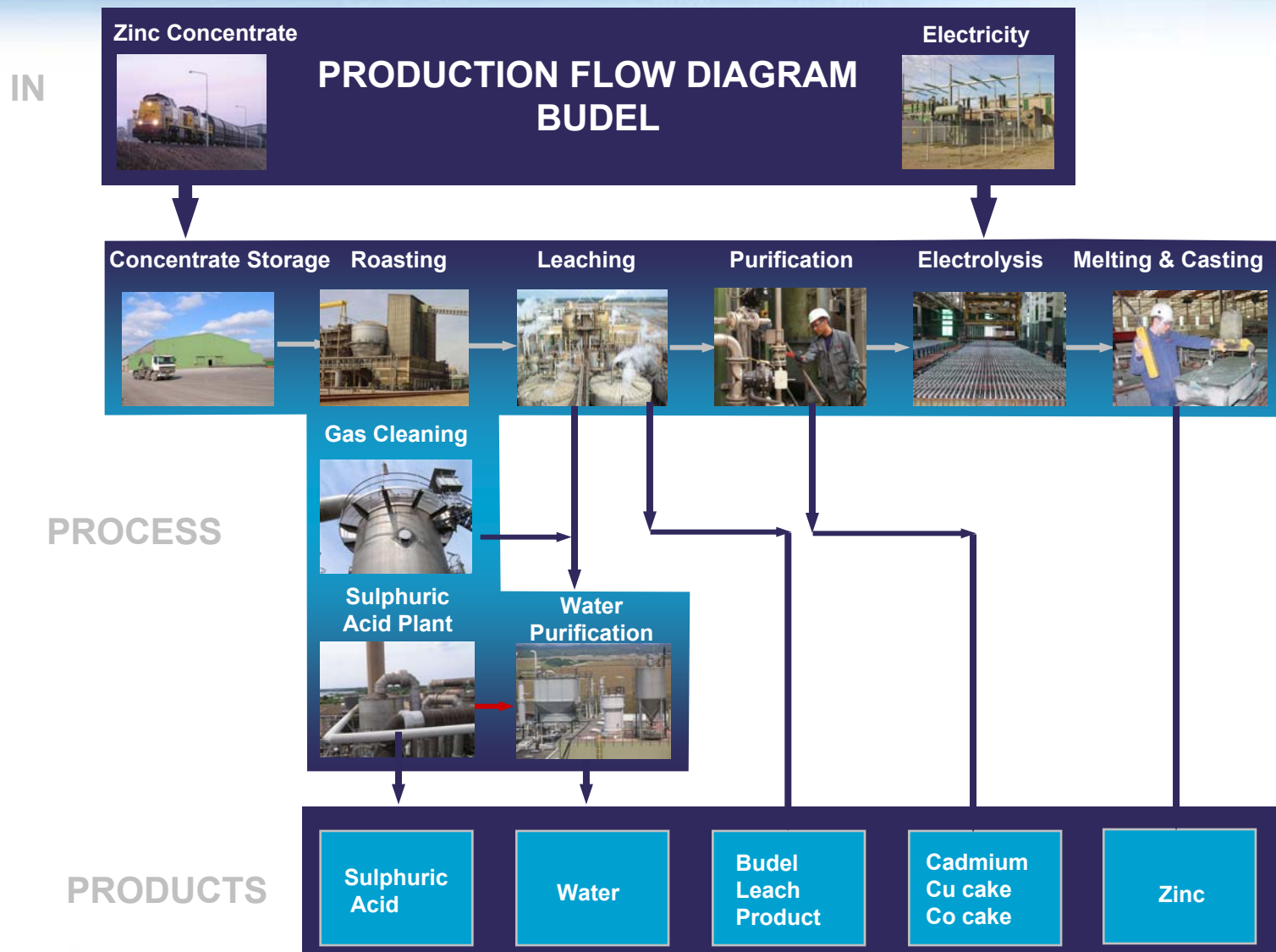Jeremy Kouw: General Manager

Fred Hornung: Deputy General Manager

Nyrstar **Budel**

- ▌ Process
- ▌ Performance
  - ▌ Safety
  - ▌ Environmental
  - ▌ Gross Profit
  - ▌ Operating Costs
- ▌ Energy
- ▌ Summary

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Smelting Process

PRODUCTION FLOW DIAGRAM BUDEL

IN

Zinc Concentrate

Electricity

PROCESS

Concentrate Storage | Roasting | Leaching | Purification | Electrolysis | Melting & Casting

Gas Cleaning

Sulphuric Acid Plant | Water Purification

PRODUCTS

Sulphuric Acid | Water | Budel Leach Product | Cadmium Cu cake Co cake | Zinc

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Budel **Production Process** – Fact Sheet

- **Feed mix to Roasting**
    - **20% Oxide, 30-70% Century, 10-50% other low iron concentrates**
- **Calcine Production**
    - **95% Roaster On-Stream Factor, Intensity 26.5 dmt/hr feed**
    - **Balanced to Cathode Production + Supplemented by Direct Leach Oxides**
- **Acid production**
    - **93% sulphur recovery, 1.2 – 1.4 tonnes H_2SO_4 for every 1 tonne market metal**
- **Leach/Purification**
    - **≈98.5% Zinc recovery**
    - **Budel Leach Product contains all Pb and Ag payable in feed, Fe and SiO_2**
    - **Cadmium, Copper Cake and Ni-Co cakes produced as payable by-products**
- **Electrolysis**
    - **93% Current Efficiency**
    - **Recycle 4% of cathode for production of zinc dust used in purification**
    - **Approximately 4000t Zn contained in liquor sold pa**
- **Casting**
    - **1% dross make (all recycled)**
    - **SHG liquid, slab + jumbo capacity**
    - **CGG capacity - up to 50% of total market metal volume**
    - **Specialty alloys - up to 20% of total market metal volume**
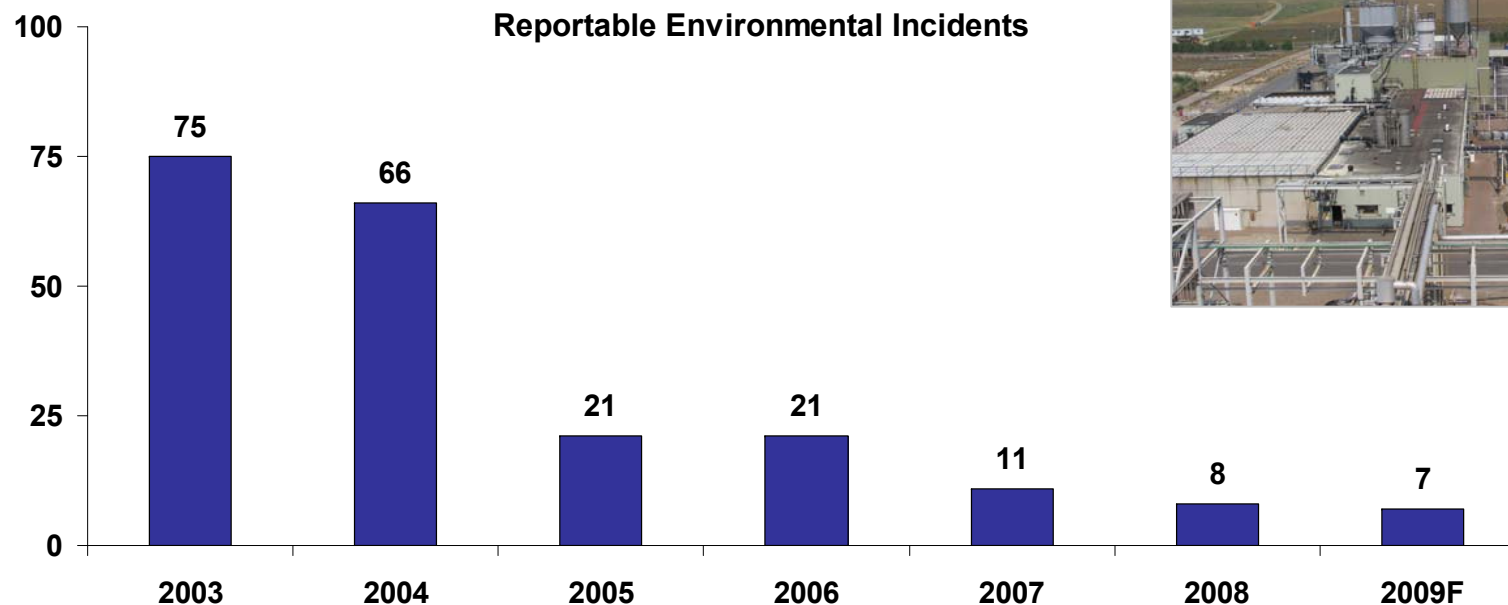
Safety Performance
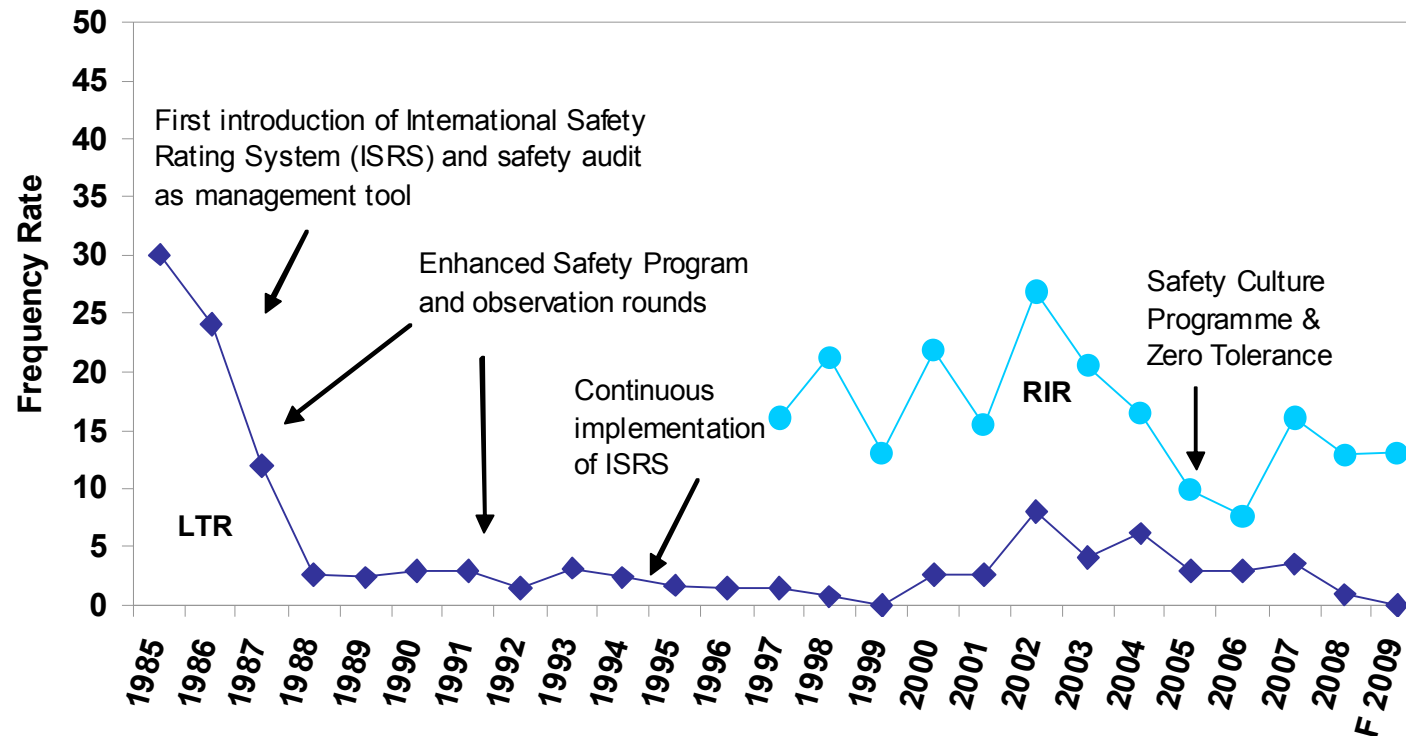
- LTR = Lost Time injury frequency Rate (the number of LTI's occurring per one million hours worked)
- RIR = Recordable Injury frequency Rate (the number of RI's occurring per one million hours worked)

Environmental Performance

❚ Waste free production process

❚ Bacteriological Water purification based on sulphide chemistry

  ❚ Best in class waste water quality

  ❚ Further increases metal recovery

❚ Minimal emissions SO2, NOx

❚ Remediated site, ≈ 2 million m^3 material excavated

❚ Historical ground water contamination, controlled since 1992

❚ Residue ponds covered 1996 - 2008

➢ Very Low Environmental Footprint

Environmental Performance

Reportable Environmental Incidents

Bar chart showing Reportable Environmental Incidents by year:
- 2003: 75
- 2004: 66
- 2005: 21
- 2006: 21
- 2007: 11
- 2008: 8
- 2009F: 7

❚ Water purification (SRB 1992 en BDS 2000) is world's best available technology

❚ Further improvements to target zero incidents are planned for 2010

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Financial Performance

€millions *Unless otherwise indicated*	Budel Smelter H1 2009	Budel Smelter H2 2008	Budel Smelter H1 2008	Budel Smelter 2008
Zinc cathode ('000 tonnes)	109	125	125	250
Zinc market metal ('000tonnes)	104	120	119	239
Sulphuric acid ('000 tonnes gross)	125	137	139	276
Revenue	87	167	222	389
Underlying EBITDA	5	9	23	32
Capital expenditure	1	7	5	12

▌ Rapid response to market conditions, ramping down production and operating in "Off Peak" production mode from November 2008 until July 2009

▌ Roaster production constrained until a scheduled Roast and Acid shutdown in October 2009

▌ No major shutdowns planned in 2010

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Elements of **Gross Profit**

€millions

Elements of Gross Profit	H1 2009	H2 2008	H1 2008	2008
Treatment charges	33	38	45	83
Free metal contribution	15	25	28	53
Premiums	10	19	23	42
By-products	13	14	20	34
Other	-15	-11	-23	-34
Gross profit	**57**	**86**	**92**	**178**

Gross Profit per tonne MM	H1 2009	H2 2008	H1 2008	2008
Treatment charges	317	317	378	347
Free metal contribution	144	208	235	222
Premiums	96	158	193	176
By-products	125	117	168	142
Other	-144	-92	-193	-142
Gross profit	**548**	**717**	**773**	**745**

▌ H1 2009 Treatment Charges impacted by reduced volumes

▌ H1 2009 Free metal & Premiums impacted by reduced volumes and prices

▌ Significant reduction in acid price in H1 2009 and going forward

▌ Continuing to target increased sales of special alloys

Source: Nyrstar 2009 Half Year Results

9

Operating Costs - Zinc Smelting Industry

Other
32%
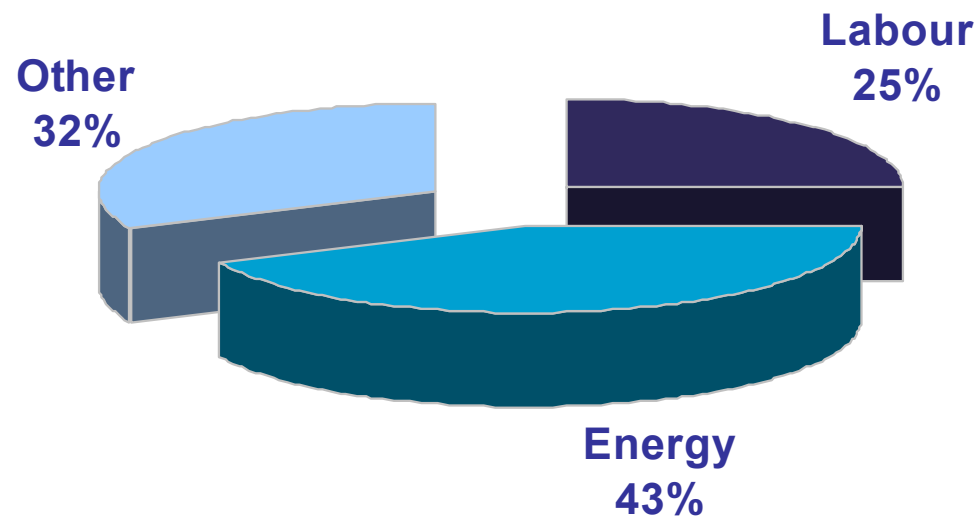
Labour
25%

Energy
43%

❚ Apart from gross profit contribution, zinc smelters compete globally on operating costs, which consist of Labour, Energy, and Other (external services, stores)

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*Typical industry cost breakdown
Source : Brook Hunt, 2008

Operating Costs

€millions

Operating costs	H1 2009	H2 2008	H1 2008	2008
Employee benefits expense	14	17	15	32
Energy expenses	25	38	33	71
Other expenses	12	23	21	44
Total operating costs	**51**	**77**	**70**	**147**

Operating costs per tonne	H1 2009	H2 2008	H1 2008	2008
Employee benefits expense	135	142	126	134
Energy expenses	240	317	277	297
Other expenses	115	192	176	184
Total operating costs	**490**	**642**	**588**	**615**

❙ Transformational changes to deliver sustainable cost saving reductions in labour and contractor costs in 2009

❙ Budel is one of the most productive smelters in Europe

❙ Significant improvement in controlling maintenance spend and increasing effectiveness

❙ Significant reduction in electricity price expected for 2010 in line with market

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Energy Consumption

❚ Electrolytic zinc production is an energy-intensive activity

❚ Energy-intensity per tonne of zinc metal:

 ❚ ~ 4,100 kWh electricity

   ❚ ~ 85% = non-energetic energy consumption = electrolysis

   ❚ ~ 15% = energetic energy consumption = cathode melting+ rotating equipment

 ❚ ~ 170 kWh other energy sources (gas, oil)

❚ Budel is one of the most energy efficient zinc smelters worldwide

 ❚ Participant of Energy Benchmarking Covenant

 ❚ Participant MEE (successor program to the Benchmarking Covenant)

 ❚ Actively assessing a range of "Green Energy" projects

❚ Applying for CO_2 emission credits in line with EU and NL regulations

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Energy Consumption

▌ Electricity needs to be considered as a raw material for electrolytic zinc consumption

▌ Zn $^{2+}$ + 2e $^-$ = Zn $_{METAL}$

▌ The amount of energy to make one tonne of zinc is governed by physics

Faraday's laws of electrolysis

From Wikipedia, the free encyclopedia

Several versions of the laws can be found in textbooks and the scientific literature. The most-common statements resemble the following:

Faraday's 1st Law of Electrolysis - The mass of a substance altered at an electrode during electrolysis is directly proportional to the quantity of electricity transferred at that electrode.

In the simple case of constant-current electrolysis, $Q = It$ leading to

$$m = \left(\frac{It}{F}\right)\left(\frac{M}{z}\right)$$

where

m is the mass of the substance altered at an electrode
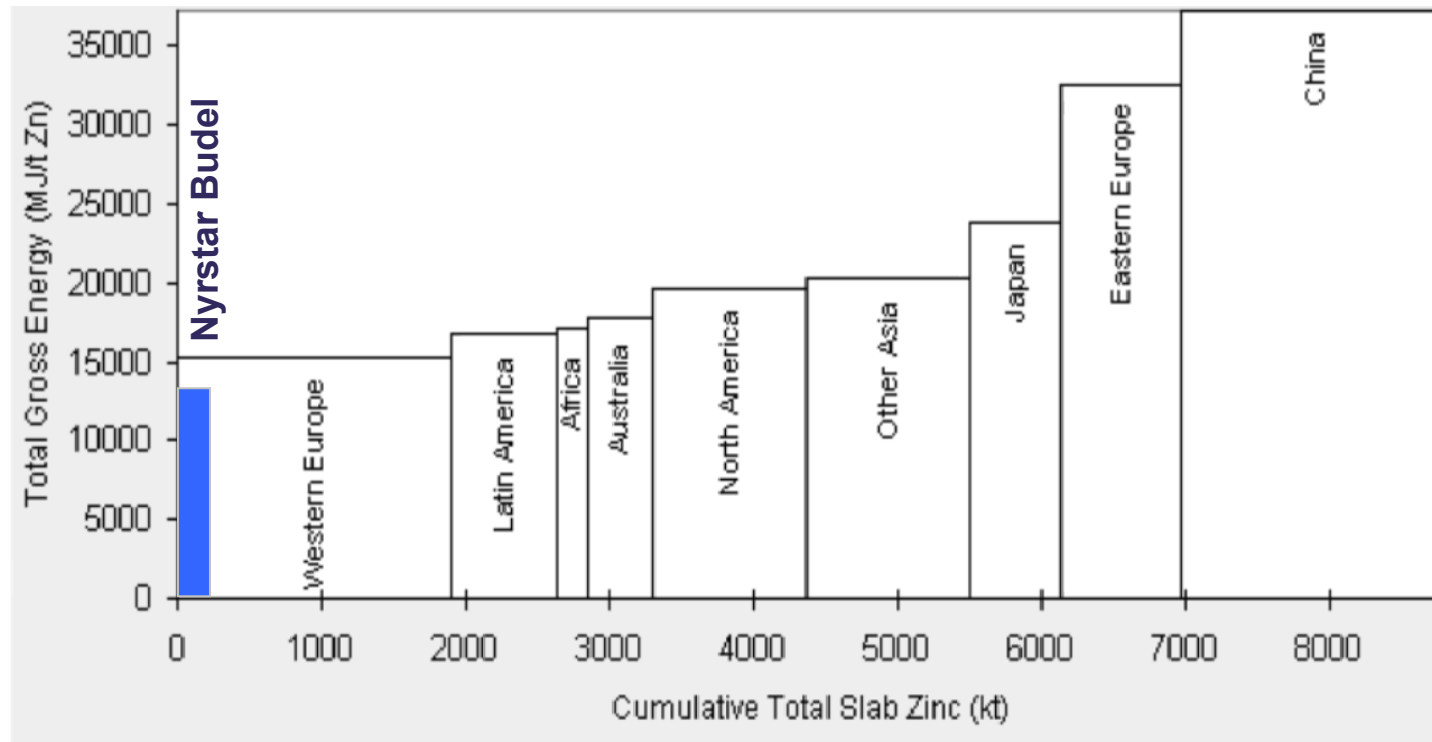Q is the total electric charge passed through the substance
$F = 96,485$ C mol^{-1} is the Faraday constant
M is the molar mass of the substance
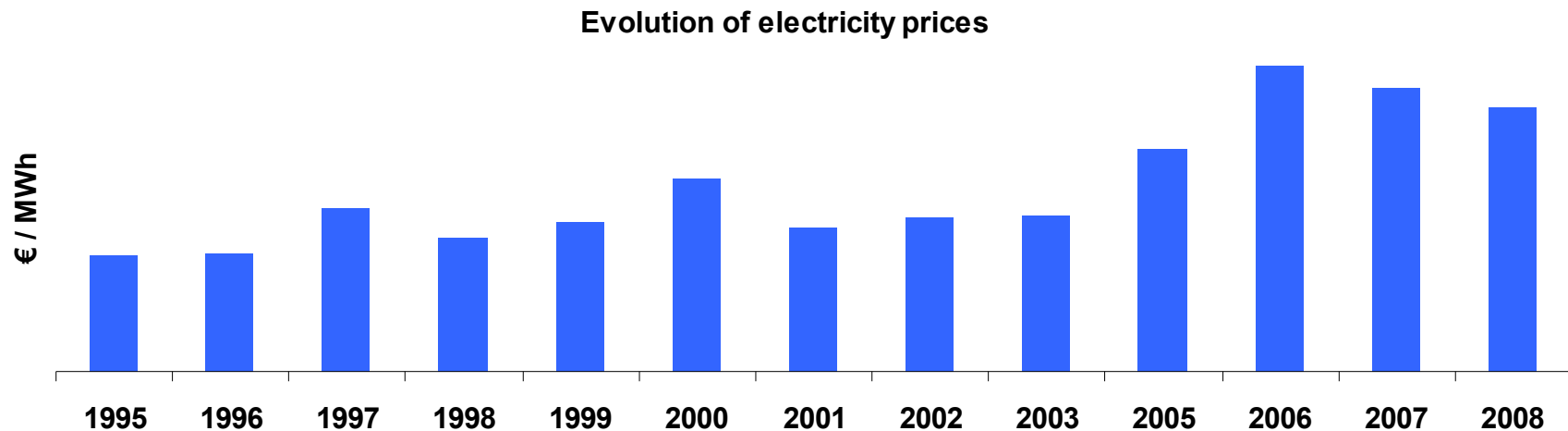z is the valency number of ions of the substance (electrons transferred per ion)

Energy Consumption

Zinc Smelting Energy Consumption by Region

I The risk of "carbon leakage" is high in the zinc sector, making it important to recognise the efficiency of developed world smelters

Energy Price Development

Evolution of electricity prices

€ / MWh

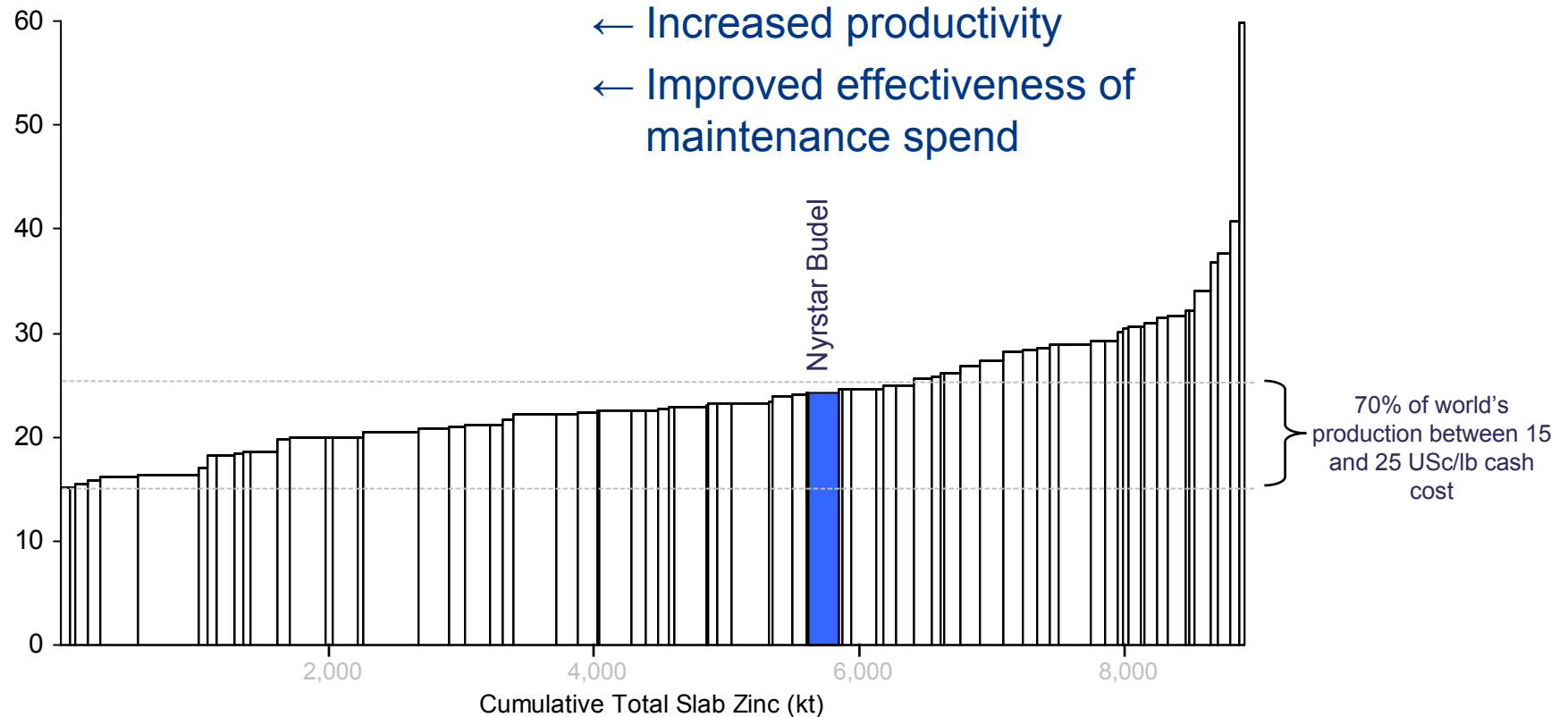1995 1996 1997 1998 1999 2000 2001 2002 2003 2005 2006 2007 2008

❚ Electricity prices in the Netherlands have approximately doubled since 2003

❚ Budel sources energy from a mix of forward and spot rates

❚ The site modulates between peak and off peak operation

❚ Flexibility to reduce energy consumption by more than 50% instantaneously

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Cost **Competitiveness**

Cash Conversion Cost USc/lb of Zn

← Lower energy price

← Increased productivity

← Improved effectiveness of maintenance spend

70% of world's production between 15 and 25 USc/lb cash cost

Cumulative Total Slab Zinc (kt)

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Budel in Summary

▌ Flexible production process

▌ Very low environmental footprint (SO2, CO_2, no leach waste, clean waste water)

▌ Waste free production process with historical issues managed

▌ One of the most energy efficient zinc smelters

▌ 20% of raw materials input from recycled material

▌ Important link in the Dutch and EU supply chain

▌ Strategically located close to major customers

▌ Flexible power consumer contributing to the stability of the national electricity grid

▌ High productivity smelter, with well trained and flexible workforce

▌ Key role in employment and training in the region

▌ Strong ties with local community

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Questions

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