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Johann Prammer, Strategic Environmental Management
UNECE Workshop – 18 January 2017, Geneva
What does “energy” mean for voestalpine?

1. Company profile → customers and markets
2. Energy efficiency from two perspectives → production and products
3. Specific situation of the steel industry and voestalpine
4. Key factors for (not) implementing energy efficiency measures
5. Why in steel production “less CO₂” means “more energy”
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Global footprint

One Group – 500 locations – 50 countries – five continents

Revenue by regions (Business year 2015/16)

- 70% European Union (of which Austria: 8%)
- 11% NAFTA
- 8% Asia
- 3% South America
- 8% Rest of world

Revenue by industries (Business year 2015/16)

- 9% Mechanical engineering
- 13% Other
- 9% Building/Construction
- 16% Energy
- 5% White goods/Consumer goods
- 3% Aerospace
- 13% Railway systems
- 32% Automotive

Revenue (BY 2015/16)

EUR 11.1 billion (~USD 12.6 billion*)

EBITDA (BY 2015/16)

EUR 1.6 billion (~USD 1.8 billion*)

Employees (BY 2015/16)

48,500

* Exchange rate: March 31, 2016 (end of Business Year 2015/16)
Mobility
Products and innovations

Focus on safety, lightweight construction and highest efficiency over the entire life cycle

Aerospace: voestalpine is one of the five largest aerospace suppliers worldwide
Aircraft parts made of high-performance materials (e.g., engine mount)

Automotive: voestalpine products are represented in almost all automobile components
Market leader in hot forming

Railway systems: World market leader in turnout technology and special rails
Energy*

Products and innovations

High-strength sour-gas-resistant seamless tubes

Heavy plate for pipelines

Linepipe plates for highest requirements, temperatures down to minus 60 °C, and extreme conditions

and gas-tight threaded connections for deep-sea pipelines

Deep sea pipelines up to 2,800 m

High-temperature steels

for highly efficient power plants

Offshore pipelines up to -60 °C

Focus on special materials and products for highest energy efficiency

* conventional and renewable
Energy efficiency requires two perspectives

**Production and processing**

Efficient and cost-optimized use and re-use of raw materials, energy, water and by-products

**voestalpine as industry benchmark in Europe**

Regarding resource and energy efficiency as well as environmental compatibility
E.g.: Integrated energy cycles, water management and electrical self-sufficiency; emission reduction technologies

**Material: high-tech steel**

Resource balance over the entire life cycle; potential of a material for sustainable savings of resources

**Advantages of steel in comparison with other materials**

Life cycle assessment as basis for sustainable resource efficiency
E.g.: Lightweight construction, increase of energy efficiency (power plants, turbines), contribution to “low carbon” transformation

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# Energy savings of steel

<table>
<thead>
<tr>
<th>Sector</th>
<th>Application</th>
<th>Net CO₂ reduction potential (Mt)</th>
<th>CO₂ emissions in steel production (Mt)</th>
<th>CO₂ reduction vs. emission</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy</strong></td>
<td>Efficient fossil-fuel power plants</td>
<td>29.5</td>
<td>&lt;0.1</td>
<td>~400:1</td>
</tr>
<tr>
<td></td>
<td>Wind power</td>
<td>14.2</td>
<td>0.4</td>
<td>32:1</td>
</tr>
<tr>
<td></td>
<td>Other renewables*</td>
<td>5</td>
<td>0.03</td>
<td>~200:1</td>
</tr>
<tr>
<td></td>
<td>Efficient transformers</td>
<td>2.1</td>
<td>0.1</td>
<td>14:1</td>
</tr>
<tr>
<td></td>
<td>Efficient e-motors</td>
<td>1.9</td>
<td>0.7</td>
<td>3:1</td>
</tr>
<tr>
<td><strong>Mobility</strong></td>
<td>Weight reduction cars</td>
<td>11.2</td>
<td>8.4</td>
<td>&gt;1:1</td>
</tr>
<tr>
<td></td>
<td>Weight reduction trucks</td>
<td>1</td>
<td>0.9</td>
<td>&gt;1:1</td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>Combined heat/power</td>
<td>9.2</td>
<td>1</td>
<td>9:1</td>
</tr>
</tbody>
</table>

- **Energy**
  - Efficient fossil-fuel power plants
  - Wind power
  - Other renewables*
  - Efficient transformers
  - Efficient e-motors
- **Mobility**
  - Weight reduction cars
  - Weight reduction trucks
- **Others**
  - Combined heat/power

* Geothermal energy, water power, biomass
** Households, industry, services

Source: WV Stahl, Boston Consulting Group; ∑ ~74 Mt ∑ ~12 Mt ∑ 6:1
voestalpine’s main site in Linz (Austria)
A highly integrated steel mill
Integrated energy cycles
voestalpine: Reduction of specific energy consumption

Specific energy consumption in GJ/t crude steel

Investments over the past 10 years alone in the modernization and enlargement of Austrian sites: > EUR 7 bn

BF top gas pressure recovery turbine
waste heat recovery reheating furnaces
new pusher type furnaces
improvement of burden
recuperator for reheating furnaces
stove combustion air preheating
new power plant block
metallurgical gas mixing stations
improvement of coke
heat recovery for district heat

BOF gas recovery
hot charging reheating furnaces
central electricity control system
steam generation galvanizing
energy accounting system
energy management system
BF automation system
electric blower
steam control system
general use of frequency converter
measurements all energy, media
steel shop optimization
new power plant block
central feed water plant
HR recovery continuous annealing
optimize BF network pressure
oxygen prediction
hot stove optimization
sintering plant optimization
small coke for BF

gas management system
optimization of pressurized air system
improved BF optimization system
energy controlling
general condensate recovery
generator mode for rolling mill
new power plant block
electricity, natural gas prediction
coordination of energy and maintenance
coke gas injection BF
energy prediction for relevant media
energy optimization system
plant conditioning monitoring
maximization of BFG recovery
optimization gas mixing system
continuous burner improvement
walking beam furnace
sinter plant waste heat recovery
general use district heat
sinter plant optimization
optimization net pressures
central energy control room
new power plant block
Energy efficiency at voestalpine

- The Linz site is nearly energy-independent and takes every effort to continually optimize process gas utilization and to increase energy recovery.

- Continual improvement is achieved through measures such as energy savings in thermal processes and utilization of waste heat.

- The implemented energy monitoring system is a powerful instrument in continually improving overall energy efficiency and plant optimization.

- Broadly implemented energy management systems across the Group (ISO 50001, EMAS, …)
Energy efficiency measures
Key issues and burdens

- **Energy** (including raw materials as basis of the integrated energy cycles) accounts for up to **25% of total crude steel production costs** – reduction in the past 3 to 4 years of max. 3% despite a broad range of implemented measures → **large financial effort, but comparably little effect** on the Group level

- **Variety and quality of national legislation, e.g.**
  - Equipment efficiency standards
  - Requirements for energy audits
  - Training and awareness building programs
  - Co-funding programs for energy efficiency research and development
  - Austrian Energy Efficiency law ("EEffG")

- However, **lack of tax related incentives, low-interest energy efficiency loans etc.**
Energy efficiency measures

Key issues and burdens (2)

- **Economic factors**, such as payback period and criteria for investments
- **Time frames** for investments in energy efficiency techniques determined by expansion or replacement of facilities, but very little effect of energy prices alone.
- **Cross-functional assessment** (e.g. R&D, production, product and technology development)
- **Inadequate understanding** of the correlation between greenhouse gas emission reduction, energy efficiency and energy consumption in the public and political discussion.
Less $\text{CO}_2$ = less energy?

For steel industry, the calculation doesn‘t work

Less $\text{CO}_2$ (e.g. electricity or natural gas instead of fossil fuels)

No – on the contrary! Further $\text{CO}_2$ reduction = higher energy consumption!

Higher external energy demand (e.g. instead of integrated energy cycles based on coke/coal and gas)
Technology options only available in the long term

Option 1
“Breakthrough“ technologies for decarbonization (e.g. on hydrogen basis) not available before ~ 2035.

Option 2
Transformation has to be technically and economically feasible!

Option 3
<20 % (100 % renewable)

Option 4
175 %

Status quo
100 % (fossil on coal base)

EU 2050 -80/-95%

$\text{CO}_2$/kg per t crude steel

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Decarbonization

Additional demand of electricity for voestalpine

- Steel production sites in Austria are currently self-sufficient with electricity (based on coal/coke)

- Zero carbon scenario would require additional (renewable) electricity of 33 TWh to be supplied by external power grid

- This equals more than > 30 river power plants only for voestalpine …

- … or four times the projected increase in wind power in Austria.

- For European steel industry overall, this decarbonization scenario would additionally require the entire production growth of renewable electricity!

Neither nationally nor on the European level, this additional demand is provided for in existing energy expansion scenarios and forecasts!
Summary
Energy and climate policies – What do do?

- It is shortsighted to focus only on emissions; the implications on energy consumption have to be considered as well.
- The success of innovative low carbon technologies will therefore depend on the sufficient availability of energy at competitive prices.
- We therefore urgently need to develop a national, but especially a coordinated European energy strategy.
- In this context, also the financing of transformation (including energy transition) has to be addressed.
- A reliable and calculable framework for long-term investment decisions (e.g. legal security, regulations, incentives, …) is essential.
- A global level playing field for climate protection is inevitable.
Summary

Energy and climate policies – 5 thoughts to discuss

1. Climate policy = energy policy = industrial policy
2. “Energy” is the key to transformation
3. No unilateral approach, but fair competition by developing European and global strategies
4. Financing issues and technical as well as economic feasibility have to be addressed and secured
5. Basic materials industry (in Europe) is indispensably required for solving climate and energy targets
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Back-up
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Overview

- European technology and capital goods group that has its own steelmaking facilities
- Leading partner to the global automotive and consumer goods industries and the oil and natural gas industry
- Global market leader in high-tech railway infrastructure (rails, turnouts) as well as tool steel and special sections
- Listed on the Vienna Stock Exchange since 1995 – owned 100% by private shareholders
- Ecological pioneer – benchmarks for emissions and energy efficiency
- Worldwide investment volume in the BY 2015/16: EUR 1.3 billion
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