

A decorative geometric pattern on the left side of the slide, composed of various colored triangles (blue, brown, gold, grey) arranged in a complex, overlapping structure.

**ENERGY TRANSITION
AND CHALLENGES FOR THE BASE INDUSTRIES**

**Clean Energy and Industrial Competitiveness
for Sustainable Development Conference**

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Executive Director, Aurubis Bulgaria

Sofia, 11 April 2018



» About Aurubis

» Challenges for the Base Industries



Aurubis Group

A leading worldwide provider of non-ferrous metals, Aurubis processes complex metal concentrates and diverse recycling materials.

Established in 1866 as a stock company, now the Group operates production facilities and sales network in 24 countries on three continents with over 6 400 employees.

Aurubis Group produces more than one million t of marketable copper cathodes annually, precious metals and a range of other products including sulfuric acid and iron silicate.



Aurubis Bulgaria

Aurubis Bulgaria operates the copper production plant of the Group in Pirdop, Srednogorie region. The company is the **second biggest entity in Bulgaria** in annual revenue with **key contribution to total export and country's GDP growth**.

Established in 1958, Pirdop copper plant consists of four main production units: Smelter, Refinery, Flotation, Acid plant. More than EUR 600 M has been invested since company's privatization.

With 850 direct employees and **record 2017 figures**, Aurubis Bulgaria is the biggest copper producer in South-Eastern Europe.

- » Largest copper producer in South-Eastern Europe
- » Over EUR 600 M of direct investment in Bulgaria
- » Four main production units: Smelter, Refinery, Acid Plant, Flotation Plant
- » Largest user of Bulgarian rails and ports.
- » Storage facilities at Burgas port
- » Leading producer of copper cathodes: 99.9 percent purity
- » London Metal Exchange certified cathodes: class A, brand Pirdop
- » ISO 9001 Quality management system and ISO14001 Environmental management system
- » 850 directly employed

Smelter



Refinery

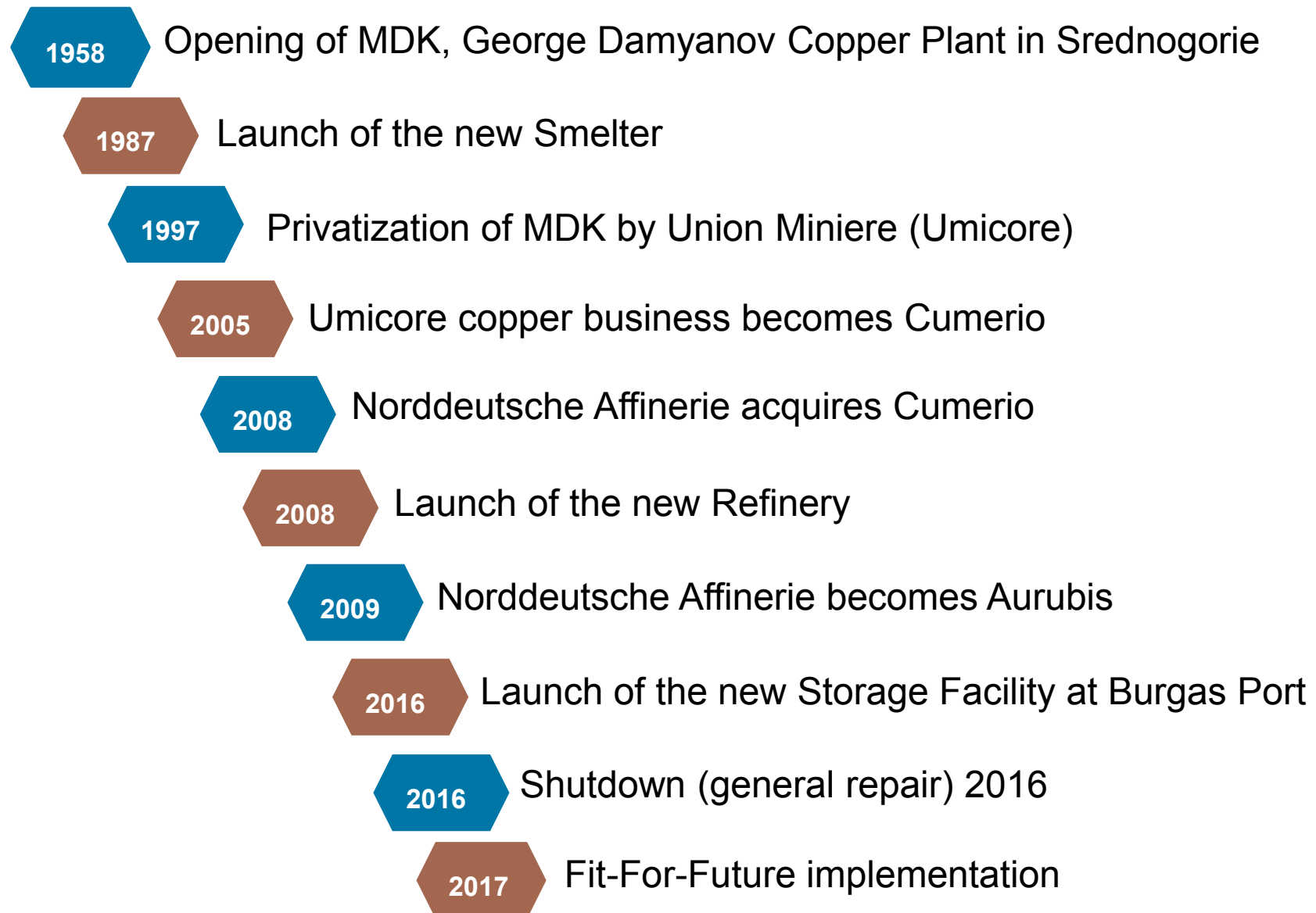



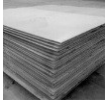


Acid plant



Flotation plant



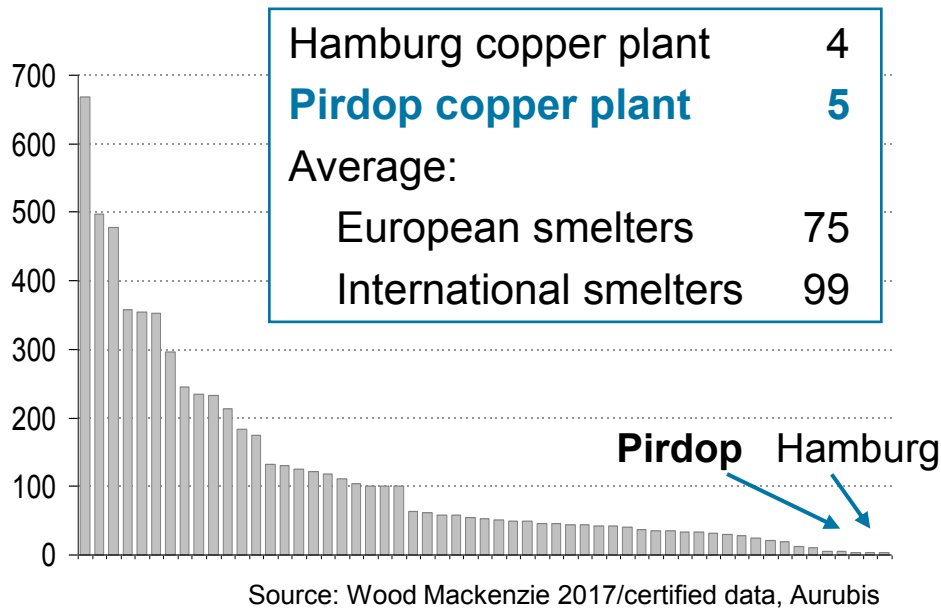


	Production (t)	2016 *	2017
	Concentrates	1 055 600	1 357 100
	Anode copper	296 800	375 200
	Cathode copper	216 400	228 500
	Sulfuric acid	1 041 400	1 358 500

(*) Figures with 54-day Shutdown

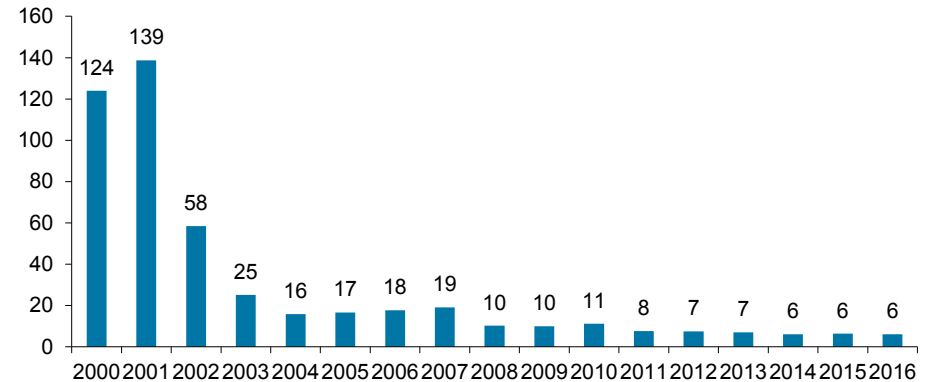


SO₂ emissions of copper smelters (kg SO₂ per t of copper)

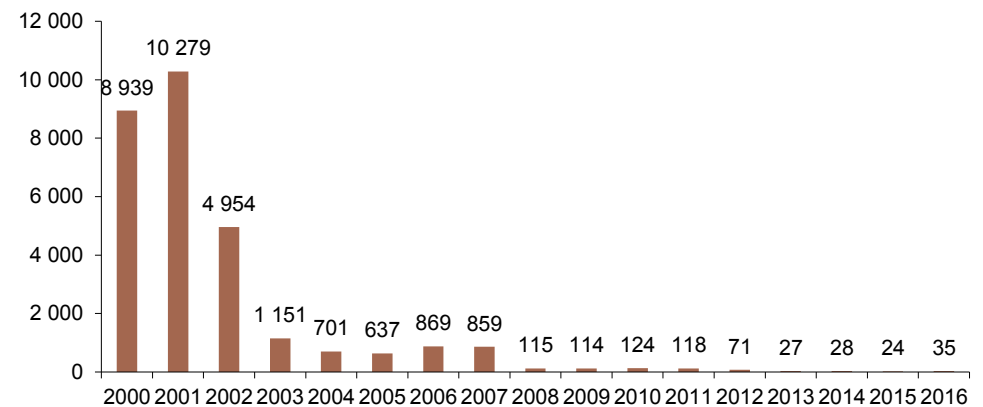


- » Outstanding success in environmental and climate protection
- » One of the most environmentally friendly copper producers in the world today

SO₂ emissions of Pirdop Plant, 2000-2016 (kg SO₂ per t of copper)



Dust emissions of Pirdop Plant, 2000-2016 (g per t of copper)



Export and import, 2017

- » EUR 2.5 Billion export sales, ~9% of Bulgaria's total export
- » EUR 1.7 Billion import of raw materials, ~6% of Bulgaria's total import

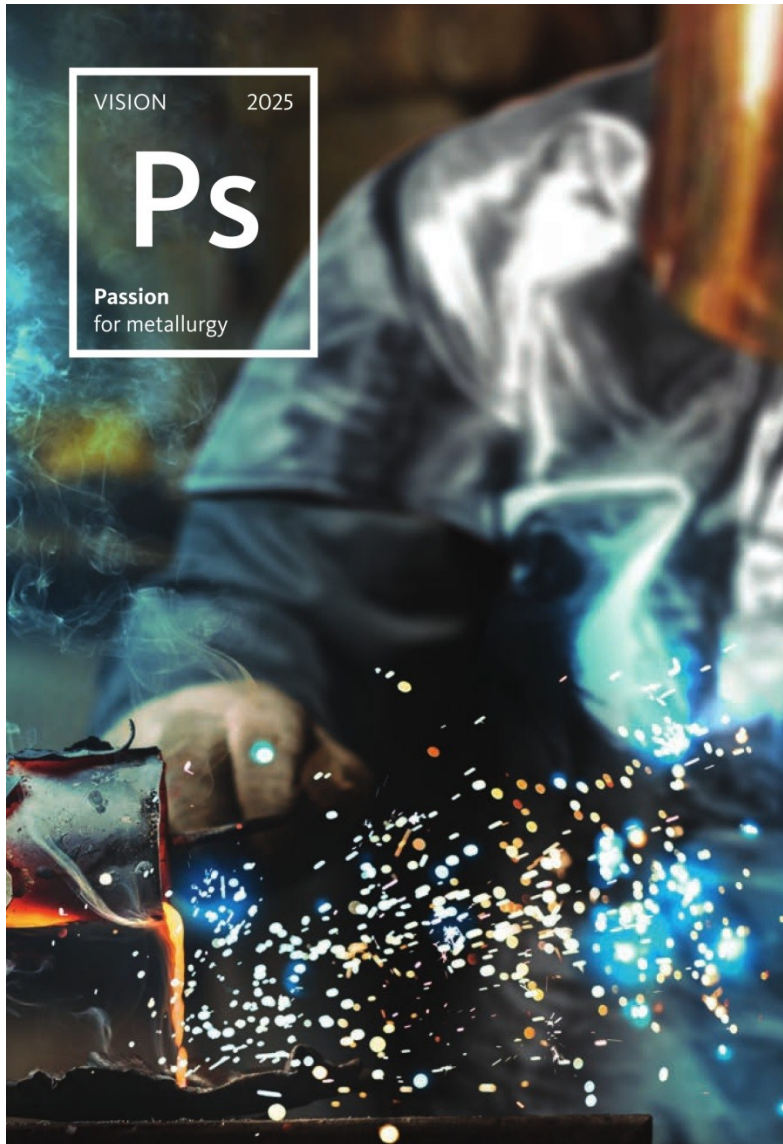
Over EUR 600 M direct investment since 1997

- » EUR 417 M in modernization of the production processes
- » EUR 106 M in environmental performance
- » EUR 78 M in equipment renovation

Spectrum 2018 EUR 180 M investment program

- » EUR 75 M in sustainable operations and control
- » EUR 55 M in ensuring competitiveness
- » EUR 26 M in improving logistics supply chain
- » EUR 20 M in renovation and improvement of smelting process
- » EUR 2.5 M in sustainable social projects





» **About Aurubis**

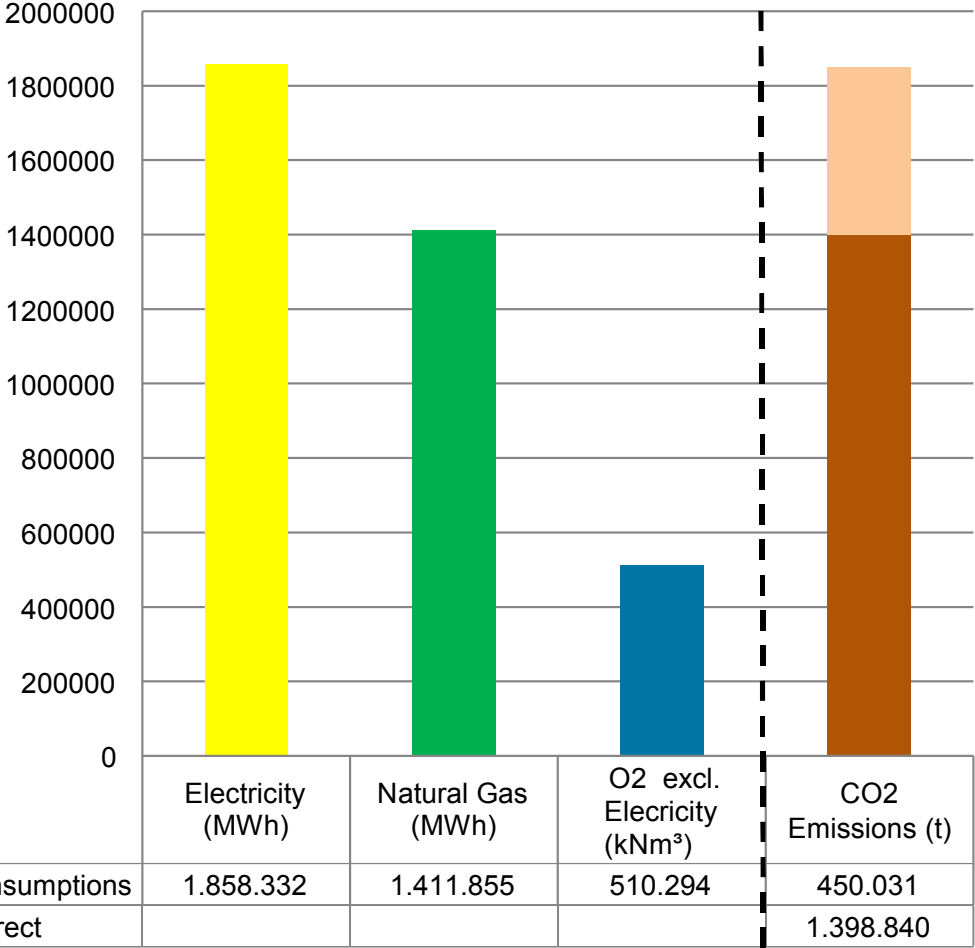
Challenges for the Base Industries

Energy Consumption and Costs

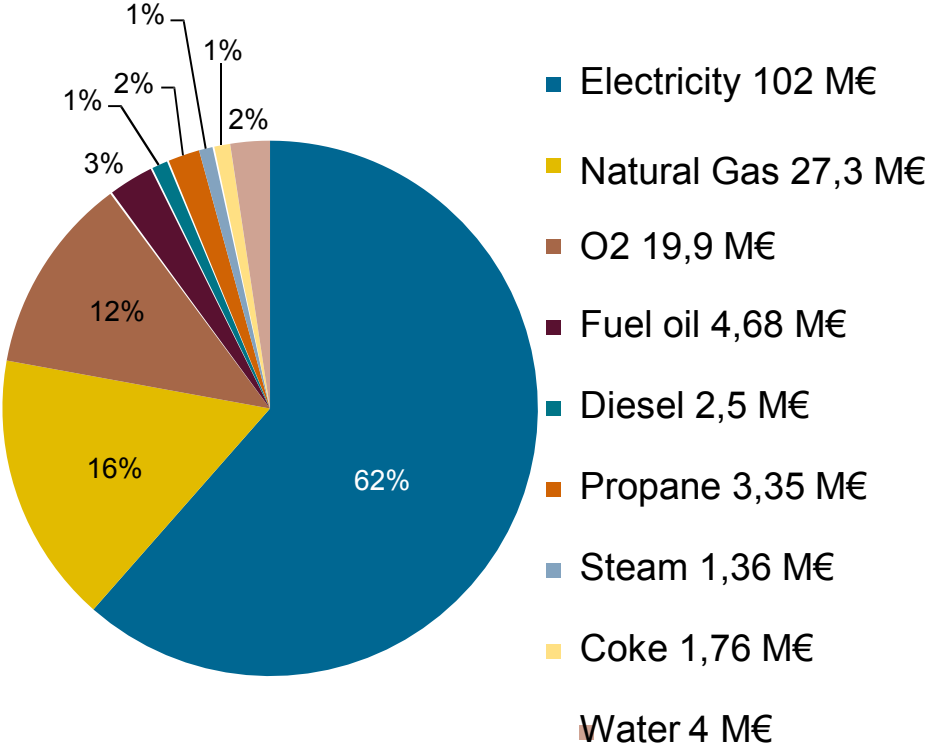
The Mix at Aurubis Group



Used energy, Aurubis Group FY 2016/2017



Energy cost allocation



» Total annual energy costs, Aurubis Group
€ 167 M

Background

- » Fight against climate change impacts energy regulation
- » Carbon reduction forces industries to change and challenge business model, processes and investments
- » CSR environmental reporting puts 'a burning glass' on public behavior

Challenges

- » Energy regulation has the potential to influence the energy intensive industry
- » Gas and water regulation adds further risks

Consequences

- » Regulatory related issues affect investment attractiveness and reputation
- » Energy costs are highest risk to commercial success and business model

Current Focus



Future Focus

- » Increase energy efficiency
- » Flexibilization of energy consumption
- » Decarbonization production processes
- » Process ore and scrap under energy and climate aspects
- » Marketing of carbon free copper
- » Analyze carbon capture and usage
- » Partner with suppliers/customers to force energy/emission savings

Decarbonization

What it means for Aurubis

Global targets

Paris Agreement

Limit climate change to less than 2°C
Support of climate adaptation and resilience
Climate financing

European targets & measures

Reduce carbon emissions by 80-95% by 2050
Integration of renewables

Clean Energy Package

Emissions Trading System

USA:
Paris Agreement exit
But „We're still in“

National targets

Germany
Klimaschutzplan 2050

The Netherlands
- Carbon Price Floor
- Coal phase out

Belgium
Coal Phase out completed

Bulgaria
Met climate target 2030
Met renewable target 2020

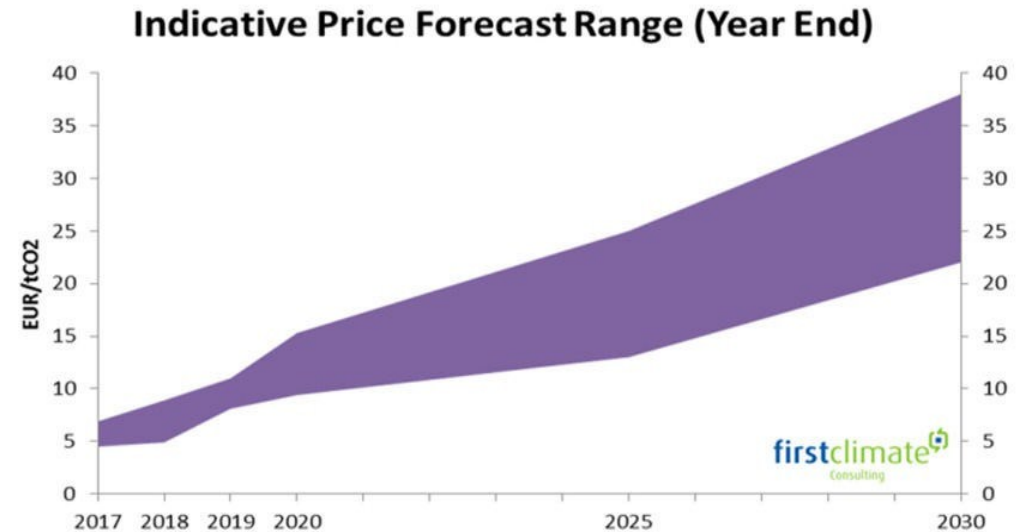
Italy
Coal Phase out until 2025

Finland
PPCA

Increased energy efficiency
Residual heat usage Flexibility
Renewable electricity
Circular Economy / Recycling / resource efficiency

Reduction of process emissions
Substitution of fossil fuels New production processes
New products
Carbon capture and Usage / Storage (CCU/CCS)

» Carbon Price will increase

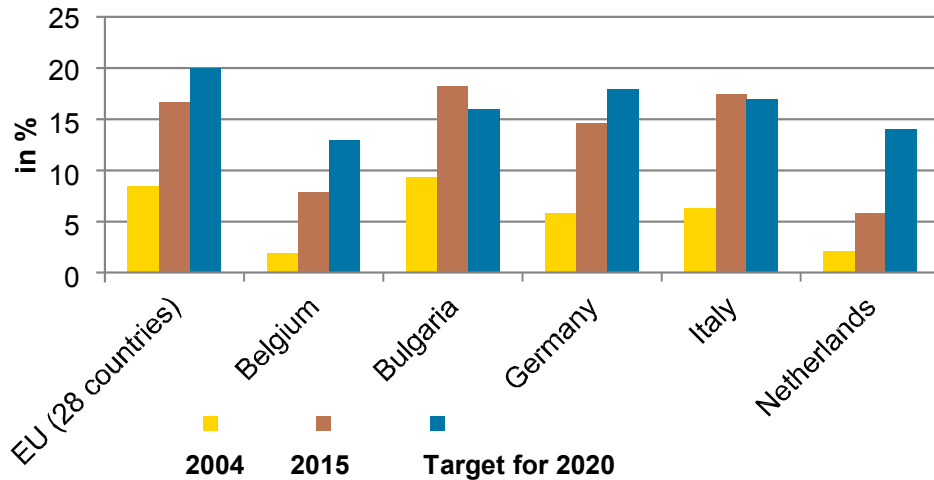


Source: Analyst survey conducted by Carbon Pulse, July 2017

Note: Markers on x axis are at year end (i.e. 2018 effectively denotes 31.12.2018)

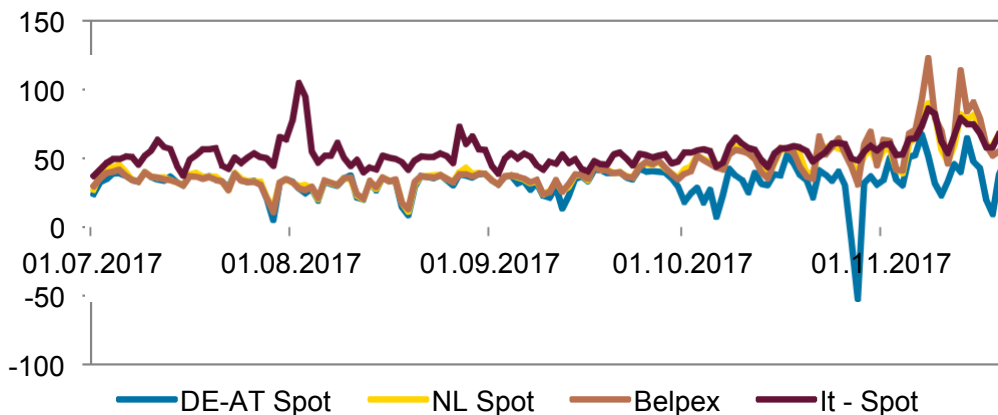
- » Price drop of sustainable technologies is happening and will continue
- » Reporting requirements on energy and climate topics will increase
- » Customers and suppliers face the same requirements and will push in the same direction

Share of RE on gross energy consumption



- » All EU-countries have set their renewable Energy targets for 2020 for the EU to reach its 20% goal
- » In 2030 the EU wants to meet a 27% Re-Goal EU-wide
- » Issues with renewable energy under current conditions:
 - » Not enough storability
 - » Fluctuating production
 - » Grid not feasible for decentralized production leads to fluctuating spot prices

Spot-electricity prices in different EU-countries



Demand Response in EU Member States with Aurubis Sites

» Countries **with** active Demand Response Systems:

- > Belgium
- > Finland
- > Germany

» Countries **without** Demand Response Systems:

- » Italy
- » Bulgaria
- » The Netherlands: only individual contracts

Reserves of Germany and Belgium:

	Minimum Size	Notification time	Activation method
Primary	1 MW	30 Seconds	Frequency control
Secondary (mainly Germany)	5 MW	5 Minutes	Remote Control
Tertiary	5 MW/ 1MW	15 Minutes	Remote Control

- Commercially active
- Partial opening
- Preliminary development
- Closed
- Not assessed



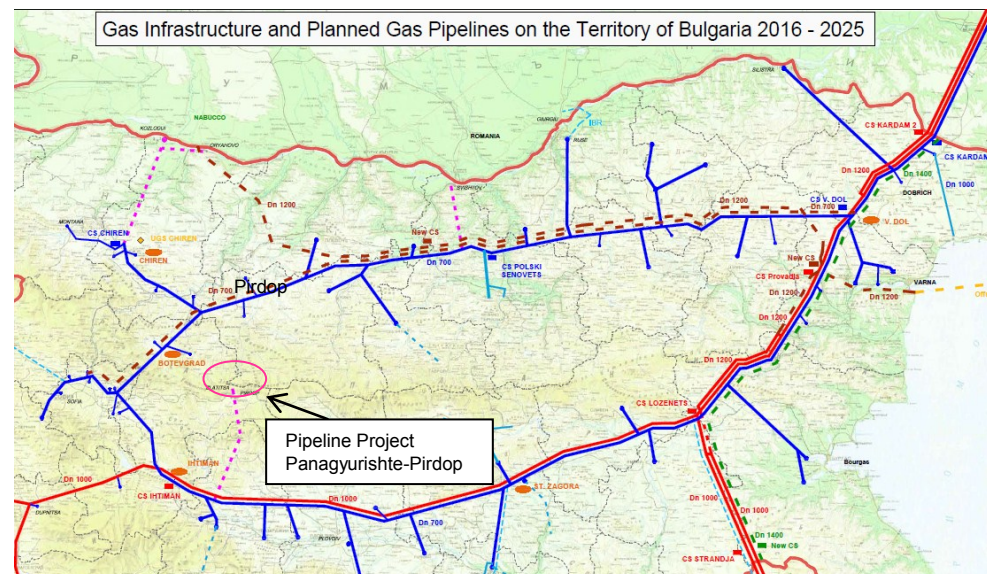
Figure 1: Map of Explicit Demand Response development in Europe today

» Interruptible Loads (Belgium, Germany, Finland)

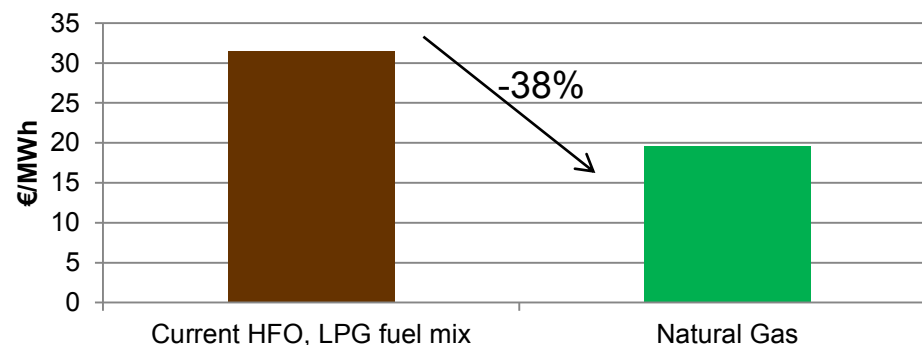
Countries are looking for potential electricity demanders to flexibilize their demand according to RE-electricity production. Demand Response cannot guarantee security of supply in cases of structural shortages.

Gasification of the Srednogorie Region in Bulgaria: CO₂ emission reduction and ensured competitiveness

- » Bulgartransgaz received a grant of 50% for the construction cost of a gas pipeline branch via Panagyurishte–Pirdop by the KIDSF*. The remaining 50% are financed by Bulgartransgaz.
- » Further delays could threaten the realization of the project
- » Substitution of Fuel Oil by natural gas will result in **31% CO₂ reduction** in general as well further harmful emissions and increase living standard in the entire region (13% reduction of Aurubis total CO₂-emissions).
- » Continuous supply with gas at **internationally competitive** prices is necessary for the industry within Srednogorie region.



Comparison of fuel costs



*KIDSF: Kozloduy International Decommissioning Support Fund

