The impact of shale gas on the Dutch chemical industry and AkzoNobel

Ludwigshafen, 22nd May 2014

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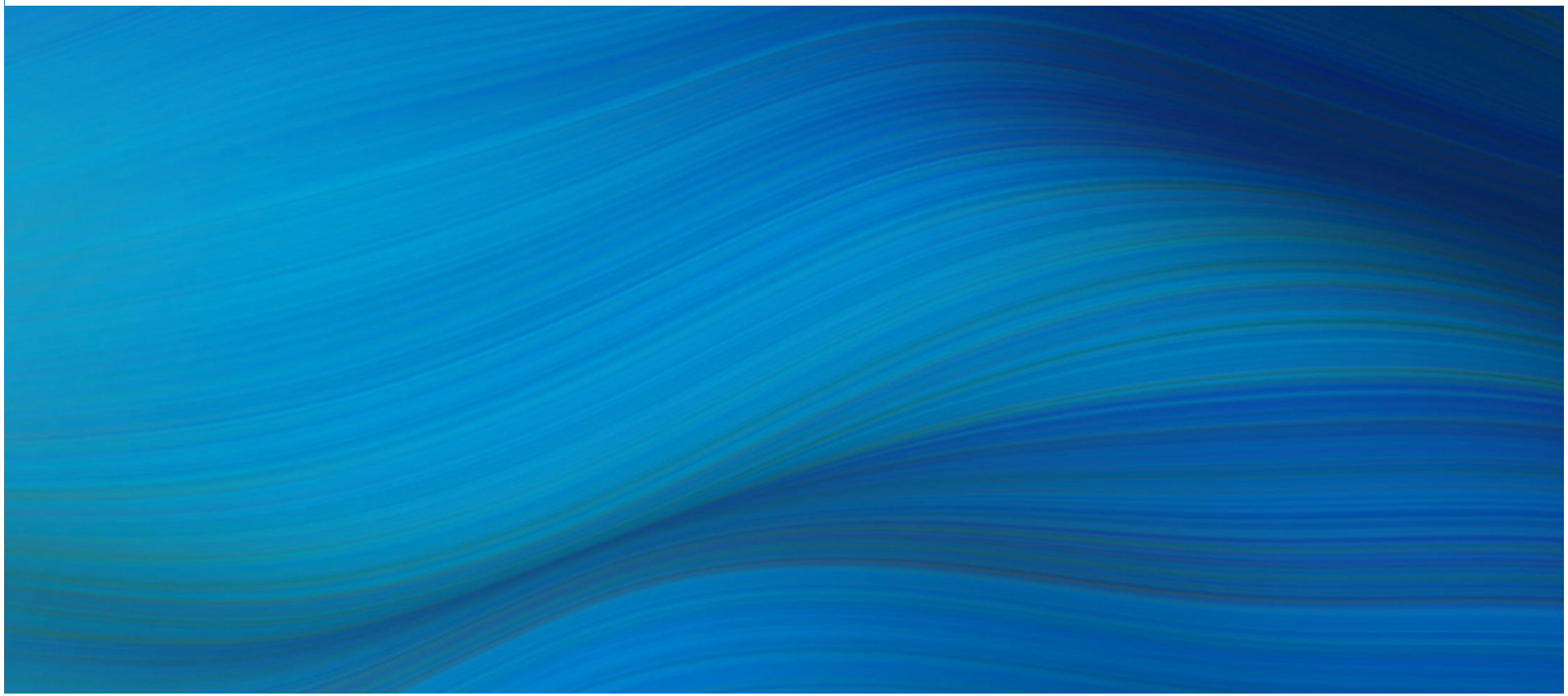
AkzoNobel



Agenda

AkzoNobel

- **Introduction to AkzoNobel**
- Shale gas effect on chemical feedstocks
- Impact of shale gas on the Dutch chemical industry
- Shale gas impact on AkzoNobel, and actions taken in biobased chemicals

Safe Harbor Statement

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This presentation contains statements which address such key issues as AkzoNobel's growth strategy, future financial results, market positions, product development, products in the pipeline, and product approvals. Such statements should be carefully considered, and it should be understood that many factors could cause forecasted and actual results to differ from these statements. These factors include, but are not limited to, price fluctuations, currency fluctuations, developments in raw material and personnel costs, pensions, physical and environmental risks, legal issues, and legislative, fiscal, and other regulatory measures. Stated competitive positions are based on management estimates supported by information provided by specialized external agencies. For a more comprehensive discussion of the risk factors affecting our business please see our latest Annual Report, a copy of which can be found on the company's corporate website www.akzonobel.com.

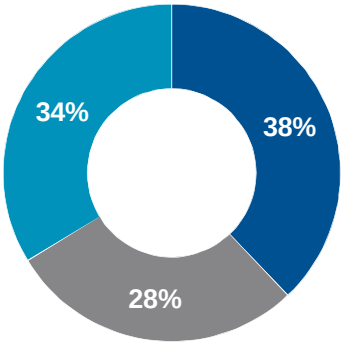
AkzoNobel today

AkzoNobel

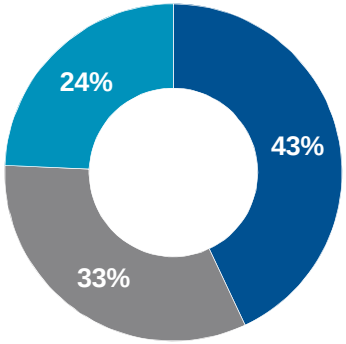
- Revenue €14.6 billion
- 49,560 employees
- 44% of revenue from high growth markets
- Major producer of Paints, Coatings and Specialty Chemicals
- Leadership positions in many markets

Dow Jones Sustainability Indexes
Sector Leader 2012/2013/2014

Revenue by Business Area

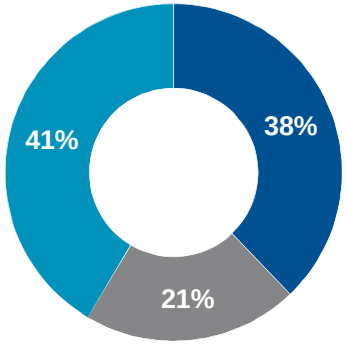


Operating income by Business Area



6.6%
Return on sales
(operating income/revenue)

EBITDA by Business Area



- Performance Coatings
- Decorative Paints
- Specialty Chemicals

10.4%
EBITDA/revenue

Market segments

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Buildings and Infrastructure

~43% of revenues

New Build Projects

Maintenance, Renovation and Repair

Building Products and Components

Transportation

~16% of revenues

Automotive OEM, Parts and Assembly

Automotive Repair

Marine and Air Transport

Consumer Goods

~16% of revenues

Consumer Durables

Consumer Packaged Goods

Industrial

~25% of revenues

Natural Resource and Energy Industries

Process Industries

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Shale gas is a new source of natural gas which has boomed in the US

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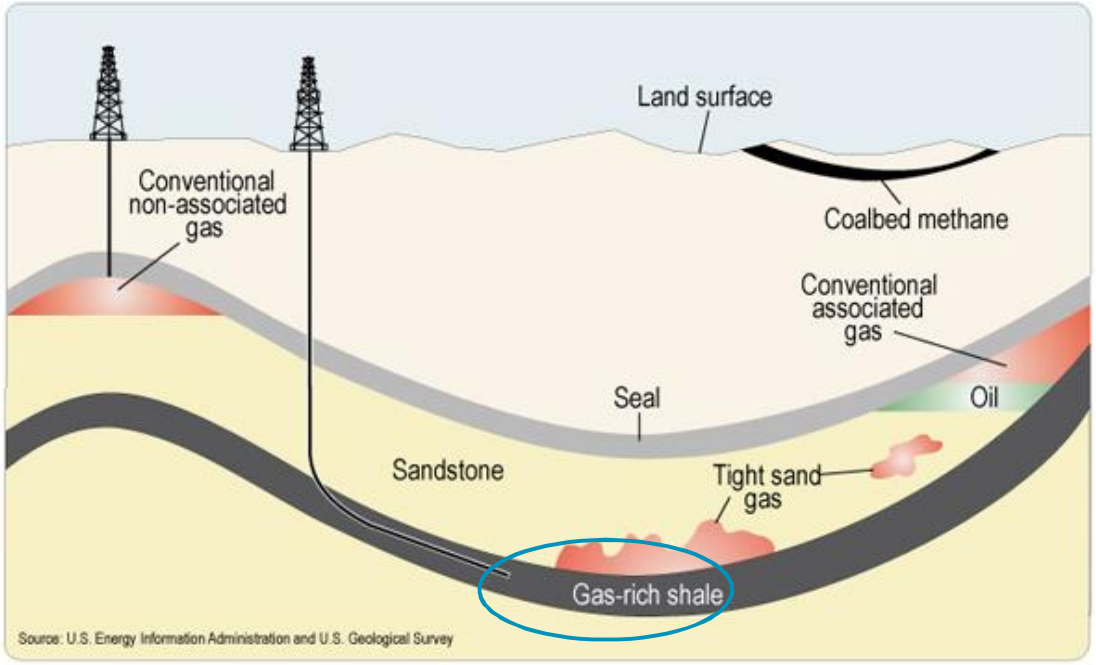
Natural gas sources



Shale gas characteristics

- Horizontal drilling and hydraulic fracturing ('fracking') allow economical access to shale gas
- In the US, use has risen quickly, with currently >35% of dry gas originating from shale
- Concerns about pollution, climate change and safety impacts have so far avoided wide exploitation outside US
- Shale gas compositions vary. 'Wet Gas' (>10% ethane and heavier hydrocarbons) is currently most valuable because ethane and heavier hydrocarbons are in demand for Chemical use. 'Dry Gas' contains > 90% methane

Source: EIA

Increased use of shale gas as hydrocarbon feedstock is affecting the global mix of ethylene, propylene, BTX and others …

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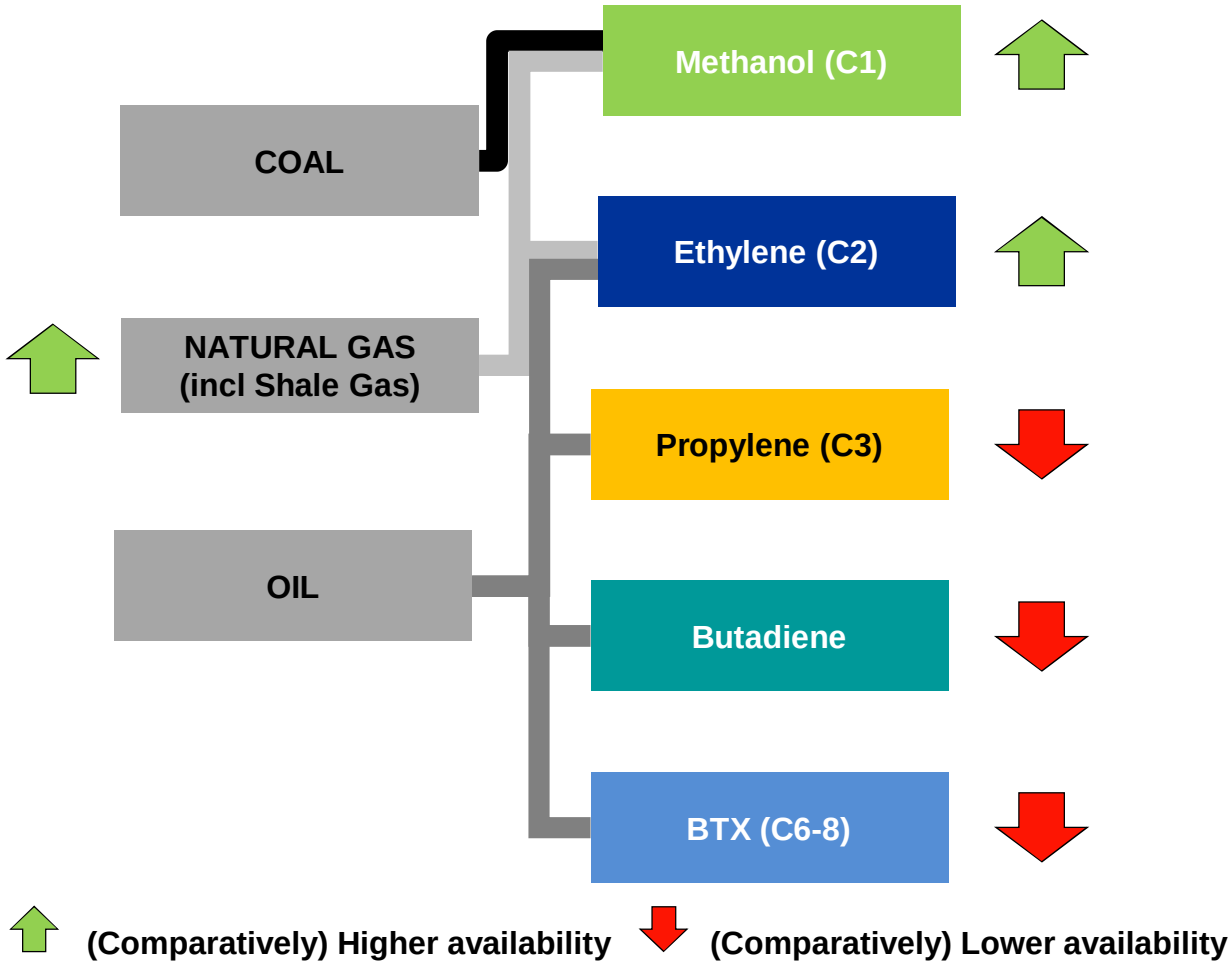

BTX = Benzene, Toluene, Xylenes (also called Aromatics)

… resulting in lower production costs for ethylene and energy in US, while propylene and BTX are going up

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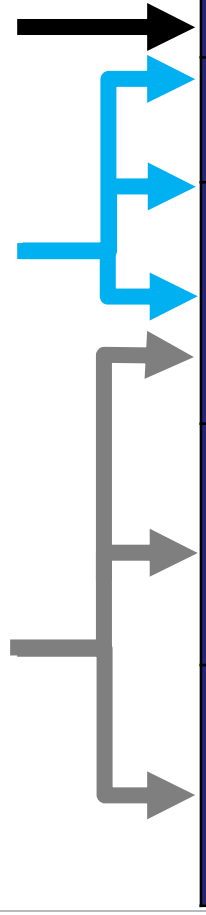
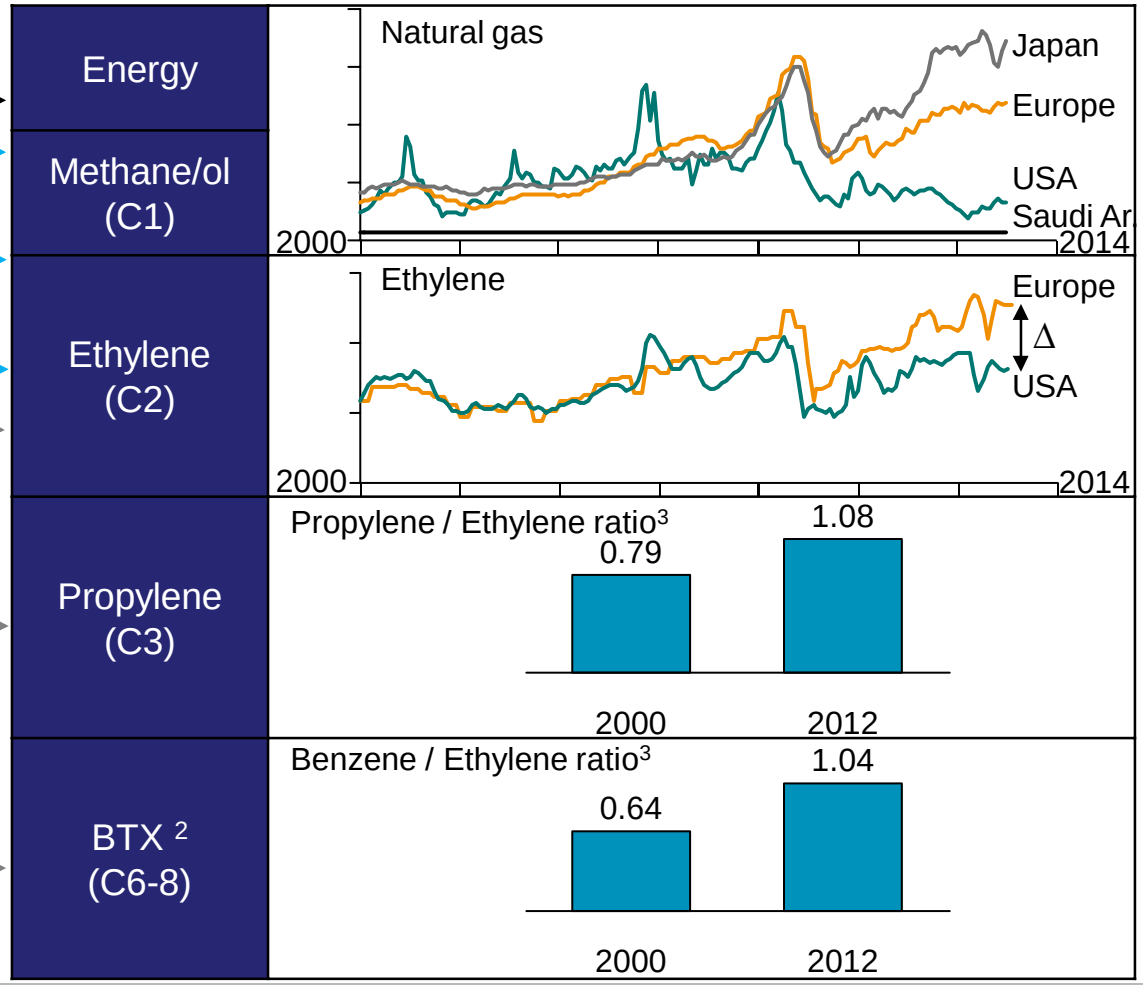
Main flows of hydro-carbon sources [1]



Price trends



1. For purposes of simplification, only main flows are shown (other flows are possible but less common)
2. BTX = Benzene, Toluene and Xylenes, also referred to as Aromatics
3. Average of NW Europe, USA, and China/Asia

Late 2012 we estimated the total cost disadvantage for the EU chemical industry could be as much as >20 bln EUR or 4% of sales

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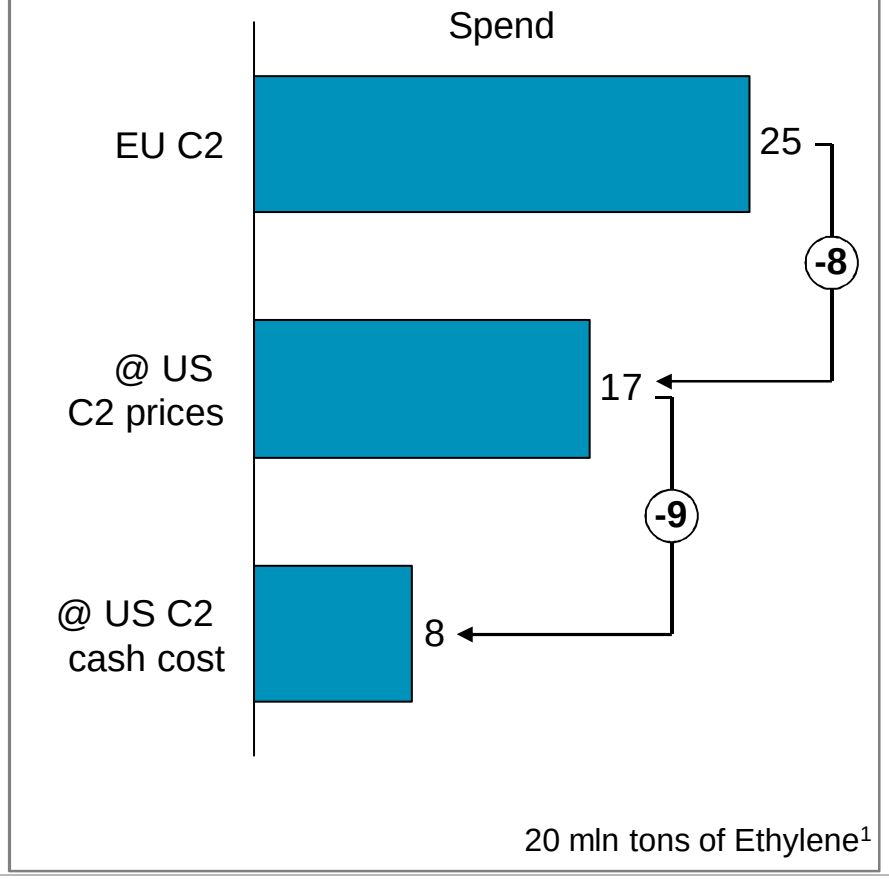
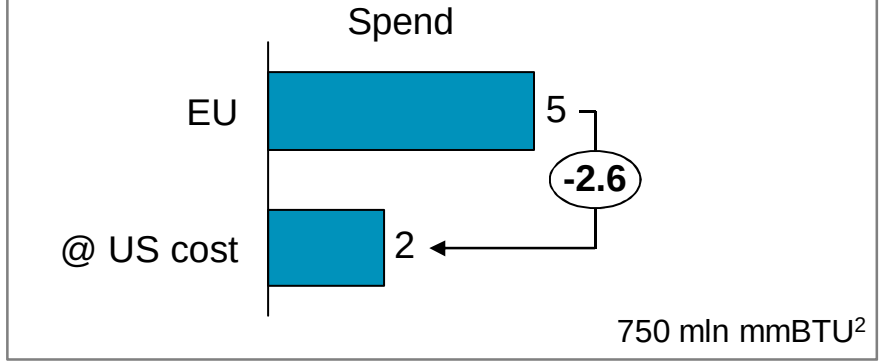
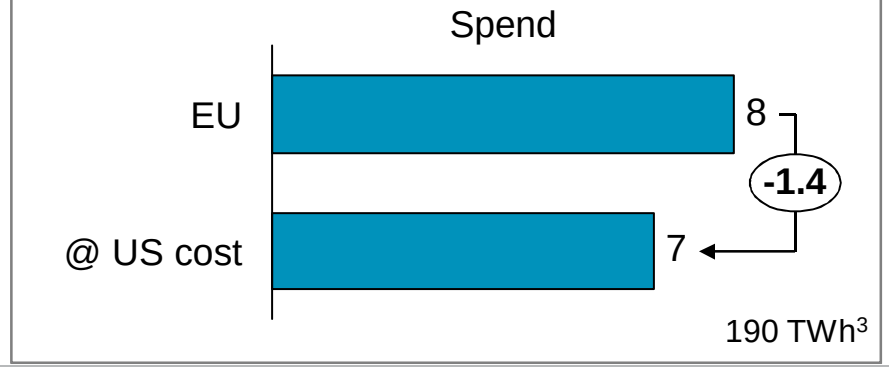
C2 price disadvantage Europe (bln EUR)



Gas price disadvantage (bln EUR)



Electricity price disadvantage (bln EUR)



[1]400 EUR/mt market price advantage, 550 EUR/mt cash cost advantage; [2]US 3.5 USD/mmBTU, EU 8 USD/mmBTU; [3]45 USD/MWh (34.75 EUR/MWh) vs. EU approx. 42 EUR/MWh

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The Dutch chemical industry is responsible for 8% of the total amount of goods and services produced

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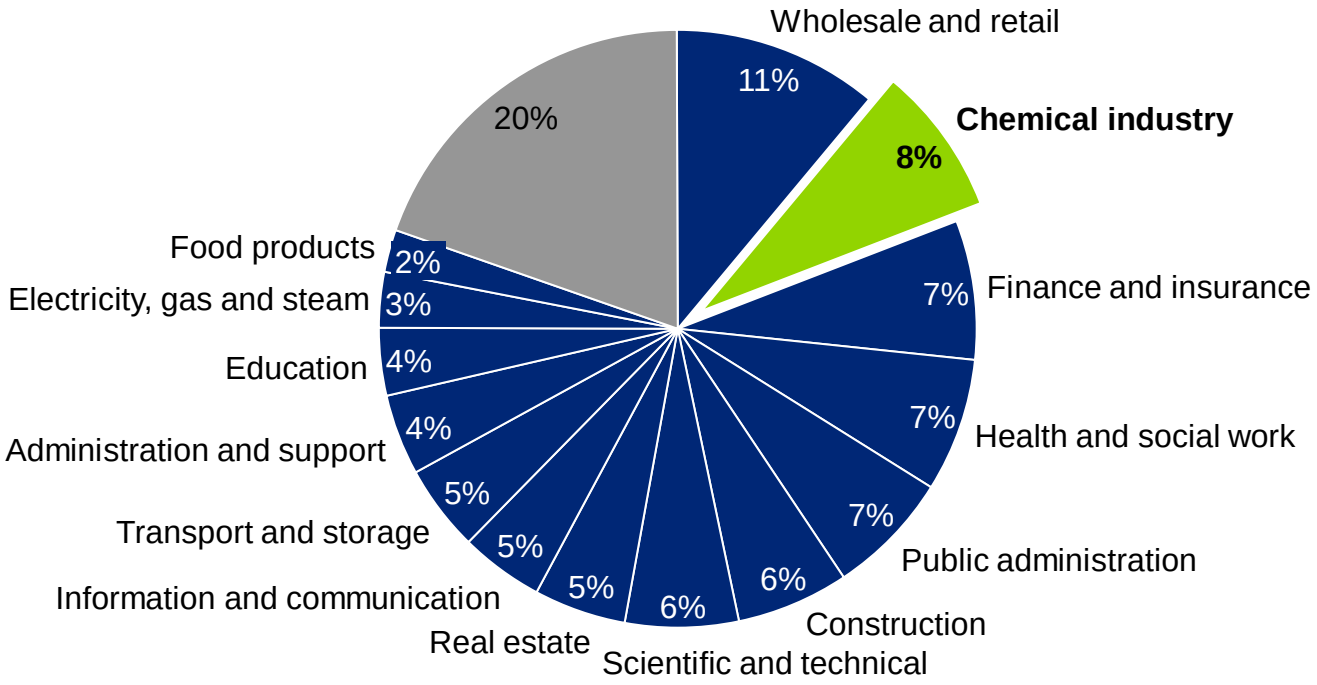
Segmentation of Dutch output*
€ Bn, 2010



* Output: the amount of goods and services produced in €

The Dutch chemical industry employs ~79 000 FTE

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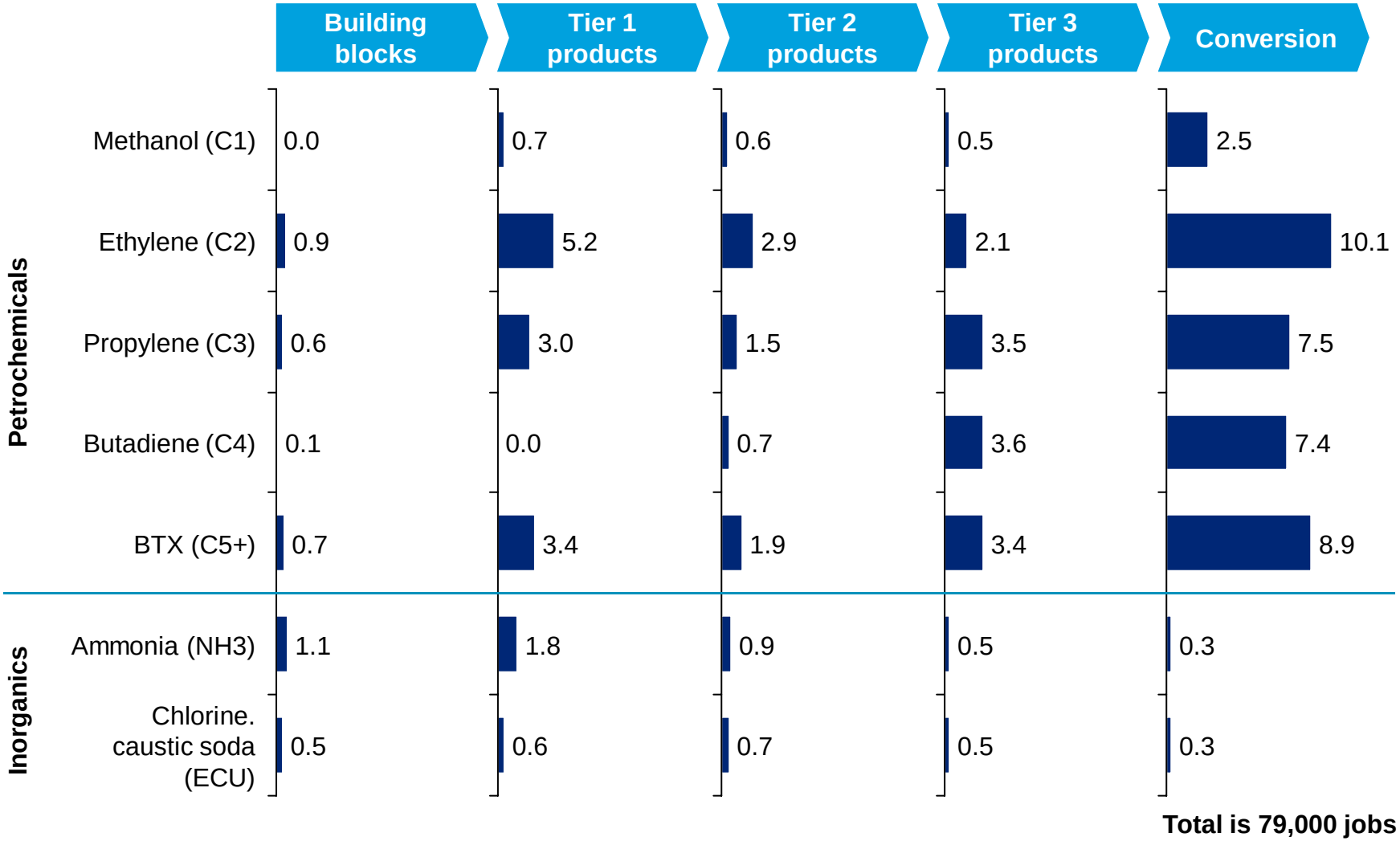

Source: ME&R Practitioners Energize Session/GdV/vp (CBS, VNCI, Deloitte analysis); © 2013 Deloitte The Netherlands

Furthermore, over 400 000 indirect jobs depend on the chemical industry – ultimately 8% of GDP and 20% of export

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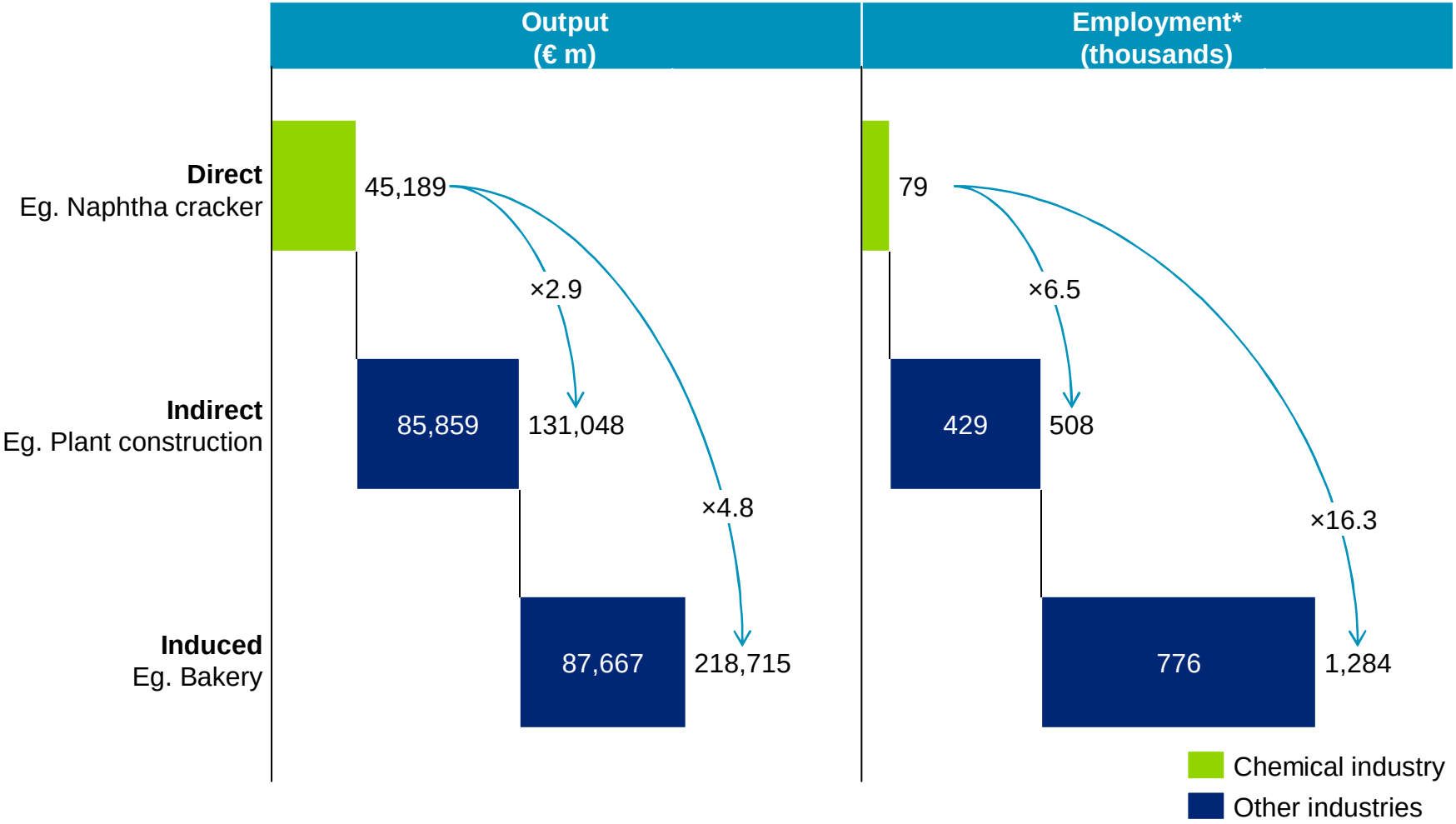

* Multipliers are calculated for chemicals and pharmaceuticals and multiplied for employment of chemicals and converters
Note: Multipliers are generally used for calculating small differences and may overstate the realistic effects due to underlying assumptions
Source: ME&R Practitioners Energize Session/GdV/vp (OECD, Deloitte analysis);

Within the chemical industry, 22 500 jobs are in segments which have a weaker position as a result of US shale gas

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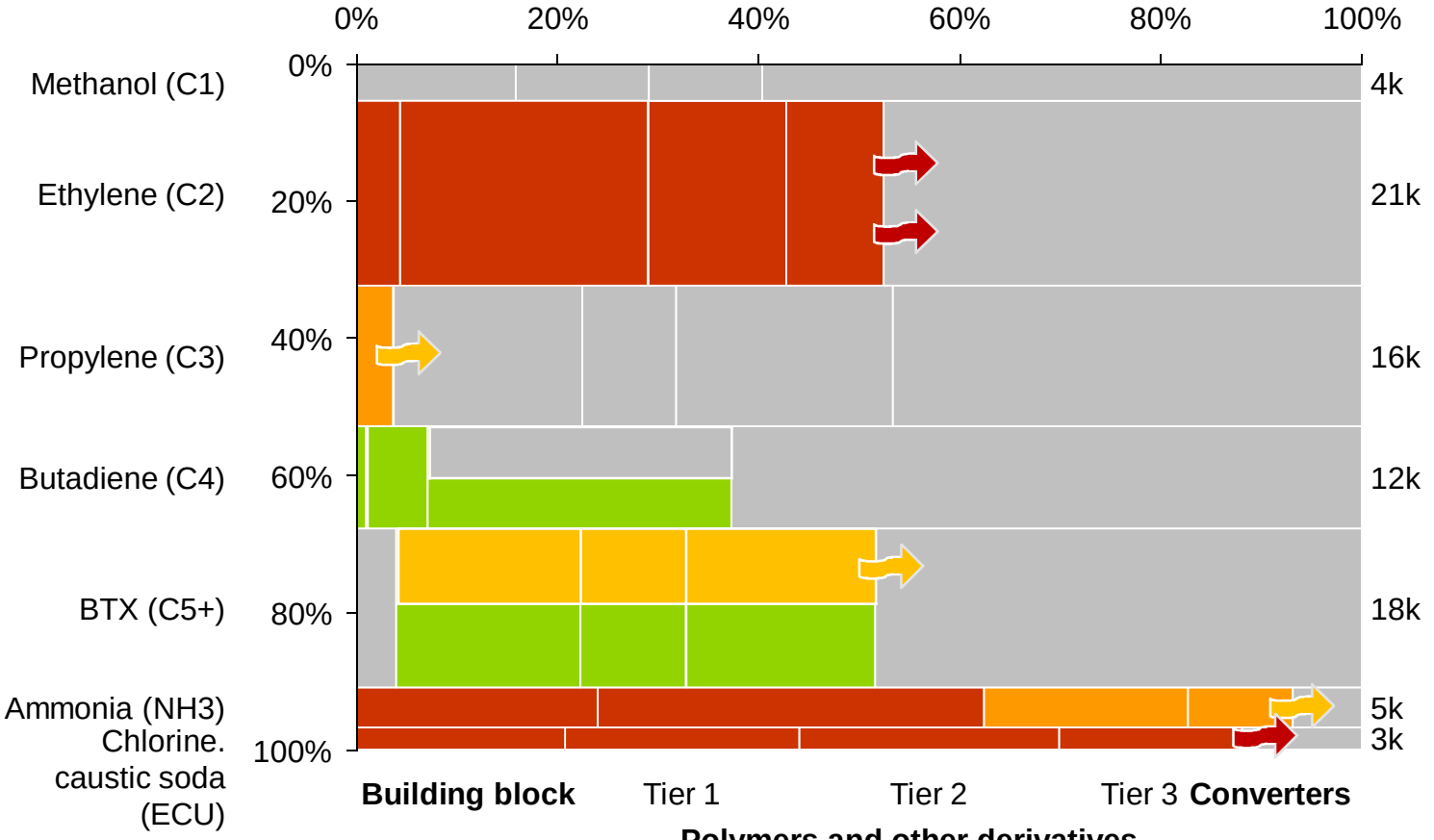

	Substantially weaker competitive position		Weaker competitive position		Neutral competitive position		Potentially stronger competitive position	
Direct jobs impacted	16.3	21%	6.3	8%	49.2	62%	7.0	9%
Revenue impacted	€ 21.1 bn	35%	€ 7.8 bn	13%	€ 24.3 bn	40%	€ 7.0 bn	12%

Source: ME&R Practitioners Energize Session/GdV/vp (CBS, Deloitte analysis)

Investments due to shale gas have a large negative effect on the production of building blocks in Europe

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Conclusions		Building Block producers
Petro-chemicals	Methanol (C1)	• Methanol production uses natural gas as its most important feedstock • US will become self sufficient where it previously imported 10% of worldwide demand
	Ethylene (C2)	• Shale gas has caused the creation of the US as a second low cost producing region of ethylene next to the Middle East • Ethane crackers in the US have high margins and more capacity is expected
	Propylene (C3)	• Shale gas has made the on-purpose production of propylene in the US competitive compared to Naphtha crackers • Capacity increase in the US is expected, but this is mainly for domestic use
	Butadiene (C4)	• The only economically viable production of butadiene is with naphtha crackers • Capacity can be increased by extracting butadiene from recycle streams, there are little shale gas benefits and this can be expected around the world
	BTX (C5+)	• BTX are produced via naphtha cracking and with on-purpose(refinery) processes • the prices are related to the gasoline value due to it's use as blend component • In the C5+ stream are other products that have significant value for use in resins
Inorganics	Ammonia (NH3)	• Ammonia uses natural gas as it's most important feedstock • The end market is in fertilizers which is a global market • Capacity expansion is announced in the US
	Chlorine & Caustic soda (ECU)	• Chlorine production is extremely energy intensive • US exports of PVC and caustic Soda are expected to increase drastically

Severe impact | Medium impact | Neutral impact | Potential opportunity

Source: ME&R Practitioners Energize Session/GdV/vp (Deloitte analysis)

For tier 1 companies the outlook is negative, although potential opportunities exist within methanol and butadiene

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Conclusions

		Tier 1
Petro-chemicals	Methanol (C1)	• Methanol can be transported easily • Capacity currently imported by the US will be targeted to Europe decreasing the prices of methanol
	Ethylene (C2)	• Ethylene capacity expansion in the US will be exported for a large portion as polyethylene
	Propylene (C3)	• no clear advantage for propylene derivatives, despite increase in (cheap) PDH derived propylene, FCC splitters will continue be the marginal producer keeping propylene prices at least at parity with Europe
	Butadiene (C4)	• The unbalance in ethylene and butadiene cannot be solved easily creating high prices for butadiene worldwide, but Europe will benefit from domestic production
	BTX (C5+)	• Despite expensive benzene, styrene (a key derivative) exports from the US are up 10-15% driven by low ethylene and competitive production costs • Benzene derivatives without ethylene exposure may be disadvantaged in the US
Inorganics	Ammonia (NH3)	• Increased domestic production of fertilizers in the US creates oversupply for current exporters • Fertilizer production in Europe and the Netherlands will experience price pressure
	Chlorine & Caustic soda (ECU)	• Cheap ethylene and Chlorine prices in the US creates a huge benefit for US producers of EDC, VCM and PVC • European producers of chlorinated hydrocarbons will be highly disadvantaged

Severe impact | Medium impact | Neutral impact | Potential opportunity

Source: ME&R Practitioners Energize Session/GdV/vp (Deloitte analysis)

Tier 2 and 3 companies will also be impacted by the shale gas revolution

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Conclusions		Tier 2 and tier 3
Petro-chemicals	Methanol (C1)	• Cheaper methanol and derivatives benefits the tier 2 and 3 companies in the value chain
	Ethylene (C2)	• Ethylene oxide is after polyethylene the most important derivative • Ethylene oxide is difficult to transport hence competitive pressure from North America will manifest itself through imported derivatives
	Propylene (C3)	• The supply increase as in ethylene is not as fierce in propylene
	Butadiene (C4)	• The unbalance in ethylene and butadiene cannot be solved easily creating high prices for butadiene worldwide, but Europe will benefit from domestic production, though Butadiene products are mostly copolymers
	BTX (C5+)	• BTX prices are based on gasoline value
Inorganics	Ammonia (NH3)	• Ammonia derivatives from exporting countries will target Europe because of the lack of demand from the US
	Chlorine & Caustic soda (ECU)	• Chlorinated hydrocarbons will be transported as polymers to Europe, because this is the easiest transported product

Severe impact | Medium impact | Neutral impact | Potential opportunity

Source: ME&R Practitioners Energize Session/GdV/vp (Deloitte analysis)

In short, there are some serious downsides on shale gas for the chemical industry, although there are also some opportunities for specialisation

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Key findings

The shale gas effect has resulted in an energy and feedstock advantage in the US. We expect this to last at least the coming decade, but likely up until 2030

The EU C_2 and vinyls chains will be significantly disadvantaged with ethylene cost prices 700$/ton higher than in the US, which will result in capacity rationalization, barring policy measures

Shale gas also offers opportunity, eg. for butadiene however this will not offset the disadvantages of C2 and vinyl's on the cluster

Due to our integrated, cluster nature, the effects on the C_2 and vinyls chains will have spill-over impacts on other, less impacted value chains like propylene, aromatics

Progressive decline of the Dutch chemical industry would affect the innovative capability of our manufacturing industry, indirectly affecting hundreds of thousands jobs

Source: ME&R Practitioners Energize Session/GdV/vp

There are mitigating factors, and the industry should remain focused on realising the original 2030/2050 vision ...

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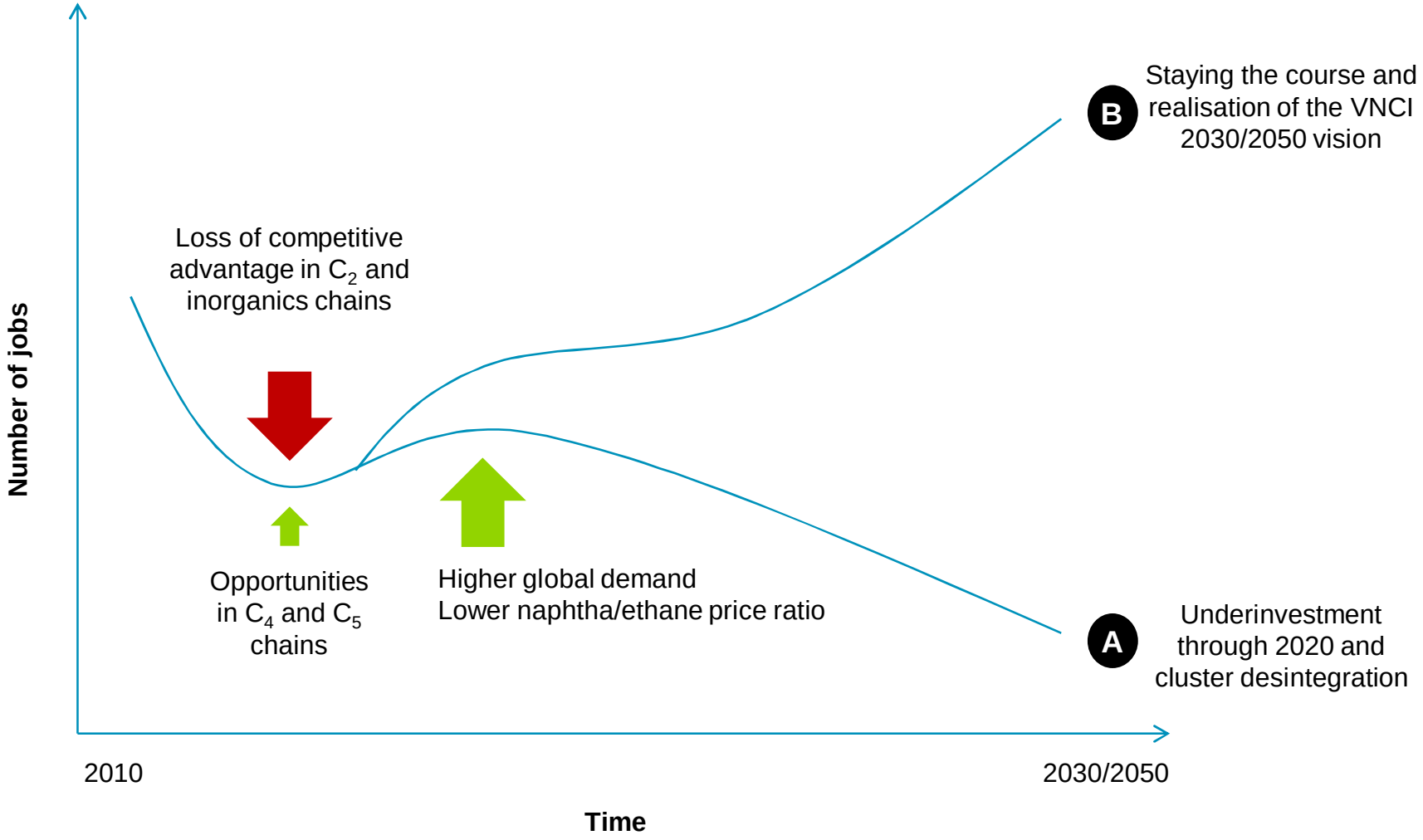

Source: ME&R Practitioners Energize Session/GdV/vp

… which emphasizes to work on four aspects to maintain a world-class cluster

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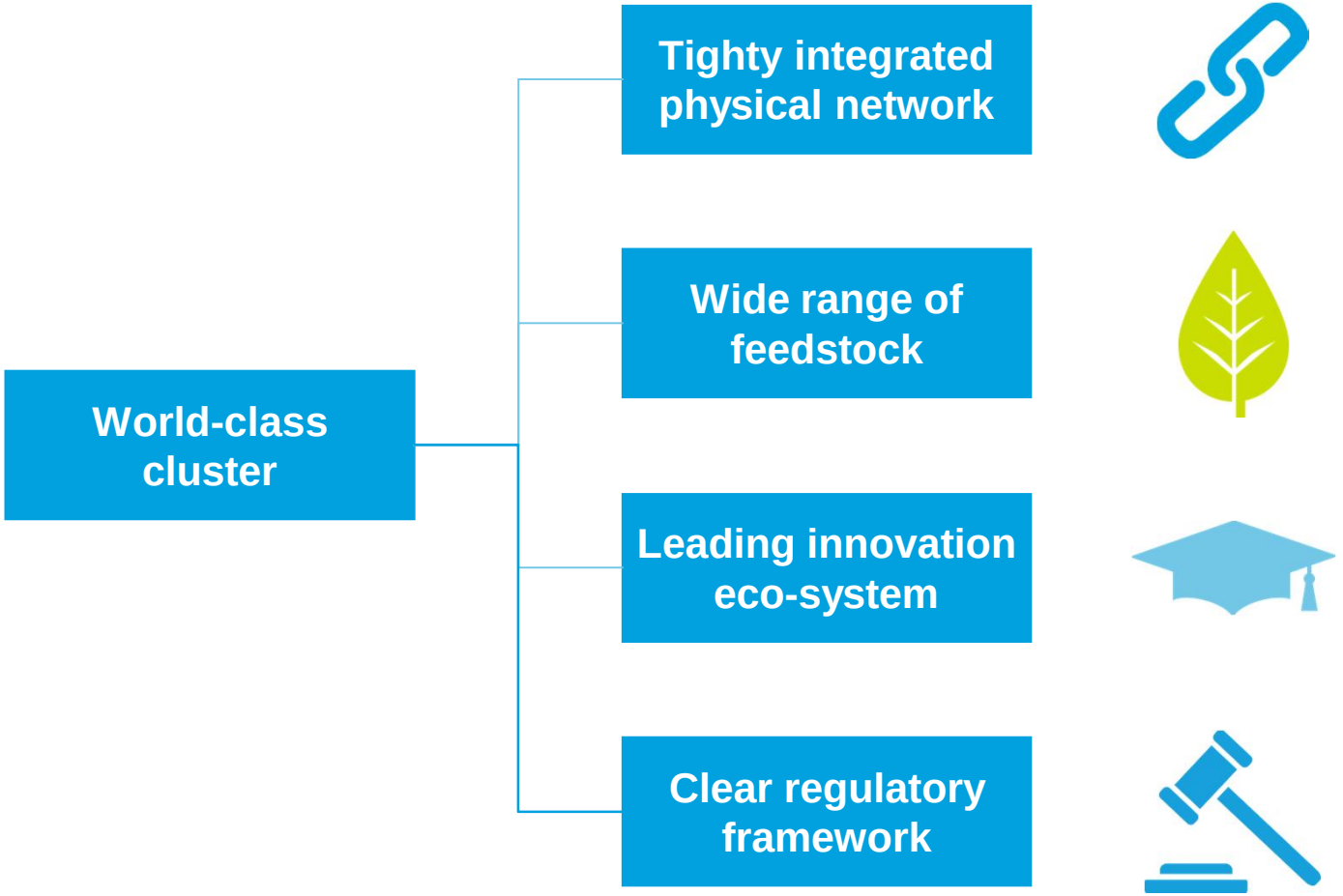
Long term vision NL chemical industry



Source: ME&R Practitioners Energize Session/GdV/vp

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In a shale-gas world, we see biobased chemicals as a way to reduce cost and differentiate our products

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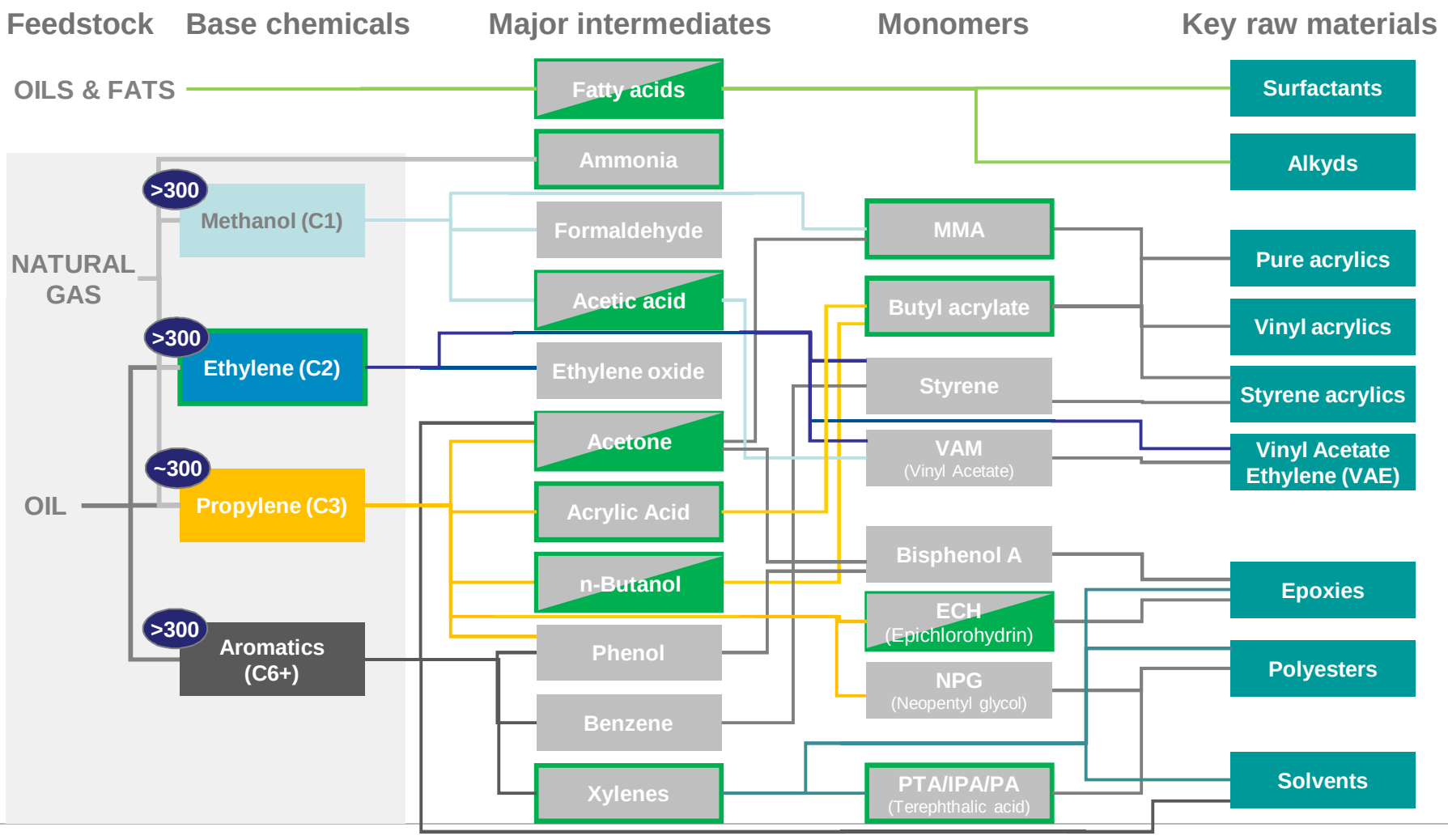
Major organic raw materials



Materials in scope

Volume in kT (incl derivatives)

We have so far announced four partnerships, and are working on a few more

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Biobased Partnerships

Biobased solvents LatAm

- **Partnership with Solvay-Rhodia** targeting volumes of up to 10 ktpa of biobased solvents by 2017, through
  - Joint formulation of Augeo type solvents into our coatings
  - Supplies of biobutanol and –acetone as drop-in

Algae-derived fatty acids

- **Partnership with Solazyme** to develop two novel fatty acids, and a supply agreement for drop-in as of 2014 in Brazil
  - For use in Surfactants and Decorative Paint applications

Biobased epichlorohydrin

- **Partnership with Solvay** to develop a chain-of-custody approach to biobased epichlorohydrin used in AkzoNobel's epoxies
  - Increase to 20% of AkzoNobel indirect use of ECH by 2016

Biobased acetic acid

- **Partnership with ZeaChem** on the feasibility of a commercial scale cellulosic acetic acid production facility in the EU or the US

tbd

Trusted portfolio of global brands

AkzoNobel

Thank you for your attention