COP 23 in Bonn

cefic

Future Oriented Chemistry

How we can deliver on the Paris Agreement…

2 Studies in 2017: Ecofys and Accenture

Peter Botschek - 6 November 2017

Ecofys Report (2017): The essential role of chemicals

Quantifying the global potential

- Evaluates the chemical industry's contribution to currently realized annual "avoided emissions", as well as contribution to annual "avoided emissions" potential with a maximum implementation level

- Examines "avoided emissions" in 2030
  - *Avoided emissions in scenarios*
  - *Policy options in 2030*

Methodologies

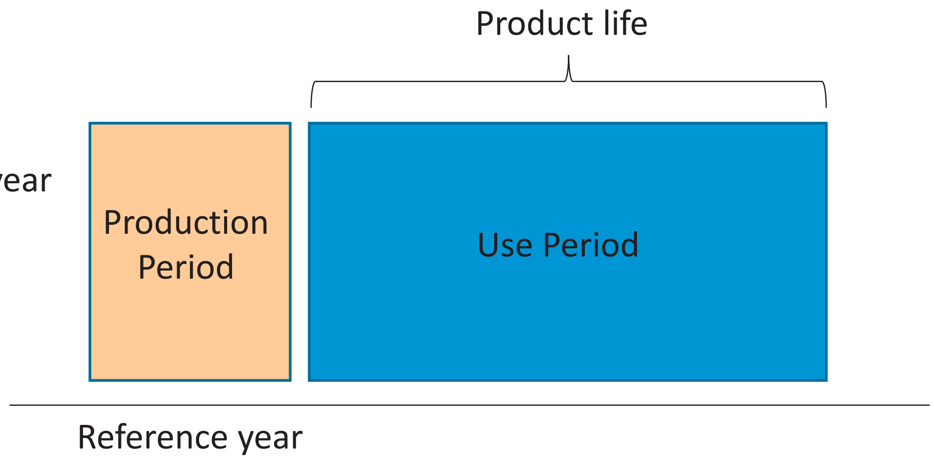
- ***Stock-based approach to assess annual avoided emissions***

Item	Phase 1	Phase 2
Purpose of the study	Identify current GHG reduction contribution and maximum reduction potential using chemicals	Assess chemicals contribution in scenarios for 2030
Level in the value chain	End-use level	End-use level
Solutions to compare	**Selected Product groups vs. Market average**	**IEA 2DS vs. 6DS** (Higher implementation rate of selected product groups in 2DS)
Time & geographic ref.	2012/World	2030/World
Scenarios	-	IEA ETP-2015 2DS and 6DS
Stock vs. Flow	**Stock based**	**Stock based**
Life cycle	Full life cycle	Use phase
Attribution	Qualitative	Qualitative

Stock-based vs. Flow-based (again)

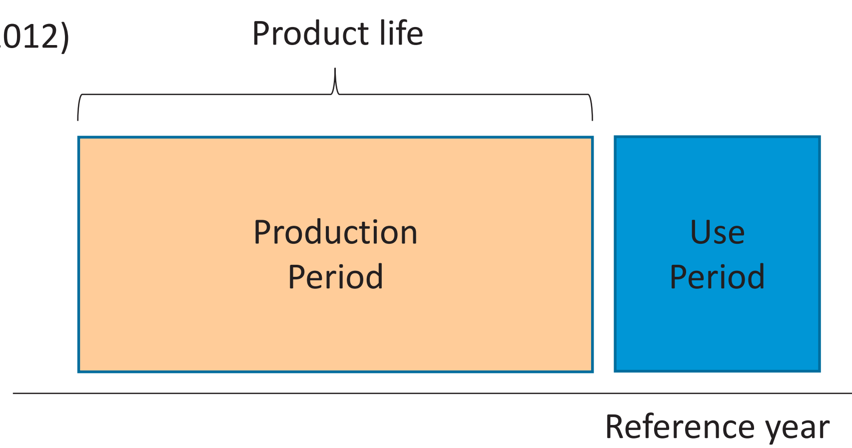
Flow-based

- **Material flow** for production in the reference year
  (e.g. 1 ton of products produced in 2012)
- **Emissions reduction over a product life**
  (e.g. 20 ton of CO2 reduction
  per 1 ton of products over 50 years)



Stock-based

- **Product stock** in the reference year
  (e.g. 50 ton of products used in the market in 2012)
- **Annual emissions** in the reference year
  (e.g. 1,000 ton of CO2 reduced in 2012)



Selected Product Groups

- ***Most impactful product groups were selected in most relevant value chains.***

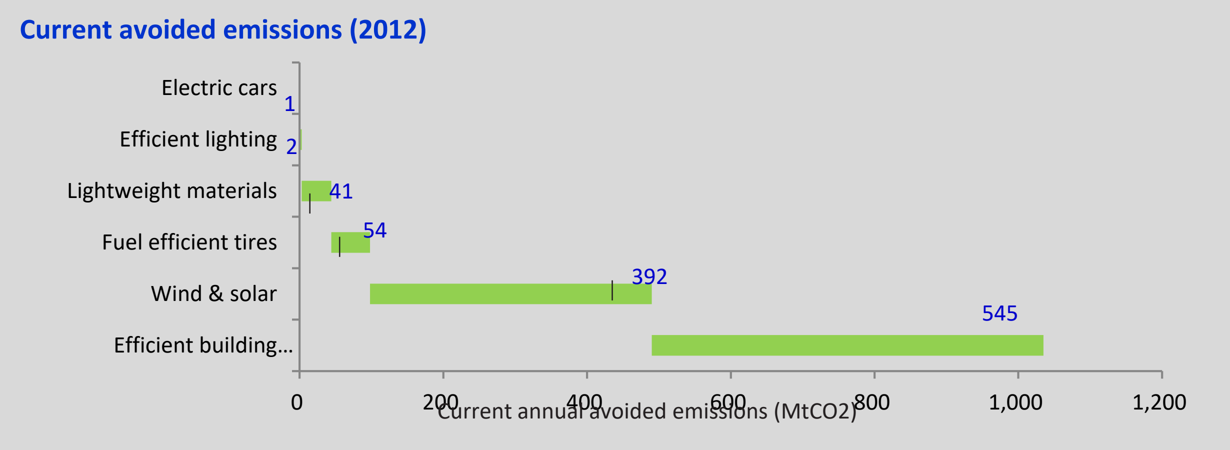
Product Group	Current GHG emissions	Chemical Products
Buildings *Insulation (Residential heating)* *LED lighting*	*Buildings: 30% of final energy demand* *Residential space heating: **2.2** Gton CO2* *Lighting: **1.3** Gton CO2*	*Polymeric insulation materials* *Gases, phosphors, sealants etc.*
Transport *Fuel-efficient tires* *Lightweight materials* *Electric cars*	*Transport: 27% of final energy demand* *Light-road passenger transport: **4.4** Gton CO2*	*Synthetic rubbers and silica* *Engineering plastics, CFRP etc.* *Li-ion battery materials*
Renewable Power *Wind power* *Solar power*	***13.4** Gton CO2 (38% of energy related CO2 (1))*	*Gear oil, resins, paints, CF* *Poly-Si, gases, sealants, films etc.*
Food Packaging *Beef packaging*	*Agriculture: **5** Gton of non-CO2 emissions plus 5 Gton of LULUC emissions (2)*	*Plastic films, trays*

Note (1): Total energy related CO2 emissions in 2012, 34.5 Gton (Data from IEA ETP-2015)
Note (2): Data form IPCC AR5 WG3 Chapter 11

Results

■ Annual avoided emissions with stock-based approach

- Currently contributing to avoided emissions of 1.0 Gt

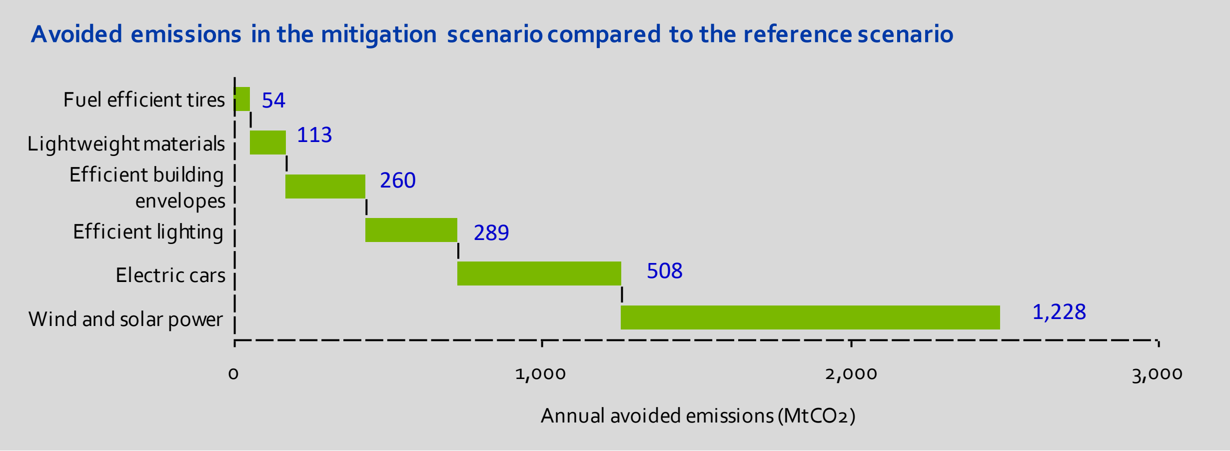


- Maximum potential of contributing to avoided emissions of 9.1Gt

Results

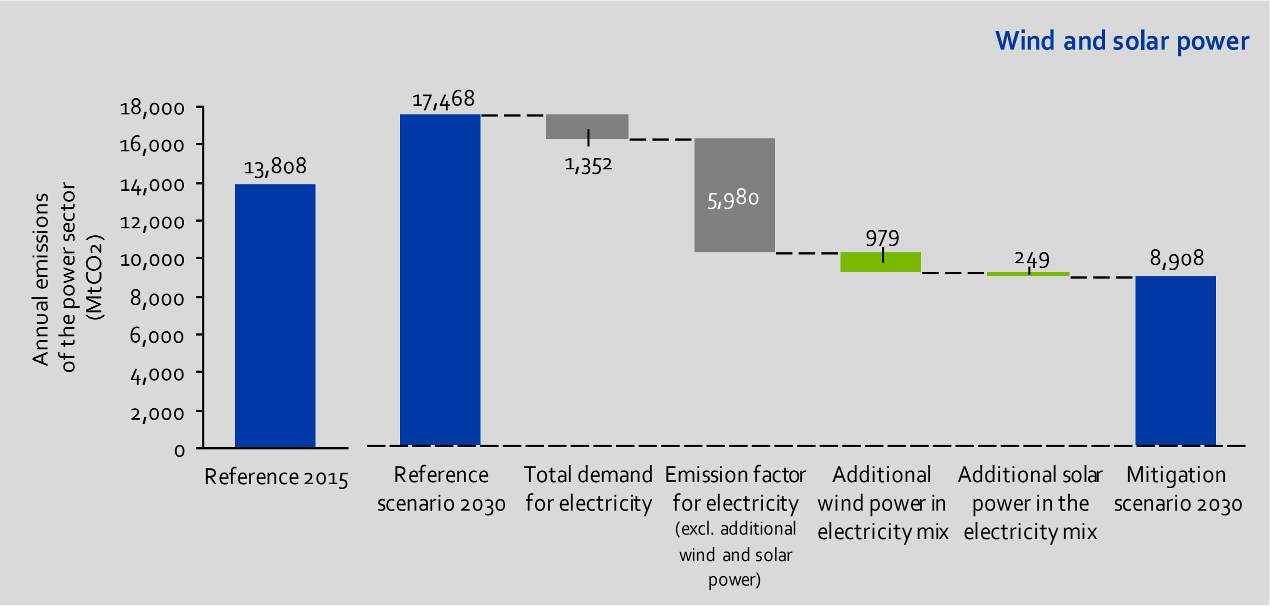
- **2.5 Gt of annual avoided emissions in 2030 based on IEA-ETP scenarios**

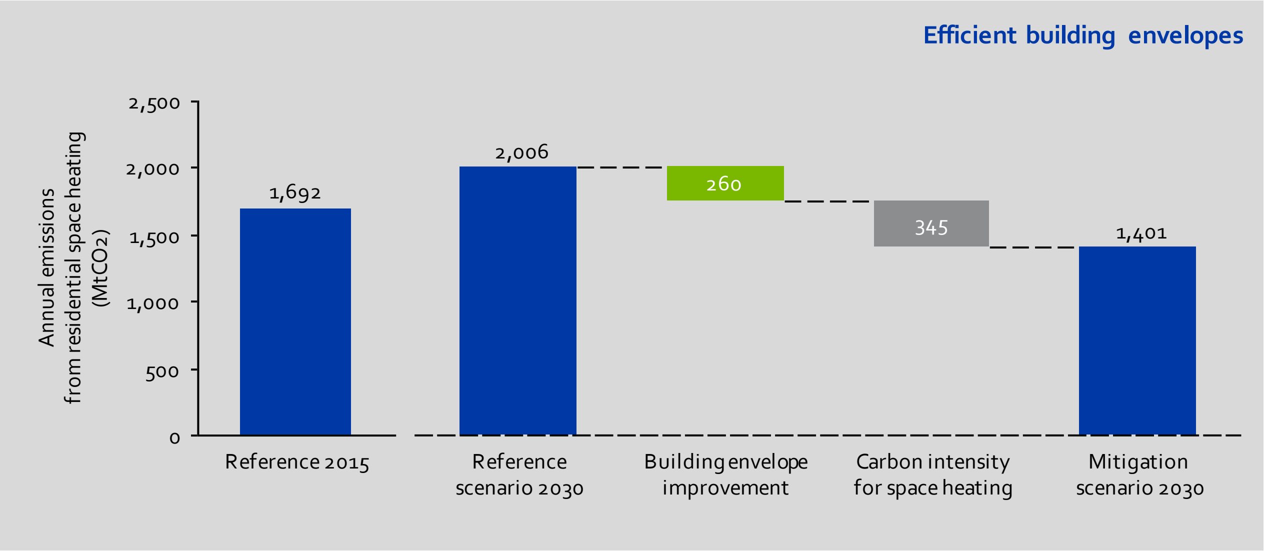
  Equivalent of 15% of CO2 reduction from 44.5Gt (6DS) to 27.3Gt (2DS)



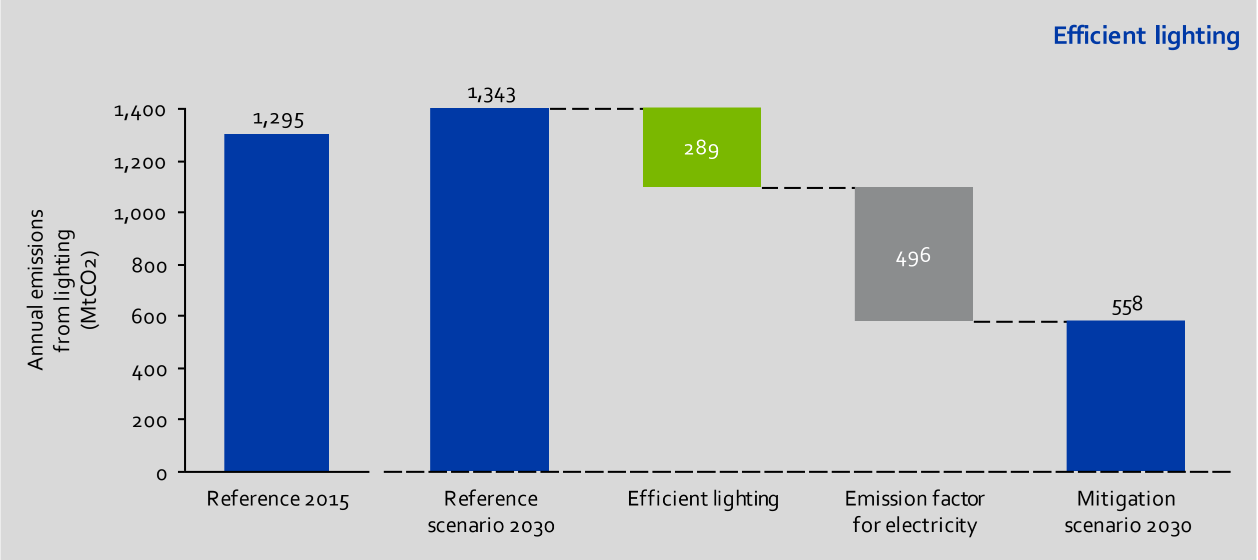
- Largest reduction contribution is found in **renewable power**
- In transport, contribution is marked in **electric cars**
- In transport, **lightweight materials**' contribution will be **two times larger**, circa 300 Mt, if consequential effect of engine downsizing is also taken into account.
- In **buildings envelope**, **contributions will double** if cooling and commercial buildings are considered.
- **IEA-ETP 6DS (BAU)** assumes 18% of floor area is equipped with BPT of insulation in 2030.

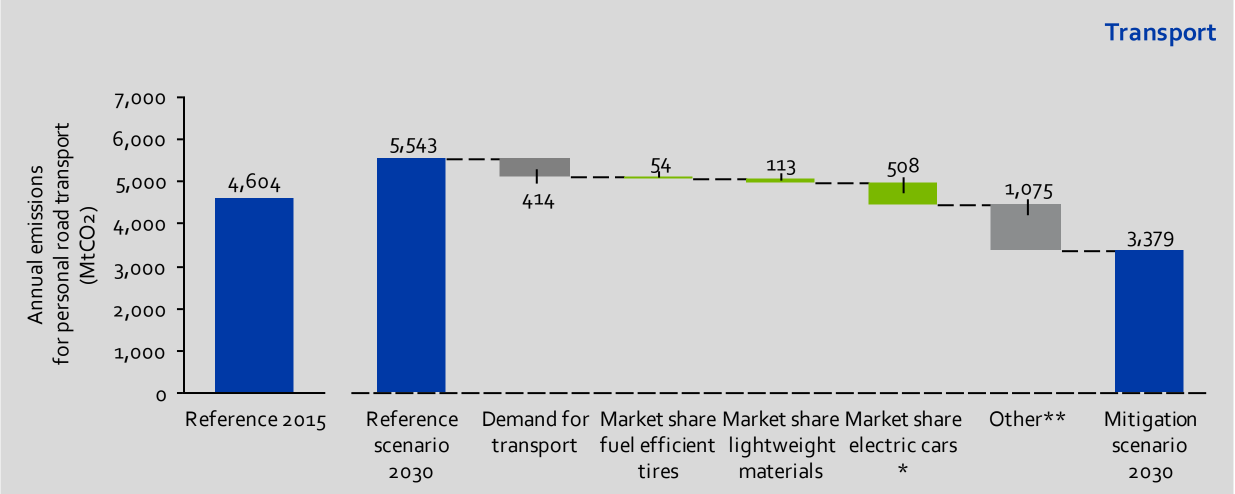
Scenario Analysis & Decomposition #1





Scenario Analysis & Decomposition #2





* Including emission factor reduction for electricity; ** Other efficiency improvement, other fuel shifting, etc.

Packaging of Beef

- **There is no solid data on food loss reduction and plastic packaging. The table shows an example calculation.**

	No implementation	*Current implementation*	*Maximum implementation*	*comment*
Market volume of beef (kg)	64.6 E 10^9	64.0E 10^9	63.4E10^9	FAO/GUA [1]
Food waste (kg)	8.1 E10^9	7.6E 10^9	7.0E10^9	FAO/GUA
Market share of plastic packaging (%)	0.0	50.0	100.0	Estimation based on GUA, 2005.
Emission of beef production waste (MtonCO2)	162	151	140	FAO
Emissions of plastic (MtonCO2)	0	0.8	1.5	Ecoinvent data 3
Avoided emissions (MtonCO2)	**0**	**10.6**	**10.6**	

(1) GUA, 2005. The Contribution of Plastic Products to Resource Efficiency

Policy options for 2DS

- **Policy options include:**
  - Create an enabling policy environment for a full lifecycle approach
    - Enhance and stimulate value chain cooperation
    - Incentivize GHG reduction along the full value chain
  - Enhance energy efficiency by
    - setting cost-effective efficiency standards,
    - encouraging manufacturers to provide easy-to-understand information,
    - raising public awareness
  - Enable cost-effective renewable energy by
    - establishing technology neutral policies
    - Integrating all technologies into normal market condition

Summary

- The chemical industry contributes to many solutions that increase the energy efficiency in multiple sectors and contribute to an increase of renewable energy supply, thereby reducing and avoiding emissions in many value chains.
- This is demonstrated with six important solutions to which the chemical industry contributes: wind and solar power, efficient building envelopes, efficient lighting, electric cars, fuel efficient tires and lightweight materials, food packaging.
- Global emissions would be over 9 GtCO2e per year lower if selected solutions were used to their full potential right now (exceeds the annual emissions of the United States).
- This study also quantifies the emission reduction in 2030 in a mitigation scenario (limiting temperature increase to 2 degrees Celsius) as compared to a reference scenario. Selected solutions reduce emissions by 2.5 GtCO2e as compared to the reference (= equivalent to the annual emissions of France, Germany, Italy and the United Kingdom together).

High performance. Delivered.

We asked ACCENTURE to stimulate a thought process about the role for the chemical industry in enabling a circular economy

[Tabled]

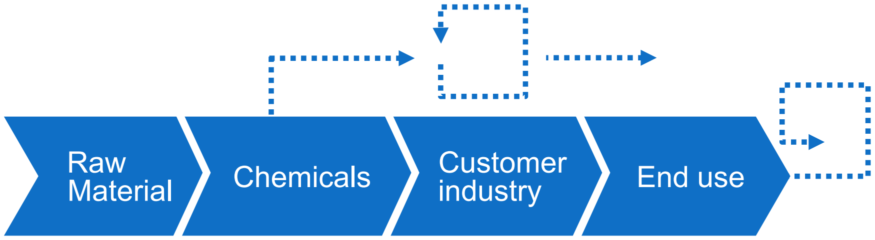
accenturestrategy

Strategy | Digital | Technology | Operations

Circularity has two aspects: enabling circularity in downstream end uses; and circulating molecules

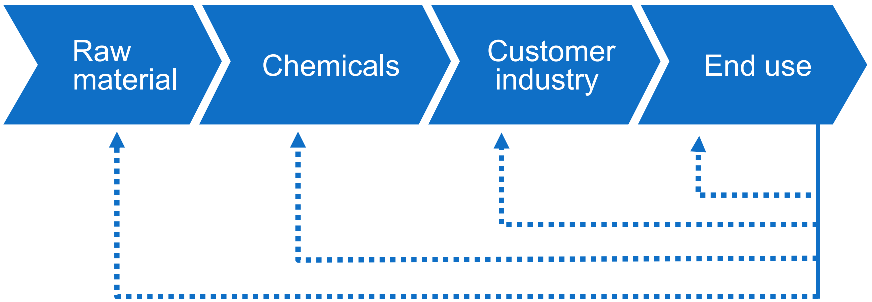
Approaches towards a more circular economy for the chemical industry

1 Enabling circularity



Enabling maximum utility in end usage
e.g. higher durability of goods, sharing cars, decreasing energy need by passive houses

2 Circulating molecules



Maximizing utility of existing molecules
e.g. reusing/recycling molecules such as PET bottles

Source: Accenture

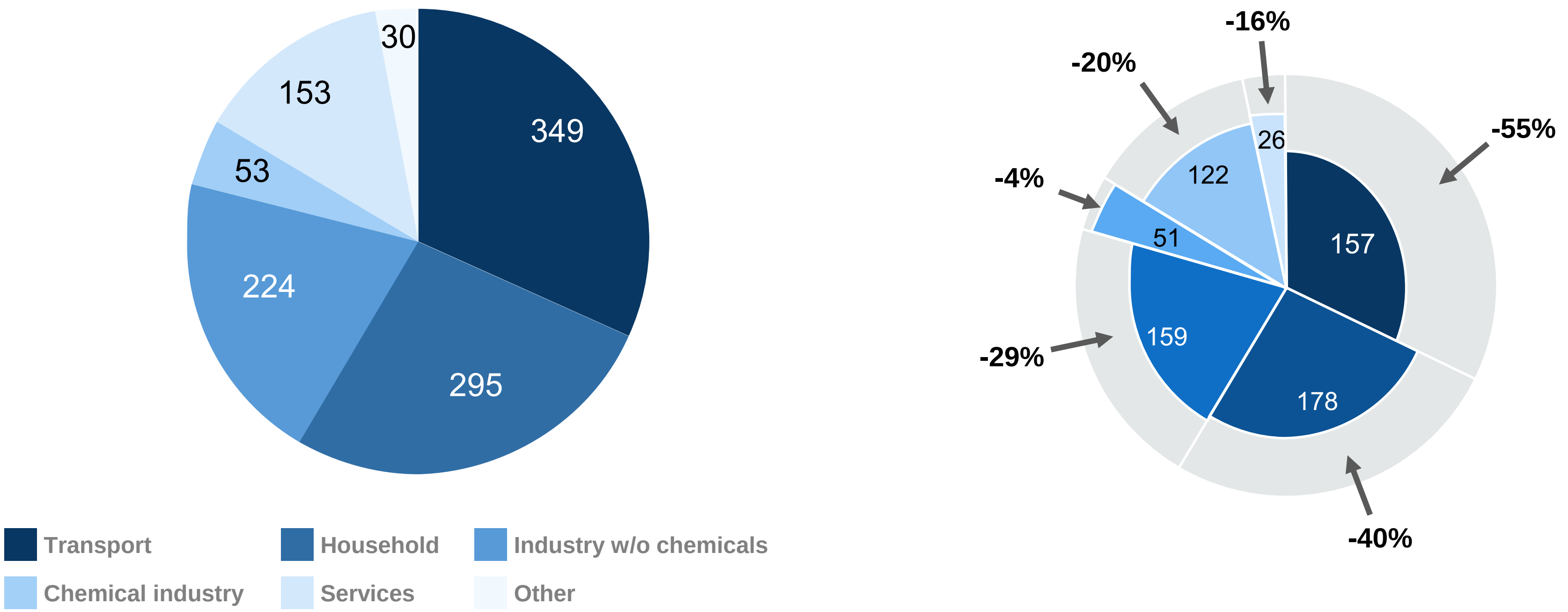
Approximately 425 Mtoe of EU energy consumption can be reduced in a full circular scenario

Impact of 2030 circularity scenario on energy consumption (in Mtoe)

As-is:
1,104 Mtoe energy consumption

-37%

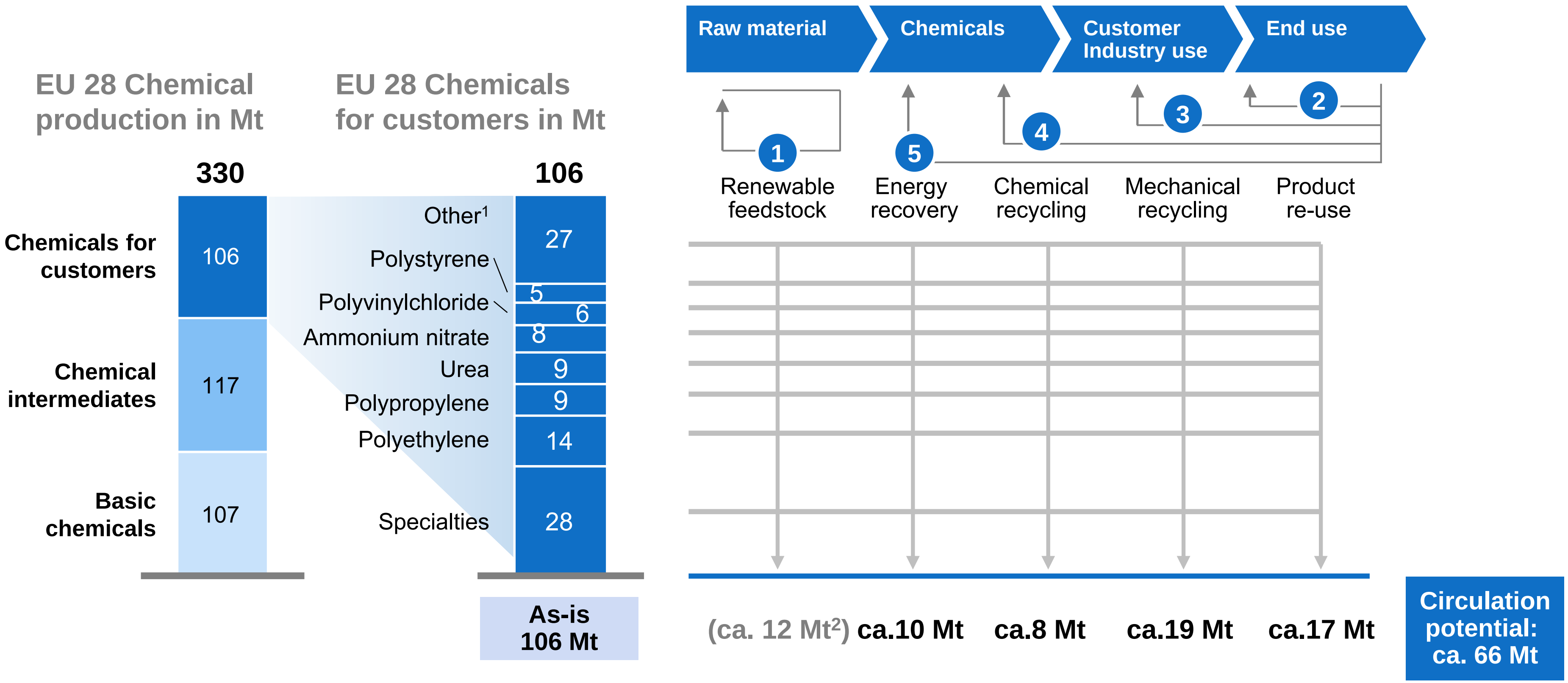
Circular scenario 2030:
679 Mtoe energy consumption



Source: Consumption of Energy, Eurostat – Energy Balance, 2013; Accenture analysis

Each circulating loop can contribute to reducing the demand for new molecules

Out of 106 Mt chemicals delivered to customers, up to 60% can be circulated



1. 44 further products assessed, some with limited loop potential, e.g., non-recoverable materials such as nano particles, coatings, solvents 2. Loop 1 is fed with biomass rather than from chemicals for customers. Assuming that, after consideration of loops 2-5, ca. 50% of remaining feedstock need can be substituted from biomass

Source: Accenture research

Background

Wrapping up: key messages

- The Chemical industry plays a decisive role in enabling efficiency in many segments of the EU economy (buildings, mobility, food , packaging)
- In all options , access to abundant and competitive low C energy is required to benefit from full chemicals potential
- Large investments required until 2050 with production costs not yet competitive

Enabling conditions

- Ambitious R&I programmes, priority topics are e.g. efficient hydrogen generation and better valorization of biomass
- Support for public-private partnerships to enable deployment and risk sharing
- Enhance cross-sectorial collaboration models (Steel-Cement, PPA)
- **Foster a competitive circular value-chain** to enable recycling of polymers and the use of polymer waste as feedstock