Charting a transition for the Chemical Industry

IEA / ICCA / DECHHEMA

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Technology Roadmap

Energy and GHG Reductions in the Chemical Industry via Catalytic Processes
Key technologies for reducing global CO₂ emissions

- **6°C Scenario** – emissions 58 Gt

- **2°C Scenario** – emissions 16 Gt

Source: Energy Technology Perspectives 2012

- **6°C Scenario** – business-as-usual; no adoption of new energy and climate policies
- **2°C Scenario** - energy-related CO₂-emissions halved by 2050 through CO₂-price and strong policies

Energy technology roadmaps
Technology roadmaps status

2009

2010

2011

2012

2013

• Building envelopes
• Energy Storage
• Hydrogen

Low-carbon energy technology roadmaps
Overview of IEA roadmap process

- Engage cross-section of stakeholders
- Identify a baseline:
  - Where is technology today?
- Establish a vision:
  - What is the deployment path needed to achieve 2050 goals?
- Identify technical, regulatory, policy, financial, public acceptance barriers
  - What are the near term action items?
- Develop implementation action items for stakeholders
Global industrial energy consumption by sector

Note: Includes feedstocks and energy use in coke ovens and blast furnaces
Source: IEA
Technical energy savings potential in the chemical industry

Note: Energy savings potential based on 2010 production levels.
Source: IEA.
CO₂ emissions reduction of 1.6 to 1.8 Gt CO₂ possible through a combination of energy efficiency, energy recovery, fuel switching and CCS
Chemical Roadmap Messages

• Catalysis and related improvements could reduce energy intensity 20% to 40% by 2050. Saving 13 EJ and 1 Gt of CO$_2$-eq in 2050

• To 2025 incremental improvements and deploying BPTs could provide substantial energy and emissions savings

• Deeper energy & emissions cuts will require development and deployment of emerging technologies that exceed current BPTs

• “Game changer” technologies, such as sustainable biomass feedstocks and low carbon hydrogen, are needed for deeper emissions reduction (additional 0.5 Gt CO$_2$-eq)
GHG emissions avoidance potential in the chemical industry via catalysis
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Evolution of energy intensity in the chemical industry via catalysis

Note: Energy consumption for olefins in this figure is based on deployment of catalytic cracking process. Source: DEchema.
Energy savings potential in the chemical industry via catalysis

![Graph showing energy savings potential in the chemical industry via catalysis.](image)

- Incremental improvement
- BPT conservative
- BPT optimistic
- Emerging technologies
- Biomass
- Hydrogen

Note: Black line represents zero axis.
Source: DEHEMA.
Total energy consumption in the chemical industry

Reason for increased energy consumption:
Chemical production is expected to increase by factor of 2-3
Regional savings potential

Largest potential in China: by 2050 5.3 EJ (40%) of the 13.2 EJ potential energy savings.
Policy recommendations

• **Enable framework** for improved research & development effectiveness

• **Secure** financing, including cost effective incentives

• **Promote** international collaboration, sharing of information, best practices and R&D

• **Integrate** legislation for more coherent policies

• **Encourage** collaboration – public/ private partnerships
Key actions in the next 10 years

Policymakers

• Develop policies that more highly reward energy efficiency investments.

• Create long term policy that reinvigorates catalyst/process improvement for high-energy-consuming processes.

• Enable policies for best practices where new facilities are built.

• Eliminate barriers to the use of more energy efficient technology
Key actions in the next 10 years

Chemical industry

- Identify top opportunities to accelerate R&D and investments.
- Facilitate R&D on game changers to lower barriers and costs.
- Promote cooperation on reducing energy and emissions.

Academia and research organisations

- Stimulate research on large-volume/high-energy use processes.
- Collaborate to identify top prospects & reduce technical barriers.

Financial institutions

- Work to better understand funding requirements and opportunities for lower carbon chemical sector transition.
Global Chemical Industry Plans

• ICCA acts as voice of global chemical industry leveraging multiple national association

• Chemicals represent largest industrial energy user but even larger solution provider in terms of energy and GHG savings

• Roadmap helps to address the dual challenge of improving our own operations while continuing work on energy and GHG savings technologies in our value chains
Next Steps and Regional Aspects

• Large variations in regional efficiency potential
  – Age of plants & growth outlook of local market
  – Feedstock and technology choices for new investments

*NEEDS policy approaches tailored to each region’s challenges*

• Roadmap is first step in providing information that encourages better future investment choices
  – Multiple launches and workshops planned regionally to make this a locally driven continuous improvement process
DOWNLOAD THE ROADMAP AND ANNEXES AT:

http://www.iea.org/publications/freepublications/publication/name,36970,en.html


www.dechema.de/industrialcatalysis

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Questions?