



**The Network of European Environment and Sustainable Development Advisory Councils (EEAC)
Energy and Climate Change Working Group**

Industrial Decarbonisation

**The possible role of energy-intensive industries in the sustainable
low-carbon economy future in the EU**

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What have we learned from initial phase of decarbonisation?



- The world does not behave like models; events happen (e.g. Fukushima, economic crisis, ...)
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- Renewables developed quickly
 - Coal was neither phased out nor captured (e.g. CCS)
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- Most efficient (theoretical) policy did not work; inefficient “pork barrel” policies worked (e.g. renewables)
- Regulation worked, e.g. buildings become 13% more efficient

Implications

- Keep all options open, e.g. CCS, nuclear, fracking, diesel, green gas, biofuels, etc. : we may need them!
- Renewables are competitive – large scale market-driven deployment is possible (e.g. further electrification of transport, buildings, industry, etc.; demand response and storage will replace peaking plants)
- Electrification depends on power price – watch Finance Ministers
- Electrification is possible in some energy-intensive industries, e.g. steel – scale is very significant.

Similarities of energy and industry sectors (electricity, mobility, buildings, oil, gas, industry)



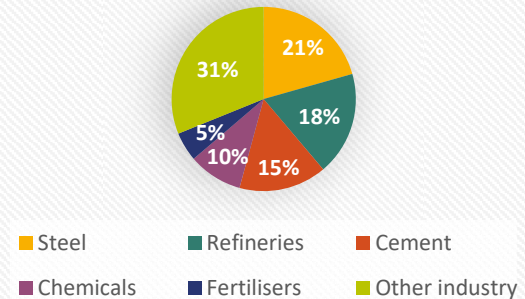
- New value chains & business models: electricity, mobility, gas, oil, industry etc. (develop slowly)
- Low-carbon energy
- Initially government-induced technological change, e.g. R&DI, finance
- Gradual (step-by-step) decarbonisation
- Sector integration

Industry-specific features

- Scale: materials, energy demand, costs
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- Circularity: global framework
- Industry collaboration & integration (largely absent to this day)
- Breakthrough technology
- New industrial landscape (new industry clusters)
- Time line (after 2035)

EU ETS industry emissions
2016



Chemicals: - 84% of 2050 emissions

- 1900 TWh low carbon power (= 55% projected available power = >3 x German total consumption)

Steel: - 82% of 2050 emissions

- 4-500 TWh low carbon power

Circularity & cross-sectoral collaboration

e.g. waste (e.g. steel, plastic) recycling, carbon recycling, cleaned syngas, hydrogen re-use, etc. requires cross-sectoral collaboration

Pathways towards low(er) carbon technologies for all sectors are developed



Steel (different pathways):

- Increased electrification with direct-reduced iron and hydrogen
→ hydrogen requires vast amounts of electricity (→ materials)
- Capturing CO₂ emissions: some of captured CO₂ can be used for industrial processes → steelmaking can be linked to chemical industry – certain base chemicals (based on ethanol) can be made using CO₂ together with other gases produced; during steelmaking, CO₂ is common input in chemicals products

Cement:

- Envisages the combustion of waste in cement kilns

Pathways for forestry-based products, liquids, gas, etc;

Preconditions (decarbonisation/circularity)



- Innovation finance: e.g. demonstration of first of kind, 'value of death'
- CCS/CCU (feasible?) & hydrogen (expensive)
- Markets for low-carbon products (carbon pricing and carbon price pass through)



Summary: challenges

- Government finance for breakthrough technologies (first in kind, pilots, early deployment ← valley of death)
- Development of key technologies: a) CCS (CCS & CCU), b) hydrogen value chains (for industry, seasonal storage) – industrial scale, materials and energy
- Vast amounts of electricity are central
- Acceptability: location of industrial clusters (social cohesion)
- Industrial collaboration: partnerships around new value chains
- Residual GHG emissions: total decarbonisation hard to imagine
- Where is the market for low-carbon products ? (domestic and international) ('market making'?) – capital-intensive investment



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