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

Christian Egenhofer

Director, CEPS Energy Climate House

Herman Teirlinck Building, Havenlaan 88, 1000 Brussels

15 May 2018

What have we learned from initial phase of decarbonisation?

- The world does not behave like models; events happen (e.g. Fukushima, economic crisis, …)

- Renewables developed quickly
- Coal was neither phased out nor captured (e.g. CCS)

- 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.

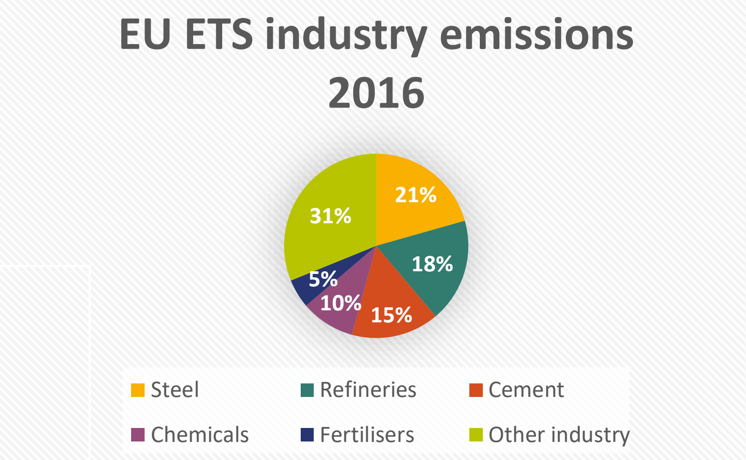
Similarities of energy and industry sectors (electricity, mobility, buildings, oil, gas, industry ….)

- 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

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



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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www.ceps.eu

www.ceps-ech.eu

@CEPS_thinktank

Christian.Egenhofer@ceps.eu

#CEPSEnergyClimate

Tel: +32 2 229 39 11 1, Place du Congrès 1000 Brussels