

Decarbonisation & industrial dynamics of energy intensive sectors

Crucial parameters for effective innovation support



Institute for
European Studies
Vrije Universiteit Brussel



Vrije
Universiteit
Brussel

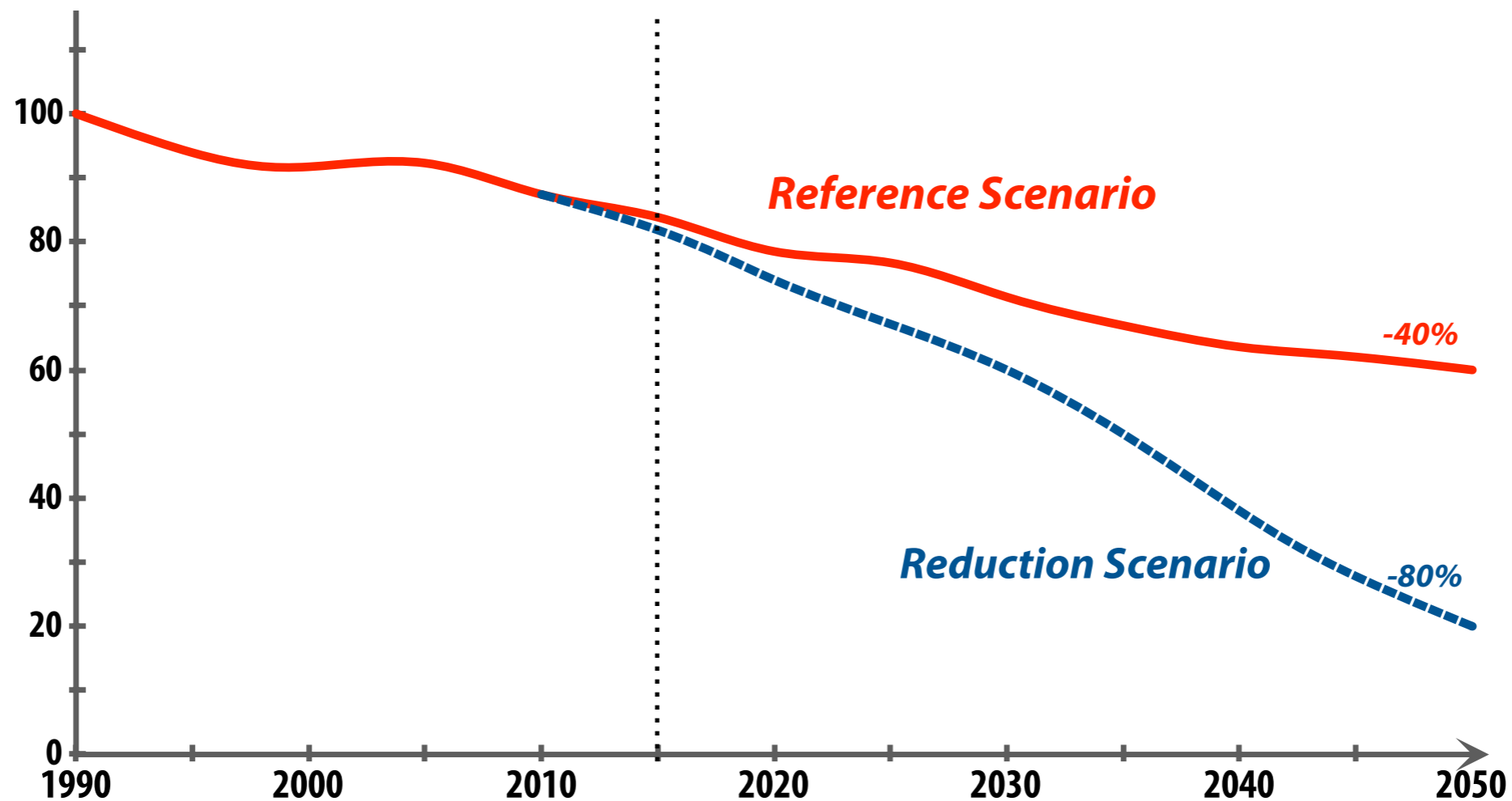
2nd Stakeholder meeting on Carbon Leakage, 10 July 2014, Brussels

Tomas Wyns - Associate Researcher

Outline

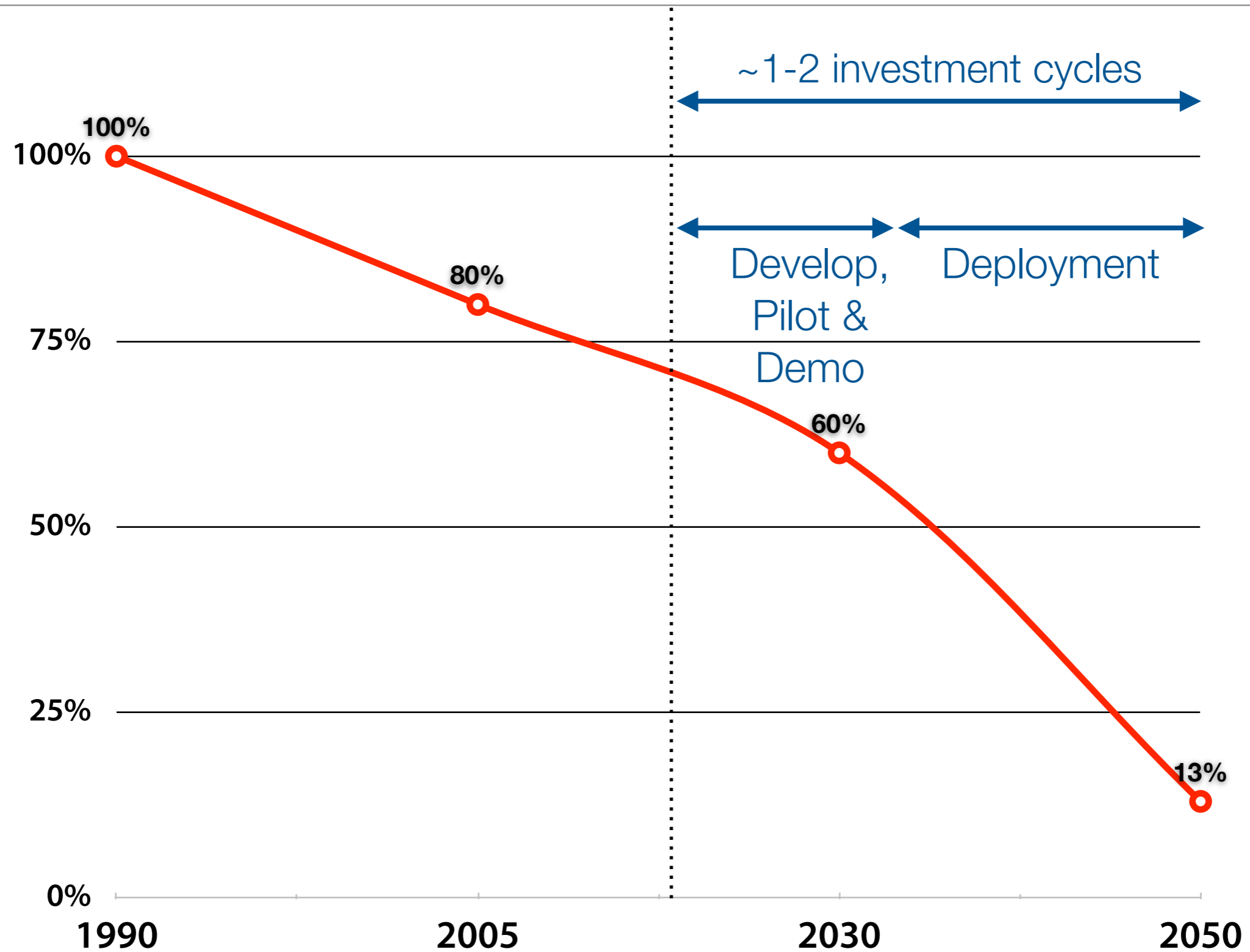
- Decarbonising the European economy (context)
- Industrial decarbonisation & challenges
- Parameters influencing radical process innovation
- Barriers for radical low-carbon process innovation
- Policy options to enhance process innovation
- Coda: The (non-negligible) risk of innovation leakage
- Conclusions

Decarbonising the European economy



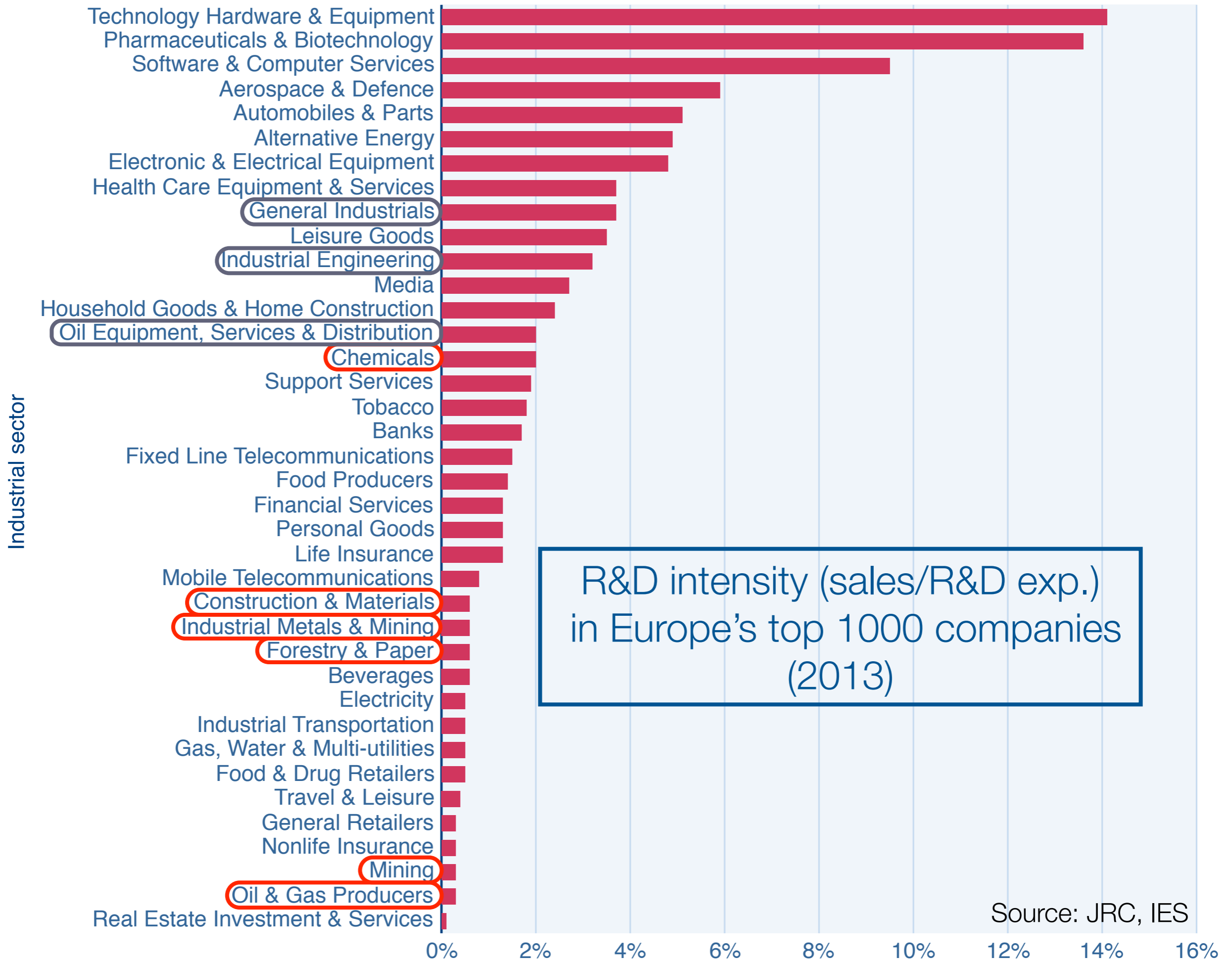
- European Commission low-carbon roadmap (2010)
- Followed by transport and energy roadmaps
- No EU industrial decarbonisation roadmap (or vision)
- Most (energy intensive) industrial sectors developed sectoral roadmaps

Industrial decarbonisation (EC 2010)



Specific challenges for energy intensive sectors in the EU

- Still recovering from crisis (weak balance sheets, low credit ratings, possible consolidation, ...)
- Higher energy costs compared to e.g. US and Middle East
- Growth in EU is low compared to e.g. emerging markets
- and therefore investments in new large process plants in EU have been low for at least a decade (mature economy)
- Long investment cycles versus predictability of policies and costs
- Low R&D intensity in most energy intensive sectors, restricted ability of companies to make needed investments in R&D



Source: JRC, IES

Parameters influencing radical process innovation in industrial sectors - literature

- **Product innovation:** innovative products drive process innovation (Reichstein, Salter 2006)
- **Cost savings factor:** cost reduction is factor in driving process innovation (Reichstein, Salter 2006) but comes over time with lower marginal returns
- **Productivity increase** key enabler & driver of important recent industrial process innovations at firm (CEO & board) level (Luiten, Blok 2001)
- **Cross company/sectoral collaboration/network** (e.g. open innovation) shows important correlation with (radical) process innovation (Reichstein, Salter 2006) (Luiten, Blok 2001) (CEPI 2-team project, 2012)
- **Stricter legislation/targets** or expectation thereof drive process innovation (e.g. ULCOS)

Barriers for (radical) process innovation in industrial sectors

- **High Capital risk** and problems with balance sheet financing in some companies
- **General (negative) investment climate** in Europe (e.g. mature market (low growth), international consolidation, costs in EU, policy risk, ...)
- **Low room and acceptance of failure** at company and policy level
- **Low R&D intensity** of energy intensive companies
- Transparency and governance related to **EU state aid rules** (NER 300)
- **Incumbents** (Schumpeter Mark II) **dominate** policy/stakeholder debate

Policy options to enhance process innovation (i)

- Link low-carbon demonstration support with increase in productivity in the process design (if and where possible) and project selection criteria (e.g. post 2020 NER 300). Within the firm, the higher management should be made aware of possible productivity improvements in these new processes (where possible).
- Enable the linkages between process and product innovation at the design stage and in the project selection criteria (e.g. post 2020 NER 300).
- Encourage cross company and cross sectoral collaboration in the R&D phase of process innovation and at the demonstration phase (e.g. to lower investment risk).
- Identify and mitigate economic and legal barriers with regard to intellectual property rights and competition related to cross company collaboration.

Policy options to enhance process innovation (ii)

- Have upfront clarity on what type or extent of national (additional) support would constitute unacceptable State Aid.
- Developing a practical guide for companies' project developers and governments, using the experiences (and examples) from the two NER 300 calls could facilitate the process for post 2020 (co-)financing of industrial low-carbon demonstration plants.
- Link the financial reward (of e.g. a post 2020 NER) not only with successful *final* project implementation but also with key *intermediate* (engineering) milestones.
[risk sharing]
- Develop a financing toolbox (e.g. EIB's risk sharing facility, equity participation, ...) that facilitates de-risking/financing of projects.
- Tolerate failure and implement lessons learned

Coda: The non-negligible risk of innovation leakage



Feb. 2014: “Archer Daniels Midland Company and Renovia, Inc. announced today that ADM has committed to a \$25 million equity investment in the privately held company, which develops catalysts and processes for the **cost-advantaged production of chemical products from renewable feedstocks.**”



Kuang-Hsi Chen, Taiwan Cement Corporation & Heng-Wen Hsu, Industrial Technology Research Institute, Taiwan: **First cement CC(S) demonstration**



Successful testing of **Hlsarna** (ULCOS) pilot blast furnace in Ijmuiden. But will demo phase be build in Europe?!



Inert Primary Aluminium Anodes

“This new technology would have a significant opportunity in growth markets (e.g. Russia and China) that have made commitments to Greenhouse Gas reductions.” US Department of Energy

Conclusions

- Additional industrial decarbonisation vision, policy and financing framework needed
- 10-15 years left to develop and commercialise key low-carbon breakthroughs
- There are important barriers and triggers towards radical process innovation
- We can develop the policy and financing tools to address these
- If radical process innovations happen first “outside” EU, structural competitive loss of Europe is certain.