An Enlightened Industrial Policy for Europe through industrial low-carbon roadmaps and their implementation

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The EU 2050 low carbon roadmap

Best practice industrial low carbon roadmap design and implementation

Examples of Industrial sectors developing roadmaps

The economic, industrial & policy challenges ahead

yes we can
European Commission’s 2050 low-carbon roadmap

**Reductions**
-80 to -95% by 2050
-80% = domestic, ref. 1990

**Investments**
€270 Bn p.a. in EU economy:
- jobs
- infrastructure
- R&D

**Savings**
€170-320 Bn p.a.
- Fuel cost
- €88 Bn in 2050
- Air quality and health

EU Member States agree on targets but not on interim milestones
2050 projections for Industry

- Low-end Industrial sectors scenario E.C. 2050 low-carbon roadmap
- High-end scenario
- 0.8% pa efficiency improvement as from 2005 (fixed production)

Deployment of New Technologies
Best practice industrial roadmaps should include

- Thorough sectoral analysis (future growth, domestic demand, challenges, opportunities, move to higher value added, ...)
- Identification of current options to reduce emissions (BAT)
- Identification of future options to reduce emissions (future BAT and breakthrough tech.)
- Broader than only end-of-pipe/process solutions (downstream product design/use)
- Seek broader benefits beyond GHG reductions (e.g. lower capex, opex, higher value added products)
- Identify technical, financial and policy barriers for implementation
- Outline of low carbon roadmap implementation plan
- Policy recommendations to facilitate implementation
EU sectoral roadmaps state of play

EU paper sector was first to develop roadmap (2011)

Followed by EU Ceramics, Steel, Chemicals and Cement sector roadmaps
EU sectoral roadmaps state of play

Steel Sector (source EUROFER)
EU sectoral roadmaps state of play

Chemical Sector (source CEFIC/Ecofys)

Upper line: greenhouse gas emissions with projected production and 2010 intensity
Lower line: greenhouse gas emissions with emission reductions

Level Playing Field

Reductions of greenhouse gas emissions due to:
- Energy efficiency improvement
- Fuel mix change
- N2O abatement
- Decarbonising electricity production
- Carbon capture and storage

Source: Ecofys
EU sectoral roadmaps state of play

Cement Sector (source CEMBUREAU)
EU sectoral roadmaps state of play

Ceramic Sector
(source CERAMEUNIE)

Sources of CO₂ Emissions:
- Fuel
- Extra electricity from kiln electrification
- Electricity
- Process

Sources of CO₂ Emissions Reductions:
- Kiln electrification
- CCS
- Other identified breakthrough technologies
- Available technologies
- Breakthrough technology syngas/biogas

Including kiln electrification
EU sectoral roadmaps state of play

Paper Sector
(source CEPI)
EU industrial roadmaps: conclusions so far

- Roadmaps offer interesting insights into possible future sectoral developments, though in most cases quite narrow (e.g. GHG only)

- Conservative estimates (low mitigation / high cost)

- Need for breakthrough technologies

- Need for policy support (but not very specific)

- Implementation plan missing except for EU paper sector (CEPI two team project)

The CEPI TWO TEAM PROJECT
1000s OF IDEAS, 2 TEAMS, 1 GOAL

51 Days 19 Hours 1 Minute 57 Seconds REMAINING

Coming soon .... (!!)
Example of possible breakthroughs in some industrial sectors

Deep reductions are possible in cement, steel, paper and chemical sectors (over time)

Source CE Delft/CAN-Europe

Steel

- Reference level (average EU blast furnace)
- New blast furnace
- Fastmelt
- Fastmelt with CCS
- Top gas recycling with CCS
- Hlsama with CCS
- Electrolysis (using renewable electricity)

Cement

- Reference level (average EU cement kiln)
- New Cement kiln (using biomass)
- Oxy-fuel technology with CCS
- Magnesium Oxide Cement

Year the mentioned technologies likely become operational on commercial scale
10-15 years time left to develop & make breakthrough technologies market ready
General challenges for the EU industry

Essential factors which determine the competitive strength and hence influence the location of the energy-intensive sectors:

- Access to raw materials
- Proximity to demand
- Transport costs and infrastructure Cost
- Availability of (competitive priced) energy
- Skilled labour-force (STEM)
In particular, EU innovation and industrial policy programme should be guided by some of the major challenges faced by the EU economy:

The ability to achieve an economically-acceptable profit margin in a mature market

The fact that the EU will have to compete with major economies which have a structural competitive advantage when it comes to energy costs and/or access to natural resources

Related to the above, the need to maximise resource efficiency and reach almost full decarbonisation within the next 3-4 decades

The need for new and advanced skills and skilled workers
Key elements of Industrial Low Carbon Transition

- **Process innovation** with the goal of bringing low-carbon breakthrough processes to the market within the next 15 years
- **Product innovation** with the goal of increasing value-added in products essential to a low-carbon and resource-efficient society
- **Value chain** and **business model transformation** with the goal of further reducing emissions, enhancing resource efficiency and finding new and smart opportunities for energy-intensive industries in a mature market
- **De-risking (venture) capital and debt** as a tool to facilitate access to finance, promote entrepreneurship and accelerate the market readiness of low-carbon products and processes
- **Social innovation** is needed to train and re-train the skills needed for the transition to a low-carbon economy
Examples

**Process Innovation**

- HISarna Blast Furnace (Tata Steel)
- Molten oxide electrolysis (MIT AMBRI)

**Product Innovation**

- US Nano-steel
- Jeans from wood-fibre
- Phase-change insulation materials (BASF)
Examples

Business model innovation

TRIMET Aluminium Germany
modulated power use (linked to RE)

Social Innovation

Innovation economics in Finland
3 important recent reports

Manufacturing the future
McKinsey Global Institute

Innovation Economics
Robert D. Atkinson

Sustainable Materials
Julian M. Allwood

Recommended reading
Spire
R&D into higher value added products

SILC II
Bio-based i ppp
ULCOS II

Process Innovation

EU ETS auctioning revenues (e.g. 18 Bn EUR 2015-2020)

R&D into higher value added products
Products contributing to EU low carbon roadmap
Diversification into new products, services and/or production/supply chains

Social transition, Education & Entrepreneurship

Product & Business model Innovation

Social Innovation

Horizon 2020
## The Industrial Low Carbon Transition Fund

<table>
<thead>
<tr>
<th>Industrial Low-Carbon Transition Fund Budget Lines (2015-2023)</th>
<th>Billion Euro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhanced support for process innovation under SPIRE, SILC II and BRIDGE</td>
<td>5</td>
</tr>
<tr>
<td>Advanced (Fundamental) Research Projects Agency for Industrial Low-Carbon Transformation</td>
<td>2</td>
</tr>
<tr>
<td>Support for industrial CCS feed-in tariff to enable and demonstrate full cycle CCS over 10 years</td>
<td>2</td>
</tr>
<tr>
<td>National and regional initiatives to promote and support SME entrepreneurship aimed at enhancing the low-carbon and resource-efficient value chain</td>
<td>2</td>
</tr>
<tr>
<td>Support for education, training and re-training to cope with industrial transformation and skills shortage</td>
<td>2</td>
</tr>
<tr>
<td>EIF capitalisation to de-risk and leverage finance for industrial low-carbon transition</td>
<td>5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
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### EIF’s market coverage

- **Innovation**
  - Tech transfer/incubators
  - Business angels, Side funds, Pre-seed

- **Venture capital**
  - Seed stage
  - Early stage
  - Expansion development capital
  - Mid-market

- **Privacy equity**
  - Later-stage, Buy-out
  - Stock exchange/Public equity
Thank You
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“Innovation distinguishes between a leader and a follower”
Steve Jobs

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