Net Zero Heavy Industry Sectors – Iron and steel

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Some of the IEA’s work on the Industry sector…

The IEA’s roadmap and other deep-dive series have covered numerous topics over the past decade, spanning three dimensions: technologies, sectors and countries.
Set near-term milestones to get on track for long-term targets

- No new unabated coal plants approved for development
- All new buildings are zero-carbon ready
- Electric cars are 60% of sales
- No new sales of fossil fuel boilers
- Universal energy access

**Buildings**

- More than 85% of buildings are zero-carbon ready
- Half of heating demand met by heat pumps
- Most appliances and cooling systems are best in class
- Phase-out of unabated coal in advanced economies

**Transport**

- Electric cars are 60% of sales
- Almost 90% of existing capacity in heavy industries reaches end of their investment cycle
- No new ICE car sales
- Half of existing buildings retrofitted to zero-carbon ready levels

**Industry**

- Most innovative low-emissions technologies in heavy industry demonstrated at scale
- All industrial electric motors are best in class
- 50% of fuels used in aviation are sustainable
- No new unabated coal plants approved for development
- Half of heating demand met by heat pumps

**Electricity**

- Net zero electricity sector globally
- Phase-out of all unabated coal and oil power plants
- Over 70% of electricity generation globally from solar PV and wind
- Net zero electricity sector globally

**Other**

- No new oil and gas fields approved for development, and no new coal mines or mine extensions
- 50% of fuels used in aviation are sustainable
- More than 90% of heavy industry production is low emissions
- Almost 90% of existing capacity in heavy industries reaches end of their investment cycle

- 1020 GW annual solar and wind additions
- Universal energy access
- 435 Mt low-carbon hydrogen; 3 000 GW electrolysers
- 7.6 Gt CO₂ captured

**2020**

- 35 Gt CO₂
- No new unabated coal plants approved for development
- No new oil and gas fields approved for development, and no new coal mines or mine extensions

**2025**

- 30 Gt CO₂
- 1 020 GW annual solar and wind additions
- Phase-out of unabated coal in advanced economies

**2030**

- 25 Gt CO₂
- Overall net zero electricity in advanced economies

**2035**

- 20 Gt CO₂
- Net zero electricity sector globally
- Phase-out of all unabated coal and oil power plants

**2040**

- 15 Gt CO₂
- Almost 70% of electricity generation globally from solar PV and wind
- 435 Mt low-carbon hydrogen; 3 000 GW electrolysers

**2045**

- 10 Gt CO₂
- 435 Mt low-carbon hydrogen; 3 000 GW electrolysers

**2050**

- 5 Gt CO₂
- 435 Mt low-carbon hydrogen; 3 000 GW electrolysers
- 7.6 Gt CO₂ captured
Prepare for the next phase of the transition by boosting innovation

Unlocking the next generation of low-carbon technologies requires more clean energy R&D and $90 billion in demonstrations by 2030; without greater international co-operation, global CO₂ will not fall to net-zero by 2050.
Challenges and opportunities associated with existing assets

Given the longevity and cost of key industry assets, 2050 is just one investment cycle away. In the G7, many industrial plants are quite old and will face a major investment decision this decade.
Steel continues to play a pivotal role across multiple end-use sectors.

Steel demand steel is projected to rise by more than a third through to 2050 in our baseline projection. In the Net Zero Emissions by 2050 Scenario, demand is reduced through material efficiency strategies.
There is great potential for more efficient use of steel

Material efficiency strategies pursued across the supply chain deliver savings of around 20% in global steel production in the Net Zero Emissions by 2050 Scenario, relative to our baseline projection.
Addressing CO$_2$ emissions from heavy industry

An array of measures can help reduce emissions in heavy industry, with innovative technologies like hydrogen and CCUS playing a critical role.
Addressing CO\textsubscript{2} emissions from heavy industry

An array of measures can help reduce emissions in heavy industry, with innovative technologies like hydrogen and CCUS playing a critical role.
Net zero means a profound transformation to the way we produce steel.

While advanced economies lead deployment to 2030, all regions must deploy near-zero emissions steel production – these routes account for upwards of 90% of global production by 2050.
Governments have a critical role to play in accelerating the transition

**Driving force: stakeholder collaboration**
- Governments, industrial producers, consumers, financial institutions and other actors

**Framework fundamentals**
- Establishing plans and policy for long-term CO₂ emission reductions
- Mobilising finance and investment

**Targeted actions for specific technologies and strategies**

**Production technologies**
- Managing existing assets and near-term investment
- Creating a market for near-zero-emission industrial products
- Developing earlier-stage near-zero-emission technologies

**Use phase**
- Improving material/use efficiency for industrial products

**Necessary enabling conditions**
- Enhancing international co-operation and creating a level playing field
- Planning and developing infrastructure
- Tracking progress and improving data
Definitions of near zero emission material production

• Why do we need definitions of “near zero emission” material production?
  ▪ Common definitions for “near zero emission material production” can establish a shared vision of the future for key production processes in heavy industry sectors
  ▪ They can form the basis for many of the ‘push’ and ‘pull’ mechanisms in the policy toolbox

• What are the key considerations in developing the definitions we propose?
  ▪ Technology neutrality and consistency with other IEA analysis and modelling
  ▪ The focus is on steel and cement, but the principles established are broadly applicable
  ▪ The definitions we propose are stable, absolute and ambitious; take account of sector specificities; focus on production and form the basis for product definitions

• How have we developed the definitions?
  ▪ The analytical basis for our definitions is IEA analysis of net zero emissions energy systems
  ▪ Broad consultation process
The analytical boundaries we adopt are wide enough to encompass the key differentiating factors between various conventional and innovative process routes and narrow enough to be manageable.
Definitions of near zero emission material production

The near zero emission production threshold range for steel production is 50-400 kgCO$_2$e/t crude steel, depending on the share of scrap use.
Valuing interim measures to substantially reduce emissions intensities

Emissions intensity thresholds for near zero and low emission steel production

Low emission production is evaluated on a continuous scale, with the quantity being proportional to the reduction in emissions intensity achieved.
Recommendations on common definitions

1. Consolidate existing work on measurement standards, ensure their fitness for purpose, and avoid the development of duplicate standards and protocols

2. Adopt stable, absolute and ambitious thresholds for near zero emission material production that take account of sector-specific nuances

3. Value interim steps taken to substantially lower emissions intensity, without compromising the stringency of the thresholds for near zero emission production

4. Extend the reach of work on definitions down existing supply chains, and into new ones