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Net-zero iron and steel production: challenges, options and what needs to happen now

Presenter:

- Dr Paul Durrant, End-use Sectors & Bioenergy, IRENA

TUESDAY, 15 DECEMBER 2020 • 15:00-15:30 CEST

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SPEAKER

Dr Paul Durrant
End-use Sectors & Bioenergy
IRENA

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Recent work on end-use sectors

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GRO 2020 edition outlines the investments and technologies needed to decarbonise the entire energy system in line with the Paris Agreement.

Reaching Zero with Renewables focuses on how industry and transport could achieve zero emissions by 2060 and assesses the use of renewables and related technologies.

Collaborative Framework on Green Hydrogen

The umbrella for IRENA hydrogen engagement

- IRENA has established a **Collaborative Framework on Green Hydrogen** in June 2020, **to foster dialogue between governments and private sector**
- 65 countries, Hydrogen Council and IPHE participation. ***Co-facilitated by EC.***

IRENA VIRTUAL EDITION INNOVATION WEEK 2020

4 days | 8 sessions | 23 panels | 101 speakers from 35 countries | 1 600+ audience from around 1 250 companies and organisations and 137 countries

Focus: **Innovative solutions for the energy-end-use sectors of transport & industry.** Showcased emerging **renewables based solutions** from around the world

Collaborating with private sector, associations and other partners

EPRI ELECTRIC POWER RESEARCH INSTITUTE · Hydrogen Council · GBEP Global Bioenergy Partnership · International Transport Forum · MISSION POSSIBLE PLATFORM · SDG7 YOUTH CONSTITUENCY YOUTH IN SUSTAINABLE ENERGY · Initiate!

Summaries and recordings at http://innovationweek.irena.org

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Global Renewables Outlook outlines options to cut energy-related CO_2 emissions to 2050

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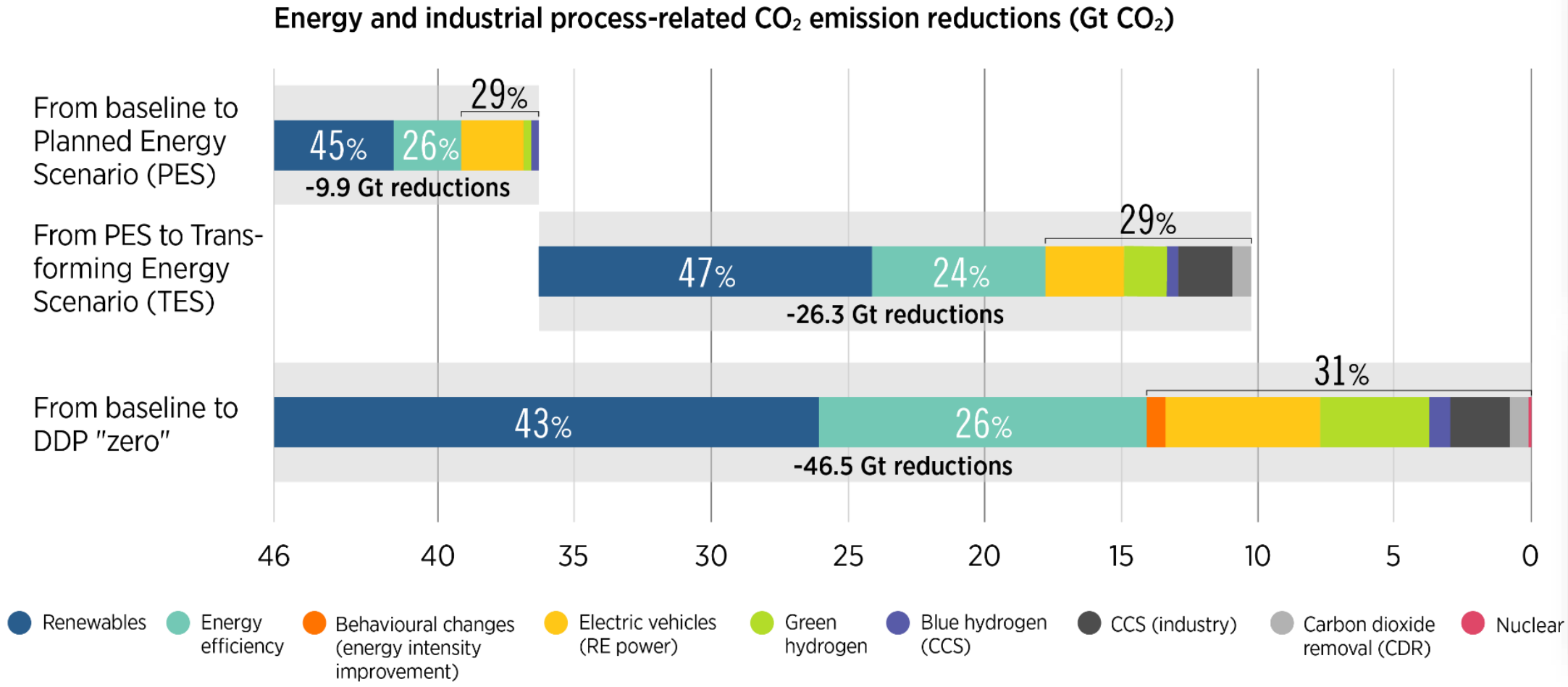

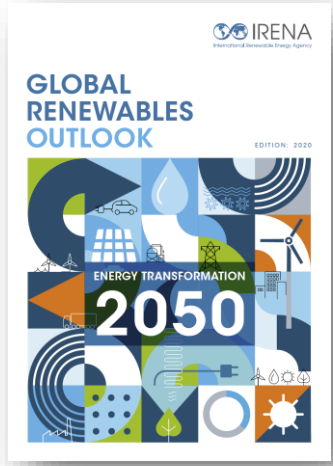

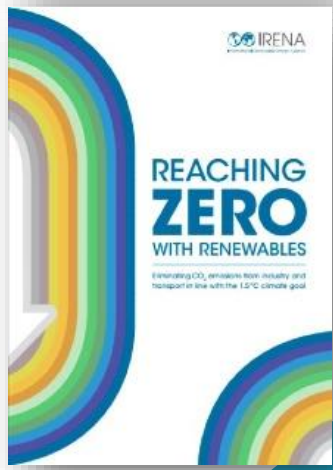

Annual energy-related CO_2 emissions would need to decline by at least 70% below today's level by 2050. End-use electrification, green hydrogen and synthetic fuels will play a crucial role to reach zero emissions.

Industry & Transport – Shares of Energy & Process Emissions

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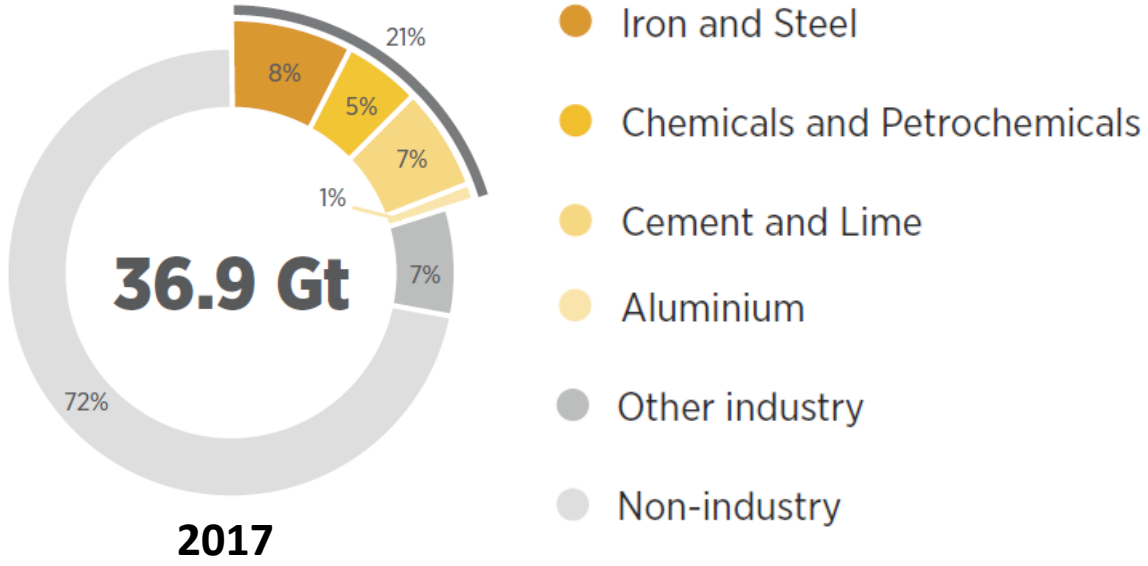
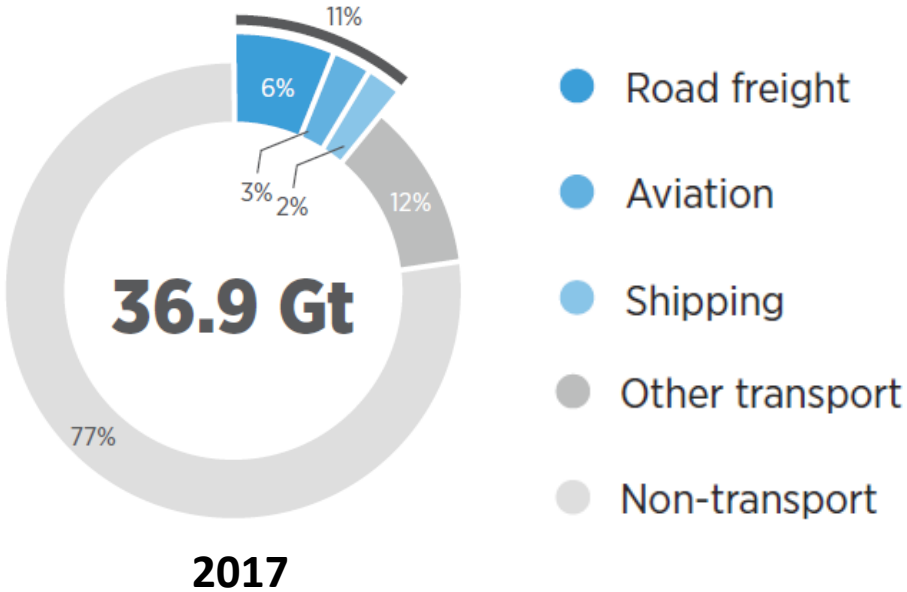
Industry



Annual emissions in Industry increase by 1 GT/yr from 2017 to 2050 PES

Emissions of 11.4 GT/yr remain in 2050

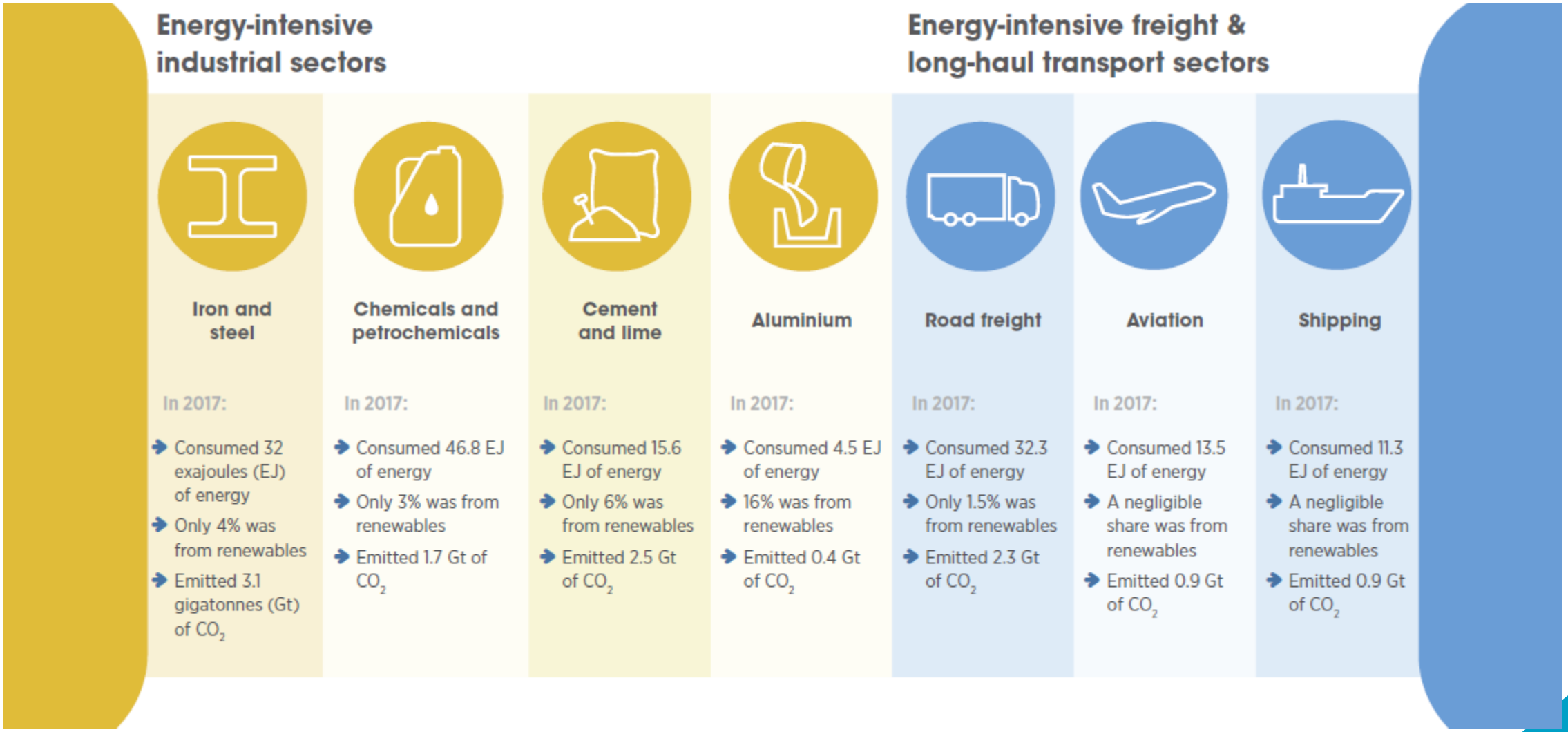
Transport



Annual emissions in Transport increase by 0.1 GT/yr from 2017 to 2050 PES

Emissions of 8.6 GT/yr remain in 2050

Seven challenging sectors



These seven will account for **38% of energy and process emissions and 43% of final energy use by 2050** unless major policy changes are pursued.

5 Measures for Reaching Zero

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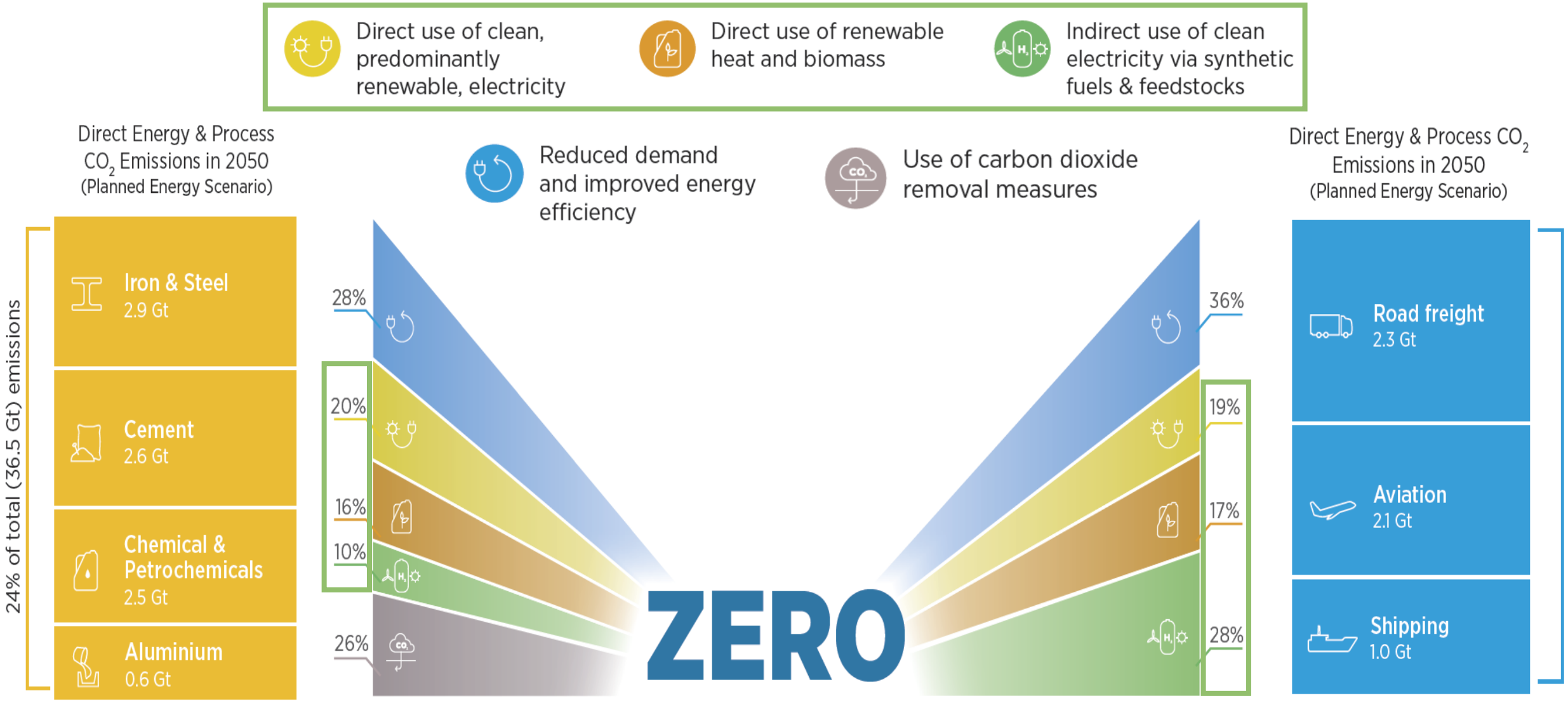

Iron & Steel

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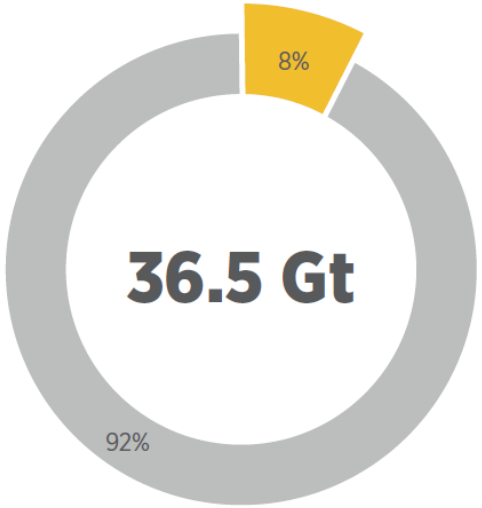
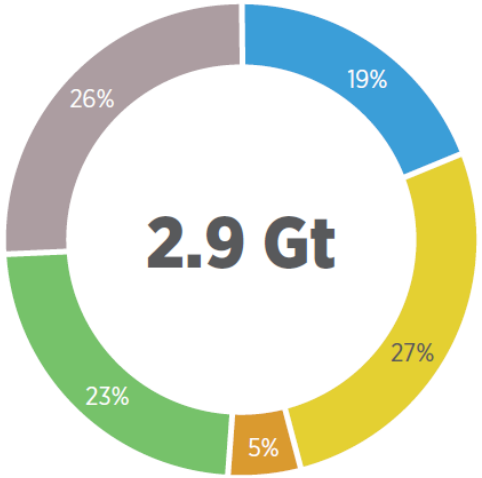
Iron and steel share of total energy and process-related CO_2 emissions in 2050 Planned Energy Scenario (Gt).

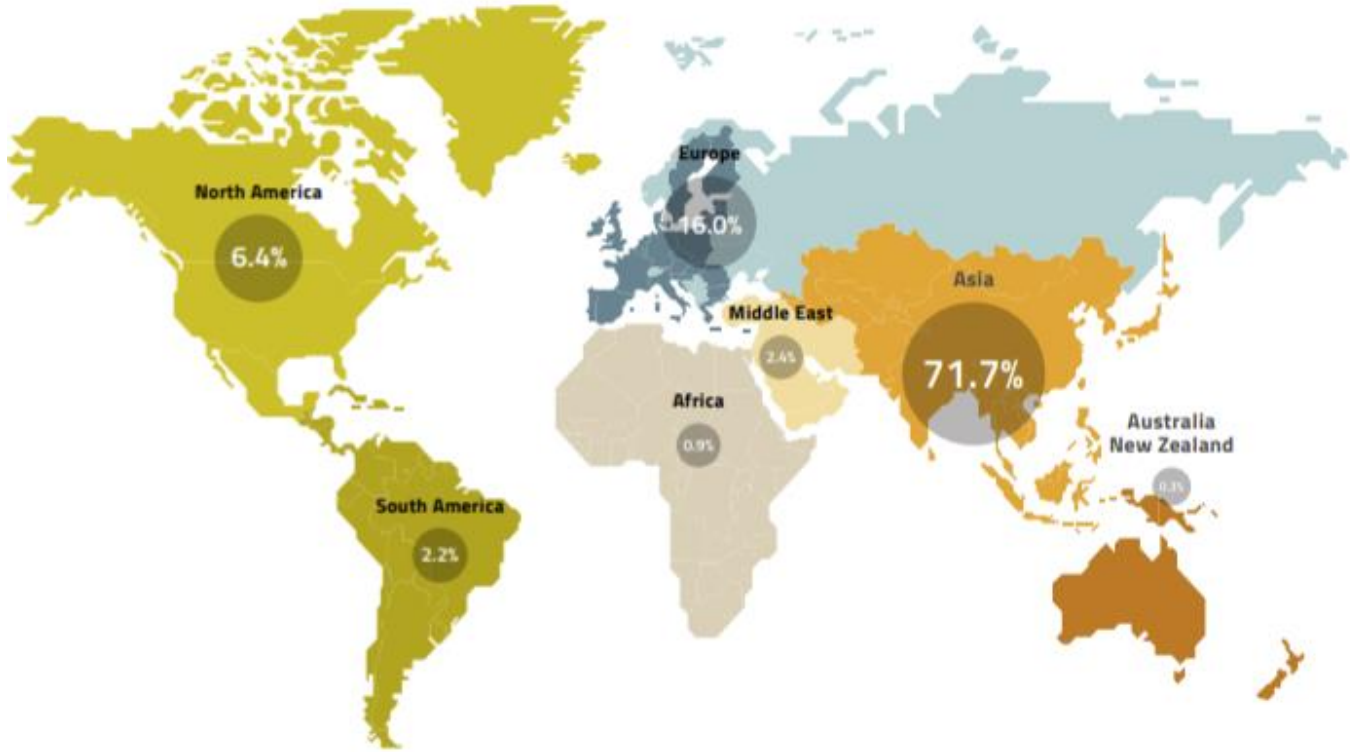


Estimated role of key CO_2 emission reduction measures to reduce steel Planned Energy Scenario emissions to zero.



- Direct use of clean, predominantly renewable, electricity
- Direct use of renewable heat and biomass
- Indirect use of clean electricity via synthetic fuels & feedstocks
- Reduced demand and improved energy efficiency
- Use of carbon dioxide removal measures

Steel Production by Region



Source: ECOWAS, 2019

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Iron & Steel – Options for reaching zero

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2 options compatible with reaching zero emissions

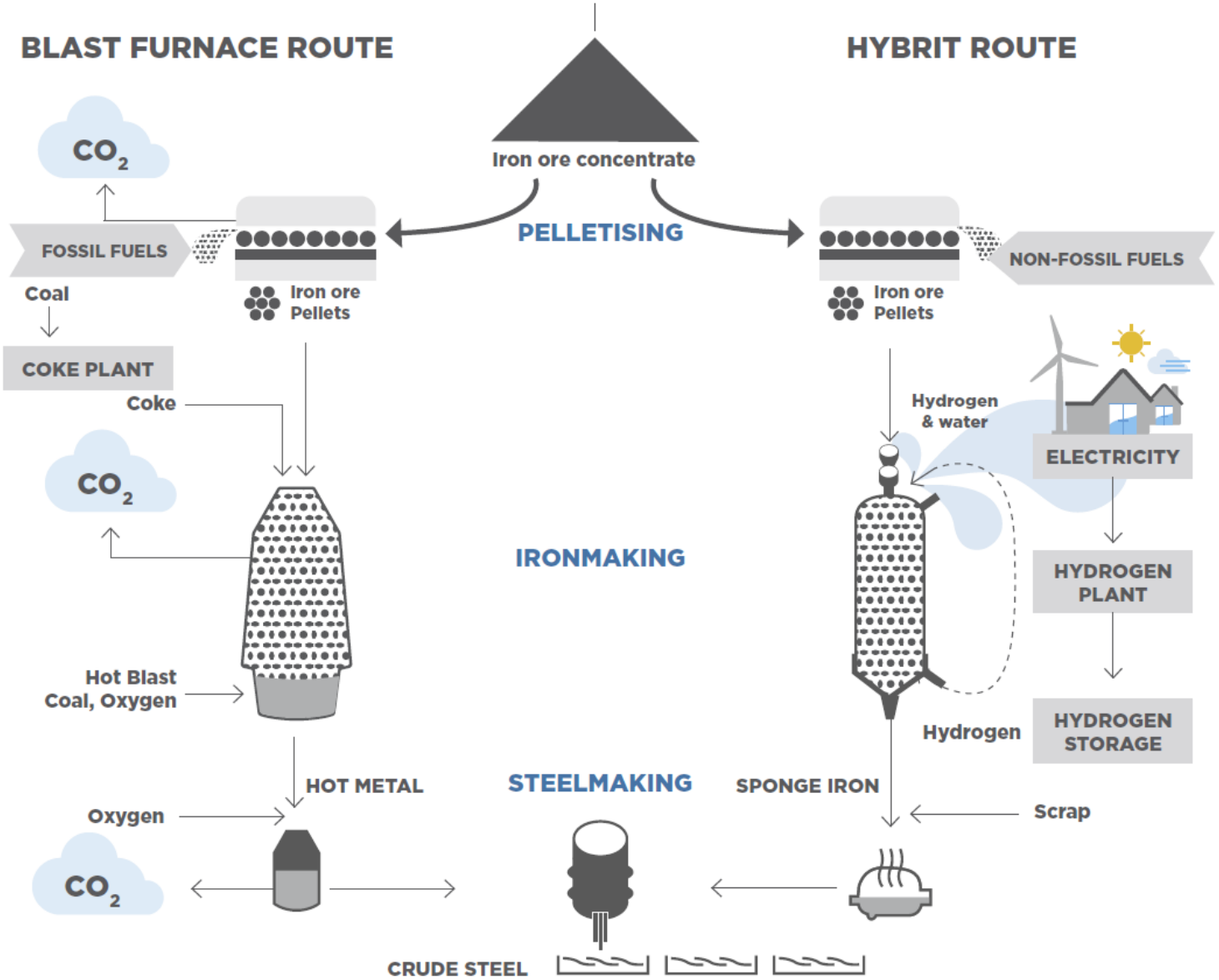
Hydrogen-based direct reduction of iron and electric arc furnace-based steel production

- Produce iron via the direct reduction process using clean, preferably green, hydrogen as a reducing agent.
- Produce steel using electric arc furnaces.
- Source all heat and electricity inputs from renewables.

Capturing and storing process and waste emissions, and using renewables for energy

- Apply CCUS to existing iron and steel production processes.
- Source all heat and electricity inputs from renewables.

Renewable hydrogen-based DRI-EAF route



Renewable hydrogen-based DRI-EAF route being piloted in Sweden compared to the conventional BF-BOF route

Ten priorities for action (current global efforts are patchy)

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Co-develop strategies & plans

Pursue a renewables-based with an end goal of zero emissions.

- Requires linked sectoral strategies at the local, national and international levels
- Plans built on the five technology pillars.

Develop a shared vision and strategy and co-develop practical roadmaps.

- Must be supported by all key actors
- So co-develop with broad engagement nationally and internationally to build consensus.
- International and inter-governmental bodies can assist.

Address enabling conditions

Build confidence and knowledge among decision makers.

- Decision makers need to better understand the risks.
- Many more demonstration and lighthouse projects are needed.
- Those who can must lead, showing what is possible.

Plan and deploy enabling infrastructure early on.

- New approaches will require substantial new infrastructure.
- Investment needs to come ahead of the demand.
- Requires carefully co-ordinated planning & targeted incentives.

Enhance business models

Foster early demand for green products and services.

- Creating early sources of demand for green fuels, materials, products and services will help scale of production and reduce costs.
- Use public procurement, corporate sourcing, regulated minimum percent requirements, etc.

Develop tailored approaches to ensure access to finance.

- Sectors have specific needs i.e., high CAPEX, long payback periods, etc.
- So tailored financial instruments along the whole innovation cycle are needed.
- Co-operation between public and private financial institutions can help.

Work international

Collaborate across borders.

- A global challenge, and the solutions needed are complex and expensive.
- Countries working alone will not be able to explore all options in the necessary depth.
- Countries can share the burden.

Think globally, utilise national strengths.

- Relocating industrial production to access low-cost renewable energy could reduce costs and create new trade opportunities.
- Countries with large or expanding production should be supported in getting on the right (zero-carbon-compatible) track early on.

Establish pathways for evolving regulation & international standards.

- Regulations and standards are both enablers and barriers for change
- Requires careful planning to ensure that they shift at the same pace as the technological changes.

Support further innovation

Support RD&D and systemic innovation.

- Large gaps in capability and large cost differences still remain.
- Increased investment in RD&D is needed across a range of technologies to reduce costs, improve performance and broaden applicability.
- Innovation support needs to be systemic.

Delving deeper – some of IRENA's upcoming analysis

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Re Reaching Zero - Coming shortly - Technical Briefs on:

- Electrolyser Cost Reduction report
- Biojet fuels report
- Renewable Methanol report
- Deeper dives into the scale of the challenge on Steel and Chemicals
- Policy briefs on Hydrogen & Bioenergy

Re Reaching Zero - Coming up in 2021:

- Regional perspectives: deeper dives into some specific regions / countries
- Closer look at cost and cost reduction drivers
- Closer look at key enabling conditions, infrastructure standards, global trade.
- 2021's Global Renewables Outlook – 1.5-degree /net-zero pathway
- Innovation landscape for electricity use in end-use sectors.

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Q & A
10 min

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- **TUESDAY, 5 JANUARY 2020 • 14:00 – 14:30 CET**
  "Thermal energy storage: a key enabler of increased renewables penetration in energy systems"
  For more information and to register: https://irena.org/events/2020/Aug/IRENA-SEDA-Joint-Webinar

- **TUESDAY, 26 JANUARY 2020 • 14:00 – 14:30 CET**
  "INSPIRE: IRENA's interactive tool for patent trends and international standards in RE"
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