Carbon Neutrality Project
Decarbonizing Energy Intensive Industries

Workshop on Pathways to Effectively Decarbonizing Industry – GEEE 8 and 11th IFESD

20 September 2021
Project Objective: Attaining carbon neutrality across power and energy intensive industries in the UNECE region.

Key question: What is the available carbon budget (% total GHG target by 2050) for power and energy intensive industry in the UNECE region?

Cut 90Gt of CO$_2$ emissions by 2050 & meet quality of life aspirations

Develop & deploy zero and negative carbon technologies
UNECE countries must cut/capture at least 90Gt of CO$_2$ by 2050 to meet 2°C. There are variety of pathways to attain carbon neutrality in the UNECE region.

- Decreasing environmental footprint of energy sector by deploying low and zero carbon technologies
- Increasing capacity of natural carbon sinks
- Deploying technologies that increase negative carbon emissions, BECCS and DAC

Various pathways for carbon neutrality by 2050
Taking whole system approach. Attaining carbon neutrality through balancing emissions with carbon removal – through natural systems, sector coupling and integrated approach.

Holistic Energy System Approach

- Natural carbon sinks (e.g. soil, forests and oceans)
- Source of Energy
- Transmission & Distribution
- Industry sector
- Transport sector
- Buildings sector

Supply Side

Demand Side
UNECE Toolkit for policy makers to make informed decisions and attain carbon neutrality
Targeting energy intensive industries

Source: IEA 2019. All rights reserved.
Net zero solutions for carbon neutral energy intensive industries

Systemic Efficiency and Circularity
- Increase circularity within a cluster through cross-entity waste utilization
- Integrate processes within a cluster to share energy and material streams
- Provide cost-effective system benefits outside the cluster

Direct Electrification and Renewable Heat
- Electrify low-to-medium temperature and pressure processes
- Generate low-cost, renewable electricity and heat onsite (e.g., rooftop solar, biomass, concentrated solar power)
- Pursue shared infrastructure (e.g., microgrid, storage, flexibility)

Hydrogen
- Leverage electricity and heat from nearby zero-carbon sources (wind, solar, nuclear, biomass)
- Produce low-to-zero carbon hydrogen from the most economical source (e.g., blue, green)
- Use produced hydrogen as an alternative fuel for hard-to-electrify industrial processes, building heating and transport

Carbon Capture, Utilization and Storage (CCUS)
- Capture carbon from energy and hydrogen production
- Use captured carbon for industrial and manufacturing processes
- Store carbon underground where feasible

Source: Accenture and WEF 2021
Circular carbon economy concept

Source: IAEE and KAPSARC 2021