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Report of the Committee on Sustainable Energy on its twenty-ninth session

Addendum

Attaining carbon neutrality through carbon capture, utilization and storage

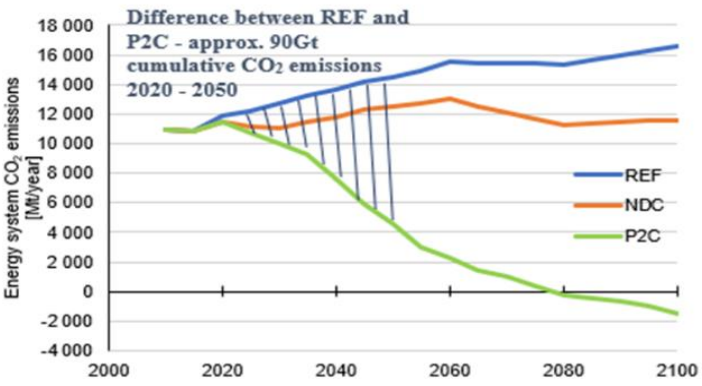
I. Introduction

1. Energy is critical for assuring quality of life and underpins attainment of the 2030 Agenda for Sustainable Development (2030 Agenda). The role that energy plays in modern society is recognized, but there remains an important disconnect between countries' agreed energy and climate targets and what countries are doing in reality.

2. The countries from the United Nations Economic Commission for Europe (ECE) region will need to reduce their dependence on fossil fuels from over 80% to 50% or less by 2050 and achieve significant negative carbon emissions. To stay on a pathway to meet the 2ºC target set by the Paris Agreement, countries in the ECE region need to cut or capture at least 90 gigatonnes (Gt) of carbon dioxide (CO_2) emissions by 2050 (see Figure I).

3. As fossil fuels are likely to continue to play an important role for ECE member States in the short and medium term, the deployment of carbon capture, use and storage (CCUS) technologies is essential to achieving carbon neutrality. CCUS technologies are widely recognized as essential for large scale decarbonization of the coal and gas power and heavy industry sectors to bridge the gap until next generation carbon-neutral energy technologies are commercialized.

Figure I.
CO_2 Emissions in the ECE Region by Policy Scenario for the Energy Sector[1]



II. Snapshot of carbon capture, utilization and storage technologies

4. CCUS is the process of capturing CO_2 emissions from industrial processes, such as steel and concrete production, combustion of fossil fuels in power generation, or to remove accumulated and residual emissions. This carbon is then stored deep underground or used as feedstock in industries. A portfolio of CCUS technologies is show in Figure II.

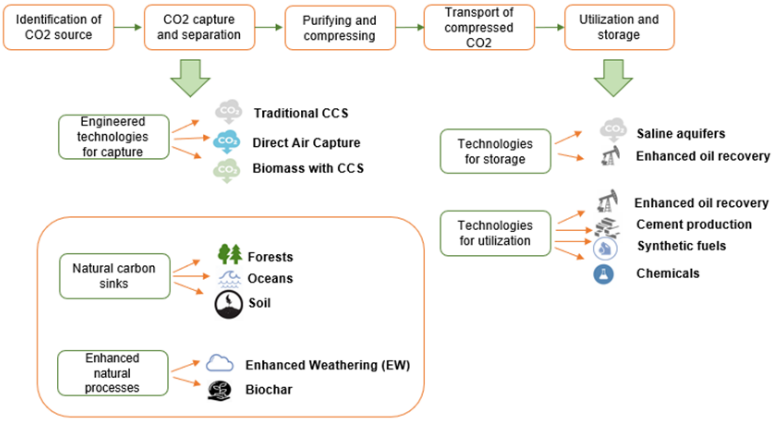
(a) Carbon can be **captured** at point sources such as power and industrial plants efficiently with a capture level of over 90% before it reaches atmosphere. Biomass energy with CCS (BECCS) is a method where CO_2 is taken out of the atmosphere by vegetation, then recovered from the combustion products when the biomass is burnt. The most expensive method is capturing carbon from the air in a method called Direct Air Carbon Capture and Storage (DACCS). BECCS and DACCS are also known as net negative emissions technologies and are key to reach net-zero and then net negative emissions.

(b) Carbon can be **stored** by being injected deep into geological formations. Saline aquifers are vast geological formations containing brine (salt water) in porous rock found all over the world at depths over 1km. Saline aquifers remain the most significant storage option available. Enhanced Oil Recovery (EOR) is family of techniques to increase the recovery of oil and gas reservoirs by injecting CO_2 into the oil and gas wells at pressure. EOR is used today for about 2% of global oil production.

(c) Carbon **utilization** or use of the captured carbon can create products with economic value and become energy efficient. Carbon utilization can unlock the commerciality of CCUS projects for the industrial, steel, cement and chemical sectors. Concrete has great potential to become a large market for CO_2 in the immediate future. CO_2 can be used to create synthetic fuels such as methanol or carbon neutral fuel.

[1] REF: scenario is based on a "Business-as-Usual Pathway" that does not include climate mitigation policies or measures. NDC: scenario assumes the implementation of Nationally Determined Contributions (NDCs) under the Paris Agreement up to 2030 and beyond. P2C: scenario is where regional CO2 constraints, consistent with NDCs through 2030, are assumed to continue reduction beyond 2030 and stay below 2°C by 2100.

Figure II.
Portfolio of Carbon Capture, Use and Storage Technologies



III. Imperatives to scale CCUS technologies

5. CCUS technologies are essential to achieve carbon neutrality. Political agreement is required for long-term engagement and societal commitment, recognizing the scale and cost for the industry that needs to develop and deploy them in a very short time – billions of tonnes of CO_2 and trillions of US$.

(a) **More needs to be done:** Structural change will be much deeper than most people expect and needs to start now. The greater the delay, the greater the change required;

(b) **Sharing good practice is needed:** Inclusive multi-stakeholder initiatives strengthened by public-private partnerships. Government and industry support are key;

(c) **Industry commits to wide ranging greening**: The private sector should lead the structural change through design, material efficiency, sustainable energy technology interplay;

(d) **Scale up favorable conditions:** Develop financial and regulatory frameworks alongside infrastructure and banking institutions;

(e) **Working together beyond borders:** A sub-regional approach is needed to share knowledge and best practices to improve cost efficiencies for large infrastructure projects;

(f) **CCUS unlocks full decarbonization of the energy sector:** Countries need to include CCUS in long term-strategies and commence retrofitting existing infrastructure.

IV. Capacity-building and involvement of countries

6. ECE has taken action to support countries in implementing CCUS technologies and attaining carbon neutrality. This action has focused on three core aims:

(a) **Raise awareness:** Recognize CCUS as a viable climate mitigation option and consider it when developing national plans;

(b) **Accept technology:** Develop and integrate policies to allow full commercialization of CCUS technologies;

(c) **Finance projects:** Create funding mechanism for CCUS and direct investments towards modernization of energy infrastructure.

7. High-level roundtables, policy dialogues and development of financial guidelines continue to raise awareness with stakeholders about the potential of CCUS technologies to attain carbon neutrality in the ECE region.

8. ECE's work on CCS and CCUS is undertaken by the Sustainable Energy Division and the ECE Group of Experts on Cleaner Electricity Systems. As part of the sixteenth session of the Group of Experts (23-24 November 2020), a Roundtable on Achieving Carbon Neutrality with Carbon Capture, Use and Storage was organized in Geneva, Switzerland, on 23 November 2020.[2.]

V. Further information

9. ECE has established a Task Force on Carbon Neutrality under the auspices of the Group of Experts on Cleaner Electricity Systems to understand the potential of CCUS technologies across the ECE region.

10. This work has been conducted by the Task Force on Carbon Neutrality as part of implementation of the extrabudgetary project on "Enhancing the understanding of the implications and opportunities of moving to carbon neutrality in the ECE region across the power and energy intensive industries by 2050".

11. Further information on the work of the ECE Group of Experts on Cleaner Electricity Systems is available on the ECE Sustainable Energy website.[3]

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[2] https://unece.org/fileadmin/DAM/energy/se/pp/ces/ge16_2020/CCUS_Roundtable.pdf

[3] https://unece.org/sustainable-energy/cleaner-electricity-systems