

Scoping paper for the CAETS 2022 Energy Committee report on

DECARBONISATION OF ENERGY END-USES

Final version validated on 3 May 2021 by the Committee

After a report on *Clean Energy technologies – Challenges and Solutions* published in 2018 and a report on *Solutions for High-Level Penetrations of Intermittent renewable Energy* in 2020, the CAETS 2022 Energy Committee report will focus on the decarbonisation of final energy uses. The resulting reduction in CO₂ emissions is crucial for reaching the Sustainable Development Goals (SDGs) set by the UN in 2015 and, in particular, for keeping the increase in average global temperature below 1.5 degrees Celsius. Different tools are already available in different energy-dependent sectors, such as:

- replacing processes or equipment using fossil fuels by others that use decarbonised electricity, e.g.:
 - for heating, replacing gas heaters by heat pumps (where possible);
 - for hydrogen production, replacing methane by electrolysis, etc;
- refurbishing processes or equipment if possible (in order to use alternative energy sources or to adapt them to coupling with different systems, etc.);
- replacing systems and equipment by more efficient ones (energy efficiency);
- capturing and storing or using the produced CO₂.

Sustained RD&D efforts are expected to produce novel solutions to give new possibilities to reduce emissions.

All these changes are not only of technological nature: they have economic, industrial, environmental, societal dimensions and can be more or less promoted by regulations, taxes, subsidies, incentives, etc.

The report to be prepared shall be as useful as possible:

- for the public authorities and the stakeholders in the energy area in our countries,
- for our academies and their actions.

Taking into account the benefits from our diversity, but also our limitations, we have to focus on end-uses that are the most emission-intensive and complex to deal with. We believe that sharing information and best practices is valuable for producing a pertinent report.

As for the previous reports, a questionnaire will be sent to all Academies to gather such information and best practices.

Our report will contain three parts:

- A transversal part with the key findings from our analyses and some recommendations;
- A focus on selected end-uses (see below), including case studies on best practices and lessons learnt from successful or unsuccessful projects;
- Brief monographs about the present situation and national roadmaps in each of our countries, if possible, with data on energy sources for different end-uses and on their CO₂ emissions. The national energy profiles (energy mix, GHG emissions...) will be taken from the International Energy Agency database.

The selected end-uses will be chosen from the following list:

1. Buildings and sustainable cities (including but not limited to: heating and cooling systems, insulation, infrastructures for the energy supply such as district heating and cooling...)
 - a. Existing buildings (and existing cities)
 - b. New buildings (and new districts)
2. Industry
 - a. Steel industry (including mining)
 - b. Aluminium industry (including mining)
 - c. Cement industry
 - d. Oil industry (refinery)
 - e. Chemical industry (in particular petrochemicals: ammonia, ethylene, plastic...)
 - f. Information and telecommunication
 - g. Food and agriculture: from farm to fork
 - h. Other mining industries: cobalt, copper, rare earth, lithium...

We did not include transportation because we believe it is not a sector where our diversity would be most valued. It will however be included in the questionnaire, so that each Academy can decide if they want to include it in their national monograph.

In order to cover the selected end-uses, 5 to 7 thematic working groups will be created, ideally composed of members from 3 to 5 academies each. The subgroups could present to the CAETS Energy committee: the topic, the issues and challenges, some best practices and case studies; and could make some recommendations regarding decarbonisation. The subgroups will be free to consult and interview external experts to conduct their analysis.

Until the end of 2021, the Committee will meet remotely on a regular basis, in a format similar to that of our first seminar on 3 and 4 May — a 2h session in the morning and a 2h session in the afternoon on 2 consecutive days — on the following dates:

- 12 and 13 July 2021,
- 13 and 14 September 2021,
- 25 and 26 October 2021,
- 29 and 30 November 2021.

There will be no session in December. Each thematic subgroup could prepare the morning and the afternoon sessions for one of the days listed above.

During our November session, we will decide our organisation for 2022 until the CAETS 2022 meeting in September in Paris.