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## Student Contest Problem 2023

This Student Contest Problem (SCP) is organized by the European Committee for the Use of Computers in Chemical Engineering Education (EURECHA), with the support of the CAPE Working Party and the Energy section of the European Federation of Chemical Engineering. The contest problem is open to Bachelor/Master/PhD level students. The participants have a few months to prepare and submit solutions to an open problem that involves Energy and Chemical Engineering, while using tools of Computer Aided Chemical Engineering. The deadline for submission is **April 15 2023, 23:59 CET**. Solutions can be prepared by individuals or by teams.

The jury will select the best solution based on seven equally weighted technical and writing skills: (1) scope of the proposal, (2) relevance of assumptions, (3) overall technical consistency, (4 and 5) relevant use of Computer Aided Process Engineering tools for simulation & optimization, (6) creativity of the proposed solution and (7) quality of the written report. The jury will also take into account the size of the team and their academic level (Bachelor/Master/PhD). If no satisfying solutions are received, the EURECHA SCP committee may decide not to award any prize.

The Award includes:

1. First prize: One invitation to attend the ESCAPE-33, to be held in Greece, to present the solution and get the award. First-prize award also includes a money transfer of 1000 EUR, after the ESCAPE event, to cover the travel and accommodation expenses.
2. Second prize: One invitation to attend the CAPE Forum, to be held in 2023 in Portugal to present the solution and get the award. Second-prize award also includes a money transfer of 750 EUR, after the CAPE-forum event, to cover the travel and accommodation expenses.
3. Both first and second prizes will be invited for licencing their work under Creative Commons licence. The reports will be published on the EURECHA website ([www.wp-cape.eu/index.php/eurecha/](http://www.wp-cape.eu/index.php/eurecha/)). Process models and supporting documents will also be licenced and made available to the CAPE community.

The winning teams will also be offered to prepare a short video recording of their presentation for communication purposes.



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### Submission procedure:

The written report should consist of a **pdf** file written in **English** and not exceeding **15 pages** (including figures). The process flowsheet and runnable simulation files must also be provided. For solutions judged as high-quality results, these documents will be shared in an open repository, to increase the impact of the EURECHA SCP.

The **written report**, the runnable simulation files and any **other support files** (Annexes, SpreadSheets, Simulation Input files, etc.), as well as a support letter from an academic supervisor at your home university, should be packed (zip format) and sent, before the established deadline, as e-mail attachment to [eurecha.secretariat@gmail.com](mailto:eurecha.secretariat@gmail.com).

In the body of this e-mail you **must** include the following information:

- Complete name (for all authors);
- Level (Degree/Master/PhD) and current year of your studies (**for all authors**). If available, please provide a link to a web page at your home institution related to one of the courses you are currently enrolled;
- Complete name and address of your home institution (School/Department/Research Center, etc.). Please provide a link to the web page of your home institution and an official contact to eventually confirm the affiliation/enrolment.

**Important Note:** The intention to participate should be registered on Eurecha website:

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## 2023 Challenge

### Manufacturing Chemical Products from CO<sub>2</sub> using Renewable Energy Resources

#### Project description

The goal of the project is to investigate novel and alternative process designs that use CO<sub>2</sub> and renewable energy to produce key chemical products.

#### Purpose

Due to the challenges of the energy transition and the goals of greenhouse gas emissions mitigation set by the Paris agreement, the chemical industry is facing a challenge of reducing the use of fossil resources and integrating intermittent and stochastic renewable energy sources. Therefore, there is a need to develop novel process designs for chemicals that do not involve the use of fossil carbon. Apart from the use of biomass as a biogenic carbon source, there is also the opportunity of using captured CO<sub>2</sub> as a source of carbon to produce novel chemicals. However, the change of the oxidation level of carbon will require energy that needs to be of renewable source and well-integrated with the energy system and its management.

#### Activities

The challenge will be to propose a process design that integrates captured CO<sub>2</sub> and renewable energy sources to manufacture chemical products that will substitute key fossil-based chemicals and demonstrate their contribution to the sustainable development goals. Contributions in form of process designs covering the following aspects are welcome:



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- Choice of the key chemicals
  - Choice of the reaction and process pathways
  - Choice of the source for renewable energy
  - Process simulation and synthesis
  - Process energy and material balance and energy system integration
  - Key performance indicators in terms of CO<sub>2</sub> mitigation and renewable energy integration as well as thermodynamic and economic performance

The source of CO<sub>2</sub> stream, including flowrate and composition, should be specified and justified in the proposal. In order to give some additional context to the challenge, it is required to consider that the selected process will be implemented in the country organizing the ESCAPE conference in the following year. For SCP 2023, the selected process will thus have to use the boundary conditions of Greece (for instance in terms of renewable energy sources).

The report shall be written as a technical and business plan, describing and justifying the technological and economic assumptions. It is left free when the process implementation should take place.

## References

[12 Principles of Green Chemistry - American Chemical Society](#), 2022

**Important Note:** This SCP challenge will be open during several editions, with one submission deadline per year.



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