An agro-food industry established in the South of Spain, near Granada, would like to produce its own energy, in order to meet both its electricity and heat needs.

Freshly hired as an energy efficiency engineer, the CEO asks you to investigate the possibility of building a CSP plant. It should be designed to avoid injecting electricity on the grid to maximize the ROI. He also asks you to think about a management of the production during the night so that the factory does not stop running, but still runs at a capacity factor of minimum 30% of the design baseload. You have three weeks to do the job and write a report in the form of an executive summary to the BoD.

At nominal load, the facility processes 14 000 tons of sugar-beets per day, during its seasonal operation. The production of 1 kg of sugar requires 6.5 kg of beets. For the extraction and purification processes, the facility requires 220 kWh_{th}/t_{sugar}. For the evaporation process, it requires steam at 133°C and 3 bar. After the evaporation, and the crystallisation, the steam has a lowered temperature of 65°C, and is used in closed loop. The energy required for the evaporation - crystallisation process is 270 kWh_{th}/t_{sugar}. The electricity produced should cover the needs of the installation, which are 90 kWh_{e}/t_{sugar}.

The provided data for the sugar beet industry comes from De Smet Engineers & Contractors.

You are asked:

1. to size the installation, and the different parts of the power and heat cycles, in order to match the requirements at the design point (e.g.: power production cycle, size of the field, number of solar collector assemblies, etc.),
2. to provide analyses which includes off-design points, and discuss the latter regarding the requests of the CEO,
3. to propose to the CEO a way to use the CSP plant for the off-season.

Practical information:

- You have to use the open-source System Advisory Model SAM (that you can download here: https://sam.nrel.gov/download.html).
- The Heat Transfer Fluid (HTF) for the CSP is Therminol VP-1.
- For the python code, use the `CoolProp` (http://www.coolprop.org) package for the thermophysical properties of the fluids.

Groups: You can form **groups of 3 or 4 people**. You should register in your group on Moodle.

Collaboration: You are allowed, and even encouraged, to exchange ideas on how to address this assignment with students from other groups. However, you must do all the implementation and writing only with your own group; it is strictly forbidden to share the production of your group. Plagiarism will be checked.

Writing: The report should take the form of an executive summary of around 5 pages, which you will hand in to the CEO of the agro-food industry.

Language: All reports and communications are equally accepted in French and English.

Deliverables: Each group is asked to submit on Moodle:

- a report named `executiveSummary_groupX.pdf`,
- a folder `supplementaryMaterial_groupX.zip` containing the codes (.py) and .csv files used for the report,

where `X` is the group letter.

Deadline: The work must be submitted on Moodle before **November 12th at 11.59 p.m.**

Questions: You can address questions at the Q&A sessions held on Wednesdays at 4.15 p.m. Direct messages on Teams will not be considered.