

# Modeling and Optimisation of Energy Systems

## Conclusions 2025

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- During the semester: **Quizz**
  - **5%**: your results to the quizzes during the semester.
- 19.12.2025 (23:59) - **Project Report** (20-25 pages + References + Annexes)
  - **50%** :The report grade will be "weighted" by an anonymous peer-self-evaluation.
  - Note that you are supposed to know what is in the report as you have signed it.
- 12.01.2026 - **Peer Review report** (2-4 pages)
  - **15%**: your peer review of the report of an other group.
- 17.01.2026 (15:15-18:15) - **Written Exam** (CO1 EPFL)
  - **30%**: your answer to the review. For the written exam, you will receive a 4 reviews concerning your report: one from an assistant and one from your peers. The written exam will consist in commenting the reviews and explaining what you will do to answer the remarks and suggestions from the reviewers.
  - Documents: your report + 10 pages of your own theory summary

- **A : Analyse** : State the problem and Activate your knowledge
- **G : Generate** : Generate numbers by computer tools
- **I : Interpret** the generated results
- **R : Report** for the rest of the world and your peers (your boss)...
  - Producing a report in industry
    1. **Draft** by the authors of the study
    2. **Review** by the peers
    3. **Answers** to the reviewer's comments
    4. **Final** version after review and approval by the peers
  - Write the report you would like to receive as a reviewer

- **Summary of your main results & findings**
  - Highlight what is important
  - Not all the calculations made only the interesting ones ;-)
- **Document your work**
  - Allow others to reproduce your work:
    - assumptions, level of details, validity limits,...
- **Synthesis of the main findings**
  - Tables and graphs with explicit captions
  - Explanations of the results
- **Conclusions**
  - Main findings
  - Perspectives
- **References**
- **Supplementary information**

- **Title page**
  - Title of the project
  - Authors
  - Date
  - Status
- **Executive summary**
  - Content of the report (should give the motivation to read the report)
- **Context and main goals**
  - Why - What - How
- **Chapters for each sub tasks**
- **Conclusions**
- **References**
- **Annexes & supplementary information**

- **Problem statement**
  - What is the problem solved
  - What are the assumptions and the levels of detail
  - Sources of data
- **Method**
  - Brief explanation of method used (steps)
- **Results**
  - Tables and graphs for comparison and interpretation
    - Engineering values : number [Phys unit] explanation
    - Captions and legends
  - Explanation on the result interpretation
- **Conclusions & perspectives**
- **References**
- **Annexes**
  - supplementary information useful to a detailed understanding of the results

<b>Final grade</b>	
<b>Section 1: Report quality</b>	<b>0,25</b>
Report structure	1
Scientific writing	2
Bibliography and references	0,5
Quality of figures, tables, graphs	1,5
<b>Section 2: Report content</b>	<b>0,75</b>
<b>Abstract</b>	<b>0</b>
Project is well summarized	1
Key results and findings are provided	0,5
<b>Part 1 - Energy demand of EPFL campus</b>	<b>2</b>
Methodology	1
Assumptions	0,5
Heat gains calculations	0,5
Building envelope properties	0,5
Impact of renovation	1
Clustering methodology	1
Clustering results and performance analysis	1
<b>Part 2 - Results &amp; Methodology &amp; Discussion</b>	<b>1,5</b>
Methodology and assumptions	2
Units characterization (describe mass flow, energy, T°)	0,5
Result presentation	1
Discussion	1
<b>Part 2 - Modeling &amp; convergence</b>	<b>0,5</b>
Reference scenario	1
Data center heat recovery	1
Air ventilation heat recovery	1
Air ventilation heat recovery + heat pump integration	1
<b>Part 3 - Modelling of a heat pump and data reconciliation</b>	<b>1,5</b>
Contextualization + fluid selection	1
Degree of freedom analysis	1
Carnot regression factors	1
Unit cost calculation + decision support	1
<b>Part 4 - MILP &amp; Scenario analysis</b>	<b>2</b>
Data input and assumptions & methodology	1,5
3 scenario	0,5
Multi-objective optimisation	1
Sensitivity analysis	1
<b>Conclusion</b>	<b>0,75</b>
Overall summary	1
Key results presented	1
Support to decision for future EPFL campus heating system	2
<b>Weighted grade (scaled to 6)</b>	

- How to write a review (<https://plos.org/resource/how-to-write-a-peer-review/>)
- Short summary of the review
- **Numbered** comments of the report
  - **Method** used
    - is the method valid
    - are the assumptions clear and well documented (references)
  - **Results**
    - are the numbers valid (order of magnitude, physical units)
    - Can you reproduce the results with the information given
  - **Interpretation**
    - are the results easy to understand and interpret (esp. table/graphs)
    - are the interpretation clear and valid
  - **Conclusions**
    - are the conclusions and perspective clear and valid
    - can you define the next steps for this study

- Report and reviews are anonymous
- Be constructive
  - you are supposed to help your colleagues
  - give recommendations to improve
  - put your recommendations in context (explain)
- The wordings needs to be anonymous

Which of the following is the BEST example of a proper 2–3 sentence overview?

- a. "The project was interesting, well written, and the figures were excellent. It analyzed heat losses in a thermal system and showed useful results."
- b. "In this project, the authors present several results, discuss their meaning, and conclude with future work ideas."
- c. "The project models heat losses in a small-scale thermal system using a simplified energy balance and concludes that insulation improvements can reduce losses by 25%."
- d. "The authors describe their modeling assumptions, compute equations, and present many figures and discussions about heat transfer."

Which general-feedback paragraph fits the guidelines?

- a. "Your writing style is a bit dry and I would change the font sizes in several places."
- b. "The report is good but could be more engaging, and the methodology should be explained earlier."
- c. "The motivation is clear, the narrative flows logically, and figures effectively reinforce the main points without overwhelming the reader."
- d. "The project is logically structured, though some transitions feel abrupt. The goals are clear, and the figures generally support the narrative."

Which is the best example of detailed feedback (short, essential, high-impact)?

- a. "You should provide more references because the field is broad and readers need context."
- b. "Your assumption about constant airflow is critical; clarifying its justification would strengthen the validity of your results."
- c. "Figure 4 should use a different colormap and labels should be larger."
- d. "The introduction could be more concise and focused on the key message."

Which question for a major section shows the right level of depth?

- a. "Could you explain your method again but more simply?"
- b. "Did you consider any other equations for your model?"
- c. "How would your results change if the boundary condition you selected were relaxed or replaced by a variable one?"
- d. Why did you label Figure 6 the way you did?"

Which question appropriately probes a model assumption?

- a. "How sensitive are your results to the assumed constant efficiency of the heat exchanger?"  
"How sensitive are your results to the assumed constant efficiency of the heat exchanger?"
- b. "Could you run your model with more colors to see differences?"
- c. "How long did it take you to generate the simulation results?"
- d. "What made you choose MATLAB rather than Python?"

- Quantity, pertinence of the comments
- Language used to address the comment, aggressivity, un-justified depreciation of the work
- Relevance of the comments, justification of the comments
- Critical discussion of the results and the interpretations
- Critical discussion of the conclusion and the report outcomes

- Prepare the answers to the comments of the peer reviews
  - Are the comments valid ?
    - note : comments are numbered, refer the comment number of the reviewer nb
  - How would you answer the comments: explain the method to answer
    - *I will make a sensitivity analysis by modifying this value from  $x$  to  $y$ , this will proceed by the following steps*
- One reviewer will be an assistant
  - there will be comments on the method used and their justification
    - *How is this problem solved ?*
    - *What would be the alternative method and why to choose this one?*