

I. IDENTIFICATION DATA

Thesis title:	High-capacity accumulation of electricity from renewable sources
Author's name:	Anam Ayman
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Mechanical Engineering (FME)
Department:	Department of Energy Engineering 12115
Thesis reviewer:	Jan Opatřil, Ph.D.
Reviewer's department:	Department of Energy Engineering 12115

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment <i>How demanding was the assigned project?</i>	ordinarily challenging
The topic of the bachelor's thesis is ordinarily challenging and provides a wide range of possible solutions for the student.	

Fulfilment of assignment <i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	fulfilled with minor objections
The work fulfills all the tasks of the assignment and all the goals. The research part has approximately 36 pages, and almost half is dedicated to wind turbines. I am missing usage of this part further in the work. This part seems to be overextended.	

Methodology <i>Comment on the correctness of the approach and/or the solution methods.</i>	partially applicable
I am missing discussion and analysis related to choosing of appropriate accumulation technology. It seems that, a few technologies were randomly chosen without any context. May be not, but it is not included in the work. It should be accompanied by analysis of different physical principles of energy accumulation and their appropriate applications. The methodology of accumulation dimensioning, and economical evaluation are significantly simplified to just capacity based on monthly and weekly balances. Selected lead-acid batteries and hydrogen technologies provides different possibilities of dimensioning capacity and power with impacts to the CAPEX. According to my opinion it should be based on daily or ideally hourly data including the power dimensioning. The economical evaluation should be more detailed, also for comparison I would recommend common tools such LCOE. It should be followed by sensitivity analysis in the wider scope and better presented.	

Technical level <i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	E - sufficient.
The methodology of data analysis, dimensioning and economic evaluation are poorly explained, and it is hard to understand.	

Formal and language level, scope of thesis <i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	D - satisfactory.
The scope, logical organization of the work and English are good, however there are missing texts connecting individual parts together. Also as mentioned above, the student's approach in practical parts of thesis is not sufficiently explained. The presentations of results should be more technically oriented, clearly defined by numbers and graphs, especially in the economical evaluation part. There is also inconsistent labeling of physical quantities, numbering of equations is missing, chapter 5.6 contains only tables and accompanying text is missing, images are not referenced in the text.	

Selection of sources, citation correctness**B - very good.**

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

Number of references as well as their adequacy are very good.

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

-

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

From the opponent's point of view, the research part of the work should be primarily focused on the energy accumulation itself. It looks like a few randomly selected and described technologies rather than research. Here I would expect a division and analysis of technologies, for example according to the physical principle of storage and accumulation time, including justification of the selected technologies for comparison.

To the other parts, here are just two key criticisms:

- *System dimensioning is not understandable, basic parameters are not given*
- *Unintelligible economic evaluation, lack of clear definition of inputs and comprehensible description of procedure, insufficient sensitivity analysis*

In general, the procedures are extremely simplified and poorly described.

However, despite the above-mentioned critics, I find the work to be sufficient from the point of view of fulfilling the minimum requirements for a bachelor's thesis.

The grade that I award for the thesis is **E - sufficient**.

Please explain following questions:

1. I do not understand benefits of renewable energy, which is written in the chapter 1.2 – "*Renewable energy could be extracted with limited resources*". Please provide explanation of this benefit.
2. In the thesis is written that large scale battery energy systems are only lead-acid, NiCd and NaS. Could you explain what happened to Li-Ion batteries?

Date: **21.7.2023**

Signature: 