TALLINN UNIVERSITY OF TECHNOLOGY
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# SUGGESTIONS TO IMPROVE THE ENERGY EFFICIENCY OF THE TALLINN EUROPEAN SCHOOL

PROPOSAL

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# INTRODUCTION

The aim of this proposal is to present the Tallinn European School ideas for lowering their electricity, water and HVAC (Heating, Ventilation, Air Conditioning) bills. As discussed during our visit to the school, the proposal will be divided into three parts: affordable, medium-priced and costly measures.

The affordable measures will mainly consist of suggestions regarding changing the behavioural patterns of students and staff, mostly focusing on inculcating energy-efficient behaviour and habits.

The medium-priced section will give an overview of ideas that would require a certain budget to execute while still remaining doable and not too financially burdensome.

The costly measures, as their name suggests, are the most financially demanding of the three, however, for their implementation it is possible to get grants/incentives or funding (from the government, EU funding projects, private companies or the European School's Council).

It should also be noted that the more measures out of this list are implemented, the more money is to be saved off of the utility bills, hence even more opportunities to implement other energy-efficient solutions. Energy efficiency is a cycle, to enter which taking the right first step is crucial. The given proposal was composed with the aim of allowing the Tallinn European School to get acquainted with the world of energy-efficiency and for them to get an understanding of the necessary future improvements.

## AFFORDABLE MEASURES

- During daytime, when the light is not too intense to bother the students during the lessons, keep the blinds up. Sunlight during the day could be the main source of light in the classroom;

- Check how the radiators are working- which ones are working full power and which ones are off- no need for one to compensate for the other, both should be set to work moderately;

- Keep the temperature in all the used rooms even. For example, in the library and the kitchen it was way too hot, while in the hallways and classrooms it was rather chilly. In rarely used rooms the temperature can be lowered, in most classrooms, on the contrary, slightly turned up;

- Plan ahead- know when the bigger classrooms and the assembly hall are needed and only increase the temperature before events, no need to keep heating the room up when it is not in use, especially so during the weekends; additionally, unplug electrical devices (speakers, sound systems, projectors) from the outlet after events;

- Use sockets smartly. During our visit we have noticed a tendency (especially so for computers) of using one socket with an extension cord instead of separate sockets. The more devices are plugged into the extension cord of just one socket, the greater the load on a singular phase, the imbalance of which can lead to overheating, voltage fluctuations, reduced efficiency of electrical equipment, fire hazards and potential electrical failures;

- We have also taken notice of some windows not being properly closed. However childish this piece of advice may seem, always see to it that all handles have been pushed down to the maximum and that all windows are actually fully closed;

- Avoid keeping the temperature too high in the kitchen, whether it's a cooking classroom or a large kitchen where meals for students are prepared. Kitchen appliances such as stoves and ovens generate heat while in use, which naturally warms up the space. If the room is also heated up excessively, the kitchen can become uncomfortably hot. To maintain a comfortable working environment and reduce unnecessary energy use, we recommend being mindful of the additional heat from appliances and adjusting the heating accordingly;

- Unplug the microwaves when not in use;

- Check that the radiators are not blocked by furniture;

- Close the door to the classroom after the end of the lesson/when exiting to prevent heat loss.

## MEDIUM-PRICED MEASURES

- Installing window inserts- acrylic sheets, laser-measured to fit any window, ribbed with compression tubing that squeezes into the window frame, sealing cold air out and keeping warm air in [1]. Once they are popped in (no hardware required), they blend in with the window and become barely noticeable [1]. They additionally act as noise reductors, allowing students to fully focus on their studies. Since during warmer seasons there might arise a need to open the windows to air out the room, installing the inserts is recommended (but not limited to) during colder weather conditions;

- We did not end up visiting any bathrooms during our tour of the school, but in the case of regular faucets being installed there, they could be replaced with sensor/touchless ones. This would allow to keep the excessive water usage at a minimum. The temperature could be set to a moderate yet warm one, allowing to save water where students would normally let it run until it gets to their preferred temperature;

- Since the backstage area of the assembly hall is barely used, it is suggested to separate it from the main stage with an insulating curtain. This would allow to keep the temperature in the unused space lower and prevent the cold from permeating the stage itself as well as the hall;

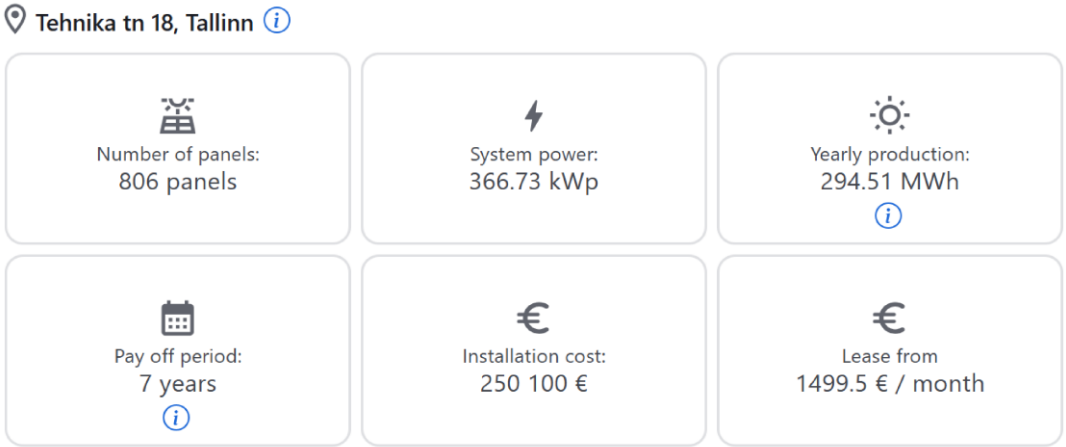
- Install motion activated lights in hallways, bathrooms and storage rooms. As we were told, the breaks between lessons last only 10 minutes. For example, if students forget to turn off the lights in the hallway, then for the entire duration of the lesson the lights will stay on. During our visit to the school we stopped by a rarely used storage room on the upper floor where the lights were on when we entered, despite there being nobody there. Especially for rooms less frequented, where if the lights were to stay turned on nobody would notice, motion activated lights would be an excellent solution;

- All of the secondary entrances have only one door which leads straight into the building, meaning that whenever somebody enters the school in the winter, the cold air seeps right into the building. The solution would be to install a second door, creating a vestibule to reduce heat loss and improve energy efficiency.

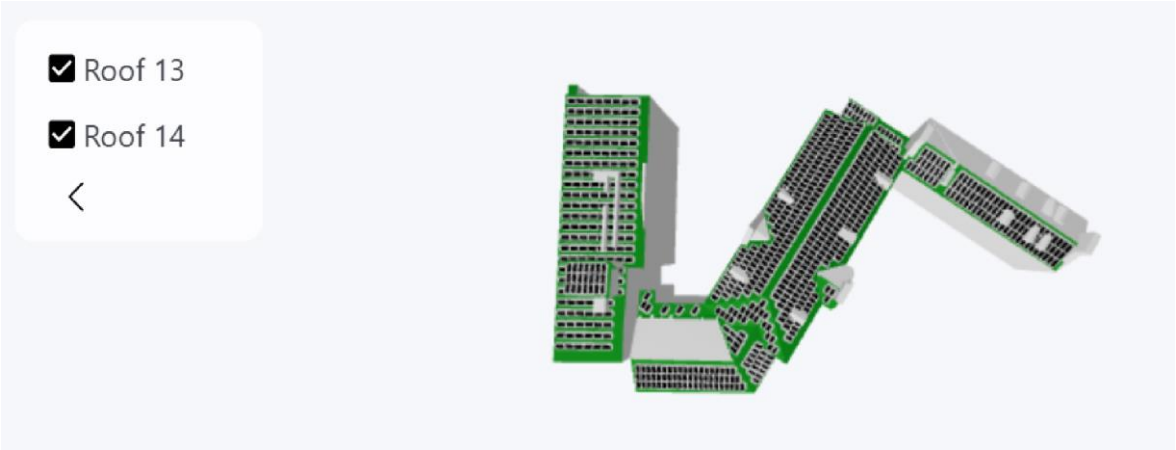
## COSTLY MEASURES

- Replacng all doors and windows while opting for those with lower thermal conductivity to minimise potential heat loss. While the windows did seem relatively new, from what we felt ourselves and from the experience of the students, they do not seem to be performing poperly, hence the need for an upgrade;

- Solar panels- certainly has levels to it. If the budget is not nlimited, then it is possible to install the panels on the entire surface area of the roof. However, if the budget is limited, then installation of the panels is also possible on the exact part of the roof that is exposed to the greatest amount of daylight. There is no obligation to cover the enirety of the roof, the choice is totally up to the buyer and their budget. Picture 1. demonstrates the technical and financial details in the case of the whole roof being covered [2]. Picture 2. shows the entire layout of the roof, where it can also be seen that it consists of 14 different parts/areas [2]; which ones to install the panels on is, once again, fully dependent on the budget of the school. Please note that all the numbers shown in Pictures 1-3. are but estimations. To get the exact numbers we would have to directly consult with professionals and ask for an offer.

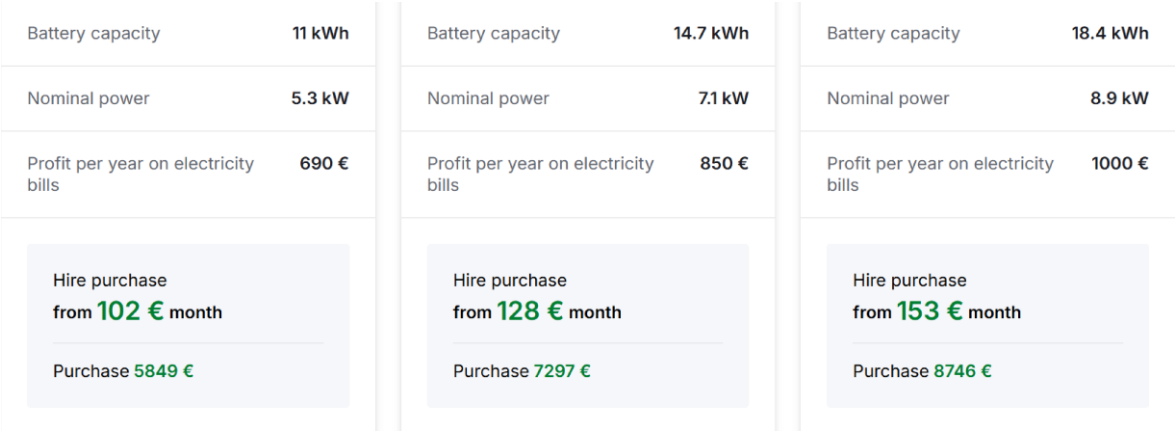



Picture 1. Details of the installation of the solar panels




Picture 2. Overview of the roof of the building

An additional option that comes with solar panels are batteries, which store excess electricity for later use or during power outages [2]. Once again, whether to get them or not depends fully on the budget of the buyer.




Picture 3. Battery options

- Switching out radiators for underfloor heating (UFH). UFH might be pricier to install, however it has a ton of pros as compared to conventional radiators, such as:
  - more even and consistent warmth;
  - thermostats in every room/zone to keep the temperature exactly as needed [3];
  - being at least 25% more energy-efficient than radiators (even up to 40% more efficient when paired with a heat pump), since UFH covers a large surface area and operates at lower water temperatures [3];
  - since it frees up wall space and does not take up any space near windows, it is also possible to install insulating curtains on windows

which emanate the most cold to prevent any cold from permeating the room (fits especially well in the case of storage rooms or rarely used rooms where blackout curtains would be suitable);
- makes the room safer in the case of spaces occupied mostly by younger children (no risk or danger bumping into sharp metal constructions) [3].

In should also be noted that underfloor heating and radiators can both be successfully installed in different areas of a property to create a flexible and efficient heating system [3], meaning that the two systems can work alongside one another. Which and how many rooms to install UFH to is fully dependent on the needs of the school (probably ones with the most uneven/inconsistent heating).

- Install a system that uses greywater to flush the toilets (also possible with rainwater). Greywater or lightly polluted wastewater, originating from sinks, showers and washing machines, can be filtered and reused for non-hygienic applications, precisely such as toilet flushing [4]. This way the water usage of the school will be noticeably minimised, since with ca 500 students and all the personnel the toilets alone require considerable amounts of water daily.

# SUMMARY

The given proposal was composed with very limited information regarding all of the technical aspects and data (such as phase distribution, which section of the building consumes the most electricity, what electricity plan is currently in use, the amount of reactive energy etc). To give more precise recommendations additional tests and measurements are to be carried out in the future.

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4. https://waterwisegroup.com/blogs/greywater-education/how-can-i-use-greywater
5. Picture 1. Details of the installation of the solar panels, source [2]
6. Picture 2. Overview of the roof of the building, source [2]
7. Picture 3. Battery options, source [2]