

reflection paper | aE studio

unclogging the grid – a study on how deep energy renovations can reduce the load on the electrical energy grid and create a self-sufficient building



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studio
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Reflection

During my graduation project I have researched how existing buildings can be made energy neutral without burdening the electrical energy grid. The method used to research this topic was visual validation where load graphs are scaled to a comparable scale to get insight what interventions will lower the load peaks. Furthermore to assess the effect on the annual load curve a simple simulation tool is used; the ZED-tool.

The methods used for this research did work to gain more insight in how to lower peaks in the load profile of a residential building. Because very little literature exists on the effects of interventions on the load curve the results of the research are adding to the existing body of knowledge. However the research can be expanded by trying to make a very elaborated simulation tool that takes all parameters into account. This way it is possible for designers to see how changing a parameter changes other parameters in which the designer needs to make a choice.

The feedback of my mentors was very constructive. Sometimes I did not really get their feedback so they had to clarify it to me again. I have tried to implement helpful tips from my mentors like; Kill your darlings, don't be afraid for bad sketches as they always learn you something and don't overthink everything.

During my graduation I have learned to get my ideas out of my head on to paper. If I make my ideas more explicit it creates a better academic argumentation. It also helps with idea creation and seeing new possibilities in the design.

Relation between graduation project topic, master track, and master program

The relation between my graduation topic and the studio topic is that they both combine the technical and social aspects of architecture. As the research focuses on the local energy generation to reduce the energy use and peak loads of the grid and the design focuses on the integration of these measures while updating post-war architecture.

This last part links the Architecture track to my topic as my design seeks a new aesthetic to retrofit post-war architecture to make these existing buildings more energy efficient and improve social interaction in the building.

Because changing a building has impact on all levels I feel this graduation project touches all the specialisations (A,U,BT,LA & MBE) within the Master, with a focus on architecture as I am designing a building in the end. I feel like my project will affect the Urban context as I am improving the social interaction with the street in my design. Furthermore my design has a technical character to make sure the load on the grid is not burdened by reducing demand and implement energy generation which is connected with Building Technology. As the existing building is a social housing block and my goal is to challenge the current business model of social housing I touch MBE as well. Finally the whole neighbourhood can work together generating and sharing energy to maximize the self consumption of renewable energy which has impact on the Landscape of the neighbourhood. So all tracks are touched in my graduation thus representing the whole master programme.

Influence of research on design/recommendations and influence of design/recommendations on the research

As my research showed that the implementation of wind and solar energy on the façade on a building will lower the grid congestion it influenced my design quite a lot. Moreover I had to calculate the amount of solar energy I could harvest on the façade without interfering with the daylight openings. Therefore I had to determine if it was feasible to apply this spatially on a building.

The design part influenced my research a bit as I had to find a space to place certain installations like a battery in an existing building. This is why I did not look further than the building in my research. This while my research could go a bit deeper in the larger context like a street or neighbourhood as not all buildings can generate renewable energy that does not increase the load on the grid.

Assessment on the value of the used approach

I would say my way of working and methods gave a good insight in my topic. I have learned that I need to stop overthinking and put the thoughts on paper as it makes the problem more visible and easier to communicate. Although sometimes my rational thinking blocked my creativity or exploration of extreme options in the design. The methods used in the research however worked really good. In the future I would like to dive deeper and try to make the graphs and simulations myself to gain precise data that show if certain techniques really lower the load profile.

Assessment of the academic and societal value, scope and implication of the graduation project, including ethical aspects

The relevance of my graduation work in larger social framework is to provide a solution to speed up the energy transition, to densify and improve post-war neighbourhoods. Especially now that energy prices are high low income households struggle to make ends meet. Thus by lowering the energy consumption of a building the energy costs for households will drop improving their financial situation. Now that the Dutch government is planning to abolish the net-metering regulations, the financial incentive to implement renewable energy sources (RES) as a household is lower. This hits the low-income households the most as installing RES costs a lot of money and without the net-metering rule it becomes harder to earn back their investment. By installing RES in the way that is proposed in this research will increase the self-consumption of energy lowering the amount of energy bought from the grid thus, lowering the energy bill and decreasing the amount of fossil fuels.

In the professional framework my work will provide a new insight in transforming post-war dwellings as there are a lot of similar buildings in the Netherlands that have use a lot of energy contributing to the climate change.

And regarding the scientific framework my graduation will give more insight in peak shaving measures and provide a basis for a tool to simulate the load profile of a household. This tool can be used by designers to test different energy concepts to lower the load on the grid and become more self-sufficient in energy use.

Ethical the critical question can be raised that the implementation of more wind and solar energy leads to more use of scarce materials like graphene.

Assessment on the value of the transferability of the project results

I think my results are easily transferable to other buildings or contexts in the residential domain. As there are a lot of buildings built in the 1960s that would fit perfectly within my proposed design strategy. My method can also be used to research this topic on non-residential projects. As said earlier I did not look at a neighbourhood scale that much yet. However, with the knowledge gained during my graduation this should not be too hard to transfer.

Reflective questions

Finally, I can ask myself the following critical questions on the content of my graduation:

- How does your strategy work in a bigger scale to lower the neighbourhoods load profile?
- Is this idea still feasible if the large façade of the building was oriented to the south?
- What is new and innovative about your plan?



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