Reflection

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Position topic in the graduation studio

The master building technology combines design and engineering with a focus on sustainable façade, climate and structural design in the built environment. In this thesis a roadmap for the energy transition of the city Delft is developed together with an approach for the transition of Dutch municipalities. Both roadmap and approach focussed on the technical aspects of the energy transition. The roadmap integrates the required interventions on different scales: urban, district, neighbourhood and building scale. The interventions at the building scale will show the consequences of the chosen energy system for the district/neighbourhood towards the envelope and the installations of the building. Thereby the thesis is focussing on the climate and sustainability department.

Relation between the research approach and aimed results

This thesis is divided in 3 parts: I the basics of the energy transition (literature review), II the approach and III the roadmap of the city Delft. With the literature study the basic knowledge about the Dutch energy transition and the available technologies for generation, conversion, storage and transportation of energy was gained. This resulted in an overview of available technologies and in guidelines that helped to create the approach and the roadmap.

In the next phase the approach (II) and roadmap of Delft (III) were designed. As proposed in the research approach these steps where performed simultaneously. Finding during the design of both methodology and roadmap affected each other until the final methodology was created.

The first steps of the approach are the analysis of the context of the roadmap including characteristics of the city, energy demands, existing energy systems and energy potentials. In the next phase the roadmap was designed. The design process of the roadmap and the approach was a more complex process of trial and error. Finally, as aimed, the final roadmap integrated the defined interventions based on local potentials on all scales of the all scales of the city by going through all scales of the city during the design process.

Relation between research and design

The research focussed on the general background information of the energy transition: the current energy system in the Netherlands, sustainable energy sources and load matching technologies. This resulted in guidelines for the energy transition of Dutch cities. Together with the analysis of existing methodologies for the energy transition this formed the initial basis of both

approach and roadmap (design-by-research). The literature study results can clearly be found in the created 'sustainable heating systems tool'.

While the research done resulted in the first version of the design, the remaining part of the roadmap and approach is defined with research-by-design. By designing the roadmap the last steps in the approach towards the roadmap were designed.

Application of results in practice

The defined approach should help municipalities to simplify the transition process by providing steps that result in a roadmap design that integrates the sustainable energy systems on all scales (based on local potentials). This approach is supported by tools that help to determine which energy system and energy sources can be implemented on which location.

The approach doesn't include how to involve the stakeholders to finally realise the by the roadmap proposed interventions. However it helps the municipality to define a roadmap and thereby they will have a concept/idea about what can be done at which location and what the scale is of the transition task.

Achievement of projected innovation

The city Delft is aiming to become energy neutral in 2050. However the road towards this energy neutrality is unknown. The designed roadmap for the city Delft results in a proposed energy strategy for the transition, This proposal appoints which energy system and interventions have to be implemented in which district/neighbourhood to succeed in the transition towards energy neutrality.

Compared to existing methodologies the approach is not only focussing on a roadmap at urban scale, but it makes sure that the chosen interventions are integrated at all scales of the city (urban, district, neighbourhood and building block). The developed tools that are added to the approach can help the municipality with this integration.

Contribution to sustainable development

The designed roadmap results in an energy neutral Delft. Energy neutrality means that no energy originating from fossil fuels is used, so only renewables do supply the energy demands. Thereby no CO_2-emissions will be released.

The created approach for the energy transition of Dutch municipalities will help to define a roadmap for other cities. Beside that the thesis focusses on the urgency of the transition and the importance of an active role of the municipality in this transition process by the slow development of the energy transition by the national government.

Impact on sustainability (PPP)

Planet - Currently the global temperature is increasing: the climate is changing. An energy transition is required to limit this climate change and to be able to preserve the world we live in and thereby keep it liveable for our next generations. Therefor we should get rid of an energy

system based on fossil fuels (results in CO_2-emissions) and change to a system based on renewables.

People - The world is running out of his fossil fuel reserves; therefore the transition is required to be able to guarantee the energy supplies to furfill our demands. The approach will result in a roadmap in which the energy system is based on renewables. Thereby the energy supplies will be guaranteed. At the same time the use of renewables will not result in the release of CO_2-emissions, so that the air pollution can be avoided.

Currently a lot of citizens in the Netherlands are living in energy-poverty. The first step of the energy transition to energy neutrality is energy retrofitting of buildings. These renovations will lead to a decrease of energy demands and thereby smaller energy bills. At the same time these renovations will increase the indoor climate and living conditions of citizens.

Profit - Because fossil fuels are running out not only the supply of energy should be guaranteed, but also energy supply should stay affordable. This is another reason for the transition. The transition is a complex and expensive process, but at the same time this will lead to new jobs in the knowledge, management and construction sectors.

Relation between the project and the wider social context

The energy transition asks for good management from the governmental institutions, but will also ask for participation and effort of companies and the citizens. Therefor the municipality should make the citizens aware of the urgency of the transition and at the same time they should provide information about the measures that the citizens and companies can take. Although quite some citizens are willing to contribute, the municipality should also expect resistance from their citizens. Not all citizens and companies will be able or willing to participate in the transition by energy retrofitting their buildings. At the same time citizens should chance their traditional view on the energy supplies, as being invisible. In this new sustainable world energy will be a visual factor; wind-turbines, roofs covered with PV and solar collectors will fill the skylines of the cities. To succeed the energy transition the participation of both citizens and companies is one of the most important factors.

Influence of project to architecture / the built environment

Currently architects are become more aware of sustainability, this leads to a trend of sustainable buildings, often heated with a heat pump. However this process of choosing a heating system should become more integrated with surrounded the built environment. The energy potentials in the surroundings should be well analysed in order to choose the best suitable heating option which won't be contradicted to the energy transition roadmap of the full city. For existing buildings intelligent energy systems/technologies should be chosen that limit the required interventions in the area. The energy transition will only succeed if all scales of the built environment are integrated.