

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Submit your Graduation Plan to the Board of Examiners (Examencommissie-BK@tudelft.nl), Mentors and Delegate of the Board of Examiners one week before P2 at the latest.

The graduation plan consists of at least the following data/segments:

Personal information	
Name	Jelle Geert Emmen
Student number	4454219

Studio		
Name / Theme	Energy and Climate	
Main mentor	Fred Veer	Structural Design
Second mentor	Regina Bokel	Climate Design
Argumentation of choice of the studio	Personal interest and motivation to research alternative energy sources to achieve a truly sustainable future.	

Graduation project	
Title of the graduation project	Research on the deployment of nuclear reactors in the urban environment
Goal	
Location:	Port of Rotterdam / Rotterdam–The Hague metropolitan area
The posed problem,	The current energy transition strategy focuses completely on renewables and compensates its energy gap with biomass and import. Does this result in a truly sustainable world or does it move the problem of polluting energy sources to other countries.
research questions and	To what extend can nuclear energy implementation in the Dutch energy mix enhance a genuine carbon neutral country?
design assignment in which these result.	Extensive investigation and comparison on the material, land use and synergy potential effects of certain energy strategies. Including suggestions for possible new connections between the built environment and industry.

Process

Method description

This master thesis project is part of a joined graduation project with Materials Science and Engineering, for that reason includes various aspects not broadly discussed and researched at the AUBS faculty.

First, literature and case studies will be discussed to describe the most likely energy transition strategy for the Netherlands and the Port of Rotterdam / Rotterdam–The Hague metropolitan area specifically. Combining this information with the energy requirements of the port of Rotterdam gives a clear image of the challenges and problems of the current strategy. These figures allows for a second strategy including near-future nuclear power plants, consequently allowing for an extensive comparison study between these different scenarios. Elements that will be discussed are:

- i) Possibility to acquire a 100/% carbon free primary energy consumption in the Netherlands / researched area
- ii) Land use study
- iii) Material requirements; primary and secondary
- iv) End of Life scenarios for the various energy sources
- v) Dependence, including grid stability and future energy shifts
- vi) Rough cost estimations

To analyse these scenarios a computational script will be written that converts open GIS data. This script will allow for a clear comparison between the systems and results in additional bottlenecks and synergy potentials of these scenarios.

Finally, the most optimal system is chosen and the resulting bottlenecks and synergy potentials related to the built environment and its connection with the port of Rotterdam will be discussed. After, follows a built environment infrastructure proposal based on the earlier discussed elements. The main purpose of this design is to show the potentials of complex urban energy systems and their direct and indirect effect on the sustainable goals set by the European Union and the Dutch government.

Literature and general practical preference

- Case studies and spatial energy strategy reports (Klimaatakkoord, PBL reports, KEV)
- Nuclear feasibility studies, nuclear technology reports and books (specifically: gen-III+, ASMRs and gen-IV)
- Technical reports and GIS data on current energy infrastructure, their background technology and waste chemicals/heat networks

Reflection

1. What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?
2. What is the relevance of your graduation work in the larger social, professional and scientific framework.

