

# Master Thesis

## Building Climate Modelling Greentower

### About MEP

The Munich Institute of Integrated Materials, Energy and Process Engineering (MEP) is an Integrative Research Institute, clustering a number of departments at TUM. Interdisciplinary research at ZEI focuses on energy and sustainability, particularly specializing in renewable energies, electro mobility, energy generation, energy storage, power plant technologies and energy efficiency in the construction industry.

### Background

Vertical farming has emerged during the last decade as a way to grow food in a completely controlled environment. Indoor farming in stacked layers allows a very low water and much lower fertilizer demand compared to conventional farming on the field, enables multiple harvests throughout the year and therefore a much higher yield. The big challenge is to decrease the very high energy demand for lighting and environmental control.

We consider vertical farming as a holistic system with the goal to develop an energy-optimized concept based on all sub-components and an adapted building design. Thereby we focus on an optimized lighting and engineering concept, combining renewable power supply within an integrated building concept including new designed cooling and ventilation systems. Hence, a thermodynamic model including all sub-components for a vertical farm is needed.

### About this Position

An interdisciplinary research team has been established to optimize the system vertical farming. We will analyse the potential to convert a former cartower into a greentower to install containers for vertical farming. The goal of this thesis is to derive a model of the cartower with a thermal dynamic simulation program. The model can be validated against measured data from the existing tower.

The main tasks are:

- 1) Derive a model of the tower with a thermal dynamic simulation program
- 2) Validate the model against measured data
- 3) Gradually increase the level of detail for the installation of the containers including lighting, water cooling, ventilation and air conditioning

### Requirements

- Enrolled student in one of the master programs at TUM
- Good knowledge of thermodynamics
- Experience with a thermal dynamic simulation program is beneficial

### What we offer

- Exposure to state of the art research topics
- An international and multidisciplinary working environment
- Opportunity for publishing in international journals

Please send your application to Dr.-Ing. Petra Liedl, [petra.liedl@tum.de](mailto:petra.liedl@tum.de)