EuroTech Energy Efficient Buildings and Communities
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Modelling and Simulation of Robust Net-Zero Energy Buildings

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Group	Computational Building Performance Simulation (CBPS)
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Background

To meet demanding building regulations, net-zero energy buildings are currently designed to have highly insulated building envelopes and consequently minimum energy demands. These low energy demands are often met by minimally sized energy systems. Uncertainties in the building future use, operation and external conditions such as climate change, occupant behavior etc. impact the performance of these buildings causing variations in energy consumption and indoor environmental quantity. Net-zero energy buildings, with minimally sized energy systems in combination with highly insulated and airtight building envelopes, might not be able to cope with these performance variations.

Hence, net-zero energy buildings and their energy systems must be robust such that climate change or uncertainties due to occupant behaviour must not result in great variations of the energy consumption and indoor environment. To achieve this, proper balance between energy demand, HVAC and renewable energy system capacities needs to be investigated, instead of aiming for very low energy demands, to meet the performance requirements over the whole building life span.
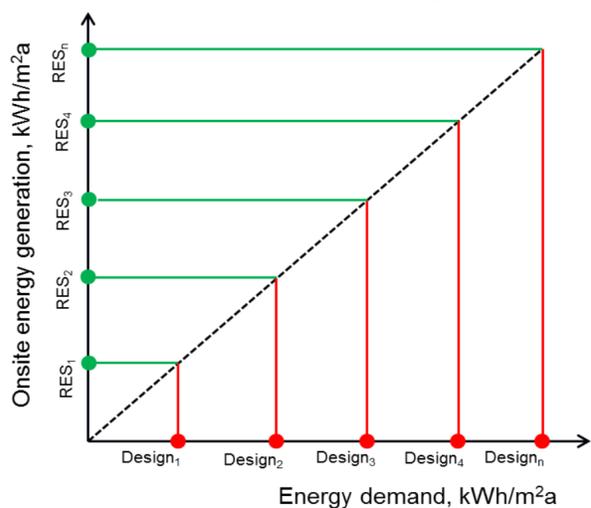

Figure 1 : Balance between energy demand and onsite generation of various net-zero energy designs
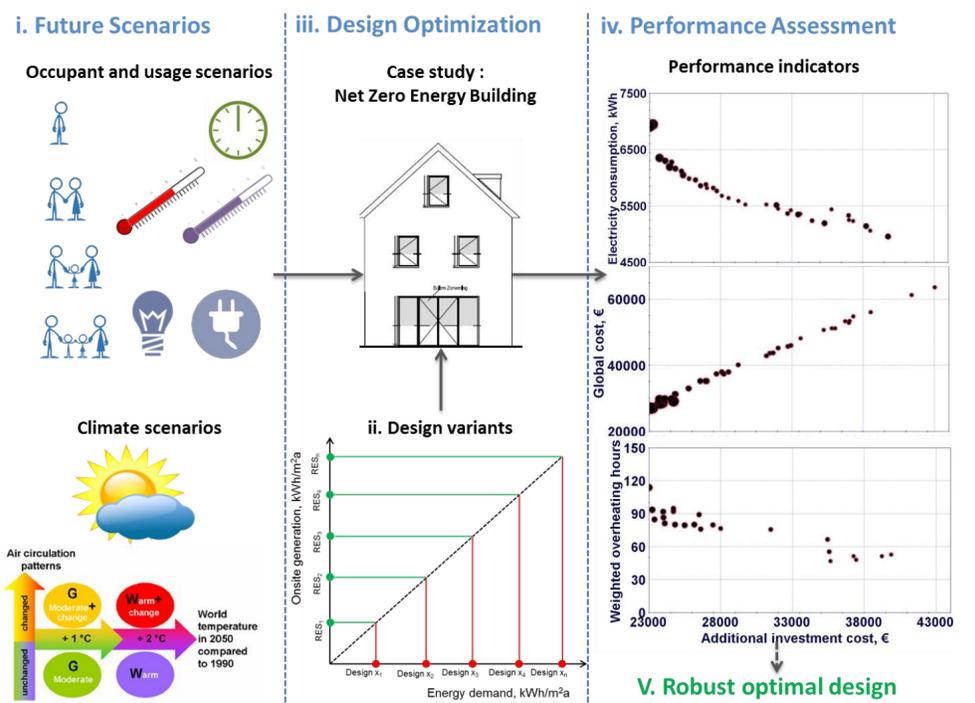
Aim of the Project

The aim of this study is to develop a **design optimization and performance assessment methodology** to assess the performance **robustness** of net-zero energy designs considering future scenarios like climate, occupant and usage scenarios.

Research Approach
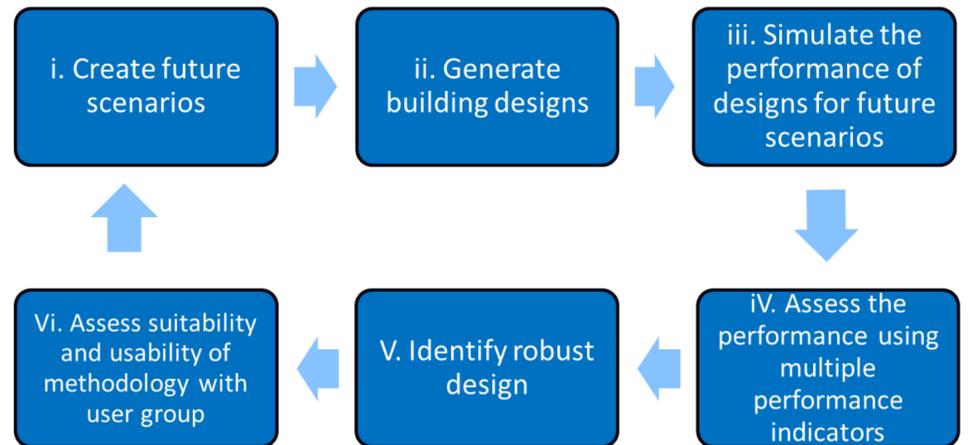
Methodology

Expected Results

➤ Design optimization and performance assessment methodology for assessing design robustness

➤ Using this methodology, the decision maker can chose a robust design by prioritizing a performance indicator and carrying out trade off with robustness of other performance indicators and required additional investment cost

➤ This methodology also provides a decision maker with information to trade off investment in improving building insulation levels with that of energy generation systems (energy balance) and robustness of design