AixLib – An Open-Source Modelica Library within the IEA-EBC Annex 60 Framework

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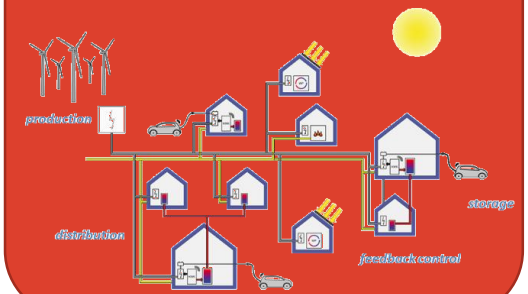
E.ON Energy Research Center

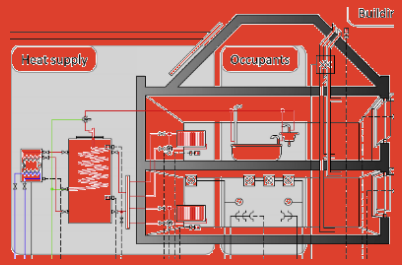
RWTH AACHEN UNIVERSITY

AixLib: A model library for building performance simulation

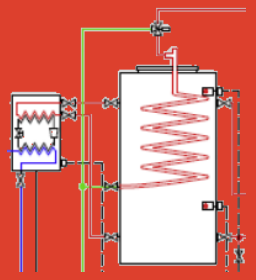
Urban Scale



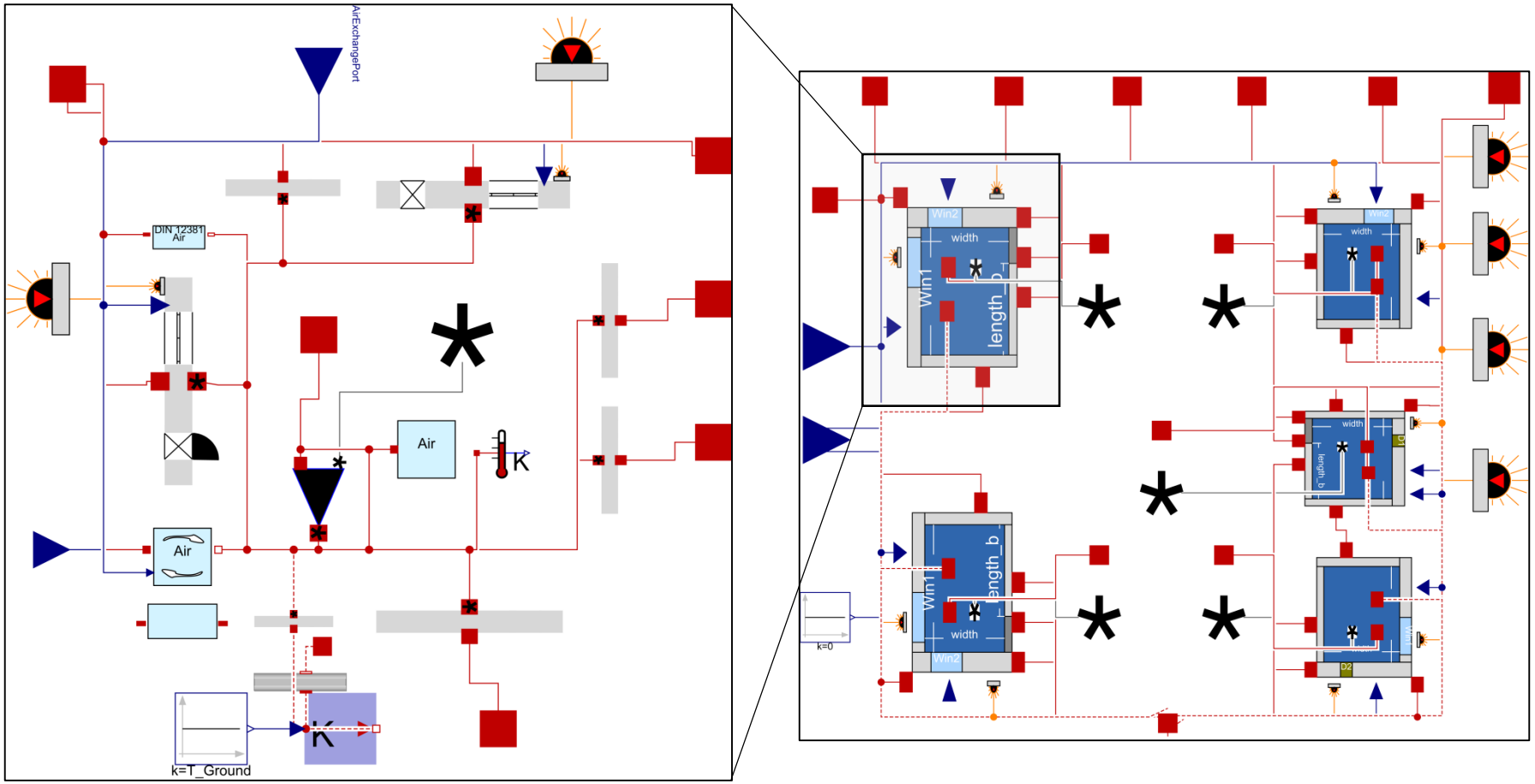
Building Scale



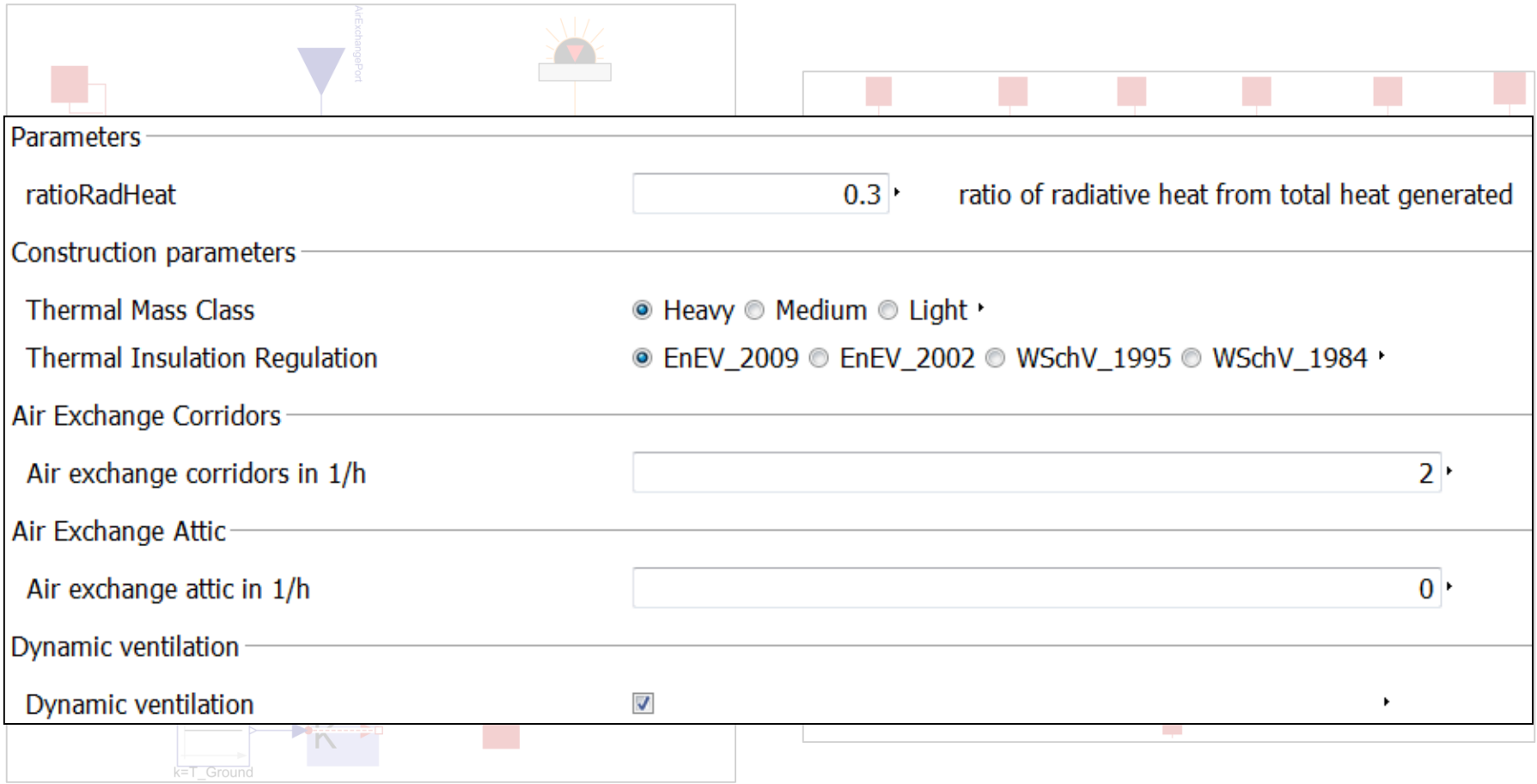
Single Components



High Order Building Model

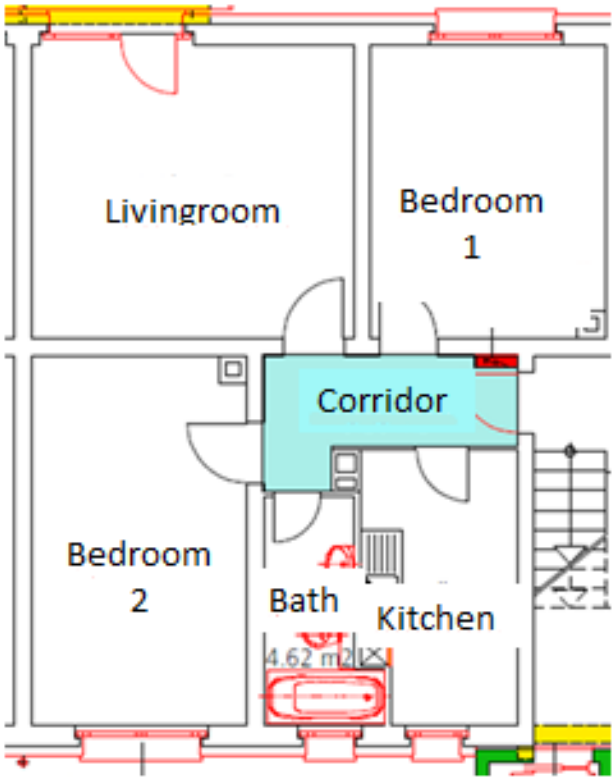


High Order Building Model



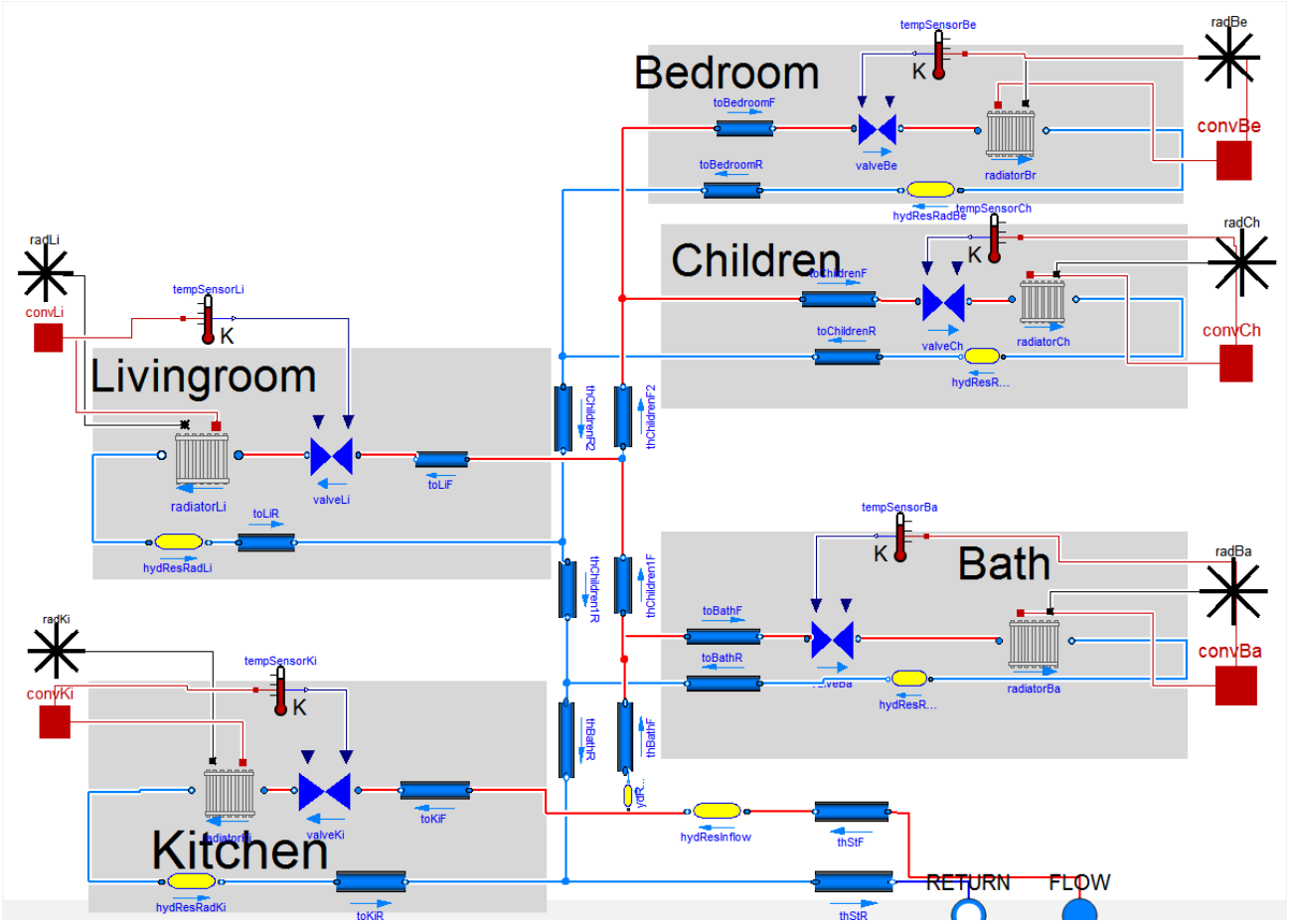
Use Case: Demand Side Management by Overheating an Apartment

- Heavy building with properties of thermal insulation regulation WSchV1984
- Apartment with 70 m² net floor area
- Aim:
  - Reduce heat demand during peak load hours
  - Store energy in building mass by overheating



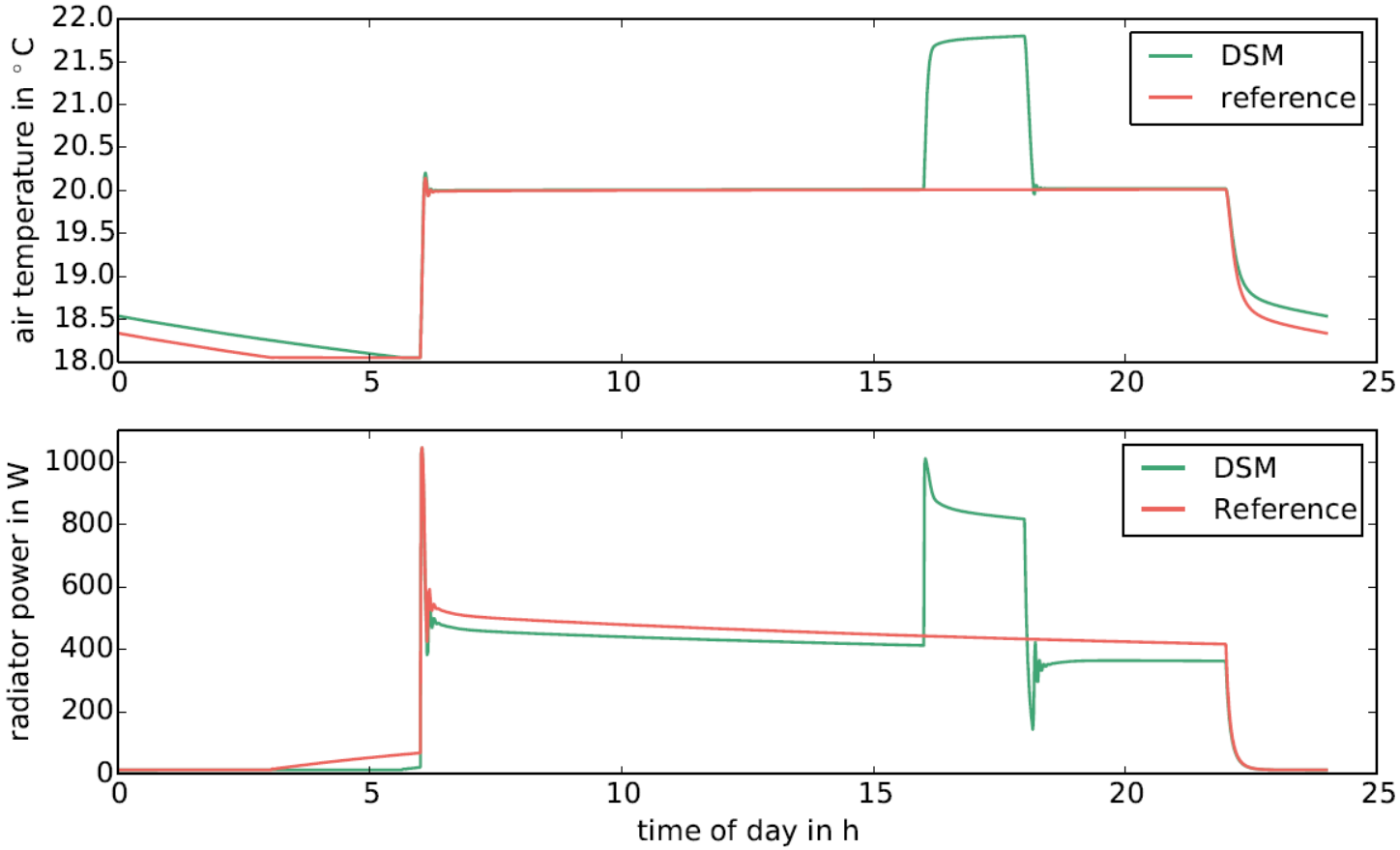
Use Case: Demand Side Management by Overheating an Apartment

Combined modeling of building envelope and energy system



Use Case: Demand Side Management by Overheating an Apartment

Slight overheating between 16:00 and 18:00 leads to 14 % demand reduction during peak load hours



AixLib: A model library for building performance simulation

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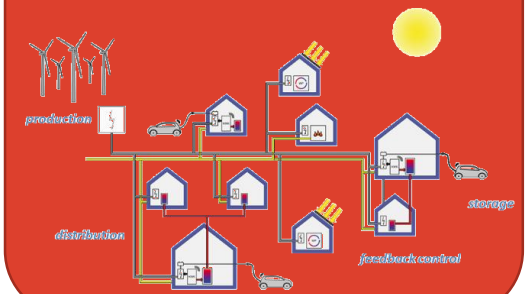
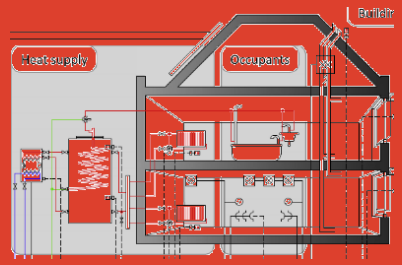
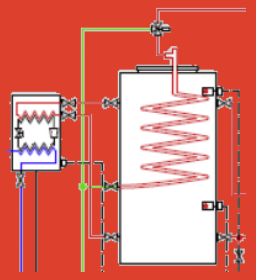


Building Scale



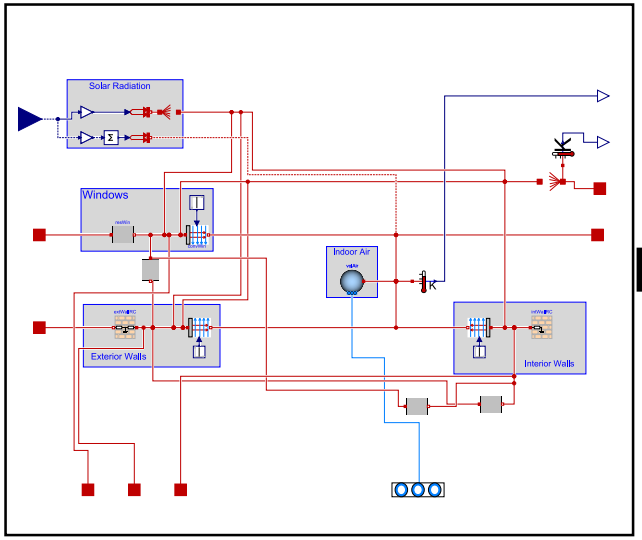
Single Components



Reduced Order Model as Core of Multizone Model

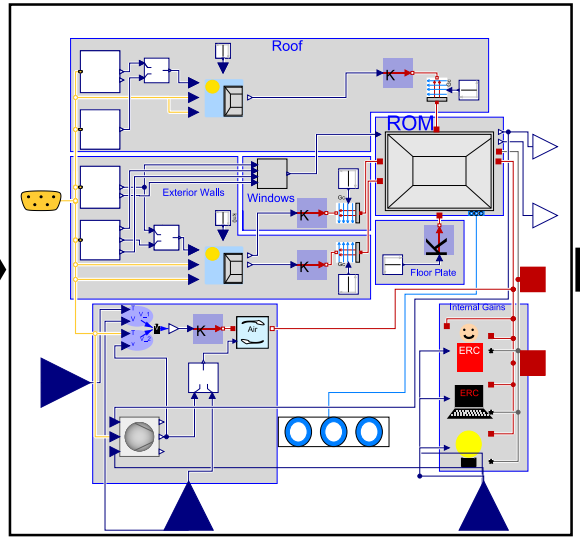
Thermal building model with variable number of layers, walls and zones

Reduced Order Model



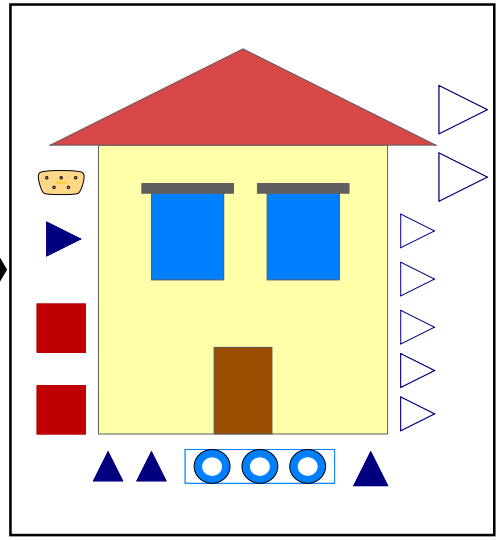
Accounts for building‘s mass

Thermal Zone



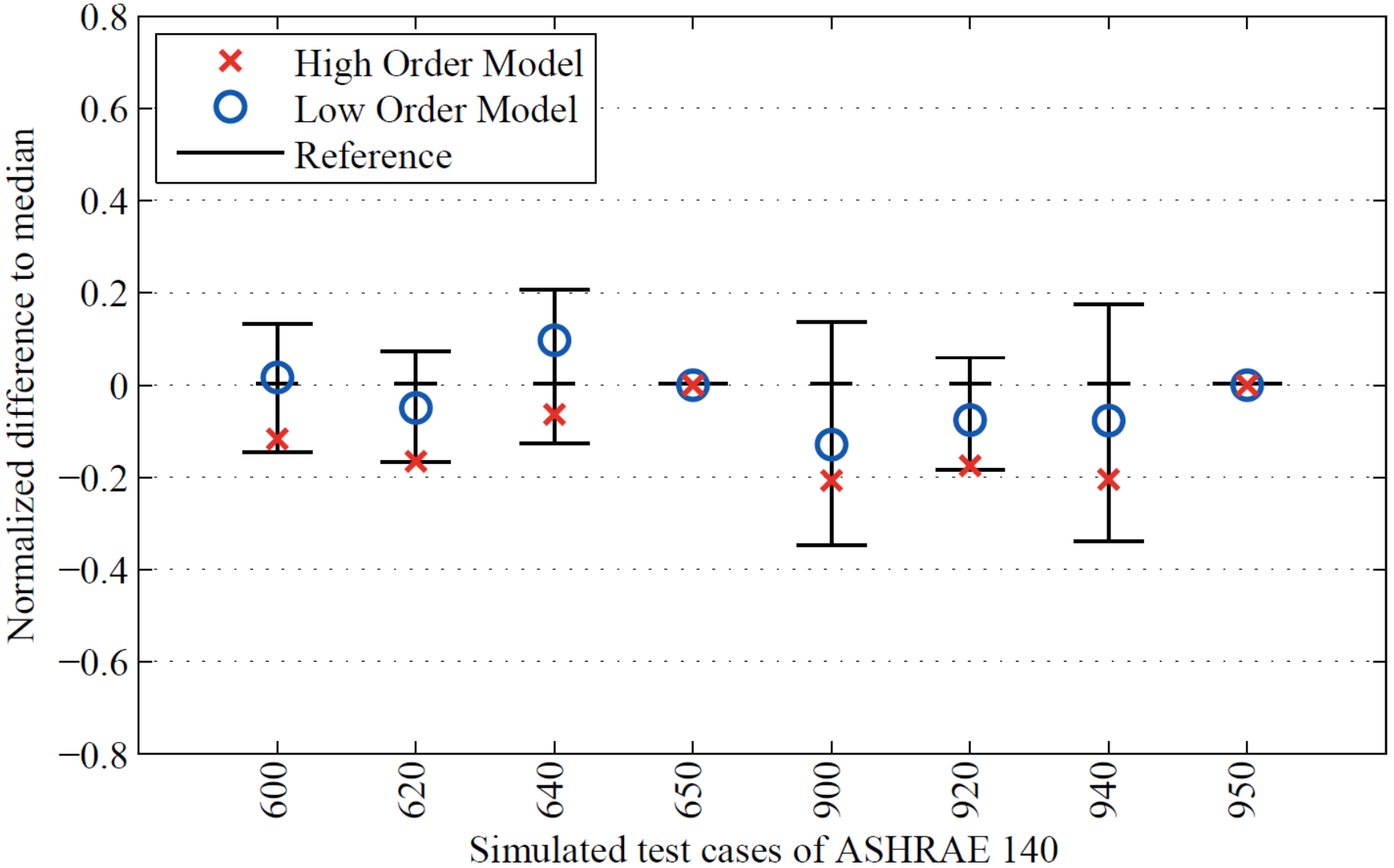
Adds solar radiation and internal gains

Multizone



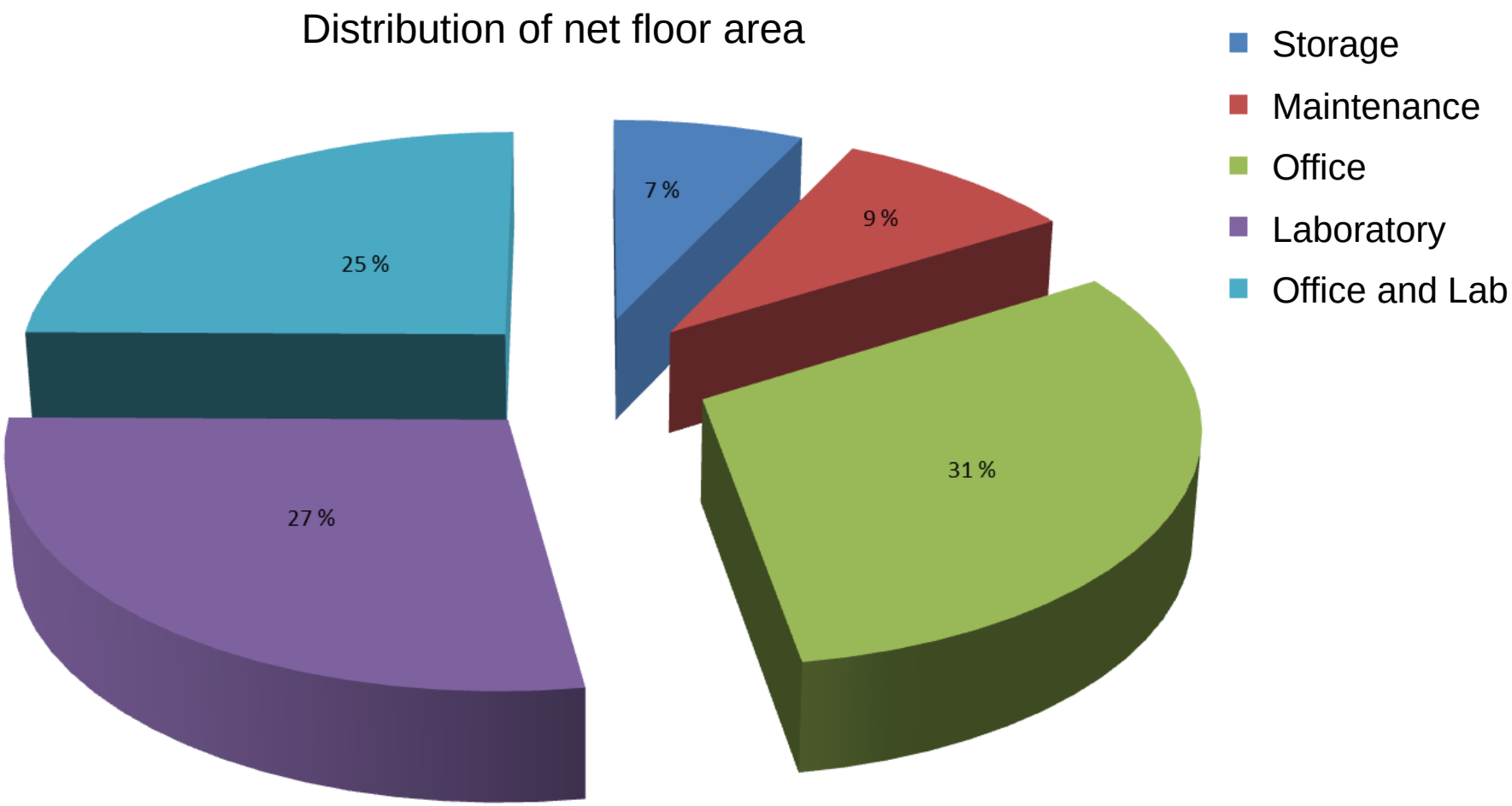
Adds a variable number of zones

Annual Heat Load Validation According to ASHRAE 140

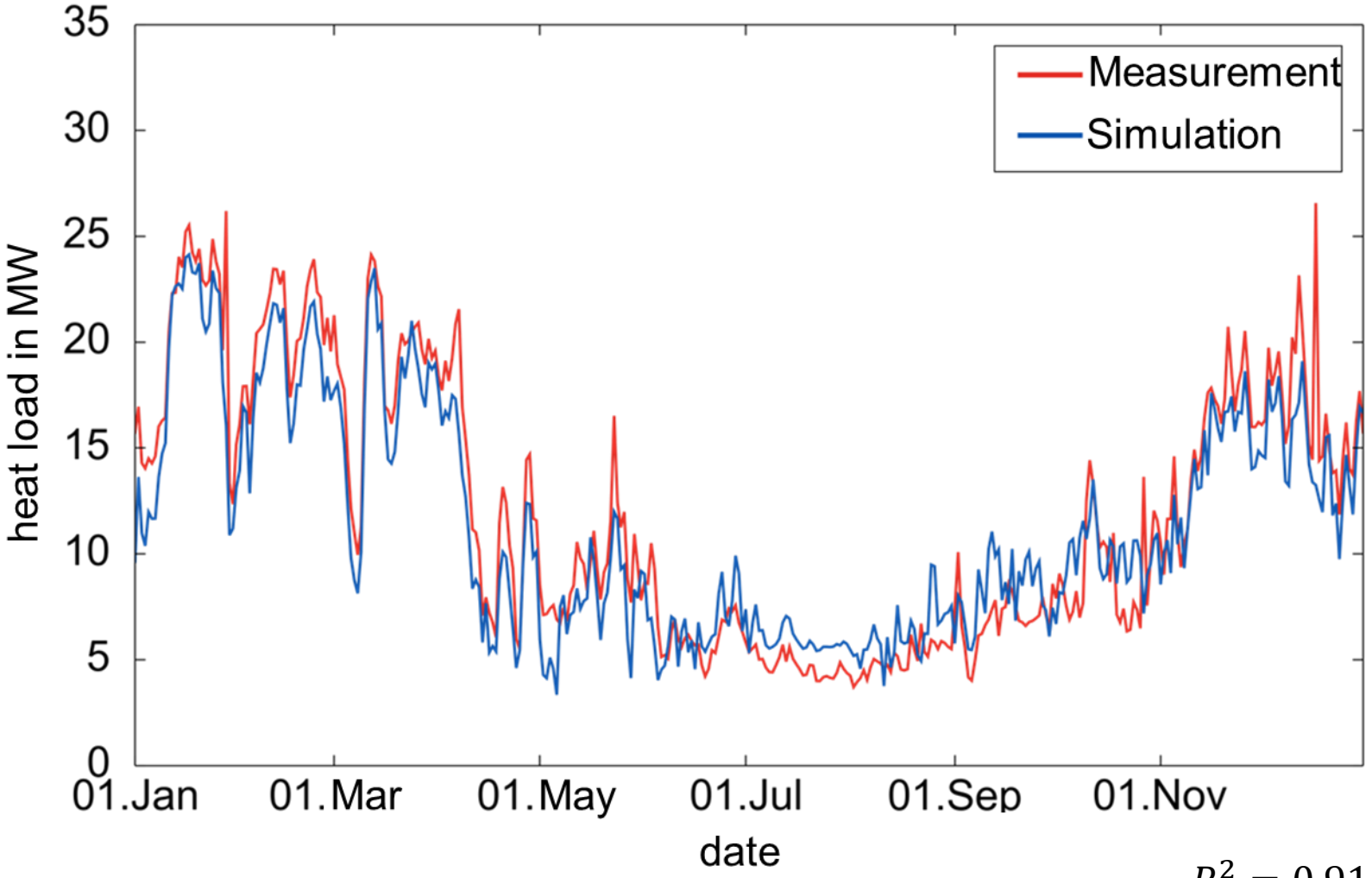


Use Case: Forschungszentrum Jülich
Heat Demand Profiles

200 buildings of different use, year of construction and net floor area

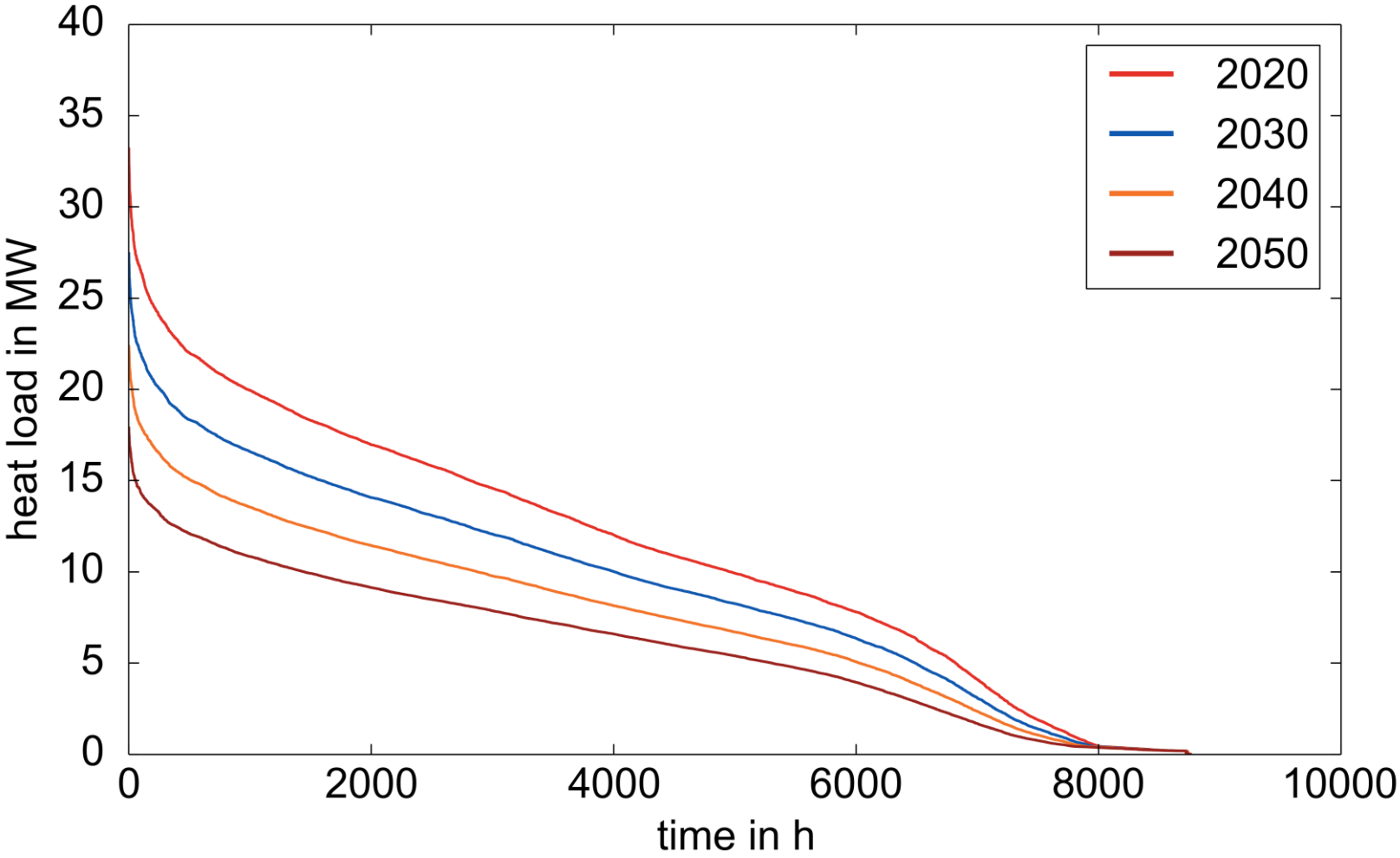


Use Case: Forschungszentrum Jülich
Comparison of Simulation to Measurement



$R^2 = 0.91$

Use Case: Forschungszentrum Jülich
Heat Demand Reductions with 1.7 % Retrofit Rate



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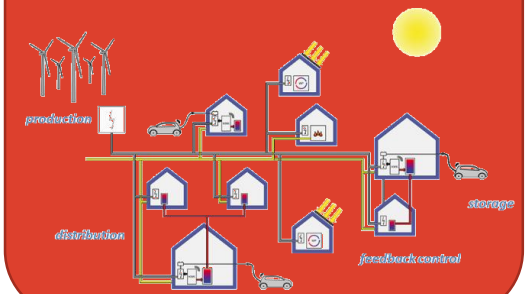
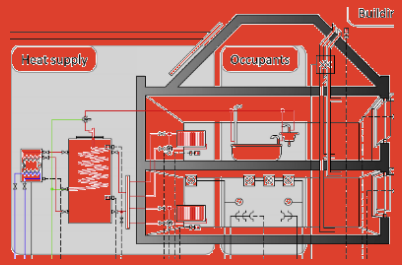
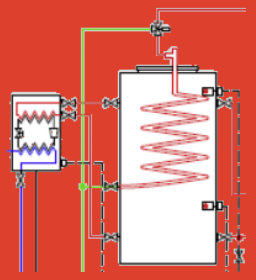


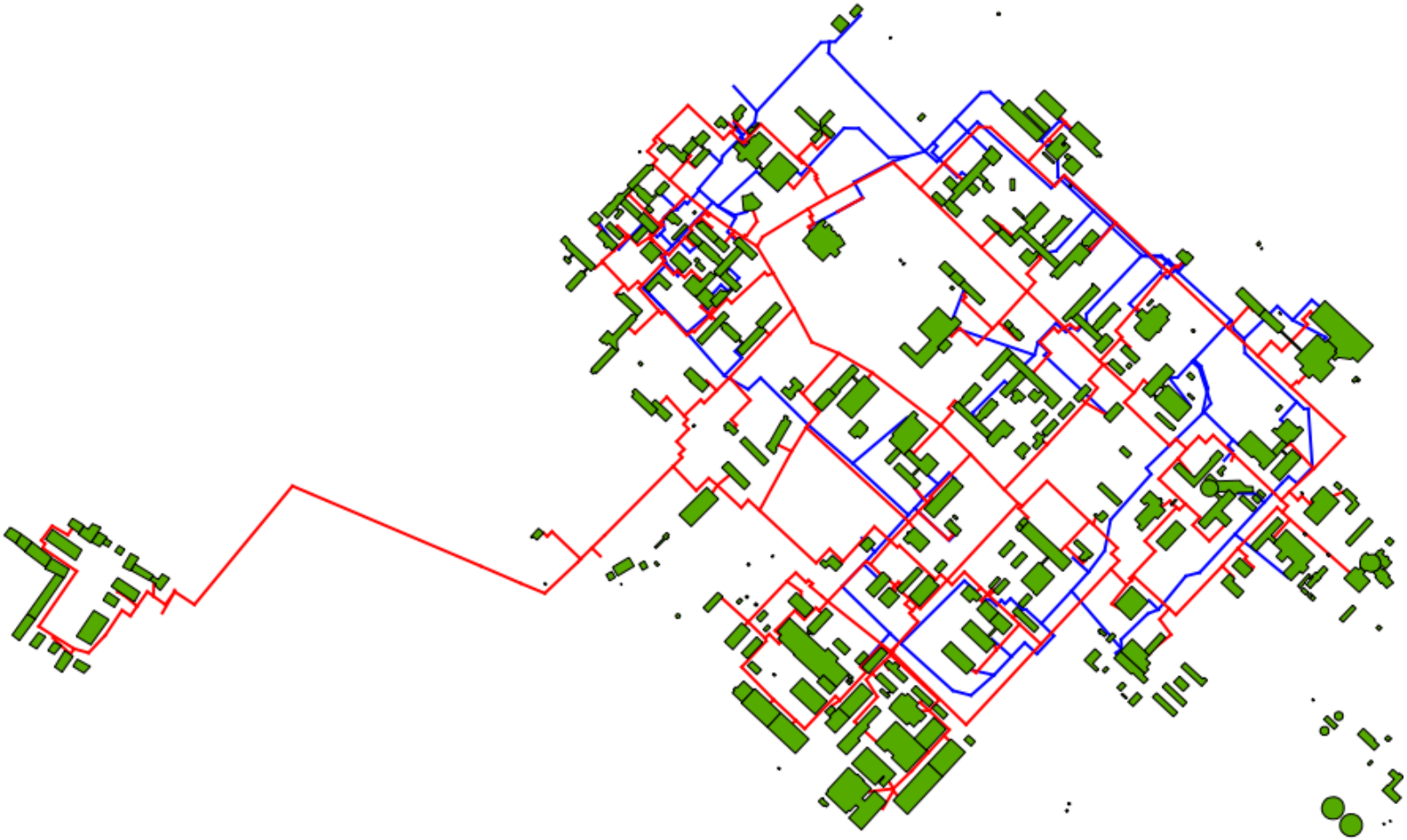
Building Scale



Single Components



Use Case: Forschungszentrum Jülich
Energy Grid System



Automated Model Generation for District Energy Systems

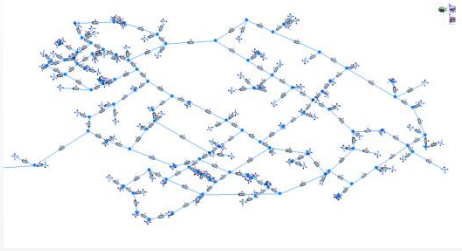
Input from GIS

Existing district data for real cases

Generate Use Cases

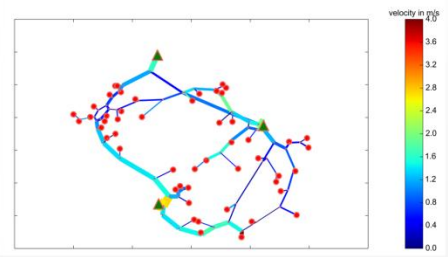
Generic districts for case studies

DES Modelling Routine



Full thermo-hydraulic system model

Visualization

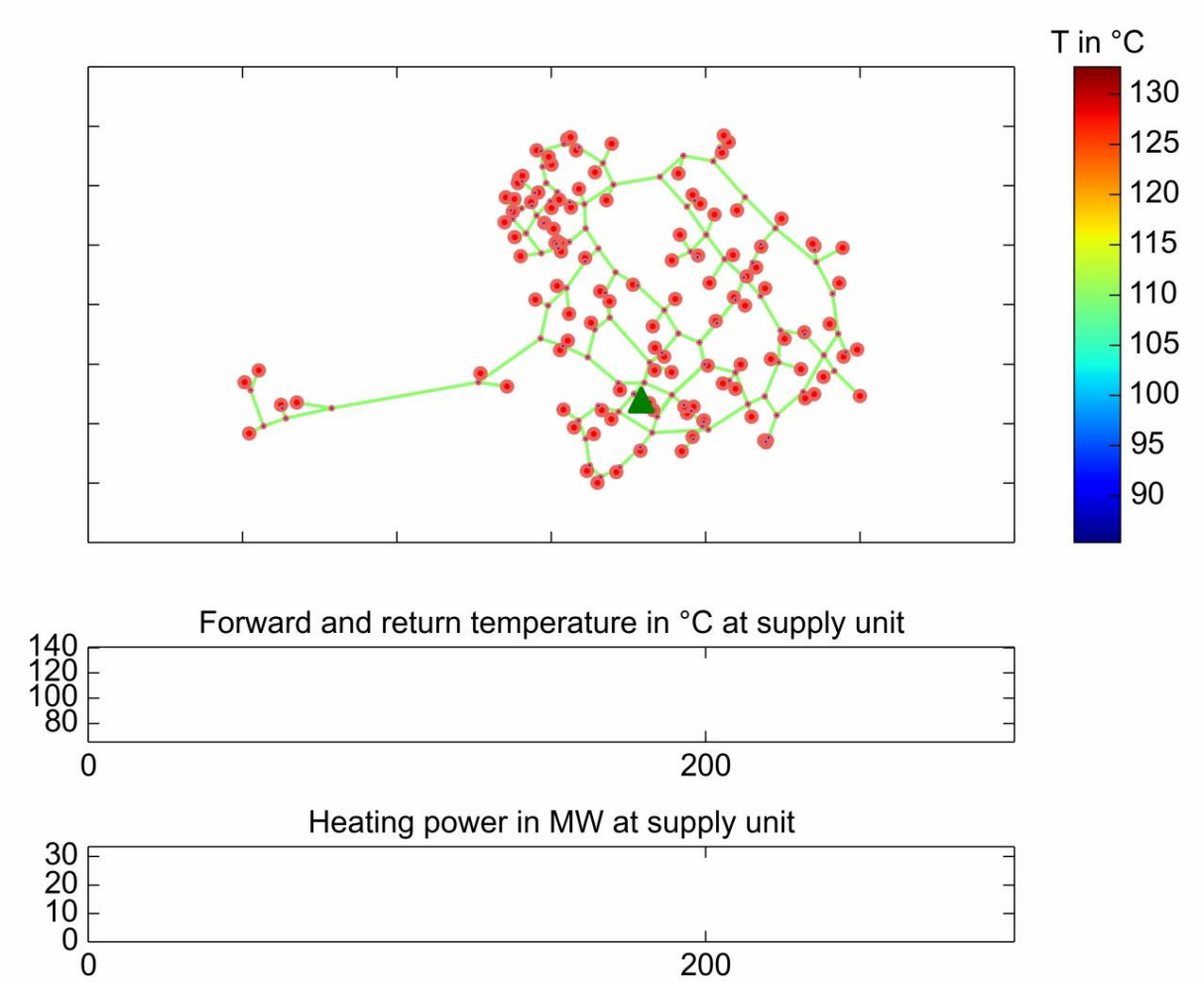


Display system operation and energy flows

Optimization

Minimize operation costs, primary energy demand, ...

Visualization of Dynamic Network Simulation



Recent News

AixLib V0.4 is expected to be released begin of November `16 including:

- Support of Reduced Order Model core form Annex60 in Multizone model
- HVAC:
  - Boiler
  - CHP
  - HeatPump
  - Radiator
  - Storage
  - PV
- Clean-Up of duplicative models

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www.github.com/RWTH-EBC/AixLib

www.github.com/RWTH-EBC/TEASER

We gratefully acknowledge the financial support for this work by BMWi (German Federal Ministry for Economic Affairs and Energy), Promotional Reference Number 03ET1177A.

Gefördert durch:

Bundesministerium für Wirtschaft und Energie

aufgrund eines Beschlusses des Deutschen Bundestages