Project 1

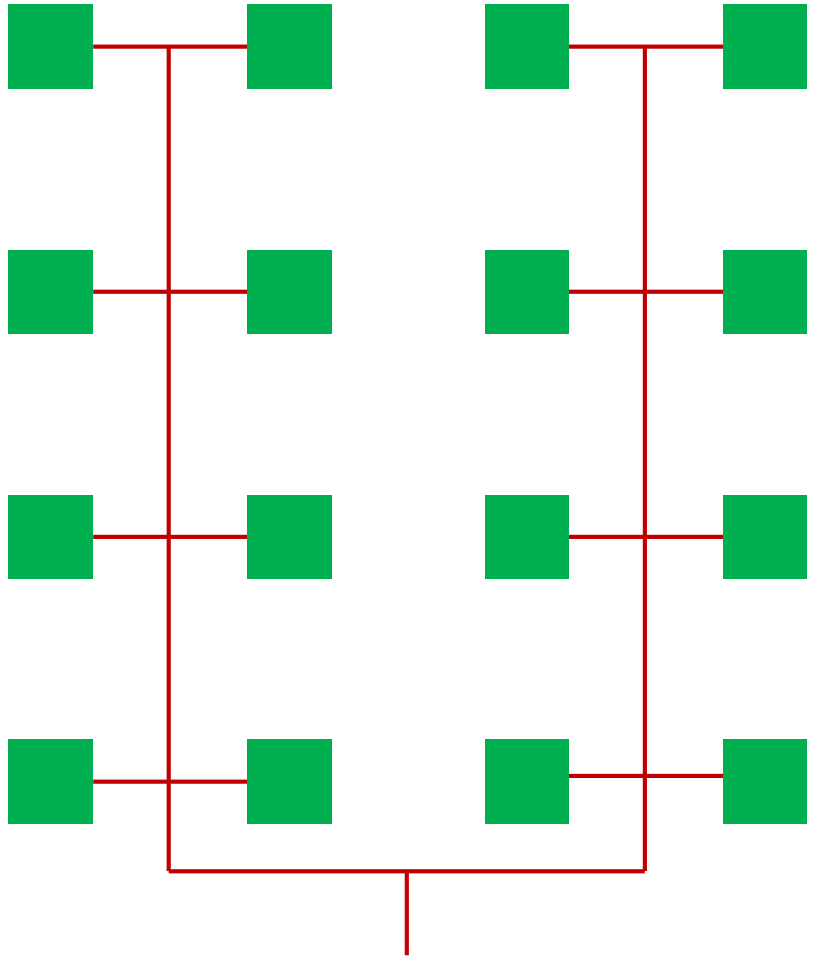
Network Modelling Subgroup

Motivation

- Define modelling and simulation cases for:
  - Validating new component models
  - Validating/benchmarking new network designs
  - Benchmarking control strategies

Efforts so far

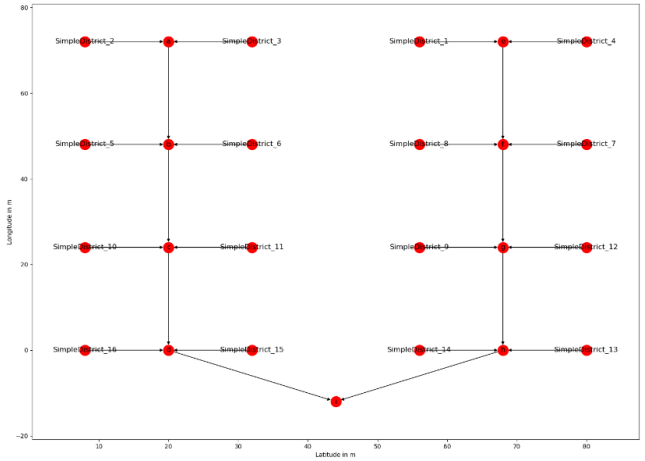
- Definition and simulation of one single simple case
  - → to establish common ground
- 16 buildings with same load, radial network layout
- Simulated pipe models:
  - Plug-flow
  - Dynamic pipe
  - Dimosim



Automatic model generation

- Felix: pipe dimensioning, insulation sizing

Index	Beginning Node	Ending Node	Length [m]	Inner Diameter [m]	Insulation Thickness [m]	Peak Load [kW]	Total pressure loss [Pa/m]	U-value [W/mK]
0	SimpleDistrict_1	e	12	0.025	0.11	19.3473	3093.16	0.035
1	SimpleDistrict_4	e	12	0.025	0.11	19.3473	3093.16	0.035
2	SimpleDistrict_13	h	12	0.02	0.11	19.3473	9515.79	0.035
3	g	h	24	0.05	0.14	116.084	5538.45	0.035
4	SimpleDistrict_10	c	12	0.02	0.11	19.3473	9515.79	0.035
5	h	i	36	0.05	0.14	154.778	14392	0.035
6	SimpleDistrict_3	a	12	0.025	0.11	19.3473	3093.16	0.035
7	c	d	24	0.05	0.14	116.084	5538.45	0.035
8	SimpleDistrict_2	a	12	0.025	0.11	19.3473	3093.16	0.035
9	SimpleDistrict_8	f	12	0.02	0.11	19.3473	9515.79	0.035
10	SimpleDistrict_7	f	12	0.02	0.11	19.3473	9515.79	0.035
11	SimpleDistrict_15	d	12	0.02	0.11	19.3473	9515.79	0.035
12	f	g	24	0.04	0.125	77.3891	7921.77	0.035
13	d	i	36	0.05	0.14	154.778	14392	0.035



- Michael: layout, sizing, model generation

Automated model generation and simplification for district heating and cooling networks

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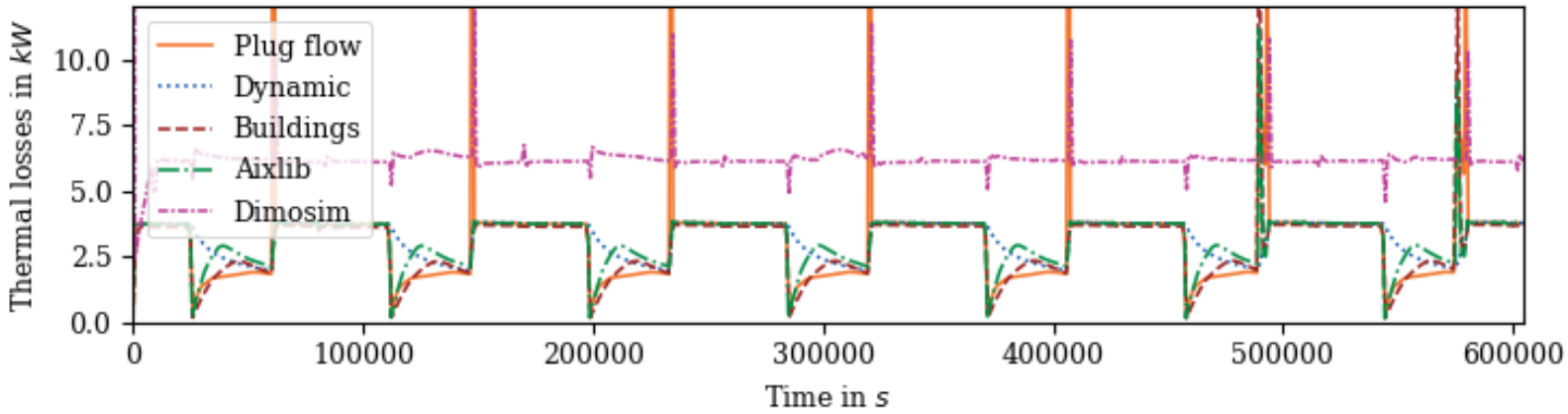
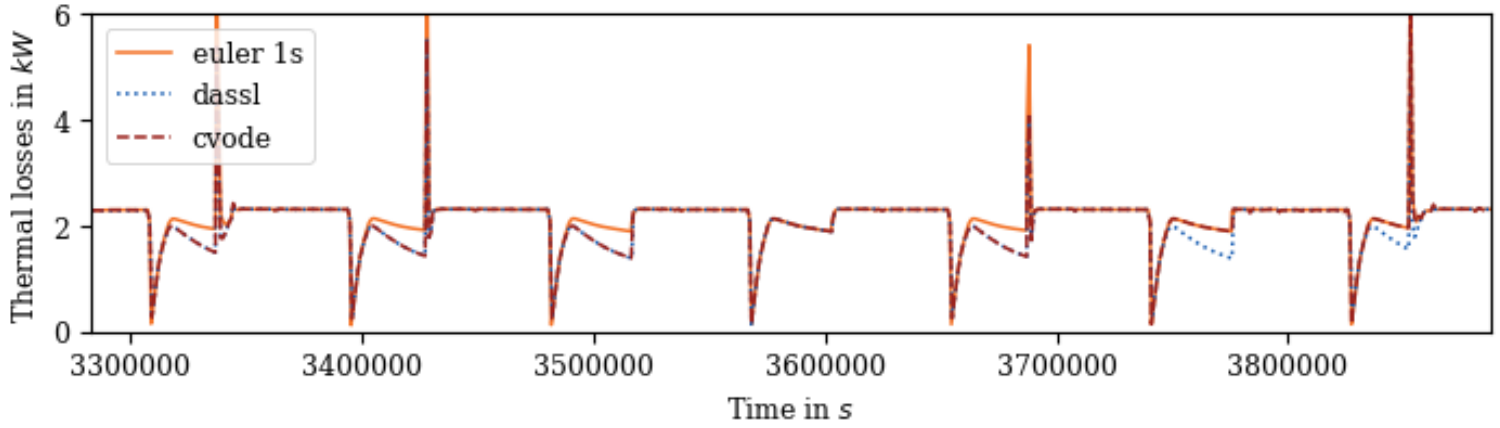
Results

- Heating losses



- Numerical issues



Encountered difficulties

- Model behavior strongly dependent on solver
- Model behavior strongly dependent on control strategies
  - Bypass mass flow rate
  - Supply temperature
  - Temperature difference

- → Need for very precise case description, even more for future cases

First exercise – Next steps

- Further documentation and improved description of the exercise by including (e.g.):
  - Pipe roughness
  - Solvers (for Dymola / Modelica users)
  - Refactor the models
  - Integrate the models into the ibpsa-modelica?

- Further comparison of the models:
  - Temperatures at different substations
  - Changing supply temperature

Network Modelling Subgroup – Next steps

- Diverse heat demand:
  - Integration of other building types
  - Change in network Layout

- New little more complex and not symmetric layout

- Integration of multiple renewable energy sources

- We need to rethink what we want to accomplish for that and what kind of investigations are making sense in that case