



IBPSA Project 1

WP 3.2 Application

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Objective of WP3.2

To demonstrate capabilities enabled by the use of Modelica for building and district energy systems design and operation

Outcome

Collection of application case studies aiming at:

- disseminating best practices to the simulation community,
- illustrating the possibilities that Modelica offers for the design, modeling and analysis of building and district energy system, and
- identifying research needs for Task 1 and Task 2 of IBPSA Project 1

How are the case studies being collected?

Participants fill in a “case study template” available at https://github.com/ibpsa/project1/tree/master/wp_3_2_app

Template for description of application case studies – IBPSA Project 1 WP3.2

1. Title and authors

-Provide a title for the application case study

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-Name the authors that are responsible for the case study

Name/Institution/Country.....

Name/Institution/Country.....

.....

2. General Description:

-Formulate a general outline of the case study by including: objective, description of HVAC/district system and main results (if already available)

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3. Diagram and picture

-Include at least two pictures for your case study:

1. One diagram showing the layout of the HVAC/district system
2. One picture of Modelica model

4. Thermal zone modeling

-How many buildings have you modelled?

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-How many thermal zones per building have you modelled? How many in total?

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-What's the complexity of the thermal zone model (Low order / High order)?

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-(only for district simulations) Are network and buildings coupled or decoupled?

- ☐ Coupled
☐ Decoupled

5. Modelica libraries and tools:

-Which Modelica library have you used? (Keep in mind that IBPSA library is for developers, not for users)

- ☐ AixLib
☐ Buildings
☐ BuildingSystems
☐ IDEAS

Current case studies


So far 11 case studies have been collected

	Institute	Scale
1	KU Leuven	District
2	University of Southern Denmark	District
3	University of Southern Denmark	District
4	University of Southern Denmark	District
5	University of Southern Denmark	Building
6	University of Colorado Boulder	Building
7	University of Colorado Boulder	District
8	University of Colorado Boulder	District
9	University of Colorado Boulder	Component
10	RWTH Aachen University	District
11	Aalborg University	District

New case study
from LBNL
coming soon!

Uploading case studies on IBPSA Project 1 website


The case studies have been recently uploaded on the Project 1 website at <https://ibpsa.github.io/project1/applications>

**IBPSA Project 1**

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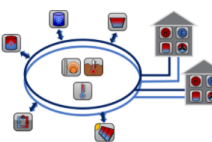
List of case studies

On this page, a number of case studies that emerged from IBPSA Project 1 participants are listed. The case studies deal with different applications ranging from HVAC systems in buildings to district heating networks. The aim is to demonstrate capabilities that are enabled through the use of Modelica.




Comprehensive Plant Permissive Priority Optimization (C3PO)
by University of Colorado at Boulder (USA)

[Read more](#)



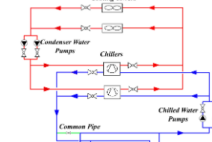
Erdeis II – Local DHC provided with a LTN for residential buildings and a geothermal ice storage
by RWTH Aachen University (Germany)

[Read more](#)




5G district heating and cooling system in Koge Nord
by Aalborg University (Denmark)

[Read more](#)




Equation-Based Object-Oriented Modeling and Simulation for Data Center Cooling: A Case Study
by University of Colorado at Boulder (USA)

[Read more](#)




Multi-Infrastructure Modeling of Smart and Connected Communities
by University of Colorado at Boulder (USA)

[Read more](#)



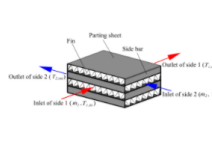
Quantifying uncertainty propagation for the district energy demand using realistic variations on input data
by KU Leuven (Belgium)

[Read more](#)



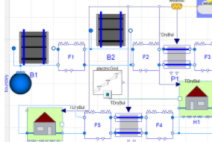
Single-zone model of a university building with hydronic heating and CO2-driven ventilation system
by Southern University of Denmark (Denmark)

[Read more](#)



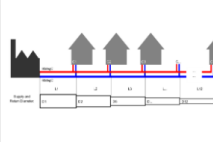
Modeling Air-to-Air and Finned-Tube Heat Exchangers
by University of Colorado at Boulder (USA)

[Read more](#)



MPC-oriented models of a small district with geothermal heat pumps
by Southern University of Denmark (Denmark)

[Read more](#)



Dimensioning of IBPSA plug flow pipes for Vejle Nord LiveLab using Dymola FMI and Python
by Southern University of Denmark (Denmark)

[Read more](#)

Next steps

- Continuing the collection and coordination of new case studies (if you have a new case study to be included in the IBPSA Project 1 please drop me an email at amac@build.aau.dk)
- New potential activities will be discussed in the coming months. Possible ideas are:
 - Making publicly available the Modelica models of the case studies
 - Developing python-based scripts in collaboration with Task 2 for accelerating the generation of Modelica models