IBPSA Project 1

WP 3.2 Application

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BREAKING NEW GROUND

AALBORG UNIVERSITY

Objective of WP 3.2
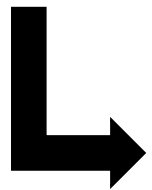
To demonstrate capabilities enabled by the use of Modelica for building and district energy systems design and operation

Outcome

Collection of application case studies that aim at sharing best practices and document them for dissemination to the simulation community

Case studies will be described using a unified *case study template*

1. **Title and authors**
- *Provide a name for the application case study*
- *Name the institution and the authors that are responsible for the case study*

2. **General Description:**
Formulate a general description of the case study, which includes the following topics:

- *What are the objectives of simulation? (e.g. system design, optimization, economic analysis etc)*
- *What's the scale of simulation? (component / building / district)*
- *What's the location? (weather file)*
- *Describe the building types and HVAC/district system technologies analyzed (including information about the complexity of models used -> e.g. high or low order building models?*
- *Describe the main results*

3. **Diagram and pictures:**
Include at least two pictures for your case study:
1) *One diagram showing the layout of the energy system*
2) *One picture of the energy system from the Modelica simulation tool*

If the case study refers to a "real" case study in operation, perhaps you could also include a picture of the building/neighborhood

4. **Modelica libraries and simulation tools:**
- *Name the Modelica libraries used*
- *Which simulation tool did you use? (e.g. Dymola / OpenModelica)*
- *What's the computational time? (Provide specifications of machine) / Which solver?*
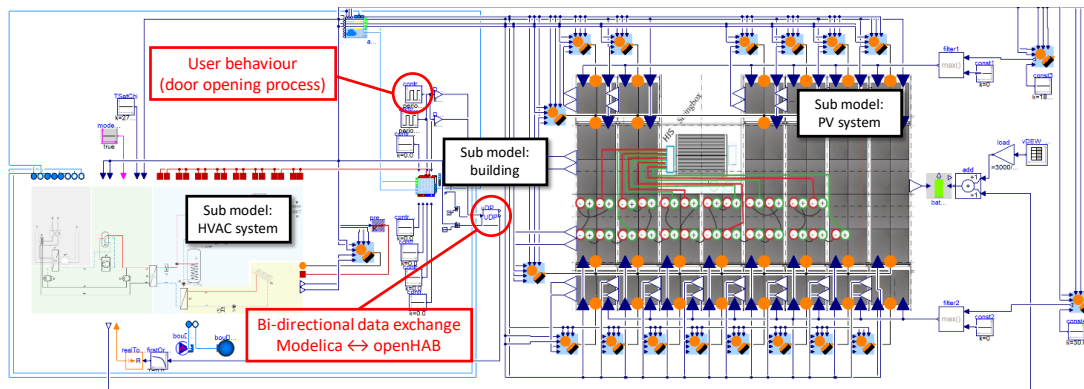
Application case studies (13 case studies from 7 different institutes)

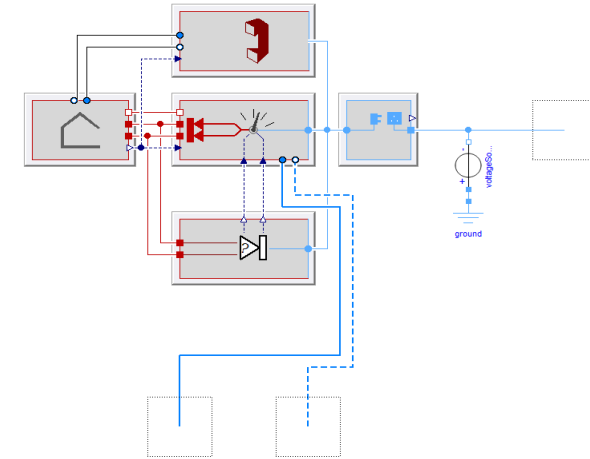|	Institute	Main author
1	Leuven University	Ina De Jaeger
2	Leuven University	Annelies Vandermeulen
3	University of Southern Denmark	Konstantin Filonenko
4	University of Southern Denmark	Konstantin Filonenko
5	University of Southern Denmark	Konstantin Filonenko
6	University of Southern Denmark	Tao Yang
7	SINTEF	Igor Sartori
8	RWTH Aachen	Michael Mans
9	UdK Berlin	Christoph Nytsch-Geusen
10	ETH Zurich / EMPA	Felix Bünning
11	University of Colorado Boulder / Guangzhou University	Yunyang Ye
12	University of Colorado Boulder / Virginia Tech	Kathryn Hinkelman
13	University of Colorado Boulder / PNNL	Jing Wang

Application case studies

Title: Quantifying Uncertainty Propagation For The District Energy Demand

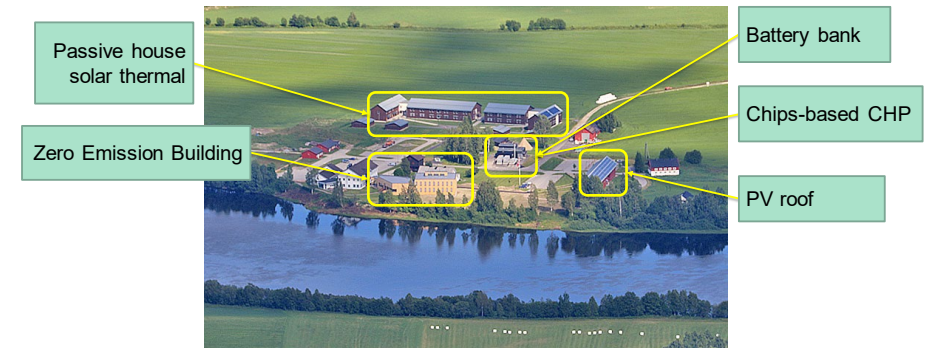**Institute:** KU Leuven (Ina De Jaeger)

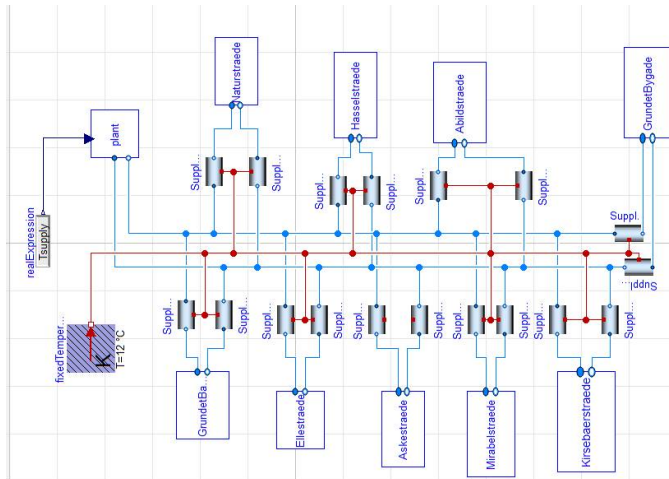**Title:** Development of a digital twin for an experimental research building (Rooftop building)

Institute: Berlin University of the Arts (Christoph Nytsch-Geusen)

Title: Campus Evenstad: flexible energy demand and local generation

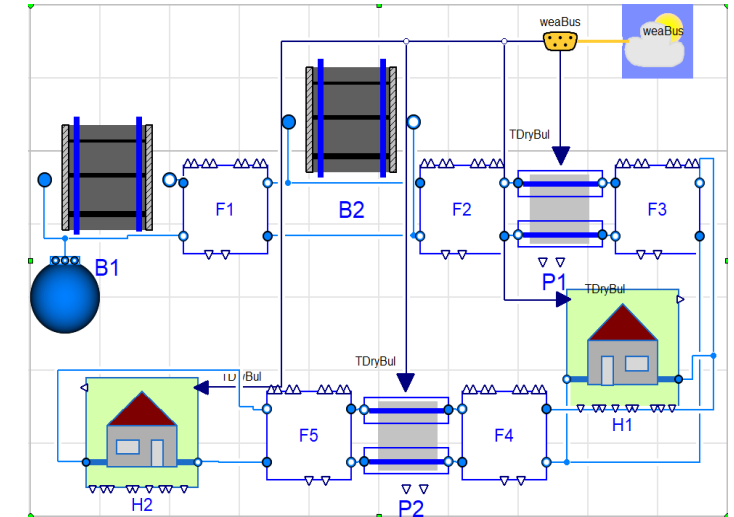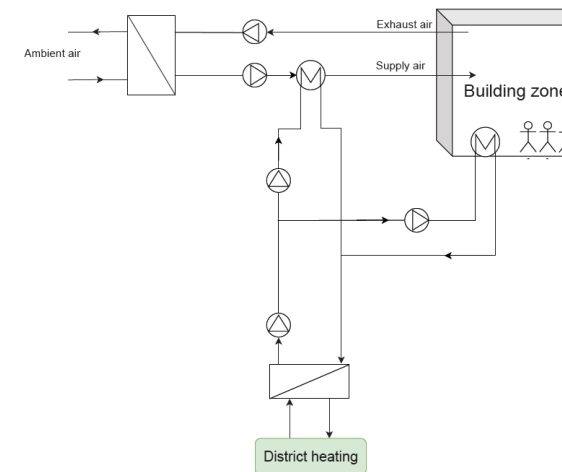**Institute:** SINTEF (Igor Sartori)

Application case studies

Title: MPC-oriented model of a small district with geothermal heat pumps

Institute: University of Southern Denmark (Konstantin Filonenko)

Title: Modeling of DH grid for Smart Energy Pool in Vejle Nord LiveLab

Institute: University of Southern Denmark (Daniel Howard)

Title: Single-zone model of a university building with hydronic heating and CO2-driven ventilation system
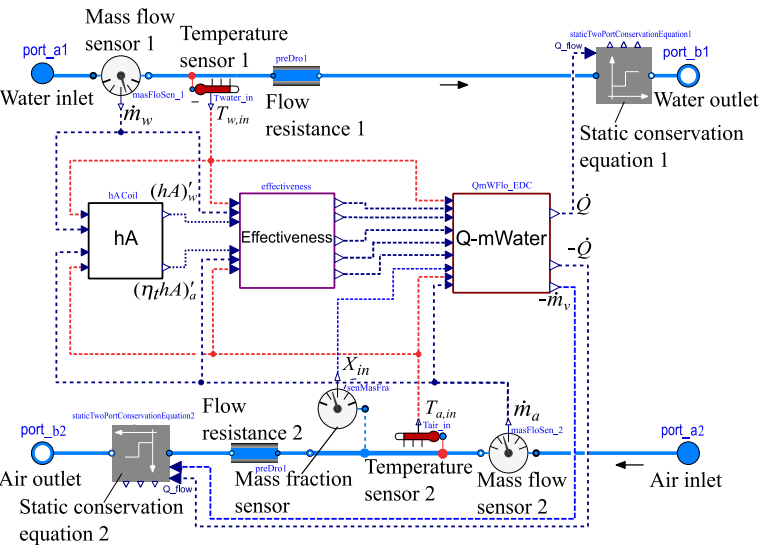
Institute: University of Southern Denmark (Tao Yang)
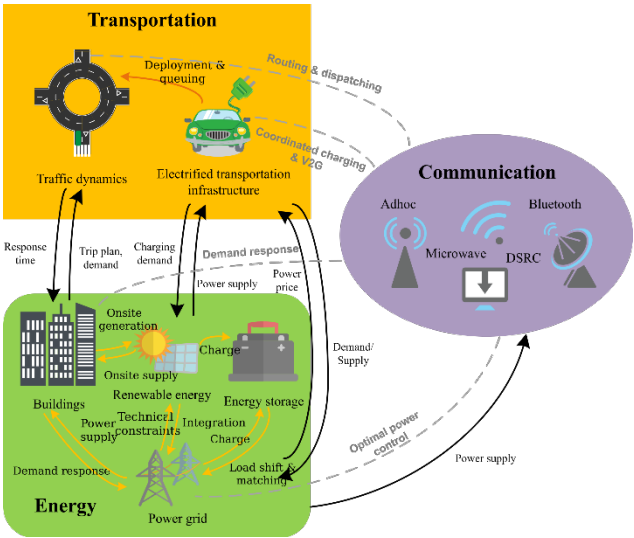
Application case studies

Title: Modeling Air-to-Air and Finned-Tube Heat Exchangers

Institute: University of Colorado Boulder & Guangzhou University (Yunyang Ye)
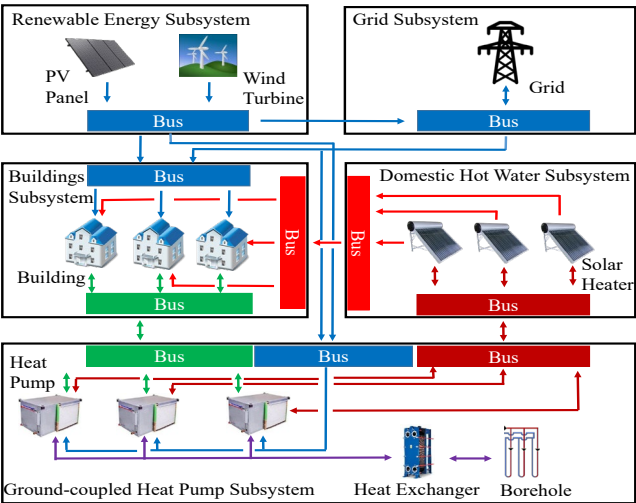

Title: Multi-Infrastructure Modeling of Smart and Connected Communities

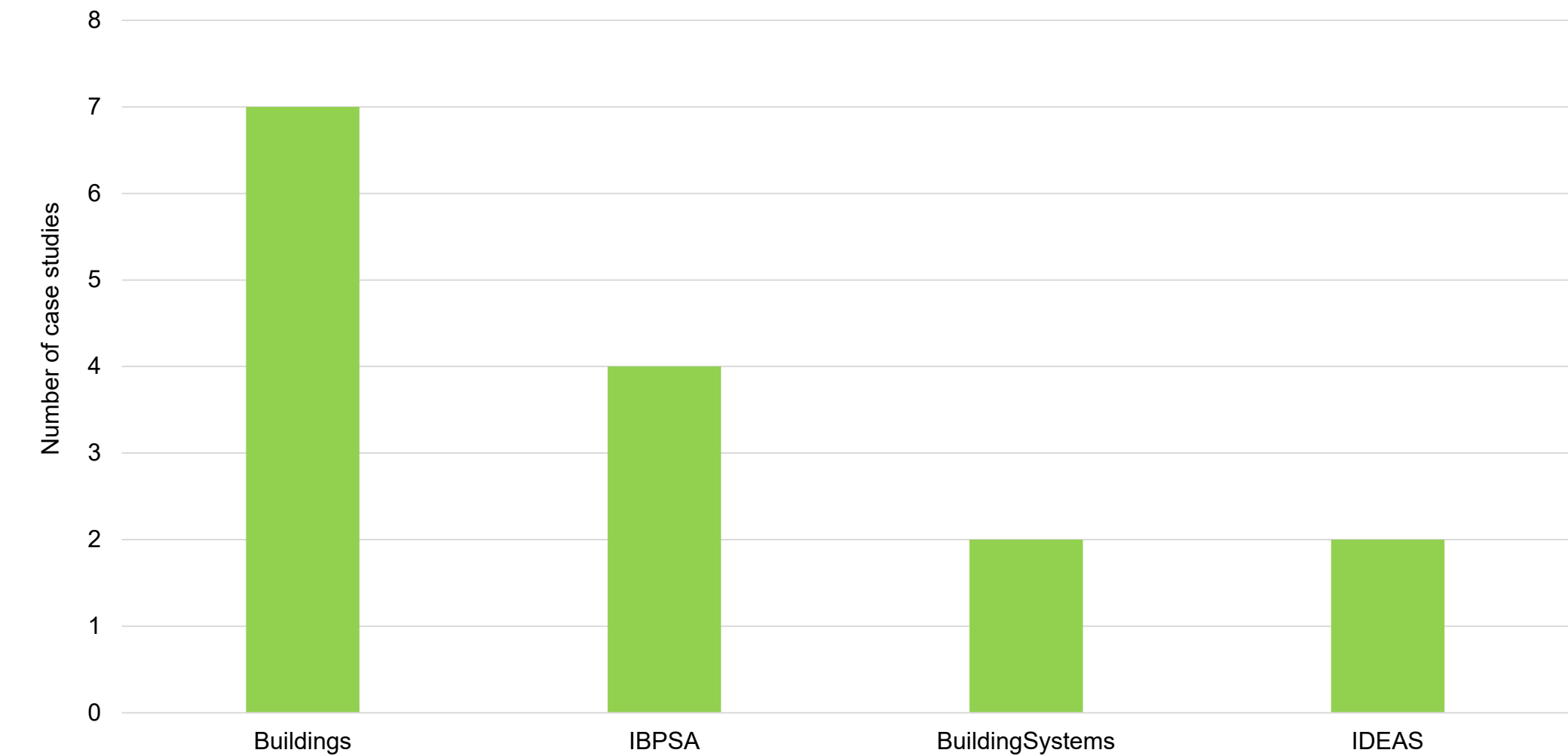**Institute:** University of Colorado Boulder & Virginia Tech (Kathryn Hinkelman)

Title: Comprehensive Pliant Permissive Priority Optimization (C3PO)

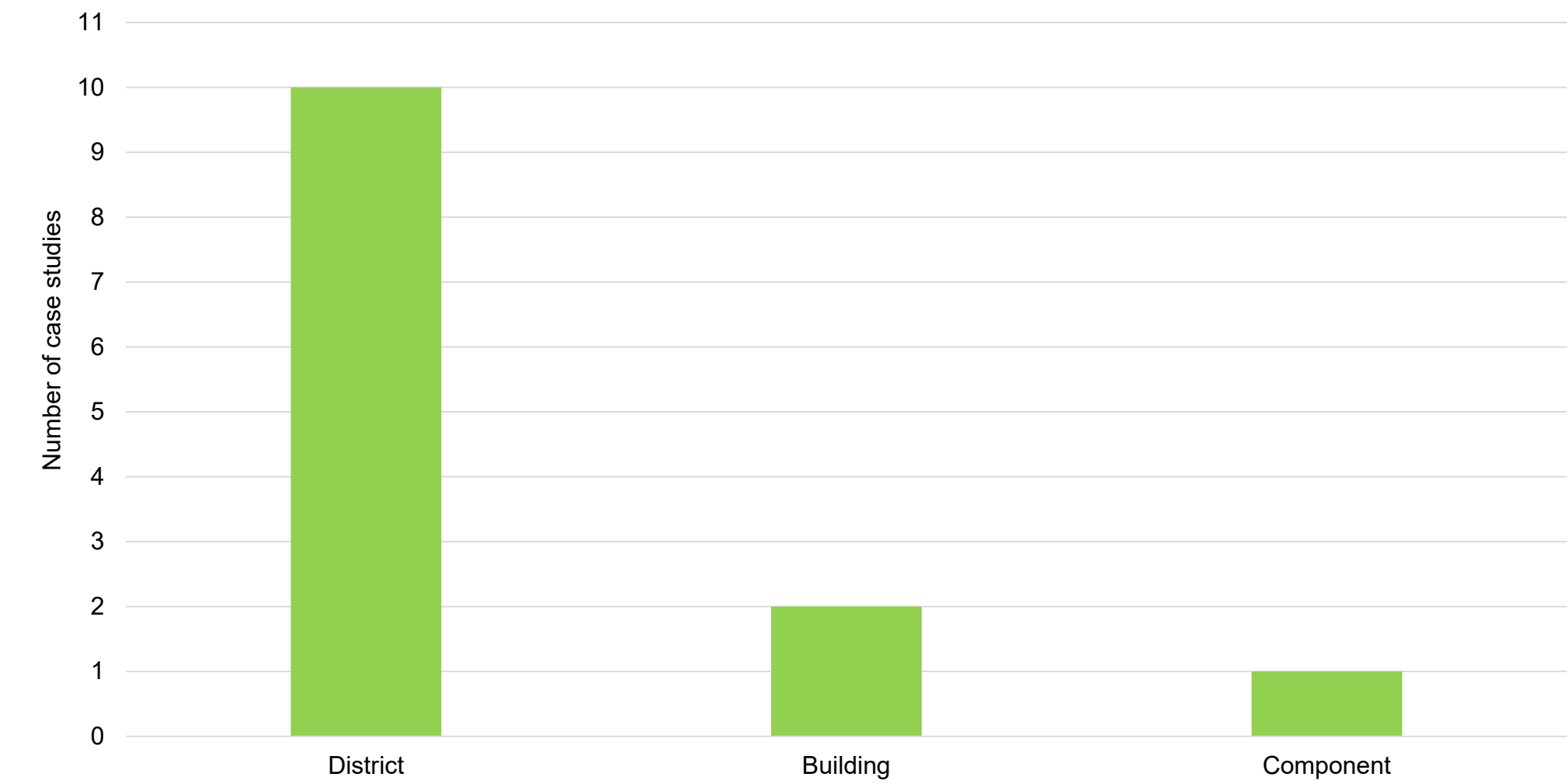**Institute:** University of Colorado Boulder & PNNL (Jing Wang)

Modelica libraries used

Scale of simulation

Break-out session

WP3.2 will have one break-out session tomorrow (BS 2-2)

	* Substation modeling for 5th generation networks	Michael	
	* Coupled simulations	contribution from Annelies	
BS 1-2	**Topic 1.2 Feedback from past research activities**		**90 min**
	Building and network modeling team, without 1.1	Ina & Felix	
	Possibility for free contributions (substations f.i.)		
	Time for free discussion		
BS 2-1	**Topic 2.1 Discussion on reporting and publications**		**70 min**
	Review of reporting so far (first case description)	Dirk	
	Outline of future publications		
	Outline of content of future reports		
	Time for free discussion		
BS 2-2	**Topic 2.2 WP3.2 Application**		**85 min**
	Full template for collecting case studies (15 min)	Alessandro	
	CU Boulder - 3 case studies (15 min + 5 Q&A)	Wangda & Katy	
	SDU - 4 case studies (20 min + 5 Q&A)	Konstantin	
BS 2-3	**Topic 2.3 Future steps in the DESTEST developement**		**70 min**
	Continued: Modeling of 1000s or 100,000s of buildings, coupled and uncoupled, jointly w Dirk, Ina, Christoph NG others who have experience? [contact Dirk]		