International Building Performance Simulation Association

BIM/GIS and Modelica Framework for building and community energy system design and operation

Co-operating agents:

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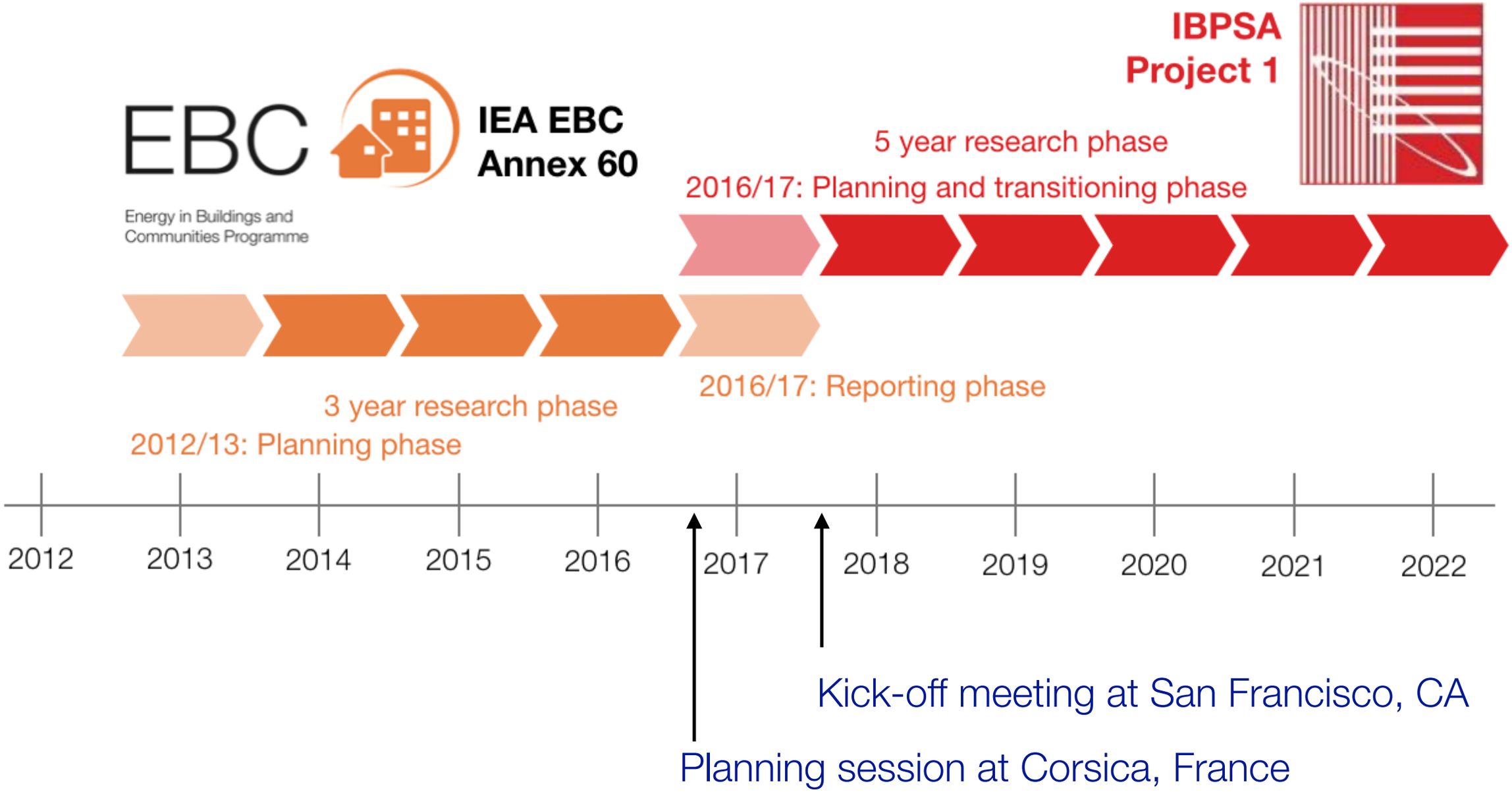
BERKELEY LAB Lawrence Berkeley National Laboratory

RWTH AACHEN UNIVERSITY

Timeline


EBC
Energy in Buildings and Communities Programme
IEA EBC Annex 60
IBPSA Project 1
5 year research phase
2016/17: Planning and transitioning phase
3 year research phase
2012/13: Planning phase
2016/17: Reporting phase
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Kick-off meeting at San Francisco, CA
Planning session at Corsica, France

The vision of IBPSA Project 1 is to create open-source software that builds the basis of next generation computing tools for the buildings industry

Allow engineers and scientists to

1) drag and drop preconfigured, modifiable and scalable component models of

- buildings,
- district heating and cooling,
- HVAC, and
- controls.

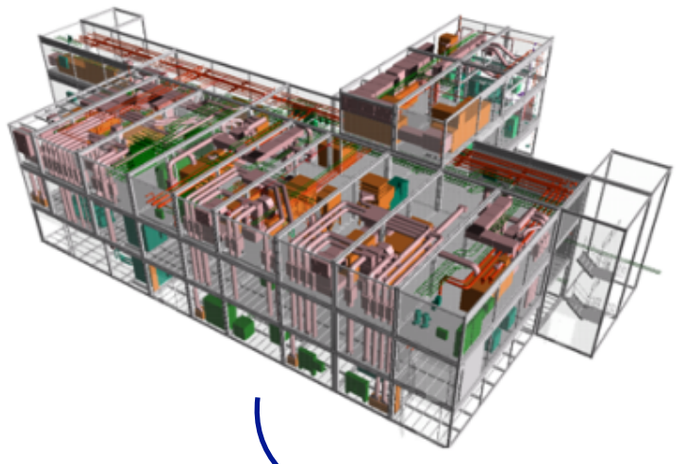
2) generate system models from BIM, GIS and schematic diagrams

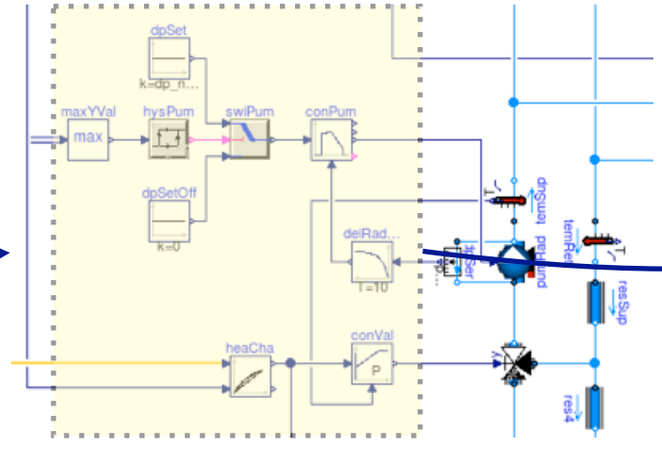
3) optimize the performance of technology options and control strategies in simulation, and

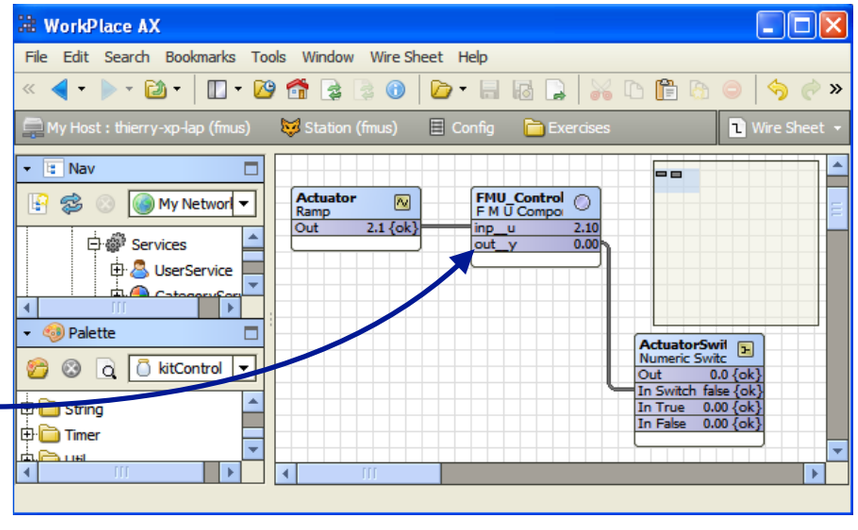
4) export models and control algorithms for

- hardware in the loop testing
- deployment to control systems and embedded hardware, and
- to run as a web service for real time operational support

All developed software is open source.







Introduction

IBPSA Project 1 goals

1. to consolidate the development of these technologies, ranging from equipment to system representations of the data (BIM/GIS) and their dynamic behavior (Modelica),
2. to share efforts for, and increase the range of, model validation, and
3. to provide to simulation tool providers stable, well-tested, validated and documented code that they can integrate in their software tools for deployment to design firms, energy service companies, equipment and control manufacturers.
4. to demonstrate through applications capabilities that are enabled through Modelica, and to identify and test through applications research needs and research results.

Needs addressed by Project 1

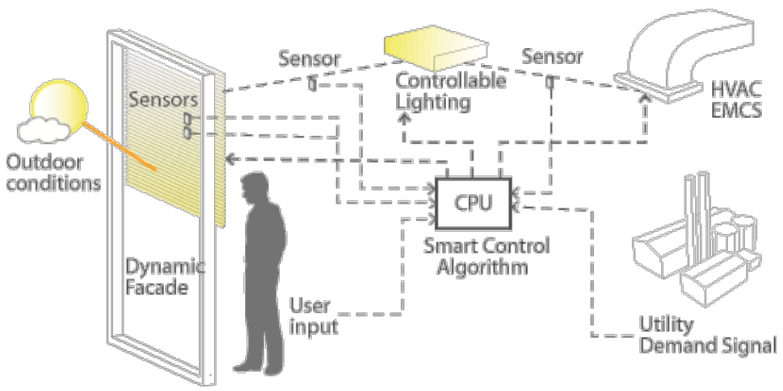
Comprehensive, validated tools for

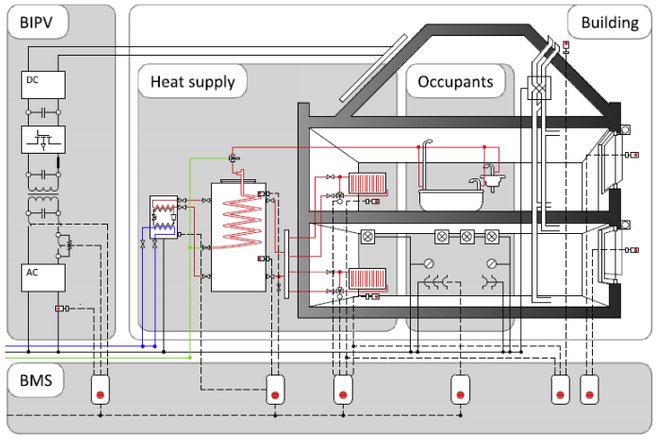
- design and operation of new buildings, energy grids and their control system
- model-based design, rapid virtual prototyping and hardware-in-the-loop

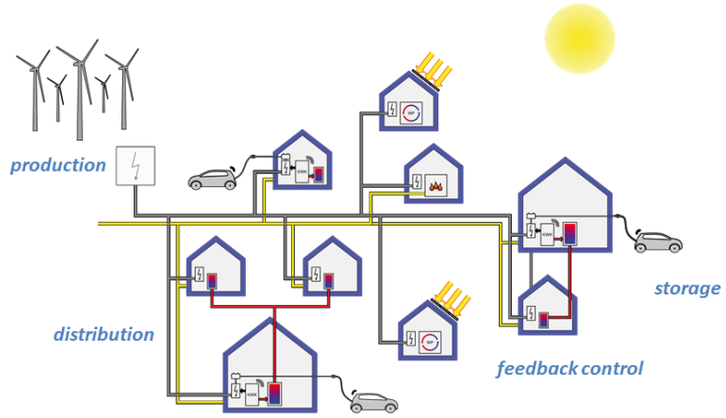
Scales from

- local loop controller to supervisory controllers
- equipment to building systems
- buildings to community energy grids

Multiple domains including thermal, air quality, electrical, control, lighting/daylighting and user behavior.







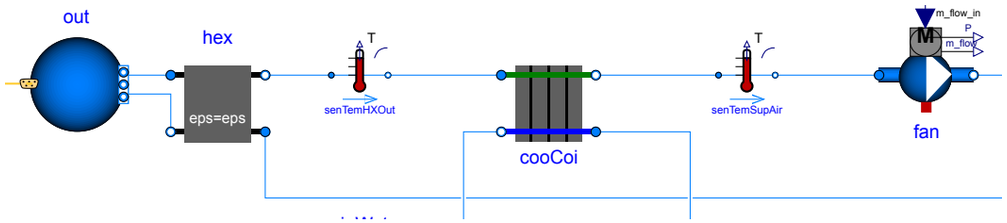
From controls to buildings and communities

Structure

Tasks span from buildings to communities, and design to operation

Task 1: Modelica libraries for building and community energy systems - Michael Wetter

- WP 1.1: Library for design and operation
- WP 1.2: Library, and approaches, for Model Predictive Control

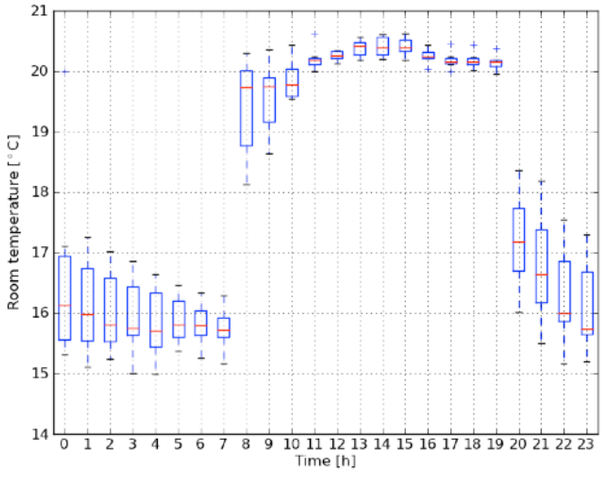


Task 2: Building and City Quarter Models — Christoph van Treeck

- WP 2.1: City Quarter Information Modeling
- WP 2.2: Building Information Modeling

Task 3: Application and Dissemination — TBD

- WP 3.1: Application, including “BESTEST” for DHC
- WP 3.2: Dissemination



Levels of participation

Sponsoring participant

- Cash $5k per year.

Organizational participants

- minimum 0.5 full time employee per year, over the 5 year project
- contribute to 5 to 10 web-based coordination meetings annually
- attend semi-annual expert meeting, generally lasting 2 days

Individual participants

- no predetermined level of commitment, but needs to provide substantial contributions

Intellectual property

All workshops, software and documentation will be open accessible to anyone.

Modelica models will — most likely — use BSD 3-Clause License — or a slightly modified version of the Modelica 2 license or BSD (based on development of Modelica Association).

Code other than Modelica models will use the open-source BSD 3-Clause License.

IBPSA is the copyright and license holder.

See https://ibpsa.github.io/project1/license.html

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Next:

Overview of Tasks, Workplan Review & Commitment