HP_sim&app23 - Carnot User Meeting 2023, 22-23 June 2023

New site of the School of Engineering and Architecture, via Terracini 24, Bologna

Day 1, Thursday 22 June 2023
Heat pump applications, sessions from industries

Program-at-a-glance

Time	Activity
09:00	Arrival
09:15 – 09:30	Welcome and introduction
09:45 – 10:45	Presentations block 1 - Prospects for heat pumps towards the decarbonization of buildings
11:00	Coffee break
11:15 – 12:30	Presentations block 2 - Multi-source heat pump systems and low-impact refrigerants
12:45	Wrap-up morning session Day 1
13:00 – 13:45	Lunch (on site)
14:00 – 15:15	Presentations block 3 - New insights on heat pumps and heat pump systems at building and district levels
15:30	Coffee break
15:45 – 16:45	Presentations block 4 - Simulink-based tools for dynamic modeling of buildings and HVAC systems
17:00	Wrap-up Day 1
17:15 – 17:45	Applied Thermal Engineering Lab visit
18:00	End Day 1

Day 1, Thursday 22 June 2023, 9:00 - 18:00
Heat pump applications, sessions from industries

Detailed program

9:00

Arrival and welcoming
New site of the School of Engineering and Architecture, via Terracini 24, Bologna

9:15 – 9:45

Welcoming and introduction to HP_sim&app23 - Carnot User Meeting 2023
Ground Floor, Room TA-03

> **9:15 – 9:25**
> **Welcome from the Department of Industrial Engineering Executive Director**
> *Alfredo Liverani, University of Bologna, IT*

> **9:25 – 9:45**
> **Introduction to HP_sim&app23 - Carnot User Meeting 2023**
> *Gian Luca Morini, University of Bologna, IT*

9:45 – 10:55

Presentation block 1: Prospects for heat pumps towards the decarbonization of buildings
Ground Floor, Room TA-03
Chair: Prof. Gian Luca Morini, University of Bologna, IT

> **9:45 – 10:15**
> **Keynote lecture - Outlook for Heat Pumping Technologies**
> *Caroline Haglund Stignor, Heat Pump Center, SE*

10:15 – 10:35

Optimization of SPF or CO₂ emissions? Impact of control strategies on a bivalent waste-water heat pump system for high energy standard buildings

Pierre Hollmuller, University of Geneva, CH

10:35 – 10:55

Make renewable heating the standard in residential building sector

Alberto De Cristofaro, Daikin, IT

10:55 – 11:15

Coffee Break
Ground Floor

11:15 – 12:55

Presentation block 2: Multi-source heat pump systems and low-impact refrigerants

Ground Floor, Room TA-03
Chair: Prof. Eugenia Rossi di Schio, University of Bologna, IT

11:15 – 11:35

Optimal management of a hybrid heat pump for heating through the assessment of building thermal load and dynamic performance

Cristiana Bronzoni, Immergas, IT

11:35 – 11:55

Geothermics and multi-source heat pumps: application case studies

Paolo Nobile, Eneren, IT

11:55 – 12:15

Multi-source heat pumps: the IDEAS project experience

Eleonora Baccega, University of Ferrara, IT

12:15 – 12:35

Commercial refrigeration revolution: Energy efficiency – Natural refrigerants – Safety and digitalization

Giuseppe Vitri, Rivacold, IT

12:35 – 12:55

R290 retrofit of an R454B inverter-driven heat pump: thermodynamic analysis, issues and possible developments

Filippo Genovese, Galletti, IT

12:55 – 13:00

Wrap-up morning session Day 1 HP_sim&app23_Carnot User Meeting 2023
Ground Floor, Room TA-03
Prof. Eugenia Rossi di Schio, University of Bologna, IT

13:00 – 14:00

Lunch Break
Ground Floor

14:00 – 15:30

Presentation block 3: New insights on heat pumps and heat pump systems at building and district levels
Ground Floor, Room TA-03
Chair: Dr. Claudia Naldi, University of Bologna, IT

14:00 – 14:30
Keynote lecture - Heat pumps integration in the next generation of sustainable buildings
Claudio Zilio, University of Padova, IT

14:30 – 14:50

Simulation-assisted development of a mini-split heat pump for space heating in minimal invasive renovations

William Monteleone, Elisa Venturi, University of Innsbruck, AT

14:50 – 15:10

Smart city: heat pumps applied to data centers

Fabio Poletto, Href, IT

15:10 – 15:30

How hydronic balancing in buildings could be set-up to ensure an optimal functioning of heat pumps?

Mauro Dossi, Danfoss, IT

15:30 – 15:45

Coffee Break
Ground Floor

15:45 – 17:00

Presentation block 4: Simulink-based tools for dynamic modeling of buildings and HVAC systems

Ground Floor, Room TA-03
Chair: Dr. Matteo Dongellini, University of Bologna, IT

15:45 – 16:00

Heating and Cooling Systems Design with MATLAB & Simscape

Aldo Caraceto, MathWorks, IT

16:15 – 16:30

The Conventional and Renewable Energy Optimisation Toolbox CARNOT - what is it made for

Bernd Hafner, Viessmann, DE

16:30 – 16:45

Optimizing HP Systems for MFH with CarnotUIBK / Simulink

Fabian Ochs, University of Innsbruck, AT

16:45 – 17:00

ALMABuild, an open-source Simulink tool for buildings and HVAC systems modelling

Claudia Naldi, University of Bologna, IT

17:00 – 17:15

Wrap-up Day 1 HP_sim&app23_Carnot User Meeting 2023

Ground Floor, Room TA-03

Prof. Gian Luca Morini, University of Bologna, IT

17:15 – 18:00

Visit to Applied Thermal Engineering Lab (walking tour)

New site of the School of Engineering and Architecture, via Terracini 24, Bologna

Day 2, Friday 23 June 2023
Heat pump simulations, Carnot User Meeting 2023

Program-at-a-glance

Time	Session
09:00	**Welcome and introduction**
09:15	
09:30	
09:45	
10:00	**Presentations block 5 - Simulation and optimization of local district networks and multi-family buildings**
10:15	
10:30	
10:45	
11:00	**Coffee break**
11:15	
11:30	
11:45	
12:00	**Presentations block 6 - Carnot User Meeting 2023: new developments on components and control strategies**
12:15	
12:30	
12:45	
13:00	
13:15	**Lunch (on-site)**
13:30	
13:45	
14:00	
14:15	
14:30	
14:45	**Presentations block 7 - Multi-source heat pump systems for sustainableand efficient buildings**
15:00	
15:15	
15:30	
15:45	
16:00	**Wrap-up HP_sim&app23 - Carnot User Meeting 2023**
16:15	
16:30	**Drinks and coffee**
16:45	
17:00	
17:15	**Expert workshop on ALMABuild tool (optional)**
17:30	
17:45	
18:00	**Farewell**

Day 2, Friday 23 June 2023, 9:00 - 18:00
Heat pump simulations, Carnot User Meeting 2023

Detailed program

9:00 – 9:15

Welcome and introduction to Day 2 of HP_sim&app23 - Carnot User Meeting 2023
Ground Floor, Room TA-03
Prof. Gian Luca Morini, University of Bologna, IT

9:15 – 11:00

Presentation block 5: Simulation and optimization of local district networks and multi-family buildings
Ground Floor, Room TA-03
Chair: Prof. Gian Luca Morini, University of Bologna, IT

9:15 – 9:30
Optimizing Heat Supply for Neighborhoods and Industrial Clusters through Dynamic Simulation: Utilizing the CARNOT models within a Simscape Environment
Anna Vannahme, Michael Feichtinger, Technische Hochschule Ingolstadt, DE, Allplan, AT

9:30 – 9:45
Automatic model generation approach for local district heating networks
Dharmik Patel, Technische Hochschule Ingolstadt, DE

9:45 – 10:00
Load profile generation: from individual houses to districts
Joachim Goettsche, Tobias Blanke, FH Aachen - University of Applied Sciences, DE

10:00 – 10:15
Using the MATLAB Reinforcement Learning Toolbox for energy system control of a multi-family building modelled in MATLAB CARNOT
Michael Bachseitz, Technische Hochschule Ingolstadt, DE

10:15 – 10:30

Evaluation of local heat transfer coefficients in a multiscale framework for dynamic simulation of buildings

Beatrice Pulvirenti, University of Bologna, IT

10:30 – 11:00

Modeling the physics of HVAC systems with Simscape

Aldo Caraceto, MathWorks, IT

11:00 – 11:30

Coffee Break
Ground Floor

11:30 – 13:00

Presentation block 6: Carnot User Meeting 2023: new developments on components and control strategies

Ground Floor, Room TA-03
Chair: Prof. Eugenia Rossi di Schio, University of Bologna, IT

11:30 – 11:45
New developments in Carnot
Bernd Hafner, Viessmann, DE

11:45 – 12:00
(Co-simulation) Approaches for Complex Systems of ODEs and PDEs – Example of a Wall Heating System
Fabian Ochs, University of Innsbruck, AT

12:00 – 12:15
Update of the development of control functions for ice storage / heat pump systems with CARNOT
Ralf Dott, Viessmann, DE

12:15 – 12:30

From IFC to a comprehensive thermal finite element analysis as the basis of the next-generation BES

Dietmar Siegele, Fraunhofer Italia, IT

12:30 – 12:45

Improved Carnot Window model based on the WINDOW database

Mara Magni, University of Innsbruck, AT

12:45 – 13:00

Solar Keymark Database Analysis and Proposal of a more user-friendly CARNOT Block for Solar Thermal Collectors

Thorsten Summ, Technische Hochschule Ingolstadt, DE

13:00 – 14:00

Lunch Break
Ground Floor

14:00 – 16:00

Presentation block 7: Multi-source heat pump systems for sustainable and efficient buildings

Ground Floor, Room TA-03
Chair: Dr. Claudia Naldi, Dr. Matteo Dongellini, University of Bologna, IT

14:00 – 14:15

Evaluation of strategies with multiple heat sources for the larger heat pump capacity range

Carsten Wemhoener, Institute for Energy Technology - OST, CH

14:15 – 14:30

Integration of air-source heat pumps in large non-retrofitted multi-family buildings: lessons learned in actual conditions and sensitivity analysis with numerical simulation

Omar Montero Dominguez, University of Geneva, CH

14:30 – 14:45

Heat pump and CHP unit – a win-win combination

Bernd Thomas, Reutlingen University, DE

14:45 – 15:00

Dual Source Heat Pump with Parallel Operation of Two Heat Sources

Tobias Reum, Technische Hochschule Ingolstadt, DE

15:00 – 15:15

Long term performance analysis of a Dual-Source Heat Pump system by means of ALMABuild

Christian Natale, University of Bologna, IT

15:15 – 15:30

Efficiency studies on a heat pump system with a stratified storage tank for space heating and domestic hot water based on hardware in the loop tests

Maximilian Kampmann, University of Applied Sciences Düsseldorf, DE

15:30 – 15:45

Predictive control of an air-source heat pump utilizing thermally activated buildings

David Schmitt, Technische Hochschule Ingolstadt, DE

15:45 – 16:00

Performance analysis of heat pumps coupled to probes thermally exchanging from ground heated by solar collectors: a Trnsys dynamic simulation

Vincenzo Ballerini, University of Bologna, IT

16:00 – 16:15

Wrap-up Day 2 and end HP_sim&app23_Carnot User Meeting 2023
Ground Floor, Room TA-03
Prof. Gian Luca Morini, Prof. Eugenia Rossi di Schio, Dr. Claudia Naldi, Dr. Matteo Dongellini, University of Bologna, IT

16:15 – 16:45

Drinks and Coffee
Ground Floor

16:45 – 18:00

Expert workshop on the open-source Simulink tool ALMABuild (optional)
First Floor, Room TA-09