

Giorgio Besagni

Curriculum Vitae – Scientific and Professional Activities (February 2024)

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1. Personal Information

Surname, Name	Besagni, Giorgio
E-mail	giorgio.besagni@polimi.it (work)
Researcher Identifier	Scopus author ID 56429601800
Skype	gbesagni
Nationality	Italian

2. Educational Activities

2.1 Academic Qualifications

February 2016	PhD cum Laude in Energy and Nuclear Science and Technology Department of Energy, Politecnico di Milano, Italy Thesis Title: <i>Bubble column fluid dynamics: experimental and numerical investigations</i> Supervisor: Prof. Fabio Inzoli Main Activities: <i>multi-scale experimental and numerical studies of large-scale bubble columns</i>
December 2012	Master of Science in Energy Engineering (110 cum Laude/110) Politecnico di Milano, Italy Thesis Title: <i>An integrated thermodynamic/CFD approach to ejector modeling</i> Supervisor: Prof. Paolo Chiesa Main Activities: <i>numerical study of a convergent nozzle ejector and development of an integrated lumped parameter – CFD modeling approach</i>
July 2010	Bachelor Degree in Energy Engineering (110/110) Politecnico di Milano, Italy

2.2 Other Qualifications

April 2018	National Academic Qualification (09/C2) as Associate Professor <i>National Scientific qualification as associate professor in the Italian higher education system, in the call 2016/2018 (Ministerial Decree n. 1532/2016) for the disciplinary field of 09/C2-Thermal sciences, energy technology, building physics and nuclear engineering</i> Validity: from 03/04/2018 to 03/04/2029
March 2015	Qualification to practice engineering profession

2.3 Other Education Experiences

4-5 December 2017	Simulazione Termoenergetica Dinamica degli Edifici, Modulo STEC C, Software TRNSYS (Building Energy Simulation with TRNSYS Software) AICARR Formazione S.r.l., Milano, Italy Topics: building energy simulation strategies
26-27 October 2017	Simulazione Termoenergetica Dinamica degli Edifici, Modulo STEC A, Fondamenti (Building Energy Simulation Fundamentals) AICARR Formazione S.r.l., Milano, Italy Topics: building physics

3. Professional and Academic Positions

3.1 Current Position

February 2024 – ongoing	Associate Professor (Full time, RTD-B, SSD ING-IND/10) Department of Energy, Politecnico di Milano, Italy Main Activities: <i>multi-scale modeling of the residential sector (i.e., bottom-up approaches, energy poverty, ...). Experimental and computation fluid-dynamic modeling of single and multi-phase flows.</i>
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3.2 Previous Positions

Full Time Positions	
June 2022 – January 2024	Senior Assistant Professor (Full time, RTD-B, SSD ING-IND/10) Department of Energy, Politecnico di Milano, Italy Research Project: “Energy Communities planning and management models” Main Activities: <i>multi-scale modeling of the residential sector (i.e., bottom-up approaches, energy poverty, ...). Computation fluid-dynamic modeling of single and multi-phase flows, to support the design and operation of energy-system components (e.g., to be used in renewable energy-based technologies to decarbonize the residential sector) and chemical reactors</i>
February 2021 – June 2022	Junior Assistant Professor (Full time, RTD-A, SSD ING-IND/10) Department of Energy, Politecnico di Milano, Italy Research Project: “Characterization of transport processes in porous media in multiple spatial scale” Main Activities: <i>multi-scale experimental and numerical investigations of innovative ejector-based technologies (i.e., propane heat pumps, water-based high temperature heat pumps, ...). Modeling of multi-phase flows, to support the design and operation of chemical reactors and energy-system components</i>
July 2017 – January 2021	Researcher Energy Systems Development Department, Ricerca sul Sistema Energetico (RSE Spa), Italy Main Activities: <i>experimental and numerical investigations of renewable energy-based technologies to decarbonize the residential sector (i.e., ejector technology, multi-source heat pumps, solar-based systems, thermal storage, ...). Multi-scale modeling of the residential sector (i.e., bottom-up approaches, energy poverty, forecasting, ...)</i>
November 2016 – July 2017	R&D Engineer Innovation Centre, EPTA Spa, Italy Main Activities: <i>experimental and numerical investigations of novel commercial refrigeration systems (i.e., R744 and R290 water-loop, ejectors, ...) and collaboration with Department of Management, Information and Production Engineering, Università degli Studi di Bergamo (numerical modeling of CO₂ ejectors)</i>
February 2016 – November 2016	Post-Doctoral Fellow (Assegno di Ricerca – SSD ING-IND/10) Department of Energy, Politecnico di Milano, Italy Supervisor: Prof. Fabio Inzoli Research Title: “Analisi sperimentale e numerica di colonne a gorgogliamento in contro-corrente” (“Experimental and numerical analysis of counter-current bubble columns”) Main Activities: <i>multi-scale experimental and numerical studies of large-scale bubble columns with different gas spargers</i>
Guest Researcher Positions	
May 2019	Guest Researcher Department of Mechanical Engineering, Eindhoven University of Technology, Netherlands Main Activities: <i>developing a general and physical based novel correlation for aspect ratio of bubbles in different liquid media</i>
April – May 2016	Guest Researcher Power Generation Department, Ricerca sul Sistema Energetico (RSE Spa), Italy

April – July 2015	Main Activities: <i>comprehensive experimental investigation of the multi-phase fluid dynamics in pool scrubbing systems: influence of the liquid phase properties</i> Guest Researcher Computational Fluid Dynamics Department, Helmholtz-Zentrum Dresden-Rossendorf, (HZDR), Germany Main Activities: <i>numerical simulation of large-scale bubble columns within the Eulerian Multi-Fluid approach (bi-dispersed and population balance models)</i>
May – June 2014	Guest Researcher Power Generation Department, Ricerca sul Sistema Energetico (RSE Spa), Italy Main Activities: <i>comprehensive experimental investigation of the multi-phase fluid dynamics in pool scrubbing systems: influence of the gas sparger design</i>

4. Teaching Activities

4.1 Academic Teaching

September 2023 – January 2024	Lecturer (docente titolare) Course: CFD for Nuclear Engineering, 5 CFU, SSD: ING-IND/10 Graduate Course in Nuclear Engineering, Politecnico di Milano, Italy Main Activities: <i>lecturer of the course, delivering ex-cathedra lessons, student support and hands-on trainings</i>
September 2023 – January 2024	Lecturer (docente titolare) Course: Fisica Tecnica (Thermodynamics and Heat Transfer), 10 CFU, SSD: ING-IND/10 Graduate Course in Aerospace Engineering, Politecnico di Milano, Italy Main Activities: <i>lecturer of the course, delivering ex-cathedra lessons, student support and hands-on trainings</i>
March 2023 – June 2023	Lecturer (docente titolare) Course: Fisica Tecnica (Thermodynamics and Heat Transfer), 5 CFU, SSD: ING-IND/10 Graduate Course in Computer Science and Engineering, Politecnico di Milano, Italy Main Activities: <i>lecturer of the course, delivering ex-cathedra lessons, student support and hands-on trainings</i>
September 2022 – January 2023	Lecturer (docente titolare) Course: CFD for Nuclear Engineering, 5 CFU, SSD: ING-IND/10 Graduate Course in Nuclear Engineering, Politecnico di Milano, Italy Main Activities: <i>lecturer of the course, delivering ex-cathedra lessons, student support and hands-on trainings</i>
September 2022 – January 2023	Lecturer (docente titolare) Course: Fisica Tecnica (Thermodynamics and Heat Transfer), 10 CFU, SSD: ING-IND/10 Graduate Course in Aerospace Engineering, Politecnico di Milano, Italy Main Activities: <i>lecturer of the course, delivering ex-cathedra lessons, student support and hands-on trainings</i>
March 2022 – June 2022	Lecturer (docente titolare) Course: Fisica Tecnica (Thermodynamics and Heat Transfer), 5 CFU, SSD: ING-IND/10 Graduate Course in Computer Science and Engineering, Politecnico di Milano, Italy Main Activities: <i>lecturer of the course, delivering ex-cathedra lessons, student support and hands-on trainings</i>
September 2021 – January 2022	Teaching Assistant Course: Fisica Tecnica (Thermodynamics and Heat Transfer), 10 CFU, SSD: ING-IND/10 Graduate Course in Aerospace Engineering, Politecnico di Milano, Italy Lecturer: Prof. Fabio Inzoli

November 2021 – January 2022	Main Activities: <i>delivering ex-cathedra lessons, student support and hands-on trainings</i> Teaching Assistant Course: CFD for Nuclear Engineering, 5 CFU, SSD: ING-IND/10 Graduate Course in Nuclear Engineering, Politecnico di Milano, Italy Lecturer: Prof. Fabio Inzoli Main Activities: <i>delivering ex-cathedra lessons, student support and hands-on trainings</i>
February 2021 – June 2021	Teaching Assistant Course: Fisica Tecnica (Thermodynamics and Heat Transfer), 5 CFU, SSD: ING-IND/10 Graduate Course in Computer Science and Engineering, Politecnico di Milano, Italy Lecturer: Prof. Gael Guedon Raymond Main Activities: <i>delivering ex-cathedra lessons, student support and hands-on trainings</i>
November 2020 – January 2021	Teaching Assistant Course: CFD for Nuclear Engineering, 5 CFU, SSD: ING-IND/10 Graduate Course in Nuclear Engineering, Politecnico di Milano, Italy Lecturer: Prof. Fabio Inzoli Main Activities: <i>delivering ex-cathedra lessons, student support and hands-on trainings</i>
October 2015 – January 2016	Teaching Assistant Course: CFD for Energy Engineering, 8 CFU, SSD: ING-IND/10 Graduate Course in Energy Engineering, Politecnico di Milano, Italy Lecturer: Prof. Fabio Inzoli Main Activities: <i>delivering ex-cathedra lessons, student support and hands-on trainings</i>
October 2014 – January 2015	Teaching Assistant Course: CFD for Energy Engineering, 8 CFU, SSD: ING-IND/10 Graduate Course in Energy Engineering, Politecnico di Milano, Italy Lecturer: Prof. Fabio Inzoli Main Activities: <i>delivering ex-cathedra lessons, student support and hands-on trainings</i>

4.2 Other Educational Contributions

10 th October, 2019	Bubble Column Fluid Dynamics: a Multi-Scale Perspective Invited lecture from Prof. C.N. Markides (c.markides@imperial.ac.uk), Imperial College London, London, United Kingdom - www.imperial.ac.uk/events/96531/bubble-column-fluid-dynamics-a-multi-scale-perspective
13 th December, 2018	Bubble Column Technology and Fluid Dynamics Seminar (1 hour) Invited lecture from Prof. L.P.M Colombo (luigi.colombo@polimi.it), Politecnico di Milano, Graduate Course in Energy Engineering (Course: Multiphase systems and technologies), Politecnico di Milano, Italy
18 th May, 2016	Bubble Column Fluid Dynamics: Experimental and Numerical Investigations Invited lecture from Dr. Ada Del Corno (ada.delcorno@rse-web.it), Ricerca sul Sistema Energetico (RSE Spa), Italy
10 th June 2014	Introduction to Multiphase Fluid dynamics Simulation Lecture within “<i>Orienteering in thermo-fluid dynamics simulation applied to Multiphase Transport Systems</i>” course at Eni Spa, Italy
11 th September 2014	La modellazione Euleriano-Euleriano Lecture within “<i>Corso Avanzato di Termo-Fluidodinamica Computazionale per applicazioni industriali di fenomeni multifase</i>” course at Enginsoft, Italy

4.2 Supervision of graduate and undergraduate students

October 2022 - Ongoing	Supervisor of Post doctoral researcher Jiquan Han during his guest stay at SESAM Research Group, Department of Energy, Politecnico di Milano. Research topic: <i>“Dynamic characteristics of ejectors in proton exchange membrane fuel cell systems”</i> .
November 2021 - Ongoing	Supervisor of PhD candidate Rafal Piotr Fingas. Thesis title: <i>“Comprehensive system and numerical analysis of small-scale ejector-based propane heat pump”</i> . Joint PhD between Politecnico di Milano (Energy and Nuclear Science and Technology PhD programme, supervisor: Dr Giorgio Besagni) and Silesian University of Technology (supervisor: Prof. Jacek Smolka; co-supervisor: Dr Michal Haida)
November 2021	Supervisor of PhD candidate Omar Abu Khass (thesis title: <i>Supersonic Two-Phase Steam Ejector – application in High-Temperature Heat Pump</i>) during his guest stay at SESAM Research Group, Department of Energy, Politecnico di Milano
December 2016 - Ongoing	Supervision of 13 Master of Science theses (9 completed; 4 ongoing) in Energy Engineering and Management Engineering Co-supervision of 22 Master of Science theses in Energy Engineering, Management Engineering and Environmental Engineering Opponent of 6 Master of Science theses in Energy Engineering

5. Research Activities: research description and participation in funded projects

5.1 Research Field Description

I obtained a PhD in Energy and Nuclear Science and Technology at Politecnico di Milano (2013 – 2016). After post-doctoral activities at Politecnico di Milano, I moved in the innovation-center of a commercial-refrigeration company (2016 – 2017) where I studied, experimentally and numerically, innovative commercial refrigeration systems. From July 2017 till February 2021, I served as a researcher at Ricerca sul Sistema Energetico (RSE Spa), a publicly controlled research center focused on national strategic projects. From February 2021 I was a Junior Assistant Professor (RTD-a) at Politecnico di Milano and, since June 2022, I have become a Tenure-Track Assistant Professor (RTD-b) at Politecnico di Milano. During my Doctoral, Post-Doctoral and Researcher activities I collaborated with different research groups, industries, and institutions. The main goal of my research activities has been to understand, by using experimental and numerical approaches, the **multi-scales relationships** in cutting-edge technologies, encompassing the underlying physics to explain the global behavior, to scale-up towards practical applications.

Research activity#1. Experimental and Numerical Investigations of Multiphase Flows

This research activity started in 2013, and it is still currently carried on, with my doctoral studies at the *CFDLab@Energy* group of Politecnico di Milano and was focused on investigating **bubble columns fluid dynamics**. This project started with a founding received from Eni Spa to support the design of a novel downhole sour gas removal system; within this project I supported the research activities leading to a patent (*“WO2017175206, Process for the removal in the well of the acid components from hydrocarbons and related well”*). The cutting-edge research topic in bubble columns fluid dynamics is made clear considering that, despite the simple bubble column layouts, the coupling between the phases gives rise to rich and multi-scale fluid dynamics phenomena. To clarify the multi-scale connections between the local- and the global-scales, I built a **large-scale bubble column** and developed a coupled **experimental/numerical approach**. The **experimental method** consisted of a **variety of experimental techniques** (viz., gas holdup, gas disengagement, image analysis, optical probe measurements, particle image velocity) applied to different bubble column designs and liquid phases. The experimental activities were also carried out in collaboration with the Department of Chemistry, Materials and Chemical Engineering of Politecnico di Milano, aiming at scaling-up towards the industrial-scale, and with the Computational Fluid Dynamics group of Helmholtz-Zentrum Dresden-Rossendorf (*HZDR*), through the Forschungsgemeinschaft project (*project number: 335448239*). The proposed experimental approach was also applied to study the multiphase fluid dynamics within pool scrubbing systems (PASSAM European project), during two guest stay periods (2014 and 2016) at Ricerca sul Sistema Energetico. The **numerical methods** consisted of **CFD models** (mono- and bi-dispersed *CFD* approaches implemented within the FLUENT code) as well as **lumped parameter models**. The latter consisted of population balance models and correlations. The development and implementation of *CFD* and lumped parameter models were also supported by **international collaborations**. To support the development of *CFD* approaches, I spent a guest stay period at *HZDR* (2015; Dr. D. Lucas, head of Computational Fluid Dynamics group), focusing on advance methods to simulate bubble columns: as an outcome, a bi-dispersed approach was developed

within the CFX code. Since my guest period, I worked to consolidate the collaboration and I organized exchange of students between the institutions, thus allowing the exchange of methods and data. The collaboration is still ongoing and, in since 2023, moved towards the application of morphology-adaptive multifield two-fluid model to modeling the transition from unresolved to resolved bubbles and two-phase flow in horizontal pipes. The collaboration resulted in different papers presented in international journals and conferences. On the other hand, to support the development of lumped parameter models, in 2019 I spent a guest stay period at the Department of Mechanical Engineering, Eindhoven University of Technology (Prof. N.G. Deen), to develop a simple and physics-based correlation, relating the bubble aspect ratio to non-dimensional groups. Since 2021, the research activities on bubble column fluid dynamics moved on defining a novel and comprehensive theory to define the flow regimes in bubble columns based on the a-priori definition of the regime transitions.

Research activity#2. Experimental and Numerical Investigations of Renewable Energy-Based Technologies

This research activity started in 2013: it was initially focused on studying the **on- and off- design performances of ejector component**, and since 2017 it was extended to **other components and systems**. Ejectors find their application in different energy conversion systems: the efficiency of ejector-based systems ("*system-scale*") relies on the behavior of the ejector ("*component-scale*"), related to the flow phenomena within the component itself ("*local-scale*"). The research activity aims at studying and connecting the different scales, using lumped parameter modes, *CFD* and coupled "*lumped parameter-CFD*" approaches. First, single-phase, and multi-phase lumped parameter models have been validated and, subsequently, applied to identify suitable working fluids. Second, comprehensive validations of *CFD* modeling approaches for single-phase (since 2013) and two-phase (since 2016, related to modelling flashing flows) ejectors have been conducted. Third, lumped parameter modes and *CFD* approaches were coupled to relate the local-, component- and system-scales. Since 2019, ejector research has been focused on developing a novel ejector-based high temperature heat pump and, starting from, 2021, as part of a double PhD programme with Silesian University of Technology, to study ejector-based heat pumps using natural refrigerant (propane) as working fluid. Starting from 2017, this research activity was extended to study other renewable energy-based components and systems. The system point of view consisted of **novel heat pump systems**, and, in this sense, attention was devoted to design innovative solar-assisted dual-source multifunctional heat pumps; this activity has also involved a collaboration with the Department of Architecture, Built Environment and Construction Engineering of Politecnico di Milano, within the Hybrid PVT Assisted Heat Pump research project (founded by the Ministry of Economic Development). As the performance of such heat pump systems is highly related to the different components, particular attention was devoted to photovoltaic thermal hybrid solar collectors and thermal storages. To this end, **photovoltaic thermal hybrid solar collectors** have been experimentally and numerically studied: monitored data were used to validate a lumped parameter model; the numerical activity was carried out in collaboration with the Department of Industrial Engineering of Università degli Studi di Padova. Regarding **thermal energy storages**, in 2018, a pilot-scale phase-change material storage for solar-assisted heat pumps has been designed, built, and tested. In the perspective of coupling all above technologies and pointing towards a system point of view, starting from 2019, I contributed in setting-up a novel laboratory (simulating an all-electric household), whose control system will be implemented using machine learning tools; the latter activity is carried out in collaboration with the Department of Industrial Engineering of Università degli Studi di Padova.

Research activity#3. Bottom-Up Modeling of the Italian Residential Sector

This research activity started in 2017 and was focused in developing a **comprehensive bottom-up model of the residential sector**, which may serve as basis for policymakers when planning investments aiming to reduce the primary energy consumption. The project is grounded on a **collaboration with the Italian Institute of Statistics (ISTAT)**, which provided different datasets (microdata characterized by a statistical-nationwide-representative sample) regarding household expenditures, energy consumption and household behavior. The research activity aims at applying these datasets to reconstructing the energy consumption at the "*country-scale*" starting from the modeling of the "*sociodemographic-scale*". First, the research activity was devoted to clarifying the **determinants** of energy and transportation expenditures as well as to describe the demand-side considering comfort related constrains. Second, an **analytical bottom-up modelling approach** (named *MOIRAE*) to compute the thermal and electrical energy consumptions of the Italian residential sector has been developed, validated, and applied. Within this modeling approach, lumped parameter models of the different appliances (based on datasets gathered in the last decades of Ricerca sul Sistema Energetico research activities) have been applied to the "*household energy consumption*" microdata provided by *ISTAT*. Ongoing research activities aim at extending *MOIRAE* to cover other sectors (e.g., the household transportation, waste production, ...), to include an economical sub-model (considering the household budget constrains) as well as to implement the time variable (e.g., aging of population, ...). To this end, a research contract with the Department of Management, Information and Production Engineering of Università degli Studi di Bergamo has been established to support the statistical analysis of the micro-data and to couple all available datasets. Finally, a focus was

devoted to **energy poverty** issues and an integrated statistical/lumped parameter approach to estimate the incidence of fuel poverty in Italy was developed.

5.2 National/International Research Collaborations

February 2021 - Ongoing	Researcher in the SESAM Research Group, Department of Energy, Politecnico di Milano, Italy
July 2017 – January 2021	Researcher in the Energy Efficiency Research Group, Energy Systems Development Department, Ricerca sul Sistema Energetico (RSE Spa), Italy Head of Research Group: Dr. Marco Borgarello (marco.borgarello@rse-web.it) Department Director: Dr. Michele Benini (michele.benini@rse-web.it)
January 2013- November 2016	Researcher in the CFDLab@Energy Research Group, Department of Energy, Politecnico di Milano, Italy Supervisor: Prof. Fabio Inzoli (fabio.inzoli@polimi.it)
July 2023- ongoing	Collaboration with Computational Fluid Dynamics Department, Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Germany Contact: Dr. Dirk Lucas (d.lucas@hzdr.de), Dr. Fabian Schlegel (f.schlegel@hzdr.de), Dr. Roland Rzehak (r.rzehak@hzdr.de) Research Contribution: <i>numerical simulation of multiphase flows within the Eulerian Multi-Fluid and the Morphology-adaptive approaches</i>
July 2017 - January 2021	Collaboration with the Italian Institute of Statistics (ISTAT), Italy Research Contribution: <i>developing a bottom-up model of the residential sector using microdata obtained by the Italian Institute of Statistics</i> Outcome: <i>journal papers [J21, J27, J30, J34, J39, J41, J47, J49, J52] (refer to Section 6 for publication details)</i>
July 2017 - January 2021	Collaboration with the Department of Industrial Engineering, Università degli Studi di Padova, Italy Contact: Prof. Angelo Zarrella (angelo.zarrella@unipd.it) Research Contribution: <i>development of a novel lumped-parameter-model for photovoltaic-thermal hybrid panels, machine learning-based control system for households supply side management</i> Outcome: <i>journal papers [J36, J46] and conference papers [C8, C19] (refer to Section 6 for publication details)</i>
July 2017 - January 2021	Collaboration with Department of Architecture, Built Environment and Construction Engineering (DABC), Politecnico di Milano, Italy Contact: Dr. Fabrizio Leonforte (fabrizio.leonforte@polimi.it) Research Contribution: <i>development a novel multifunctional solar-assisted heat pump</i> Outcome: <i>journal paper [J35] (refer to Section 6 for publication details)</i>
December 2019 - January 2021	Collaboration with Department of Management, Information and Production Engineering, Università degli Studi di Bergamo, Italy Contact: Prof. Francesco Finazzi (francesco.finazzi@unibg.it) Research Contribution: <i>statistical modeling of the Italian residential sector</i> Outcome: <i>journal paper [J27] (refer to Section 6 for publication details)</i>
May 2019	Collaboration with the Department of Mechanical Engineering, Eindhoven University of Technology, Netherlands Contact: Prof. Niels G. Deen (n.g.deen@tue.nl) Research Contribution: <i>developing a general and physical based novel correlation for</i>

	<i>aspect ratio of bubbles in different liquid media</i> Outcome: <i>journal papers [J38] (refer to Section 6 for publication details)</i>
December 2018	Collaboration with Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA), Italy Contact: Dr. Maurizio Pieve (maurizio.pieve@enea.it) Research Contribution: <i>support the HPT Member Country Report 2018</i> Outcome: <i>HPT Member Country Report 2018</i>
September 2017 – January 2018	Collaboration with Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile (ENEA), Italy Contact: Dr. Rainiero Trinchieri (rainiero.trinchieri@enea.it) Research Contribution: <i>support the SIMTE report regarding heat pumps</i> Outcome: <i>SIMTE report regarding heat pumps - http://simte.enea.it</i>
November 2016 – July 2017	Collaboration with Department of Management, Information and Production Engineering, Università degli Studi di Bergamo, Italy Contact: Dr. Alessandro Colombo (alessandro.colombo@unibg.it) Research Contribution: <i>numerical modeling of CO₂ ejectors within a research contract founded by EPTA Spa</i>
April 2015– February 2017	Collaboration with Computational Fluid Dynamics Department, Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Germany Contact: Dr. Dirk Lucas (d.lucas@hzdr.de), Dr. Thomas Ziegenhein (t.ziegenhein@hzdr.de) Research Contribution: <i>numerical simulation of large-scale bubble columns within the Eulerian Multi-Fluid approach (bi-dispersed and population balance); experimental studies of bubble column fluid dynamics using particle tracking velocimetry</i> Outcome: <i>journal papers [J40, J45, J55, J56, J64, J73] and conference papers [C29, C31, C40] (refer to Section 6 for publication details)</i>
January 2013– November 2016	Collaboration with Group on Advanced Separation Processes & GAS Processing (GASP) Research Group, Department of Chemistry, Materials and Chemical Engineering, Politecnico di Milano, Italy Contact: Prof. Laura Pellegrini (laura.pellegrini@polimi.it) Research Contribution: <i>experimental investigation of bubble column fluid dynamics with different liquid phases to support scaling-up procedures and methods</i> Outcome: <i>journal papers [J65, J69, J74, J76] and conference papers [C36, C39] (refer to Section 6 for publication details)</i>
April – May 2016	Collaboration with Power Generation Department, Ricerca sul Sistema Energetico (RSE Spa), Italy Contact: Dr. Ada Del Corno (ada.delcorno@rse-web.it) Research Contribution: <i>experimental investigation of the multi-phase fluid dynamics in pool scrubbing systems: influence of the liquid phase properties</i> Outcome: <i>conference presentation [C32] (refer to Section 6 for publication details)</i>
May – June 2014	Collaboration with Power Generation Department, Ricerca sul Sistema Energetico (RSE Spa), Italy Contact: Dr. Sonia Morandi (sonia.morandi@rse-web.it) Research Contribution: <i>experimental investigation of the multi-phase fluid dynamics in pool scrubbing systems: influence of the gas sparger design</i> Outcome: <i>conference poster [C41] (refer to Section 6 for publication details)</i>

5.3 Responsibility of Research Contracts and Funded Projects

September 2021 – December 2021	Research Contract between Ricerca sul Sistema Energetico (RSE Spa) and Politecnico di Milano Title: <i>Analisi del funzionamento di un eiettore a geometria variabile a propano</i> Customer: Ricerca sul Sistema Energetico (RSE Spa), P.I.: Prof Fabio Inzoli and Dr. Giorgio Besagni – Politecnico di Milano
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5.4 Participation in National/International Projects

September 2021 - Ongoing	Team Member Project “<i>Improvement of the Average Seasonal Performance of HVAC+R Systems through Controlled Ejectors. Development and experimental research of modular ejectors (Mejora del Rendimiento Medio Estacional de Equipos de Producción de Frío mediante Eyectores Controlados. Desarrollo e investigación experimental de eyectores modulares)</i>” funded by the spanish Ministry of Science and Innovation https://bibliometria.us.es/prisma/financiacion/14650 Main Activities: <i>experimental and numerical study of variable geometry and multi-ejector systems to improve the performance of HVAC+R Systems</i>
2019 – January 2021	Team Member Project 2.1 “<i>Strumenti e modelli, anche settoriali, per scenari energetici ed elettrici, adeguati all'evoluzione del sistema - Analisi di evoluzione dei mercati e della regolazione</i>” (WP#1, <i>modelli per scenari energetici</i>) funded by the Research Fund for the Italian Electrical System (PAR 2019 – 2021) from the Ministry of Economic Development Main Activities: <i>developing a bottom-up model of the Italian residential sector</i>
2019 – January 2021	Team Member Project 1.7 “<i>Tecnologie per la penetrazione efficiente del vettore elettrico negli usi finali</i>” (WP#1, <i>Promozione dell'efficienza energetica</i>, and WP#2, <i>Pompe di calore</i>) funded by the Research Fund for the Italian Electrical System (PAR 2019 – 2021) from the Ministry of Economic Development Main Activities: <i>setting-up a novel laboratory (simulating an all-electric household), whose control system is implemented using machine leaning tools (WP#1); developing an ejector-based high temperature heat pump (WP#2)</i>
2017 –2020	Team Member Project “Hybrid PVT Assisted Heat Pump (PVT-SAHP) - Sviluppo di un sistema integrato per la climatizzazione da fonte fotovoltaica”, founded by the Italian Ministry of Economic Development Partners : Politecnico di Milano, Hydros s.r.l., Gualini Spa Main Activities: <i>developing an innovative solar-assisted heat pump: experimental setup monitoring and performance evaluation</i>
2018	Team Member Project D5 “<i>Gestione della domanda</i>” funded by the Research Fund for the Italian Electrical System (PAR 2018) from the Ministry of Economic Development Main Activities: <i>statistical study of the determinants of household energy expenditures</i>
2018	Team Member Project D4 “<i>Impianti di conversione di energia di piccola taglia</i>” funded by the Research Fund for the Italian Electrical System (PAR 2018) from the Ministry of Economic Development

2017	Main Activities: <i>building and testing a pilot—scale phase-change-material storage system</i> Team Member Project D6 “<i>Gestione della domanda</i>” funded by the Research Fund for the Italian Electrical System, (PAR 2017) from the Ministry of Economic Development Main Activities: <i>statistical study of the determinants of household energy expenditure and segmentation strategies</i>
2017	Team Member Project D4 “<i>Impianti di conversione di energia di piccola taglia</i>” funded by the Research Fund for the Italian Electrical System, (PAR 2017) from the Ministry of Economic Development Main Activities: <i>experimental studies of novel multi-functional solar-assisted heat pumps</i>
2017 – 2018	Team Member Project “<i>Deployments of heat pumps to replace conventional heating systems: technical-economic study</i>” funded by ENEL X Main Activities: <i>lumped-parameter modelling of the Italian Residential Building Stock and economical evaluations</i>
2017 – 2018	Team Member Assist2gether project founded by the European Union's Horizon 2020 research and innovation programme under grant agreement n° 754051 Main Activities: <i>Italian household segmentation and identification of vulnerable households</i>
2016 – 2017	Team Member CommONEnergy project founded by the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 608678 Main Activities: <i>experimental investigation of R744 and R290 water-loop systems for commercial refrigeration applications</i>
2016 - 2017	Cooperation partner Deutsche Forschungsgemeinschaft project number 335448239 “Generating a database to validate CFD simulations using a pilot-plant scale bubble column operating with water and ethanol” Main Activities: <i>obtaining a complete database for CFD validation that includes locally resolved information about the bubble size and gas void fraction with the information about the liquid velocity at different operating conditions</i>
2014 and 2016	Team Member as Guest Researcher PASSAM project founded by the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 323217 Main Activities: <i>experimental investigation of multi-phase fluid dynamics in pool scrubbing systems</i>

6. Publications, Editorial Activities, Evaluation panels and Conference Boards

6.1 Publications in International Journals

- [J1] Han, J., Pang, Z., Feng, J., **Besagni, G.**, Mereu, R., Inzoli, F., & Peng, X. (2023). Experimental and numerical study on the ejector containing condensable species in the secondary flow for PEM fuel cell applications. *Applied Thermal Engineering*, 121091.
- [J2] Varallo, N., **Besagni, G.**, & Mereu, R. (2023). Bubble Column Reactors: the Variables Influencing the Mono-dispersed Homogeneous Flow Regime. *Chemical Engineering Transactions*, 100, 361-366.
- [J3] Arias, D. M., García-Valladares, O., **Besagni, G.**, & Markides, C. N. (2023). A vision of renewable thermal technologies for drying, biofuels production and industrial waste, gas or water recovery. *Applied Thermal Engineering*, 223, 120022.
- [J4] **Besagni, G.**, Varallo, N., & Mereu, R. (2023). Computational Fluid Dynamics Modelling of Two-Phase Bubble Columns: A Comprehensive Review. *Fluids*, 8(3), 91.
- [J5] Vujanović, M., **Besagni, G.**, Duić, N., & Markides, C. N. (2023). Innovation and advancement of thermal processes for the production, storage, utilization and conservation of energy in sustainable engineering applications. *Applied Thermal Engineering*, 221, 119814.
- [J6] Wieland, C., Schiffelechner, C., Braimakis, K., Kaufmann, F., Dawo, F., Karellas, S., **Besagni, G.** & Markides, C. N. (2023). Innovations for organic Rankine cycle power systems: Current trends and future perspectives. *Applied Thermal Engineering*, 225, 120201.
- [J7] Vilà, L. P., Trabucchi, A., Ferrè, L., Grosso, M., Borgarello, M., & **Besagni, G.** (2022). Bottom-up modelling of the Italian municipal waste generation: Model set-up, validation and pathways towards 2040. *Journal of Cleaner Production*, 357, 131719.
- [J8] Leonforte, F., Miglioli, A., Del Pero, C., Aste, N., Cristiani, N., Croci, L., & **Besagni, G.** (2022). Design and performance monitoring of a novel photovoltaic-thermal solar-assisted heat pump system for residential applications. *Applied Thermal Engineering*, 210, 118304.
- [J9] **Besagni, G.**, Nedeltchev, S., Ziegenhein, T., & Fletcher, D. F. (2022). Multi-scale approaches in bubble column fluid dynamics. *Chemical Engineering Research and Design*, 183, 134-135.
- [J10] Fingas, R., Haida, M., Smolka, J., **Besagni, G.**, Palacz, M., Bodys, J., & Nowak, A. J. (2022). Numerical Investigation of the Expansion Devices Applied in Modern Vapour Compression Refrigeration Unit Considering Specific Entropy and Entropy Generation Analyses. *Chemical Engineering Transactions*, 96, 325-330.
- [J11] Li, G., Li, M., Taylor, R., Hao, Y., **Besagni, G.**, & Markides, C. N. (2022). Solar energy utilisation: Current status and roll-out potential. *Applied Thermal Engineering*, 209, 118285.
- [J12] He, L., Xu, H., Mao, X., & **Besagni, G.** (2022). Some recent advances in computational heat transfer and fluid flow. *Applied Thermal Engineering*, 118645.
- [J13] Mameli, M., **Besagni, G.**, Bansal, P. K., & Markides, C. N. (2022). Innovations in pulsating heat pipes: From origins to future perspectives. *Applied Thermal Engineering*, 203, 117921.
- [J14] **Besagni, G.**, Inzoli, F., Croci, L., Brignoli, V., Smolka, J., Palacz, M., Haida, M.; Bodys, J.; Fingas, R.; Nowak, A.; Melka, B.; Stebel, M. & Piechnik, E. (2023, May). Experimental study of a R290 variable geometry ejector. In *Journal of Physics: Conference Series* (Vol. 2509, No. 1, p. 012006). IOP Publishing.
- [J15] Fingas, R., Haida, M., Smolka, J., **Besagni, G.**, Palacz, M., Bodys, J., & Nowak, A. J. (2022, December). The comparative analysis of the R290 heat pump system working with standard expansion valve and two-phase ejector. In *Journal of Physics: Conference Series* (Vol. 2385, No. 1, p. 012093). IOP Publishing.
- [J16] **Besagni, G.**, Croci, L., Bellasio, P., & Colombo, L. P. M. (2021, November). Ejector refrigeration: perspectives and comparative analysis. In *Journal of Physics: Conference Series* (Vol. 2116, No. 1, p. 012090). IOP Publishing.
- [J17] **Besagni, G.**, Croci, L., Cristiani, N., Inzoli, F., & Guédon, G. R. (2021, November). Computational fluid dynamic modelling of supersonic ejectors: comparison between 2D and 3D modelling. In *Journal of Physics: Conference Series* (Vol. 2116, No. 1, p. 012091). IOP Publishing.

- [J18] **Besagni, G.** (2021). Lumped parameter modelling of two-phase ejectors: numerical implications of the equilibrium assumptions. In *Journal of Physics: Conference Series* (Vol. 2116, No. 1, p. 012089). IOP Publishing.
- [J19] **Besagni, G.** (2021). The effect of operating and design parameter on bubble column performance: The LOPROX case study. *Chinese Journal of Chemical Engineering*, 40, 48-52.
- [J20] Anvari-Moghaddam, A., **Besagni, G.**, & Markides, C. N. (2021). Multi-Energy Islands: Advances in Local District Heating, Cooling and Power Systems. *Applied Thermal Engineering*, 199, 117423.
- [J21] Trabucchi, A., Premoli Vilà, L., Borgarello, M., & **Besagni, G.** (2021). Assessing the Impact on Grid Infrastructure of Electrification Pathways for the Italian Residential Sector. *Electricity*, 2(1), 48-62.
- [J22] Bianchi, G., **Besagni, G.**, Tassou, S. A., & Markides, C. N. (2021). Overview and Outlook of Research and Innovation in Energy Systems with Carbon Dioxide as the Working Fluid. *Applied Thermal Engineering*, 195, 117180.
- [J23] **Besagni, G.**, Croci, L., Cristiani, N., Inzoli, F., & Guédon, G. R. (2021). Multi-scale performance evaluation of ejector refrigeration systems. *Journal of Physics: Conference Series* (Vol. 1868, No. 1, p. 012013). IOP Publishing.
- [J24] **Besagni, G.**, & Cristiani, N. (2021). Multi-scale evaluation of an R290 variable geometry ejector. *Applied Thermal Engineering*, 188, 116612.
- [J25] **Besagni, G.**, Cristiani, N., Croci, L., Guédon, G. R., & Inzoli, F. (2021). Computational fluid-dynamics modelling of supersonic ejectors: Screening of modelling approaches, comprehensive validation and assessment of ejector component efficiencies. *Applied Thermal Engineering*, 186, 116431.
- [J26] **Besagni, G.**, Cristiani, N., Croci, L., Guédon, G. R., & Inzoli, F. (2021). Multi-scale evaluation of ejector performances: The influence of refrigerants and ejector design. *Applied Thermal Engineering*, 186, 116502.
- [J27] **Besagni, G.**, Vilà, L. P., Borgarello, M., Trabucchi, A., Merlo, M., Rodeschini, J., & Finazzi, F. (2021). Electrification pathways of the Italian residential sector under socio-demographic constraints: Looking towards 2040. *Energy*, 217, 119438.
- [J28] **Besagni, G.** (2021). Bubble column fluid dynamics: A novel perspective for flow regimes and comprehensive experimental investigations. *International Journal of Multiphase Flow*, 135, 103510.
- [J29] Croci, L., Cristiani, N., Benini, M., & **Besagni, G.** (2021). Experimental Study of a Novel Integrated System for Air Conditioning and Domestic Hot Water Production. *Chemical Engineering Transactions*, 86, 631-636.
- [J30] Besagni, G., & Borgarello, M. (2020). The socio-demographic dimensions of the private transportation emissions. *Economics and Policy of Energy and the Environment*.1, 13-24.
- [J31] Grea, G., Borgarello, M., & **Besagni, G.** (2020). Mobility, energy, environment and disruptive innovation: Challenges, opportunities and perspective for new sustainable integrated approaches to planning. *Mobility, energy, environment and disruptive innovation: challenges, opportunities and perspective for new sustainable integrated approaches to planning*, 5-12.
- [J32] **Besagni, G.**, Premoli Vilà, L., & Borgarello, M. (2020). Italian household load profiles: A monitoring campaign. *Buildings*, 10(12), 217.
- [J33] **Besagni, G.**, Croci, L., Cristiani, N., Guédon, G. R., & Inzoli, F. (2020). Refrigerant selection for ejector refrigeration systems: a multiscale evaluation. *E3S Web of Conferences*. 197, 10011.
- [J34] **Besagni, G.**, Borgarello, M., Premoli Vilà, L., Najafi, B., & Rinaldi, F. (2020). MOIRAE – bottom-up MODEL to compute the energy consumption of the Italian RESidential sector: model design, validation and evaluation of electrification pathways. *ENERGY*. 211, 118674.
- [J35] Leonforte, F., Del Pero, C., Aste, N., Miglioli, A., Croci, L., & **Besagni, G.** (2020). Energy assessment and monitoring of a novel photovoltaic-thermal collector designed for solar-assisted heat pump systems. *IET Renewable Power Generation*, 14(13), 2323-2330.

- [J36] Emmi, G., Bordignon, S., Zarrella, A., Vivian, J., Croci, L., & **Besagni, G.** (2020). A simulation-based analysis of photovoltaic thermal hybrid solar collectors with a new TRNSYS type model. In *Journal of Physics: Conference Series* (Vol. 1599, No. 1, p. 012030). IOP Publishing.
- [J37] **Besagni, G.**, & Croci, L. (2020, August). Experimental study of a phase change material storage for low-temperature applications. In *Journal of Physics: Conference Series* (Vol. 1599, No. 1, p. 012003). IOP Publishing.
- [J38] **Besagni, G.**, & Deen, N. G. (2020). Aspect ratio of bubbles in different liquid media: A novel correlation. *Chemical Engineering Science*, 215, 115383.
- [J39] **Besagni, G.**, & Borgarello, M. (2020). A bottom-up study on the relationships between transportation expenditures and socio-demographic variables: Evidences from the Italian case study. *Travel Behaviour and Society*, 19, 151-161.
- [J40] Ziegenhein, T., Lucas, D., **Besagni, G.**, & Inzoli, F. (2020). Experimental study of the liquid velocity and turbulence in a large-scale air-water counter-current bubble column. *Experimental Thermal and Fluid Science*, 111, 109955.
- [J41] **Besagni, G.**, & Borgarello, M. (2020). What are the odds? On the determinants of high residential energy expenditure. *Energy and Built Environment*, 1(3), 288-295.
- [J42] **Besagni, G.**, & Croci, L. (2019). Experimental study of a pilot-scale fin-and-tube phase change material storage. *Applied Thermal Engineering*, 160, 114089.
- [J43] **Besagni, G.**, & Inzoli, F. (2019). Bubble sizes and shapes in a counter-current bubble column with pure and binary liquid phases. *Flow Measurement and Instrumentation*, 67, 55-82.
- [J44] **Besagni, G.**, Gallazzini, L., & Inzoli, F. (2019). On the scale-up criteria for bubble columns. *Petroleum*, 5(2), 114-122.
- [J45] **Besagni, G.**, Inzoli, F., Ziegenhein, T., & Lucas, D. (2019). The pseudo-homogeneous flow regime in large-scale bubble columns: experimental benchmark and computational fluid dynamics modeling. *Petroleum*, 5(2), 141-160.
- [J46] Zarrella, A., Emmi, G., Vivian, J., Croci, L., & **Besagni, G.** (2019). The validation of a novel lumped parameter model for photovoltaic thermal hybrid solar collectors: a new TRNSYS type. *Energy conversion and management*, 188, 414-428.
- [J47] **Besagni, G.**, & Borgarello, M. (2019). Measuring Fuel Poverty in Italy: A Comparison between Different Indicators. *Sustainability*, 11(10), 2732.
- [J48] **Besagni, G.** (2019). Ejectors on the cutting edge: The past, the present and the perspective. *Energy*, 170, 998-1003.
- [J49] **Besagni, G.**, & Borgarello, M. (2019). The socio-demographic and geographical dimensions of fuel poverty in Italy. *Energy Research & Social Science*, 49, 192-203.
- [J50] **Besagni, G.**, Croci, L., Nesa, R., & Molinaroli, L. (2019). Field study of a novel solar-assisted dual-source multifunctional heat pump. *Renewable Energy*, 132, 1185-1215.
- [J51] **Besagni, G.**, & Inzoli, F. (2019). Prediction of bubble size distributions in large-scale bubble columns using a population balance model. *Computation*, 7(1), 17.
- [J52] **Besagni, G.**, Businge, C. N., & Borgarello, M. (2019). On the Relationship between Private Transportation Expenditure and Socio-Demographic Variables. *Chemical Engineering Transactions*, 76, 1075-1080.
- [J53] Le Quang, D., Mereu, R., **Besagni, G.**, Dossena, V., & Inzoli, F. (2019). Numerical modelling of flashing flow phase change in convergent-divergent nozzle: A sensitivity analysis. *Journal of Physics: Conference Series* (Vol. 1224, No. 1, p. 012010). IOP Publishing.
- [J54] **Besagni, G.**, Inzoli, F., Zieghenein, T., & Lucas, D. (2019). Experimental study of liquid velocity profiles in large-scale bubble columns with particle tracking velocimetry. *Journal of Physics: Conference Series* (Vol. 1224, No. 1, p. 012036). IOP Publishing.
- [J55] **Besagni, G.**, Inzoli, F., & Ziegenhein, T. (2018). Two-phase bubble columns: A comprehensive review. *ChemEngineering*, 2(2), 13.

- [J56] Ziegenhein, T., Lucas, D., **Besagni, G.**, & Inzoli, F. (2018). The Bubble Shape in Contaminated Bubbly Flows: Results for Different NaCl Concentrations in Purified Water. *ChemEngineering*, 2(2), 18.
- [J57] **Besagni, G.**, & Borgarello, M. (2018). The determinants of residential energy expenditure in Italy. *Energy*, 165, 369-386.
- [J58] Dang Le, Q., Mereu, R., **Besagni, G.**, Dossena, V., & Inzoli, F. (2018). Computational fluid dynamics modeling of flashing flow in convergent-divergent nozzle. *Journal of Fluids Engineering*, 140(10).
- [J59] **Besagni, G.**, Guédon, G. R., & Inzoli, F. (2018). Computational fluid-dynamic modeling of the mono-dispersed homogeneous flow regime in bubble columns. *Nuclear engineering and design*, 331, 222-237.
- [J60] **Besagni, G.**, Gallazzini, L., & Inzoli, F. (2018). Effect of gas sparger design on bubble column hydrodynamics using pure and binary liquid phases. *Chemical Engineering Science*, 176, 116-126.
- [J61] **Besagni, G.**, Croci, L., & Nesa, R. (2018). A Screening of Low-GWP Refrigerant for Ejector Refrigeration. *Chemical Engineering Transactions*, 70, 1291-1296.
- [J62] **Besagni, G.**, Croci, L., & Nesa, R. (2018). Solar-Assisted Dual-Source Multifunctional Heat Pump: Field Tests Results and Thermodynamic Analysis. *Chemical Engineering Transactions*, 70, 253-258.
- [J63] **Besagni, G.**, & Inzoli, F. (2017). The effect of liquid phase properties on bubble column fluid dynamics: Gas holdup, flow regime transition, bubble size distributions and shapes, interfacial areas and foaming phenomena. *Chemical Engineering Science*, 170, 270-296.
- [J64] **Besagni, G.**, Inzoli, F., Ziegenhein, T., & Lucas, D. (2017). Computational Fluid-Dynamic modeling of the pseudo-homogeneous flow regime in large-scale bubble columns. *Chemical Engineering Science*, 160, 144-160.
- [J65] **Besagni, G.**, Inzoli, F., De Guido, G., & Pellegrini, L. A. (2017). The dual effect of viscosity on bubble column hydrodynamics. *Chemical Engineering Science*, 158, 509-538.
- [J66] **Besagni, G.**, & Inzoli, F. (2017). Computational fluid-dynamics modeling of supersonic ejectors: Screening of turbulence modeling approaches. *Applied Thermal Engineering*, 117, 122-144.
- [J67] **Besagni, G.**, & Inzoli, F. (2017). The effect of electrolyte concentration on counter-current gas-liquid bubble column fluid dynamics: Gas holdup, flow regime transition and bubble size distributions. *Chemical Engineering Research and Design*, 118, 170-193.
- [J68] Guédon, G. R., **Besagni, G.**, & Inzoli, F. (2017). Prediction of gas-liquid flow in an annular gap bubble column using a bi-dispersed Eulerian model. *Chemical Engineering Science*, 161, 138-150.
- [J69] De Guido, G., Pellegrini, L. A., **Besagni, G.**, & Inzoli, F. (2017). Acid gas removal from natural gas by water washing. *Chemical Engineering Transactions*, 57, 1129-1134.
- [J70] **Besagni, G.**, Mereu, R., Inzoli, F., & Chiesa, P. (2017). Application of an integrated lumped parameter-CFD approach to evaluate the ejector-driven anode recirculation in a PEM fuel cell system. *Applied Thermal Engineering*, 121, 628-651.
- [J71] **Besagni, G.**, Di Pasquali, A., Gallazzini, L., Gottardi, E., Colombo, L. P. M., & Inzoli, F. (2017). The effect of aspect ratio in counter-current gas-liquid bubble columns: Experimental results and gas holdup correlations. *International Journal of Multiphase Flow*, 94, 53-78.
- [J72] **Besagni, G.**, & Inzoli, F. (2017). Novel gas holdup and regime transition correlation for two-phase bubble columns. *Journal of Physics: Conference Series* (Vol. 923, No. 1, pp. 1-10). Institute of Physics Publishing.
- [J73] **Besagni, G.**, Inzoli, F., Ziegenhein, T., Hessenkemper, H., & Lucas, D. (2017). Bubble aspect ratio in dense bubbly flows: experimental studies in low Morton-number systems. *Journal of Physics: Conference Series* (Vol. 923, pp. 1-10). IOP Publishing.
- [J74] **Besagni, G.**, Inzoli, F., De Guido, G., & Pellegrini, L. A. (2017). Gas holdup and flow regime transition in spider-sparger bubble column: effect of liquid phase properties. *Journal of Physics: Conference Series* (Vol. 796, No. 1, p. 012041). IOP Publishing.
- [J75] **Besagni, G.**, Brazzale, P., Fiocca, A., & Inzoli, F. (2016). Estimation of bubble size distributions and shapes in two-phase bubble column using image analysis and optical probes. *Flow Measurement and Instrumentation*, 52, 190-207.

- [J76] **Besagni, G.**, Inzoli, F., De Guido, G., & Pellegrini, L. A. (2016). Experimental investigation on the influence of ethanol on bubble column hydrodynamics. *Chemical Engineering Research and Design*, 112, 1-15.
- [J77] **Besagni, G.**, & Inzoli, F. (2016). Comprehensive experimental investigation of counter-current bubble column hydrodynamics: Holdup, flow regime transition, bubble size distributions and local flow properties. *Chemical Engineering Science*, 146, 259-290.
- [J78] **Besagni, G.**, & Inzoli, F. (2016). Bubble size distributions and shapes in annular gap bubble column. *Experimental Thermal and Fluid Science*, 74, 27-48.
- [J79] **Besagni, G.**, & Inzoli, F. (2016). Influence of internals on counter-current bubble column hydrodynamics: Holdup, flow regime transition and local flow properties. *Chemical Engineering Science*, 145, 162-180.
- [J80] **Besagni, G.**, Mereu, R., & Inzoli, F. (2016). Ejector refrigeration: a comprehensive review. *Renewable and Sustainable Energy Reviews*, 53, 373-407.
- [J81] **Besagni, G.**, Guédon, G. R., & Inzoli, F. (2016). Annular gap bubble column: experimental investigation and computational fluid dynamics modeling. *Journal of Fluids Engineering*, 138(1).
- [J82] **Besagni, G.**, Mereu, R., Di Leo, G., & Inzoli, F. (2015). A study of working fluids for heat driven ejector refrigeration using lumped parameter models. *international journal of refrigeration*, 58, 154-171.
- [J83] **Besagni, G.**, Mereu, R., Chiesa, P., & Inzoli, F. (2015). An Integrated Lumped Parameter-CFD approach for off-design ejector performance evaluation. *Energy Conversion and Management*, 105, 697-715.
- [J84] **Besagni, G.**, Mereu, R., & Inzoli, F. (2015). CFD study of ejector flow behavior in a blast furnace gas galvanizing plant. *Journal of Thermal Science*, 24(1), 58-66.
- [J85] **Besagni, G.**, & Inzoli, F. (2015). Influence of electrolyte concentration on holdup, flow regime transition and local flow properties in a large scale bubble column. *Journal of Physics: Conference Series* (Vol. 655, No. 1, p. 012039). IOP Publishing.
- [J86] **Besagni, G.**, Guédon, G., & Inzoli, F. (2014). Experimental investigation of counter current air-water flow in a large diameter vertical pipe with inners. *Journal of Physics: Conference Series* (Vol. 547, No. 1, p. 012024). IOP Publishing.

6.2 Books and Contributions in Books

- [B1] Croci, L., Borgarello, M., Grattieri, W., Bazzocchi, F., **Besagni, G.**, Gaeta, M., & Maggiore, S. (2018). La pompa di calore: una soluzione efficiente e sostenibile. Editrice Alkes.
- [B2] **Besagni, G.**, Guédon, G. R., & Inzoli, F. (2014). The Eulerian-Eulerian approach for reactor design: a case study. Chapter in *ANSYS User Group Meeting 2014* (pp. 1-15). Cobalto Casa Editrice.

6.4 Contributions in National/International Conferences

- [C1] Varallo, N., **Besagni, G.**, Mereu, R. & Inzoli, F. (2023). Two Phase Bubble Columns: the Determinants of the Flow Regime Transitions. 40th International Heat Transfer Conference, Assisi (Italy), 26th – 28th June 2023.
- [C2] Varallo, N., **Besagni, G.**, & Mereu, R. (2023). Bubble Column Reactors: the Variables Influencing the Mono-Dispersed Homogeneous Flow Regime. 16th International Conference on chemical and process engineering (ICHEAP16), Naples (Italy), 21th – 24th May 2023.
- [C3] Fingas, R. P., Dario, G., Mereu, R., & **Besagni, G.** (2023). A comprehensive validation of CFD-based wet steam approach for the modelling of steam ejectors. 8th Thermal and Fluids Engineering Conference (TFEC), Partially Online Virtual and at University of Maryland (MD), 26th – 29th March 2023.
- [C4] **Besagni, G.**, Inzoli, F., Croci, L., Brignoli, V., Smolka, J., Palacz, M., Haida, M.; Bodys, J.; Fingas, R.; Nowak, A.; Melka, B.; Stebel, M. & Piechnik, E. (2022). Experimental study of a R290 variable geometry ejector. 39th UIT International Heat Transfer Conference, Gaeta (Italy), 20th – 12th June 2022.
- [C5] **Besagni, G.** Multi-scale modelling of ejector refrigeration systems. 9th Heat Powered Cycles Conference, Bilbao (Spain), 10th – 13th April 2022.
- [C6] Fingas, R., Haida, M., Smolka, J., **Besagni, G.**, Palacz, M., Bodys, J., & Nowak, A. J. (2022). The comparative analysis of the R290 heat pump system working with standard expansion valve and two-phase ejector, 77th Congresso Nazionale ATI, Bari (Italy), 12th - 14th September 2022.

- [C7] Fingas, R., Haida, M., Smolka, J., **Besagni, G.**, Palacz, M., Bodys, J., & Nowak, A. J. (2022). The experimental analysis of ejector-based R290 heat pump system for domestic applications, *15th IIR-Gustav Lorentzen Conference on Natural Refrigerants (GL2022)*, Trondheim (Norway), 13th – 15th June 2022.
- [C8] Vivian, J., Zarrella, A., **Besagni, G.**, & Croci, L. (2021). Experimental tests on the optimal management of all-electric dwellings, *Building Simulation 2021 Conference*, Bruges (Belgium), 1st – 3rd September 2021.
- [C9] **Besagni, G.**, & Inzoli, L. (2021). The influence of Variable Geometry Control on a R290 Ejector Refrigeration System, *38th UIT National Heat Transfer Conference*, Virtual, 21th – 23th June 2021.
- [C10] Croci, L., Cristiani, N., Benini, M., & **Besagni, G.** (2021). Experimental Study of a Novel Integrated System for Air Conditioning and Domestic Hot Water Production. *ICheaP 15- 15th International Conference on Chemical and Process Engineering*, Virtual, 23th – 26th May 2021
- [C11] **Besagni, G.** Lumped parameter modelling of two-phase ejectors: numerical implications of the equilibrium assumptions. *8th European Thermal Sciences Conference (EUROTHERM)*, Virtual, 20th – 23th September, 2021
- [C12] **Besagni, G.**, Croci, L., Bellasio, P., & Colombo, L.P.M. Ejector refrigeration: perspectives and comparative analysis. *8th European Thermal Sciences Conference (EUROTHERM)*, Virtual, 20th – 23th September, 2021
- [C13] **Besagni, G.**, Croci, L., Cristiani, N., Inzoli, F., & Guédon, G.R. Computational fluid dynamic modelling of supersonic ejectors: comparison between 2D and 3D modelling. *8th European Thermal Sciences Conference (EUROTHERM)*, Virtual, 20th – 23th September, 2021.
- [C14] **Besagni, G.**, Croci, L., Cristiani, N., Inzoli, F., & Guédon, G.R. (2020). Refrigerant Selection For Ejector Refrigeration Systems: A Multiscale Evaluation, *75th Congresso Nazionale ATI*, Virtual, 15th - 16th September 2020.
- [C15] **Besagni, G.**, Croci, L., Cristiani, N., Inzoli, F., & Guédon, G.R. (2020). Multi-scale performance evaluation of ejector refrigeration systems. *2020 UIT Seminar on Heat Transfer (UIT-HTS 2020)*, Virtual, 28th September 2020.
- [C16] **Besagni, G.**, Businge, C. N., & Borgarello, M. (2019). The Relationships between Private Transportation Expenditure and Socio-Demographic Variables. *22st Conference on Process Integration, Modelling and Optimisation for Energy Saving and Pollution Reduction*, Agios Nikolaos - Crete, (Greece), 20th – 23rd October 2019.
- [C17] **Besagni, G.**, & Croci, L. (2019). Experimental study of a phase change material storage for low-temperature applications, *12th European Congress of Chemical Engineering & 5th European Congress of Applied Biotechnology (ECCE12/ECAB5)*, Florence (Italy), 15th – 19th September 2019.
- [C18] **Besagni, G.**, & Croci, L. (2019). Experimental study of a phase change material storage for low-temperature applications, *37th UIT National Heat Transfer Conference*, Padova (Italy), 24th – 26th June 2019.
- [C19] Emmi, G., Bordignon, S., Zarrella, A., Vivian, J., Croci, L., & **Besagni, G.** (2019). A simulation-based analysis of photovoltaic thermal hybrid solar collectors with a new TRNSYS type model, *37th UIT National Heat Transfer Conference*, Padova (Italy), 24th – 26th June 2019.
- [C20] **Besagni, G.** (2019). Bubble column fluid dynamics: a multi-scale perspective, *Burgers Symposium*, JM Burgerscentrum TU Delft (Netherlands), 21th – 22th May 2019.
- [C21] **Besagni, G.**, & Borgarello, M. (2019). Measuring fuel poverty in Italy: application of different fuel-poverty criteria to a national household segmentation, *The International Conference on Innovative Applied Energy (IAPE'19)*, Oxford (United Kingdom), 14th – 15th March 2019.
- [C22] **Besagni, G.**, & Borgarello, M. (2019). On the relationship between residential energy expenditure and building factors, socio-demographic variables and appliances, *51st AICARR International Conference*, Venice (Italy), 20th – 22th February 2019.
- [C23] Realini, A., Maggiore, S., Crespi, V., & **Besagni, G.** (2018). Behavioural changes to alleviate energy poverty in Europe, *Behave 2018*, Zurich (Switzerland), 5th – 7th September 2018.

- [C24] **Besagni, G.**, Croci, L., & Nesa, R. (2018). A Screening of Low-GWP Refrigerant for Ejector Refrigeration. *21st Conference on Process Integration, Modelling and Optimisation for Energy Saving and Pollution Reduction*, Prague (Czech Republic), 25th– 29th August 2018.
- [C25] **Besagni, G.**, Croci, L., & Nesa, R. (2018). Solar-Assisted Dual-Source Multifunctional Heat Pump: Field Tests Results and Thermodynamic Analysis. *21st Conference on Process Integration, Modelling and Optimisation for Energy Saving and Pollution Reduction*, Prague (Czech Republic), 25th– 29th August 2018.
- [C26] **Besagni, G.**, Inzoli, F., Zieghenein, T., & Lucas, D. (2018). Experimental study of liquid velocity profiles in large-scale bubble columns with particle tracking velocimetry, *36st UIT National Heat Transfer Conference*, Catania (Italy), 25th – 27th June 2018.
- [C27] **Besagni, G.**, Croci, L., Nesa, R., Molinaroli, L., & Quaglia, P. (2017). Field tests of a novel solar-assisted dual source multifunctional heat pump. *ISES Solar World Congress 2017*, Abu Dabi (Emirate of Abu Dhabi), 27th October – 2nd November 2017. (Scopus Indexed)
- [C28] **Besagni, G.**, Gallazzini, L., & Inzoli, F. (2017). On the scale-up criteria for bubble columns, *14th International Conference Multiphase Flow in Industrial Plant MFIP17*, Desenzano del Garda (Italy), 13th – 15th September 2017.
- [C29] **Besagni, G.**, Inzoli, F., Ziegenhein, T., & Lucas, D. (2017). Prediction of bubble size distributions in large-scale bubble columns using computational fluid dynamics, *14th International Conference Multiphase Flow in Industrial Plant MFIP17*, Desenzano del Garda (Italy), 13th – 15th September 2017.
- [C30] **Besagni, G.**, & Inzoli, F. (2017). Novel correlation for the gas holdup and the flow regime transition in two-phase bubble colums, *35st UIT National Heat Transfer Conference*, Ancona (Italy), 26th – 28th June 2016.
- [C31] **Besagni, G.**, Inzoli, F., Ziegenhein, T., H. Hessenkemper, & Lucas, D. (2017). Bubble shapes in dense bubbly flows: experimental studies in low morton-numbers systems, *35st UIT National Heat Transfer Conference*, Ancona (Italy), 26th – 28th June 2016.
- [C32] Del Corno, A., Cavallari, A., Morandi, S., Parozzi, F., **Besagni, G.**, Imo, M., & Turni, M. (2017). Pool scrubbing and hydrodynamics in natural water, sea water and with additives, *PASSAM Final Workshop on source term mitigation of severe accidents*, Paris (France), 28th February 2017.
- [C33] **Besagni, G.**, & Inzoli, F. (2016). Bubble column fluid dynamics: experimental and numerical investigations, *International CAE conference 2016*, Parma (Italy), 17th – 18th October 2016.
- [C34] Dang Le, Q., Mereu, R., **Besagni, G.**, Dossena, V. & Inzoli, F. (2016). Numerical study of saturation steam/water mixture flow and flashing initial sub-cooled water flow inside throttling devices, *1st Cryogenic Safety seminar*, Geneva - CERN (Switzerland), 21th – 23th September 2016.
- [C35] Dang Le, Q., Mereu, R., **Besagni, G.**, & Inzoli, F. (2016). Numerical investigation of flash boiling flow inside nozzle: sensitivity analysis on turbulence modeling approaches, *7th ICHMT International Symposium on Advances in Computational Heat Transfer*, Naples (Italy), 28th May – 2th June 2016. (Scopus Indexed)
- [C36] **Besagni, G.**, Inzoli, F., De Guido, G., & Pellegrini, L. A., (2016). Gas holdup and flow regime transition in spider-sparger bubble column: effect of liquid phase properties, *34st UIT National Heat Transfer Conference*, Ferrara (Italy), 4th – 6th July 2016.
- [C37] **Besagni, G.**, Mereu, R., & Fabio, I. (2016). Numerical investigation of R-134a ejector, *1^o International Conference of Cryogenics and Refrigeration Technology, ICCRT 2016* (pp. 124-133). International Institute of Refrigeration. Bucarest (Romania), 22th – 25th June 2016 (Scopus indexed).
- [C38] Dang Le, Q., Mereu, R., **Besagni, G.**, Dossena, V., & Inzoli, F. (2016). Numerical modelling of R718 flash boiling flow inside motive nozzle of ejector, *1^o International Conference of Cryogenics and Refrigeration Technology, ICCRT 2016* (pp. 22-25). International Institute of Refrigeration. Bucarest (Romania), 22th – 25th June 2016 (Scopus indexed).
- [C39] De Guido, G., Pellegrini, L. A., **Besagni, G.**, & Inzoli, F. (2016). New gas holdup experimental data in large counter-current bubble columns, *International Conference on Multiphase Flow ICMF 2016*, Florence (Italy), 22th – 27th May 2016.

- [C40] **Besagni, G.**, Inzoli, F., Ziegenhein, T., & Lucas, D. (2016). Homogeneous flow in a large scale bubble column: experimental investigation and CFD modelling, *International Conference on Multiphase Flow ICMF 2016*, Florence (Italy), 22th – 27th May 2016.
- [C41] Morandi, S., Del Corno, A., Parozzi, F., Cavallari, A., **Besagni, G.**, Imo, M., & Inzoli, F. (2015). Pool Scrubbing system for aerosol removal: focus on bubble characteristics and modeling, *European Aerosol Conference EAC 2105*, Milan (Italy), 6th – 11th September 2015.
- [C42] **Besagni, G.**, & Inzoli, F. (2015). Role of interfacial forces in bubble column simulations, *33st UIT National Heat Transfer Conference*, Aquila (Italy), 22th – 24th June 2015.
- [C43] **Besagni, G.**, & Inzoli, F. (2015). Influence of electrolyte concentration on holdup, flow regime transition and local flow properties in a large scale bubble column, *33st UIT National Heat Transfer Conference*, Aquila (Italy), 22th – 24th June 2015.
- [C44] **Besagni, G.**, Guédon, G., & Inzoli, F. (2014). Experimental and numerical study of counter-current flow in a vertical pipe, Pp. V002T11A009. *ASME 2014 12th Biennial Conference on Engineering Systems Design and Analysis*. Volume 2. American Society of Mechanical Engineers Digital Collection. 25th – 27th July, 2014 (Scopus Indexed).
- [C45] **Besagni, G.**, Mereu, R., & Colombo E. (2014). CFD study of ejector efficiencies, Pp. V002T11A004. *ASME 2014 12th Biennial Conference on Engineering Systems Design and Analysis*. Volume 2. American Society of Mechanical Engineers Digital Collection. 25th – 27th July, 2014 (Scopus indexed).
- [C46] **Besagni, G.**, & Inzoli, F. (2014). Holdup and local flow properties in a counter-current bubble column, *12th Multiphase Flow Conference & Short Course - Simulation, Experiment and Application*, Dresden (Germany), 25th – 27th November 2014.
- [C47] **Besagni, G.**, Guédon, G., & Inzoli, F. (2014). Two-phase counter-current flow in a large diameter vertical pipe with internal pipes: experiments and numerical simulations, *13th International Conference Multiphase Flow in Industrial Plants MFIP14*, Sestri Levante (Italy), 17th – 19th September 2014.
- [C48] **Besagni, G.**, Guédon, G., & Inzoli, F. (2014). Numerical modeling of bubbly flow in square column, *13th International Conference Multiphase Flow in Industrial Plants MFIP14*, Sestri Levante (Italy), 17th – 19th September 2014.
- [C49] **Besagni, G.**, Mereu, R., Colombo, E., Chiesa, P., & Maddiotto, D. (2014). The influence of operating conditions and working fluids over ejector efficiencies: a CFD study, *32st UIT National Heat Transfer Conference*, Pisa (Italy), 23th – 25th June 2014.
- [C50] **Besagni, G.**, Guédon, G., & Inzoli, F. (2014). Experimental investigation of counter current air-water flow in a large diameter vertical pipe with inners, *32st UIT National Heat Transfer Conference*, Pisa (Italy), 23th – 25th June 2014.
- [C51] **Besagni, G.**, Guédon, G., & Inzoli, F. (2014). The Eulerian-Eulerian approach for reactor design: a case study, *ANSYS User Group Meeting (UGM) 2014*, Sesto San Giovanni (Italy), 22th – 23th May 2014.

6.5 Contribution in Project Reports

- [P1] Croci, L. & **Besagni, G.** (2020). Stima del potenziale applicativo e dell'impatto sul sistema elettrico. *Rapporto RSE 20011016 (WP13 – LA13.2 - Progetto PVT-SAHP)*.
- [P2] Croci, L. & **Besagni, G.** (2020). Attività di monitoraggio dell'installazione sperimentale definitiva. *Rapporto RSE 20011015 (WP12 – LA12.3 - Progetto PVT-SAHP)*.
- [P3] Croci, L. & **Besagni, G.** (2020). Croci, L. & Besagni, G. (2020). Realizzazione e monitoraggio dell'installazione sperimentale definitiva. *Rapporto RSE 20011014 (WP12 - Progetto PVT-SAHP)*.
- [P4] Croci, L. & **Besagni, G.** (2020). Monitoraggio sperimentale del sistema prototipale. *Rapporto RSE 20011013 (WP8 – LA8.1 - Progetto PVT-SAHP)*.
- [P5] Croci, L. & **Besagni, G.** (2020). Monitoraggio sperimentale del prototipo e validazione del modello di simulazione. *Rapporto RSE 20011012 (WP8 - Progetto PVT-SAHP)*.
- [P6] Croci, L. & **Besagni, G.** (2020). Messa a punto del modello di simulazione del sistema prototipale. *Rapporto RSE 20011011 (WP7 – LA7.2 - Progetto PVT-SAHP)*.

- [P7] Croci, L. & **Besagni, G.** (2020). Progetto e realizzazione del sistema di monitoraggio. *Rapporto RSE Progetto e realizzazione del sistema di monitoraggio (WP6 – LA6.2 - Progetto PVT-SAHP)*.
- [P8] Croci, L. & **Besagni, G.** (2020). Analisi di requisiti/esigenze e prestazioni attese relative alla pompa di calore, ai relativi scambiatori ed al circuito idraulico. *Rapporto RSE 20011008 (WP1 - LA1.2 - Progetto PVT-SAHP)*.
- [P9] **Besagni, G.**, Croci, L., & Viani, S. (2019). Architetture di pompe di calore ad alta temperatura in relazione ai refrigeranti impiegabili. *Rapporto RSE 20000165*.
- [P10] Croci, L., **Besagni, G.**, Rota, L., & Viani, S. Laboratorio sperimentale “all-electric”: set-up. *Rapporto RSE 20000162*.
- [P11] Angelucci, V., **Besagni, G.**, Rota, L., Sperati, S., & Viani, S. (2019). Specifiche funzionali per sistemi evoluti di gestione dei consumi e di previsione dei carichi. *Rapporto RSE 20000159*.
- [P12] Maggiore, S., Realini, A., **Besagni, G.**, & Borgarello, M. (2019). La povertà energetica: analisi dello stato dell'arte e caratterizzazione del consumatore vulnerabile. *Rapporto RSE 20000111*.
- [P13] **Besagni, G.**, Maggiore, S., Realini, A., Rota, L., Croci, L., & Borgarello, M. (2019). Fabbisogni e consumi energetici delle famiglie italiane. *Rapporto RSE 20000110*.
- [P14] **Besagni, G.**, Realini, A., Rota, L., & Borgarello, M.. (2019). I fabbisogni dei consumatori: l'integrazione di energia, acqua e mobilità in un modello di metabolismo energetico. *Rapporto RSE 20000108*.
- [P15] Croci, L., Viani, S., & **Besagni, G.**, Croci, L., & Viani, S. (2019). Verifica sperimentale sull'impiego delle lame d'aria per l'efficienza energetica nella climatizzazione. *Rapporto RSE 19013007*.
- [P16] Croci, L., Viani, S., **Besagni, G.**, Rota, L., Ravasio, F., Menga, R., & Bazzocchi, F. (2018). Fabbisogno di climatizzazione invernale ed estiva degli edifici residenziali e del terziario. *Rapporto RSE 18007687*. Available at: www.rse-web.it/documenti/pubblicazione/318378
- [P17] Borgarello, M., Realini, A., Maggiore, S., **Besagni, G.**, Croci, L., & Nsangwe Businge C. (2018). Caratterizzazione dei consumi energetici delle famiglie. *Rapporto RSE 18007633*. Available at: www.rse-web.it/documenti/pubblicazione/318372
- [P18] **Besagni, G.**, Croci, L., Curcio, F., & Viani, S. (2018). Caratterizzazione sperimentale di un innovativo serbatoio di accumulo con materiale a cambiamento di fase (PCM). *Rapporto RSE 18007623*. Available at: www.rse-web.it/documenti/pubblicazione/318366
- [P19] Viani, S., Croci, L., **Besagni, G.**, & Nesa, R. (2018). Aspettative di comfort termico e domanda di climatizzazione in edifici residenziali con diversi sistemi impiantistici. *Rapporto RSE 18001195*. Available at: <http://www.rse-web.it/documenti/documento/318211>
- [P20] Borgarello, M., Maggiore, S., **Besagni, G.**, Realini, A., & Nesa, R. (2018). Caratterizzazione dei consumi elettrici delle famiglie. *Rapporto RSE 18001188*. Available at: www.rse-web.it/documenti/pubblicazione/318200
- [P21] **Besagni, G.**, Croci, L., Viani, S., & Nesa, R. (2018). Architetture innovative per la climatizzazione: descrizione e risultati dell'attività. *Rapporto RSE 18001222*. Available at: www.rse-web.it/documenti/pubblicazione/318180

6.6 Other Dissemination Activities

- [D1] **Besagni, G.**, & Borgarello, M. (2018). Dimmi chi sei e ti dirò quanto consumi, Nuova Energia.
- [D2] **Besagni, G.**, Borgarello, M., & Croci, L. (2018). La scelta green che non ti lascia al verde, Nuova Energia.

6.7 Editorial Activities

Ongoing appointments

April 2023 – ongoing	Editor for <i>Chemical Engineering Science</i> (ISSN: 1873-4405; IF = 4.889, https://www.sciencedirect.com/journal/chemical-engineering-science)
April 2023 – ongoing	Subject editor for <i>Chemical Engineering Research and Design</i> (ISSN: 1744-3563; IF = 4.119, https://www.sciencedirect.com/journal/chemical-engineering-research-and-design)

March 2023 - ongoing	Associate Editor for <i>Frontiers in Energy Research/nuclear energy</i> (ISSN: 2296-598X; IF = 3.858, www.frontiersin.org/journals/energy-research)
September 2021 – ongoing	Associate editor for <i>Cleaner Energy Systems</i> (ISSN: 2772-7831; www.journals.elsevier.com/cleaner-energy-systems)
August 2021 – ongoing	Journal Development editor for <i>Applied Thermal Engineering</i> (ISSN: 1359-4311; IF = 6.465, www.journals.elsevier.com/applied-thermal-engineering). I support the editor in chief in the journal management and development (e.g., supporting and overseeing all special Issue initiatives, implementation of novel concepts and ideas, ...).
January 2021 – ongoing	Subject editor for <i>Renewable Energy</i> (ISSN: 0960-1481; IF = 8.634, www.journals.elsevier.com/renewable-energy)
March 2021 – ongoing	Editorial board member for <i>International Journal of Energy and Environmental Engineering</i> (ISSN: 2008-9163, www.springer.com/engineering/journal/40095)
May 2020 - ongoing	Editorial board member for <i>Electricity</i> (ISSN: 2673-4826, www.mdpi.com/journal/electricity/editors)
May 2018 – ongoing	Associate editor for <i>Journal of Cleaner Production</i> (ISSN: 0959-6526; IF = 11.072, www.journals.elsevier.com/journal-of-cleaner-production)
July 2018 – ongoing	Editorial board member for <i>Eastern-European Journal of Enterprise Technologies</i> (ISSN: 1729-3774, http://journals.urau.ua/eejet/about)
May 2017 – ongoing	Associate Editor for <i>Energy, Ecology and Environment</i> (ISSN: 2363-7692, IF = 4.4, www.springer.com/energy/journal/40974)
June 2017 – ongoing	Editorial Board Member for <i>Sustainable Energy Research (formerly known as Renewables: Wind, Water, and Solar)</i> (ISSN: 2198-994X, https://jrenewables.springeropen.com)
November 2016 – ongoing	Editorial board member for <i>ENERGY, The International Journal</i> (ISSN: 0360-5442; IF = 8.857, www.journals.elsevier.com/energy)

Previous appointments

August 2020 – March 2023	Review Editor for <i>Frontiers in Energy Research/nuclear energy</i> (ISSN: 2296-598X; IF = 3.858, www.frontiersin.org/journals/energy-research)
July 2018 – November 2022	Editorial board member for <i>Mathematical Problems in Engineering</i> (ISSN: 1024-123X; IF = 1.305, www.hindawi.com/journals/mpe)
July 2021 – October 2021	Associate editor for 38 th UIT Conference Special Issue to be published on Journal of Physics: Conference Series
September 2020 – November 2021	Guest Editor for "Bubble column fluid dynamics" Special Issue in <i>Chemical Engineering Research and Design</i> (ISSN: 0263-8762, IF = 3.739, www.journals.elsevier.com/chemical-engineering-research-and-design)
January 2019 – July 2021	Associate editor for <i>Applied Thermal Engineering</i> (ISSN: 1359-4311; IF = 5.295; www.journals.elsevier.com/applied-thermal-engineering). After July 2021, my role in <i>Applied Thermal Engineering</i> has been changed, as I have been promoted as Journal Development editor .
April 2016 – January 2021	Editorial board member for <i>Renewable Energy</i> (ISSN: 0960-1481; IF = 8.001, www.journals.elsevier.com/renewable-energy)
February 2019 – March 2021	Associate editor for <i>International Journal of Energy and Environmental Engineering</i> (ISSN: 2008-9163, www.springer.com/engineering/journal/40095)
February 2020 - September 2020	Guest Editor for "Electrocatalytic Nanomaterials for Energy Conversion and Storage" Special Issue in <i>Materials</i> (ISSN: 1996-1944, IF = 3.623; www.mdpi.com/journal/materials)

September 2017 – February 2019	Assistant editor for <i>International Journal of Energy and Environmental Engineering</i> (ISSN: 2008-9163, www.springer.com/engineering/journal/40095)
September 2017 – January 2019	Guest Editor for "Recent advances in ejector technology: applications and modelling" Special Issue in <i>ENERGY, The International Journal</i> (ISSN: 0360-5442; IF = 7.147, www.journals.elsevier.com/energy)
July 2017 – September 2018	Guest Editor for "Bubble column Fluid Dynamics" Special Issue in <i>ChemEngineering</i> (ISSN: 2305-7084, www.mdpi.com/journal/ChemEngineering)
December 2017 – May 2018	Editorial board member for <i>Journal of Cleaner Production</i> (ISSN: 0959-6526; IF = 9.297, www.journals.elsevier.com/journal-of-cleaner-production)

6.8 Participation in Evaluation Panels

2022	Evaluation panel for the National Science Centre (Poland)
2022	PhD External Thesis Examiner for Stellenbosch University (South Africa)
2022	PhD External Thesis Examiner for Silesian University of Technology (Poland)
2021	Evaluation panel for the Czech Science Foundation projects (Czech Republic)
2021	PhD External Thesis Examiner for Politecnico di Torino (Italy)
2020	PhD Thesis Examiner for the University of Southern Queensland (Australia)
2019	ERC StG 2019 External reviewer, panel: PE8
2016	Evaluation panel for the Czech Science Foundation projects (Czech Republic)
2016	Evaluation panel for the National Science Centre (Poland)

6.9 Conference Board Member

<i>Conference organization and board member</i>	
2023	Scientific committee "Global Cleaner Production Conference", Shanghai (China), 9 th – 12 th November, 2023
2023	Organizing committee "International Conference on Cleaner Production and Circular Economy, Cleaner Production 2023", Dubai (UAE), 6 th – 8 th November, 2023
2023	Technical program committee "2023 11 th International Conference on Smart Grid and Clean Energy Technologies ", Kuala Lumpur (Malaysia), 13 th – 15 th October, 2023
2023	Scientific committee "Heat Powered Cycles Conference 2023, Edinburg (UK), 3 rd – 6 th September, 2023
2023	HEFAT-ATE Partnership Manager "16 th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT) and Editorial Board of Applied Thermal Engineering (ATE). (HEFAT 2022)", Virtual Conference, 8 th – 10 th August, 2022
2022	Technical committee "2022 (10 th) International Conference on Smart Grid and Clean Energy Technologies (ICSGCE 2022)", Kuala Lumpur (Malaysia), 14 th – 16 th October, 2022
2021	Scientific committee "2021 International Conference on Cleaner Production and Sustainability", Virtual, 12 th – 13 th December, 2021
2021	Chairman "8 th European Thermal Sciences Conference (EUROTHERM)", Virtual, 20 th – 23 th September, 2021
2021	Scientific committee

	<i>"Alternative Energy Sources, Materials & Technologies (AESMT'21)"</i>, Ruse (Bulgaria), 14th – 15th June, 2021
2019	Scientific committee <i>"International Conference on Renewable Energy Systems and Environmental Engineering (IRESE)"</i>, Brussels (Belgium), 18th – 20th July, 2020
2017 – 2019	Scientific advisory committee <i>"International conference on Energy, Ecology and Environment"</i> in three editions: ICEEE2017, ICEEE2018 and ICEEE2019
2019	Scientific committee <i>"2019 International Conference on Cleaner Production and Sustainability (CPS 2019)"</i>, Hong Kong (China), 31st October – 1st November, 2019
2019	Poster evaluation committee <i>"22st Process Integration for Energy Saving and Pollution Reduction (PRES2019)"</i>, Agios Nikolaos, Crete (Greece), 20th – 23rd October, 2019
2019	Scientific committee <i>"International Conference on Bio-fuels and Bio-energy (Biofuels 2019)"</i>, Barcelona (Spain), 23rd – 25th September, 2019
2018	Chairman and poster evaluation committee <i>"21st Process Integration for Energy Saving and Pollution Reduction (PRES2018)"</i>, Prague (Czech Republic), 25th – 29th August, 2018
2018	Program committee <i>"International Conference on the Finite Volume Method: Applications and Numerics (ICFVM 2018)"</i>, Beirut (Libanon), 11th – 13th July 2018
2018	Program committee <i>"International Conference on Green Nanotechnology and Computational Fluid Dynamics (GCFD 2018)"</i> Cambridge (UK), 22nd – 23rd March 2018
Additional connections with conference organizers	
2020 - ongoing	Overseeing editor for Conference Special Issues Overseeing Editor for the following Conference Special Issues within Applied Thermal Engineering journal. I coordinate with the conference organizers to set up, manage and coordinate all the special issue process (paper selection and editorial procedures): ➤ <i>"Alternative energy sources, materials and technologies (AESMT'22)"</i>, 16th – 17th May, 2023 ➤ <i>"17th SWEDES conference"</i>, Paphos (Cyprus), 6th – 10th November, 2022 ➤ <i>"3rd LA SWEDES conference"</i>, San Paulo (Brazil), 24th – 28th July, 2022 ➤ <i>"Alternative energy sources, materials and technologies (AESMT'22)"</i>, 27th – 28th June, 2022 ➤ <i>"5th SEE SWEDES conference"</i>, Vlorë (Albania), 22th – 26th May, 2022 ➤ <i>"International symposium on Renewable Energy and Sustainability (ISRES'2020+1)"</i>, Virtual, 8th – 12th November, 2021 ➤ <i>"16th SWEDES conference"</i>, Dubrovnik (Croatia), 10th – 15th October, 2021 ➤ <i>"6th International Seminar on ORC Power Systems (ORC2021)"</i>, Munich (Germany), 11th – 13th October, 2021 ➤ <i>"International conference on polygeneration (ICP2021)"</i>, Virtual, 4th – 6th October, 2021 ➤ <i>"8th Asian Symposium on Computational Heat Transfer and Fluid Flow (ASCHT2021)"</i>, Qingdao (China), 23rd – 26th September, 2021

	➤ “8 th European Thermal-Sciences Conference (EUROTHERM 2021)”, Virtual, 20 th – 23 th September, 2021
	➤ “6 th International Workshop on Heat/Mass Transfer Advances for Energy Conservation and Pollution Control (IWHT2021)”, Harbin (China), 13 th – 16 th August, 2021
	➤ “15 th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics and Editorial Board of Applied Thermal Engineering (HEFAT-ATE)”, Virtual, 25 th – 28 th July, 2021
	➤ “32 nd International Symposium on Transport Phenomena (ISTP32)”, Tianjin (China), 19 th – 21 th March, 2021

6.10 Invited keynote & lectures in National/International Conferences

2022	“ <i>Ejector technology: a multi-scale perspective</i> ” keynote talk at “Heat Powered Cycles Conference 2021” (Bilbao, Spain, 10 th – 23 th April, 2022)
2020	“ <i>Bubble Column Fluid Dynamics: a novel perspective for flow regimes</i> ” invited lecture at “EFCE Spotlight Talks - Multiscale Mixing in Multiphase Flows” (Online, 1 st December 2020)
2019	“ <i>Measuring fuel poverty in Italy: application of different fuel-poverty criteria to a national household segmentation</i> ” invited lecture at “International Conference on Innovative Applied Energy (IAPE19)” (Oxford, UK, 14 th – 15 th March, 2019)
2015	“ <i>Annular gap bubble column hydrodynamics: experimental investigation and CFD modeling</i> ” Invited lecture at “La Simulazione dei flussi multifase”, ANSYS (Milan, Italy, 17 th February 2015)

7. Awards

2023	Awarded with a Seed fund for research by Politecnico di Milano (150k€)
2020 – 2021 – 2022	Top 2% of researchers world-wide by Stanford University – Ref. https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/3
- 2023	
2021	ChemEngineering 2020 Best Paper Awards for the paper “Two-Phase Bubble Columns: A Comprehensive Review”
2016 - 2019	Best/top reviewer awards: Chemical Engineering Research and Design (2018), Applied Energy (2018, 2017, 2016), Bioresource Technology (2017), Renewable Energy (2015)
2014	Ansyes UGM 2014 Best Paper Award

8. Affiliations

2019 – ongoing	Board of Directors, International Association of Energy, Environment and Economy
2018 – ongoing	Member, European Federation of Chemical Engineering (EFCE) - Energy Section
2016 – ongoing	Member, Italian Union of Thermal-Fluid Dynamics (UIT)

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