Stefano Lorenzi

Current position: Associate Professor
Nuclear Reactor Group – Dipartimento di Energia (DEng), Politecnico di Milano (PoliMi)
Via La Masa 34 – 20156 Milano, Italy
Phone: +39 02 2399 6326 – **Mobile**: +39 347 2215104 – **Email**: stefano.lorenzi@polimi.it

Education

November 2012 – December 2015: *Politecnico di Milano, Italy.*
Ph.D. cum laude in "Energy and Nuclear Science and Technology" (XXVIII cycle) at Politecnico di Milano (Thesis defence discussed on 10/12/2015). PhD thesis title: "Improvement of the Control-oriented Modelling of the Gen-IV Lead-cooled Fast Reactor: Development of Reduced Order Methods". Research Supervisor: Prof. Antonio Cammi

February 2015 – June 2015: *International School for Advanced Studies (SISSA), Trieste, Italy.*
Visiting Student at SISSA Mathlab. Collaboration for the development of a control-oriented spatial coolant pool model of Generation-IV Lead-cooled Fast Reactors. Supervisor: Prof. G. Rozza.

September 2008 – July 2011: *Politecnico di Milano, Italy.*
Master's degree in Nuclear Engineering at Politecnico di Milano. Thesis Title: "Development of a control-oriented simulator for a Lead-cooled Fast Reactor demonstrator". Thesis supervisor: Prof. Antonio Cammi. Final grade 110/110 cum laude.

September 2005 – July 2008: *Politecnico di Milano, Italy.*
Bachelor's Degree in Physic Engineering at Politecnico di Milano. Thesis title: "Development of spectral compression system for generation of tunable picoseconds pulse". Thesis supervisor: Prof. Nicola Cerullo. Final grade 103/110.

Research experience

April 2024 – Present: *Politecnico di Milano, Italy.*
Associate Professor in Nuclear Power Plant at Politecnico di Milano, Department of Energy, Nuclear Engineering Division.

October 2021 – March 2024: *Politecnico di Milano, Italy.*
RTDB researcher - Assistant Professor at Politecnico di Milano, Department of Energy, Nuclear Engineering Division.

January 2020 – September 2021: *Politecnico di Milano, Italy.*
RTDA researcher at Politecnico di Milano, Department of Energy, Nuclear Engineering Division.

February 2016 – December 2019: *Politecnico di Milano, Italy.*
Postdoctoral researcher at Politecnico di Milano, Department of Energy, Nuclear Engineering Division. Research field: "Modelling and simulation of Generation-IV Molten Salt Fast Reactor".

September 2011 – October 2012: *Politecnico di Milano, Italy.*
Research assistant at Politecnico di Milano, Department of Energy, Nuclear Engineering Division. Research field: "Development of control-oriented models for innovative nuclear reactor".

Language skills

Native Italian speaker. Fluent in English (TOEIC certification, June 2008, 830/990), good comprehension and speaking in French (DELF A2 certification, 2002, 10/20).

Computational skills

Numerical Computing Environments: MATLAB; *Dynamic System Modelling*: Modelica language, Dymola, MATLAB Simulink; *Neutronics:* SERPENT; *Fuel performance*: Transuranus; *Finite Element Solvers*: FreeFem++, Comsol; *Computational Fluid Dynamics*: FLUENT, OpenFOAM; *Programming Languages*: C, C++, Visual Basic and SQL; *Others*: Microsoft Office.

Research interest

Experiences in ERC research areas: PE6_12, PE7_3, PE8_4, PE8_6

My research expertise includes control-oriented simulation of Nuclear Power Plants (NPPs), control scheme investigation for NPPs, multiphysics and reduced order modelling, nuclear hybrid systems and integration with cogenerative application for innovative nuclear reactors, i.e., Small Modular Reactors and Generation-IV Reactors as Lead-cooled Fast Reactors and Molten Salt Reactors.

My research interests are mainly focused on:

a) Linear stability analysis and dynamics characterization of nuclear systems.
b) Object-oriented modeling of Nuclear Power Plants, control-oriented simulation by means of Modelica language and Dymola environment.
c) Control scheme investigation for Nuclear Power Plant: full power mode definition, reactor startup and shutdown definition, load-frequency regulations and grid operation.
d) Development of multiphysics models (for design and safety analysis of nuclear reactors) and reduced order models (for the control-oriented simulations)
e) Lead-cooled Fast Reactors (LFR): engineering design, neutronics, CFD, fuel performance, control system architecture.
f) Molten Salt Reactors (MSR): engineering design, neutronics, CFD, control system architecture.
g) Fusion engineering (ITER, DEMO): control system for remote handling and ancillary systems
h) Nuclear hybrid system: integration of nuclear power plant and renewable energies for carbon-neutral scenarios (modelling and control systems)
i) Experimental activities at Pavia TRIGA nuclear reactor (neutronics and thermal hydraulics characterization) and DYNASTY facility (natural circulation loop for the study of natural circulation).
j) Nuclear energy systems for space application: analysis and design of nuclear electric propulsion system and for ground application (e.g., lunar base).

Scientific projects and contracts

I am the principal investigator for the following peer-reviewed research projects:

[1] February 2024 – January 2027: SELENE Project (ASI call "Sviluppo di progetti/esperimenti scientifici per la Luna – Area Tematica A "Studio e realizzazione di tecnologie e breadboard per Power Production e Beaming sulla Luna) on the development of a Nuclear Energy Hub for a Lunar base. Total grant: 1,448,328.08 €. Budget for PoliMi – DEng: 361,224.13€. **Principal Investigator** for PoliMi – DEng unit.
[2] June 2023 – May 2024: RocketRoll Project (ESA call, ITT/1-11474/22/FR/K) on the Preliminary European reckon on nuclear electric propulsion for space applications. Total grant: 249,857 €. Budget for PoliMi – Deng: 22,500 €. **Principal Investigator** for PoliMi – DEng unit.

I have been the Principal Investigator of the following research/educational contracts

[1] 2020 – Milano Multiphysics. Topic of the research contract: “Multiphysics simulation of nuclear reactors and energy systems”.
[2] 2021 – Milano Multiphysics. Topic of the educational contract: “Educational course on cyber-physical simulation in nuclear and energy field”.

I have been/am involved as member of the research team for the following research projects.

[1] October 2024 – September 2028: ENDURANCE Project (Horizon Europe, Project n° 101165896) on the support of the safe operation and the technological development of MSR in Europe. Budget for PoliMi – DEng: € 674 625,00. **Coordinator** of the project **and Principal Investigator** for PoliMi – DEng unit.
[2] September 2022 – August 2026; ANSELMUS Project (Horizon Europe, Project n° 101061185) on Support deployment of Heavy Liquid Metal (HLM) cooled advanced reactors in Europe.
[3] September 2022 – August 2025: TANDEM Project (Horizon Europe, Project n° 101059479) on the evaluation of the SMR safety, technical and economic issues related to the SMR integration into hybrid energy systems, considering a near-term deployment in Europe at 2030’s horizon. Additional role: WP2 “Modelling for the simulation of the hybrid system behaviour” co-leader.
[4] November 2020 – October 2024: PASCAL Project (EURATOM H2020, GA n. 945341) on the safety of the reactor coolant system.
[5] 2EUROFUSION Project (EURATOM H2020, GA n. 633053) on activities related to “Plant Level System Engineering, Design Integration and Physics Integration” (“WCLL-TBS Conceptual design”), to “Early Neutron Source Definition and Design”, Progetto “Remote Handling for the Lithium Systems”, and to “Breeding Blanket”, “WCLL BB Design and Water Cooling Technology” Project.
[6] October 2019 – September 2023: SAMOSAFER Project (EURATOM H2020, GA n. 847527) on the development and demonstration of new safety barriers for more controlled behaviour of Molten Salt Reactors in severe accidents. Additional role: WP7 “Education and Training” leader.
[7] September 2019 – February 2023: ELSMOR (“European Licensing of Small MOdular Reactor”) Project (EURATOM H2020, GA n. 847553) on the development of methods and tools for the European stakeholders to assess and verify the safety of light water small modular reactors (LW-SMR) that would be deployed in Europe.
[8] August 2015 – July 2019: SAMOFAR (“Safety Assessment of the Molten Salt Fast Reactor”) Project (EURATOM H2020, GA n. 661891) on the analysis of innovative safety concepts of the MSFR by advanced experimental and numerical techniques. Involvement in WP1 “Integral safety approach and system Integration” for the Preliminary definition of the Control Architecture”, WP3 “Experimental proof of i) shut-down concept and ii) natural circulation dynamics for internally heated molten salt” and WP4 “Accident Analysis”.
[9] October 2016 – November 2017: MSE-ENEA PAR 2016 on Generation-IV reactor research (Italian project). Involvement in LP2 “Characterization of the Modeling Needs for the instrumentation and control area” and “Development of Multi-Physic Code for Lead-Cooled Fast Reactor”.
[10] October 2014 – September 2015: MSE-ENEA PAR 2014 on Generation-IV reactor research (Italian project). Involvement in LP2 “Characterization of the new ALFRED core configuration”.
[11] October 2013 – September 2014: MSE-ENEA PAR 2013 on Generation-IV reactor research (Italian project). Involvement in LP2 “Modeling and Analysis of Nuclear Fuel Pin Behavior for Innovative Lead Cooled FBR” and “Studi di sostenibilità volti a massimizzare l’utilizzo del combustibile e a minimizzare le scorie nucleari con i sistemi veloci refrigerati a piombo”.
[12] October 2011 – September 2012: MSE-ENEA PAR 2011 on Generation-IV reactor research (Italian project). Involvement in LP2.C2 “Progettazione di simulatori ingegneristici avanzati per reattori LWR evolutivi" and in LP3.A3 "Nuova concettualizzazione del nocciolo di DEMO-LFR: progetto preliminare neutronico, termoidraulico and termomeccanico".
[13] May 2011 – November 2011: MSE-ENEA PAR 2010 on Generation-IV reactor research (Italian project). Involvement in LP1.D1 “Definizione delle caratteristiche richieste ad un modulo di termomeccanica in un codice multifisica di dinamica tridimensionale per reattori termici".

[14] October 2010 – September 2011: MSE-ENEA PAR 2008-09 on Generation-IV reactor research (Italian project). Involvement in LP3.E3 "Development of a Dynamic Simulator for a LFR DEMO" and LP2.C1 ""Definizione delle caratteristiche funzionali e tecniche dei simulatori ingegneristici".

[15] April 2010 – October 2013: LEADER ("Lead-cooled European Advanced DEmonstration Reactor") Project (EU FP7, GA n. 249668) on development to a conceptual level of a Lead Fast Reactor Industrial size plant and of a scaled demonstrator of the LFR technology. Involvement in WP4 "Plant Operation, Instrumentation, control and protection system design" for the Preliminary definition of the Control Architecture" and in WP2 "Core Design" for the thermal-hydraulic analysis of the LFR and ETDR.

Honors and Awards

[1] 2018: National Scientific Qualification for associate professor in the sector 09/C2 "Fisica Tecnica e Ingegneria Nucleare". Valid from October 2018 to October 2029.

[2] 2016: Winner of the ENEN (European Nuclear Education Network) Phd Prize 2016 for the Phd thesis "Improvement of the Control-Oriented Modelling of the Gen-IV Lead-cooled Fast Reactor: Development of Reduced Order Methods"

Scientific services

Co-organized workshop/conference/course:

[1] 2nd Molten Salt Bootcamp, Berkeley, September 6th – 8th, 2023. Organized by Massimiliano Fratoni, Raluca Scarlat, Stefano Lorenzi, Sandra Dulla.

[2] International Summer School on Early-deployable Small Modular Reactors. Lecco, July 5th – 8th, 2022. Organized by Marco Ricotti, Stefano Lorenzi.

[3] Young Molten Salt Reactor (YMSR) conference. Lecco, June 6th – 8th 2022. Organized by Stefano Lorenzi, Sandra Dulla, Jan Leen Kloosterman, K. van der Graaf.

[4] SAMOSAFER Online School. September 2022 – December 2022. Organized by Sandra Dulla, Stefano Lorenzi.

[5] OPENER Summer School - OpenFOAM for multiphysics modeling of Nuclear Reactors, Milano, Italy, September 3 – 7, 2018. Organized by: Stefano Lorenzi, Antonio Cammi, Manuele Aufiero, Carlo Fiorina.

[6] International Seminar on Nuclear Reactor Core Thermal Hydraulics Analysis, Lecco, Italy, August 29 – 31, 2018. Local Program Committee: Hisashi Ninokata, Stefano Lorenzi, Antonio Cammi.

[7] Second Workshop on Research into Nuclear Fuel and cladding in Europe, Lecco, Italy, September 4 – 6, 2017. Local Organizing Committee: Tommaso Barani, Stefano Lorenzi, Davide Pizzocri.

[8] Molten Salt Reactor Summer School organized inside the SAMOFAR Project, Lecco, Italy, July 3 – 5, 2017, organized by J. L. Kloosterman, K. van der Graaf, Stefano Lorenzi, S. Mastromarino.

[9] Joint training course "Multiphysics simulation of nuclear systems" for the ENEN-RU II Project, Milan, Italy May 17 – 19, 2017. Organized by P. Ravetto, Stefano Lorenzi, A. Cammi.

[10] Workshop on "Reduced Order Modelling and Multiphysics, Milan, Italy, September 30, 2016. Organized by Stefano Lorenzi, A. Cammi.

[11] 6th International Serpent User Meeting, September 26 – 29, 2016. Organized by J. Leppänen, Stefano Lorenzi, A. Cammi.

Reviewer for the following scientific journals:

Annals of Nuclear Energy, Journal of Nuclear Science and Technology, Nuclear Engineering and Design, Simulation Modelling Practice and Theory, Nuclear Engineering and Technology, International Journal of Thermal Science, Advances in Computational Mathematics, EPJ-N, Journal Of Computational Physics, Applied Mathematical Modelling, Fluids, International Journal for Numerical Methods in Engineering.

Supervision of MSc and PhD students:

[1] Supervision of 5 PhD students (5 ongoing) in Science, Technology, and Policy for Sustainable Change and Energy and Nuclear Science and Technology PhD programme.

[2] Supervision of 18 MSc students in Nuclear Engineering MSc programme.

Teaching experience

2022/2023. Professor of "Laboratorio di Ingegneria Nucelare", 5 CFU, Ingegneria Energetica BSc, Politecnico di Milano.

2021/2022 – Present. Professor of "Integration of Nuclear and Renewable Energy for Carbon Neutral Scenarios", 3 CFU, Nuclear Engineering MSc & PoliMi Ambassador in Green Technologies programme, Politecnico di Milano.

2020/2021 – Present. Professor of "Experimental Nuclear Reactor Kinetics", 5 CFU, Nuclear Engineering MSc, Politecnico di Milano.

Lecturer for the Nuclear Engineering Master's courses "Introduction to Nuclear Engineering A + B" and "Fission Reactor Physics I" (Academic year 2020/2021)

Lecturer for the Nuclear Engineering Master's courses "Experimental Nuclear Reactor Kinetics" and "Dynamics and Control of Nuclear Plants" (Academic year 2016/2017, 2017/2018)

Invited lecturer for different training courses, workshops and summer schools:

[1] Lecturer for the 2nd Molten Salt Bootcamp, Berkeley, September 6th – 8th, 2023

[2] Lecturer for Joint ICTP-IAEA Workshop on Open-Source Nuclear Codes for Reactor Analysis ("Multi-physics modelling and simulation of nuclear reactors using OpenFOAM" and "A practical introduction to OpenFOAM"), August 7 -11 2023, Trieste, Italy.

[3] Lecturer for the SAMOSAFER Online School ("MSR Thermal hydraulics" and "MSR Operation & Control"). September 2022 – December 2022.

[4] Lecturer for the Molten Salt Summer Bootcamp, Module 5, "Stability Analysis of Natural Convection Loop with Internal Heat Generation", 1-3 July 2019, TU Delft, Netherlands

[5] Lecturer for the OPENER Summer School - OpenFOAM for multiphysics modeling of Nuclear Reactors, September 3 – 7, 2018.

[6] Lecturer for the Joint training course "Multiphysics simulation of nuclear systems" for the ENEN-RU II Project "Strengthening of Cooperation and Exchange for Nuclear Education and Training between the European Union and the Russian Federation", May 17 – 19, 2017

[7] Lecturer for the Molten Salt Reactor Summer School, "Control strategy for MSR", Lecco, Italy, July 2 – 4 2017.

Research Publications

88 papers, 886 citations by 583 documents, h-index: 17. Source: Scopus (accessed on July, 2024).

Peer-reviewed publication in International Journals

[1] Loi, L., Lorenzi, S., Cammi, A., Introini, C., 2024. "A Monte Carlo Fuel Assembly Model Validation Adopting Post Irradiation Experiment Dataset", Journal of Nuclear Engineering and Radiation Science, 10, 014502.

[2] Vaglio-Gaudard, C., et al. 2024. « The TANDEM Euratom project: context, objectives and workplan". Nuclear Engineering and Technology.

[3] Guilbaud T., Fiorina C., Lorenzi, S., Scolaro A., Carminati F., Maire D., Pautz, A., 2024. "Investigating the Functional Mock-up Interface as a Coupling Framework for the multi-fidelity analysis of nuclear reactors", *Progress in Nuclear Energy*, **169**, 105022.

[4] Habtemariam, N., Fiorina, C., Lorenzi, S., Cammi, A., 2024. "On the need for multi-dimensional models for the safety analysis of (fast-spectrum) Molten Salt Reactors", *Annals of Nuclear Energy*, **197**, 110237

[5] S. Lansou et al., 2023. "ELSMOR project Methodology recommendations for LW-SMR safety assessment", *Open Research Europe*, 3:158, 16360.

[6] Pizzocri D., Di Gennaro M., Barani T., Silva F.A.B, Zullo G., Lorenzi, S., Cammi A., 2023. "A reduced order model for fission gas diffusion in columnar grains", Nuclear Engineering and Technology, 2023, 55(11), pp. 3983–3995.

[7] Masotti G., Cammi, A., Lorenzi, S., Ricotti, M., 2023. "Modeling and simulation of nuclear hybrid energy systems architectures", *Energy Conversion and Management*, 298, 117684.

[8] Chebac R., Cammi, A., Ricotti, M., Lorenzi, S., Sadeghi, K., Ghazaie, S. H., Sokolova, K., Fedorovich E., 2023. "ALFRED reactor and hybrid systems: A test case", *Annals of Nuclear Energy*, 191, 109934

[9] Scioscioli, F., Cammi, A., Lorenzi, S., 2023. "Analysis of the Operational and Safety Features of the in-core Bubbling System of the Molten Salt Fast Reactor". Nuclear Science and Engineering, 197 (12).

[10] Tartaglia, D., Cammi, A., Introini, C., Lorenzi, S., 2023. "Numerical Modelling and Simulation of Melting Phenomena for Freeze Valve Analysis in Molten Salt Reactors". Nuclear Science and Engineering, 197 (12), 3058-3081.

[11] Benzoni G., Introini, C., Lorenzi, S., Loi, L., Cammi A., 2023. "1D modelling and preliminary analysis of the coupled DYNASTY-eDYNASTY natural circulation loop". Frontiers in Energy Research, 11, 1165179.

[12] Riva, S., Introini, C., Cavalleri, S., Lorenzi, S., Cammi A., 2023. "Hybrid Data Assimilation methods (Part I): numerical comparison between GEIM and PBDW". *Annals of Nuclear Energy*, 190, 109863

[13] Riva, S., Introini, C., Cavalleri, S., Lorenzi, S., Cammi A., 2023. "Hybrid Data Assimilation methods (Part II): Application to DYNASTY facility". *Annals of Nuclear Energy*, 190, 109863

[14] Introini, C., Cavalleri, S., Lorenzi, S., Riva, S., Cammi A., 2023. "Non-intrusive system state reconstruction from indirect measurements: a novel approach based on Hybrid Data Assimilation methods". *Annals of Nuclear Energy*, 2023, 182, 109538

[15] Introini, C., Cavalleri, S., Lorenzi, S., Riva, S., Cammi A., 2023. "Stabilisation of Generalized Empirical Interpolation Method (GEIM) in presence of noise: a novel approach based on Tikhonov regularization". *Computer Methods in Applied Mechanics and Engineering*, 2023, 404, 115773

[16] Benzoni, G., Introini, C., Lorenzi, S., Cammi, A., 2023. "Preliminary Validation of the 1D Modeling of the DYNASTY Natural Circulation Loop Against Results from Water Experimental Campaign". *Progress in Nuclear Energy*, 2023, 155, 104486.

[17] Tripodo, C., Lorenzi, S., Cammi, A., Di Ronco, A., Miccichè, G., 2022. "Object-oriented modeling, simulation and control of a 6-DoF Parallel Kinematic Manipulator for Remote Handling in DONES facility". *Fusion Engineering and Design*, 2022, 184, 113304.

[18] Caruggi, F., Cammi, A., Cervi, E., Di Ronco, A.. Lorenzi, S., 2022. "Multiphysics Modelling of Gaseous Fission Products in the Molten Salt Fast Reactor". *Nuclear Engineering and Design*, 392, 111762.

[19] Di Ronco, A., Lorenzi, S., Giacobbo, F., Cammi, A., 2022. "Multiphysics analysis of RANS-based turbulent transport of solid fission products in the Molten Salt Fast Reactor". *Nuclear Engineering and Design*, **391**, 111739.

[20] Nalbandyan, A., Cammi, A., Lorenzi, S., Klinkby, E., B., Lauritzen, B., 2022. "Computational Fluid Dynamics Modelling of the DYNASTY Loop". *EPJ Nuclear Science and Technology*, **5**, 14.

[21] Fiorina, C., Clifford, I., Kelm, S., Lorenzi, S., 2022. On the development of multi-physics tools for nuclear reactor analysis based on OpenFOAM®: state of the art, lessons learned and perspectives. *Nuclear Engineering and Design*, **391**, 111739.

[22] Vergari, L., Cammi A., Lorenzi, S., 2021. "Reduced Order Modeling for Coupled Thermal-Hydraulics and Reactor Physics Problems". *Progress in Nuclear Energy*, **140**, 203899.

[23] Introini, C., Chiesa, D., Lorenzi, S., Nastasi, M., Previtali, E., Salvini, A., Sisti , M., Snoj, L., Cammi, A., 2021. "Assessment of the integrated mass conservative Kalman filter algorithm for Computational Thermo-Fluid Dynamics on the TRIGA Mark II reactor", *Nuclear Engineering and Design*, **384**, 111431.

[24] Di Ronco, A., Lorenzi, S., Giacobbo, F., Cammi, A., 2021. "An Eulerian single-phase transport model for solid fission products in the Molten Salt Fast Reactor: Development of an Analytical Solution for Verification Purposes", *Frontiers in Energy Research*, **9**, 692627.

[25] Silva, F.A.B., Lorenzi, S., Cammi, A., 2021. "An Empirical Interpolation Method for two-dimensional vector fields and vector measurements". *International Journal for Numerical Methods in Engineering*,**122** (15), 3733–3748.

[26] Pietro Arena; Alessandro Del nevo; Marco Utili; Maurizio Bruzzone; Ilenia Catanzaro; Cristiano Ciurluini; Pietro Alessandro Di Maio; Ruggero Forte; Fabio Giannetti; Ferruccio Paoletti; Stefano Lorenzi; Konstantina Voukelatou; Andrea Tarallo; Rocco Mozzillo; Carlos Moreno; Emanuela Martelli; Carlos Ortiz Ferrer; Italo Ricapito; Gandolfo Alessandro Spagnuolo; Claudio Tripodo; Vincenzo Narcisi; Pierluigi Chiovaro; Jessica Korzeniowska; Antonio Cammi; Erik Walcz, 2021. "Conceptual design of the main Ancillary Systems of the ITER Water Cooled Lithium Lead Test Blanket System". *Fusion Engineering and Design*, **167**, 112345.

[27] Battistini, A., Cammi, A., Lorenzi, S., Colombo, M., Fairweather, M., 2021. "Development of a CFD - LES model for the dynamic analysis of the DYNASTY Natural Circulation Loop ". *Chemical Engineering Science*, **237**, 116520.

[28] A. Cechet, S. Altieri, T. Barani, L. Cognini, S. Lorenzi, A. Magni, D. Pizzocri, L. Luzzi, 2021. A new burn-up module for application in fuel performance calculations targeting the helium production rate in (U,Pu)O2 for fast reactors. *Nuclear Engineering and Technology*, **53**, 1893 – 1908

[29] Tripodo, C., Lorenzi, S., Cammi, A., 2021. "Definition of model-based control strategies for the Molten Salt Fast Reactor nuclear power plant". *Nuclear Engineering and Design*, **373**, 111015.

[30] Di Ronco, A., Giacobbo, F., Lomonaco, G., Lorenzi, S.,Wang, X., Cammi, A., 2020. "Preliminary Analysis and Design of the Energy Conversion System for the Molten Salt Fast Reactor." Sustainability 2020, **12**, 10497.

[31] Castagna, C., Cervi, E., Lorenzi, S., Cammi, A., Chiesa, D., Sisti, M., Nastasi, M., Previtali, E., 2020. A Serpent/OpenFOAM Coupling for 3D Burnup Analysis. The European Physics Journal Plus, **135(6):**433.

[32] Bajpai, P., Lorenzi, S., Cammi, A., 2020. A Multiphysics Model For Analysis Of Inert Gas Bubbles In Molten Salt Fast Reactor. The European Physics Journal Plus, **135(6):**409.

[33] Tiberga, M., de Oliveira, R.G.G., Cervi, E., Blanco, J.A., Lorenzi, S., Aufiero, M., Lathouwers, D., Rubiolo, P., 2020. Results from a multi-physics numerical benchmark for codes dedicated to molten salt fast reactors. *Annals of Nuclear Energy*, **142**, 107428

[34] Jamalipour, M., Cammi, A., Lorenzi, S., 2020 A coupled neutronic and thermal-hydraulic model for ALFRED. The European Physics Journal Plus, **135(3):**328.

[35] Castagna, C., Aufiero, M., Lorenzi, S., Lomonaco, G., Cammi, A., 2020. Development of a Reduced Order Model for Fuel Burnup Analysis, *Energies*, **13**(4), 890.

[36] Di Lecce, F., Aufiero, M., Lorenzi, S., Saracco, P., Alemberti A., 2020. Coarse-mesh thermal-hydraulics and neutronics coupling for the ALFRED reactor. The European Physics Journal Plus, **135(2):**221.

[37] Di Ronco, A., Introini, C., Cervi, E., Lorenzi, S., Jeong, Y. S., Seo, S. B., Bang, I. C., Giacobbo, F., Cammi, A., 2020. Dynamic mode decomposition for the stability analysis of the Molten Salt Fast Reactor core. *Nuclear Engineering and Design*, *362*, 110529.

[38] Vergari, L., Cammi A., Lorenzi, S., 2020. Reduced Order Modeling Approach for Parametrized Thermal-Hydraulics Problems: Inclusion of the Energy Equation in the POD-FV-ROM Method. *Progress in Nuclear Energy*, 118.

[39] Di Ronco, A., Cammi, A., Lorenzi, S., 2020. Preliminary analysis and design of the heat exchangers for the Molten Salt Fast Reactor. *Nuclear Engineering and Technology*, **52** (1), 51 – 58.

[40] Pini, A., Cammi, A., Lorenzi, S., Cauzzi, M.T., Luzzi, L., 2019. A CFD-based analysis tool for the stability analysis of natural circulation system, *Progress in Nuclear Energy*, **117**,

[41] F. Di Lecce, A. Cammi, S. Dulla, S. Lorenzi, S., P. Ravetto, 2019. Simplified 0-D Semi-Analytical Model for Fuel Draining in Molten Salt Reactors. EPJ Nuclear Science and Technology. **5**, 14.

[42] Tripodo C., Di Ronco, A., Lorenzi, S., Cammi, A., 2019. Development of a control-oriented power plant simulator for the Molten Salt Fast Reactor. EPJ Nuclear Science and Technology. **5**, 13.

[43] Cervi, E., Lorenzi, S., Cammi, A., Luzzi, L., 2019. Multiphysics analysis of the MSFR helium bubbling system: a comparison between neutron diffusion, SP3 neutron transport and Monte Carlo approaches. *Annals of Nuclear Energy*, **132**, 227 – 235.

[44] Cervi, E., Lorenzi, S., Cammi, A., Luzzi, L., 2019. Development of a multiphysics model for the study of fuel compressibility effects in the Molten Salt Fast Reactor. *Chemical Engineering Science*, **193**, 379 – 393.

[45] Cervi, E., Lorenzi, S., Cammi, A., Luzzi, L., 2019. Development of an SP3 neutron transport solver for the analysis of the Molten Salt Fast Reactor. *Nuclear Engineering and Design*, **346**, 209 – 219.

[46] Introini, C., Cammi, A., Lorenzi, S., Magrotti, G., 2019. An improved zero dimensional model for simulation of TRIGA Mark II dynamic response. *Progress in Nuclear Energy*, **111**, 85-96.

[47] Introini, C., Lorenzi, S., Cammi, A., Baroli, D., Peters, B., Bordas, S., 2018 A Mass Conservative Kalman Filter Algorithm for Computational Thermo-Fluid Dynamics. *Materials*, **11**(11), 2222.

[48] Wang, W., Cammi, A., Di Maio, F., Lorenzi, S., Zio, E., 2018. A Probabilistic Modelling and Simulation Framework for Identifying Components Vulnerable to Cyber Threats in Nuclear Power Plants. *Reliability Engineering and System Safety*, **175**, 24 – 37.

[49] Turati, P., Cammi, A., Lorenzi, S., Pedroni, N., Zio, E., 2018. Adaptive simulation for failure identification in the Advanced Lead Fast Reactor European Demonstrator. *Progress in Nuclear Energy*, **103**, 176 -190.

[50] Lorenzi, S., 2018. An Adjoint Proper Orthogonal Decomposition method for a neutronics reduced order model. *Annals of Nuclear Energy*, **114**, 245 – 258.

[51] Stabile, G., Hijazi, S., Mola, A., Lorenzi S., Rozza, G., 2017. POD-Galerkin reduced order methods for CFD using Finite Volume Discretisation: vortex shedding around a circular cylinder. *Communications in Applied and Industrial Mathematics* 8 (1), 210-236.

[52] Lorenzi, S., Cammi, A., Luzzi, L., Rozza, G., 2017. A reduced order model for investigating the dynamics of the Gen-IV LFR coolant pool. *Applied Mathematical Modelling*, **46**, 263-284.

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Invited talks at conferences, workshops and seminars:

[1] "SAMOSAFER project and beyond: results from EU MSFR programme and new MSR research proposal", KAIST-HYU MSR workshop, Daejeon, South Korea, 19-20 February 2024.
[2] "Modelling challenges for the MSR: insights on multiphysics and natural circulation", Thorium: Future of clean energy, TOBB workshop, 22 June 2022 (online).
[3] "A control-oriented model for the simulation of the Accelerator Driven Systems", Fourth International Workshop on Technology and Components of Accelerator-Driven Systems (TCADS-4), Antwerp, Belgium, 14-17 October 2019
[4] "Analysis of the Void Reactivity Effect in the Molten Salt Fast Reactor: Impact Of The Helium Bubbling System", the 4th International Conference on Physics and Technology of Reactors and Applications, Marrakech, Morocco, September 17 – 19, 2018.
[5] "MSR-relevant R&D at Politecnico di Milano in Italy", IAEA Technical Meeting on the Status of Molten Salt Reactor Technology, Vienna, Austria, September 25, 2017.

[6] "Control Strategies of MSR", Molten Salt Reactor Summer School - SAMOFAR Project, Lecco, Italy, July 3, 2017.
[7] "MSR-related modelling activities at Politecnico di Milano", Workshop on Multi-physics modeling and simulation of Molten Salt Reactors, Berkeley, USA, June 15, 2017.
[8] "A POD-Finite Volume-ROM method for Navier-Stokes and turbulent RANS equations: an industrial application". Workshop of WG 3 "Applications of Model Order Reduction Methods in Industrial Research and Development", COST action (TD 1307) EU-MORNET (European Union Model Order Reduction Network), Luxembourg, March 10, 2017
[9] "Modelling and experimental activities on Molten Salt Reactors (MSRs) developed at Politecnico di Milano in Italy", IAEA Technical Meeting on the Status of Molten Salt Reactor Technology, Vienna, Austria, November 2, 2016.
[10] "Reduced Order Methods for nuclear reactor modelling: neutronics and fluid dynamics applications", Workshop on "Reduced Order Modelling and Multiphysics, Milan, Italy, September 30, 2016.
[11] "A POD-Finite Volume-ROM approach of Navier-Stokes and turbulent RANS equations for industrial applications". Mini Simposia "Advanced Numerical Methods for Partial Differential Equations and Applications. Part II of SIMAI conference, Milan, Italy, September 15, 2016.
[12] "Improvement of the Control-oriented Modelling of the Gen-IV Lead-cooled Fast Reactors: Development of Reduced Order Methods". 2nd ESNII+ Summer School "The challenges of the future Gen IV Reactors: safety issues in support to the design and operation", Pisa, Italy, May 11, 2016.
[13] "POD-Galerkin method for Finite Volume approximation of Navier-Stokes and turbulent RANS equations". Workshop of WG 1 "Methodological developments of model reduction", COST action (TD 1307) EU-MORNET (European Union Model Order Reduction Network), Trieste, Italy, February 26, 2016.
[14] "Reduced order modelling for dynamics and control of Lead-cooled Fast Reactors". Workshop on multiphysics simulation for nuclear reactors `"SERPENT and Multiphysics", Grenoble, France, February 27, 2015.

Autorizzo il trattamento dei dati personali contenuti nel mio curriculum vitae in base art. 13 del D. Lgs. 196/2003

Milano, 16/09/2024 Firma Stefano Lorenzi