

## Author's short bio

Guido Francesco Frate received his Bachelor's and Master's degree in Energy Engineering from the University of Pisa (Italy) in 2013 and 2016, respectively, and the PhD from the University of Pisa (Italy) in 2020, with a thesis titled "*Analysis of a pumped thermal electricity storage system with the integration of low-temperature heat sources*".

From 2020 to 2022, Guido Francesco was a postdoctoral researcher in the Department of Energy, Systems, Territory and Construction Engineering at the University of Pisa, where he is now an Assistant Professor. Guido Francesco teaches *Fluid Machines, Energy Systems* and *Applied Energetics* in graduate and undergraduate engineering courses at the University of Pisa. In 2022, Guido Francesco was *Visiting Researcher* at the Centre for Energy Storage at the University of Birmingham (UK) for three months and, in 2023, he was *Visiting Researcher* at Laboratory of Applied Thermodynamics at the University of Liege (BE) for three months.

Guido Francesco's research focuses on using traditional and innovative energy storage technologies (particularly power-to-heat-to-power and Carnot Batteries) to integrate renewables in energy systems, on the optimal management of energy systems and the modelling and simulation of components for innovative energy storage and power-production plants.

Guido Francesco co-authored more than 28 journal papers with national and international researchers and industrial partners and presented at several national and international congresses in the EU and USA. He participated in several nationally and internationally funded research projects on energy savings in commercial activities, Innovative power production systems and hybrid electro-thermal energy storage technologies. Finally, Guido Francesco participated in several research activities funded by companies to promote energy savings and develop new technologies for more sustainable power production.