

Riccardo Toffanin

Energy Engineer - Smart Grids and Sustainable Energy

Summary

- Dynamic **energy engineer and project manager** with over six years of experience in **applied research** within national and European-funded smart grid and energy transition projects
- Proficient in programming languages, such as **Python and MATLAB**, for **energy system modeling and simulation**, with expertise in formulating and solving convex **optimization** problems (linear, quadratic, and mixed-integer linear programming) and implementing advanced **control algorithms** such as Model Predictive Control (MPC)
- Familiar with pandapower for **power system modeling** and simulation
- Hands-on expertise in **data science and machine learning** for analyzing high-resolution smart meter data
- Proven track record in designing **innovative smart grid solutions** (dynamic grid tariff)
- Experience in **technical reporting, peer-reviewed publishing**, and student supervision
- Personally motivated by the challenge of advancing smart grids through real-world research

Professional Experience

Project Manager - Energy Systems

Azienda Elettrica di Massagno (AEM) - DSO

OCT 2022 - PRESENT, MASSAGNO (CH)

- Led and participated in **national and Horizon Europe research projects** in collaboration with academic and industrial partners on energy communities, energy and flexibility markets, demand-side flexibility and smart grids
- Contributed to **proposal writing** for grant applications, supporting the acquisition of research funding
- Developed a **dynamic grid tariff** offered to end-users in 2025 awarded the **2025 Swiss Watt d'Or prize for energy innovation**
- Developed **demand-side management algorithms in Python for battery energy storage systems (BESS)** to improve grid stability and congestion management
- Developed a **Python-based hydropower plant simulation tool** to support concession renewal planning
- Participated in **field trials** (V2X Suisse), implementing **Model Predictive Control (MPC) in Python** for peak shaving using EV bidirectional charging

Research Assistant

University of Applied Science and Arts of Southern Switzerland (SUPSI)

MAY 2019 - SEP 2022, LUGANO (CH)

- Modeled **district heating networks** and **building HVAC systems in C++ and Python**
- Created a **Python tool for pre-feasibility analysis of district heating systems** using GIS data ([GitHub](#))
- Conducted **CFD simulations in Ansys Fluent** for solar fuel production in collaboration with *Synhelion SA*
- Supervised **BSc student projects**, including laboratory testing

Research Intern

Institut de Recerca en Energia de Catalunya (IREC)

FEB 2018 - OCT 2018, BARCELONA (ES)

- Developed a **Model Predictive Control (MPC)** system for optimizing residential heat pump performance and integrated **dynamic building models in TRNSYS with MATLAB** for co-simulation as part of the master's thesis titled *Energy Flexibility Strategies for Residential Buildings*

Research Intern

Concordia University

JUL 2017 - SEP 2017, MONTREAL (CA)

- Modeled and analyzed the thermal and electrical **performance of Building-Integrated Photovoltaic/Thermal (BIPV/T) systems using MATLAB** under varying climatic and operating conditions

Education

Double Master's Degree in Environomical Pathways for Sustainable Energy Systems (SELECT)

Universitat Politècnica de Catalunya (UPC)
Royal Institute of Technology (KTH)

SEP 2017 - OCT 2018, BARCELONA (ES)
AUG 2016 - JUN 2017, STOCKHOLM (SE)

Bachelor's Degree in Energy Engineering


Politecnico di Milano (PoliMi)

OCT 2013 - JUL 2016, MILAN (IT)

Skills

- **Languages:** Italian (native), English (C1 - IELTS 2016), French (A2), Spanish (A2)
- **Programming:** Advanced in Python (pandas, numpy, scikit-learn, cvxpy, pyomo, pulp, pandapower), MATLAB, C++
- **Optimization and control:** convex optimization, Model Predictive Control (MPC), demand response algorithms
- **Simulation:** TRNSYS, Ansys Fluent, PVSyst, GaBi, custom simulation tools in Python/MATLAB
- **Data science and AI:** ingestion, pre-processing, visualization (matplotlib, seaborn), statistical analysis and machine learning (regression, classification, clustering, time series forecasting)
- **Smart grids:** distributed energy resources (DER) integration, dynamic grid tariffs, energy communities, energy and flexibility markets, V2G/V2X
- **Tools:** Git, Jupyter, MS Office, Notion, Slack

Awards

- Swiss Federal Office of Energy (SFOE) award - 2025 Watt d'Or  Watt d'Or 2025 Spezialpreis der Jury
- EIT InnoEnergy - Scholarship for MSc SELECT (2016-2018)

Publications

- Rocca, R., Leonori, S., Aznar, G. F., Toffanin, R., & Luengo-Baranguan, L. (2025). Optimal scheduling of district heat pumps conceived for implementation in Energy Management Systems to participate in demand response. *Energy Conversion and Management: X*, 27, 101074. <https://doi.org/10.1016/J.ECMX.2025.101074>
- Rocca, R., Elorza-Uriarte, L., Zubia, I., Farrace, D., Toffanin, R., & Rivas-Ascaso, D. M. (2024). Techno-economic analysis of electrical flexibility in combustion-based district heating systems: A Swiss case study. *International Journal of Electrical Power & Energy Systems*, 157, 109869. <https://doi.org/10.1016/J.IJEPES.2024.109869>
- Zavattoni, S. A., Good, P., Geissbühler, L., Rutz, D., Toffanin, R., Montorfano, D., Ambrosetti, G., & Barbato, M. C. (2024). Performance Evaluation of the Pressurized Synhelion Absorbing Gas Receiver. *SolarPACES Conference Proceedings*, 1, 97–110. <https://doi.org/10.52825/solarpaces.v1i.898>
- Toffanin, R., Caputo, P., Belliardi, M., & Curti, V. (2022). Low and Ultra-Low Temperature District Heating Equipped by Heat Pumps—An Analysis of the Best Operative Conditions for a Swiss Case Study. *Energies*, 15(9), 3344. <https://doi.org/10.3390/en15093344>
- Toffanin, R., Curti, V., & Barbato, M. C. (2021). Impact of Legionella regulation on a 4th generation district heating substation energy use and cost: the case of a Swiss single-family household. *Energy*, 228, 120473. <https://doi.org/10.1016/j.energy.2021.120473>
- Toffanin, R., Curti, V., & Barbato, M. C. (2020). Impact of Legionella regulation on a 4th generation district heating substation energy use and cost: the case of a Swiss single-family household. *Conference Proceedings of 6th International Conference On Smart Energy Systems*, Aalborg, Denmark
- Toffanin, R., Ge, H., & Athienitis, A. (2019). Integration of Building Integrated Photovoltaic/Thermal (BIPV/T) System with Heat Recovery Ventilators for Improved Performance Under Extreme Cold Climates. *Cold Climate HVAC 2018*, 97–110. https://doi.org/10.1007/978-3-030-00662-4_9
- Toffanin, R., Péan, T., Ortiz, J., & Salom, J. (2019). Development and Implementation of a Reversible Variable Speed Heat Pump Model for Model Predictive Control Strategies. *Building Simulation 2019*, 16, 1866–1873. <https://doi.org/10.26868/25222708.2019.210611>

Hobbies

- Playing electric and acoustic guitar, stand up paddle (SUP), reading (a bit of everything)