Serafeim Michas

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Profile

Serafeim Michas is a research associate at the Technoeconomics of Energy Systems Laboratory (TEESlab) of the University of Piraeus (UNIPI). He holds a PhD in the exploratory assessment of adaptive pathways toward renewable energy systems from the department of Industrial Management and Technology (IMT) of UNIPI, and a M.Sc. degree on Mechanical Engineering from the National Technical University of Athens (NTUA). He has 8 years of research experience acquired through his participation in several European and national funded projects. His expertise is in the modeling, simulation and optimization of complex systems, the exploration of decarbonization pathways, the analysis of the socio-economic implications of energy transitions, and decision support for the assessment of policy measures' effectiveness under contextual uncertainties. He is the lead developer of the AIM model which perform exploratory and participatory assessments of policy and strategy pathways under deep uncertainty, and the STREEM model which simulates at a high temporal resolution the operation of electricity storage systems and quantifies the storage capacity requirements towards maximization of renewable energy integration. His technical qualifications include knowledge of several programming languages (Python, C, C#), engineering software (SolidWorks), and modelling software (MATLAB, Unity3D). So far, he has published 6 papers in peer-reviewed international scientific journals with high impact factor, 2 chapters in scientific books and more than 15 technical reports. He has also been a guest editor in a book published in Springer's climate series, and his work has been accepted for presentation in several international scientific conferences and events, including the European Climate & Energy Modelling Platform (ECEMP), the EU Sustainable Energy Week and the Conference on Sustainable Development of Energy, Water, and Environment Systems (SDEWES). Finally, he is currently an adjunct professor at the IMT department of UNIPI for the academic year 2024-2025, teaching "Introduction to systems' modelling, simulation and optimization" at undergraduate level, and "Modelling and optimization of energy and environmental systems" at graduate levels. In the past, he has served as a teaching assistant at UNIPI, giving tutorial lectures on "Engineering Economics", "Energy and Climate Policy" and "Design of production Systems", and at NTUA giving tutorial lectures on energy modelling as part of the course "Energy Resources Management".

Research Interests

Modeling, simulation and optimization of complex systems, Uncertainty quantification in modelling, Adaptive and stakeholder-interactive modelling, Simulation of energy markets based on merit order and marginal pricing, Analysis of the socio-economic implications of energy transitions, Decision support for the assessment of policy measures' effectiveness under contextual uncertainties.

Education

Apr 2024 - Today **Post-doc Affiliate**
Technoeconomics of Energy Systems laboratory (TEESlab), Department of Industrial Management and Technology, University of Piraeus, Greece

Oct 2017 - Mar 2024	**PhD in Energy Modelling** *University of Piraeus, Greece* Dissertation: Exploratory assessment of adaptive pathways toward renewable energy systems: a modelling framework facilitating decision making under deep uncertainty Advisor: Prof. Alexandros Flamos
Sep 2010 - Sep 2015	**Diploma in Mechanical Engineering (5 years Equivalent to Master)** *National Technical University of Athens, Greece* Thesis: Industrial robot programming and tele-monitoring using virtual reality and common commercial sensors Advisor: Prof. George-Christopher Vosniakos

Work Experience

Academic

Apr 2024 - Today	**Post-Doc Research Associate** *Technoeconomics of Energy Systems laboratory (TEESlab), Department of Industrial Management and Technology, University of Piraeus, Greece*
Oct 2016 - Apr 2024	**PhD Research Associate** *Technoeconomics of Energy Systems laboratory (TEESlab), Department of Industrial Management and Technology, University of Piraeus, Greece*
Jan 2015 - Sep 2015	**Diploma Thesis Research Associate** *Manufacturing Technology Laboratory, School of Mechanical Engineering, National Technical University of Athens, Greece*

Industrial

Aug 2016 - Oct 2016	**Energy Auditor** *Housecheck private company*
Jul 2014 - Aug 2014	**Mechanical Engineer Intern** *Aluminium of Greece, member of METLEN Group of Companies*

Teaching Experience

Adjunct Professor

Fall ‘24	Introduction to systems’ modelling, simulation and optimization, Undergraduate, University of Piraeus
Fall ‘24	Modelling and optimization of energy and environmental systems, Graduate, University of Piraeus

Teaching Assistant

Spring ‘24	Energy Resources Management, Graduate, National Technical University of Athens
Spring ‘19, ‘20, ‘24	Engineering Economics, Undergraduate, University of Piraeus
Fall ’19, ’20, ’21, ’22, ’23, ‘24	Energy and Climate Policy, Undergraduate, University of Piraeus

Spring ‘17, ‘18 Design of production Systems, Undergraduate, University of Piraeus

Journal Publications (peer-reviewed)

J1 **Michas, S.**, & Flamos, A. (2024). Least-cost or sustainable? Exploring power sector transition pathways. Energy, 296, 131086. Doi: https://doi.org/10.1016/j.energy.2024.131086

J2 **Michas, S.**, & Flamos, A. (2023). Are there preferable capacity combinations of renewables and storage? Exploratory quantifications along various technology deployment pathways. Energy Policy, 174, 113455. Doi: https://doi.org/10.1016/j.enpol.2023.113455

J3 Kontochristopoulos, Y., **Michas, S.**, Kleanthis, N., & Flamos, A. (2021). Investigating the market effects of increased RES penetration with BSAM: A wholesale electricity market simulator. Energy Reports, 7, 4905-4929. Doi: https://doi.org/10.1016/j.egyr.2021.07.052

J4 **Michas, S.**, Stavrakas, V., Papadelis, S., & Flamos, A. (2020). A transdisciplinary modeling framework for the participatory design of dynamic adaptive policy pathways. Energy Policy, 139, 111350. Doi: https://doi.org/10.1016/j.enpol.2020.111350

J5 **Michas, S.**, Stavrakas, V., Spyridaki, N. A., & Flamos, A. (2019). Identifying Research Priorities for the further development and deployment of Solar Photovoltaics. International Journal of Sustainable Energy, 38(3), 276-296. Doi: https://doi.org/10.1080/14786451.2018.1495207

J6 **Michas, S.**, Matsas, E., & Vosniakos, G. C. (2017). Interactive programming of industrial robots for edge tracing using a virtual reality gaming environment. International Journal of Mechatronics and Manufacturing Systems, 10(3), 237-259. Doi: https://doi.org/10.1504/IJMMS.2017.087548

J7 **Michas, S.,** Kliafas, L., & Flamos, A. (Forthcoming). Is a Green rebranding feasible? Exploring energy transition scenarios in a former coal and carbon intensive region.

J8 **Michas, S.** & Flamos A. (Forthcoming). Sizing PV and storage projects alleviating energy costs for energy-vulnerable households.

Book Chapters (peer-reviewed)

B1 Frankowski, J., Sokołowski, J., **Michas, S.**, Mazurkiewicz, J., Kleanthis, N., & Antosiewicz, M. (2024). Assessing macroeconomic effects of a carbon tax as a tipping intervention in economies undergoing coal phase-out: The Cases of Poland and Greece. In Positive Tipping Points Towards Sustainability: Understanding the Conditions and Strategies for Fast Decarbonization in Regions (pp. 301-323). Doi: https://doi.org/10.1007/978-3-031-50762-5_15

B2 García-Mira, R., Garha, N. S., **Michas, S.**, Mey, F., Basu, S., & Süsser, D. (2024). Leave No One Behind: Engaging Communities in the Just Transition Process Towards Climate Neutrality. In Strengthening European Climate Policy: Governance Recommendations from Innovative Interdisciplinary Collaborations (pp. 87-98). Doi: https://doi.org/10.1007/978-3-031-72055-0_8

Announcement in conferences (peer-reviewed)

C1 **Michas, S.** & Flamos, A. (2023). Dodging the energy crisis? Renewable deployment pathways to 2030. ECEMP 2023: Net Zero, intermediate targets, and sectoral decarbonization facing geopolitical and macroeconomic challenges, 5-6 October 2023, Online. https://www.ecemf.eu/wp-content/uploads/2023/10/ECEMP-2023-Programme.pdf

C2 **Michas, S.** & Flamos, A. (2023). Locked-in or open-sighted? Exploring energy transition pathways resilient to external disruptions. 18th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), 24-24 September 2023, Dubrovnik, Croatia. https://www.dubrovnik2023.sdewes.org/schedule

C3 **Michas, S.** (2023). Megalopolis: The lost opportunity for A "Green rebranding". EU Sustainable Energy Week. 20-22 June 2023, Online. https://interactive.eusew.eu/eusew-2023/sessions/e372aa35-06ca-47fe-a6ae-a71d3c76f13a

C4 Kleanthis, N., **Michas, S.**, Flamos, A. (2020). Investigating electricity generation by analysing influential factors in the Greek electricity system in 2030, 15th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES), 1-5 September 2020, Online

C5 **Michas, S.**, Kleanthis, N., Flamos, A. (2020). How much storage capacity is needed for a sustainable and cost-efficient nearly-zero emissions electricity system? The case of Greece. 4th SEE Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES). 28 June – 2 July 2020, Online

C6 Stavrakas, V., **Michas, S.**, Papadelis, S., & Flamos, A. (2018). Achieving a low-carbon power system through empowering consumers to produce and store clean energy at the local level: The case of Greece. 7th International Symposium & 29th National Conference on Operational Research (HELORS) Conference, 14-16 June 2018, Chania, Greece

C7 Papadopoulou, A., Vasileiou, G., **Michas, S.**, Flamos A. (2017). CSP business models and value chain mapping: Insights from the CSP industry. 12th International Scientific Conference on Energy and Climate Change, 10 October 2017, Athens, Greece. http://www.promitheasnet.kepa.uoa.gr/wp-content/uploads/e_Proceedings_FINAL_m.pdf

Models Developed

AIM *Role:* Lead Developer
Language: Python
Original Publication: https://doi.org/10.1016/j.enpol.2020.111350
Short description: The Adaptive polIcymaking Model (AIM) is a decision support model which enables the exploratory assessment of policy/strategy pathways towards the achievement of one or multiple targets, identifying in parallel their conditions of success. To do so, AIM performs meta-analysis of simulations models' outputs, and evaluates the performance of selected policies/strategies over many combinations of a large number of contextual uncontrollable variables (scenarios). Then, it visualizes successful policy pathways towards a predefined target, and sets up a monitoring system for real-world policy adaptations in case of unexpected contextual future evolutions.

STREEM *Role:* Lead Developer
Language: Python
Original Publication: https://doi.org/10.1016/j.enpol.2023.113455
Short description: The STorage RequirEmEnts and dispatch Model (STREEM) is a high resolution energy model, which (i) simulates the operation of electricity storage systems, aiming at improving the matching of renewable energy generation and electricity demand profiles, and (ii) identifies the RES and storage capacity requirements of a region, towards multiple criteria (e.g., maximization of renewable energy integration, maximization of self-consumption, arbitrage). STREEM

simulates both short-term (e.g., batteries) and long-term storage (e.g., pumped hydro storage), applying priority rules. Furthermore, STREEM can provide economic outputs, such as the levelized cost of energy, the capital expenditure, or the levelized cost of storage. The applicability of STREEM ranges from local energy communities, to national or international scale.

BSAM *Role:* Co-Developer
Language: Python
Original Publication: https://doi.org/10.1016/j.egyr.2021.07.052
Short description: BSAM is an agent-based electricity wholesale market simulation model which simulates the complex operations within a power pool, central dispatch, day ahead electricity market. The model simulates electricity generators as entities who progressively learn to bid their capacities in the wholesale electricity market, with ultimate goal the maximization of their profits. In parallel, a unit commitment and optimal dispatch algorithm calculates the quantities injected by each generation unit, the system marginal price, the system costs, as well as derived outputs, such as, CO2 emissions and profits of each generator. The model can support cost-benefit analysis of future policy and/or technology deployment scenarios. It is very flexible since it simulates the power generators as agents that compete with each other and adapt to policy and/or market changes.

Funded projects

APOLLON *Role:* Lead researcher
Duration: 2024 - Ongoing
Funder: Regulatory Authority for Energy/Ministry of Environment and Energy
Short description: The "APOLLON" project is the largest energy net metering program in Greece. The aim of the study undertaken under APOLLON is to simulate the required auctioned capacity of renewable energy projects, accompanied by battery systems, in order to facilitate the supply of vulnerable households with 90-100% renewable energy. The study uses STREEM to explore optimal combinations of renewable energy sources and storage that lead to the lowest levelized cost of energy.

POLIZERO *Role:* Lead researcher
Duration: 2019 - Ongoing
Funder: Swiss Federal Office for Energy
Short description: The project "Swiss Policy towards Zero CO2 Emissions compatible with European Decarbonisation Pathways" (POLIZERO) addresses the topic of efficient policies for promoting a net-zero energy transition of the Swiss energy system in a European context. The project employs a modelling framework consisting of the JRC EU-TIMES and AIM models.

SENTINEL *Role:* Associate researcher
Duration: 2019 - 2022
Funder: European Commission
Short description: The project "Sustainable Energy Transitions Laboratory" (SENTINEL) developed, tested and made freely available a modelling framework that allows stakeholders to address the critical challenge of re-designing the energy system around non-fossil energy sources.

SRI2MARKET *Role:* Lead researcher
Duration: 2022 - Ongoing
Funder: European Commission
Short description: The project "Paving the way for the adoption of the Smart Readiness Indicator into the national regulation and market" (SRI2MARKET) aims at supporting Member States in successfully planning for the rollout of the Smart Readiness Indicator (SRI) in their national regulation and markets. As part of the project, a new model is being developed quantifying energy savings deriving from upgrades in the smart readiness of buildings.

TRANSrisk *Role:* Associate Researcher
Duration: 2015 - 2018
Funder: European Commission
Short description: The project "Transitions pathways and risk analysis for climate change mitigation and adaptation strategies" (TRANSrisk) studied the risks and uncertainties within low carbon transition pathways, and how transitions can be implemented in ways that are technically, economically, and sociably feasible. As part of TRANSrisk, the AIM was developed.

TIPPING+ *Role:* Lead Researcher
Duration: 2020 - 2023
Funder: European Commission
Short description: The project "Enabling Positive Tipping Points towards clean-energy transitions in Coal and Carbon Intensive Regions" (TIPPING+) aimed to understand why and under which conditions a given social-ecological regional system heavily dependent on coal and carbon-intensive activities may flip into a low-carbon, clean energy development trajectory – or on the contrary may fall into an opposite trajectory with all its negative implications. As part of the project, the STREEM model was used to investigate RES and storage projects which transform Megalopolis into a Green powered city.

CARISMA *Role:* Associate Researcher
Duration: 2015 - 2018
Funder: European Commission
Short description: CARISMA supported the development and diffusion of options, both technological and practices, for reducing greenhouse gas emissions. Climate-friendly technologies and practices often already exist, yet for several reasons they do not enter the mainstream. CARISMA drew on existing and new insights for recommendations on research and innovation efforts for the development and diffusion of climate change mitigation options, through international cooperation and better coordination of efforts as well as through policy and governance aspects.

Editorial Service

Guest Editor Tàbara, J. D., Flamos, A., Mangalagiu, D., & Michas, S. (2024). Positive Tipping Points Towards Sustainability: Understanding the Conditions and Strategies for Fast Decarbonization in Regions (p. 343). Springer Nature. Doi: https://doi.org/10.1007/978-3-031-50762-5

Reviewer Energy and buildings (Elsevier Journal), Energy (Elsevier Journal) Operational Research (Springer Journal), Sustainable Development of Energy, Water, and Environment Systems (SDEWES Conference)

Skills

Programming Languages Python, C#, C

Office Tools Excel, Word, PowerPoint, Sharepoint, etc.

Software MATLAB, Solidworks, Unity 3D

Languages English (Level C2/Proficiency – University of Michigan)