

2-year Postdoctoral position on industrial energy in Integrated Assessment Models

Grenoble Applied Economics Laboratory (GAEL) is advertising a 2-year postdoctoral position, which will focus on providing better insights into the current modeling practices of industrial energy in Integrated Assessment Models (IAMs) and exploring improvement avenues. Specifically, the postdoc will compare how industrial energy is modeled and estimated in IAMs, and evaluate the impact of using industry-standard cost-supply curves of fossil fuels on transition pathways. To achieve this, you will work with an interdisciplinary team of scientists based in Grenoble, France and abroad.

Background to the call

As countries seek to develop new NDCs and the IPCC considers reforming itself to produce more relevant knowledge for climate action, current momentum is towards the development of a new generation of IAMs. Such models have indeed been criticized for their representation of the industry sector in IAMs (Bataille et al., 2021; Keppo et al., 2021), and especially the energy-producing one and its links with the economy (Pauliuk et al., 2017; Delannoy et al., 2023).

This gap is said to be not only responsible for poorly evaluating the industrial energy of the energy transition, i.e., the energy required to build, operate and dismantle the energy production infrastructure, but also for preventing the assessment of the implications of rising energy consumption by the industry on transition pathways. Given the significant energy required for global infrastructure development (Vidal et al., 2018; Vidal et al., 2021), this lack is even more crucial as it raises concerns regarding the IPCC framework's ability to adequately assess societal transformations.

Expected work

The scientific program of the FiEStA (*Feasible Energy Scenarios in Tercomparison Assessment*) project is based on two work packages (WP) which will result in publications in high-impact peer-reviewed scientific journals and external communication:

- **WP1: Critical intercomparison of industrial energy in IAMs**
 - **WP1.1. Conceptual and technical review of industrial energy computation in IAMs.**
The first phase of the FiEStA project consists in a thorough review of industrial energy modeling in IAMs. The person responsible will have to assist the team in developing collaborations and working with international researchers at both the conceptual and technical levels to compare methodologies.
 - **WP1.2. Estimation of industrial energy in IAMs and comparison with DyMEMDS outputs.** After a conceptual and technical phase (WP1.1.), the work will consist in

estimating the industrial energy in the Shared Socioeconomic Pathways (SSP), before comparing results to bottom-up estimates obtained from the DyMEMDS model (Le Boulzec et al, 2022, 2023).

- **WP2: Advancing industry-standard cost-supply curves of fossil fuels in IAMs.** The work envisioned will consist in assessing the impact of revised cost-supply curves and extraction rates data of fossil fuels in integrated modeling, and along Shared Socioeconomic Pathways.

Leading institution

GAEL is a joint research unit of CNRS, INRAE, University Grenoble Alpes (UGA) and Grenoble INP. GAEL has been leading prospective modeling on energy systems since the 1990s, and currently hosts the POLES (*Prospective Outlook on Long-term Energy Systems*) model used for prospective studies by the European Commission and in the third Working Group of the IPCC. The team enjoys a high visibility at the national, European and international levels through its participation in European research programs.

Collaborating institutions

The Institute of Earth Sciences (ISTerre) is a joint research unit of the CNRS, Grenoble-Alpes University, the University of Savoie Mont Blanc, the IRD, and Gustave Eiffel University. As part of its research program on resources requirements for human development, ISTerre hosts the DyMEMDS (*Dynamic Modeling of Energy and Matter Demand and Supply*) model. It is a stock and flow model using a bottom-up approach to estimate the historical and future stocks of technologies and raw materials, and the associated energy and environmental impacts.

A collaboration with other international institutions is in talks and has already been budgeted.

Collaborators

Sandrine Mathy is a CNRS senior researcher in environmental and energy economics at the Grenoble Applied Economic Laboratory (GAEL), where she has led the energy axis since 2015. Coordinator for the CNRS of the governmental review of the IPCC group 3 report in 2021, Sandrine has worked on multiple transdisciplinary projects of environment-energy-economy modeling for policy-making purposes.

Olivier Vidal is a CNRS in geology senior researcher at the Grenoble Institute of Earth Sciences (ISTerre). He has participated in and coordinated numerous research projects on the energy transition and global raw materials supply issues, including the recent exploratory PEPR14 (Priority research program and equipment): "Subsoil, a common good". He has published the book "Mineral Resources and Energy".

Louis Delannoy is a postdoctoral researcher at the Stockholm Resilience Centre and the Global Economic

Dynamics and the Biosphere program (GEDB) of the Royal Swedish Academy of Sciences. His research consists in understanding how energy, economy and finance interact, at times of crises.

Hugo Le Boulzec is a postdoctoral researcher at the Grenoble Applied Economic Laboratory (GAEL). He is currently conducting research on the links between raw materials and energy through the DyMEMDS model (ISterre), and on synergies and antagonisms between GHG emissions and atmospheric pollutant at the French scale through a coupling between the POLES and the GAINS (developed at IIASA) models.

Baptiste Andrieu is a postdoctoral researcher in the Resource Efficiency Collective at Cambridge University. During his PhD he used input-output modeling to regionalize impacts in the DyMEMDS model. He now studies critical raw material supply chains in Global South countries as part of the Climate Compatible Growth programme.

François Verzier is a PhD student at the Grenoble Earth Science Institute. His research focuses on endogenously modeling industrial energy in forecasting models for the energy transition. More specifically, he is in charge of the development of the DyMEMDS model.

Qualifications

The selected candidate should have strong quantitative, analytical skills, with a keen and established interest in interdisciplinary and policy-relevant research. Proven aptitude for modeling and programming (R and/or Python), especially related to Integrated Assessment Models, are highly desirable. Knowledge on energy or climate-related issues is a plus as well. Candidates with previous experience in large-scale projects involving various partners are especially encouraged to apply. Candidates should have a PhD (or equivalent) in economics, engineering, operations research or related field (e.g., mathematics, physics).

Interested candidates should send a detailed curriculum vitae, a cover letter and two recommendation letters before December 15th to Sandrine Mathy (sandrine.mathy@univ-grenoble-alpes.fr), and copy Hugo Le Boulzec (hugo.le-boulzec@univ-grenoble-alpes.fr) and Louis Delannoy (louis.delannoy@kva.se). Please specify "Postdoc industrial energy" in the subject of the email.

Conditions

Contract period: 24 months, with possibility of extension depending on fundings.

Expected date of employment: beginning of 2024.

Salary: competitive and based on the qualifications and experience of the selected candidate.

Workplace: GAEL (Grenoble) with international research stays.

References

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