

Assessing the role of negative emission technologies for the decarbonization of energy intensive industries using TIMES-EU model

Presentation of the postdoctoral project: The “Carbon management and negative CO₂ emissions technologies towards a low carbon future” ([CarMa](#)) chair, aims to provide concrete answers to the viability of the deployment of negative emissions technologies (NETs) to help the decarbonization of the energy system. These innovative technologies appear to be one of the most promising options to mitigate greenhouse gas emissions within the industrial sector. In pursuit of this mission, the CarMa Chair of IFPEN is seeking a Postdoctoral Researcher that can further contribute to the modeling of the energy intensive industry in the TIMES MIRET-EU IFPEN model and assess the potential of NETs in driving the decarbonization efforts across different energy intensive industries. By joining our team, the postdoctoral researcher will play a pivotal role in unraveling how NETs can be harnessed to reduce emissions and promote sustainability within energy-intensive industries.

Background: The industrial sector is required to massively reduced its emissions if it aims to contribute to climate objectives. However, its decarbonization is challenging, as even replacing all fossil fuels with renewable energies, or developing new low-carbon technologies would not eradicate the CO₂ emissions produced from the use of carbon-bearing materials. To achieve carbon neutrality in the industrial sector, the use of biomass with carbon capture and storage/utilization can be an effective strategy as it can produce negative emissions to compensate for hard-to-abate ones. On the other hand, through previous research developed under the CarMa chair, it has been developed a modeling framework for accurately identifying whether negative emissions can be produced within the global energy system, and it was used to analyze how NETs could help decarbonizing the iron and steel and cement industry. This modeling framework can be further used to assess the decarbonization of the rest of the industrial, and other sectors of the energy system as well. Therefore, the objective of this research will be to analyze and evaluate how NETs can help to decarbonize the whole energy intensive industry. The main questions of this research (but not limited to) are: which industrial sector might rely the most on NETs for its decarbonization? when and how are NETs being deployed? how biomass resources are allocated across the different industrial sectors? how NETs can contribute to European climate objectives?

Scope of the research: The candidate can start by **representing into TIMES MIRET-EU other energy intensive industrial activities** in terms of materials production, detailing each of the production steps, and clearly identifying those processes (existing and new) where process emissions are produced and where biomass can substitute fossil fuels and if it is possible to couple them with CCS/CCU. The postdoctoral researcher can start by detailing the **pulp and paper industry**. Thereafter, it can explore the **refinery, aluminum, ammonia industry, and/or hydrogen production**. Furthermore, the candidate should assess the impact of the implementation of other abatement technological options, e.g. **DACCS**, that could potentially contribute to indirectly reducing emissions from the industrial sector. Another contribution would be regarding the modelling of **CO₂ mineralization**. Finally, different **sensibility analysis** for NETs deployment should be performed, for example: different discount rates, lower biomass potentials, limit to the CO₂ that can be stored per year, etc.

Candidate’s profile: PhD degree in energy and prospective modeling, experience in mathematical optimization, strong knowledge of the TIMES model, analytical skills, and self-driven personality.

Funding: This postdoctoral project benefits from a generous research funding provided by the Chair Carbon Management ([CarMa](#)) at IFP School. The selected candidate will thus be fully integrated in the Chair and will contribute to the Chair’s activities. That insertion will also provide the candidate with a host of opportunities (e.g., an insertion within the Chair’s international research network and the opportunity to visit to eminent research institutions during the postdoctoral project).

Contact: you can send your CV and motivation letter to: Carlos Andrade - carlos.andrade@ifpen.fr

Duration: 18 months

Salary: € 3000 - € 3400 gross monthly salary