

## Expression of Interest-UPM Supervisor

### Marie Skłodowska Curie Action–Postdoctoral Fellowship 2026 (MSCA-PF-2026)

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<b>Department /Institute</b>	Department of Energy Engineering
<b>Research Area</b>	<p>Physics (PHY)</p> <ul style="list-style-type: none"> <li>- P5 - Applied physics: <ul style="list-style-type: none"> <li>o Computational modelling</li> </ul> </li> </ul> <p>Information Science and Engineering (ENG)</p> <ul style="list-style-type: none"> <li>- G3 - Products and Processes Engineering: Product design, process design and control, construction methods, civil engineering, energy processes, material engineering <ul style="list-style-type: none"> <li>o Machine learning, statistical data processing and applications using signal processing (e.g. speech, image, video)</li> <li>o Numerical analysis, simulation, optimisation, modelling tools</li> </ul> </li> </ul>
<b>Research team/group</b>	<p>The TE4S (Thermal Energy for Sustainability) research group active in a range of research lines: hydrogen production, electrification of process heat, production of renewable electricity and heat from solar energy, thermal energy storage and waste-heat recovery.</p> <p>TE4S manages fully instrumented turbomachinery testing cells, a liquid metal methane pyrolysis reactor, solar concentrators, a temperature sensor calibration facility and a PTES loop. TE4S has access to a wider range of facilities within UPM and the federated lab access platform of the Madrid region. Knowledge-wise, TE4S has internationally relevant expertise in heat transfers with notably in: coupled multiphysics models, radiative transfers, Monte-Carlo ray tracing, turbomachinery, microfluidics and dynamic system modelling.</p>
<b>Keywords</b>	Monte-Carlo ray-tracing, energy balance, radiative transfers, hybrid methods
<b>Research Focus</b>	<p><b>Hybrid methods to solve energy balances in complex radiant systems</b></p> <p>Radiative transfer simulations are vital to accurately model energy balances in many applications (high-temperature industry, aerospace, defense, energy...). However, they face challenges, such as high computational costs and issues in capturing complex interactions like anisotropic behaviors. Monte-Carlo Ray-Tracing can simulate intricate systems with scattering and anisotropy but can be computationally intensive. Conversely, matrix inversion methods, like net-radiation and zonal methods, are efficient but struggle with spectro-directional radiative properties. A notable challenge in energy balance is that temperature fields aren't predetermined and must be derived from energy flows.</p> <p>Combining both deterministic and stochastic approaches could address some of these difficulties. This research topic will seek to develop hybrid methods and techniques that significantly improve the performance of radiative transfer simulations for energy balances in complex radiant systems.</p>
<b>Applications: documents to be submitted and deadlines</b>	Provide an updated academic CV, a motivation letter indicating the most relevant merits related to the research focus and at least one recommendation letter to <a href="mailto:charlesalexis.asselineau@upm.es">charlesalexis.asselineau@upm.es</a> by the end of April 2026.