

## RESEARCH TOPIC FOR THE PARISTECH/CSC PHD PROGRAM

**Field: Energy, Processes**

**Subfield:** Thermodynamics, fluid mechanics, heat transfer

**Title:** Life cycle assessment of hydrogen production and utilization in industry and mobility

**ParisTech School:** Arts et Métiers Sciences et Technologies

**Advisor(s) Name:** Michael DELIGANT and Christelle PERILHON

**Advisor(s) Email:** [michael.deligant@ensam.eu](mailto:michael.deligant@ensam.eu),

[christelle.perilhon@lecnam.net](mailto:christelle.perilhon@lecnam.net)

**Research group/Lab:** Lifse

**Lab location:** Paris

**(Lab/Advisor website):** <https://lifse.artsetmetiers.fr>

**Short description of possible research topics for a PhD:**

Hydrogen is a promising energy vector that does not generate locally pollutants or carbon emissions. The benefits of hydrogen usages in industry and mobility in the future depend of the impact of the whole chain from production to consumption. Indeed, hydrogen can be produced from various sources ranging from methane cracking to electrolysis from renewable energy. Hydrogen production is also considered as solution for storing fluctuating renewable energy.

The objective of this study is to explore and evaluate the environmental impact of the different uses of hydrogen in the context of energy transition, industry and carbon-free transportations. This will be carried out combining the thermodynamic modelling and Life Cycle Assessment. Different case studies will be carried out taking into account the country production and its energy infrastructure.

**Required background of the student:** Energy, energy systems, thermodynamics, process engineering (appreciated)

**A list of 5 (max.) representative publications of the group**

1. C. Périlhon, D. Alkadee, G. Descombes, S. Lacour, Life cycle assessment applied to electricity generation from renewable biomass, Energy Procedia 18 (2012)
2. S. Lacour, T. Chinesea, D. Alkadee, C. Périlhon, G. Descombes, Energy and environmental balance of biogas for dual-fuel mobile applications, Renewable and Sustainable Energy Reviews, Volume 16, Issue 3, April 2012
3. P. Atta Atta, Y. N'guessan, C. Morin, A. Jaecker Voirol, G. Descombes. Calculation of greenhouse gas emissions of jatropha oil and jatropha biodiesel as alternative fuels for electricity production in Côte d'Ivoire. AIP Conference Proceedings 1814, (2017)
4. M. Speklin, M. Deligant, S. Porcheron, M. Wagner, F. Bakir Experimental study and modelling of a high-pressure ratio liquid piston compressor. HEFAT 2019, Wicklow, Ireland