Post-Doc position in energy system modeling to assess global impact of H2/NH3 as energy carriers.

Context

FLEXnCONFU - FLEXibilize combined cycle power plant through Power-to-X solutions using CONventional fuels is a research project funded by Horizon2020 EU's research and innovation programme (GA 884157), with the goal to develop and demonstrate innovative, economically viable and replicable Power-to-X-to-Power (P2X2P) solutions that combines all available options for the effective and flexible use of surplus power from renewable energies to levelling the power plant load convert electricity into hydrogen or ammonia prior to converting it back to power. This will enable the design and operation of an integrated power plant layout that can un-tap additional Combined Cycle (CC) flexibility. The project, with a total budget of 12.6 Million Euros and duration of 48 months (1 April 2020 – 1 April 2024), brings together the entire supply chain of the centralised power generation.
In order to achieve the EU 2030 and 2050 Climate and Energy goals, a high penetration of renewable energy sources (RES) into the grid is required as well as the use of alternative carbon-free fuels in already existing dispatchable centralised power plants. Combined Cycle Gas Turbine (CCGT) plants will be a crucial technology with the required flexibility to compensate the intermittency of the RES. The injection of alternative fuels (i.e. hydrogen (H2) and ammonia (NH3)) will help the required "fuel switch" the EU is facing, drastically reducing CO/CO2/HC emissions, which are more difficult to manage in comparison to NOx. The P2X solutions, which are currently widely studied coupled with RES, could help the CC to levelling their load and reducing their environmental impact. Hence, developing proper technologies and solutions to couple P2X2P systems with GT is mandatory.

Description of the Post-Doc

The researcher will follow-up and manage the project for all the tasks where UCLouvain is involved. More specifically, the main activities will be within the work package "**Combustion system compatibility with non-conventional fuels"**. This work package seeks to numerically and experimentally study the use of ammonia and hydrogen/nitrogenated mixtures co-fired with NG for their use in large GT combustion systems. Understanding of the behavior of these blends will enable to improve commercial combustion systems, aiming at the reduction of unwanted emissions (NOx and CO) with an increase of stability. Results will be employed to determine the feasibility of conversion whilst giving details for the analysis of overall impacts of these systems at a global scale.
Within this work package, the researcher will lead the research in the task **global impact of H2/NH3 based combustion processes**. A comprehensive model will be developed to evaluate the contribution of imported synthetic/electro fuels and their usages and, also, the non-energy use of energy vectors. The model will be used in different scenarios considering two objectives: the minimization of the economic cost (LCOE) and the minimization of the Global Warming Potential (GWP). However, when taking the parameters to optimize as perfectly known, the real objective could even be really far, leading to a fragile optimum, and therefore insecurity of supply. Instead of deterministic optimization, this task will include uncertainty quantification analysis in order to perform robust optimization

instead. Considering the uncertainties, it will provide much richer information to policy maker or system designers.

Description of Team

This offer is for a Post-Doc at UCLouvain (Louvain-la-Neuve) with two supervisors, Prof. F. Contino and Prof. H. Jeanmart.

Francesco Contino has a long experience in HCCI engines: he performed his thesis on the topic, and through the supervision of PhD students he published a dozen of papers on experiments and simulations in such engines. His research interests also lie in energy systems and how combined heat and power based on engines would be a key contribution.
Hervé Jeanmart focuses his research effort on three strands: Energy system, biomass conversion, and combustion. In combustion, fundamental chemical kinetic research is carried experimentally on low pressure burners and applied research is performed in engine related conditions. In both cases the focus is on the understanding on the underlying kinetic mechanisms.

Starting date: September 2020
End date: September 2021 (possible extension of 2 years)
Location: UCLouvain (Louvain-la-Neuve, Belgium)
Salary: 2600€ (approximate net income depending on experience)
Profile: Candidates should be proficient in English, motivated and well aware of the energy context. Experience in programming would improve the ranking.

Application: applications should contain a curriculum vitae, a letter of motivation, a letter of recommendation, a short analysis of the project idea (max one page), and a short video (2 minutes max) explaining why we should hire the candidate. The application package should be sent to herve.jeanmart@uclouvain.be and francesco.contino@uclouvain.be.

More information on the project: http://www.flexnconfu.eu

More information on working at UCLouvain:
https://jobs.uclouvain.be/content/WorkingatUCL/?locale=en_GB