Faculté des Sciences Appliquées
Laboratoire de Thermodynamique et d'Energétique
Integrated & Sustainable Energy Systems (ISES)

Master Thesis Proposal: Energy Scenarios considering the life cycle carbon footprint

Advisors: Prof. Sylvain Quoilin

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Context

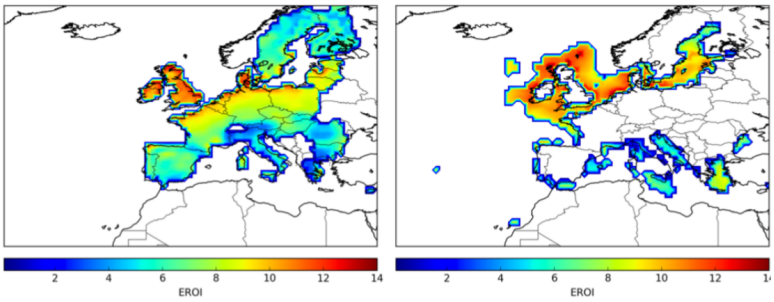
The economic efficiency and wealth of a society depends on the choice of energy supply techniques. The Energy returned on investment (EROI), the life-cycle carbon footprint are both relevant indicators commonly used to compare different energy sources. To mitigate the climate change the IPCC reports set guidelines to shift from fossil fuels to renewable energy. It is of primary importance to assess and estimate the resulting EROIs and carbon footprints of such trajectories.

Objectives

The goal is to develop and validate innovative methodologies to estimate the evolution of the carbon footprints of renewable energy in several scenarios at the country or local levels[1]. The implementations will be in open source models such as EnergyScope[2].

Requirements

The candidate must be familiar with or have a deep interest in system modeling. A bachelor degree in engineering, computer science, data science, or mathematics is required along with a deep interest in the energy sector.



(a) Onshore wind (b) Offshore wind

Figure 1: EROI of some considered technologies

[1] Dupont, Elise, and Hervé Jeanmart. "Global potential of wind and solar energy with physical and energy return on investment (EROI) constraints; application at the European level (EU 28 countries)." Proceedings of the ECOS (2019)

[2] Limpens, Gauthier, et al. "EnergyScope TD: A novel open-source model for regional energy

Prof. Sylvain Quoilin (squoilin@uliege.be)
Allée de la Découverte 17 (B49) B–4000 Liège (Belgium)
Tel: +32 (0)4 366.48.22
url: http://ises.uliege.be/

Location

This final thesis will be performed mainly within the University of Liège, but in close collaboration with partner universities such as UCLouvain. The two units involved at the University of Liege are the Smart-microgrids research units and Integrated and Sustainable Energy Systems (ISES) unit.

This constitutes a unique opportunity to get experience within top-ranked European energy research institutions, and to work in a motivating, multicultural and highly professional environment.

Information

Further information can be obtained by directly contacting S. Quoilin by e-mail.

Prof. Sylvain Quoilin (squoilin@uliege.be)
Allée de la Découverte 17 (B49) B–4000 Liège (Belgium)
Tel: +32 (0)4 366.48.22
url: http://ises.uliege.be/