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To cite this version:
Lou Morriet, Gilles Debizet, Frédéric Wurtz. Multi-actor modelling for MILP energy systems optimisation: application to collective self-consumption. Building Simulation 2019, Sep 2019, Rome, Italy. hal-02285965

HAL Id: hal-02285965
https://hal.archives-ouvertes.fr/hal-02285965
Submitted on 4 Oct 2019

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Multi-actor modelling for MILP energy systems optimisation: Application to collective self-consumption

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ABSTRACT
We aim to propose a multi-actor modelling based on stakeholders’ objectives and constraints and to apply it on the optimisation model generation tool OMEGAlpes. Based on social science literature, this modelling aims to help stakeholders to formalise their constraints and objectives and to negotiate them in a multi-stakeholders problem setting process. This modelling has been applied to a simplified collective self-consumption project.

1 – Problematic: Reduce the Socio-technical Optimality Gap
- Social science literature highlights that energy project should be considered as sociotechnical as it depends on (Akrich, 1989):
  - Social dimensions (technical, social, political and legal institutions...)
  - Technical issues (material selection, available technology...)

- Decision support tools only focus on technical optima creating a socio-technical optimality gap defined by Hinker et al. (2017) as:
  - A socio-technical optimality gap is said to be existing for an optimization problem if the solution found is non-optimal because of an imprecise problem formulation, or if the optimum found is rejected due to non-feasibility in practice.

2 – From Social Science concepts to Object Oriented Actor Modelling with constraints and objectives

Multi-stakeholder projects in pre-study phases require to help stakeholders to:
- understand the impact of their requirements – constraints and objectives – on the solution (Fig 4)
- discuss and coordinate on possible and satisfactory solutions mainly negotiating their constraints and objectives (Fig 3)

3 – “Problem setting” step & stakeholder negotiations

In France, the collective self-consumption act enables prosumers to share their electricity production between various consumers connected to the public network

Study cases available at: https://omegapes-examples.readthedocs.io/en/latest/article_study_case.html

4 – Application to Collective self consumption

In France, the collective self-consumption act enables prosumers to share their electricity production between various consumers connected to the public network

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Acknowledgement
This work has been partially supported by the CDP Eco SEES research grant from the French National Research Agency in the framework of the “Innovations d’Ouvrage” program (ANR-15-DEA-01) and by the ADEME the French Agency for Environment and Energy Management with the RETHEME project.