

Master thesis proposal

Title:

Decarbonisation of regional energy systems: assessing future scenarios through Calliope modeling framework

Keywords:

Energy System Modeling, Optimization, Planning, Operation, Renewable Energy

Reference persons:

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Research groups:

Energy Center Lab

Thesis type:

Numerical

Description:

The thesis proposal aims at developing an energy model of an Italian region (case study) by means of the Calliope [1] modelling framework, which is based on operational research mathematical programming, and at developing a set of energy transition scenarios [2].

The candidate will learn and make use of the Python programming language to fully exploit Calliope functionalities and enhance the modelling framework. A specific challenge will be to develop suitable methodologies to integrate the medium-term planning and the operational phase of energy systems, to precisely evaluate the feasibility of high-RES penetration energy scenarios.

The energy system of an Italian region will be examined in depth to build the case study and develop energy scenarios towards high levels of decarbonization. The outcomes will be compared with the on place or envisaged regional energy policies, providing advice for future regional energy planning.

References

[1] Calliope documentation, <https://calliope.readthedocs.io/en/stable/index.html>

[2] Emmanuel et al., A review of power system planning and operational models for flexibility assessment in high solar energy penetration scenarios, *Solar Energy*, 2020, <https://www.sciencedirect.com/science/article/pii/S0038092X20307489>