LICENSING & PARTNERING OPPORTUNITY

Eurac research
Institute for renewable energy

A multi-objective optimization approach for energy scenarios

Future energy system

Inspecting the best future alternatives of the energy system requires particular characteristics and resolution to completely assess the challenges of the energy transition. A high temporal resolution in the modelling is required to properly catch renewable energy variability. Sector-coupling is needed to accurately evaluate the synergies between energy sectors. EPLANopt model based on EnergyPLAN software, developed by Aalborg University, has the above-mentioned features.

A multi-objective optimization approach

Eurac research has coupled the EnergyPLAN software with a multi-objective evolutionary algorithm to perform the expansion capacity optimization with a multi-objective approach. The multi-objective optimization approach allows the modelers to present the final results to the policy makers in the most transparent way enabling a participatory process for the selection of best future alternatives for the energy system.

APPLICATIONS

- Future best energy mixes
- Evaluation of the costs of the current and future energy system
- Analysis of the structure of the cost of the energy system
- Analysis of the energy flows and exchanges on hourly basis
- Analysis of the must-haves and must-avoids within the decarbonization measures

Solution Advantages

Eurac research bottom-up energy system modelling approach to find the optimal future alternatives for the energy system is characterized by the following features:

- **Integrated:** the model consider the different sectors of the energy system through an integrated approach: power, heating, cooling, transport and industry.
- **High resolution:** the EPLANopt model is characterized by high temporal resolution. This is a relevant characteristic to properly evaluate intermittence of renewable energy sources.
- **Transparent:** the output of EPLANopt model is the Pareto front of optimal techno-economic solutions. This result is then submitted to the policy makers to support them in the most transparent way and facilitate their choice for the future energy system.
- **Must-have and must-avoids:** The Pareto front of optimal solutions is studied to analyze the solution on the Pareto front. This allow the modeler to identify the common and missing elements of the identified optimal scenarios.
- **Demonstrated:** Eurac research has applied the EPLANopt model to different case studies at different scales. Country level: Italy, regional level: South Tyrol, Niederösterreich, Salzburg, Val D'Aosta, municipal level: Bressanone-Brixen, Island level: Favignana. It has also been used by Eurac partners for the case study of India.

LICENSE

Eurac research is offering consultancy services to the correct use of the EPLANopt tool. For more information, please contact:

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