



Un algoritmo olistico per la progettazione di comunità energetiche

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Energy communities



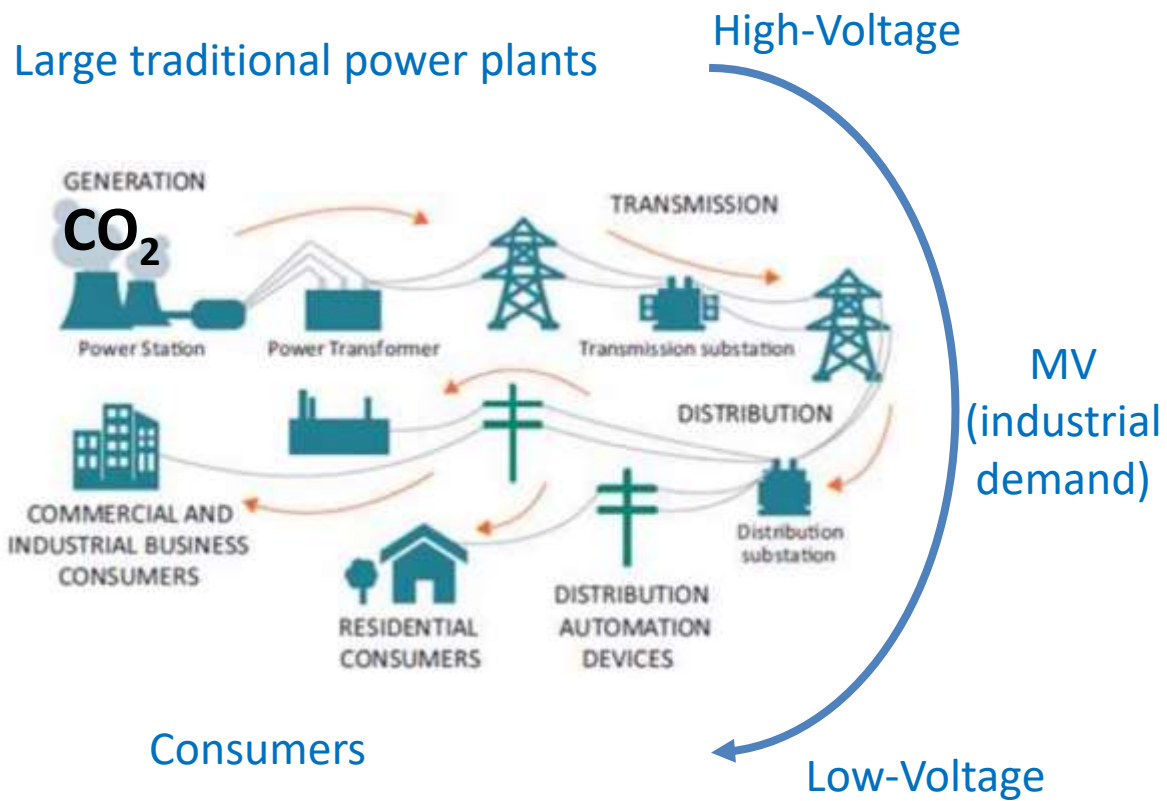
Cooperation



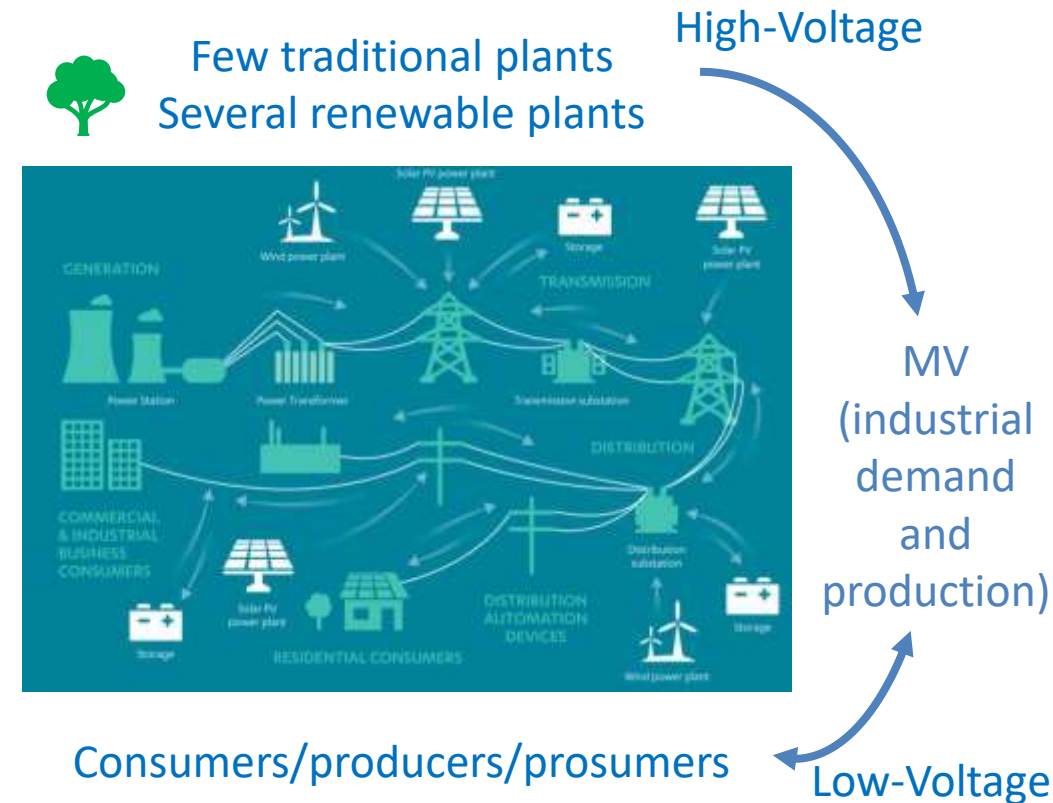
for a sustainable future

The transition of the power system

Yesterday



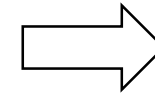
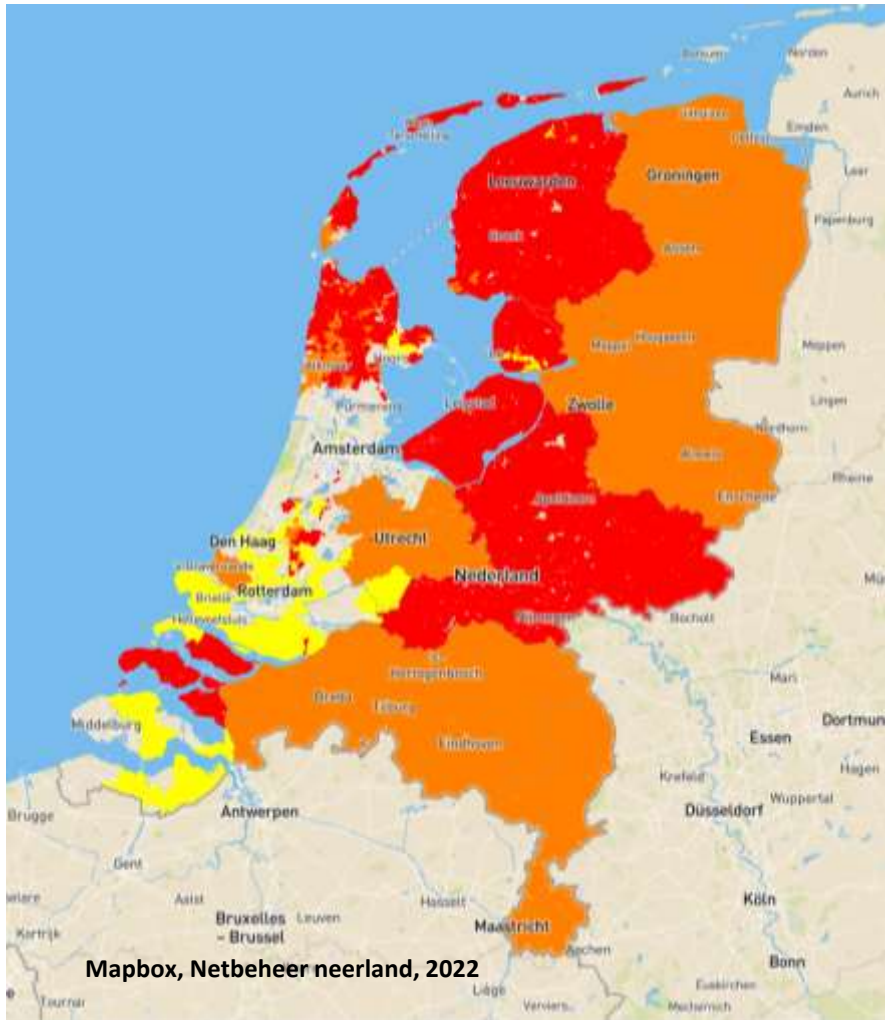
Today and tomorrow



The power system is becoming bidirectional, not without challenges

Limits for the decarbonization - today

Netherlands is not accepting new large renewable power plants



Need for:

- **Investments in infrastructure**
- **Decentralized systems**
- **Coordination** between local demand and production



Energy Communities:
part of the solution



Energy Communities: EU directives and Italian adoption



Renewable Energy Communities (REC)

Renewable Energy Directive 2018/2001/EU (RED II)

Citizen Energy Communities (CEC)

Internal Market in Electricity Directive 2019/944/EU (IEMD)

Objectives: environmental, social and lastly economic

Free participation, local ownership and no-profit scope

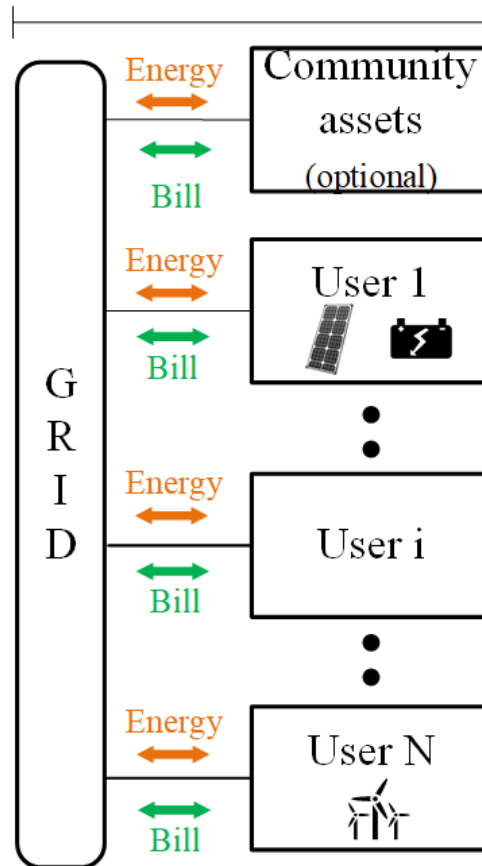
Italian regulation:

- Decree Milleproroghe 162/2016 – legge 8/2020
- Implementing acts 318/2020 ARERA and DM 16/9 2020 MiSE; D.lgs. 199/2021
- Implementing acts 120/2022 and 390/2022 ARERA

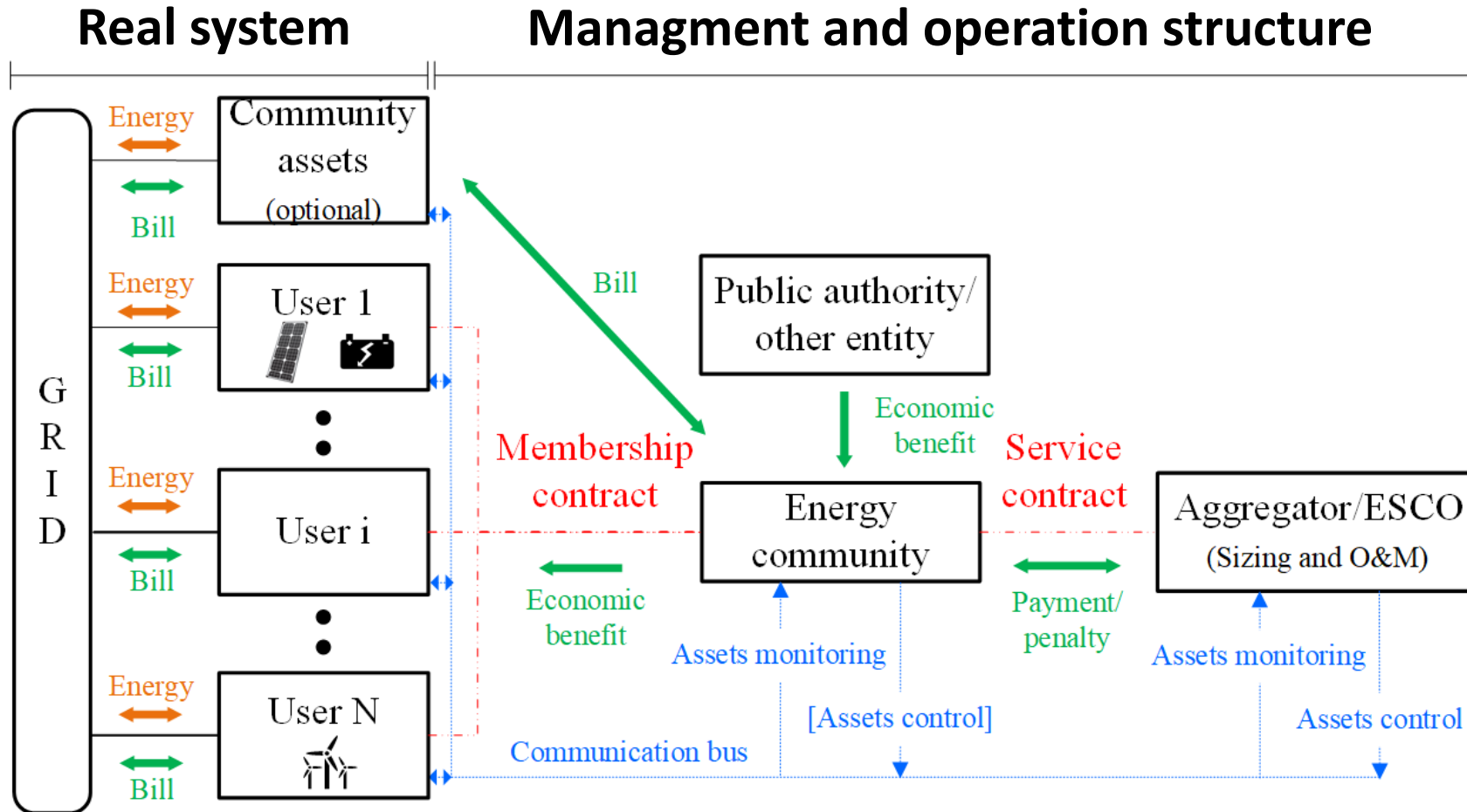
Energy Community: not just engineering ...



Real system



Energy Community: ... a multidisciplinary system

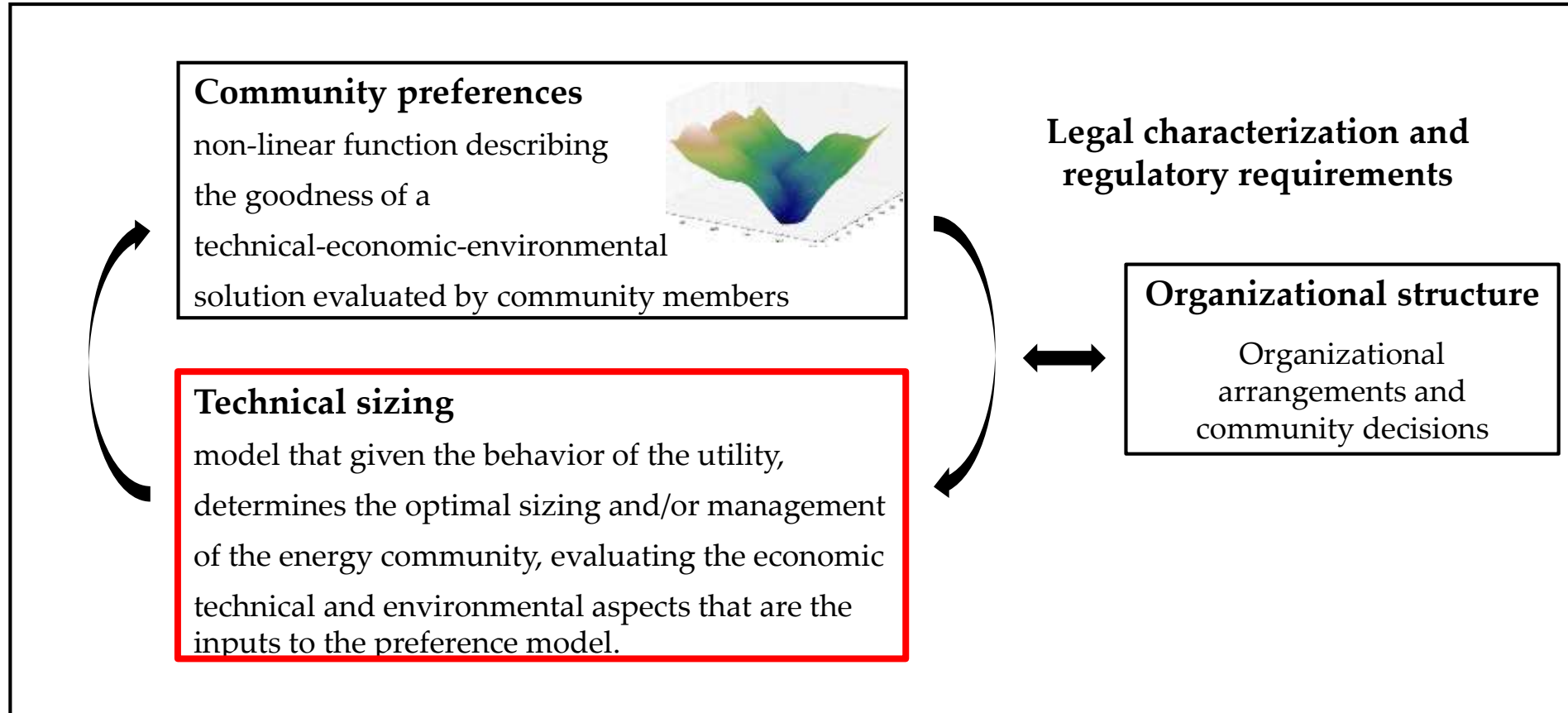


AUTENS approach: an holistic method to dominate complexity

Holistic model for Energy Communities



AUTENS



The technical method is influenced by organizational and legal framework: FOCUS

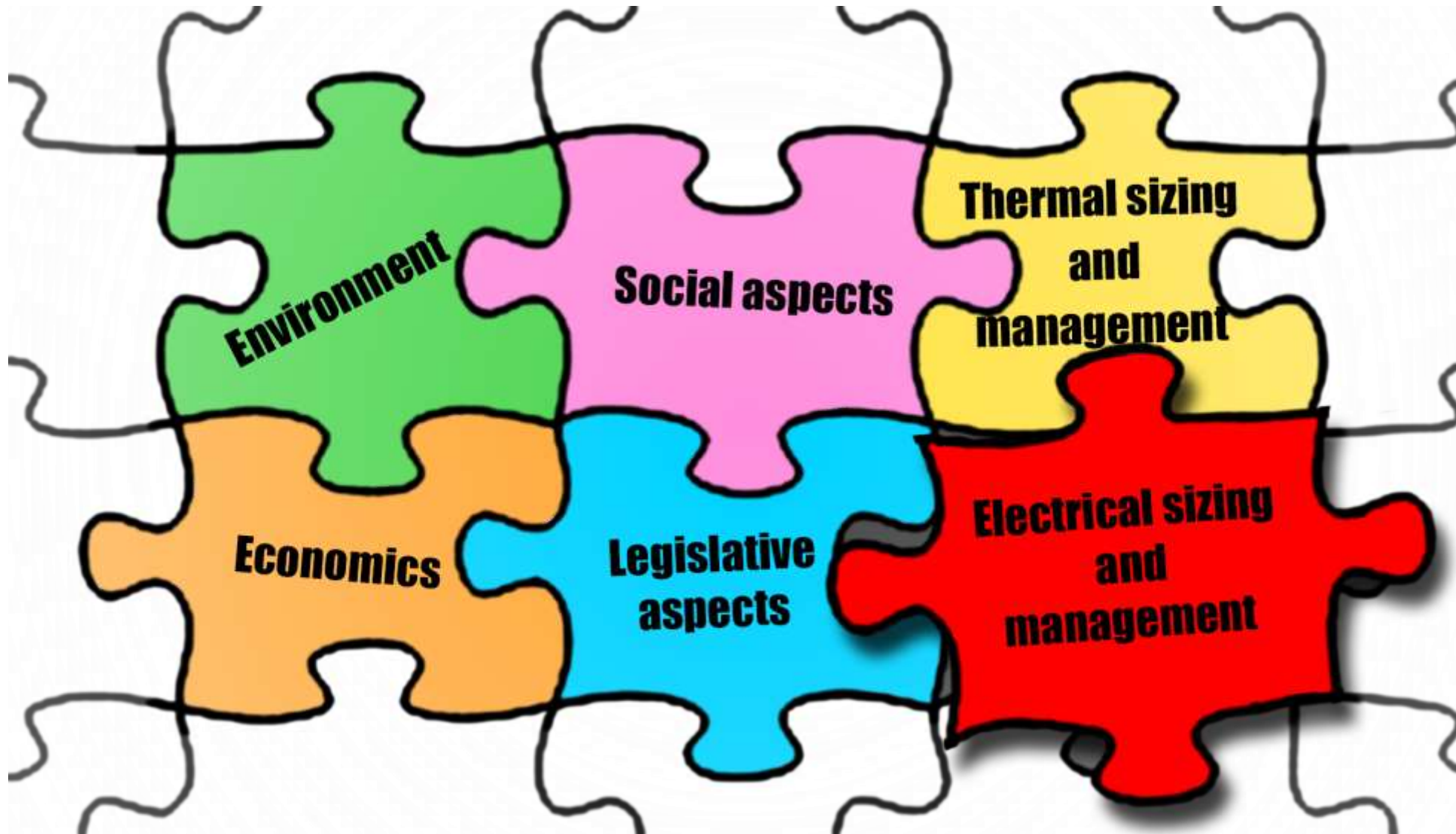


Holistic algorithm for Energy Communities design



- Decision support **tool** that can address the need to **design, develop, and manage** an **Energy Community**;
- Designed with philosophies of **parametricity, modularity, and flexibility**;
- High **interdisciplinarity** and **combination** of different management aspects.

Interdisciplinarity



Operations Research

- **Operations Research** is subfield of mathematical sciences that deals with the development and application of analytical methods to improve **decision-making**.
- Two major sub-disciplines are:
 - **Simulation**, i.e., models and algorithms which attempts to **predict** the **behavior** of the system from a set of parameters and initial conditions;
 - **Optimization**, i.e., an analytical formulation that represents a problem through a **mathematical model** and allows to find the **optimal** solution.

Multiobjective optimization

- **Economic** objective function;
- **Environmental** objective function;
- **Social** objective function.

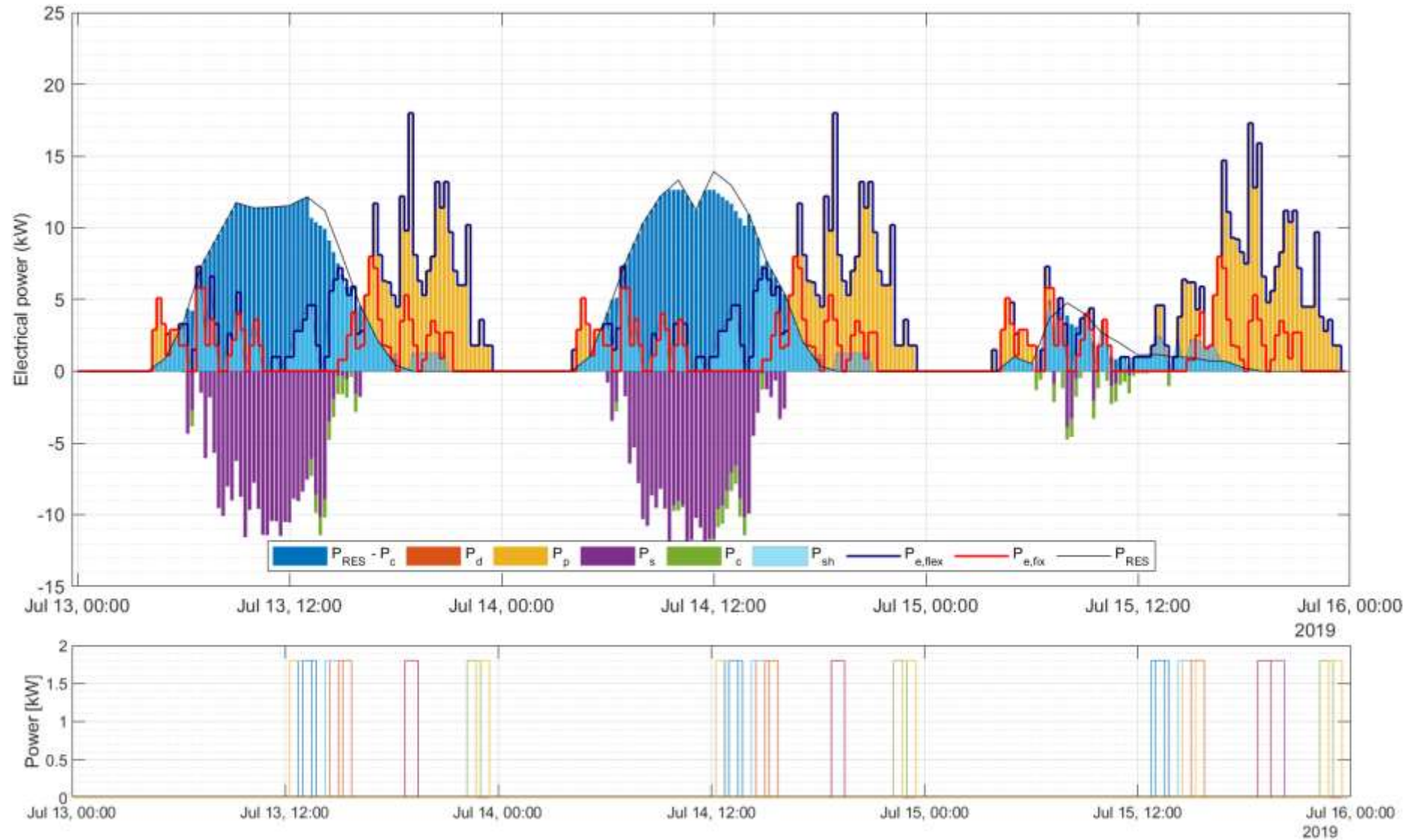


The Mind Illuminated: A Complete Meditation Guide Integrating Buddhist Wisdom and Brain Science for Greater Mindfulness, Atria Books, 2017.

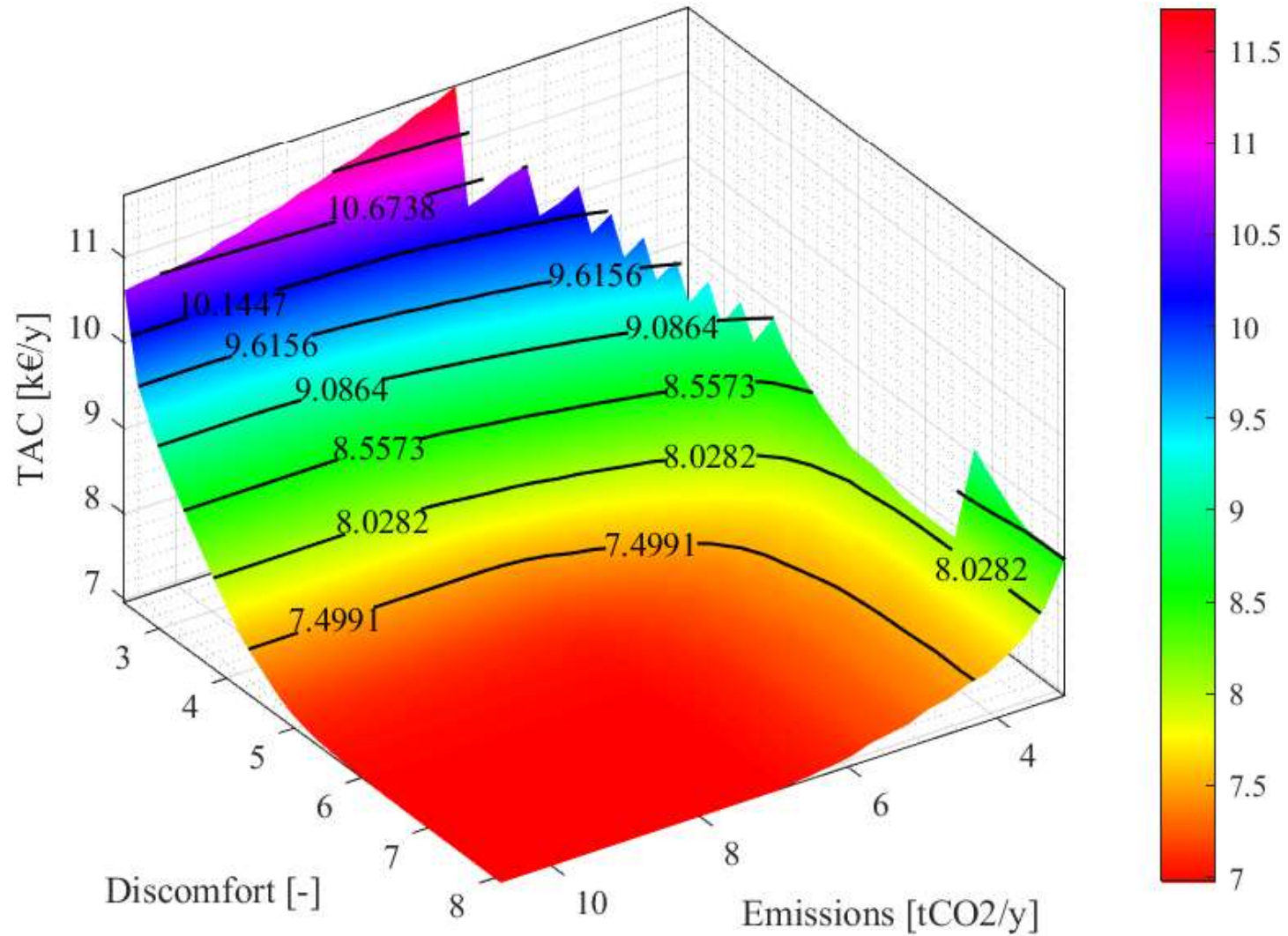
Optimal Management



Optimal Management



Pareto Front





Thank you for your attention!

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