

Integrated planning of multi-energy systems: a comprehensive modelling framework and Decision Support Tool

Luca Ferrari

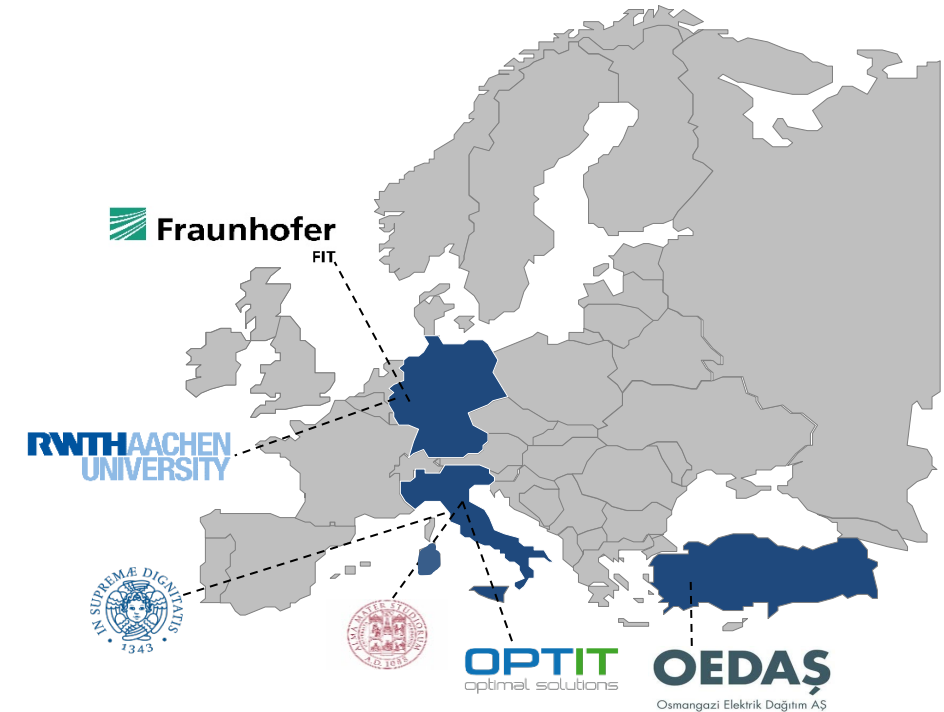
OPTIT
optimal solutions



Objectives

- Develop a **decision support tool**
- Design of efficient transition paths for the energy systems of the future, **both at generation & infrastructure levels**
- **Integrating** the electricity, heat, gas and mobility sectors to exploit **synergies and flexibilities**
- Main Targets:
 - European and National System planners
 - System Operators (TSOs & DSOs)
 - Multi-utilities
- Objective year: **2050**

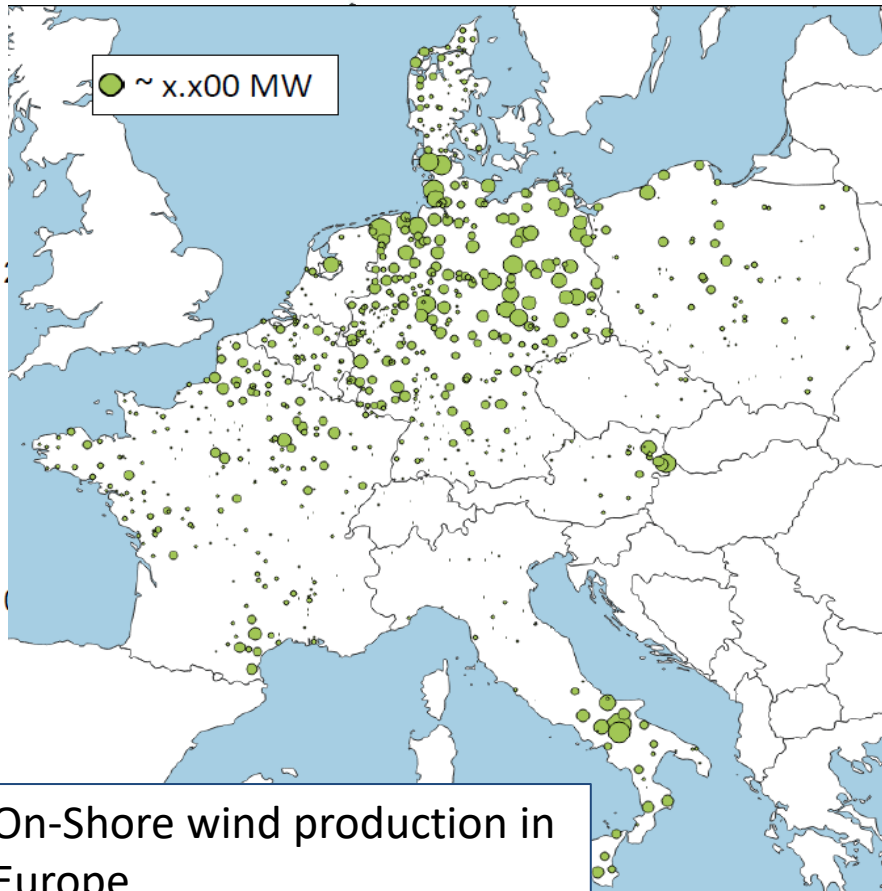
Partners



Advisory board

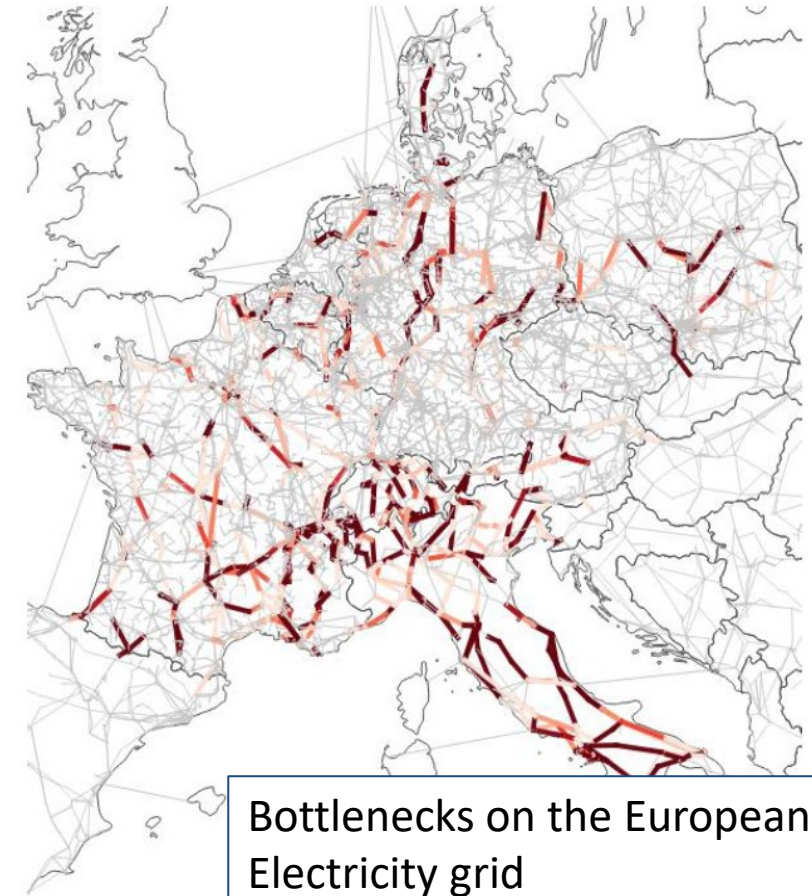


Why a multi energy system approach?

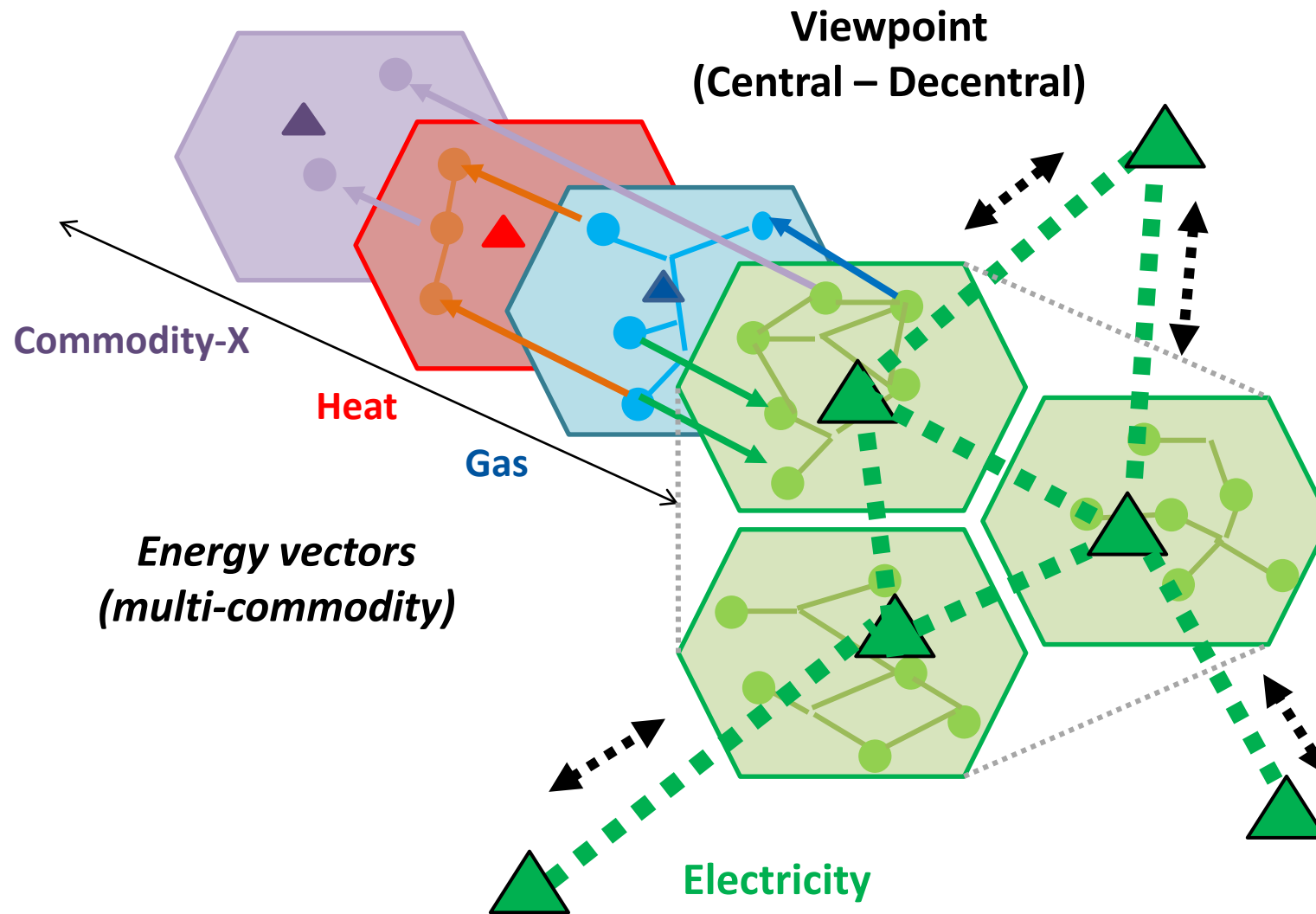


- ← Generation Imbalances
- ← RES Volatility
- ← Generation vs load







- Infrastructure Limitations
- GRID Constraints
- Expansions Planning
- Investments Allocations



What is a Multi-Energy System Approach?






Electric infrastructure

-  Model Target, e.g. Denmark
-  Macro area, e.g. Northern Denmark
-  Transmission line
-  Transmission nodes (e.g. Large power plants Macro area clusters)
-  Distribution line
-  Distribution nodes, e.g. Electric substations Medium voltage

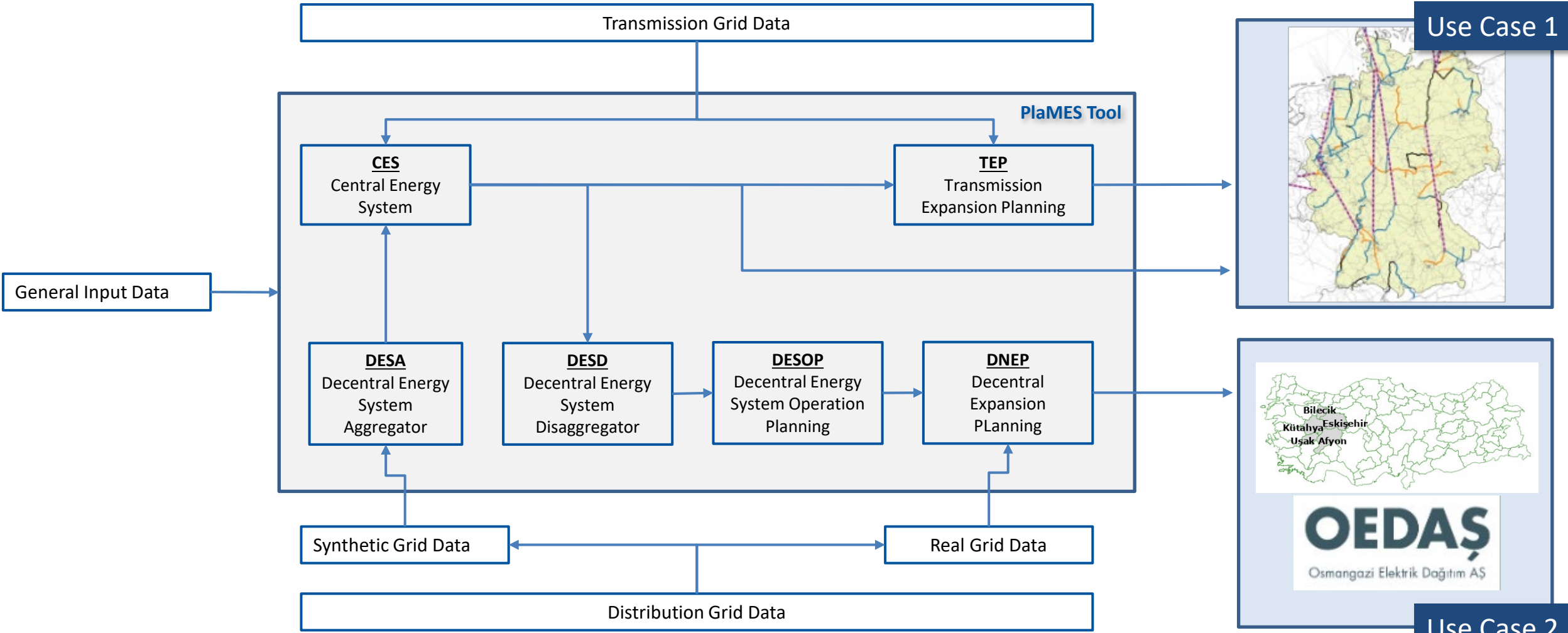
Gas infrastructure, e.g.

- Power plants 
- Power-to-gas 

Heat infrastructure, e.g.

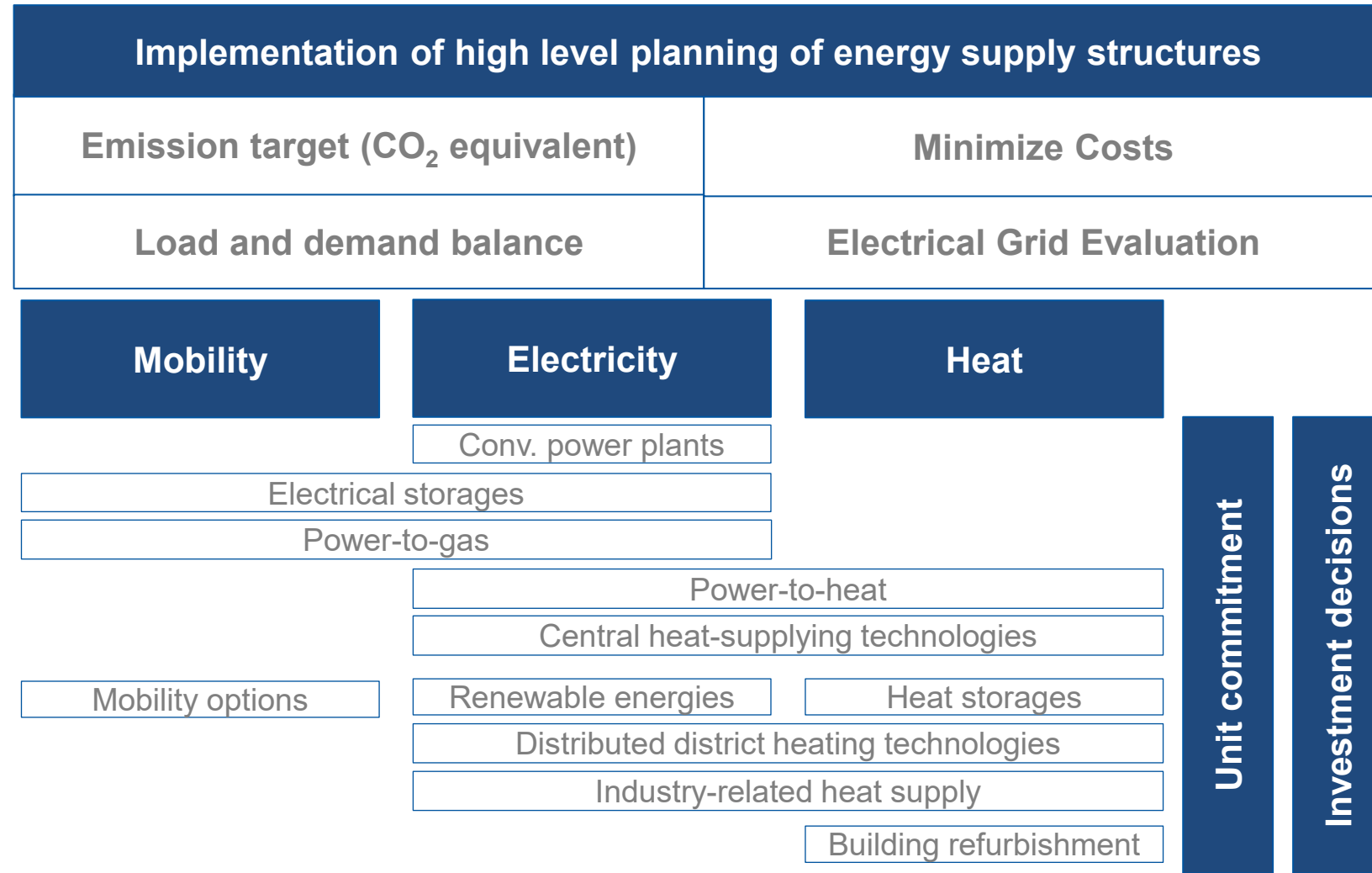
- Boiler, Cogeneration 
- Commodity-X, e.g. cooling
- Absorption chiller 
- Compression chiller 

PlaMES Modeling Approach



Overlap of Energy Structures

Mathematical description



How the tool will be used?

The tool will have two main target uses:

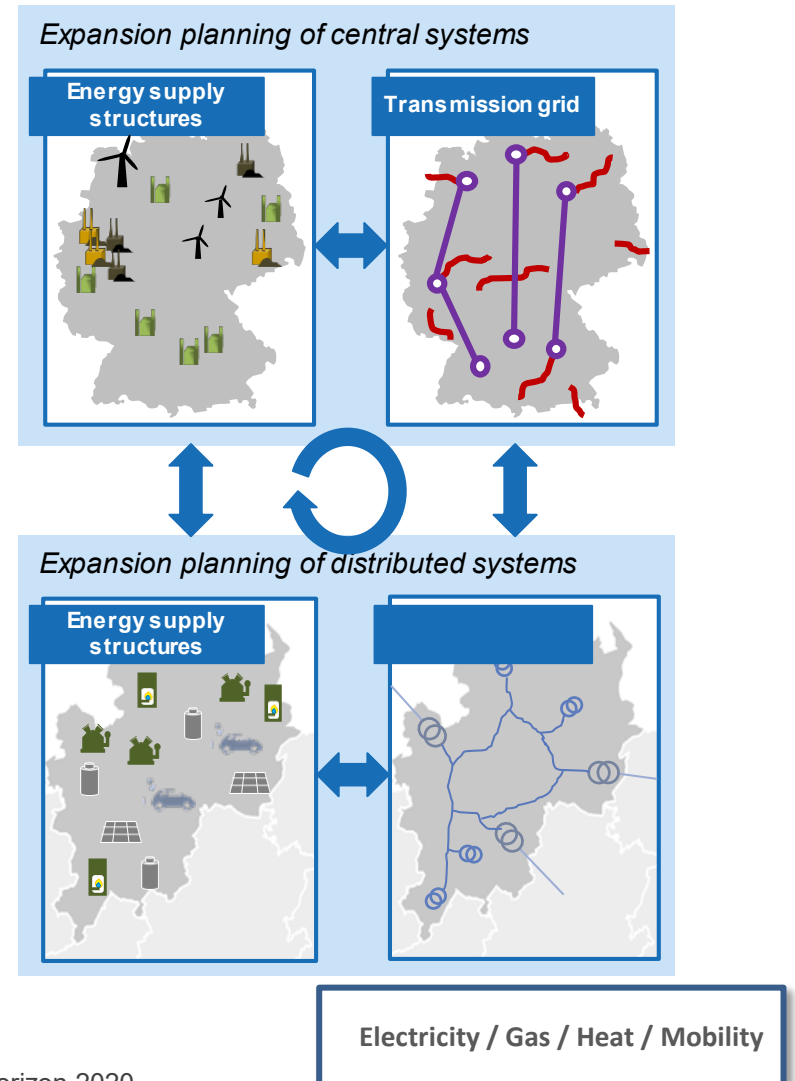
Central Use:

- Plan the development of infrastructures at Transmission Levels
- Target Users:
 - European and National Energy Agencies
 - Transmission System Operators (TSOs)

De-Central Use:

- Energy Infrastructure Planning at Local Level
- Synergies between different energy vectors at distribution level
- Target Users:
 - Local Authorities
 - Distribution System Operators (DSOs)
 - Multi-Utility Companies
 - Independent Power Generators
- Results could be useful also for: OEMs and Investors

Transmission vs Distribution



Thanks for your attention

Luca Ferrari
luca.ferrari@optit.net

