



Qualitative analysis to model energy sharing project

Analyse qualitative pour la modélisation de projets énergétiques locaux

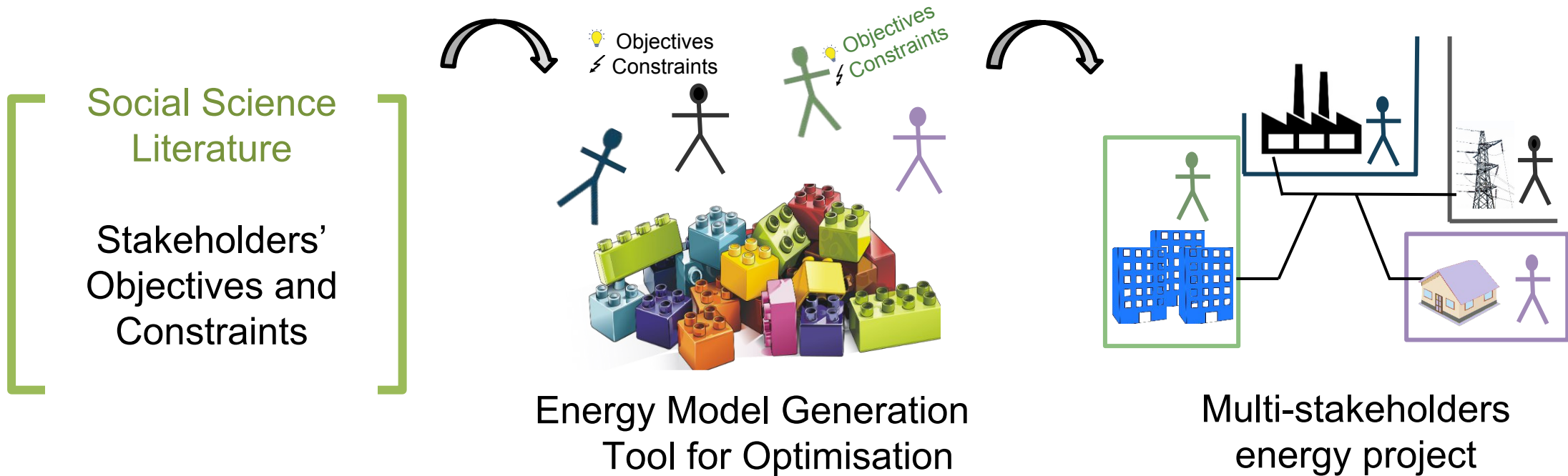
Lou Morriet, Frédéric Wurtz, Gilles Debizet
Université Grenoble Alpes

Energy communities for collective self-consumption: frameworks, practices and tools

Session 3 – June 16, 2020

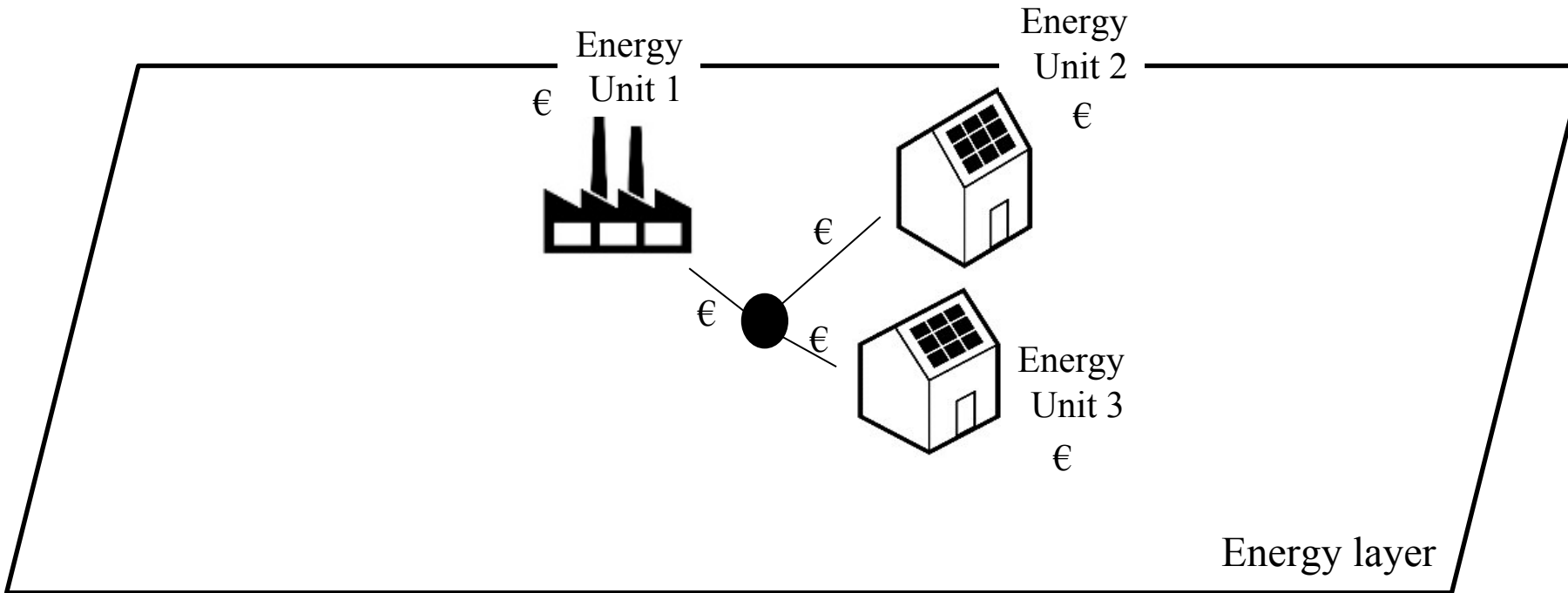
Which skills and tools to support energy communities?

SUMMARY



Use case: energy sharing in a participative multi-dwelling building

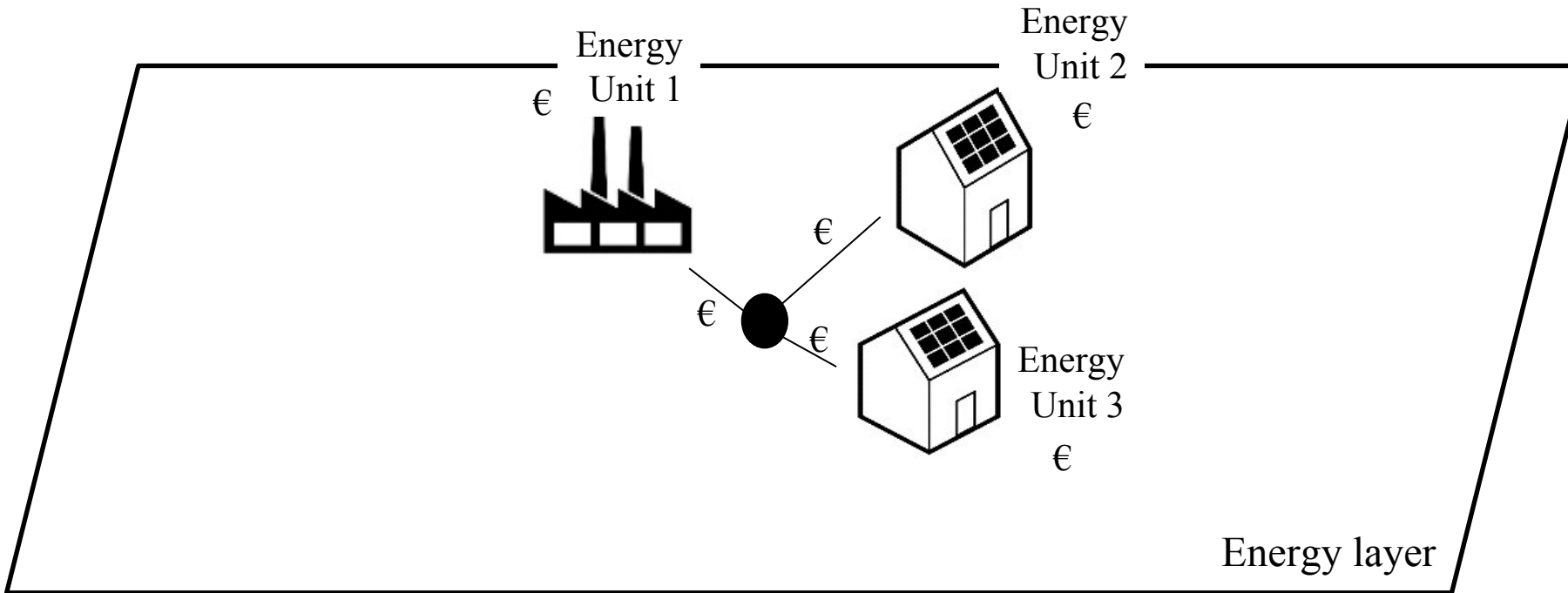
ENERGY MODELING TOOLS FOR EARLY DESIGN



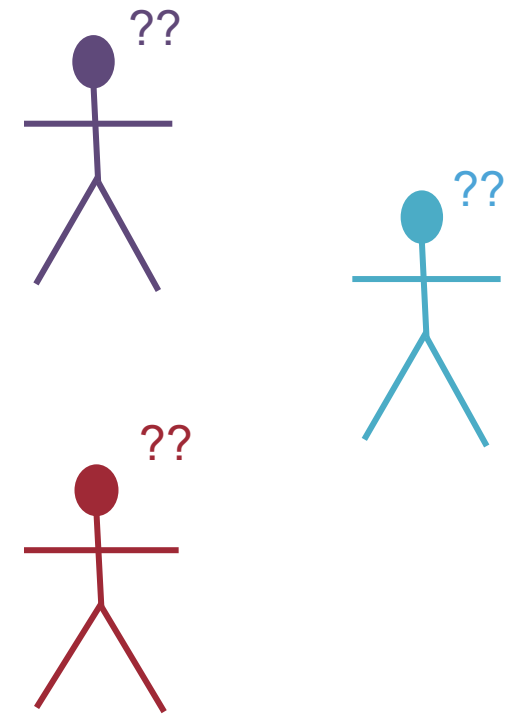
Environmental and resource data

Needs in early design
 Optimization
 Problem formulation
 Multistakeholders' agreement

ENERGY MODELING TOOLS FOR EARLY DESIGN

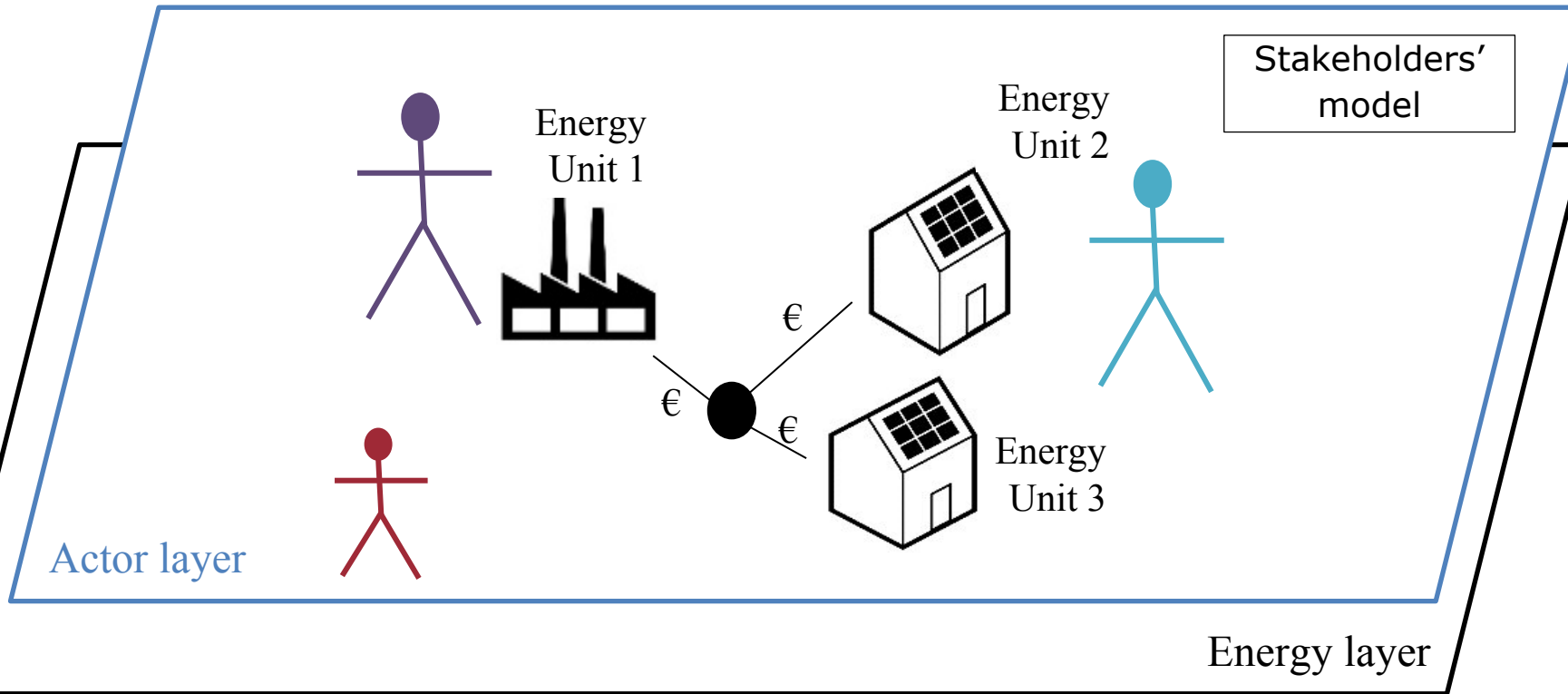


Environmental and resource data



MODELING PROPOSAL

MULTI-STAKEHOLDER MODELING PROPOSAL



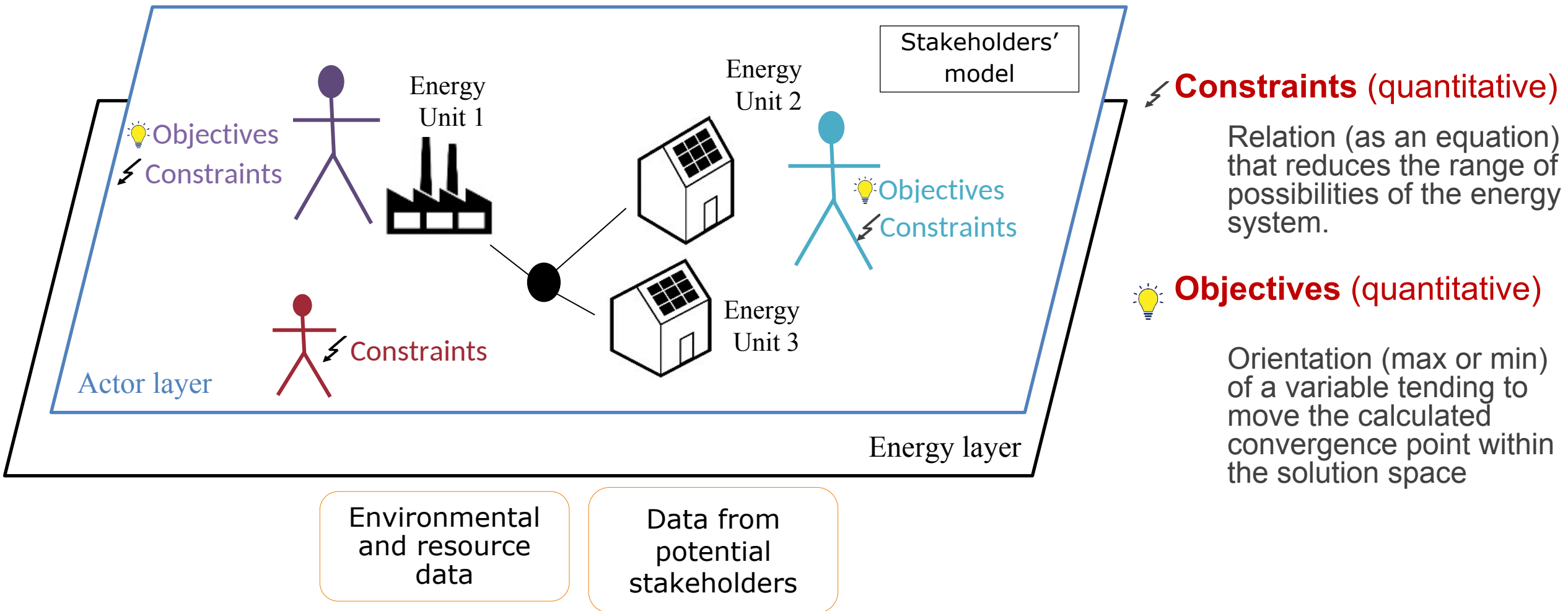
Stakeholder

Decision-maker or a set of decision-makers with the potential to influence the final solution of the project

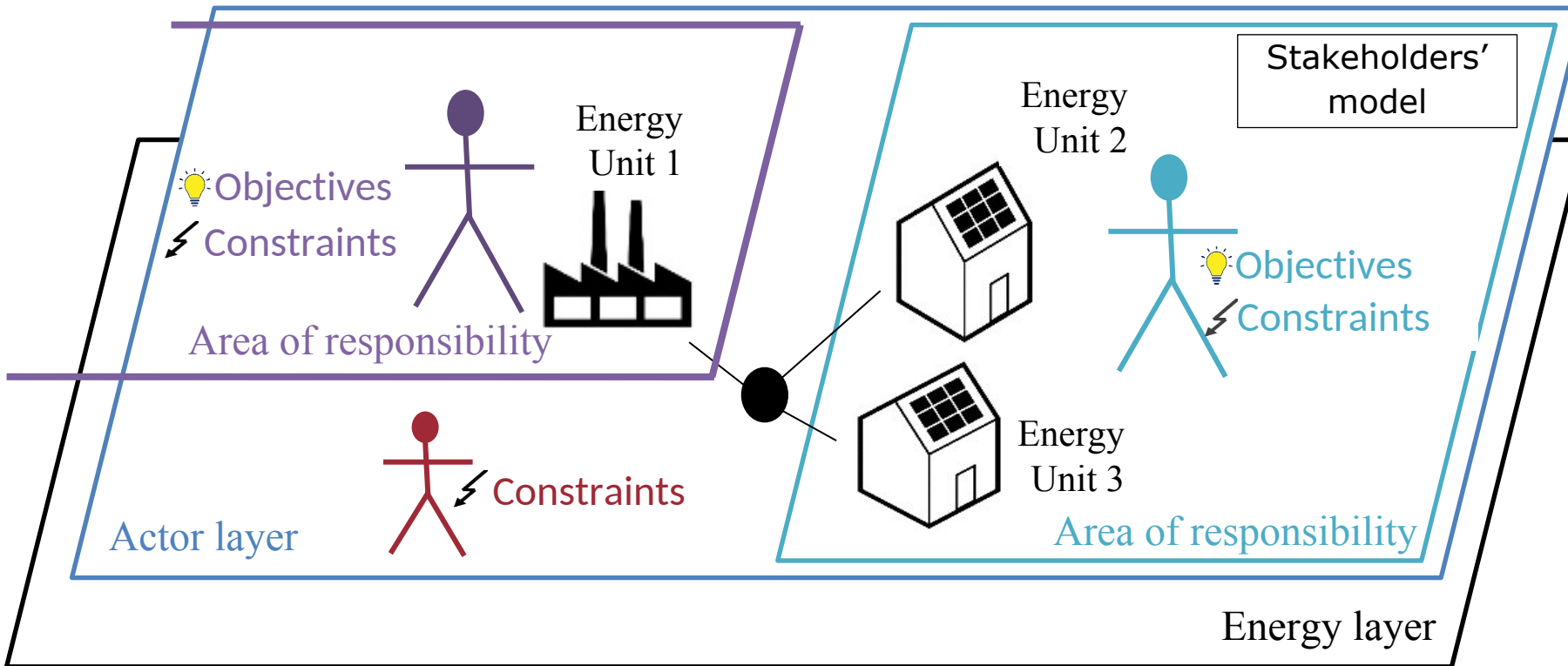
Environmental and resource data

Data from potential stakeholders

MULTI-STAKEHOLDER MODELING PROPOSAL



MULTI-STAKEHOLDER MODELING PROPOSAL



Operator

operates one or a set of energy units constituting a socio-energy node

- Producer,
- Consumer,
- Prosumer,
- Supplier,
- Network operator,
- Energy manager.

Regulator

lays down rules and procedures at the level of networks and natural resources

- Local authorities,
- Public authorities.

Environmental
and resource
data

Data from
potential
stakeholders

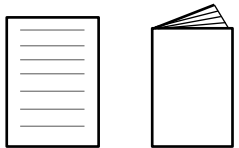
(Morriet et al., Building Simulation
2019)

METHODOLOGY

IDENTIFICATION METHODOLOGY

Definition of the corpus

Monography and interviews

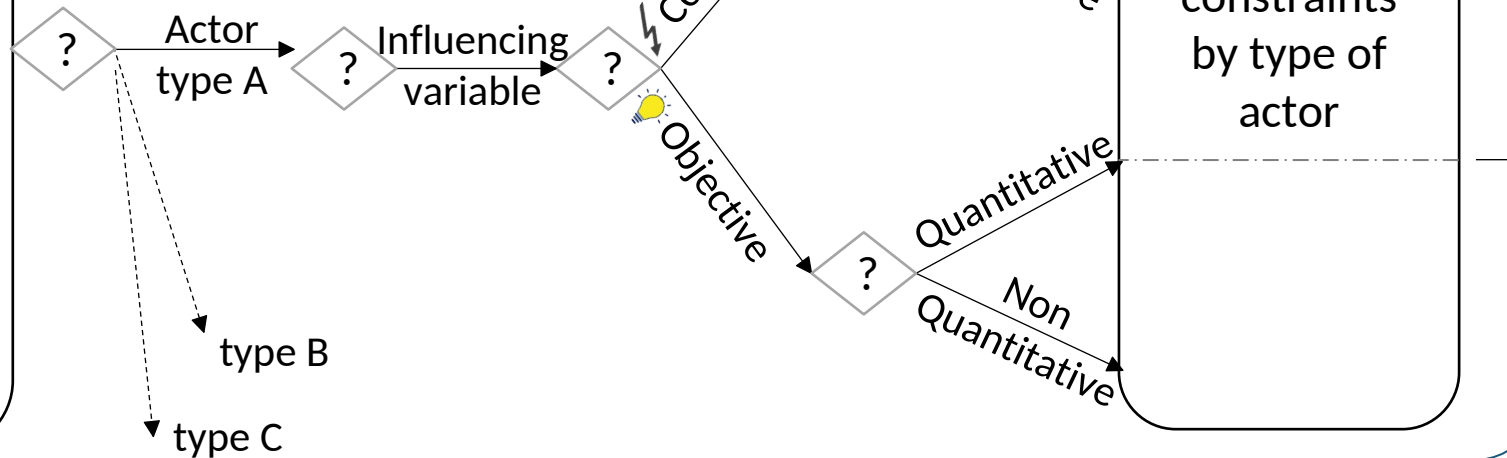


Interviews of persons who participated or observed the project

Analyses from F. Aubert's thesis & verbatims

Extraction of constraints and objectives from the interviews of the participants or observers

NVIVO



Synthesis

Maths reformulation

Model library

Treatment

Treatment

Models of quantitative constraints and objectives associated with types of stakeholders

Covered in this presentation

Qualitative analysis in order to identify and model stakeholders' constraints and objectives involved in (cooperative) energy sharing project

Lou Morriet, Frédéric Wurtz, Gilles Debizet

USE CASE: ENERGY SHARING IN A PARTICIPATIVE MULTI-DWELLING BUILDING

- I. Stakeholder identification
- (II. Influencing variable identification)
- III. Objectives & constraints identification
- IV. Qualitative and quantitative distinction

=> Objectives & constraints impact

I. STAKEHOLDER IDENTIFICATION

I. STAKEHOLDER IDENTIFICATION

Actors:

- 11 Households
- Energy community
- Operator of the public electrical distribution network
- Electricity supplier

- Town Hall
- **European Union via laws**
- Consuel
- Electrician

- Architect
- Energy associations (Hespul)
- Energy companies (TECSOL et ENERPLAN)

I. STAKEHOLDER IDENTIFICATION

Stakeholders:

- 11 Households
- Energy community
- Operator of the public electrical distribution network
- Electricity supplier

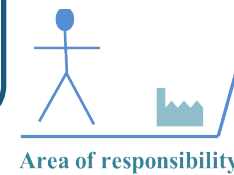
- Town Hall
- European Union via laws
- Consuel
- Electrician

- Architect
- Energy associations (Hespul)
- Energy companies (TECSOL et ENERPLAN)

I. STAKEHOLDER IDENTIFICATION

Operator Actor:

- 11 Households
- Energy community
- Operator of the public electrical distribution network
- Electricity supplier



Regulator Actor:

- Town Hall
- European Union via laws
- Consuel
- Electrician

Other actors:

- Architect
- Energy associations (Hespu)
- Energy companies (TECSOL et ENERPLAN)

I. STAKEHOLDER IDENTIFICATION

Operator Stakeholder:

- 11 Households
- Energy community
- Operator of the public electrical distribution network
- Electricity supplier

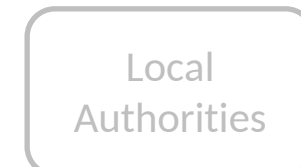
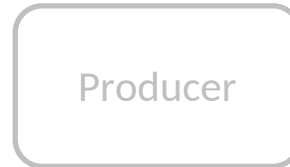


Area of responsibility



Regulator Stakeholder:

- Town Hall
- European Union via laws
- Consuel
- Electrician



Other actors:

- Architect
- Energy associations (Hespu)
- Energy companies (TECSOL et ENERPLAN)



III. OBJECTIVES & CONSTRAINTS IDENTIFICATION & IV. QUALITATIVE AND QUANTITATIVE DISTINCTION

II. OBJECTIVES AND CONSTRAINTS IDENTIFICATION

Energy Community

Verbatims :

« La première étape vers l'autonomie énergétique consiste à concevoir un habitat très basse consommation. Ensuite, l'objectif est de produire l'énergie restante nécessaire au maximum sur place. » (Aubert 2020)

« l'électricien explique y avoir passé beaucoup plus de temps que sur un projet classique, afin de pouvoir « répondre au souhait [du collectif] – d'autoconsommer au maximum. Cela a représenté beaucoup de travail ». » (Aubert 2020)

Verbatims (translation) :

“The first step towards energy autonomy is to design a very low-energy home. Then, the aim is to produce the remaining energy as much as possible on site.” (Aubert 2020)

“The electrician explains that he spent a lot more time than on a conventional project, in order to be able to “meet [the community's] desire - to self-consume as much as possible. It was a lot of work.” ”(Aubert 2020)



Objective : Maximize self-consumption

Modeling : $\min(\sum_t | production_locale(t) - consommation(t) |)$

OBJECTIVES AND CONSTRAINTS IDENTIFICATION



European law

Verbatims :

« *comme il s'agit d'habitations, il est nécessaire d'avoir un compteur par habitation, pour que chaque consommateur (i.e. unité d'habitation) puisse choisir librement son fournisseur d'électricité. (...) On observe ici qu'un premier actant non-humain, une loi européenne sur le marché de l'électricité, vient enclencher un premier changement technique dans l'assemblage préalablement constitué.* »
(Aubert 2020)

Verbatims (translation) :

“*As they are dwellings, it is necessary to have one meter per dwelling, so that each consumer (i.e. housing unit) can freely choose its electricity supplier. (...) We observe here that a first non-human act, a European law on the electricity market, has just triggered a first technical change in the previously constituted assembly.*” (Aubert 2020)



Constraint : One electricity delivery point per dwelling

Modeling : -

OBJECTIVES AND CONSTRAINTS IDENTIFICATION

Energy Community

Verbatims :

« *C'est pourquoi [le collectif a] cherché un moyen pour diminuer la part d'électricité passant par le réseau et augmenter la part autoconsommée directement.* » (Aubert 2020)

Verbatims (translation) :

“*That is why [the community] looked for a way to decrease the amount of electricity going through the grid and increase the amount consumed directly.*” (Aubert 2020)



Objective : Minimize extra costs of community electricity generation

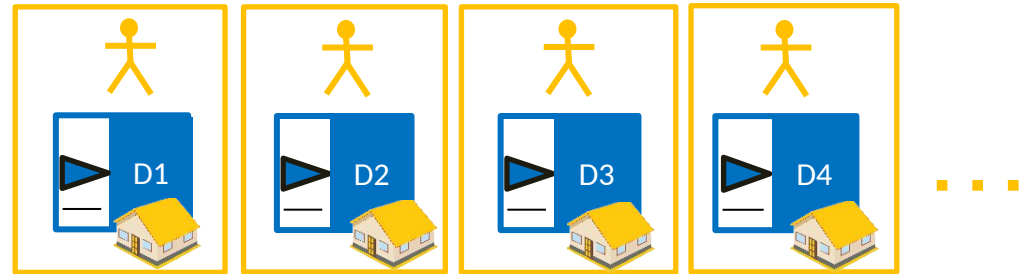
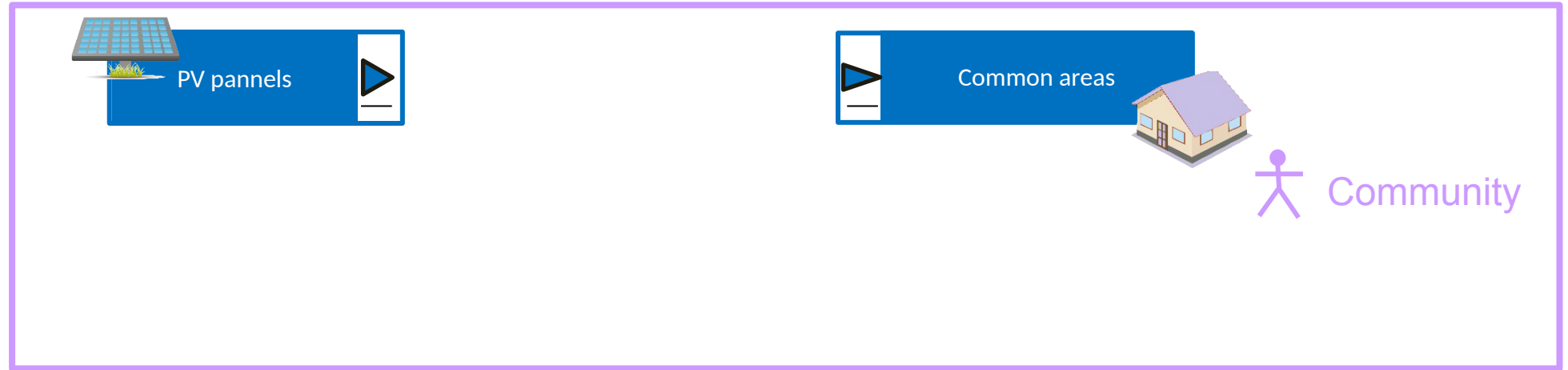
Modeling : $\min(\sum_t \text{coûts}_{\text{production_locale}}(t))$

OBJECTIVES & CONSTRAINTS IMPACT

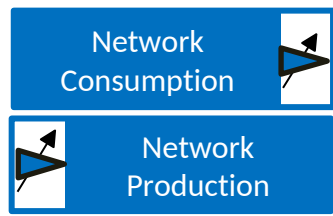
STAKEHOLDERS

Legend

- Energy flow
- Production unit
- Consumption unit
- Community
- Household
- Network Operator & Supplier
- Regulator
- Socio-energy node



European law

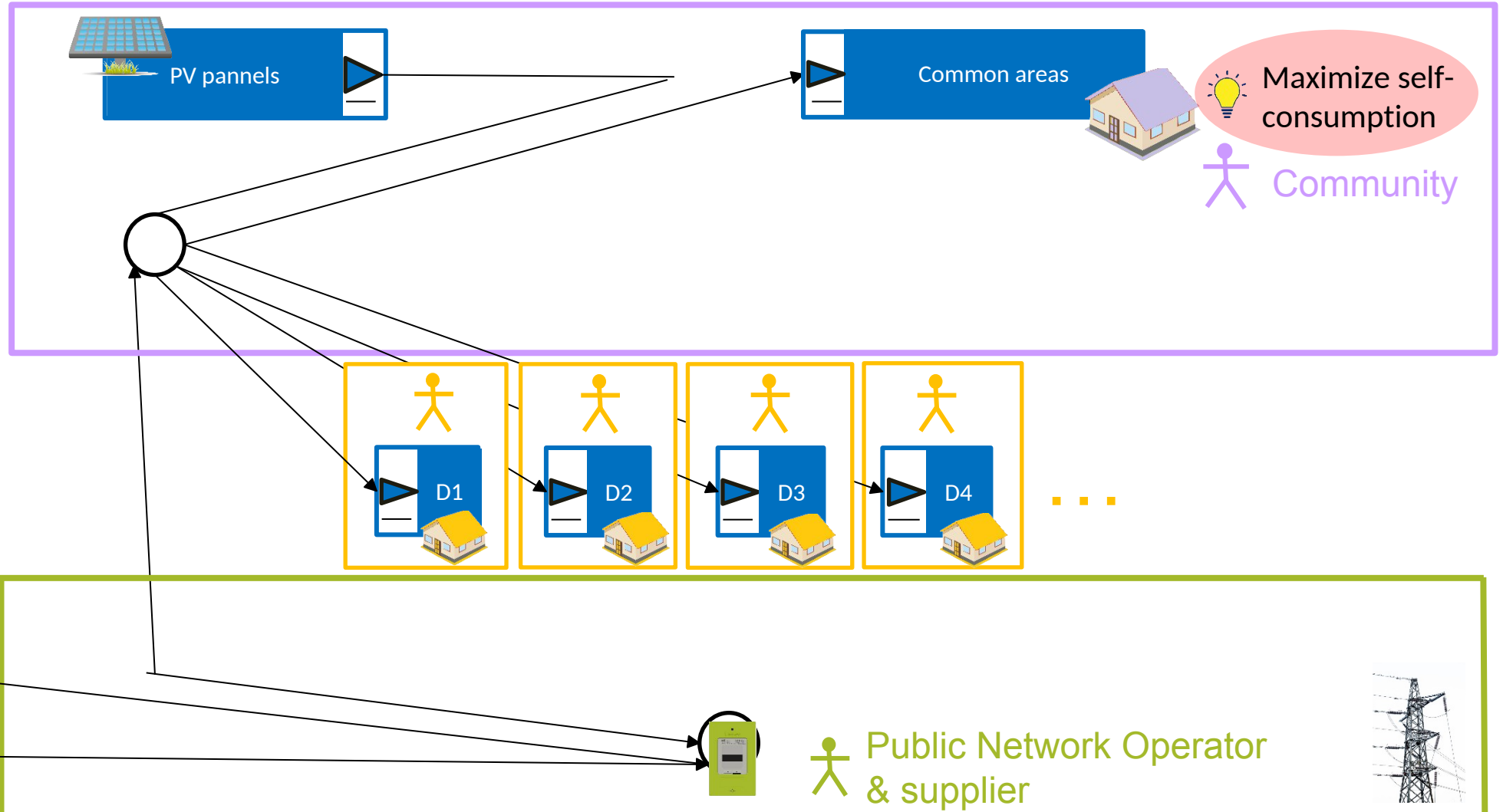


1st ASSEMBLAGE :

DIRECT SELF-CONSUMPTION

Legend

- Energy flow
- Production unit
- Consumption unit
- Community
- Household
- Network Operator & Supplier
- Regulator
- Socio-energy node



2Nd ASSEMBLAGE:

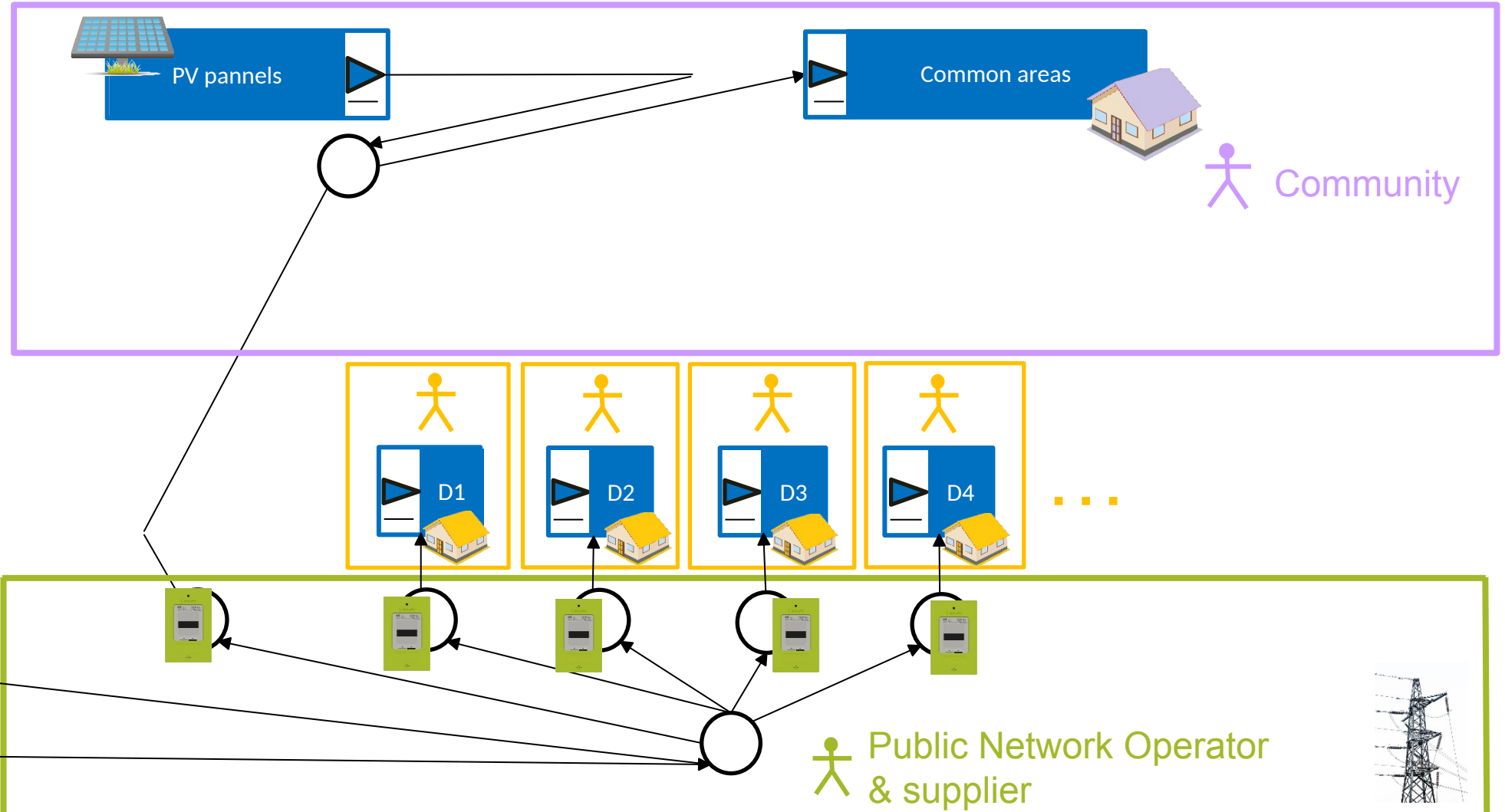
COLLECTIVE SELF-CONSUMPTION + SELF-CONSUMPTION FOR COMMON AREAS

Legend

- Energy flow
- Production unit
- Consumption unit
- Community
- Household
- Network Operator & Supplier
- Regulator
- Socio-energy node

One electricity delivery point per dwelling

European law

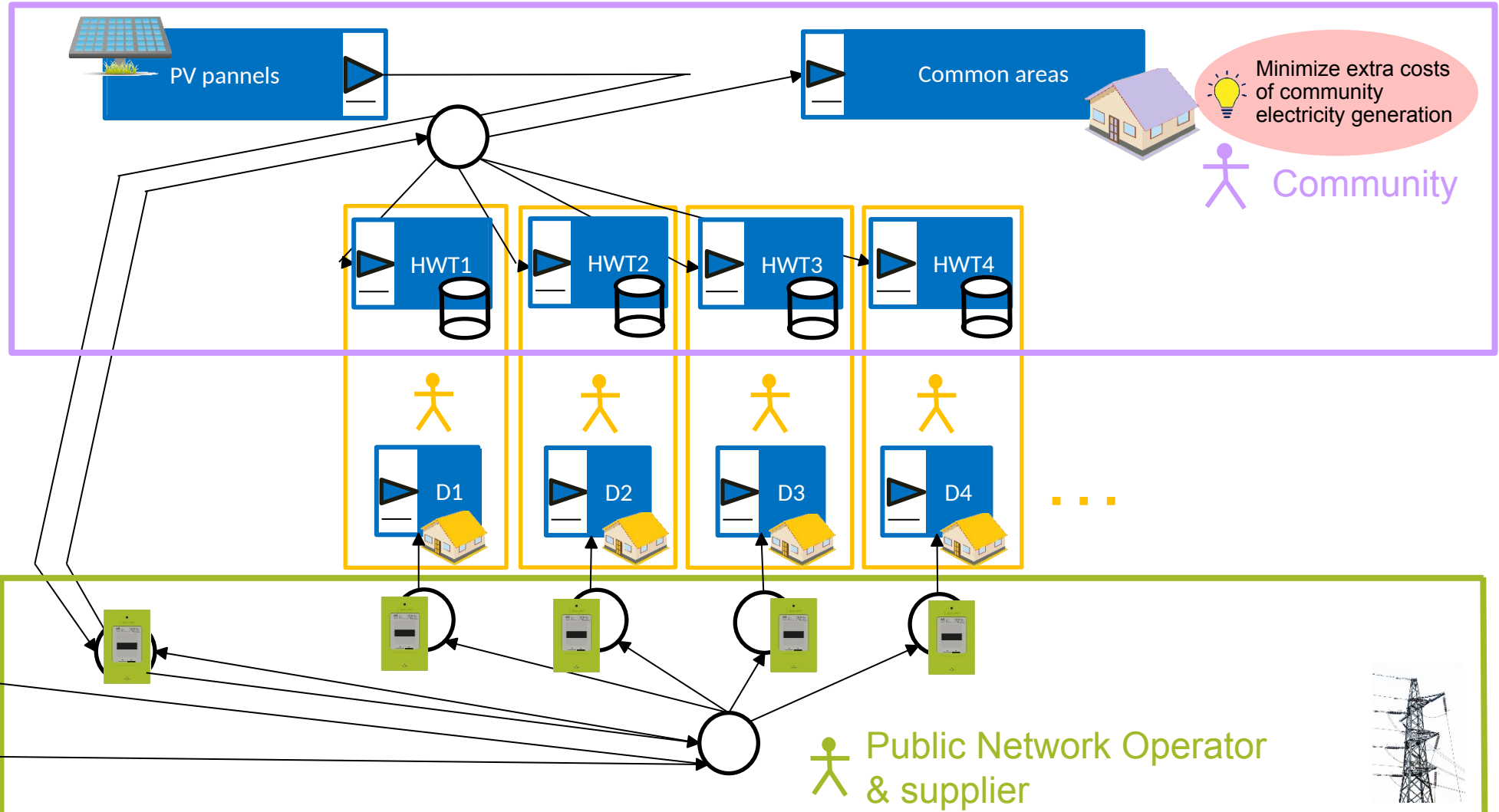


3Rd ASSEMBLAGE

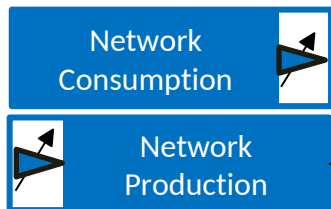
COLLECTIVE SELF-CONSUMPTION + DIRECT SELF-CONSUMPTION FOR HEAT WATER TANKS

Legend

- Energy flow
- Production unit
- Consumption unit
- Community
- Household
- Network Operator & Supplier
- Regulator
- Socio-energy node

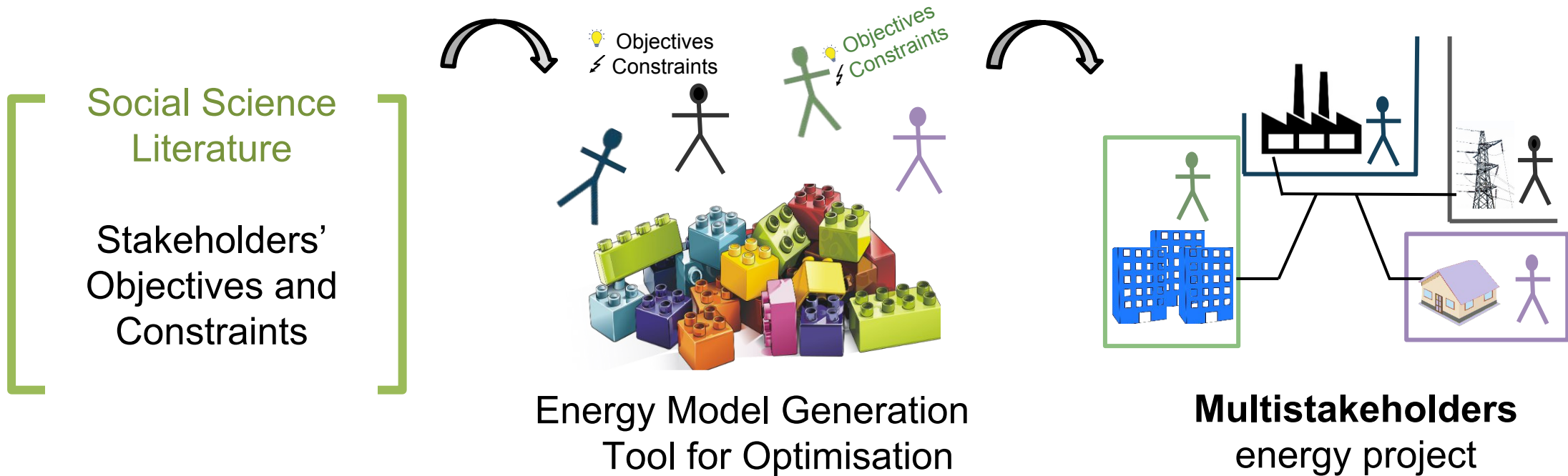


European law



Public Network Operator & supplier

SUMMARY



Use case: energy sharing in a participative multi-dwelling building

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Thank you for your attention !

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