BLACKLIGHT ANALYTICS

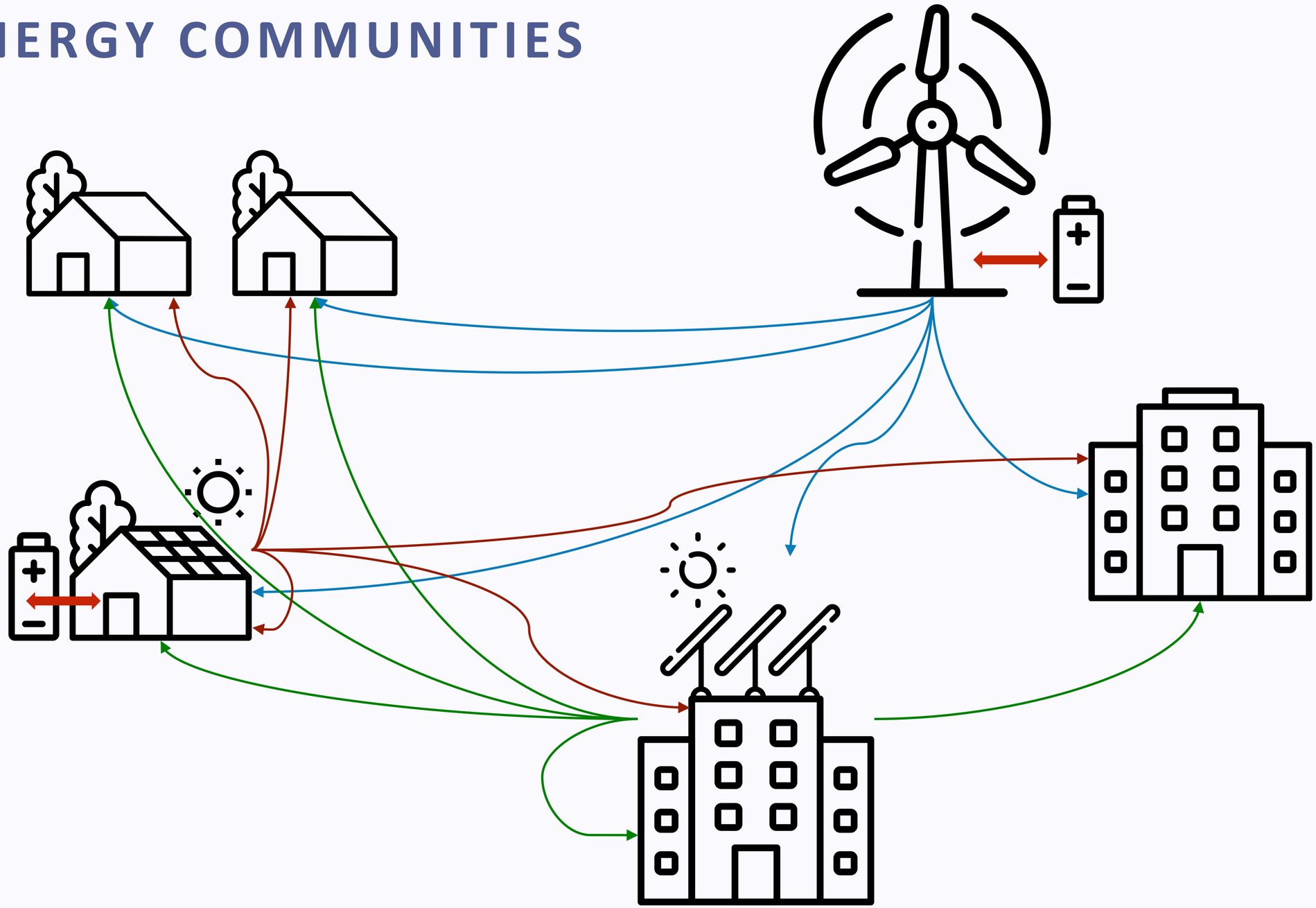
WE PROVIDE INTELLIGENT SOFTWARE SOLUTIONS FOR ENERGY SYSTEMS

ENERGY MANAGEMENT SYSTEMS FOR ENERGY COMMUNITIES

SMARTENERGY Six pack training series

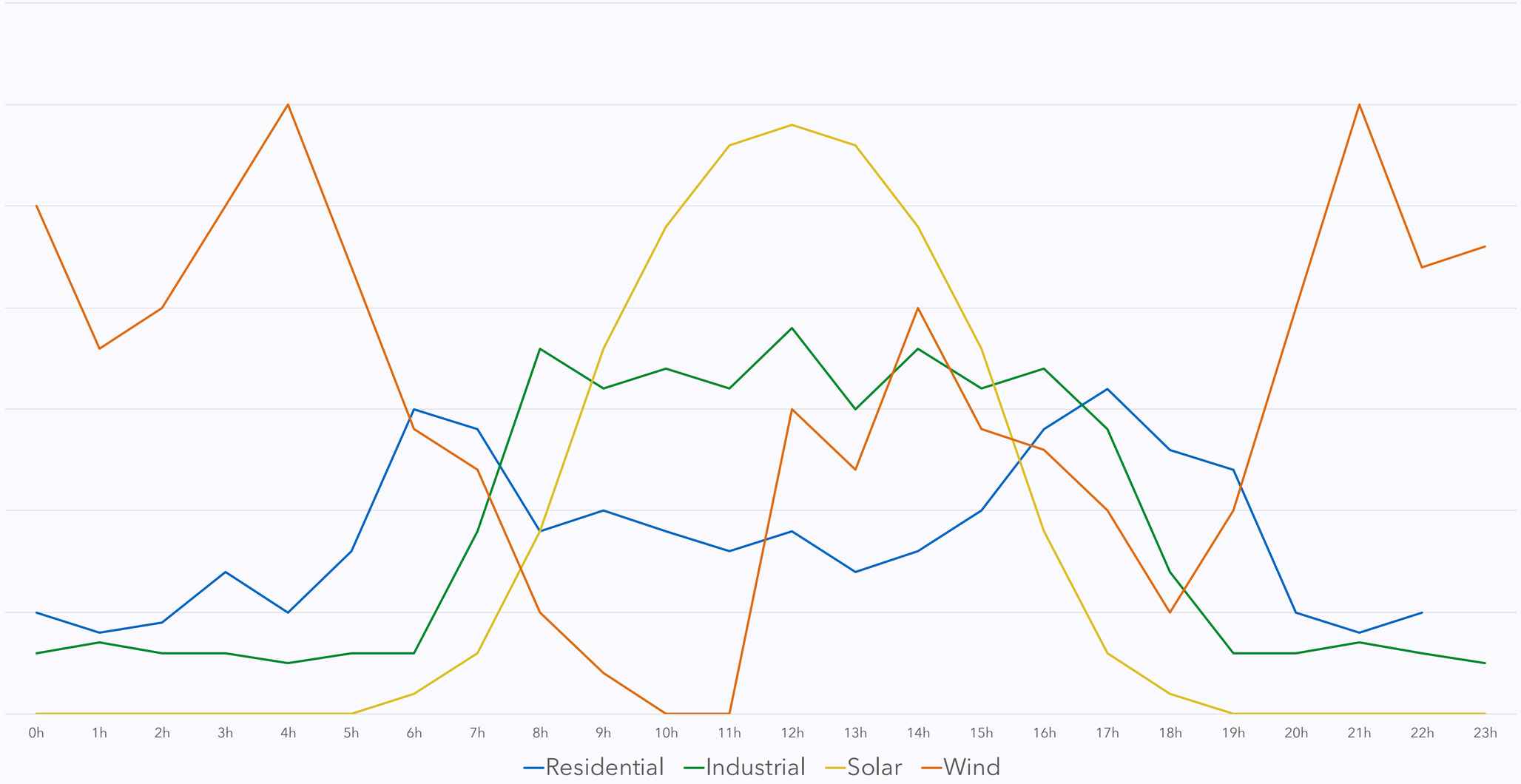
Q. Gemine – March 16, 2021

ENERGY COMMUNITIES



ENERGY COMMUNITIES

ENERGY PROFILES



MINIMIZE ELECTRICITY COSTS

We can formulate an optimization problem to minimize the sum of electricity costs of the community members over time :

$$\sum_{t=0}^{T} \sum_{i=1}^{I} \left[\xi_i^b \cdot \left(C_{t,i}^n - a_{t,i} \right) + \xi_i^{l-} \cdot a_{t,i} - \xi_i^{l+} \cdot y_{t,i} - \xi_i^s \cdot \left(P_{t,i}^n - y_{t,i} \right) \right] \quad \forall (t,i)$$

Supply & grid import price

Demand – community import

Community import price

Community import

Community export price

Community export

Selling & grid export price

Production – community export

COSTS

REVENUES

CONTROL MEANS - VIRTUAL

Allocation of local energy production to community members is a virtual control mean as it affects metering data instead of energy flows. These control means are:

- the share of local renewable production that is allocated to every member,
- the share of each member's production that goes to the community.

$$\sum_{t=0}^{T} \sum_{i=1}^{I} \left[\xi_i^b \cdot \left(C_{t,i}^n - a_{t,i} \right) + \xi_i^{l-} \cdot a_{t,i} - \xi_i^{l+} \cdot y_{t,i} - \xi_i^s \cdot \left(P_{t,i}^n - y_{t,i} \right) \right] \quad \forall (t, i)$$

OPTIMAL CONTROL

The optimization process for minimizing energy costs of community members can be performed in two steps:

1. Plan both physical and virtual control means under uncertainty, eventually in a receding horizon approach.

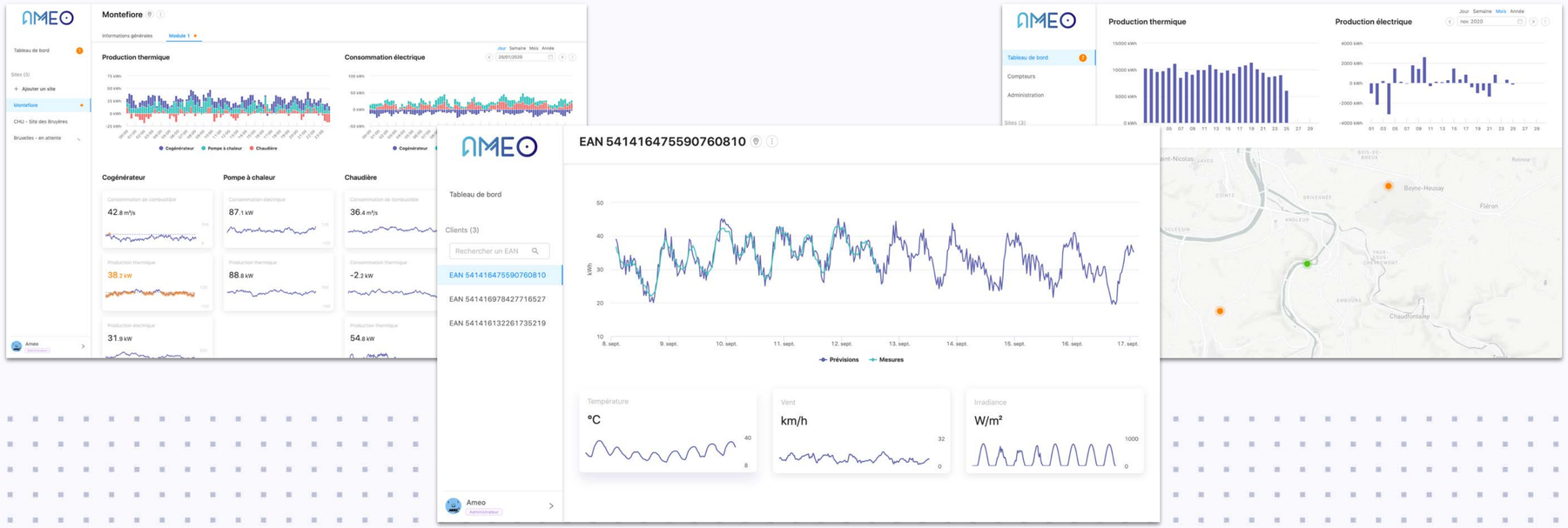
2. Run an ex-post optimization of virtual control means, once all energy flows are known with certainty.

$$\sum_{t=0}^{T} \sum_{i=1}^{I} \left[\xi_i^b \cdot \left(C_{t,i}^n - a_{t,i} \right) + \xi_i^{l-} \cdot a_{t,i} - \xi_i^{l+} \cdot y_{t,i} - \xi_i^s \cdot \left(P_{t,i}^n - y_{t,i} \right) \right] \quad \forall (t, i)$$

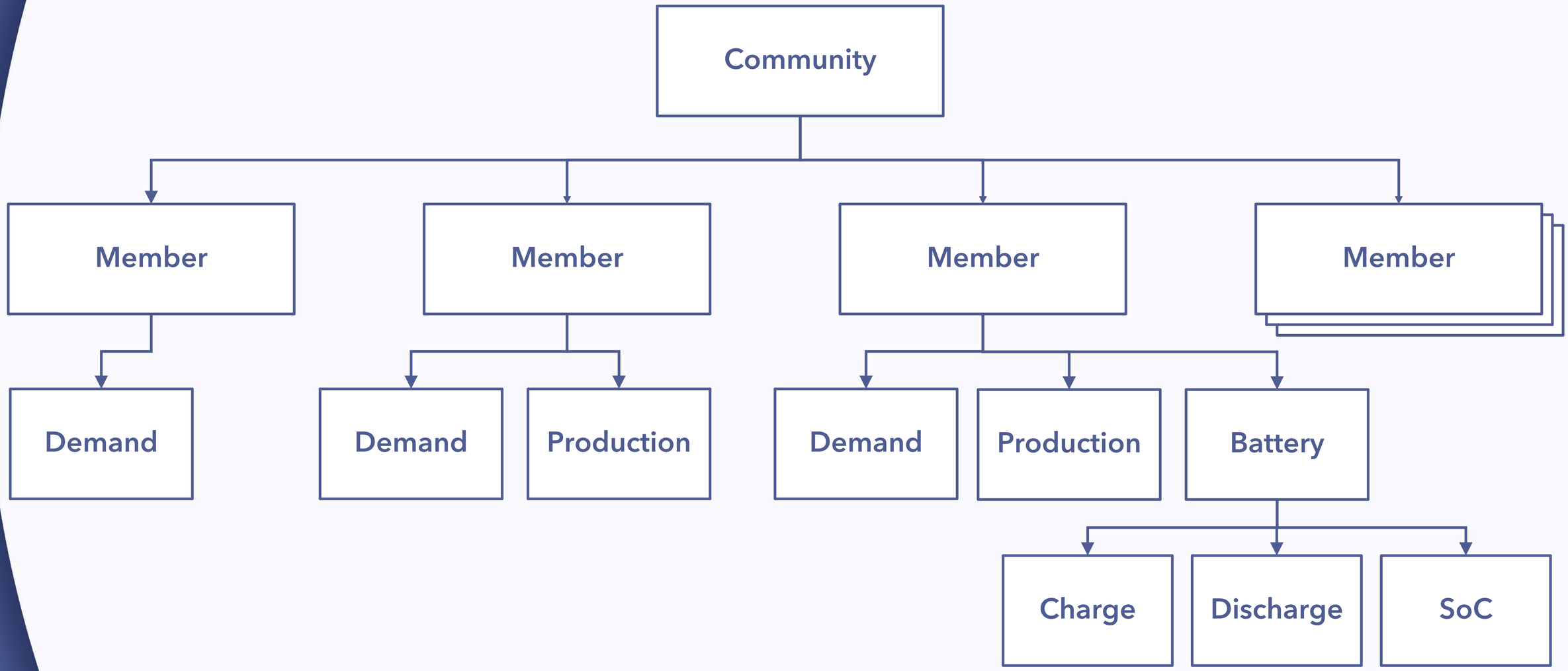
AMEO

Advanced Management of Energy Operations is a software solution developed by Blacklight Analytics and dedicated to the advanced management of energy data and operations.

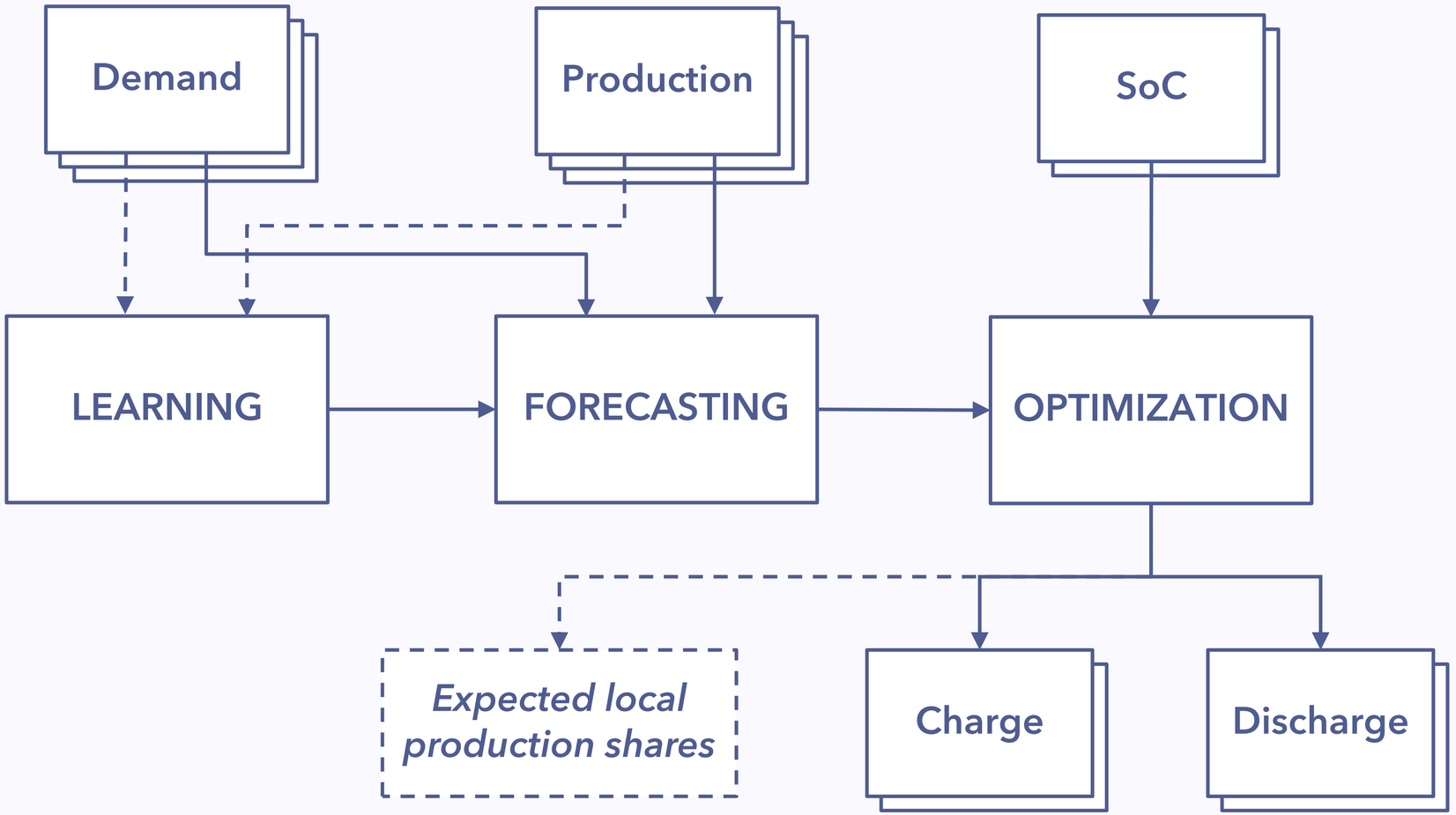
The solution collects and processes data from various sources and runs intelligent forecasting and decision-making algorithms to optimize the economic and technical operations of energy systems.



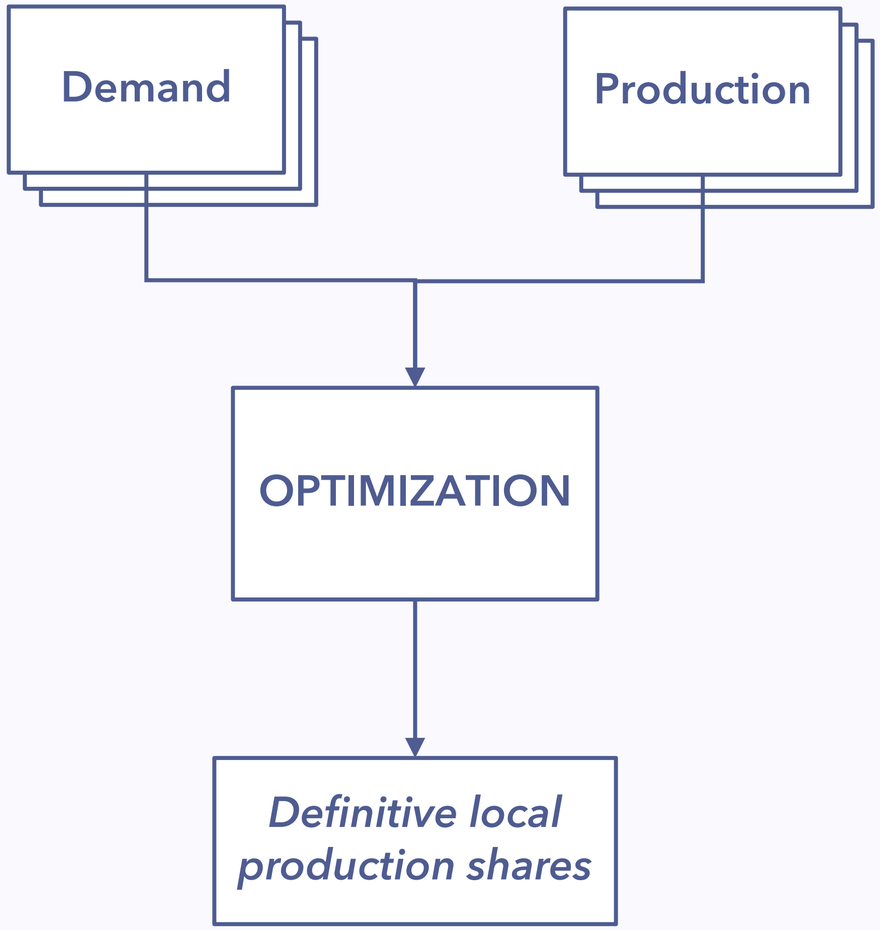
AMEO FOR ENERGY COMMUNITIES



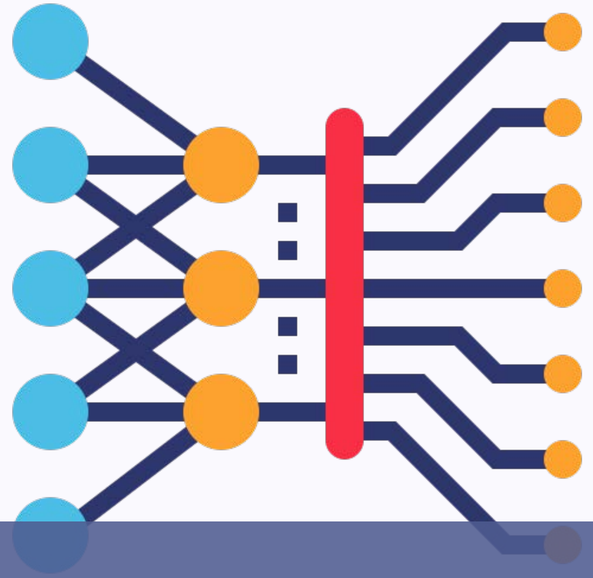
ACTIVE COMMUNITY MANAGEMENT



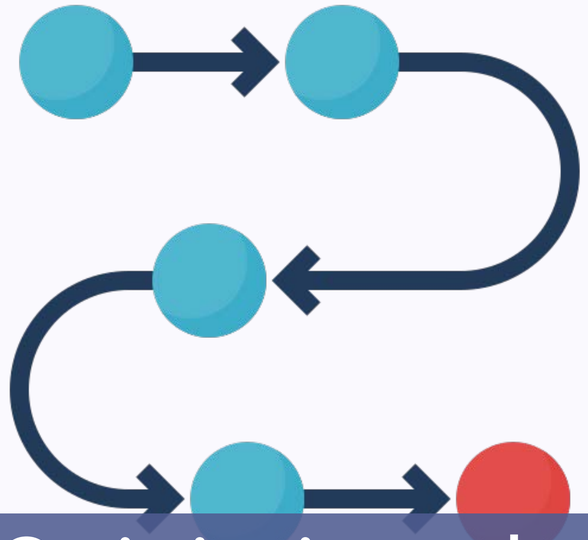
EX-POST OPTIMIZATION



R&D FOR ENERGY COMMUNITIES…



Machine Learning



Optimization under uncertainty

Optimal Bidding

... AND FOR OTHER USE CASES

Modeling level

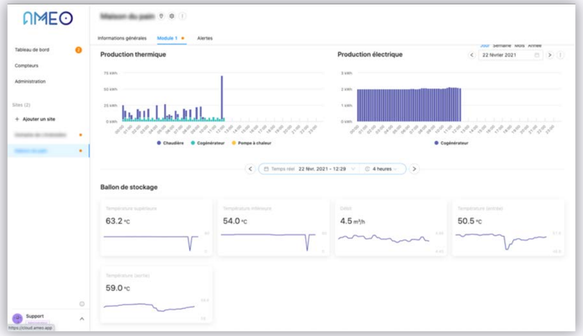
Aggregated

Detailed

Aggregated day-ahead nominations

Demand forecasting, flexibility planning, and nominations

Process supervision



Real-time *Intraday* *Day-ahead*

Time horizon

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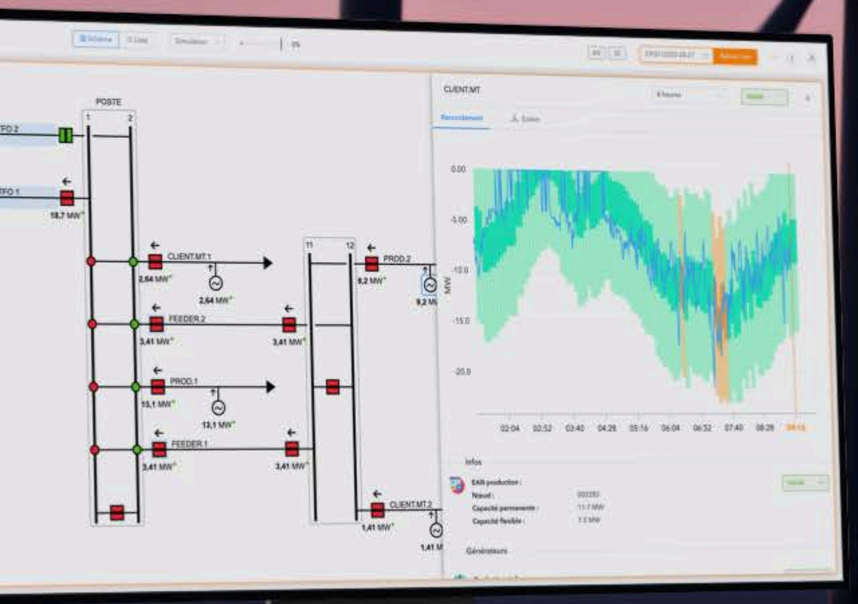

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