

# Energy sharing models and flexibility delivery from energy communities

**U24U Webinar Series**

March 20<sup>th</sup>, 2026

Organizer: Anibal Sanjab (VITO)



# Agenda



- **Timing: 10:00 – 12:00 CET**
- **Welcome** (5 min)
- **U2Demo Project introduction** (5 min)
- **Technical presentations – energy sharing models and flexibility provision**
  - Energy sharing models and flexibility instruments classification – VITO (15 min)
  - General case study description (5 min)
  - Capacity, energy, and revenue allocation model – VITO (15 min)
  - Energy sharing at predefined internal prices model – KU Leuven (15 min)
  - Auction-based local energy trading models – Artelys (15 min)
  - Pool-based peer-to-peer energy trading models – INESC-ID (15 min)
- **Panel discussion and Q&A** (30 min)

# Presenters and Panelists

## Opportunities and challenges of local energy sharing and flexibility provision by energy communities



### Presenters

**Anibal Sanjab** (VITO & EnergyVille)

**Wicak Ananduta** (VITO & EnergyVille)

**Yucun Lu** (KU Leuven & EnergyVille)

**Nicolas Fatras** (Artelys)

**Diogo Pinto Ferreira** (INESC-ID)

### Panelists

**Rita Alexandra Mota** (EDP & Eurelectric)

**Maximilian Urban** (Netz Niederösterreich & E.DSO)

**Lucila de Almeida** (EUI - FSR)

**Bart De Bruyne** (KLIMAAN)

**Francisco Luque** (INTELLIGENT project & R2M Solution)





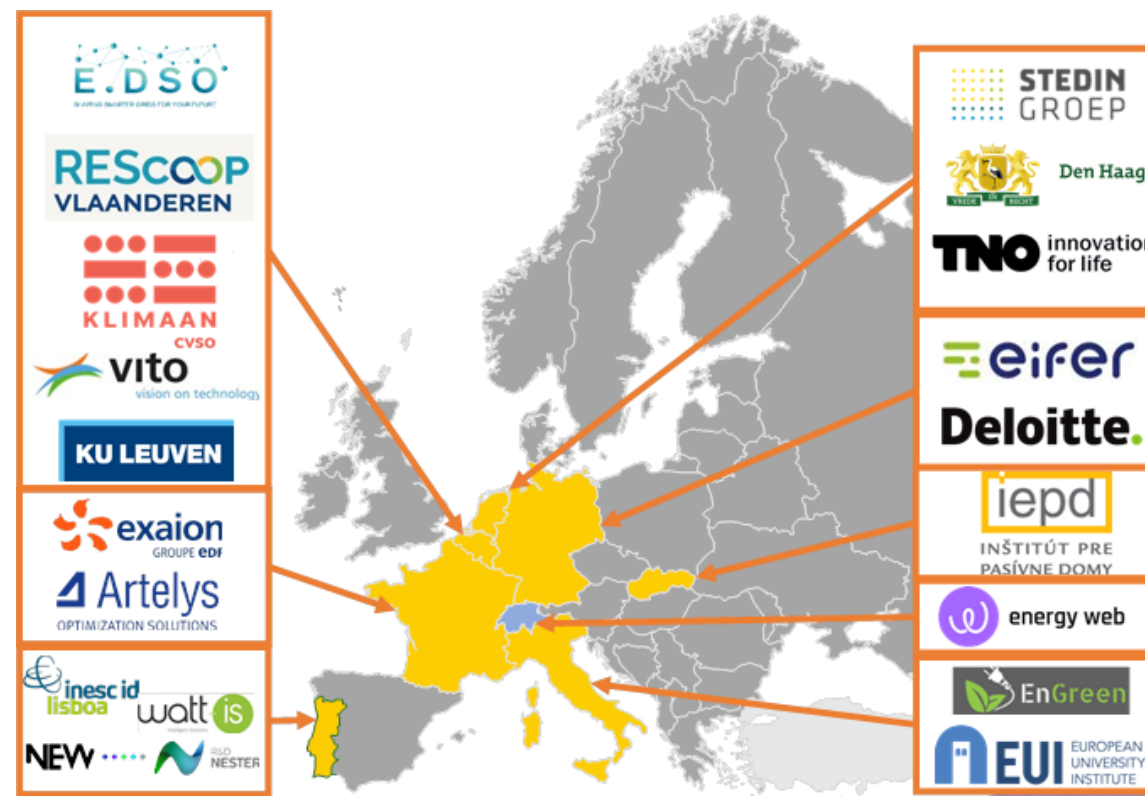
# U2Demo Project



# U2Demo Project

## Use of open-source P2P energy sharing platforms for energy democratization

- ✓ Horizon Europe
- ✓ Kick-off September 2024 (42 months)
- ✓ Coordinated by INESC-ID
- ✓ 20 partners
- ✓ 8 countries
- ✓ 4 demonstration sites:
  - The Netherlands, Italy, Belgium, Portugal



Creation of innovative solutions that facilitate  
a widespread participation in P2P trading and Energy Sharing



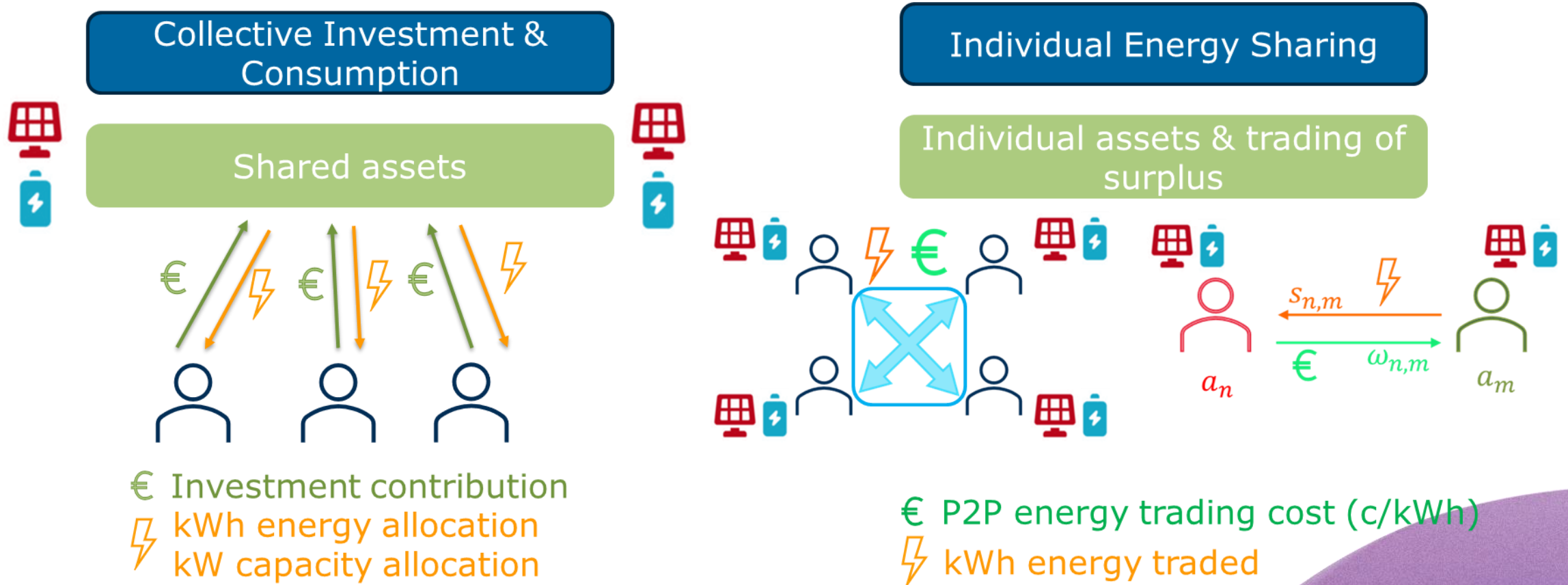
**U2DEMO**

# Classification of Energy sharing models and flexibility instruments

Anibal Sanjab  
(VITO)

# Local Energy Sharing Models

## Main classification dimensions



Remark: Energy sharing vs. trading

# Local Energy Sharing Models

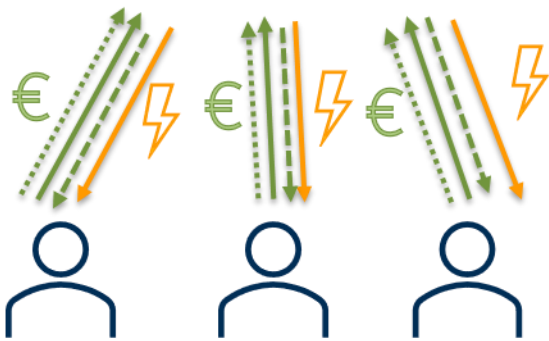
## Collective investments and consumption

Collective Investment & Consumption

Cooperative model w/o energy sharing

Cooperative model without energy sharing (Model 1):

- Members buy in.
- Members potentially receive dividends.
- No energy sharing: members receive a supply contract (static or dynamic) from their cooperative.



€ → Buy in/Membership fee (share purchasing)  
€ - - - Dividends  
€ ···· Reduced rate (static or dynamic)

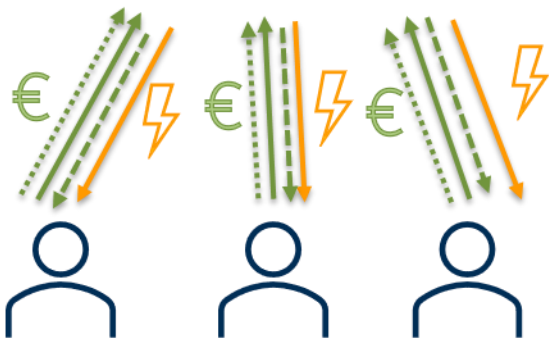
⚡ kWh energy use – similar to a supplier function

# Local Energy Sharing Models

## Collective investments and consumption

### Collective Investment & Consumption

#### Cooperative model w/o energy sharing



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- Dividends
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#### Cooperative model without energy sharing (Model 1):

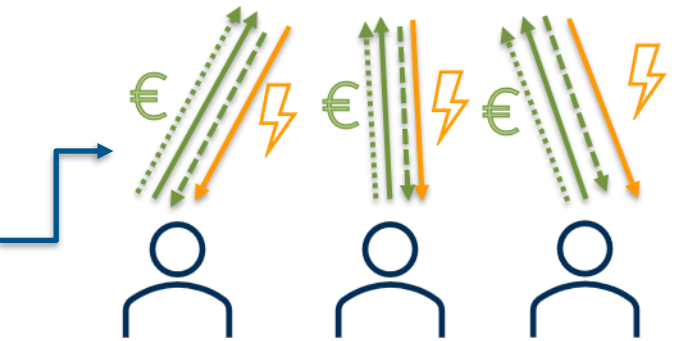
- Members buy in.
- Members potentially receive dividends.
- No energy sharing: members receive a supply contract (static or dynamic) from their cooperative.

#### Capacity, energy, and revenue allocation model (Model 2):

- Members join a collective investment (e.g., share buy in).
- Members potentially receive dividends.
- Energy, capacity, and/or revenue sharing: energy, capacity, and/or revenue sharing: energy/capacity available is allocated among the members (reduced rate), while residual demand is met by a regular supplier.

### Collective Investment & Consumption

#### Capacity or Energy Sharing



- € → Buy in and investment costs
- Dividends
- ⋯ Reduced rate (static or dynamic)

⚡ kWh energy allocation  
kW capacity allocation

# Local Energy Sharing Models

## Individual energy sharing – Centralized models

Individual Energy Sharing – Centralized

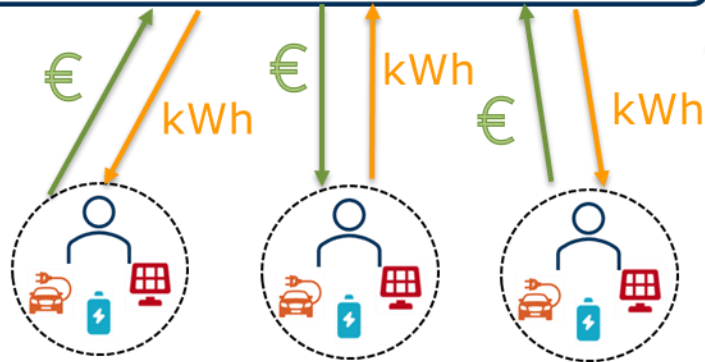
Predefined pricing mechanism (uniform)

Community Manager – Definition of Internal Pricing

No P2P Trading, rather: Peers-to-Pool, Pool-to-Peers

Energy sharing at predefined internal prices (Model 3):

- Price defined by community manager for internal energy sharing
- Collective surplus energy is allocated (based on defined rules) to (partially) meet the needs of the community members
- Potential application in ex-post accounting within the community



€ Internal price defined by manager

kWh Energy received from other peers

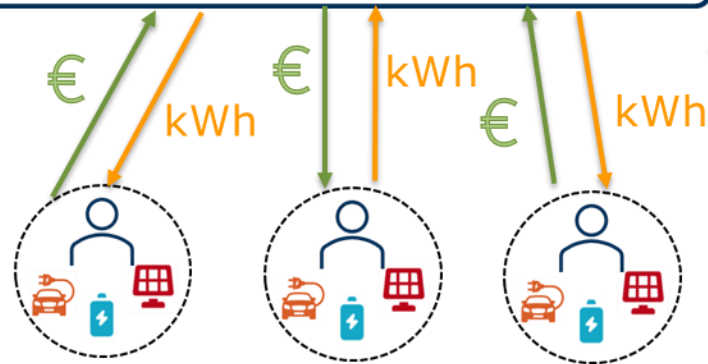
# Local Energy Sharing Models

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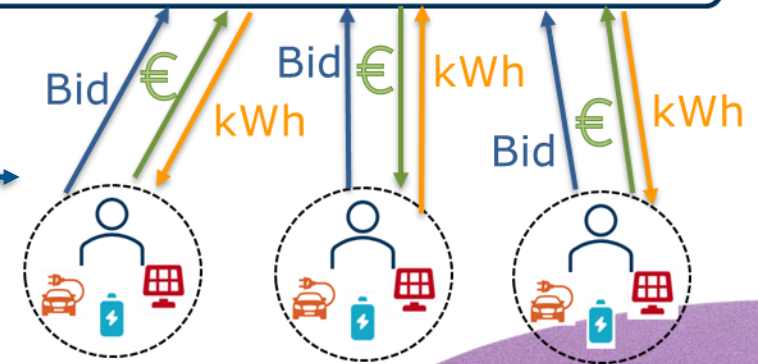
Auction-based local trading (Model 4):

- Peers submit sell offers and buy bids (e.g. price quantity pairs)
- Market cleared by community manager, resulting in an energy allocation
- Max SEW, or min cost measures for market clearing

Individual Energy Sharing – Centralized

Auction based energy sharing

Local Market (centralized, auction-based)



Bid Bids: {price, quantity}pairs

€ Market price

kWh Energy allocation/dispatch



# Local Energy Sharing Models

## Individual Energy Sharing – Distributed

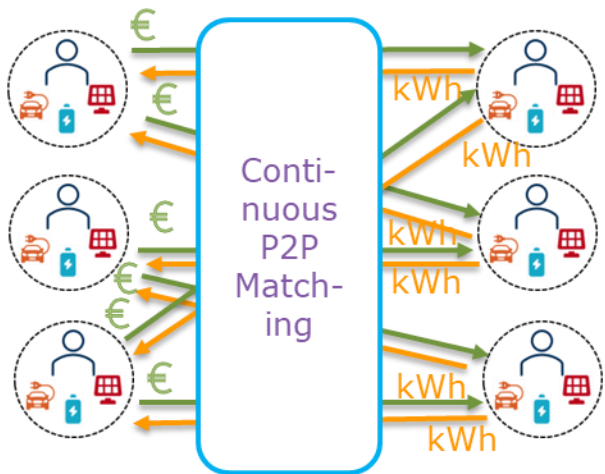
P2P/Energy Sharing – Distributed

Actual peer-to-peer trading

Continuous P2P Trading

**Continuous P2P Trading (Model 5):**

- P2P trading platform in which peers place sell offers and buy bids (prices and quantities)
- Peers enter and decide to match with other peers (first come, first served basis) based on monetary and/or other criteria
- No matching algorithm required



€ Bilateral, P2P, trading price  
kWh Bilateral, P2P, energy exchange

# Local Energy Sharing Models

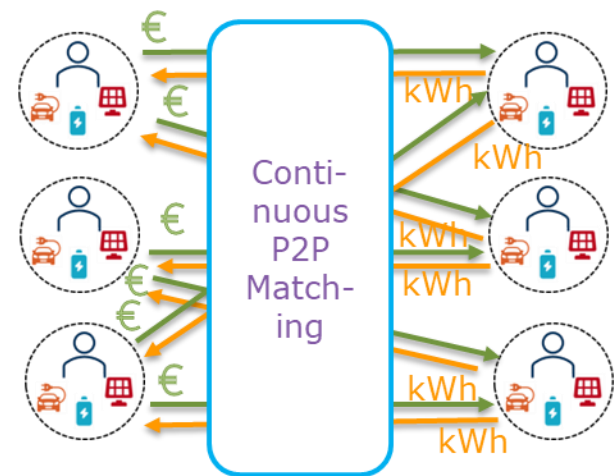
## Individual Energy Sharing – Distributed

P2P/Energy Sharing – Distributed

Actual peer-to-peer trading

P2P/Energy Sharing – Distributed

Continuous P2P Trading



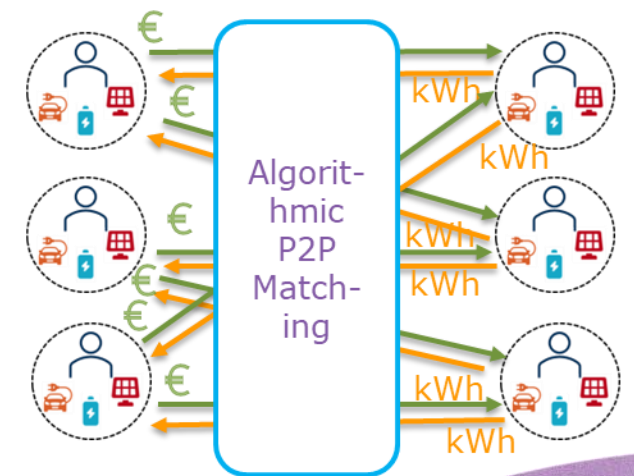
### Continuous P2P Trading (Model 5):

- P2P trading platform in which peers place sell offers and buy bids (prices and quantities)
- Peers enter and decide to match with other peers (first come, first served basis) based on monetary and/or other criteria
- No matching algorithm required

### Pool-based P2P trading (Model 6):

- Each peer has options to trade with other peers
- Peers' have preference (monetary and non-monetary)
- Reciprocity constraint (game-theoretic matching problems)

Pool-based P2P Matching

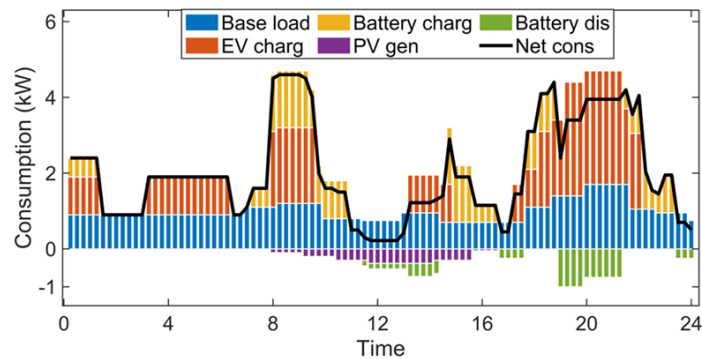
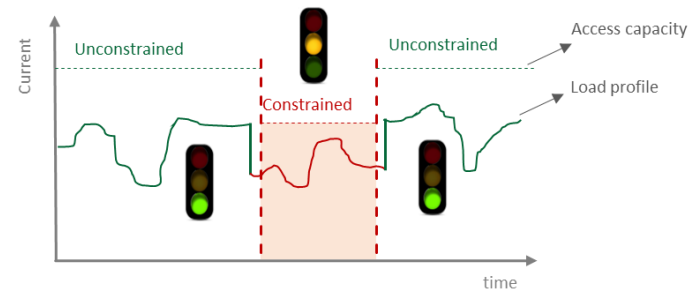
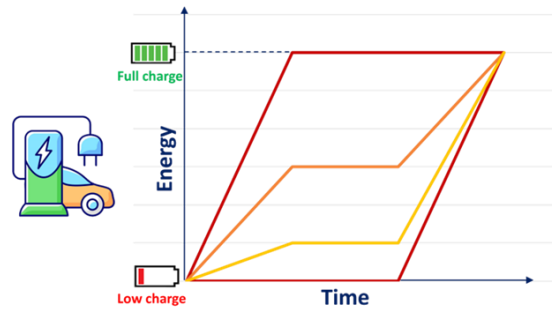


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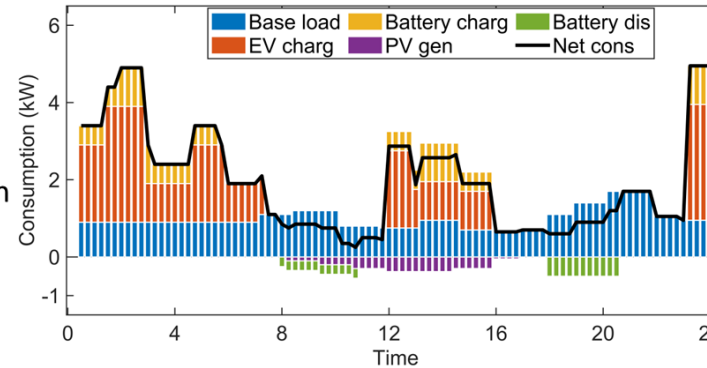
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# Energy Management vs. Flexibility Instruments vs. Flexibility Services

**Flexibility:** Changing net-consumption schedule via direct control/imposed limits, in reaction to price incentives (**implicit flexibility**), or to explicitly offer a flexibility volume for an ask price (**explicit flexibility**)



Change in  
→  
Consumption  
schedule



Flex within community falls within the energy sharing model and not within flexibility services delivery (flexibility reservation and activation for grid/system services)

# Energy Management vs. Flexibility Instruments vs. Flexibility Services

## Flexibility instruments



Technical solutions including network reconfiguration



Rule based solutions and connection agreements (direct control)



Tariff based solutions (indirect control)



Market based solutions (purchase flexibility)

# Energy Management vs. Flexibility Instruments vs. Flexibility Services

## Flexibility instruments: Direct control



Technical solutions including network reconfiguration



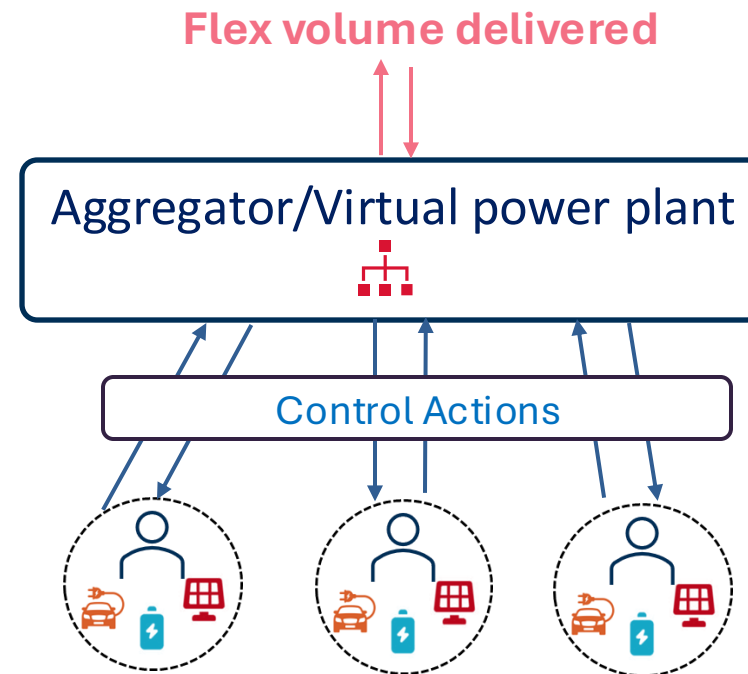
Rule based solutions and connection agreements (direct control)



Tariff based solutions (indirect control)



Market based solutions (purchase flexibility)



# Energy Management vs. Flexibility Instruments vs. Flexibility Services

Flexibility instruments: Flexible (dynamic) connection agreements



Technical solutions including network reconfiguration



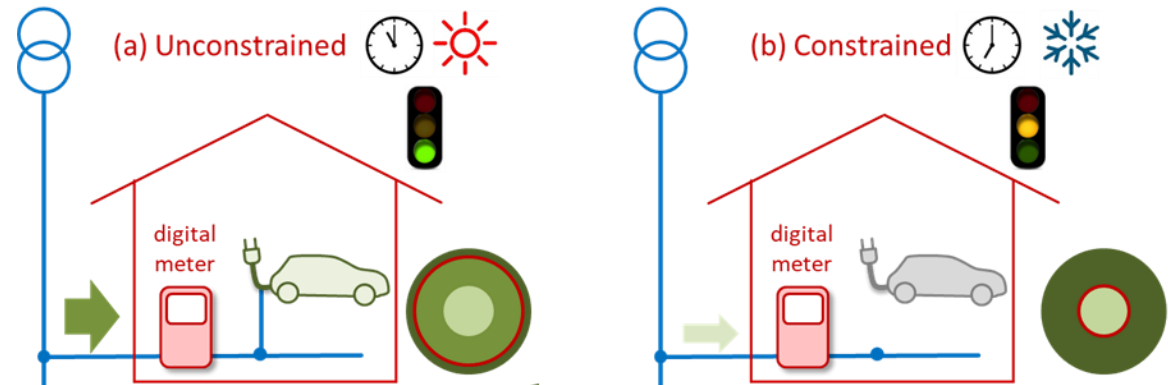
Rule based solutions and connection agreements (direct control)



Tariff based solutions (indirect control)



Market based solutions (purchase flexibility)



Connection capacity modified by SO depending on the state of the grid

# Energy Management vs. Flexibility Instruments vs. Flexibility Services

## Flexibility instruments: Implicit flexibility



Technical solutions including network reconfiguration



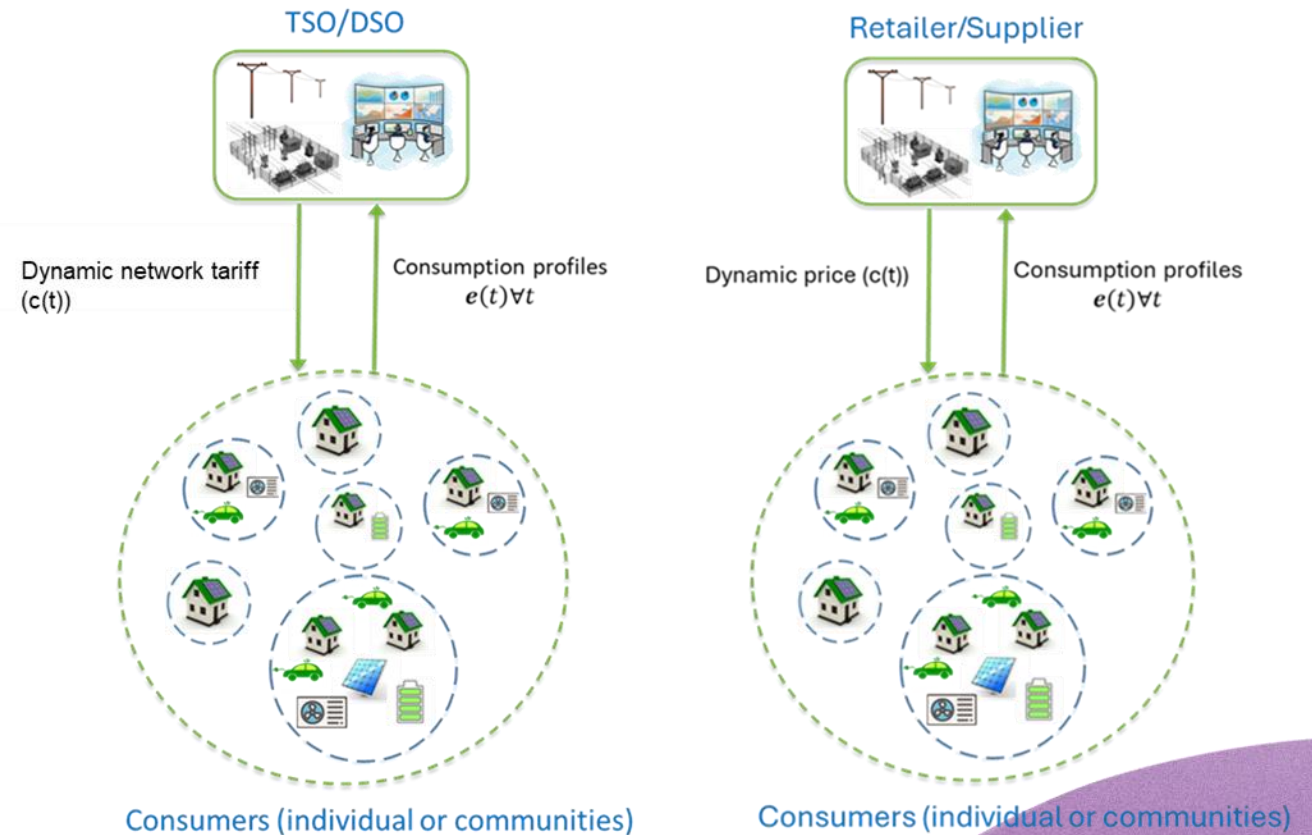
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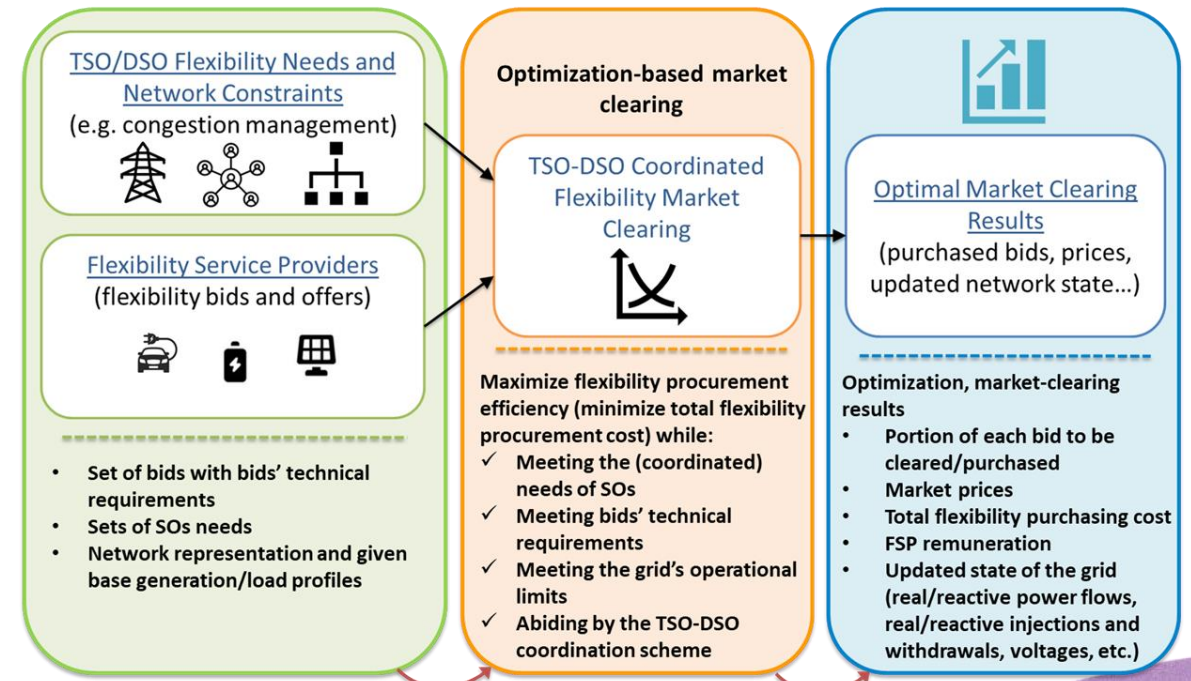
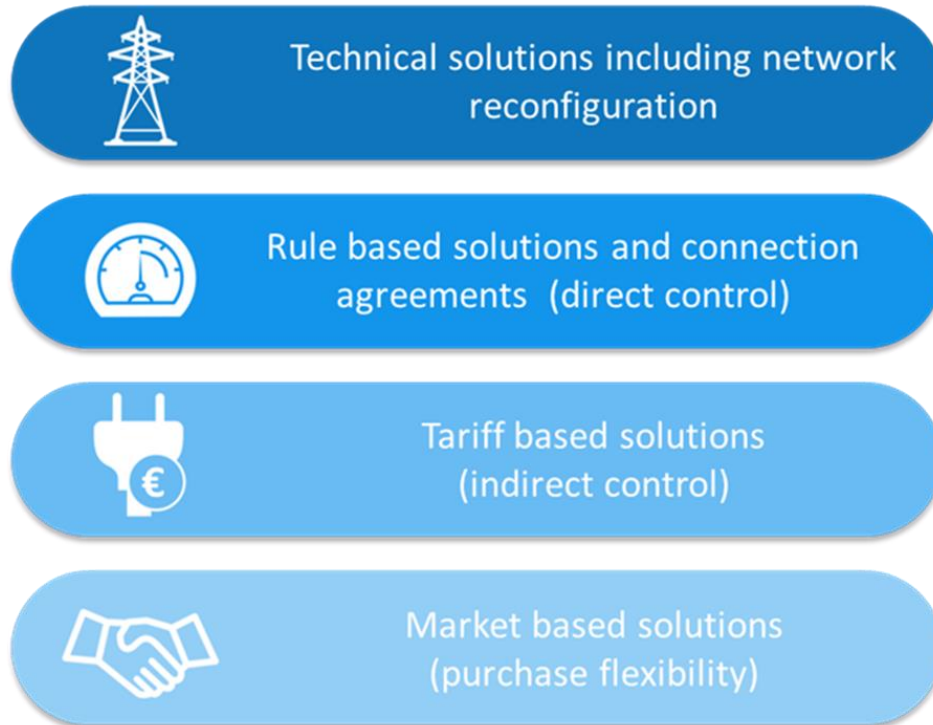
Market based solutions (purchase flexibility)



Community members receive and react to time-varying prices (static vs. dynamic retail prices, static vs. dynamic/ energy-based vs. capacity-based network tariffs)

# Energy Management vs. Flexibility Instruments vs. Flexibility Services

## Flexibility instruments: Explicit flexibility



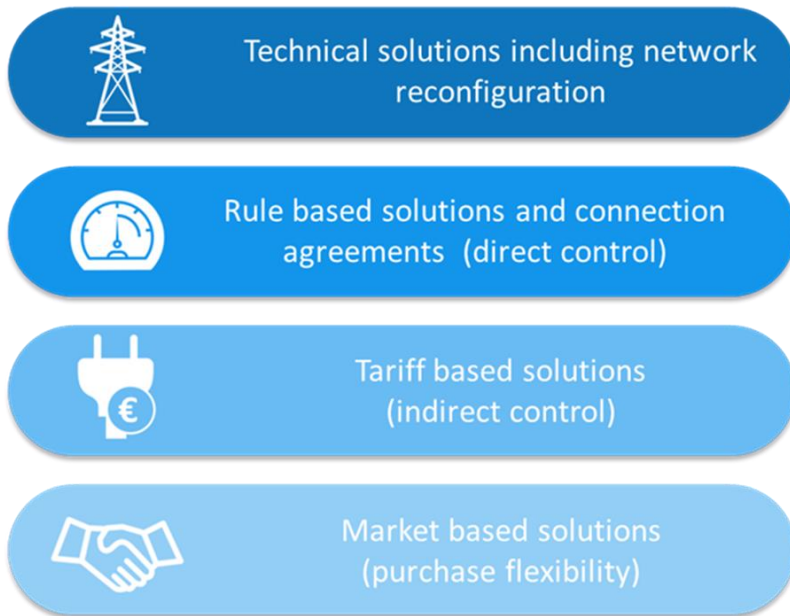
Source: H2020 OneNet D3.3

Community explicitly offers flexibility (e.g., price, quantity pairs) – the responsibility to meet the collective flexibility offers will then have to be split among the community members

# Energy Management vs. Flexibility Instruments vs. Flexibility Services

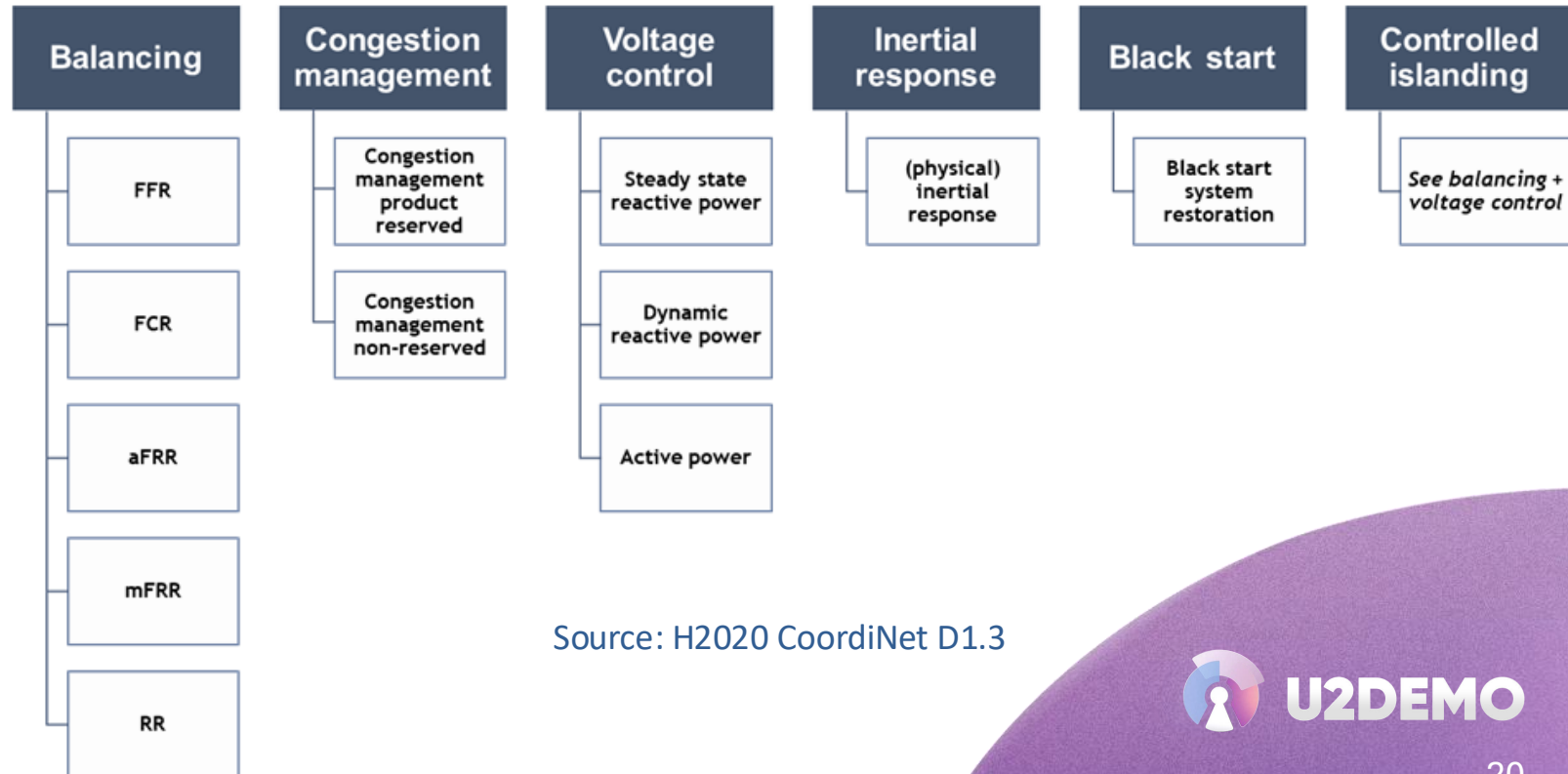
System or grid service delivered via flexibility

## Flexibility instruments



Practical example: Peak shaving (kWmax)

## Flexibility services



Source: H2020 CoordiNet D1.3



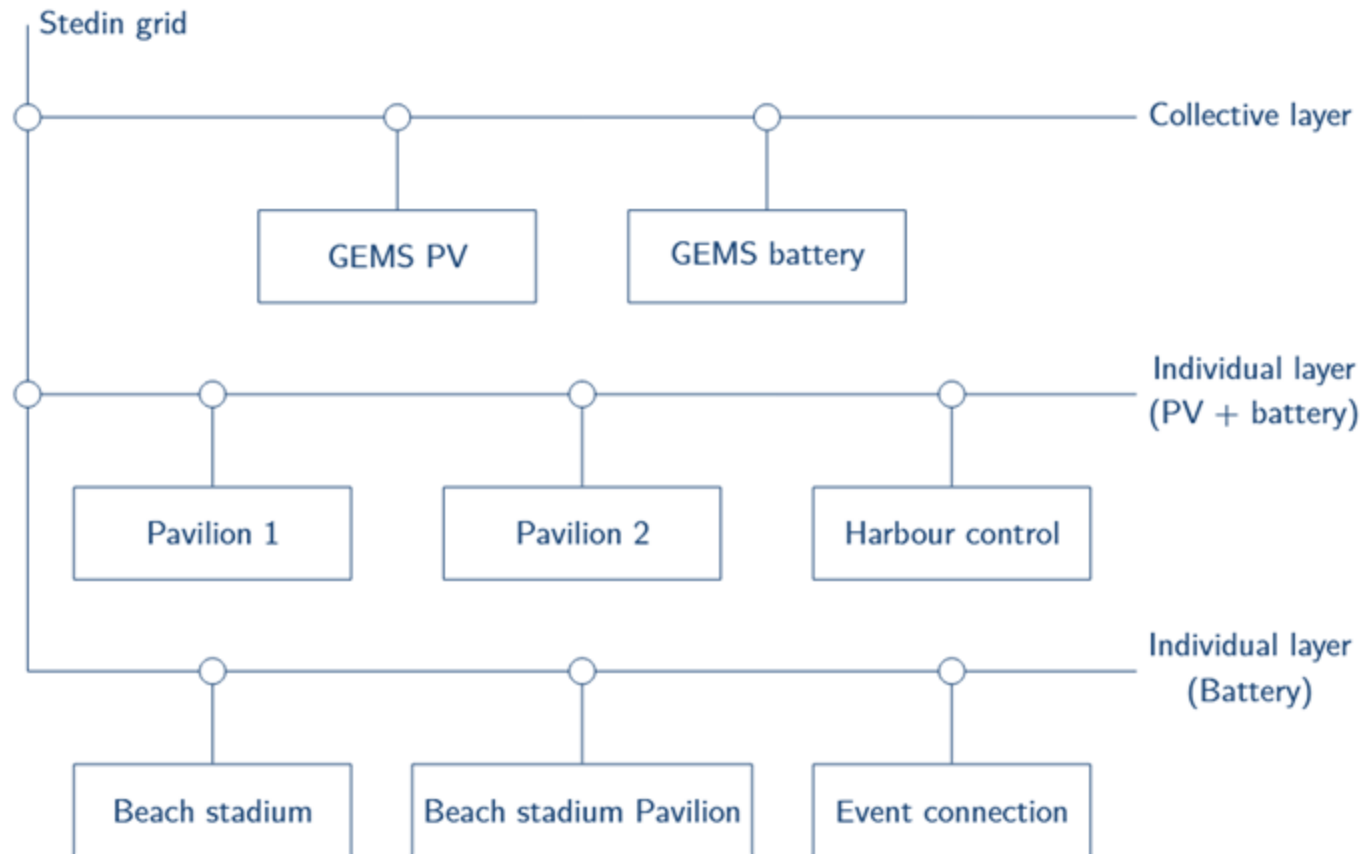
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# Common case study definition

**Wicak Ananduta  
(VITO)**

# The Dutch pilot

## The Scheveningen living lab, The Hague



# Case description

- **Case 1:** current setting
- **Case 2:** lower flexibility (higher local generation)
- **Case 3:** higher flexibility (higher local generation)

Entity	Type	Case 1		Case 2		Case 3	
		Power	Energy	Power	Energy	Power	Energy
GEMS	Collective	200	425	20	42.5	200	425
Pavilion 1	Individual	0	0	22	66	22	66
Pavilion 2	Individual	0.8	1.5	0.8	1.5	15	30
Harbour control	Individual	0	0	0	0	30	70
Beach stadium	Individual	0	0	0	0	2	4
Beach stadium Pavilion	Individual	0	0	0	0	2	4
Event connection	Individual	0	0	0	0	10	20

Battery parameters

Entity	Type	Case 1	Case 2	Case 3
GEMS	Collective	9	45	45
Pavilion 1	Individual	0	9	9
Pavilion 2	Individual	9	9	9
Harbour control	Individual	29	29	29
Beach stadium	Individual	0	0	0
Beach stadium Pavilion	Individual	0	0	0
Event connection	Individual	0	0	0

PV parameters

- **Electricity contracts:**
  1. Dynamic
  2. Static
- **Simulation period:** August 2024-July 2025 (30 representative days)

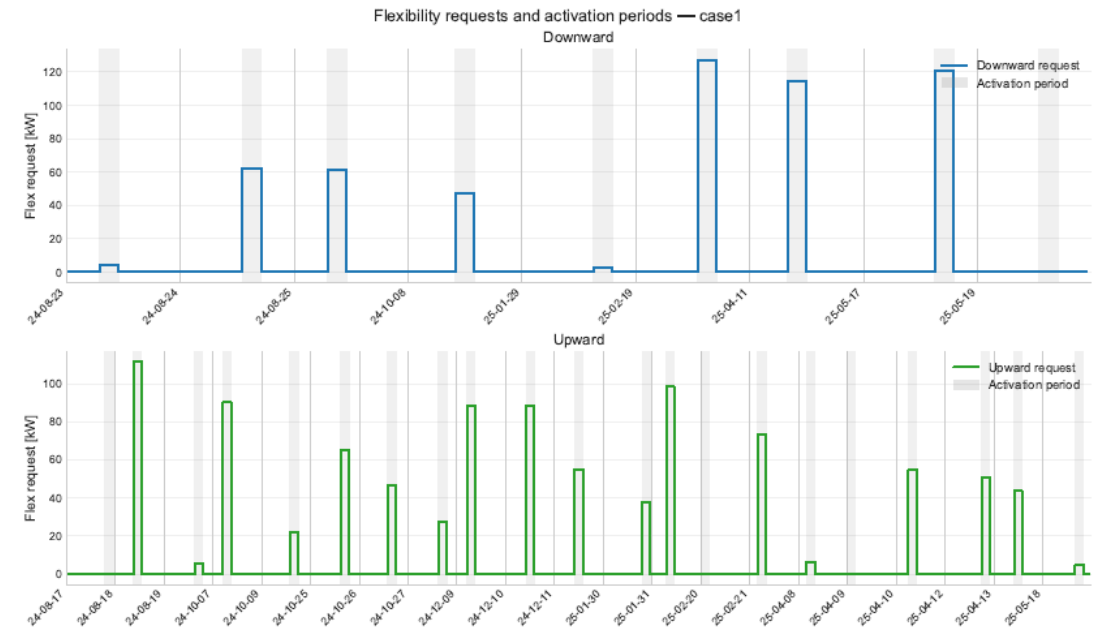
# Flexibility Provision Services and instruments

## kW-max Service

- Limiting offtake/injection of community
- Implicit (Tariff-based) mechanisms: Capacity and Time-of-Use (volumetric)
  - Capacity tariff according to local DSO
  - ToU tariff with similar budget
- Rule-based mechanism:
  - Static limit at 200 kW
  - Dynamic limits

## Active-power-based services

- Procurement via market
- Predefined flexibility requests (activation window, volume, and price)



# Numerical study

## Key performance indicators and baselines

### KPIs:

- Total (and individual) energy costs and cost savings
- Self-consumption rate
- Offtake peak of community
- Flexibility remuneration (revenue)

### Baselines:

- Community without energy sharing/trading
- Community without flexibility mechanisms (with energy sharing/trading)



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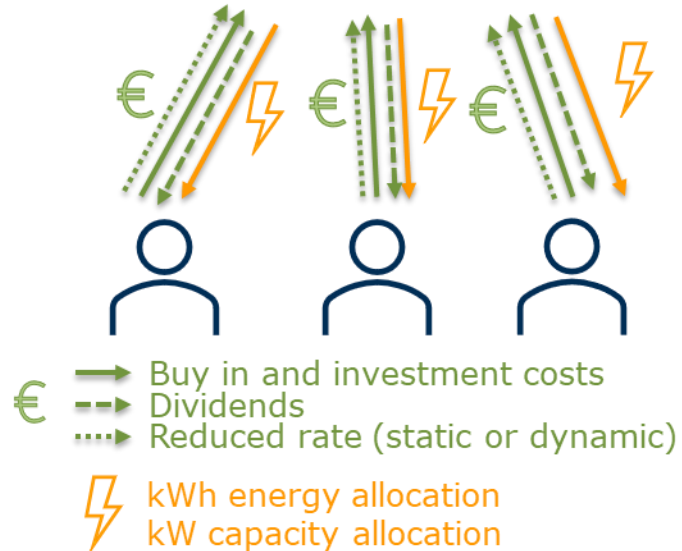
# Capacity, Energy, and Revenue allocation model

Wicak Ananduta  
(VITO)

# Model Description

Collective Investment & Consumption

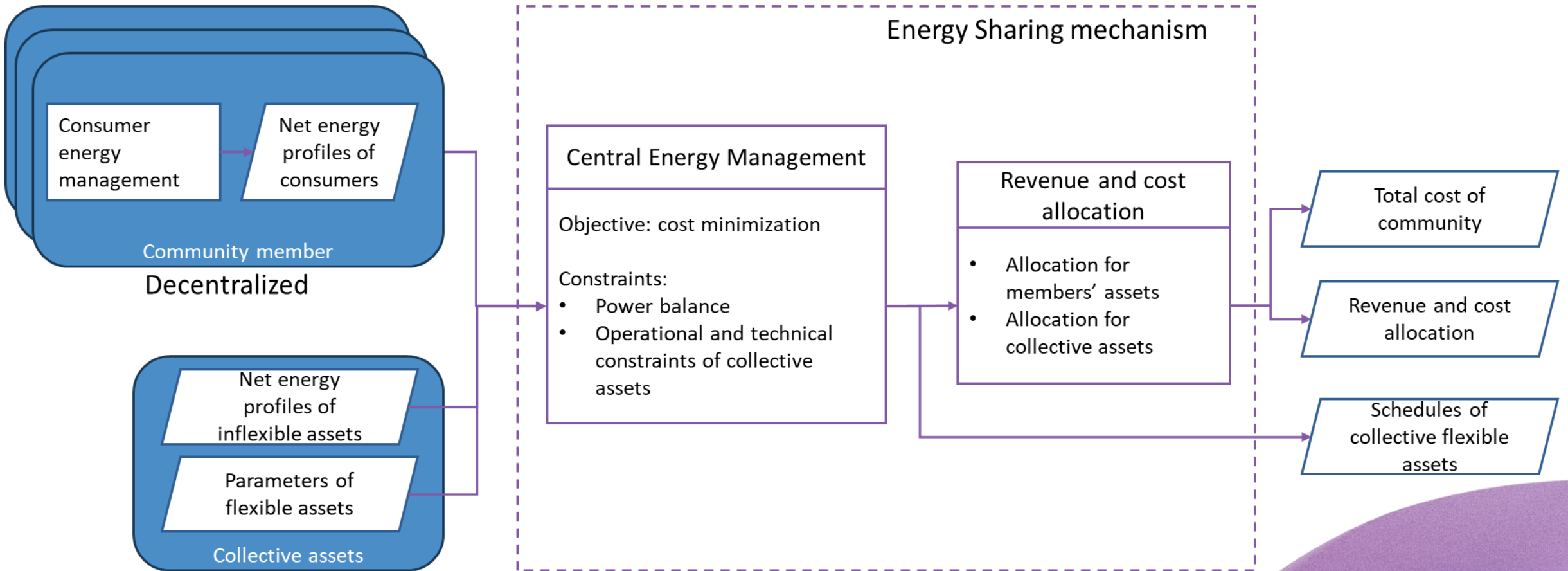
Capacity or Energy Sharing



- Community members own individual and collective assets
- Energy management schemes:
  - Decentralized
  - Centralized
- Benefit allocation mechanisms:
  - Energy allocation
  - Cost allocation
- Flexibility provision:
  - kWmax service
  - Quantification
  - Activation

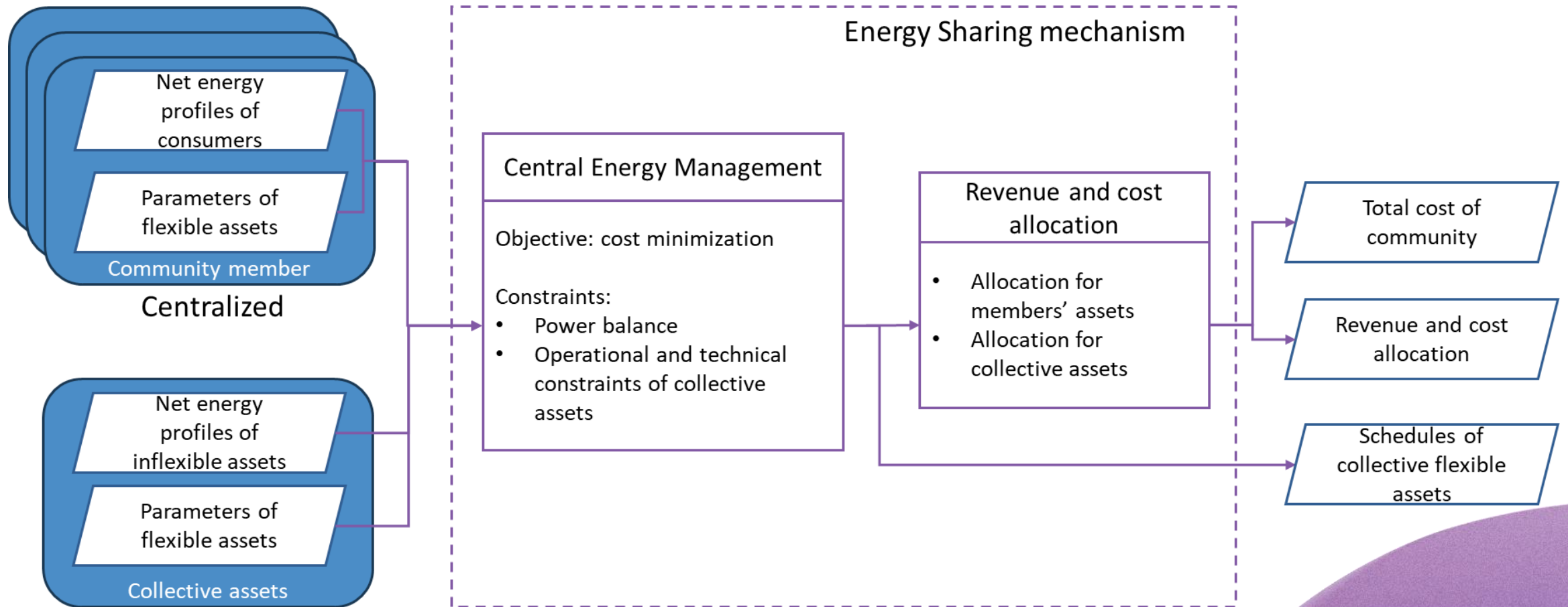
# Energy management schemes

## Optimal energy sharing



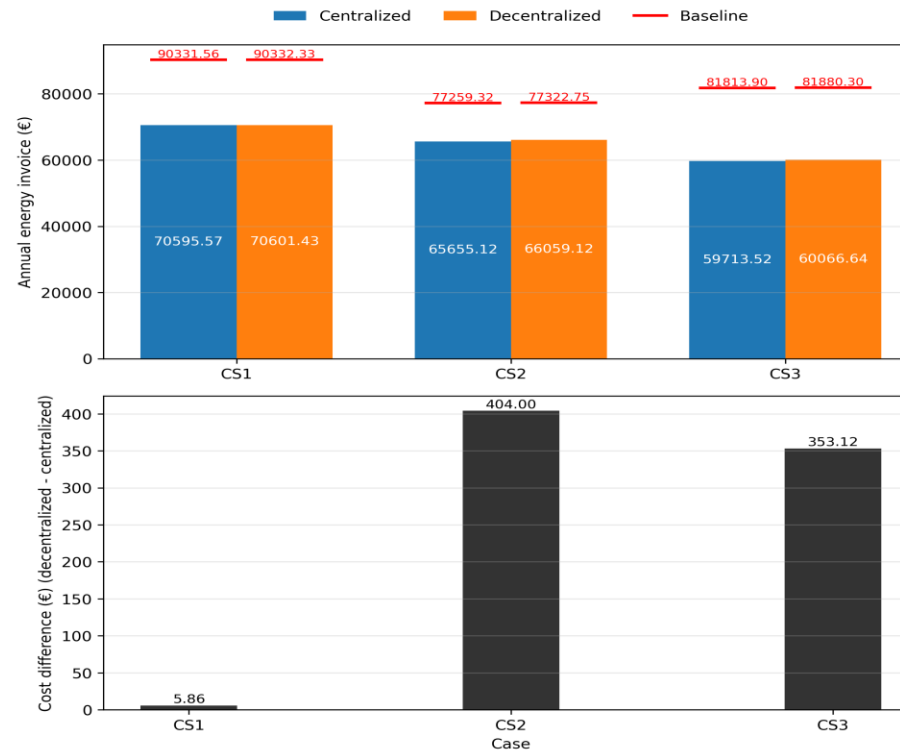
# Energy management schemes

## Optimal energy sharing



# Performance comparison

Centralized scheme	Decentralized scheme
Optimal community cost	Suboptimal community cost
Community manager controls individual assets	Members control their individual assets
Requires more info from members (asset parameters, energy profiles)	Requires less info from members (energy profiles)



# Allocation mechanisms

## Distributing benefits from energy sharing

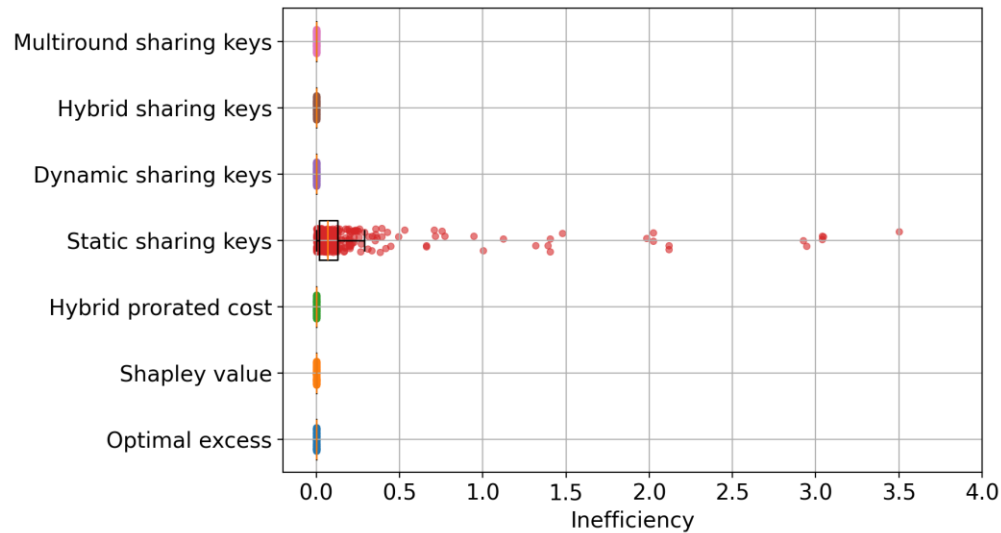
### Energy allocation

- Allocating locally generated energy
- Sharing keys: fixed, dynamic, hybrid, multi-round
- Accounting leading to recalculation of individual energy costs
- Implemented in EU countries

### Cost allocation

# Allocation mechanisms

## Performance comparison

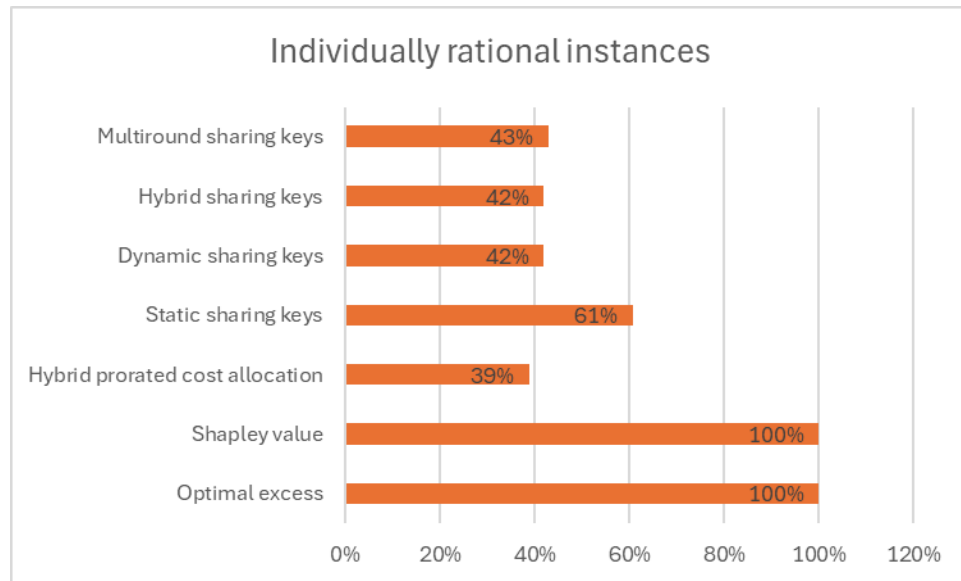


**Efficiency** (Community cost =  $\Sigma$  allocation)

- All mechanisms except the static sharing keys are efficient

# Allocation mechanisms

## Performance comparison



**Efficiency** (Community cost =  $\Sigma$  allocation)

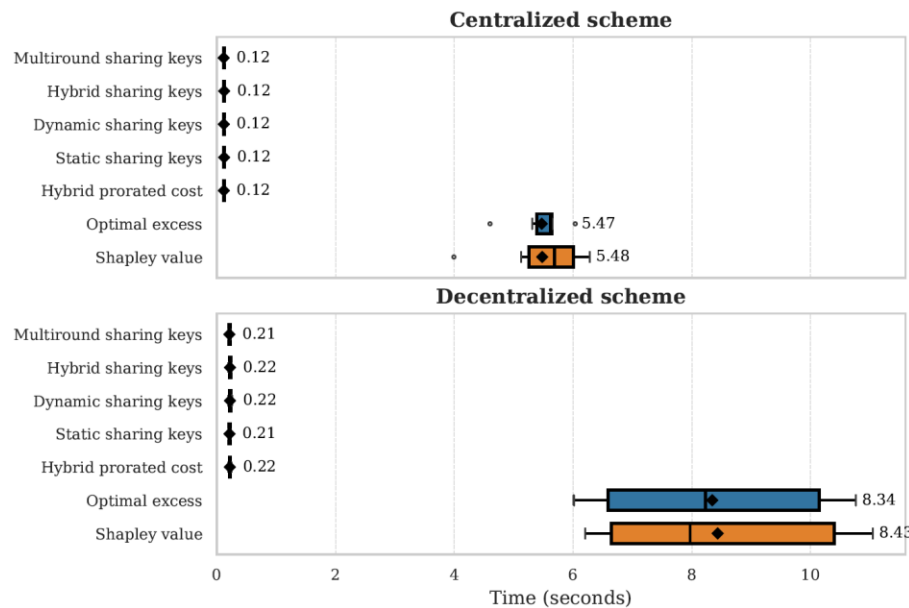
- All mechanisms except the static sharing keys are efficient

**Individual rationality** (allocation  $\leq$  cost of acting individually)

- Only optimal excess and Shapley value are individually rational

# Allocation mechanisms

## Performance comparison



### Efficiency (Community cost = $\Sigma$ allocation)

- All mechanisms except the static sharing keys are efficient

### Individual rationality (allocation $\leq$ cost of acting individually)

- Only optimal excess and Shapley value are individually rational

### Computational complexity

- Computational time of Optimal Excess and Shapley value is 40x energy allocation methods

# kWMax service

## via capacity tariff and grid limits

- Modify optimization in energy management:
  - Capacity tariff: additional objective function
  - Grid limits: additional constraints

# kWMax service

## via capacity tariff and grid limits

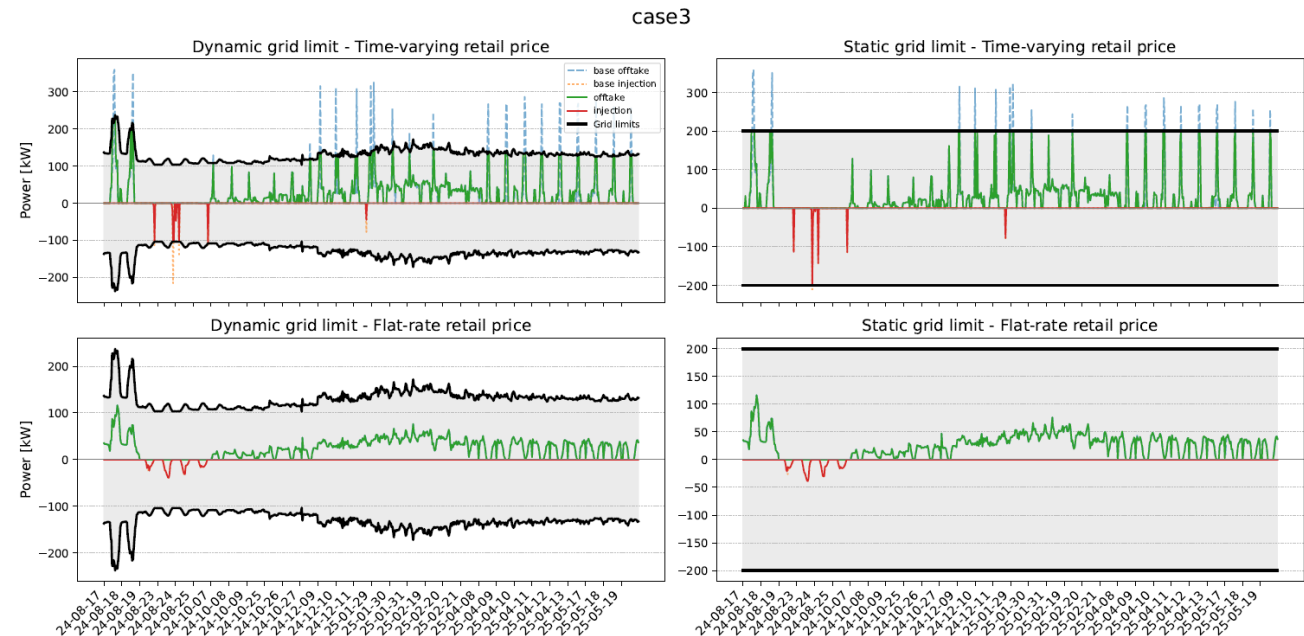
- Modify optimization in energy management:
  - Capacity tariff: additional objective function
  - Grid limits: additional constraints
- Capacity tariff reduces peak
  - Design (& tuning) of appropriate tariff requires study and tests



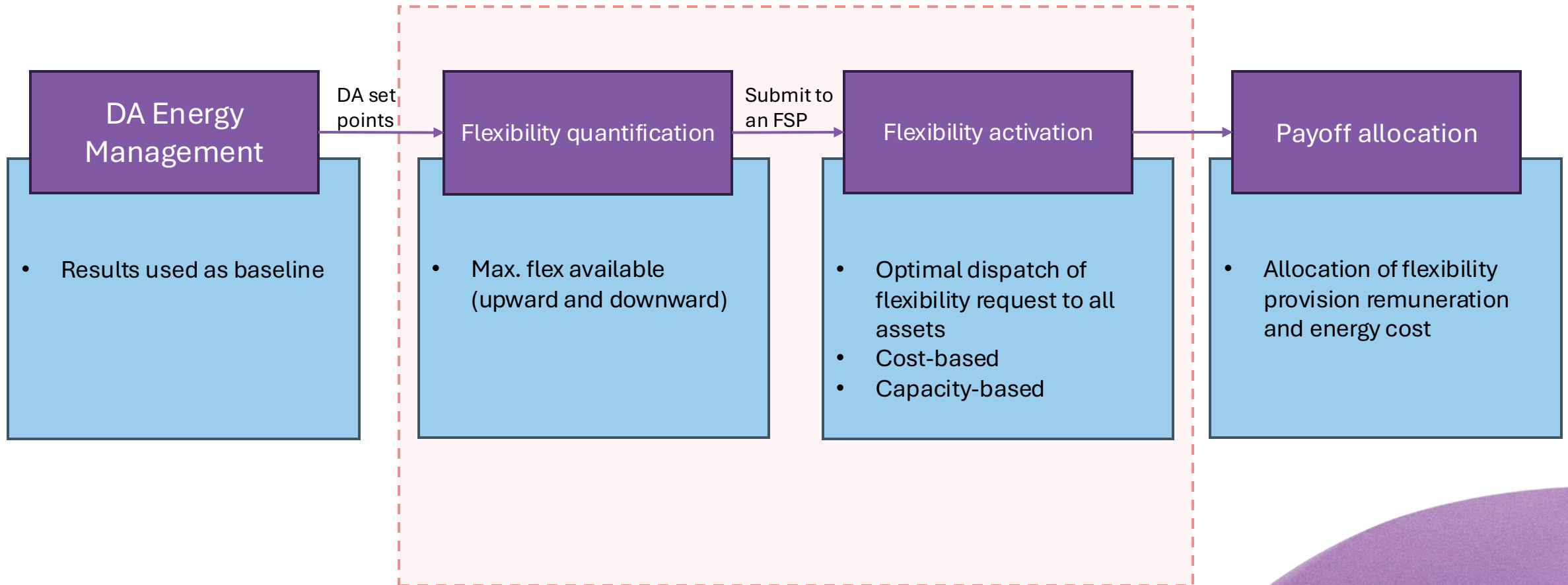
# kWMax service

## via capacity tariff and grid limits

- Modify optimization in energy management:
  - Capacity tariff: additional objective function
  - Grid limits: additional constraints
- Capacity tariff reduces peak
  - Design (& tuning) of appropriate tariff requires study and tests
- Grid limits ensure operation within bounds
- Increase energy costs (deviation from optimal schedules)

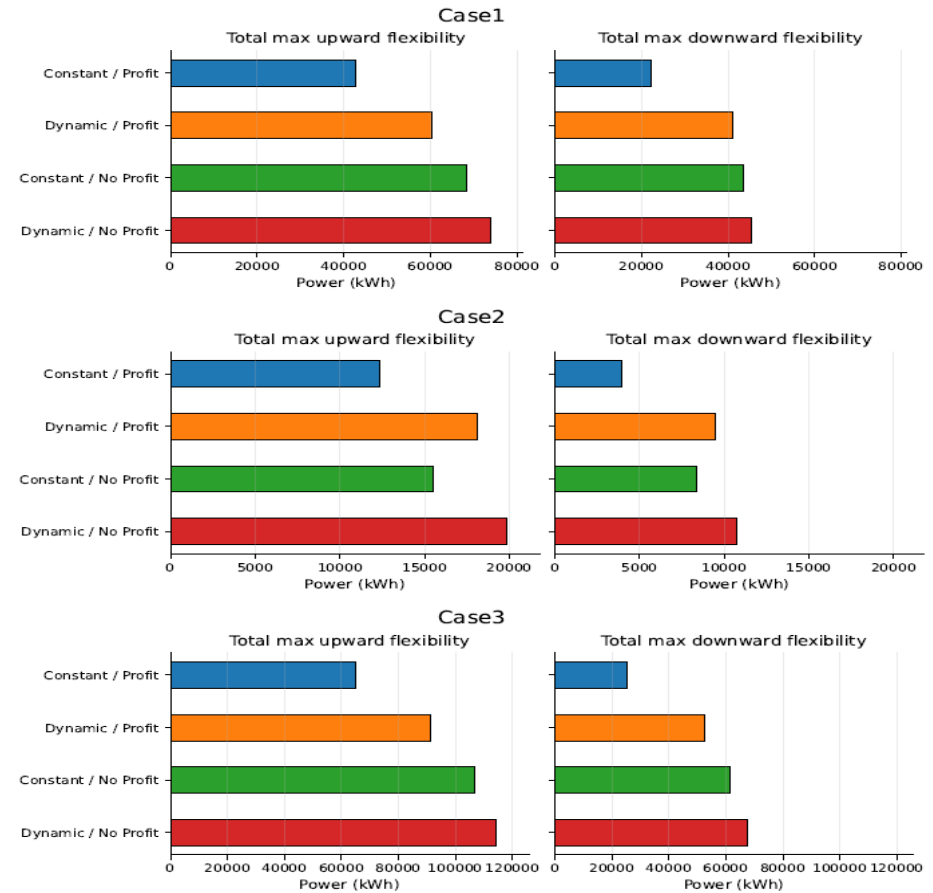


# Explicit flexibility provision



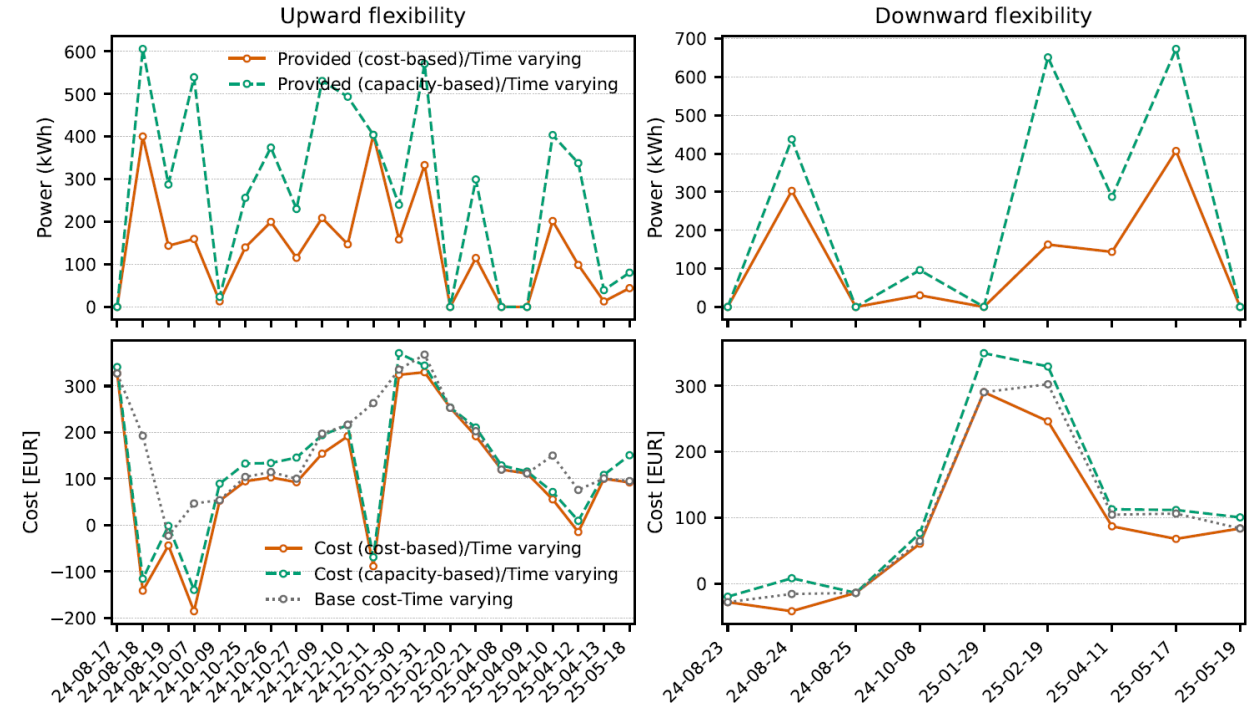
# Explicit flexibility provision

- Quantification
  - Offered flexibility can include restriction and profitability condition



# Explicit flexibility provision

- Quantification
  - Offered flexibility can include restriction and profitability condition
- Activation
  - Cost-based ensures lower energy costs
  - Capacity-based can increase costs



# Summary and recommendations

## Key takeaways



### Energy Sharing

- Decentralized energy management scheme is most practical but presents a suboptimality trade off
- Cost allocation methods outperform energy allocation but computationally expensive
  - Cost allocation can still be tractable in some cases

### Flexibility Provision

- Fine-tuning requirements for capacity tariffs
- Explicit flexibility provision holds the potential of reducing individual costs

### Outlook

Further investigation needed: Impact on the grid outside of activation window



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# Energy sharing at predefined internal prices model

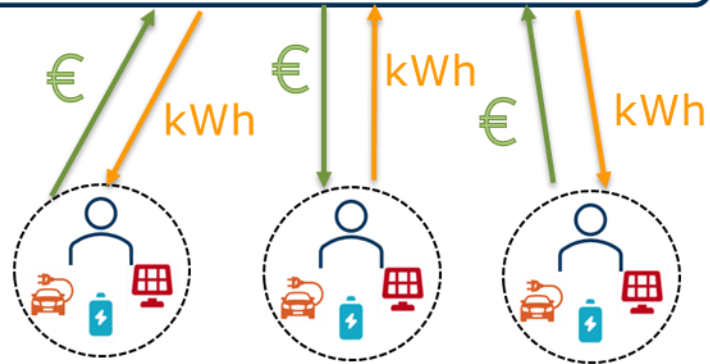
Yucun Lu  
(KU Leuven)

# Model Description

Individual Energy Sharing –  
Centralized

Predefined pricing  
mechanism (uniform)

Community Manager –  
Definition of Internal Pricing



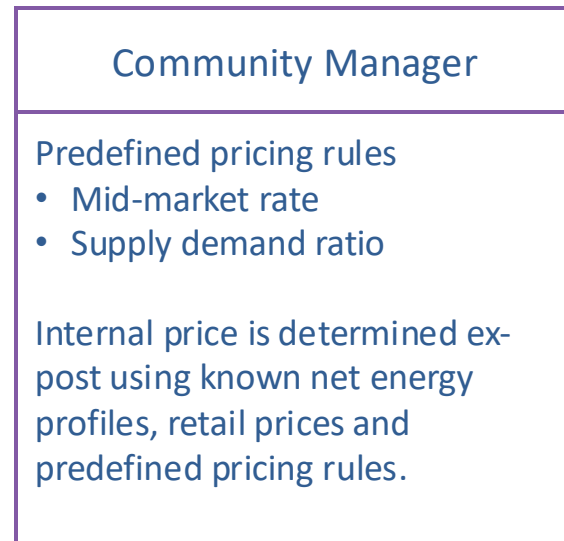
€ Internal price defined by manager  
kWh Energy received from other peers

- Uniform internal prices for all participants
- Participants can decide on the trading quantity, but not the internal price
- Improvement: Internal pricing in hourly resolution – create incentives for participants to respond
- Two types of internal pricing rules:
  - Mid-market rate (**MMR**): the average of retail offtake and injection price.
  - Supply-demand ratio (**SDR**): total supply / total demand.

# Modeling framework

**Input:** Participants' net energy profiles, retail prices, pricing rules

**Output:** Internal prices



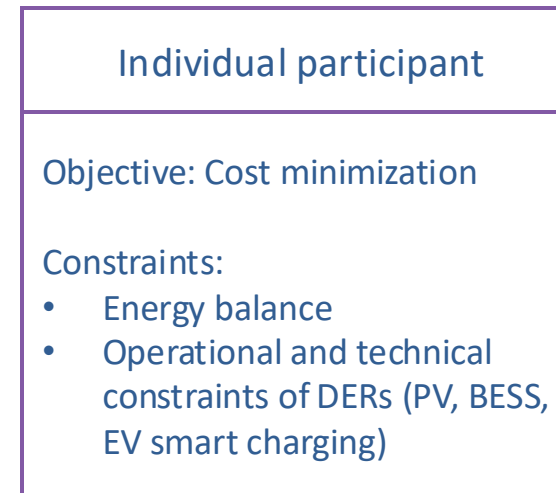
Internal Prices



Net Energy Profiles

**Input:** Internal prices

**Output:** Net energy profiles



Model: Seeking for the Nash Equilibrium of all participants' interactions in the local market

# Results: Energy sharing

Cost savings	Case 1 (Fixed/Dynamic)	Case 2 (Fixed/Dynamic)	Case 3 (Fixed/Dynamic)
SDR	2.03%/4.88%	9.80%/8.22%	9.24%/8.78%
MMR	2.01%/5.58%	10.15%/11.18%	9.65%/12.86%

\*Note: In case 1, there is a 425 kWh collective battery, but it is rarely operated, especially under the fixed price contract).

- Substantial cost saving among all cases
- Cost savings increase when flexibility increases
- When all locally generated electricity can be efficiently self-consumed, only marginal improvement from increasing flexibility

# Results: Energy sharing

Self-consumption improvement	Case 1 (Fixed/Dynamic)	Case 2 (Fixed/Dynamic)	Case 3 (Fixed/Dynamic)
SDR	+0.003/+0.013	+0.035/+0.009	+0.038/+0.022
MMR	+0.000/-0.130	+0.032/-0.015	+0.037/-0.062

- Internal pricing models increase self-consumption
- MMR decreases self-consumption under dynamic pricing as no PV curtailment incentives exist during negative price hours (MMR prices are still positive)

# Energy Sharing and Flexibility Services

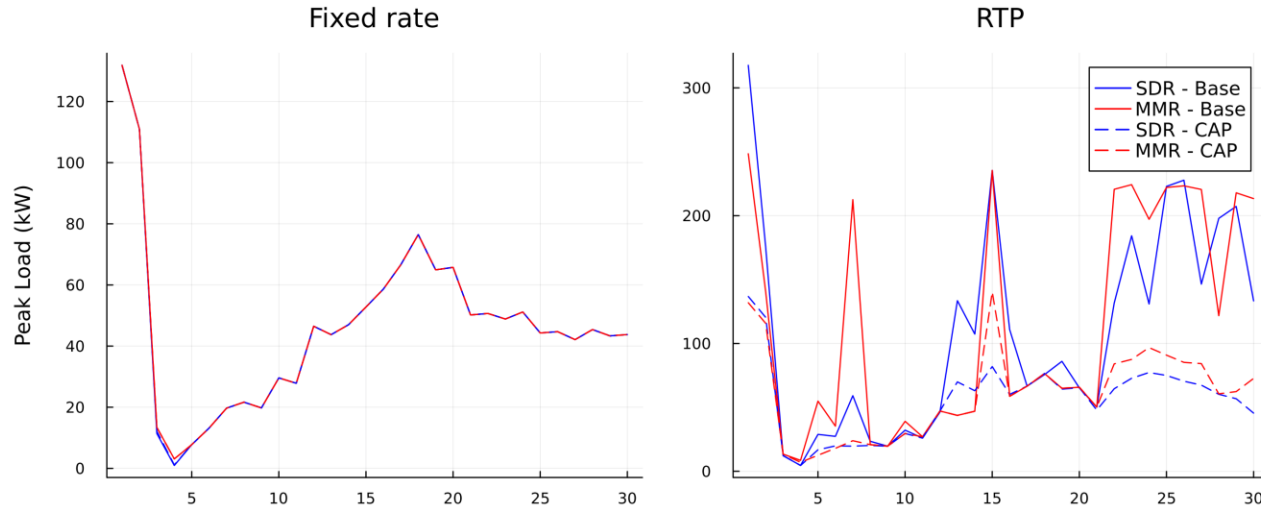
## Tariff-based Mechanisms

- Capacity tariff based on individual monthly peak offtake

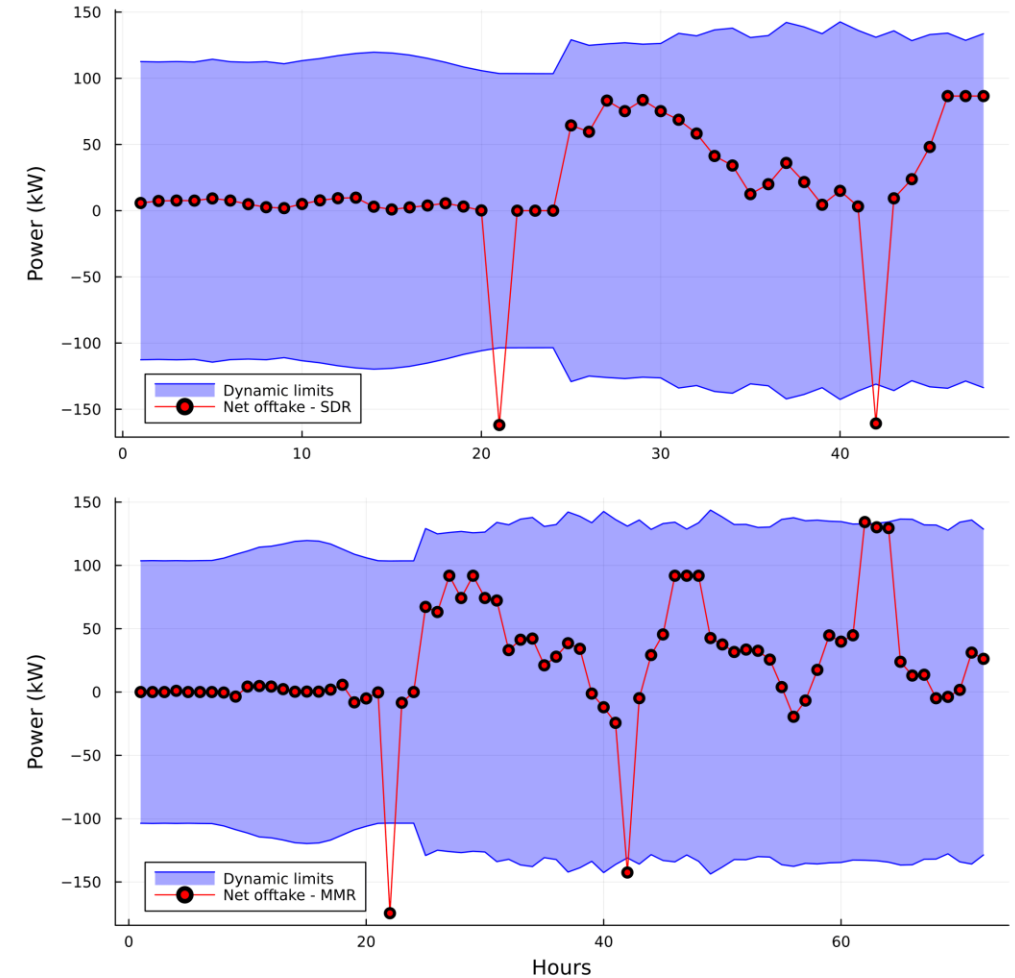
## Explicit Flexibility

- Flexibility Quantification: Quantify the maximum available upward/downward flexibility
- Flexibility Activation: Flexibility activation given the internal prices and flexibility remuneration prices
- Each participant reacts to the request independently

# Results for Capacity tariff

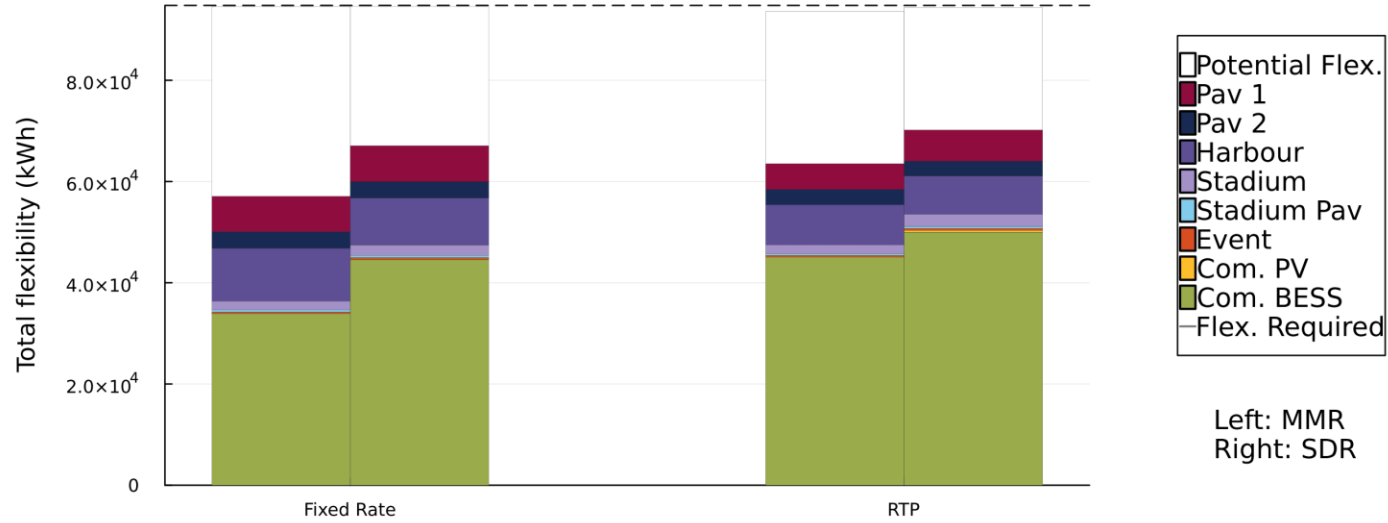


- Static limit: 200 kW
- Frequent violations in the base case
- Capacity tariff lowers peaks satisfying the static limit
- The defined capacity tariff cannot lower peaks to meet dynamic limits

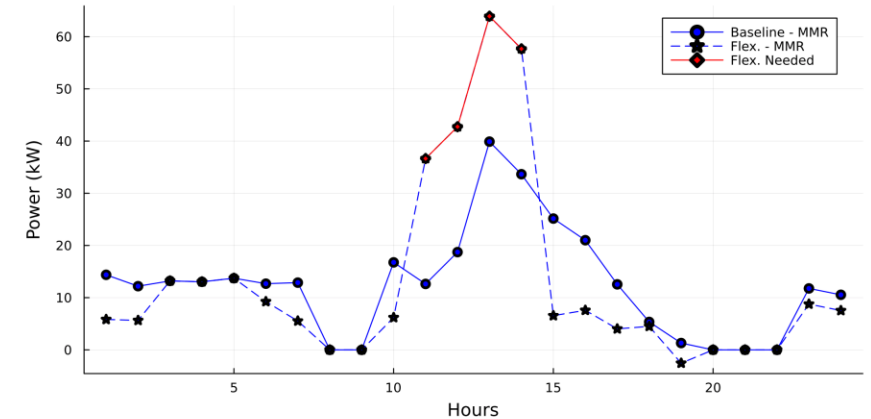
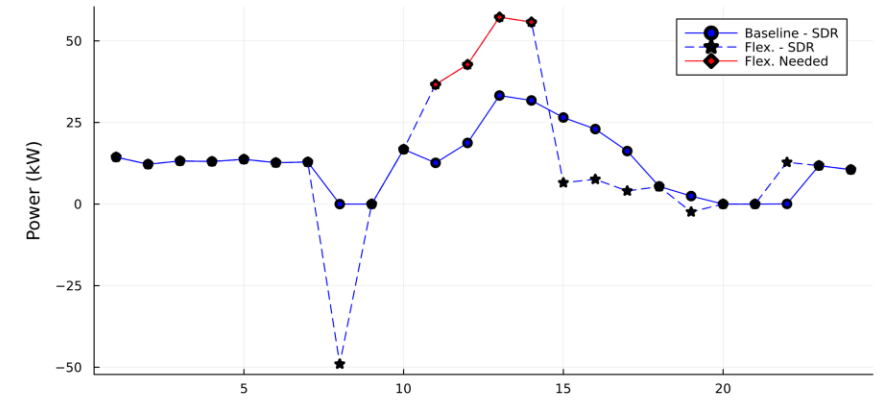


# Results for Explicit Flexibility

Case 3



- Dashed line: total flexibility requested
- Bar: total available flexibility quantified by the Flexibility Quantification
- Colored bar (without the white part): flexibility activated with the flexibility prices.
- Available flexibility can meet flexibility requirements
- All consumers react to the request, activated volume depends on their energy assets
- SDR mechanism tends to activate more flexibility



# Summary and recommendations

## Key takeaways



### Energy sharing:

- Internal pricing mechanisms can yield substantial cost savings and be readily implemented in situations with fixed retail contracts
- MMR requires additional provisions to handle negative prices
- Collective assets, particularly batteries, should either be exposed to different price signals or should be integrated in a different way

### Flexibility provision:

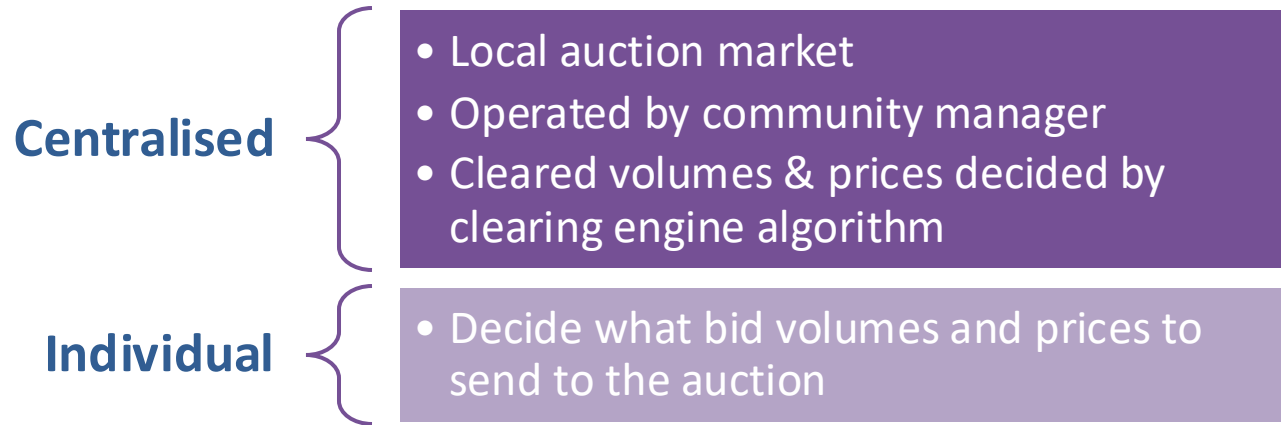
- The capacity tariff can be a reliable instrument for reducing collective offtake peaks, but cannot fully address peaks caused by injections
  - Potential solutions: reserve battery capacity or limit battery discharge
- For explicit flexibility, although the community has ample technical flexibility, internal prices significantly affects the activation
  - SDR mechanism is easier to activate more flexibility



# Auction-based local energy trading model

Nicolas Fatras  
(Artelys)

# Model description

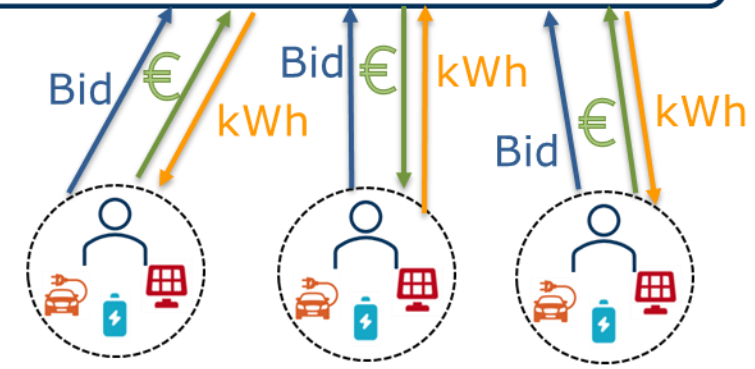


- Auction over 24 hours of the next day
- Individual decisions based on forecasts

## Individual Energy Sharing – Centralized

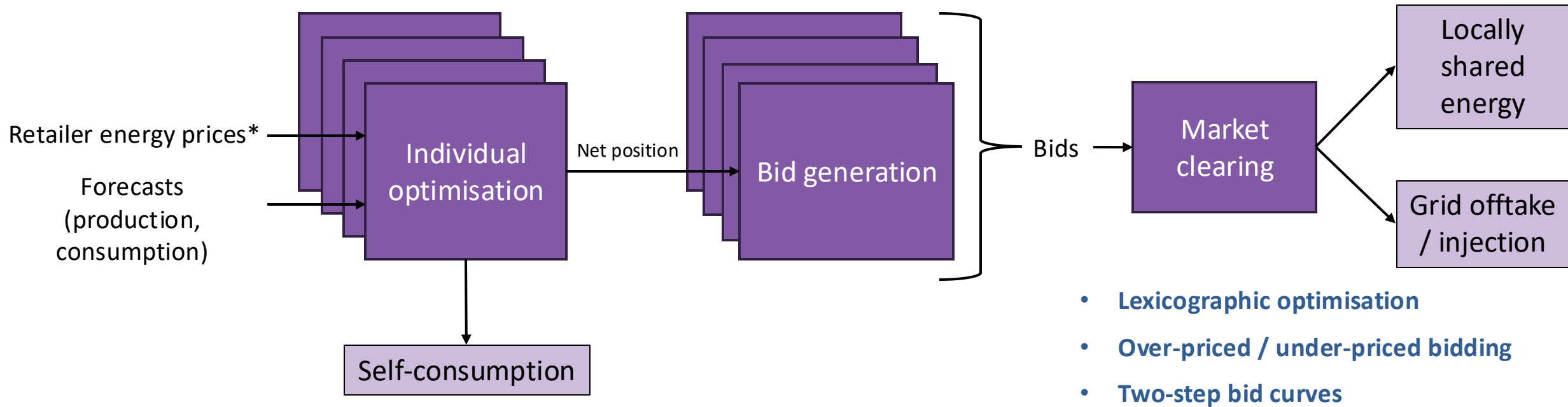
### Auction based energy sharing

#### Local Market (centralized, auction-based)



Bid Bids: {price, quantity}pairs  
€ Market price  
kWh Energy allocation/dispatch

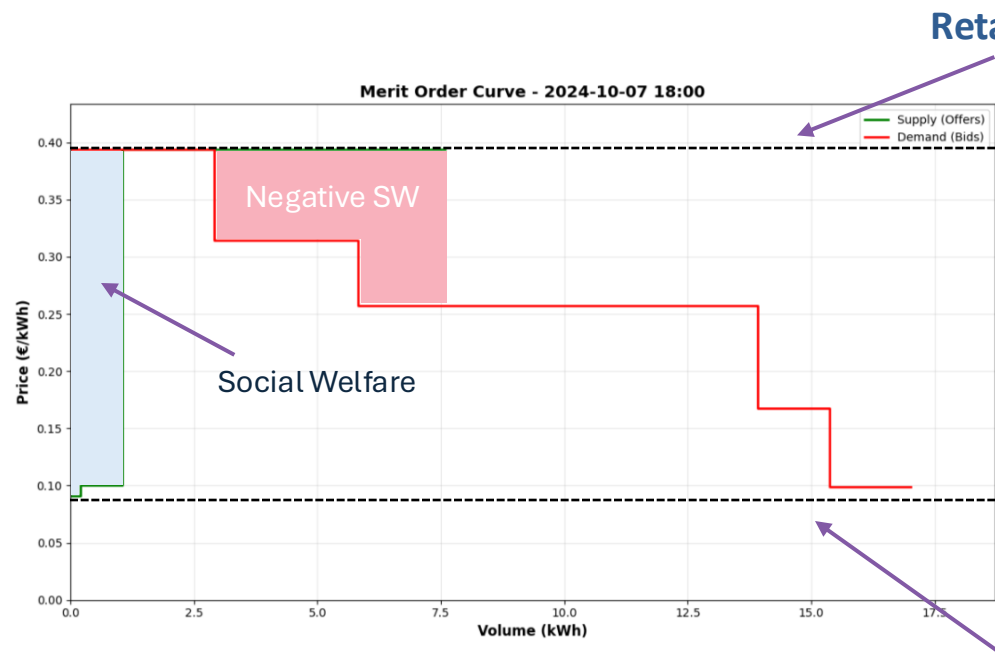
# Energy sharing workflow



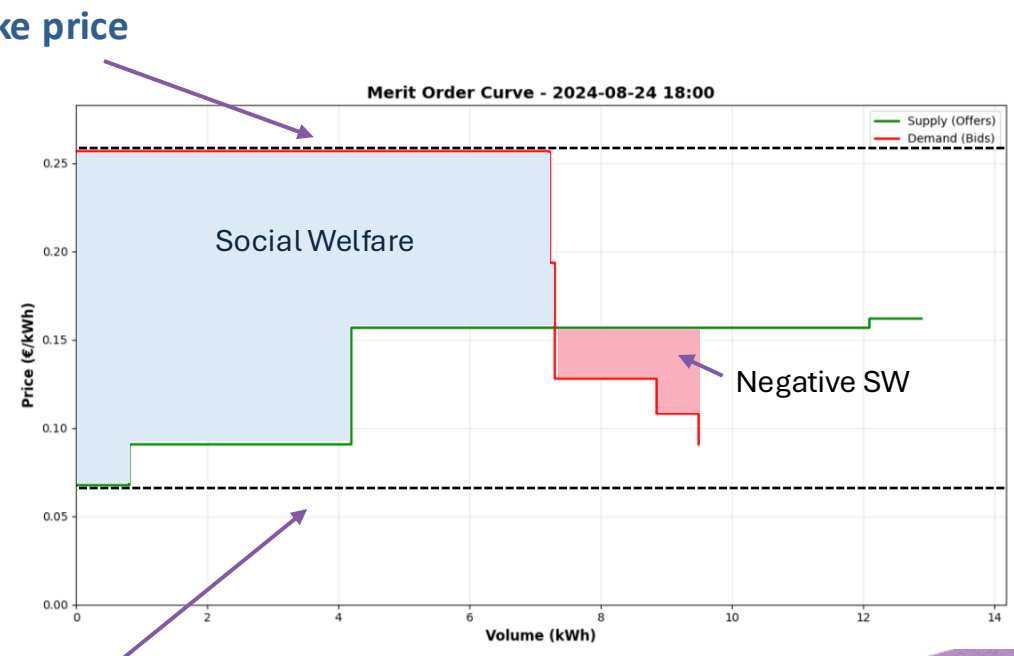
\*Note: Energy prices for collective batteries were taken to be equal to grid offtake prices in both charge and discharge directions, corresponding to day-ahead market prices + grid tariffs

# Local market clearing engine

## Clearing curves with low supply



## Clearing curves with balanced net positions



# Results: Energy sharing

	Case 1	Case 2	Case 3
Community cost savings	2% to 2.7%	5.4% to 8.5%	6.2% to 9.4%

→ The community's asset portfolio is a **key driving factor** determining savings (supply-demand balance)

# Results: Energy sharing

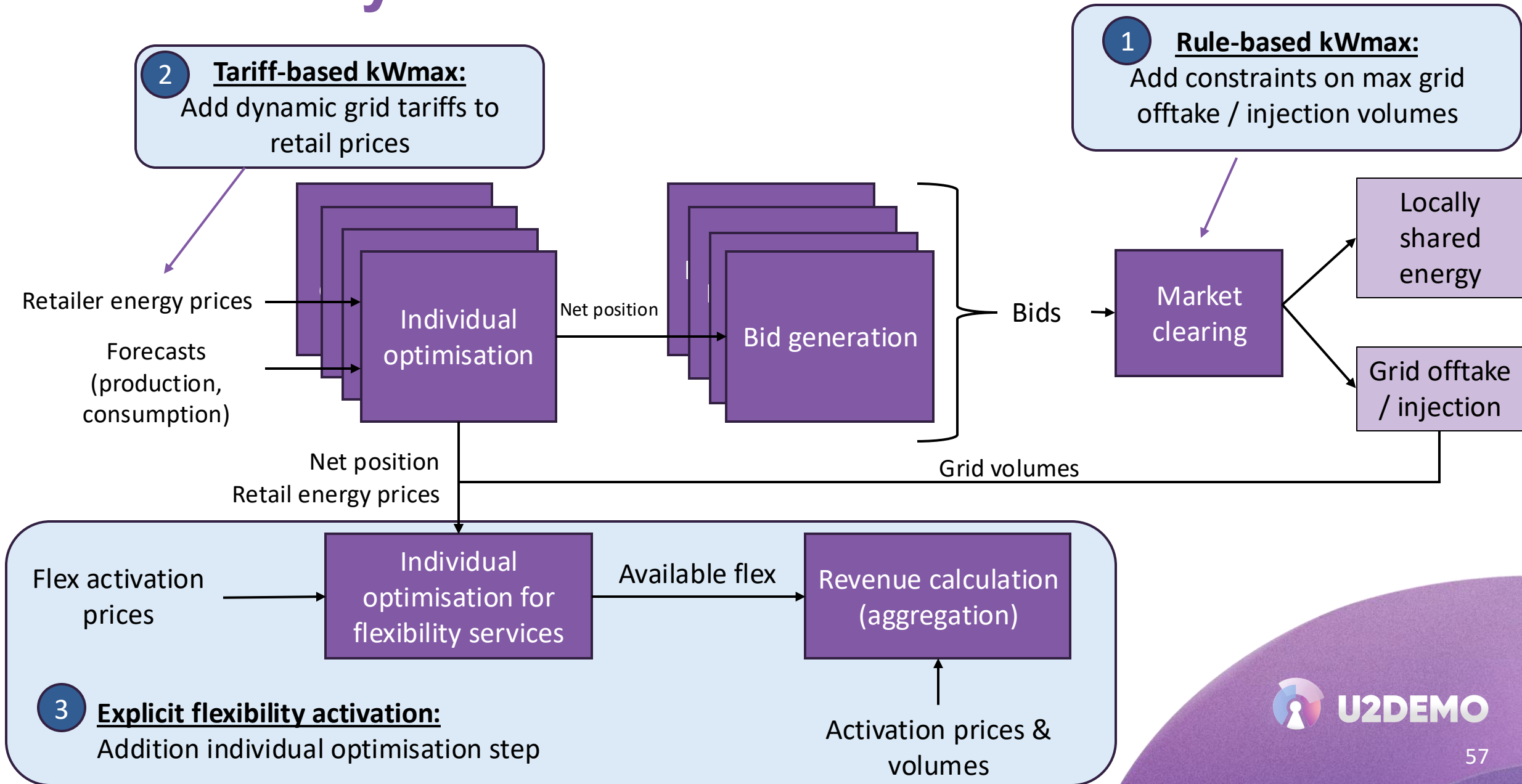
	Case 1	Case 2	Case 3
Community cost savings	2% to 2.7%	5.4% to 8.5%	6.2% to 9.4%

→ The community's asset portfolio is a **key driving factor** determining savings (supply-demand balance)

Case 3	Reference scenario	High aggressiveness	Flexible contract	Redistributive relaxation
Community cost savings	8.9%	6.2%	8.5%	9.4%

- For a given asset portfolio, more aggressive strategies are detrimental
  - Redistributive relaxation improves benefits
- Maximising traded volumes can be beneficial

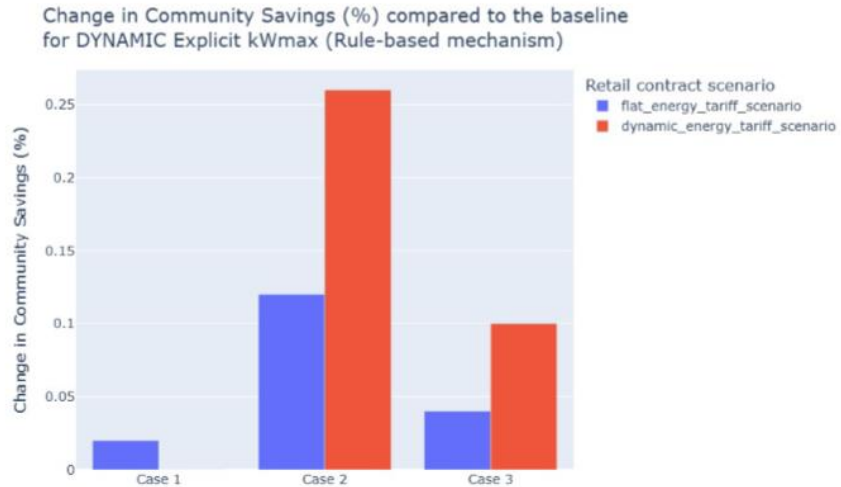
# Flexibility services workflow



# Results: Flexibility services

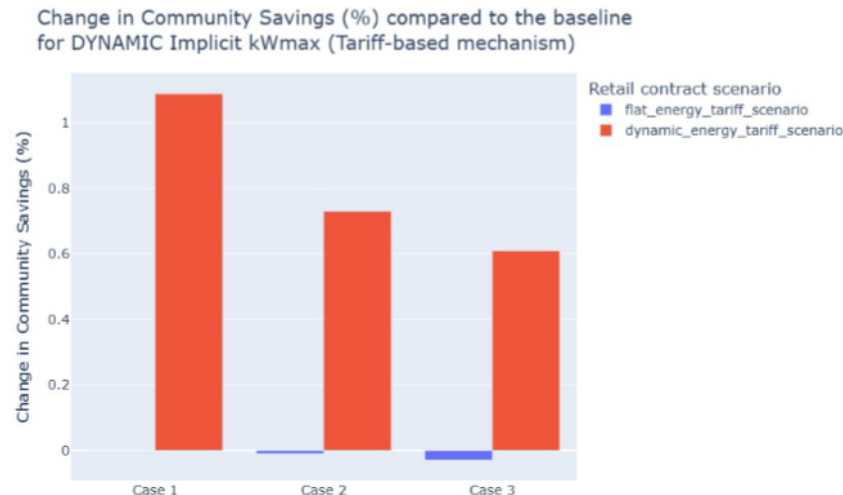
## kWmax service

Rule-based



- Overall community **energy** savings are not affected much (slightly positive).  
→ kWmax services push towards more volumes cleared internally
- Communities with dynamic retail contracts are more financially sensitive to kWmax

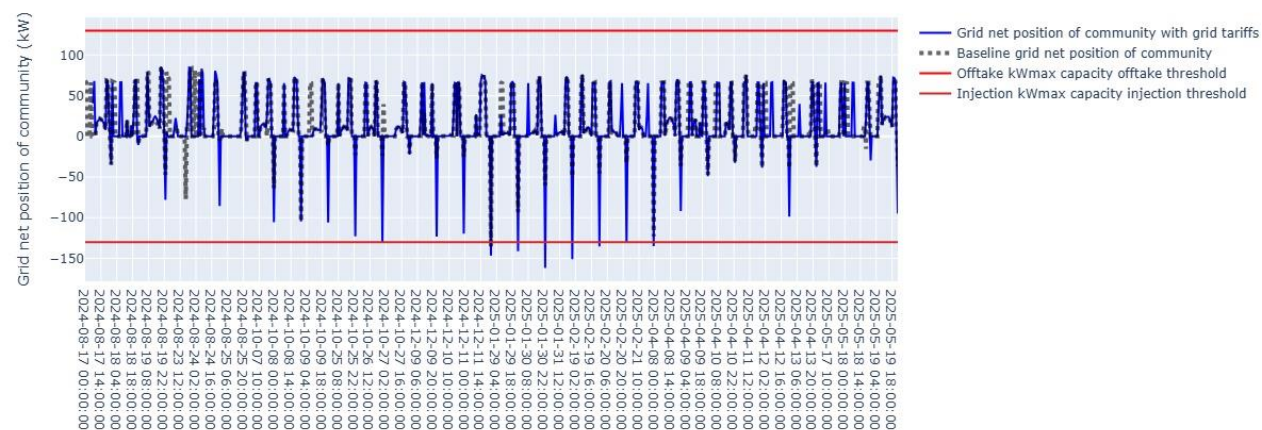
Tariff-based



# Results: Flexibility services

## kWmax service

Grid net position (in kW) of community for Case 3, with dynamic retail contract and CONSTANT implicit kWmax contract

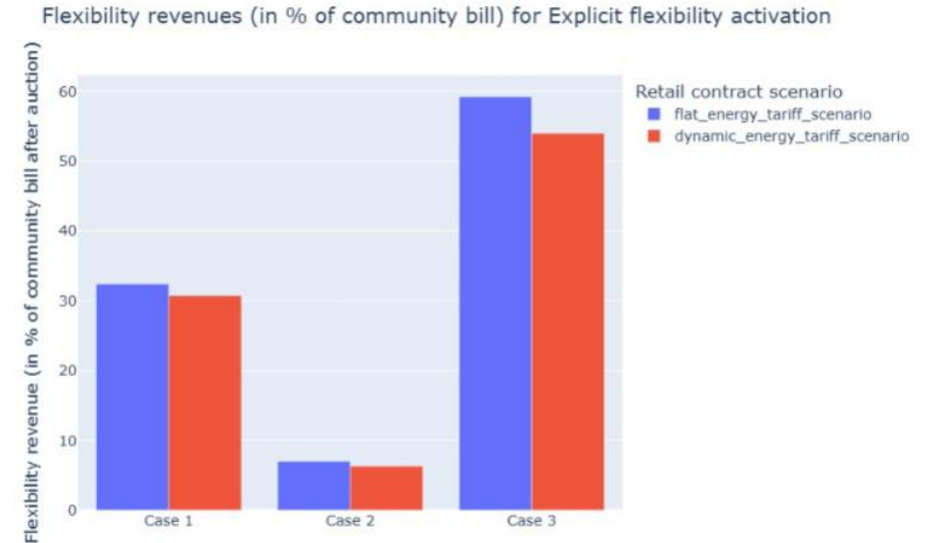


- Overall community **energy** savings are not affected much (slightly positive).  
→ kWmax services push towards more volumes cleared internally
- Communities with dynamic retail contracts are more financially sensitive to kWmax
- Implicit tariffs can in some cases worsen grid injection peaks  
→ Misalignment between grid tariff incentives, retail contracts, and community's asset portfolio

# Results: Flexibility services

## Explicit flexibility activation

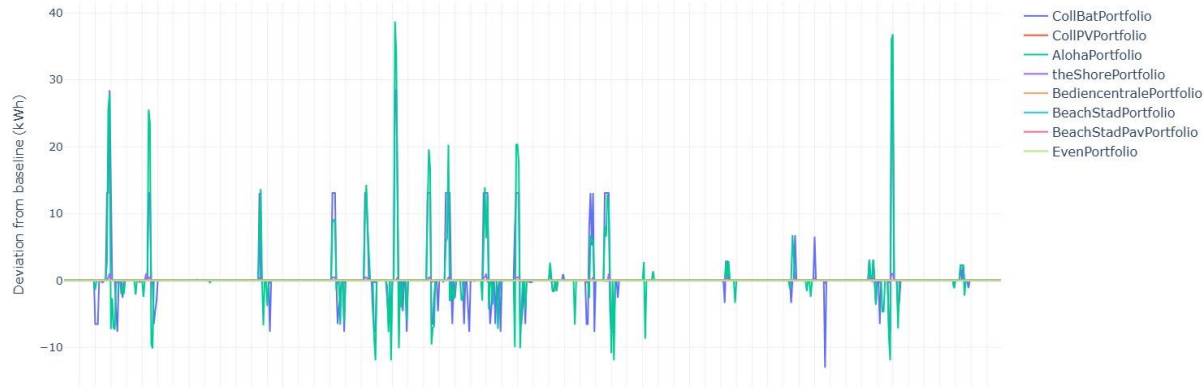
- Revenues from flex activation are considerable (up to 60%)
- To be reviewed with activation forecast uncertainty



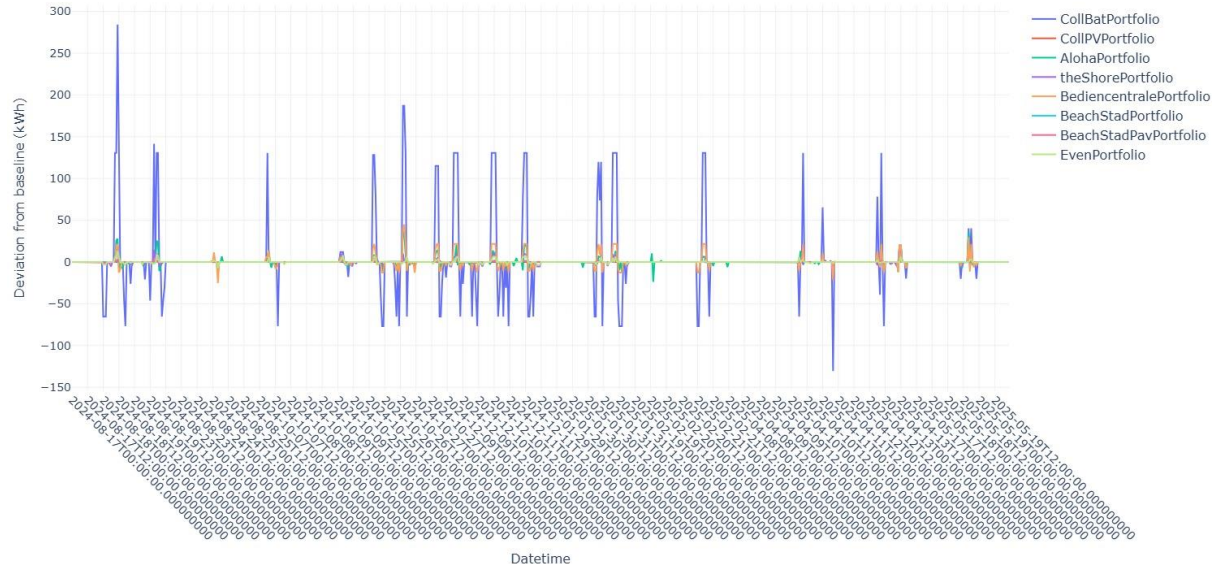
# Results: Flexibility services

## Explicit flexibility activation

Deviations from baseline per household for Case 2 and dynamic\_energy\_tariff\_scenario



Deviations from baseline per household for Case 3 and dynamic\_energy\_tariff\_scenario



- Revenues from flex activation are considerable (up to 60%)  
→ To be reviewed with activation forecast uncertainty
- The collective battery plays a key role in activated volumes
- All assets compensate activations at similar times  
→ Risk of peak increase if not coordinated properly

# Summary and recommendations

## Key takeaways



### Energy sharing:

- Achieved savings in the analysed context can be substantial (up to 10%)
- Results are highly dependant on the community's portfolio
- Members' strategic behaviour can deteriorate the community's savings
- Other objectives than social welfare (volume redistribution) can improve overall savings

### Flexibility services:

- Participation in a local auction can be combined with flexibility services
- To ensure successful implementation, flexibility services must be coordinated with:
  - Existing services (retail contracts) to avoid sending contradictory signals to community members
  - Other flexibility services to ensure a balance between financial revenues and grid congestion



**U2DEMO**

# Pool-based peer-to-peer energy trading model

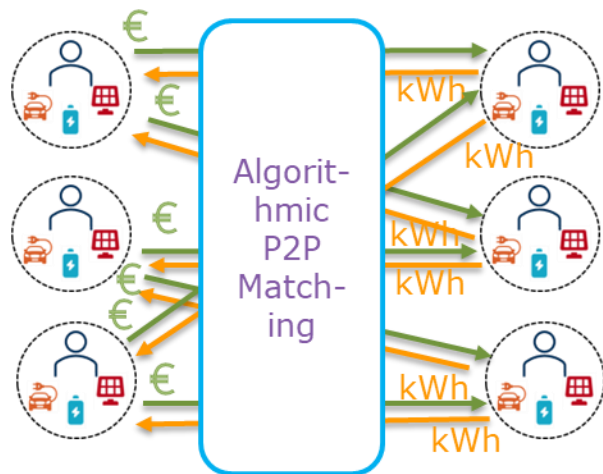
Diogo Pinto Ferreira  
(INESC-ID)

# Model description

## Pool-based P2P matching

P2P/Energy Sharing –  
Distributed

Pool-based P2P Matching



€ Bilateral, P2P, trading price

kWh Bilateral, P2P, energy exchange

Each community member can trade directly with other members (peer-to-peer matchings)

Bids from each peer:

- **Single bids:** pair energy volume (surplus or deficit after self-consumption) and price.
- **Cost curves:** a curve with upper and lower bounds on the energy volume to trade and corresponding prices

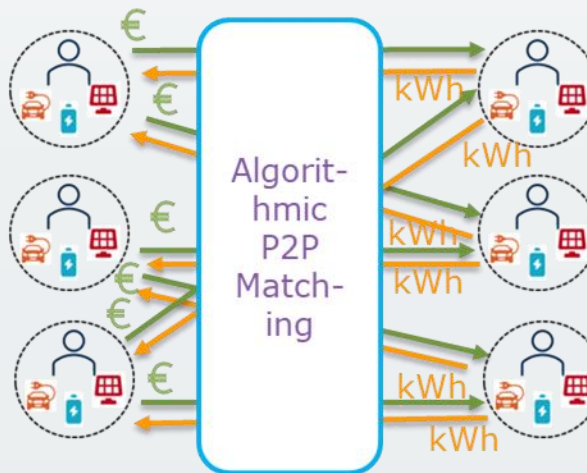
A central entity clears P2P trades by maximizing social welfare, while guaranteeing peer-specific preferences.

# Day-ahead P2P

## Inputs

- Day-ahead buy/sell bids from each peer
- Batteries' characteristics
- Contractual constraints with the retailer
- Trade constraints between peers

## P2P Method



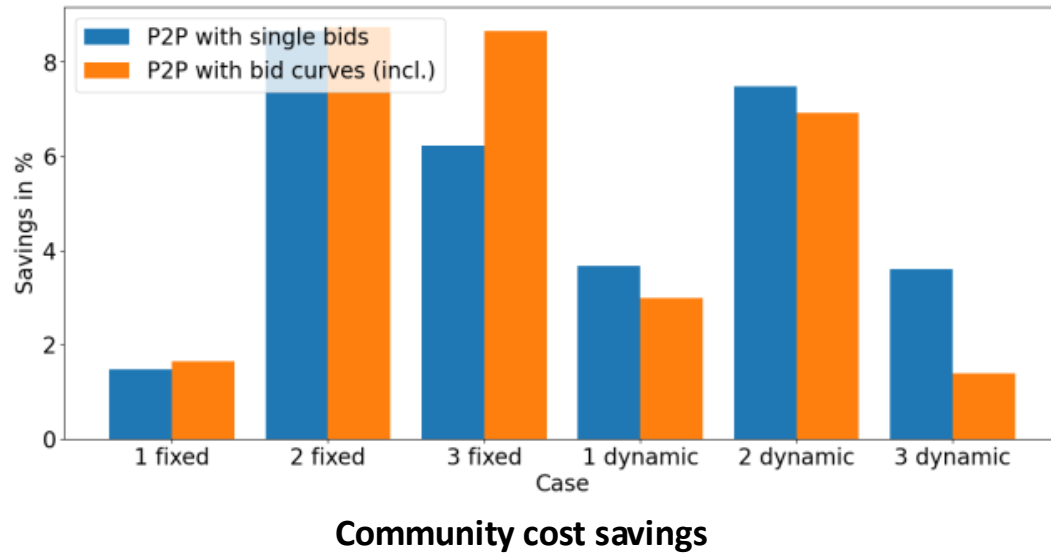
## Outputs

Day-ahead:

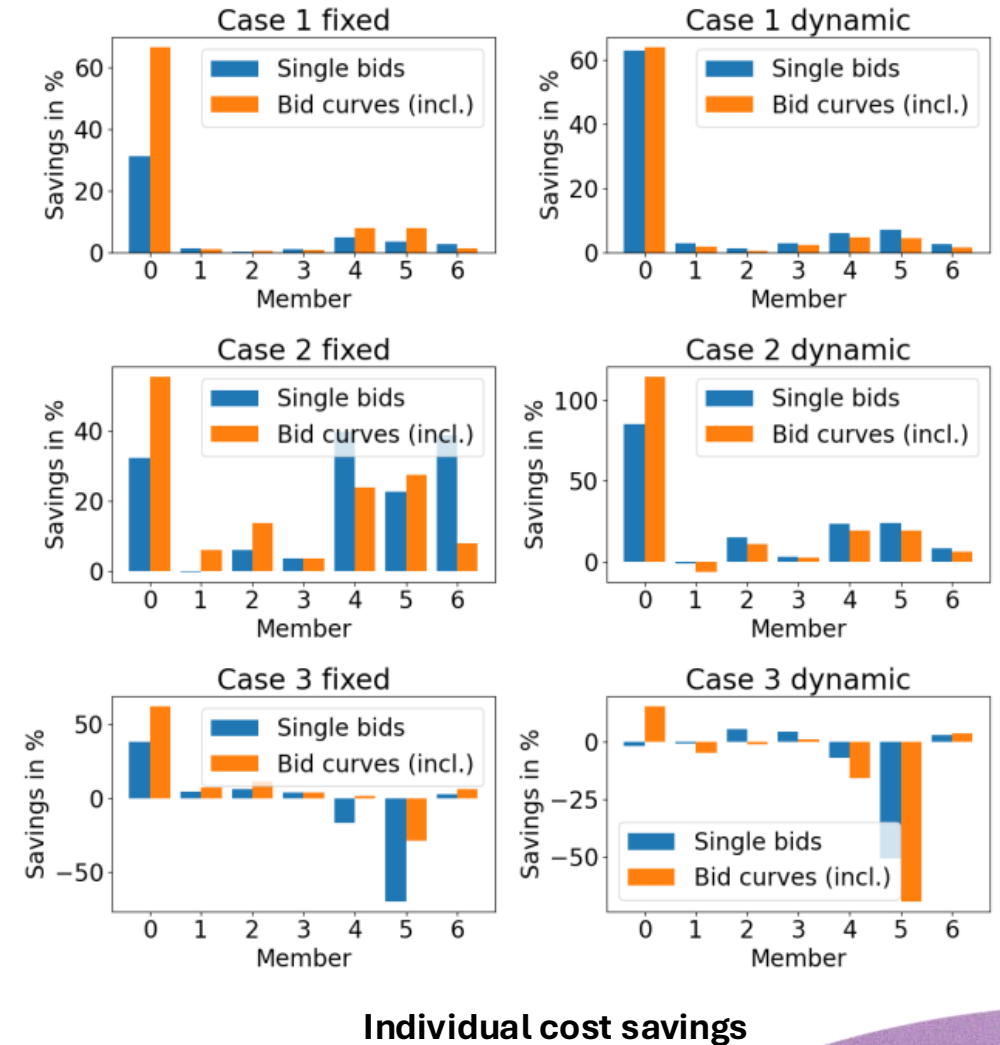
- Energy trade (volume and price) between community members and also retailer
- Battery schedules

# Energy trading results

## Community & individual impacts



- Reduction in the total energy community costs
- However, overall community advantages do not imply member-level advantages.



# P2P with flexibility services

## Rule-based mechanism for kWmax service

- A limit is imposed for the net consumption of the EC

## Tariff-based Mechanisms

- Time-of-Use tariff
- Capacity tariff

## Explicit Flexibility

- Quantification of maximum allowed upwards and downwards flexibility with batteries without rescheduling
- Day-ahead flexibility allocation based on maximization of EC remuneration
- Flexibility activation

# kWMax service results

## Rule-based mechanism for kWmax service

- Grid limits are satisfied
- Total energy bill increased

	Fixed	Dynamic
Case 1	0.15	1.18
Case 2	-0.32	0.44
Case 3	0.06	2.07

Increase of total energy bill [%]

# kWMax service results

## Rule-based mechanism for kWmax service

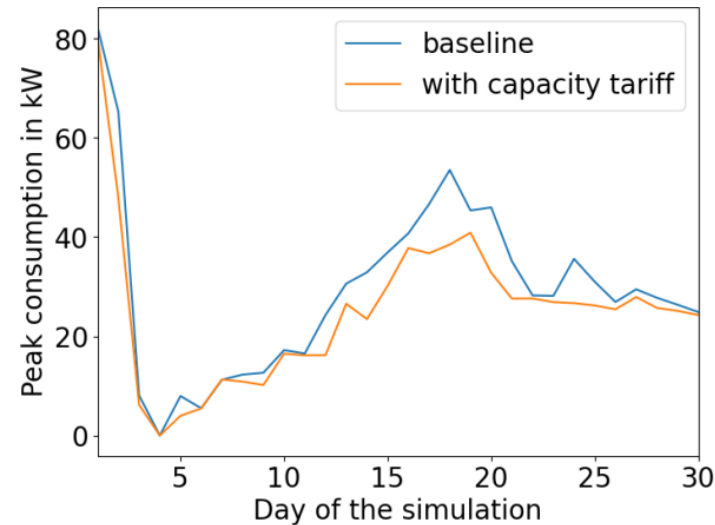
- Grid limits are satisfied
- Total energy bill increased

## Tariff-based Mechanisms

- Capacity tariff lowered the peak consumption of the EC

	Fixed	Dynamic
Case 1	0.15	1.18
Case 2	-0.32	0.44
Case 3	0.06	2.07

Increase of total energy bill [%]



Peak net consumption for each day

# kWMax service results

## Rule-based mechanism for kWmax service

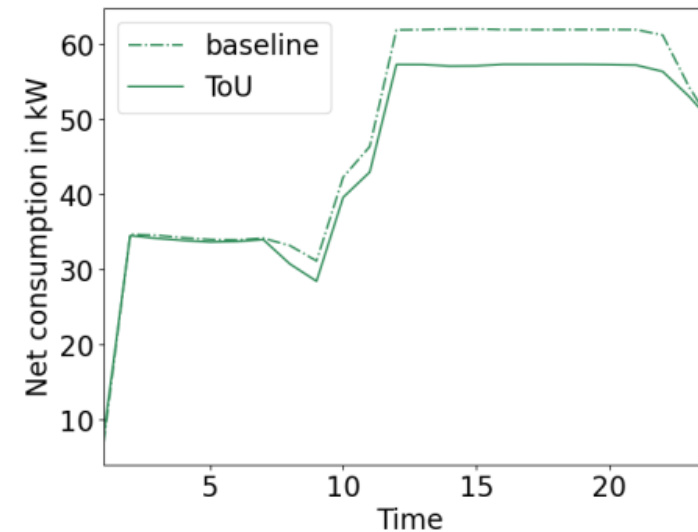
- Grid limits are satisfied
- Total energy bill increased

## Tariff-based Mechanisms

- Capacity tariff lowered the peak consumption of the EC
- ToU tariff had no significant impact

	Fixed	Dynamic
Case 1	0.15	1.18
Case 2	-0.32	0.44
Case 3	0.06	2.07

Increase of total energy bill [%]



Net consumption of the EC

# Explicit flexibility provision results

## Explicit Flexibility

- The total annual bill decreases under both the unknown and known flexibility activation scenarios

	Fixed	Dynamic
Case 1 (unknown act.)	0.67	1.85
Case 2 (unknown act.)	0.56	-0.17
Case 3 (unknown act.)	2.35	3.22
Case 1 (known act.)	6.86	1.86
Case 2 (known act.)	0.59	-0.65
Case 3 (known act.)	14.94	15.47

Reduction of the annual total bill [%]



# Summary and recommendations

## Key takeaways

### Main Findings:

- P2P model is most relevant for energy communities that are designed for peer-specific energy exchanges and more flexible bidding options
- P2P trading can reduce the total community bill
- Flexibility participation can create additional revenue opportunities
- Total community gains do not ensure fair member outcomes, and flexibility value is highly case- and service-dependent

### Outlook:

- Heterogeneous member-level impacts across the community → complementary fairness mechanisms.
- Refinement requirement of rule-based and tariff-based mechanisms



## Panel Discussion and Q&A





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## Thank you!



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