
ecoflex

ECOsystem to leverage local FLEXibility – ECOFLEX

Thursday, September 11th, 2025 – 09:00-13:30 CET

BeClimate Hub – Rue du Marais 49 - 1000 Brussels

This project has received funding from Energy Transition Fund 2022 FPS Economy, SMEs, Self-employed and Energy.

economie

ECOFLEX Consortium

Supported by

09:00	**Welcome & Registration**	
09:30	**Introduction**	
09:35	**Presentation of the ECOFLEX project**	*VUB*
09:45	**Context & Regulatory Framework**	
	The Evolution of the Energy Market & The Growing Need for Flexibility	*Elia*
	Flexibility in the Distribution Grid	*Fluvius*
	Status of Flexibility in Wallonia	*ORES/RESA*
	Flexibility and Energy Sharing in Brussels	*BRUGEL*
10:45	**Coffee break**	
11:00	**Project results**	
	Navigating the Challenges of LV Distribution Networks	*UGent*
	The Universal Flexibility Utility Platform (UFP)	*Haulogy*
	EMS: Advanced EMS & EV scheduling demonstrator	*VUB*
	Legal Insights on Flexibility: Frameworks for EMSPs and New Market Contexts	*UGent*
12:15	**General conclusions and lessons learnt**	
	Key project outcomes, challenges encountered and recommendations	*VUB*
12:30	**Panel discussion with stakeholders of the flexibility chain**	
13:20	**Closing remarks**	
13:30	**Networking lunch & drink**	

ECOFLEX Project

Prof. Maarten Messagie, Vrije Universiteit Brussel

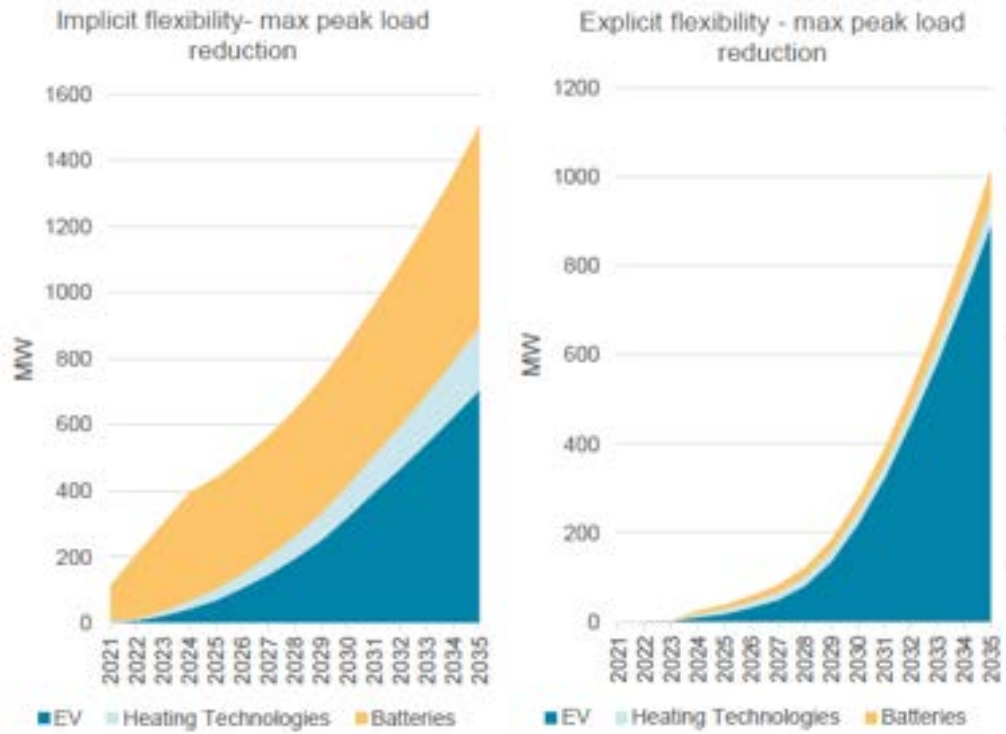
“How to include small consumers and prosumers in flexibility?”

Context and Motivation

Technologies in scope of LV flexibility:

- **Implicit flexibility:**
  Home BESS have the greatest potential in the first years, however EV batteries become significant

- **Explicit flexibility:**
  EVs have the greatest potential, because of high # of EVs, high power consumption & V2G and large batteries.



Source: ELIA Belgium consumer flexibility – Final report 2022

ECOFLEX Ecosystem

OBJECTIVES

Developing and implementing solutions to **leverage flexibility** (*implicit and explicit*) of existing distributed energy resources in:

Local Energy Communities

&

E-mobility

INNOVATIONS

❶ Advanced EMS

❷ Centralised platform: **Interoperable** management

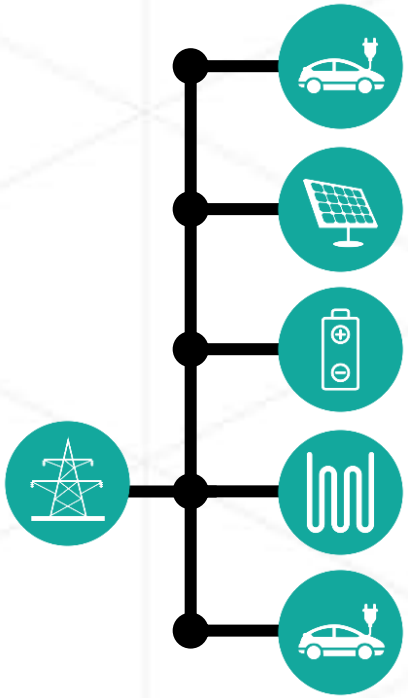
❸ Integration of various **EMSs**

❹ Integrating all kind of **markets**

USE CASES

- aFRR, Day-ahead, Intraday market Valorisation
- Imbalance steering
- Portfolio balancing (for BRPs)
- Market arbitrage

ECOFLEX Ecosystem



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Technical challenges
- Small-sized and fragmented assets
- Granularity (*e.g. time-response vs. data gathering*)
- Minimum bid size (*e.g. 1MW – aFRR*)
- Verification (*e.g. proof of actual delivery*)

Market challenges
- Admin costs vs. value per asset
- Uncertainty of activations

Legal challenges
- Contractual complexity (*e.g. BRP–BSP*)
- Eligibility rules (*e.g. market participation*)

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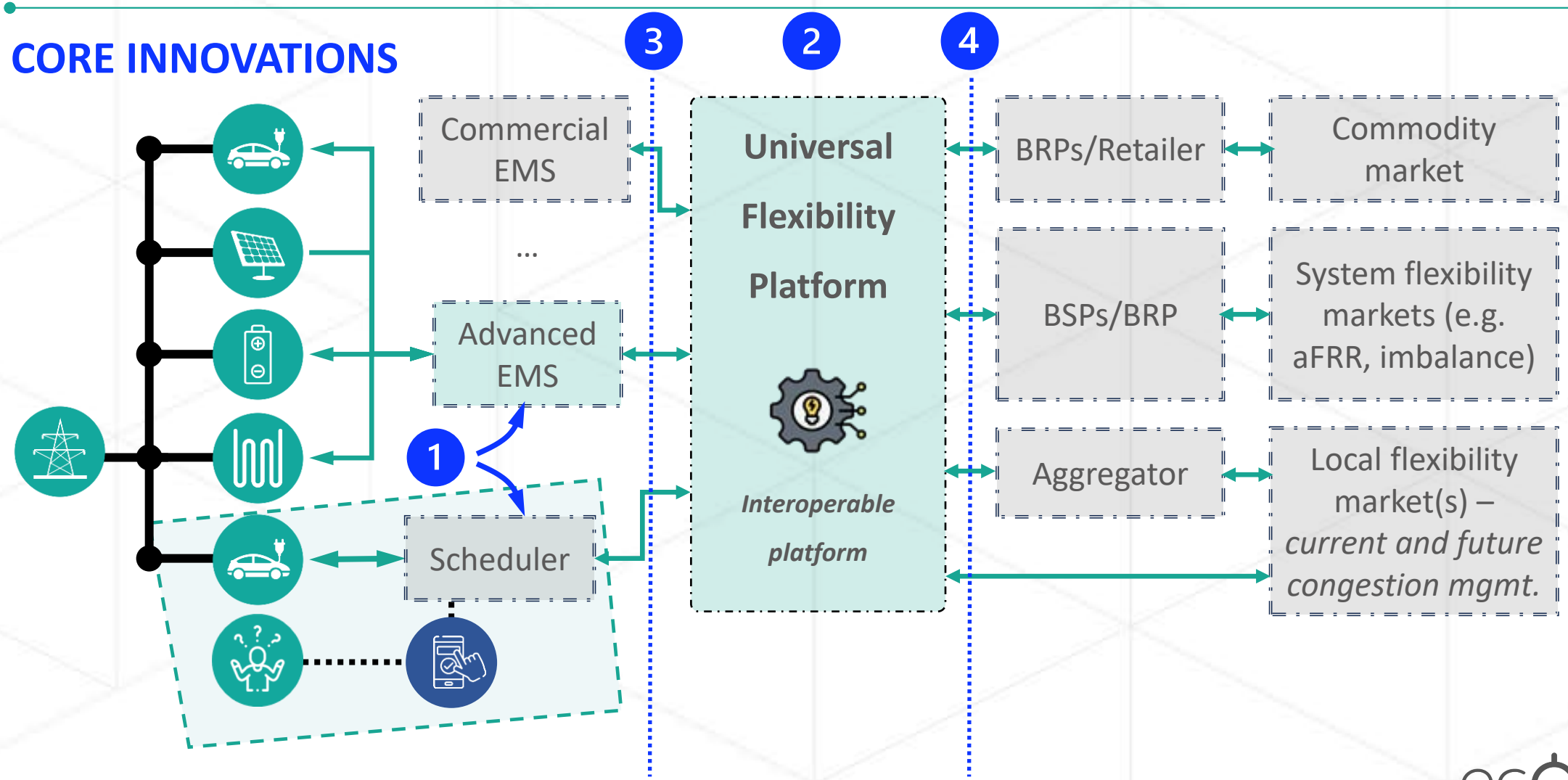
Commodity market

System flexibility markets (e.g. aFRR, imbalance)

Local flexibility market(s) – *current and future congestion mgmt.*

ECOFLEX Ecosystem

CORE INNOVATIONS



Pilot Sites

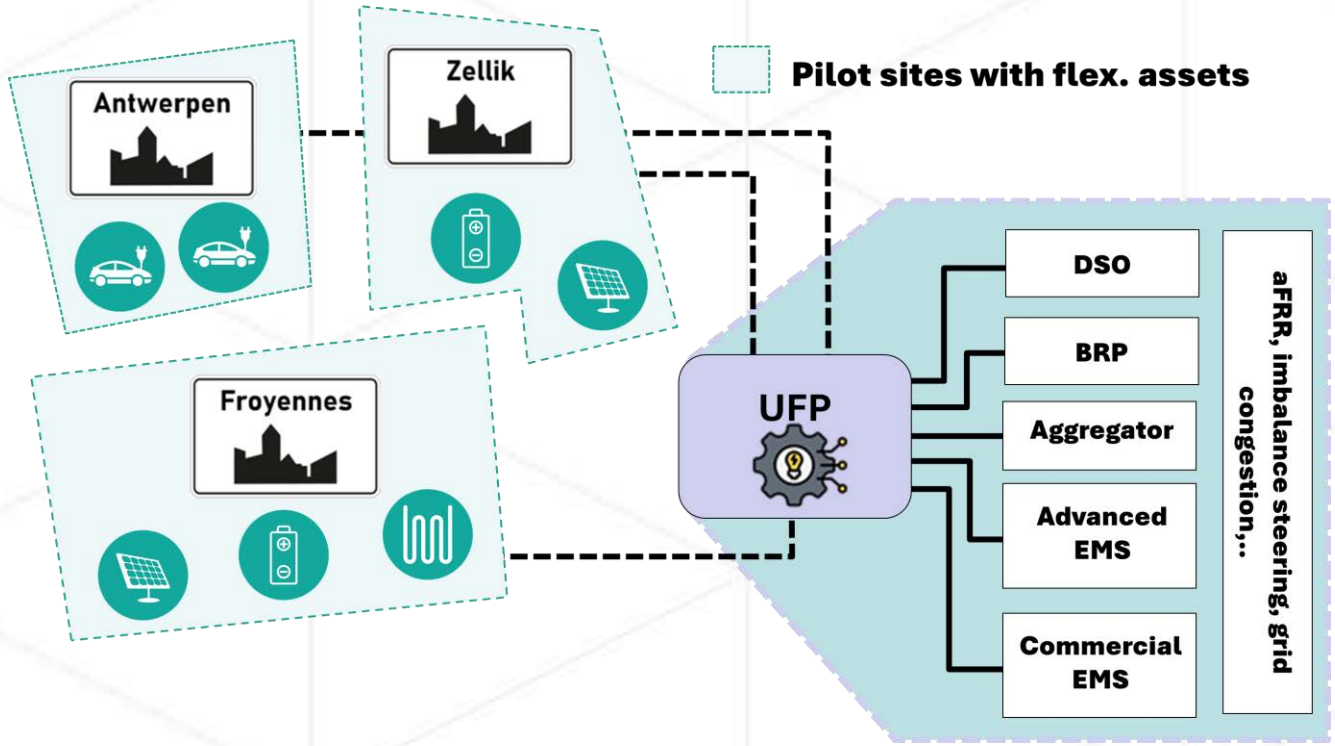
Selected cases cover a wide range of **technological** and **societal characteristics**, ensuring :

- that different stakeholders are not left behind
- various technologies are considered

Living Lab

EV Charging Stations

Local Energy Community



Dissemination & Publications

Participation to multiple events, e.g. FLEXCON, Wall4Grid, etc.

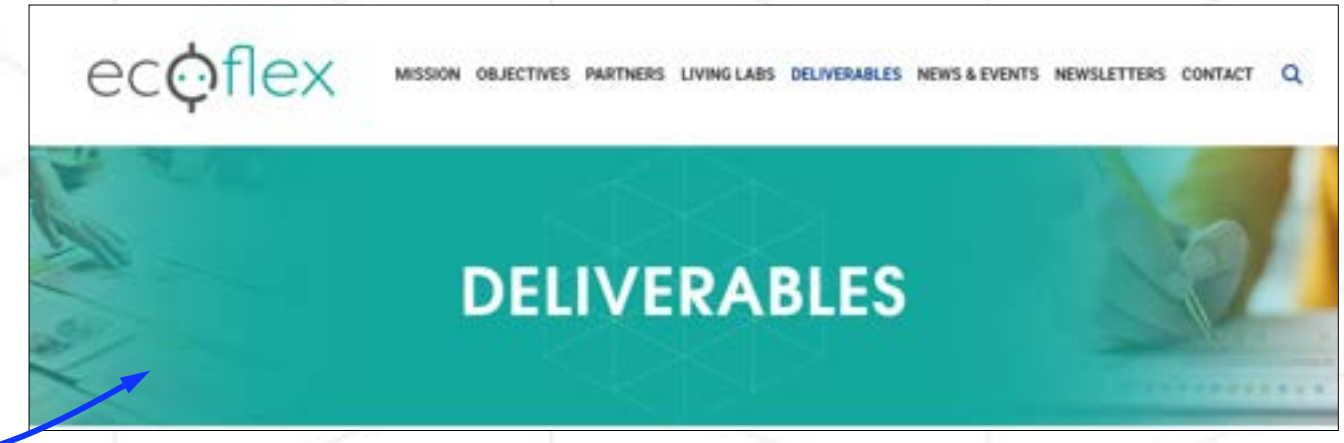
Published and presented at:

5 International conferences

4 Peer-reviewed journals

Discover more at:

http://ecoflex-project.be/



List of Publications

1. Cleenwerck, R., et al., 2023. *"Smart Meter-Based Re-Phasing for Voltage Imbalance Enhancement Through Topology Reconstruction"*. In 2023 IEEE PES Innovative Smart Grid Technologies Europe (ISGT EUROPE) (pp. 1-5). IEEE.
2. Putratama, M.A., et al., 2023. *"Flexibility Valorization in Energy Communities: Grid Constraints Impact and Mitigation"*. In 2023 IEEE PES Innovative Smart Grid Technologies Europe (ISGT EUROPE) (pp. 1-5). IEEE.
3. Huber, D., et al., 2024. *"Life Cycle Assessment of Future Energy System Flexibility – A Methodological Framework Applied to Belgium"*. In SETAC Europe 34th Annual Meeting.
4. Ruddick, J., et al., 2025. *"TreeC: A Method To Generate Interpretable Energy Management Systems Using A Metaheuristic Algorithm"*. Knowledge-Based Systems, 309, p.112756.
5. Ruddick, J., et al., 2024. *"Real-world Validation Of Safe Reinforcement Learning, Model Predictive Control And Decision Tree-based Home Energy Management Systems"*. Energy and AI, 18, p.100448.
6. Cleenwerck, R., et al., 2025. *"ECOFLEX Project: Leveraging Flexibility From Low-voltage Assets"*. In 28th International Conference on Electricity Distribution (CIRED 2025) (pp. 1-5). IET
7. Naghdizadegan Jahromi, S., et al., 2025. *"Scheduling Electric Vehicle Charging for Participation in the Belgian Imbalance Market Using Model-Free Reinforcement Learning"*. In 38th Electric Vehicle Symposium (EVS38) (pp. 1-12).
8. Cleenwerck, R., et al., 2025. *"The Low-Carbon Transition in European LV Distribution Networks: A Questionnaire-based survey on Power Quality and Digitalisation"*. *Under review*
9. D. Huber, M., et al., 2025. *"Flexibility Services of Battery Electric Vehicles: A New Assessment Methodology Considering Different Scales"*. *Under review*

Context and Regulatory Framework

Context and Regulatory Framework

- The Evolution of the Energy Market & The Growing Need for Flexibility
  Josephine Delmote, ELIA
- Flexibility in the Distribution Grid
  Andy Gouwy, Fluvius
- Status of Flexibility in Wallonia
  Delphine Dessart, RESA **&** *David Vangulick*, ORES
- Flexibility and Energy Sharing in Brussels
  Karine Sargsyan, BRUGEL

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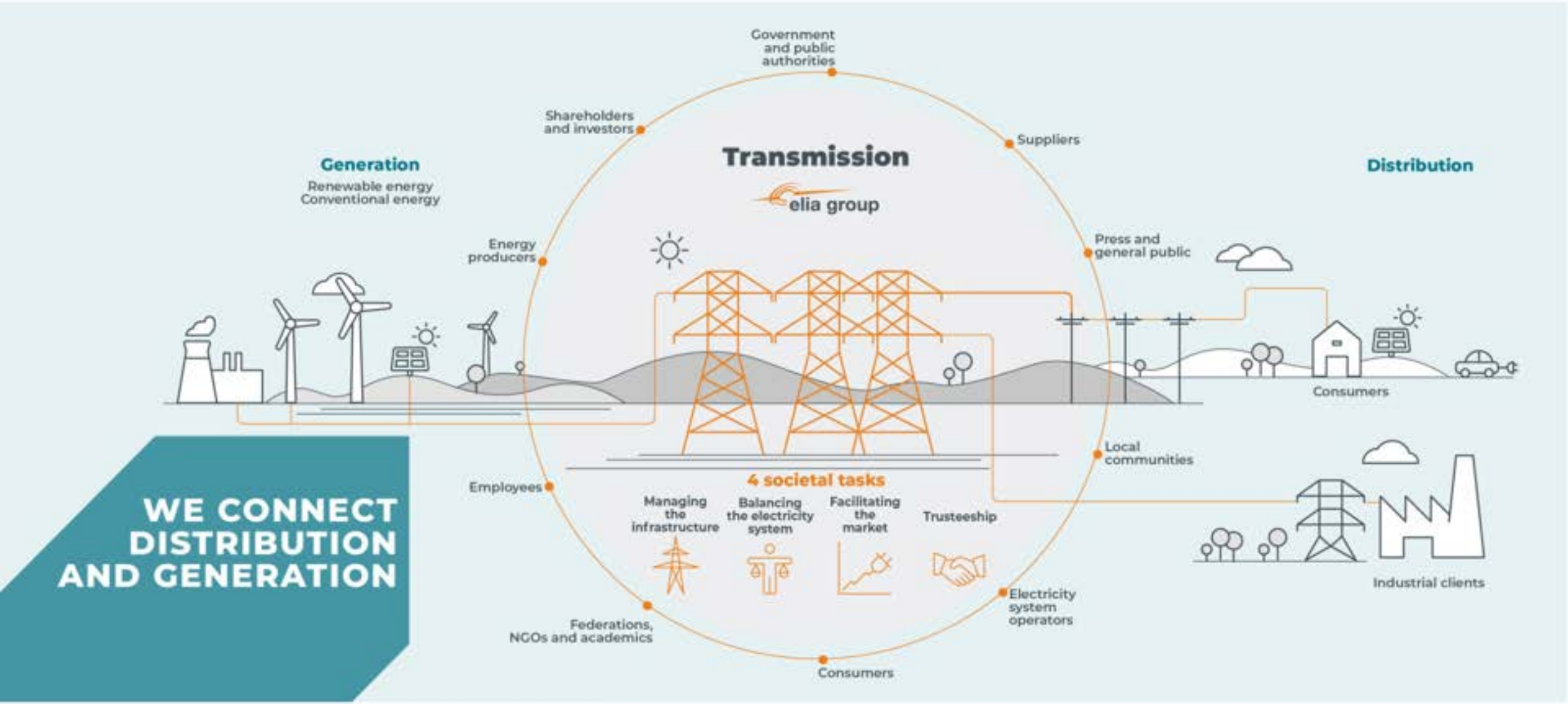
The Evolution of the Energy Market & The Growing Need for Flexibility

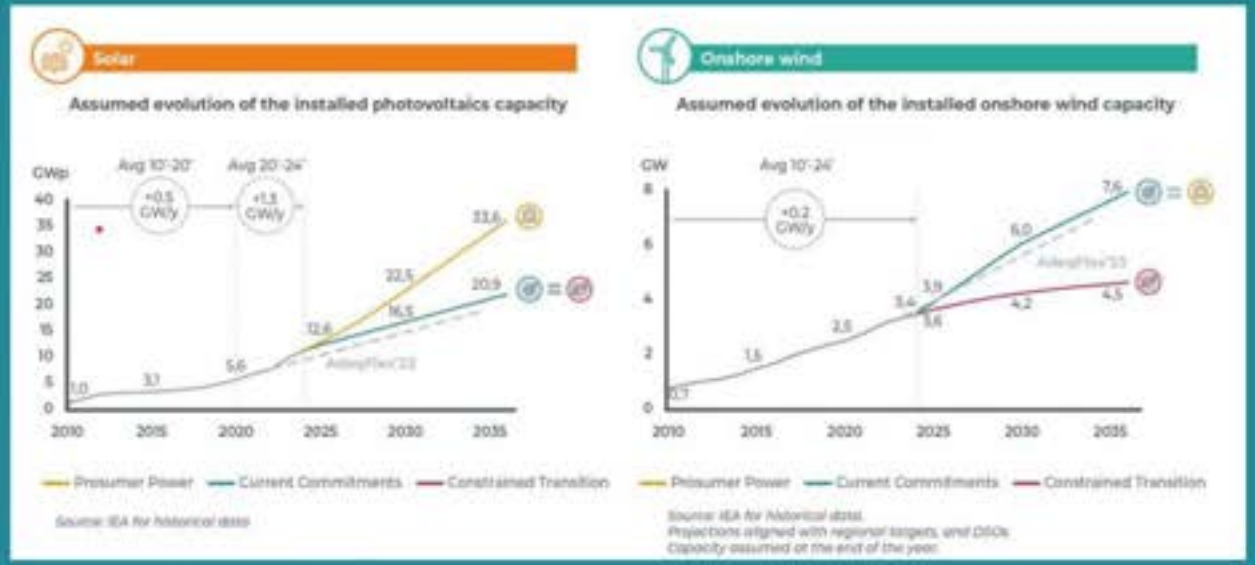
11/09/2025 – Josephine Delmote– Business Development
ECOFLEX


Government and public authorities
Shareholders and investors
Suppliers
Generation
Renewable energy
Conventional energy
Transmission
elia group
Distribution
Energy producers
Press and general public
Consumers
Local communities
4 societal tasks
Employees
Managing the infrastructure
Balancing the electricity system
Facilitating the market
Trusteeship
Industrial clients
Federations, NGOs and academics
Electricity system operators
Consumers
WE CONNECT DISTRIBUTION AND GENERATION

- **Significant increase in expected electricity demand**
- **Accelerated integration of renewable energy sources in Belgium**

Consumption

Production



Expected evolution of installed PV and onshore wind capacity

Source: Adequacy & flexibility study 2026-2036

Energy transition: focus points

1
Grid Infrastructure
For an efficient and orderly energy transition, the grid needs to be ready on time

2
Adequacy
Ensure security of supply during the increase of electricity consumption and intermittent production sources

3
Flexibility
Ensure consumers and industry can valorize their flexibility and benefit from the energy transition

Energy transition: focus points

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Adequacy

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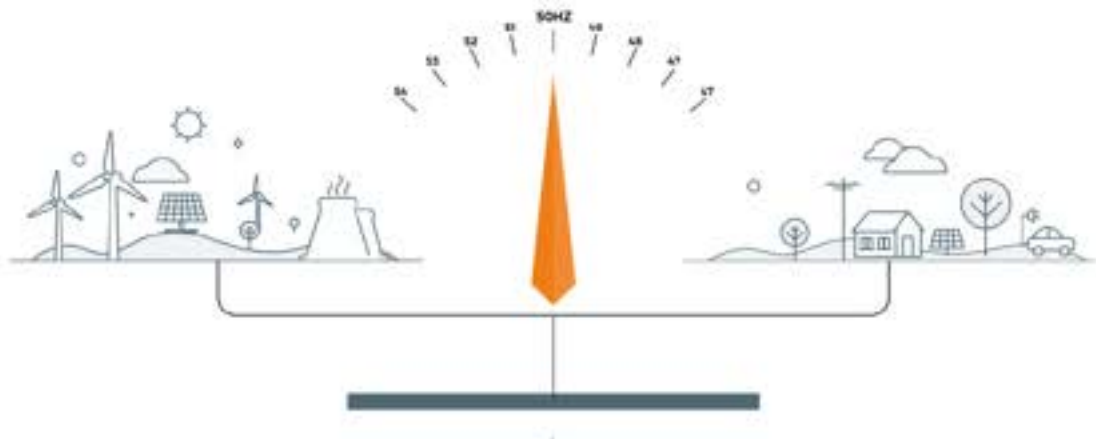
Flexibility

Ensure consumers and industry can valorize their flexibility and benefit from the energy transition



The flexibility is the ability to adjust the consumption or the production of an installation or a process

This may be in response to a price signal, the network frequency, or an activation signal from the network operator

- **Increase in flexibility needs following increased renewable energy sources**
- **Unlocking additional end-user flex towards 2036 remains a strategic priority for the energy system**

x2

Increase of flexibility needed by 2034

~7 GW

Flexibility needed in last hours before real-time

~3 GW

Flexibility needed in last 15' before real-time

Source: Adequacy & flexibility study 2024-2034

	Assumption	Benefits from optimising my devices based on a **capacity tariff** and a **dynamic contract**	Source of the benefit
No injection when negative prices	4 kWp PV installation	**40** to **250** €/year	Benefits from avoiding negative prices
Optimising my vehicle charging	EV with 60 kWh battery	**170** to **530** €/year	Benefits from - peak shaving, - energy arbitrage - increasing self-consumption
Optimising my heat pump usage	4 kW HP	**20** to **70** €/year	

Ranges provided are based on availability of the asset, different scenarios, weather years and future years.

Potential additional revenues could be gained from short-term flexibility

- *Benefits are express as a delta for a dynamic contract, do include the benefits from capacity tariffs as set today in Flanders but exclude additional benefits from providing ancillary services.*
- *Benefits are not necessarily cumulative for the 3 categories as synergies exist.*
- *Benefits including grid fees, taxes and levies*

Source: Adequacy & flexibility study 2026-2036

Different value streams of flexibility and combination thereof through value stacking are possible depending on the nature of the flexible assets

	Local		Implicit Flex			Explicit Balancing		
	Grid tariff	Self-consumption	Day-Ahead	Intraday	Real-Time	FCR	aFRR	mFRR
Trigger for service			Price			Automatic-Frequency deviation	Automatic – setpoint every 4 sec by Elia	Manual activation after Elia request
Time until full activation						30 sec	<=5 min	12,5 min

Watts Happening

Get a first idea of what different value streams can bring for your assets through a calculation tool provided by Elia*

* Not fit for exact business case calculation

BRP = Balance responsible party
BSP = Balancing service provider

Activation time = amount of time it takes for the service to be fully deployed
FCR = Frequency Containment Reserve, aFRR = automatic Frequency Restoration Reserve, mFRR = manual Frequency Restoration Reserve

How to access the different value streams?

		Implicit Flex	Explicit Balancing
			FCR / aFRR / mFRR
Provider of business opportunity	Direct	Electricity market	Elia
	Indirect	Supplier / BRP	Aggregator / BSP
Accessibility		Through energy price contract	All voltage levels having access, except LV mFRR

How to learn more

Voka Wijzer

Meerwaarde creëren dankzij energieflexibiliteit

Watts.Happening

Helping you find your way to benefit from the value of your potential flexibility

Monthly info session by Elia

How to monetize your power assets' flexibility?


Thank you!
Questions?
Contact josephine.delmote@elia.be

Fluvius

Flexibility in the distribution grid

Andy Gouwy

Expert assets and grid architecture LV Grid & Flexibility

11/09/2025

Tot bij u

Mission statement: Building an ecosystem

"Build and nurture **win-win partnerships** between Fluvius and (market-based) providers of flexibility and reactive capacity"

- **Learning to use flexibility** appropriately for the benefit of our grids, clients, society is a huge challenge
- To this end, we actively call upon the **knowledge and skills in Flanders to** approach that challenge as an ecosystem
- Target group: all providers of flexibility and support services

Today's menu

#1 What is flexibility – the energy system perspective

#2 The ecosystem players

#3 Why? Managing peak for an optimally used grid

- Congestion
- Our Action plan

#4 A deeper view on prominent initiatives

fluvius.

The needs at a glance

Balancing

Elia needs very large additional volumes (aFRR-mFRR) due to rising volatility

Sudden surges in PV injection: a real operational risk today

Volumes only from production customers and TSO network are not enough

BRPs are looking for more demand that follows production

Security of supply

Elia/Belgium is looking for capacity. Costs high if it has to be provided for infrequent peaks

Peak reduction and storage on DSO grid can play an important role

Optimal use of grid

Increase in demand much faster than we can build grids, investing alone does not suffice

Congestion has arrived: In several zones a customer will not be able to be connected 24/7/365

A major acceleration in the development of DSO flexibility will benefit every system challenge

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fluvius.

Who’s playing – our clients and their assets

MV grids

- Heat and power combined CHP
- Batteries
- Cold stores
- E-boiler, e-oven, heatpump,…
- Charging infrastructure






LV grids

- Charging station
- Home batteries
- Heat pump
- Solar panels
- …

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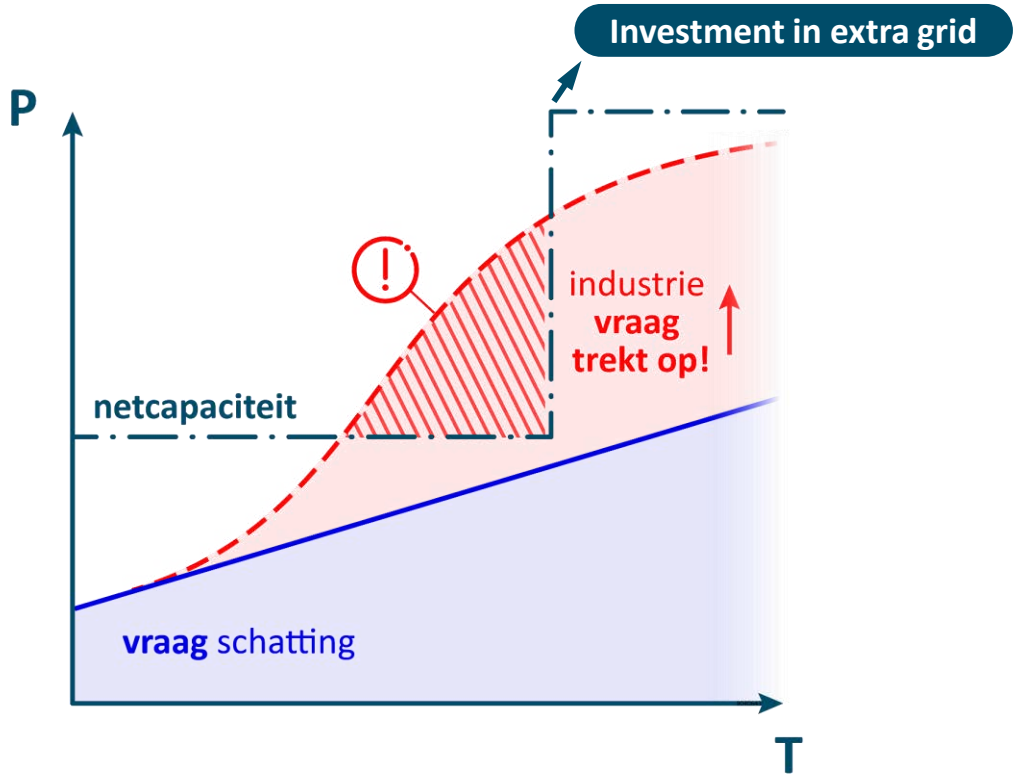
Industry growth is rising faster than we can build grids



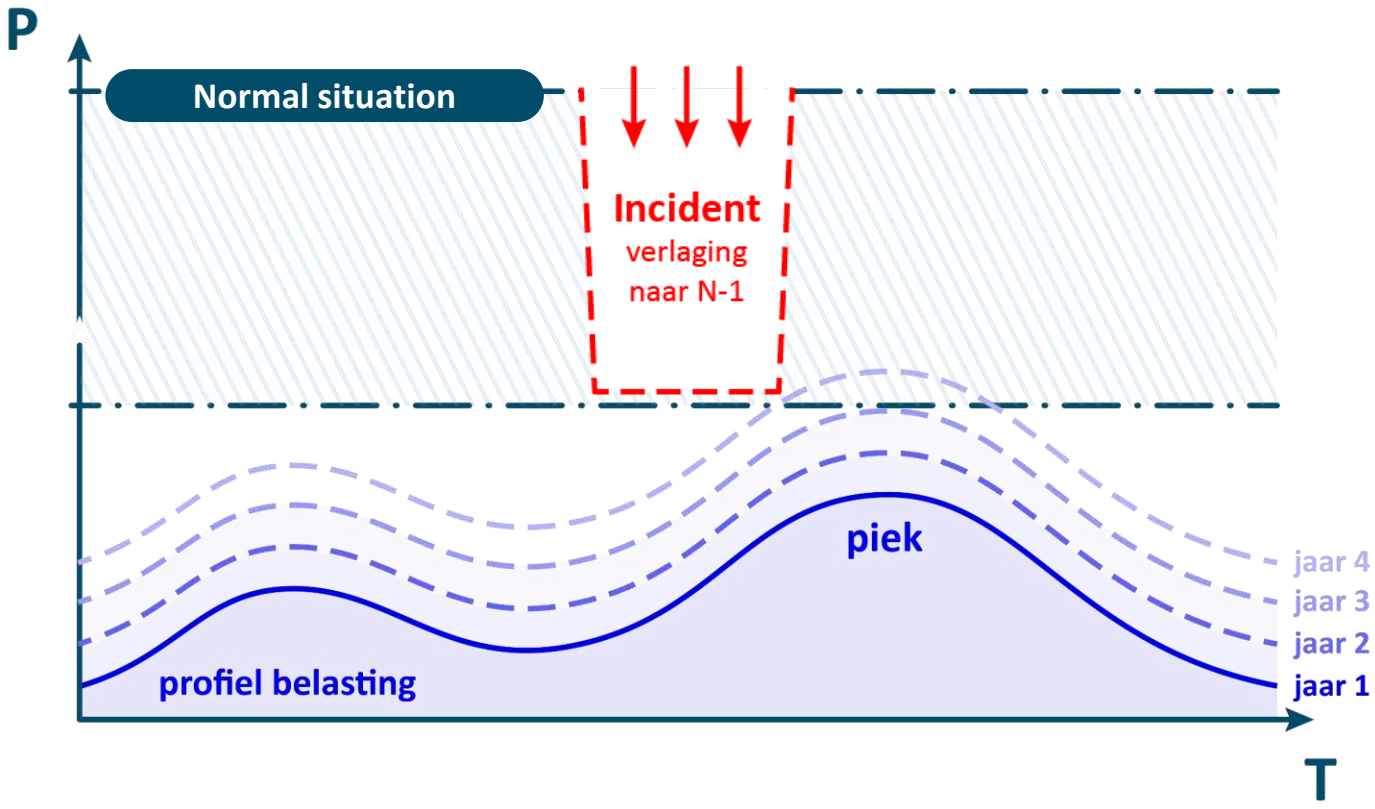
Need for long-term **growth expectations**

Clear exponential **growth in industrial connection requests**

But

- Not available 365/24/7
- Congestion emerging
- Reality for the coming years

Exponential growth on our grids



Growth

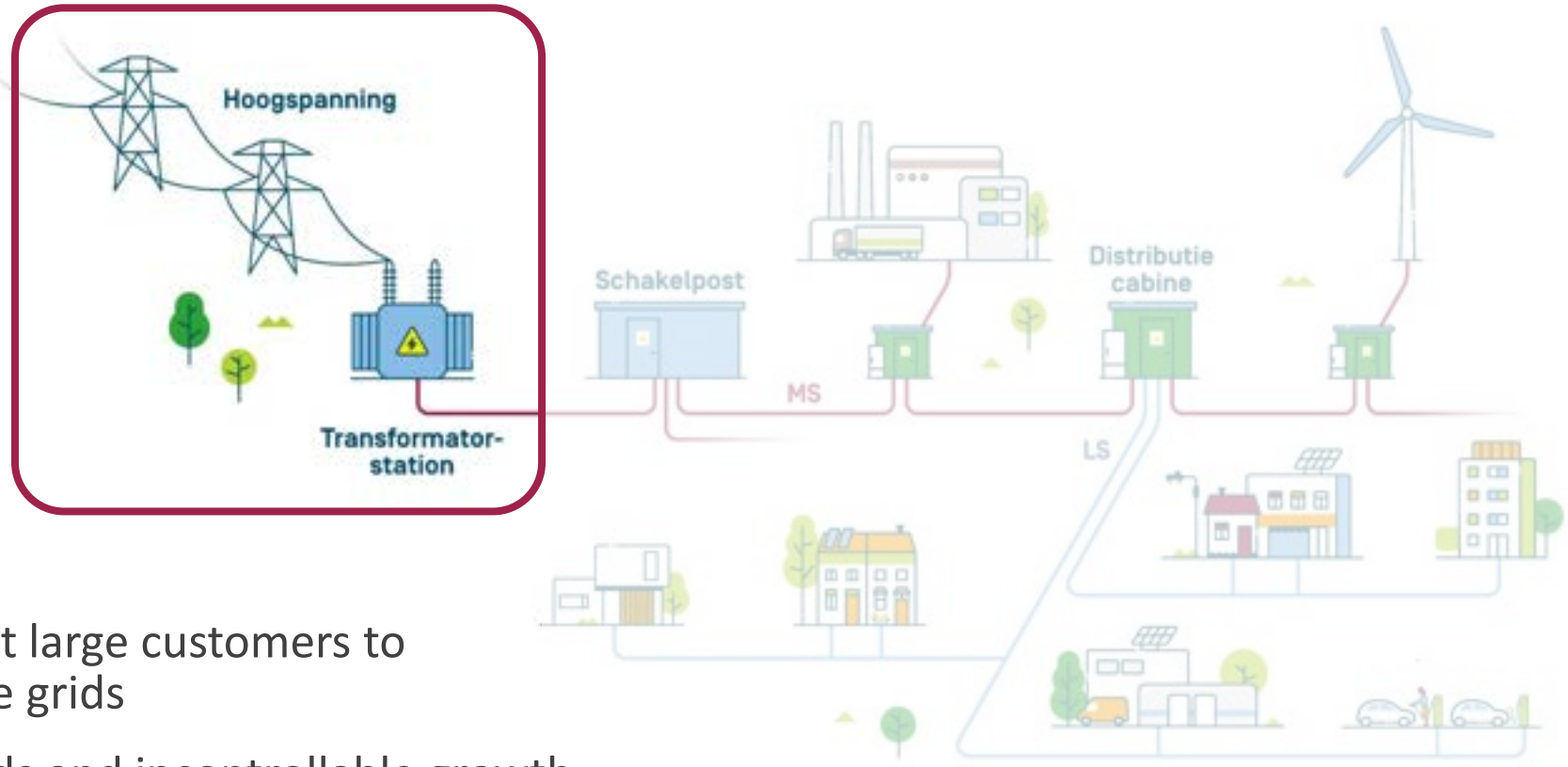
Controlled

- E.g. industrial demand 5MW
- Refusal is an option, but to be avoided wherever possible

Incontrollable, organic growth

- Use more of contractual power
- LV and MV

Challenge for Fluvius & Elia



- Continue to connect large customers to congestion sensitive grids
- Managing peak loads and incontrollable growth
- Limit operational risks involved

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fluvius.

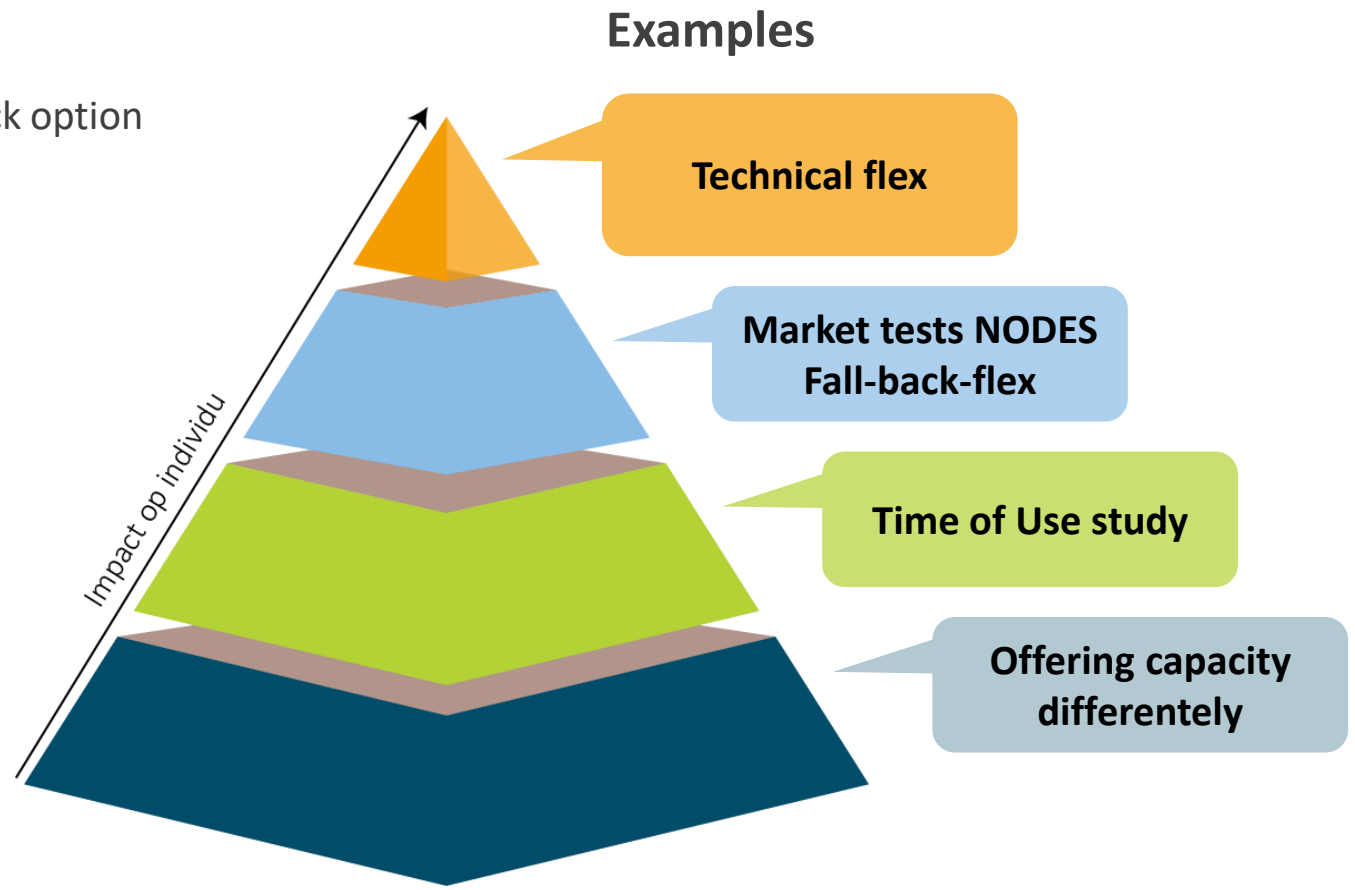
What else can we do?

4 Regulated Solutions
Explicit flexibility, direct control as a fallback option

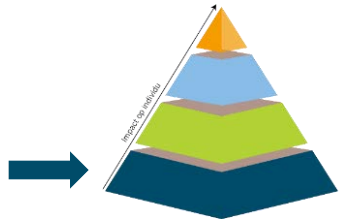
3 Market-based solutions
Explicit flex, voluntary participation

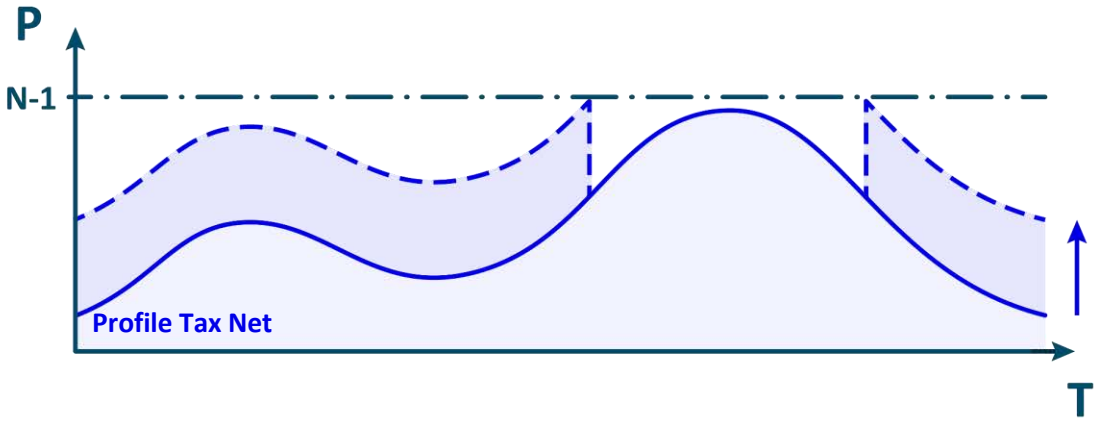
2 Incentives rate & dynamic prices
Minimise peaks & spread the mout

1 Infrastructure
Targeted investments
Dynamic grid control



When do you really need your peak power?





The customer needs his full capacity outside **peak hours**

→ Full power for certain time windows, not for others

→ Only possible if the systempeaks are fixed

Result: customer can access it without increasing peak power on the grid

The ‘full option’ connection should become more diversified

Flexible connection contracts

- For whom:
  - **Industrial customer:** wants connection (new/reinforcement) without delay, even in congestion-sensitive grid
  - **Fluvius:** wants to make optimal use of the grid and avoid increasing connection times
- What:
  - **Agreement regarding taking into account profile** or call-off **flexibility** of customer to be connected, for offtake
  - Voluntary part of the connection contract
- Profit:
  - **more kWh of connected** renewable energy or economic development, which would otherwise have to be refused due to peak
- Frequently used in the UK, NL under different variants individually and in groups

➔ **object of regulatory pathway (EMD5, Energy Decree,…)**

‘Fall-Back Flex’ and flexible connections as a tool

What

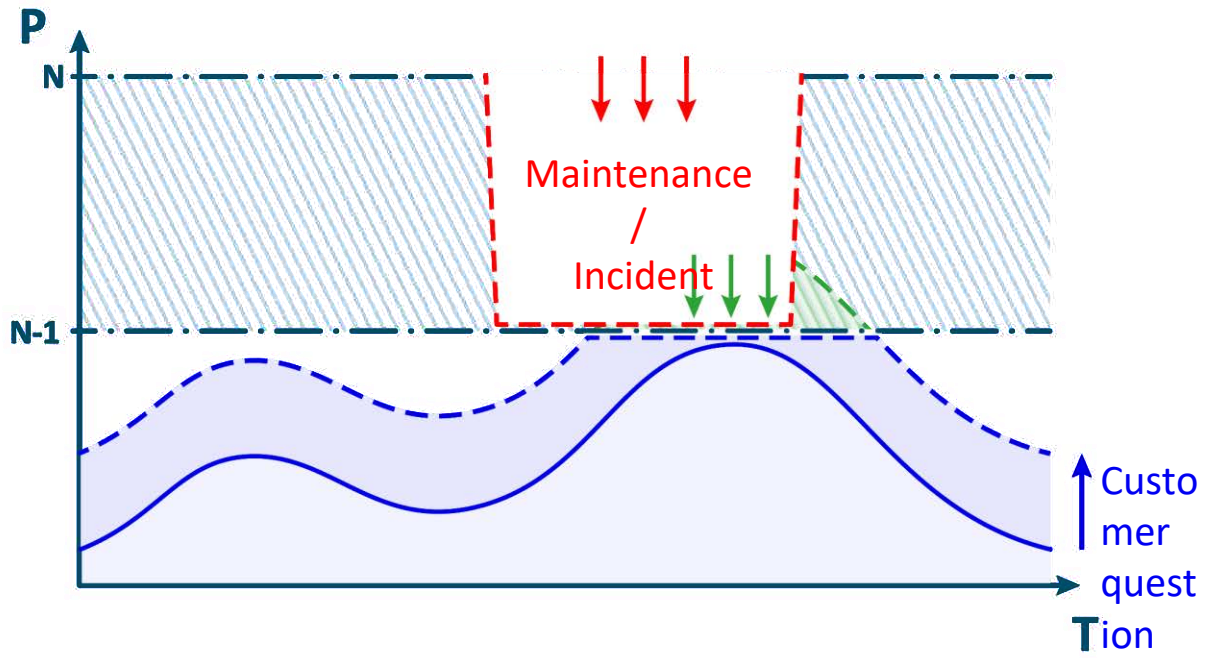
- Allowing industrial customers to connect to the 'reserve capacity' of the grid by looking for flexibility to fall back on when reserve capacity is lost (maintenance, incident,...).

Why?

- Connecting industrial customers to classic conditions introduces unacceptable grid risks.

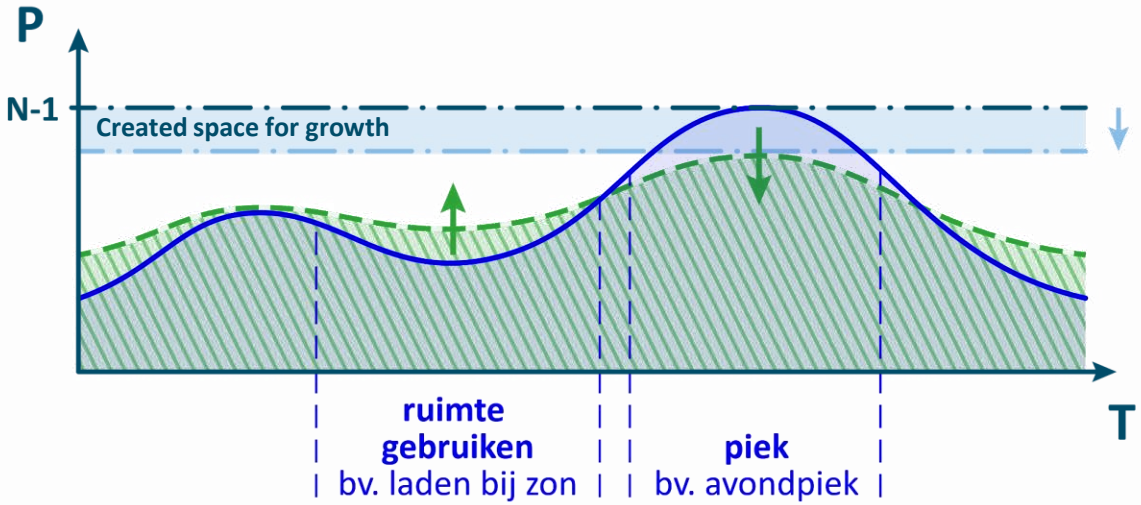
What does Fluvius do?

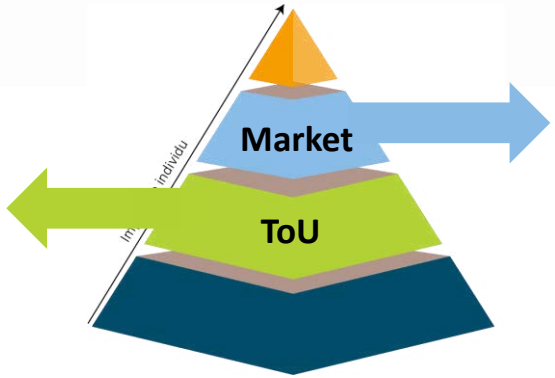
- Product elaboration via market (only regulatory route)
- Making proposals for flexible connection



Controlling peak through tariff / market

- **What?**
  - Influence organic growth and peak load of existing customers by seeking collaboration.
- **Why?**
  - Managing peak creates room for growth
  - Room for growth = investment deferral where possible
- **What does Fluvius do?**
  - Market testing flexibility: broad invitation ecosystem invitation to shape product/market combination.
  - Study Time of Use
- **What is the status?**
  - Specifications submitted, testing ongoing





Market test: iterate and learn

In order to learn as much as possible about flexibility, together with the ecosystem, Fluvius is organising several test rounds.

Winter testing 2024-2025

Focus on decrease, reduction or increase of injection

Finshed

Summer testing 2025

Focus on increasing offtake or injection reduction

started

Winter testing 2025-2026

Focus on decrease, reduction or increase of injection

Planned

Presentation of three congestion products for active power

	MaxUsage™	ShortFlex™	LongFlex™
Description	The FSP offers Fluvius the possibility, for a fee, for specific times and assets in the grid, **to limit the power that is offtake/injected to or below a certain power level**. For all moments for which Fluvius purchases this service, the FSP reduces its power to/below the promised threshold (without activation signal). The compensation is determined on the basis of the volume reduction achieved in this way compared to the long-term historical purchase/injection level.	The FSP offers Fluvius an **increase or decrease in offtake or injection by a certain volume** compared to a baseline, at a specific time and specific location in the grid. The FSP can adjust its desired fee (€/MWh) until shortly before the moment of delivery and guarantees activation of any block purchased by Fluvius. Fluvius buys on a daily basis in response to grid needs. Bidding in this ShortFlex™ market procedure can follow from a LongFlex™ reservation contract, or as free participation without previous LongFlex™ reservation.	Fluvius asks the FSP to keep a **certain capacity available** for the provision of flexibility services during specific time windows. The FSP guarantees, in return for a reservation fee, that it will participate compulsorily or automatically with the contracted (reserved) capital in the activation (ShortFlex™) market procedure in the zone during the contracted period.

Three active power congestion products

MaxUsage™	ShortFlex™	LongFlex™
Flexible production process	**Heat pumps**	**Heat pumps**
I have 3 lines in my batch production process, of 1MW each. During a normal production day, 1 to 3 lines always work, 80% of the time all 3. Still, I can't promise that I can drop another 2MW in consumption capacity in all situations. What I can do is promise that I will adjust my production plan so that a maximum of 1 line runs from 6-7 pm. For example, I limit the capacity to a maximum of 1 MW, which usually means a decrease from 3 to 1 MW. For that I want to get 5€/MW/h.	I offer a block of 500kW reduction between 6 pm and 7 pm. After all, I had promised in the LongFlex™ market to do this at a maximum cost of 40€/MWh. Today the temperature will not exceed 0°C, so the heat pumps are running at high power. I can even offer an extra 500kW on top of my reserved power of 500kW. So in total I arrive at 1MW possible purchase reduction, so an activation of 1h costs 40€. I activate every block that Fluvius buys. This way we get 1MW of consumption out of the evening peak.	I have 1000 controllable residential heat pumps in my portfolio. In the winter season, these heat pumps are usually used extensively during the evening peak. I can commit myself well in advance to drive a 500kW reduction reduction in this group of heat pumps if necessary. I make that 500kW capacity 'available' for a price of 20€/MW/h In other words, I promise to make 500kW activation blocks available to Fluvius in the ShortFlex market on the promised days and hours.™ My maximum activation price will be 40€/MWh (or lower).
Charging stations		
As an operator of charging stations, I manage 100 charging stations. Making a promise that I can send 100kW reduction in all future situations is difficult. What I can do is ensure that I purchase a maximum of 100kW with that group of charging stations in all future situations. That's why 'MaxUsage™' suits me better.		

Scope for Fluvius

What is Fluvius looking for

Congestion

Support services for the DNB

Fluvius as FRP

What is Fluvius NOT looking for

Balancing

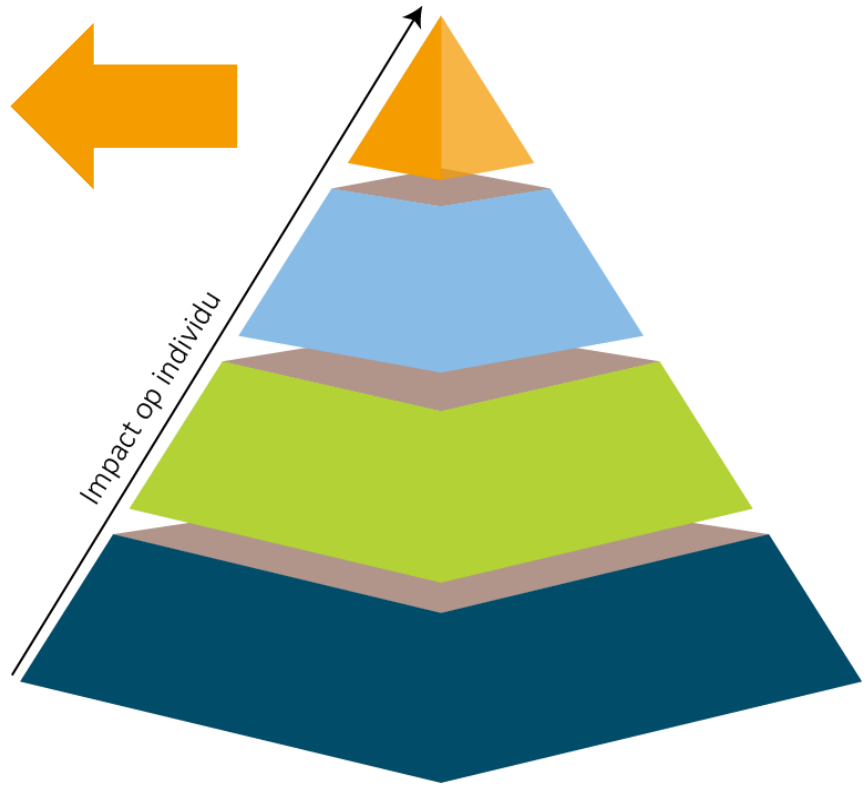
Security of supply

Fluvius as a data manager & facilitator

Regulated approaches

Technical or ‘reserved’ flexibility

- Known solutions, applied for years in eg. wind
- Regulated terms & prices
- Also needed for storage and offtake
- Available in 2026



The route is challenging

Regulation: accelerating together with regulators and policy makers to create a framework

Financial: customer/fsp looks at the financial incentive. How much is it worth to society to avoid the impact of congestion?

Daring to take the first steps within what is possible >> coming up with the perfect set-up

Thank you for Your attention!

Andy.gouwy@fluvius.be

fluvius.
Tot bij u

ECOFLEX Project

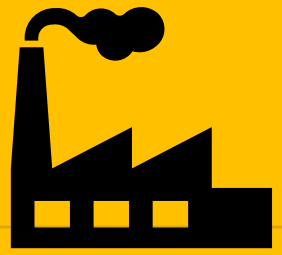
September 2025

4 revolutions

1 Distributed renewable energy production

2 Electric mobility

3 Decarbonization of heating



4 Electrification of industry

ORES

Resa

Energy transition is accelerating …

One of the key levers of the energy transition is the electrification of uses (mobility, heating, industry, etc.), with an **estimated increase of 50% in the volume of electricity passing through the grids by 2032**.

Low Voltage

PV

In 2023 alone,**100.000 new residential PV** installations, 60% more than in 2022

EV

+500.000 in 2030 on ORES network

Heat Pumps

44% en 2050

Medium Voltage

Renewables

numerous requests for new **wind farm construction or repowering**, with **3,015 MVA** of power under consideration as of April 25 ➔ **+90% in one year**

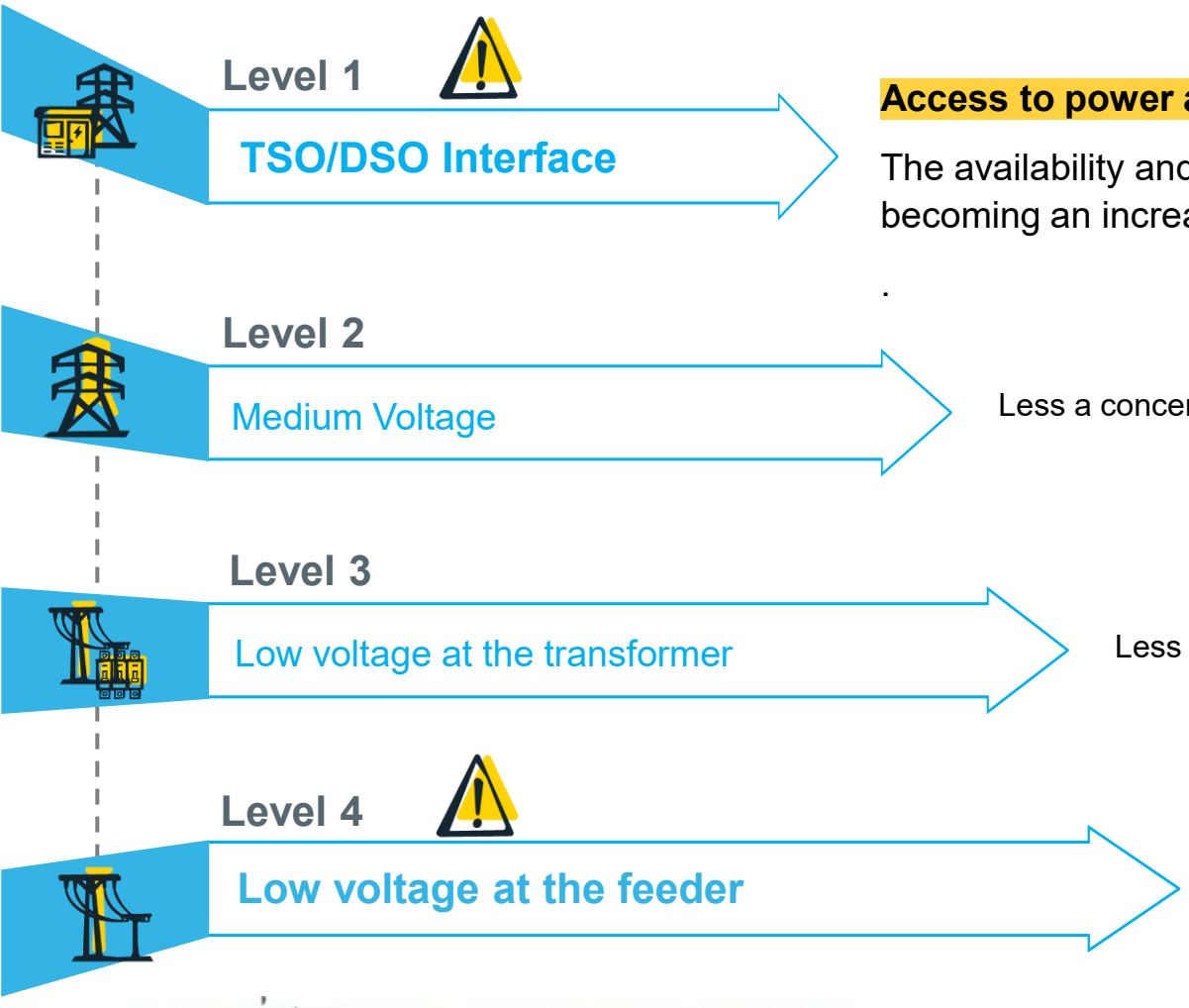
Storage batteries

a global power demand of **590 MVA** under study for BESS projects ➔ **+228% in one year**

Fast charging

hundreds of projects under study for fast charging stations (for a capacity of **400 MVA** by April 25) ➔ **+260% in one year**

Growing congestion at some levels of the distribution grid



Access to power at substations

The availability and allocation of electrical power is becoming an increasingly important issue.

.

Less a concern at this stage

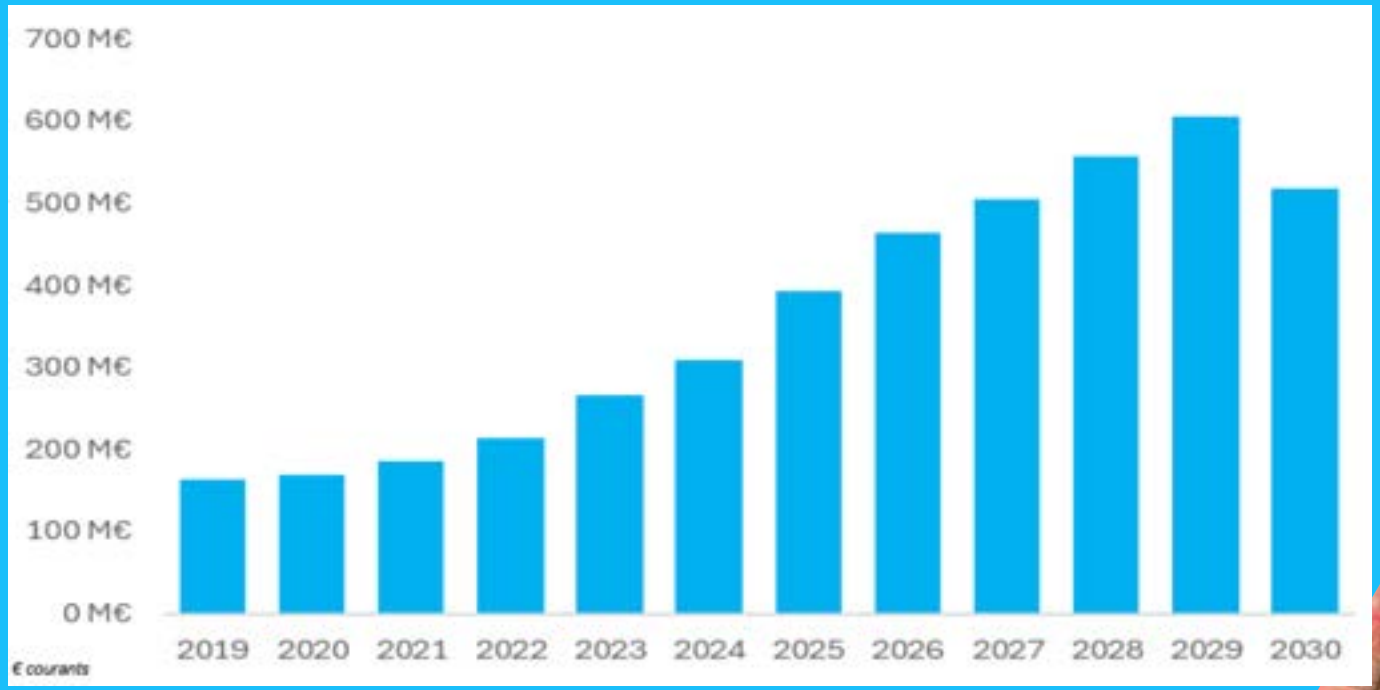
Less a concern at this stage

At this level, we find:

- **Overvoltage** linked to residential PV installations ➔ **10.000 electrical circuits out of 70.000** are vulnerable to injections of surplus renewable energy from photovoltaic panels and the arrival of electric vehicles.
- **Undervoltage** linked to excessive off-takes (e.g. charging [illegible] pumps at home).

More than ever, investment remains the backbone of the distribution system

Evolution of gross investments



Toward 2030:

8.400 KM
New cables deployed

5.000 KM
on Low Voltage grid

including

430 KM
more cables for wind power and industrial photovoltaics

3.850
new transformer substations and cabins

ORES

Investment takes time

at a time when the pace of the energy transition is accelerating and customer demands are multiplying. Flexibility must enable us to save time and limit costs for the community.

Flexibility
a key element to complement massive network investments

In a long-term industry, Flexibility as a tool for better management of:

time

Investment needs

- The client reacts to **price signals** and adapts its consumption/production accordingly.
- Application of incentive and dynamic tariffs can reduce the risk of congestion

- The client provides a **flexibility service** to the network in return for **payment.**
- Activation of Explicit Commercial Flexibility (in return for payment) via FSPs with a performance obligation

- The client can connect to the network despite the presence of congestion, on condition that the DSO can **directly modulate** consumption/production in case of need according to **predefined modalities**

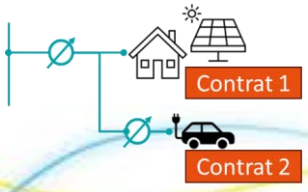
Status of flexibility in wallonia

IMPLICIT

Since **01/01/2025**:
80% reduction of the grid fee (proportional term) on shared energy

Possibility to activate a dynamic contract from **beginning 2025**

From **01/01/2026**:
Tarif Impact on volontaris basis



In progress: Multiple contracts on a single connection

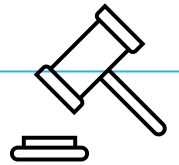
COMMERCIAL

Balancing products aFRR (**2024**) and FCR (2022) opened on LV DSO customers

Commercial flexibility for the specific needs of our net (**under exploration**)

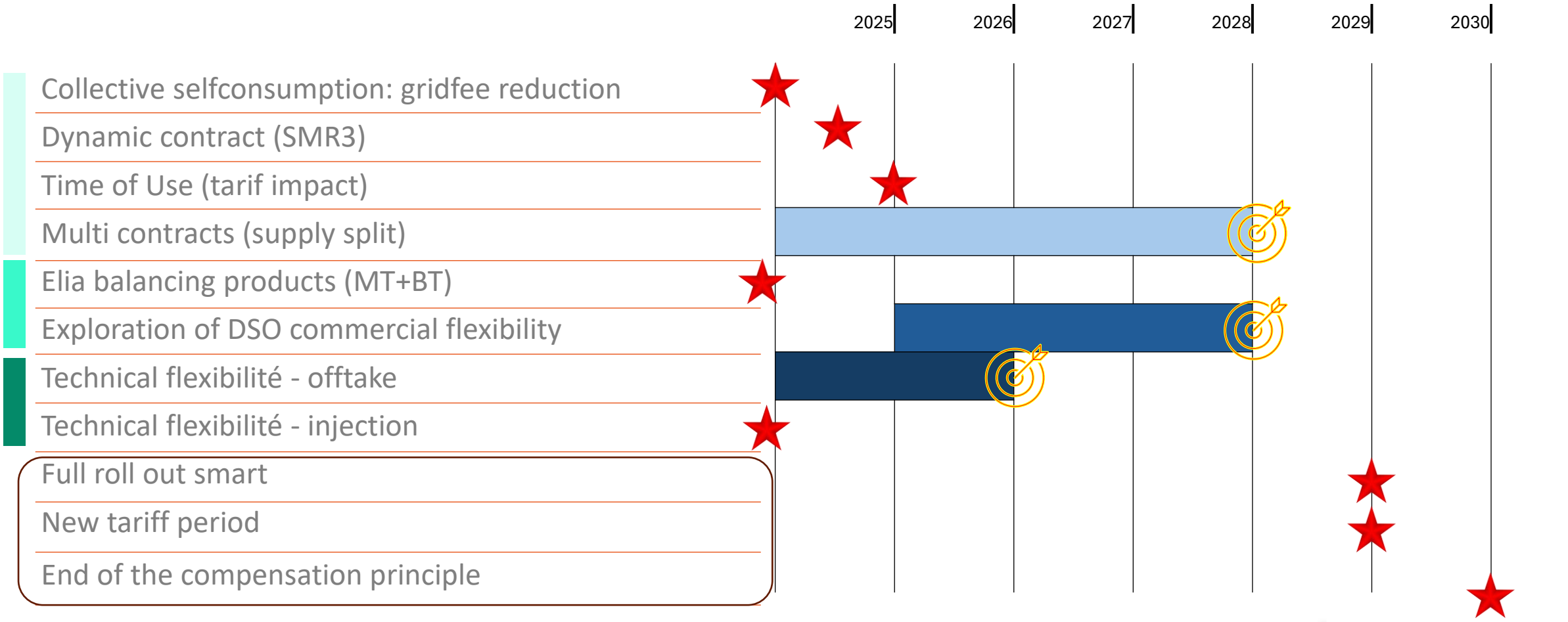
TECHNICAL

AGW T Flex **2016**
Production >250 kW

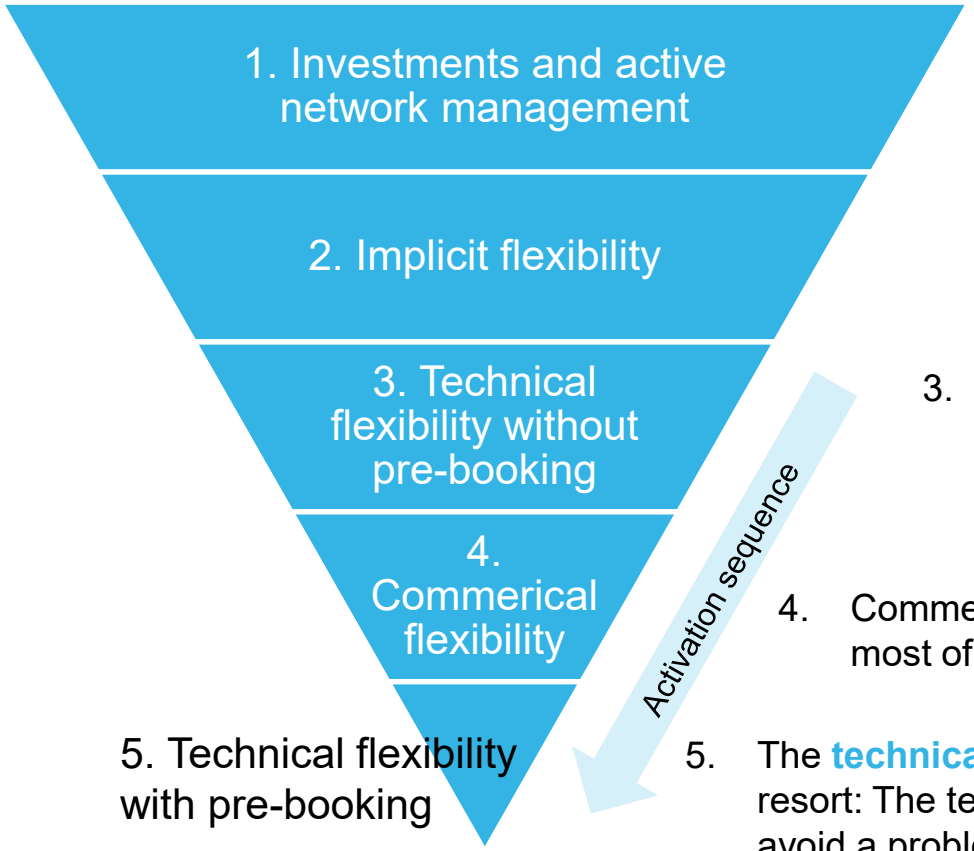


On going:
Technical flex for offtake

Status of flexibility in wallonia



The activation of the various explicit flexibility mechanisms must be coordinated



In a long-term industry, Flexibility as a tool for better management of

- **time**
- **Investment needs**

1. Plan for the **necessary investments** and link them to a trigger

2. Hoping for the effects of **implicit flexibility** to reduce the final need:
   - VE and HP in LV
   - Capacity tariff in HV (PPAD)

3. The **technical flexibility of non-pre-booked customers** will be activated in the first place. These customers are using capacity that has not been insured/granted by the competent authority. This activation is carried out within the limits of the flexible connection contract.

4. Commercial **flexibility** will be activated in order to allow customers to make the most of their flexibility: must cover the MW of overruns at the substation

5. The **technical flexibility of pre-booked customers** will then be activated, as last resort: The technical flexibility must be able to cover all the flexibility necessary to avoid a problematic situation

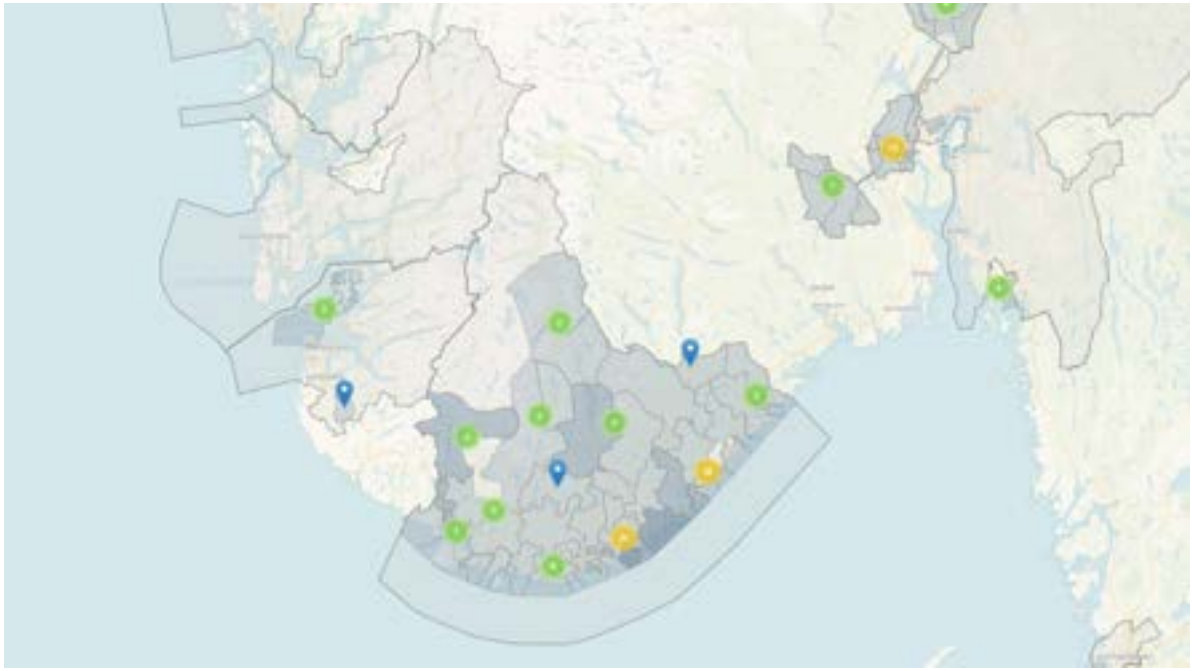
Market based flexibility

Local Flexibility Markets enable the DSO to purchase flexibility via a call for tender (often via a platform) in order to respond to congestion problems.

Tendering for HV constraints is a **rapidly developing** practice in many countries.

A public tender is currently underway to obtain a **flexibility platform** as a pilot, and to test the first calls for tender in 2025.

Current use cases mainly concern control support and work/maintenance management.



Analysis underway on the possibility of launching a pilot **secondary flexibility market**

In a secondary flexibility market, the producer (who receives an instruction, via o-one for example, to modulate his production) contracts with an industrial company to consume more, enabling the producer to continue injecting at full potential.

3 new flexibility products under construction

Power Unlock

N-1 redundancy means that a **second transformer** is typically present at the substation **without being valued** from a power availability point of view.

Change the operating mode from solo station to a dual one to **unlock potentially large volumes of contractualizable additional power**

In the event of unavailability of one of the two transformers (incident or maintenance), the power is no longer available

POWER CLEARANCE

The **saturation** of a substation is measured **at the point level**. Apart from this, there can typically be some available power that can be offered to customers

Available power expressed in the form of a **contractual envelope** giving

- By season
- By type of day (weekend/week)
- In 2-hour increments

The power limits that can be used by the customer (depending on the constraints on the substation and upstream lines)

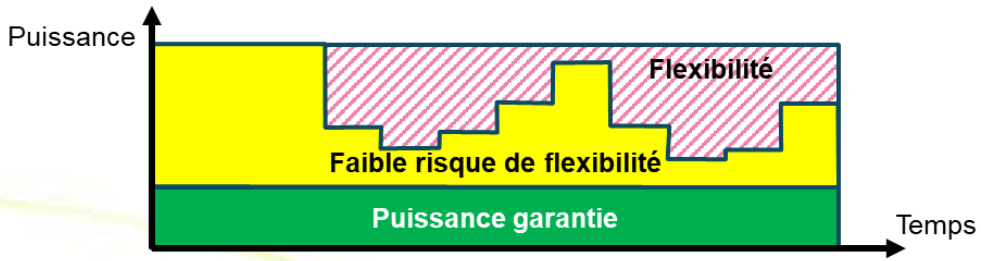
POWER RESCUE

On the substations with the most imbalance between demand and availability of power, the flexibility of the demand for power alone will not be enough to fill this gap.

Power/flexibility could be provided by other commercial players as a network service

Contractualization by the DSO of a flexibility service in the form of a **power supply** to be delivered according to the season, the weekend/week logic and in 2-hour increments

Temporary service for a period of a few months to a few years while waiting for ELIA investment



FLEXIBILITY & ENERGY SHARING IN BRUSSELS

Karine SARGSYAN
Acting Director

September 11, 2025

ECOFLEX

brugel

LE REGULATEUR BRUXELLOIS POUR L'ENERGIE
DE BRUSSELSE REGULATOR VOOR ENERGIE

BRUGEL : ENERGY REGULATOR IN BRUSSELS

Advisor

To the Brussels authorities to optimize the organization and functioning of the regional energy market

Control & sanctioning power

- DSO
- Energy actors
- Suppliers

Exclusive competences

- Approval of Network Tariffs & Network access conditions
- Granting authorizations to energy communities

REGULATORY FRAMEWORK

2019 > 2020 > 2021 > 2022

FROM 2019 TO 2022
Regulatory sandbox
managed by the regulator

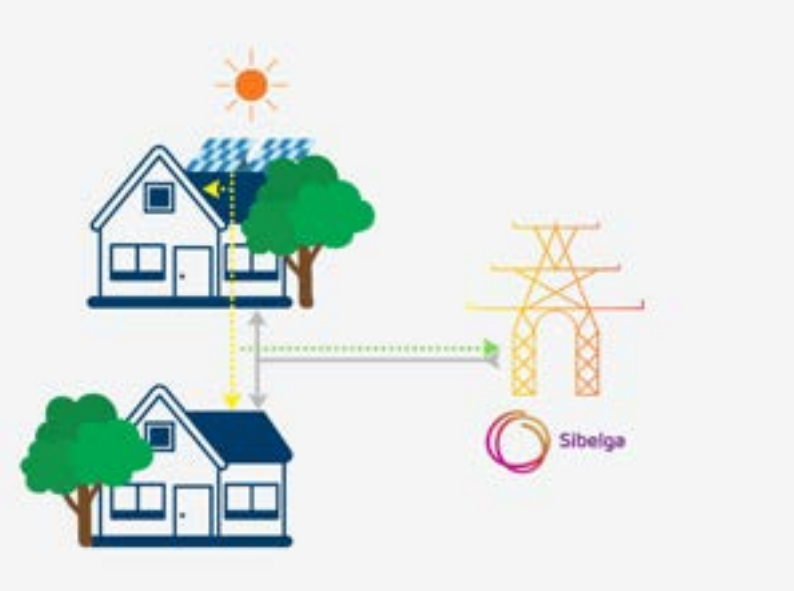
FROM 2022 Legal Framework
Law of 21 July 2001 related to the organization of electricity market in Brussels Region

Tarif regulation
- **Decision 210** related to distribution grid tariff for the energy sharing
- Cost-benefit analysis of energy sharing

Technical regulation of energy sharing
- **Decision 212** of BRUGEL related to the technical regulation of energy sharing

Authorization granted by BRUGEL to Energy communities
- BRUGEL's Interpretation guide related to the authorization granted to EC
- Granted authorizations

LEGAL FRAMEWORK : DIFFERENT MODELS OF ENERGY SHARING



Sharing in the same building

Active customers acting jointly

Sharing outside a single building

Energy Community

Citizen

Renewable

Local

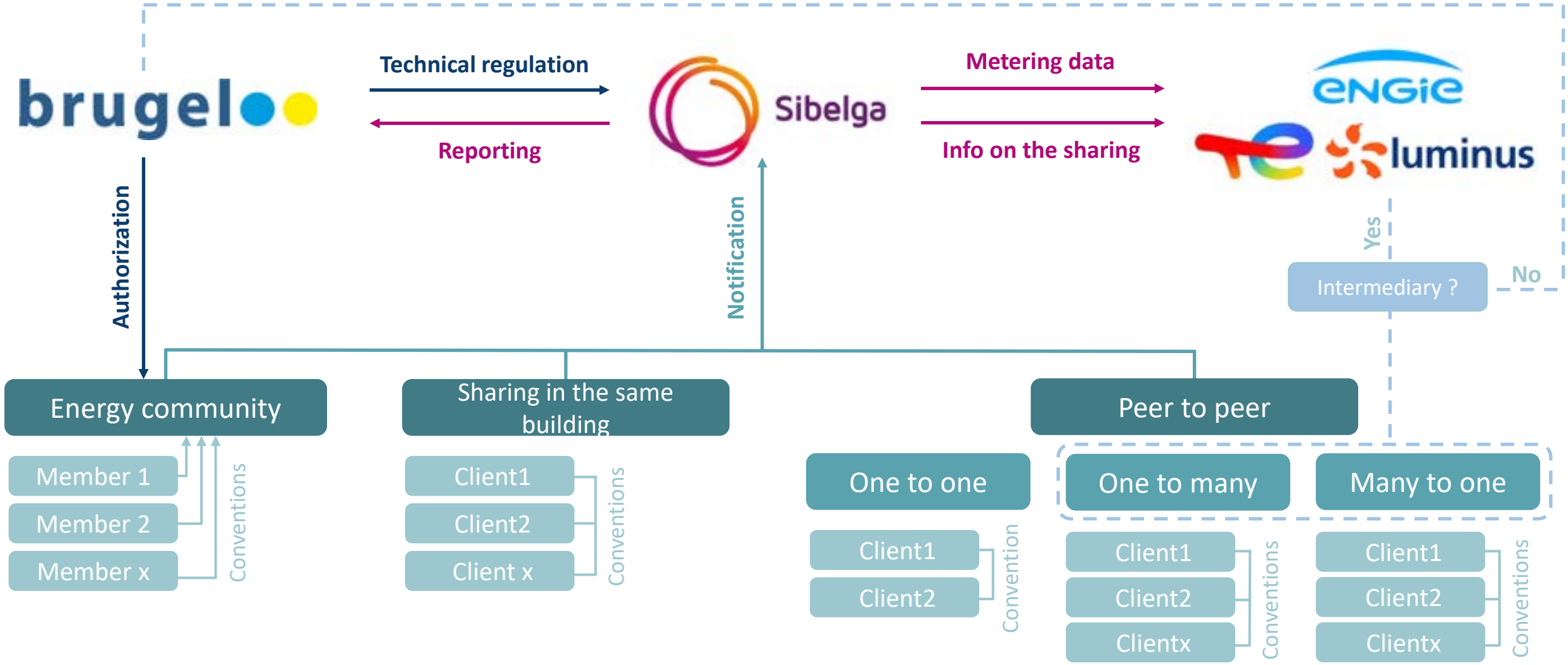
Peer to Peer

One to one

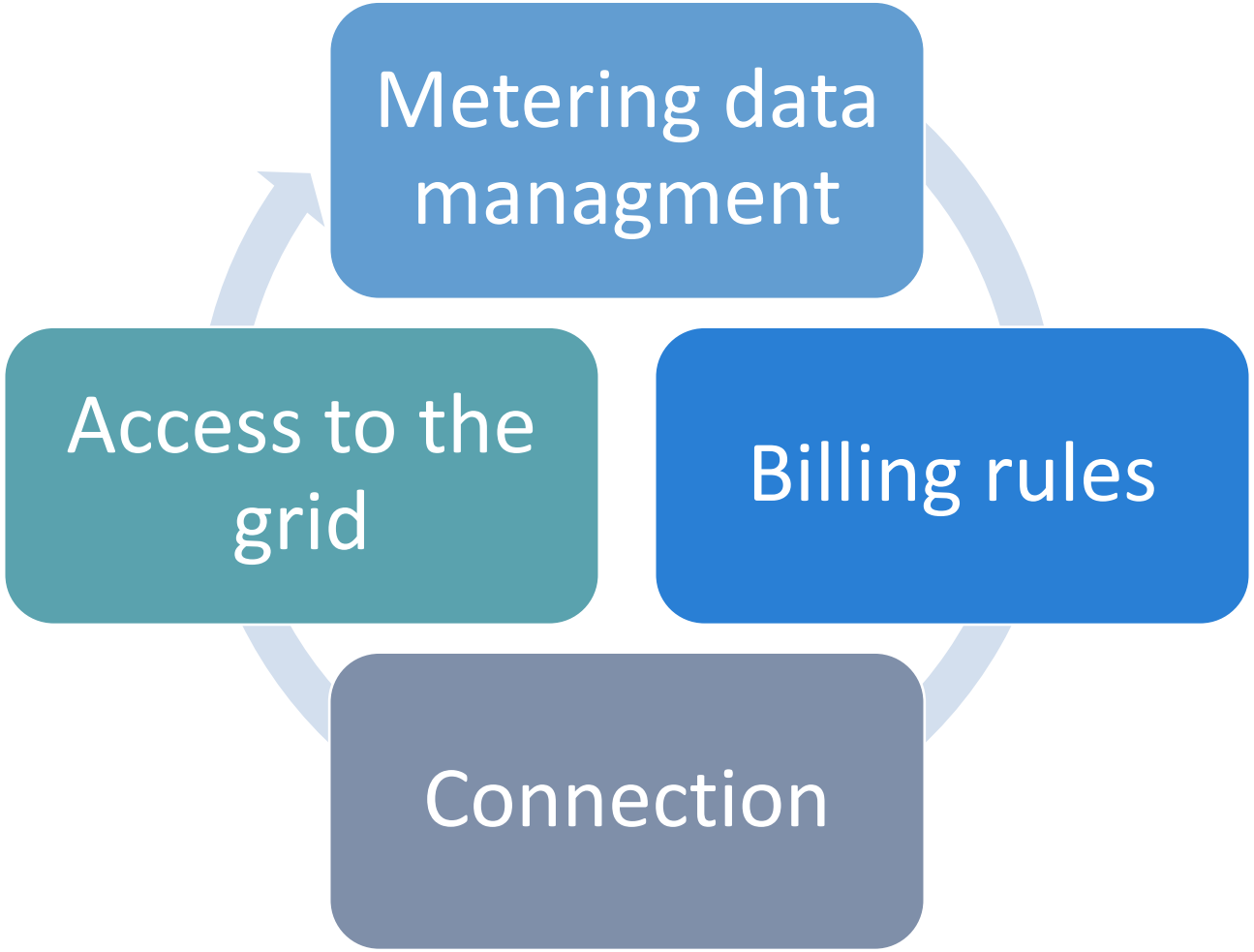
One to many

Many to one

LEGAL FRAMEWORK : CONTRACTUAL & REGULATORY RELATIONS



TECHNICAL REGULATION : DIFFERENT AXES



Tariff Regulation

2020-2024

- Preferential tariffs approved by BRUGEL for energy sharing (sept22 – dec24)

2025-2029

- Cost-benefit analysis for energy sharing
- Tariff methodology
- Preferential tariffs approved

KEY POINTS TO REMEMBER

Type B
(behind the same distribution cabin)

Type D
(many transmission cabins)

Benefits +++ → **Benefits +**

Type A
(same building)

Type C
(behind the same transmission cabin)

**The more energy is shared locally,
the more attractive it is in terms of network tariffs.**

KEY RESULTS : QUANTITATIVE ASPECTS

Assumptions

- 3 scenarios have been studied (1%, 5% and 20% of energy sharing penetration)
- In each scenario, 2 assumptions are made: each energy sharing participant contributes to the reduction of the grid peak by 0.5 kW or 1 kW compared to a situation with no sharing at all

In $€_{2022}$	Cumulative theoretical cash flow (NPV) over the period 2023-2042	
	0,5 kW per participant	1 kW per participant
Scenario 1	- 10 385 838	- 5 581 824
Scenario 2	- 8 053 730	15 966 342
Scenario 3	691 678	96 771 966

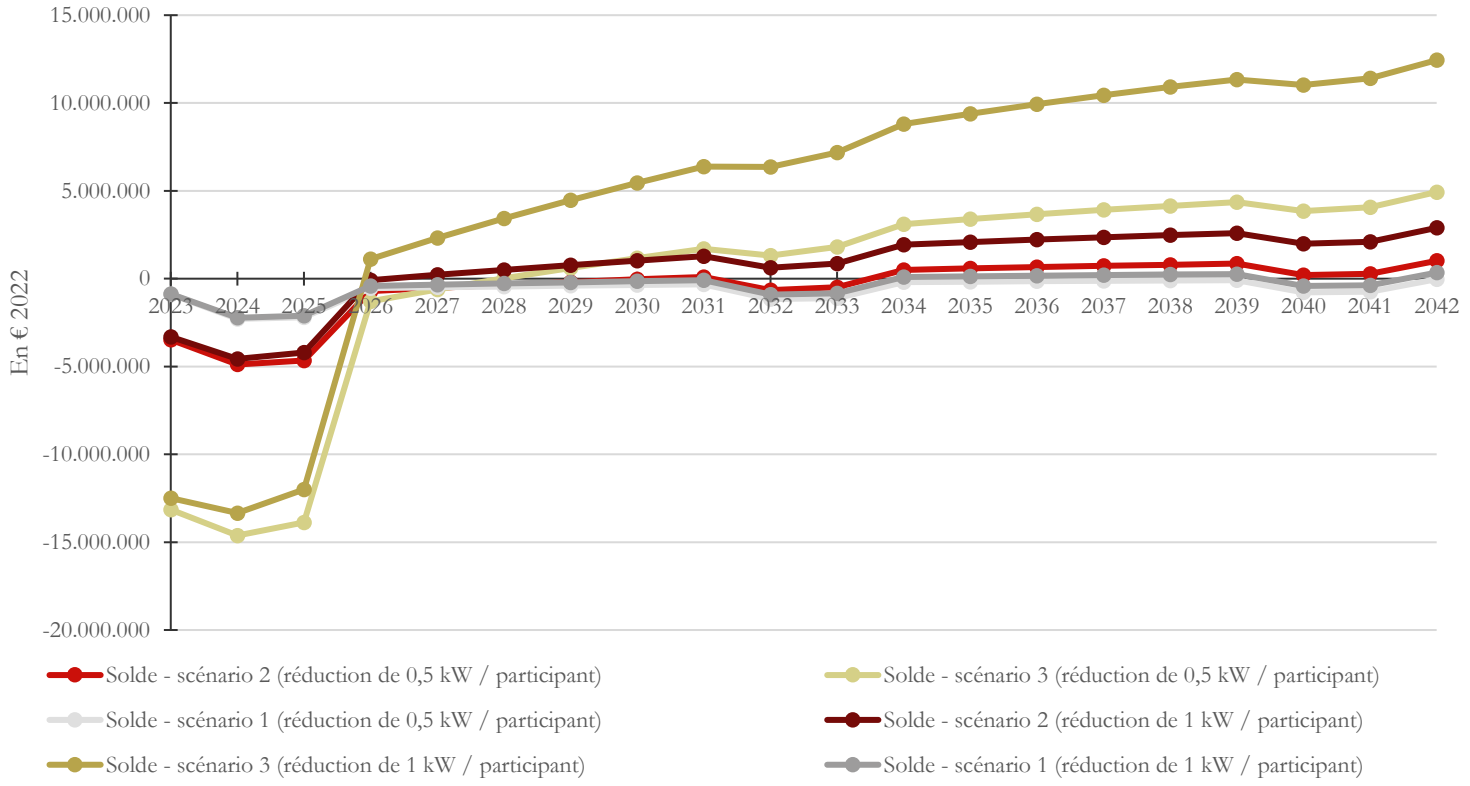
In scenario 1 the critical mass of energy sharing penetration is not reached, and the DSO will have to bear costs which are higher than benefits over the period 2023-2042

In scenario 2 represents a **tipping point for the DSO**, as the benefits exceed the costs over the period 2023-2042 where the effective reduction in peak network contribution per project participant is 1 kW. However, with a reduction in peak contribution of 0.5 kW per participant, the costs outweigh the benefits.

In scenario 3, the benefits exceed the costs, whether the reduction in peak contribution is 0.5 kW/participant or 1 kW/participant.

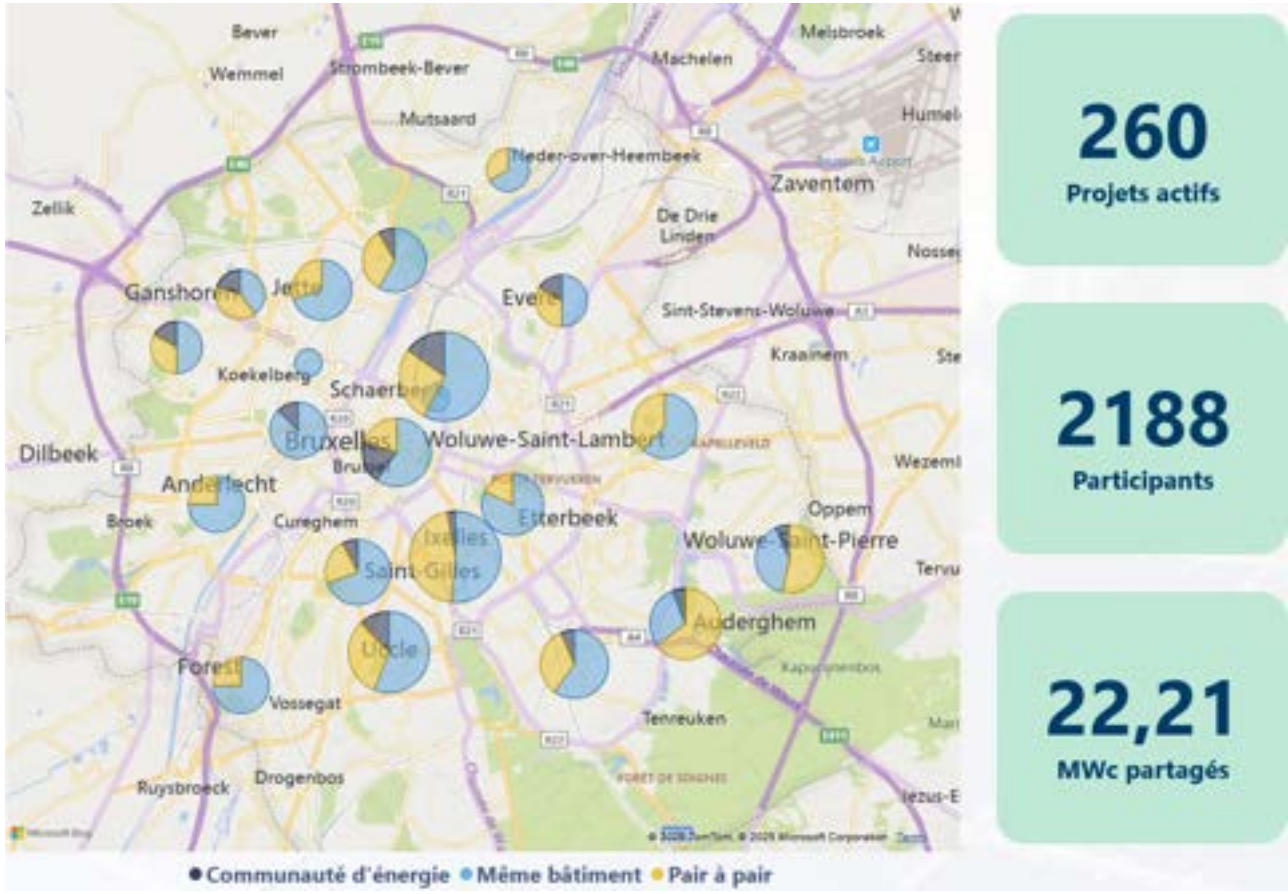
KEY RESULTS : QUANTITATIVE ASPECTS

This also means that the situation would be even more positive for the DSO with energy-sharing penetration rating above 20%, and the graph shows the value of encouraging the widest possible deployment of energy sharing



ENERGY SHARING : KEY FIGURES

Since the transposition of European directives into Brussels legislation, more than **2100 participants** have taken part in an energy-sharing scheme :



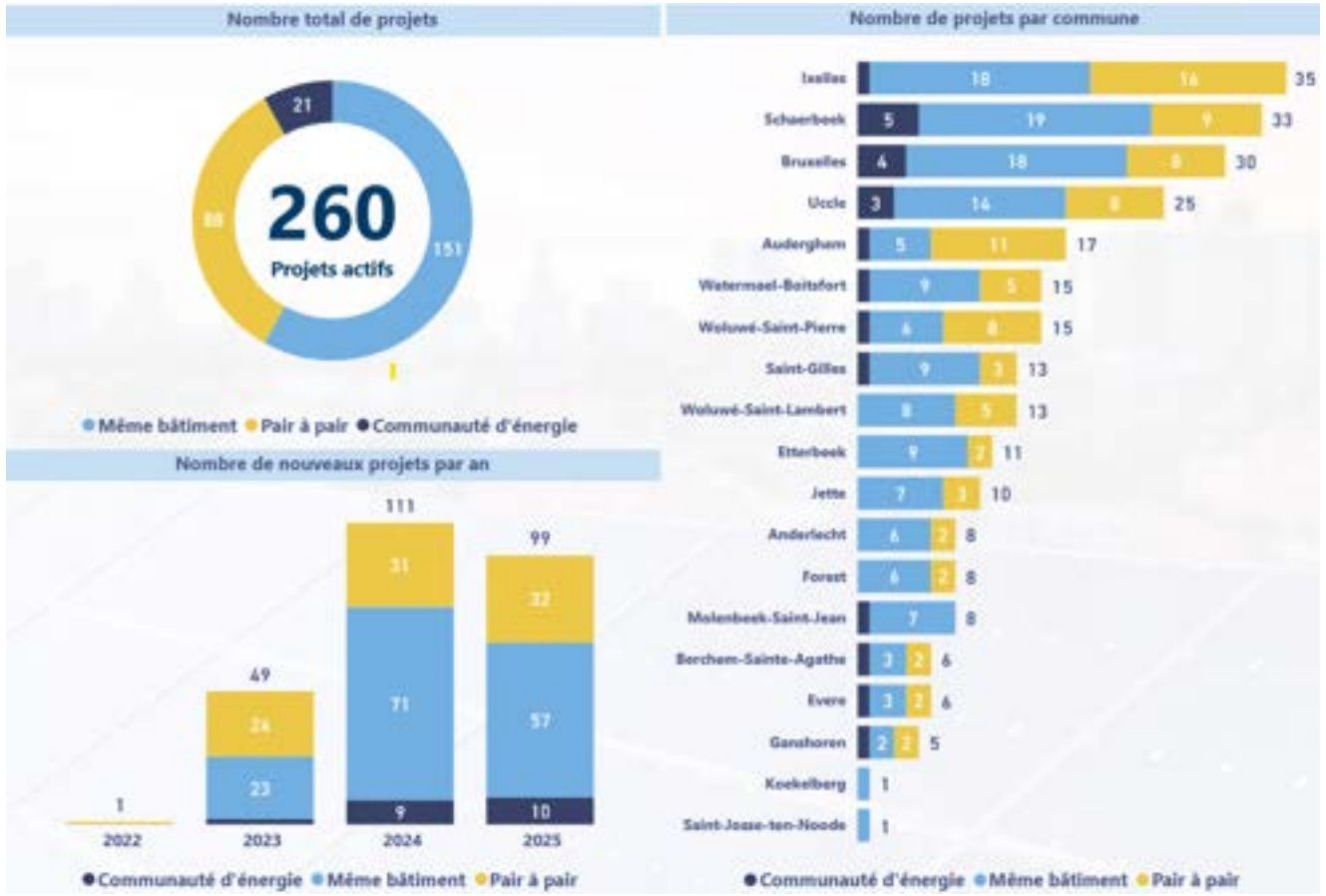
260
Projets actifs

2188
Participants

22,21
MWc partagés

ENERGY SHARING : KEY FIGURES

More than **58%** of energy sharing projects are located in the **same building** :



Flexibility

- There is an increasing need for flexibility in the grid.
- Regulatory policy must ensure that all forms of flexibility are activated.
- Energy sharing seems to offer significant flexibility for managing local congestions, especially considering Brussels urban context.

Conclusion

Brussels Region is pioneer in energy sharing

BRUGEL promotes a holistic regulatory approach based on economic aspects, energy efficiency and social welfare

BRUGEL collaborates with all stakeholders and plays a central role in exchanges

Project Results

ECOFLEX Partners

Navigating the Challenges of LV Distribution Networks

Rémy Cleenwerck, Ghent University

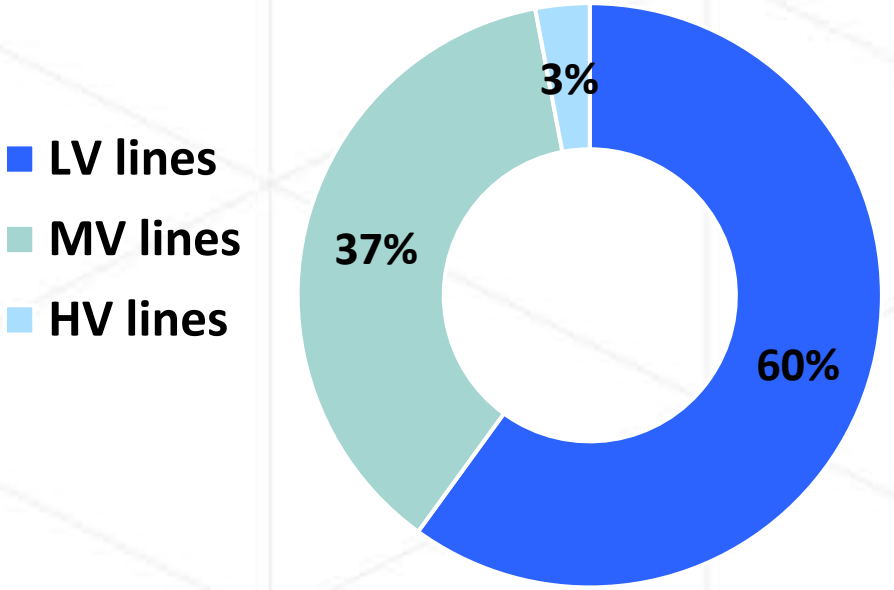
Why Flexibility Matters Now?

CHALLENGES

- RES target by 2030: **42.5%**
- Amount of EVs by 2030: **> 65 million**
- Heat pumps in use by 2030: **> 50 million**
- Aging: **40% of networks are > 40 years old**

Trend: connection requests at DSO level **increased on average by 19%** (in 2021)

Composition EU power networks



"ca. 70% of capacity would be directly connected to the distribution grids" – Eurelectric (2023)

Understanding Today's LVDNs To Plan Tomorrow

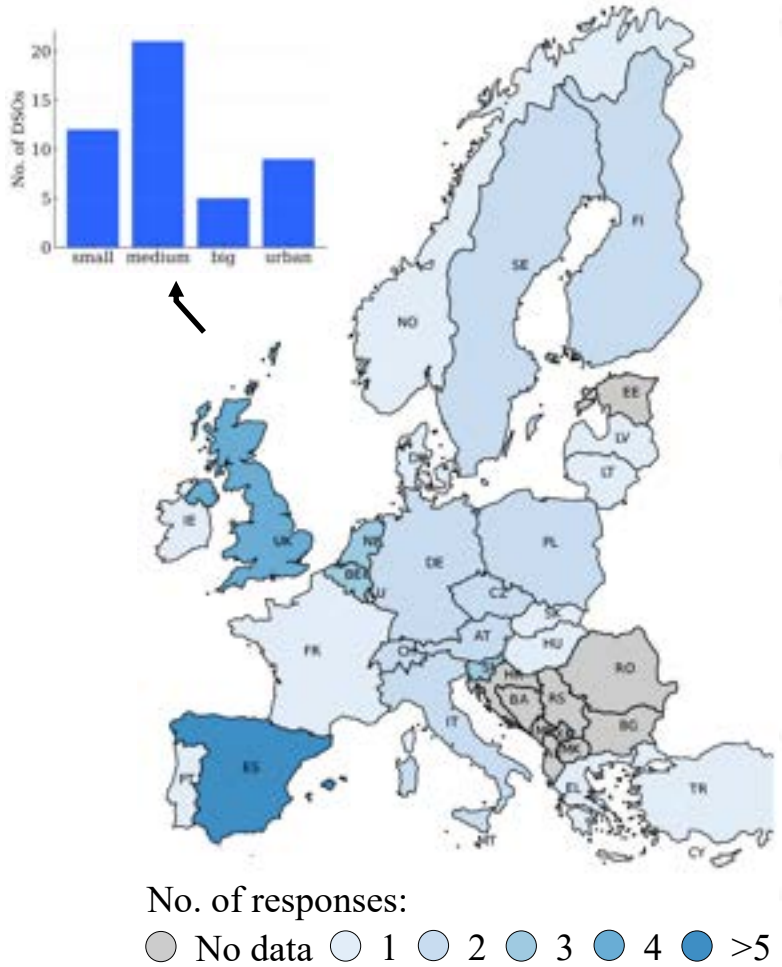
Questionnaire (March – August '24)

- Applications operational data
- Network planning and design
- Evaluation of grid stability (i.e. PQ)

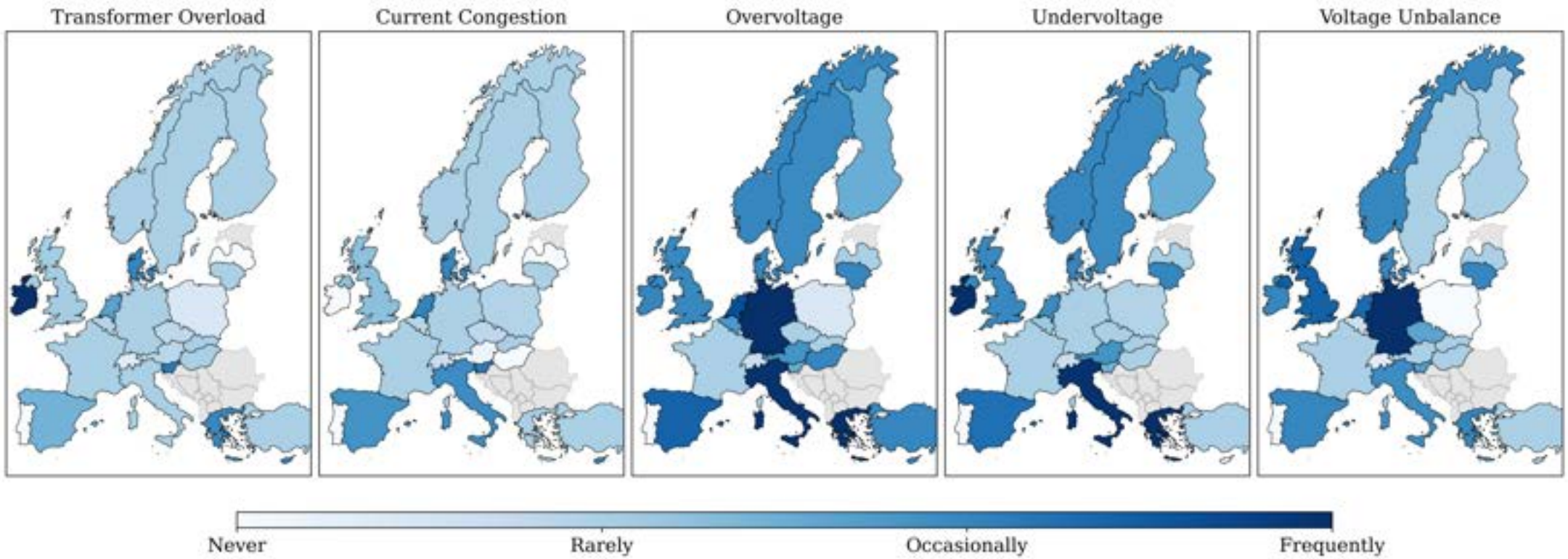
47 Responses

25 Countries

184M End-users

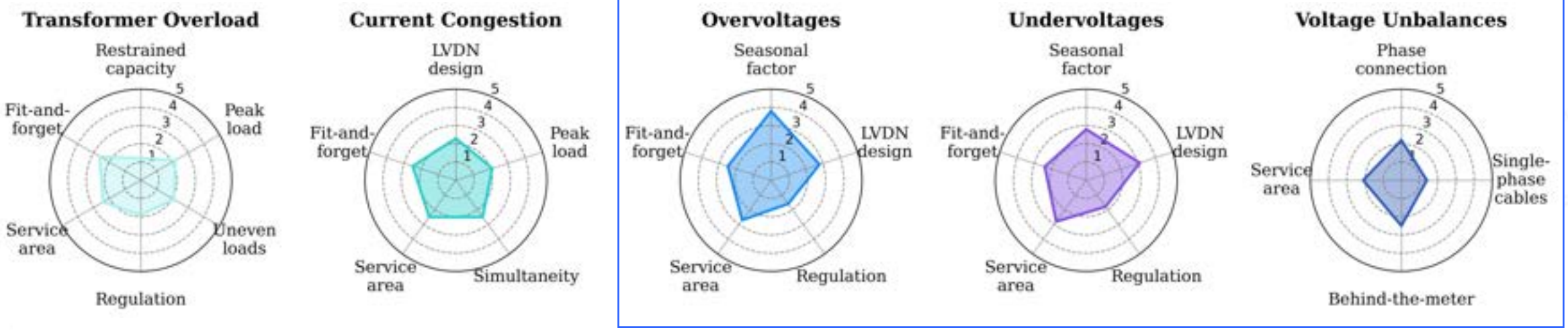


Assessing The Current State Of LV Networks



N.B.: *Responses do not always represent the situation at country level*

Assessing The Current State Of LV Networks



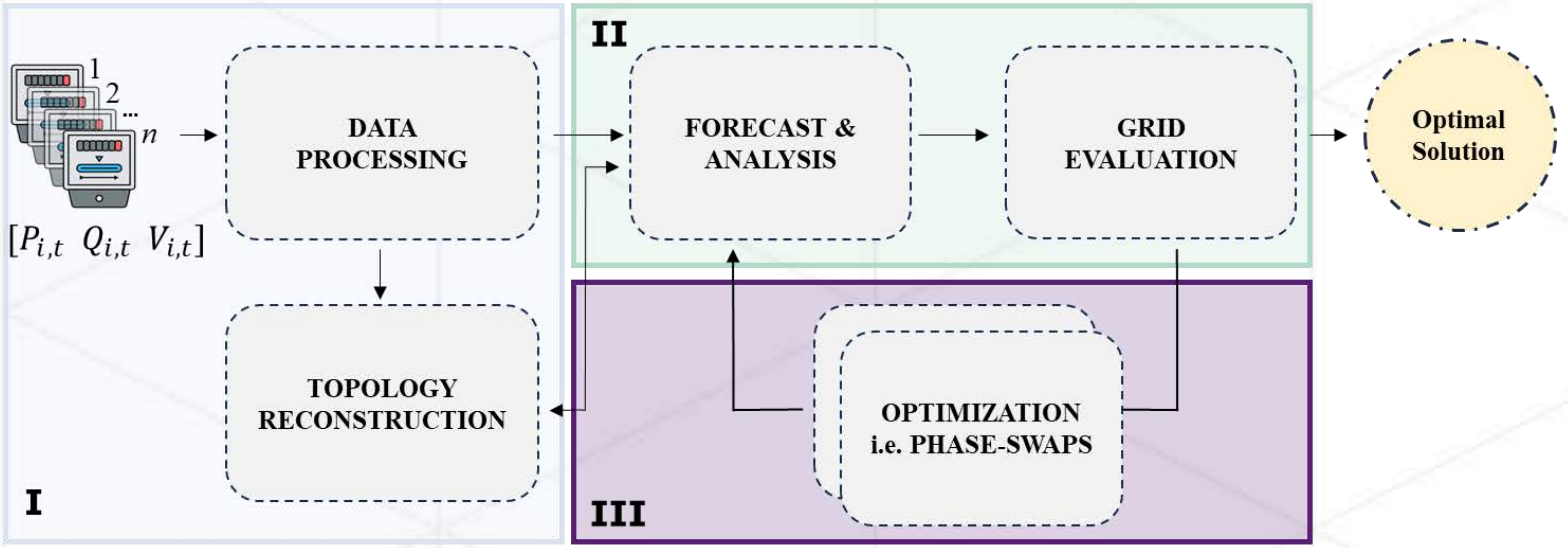
Focus of the proposed solution

Study available: *http://dx.doi.org/10.2139/ssrn.5262448*

Methodology

- 3-Step approach

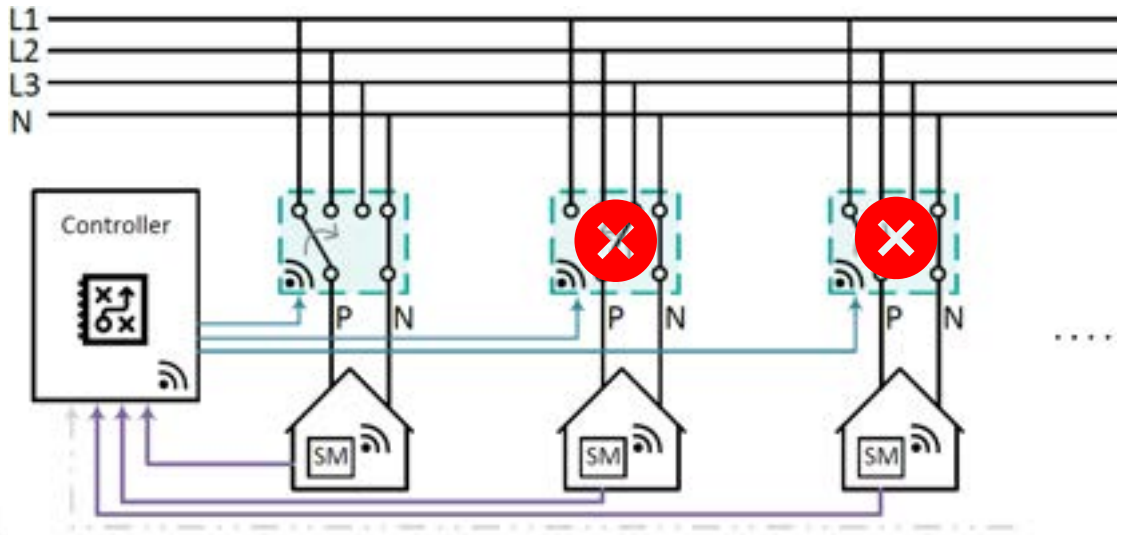
  Using SM data



- Modelling assumptions
  - Islanded network – upstream influence not included
  - Smart meter coverage = 100%

Results

- Identification of feeder that requires reinforcements via topology reconstruction & voltage forecasting
- Find a candidate for phase-swapping devices via voltage sentivity analysis (e.g. single-phase user)
- Evaluate voltage violations (cf. EN 50160)



Violations	id_15	id_16	id_17	id_18	id_19	id_20
before	9	16	18	22	23	23
after	0	1	1	3	3	3

Conclusions & Future work

- **Flexibility can defer grid reinforcements**, but requires innovative, cost-efficient solutions and regulatory support
- Derived network topology and phase connection from smart meter data only
- Mitigated voltage deterioration → Increased (dynamic) hosting capacity & consequently local flexibility
- Phase-swaps could postpone or replace grid investments (specific cases)

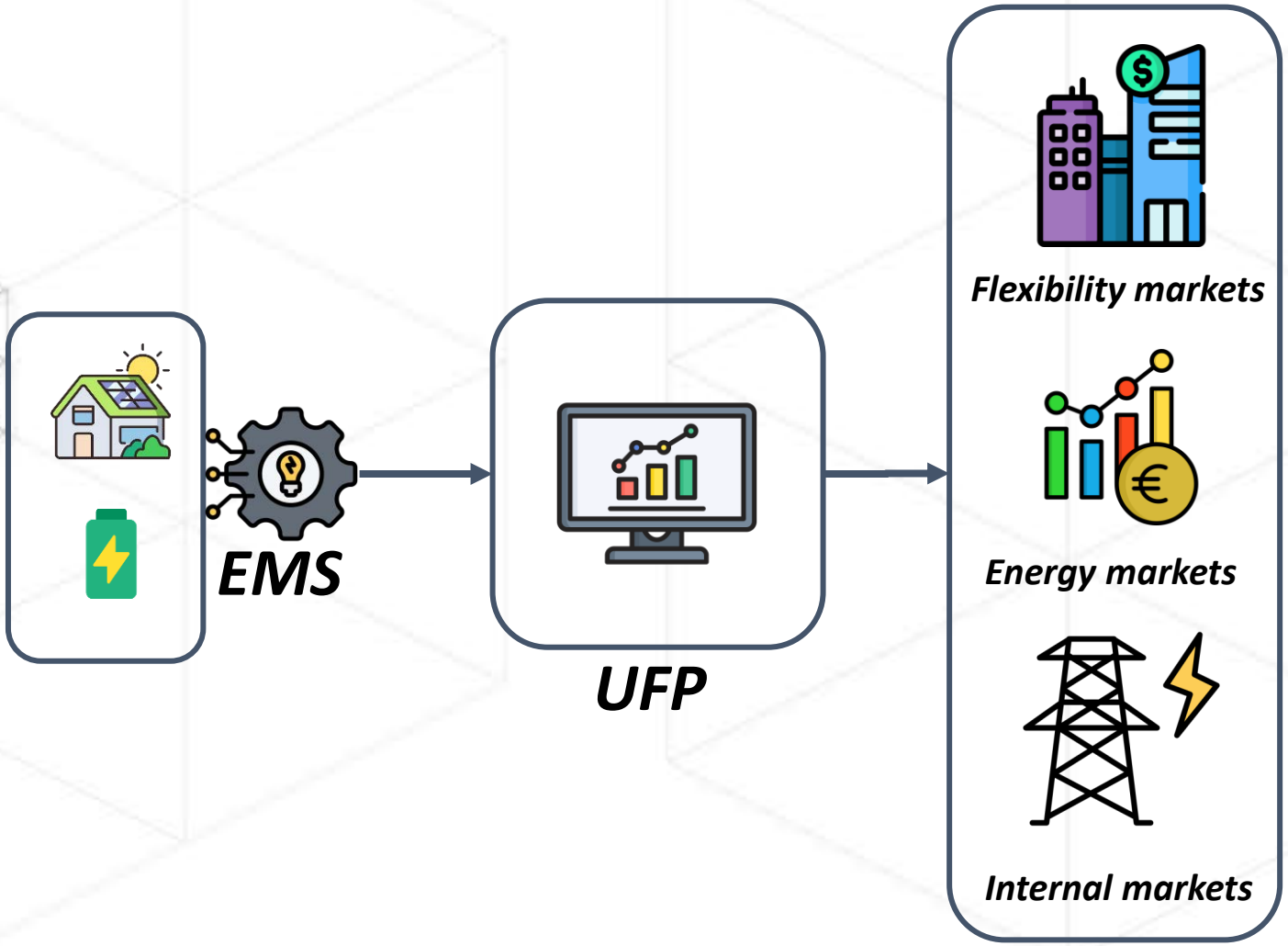
Future work

- Increase algorithm's robustness (e.g. low SM coverage, three-phased, etc.)
- Benchmarking against OLTC, cable-overlays,..

Unlocking Flexibility to Support the Grid and Empower Market Players.

Haulogy & IDETA

Universal Flexibility Platform in a nutshell



Requirements & goals:

- Generic platform with communication relying on a limited number of exchanged information
- Facilitate an asset with flexibility potentials to value its flexibility
- Ease the valorization in different markets valorizing flexibility

What are the possible usage of an UFP?

- *Standardize the interconnection between aggregators and flexibility potentials*
- *Active Network Management using commercial flexibility*
- *Exploit advanced pricing and flexibility policies to improve self-consumption & grid health*
- *Induce flexibility through indirect recommendations to consumers.*

What are the possible usage of an UFP?

- ***Standardize the interconnection between aggregators and flexibility potentials***
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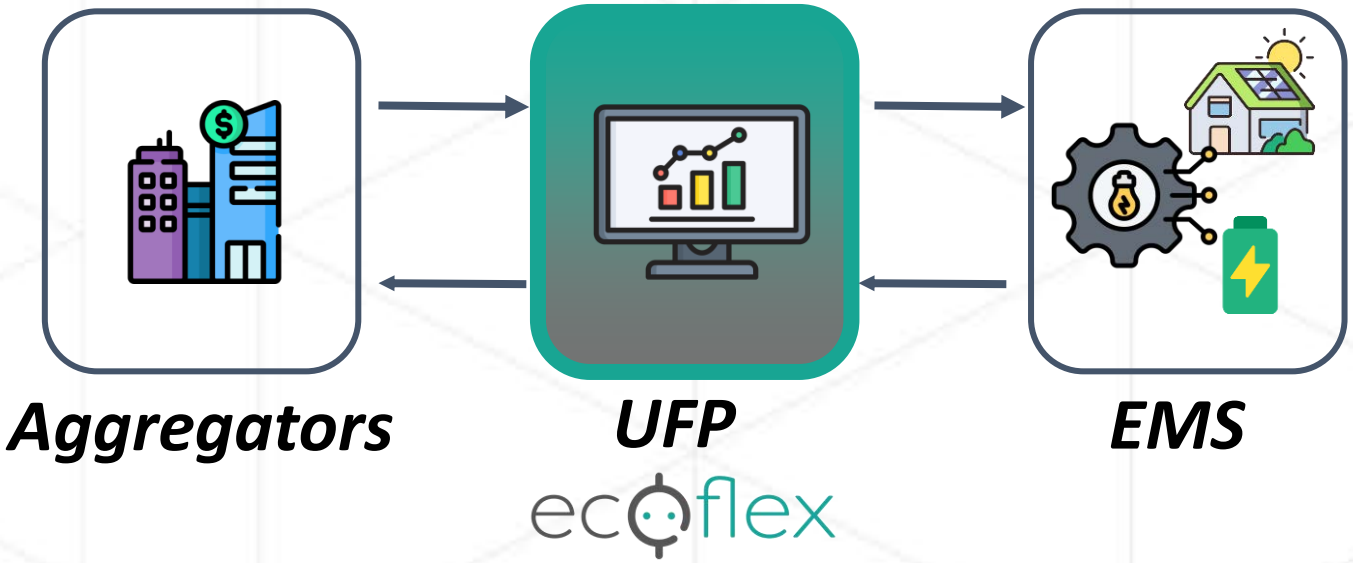
Standardize the interconnection between aggregators and flexibility potentials



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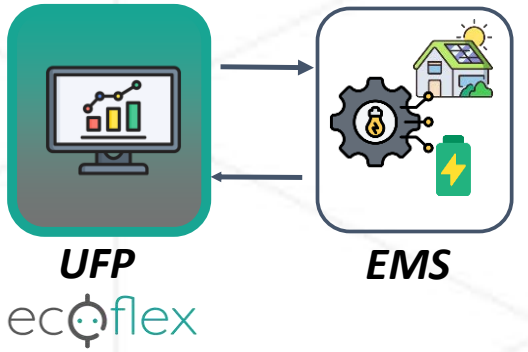
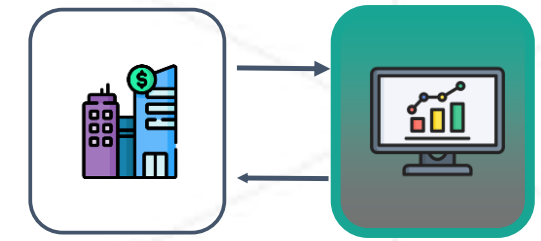
Interaction with an EMS



EMS' goals and tasks:

1. Register (subscription): *EMS wishes to register to the UFP.*
2. Share flexibility potential: *EMS shares what can be done.*
3. Get flexibility requests: *EMS receives what needs to be done and perform some control actions.*
4. EMS shares measurements: *EMS shares its data for monitoring and tracking purposes.*

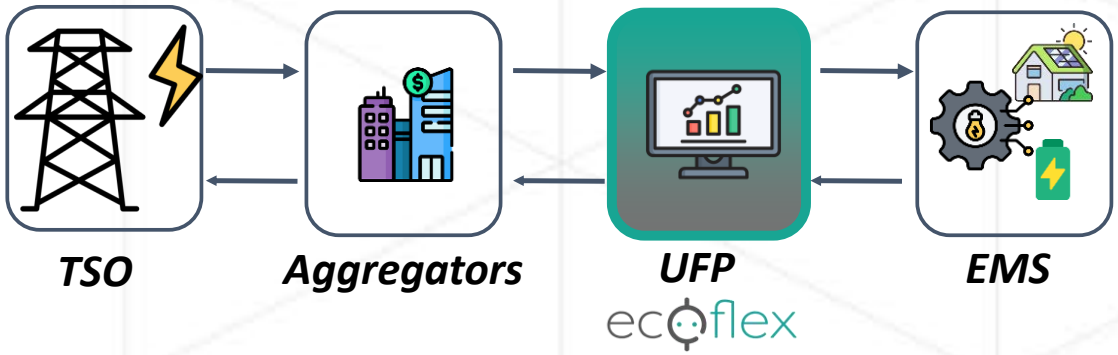
Interaction with flexibility markets



Aggregator' goals and tasks:

1. Receive flexibility potentials and offers: *Aggregator defines the accessible flexibility.*
2. Submit flexibility requests or activation: *Aggregator share how to valorize flexibility*
3. Collect measurements: *EMS shares its data with the Aggregator for controlling purposes.*

Determination of the need for flexibility



Valorization on markets such as **imbalance**.

Enable flexibility valorization for **small players** independently of the maturity and the technology of the EMS.

Exchange informations through standardized interfaces:

- baseline and flexibility potential to **analyze**
- flexibility offers or requests to **control**
- measurements to **monitor**

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What are the possible usage of an UFP?

Standardize the interconnection between aggregators and flexibility potentials

Active Network Management using commercial flexibility

Exploit advanced pricing and flexibility policies to improve self-consumption & grid health

Induce flexibility through indirect recommendations to consumers.

Active Network Management using commercial flexibility

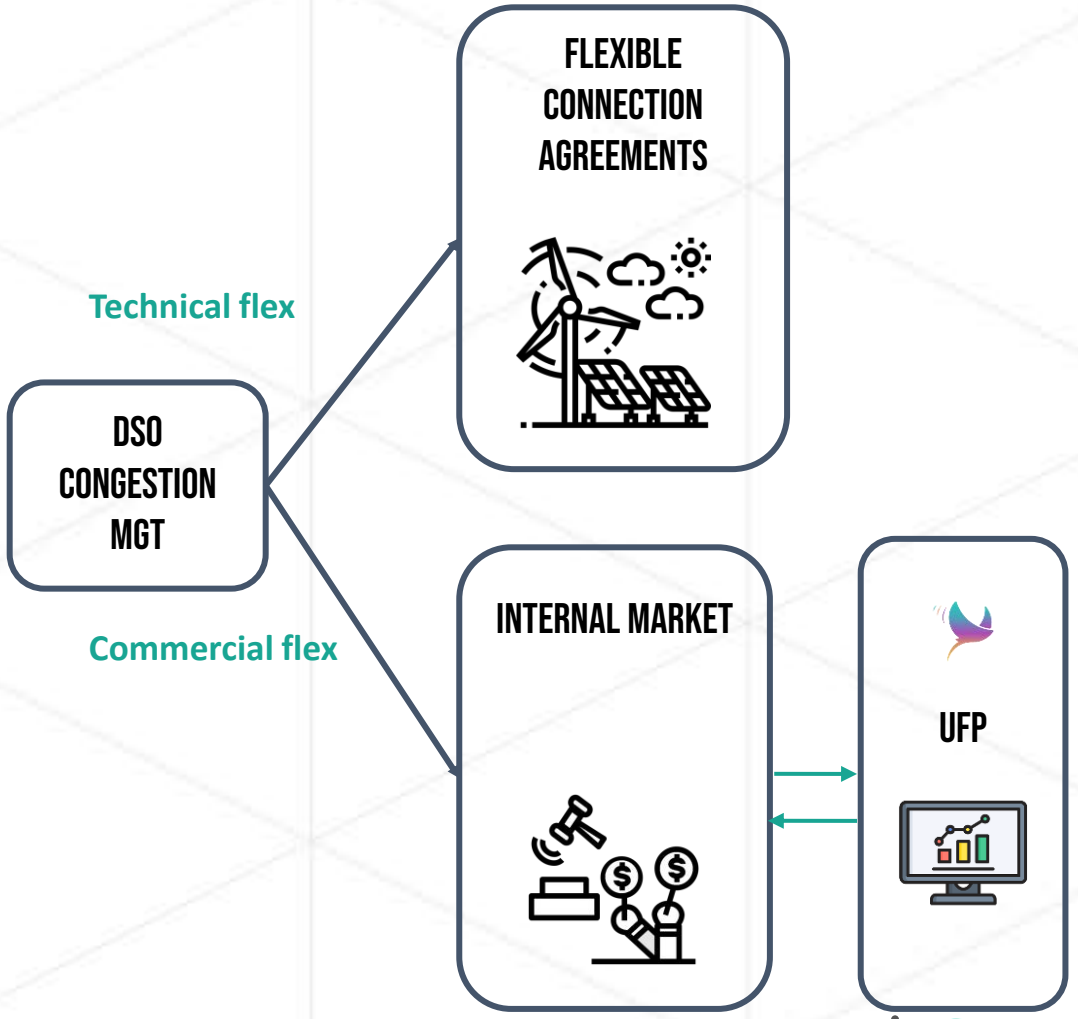
Solving network congestion using commercial flexibility

***For who**:*

- *DSOs,*
- *Support for TSO/DSO coordination,*
- *Aggregators*
- *Energy Communities*

Pros:

- ✓ *Adjust grid hosting capacity*
- ✓ *Optimize congestion management costs*
- ✓ *Optimize grid reinforcement needs*
- ✓ *Reduce imbalance compared to the use of "last resort" technical flexibility*



Active Network Management using commercial flexibility

Congestion management software for DSO

Primary flexibility platform

Aggregators

UFP

EMS

Determination of the need for flexibility

HT MT

Congestion management software anticipates congestion on this connection

Max. 20 MW

DERs and Loads located downstream this transformer

reduce production?

increase consumption?

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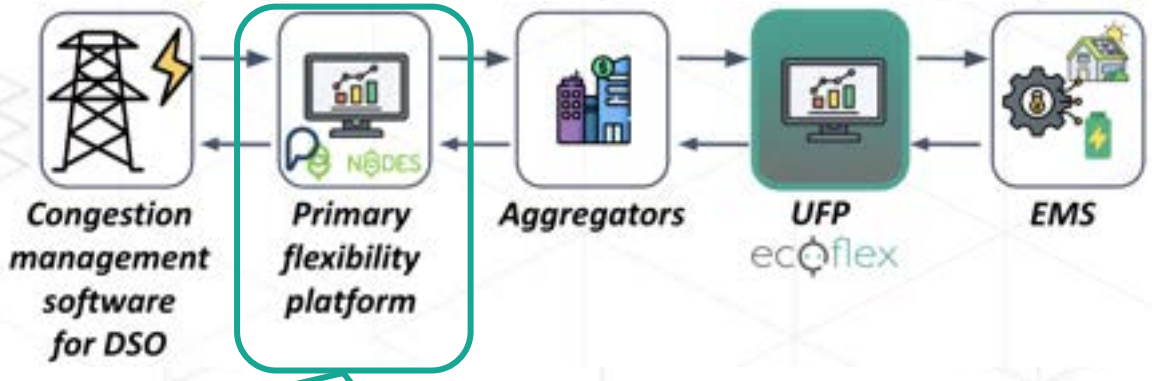
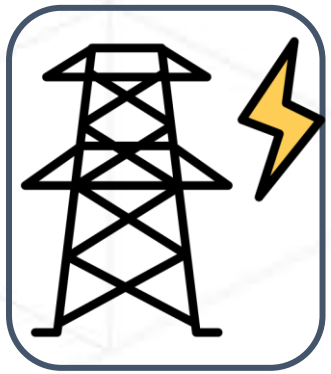
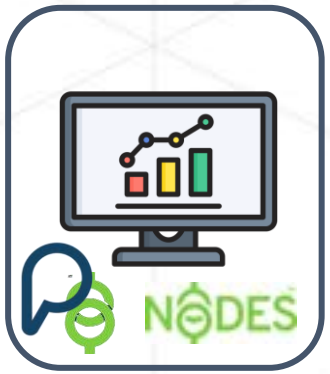
Publish demand for flexibility

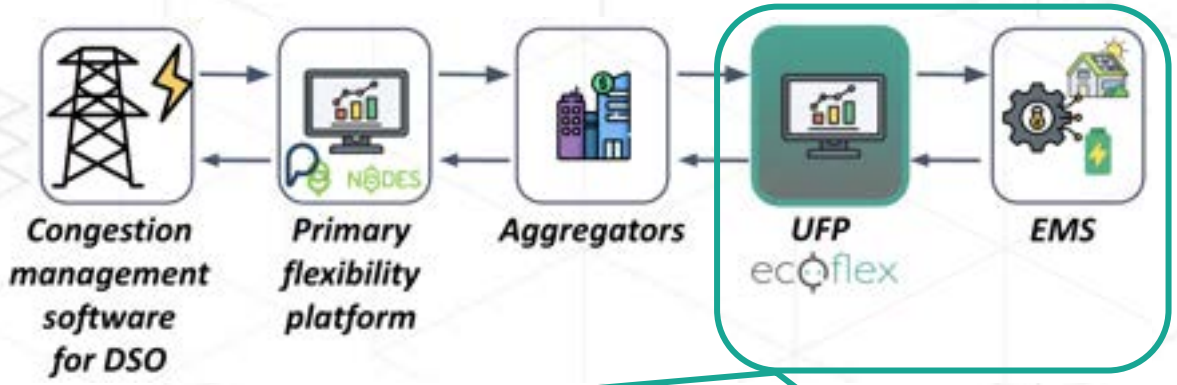




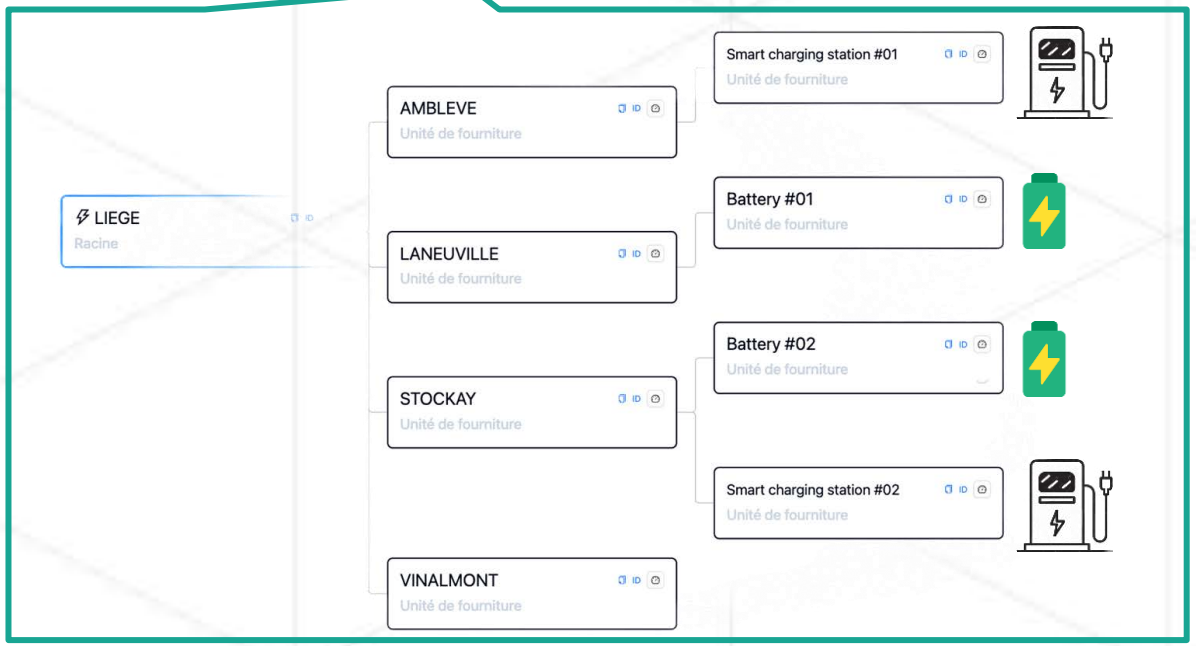
Publish demand for
flexibility
in a **specific location** on
the network



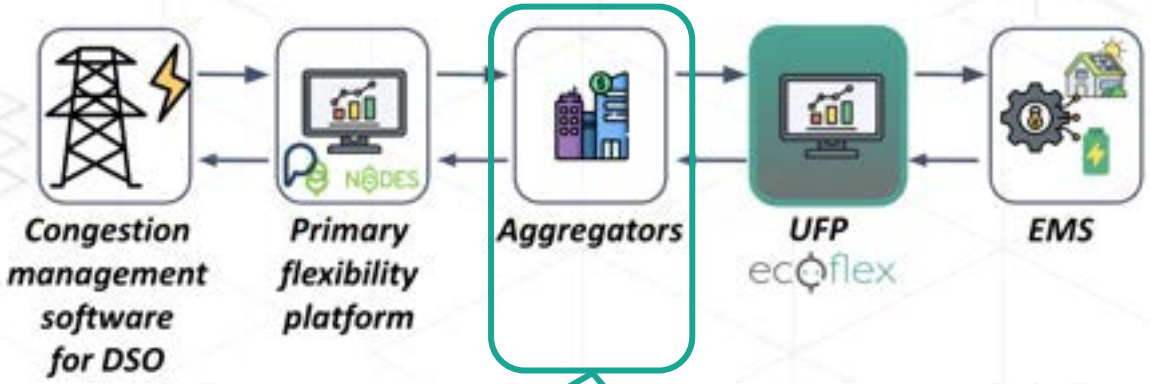
Leverage the UFP to determine the available flexibility



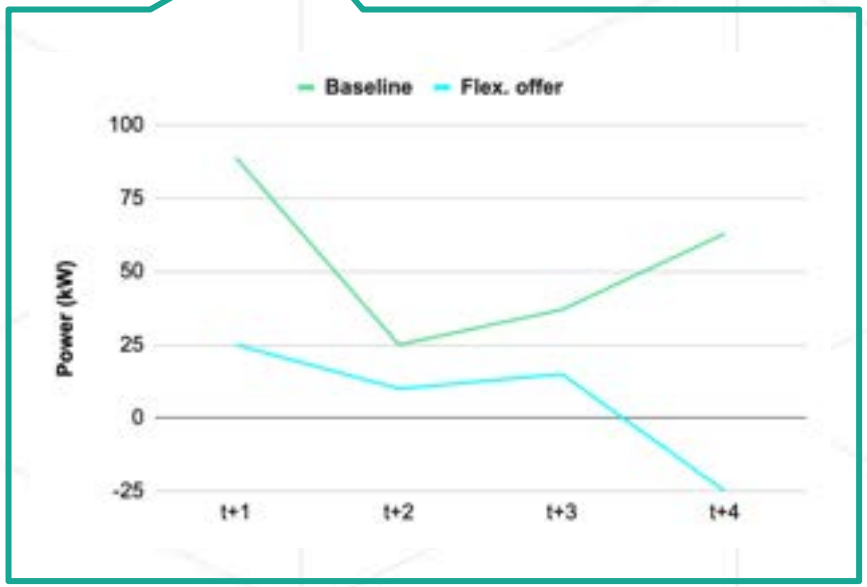
All EMS registered in the UFP can be sorted by location within a network.



Leverage the UFP to determine the available flexibility



From the UFP, the aggregator can retrieve the baseline and flexibility offers from all EMS and aggregate them.



Market clearing / Matching supply and demand

Match between request from
DSO and supply from EMS

Demand

Congestion mgt software for DSO

Primary flexibility platform

Aggregators

UFP

ecoflex

EMS

Supply

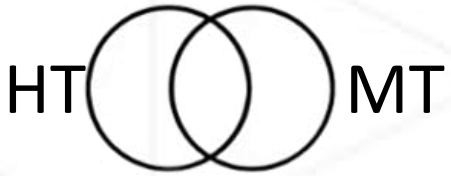
Aggregators can publish flexibility offers
on the flexibility platform

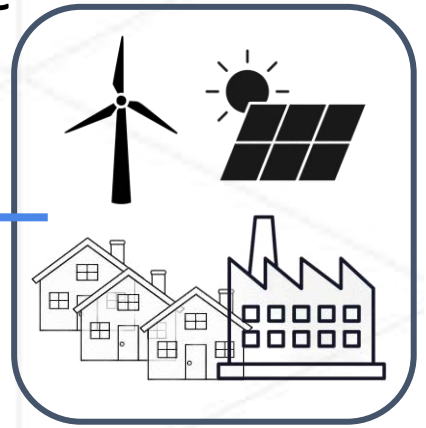
ecoflex

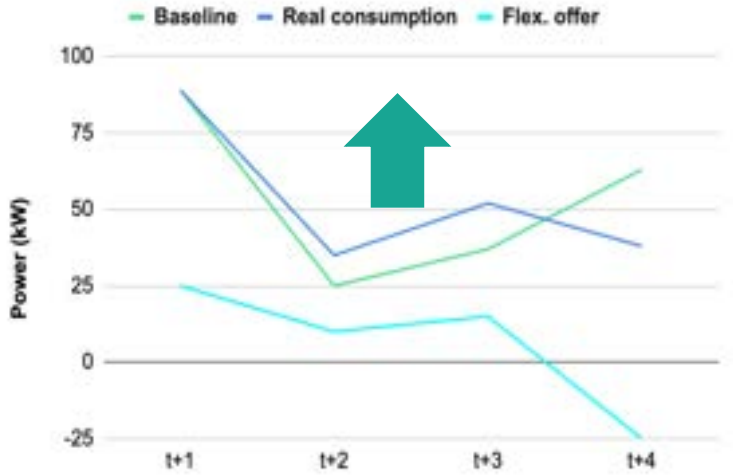
Congestion risk mitigated

No curtailment of renewable production required

Congestion is mitigated







What are the possible usage of an UFP?

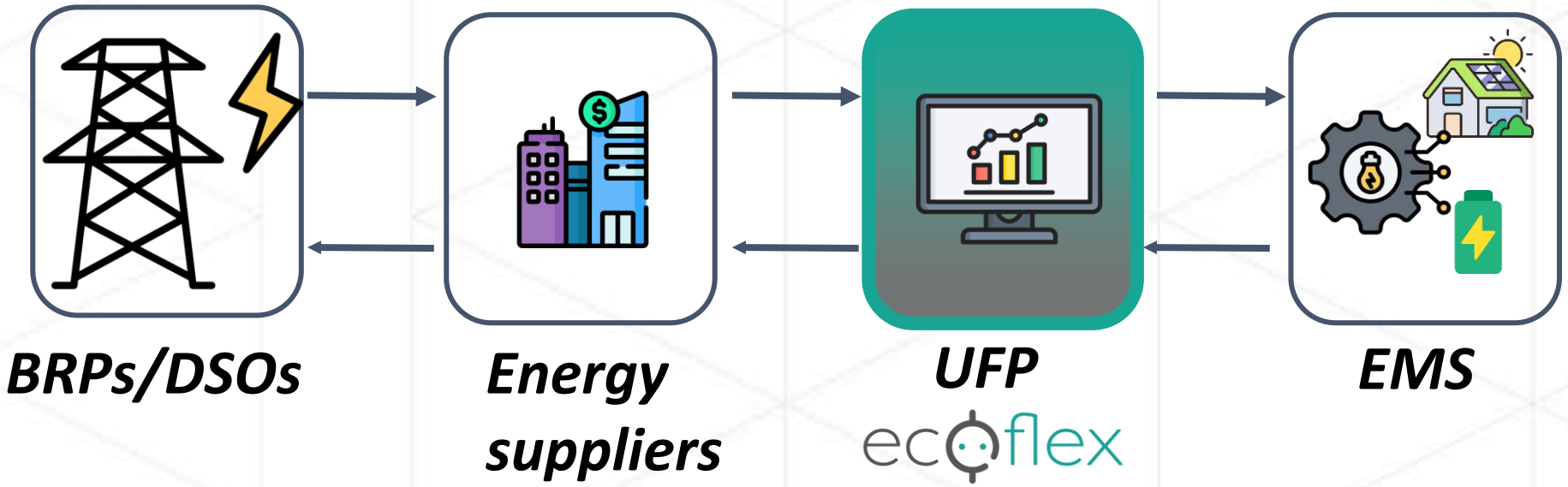
Standardize the interconnection between aggregators and flexibility potentials

Active Network Management using commercial flexibility

Exploit advanced pricing and flexibility policies to improve self-consumption & grid health

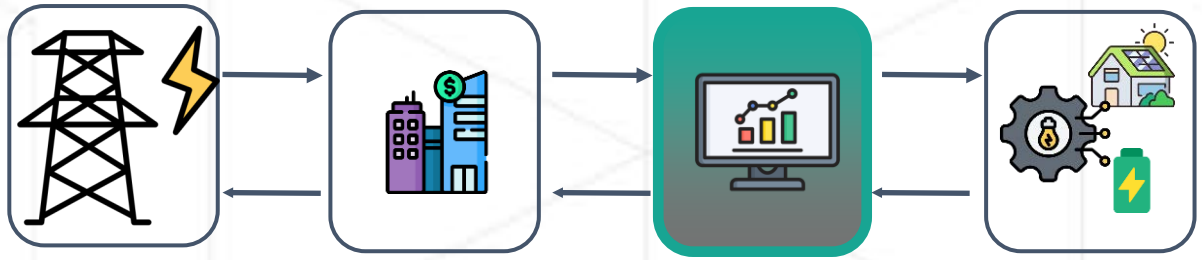
Induce flexibility through indirect recommendations to consumers.

Exploit advanced pricing and flexibility policies to improve self-consumption & grid health



ecoflex

Exploit advanced pricing and flexibility policies to improve self-consumption & grid health



Increase viability of energy communities:

- *With a pricing favoring locally ("circuit-court") produced renewable energy*
- *Minimizing network congestions and thus maximizing network utilization*

Adjust pricing with their sourcing balance in order to correct their portfolio balance.

Increase visibility on energy prices.

Facilitate adoption of flexibility mechanism

Enable pricing and flexibility policies that vary depending on the consumption usage (e.g., only for eV charging).

What are the possible usage of an UFP?

- *Standardize the interconnection between aggregators and flexibility potentials*
- *Active Network Management using commercial flexibility*
- *Exploit advanced pricing and flexibility policies to improve self-consumption & grid health*
- ***Induce flexibility through indirect recommendations to consumers.***

Use case “IDETA”: Induced flexibility via recommendations

***Goals**:*

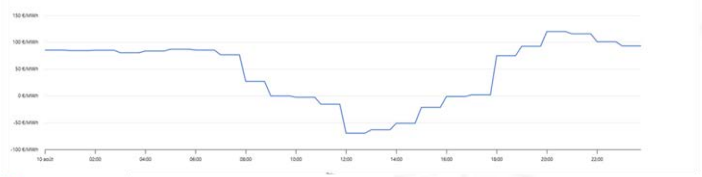
- *Is it possible to enable non-automated or partially automated flexibility through indirect recommendations?*
- *What is the impact of the recommendations (magnitude, shift time, …) ?*

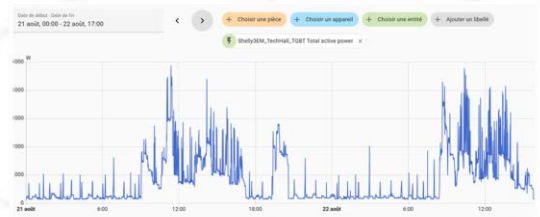
Demo sites:

1) ***CIté, IDETA headquarter***
2) ***Tech Hall : 3D printing***
3) ***Ecocoa : Chocolate factory***

Use case “IDETA”: Induced flexibility via recommendations

- **Inventory of flexible loads** carried out for each building.
- Focus on **facilitating load shifting**, especially through the **flexible scheduling of boilers**.
- **IDETA Headquarters**:
  - A dedicated contact person manages the shifting of appliances such as dishwashers.
  - Work also includes **EV charging flexibility**. Positive feedback:
- **Techhall**:
  - Installation of an additional **sub-meter**
  - This also helped identify **parasitic loads**.
- **Ecocoa**:
  - Very few flexible loads due to the nature of the chocolate-making process.





Communication & Follow-up

- Weekly emails sent with:
  - Suggested **optimal time slots** for load shifting.
  - An **analysis of the previous week’s shifting actions**.

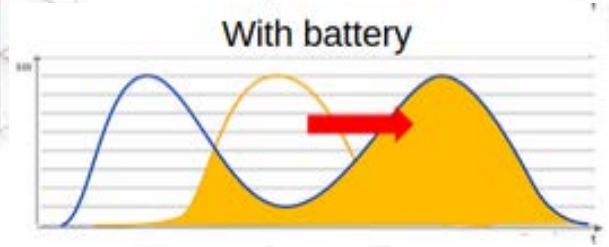
Response levels varied across sites: **high at Techhall, good at IDETA, limited at Ecocoa**.

Energy management systems for dwelling flexibility

Julian Ruddick, Vrije Universiteit Brussel

Control algorithms used in EMSs

Rule-based control



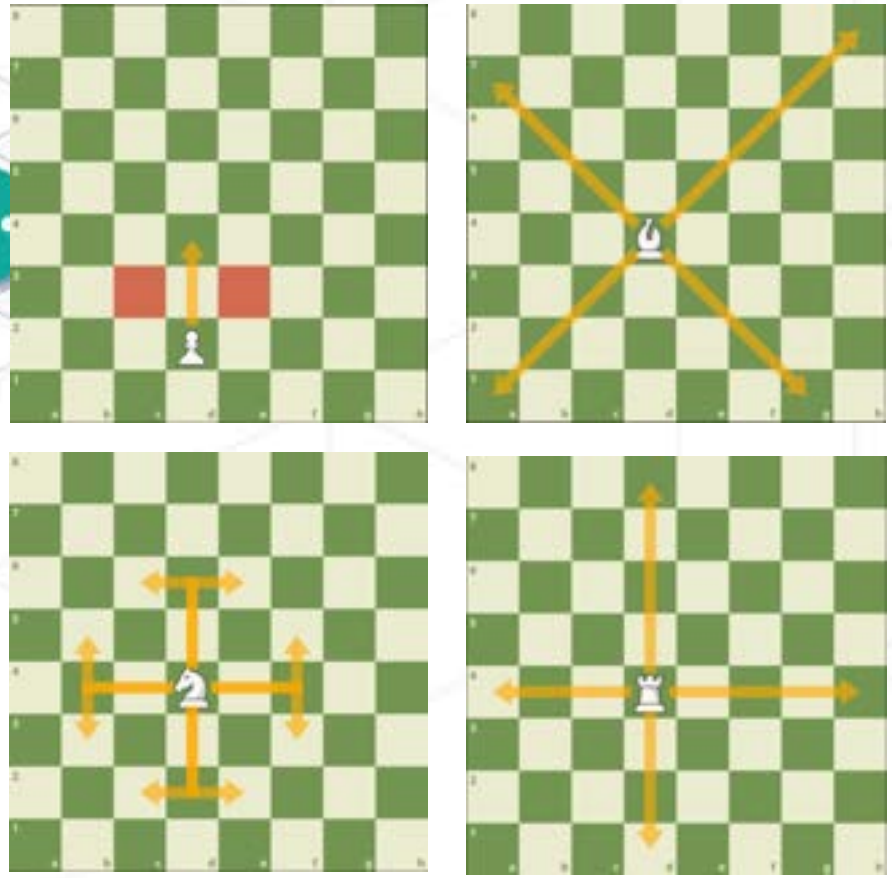
Model predictive control

Reinforcement learning

TreeC

Model predictive control

Model



Predict

Control

Reinforcement learning

Learn without model by repetition

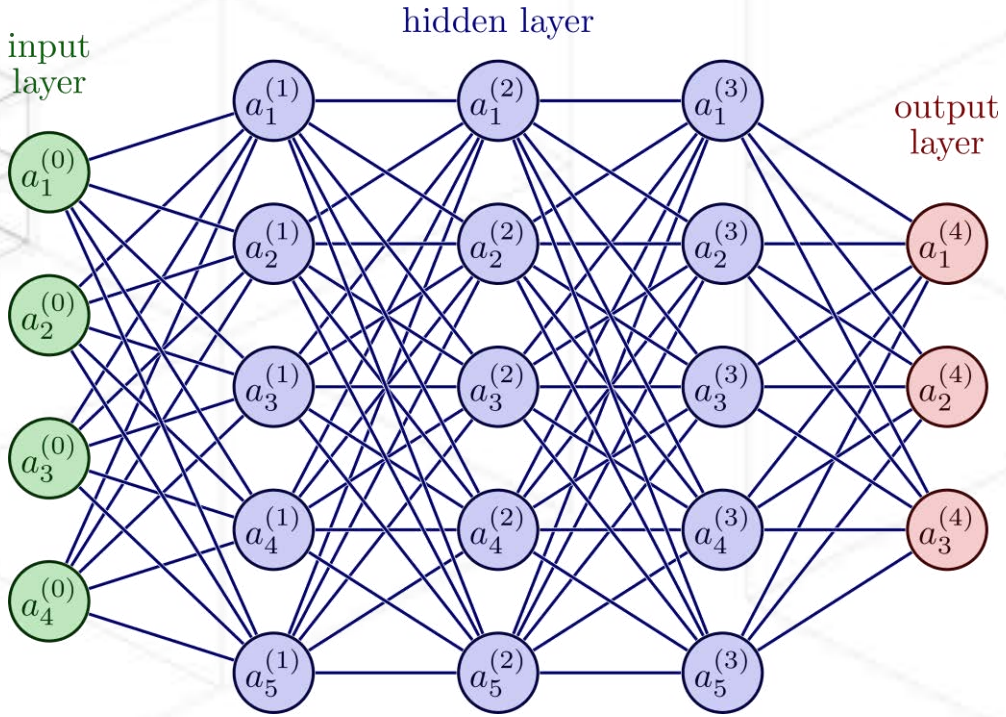
Intuition

Model predictive control

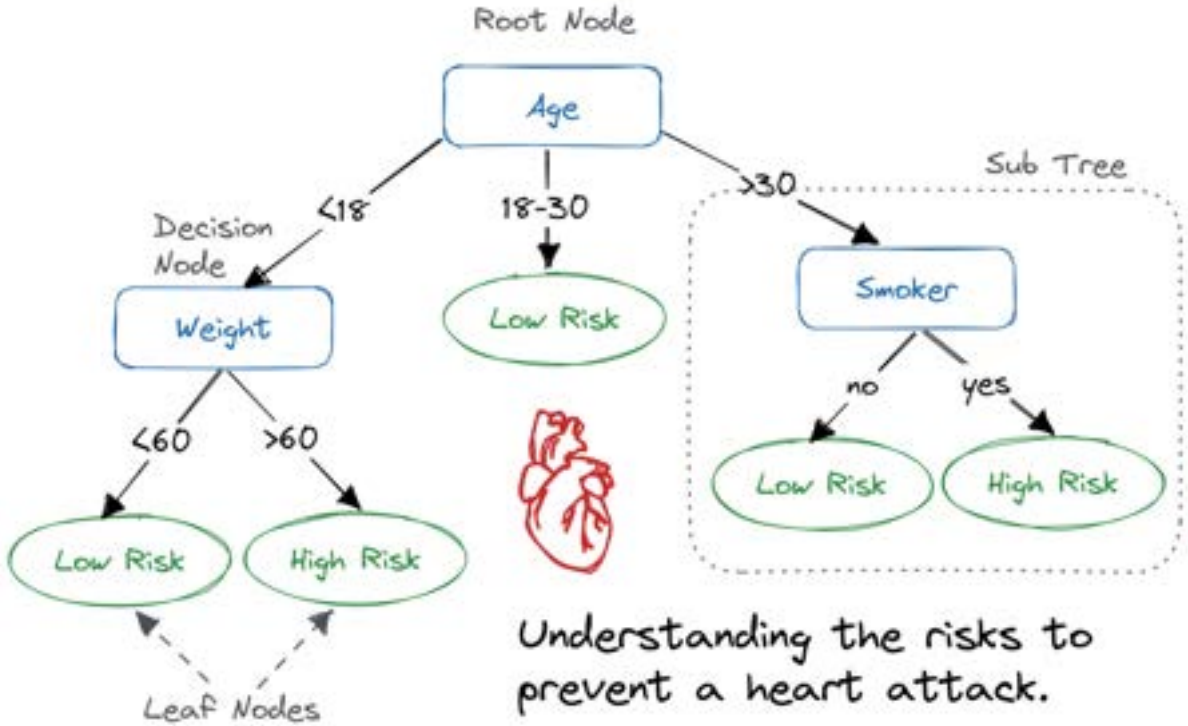
Reinforcement learning

TreeC

Neural network: Reinforcement learning



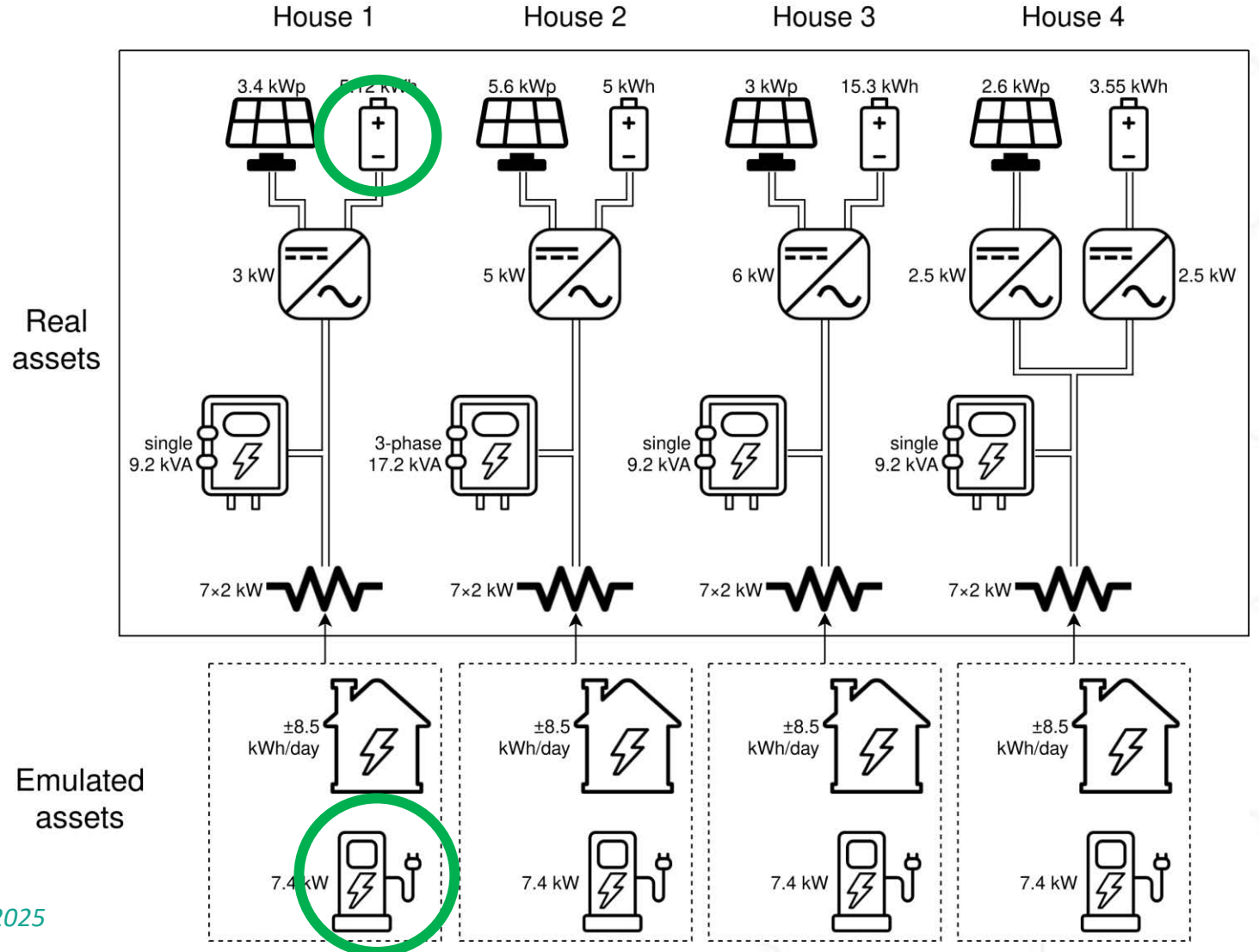
Decision tree: TreeC



Setup experiment

Setup experiment

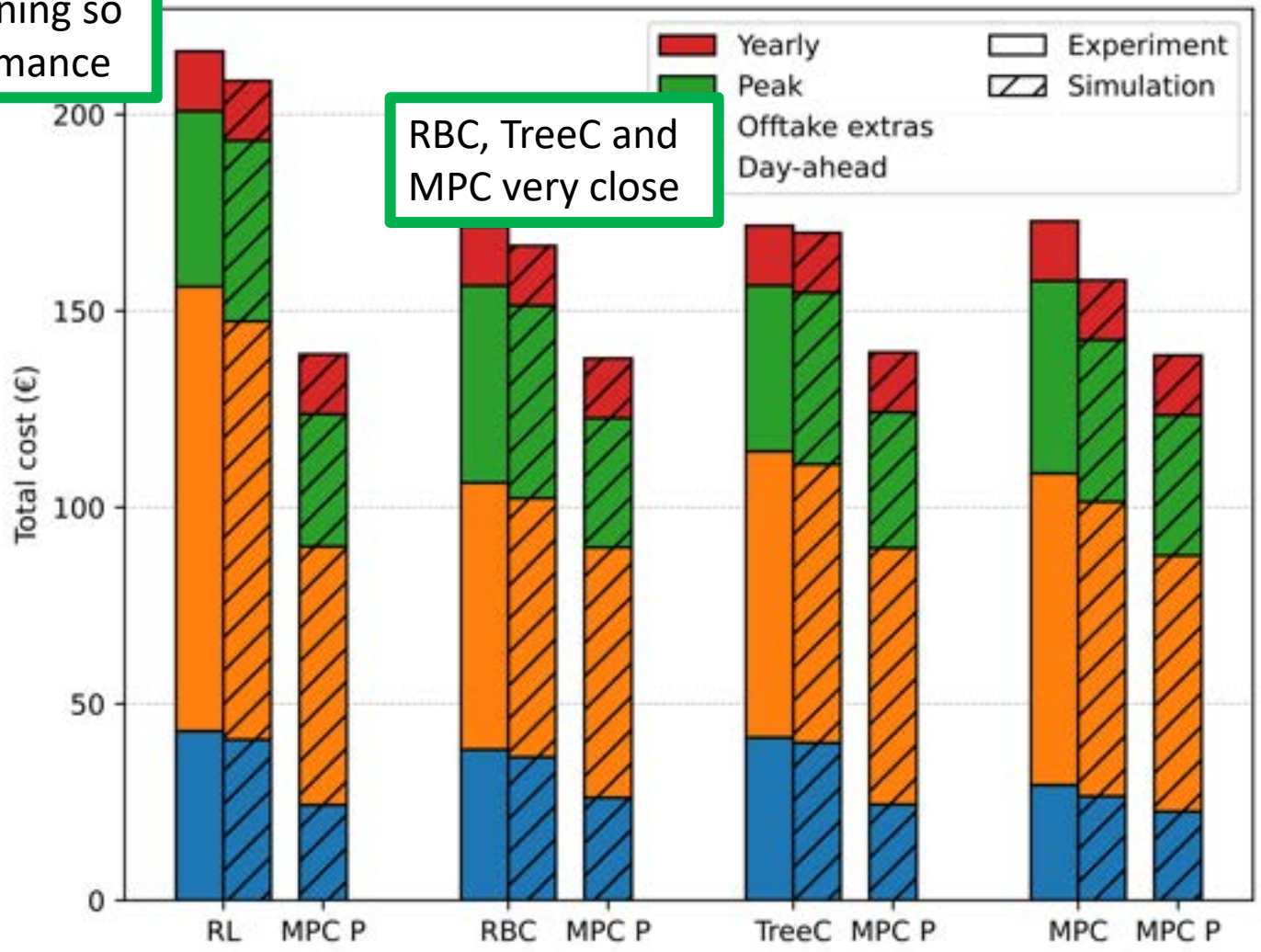
EMS control



Results experiment

RL still learning so bad performance

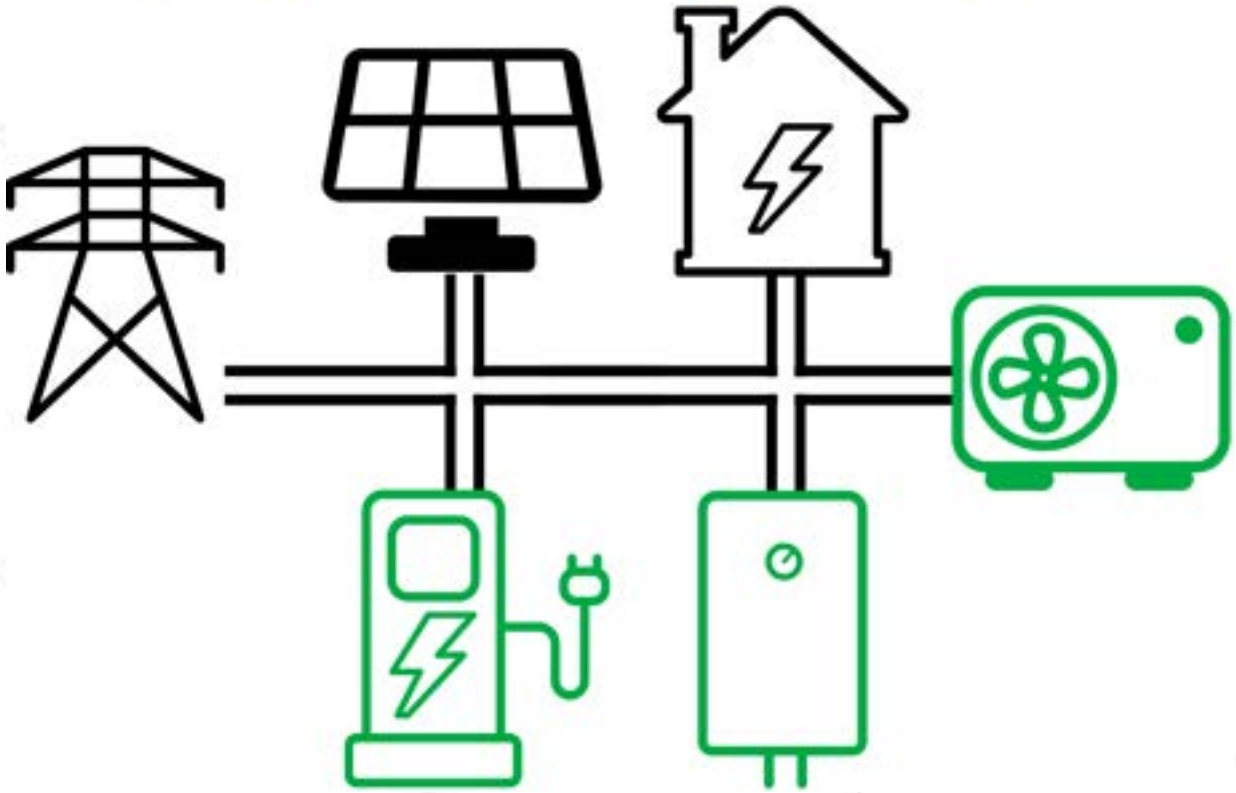
RBC, TreeC and MPC very close



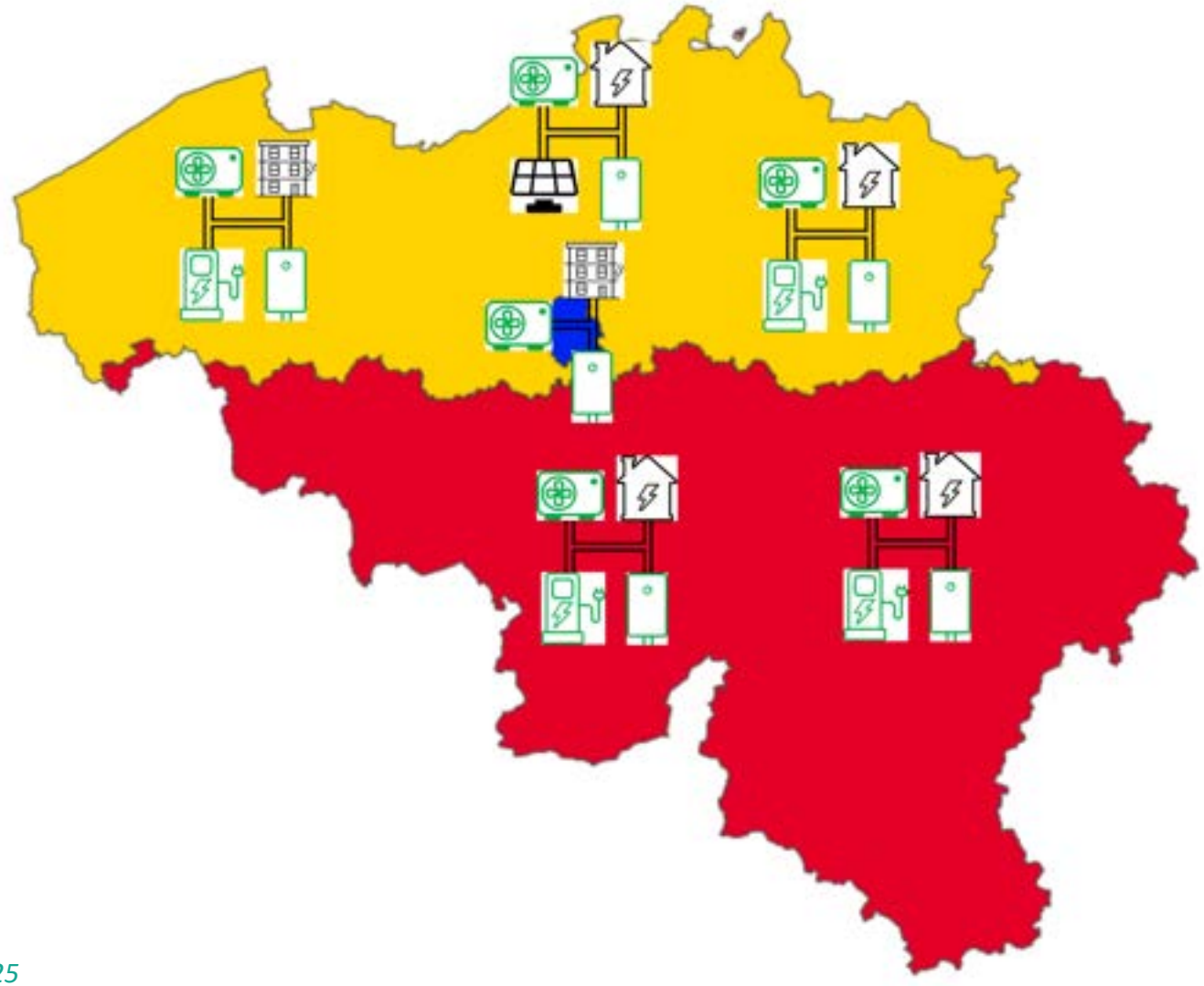
Should you install EMS electrified dwelling ?

Objectives

EMS control

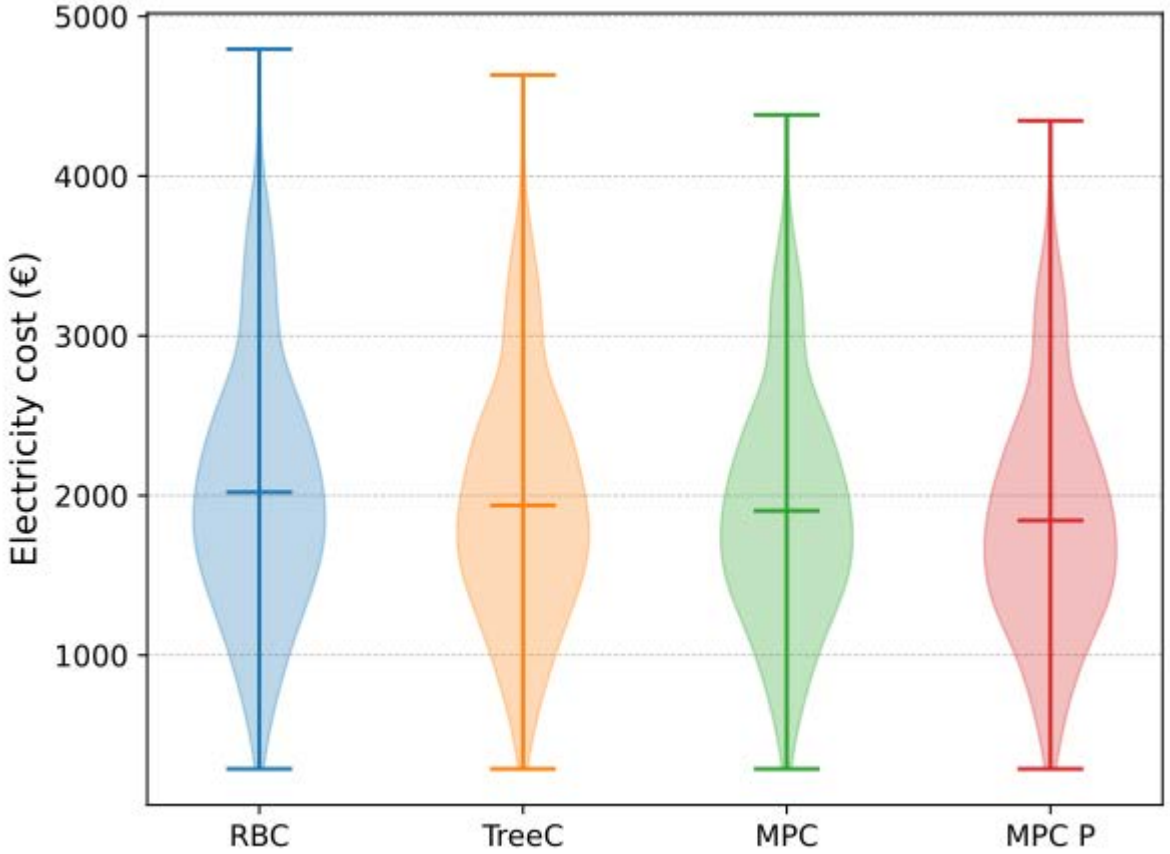


500 representative Belgian dwellings

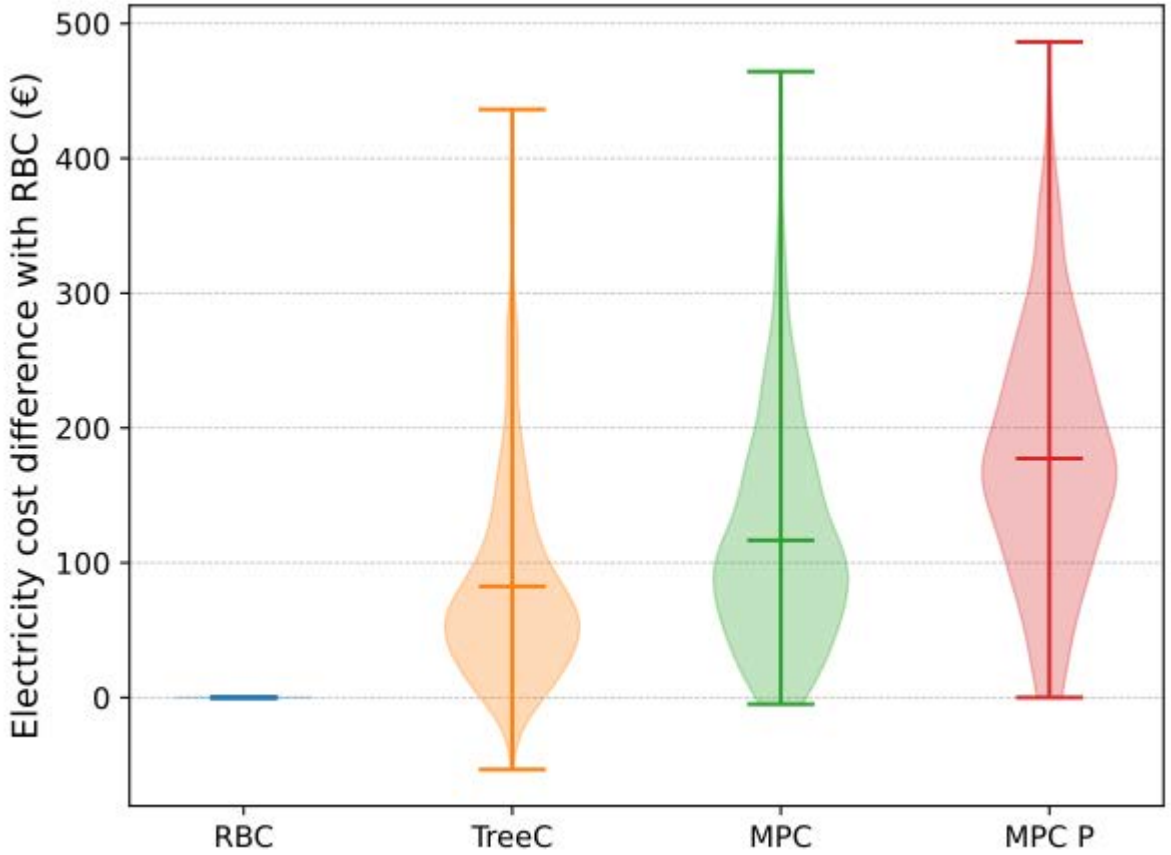


Final results

Yearly cost



Difference with rule-based control



Leveraging Electric Vehicles Flexibility for Energy Markets

Vrije Universiteit Brussel, EVERGi Research Group

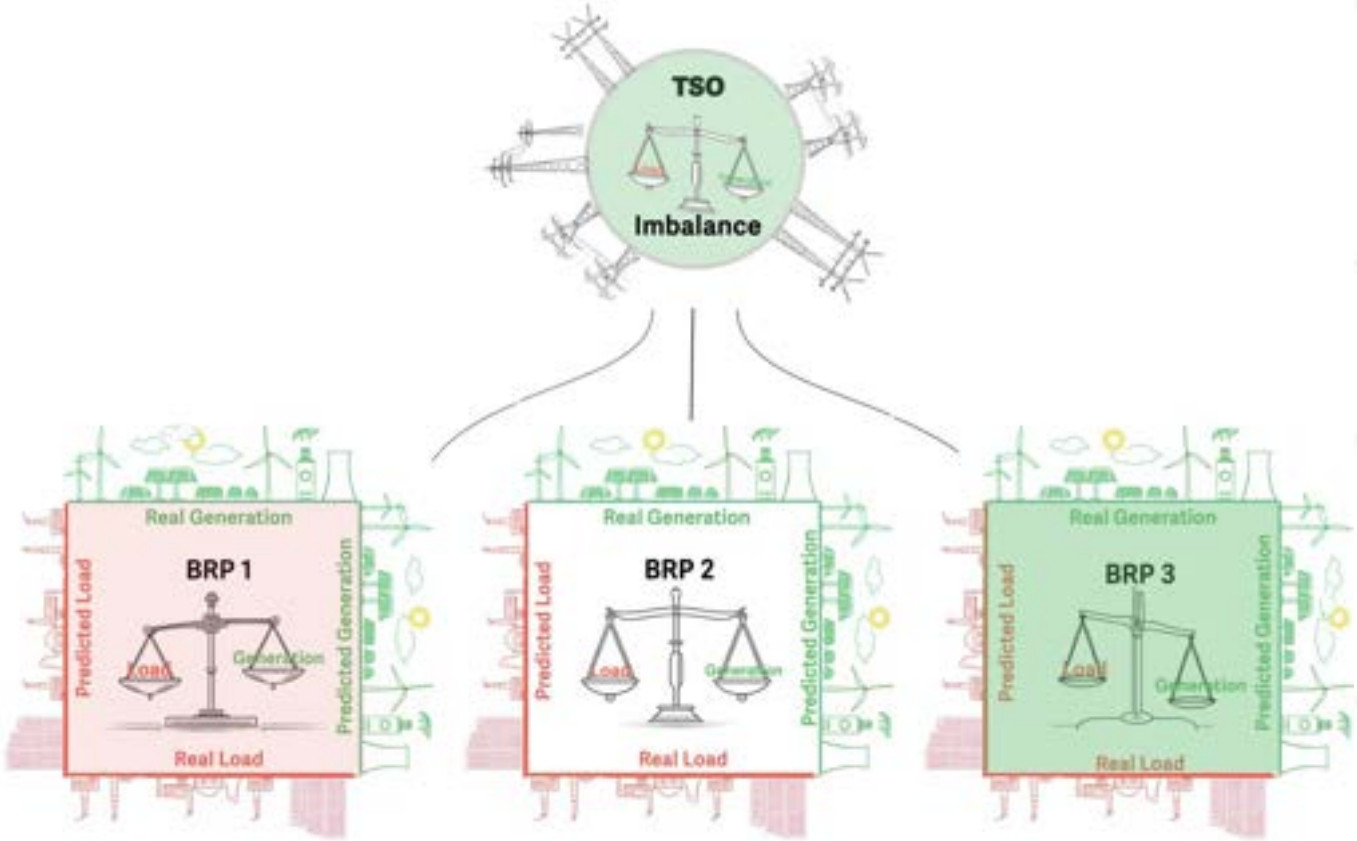
Gilles Van Kriekinge

Saeed Naghdizadegan Jahromi

CASE 1: Smart Charging in Imbalance Market

Saeed Naghdizadegan Jahromi, VUB

How does Imbalance Market work?



Based on the calculated Imbalance TSO sends Imbalance signal (price)

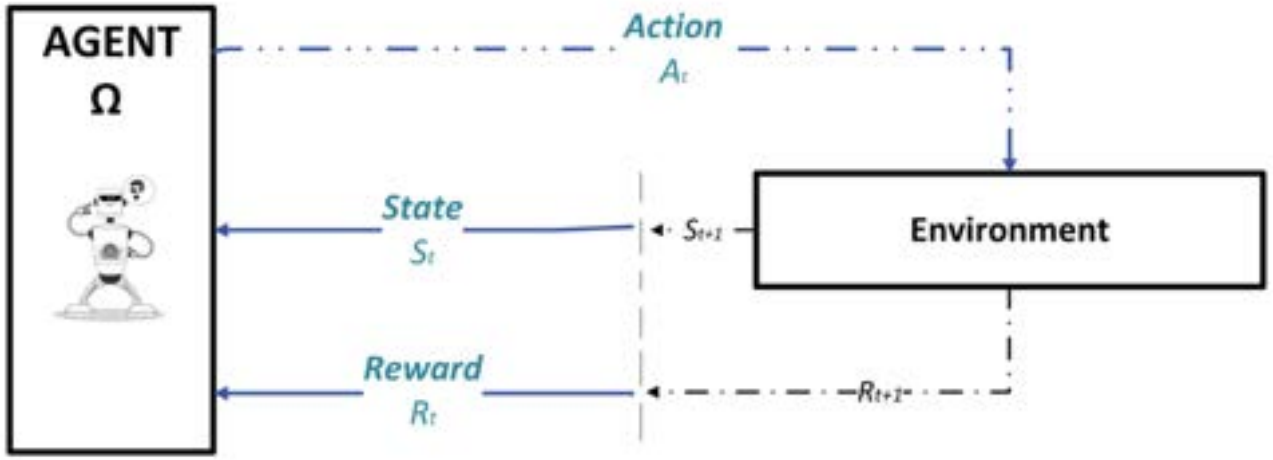
Use-Case:

Use-Case:

- Office parking lot with 10 chargers (@11 kW each)
- Simulated with 2023 Belgian imbalance prices
- EV data from a typical office in Belgium
- Zero-Baseline Consumption

Methodology

- Model-Free Reinforcement Algorithm (**RL**)
- Proximal Policy Optimization (**PPO**)

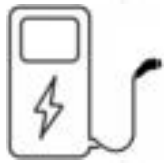


Model-free Reinforcement Learning Scheme

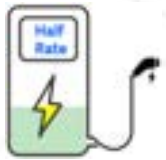
Markov Decision Process

States: Time/ Departure Time/ SOC_t / TSO Forecasted Imbalance Price

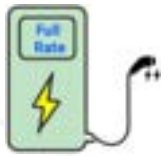
Actions:



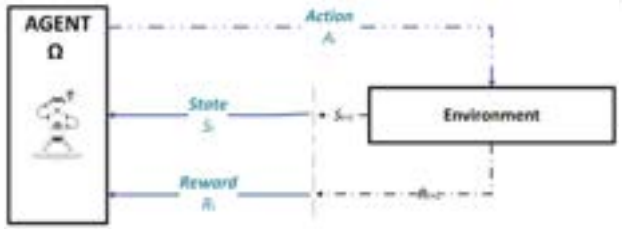
No Charging



Half Rate Charging



Full Rate Charging



Model-free Reinforcement Learning Scheme

Reward: Balances cost minimization and energy delivery (penalties for shortfall)

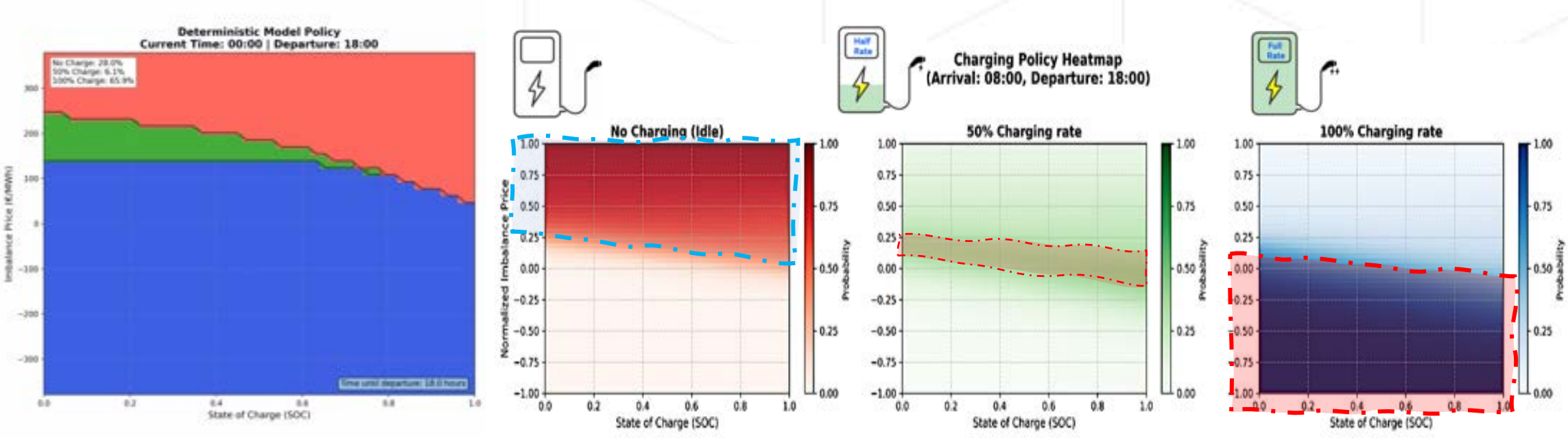
Reward *= Energy Cost Factor + Charging Progress + Insufficient Charge Penalty*

- **Low Positive Prices/Negative Prices**: High score
- **High Prices**: Lower score

Closer to Target:
- Charging the EV closer to the target level across a positive score
- More positive score as departure time nears

Insufficient Charge:
Negative score if not charged by departure

RL Policy Insights



Policy developed with PPO by knowing 15-minute imbalance price

Using the current SOC and imbalance price, the model selects the most probable action at each timestep.

Result

Model-free RL not only avoids costs but earns revenue (negative cost), with a small trade-off in energy delivery.

Comparative results of charging scenarios (21 to 30 September 2023)

Charging Simulation	Market	kWh Charged	Total Cost (€)	Cost per kWh (€/kWh)	Percentage of Energy completion
Uncoordinated charging	Day-Ahead	2282.2	216.7	0.094	100
Smart-Charging (MPC)	Day-Ahead	2282.2	170.4	0.074	100
Smart-Charging (Model-free RL) Knowing 15-min Imbalance price	Imbalance	2206.9	-45.8	-0.027	96.7
Smart-Charging (Model-free RL) Knowing 1-min imbalance price	Imbalance	2079.1	-29.4	-0.01	91.1

Key Findings

- Model-free RL can **leverage opportunities to turn EV charging from a cost into a revenue stream** by smartly timing energy use in the imbalance market.
- The RL agent **achieves cost reduction of up to 127% per kWh (–0.027 €/kWh)** while delivering **91–97% of the total target energy, compared** with day-ahead methods.
- Model-free RL heavily relies on **reward design** in this complex environment to effectively guide the model in learning optimal policies.
- The simulation using 1-minute price data demonstrated that the developed **RL model** can successfully **generate revenue** despite **forecast inaccuracies**.

CASE 2 : Smart charging with a Market Player

Gilles Van Kriekinge, VUB

Context & Objective

Context : Small prosumers (<<1MW)

- Non-controllable consumption & production assets
- EMS controls charge points
- All assets connected to single EAN

Missing opportunity

- EMS **NOT** aware/care of what is happening on the grid side !

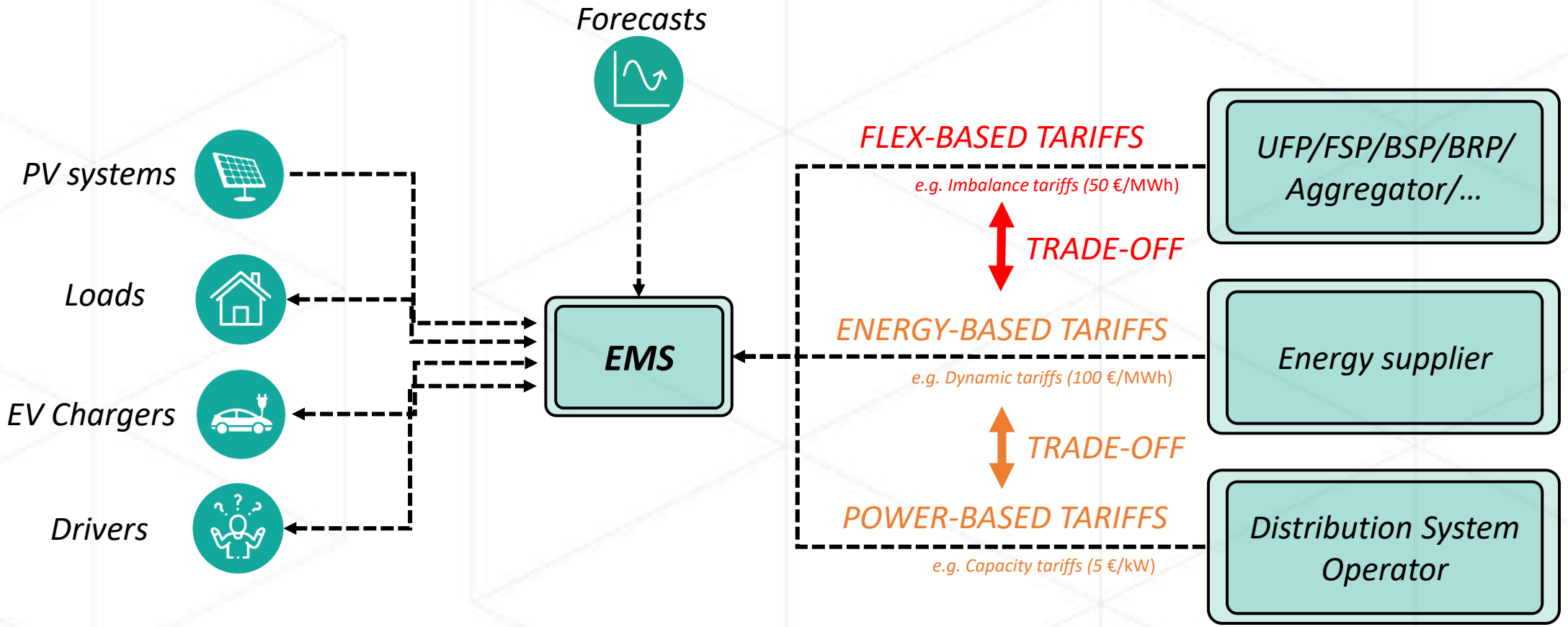
↓

How to leverage this opportunity ?

- How can a prosumer **SUPPORT/HELP** a market player ?

ecoflex

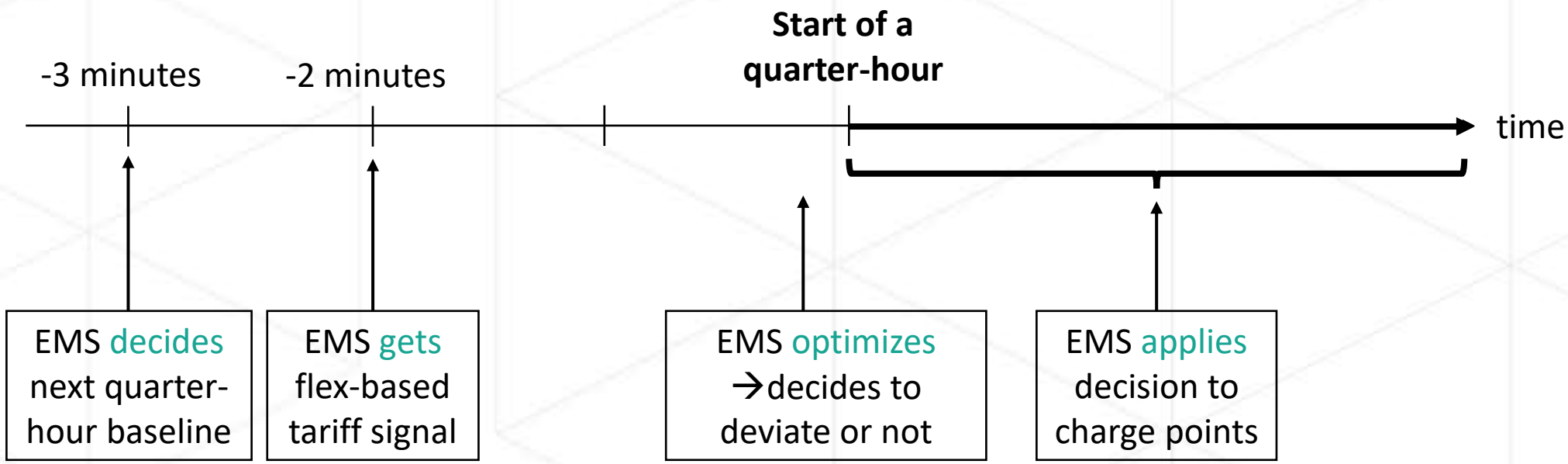
How can an EMS interact with market player ?



In Ecoflex, EMS has been adjusted to optimize the charging of EVs by considering the 3 different tariffs (see D4.1)

How to prove that EMS did respond to a flex-based tariff ?

- Quarter-hour baseline → Proove of deviation
- Chain of events → Orchestrate signals

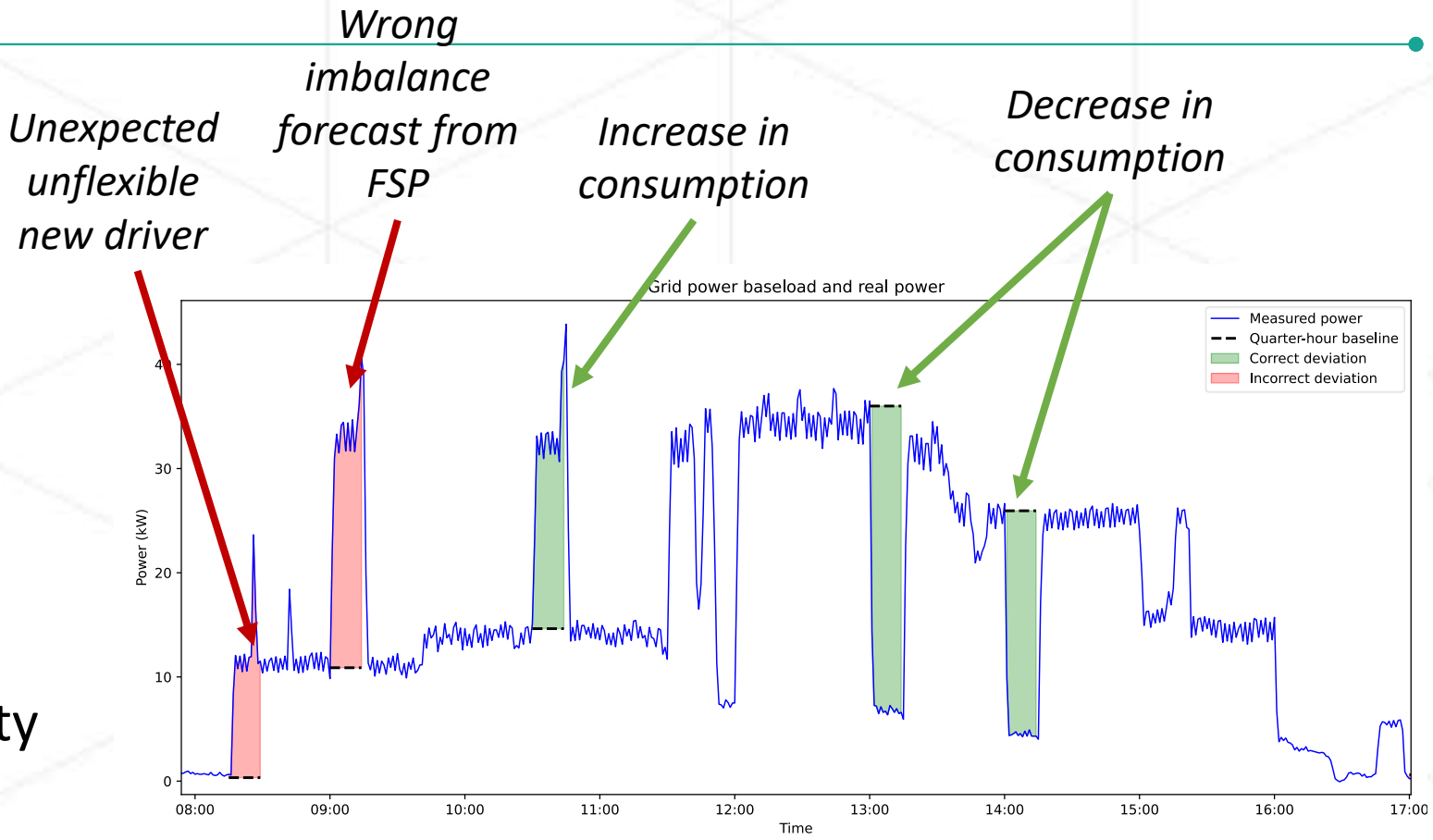


Experimental set-up

- Where : Green Energy Park
- Assets : PV, building, 10 CPs
- Market player : Flexcity (FSP)
- Goal : Help BRP to balance portfolio
- Timing : EMS ran for 3 months

Results

- One-day example :
  - 5 deviations on purpose
    - 2 incorrect (red)
    - 3 correct (green)
- On 3-months time :
  - Extra flex gains of 52 €
  - 5% reduction in electricity bill



Conclusions & Future work

- Highlights:
  - The proposed method allows **to make prosumers useful** for market players
  - The EMS modification allows to find **an optimal** trade-off between different tariffs
  - The proposed method **works** in a real-world experiment
    - But non-flexible and non-forecastable EV drivers is a challenge
- Future investigation:
  - Test different use cases
  - Test impact on driver's willingness
- More information in Deliverable 4.1 !

Legal Insights on Flexibility: Frameworks for EMSPs and New Market Contexts

Ting Chen, Ghent University

Legal Insights on Flexibility: Frameworks for EMSPs and New Market Contexts

Deliverable 2.4 Guidelines Legal Enabling Framework for Energy Management Service Providers (EMSPs)

Deliverable 2.5 Cost-benefit Analysis of the EMSP's Roles

Deliverable 7.4 Report on the Legal Context of the New Market Model

Deliverable 2.4 Guidelines Legal Enabling Framework for EMSPs

Summary:

- This deliverable provides an overview of EU and Belgian law on *demand-side flexibility.*
- It analyzes the challenges of the relevant Belgian law.
- It also outlines the role of EMSPs in enhancing consumers' engagement in flexibility provision and assesses the need for a dedicated legal framework to support EMSP activities.

Deliverable 2.4 Guidelines Legal Enabling Framework for EMSPs

Regulatory challenges of promoting demand flexibility

1. Difficulty in determining federal and regional competences

The Council of State presented the *grid impact criterion*, depending on whether flexibility services affect the transmission network or solely the distribution network.

This standard is rather general and challenging to apply, given that:

- Flexibility activation can impact multiple grid levels.
- Defining *balancing of the distribution network* as the region's exclusive competence can violate EU law.

Deliverable 2.4 Guidelines Legal Enabling Framework for EMSPs

2. A barrier frequently mentioned by the literature and stakeholders: flexibility **market design parameters** still hinder market access for **small consumers or aggregators**

- The minimum bid size in balancing markets;
- Complex market entry procedures;
- Remuneration for providing flexibility: low margin and uncertainty about future revenue

Deliverable 2.4 Guidelines Legal Enabling Framework for EMSPs

3. Challenges of achieving the required transition of the DSO's role

- In Wallonia, the DSO is still in a pilot phase for flexibility procurement.
- In both Wallonia and Brussels, the specific procurement rules are still under development.
- In Flanders, the regulator twice rejected the specifications for procuring flexibility for congestion management, due to non-compliance with the Flemish Energy Decree and the TRDE, particularly regarding transparency and substantive requirements (BESL-2022-150 and BESL-2024-02).

Deliverable 2.4 Guidelines Legal Enabling Framework for EMSPs

4. Risks posed by flexible connection agreements

The introduction of the *Fall-Back Flex product* in Flanders highlights a significant question relevant at both transmission and distribution levels:

*How to ensure compliance with the principle of market-based congestion management when **flexible connection agreements** or similar instruments offer (economically efficient) alternatives to flexibility markets?*

Deliverable 2.4 Guidelines Legal Enabling Framework for EMSPs

An assessment of the need for a legal enabling framework for independent EMSPs:

Scenarios	Need for Framework	Purpose of Framework	Key Elements
Suppliers or (I)FSPs act as EMSPs	Not necessary	No separate framework is required since suppliers/(I)FSPs already fulfill the EMSP role.	N/A
Independent EMSPs may exist	Necessary	To regulate the relationship between independent EMSPs and (I)FSPs.	Ensure non-discriminatory and efficient access to flexibility-related data controlled by EMSPs.
Application of UFP	Necessary	To structure the relationships between EMSPs, (I)FSPs, and the UFP.	Define rights and obligations of independent EMSPs and (I)FSPs in relation to the UFP.

Deliverable 2.5 Cost-benefit Analysis of the Energy Management Service Provider's Roles

Summary:

- This deliverable contains both *economic* and *legal* cost-benefit analyses (CBA).
- It identifies and classifies the costs and benefits created by independent EMSPs.
- It determines which categories of costs and benefits are relevant to economic and legal cost-benefit analysis.
- It assesses whether it is efficient and proportionate to introduce independent EMSPs or enable their activities.

Deliverable 2.5 Cost-benefit Analysis of the EMSP's Roles

Key findings:

- In the design of ECOFLEX, the introduction of independent EMSPs may not cause significant burdens on stakeholders affected by demand flexibility activation, notably suppliers and their BRPs.

- The CBA about the role of independent EMSPs varies depending on whether the UFP is involved. Thus, we evaluated costs and benefits in two scenarios.

Deliverable 2.5 Cost-benefit Analysis of the EMSP's Roles

Scenarios	Economic CBA	Legal CBA
1) (I)FSPs can access flexibility-related data cost-effectively without the UFP	Negative: Introducing independent EMSPs does not bring net added value but additional costs.	• Introducing independent EMSPs imposes additional burdens on stakeholders. • These burdens might not be clearly disproportionate; • Yet there are less burdensome alternatives
2) (I)FSPs do not provide EMSs to end customers, and the UFP is used to enhance their interactions with independent EMSPs	• The Independent EMSPs' roles in exchanging data with the UFP can bring net added value, direct and indirect costs. • Whether the benefits outweigh the costs depends on the volume of flexibility capacity unlocked by the EMSP-(I)FSP interaction via the UFP.	Requiring the (I)FSP to engage with the UFP to access flexibility-related data might not create disproportionate burdens.

Deliverable 7.4 Report on the Legal Context of the New Market Model

Summary:

- This deliverable outlines the concept of local flexibility markets (LFMs) and derives key market design parameters from theoretical market models and pilot projects across the EU.

- It discusses legal challenges of developing LFMs and integrating them into the existing sequence of electricity markets, notably considering **the purpose of ECOFLEX** (i.e., further leveraging demand flexibility to support grid balancing and security of supply)

Deliverable 7.4 Report on the Legal Context of the New Market Model

Key findings:

- Developing LFMs can create legal challenges surrounding their local nature, the DSO's role, and interactions with other electricity markets.
- A noteworthy issue: Will the rollout of LFMs affect the TSO's access to flexibility resources connected to the distribution grid?

For instance, mandating local flexibility to first bid on LFMs may increase the TSO's flexibility procurement costs and violate the EU law's fundamental principle of guaranteeing free market entry.

Price signals should still play an essential role in allocating flexibility sources and avoiding the negative implications of developing LFMs on transmission system operation.

Key takeaways

Rémy Cleenwerck, Vrije Universiteit Brussel

ECOFLEX Ecosystem

- Various kind of challenges have been identified and tackled
  - Centralised platform to facilitate LV assets' participation
  - Advanced EMSs were developed
  - Holistic review of the legal conditions was conducted
- Participation in aFRR and imbalance was envisaged, **but ..**

Implementation at GEP – aFRR

Technical requirements to participate:

- ☒ Minimum bid size (1MW)

  ↳ **Problem:** BESS (300kW < 1MW) cannot be valorised individually

  Solution: Aggregation with other aFRR bids, e.g. 700kW ‘left-over’ capacity

  However, bid was not activated due to:

  1. BSP(s) do not have particularly abundant left-over capacity
  2. (High) Price set by other asset forming the bid (merit order system)
  3. aFRR is more competitive since PICASSO

Implementation at GEP – aFRR

Legal requirements to participate:

- ☑ Flexibility provider must be associated with a BSP
- ☒ ‘Opt-out’ agreement* between BRP(s)-BSP is required

Problem: GEP has two BRPs (1 for consumption, 1 for injection)
1 BRP was unwilling to sign the opt-out agreement

Solution: Pass-through mechanism, i.e. GEP would be imbalance exposed
→ Financially not interesting due to unpredictable consumption
→ Thus: only aFRR upward deviation was possible

**An opt-out agreement ensures that the BRP transfers activation renumeration to BSP*

Implementation at GEP – Imbalance

Advantages compared to aFRR

- Imbalance is based on deviation of BRP nomination

  → No min. volume required for renumeration

- No prior commitment to TSO

  → Last-minute decision, EMS can decide to dispatch or not

But, complexities:

- Settlement, BRP may not recognise deviation = no renumeration

  → e.g. EVs have no planned baseline (or deviate from UI inputs)

- Different BRPs (cf. separate agreements – see aFRR)

The EV Case – Pluginvest analysis

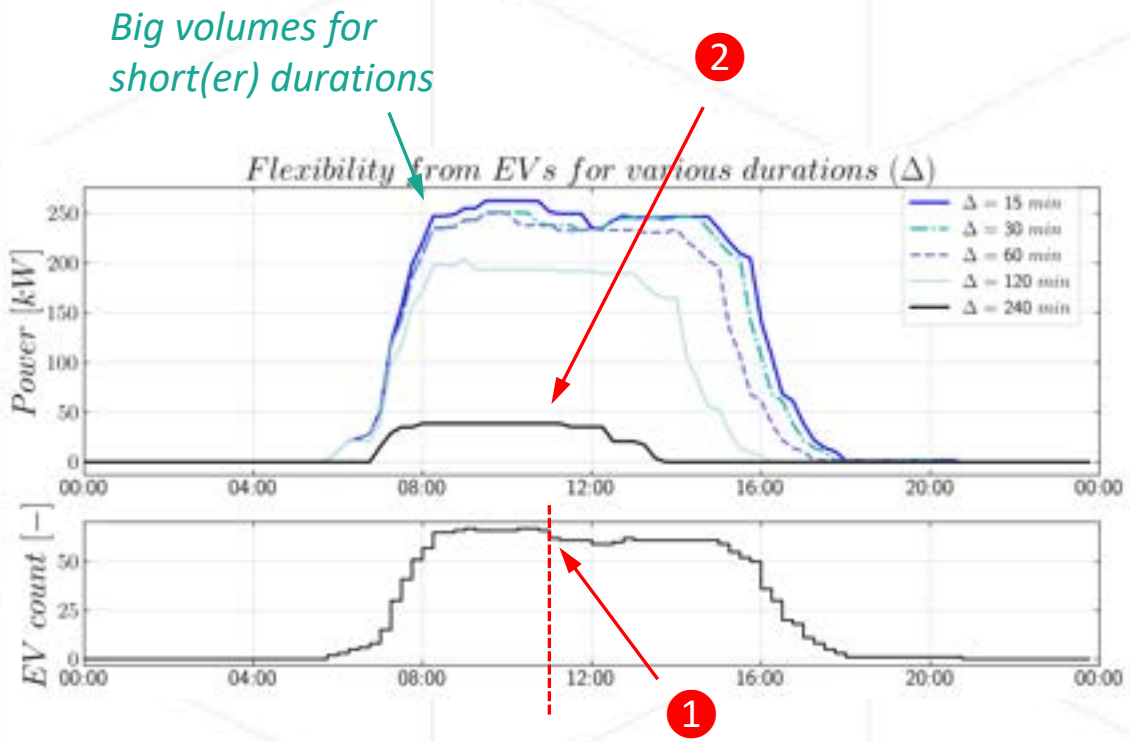
Evaluating the EV flexibility potential

What volumes can be provided ?

- Different time horizons considered
- Only downward regulation (i.e. DR)

Data (Sep. 2023 – March 2024)

- 8509 sessions recorded
- Arrival, departure and idle time
- Amount of energy during session
- 91 Charging points (22 kW)



Requirement (4h) limits activation volume:

1. *EVs disconnect / leave the parking lot*
2. *Connection time ≠ charging time, i.e. idle time or SoC = 100%*

The EV Case – Pluginvest site

- aFRR requirements form a barrier for EVs to participate (*cf. semi-public environment*)

- Imbalance steering (last-minute decision & bigger volumes) = promising

aFRR is a potential candidate for the logistics sector

→ Arrival and departure times are less/not volatile

Legal recommendations

- In case (I)FSPs' interactions with EMSs are costly → Fostering independent EMSPs to cooperate with UFP can lead to positive net social gain
- The UFP can be provided by the DSO, by invoking Article 31(10) of the Electricity Directive
- Local flexibility market should consider compatibility with unbundling requirements and implications for the TSO's access to local flexibility

(I)FSP: Independent flexibility provider
EMSP: Energy management service provider

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There is more …

- A user interface has been deployed: ‘Easily Charged’ to incorporate EV driver’s inputs (departure time; requested SoC;..)
- A sustainability & Life cycle assement (LCA) of the flexibility ecosystem has been conducted
- Benefits of LVDC Backbones as alternative form to connect flexible assets has been investigated

http://ecoflex-project.be

There is more …

http://ecoflex-project.be

Panel Discussion

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