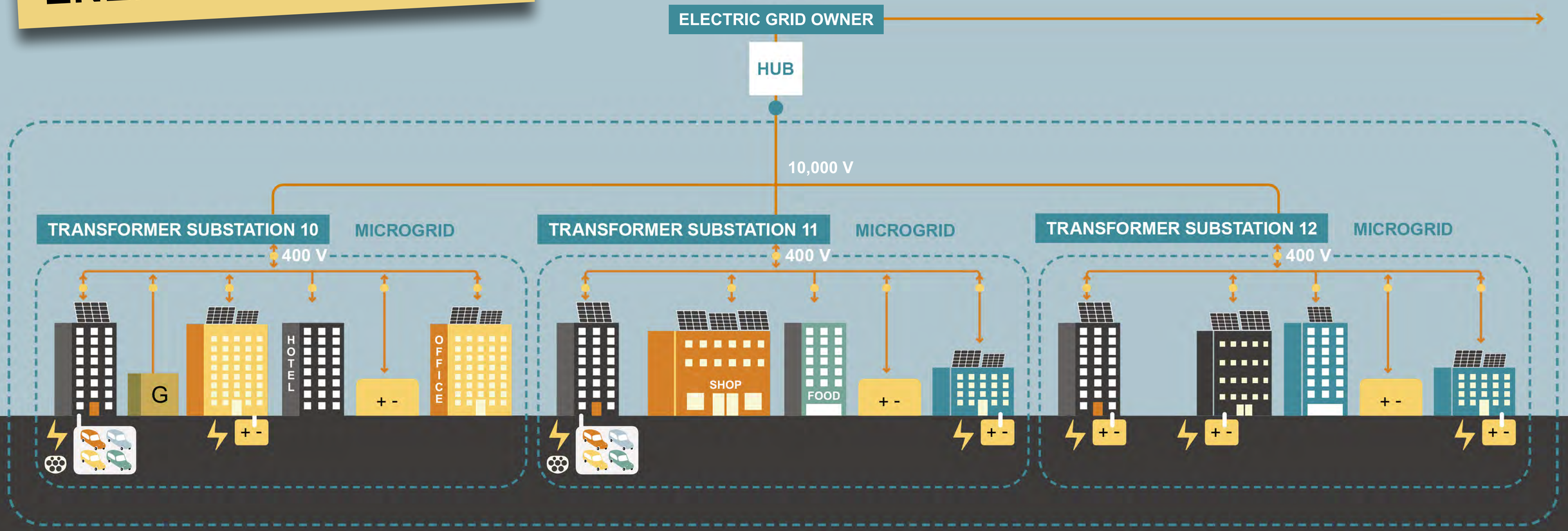
ENERGY COMMUNITY



STEERING OF ALL ENERGY RESOURCES

MODEL FOR VIRTUAL SHARING

ELECTRICITY

Welcome

Carlo Fischione, KTH

Agenda Energy Communities – 2025.05.22

12.00 Lunch

Energy Communities (30 min)

12.30 Welcome – *Carlo Fischione*, KTH

12.35 Citizen engagement and Energy Communities – *Jörgen Lööf*, ElectriCITY

12.50 Energy class journey – *Jan Fransson*, Energy Community Hammarby Sjöstad

Steering (60 min)

13.00 Steering of all energy resources – *Deniz Önder*, Bengt Dahlgren

13.15 Lasagne: AI systems and control – *Nabil Abdennadher*, HES-SO

13.30 Creating value from existing energy – *Jonas Thyni*, Recap

13.45 Social acceptance and willingness to join – *Emmanuel Fragnière*, HES-SO

14.00 Networking break

Virtual Sharing (30 min)

14.30 Model for virtual sharing – *Björn Laumert*, KTH

14.40 The role of the grid owner – *Mårten Granfors*, Ellevio

14.50 Policy, charges and taxes – *Per Everhill*, Tekniska verken

15.00 Questions

Panel Discussion (30 min)

15.10 Moderated by *Björn Laumert* with *Mårten Granfors*, *Per Everhill*, *Jonas Thyni* and *Emmanuel Fragnière*

15.40 Networking

Citizen-engagement and Energy Communities

Jörgen Lööf, ElectriCITY

ELECTRICITY

A citizens' initiative for climate neutral cities

Cities occupy

3%

of the earth's surface

ELECTRICITY

An accelerator for change

but accounts for

70%

of the CO_2-emissions!

COOPERATION IN
A QUADRUPLE HELIX

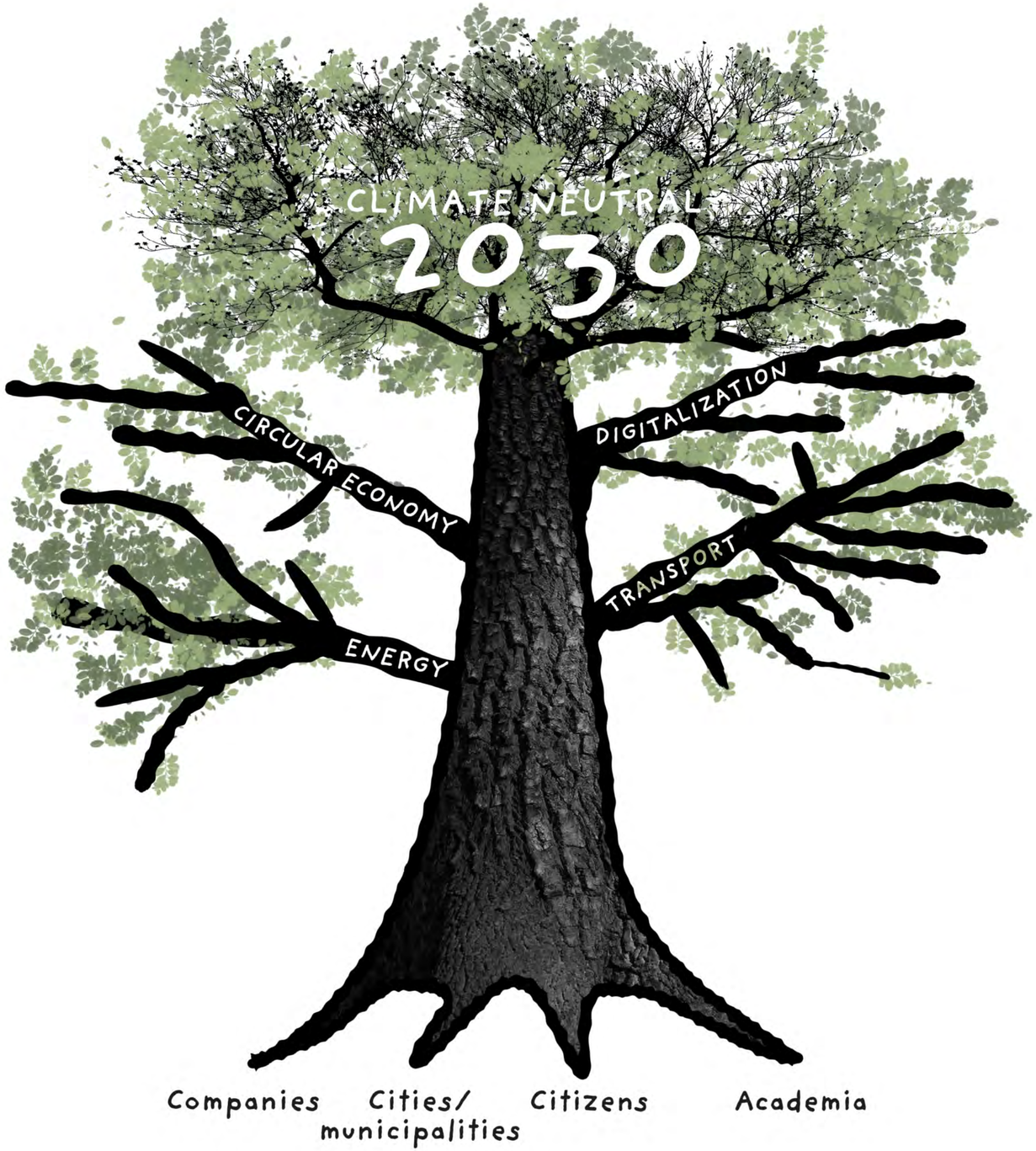
How to become climate neutral by 2030?

ELECTRICITY

OUR MEMBERS AND PARTNERS


Make Trade
meta solutions
NACKA ENERGI
NACKA KOMMUN
NACKA VATTEN AVFALL
NEWEL
NIBE
NISSAN
Nordic Solutions for C40
NUUKA
OneCo
park inn by Radisson
REDFIELD
REMONDIS
Riksbyggen
RI SE
RIVUS power that flows
SERNEKE
SIEMENS
SISAB
Sjöstadsföreningen
SKANSKA
skistar
SHG Solar HydroGenesis
SOLKOMPANIET
stella
stockholm exergi
Stockholm The Capital of Scandinavia
Stockholms stad
SWECO
SweGreen
TAXI STOCKHOLM 150000
Teknikföretagen
Telia Company
TEM
URBAN DESIGN
urbs. URBAN SYSTEMS
Vasakronan
VATTENFALL
VEIDEKKE
ve viaeuropa
VoerEir
VOLVO
VÄSTRA HAMNEN.SE HAVE IT ALL
white
xeric
ZAPTEC

OUR MAIN FOCUS AREAS



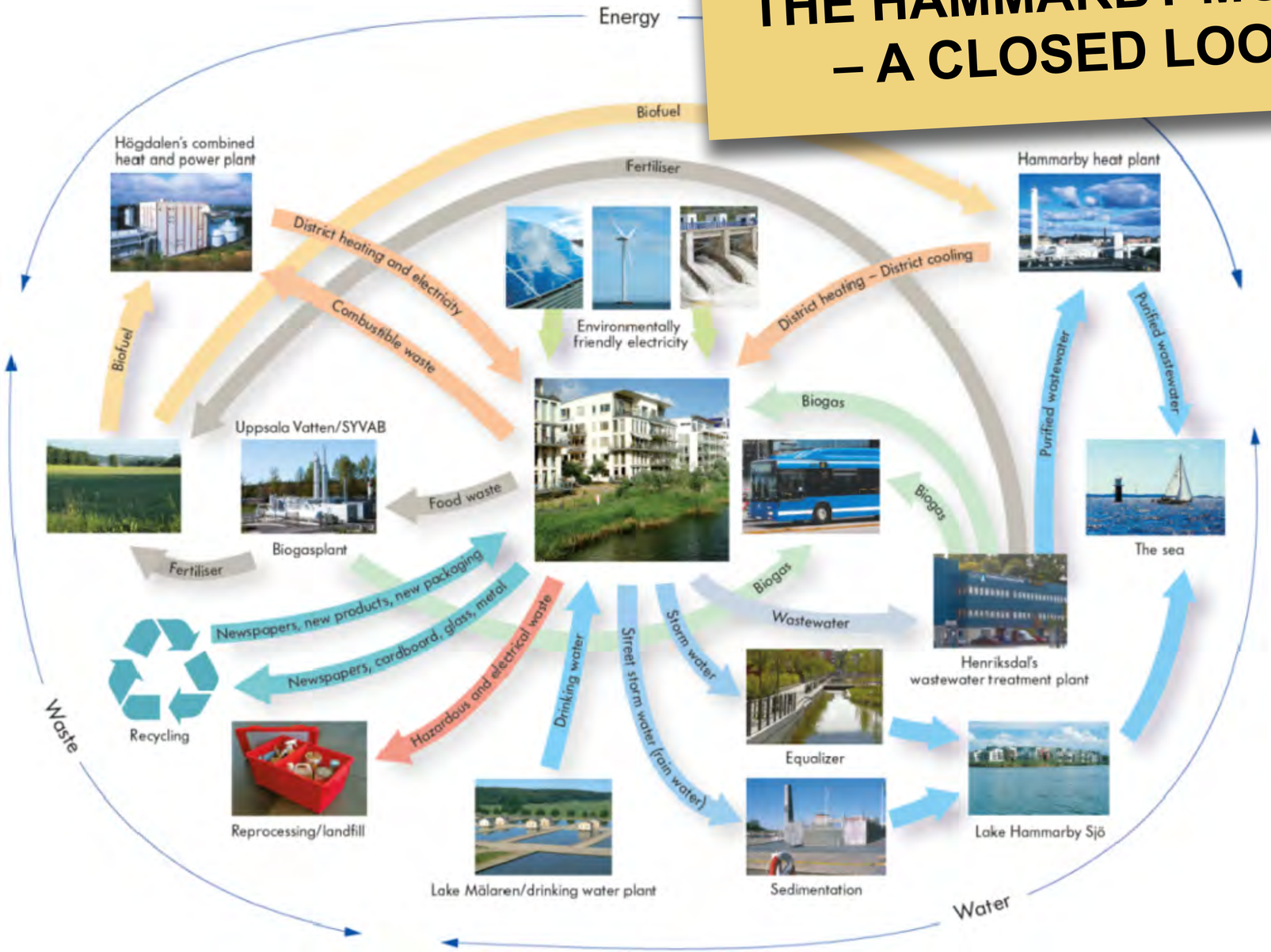
ELECTRICITY

LUGNET
1990

TWICE AS GOOD!


ECO GOVERNANCE
INTEGRATED PLANNING

THE HAMMARBY MODEL – A CLOSED LOOP



ELECTRICITY

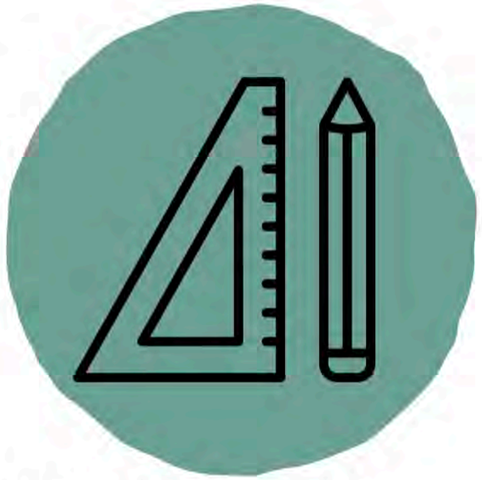

TO RENEW
A NEW CITY
ELECTRICITY


HAMMARBY
SJÖSTAD 2.0
LIVING TEST BED
WITH 18,000 PEOPLE
ELECTRICITY


WILLY OCIANSSON
CARRIES OUT ECODRIVES
NEW YORK
EMPIRE STATE
ELECTRICITY

Energy

– what could possibly go wrong?



- The design and calculations could be faulty or not up to todays standard.
- Building projects often stretch over several years and initial solutions can become outdated.

- The design and calculations used are dated or misinterpreted.
- The builders workforce could lack the necessary skills required to do the installations.

- The maintenance could either be haphazard or poorly executed.
- Lack of interest and inadequately trained staff could worsen the situation.

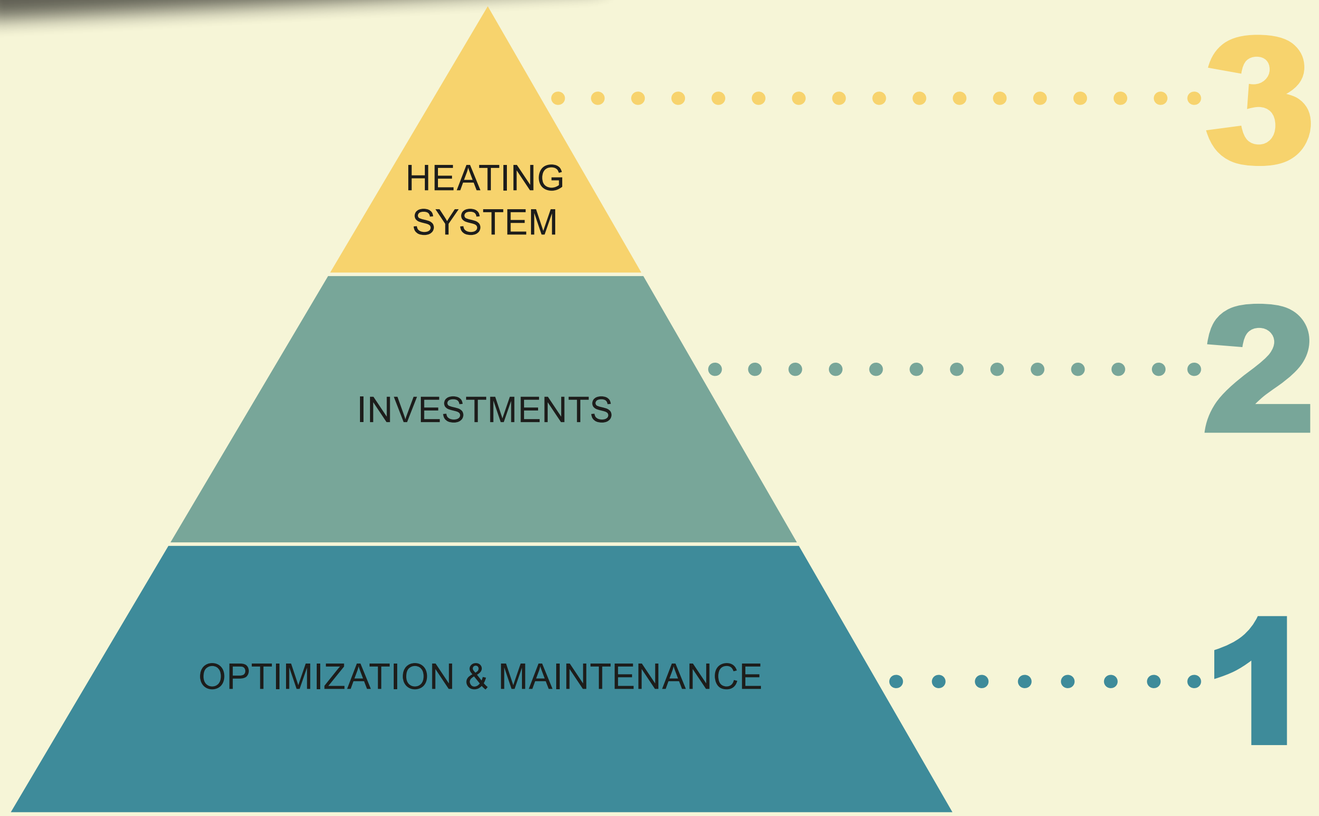

!
CHARLIE SAVES
1.8 MILLION/YEAR
ELECTRICITY

ELECTRICITY


IT IS PROFITABLE
TO BE CLIMATE SMART!

TECHNICAL MANAGEMENT

TARGETED ENERGY MANAGEMENT



3

KEY FACTORS:
Geothermal heat exchangers
District heating
Pellet boilers

2

Loft Insulation
New windows
New entrance and cellar doors
Outside cladding
Motion-controlled LED lighting
FTX - pressure controlled fans, FVP, management and control systems

1

Weather proofing windows and doors
New radiator valves and thermostats
Fine-tuning heating and ventilation systems
Turning off circulation pumps in the summer
Changing incandescent lighting to LED in existing luminaires

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JOINT PROCUREMENT

20% DISCOUNT

PROJECT MANAGEMENT FRAMEWORK DESCRIPTION

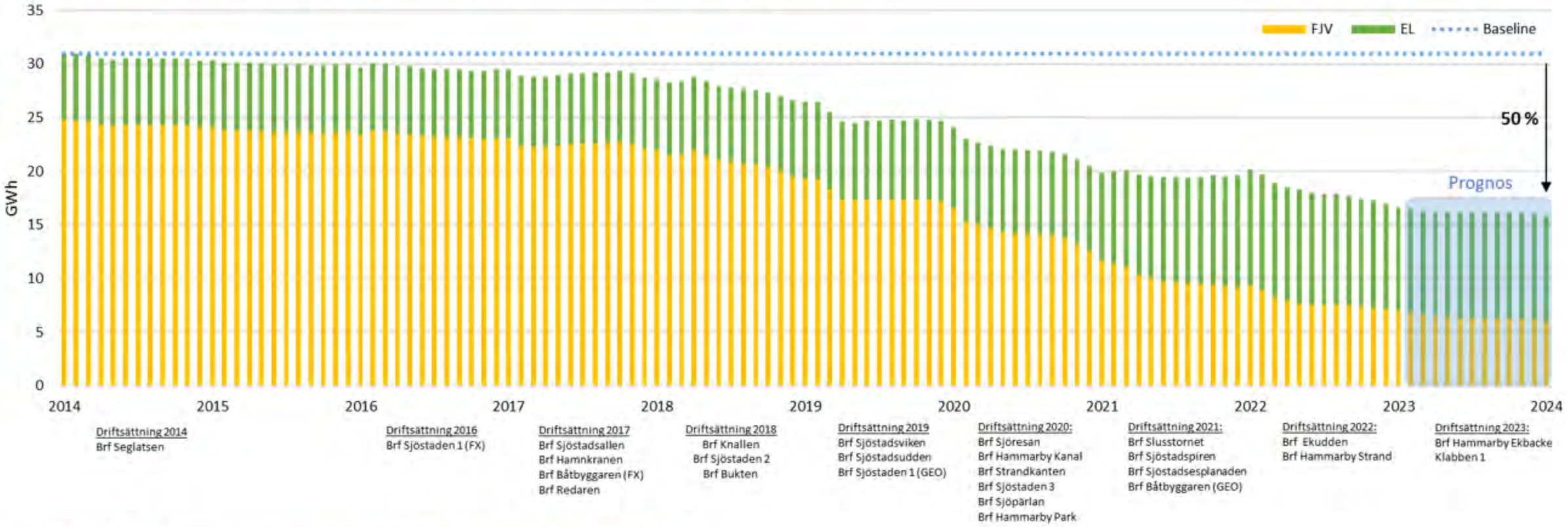
STRATEGIC PARTNERING

TURN-KEY CONTRACTS

ELECTRICITY


26 HOUSING ASSOCIATIONS
50% LESS PURCHASED ENERGY

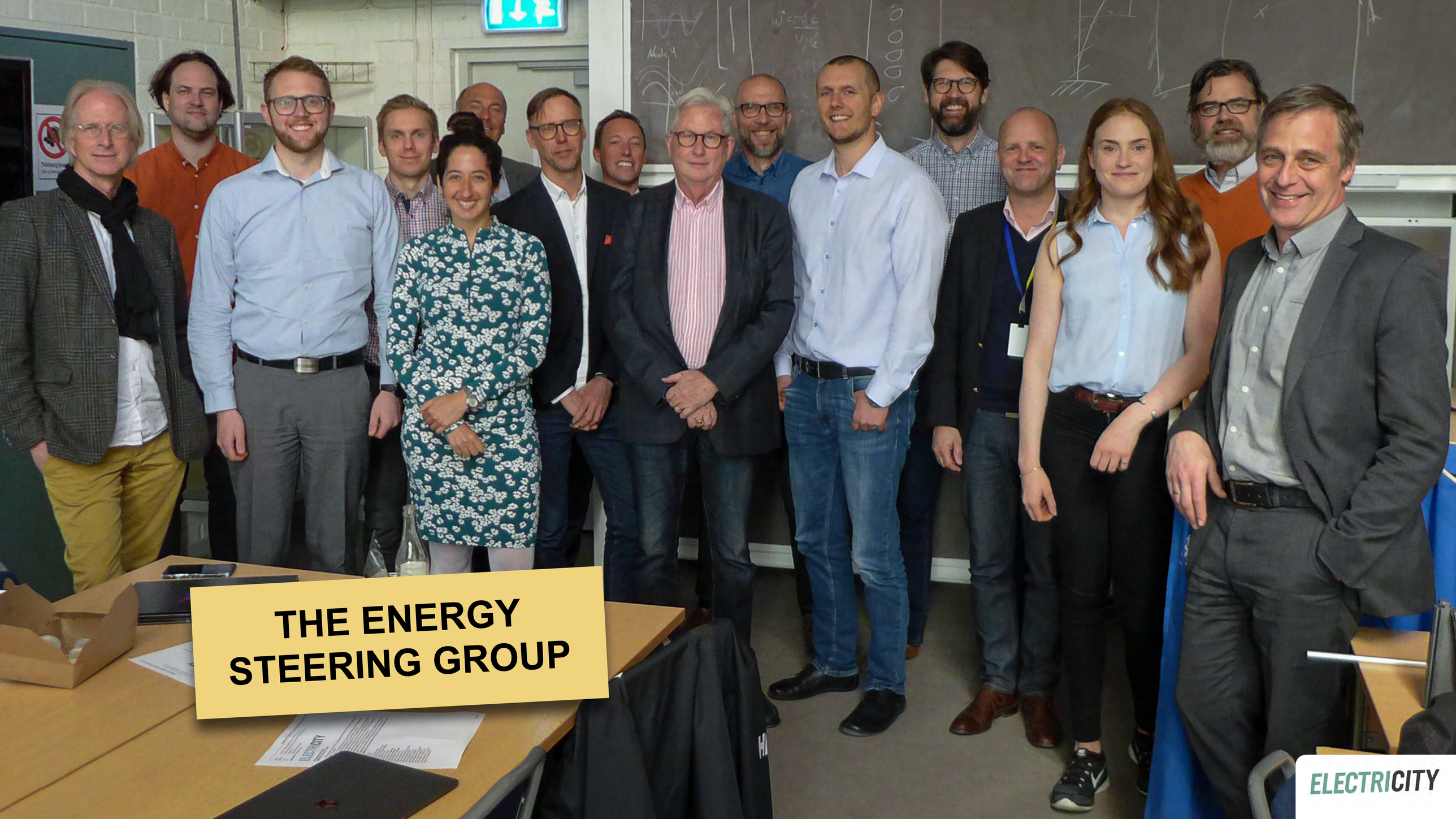
Energiprojekt Hammarby Sjöstad

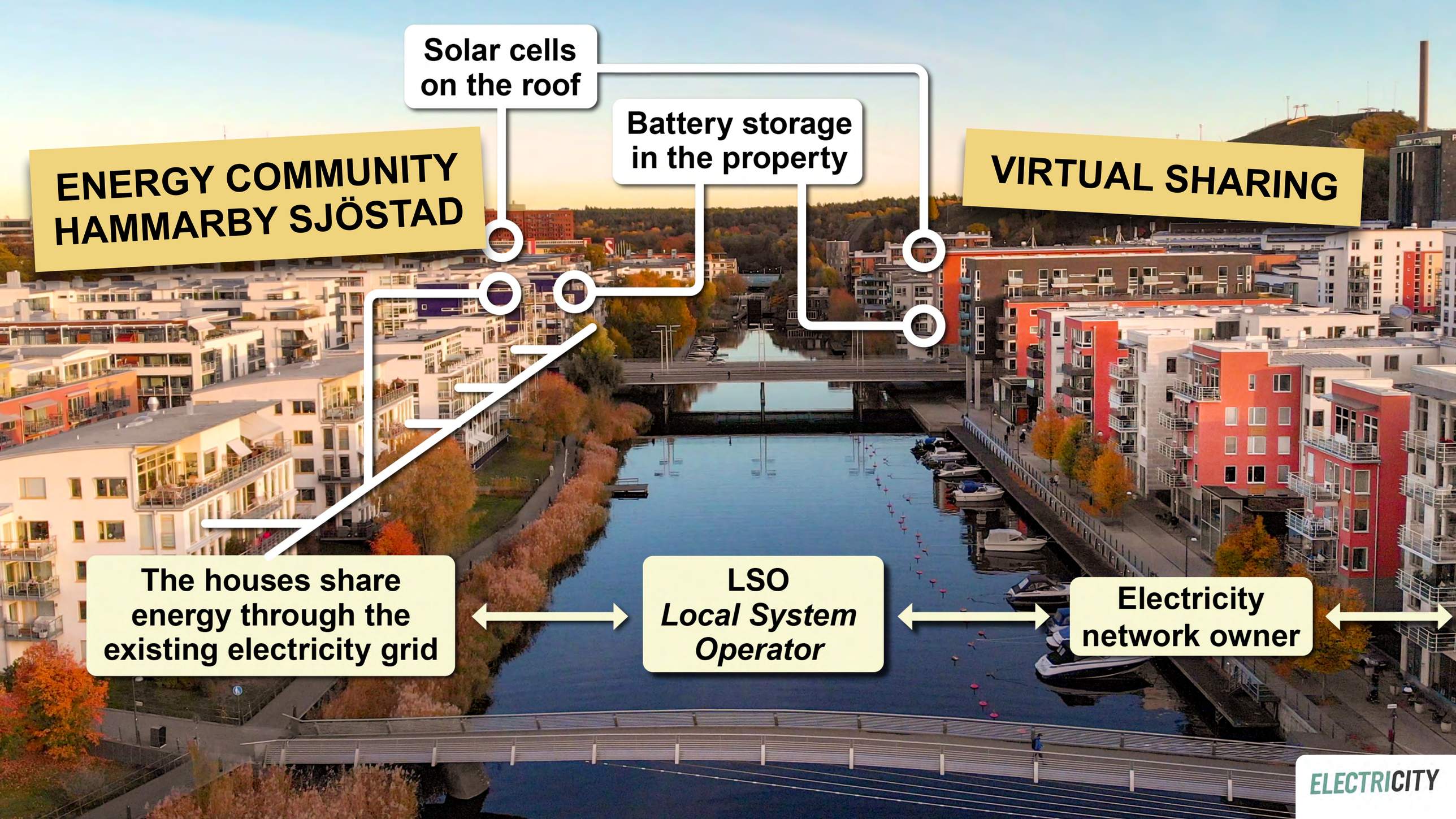


26 st energiprojekt i Hammarby Sjöstad

15 GWh minskad energianvändning per år i stadsdelen

Energistatistik avser uppmätt fjärrvärme och el på debiteringsmätare dvs köpt energi. Rullande 12.


THE ENERGY
STEERING GROUP


Solar cells on the roof
Battery storage in the property
ENERGY COMMUNITY HAMMARBY SJÖSTAD
VIRTUAL SHARING
The houses share energy through the existing electricity grid
LSO
Local System Operator
Electricity network owner
ELECTRICITY

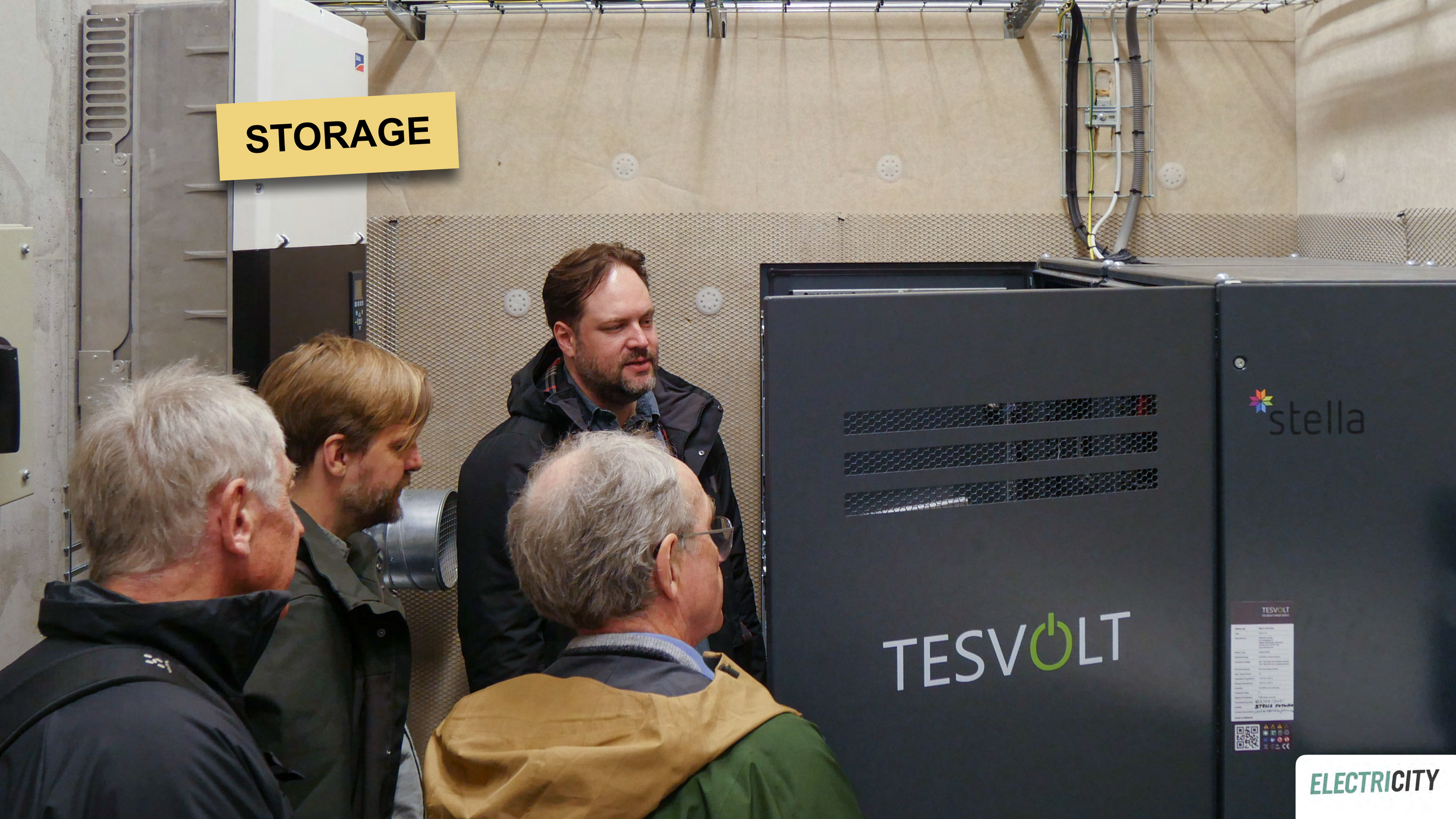

BENEFIT FOR REAL ESTATE
OPERATION-ELECTRICITY IN CASE OF POWER FAILURE
REDUCED ELECTRICITY COST
AQUADOR
ELECTRICITY


BENEFIT FOR DISTRICT
INCREASED RESILIENCE
REDUCED POWER REQUIREMENT
ELECTRICITY


BENEFIT FOR SOCIETY
GLOBAL SPREAD
A WORKING MODEL FOR ENERGY COMMUNITIES
ELECTRICITY

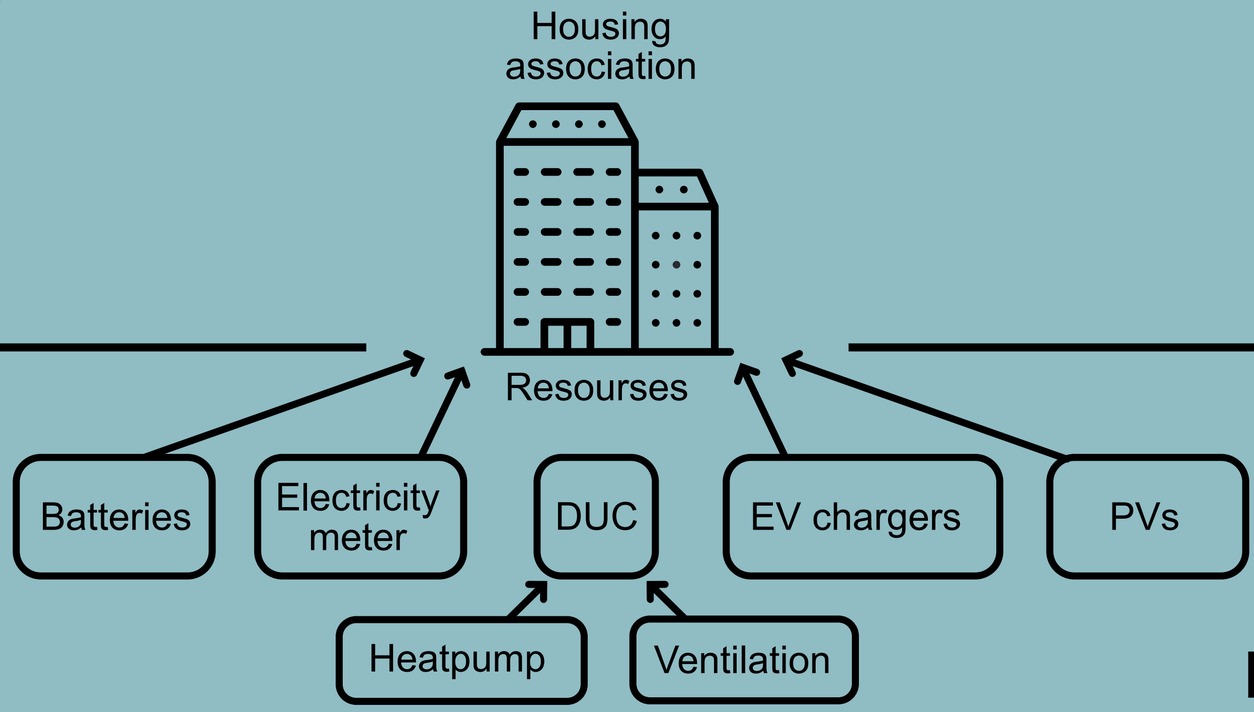
ROOFTOP SOLAR PANELS

ELECTRICITY


STORAGE
TESVOLT
stella
TESVOLT
ELECTRICITY


RESOURCE
ENSTAR
ecodan
MITSUBISHI ELECTRIC

Standardization of resources



Challenges

- Different ontologies
- Costs for hardware
- Costs for installation
- Costs for tagging
  - identifying data points and naming them

Requirements

- Open standardized data at installation
- Free connections
- Free updates

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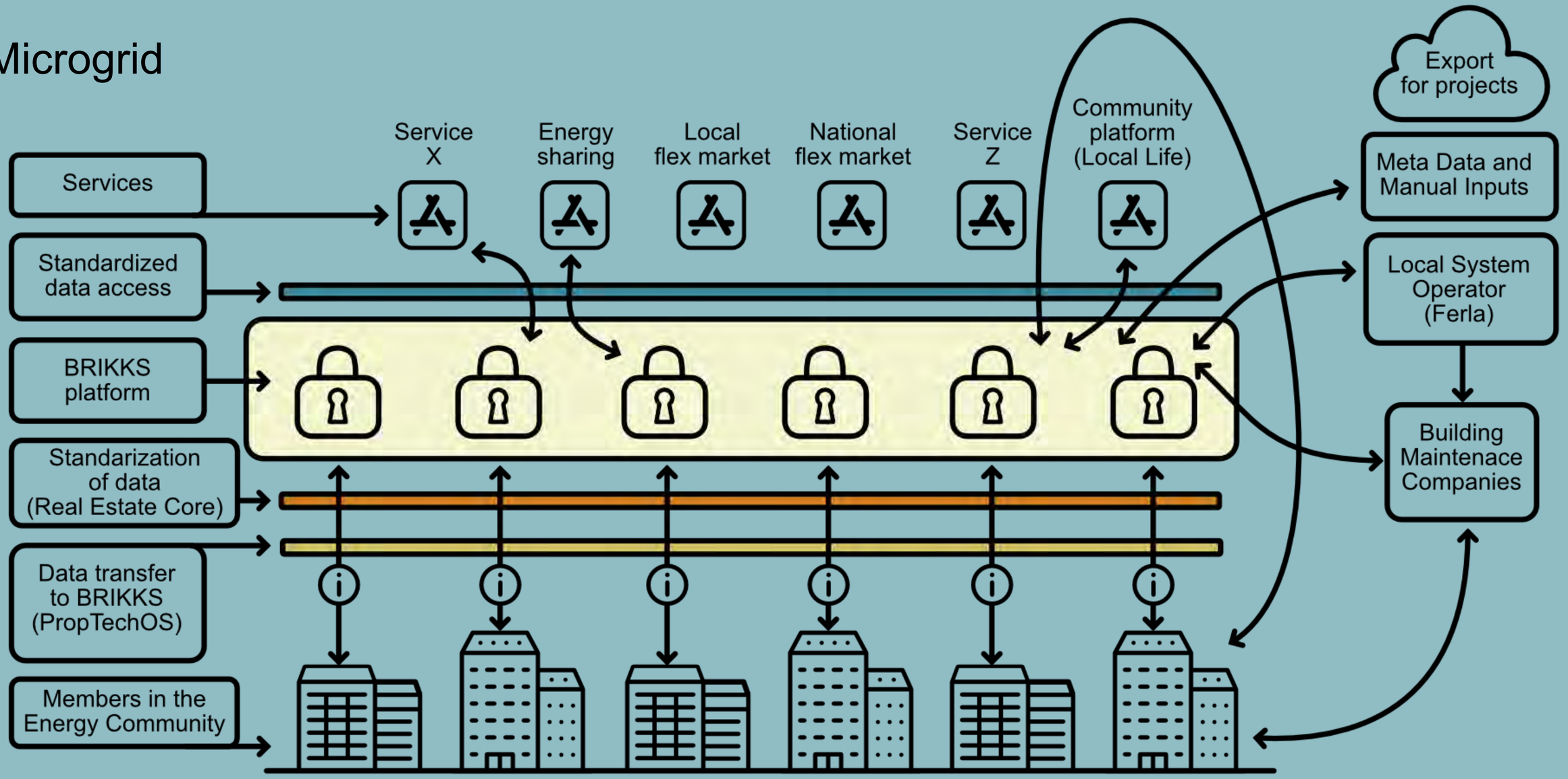
BROADBAND-JESUS
GLOBAL NON-PROFIT
ENERGY-PROTOCOL

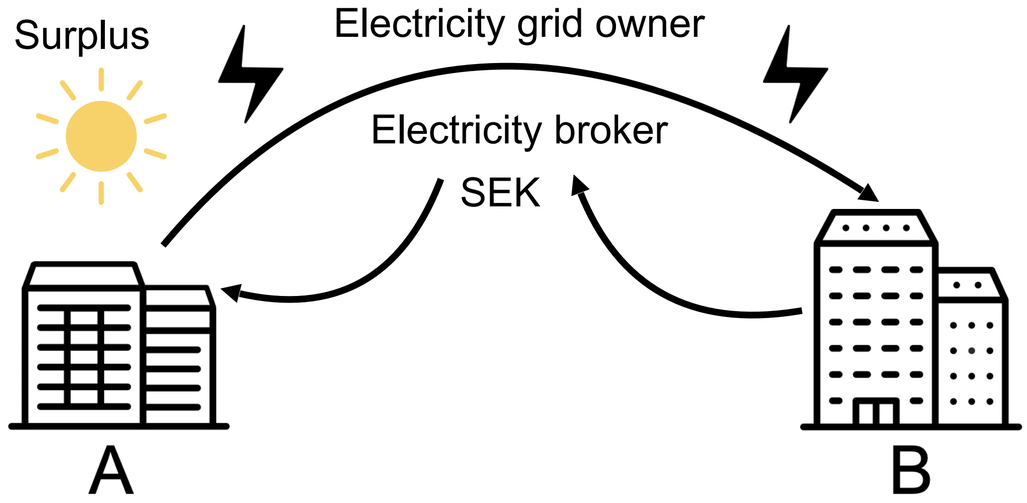
Microgrid



ELECTRICITY

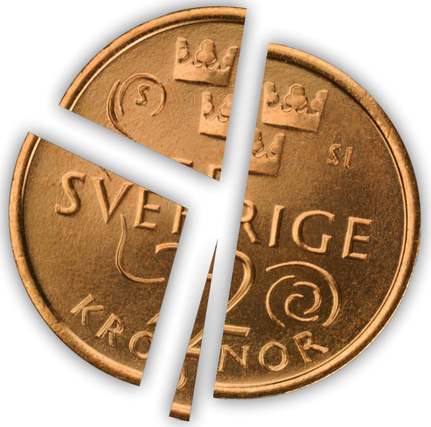
ENERGY COMMUNITY
HAMMARBY SJÖSTAD

Virtual sharing of energy



A sells the surplus to B

Invoicing via the electricity broker



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APP FOR ENERGY

COLLABORATE

COMMUNICATE

AND INSPIRE

ELECTRICITY

ENERGY COMMUNITY

- Work together to improve the buildings' energy performance
- More renewable energy production
- Stored and shared energy
- Joint investments in for example PVs
- Joint flex services
- Lower electricity costs

ELECTRICITY

Energyclass-journey

Jan Fransson, ECHS

The Energy Class Journey – Brf Sjöstaden2

The starting point

- **2015:**
- Energy class E,
  - primary energy index 129 kWh/Atemp,
  purchased energy 1947 MWh (has IMD)

  - Energy competence within the association basically zero!

What has Sjöstaden2 done

Ecodrive with Willy Ociansson (2016), the start of change

- Geothermal heating, Exhaust air recycling, Solar cells,
  - LED in garage + in common areas + outdoor lighting,
  - New energy control system,
  - Replaced exhaust fans,
  - Temperature measurement in apartment,
  - Lowered indoor temperature,
  - Review of apartment radiators,
  - Follow-up of electricity consumption of car charger., laundry room, FTX fans.
    - Car charging all (66) parking spaces (no charging 17:00-20:00)
- Continues to improve the efficiency of heating, domestic hot water production, ventilation
  - Heating now based on indoor temperature

The result

- **2024**
- Energy class B, Primary energy index 53kWh/Atemp (new calculation, 33 according to 2015)
- Purchased energy 815 MWh (100% Electricity) (of which 27 MWh car charge that did not exist in 2015)
- Reduced operating costs approx. SEK 900,000/year (despite increased electricity price)
- Energy competence in the association today MUCH HIGHER!

Steering

Steering of all energy resources to reduce costs/peak capacity

Business models, possibilities and challenges

Deniz Önder, Bengt Dahlgren

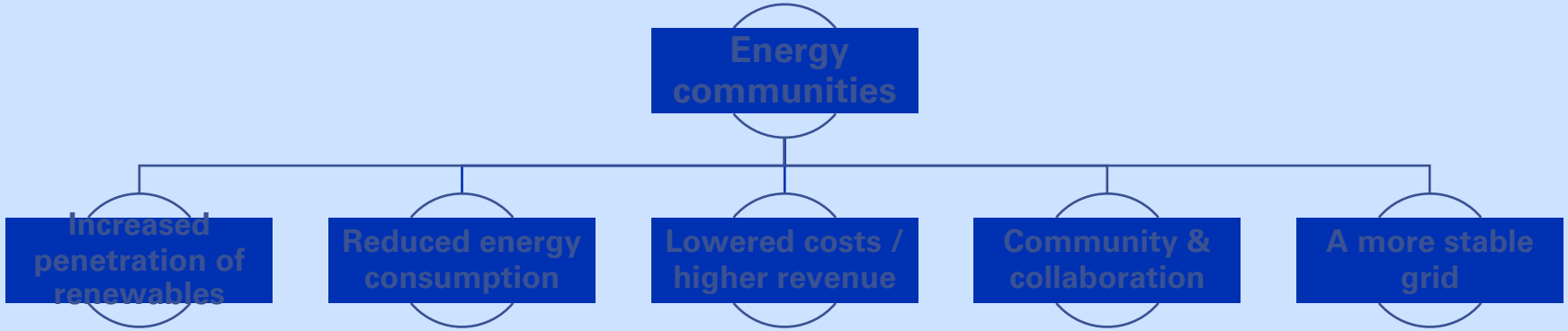
OPTIMIZING ENERGY RESOURCES – AN ENERGY COMMUNITY PERSPECTIVE

Deniz Önder

Affärsområdesansvarig Förnybar Energi & Elmarknad

Goals with energy communities

A snapshot



Energy sharing

Källa: Becquerel

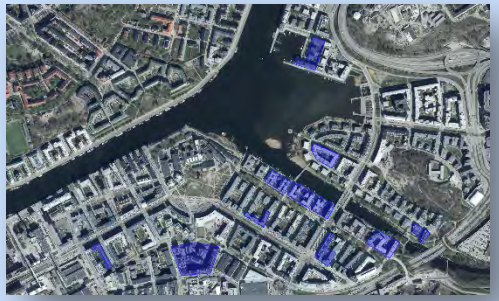
Källa: Becquerel

Källa: Becquerel

Bakslag för uppmärksa
energiprojket

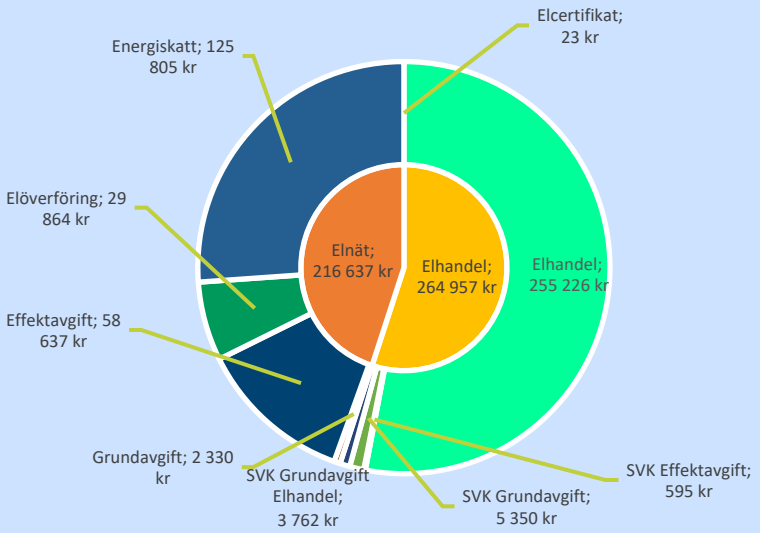
Aktörer som har solceller på flera intilliggande fastigh
på elen i ett gemensamt nät kan inte räkna med att ir
ska anses utgöra en enda anläggning när det ska beräknas
energiskatt på elektrisk kraft. Det framgår av en dom från Högsta
förvaltningsdomstolen.

Uppdaterad: 11 november 2024, 15:55 Publicerad: 11 november 2024, 12:10

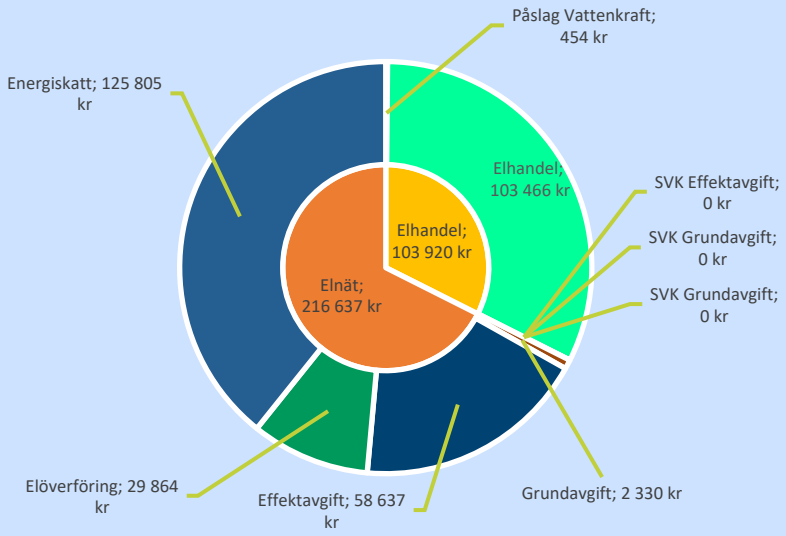


Electricity price

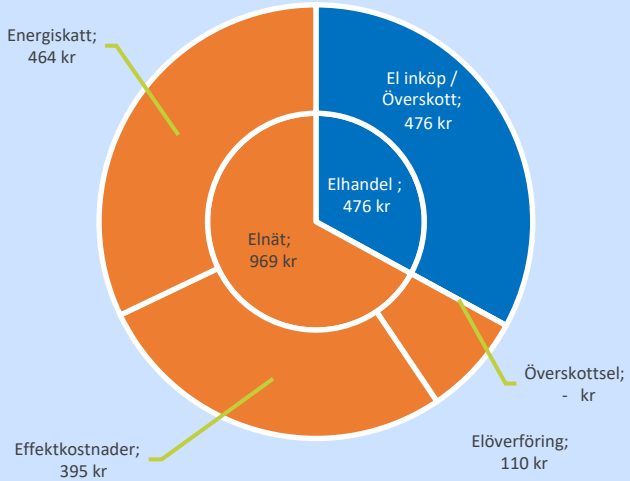
Winter



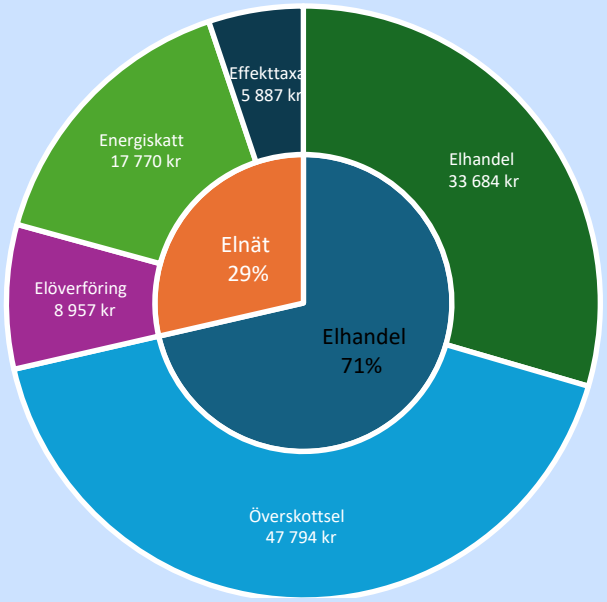
Summer



1kW solar

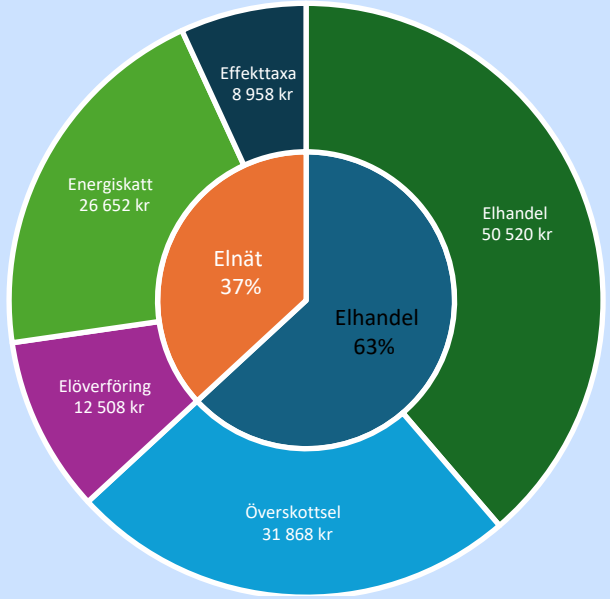


One 100kWp – Three stories



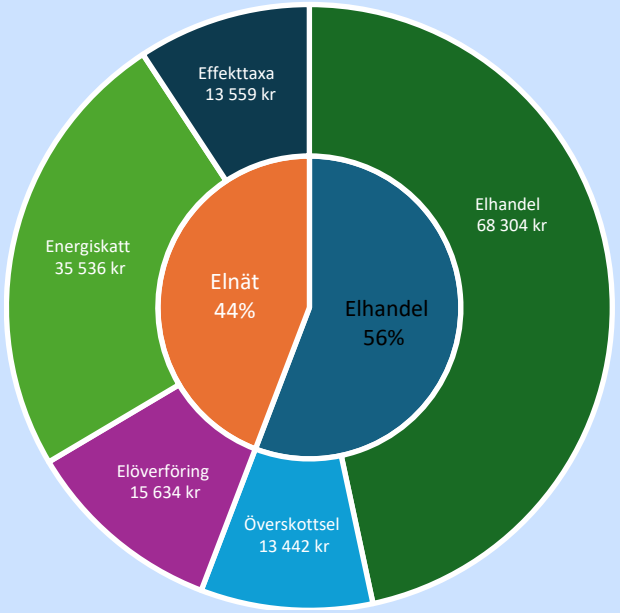
40% Self consumption

- Ca 114tkr/yr
- 18 yr payback



60% Self consumption

- Ca 130tkr/yr
- 14 yr payback

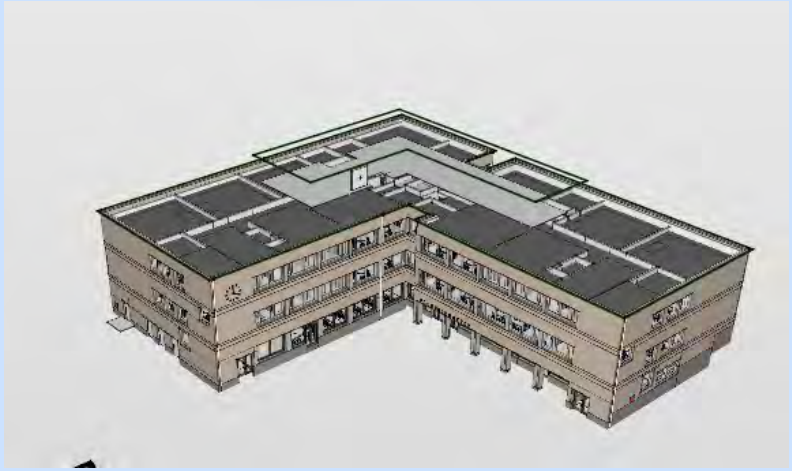


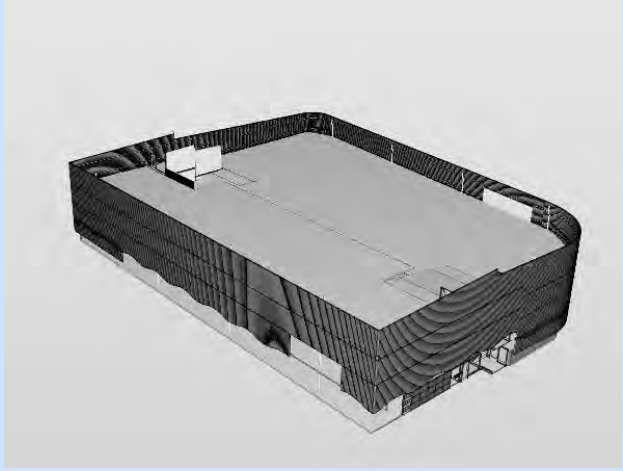
80% Self consumption

- Ca 146tkr/yr
- 12 yr payback

Increase self-consumption

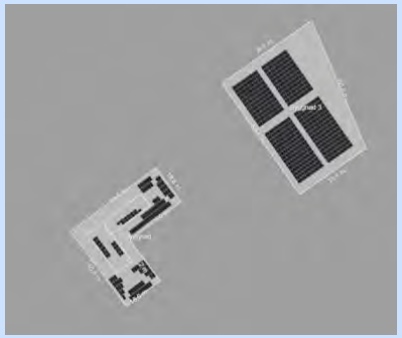
Through energy-sharing

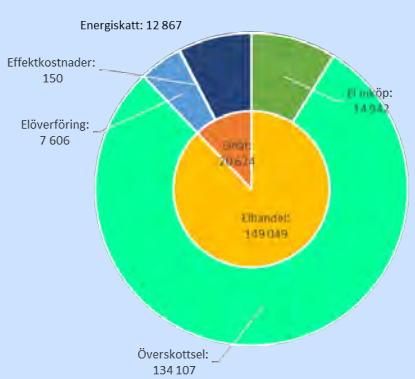


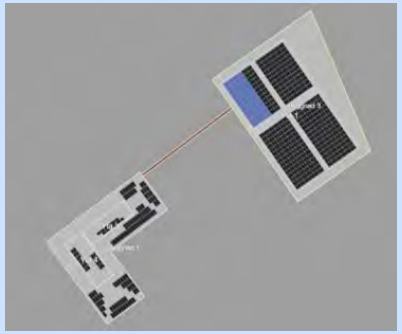


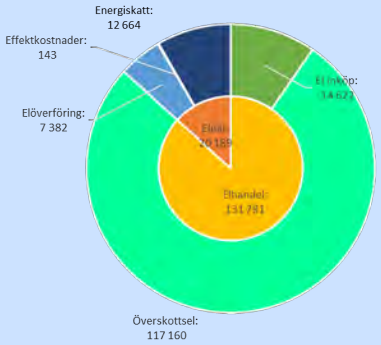
Increase self-consumption

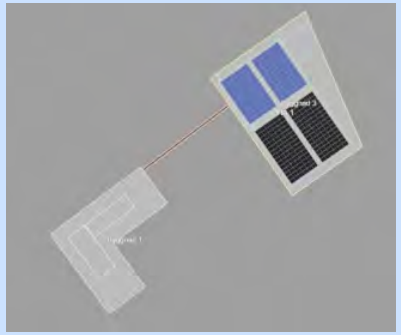
Through energy-sharing

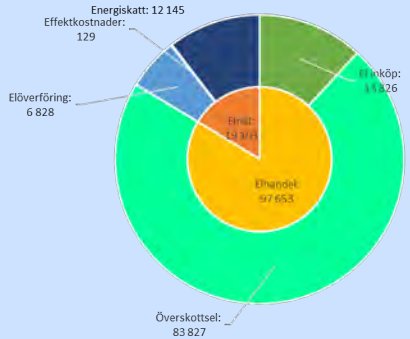


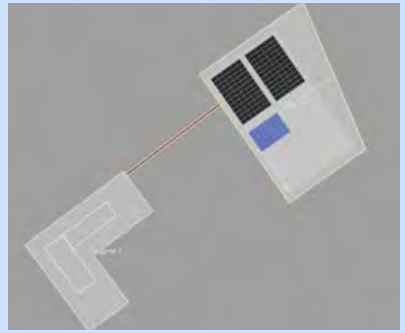


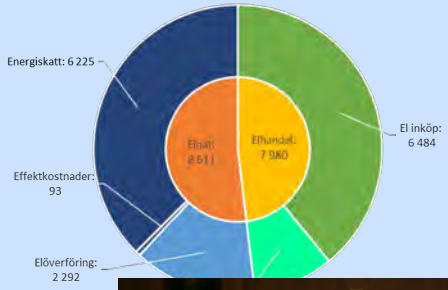




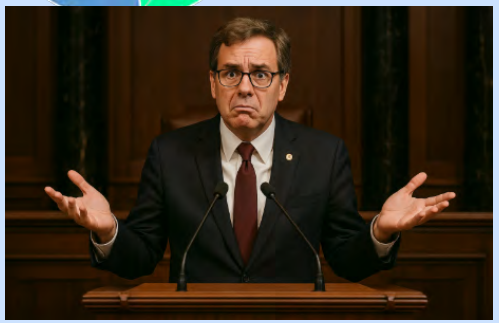








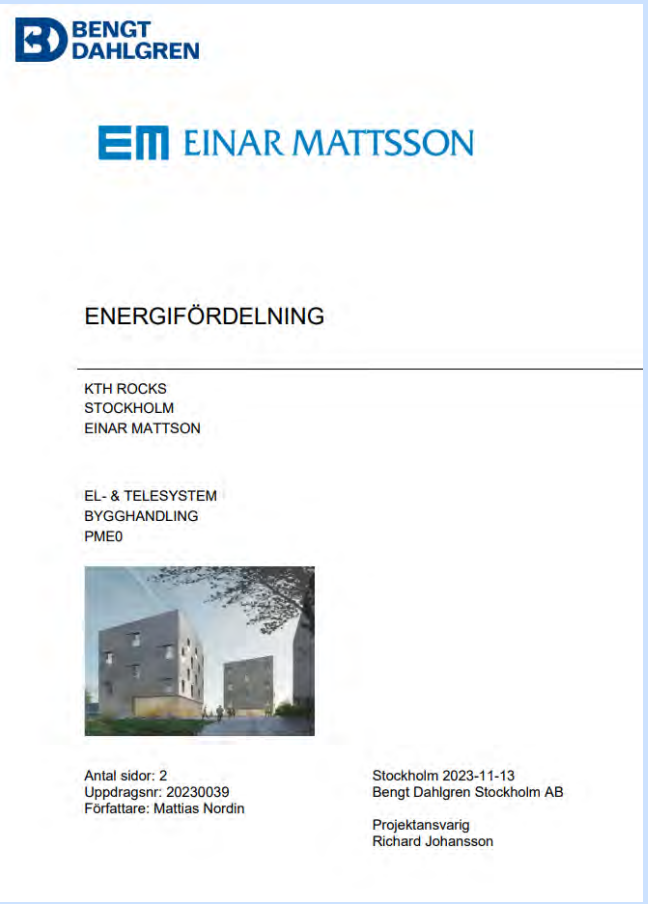
Where do we place the inverter?



Increase revenues

Through energy-sharing & batteries

- Laundry room (building 1)
- Heat pumps (building 2)
- Batteries (building 3)



BENGT DAHLGREN

EINAR MATTSSON

ENERGIFÖRDELNING

KTH ROCKS
STOCKHOLM
EINAR MATTSON

EL- & TELESYSTEM
BYGGHANDLING
PME0

Antal sidor: 2
Uppdragsnr: 20230039
Författare: Mattias Nordin

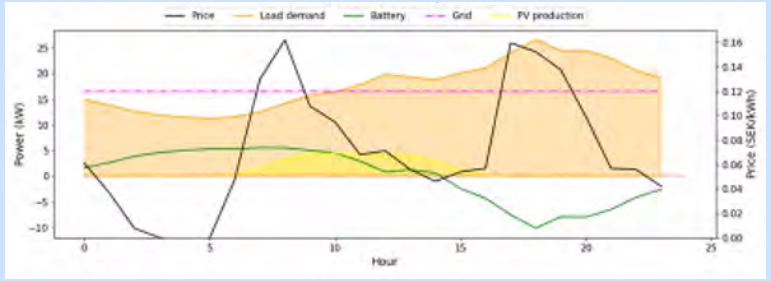
Stockholm 2023-11-13
Bengt Dahlgren Stockholm AB

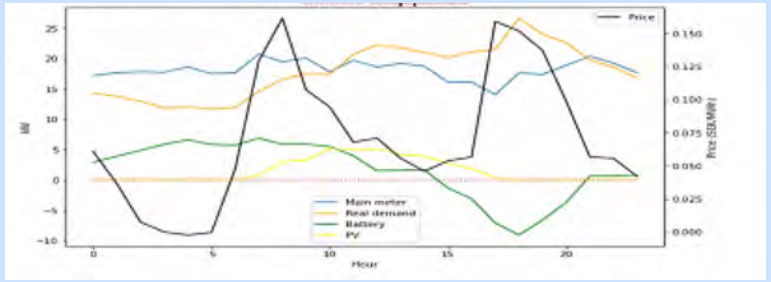
Projektansvarig
Richard Johansson

Increase revenues

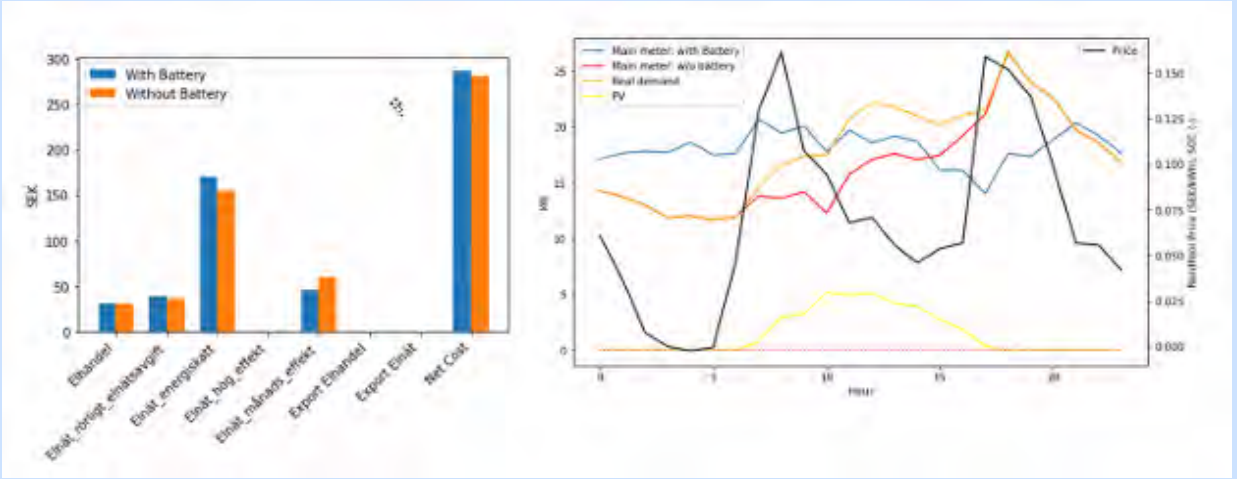
Through energy-sharing & batteries

Forecasting



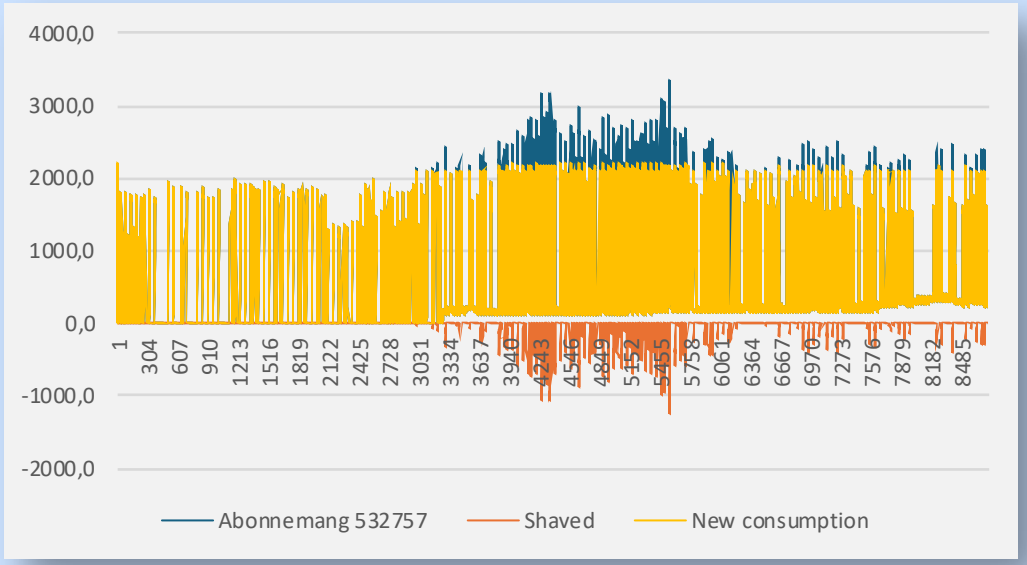


Results w/o energy sharing

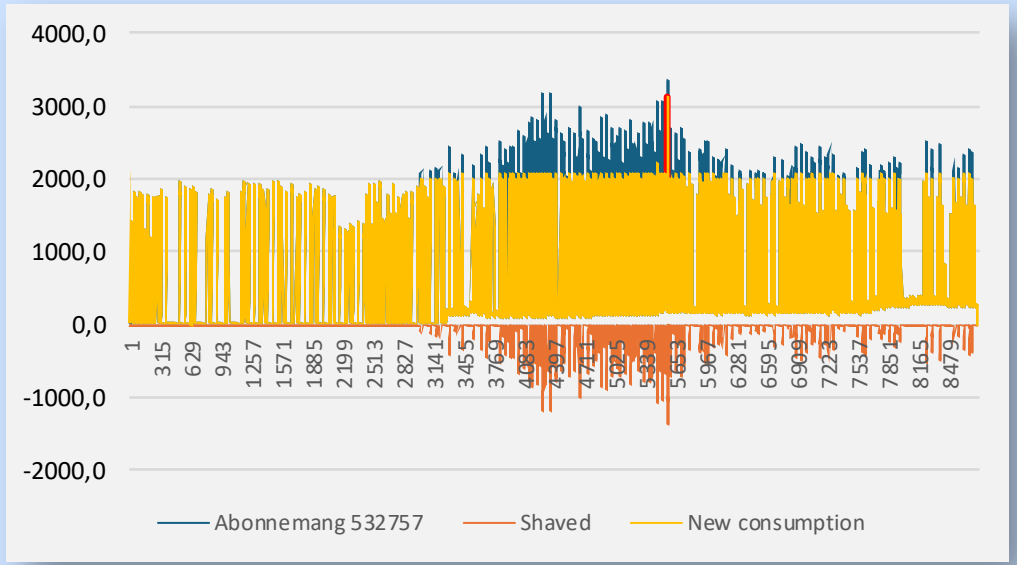


Case: Peak shaving failure

Peak shave 1,1MW



Peak shave 1,2MW



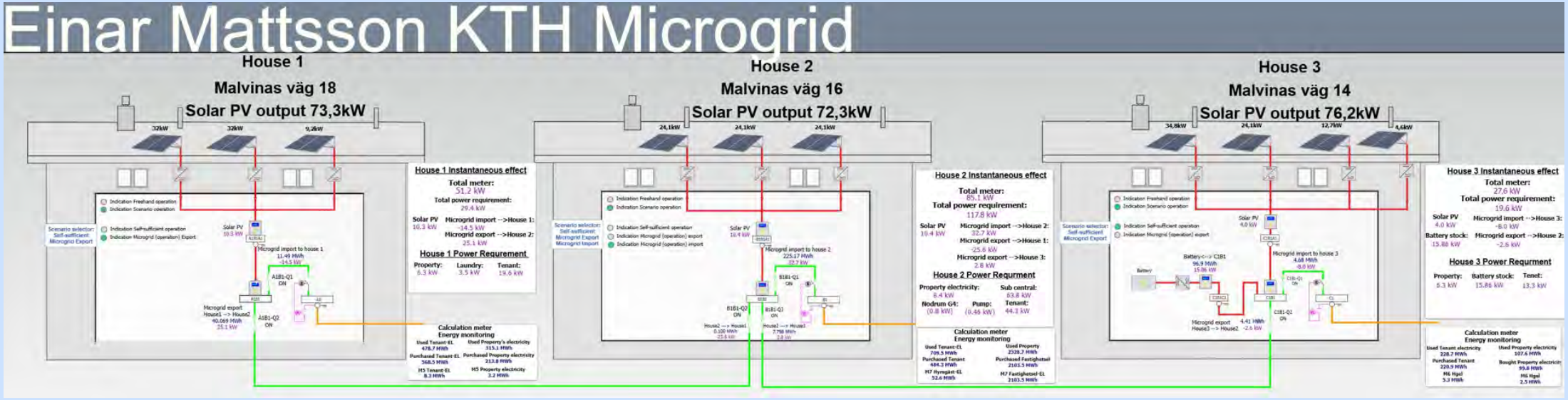
Cost of energy for peak shaving– ca 290 tkr

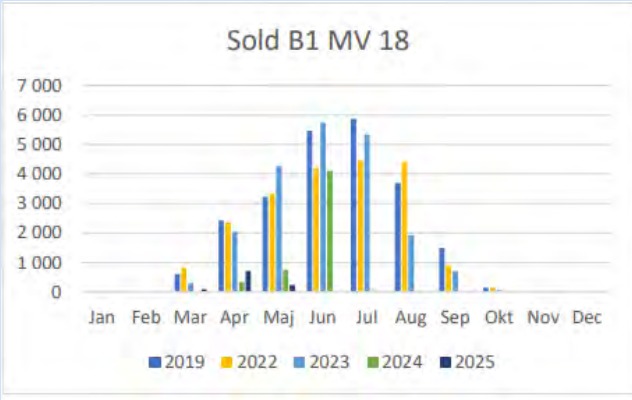
Increase revenues

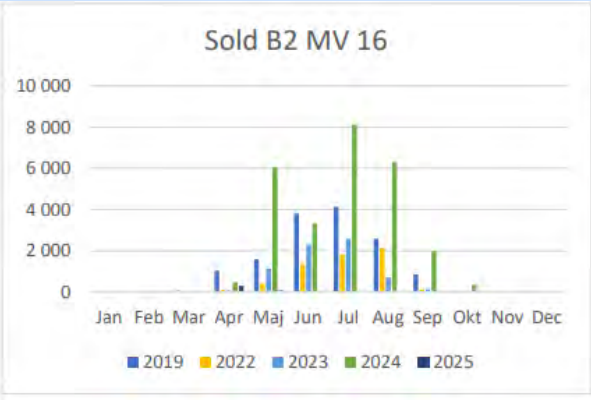
Through energy-sharing & batteries

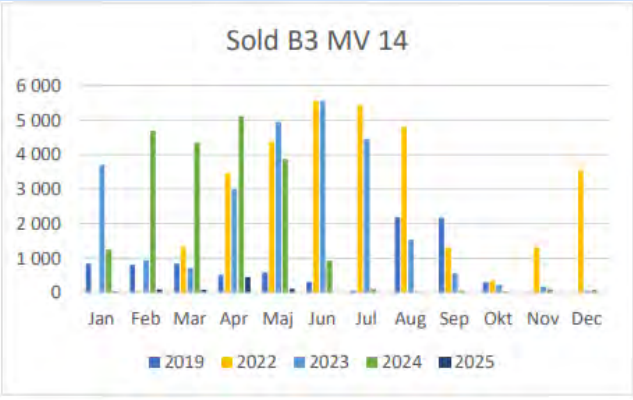
Increase revenues

Through energy-sharing & batteries







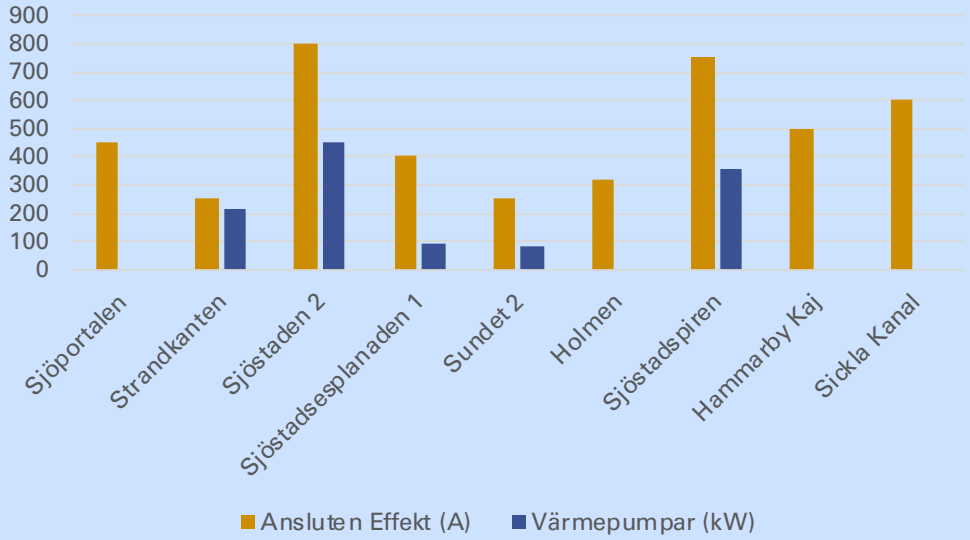


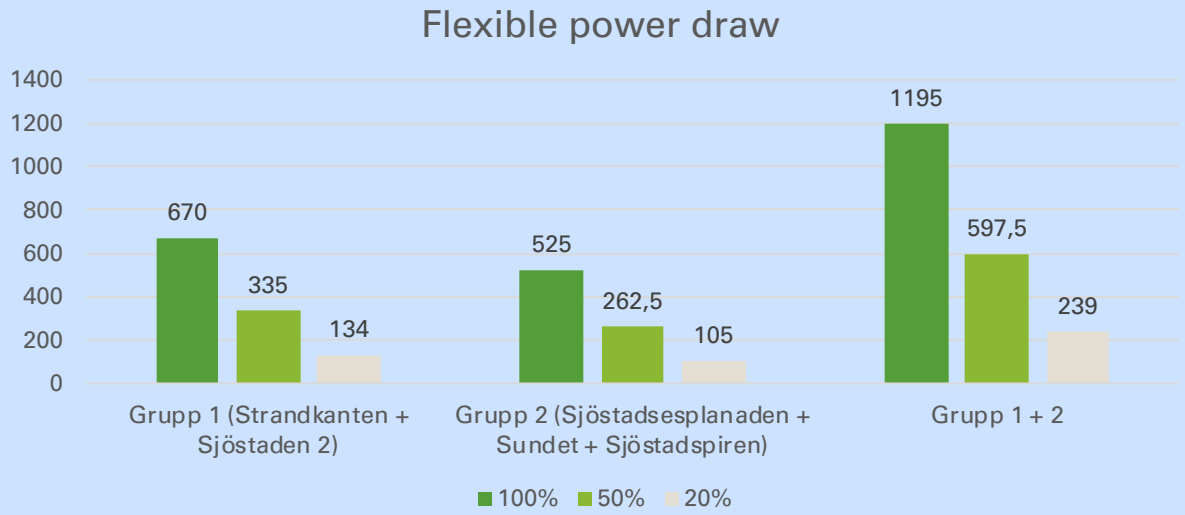
Increase revenues

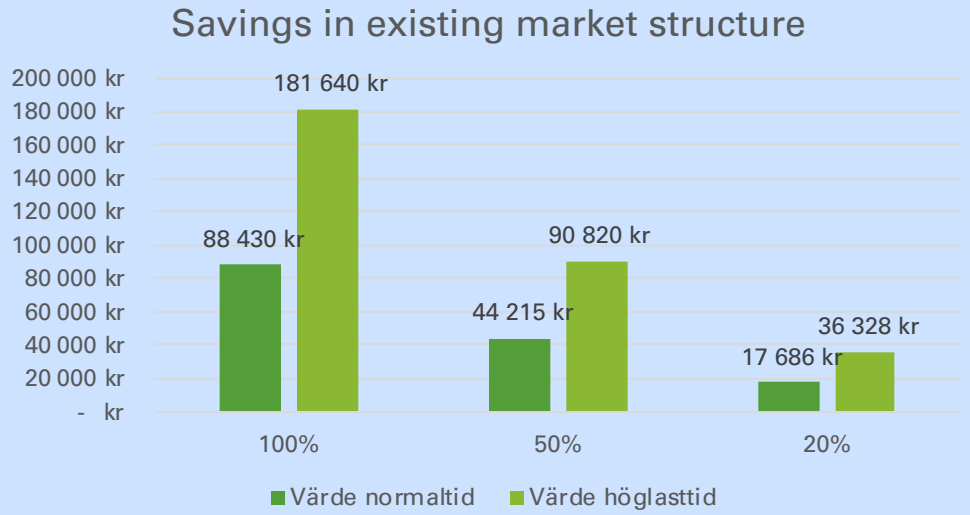
Through existing infrastructure

Increase revenues

Flexibility through existing infrastructure







The future?

Local flexibility markets & collective self-consumption

Market design uncertainty

- Existing tariffs? Avoided grid investments? Opportunity cost? Societal value?

Which auction model?

- Pay as bid?
- Marginal price?
- Clock auction, Vickrey-Clarke-Groves etc.?

Participation uncertainty

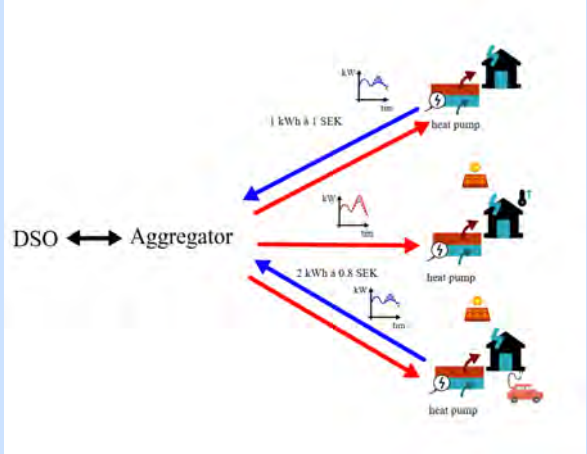
- Increased technical demands
- Unclear cost/benefit ratio
- Concerns regarding comfort, warranties etc.

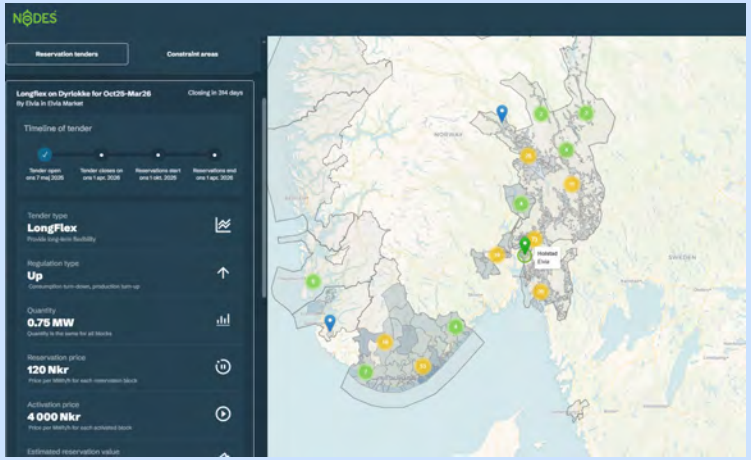
Regulatory hurdles?

- What can a DSO do?
- Revenue stacking between local flex / national markets?

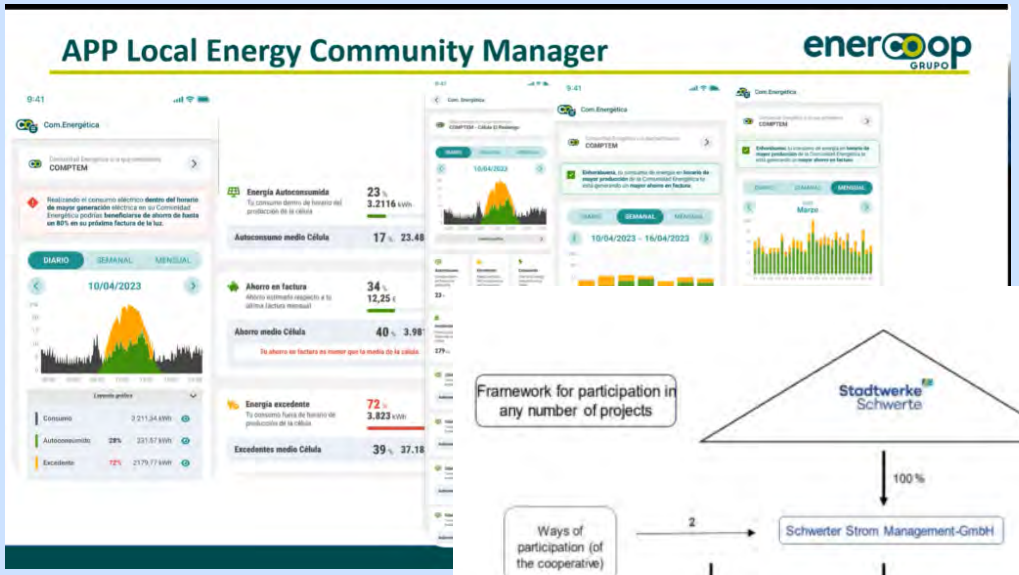
Infrastructure

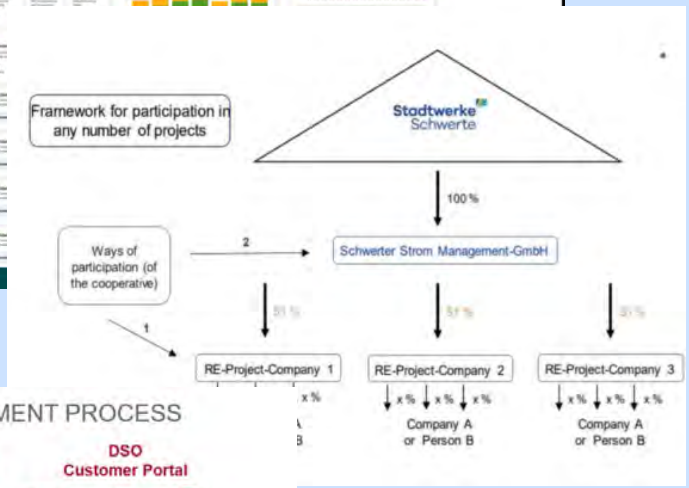
- Who builds it?
- Who controls it? Who participates in it?
- IT-security

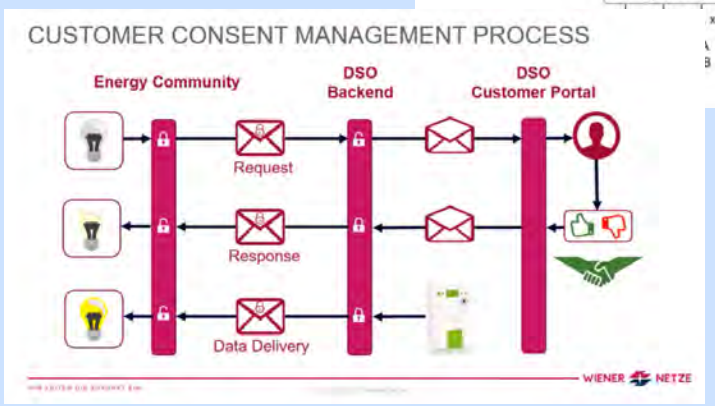




Outside in Europe







“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has.”
— *Margaret Mead*

Thank you!

deniz.onder@bengtdahlgren.se

Lasagne – General presentation and AI systems

Nabil Abdennadher, HES-SO

LASAGNE – General presentation and AI systems

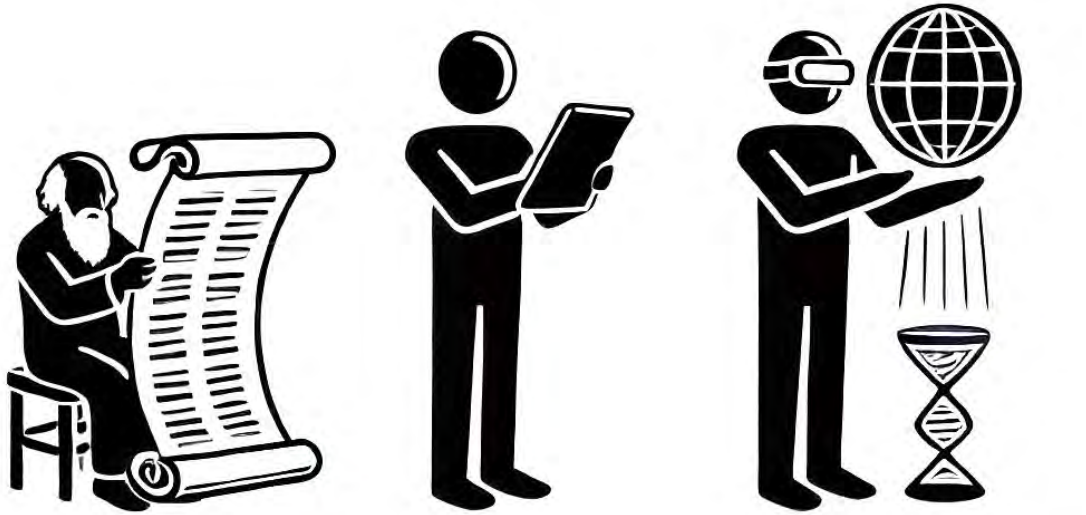
Nabil Abdennadher

Energy communities, 23 May 2025, KTH, Stockholm

Hes·so

O-CEI

Smart Energy District



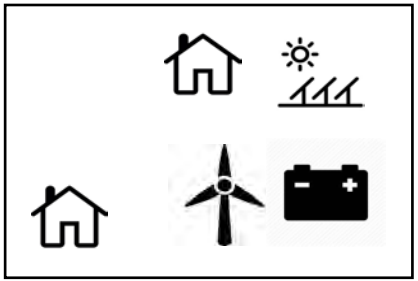
SWARM

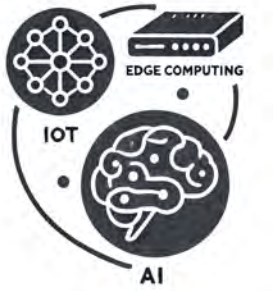
LASAGNE

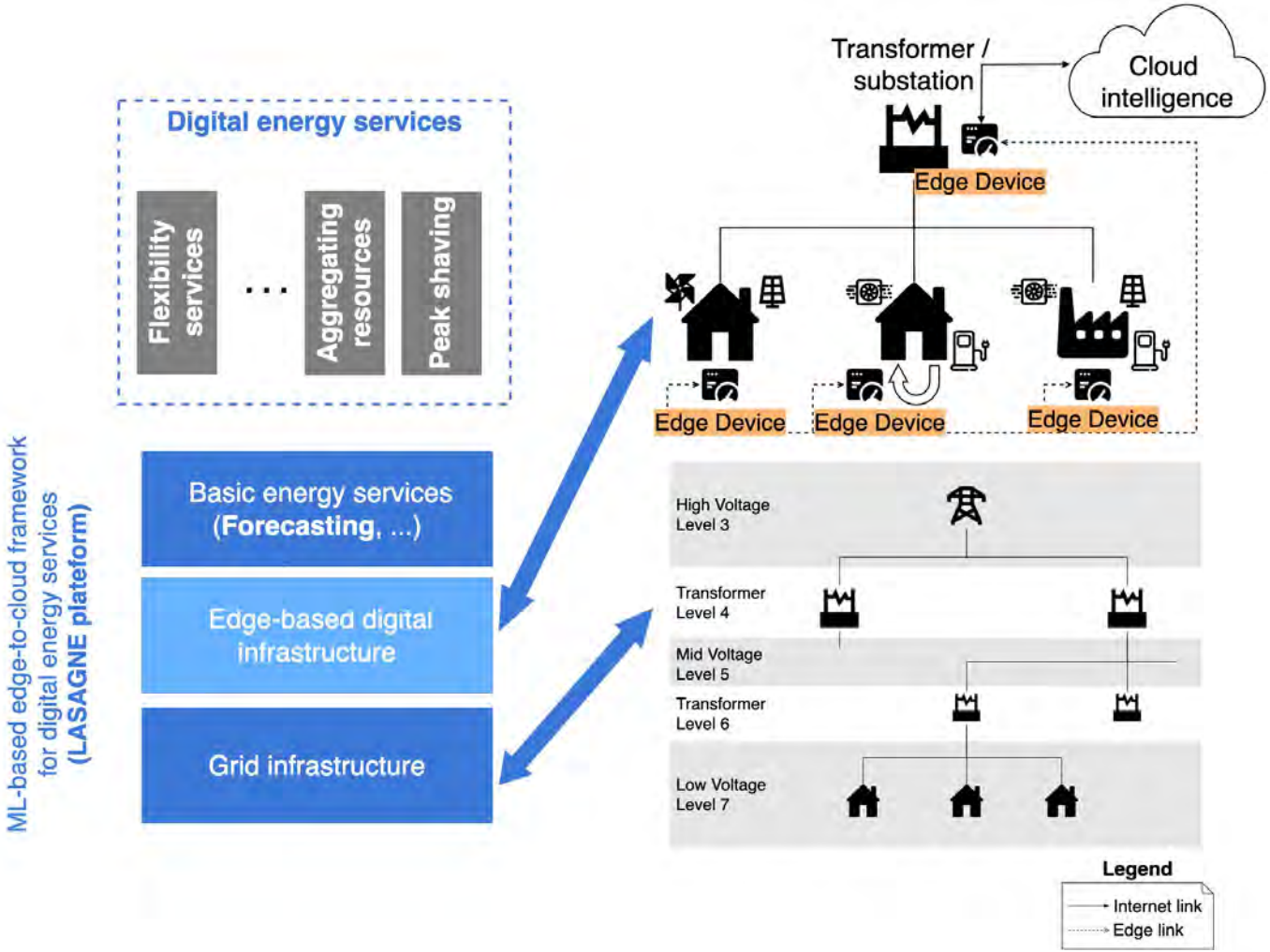
The LASAGNE Project

digita**L** fr**A**mework for **S**m**A**rt **G**rid and re**N**ewable **E**nergy

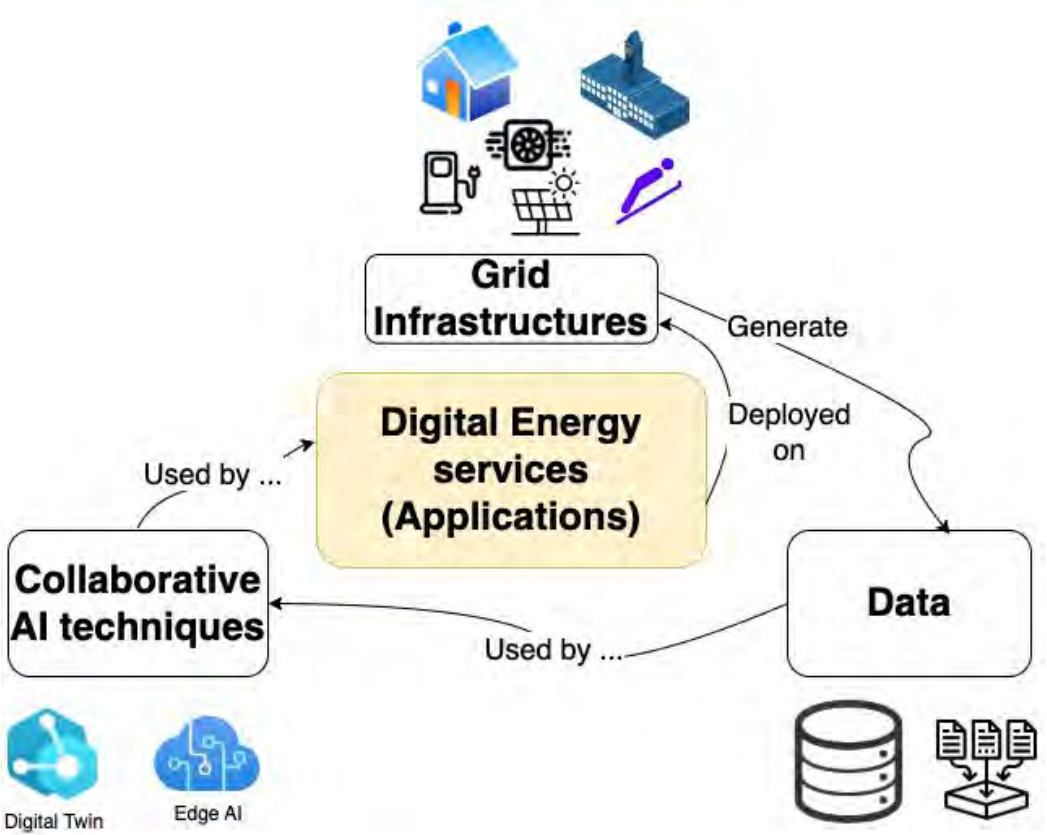
The context



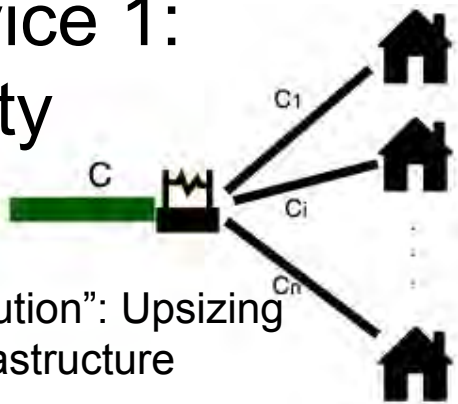



Digital energy services
Flexibility services
...
Aggregating resources
Peak shaving
ML-based edge-to-cloud framework for digital energy services (LASAGNE plateform)
Basic energy services (Forecasting, ...)
Edge-based digital infrastructure
Grid infrastructure
Transformer / substation
Cloud intelligence
Edge Device
Edge Device
Edge Device
Edge Device
High Voltage Level 3
Transformer Level 4
Mid Voltage Level 5
Transformer Level 6
Low Voltage Level 7
Legend
Internet link
Edge link

Ingredients

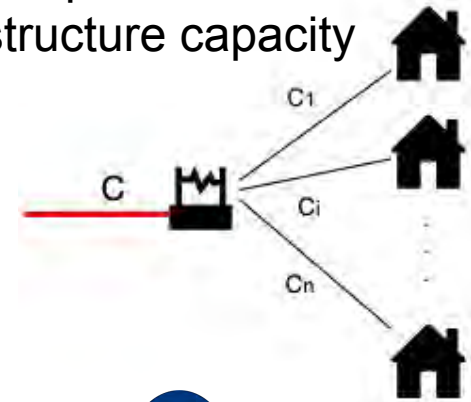


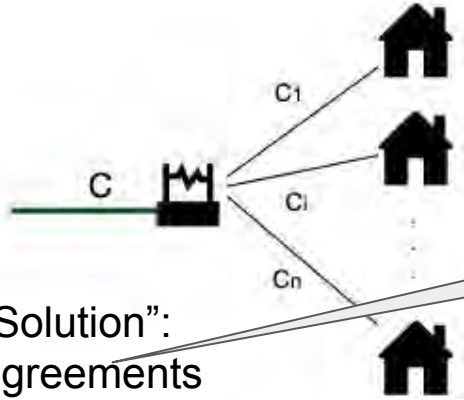
Digital Energy Service 1: Cooper vs. Flexibility



"Cooper Solution": Upsizing the Grid infrastructure

Consumption exceeds infrastructure capacity

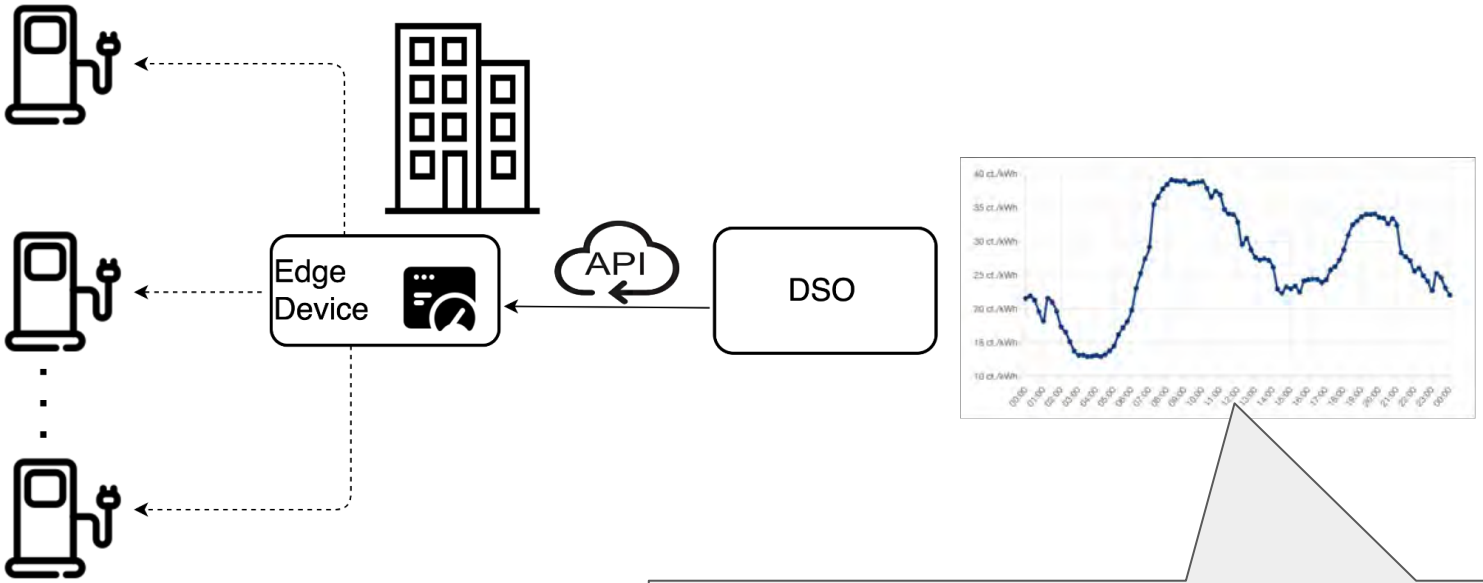




Rely on prediction

"Flexibility Solution": based on agreements between prosumers

Digital Energy Service 2: Dynamic tariff



- Dynamic tariff (based on prediction)
- The electricity cost does not change during a given time interval

CLEMAP

Digital Energy Service 2: Dynamic tariff

- T: set of time intervals, indexed by t
- c_t: electricity cost during interval t (per kWh)
- e_t: energy consumed during interval t (kWh)
- E_{total}: total energy required to fully charge the EV (kWh)
- $P_{\max}$: maximum power of the charging station (kW)
- Δt: duration of each time interval (in hours), e.g., $\Delta t = 0.25$

1 Minimizing the Total Charging Cost (TCC)

$$TCC = \sum_{t \in T} c_t \cdot e_t$$

Charging must not exceed the battery's capacity.

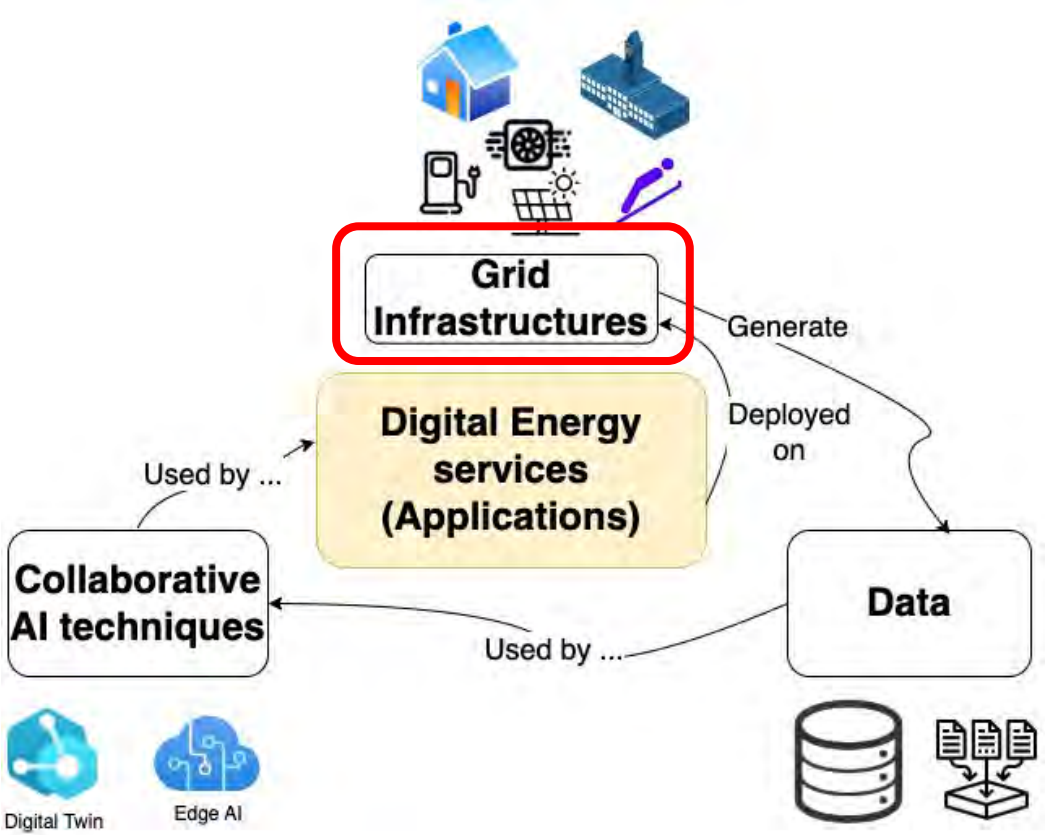
2

$$\sum_{t \in T} e_t = E_{\text{total}}$$

$$0 \leq \frac{e_t}{\Delta t} \leq P_{\max}, \quad \forall t \in T$$

3 Charging must not exceed the charging station capacity.

Ingredients

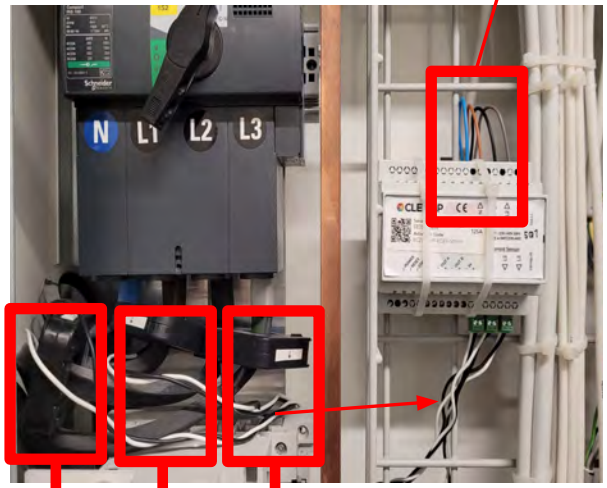


The edge device

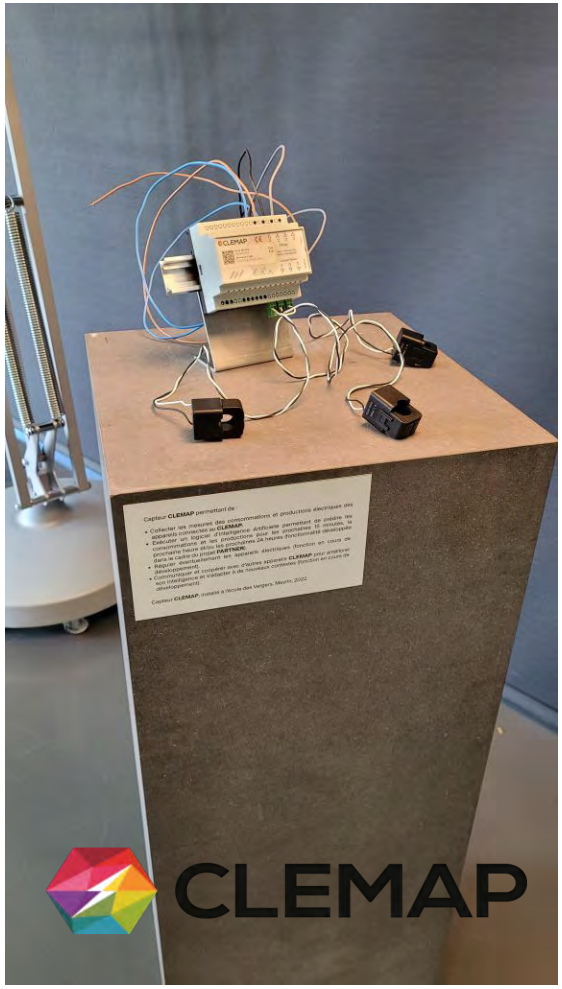
Linux (Raspberry)

Sensor : Voltage, Current

Voltage sensors



Current sensors



Grid infrastructures

Basel

Zurich

St Gallen

Berne

Schwyz

Fribourg

groupe E

Davos

Lausanne

St Moritz

Sierre

Geneva

Val d'Anniviers

CODHA
COOPÉRATIVE DE L'HABITAT ASSOCIATIF

Polygones

MEYRIN

Lugano

Geneva

Les vergers
Three buildings School (Gymnasium, Restaurant, classrooms)

CODHA
20 buildings

Polygones
5-floor building with around 28 apartments

- **Tourist Offices/stations:**
- **Buildings**
- **Charging Stations**
- **Hotels**
- **Admin building**
- **Ski Lifts**
- **Recreational Facilities:** *Ice rink, swimming pool, spa*

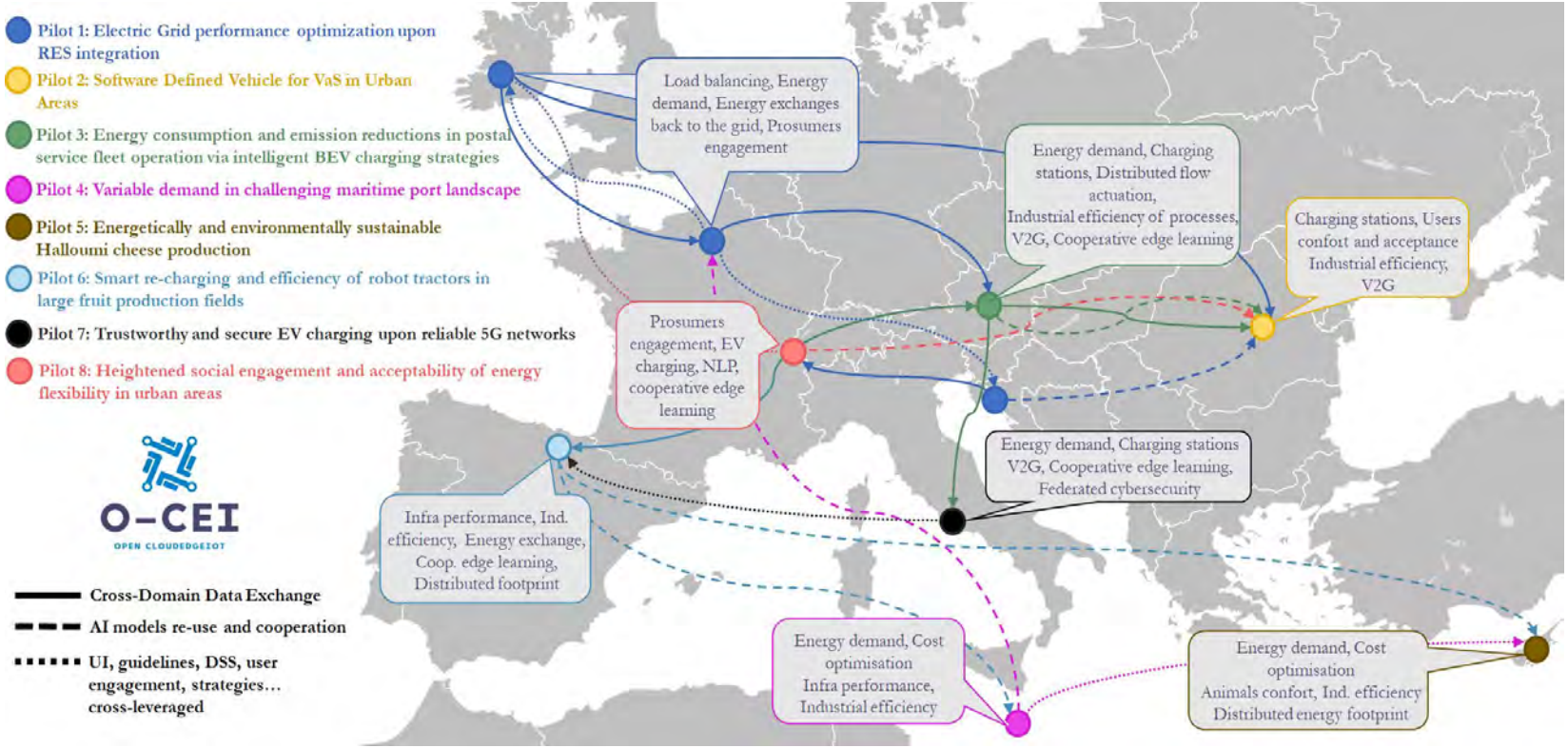
Fribourg (Marly Innovation Centre)

〉 Solar Panel capacity : **860 kWp** ; Annual production : ≈ **900 MWh/year**.

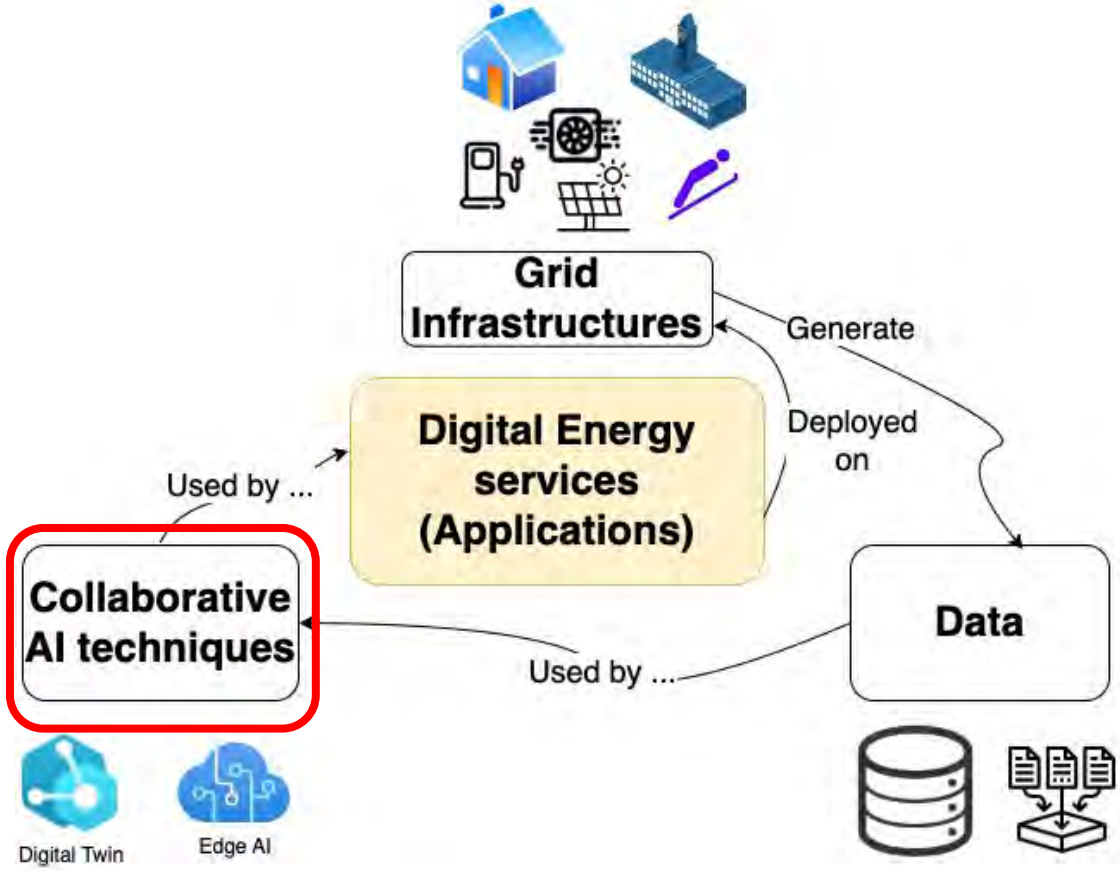
〉 Number of people on site : **>2,600**, Number of buildings : **>200**, Area : ≈ **80'000 m²**

〉 ~70 Heat Pumps (HP), District Heating : **2 MW → 6 MW**

Open CloudEdgeIoT Platform Uptake in Large Scale Cross-Domain Pilots (O-CEI)

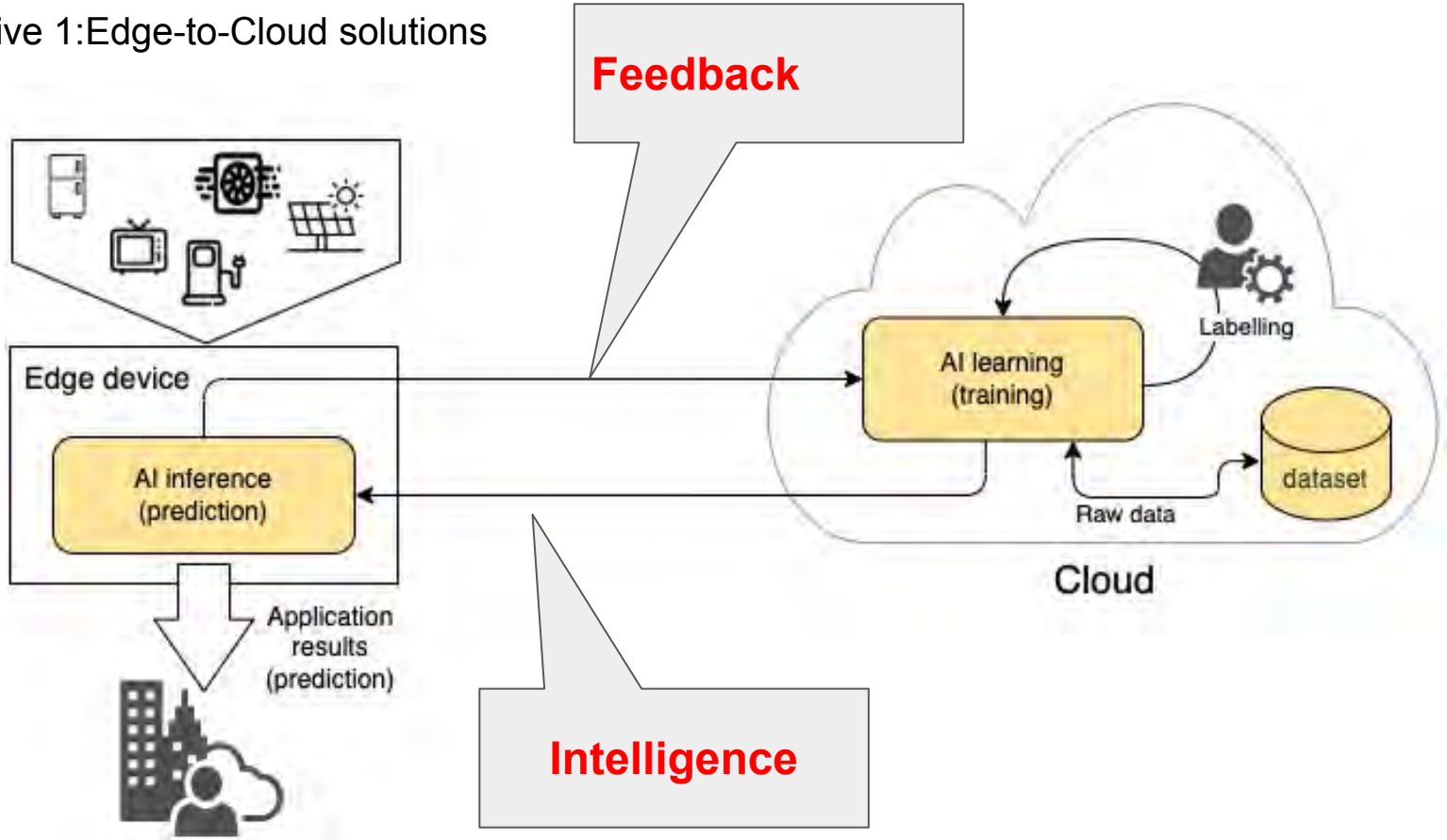


Ingredients



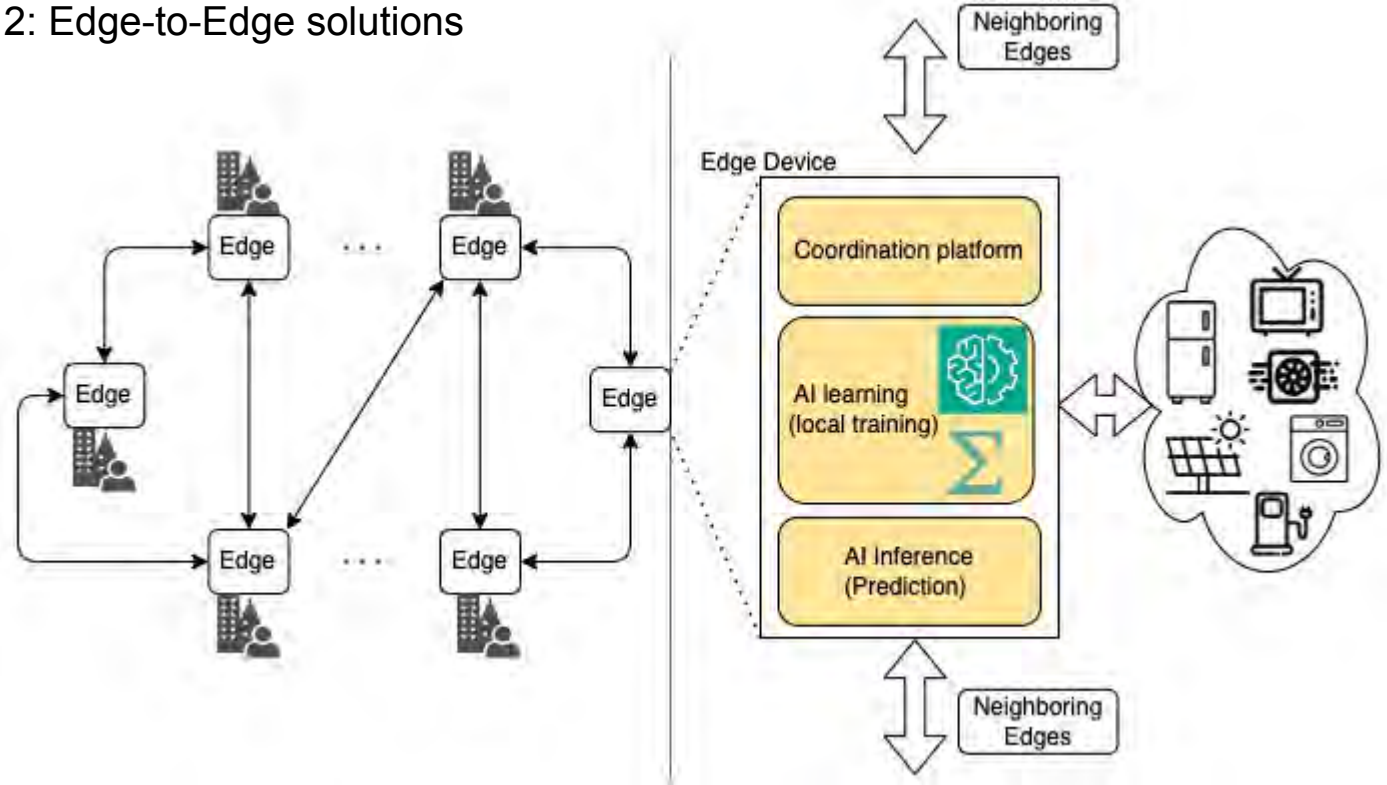
Edge-to-Cloud solution

Alternative 1:Edge-to-Cloud solutions

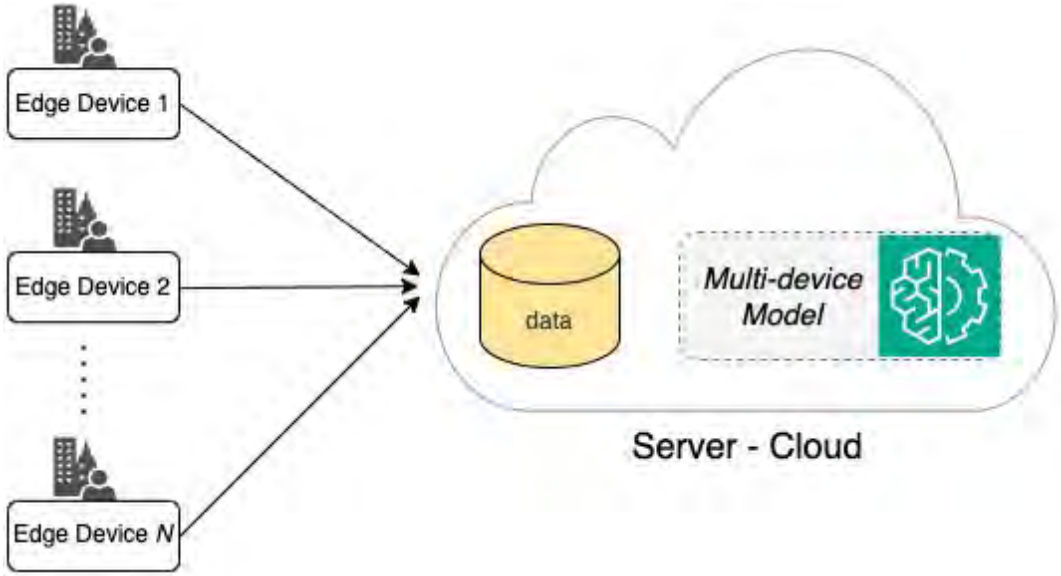


Edge-To-Edge solution

Alternative 2: Edge-to-Edge solutions



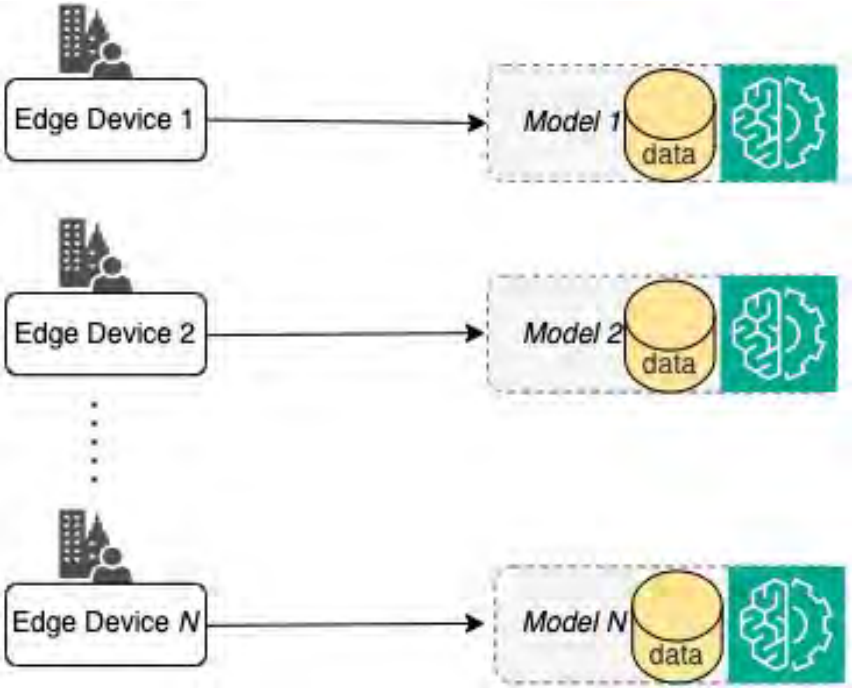
ML approach: Multi-Device model



- Reusability

- Privacy
- Scalability
- Aggregation

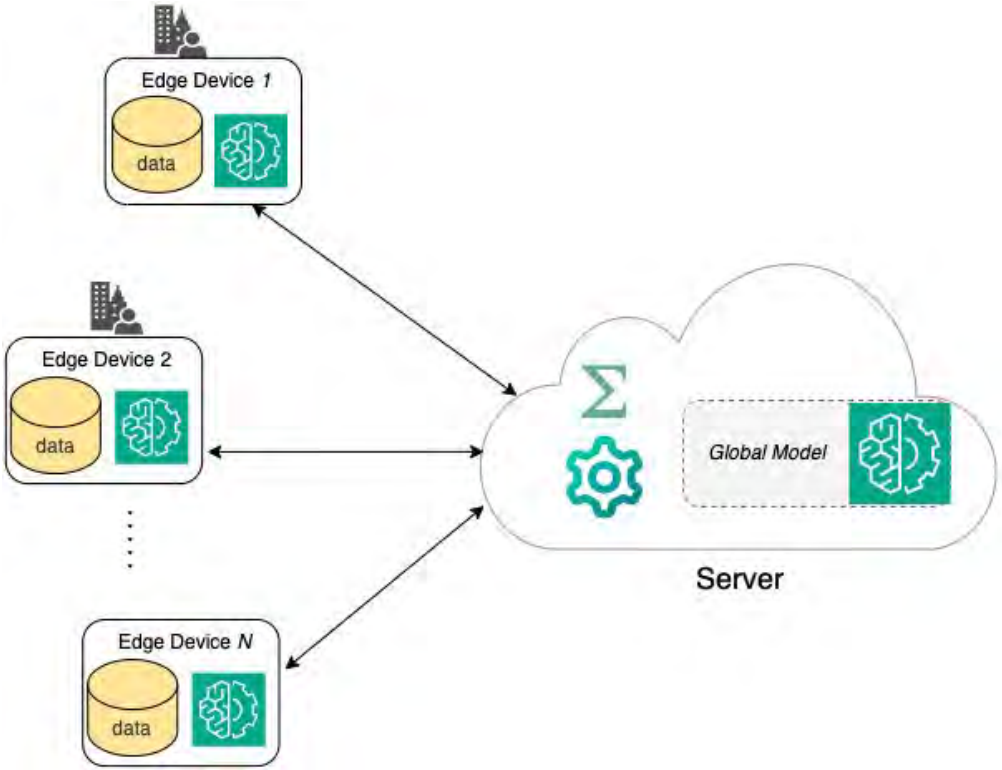
ML approach: Single-Device model



- Customised models
- Specific anomalies/habits are easily detected

- Scalability issue & Maintenance overhead

ML approach: Federated Learning



- Reusability
- Privacy
- Scalability (!)

- Aggregation
- Scalability (!)

Decentralised federated Learning

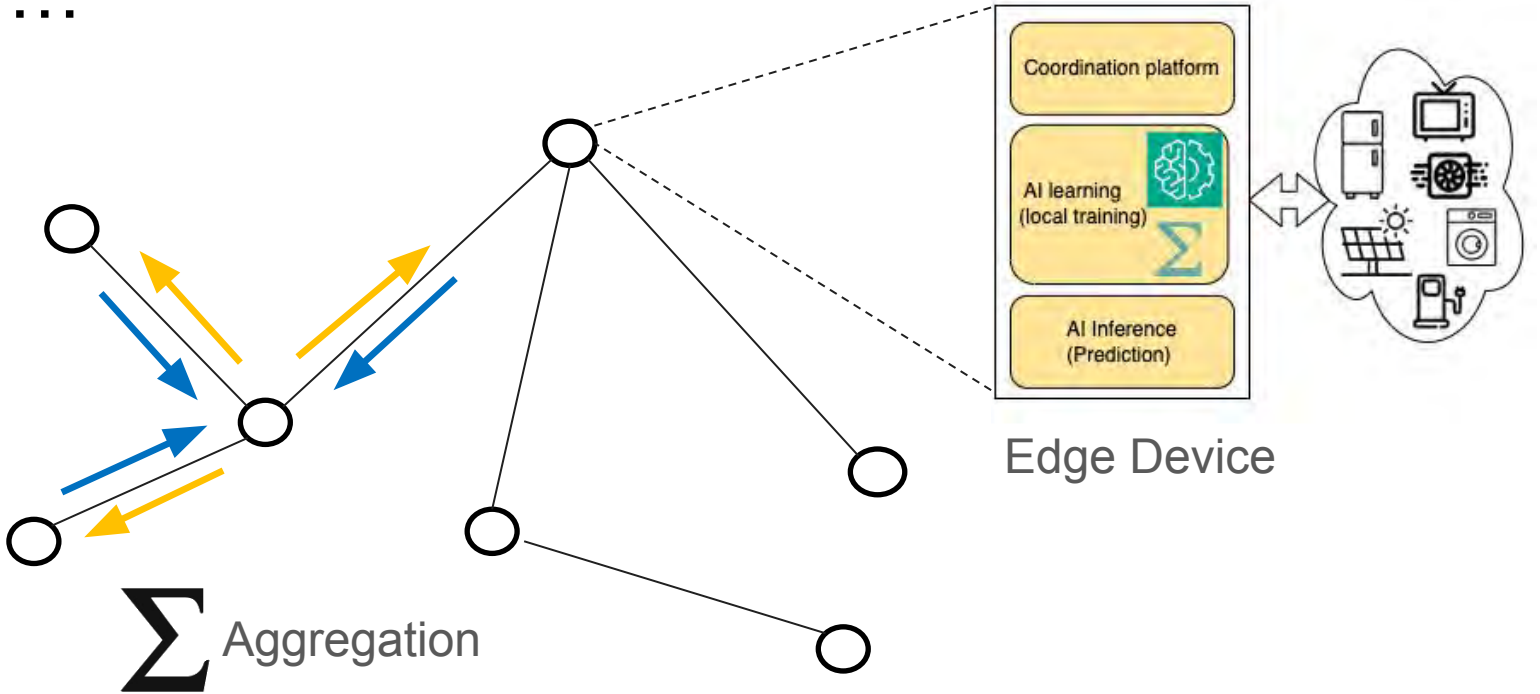
...

1

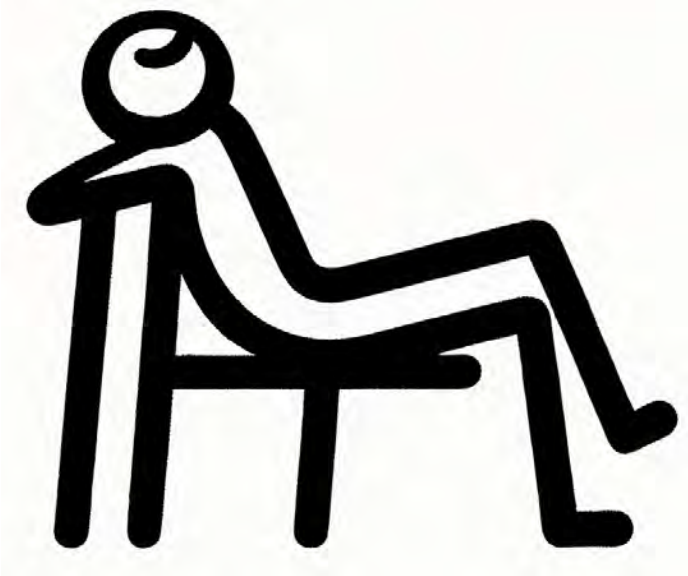
2

3

4



When should we communicate with neighbours?

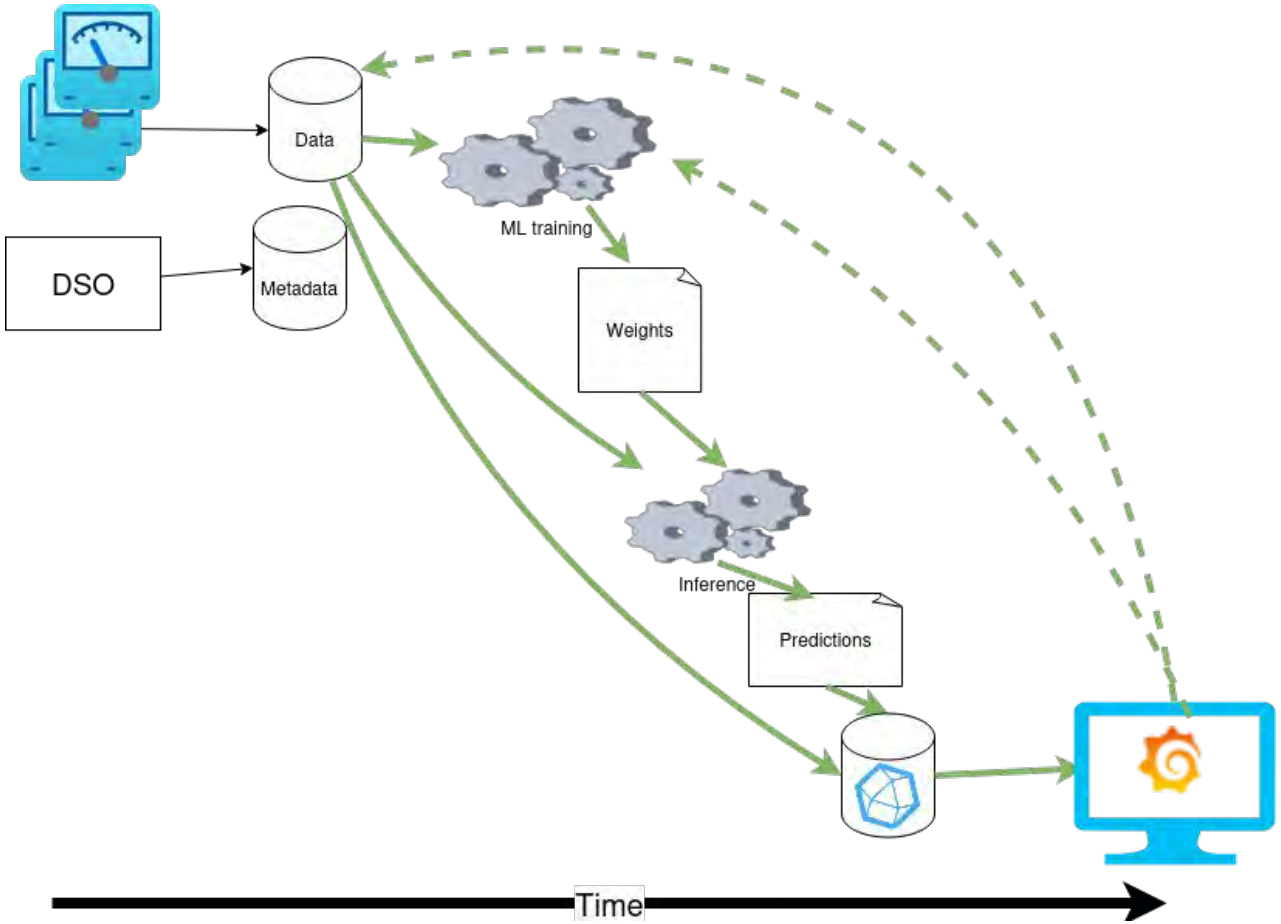


I feel good !!

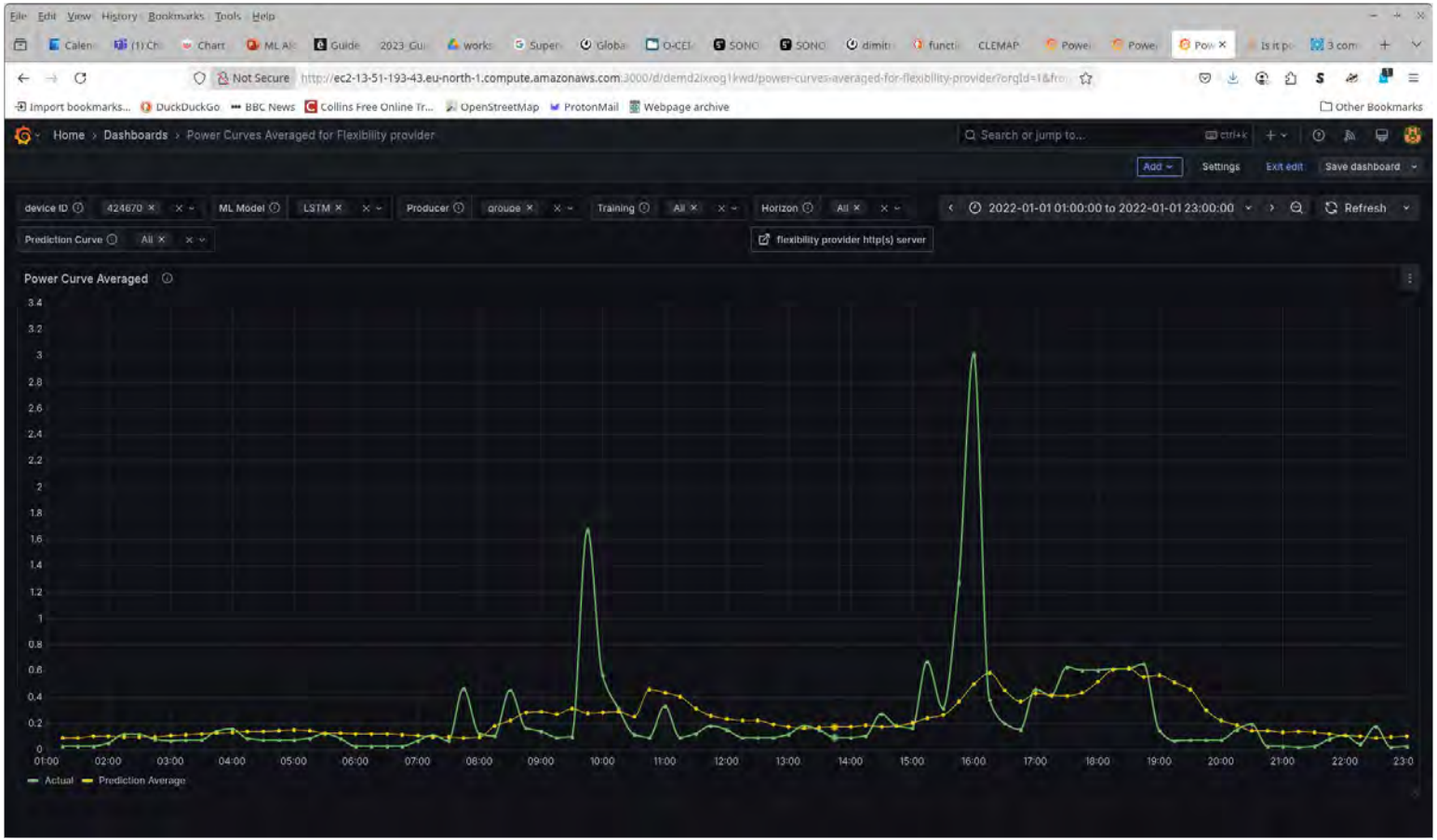
I feel bad !!

LASAGNE outcomes

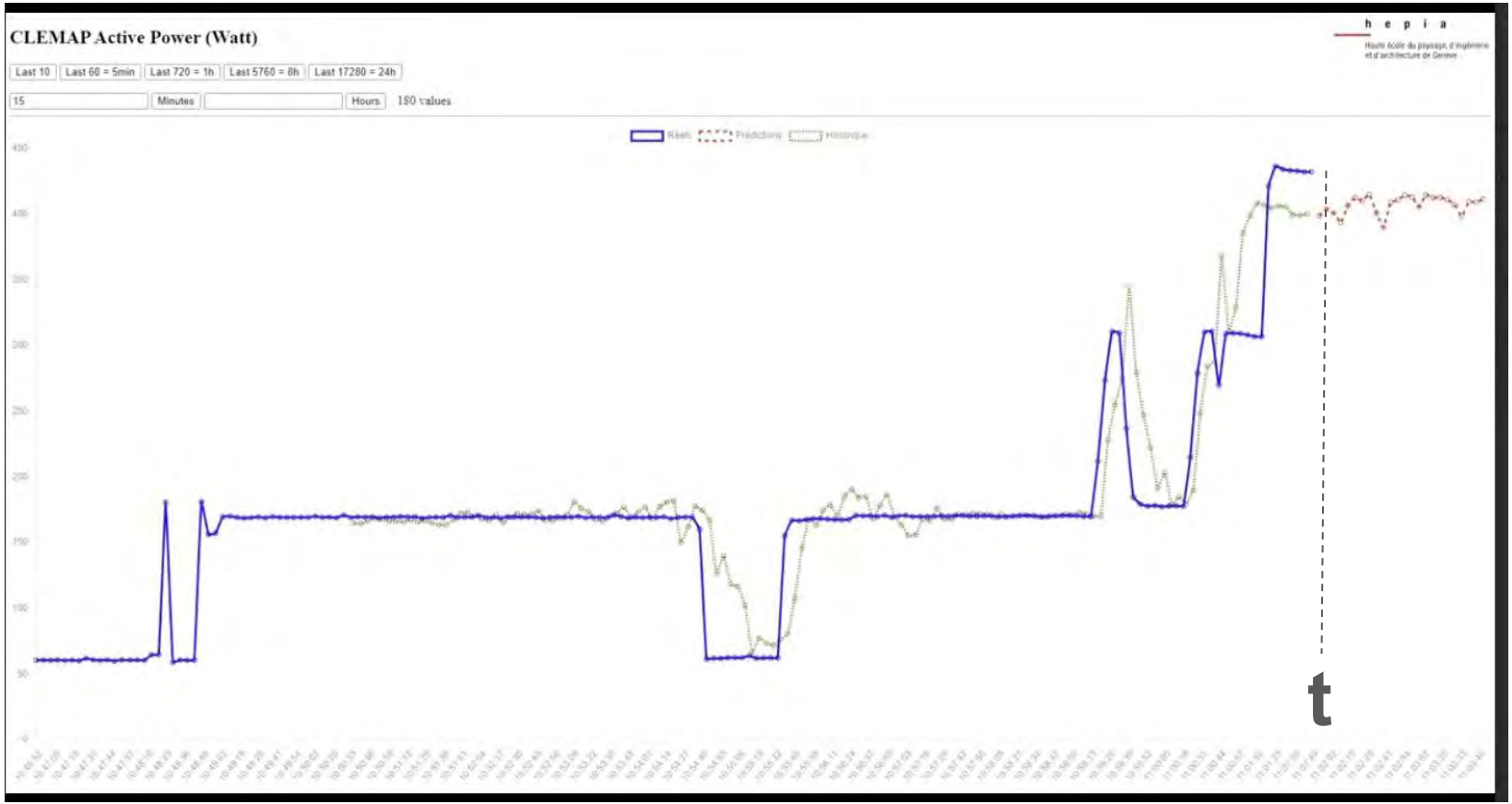
LASAGNE outcomes



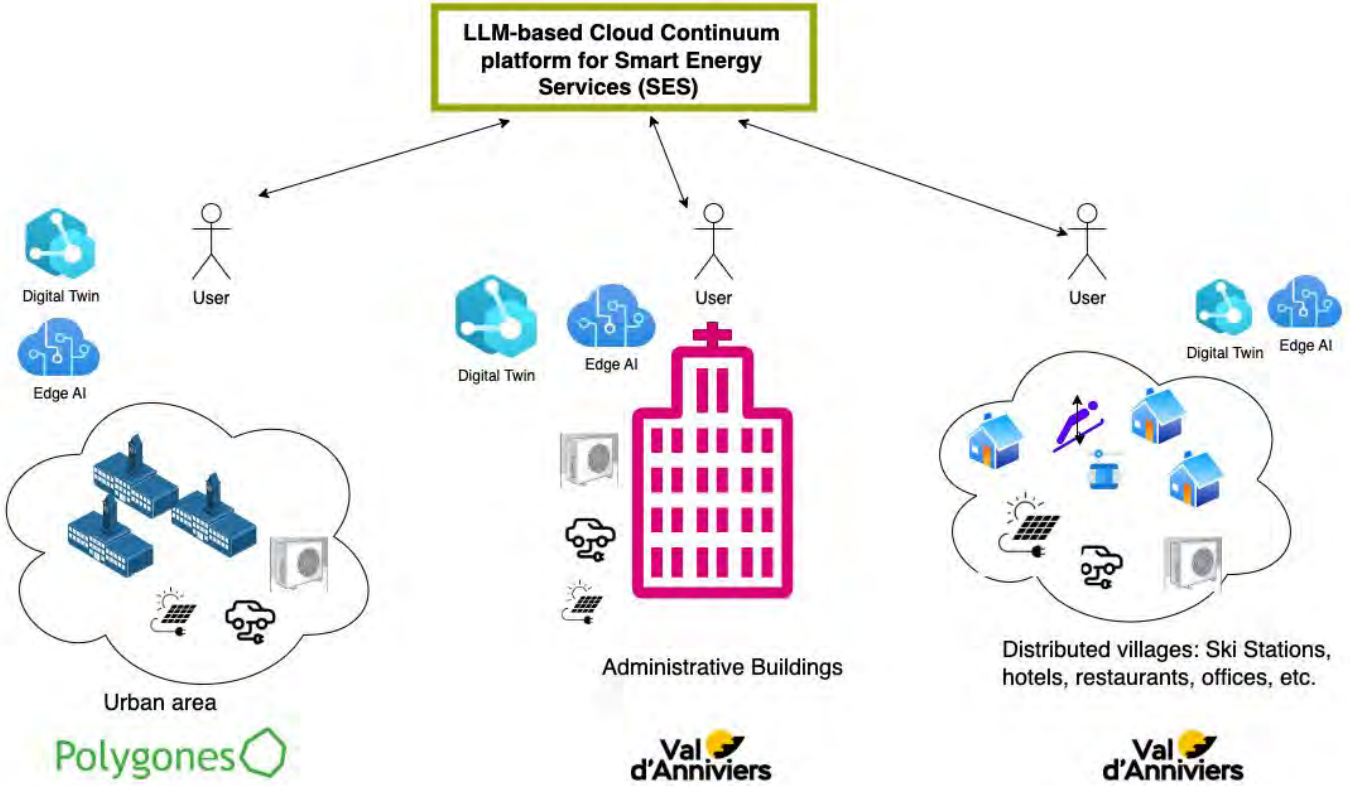
LASAGNE outcomes



LASAGNE outcomes



What next ?


LLM-based Cloud Continuum platform for Smart Energy Services (SES)
Digital Twin
Edge AI
User
Urban area
Polygones
Digital Twin
Edge AI
User
Administrative Buildings
Val d'Anniviers
User
Digital Twin
Edge AI
Distributed villages: Ski Stations, hotels, restaurants, offices, etc.
Val d'Anniviers

Thank you !

Creating value from existing energy resources

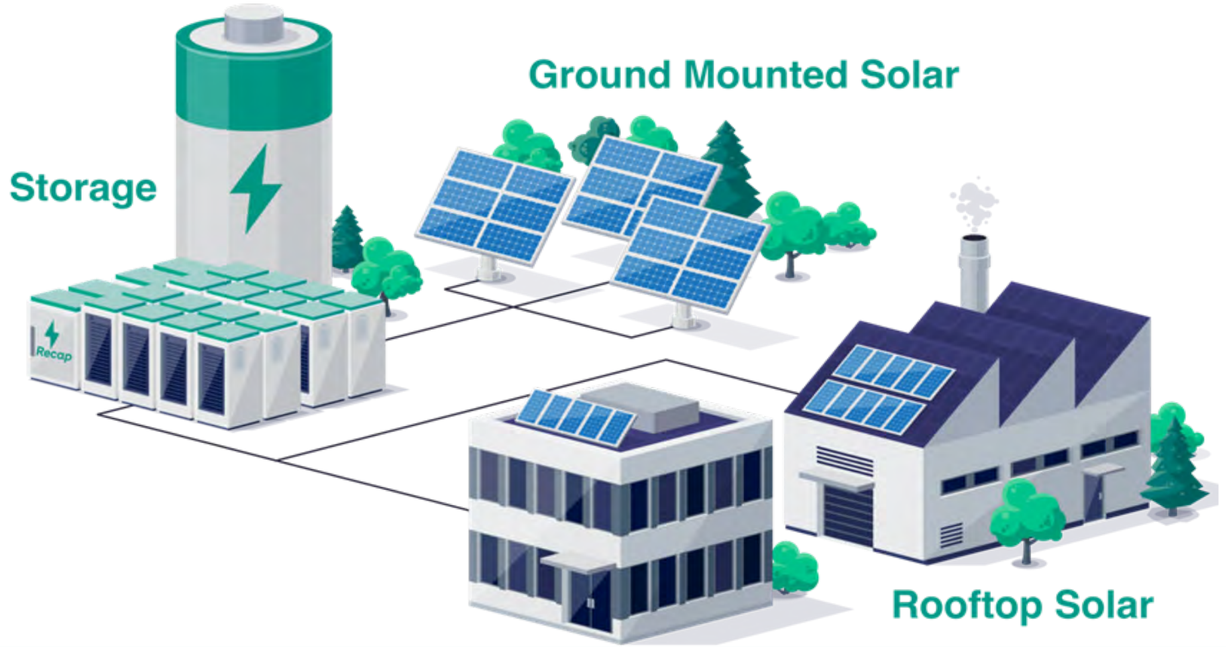
Jonas Thyni, Recap

Recap Power

LASAGNE PROJECT PRESENTATION

Recap

CREATING THE FUTURE OF ENERGY



Project development

Asset Management

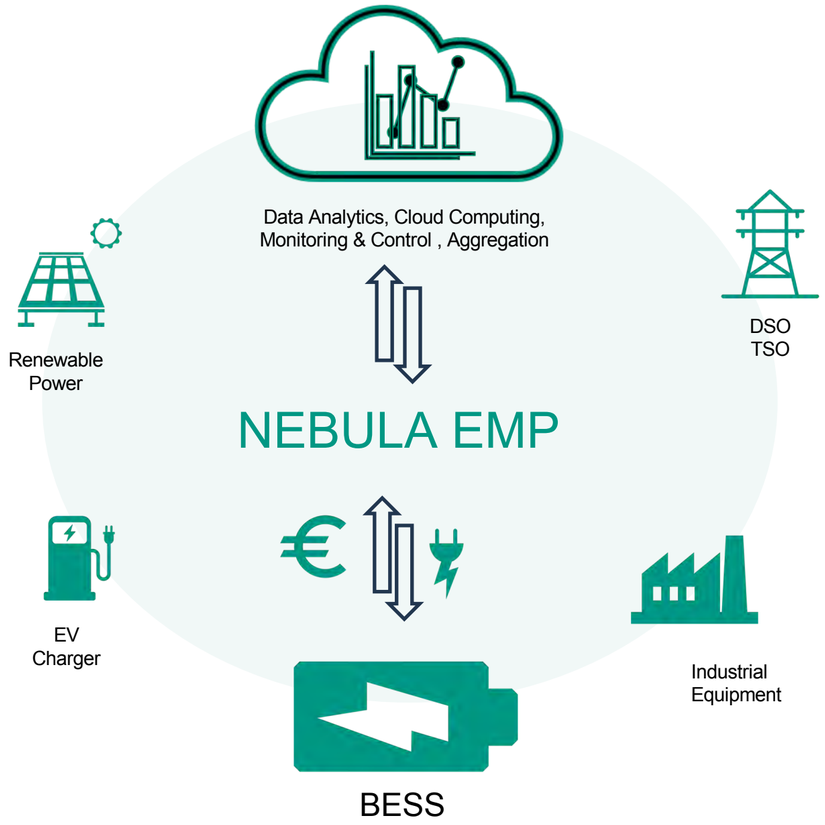
Energy Optimization Services

Energy/Battery As A Service

NEBULA- SMART ENERGY PLATFORM

- Creates Flexibility
- Unlocks Power Capacity
- Reduces Energy Costs
- Generates New Revenues

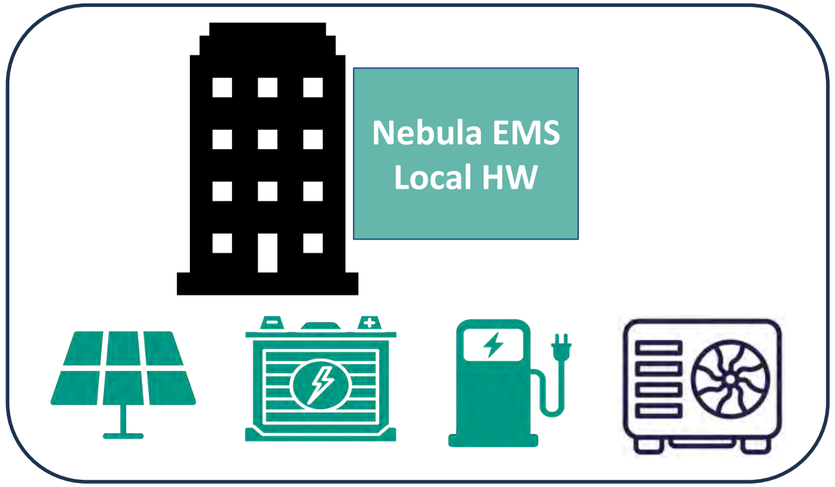
THE VIRTUAL POWER PLANT (VPP)



RECAP POWER SCOPE OF LASAGNE PROJECT

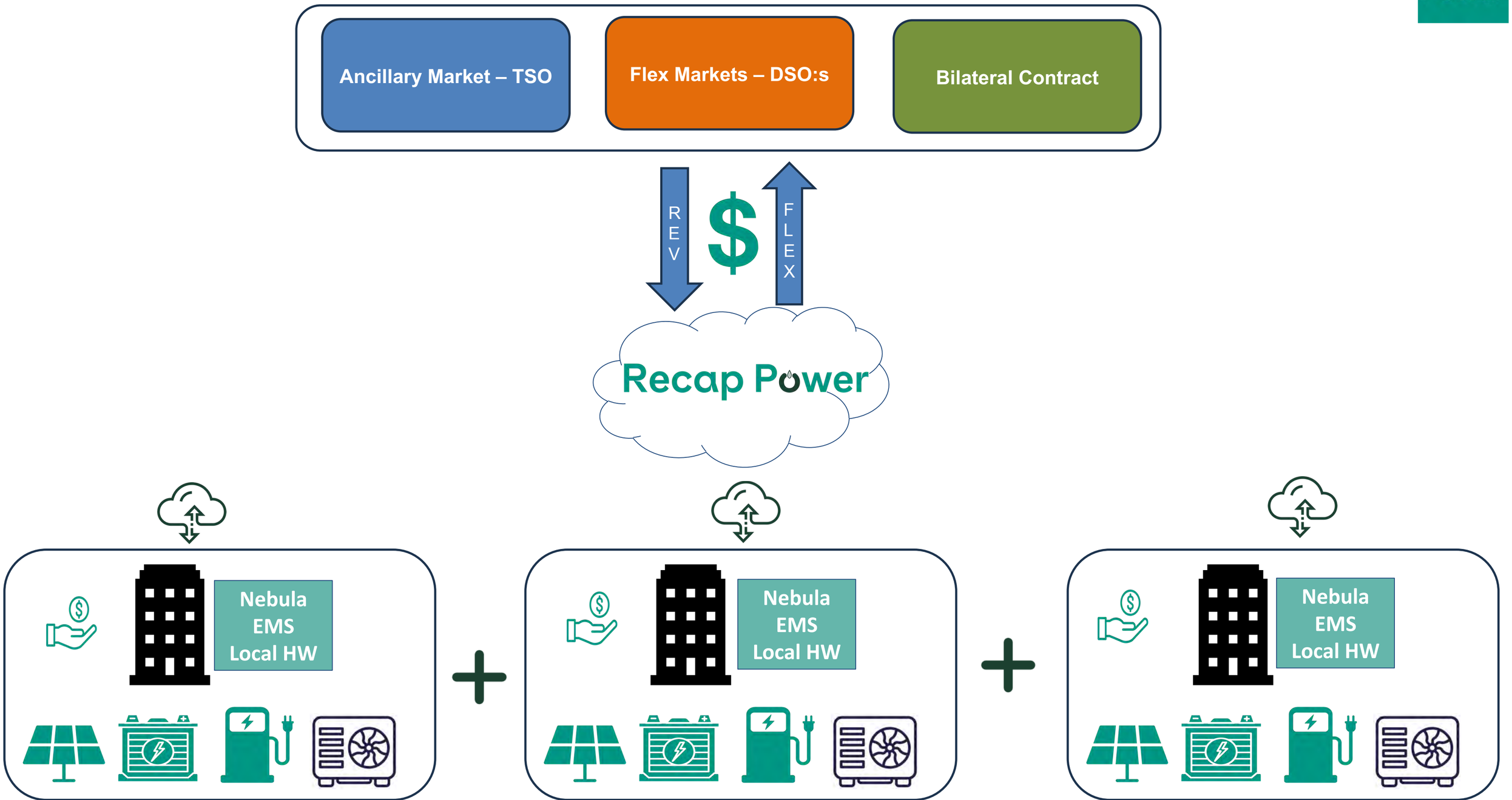
- Monitoring, Control & Aggregate flexible energy assets in residential buildings
- Design & develop solution that enables microgrid prosumers to support the electric system
- Design platform that enable energy sharing
- Create new revenue streams from ancillary and flexibility markets
- Defining the microgrid controller function

Flexible Energy Assets
- Energy Production
- Battery Systems (BESS)
- EV-Chargers
- Heating Pumps

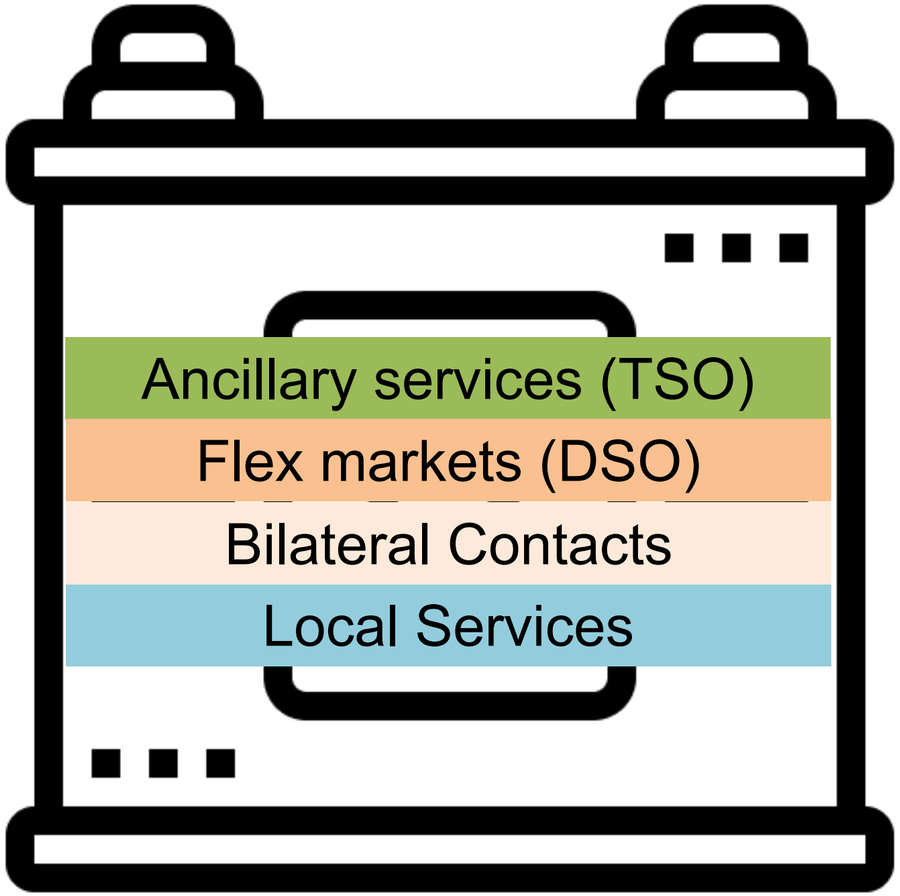


Local Services
- Peak shave
- Spot-price optimization
- Self consumption
- Reduce transfer fees
- Back-up power

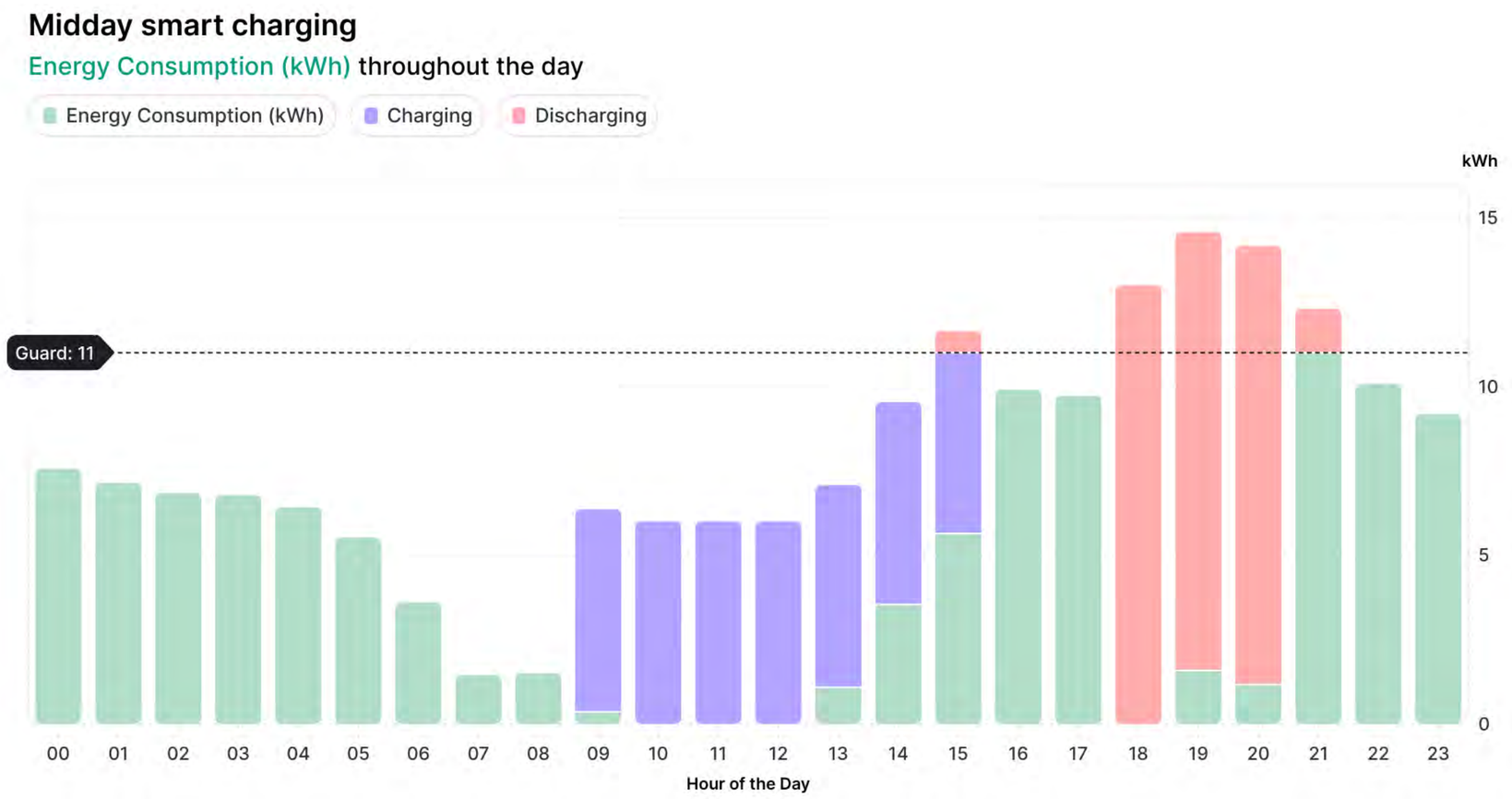
CREATING NEW REVENUE STREAMS FROM FLEXIBLE ENERGY ASSETS



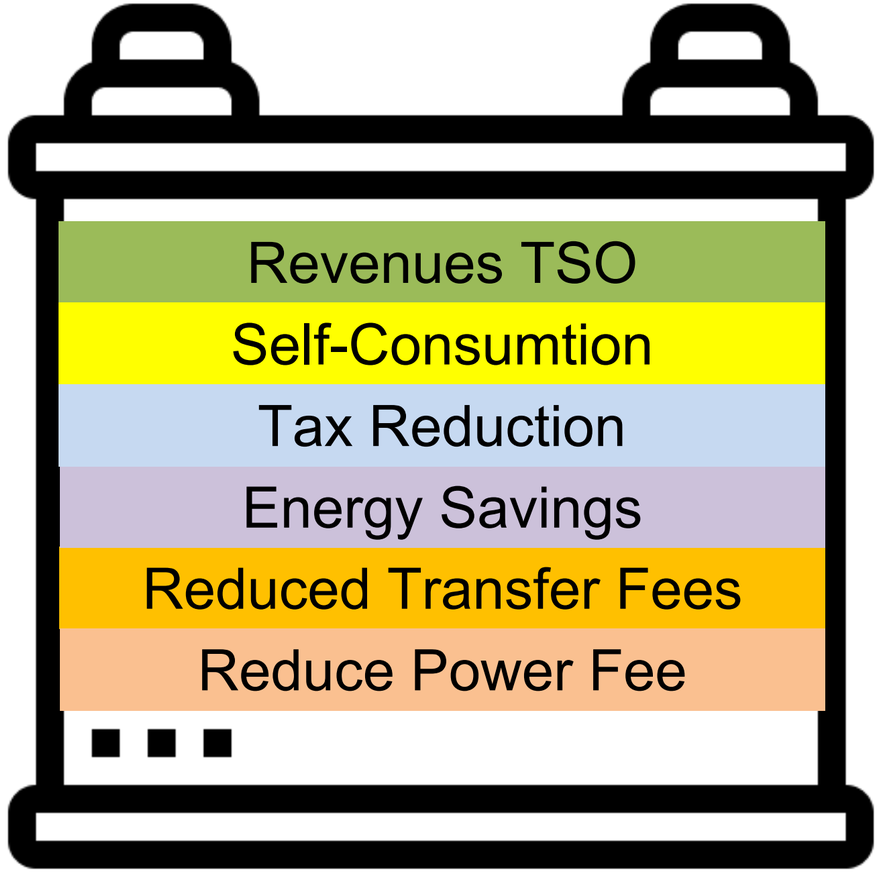
BATTERY SYSTEMS (BESS)
SERVICE STACKING



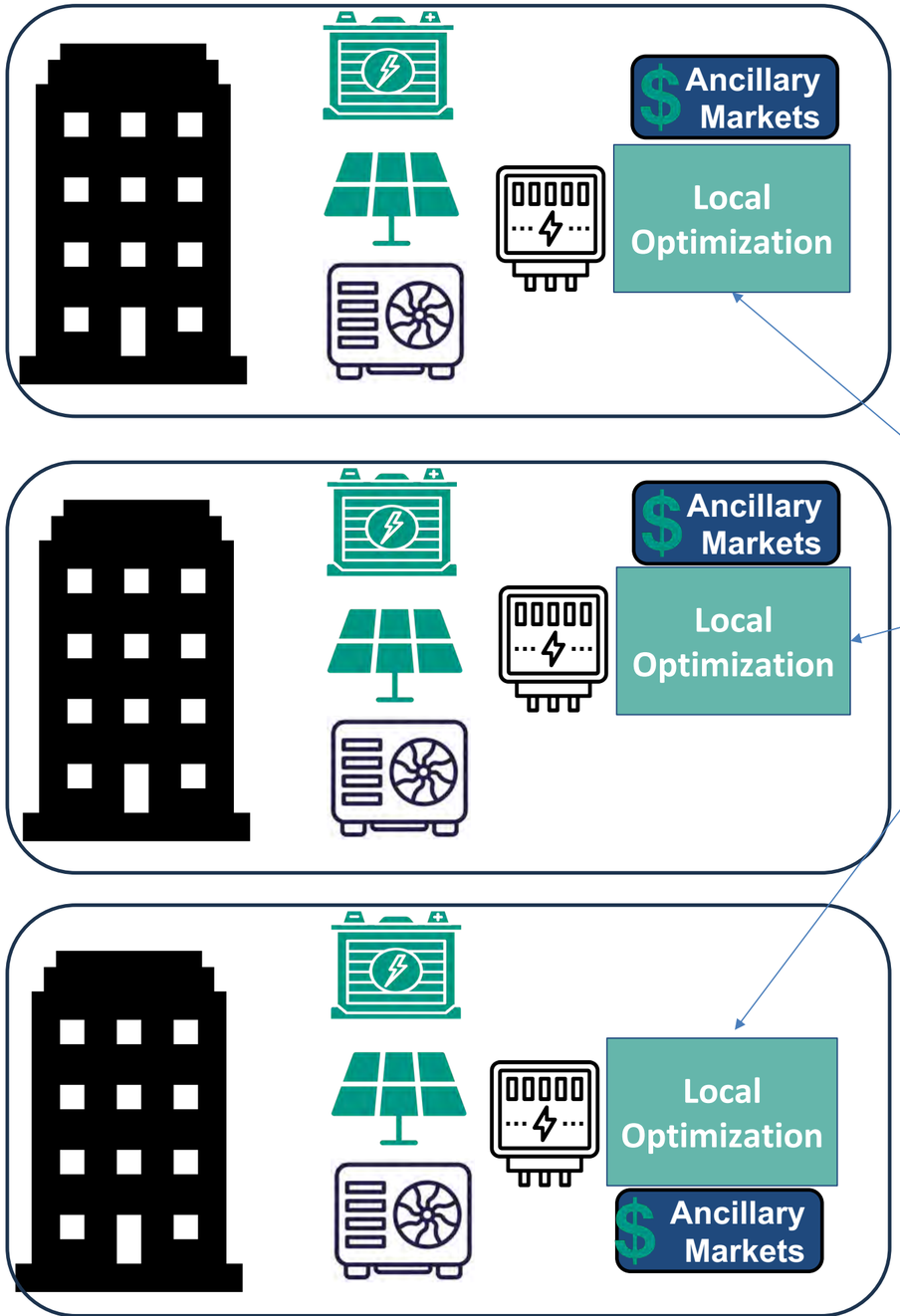
REDUCE ENERGY COSTS & OPTIMIZE SELF CONSUMTION



STACKING VALUES!



ENERGY COMMUNITY SOLUTION



- Housing associations invests in energy assets
- Building specific optimization of local energy system
- Revenues from ancillary markets to asset owner
- Shared energy production, if legislation admits…

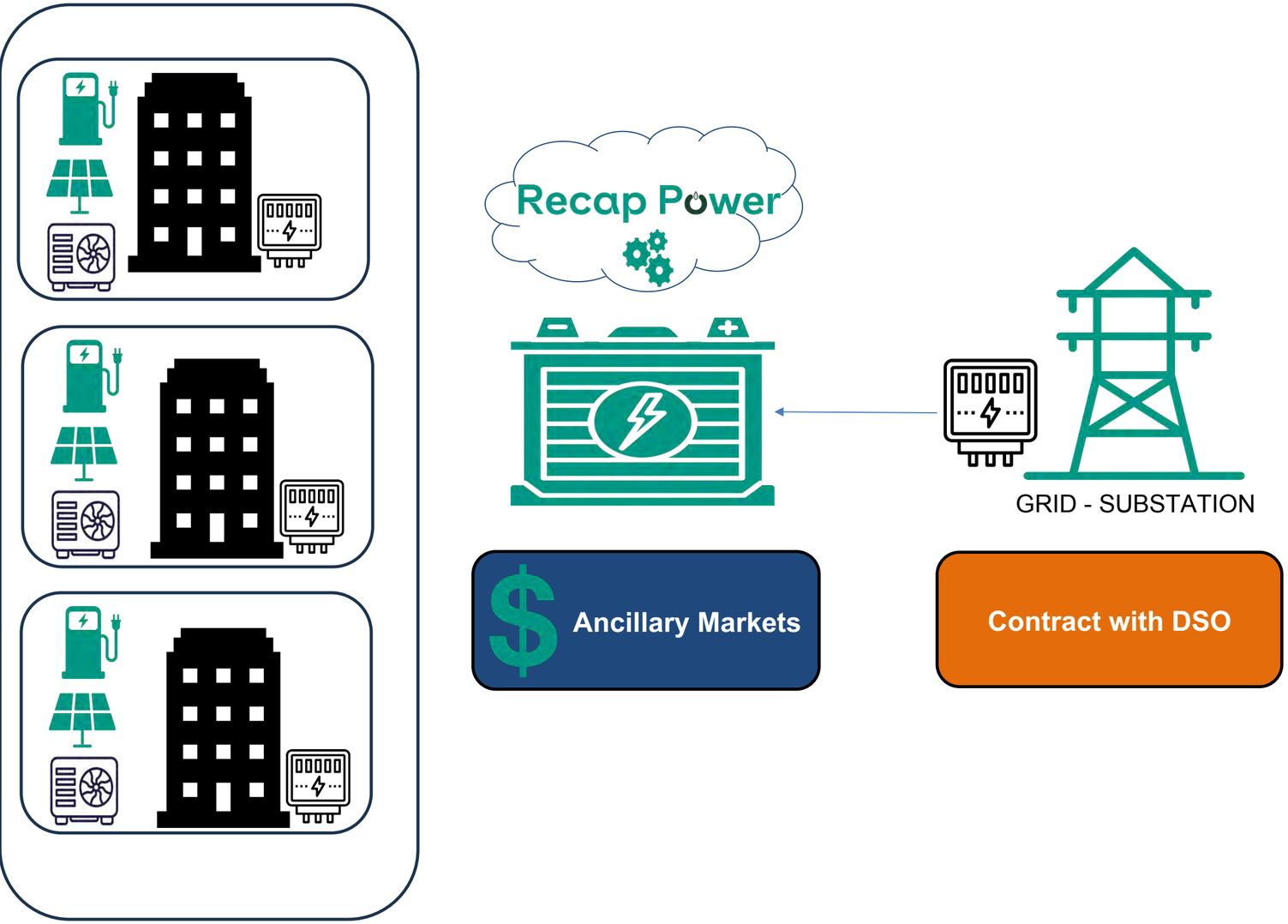
Recap Power

GRID - SUBSTATION

Bilateral contract with DSO

- Energy Community supply grid support to DSO
- Generate shared revenues

MICROGRID - JOINT INVESTMENTS



- **Individual Building Management**
- **Microgrid company**
- **Joint investment in BESS**
- **Revenues to Microgrid company**
- **Offer grid support to DSO**
- **Offer storage services to Microgrid**
- **Offer Back-Up Power to Microgrid**

CHALLENGES – LESSONS LEARNED

Technical
- Control of assets that has other primary usage demand custom solutions
- No standards for monitoring and control of energy assets in residential buildings
- Dynamic regulation based on frequency is most suitable for BESS
- Climate systems such as heating and ventilation are interconnected

Legal/Financial
- Risk VS Reward? - Decision making in a Housing Association board
- Legal contracts / Warranties?

DSO
- No standard in DSO contracts – Prices differ for energy transfer, power, fixed fees, annual fees, monthly fees, grid support reimbursement etc.
- DSO:s are introducing capacity fees for production, that limits the interest for ancillary services
- Transfer fees limits energy sharing of locally produced energy

Government
- Taxes for consumption, but no tax reductions for production
- Tax reduction needed to enable energy sharing

QUESTIONS?

Want to know more about...

... how we solve capacity challenges and enable savings and revenues with Battery Systems?

... how we can help you electrify your fleet?

... how we create revenues from your existing flexible energy assets?

Contact Jonas!

jonas.thyni@recap.se

+46 709-10 45 79

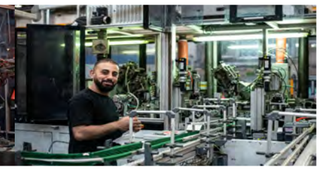
Recap
Creating the Future of Energy

Transport industry

Buildings

DSO/Energy/TSO/Microgrids

Production Industry



Recap

Creating the Future of Energy

Engaged citizens, social acceptance and the will to join Energy Communities

Emmanuel Fragniere, HES-SO

Engaged citizens, social acceptance and the will to join Energy Communities

Emmanuel Fragnière

EU project Lasagne, KTH, Stockholm, May 22, 2025

Energy Communities in the EU – The Reality Check

🟢 The Ambition

- EU policies promote renewable energy and support the creation of energy communities.
- Citizens are expected to become prosumers—both producing and consuming energy.

🔴 The Challenge

- Despite regulations, real-world implementation is lagging.
- Barriers include: complex administration, limited incentives, low public engagement

Energy Communities in the EU – The Reality Check

🟡 What's Needed

- Simplified processes
- Stronger local support
- Empowered citizens with tools for self-regulation and demand management

Citizens are then actors in the renewable energy mix, relying on two new postures:

⇒a participatory role of self-regulation

⇒an active contribution to demand side management

From Consumers to Prosumers

The energy transition is changing how we produce and use electricity

We're moving from a **"push" system** (produce as much as possible) to a **"pull" system** (produce based on demand)

Citizens are no longer just users—they're **prosumers**, both producing and consuming energy

Prosumers help manage energy more actively

This shift works best in **energy communities**, where people collaborate and adapt together.

Smart Grids + AI: A Powerful Team

Micro smart grids use **AI** to manage energy systems efficiently.
AI helps with:

- Mixing in renewable energy
- Storing energy smartly
- Balancing supply and demand

But it's not just about tech—**people matter too**.
For smart grids to work, we need to combine:

- **AI-driven systems**
- **Social acceptance** from the people using them

In this setup, **prosumers interact with AI** to shape the energy future.

Why Social Acceptance Matters

Smart grids aren’t just about tech—they need **people on board**.

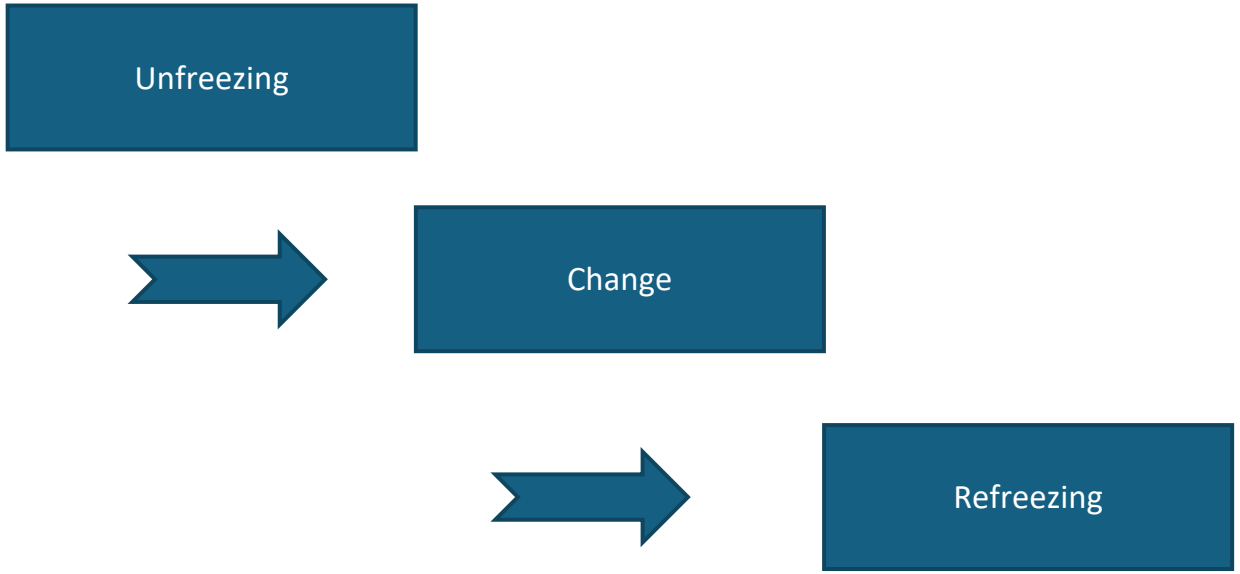
For microgrids to work, **prosumers must be engaged and cooperative**.

Social acceptance should be part of the plan **from day one**.

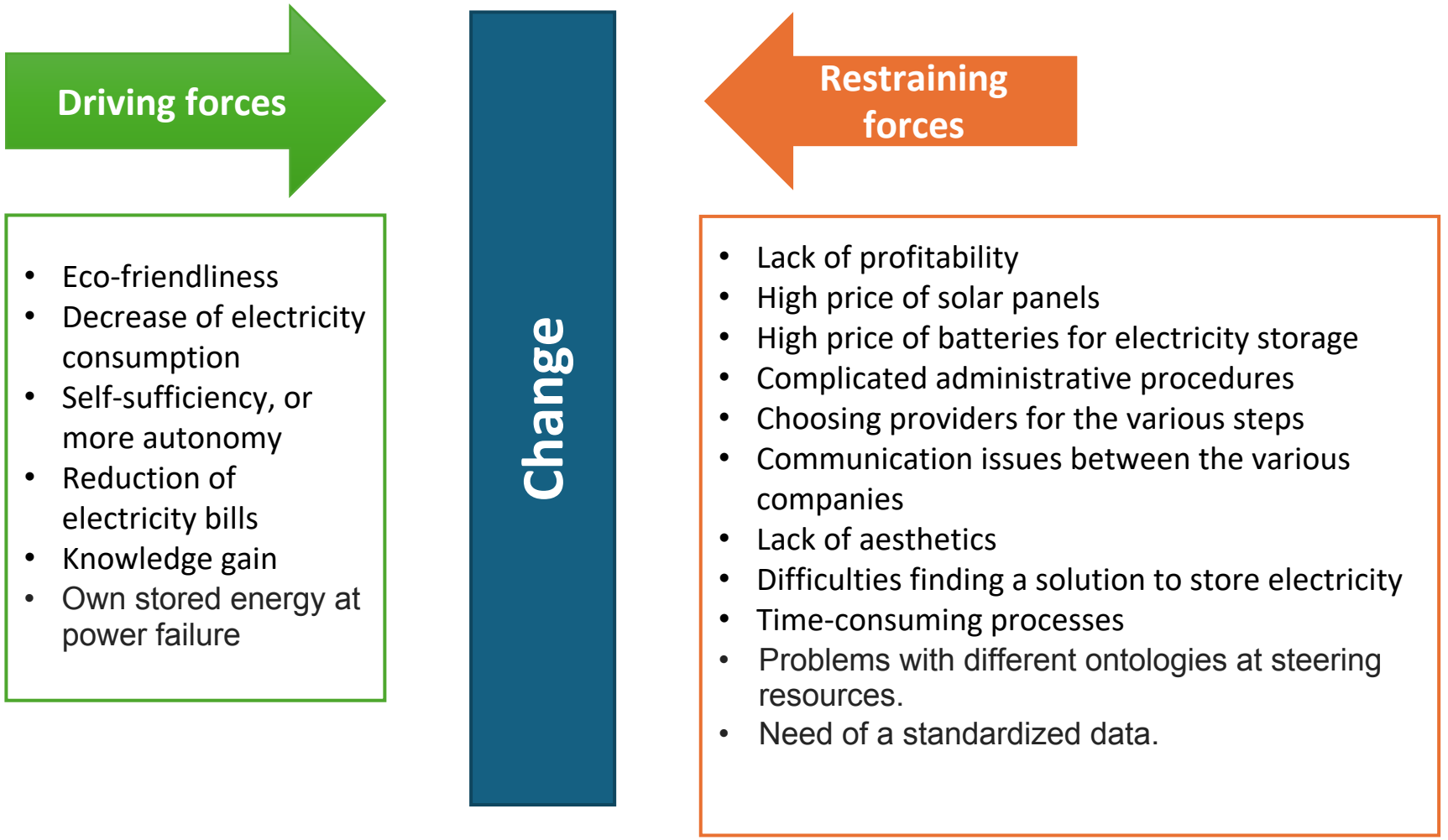
Without it, even the best-designed systems can fail.

Researchers and policymakers are starting to get it—but **real-world action is still catching up**.

Change Model by Kurt Lewin (1945)



Social Factors - Qualitative Approach

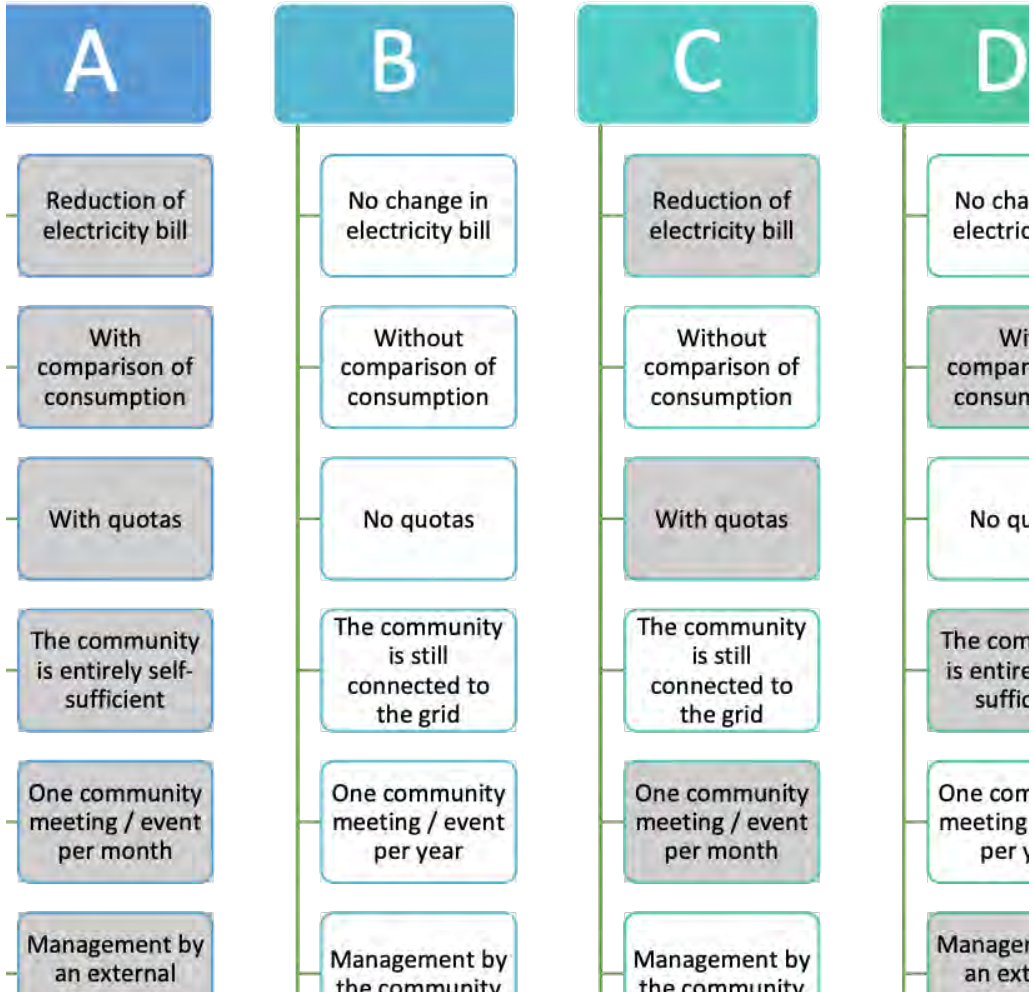


What Are Card-Based Surveys?

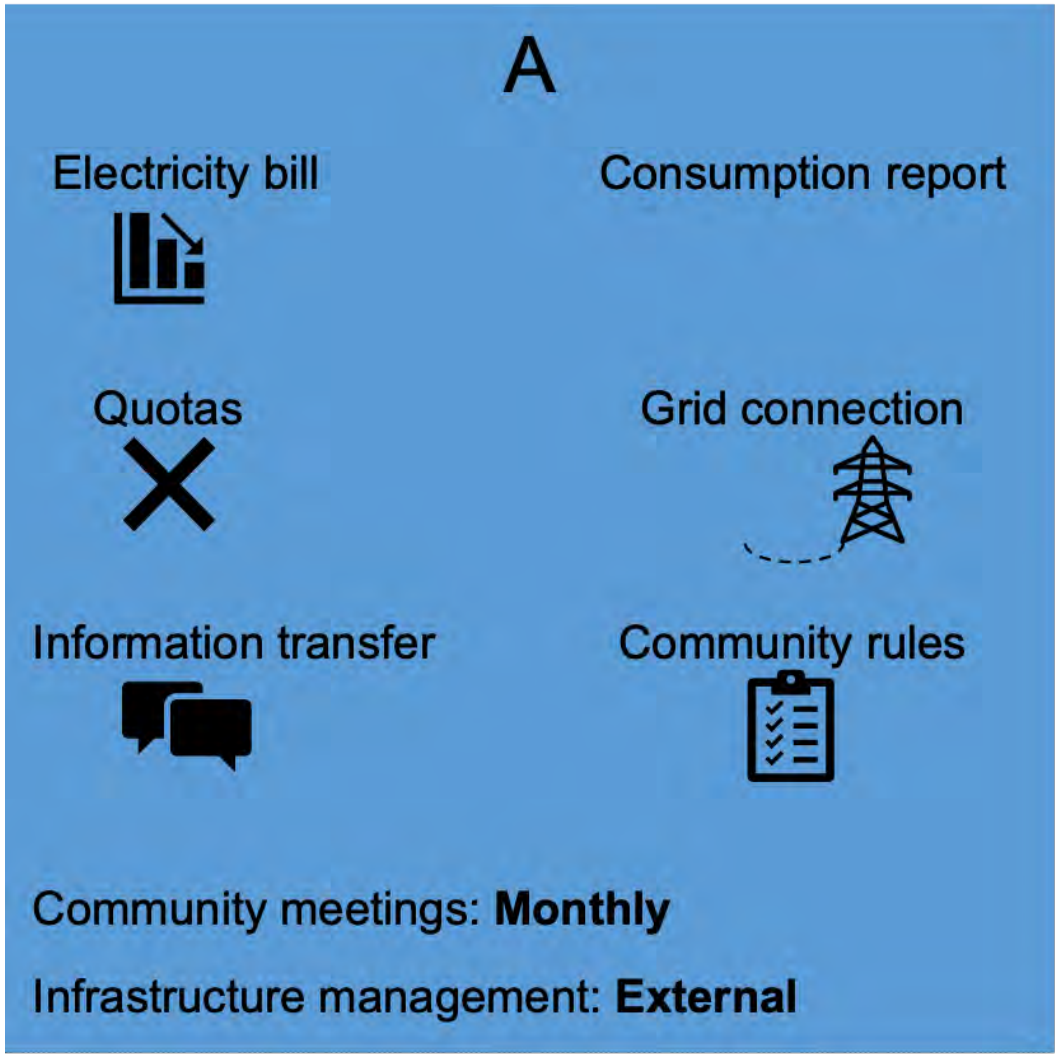
Participants are shown cards with different energy community setups.

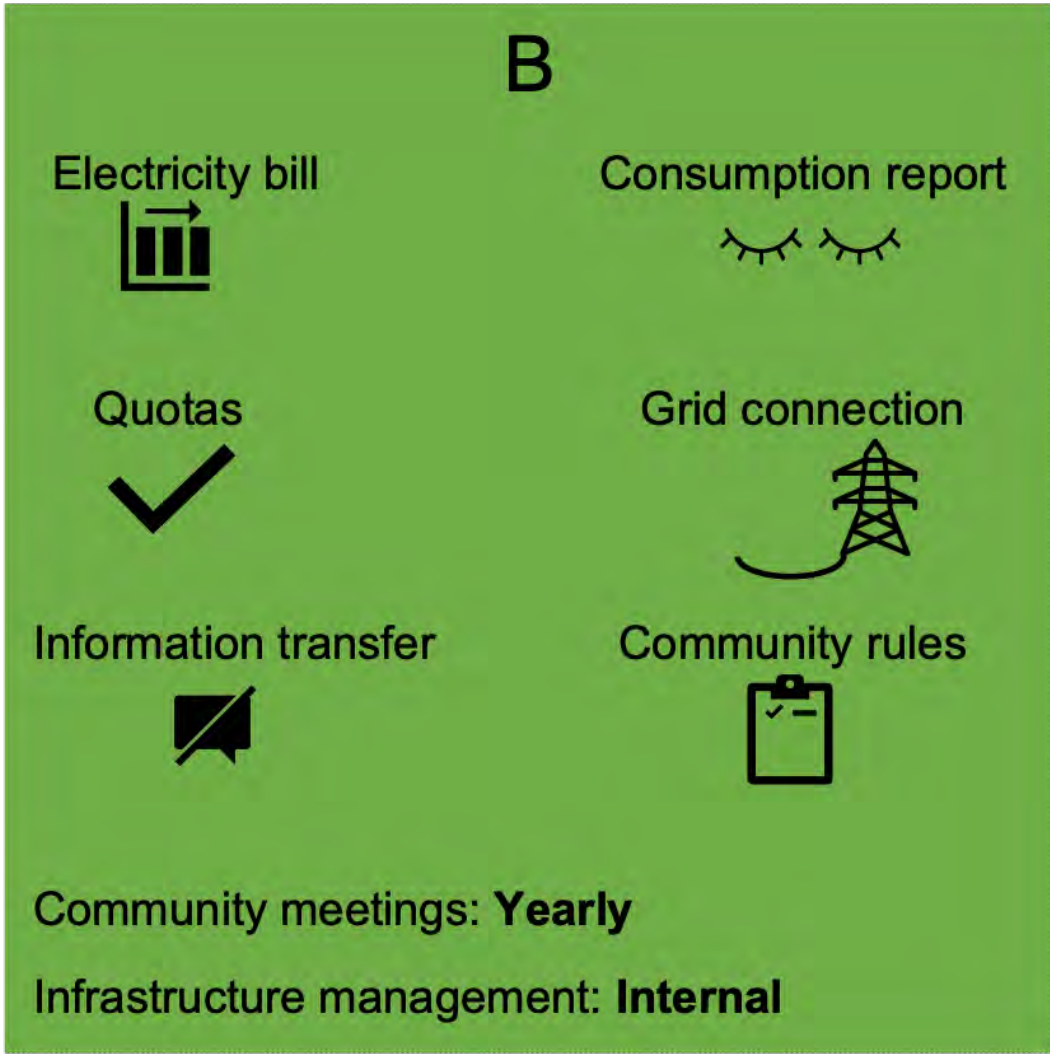
Each card includes options like:

- Grid connection or not
- Renewable mix
- Pricing model
- Data sharing
- Meeting frequency



Which community would you rather live in?





QRcodes

- EN
  https://surveys.hevs.ch/v4/s/hsjqg2

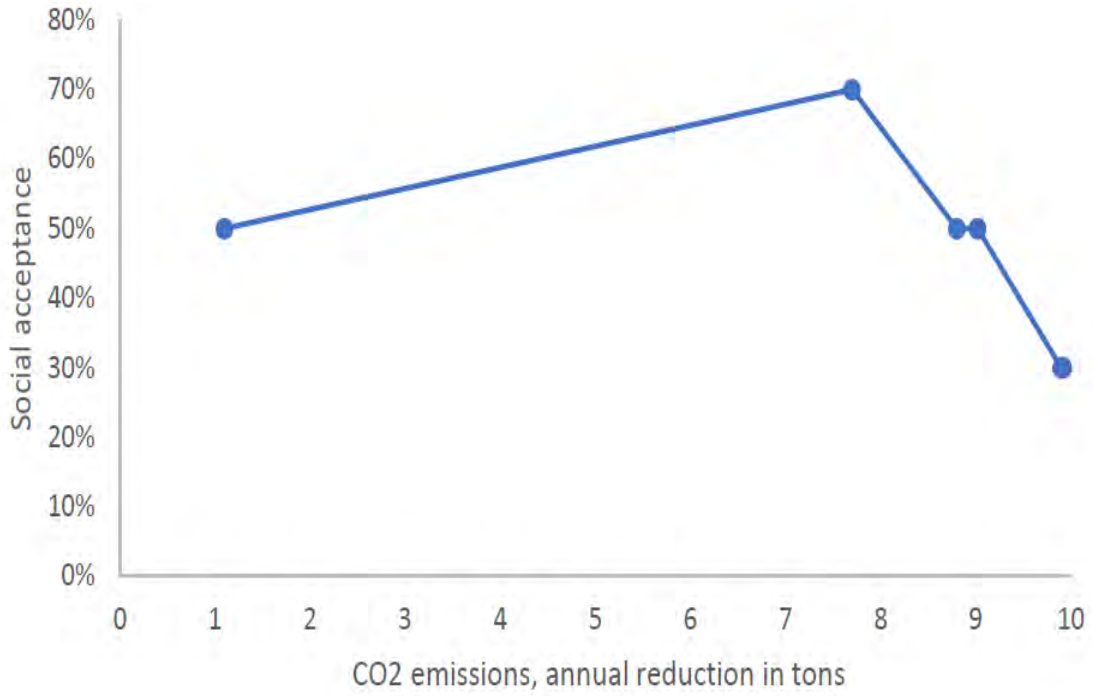
- SWE
  https://surveys.hevs.ch/v4/s/ukxxfv

From Cards to Smart Design

Conjoint Analysis
We analyze how people rank the cards.
This tells us which features matter most.

Share-of-Choice Model (optimization)
Combines preferences with cost and CO_2
Finds the best setup that:

- Maximizes social acceptance
- Minimizes cost
- Meets sustainability goals



Feeding the LASAGNE Project

🌍 LASAGNE aims to build **socially sustainable energy systems**.

Our work helps by:

- Understanding what people want
- Designing systems they'll support
- Bridging tech and community needs

But above all, continue this wonderful collaboration between Sweden and Switzerland 😊”

Networking

Virtual Sharing

Model for virtual sharing

Björn Laumert, KTH

Energy Technology Department
Energy Communalities/ Virtual Sharing

New Electricity Sharing Opportunities in EU and Sweden

- Sharing through IKN electricity network
- Network owned by Energy Communality
- Increases tax free solar production (production capacity)
- Shared solar production through IKN net is not taxed
- Reduces Network fees

- - > provides strong incentives for renewable production implementation
- -> no benefits where investment in own electricity grid is not meaningful
- -> no large benefit in building environment with similar buildings with similar load profiles

Virtual Sharing
Swedish Law Proposal

- Virtual Sharing means that an electricity load from a consumer is matched by electricity from a producer
- No direct physical connection
- Matching is done by continuous measurement of consumption and production
- Conditions and price is regulated by written agreement between producer and consumer

- -> solves electricity grid investment problem
- -> Can bring benefits when production cost is below spot price
- -> no tax benefits for energy communalities for installed capacity
- -> no tax break for the shared amount of electricity
- -> does not incentivize energy communalities to invest in renewable electricity production

Virtual Sharing
Benefitting Energy Communalities

- Virtual Sharing of electricity production and consumption within the energy communality
- No direct physical connection
- Matching is done by continuous measurement of consumption and production
- Conditions and price is regulated by written agreement between producer and consumer
- Taxes handled as in IKN based network sharing

- -> solves electricity grid investment problem
- -> can bring benefits when production cost is below spot price
- -> tax benefits for energy communalities for installed capacity
- -> tax break for the shared amount of electricity
- -> does incentivize energy communalities to invest in renewable electricity production

The role of the electricity grid owner

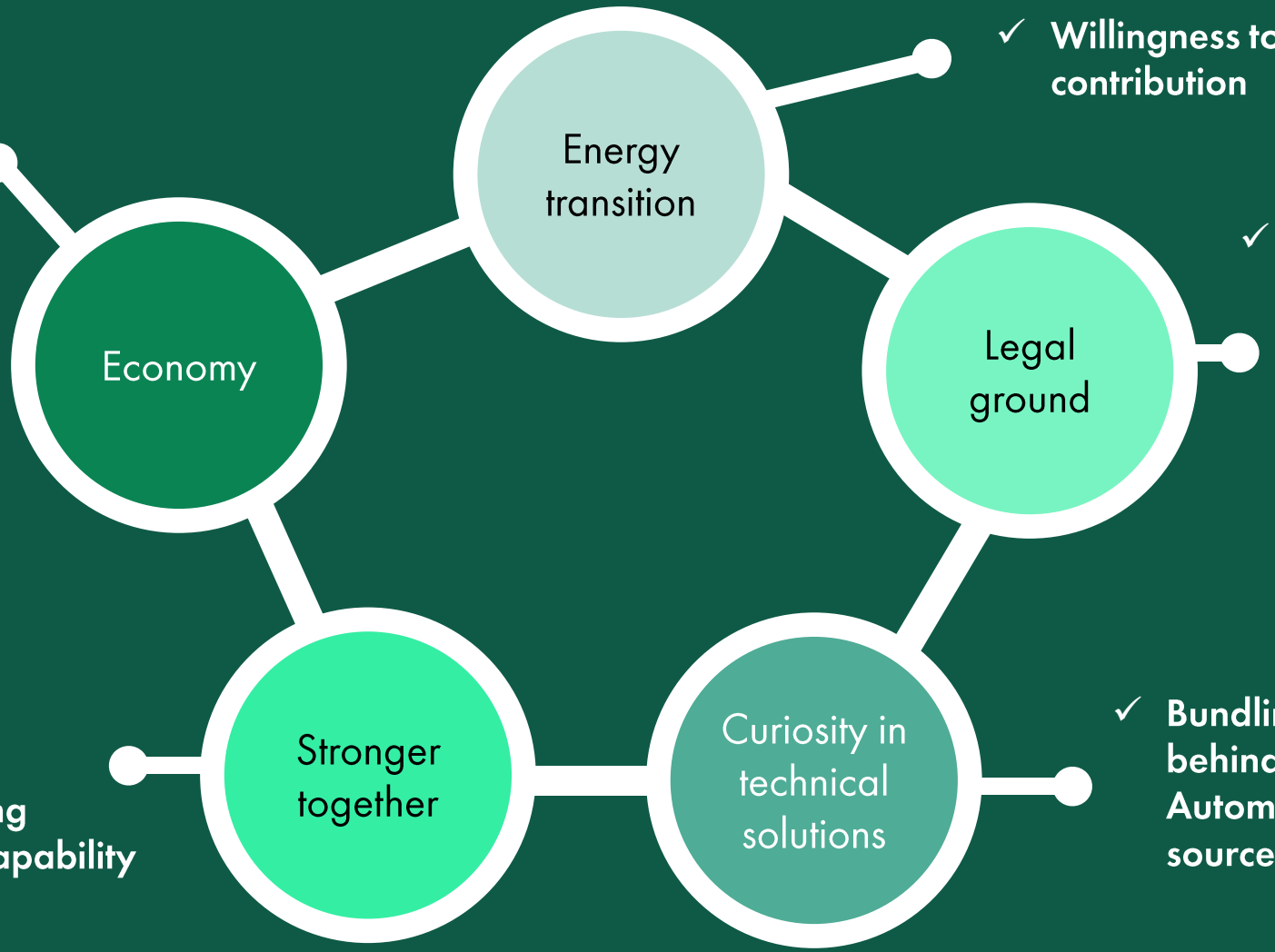
Mårten Granfors, Ellevio

The common grid is key.

Why, and some thoughts on leveraging on it among Energy Communities

ELLEVIO

EC's are pushed into owning their own grids



- ✓ Minimize energy taxes, grid fees and electricity costs
- ✓ Willingness to accelerate their own contribution
- ✓ In absence of rational regulation on energy sharing, openings in SFS 2007:215 (IKN) are explored
- ✓ Aggregated behavior
- ✓ Independency
- ✓ Solidarity and belonging
- ✓ Increased investment capability
- ✓ Bundling of energy sources behind the grid meter using Automated steering of sources behind the meter

ELLEVIO

From a society perspective, leveraging the DSO grids should be the most rational alternative

- **It's already there** → No need for parallell infrastructure for the purpose of sharing – already shared!
- **The cheapest solution on a national scale** → Cost drivers and incentives largely a regulatory topic.
- **In it for the long run.**
- **Professionals in securing stable delivery and incident handling**
- **A collective, solidarity based solution with equal rights for all.** Microgrids can fill a purpose, but they shouldn't be built on tax incentives and are not for everyone.
- **Regulated** → Secures national interests now and in the future

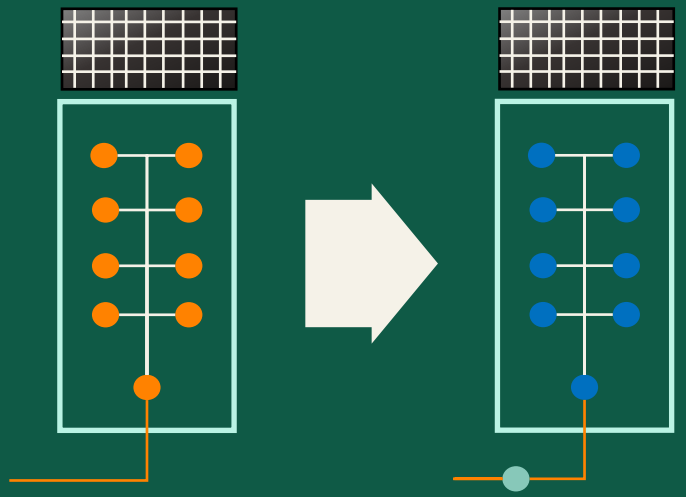
ELLEVIO

Ellevio is exploring alternatives to meet some drivers

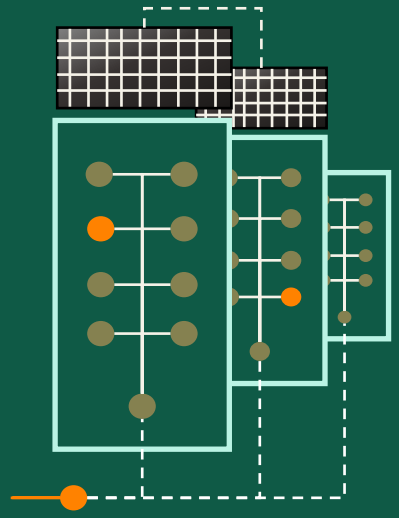
Measure tax higher up in the grid

Make it viable for the grid operator to measure in a MG

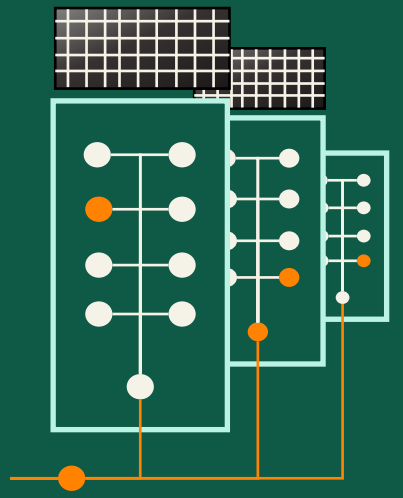
Make it viable with extended Virtual sharing



- Meter for tax, electricity & grid
- Meter for electricity & grid
- Meter for tax in point of connection
- Customer grid — Grid owners grid



- Meter for statistics and possbile market participation
- Customer grid for sharing (IKN 22c)



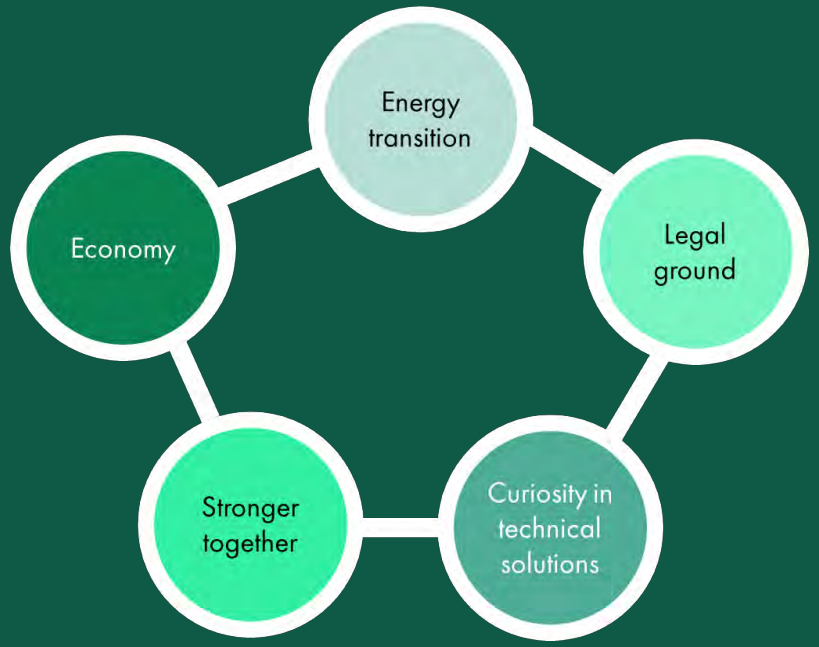
- Measurement for tax, electricity & grid but calculated for EC participants.

ELLEVIO

Some thoughts on what is needed to accelerate EC and DSO cooperation

1. Establish what incentives are best for the energy system as a whole and how they should be applied
   - Do we want microgrids driven by energy taxes just because tax is measured by the DSO meter?
2. Establish what cost-drivers an energy community can impact to create value for the DSO
   - Cost-drivers for DSOs are largely decided in DSO income regulation. Is regulation in line with what matters as a whole?
3. Enable comparable legal ground for DSOs and non-DSOs in some areas
   - Grid owners are able to offer cost effective solutions – as long as we are comparing apples to apples.

Grid Owners share many of the same drivers but have different realities



ELLEVIO

ELLEVIO

The role of energy companies, policy, electricity network charges and taxes

Per Everhill, Tekniska verken

Energy communities – sharing and steering of all energy resources
KTH Royal Institute of Technology 2025-05-22

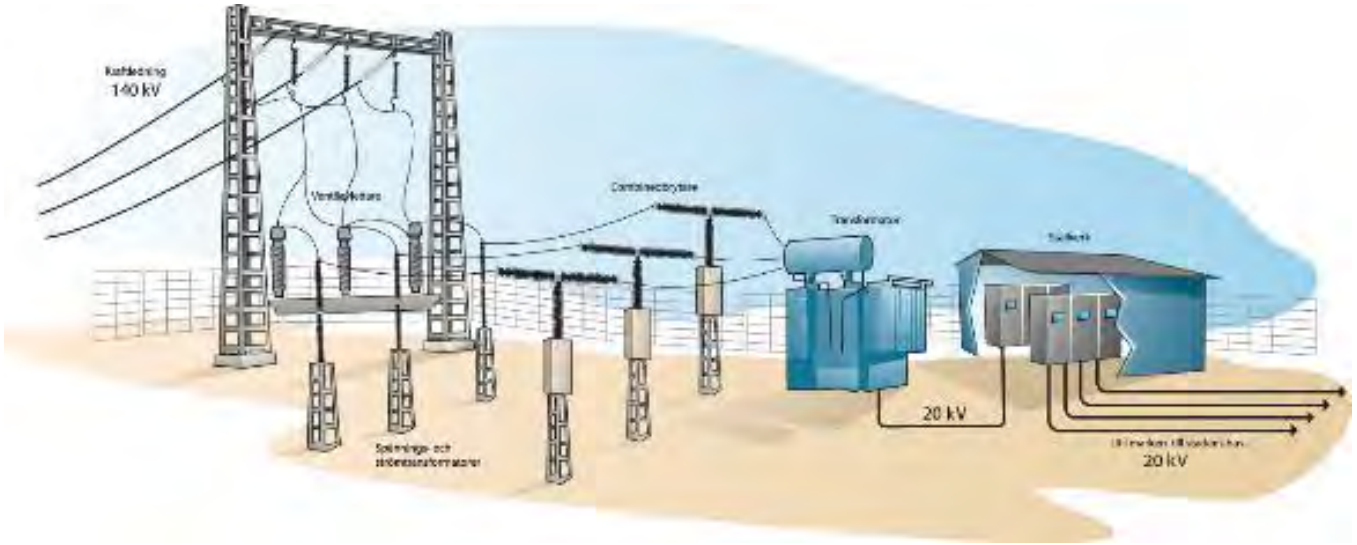
The role of energy companies, policy, electricity network charges and taxes

Per Everhill, Public Affairs manager

Tekniska verken

Electricity grid capacity and costs

Dimensioned for the highest capacity needed

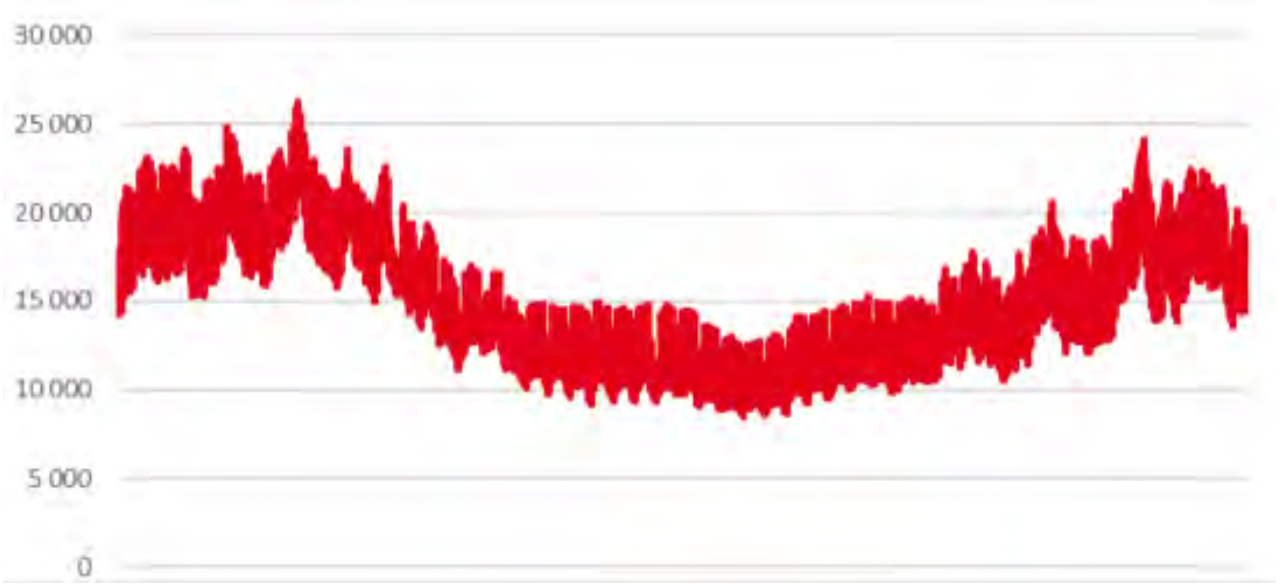


Only permanent capacity reduction reduces grid costs & capacity needs!

Tekniska verken

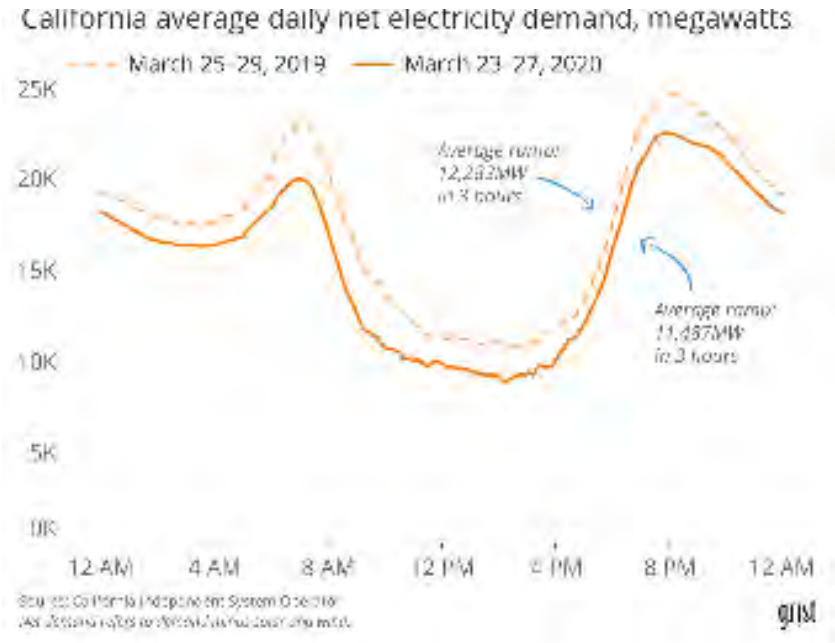
The Nordic Seasonal Challenge

The Nordics ~ Daily & Seasonal volatility



Capacity needs Sweden MW year

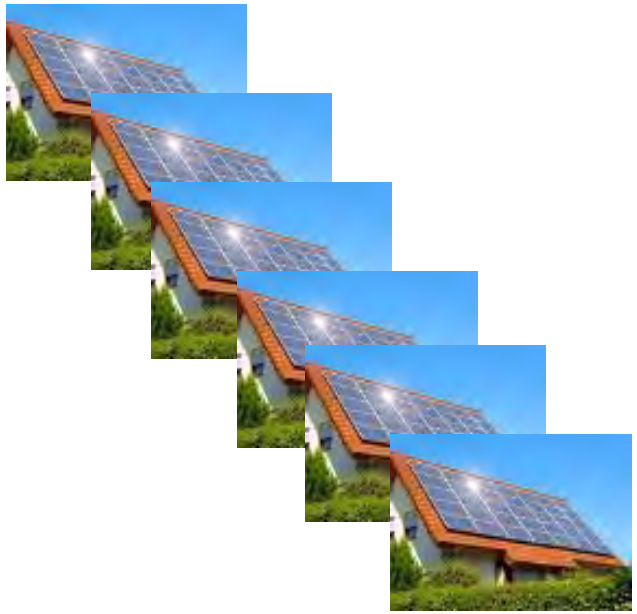
California ~ Daily volatility

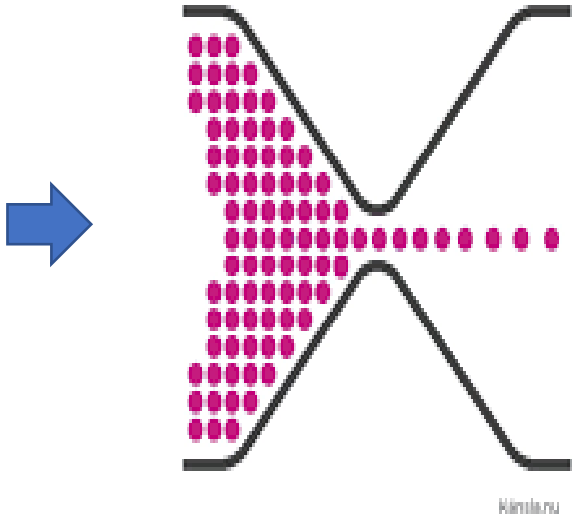


Capacity needs California MW day

Tekniska verken

Distributed solar and the grid

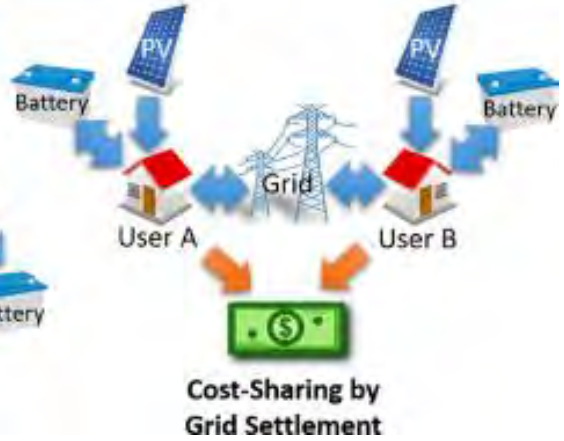




Increased consumtion ”behind the meter” in a key delivery for energy communities in the Nordics!

Tekniska verken

Virtual energy sharing – benefits



- No parallel infrastructure
- More production for the investment – other than solar!
- Sharing with other than your neighbours
- Tax reduction is key

Tekniska verken

Energy communities – sharing and steering of all energy resources
KTH Royal Institute of Technology 2025-05-22

The role of energy companies, policy, electricity network charges and taxes

Per Everhill, Public Affairs manager

Thank you for your attention!

Tekniska verken

Questions

NETWORK TARIFFS FOR SHARED ENERGY

- **Spain** – Shared energy treated as self-consumed—network fees set to zero.
- **Austria** – Reduced fees.
- **France** – Reduced fees.
- **Sweden** – No tariff reduction for shared electricity. Authorities suggest future exploration.

ENERGY TAXES

EU Framework – Aligns energy taxes with climate goals.

- **Spain** – Shared electricity under collective self-consumption is treated as self-consumed – no excise tax.
- **France** – 2025 Budget exempts electricity from collective self-consumption projects (up to 1 MW) – no excise tax.
- **Italy** – Incentives via premium tariffs and grid compensation.
- **Sweden** – No reduction on energy taxes
  – Current rules make virtual sharing uneconomical.
  – Tax Agency guidance is needed.
  – Small communities taxed more (full tax and VAT) than industry.

Panel Discussion

Citizen engagement, steering and virtual sharing

by *Björn Laumert* with

Mårten Granfors, Per Everhill, Jonas Thyni and *Emmanuel Fragniere*

Networking