Integrated energy management

OpenADR++ user conference - London - November 20th, 2024

FLEXIBLEPOWER ALLIANCE NETWORK

Integrated energy management
Introduction FAN

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FLEXIBLEPOWER ALLIANCE NETWORK

Mission

Maximum use and availability of energy flexibility via open standards.

Why?

Mitigate surpluses and shortages of (sustainable) energy through energy flexibility:
- *Raise the value of sustainable energy*
- *Allow more renewables to be installed*

Good to know:

- We are not a branche-organisation

What we do:

- Research
- Networking and knowledge-sharing events
  - https://flexcon.energy !!
- Technology - Promote open standards for Flex
- Awareness & communications
- Vision, Position papers, policy advise

PUBQUIZ: Let's get to know each other a bit better

Who has

- An all-electric EV
- A heat pump
- PV panels
- Home storage / battery
- No fossil fuel burning at home - incl EV?

- Who has more than 1 one heavy loads?
- Who has a dynamic energy contract (hourly prices, 15 minute, or even daily)
- Who has an EMS / HEMS

What is Energy Flexibility anyway?

S2 consortium:

"… Energy flexibility is the ability to alter the use of energy without a significant impact on comfort"

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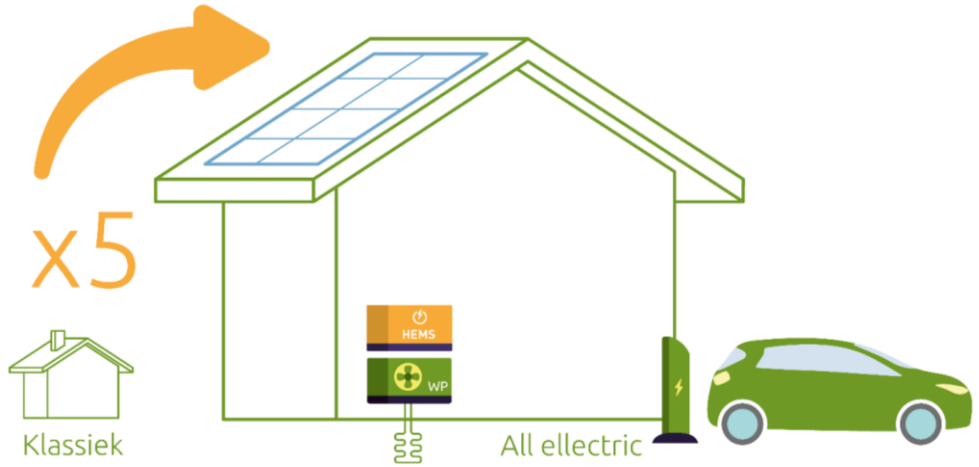
"… Energy flexibility is the ability to alter the use of energy without a significant impact on comfort"

Why do we need Flex?



EV growth in The netherlands

- Jan 1st 2024 : ± 5% of all cars is a *BEV* (*Battery Electric Vehicle*). **Ca 463.000.**
- Jan 1st 2024: market share *BEV's* new cars ± 31%. **Ca. 115.000.**
- Low estimate : **2,5 mio BEV's** in 2035.
- High estimate : **6 mio BEV's** in 2035.

* Source: Outlook personenauto's 2024 (Elaad)
** Source: beleidsvoornemen EU

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* New government less prone to stimulate EV's and sustainability in general ☹

Ca. 1,6 TWh per year
Ca. 4,5 GWh per day

Ca. 8,5 TWh per year
Ca. 25 GWh per day

Ca. 21 TWh per year
Ca. 60 GWh per day

* Source: Outlook personenauto's 2024 (Elaad)
** Source: beleidsvoornemen EU

Most EV's are still charged in nighttime

* Source: Nationaal laadonderzoek RvO

Heat pumps in The Netherlands

- 2023 ca. 570.000 total install base
- ± 400.000 gasheaters replaced in NL per year
- Estimate 2030 total 2 mln install base
- Estimate 2035 total 4 mln install base

- Congestion in residential area's :
  - City of Apeldoorn: 80 Heat Pumps not to be integrated in the grid on short term: negative exposure
- Ban on new gasheaters per 2026 is dismissed:
  - New government less prone to stimulate HP's and sustainability in general ☹

* Source: Dutch Heat Pump Association

Heat pump impact Low Voltage nets

2023 — Ca. 2,5 TWh **per year**

2030 — Ca. 10 TWh **per year**

2035 — Ca. 20 TWh **per year**

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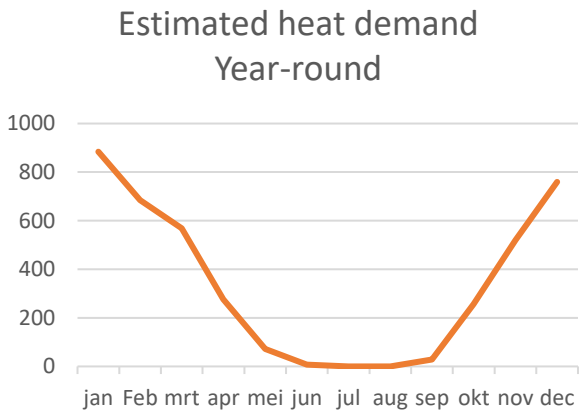


Not evenly distributed over the months

Ca. 2,5 TWh per **year**
Ca. 18,5 GWh per **winterday**

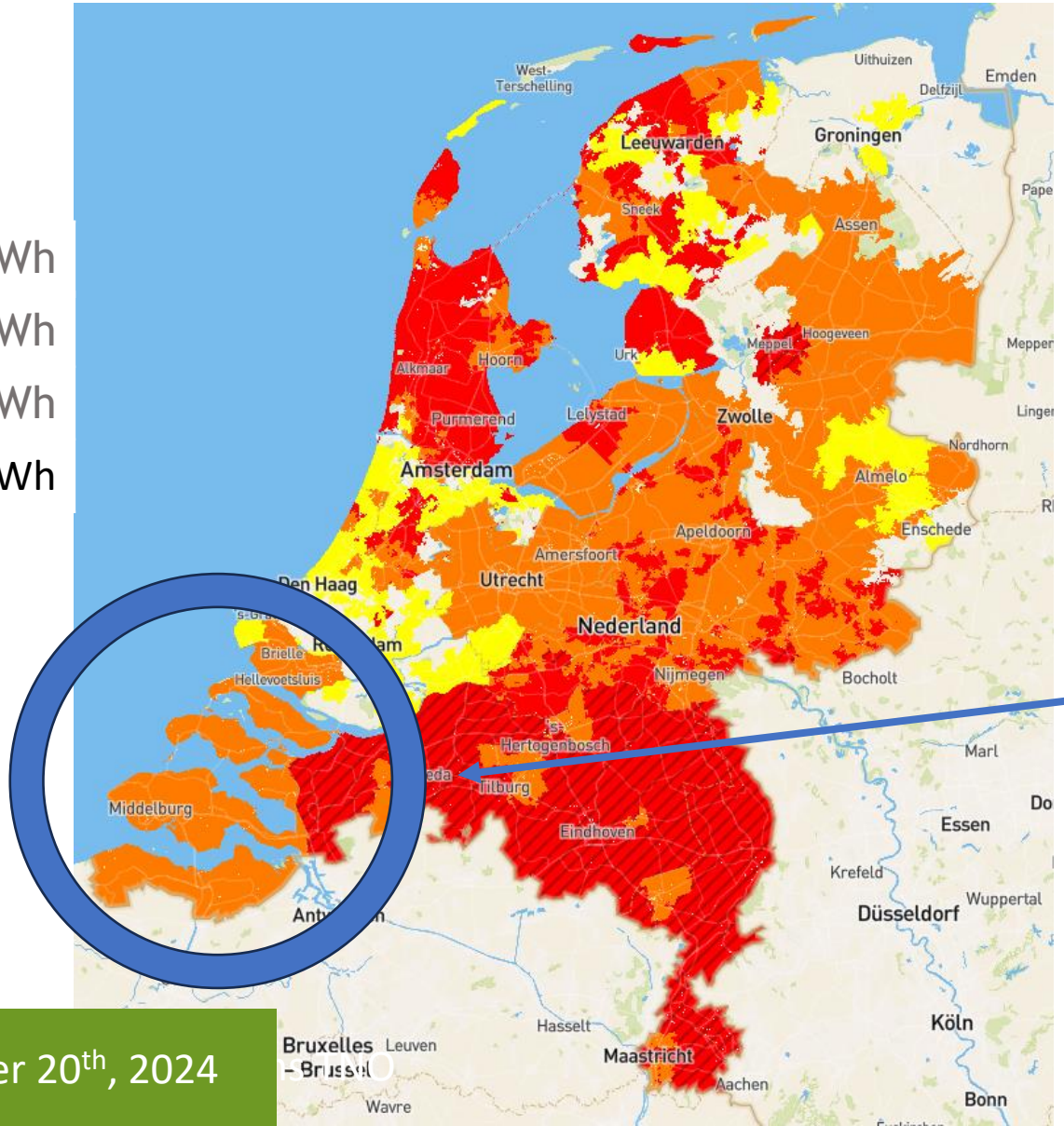
Ca. 10 TWh per **year**
Ca. 75 GWh per **winterday**

Ca. 20 TWh per **year**
Ca. 150 GWh per **winterday**

Netherlands update

Electricity Households
Winter 2022

Residential	22 GWh
EV	4,5 GWh
Heat pump	18,5 GWh
Total	55 GWh



Population

NL	18 mln
UK	68 mln
New Zealand	5.4 mln
(Old) Zeeland	0.4 mln

Surface in km^2

NL	42000
UK	244376
New Zealand	268021
(Old) Zeeland	3000

* Source: Netbeheer Nederland

Netherlands update

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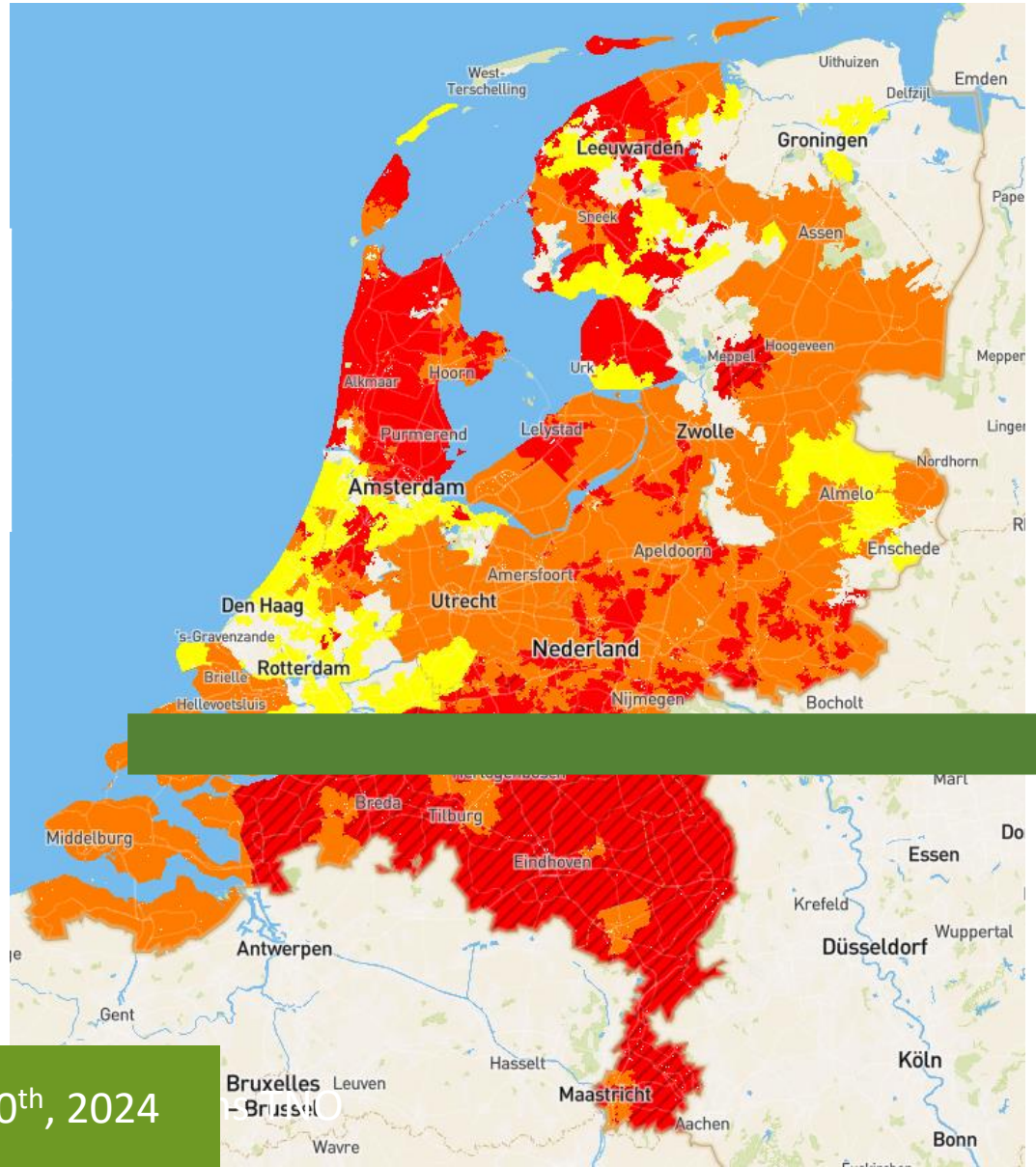
x4



Electricity Households
Winter 2035

Residential	22 GWh
EV	60 GWh
Heat pump	150 GWh
Total	232 GWh

* Source: Netbeheer Nederland

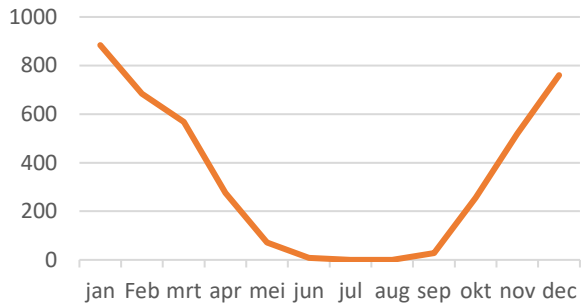
The need for ALL the flex

Winter 2035

Electricitydemand
cold winterday

Peakload

Estimated heat demand
Year-round



x4=x10 ?

The need for ALL the flex

Daily electricity usage residential

Winter 2035

Residential	22 GWh
EV	60 GWh
Heat pump	150 GWh
Home battery	? GWh
White & brown goods	? GWh
PV generation	-/- ? GWh
Total	232 GWh

Our assumption:
At least 50% has Flex potential, in usage (kWh), in power (kW), or both.

The need for ALL the flex

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Residential	22 GWh
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Game-theory risks?

PAS 1878/1879 ?

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Metering & fullfillment?

§ 14.a, Steuerbox?

Energy Sharing (local)?

Dynamic Grid Fees?

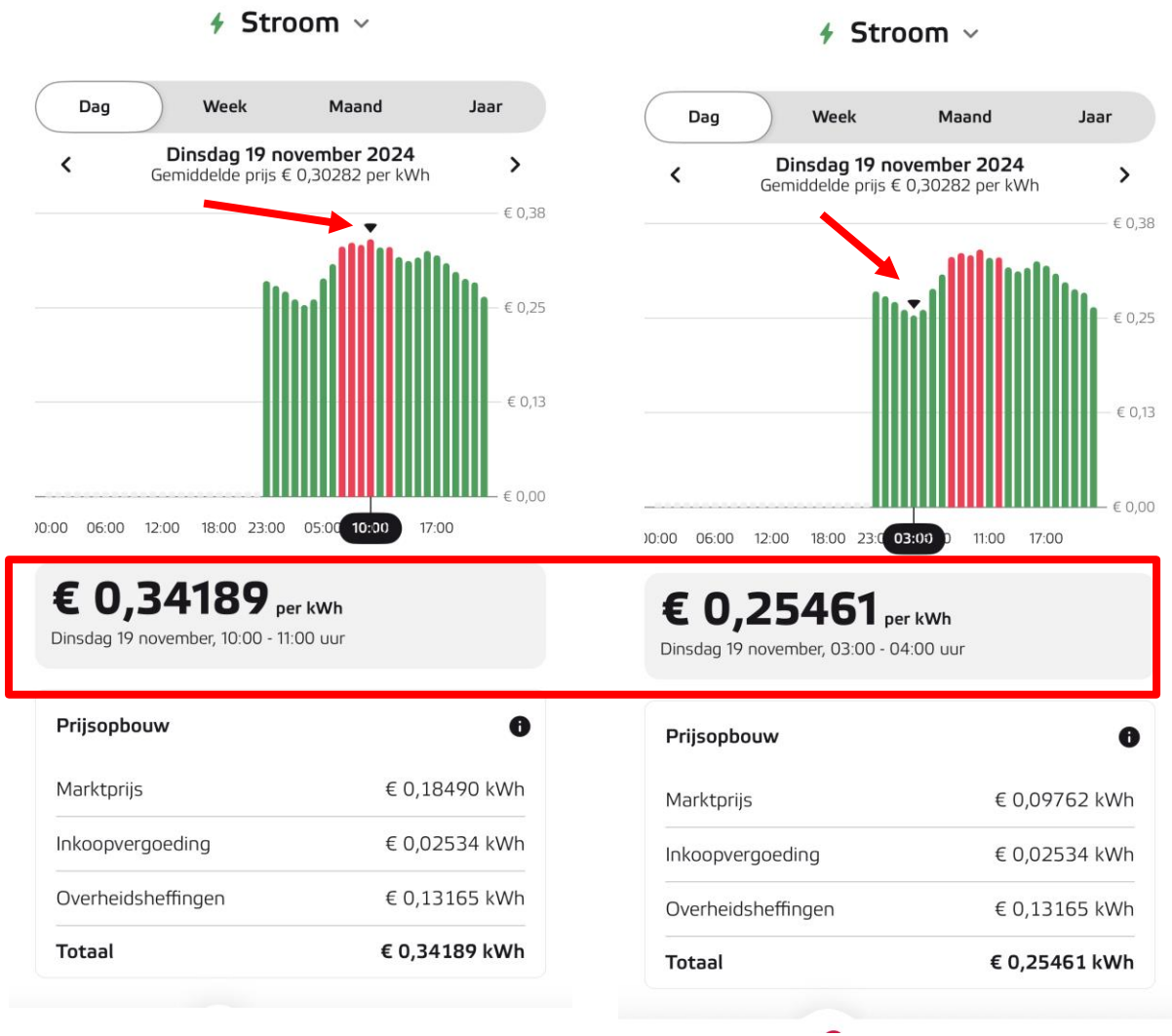
Bandwith model?

GOPACS

Finally ….. incentives !

- PV Net metering abolishment Jan 1st 2027:
  - Ambition: Raise self consumption from 30 % → 60 % will compensate
- Dynamic energy prices:
  - about 5% of Dutch consumers. Probably consumers with more & larger assets.
  - Delta of € 0.15 @ 50 kWh = € 7,50 per charging session at home… ☺
  - Green energy optimization

- Today : (2024) DNO's very eager to use Flex in Low Voltage



So…. we need that Flex …

So…. we need that Flex …

… and we need **ALL** the Flex !

S2 Standard

We need all the Flex

Development & certification of S2 2012 – 2022:

TNO

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Adoption S2:

ecos

KNX

S2 Standard

We need all the Flex

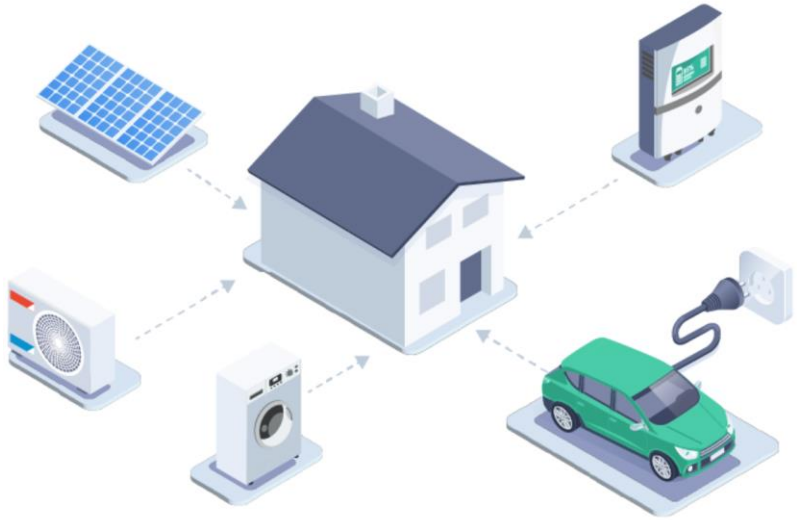
→ May 2022: formal European standard for Energy Management: EN 50491-12-2

→ Optimizing **all** energy flows **'behind the meter'**

Why?
- Least impact on comfort
- Use all available Flex in a combined way

Introduction S2 standard - EN 50491-12-2

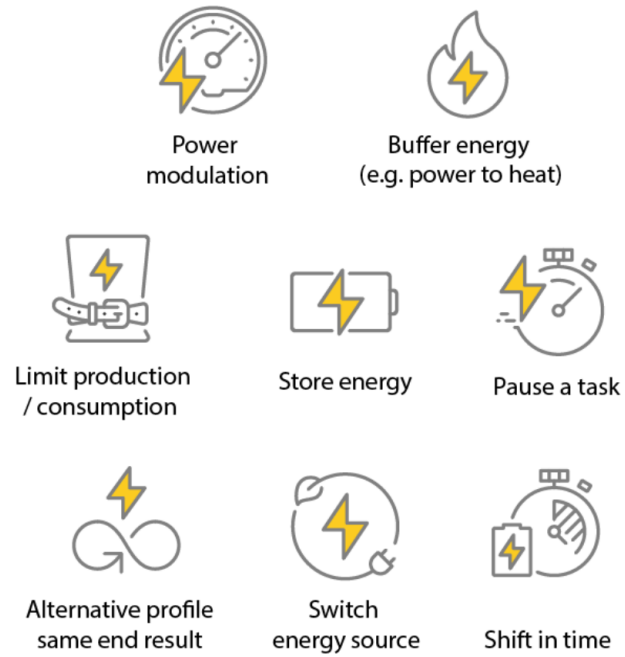
- Focus on “behind the meter”: *in* the building
- No limitation in technology
  - Wired ✓ Wireless ✓
  - Local ✓ Cloud ✓
- Ochestration: Combine multiple devices: **comfort!**
- No complex integration in firmware of devices
- S2 is device-agnostic: no focus on the device itself, but on it’s energy management capabilities.



S2 : **Future proof,** thanks to **focus on energy usage characteristics.**

1. Power modulation
2. Shift in time
3. Pause a process
4. Alternative profile with same result
5. Limit usage or feed-in
6. Buffer energy (eg. Heat in buildings)
7. Energy storage
8. Change energy source (eg. Hybrid HP)

! **No** focus on use cases like PV generation, EV charging or heat pump !



The need for ALL the flex

In S2, a *Customer Energy Manager (CEM)* input / receives information form markets and DNO's. It also knows the users preferences etc …

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Next to that, the CEM receives input from various *devices* in a building. This is done via the *resource manager (RM)* of these devices.

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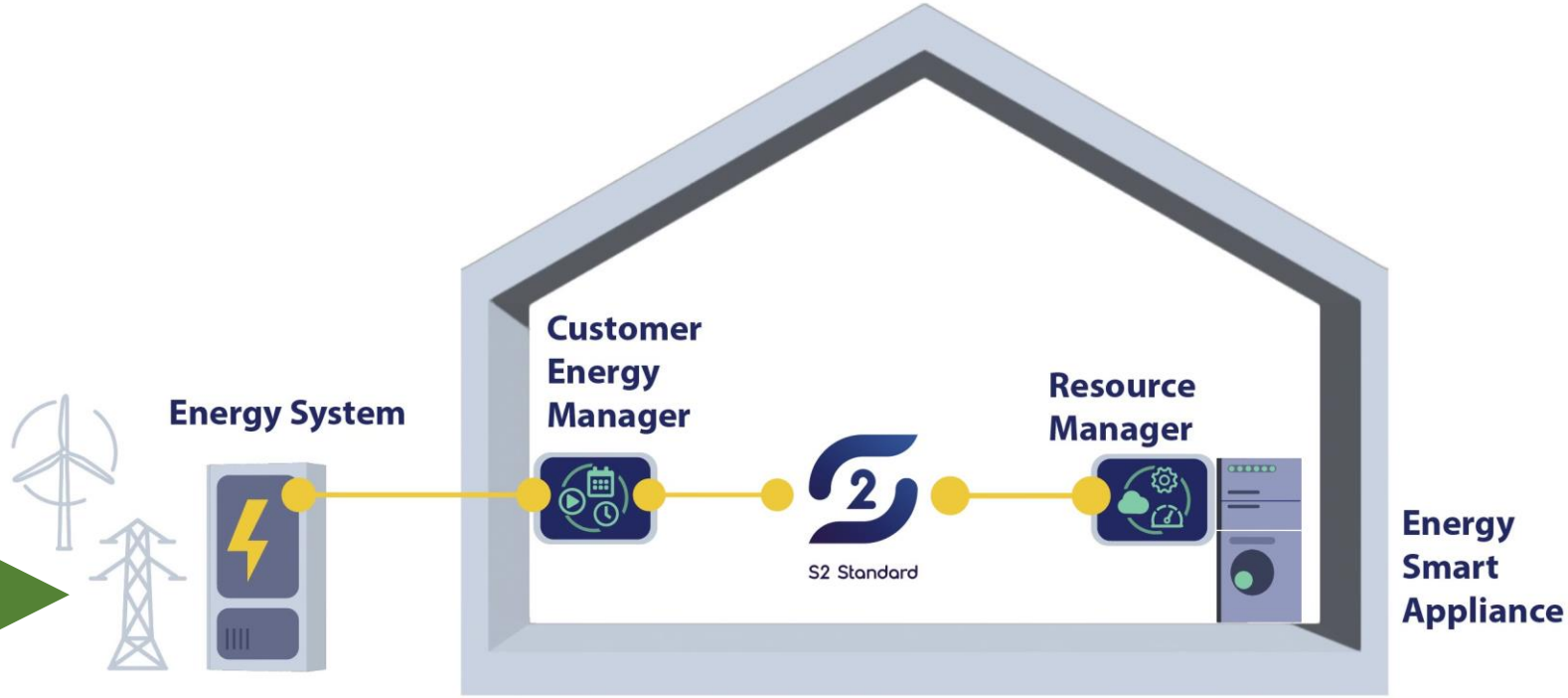
The CEM and RM communicate via S2

The need for ALL the flex

Singular representation of S2 in the energy system and homes/buildings

DNO / TNO (LS/MS/HS)
Suppliers / retailers
Aggregator / BRP
Markets
Weather forecasts
….



The need for ALL the flex

More complete representation of S2 in the energy system and homes/buildings

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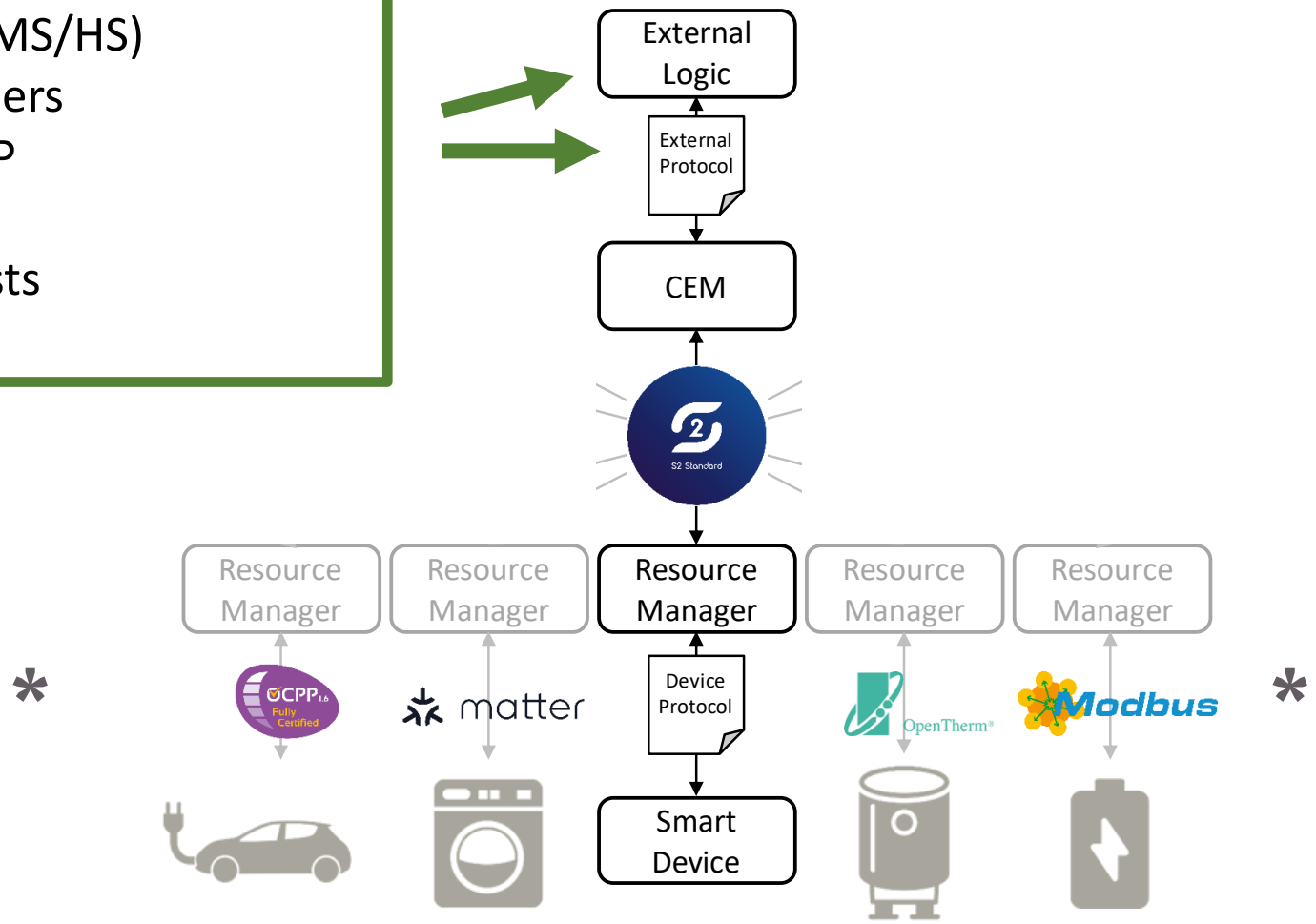
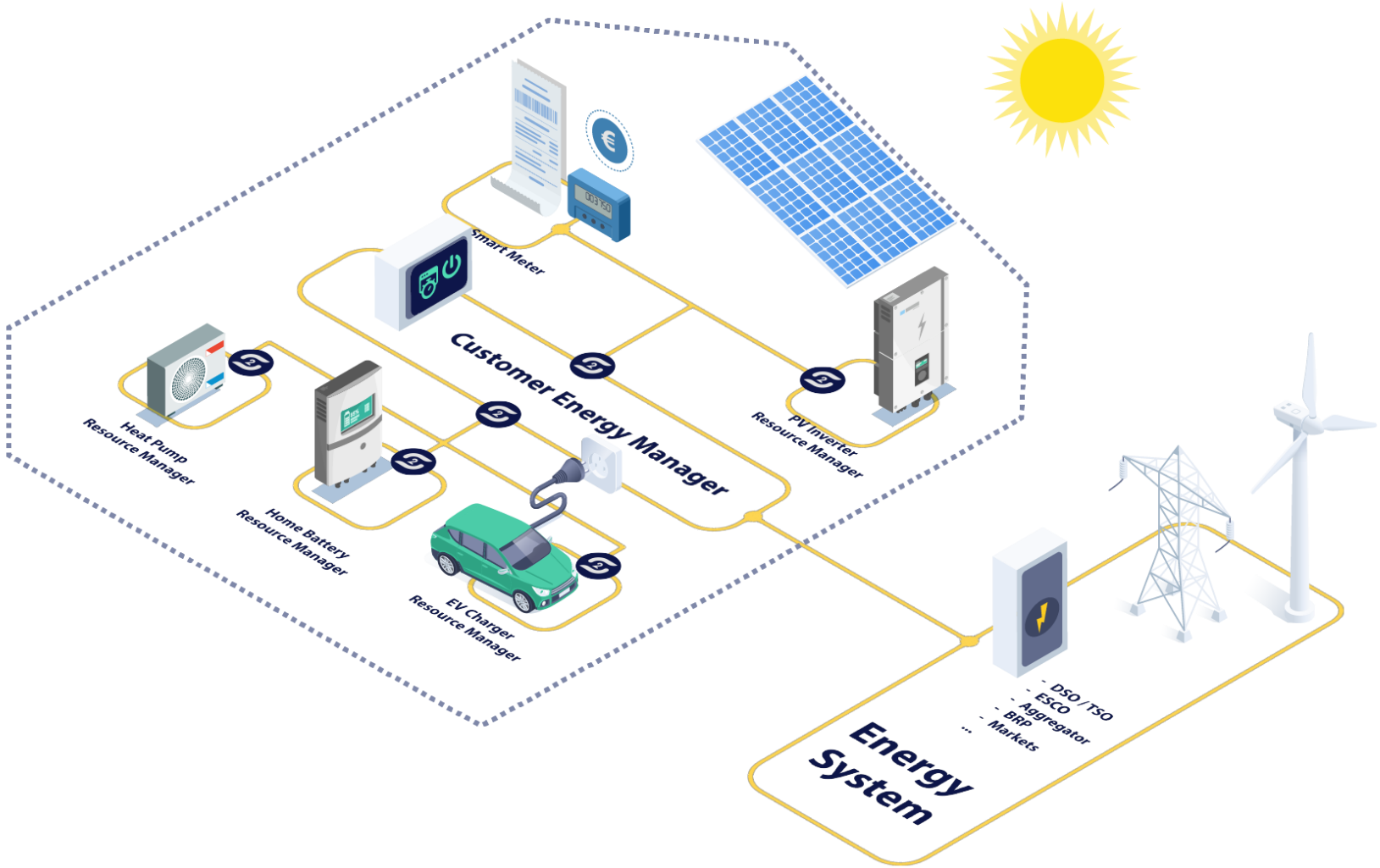


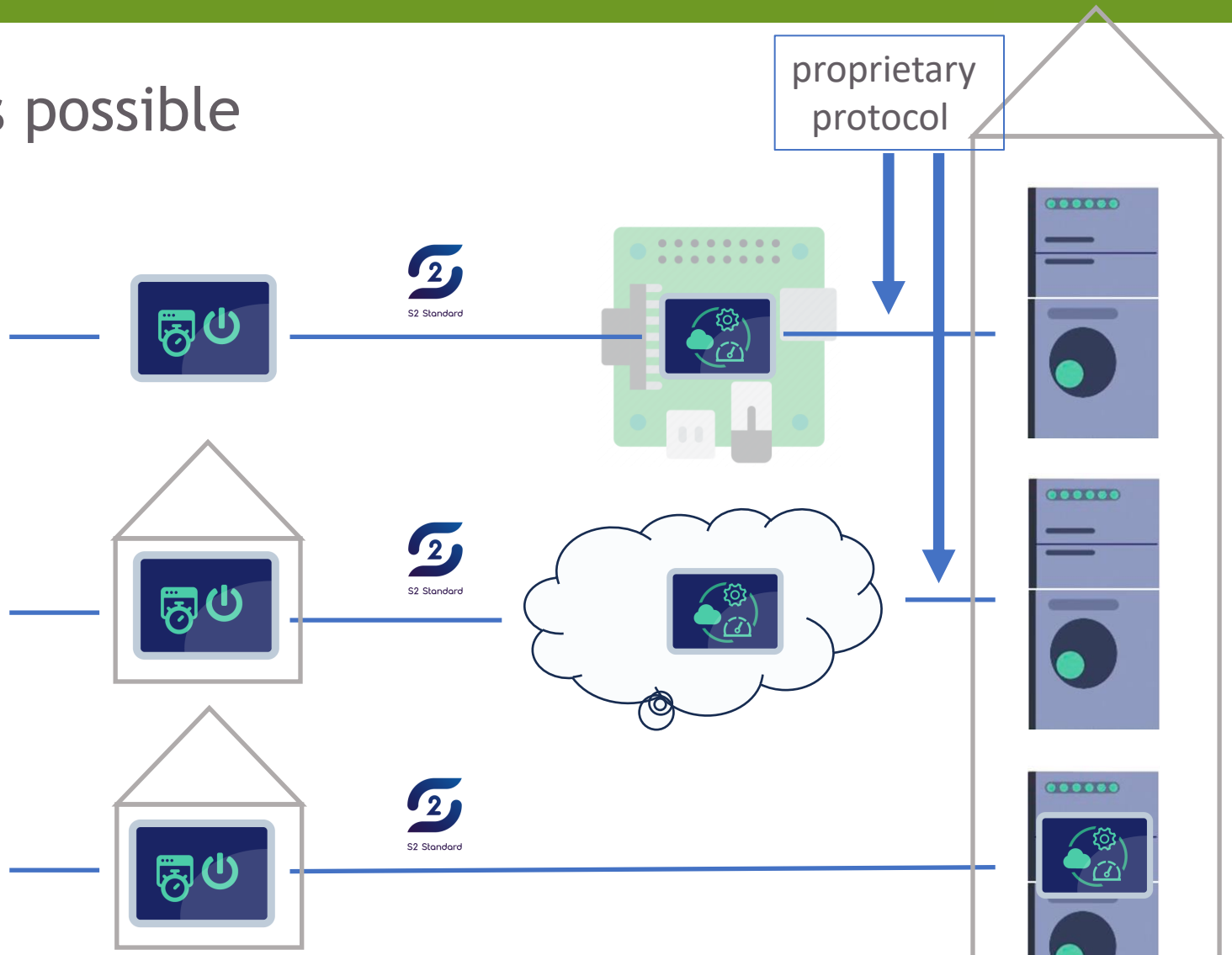
* protocols chosen randomly

The need for ALL the flex

More complete representation of S2 in the energy system and homes/buildings



Staged implementation of S2 is possible



RM on separate control-devices

(for example for quick fix or retrofit)

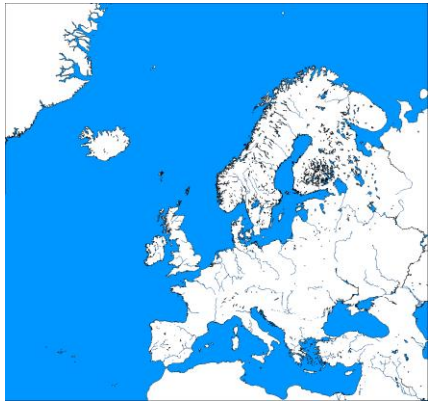
RM in the cloud

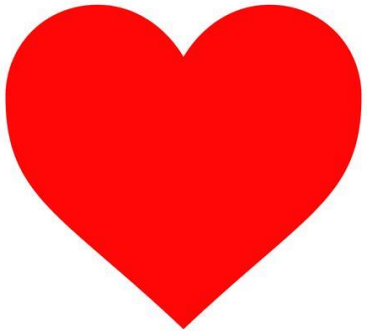
RM integrated in firmware of devices

Thank you !

Flex & incentives: financial benefits are mostly in line with sustainability goals

FLEX: “Wir schaffen das”





General considerations / discussion items

Cloud versus local discussion: [Personal notes, not per se FAN standpoint].

- Open standards + local services lower the risk of stranded assets, for example if suppliers goes bankrupt, or when a company “pulls the plug” - pun not intended.

- Cloud subscriptions cost money, both development, expansion as maintenance. OEM need to run the cloud as long as a product is economical viable, may be 10 - 15 years. Monthly fees can be € 3 to 12 **per month per asset**. That may add up when running multiple assets.

- ”**No price to device**”: price signals handled by the EMS, not the devices.

Thank you !

Want to know more?

Documentation & reports
https://flexible-energy.eu/documentation-fan/

FAN website (English)
https://flexible-energy.eu/

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- Newsletter: https://mailchi.mp/flexiblepower/signup-for-updates-and-news
- LinkedIn: https://www.linkedin.com/company/flexiblepower-alliance-network/