Residential Flexibility

Protocols and architecture for smart energy management

Knowledge and innovation centre in the field of Smart Charging infrastructure in the Netherlands.

Founded in 2009 by the Dutch grid operators.

- **Outlooks.**
- **Smart charging.**
- **EU largest testing site.**
  - Interoperability
  - Smart Charging
  - Cyber security
  - PQ
- **Promoting open innovation & open protocols.**
- **Tender support.**

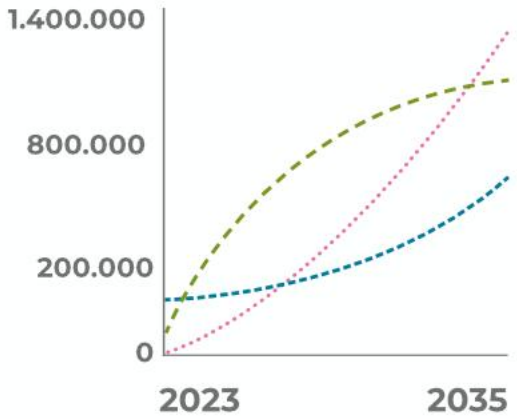
PACE OF ELECTRIFICATION IS FASTER THAN WE CAN EXPAND THE GRID

Flexibility is needed on all levels of the grid: High, Medium and Low Voltage.

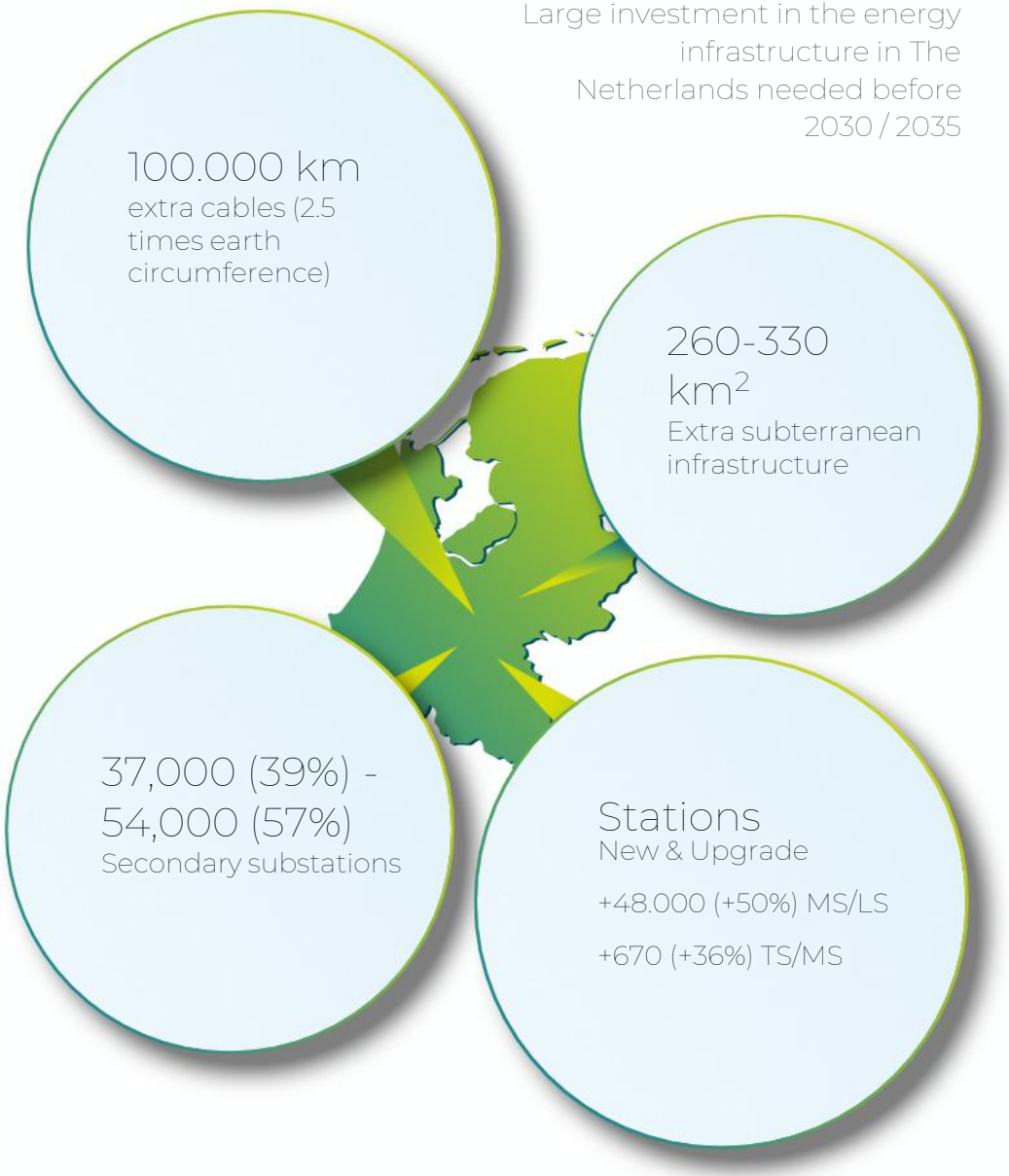
An all electric house can have a peak of 17 kW. That is 5 times higher than a traditional house.

House-holds with risk of

- Over Voltage
- Disruption
- Under Voltage



Large investment in the energy infrastructure in The Netherlands needed before 2030 / 2035

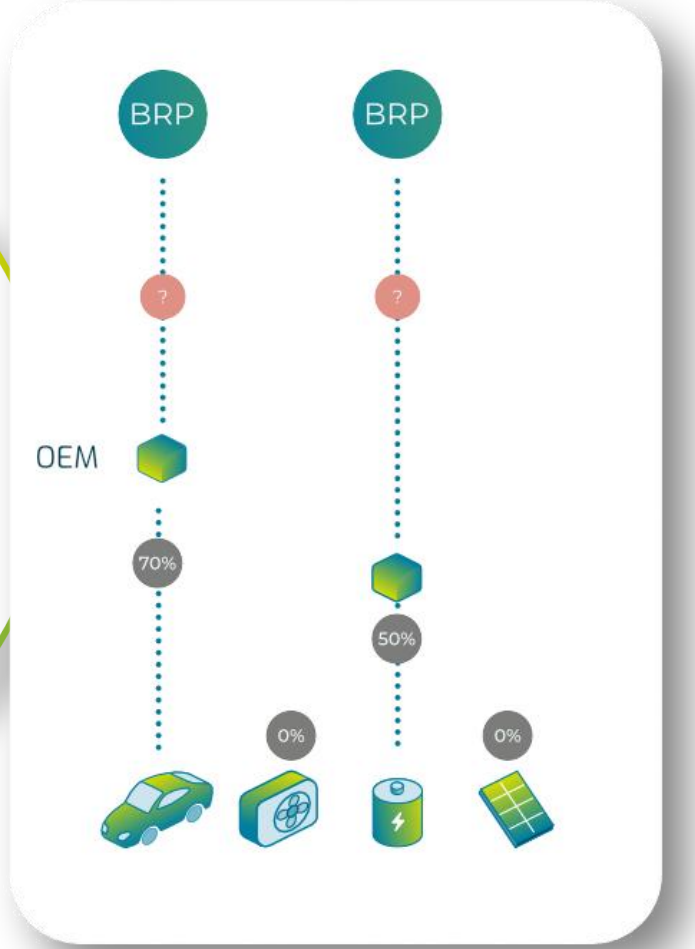


THERE ARE TWO POSSIBLE APPROACHES TO IN-HOME ENERGY MANAGEMENT

CURRENT SITUATION

Only a couple of in-home devices are connected.

They are controllable by one specific party. This can lead to signals from different parties in opposite directions



TWO OPTIONS

SILO: all main devices are connected and manageable by separate parties

HEMS: alle main devices are connected and manageable as an integral part of the energy system

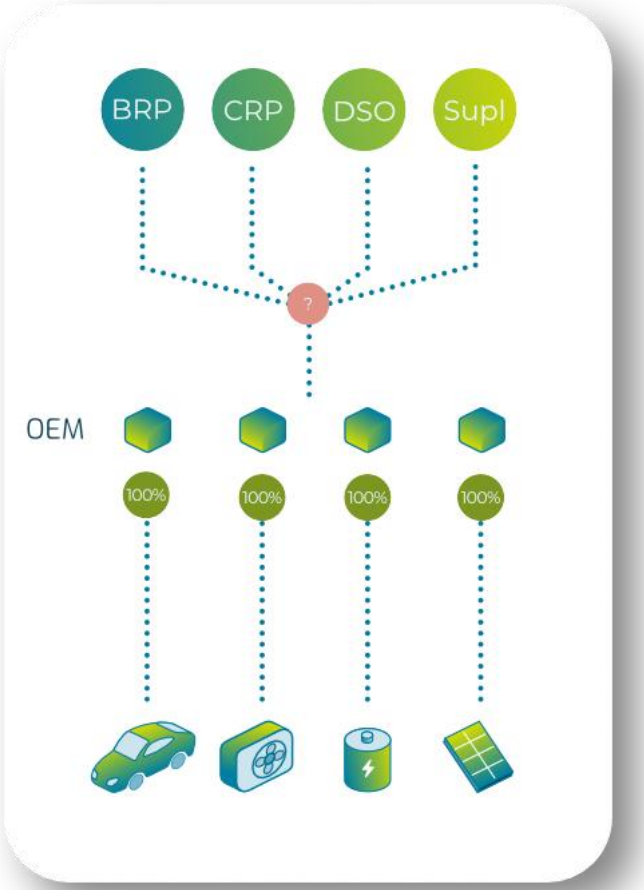
The SILO approach can be the precursor to the HEMS approach

Every device is managed by mostly one party

Conflicting signals can occur

There is limited to no orchestrion between the in-home devices

Limited possibilities for consumers to automate preferences across all devices



This approach could work but:

In-home optimisation is limited or not possible

Is more geared towards the internal operations of a single device

The SILO approach is sub-optimal

The HEMS approach

HEMS is central hub for in-home optimization

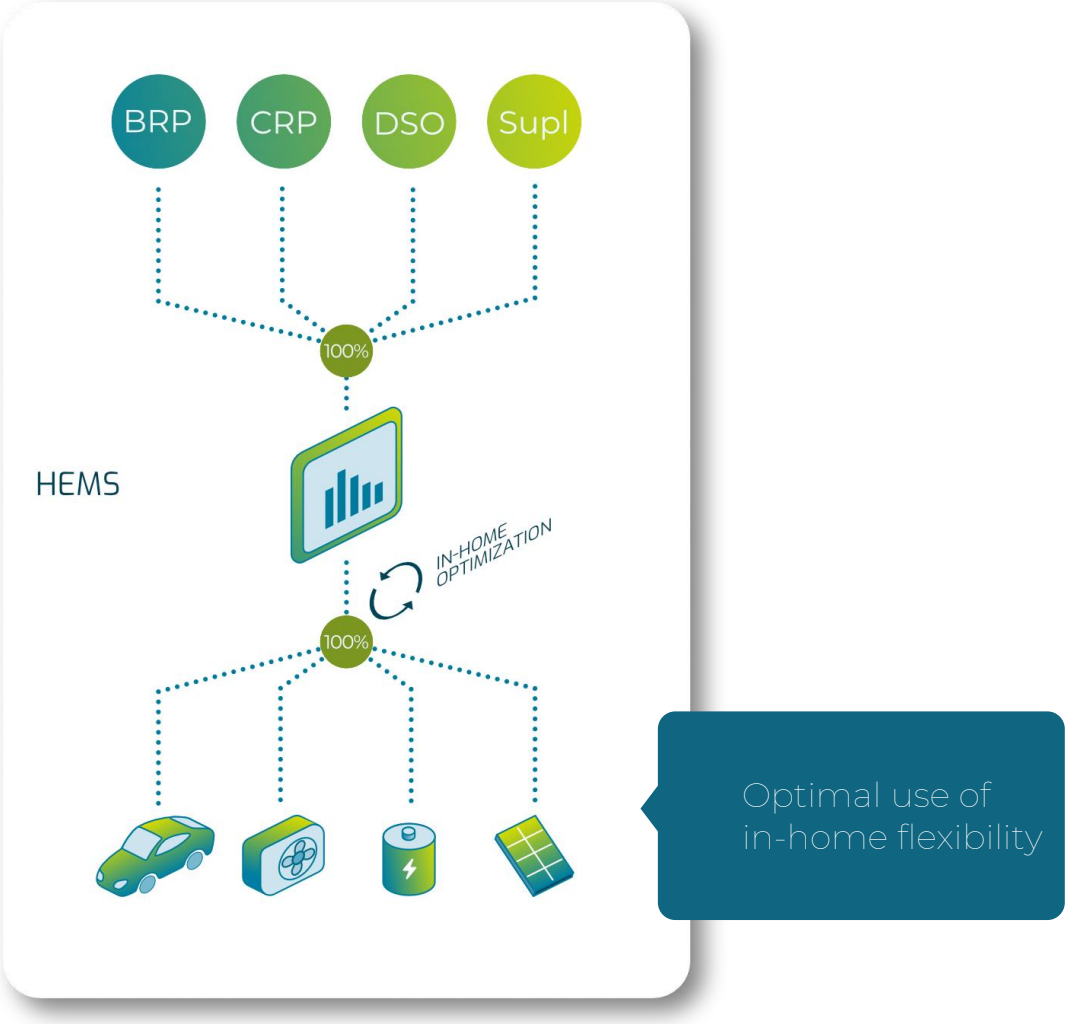
Wider array of data available: preferences, all devices, predictions

HEMS is able to prevent contradicting signals

HEMS can be positioned as the technical implementation hub to roll out future legislation

DSO can send signals to the ‘connection point’, when needed

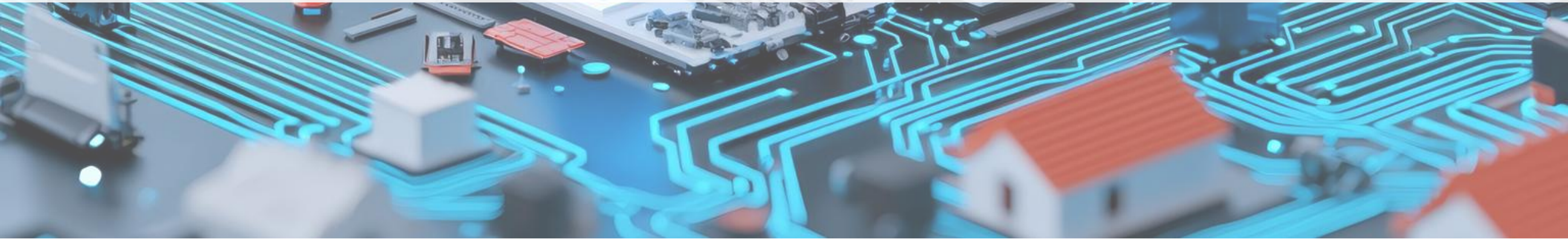
All necessary parties can provide management signals



powerfolio

Residentiële Flexibiliteit

Marktvisie op protocollen en architectuur voor slim energiemanagement

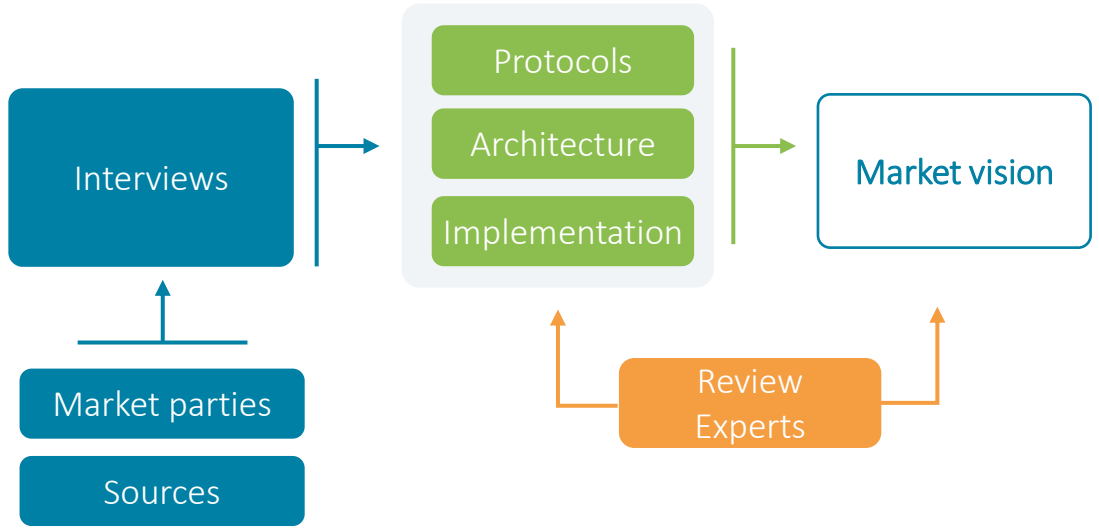


Road towards more residential flexibility

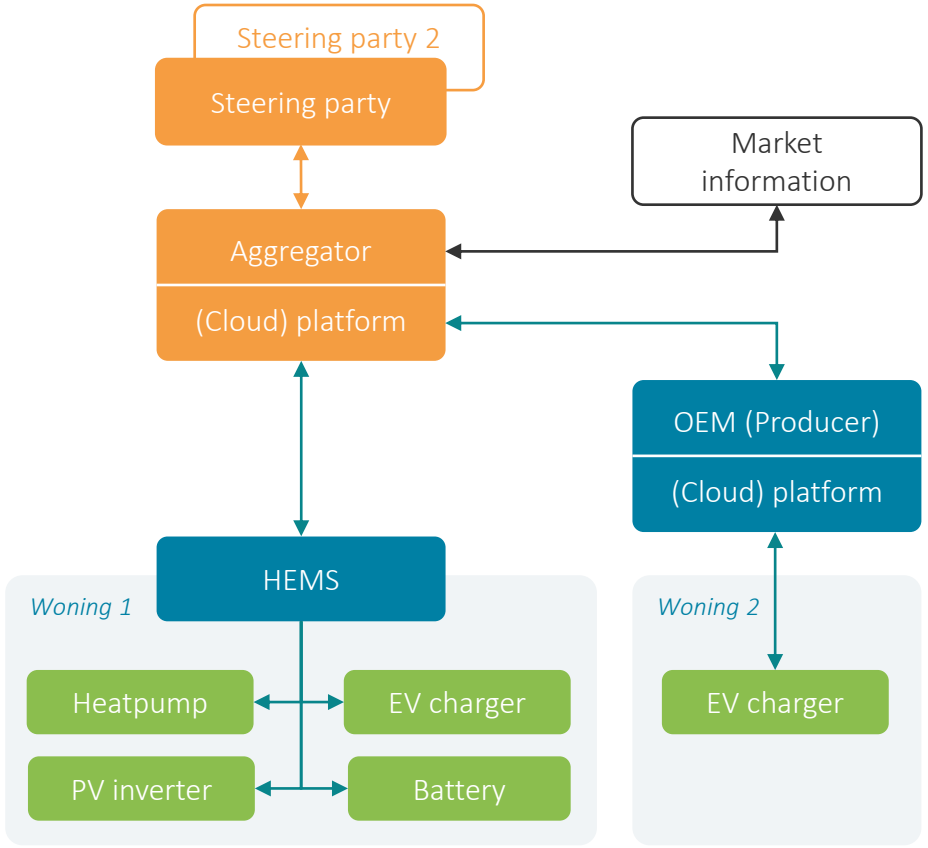
Goal is to have ‘plug and play’ HEMS, private EV chargers, PV-inverters, heat pumps and home batteries available on the market from multiple suppliers

2025-2026 | 2027-2029 | 2030+

Inventory protocols and architecture for residential flexibility



Architecture



Importance of HEMS is recognised in a future in which multiple appliances need to negotiate power usage

Now and in near future, a hybrid architecture with both cloud and local (physical) solutions will exist

Multitude of communication protocols to and from homes

26 protocols and methods

API most used towards the home

HEMS suppliers need to support over 10 protocols to communicate with all equipment in a home

Future home: MODBUS RTU, Matter, OCPP, S2 andEEBUS

	Generic or specific	Protocol	Within home	Towards home
Communication Protocol	Generic and/or own tailor made product for flex	MODBUS RTU	•	
		MODBUS TCP	•	
		OpenTherm	•	
		Eigen (bedraad) protocol	•	
		P1 (DSMR)	•	
		Wireless M-bus	•	
		Z-Wave	•	
		EPS-NOW	•	
		Matter	•	
		Proprietary RF protocol	•	
	Specific product for flexs	SG-ready (hardcontact)	•	
		OCPP	•	
		Sunspec Modbus	•	
		S2	•	
		IEEE 2030.5	•	•
		EEBus	•	
		OpenADR	•	•
Communication Method		API	•	•
		LTE		•
		MQTT	•	•
		RS485	•	
		WIFI	•	•
		Dig. I/Os / wire	•	
		Ethernet	•	
		Internet	•	•
		TF / Ripplecontrol		•

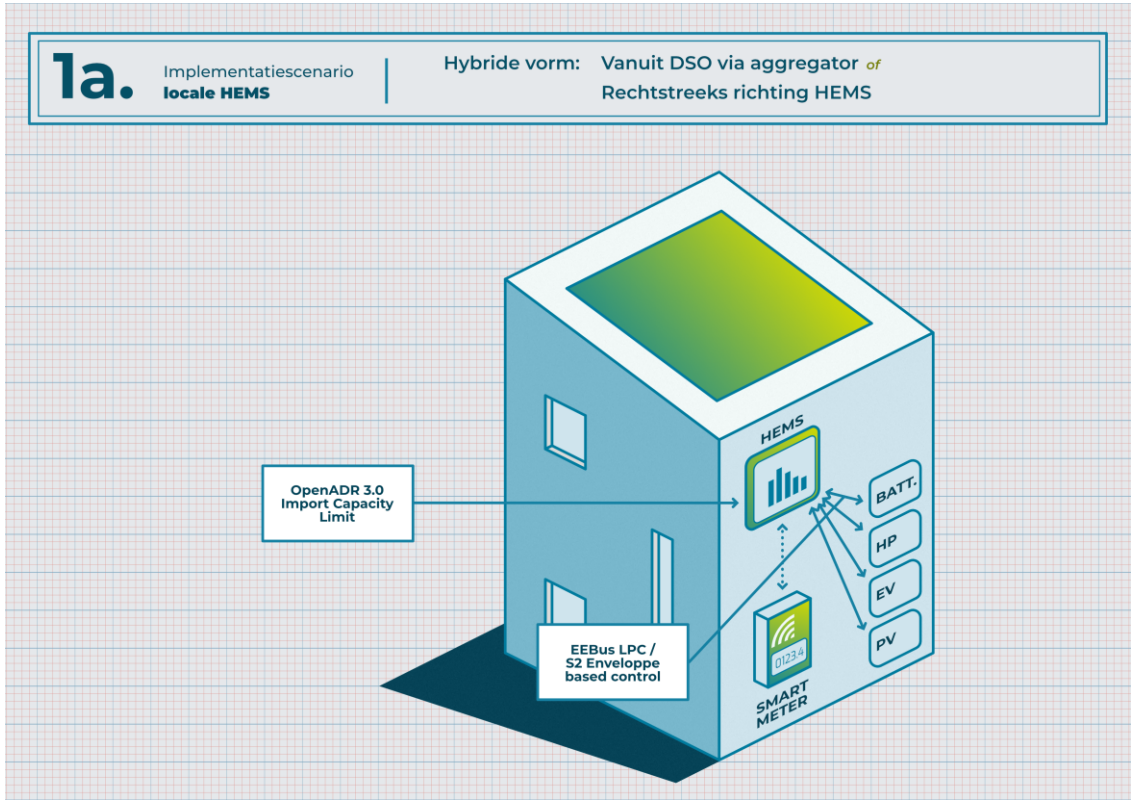
Specific flexibility protocols are used sparingly, generic protocols and tailor made methods are more popular

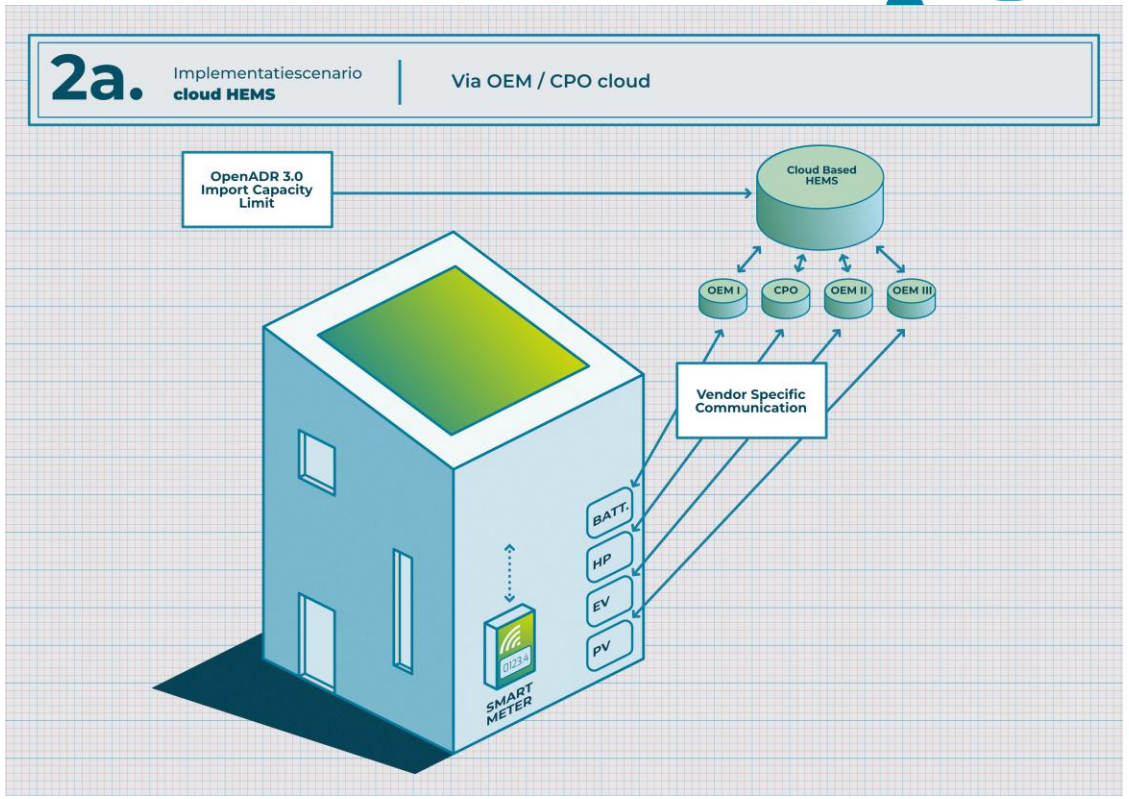
MODBUS RTU is applied most often within homes

Future homes:
API's and OpenADR

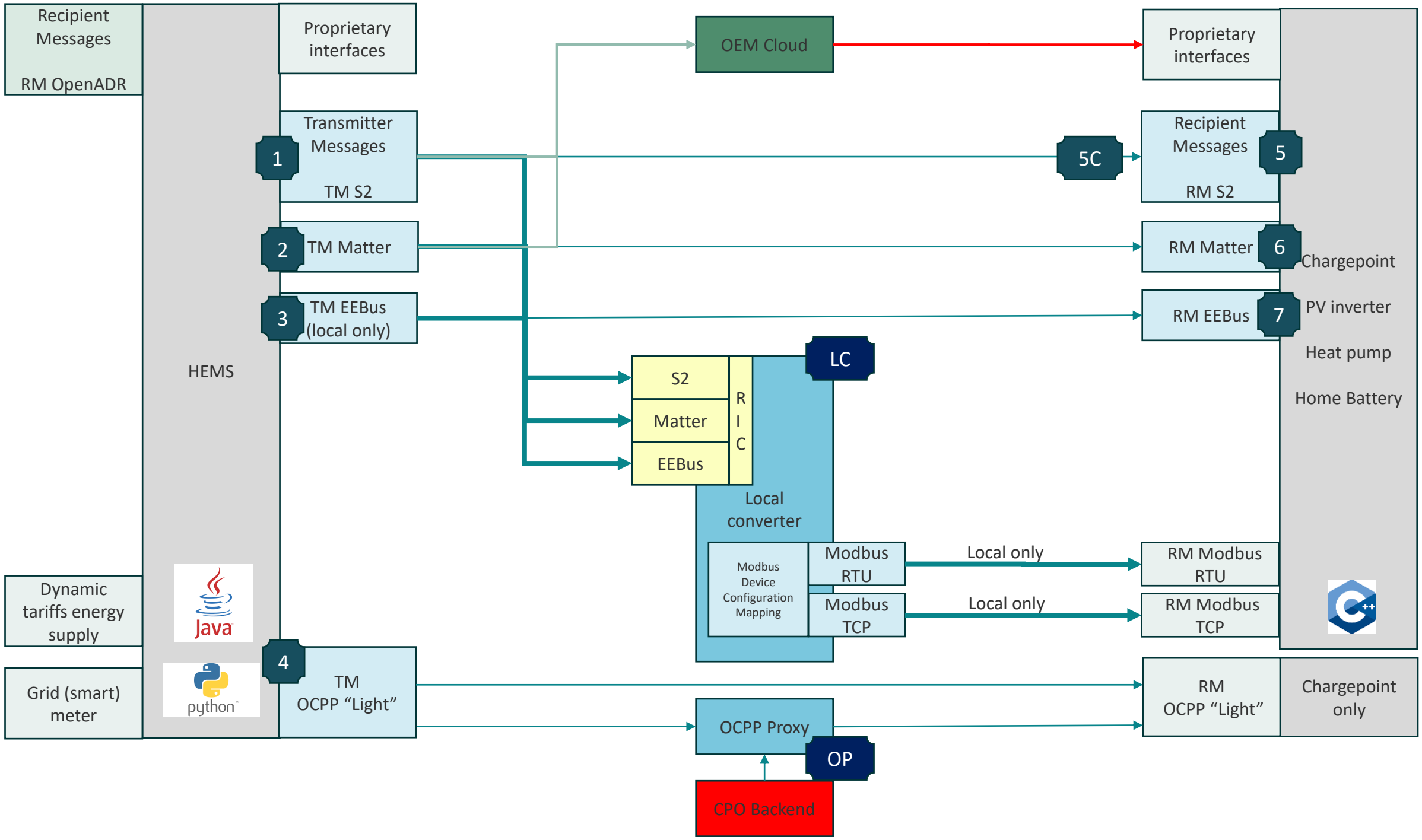
Current practice is <u>not</u> interoperable

Interoperability is needed





Interoperability helps to prevent lock-ins and minimise costs for consumers


Recipient Messages
RM OpenADR
Proprietary interfaces
OEM Cloud
Proprietary interfaces
Transmitter Messages
TM S2
1
5C
Recipient Messages
RM S2
5
2
TM Matter
RM Matter
6
Chargepoint
3
TM EEBus (local only)
RM EEBus
7
PV inverter
Heat pump
Home Battery
HEMS
LC
S2
Matter
EEBus
RIC
Local converter
Modbus Device Configuration Mapping
Modbus RTU
Modbus TCP
Local only
Local only
RM Modbus RTU
RM Modbus TCP
Dynamic tariffs energy supply
Java
python
4
TM OCPP "Light"
Grid (smart) meter
OCPP Proxy
OP
CPO Backend
RM OCPP "Light"
Chargepoint only

Interoperability is needed

		HEMS	HEMS Cloud (optional)	Device
WP1	**S2**	1A: PEBC control implementation	1C: PEBC receiver (optional)	1B: PEBC control implementation
WP2	**Matter**	2A: Matter HEMS	2C: Matter-Compatible Cloud Gateway (optional)	2B: Matter Device
WP3	**EEBUS**	3A: SHIP and SPINE		3B: SHIP and SPINE
WP4	**Modbus**			4A: Local Converter Modbus
WP5	**OCPP**	5A: OCPP "Light" Connector		5B: OCPP Controller

Interoperability helps to prevent lock-ins and minimise costs for consumers

Request for proposal

The aim is to ensure that, from 2027 onward, 'plug and play' HEMS, home chargers, PV inverters, heat pumps, and home batteries from multiple suppliers are available on the market.

2025-2026 | 2027-2029 | 2030+

RFI:
Market consultation to gather feedback on proposed choices and principles to enhance interoperability.

Thematic deep-dive workshops.

RFP:
Project for developing open-source software

Integration Phase
+
Interoperability Test Phase

27 parties responded, from all over Europe

18 parties attended in real life sessions

15 proposals

Thank you!

RESEARCHING AND TESTING
SMART AND SUSTAINABLE
CHARGING