



Home Energy Management



About LCP Delta

Our mission is to enable a better, faster energy transition for all

Founded in 2004 and based across the UK, France, Norway, the Netherlands and beyond, LCP Delta provide data-driven research, consultancy, technology products and training services to companies investing in and navigating the energy transition.

We are a diverse team from a variety of backgrounds including engineers, data analysts, environmentalists and more.

LCP Delta is a mission driven organisation - all of us want to make a difference to the energy transition and accelerate the path to a low carbon future.

The energy market is becoming increasingly complex. As consumers become more empowered and as energy systems around the world decarbonise, there is a need to understand both the generation and demand side to effectively navigate the rapid changes occurring.

We know it's a complicated topic, and we're here to help.

Andy Bradly, Partner, LCP Delta

LCP Delta was formed through the merger of Delta-EE and LCP Energy to bring together deep generation and consumer-side expertise, to provide our clients with a single partner to help them on their journey and provide them with a 360° view across the energy spectrum.



Andy Bradley
Partner
andy.bradley@lcp.com



Jon Slowe
Partner
jon.slowe@lcp.com



200+
Global clients



6
offices



110+
Colleagues

LCP Delta...

provides the best advice, support and tools to enable the energy sector to drive the energy transition



Subscription research services

Our portfolio of subscription research services offer in-depth insights across the energy transition landscape. We have been undertaking primary research with organisations active in the energy transition since 2004 – we have an unparalleled international network of contacts we can draw on. Each service focuses on a particular aspect of the energy transition.

Market and strategic advisory consulting

We provide support across the full energy value chain with bespoke research, insight, forecasts and advice tailored to them. Our consultancy offerings draws on expertise and data from across LCP Delta, from strategic market entry analysis through to detailed half-hourly revenue forecasting.



We support our clients in four ways



Technology & data

Data integration and analysis is at the heart of the energy transition. However, sourcing and navigating complex, wide-ranging datasets is challenging. At LCP Delta, we combine and curate proprietary and public datasets to provide you with a single source of truth across the energy spectrum and make this data interactive using our cutting-edge technology.

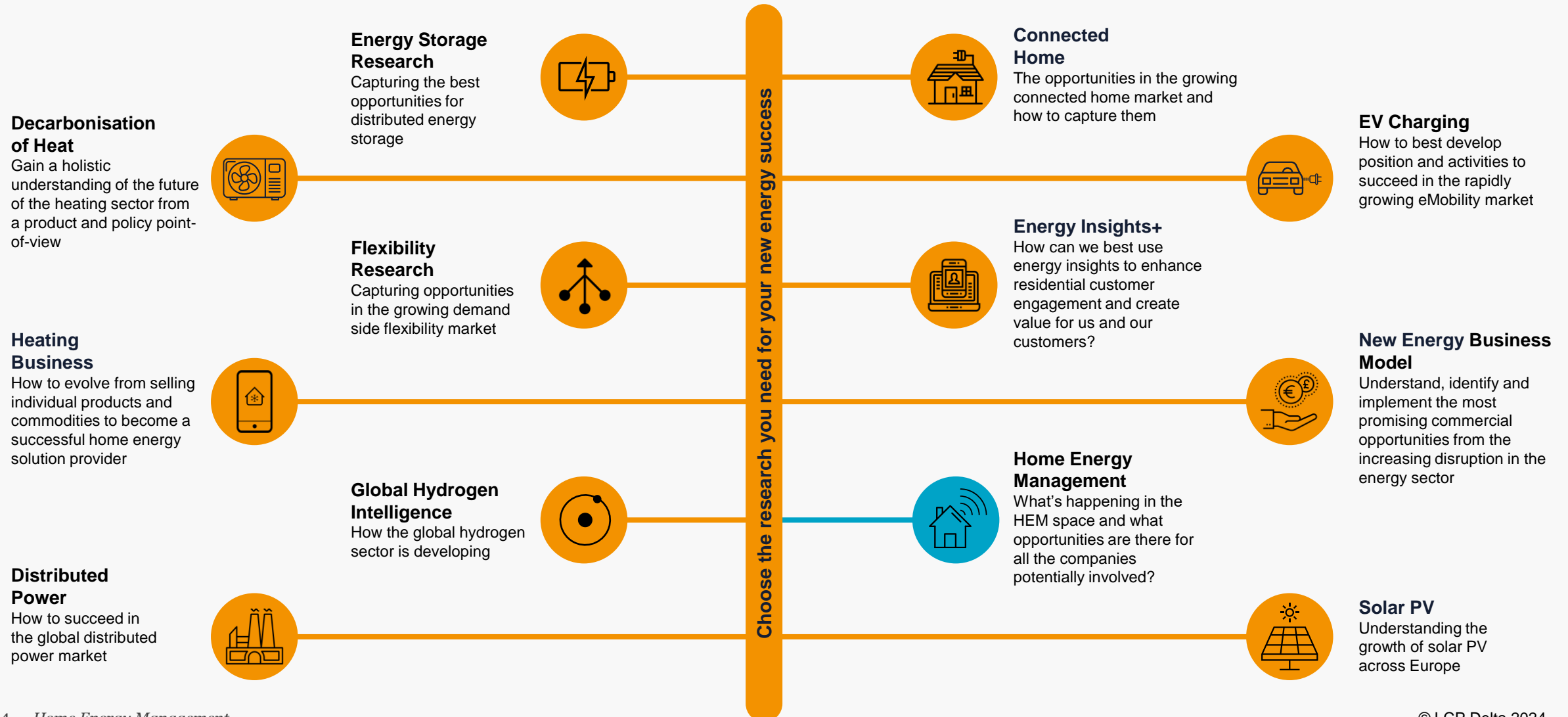
Training

Our training helps professionals quickly develop their new energy knowledge, accelerating their impact for organisations who want to capture opportunities. We provide meaningful, concise and easy to understand short courses.



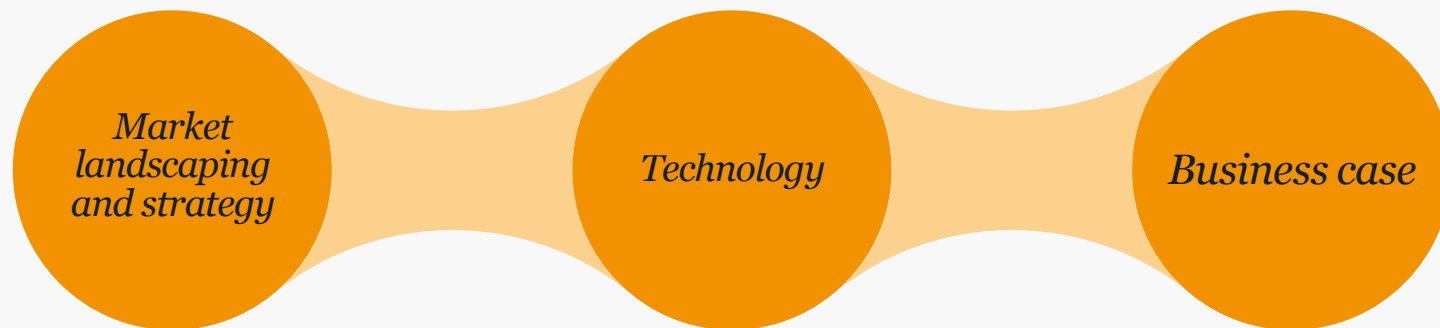
Subscription Research Services

Use a combination of our subscription research services, bespoke consultancy projects and training services to gather the information you need to ensure your business's success in the energy transition.



When we talk about HEM to organisations across Europe, it is at the center of the innovation roadmaps, or already part of the day-to-day business.

Home Energy Management



How is the market evolving, and what trends and opportunities are emerging?

How are companies positioning themselves in the market, and who are the successful players?

What's the current state of interoperability in home energy management systems, and how will this evolve?

How will home energy management evolve as the number of energy assets in homes increases?

How are protocols, standards, and communications technology developing, and how will this affect the Home Energy Management market?

What are the most promising business models and propositions in the Home Energy Management market?

How will global technology trends and big tech impact the Home Energy Management market?

Clients we support



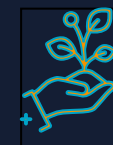
Govt, Regulators & System Operators



Energy retailers



Product manufacturers



Solution providers

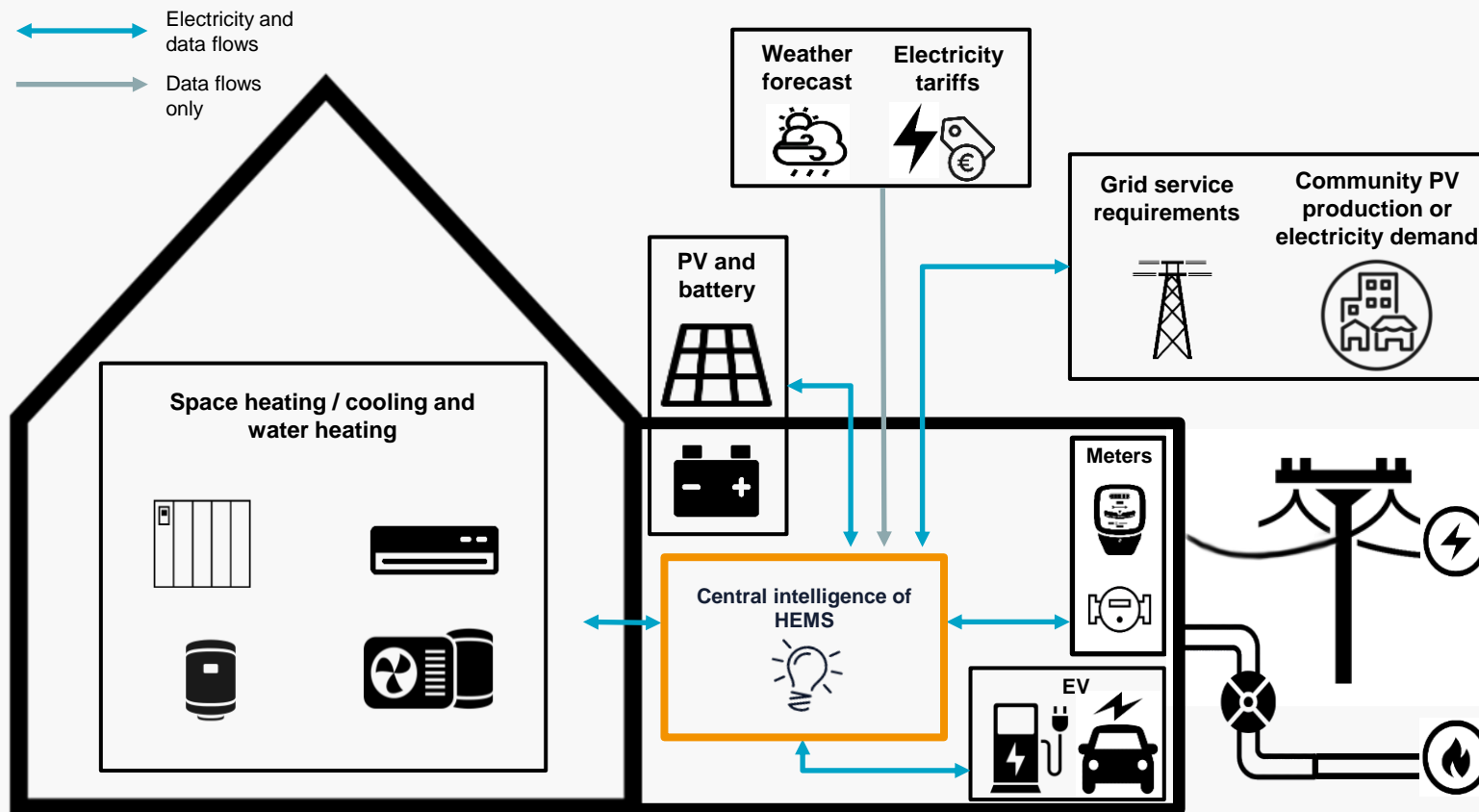


Investors

Home Energy Management provides...

data, analysis, insights and opinion on how the home energy management market is developing, enabling you to understand and capture the best opportunities

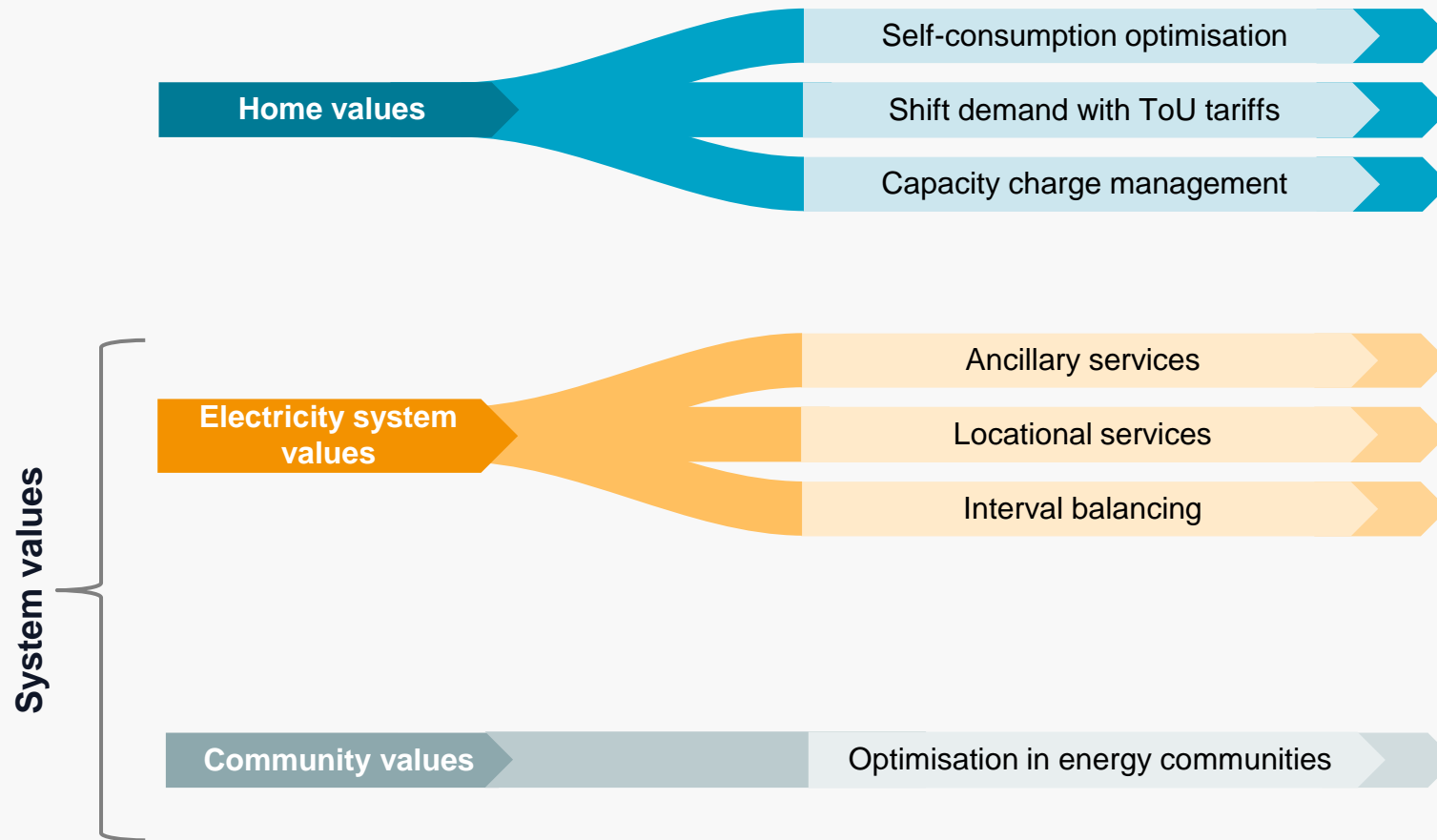
Typical assets involved in a HEMS



Our reports

- ☒ In-depth reports
- ☒ State of the market
- ☒ Viewpoints
- ☒ Customer surveys
- ☒ Databases

Exploring the value of HEM



Direct home values

Primary values for end users, accessible via PV self-consumption or electricity tariff optimisation.



Electricity system values

Grid values that customers can access when shared by companies managing their assets, including TSO ancillary services, local congestion management, DSO services or balancing energy provider's portfolio and retail positions.



Community values

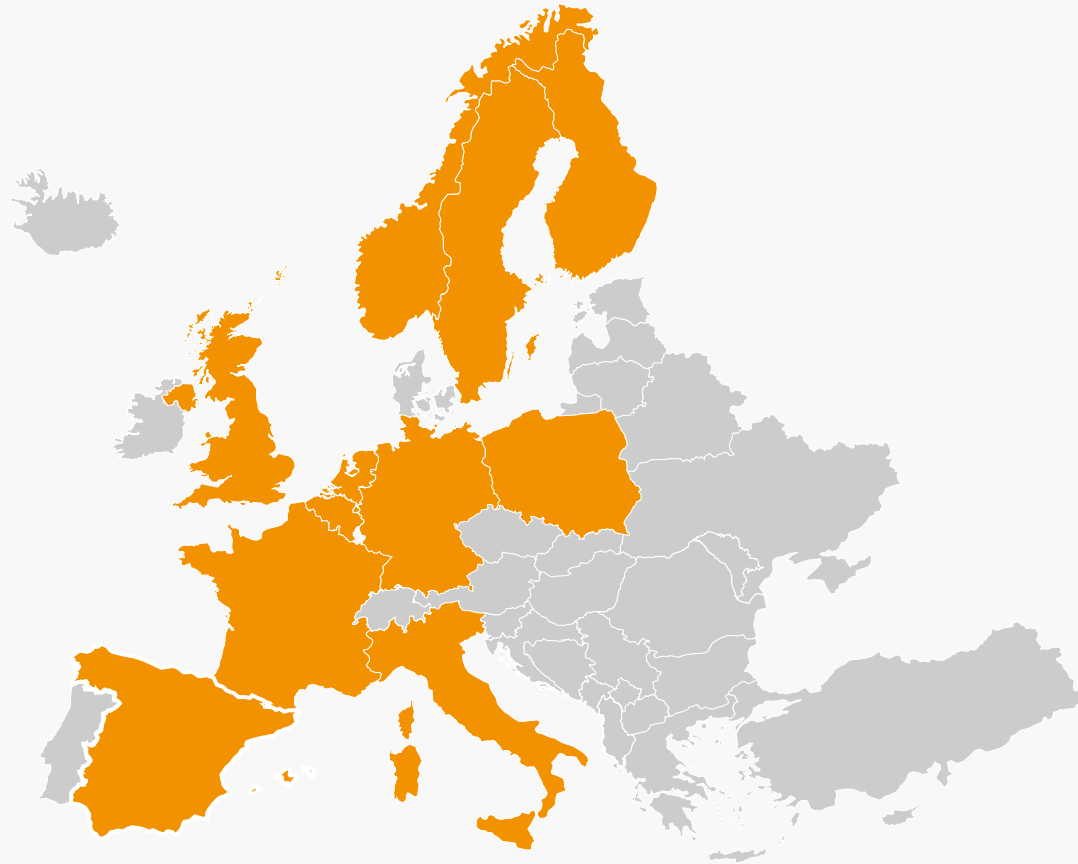
Optimising the energy supply within a physical or virtual community and enable business models such as Peer-to-Peer (P2P) trading, where customers sell their self-generated PV to each other.

TSO: Transmission System Operator
DSO: Distribution System Operator

*Currently not accessible to residential assets in Europe.

European Markets

HEM and HEM-related electrical assets



and expanding...

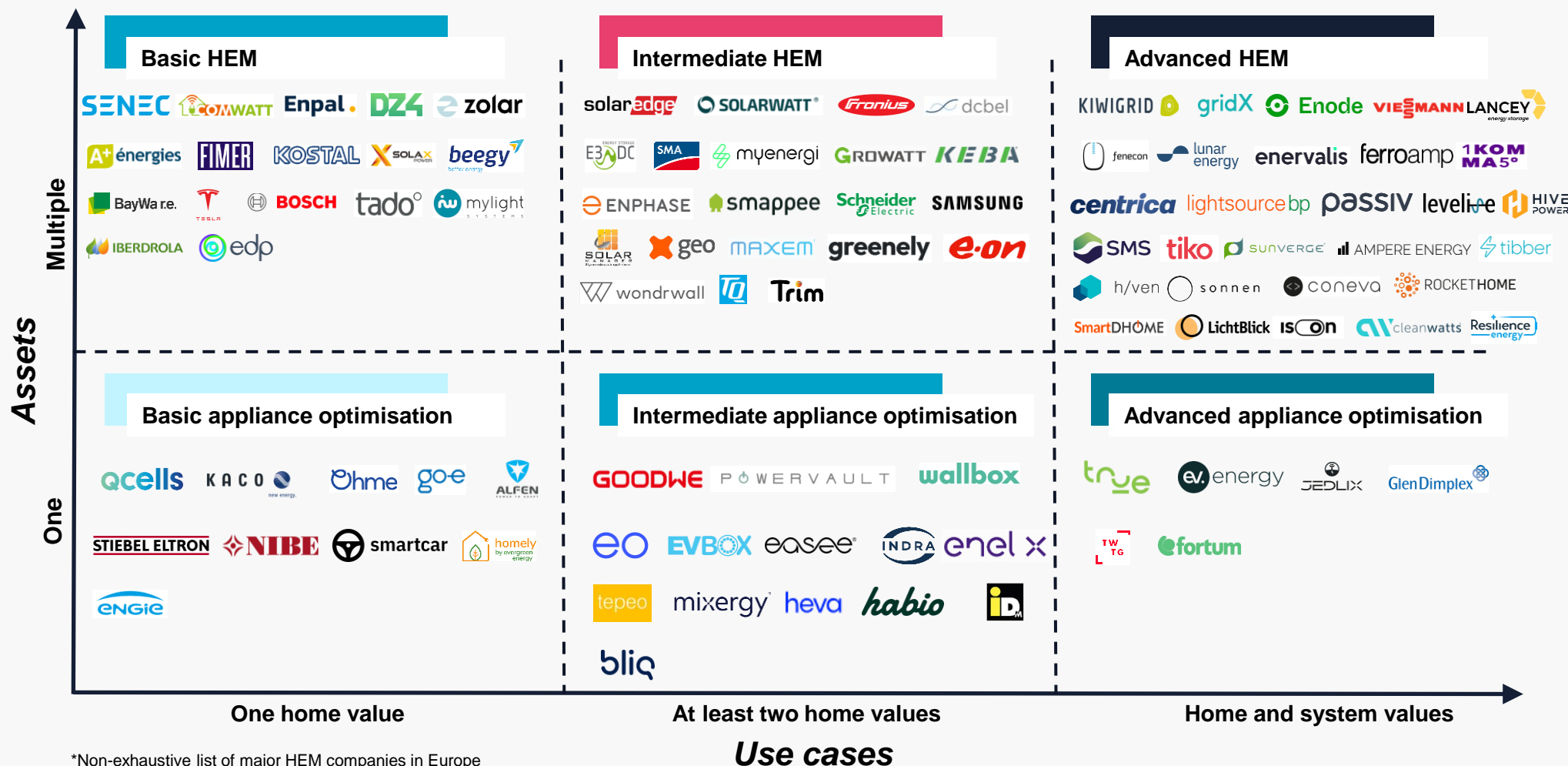
European HEM Players

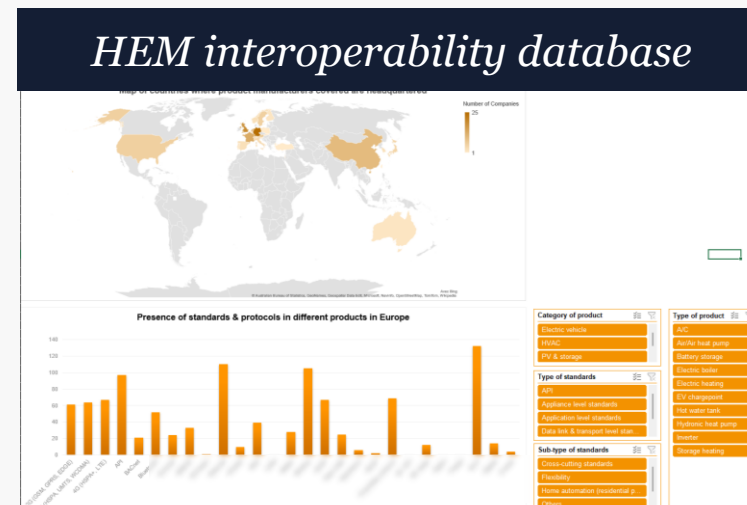
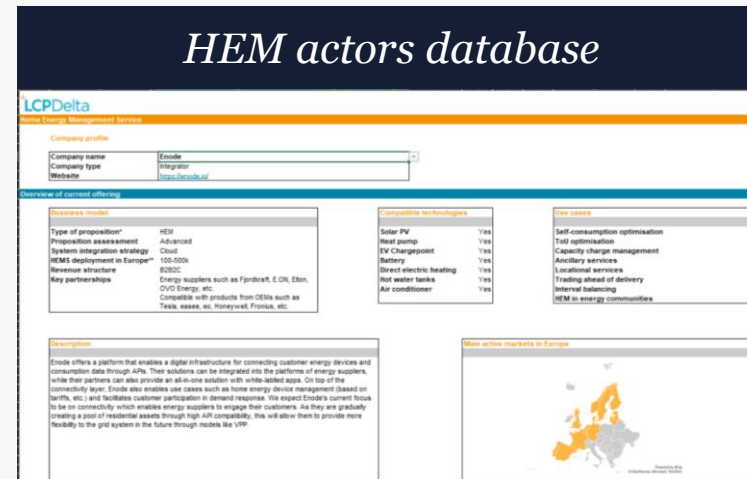
>70

Actors offering
HEMS in Europe

>110

Actors offering
HEMS or
appliance
optimisation
systems in
Europe





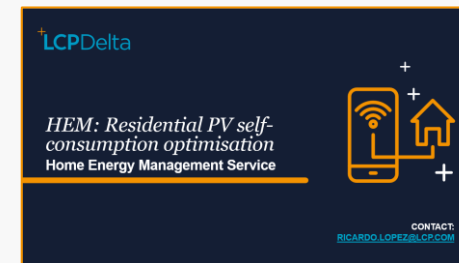
Recently published reports



HEM: EV smart charging



HEM Customer Research 2023

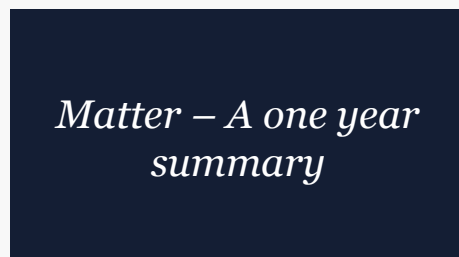


HEM: PV self-consumption optimisation



The role of smart meters in HEM

Live research¹



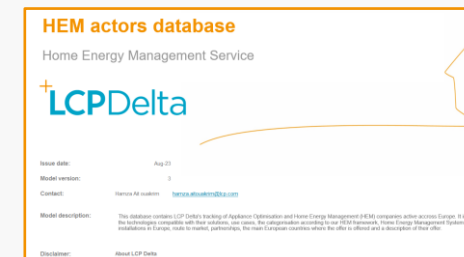
Matter – A one year summary



What role will HVACs play in the HEM market?

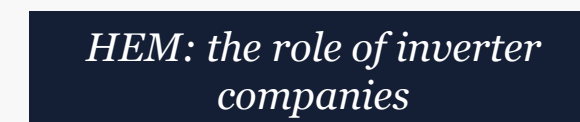
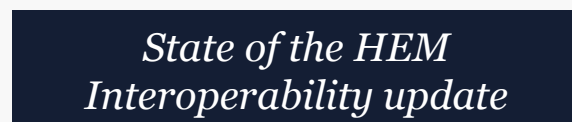


HEM systems and loads sales database²



HEM actors database²

Future research



¹To be published in the next few months

² Frequently updated

How our research helps your business


The Service provides data, analysis, insights and opinion on how the connected home market is developing, enabling you to understand and capture the best opportunities.

Benefits

- Understand who is really doing what and see who is actually doing Home Energy Management VS those who are not but pretending to
- Be equipped with the best-in-class data to support your decisions
- Challenge your views with some of the best experts about this market in Europe
- Identify competitors and/or partners
- Understand the challenges ahead for those who want to invest in HEM
- Have the confidence that this market is going to be a central point of the energy transition, based on neutral, objective and well researched opinions.

Example clients

- eMobility specialists
- Car OEMs
- Inverter/battery specialists
- HEM specialists
- Energy suppliers
- HVACs
- Electricity OEMs



LCP Delta writes reports in a consumer-friendly way, making complicated information simple to understand.

Policymaker



Research highlights

Fundamentals of HEM

Synopsis

The Fundamentals of Home Energy Management (HEM) report explores the HEM ecosystem and its main characteristics. It also presents the LCP Delta HEM framework and analyses the current market status by benchmarking major European HEM players. The main takeaways are:

- A HEMS autonomously monitors, controls and optimises the timing, volume and mix of energy flows within the home, in order to minimise customer's energy costs while meeting customer's preferences (such as comfort, EV use, carbon emission, etc.).
- Advanced HEMSs, while accessing multiple value streams, remain less common than appliance optimisation today.
- HEM providers are evolving towards more advanced models by integrating more assets and expanding use cases while interoperability, technical complexity and customer awareness remain as main hurdles.

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Executive summary (1/2) LCP Delta's definition of Home Energy Management

Three aspects defining the characteristics of a HEMS:

1. Optimisation
Optimisation must be autonomous and can be based on one or several parameters.

2. Connectivity and compatibility
Advanced HEM entails connecting to multiple devices inside the home and to the cloud.

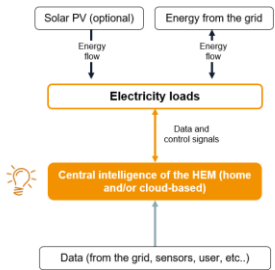
3. Use cases
There are many use cases including self-consumption optimisation, shifting demand, and more.

A Home Energy Management (HEM) system autonomously monitors, controls and optimises the timing, volume and mix of energy flows within the home, in order to minimise customer's energy costs while meeting customer's preferences (such as comfort, EV use, carbon emission, etc.).

The HEMS optimises home energy use by leveraging main residential electricity loads based on a variety of parameters and data sources.

Therefore, a HEMS creates value for householders, while also potentially creating value from the wider energy system which can also then be shared with householders.

Data, controls and energy flows within a HEMS – simplified diagram

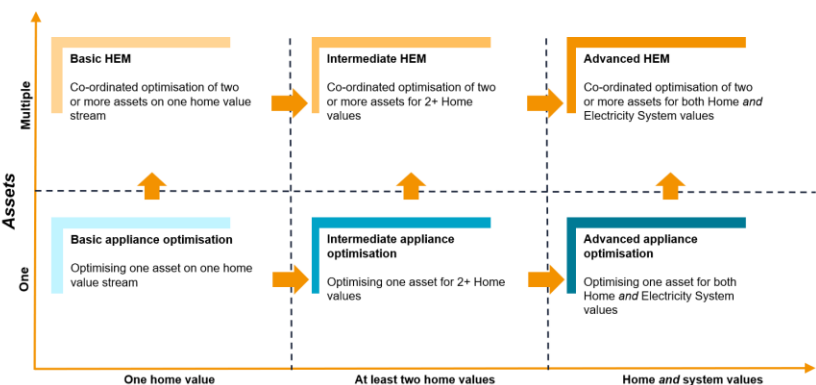


Executive summary (2/2) LCP Delta HEM framework and examples

Optimising one appliance on one or two value streams is becoming common in the European market.

More complex and advanced solutions that integrate several assets and optimise on several value streams are still limited.

Interoperability, technical complexity, lack of value streams and customer awareness remain the main hurdles to the development of advanced HEMSs.



Annual HEM State of the Market

Synopsis

The State of the Home Energy Management Market report (2023) focuses on the current and future development of the HEM market across Europe:

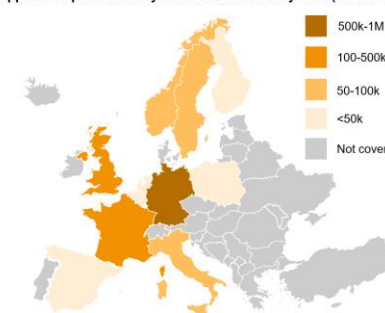
- The report contains an analysis of residential large electrical assets in Europe (including each product's installed base, market trends and a forecast to 2030).
- It summarises the HEM-related use cases, value streams, regulations and provides an assessment of their growth potential over the next five years in each market.
- It also includes a country-by-country (Belgium, Finland, France, Germany, Italy, The Netherlands, Norway, Poland, Spain, Sweden, The UK) analysis highlighting the drivers and barriers to the HEM market and provides HEM solution sales forecasts to 2030.
- Finally, the report includes a competitor landscape based on each HEM company's use cases and covered assets.

Executive summary (1/3)

The installed base of electrical assets is fundamental to the development of HEMS, particularly residential PV and batteries in the current context

HEM value streams	Active countries
Self-consumption optimisation	
ToU tariff optimisation	
Capacity charge management	
Ancillary services	
Locational services	
Interval balancing	
Energy community optimisation	

HEMS and appliance optimisation system installed base by 2022 (household)



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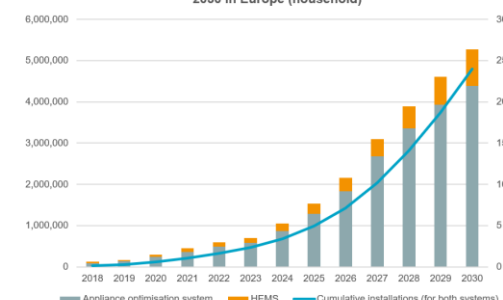
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Self-consumption optimisation / Time-of Use tariff optimisation / capacity charge management / electricity system services / energy community optimisation / subsidies / other regulations related to connectivity or interoperability		The Netherlands	
		Norway	
		Poland	
		Spain	
		Sweden	
		The UK	
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Executive summary (2/3)

The high market growth rate is expected to be sustained, driven by increasing appliance connectivity and the growing demand for grid balancing

- 1.6M HEMS and appliance optimisation systems were installed in Europe in total by 2022 (holistic HEMS currently represent 19% of total installations).
- Compared to 2021, the market grew by 33% last year, mostly driven by the growing demand for PV self-consumption optimisation in the context of energy crisis.
- Other factors such as: household electrification, volatile electricity prices, openness of the Demand-Side Flexibility (DSF) market and the development of the ToU tariffs have also contributed to market growth.
- In the long term, the market is expected to grow at a 40% CAGR to 2030, driven by increased customer awareness, improved appliance connectivity and the growing need for grid balancing pushed by the energy industry.

HEMS and appliance optimisation system annual sales forecast to 2030 in Europe (household)



State of HEM interoperability

Synopsis

This report is an update on the state of interoperability of home energy management (HEM) in Europe. It provides a summary of current communication protocols & standards adopted by major HEM assets (HVAC appliances, EV chargepoints, inverters, battery storage, etc.), cloud API development for each asset, interoperability strategies of asset manufacturers, and integration approaches of HEM solution providers.

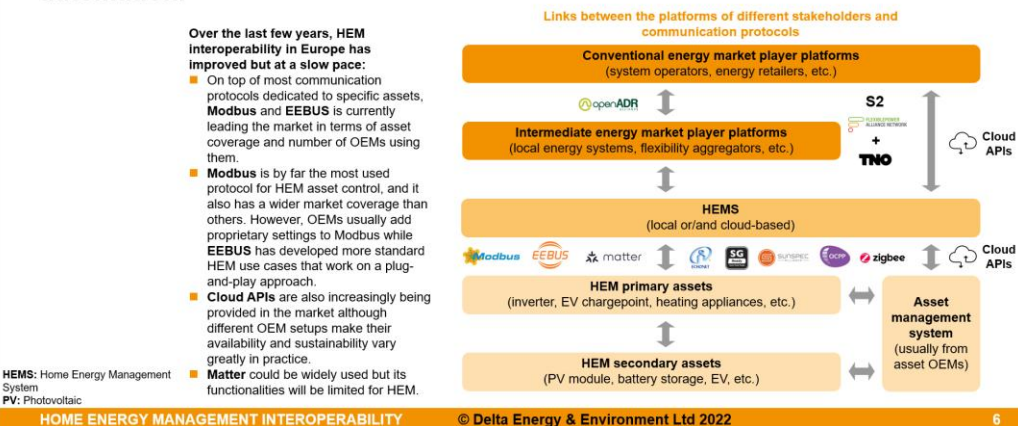
The report also analyses the benefits that stakeholders across the HEM value chain can gain from interoperability and discusses the possible impact of other important factors (IT giants, regulation, alliances, etc.) on the future HEM interoperability development.

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Protocols and standards for: cross-product integration, inverter, battery, heating & cooling, EV charging, smart meter, data transmission and energy system services			
Cloud APIs			

Executive summary (2/3)

Modbus, EEBUS and cloud APIs are the most common approaches to achieving interoperability today. Matter is likely to lead to home automation.



Executive summary (3/3)

OEMs have different approaches for API availability and protocol backing

Click to add text	Inverter OEM	Battery OEM	EV chargepoint OEM	HVAC OEM
Tier 1: Help promote HEM interoperability Compatible with cross-cutting HEM open protocols / promote commercialised and easy access APIs*	KOSTAL SMA	TESLA	EVBOX hager juice Schneider Electric MENNEKES SIEMENS enel x legrand	BOSCH DAIKIN VAILLANT BDR THERMA GROUP VIEHMANN Panasonic MITSUBISHI ELECTRIC STIEBEL ELTROTH
Tier 2: Maintains basic interoperability Compatible with most open protocols within its own industry / provides API access	ENPHASE FIMER Fronius solis GOODHE GROWATT Ingeteam SEAR solar edge XENOS SUNBIRD	sonnen SENECE Jencon E3DC VARTA SOLARWATT Alphasys	ABL Ohme e2energy EO ROLEC DBT wallbox pulse adidas -chargepoint G40 stryker heliox	ARISTON NIBE SAMSUNG LG FADAX mixergy
Tier 3: Maintains limited interoperability Compatible with a small number of open protocols within its own industry / provides limited or no APIs	KRACO	BYD LG Chem	KEBA ambibox ecotap zpn energy Loaded FIMER Ingeteam necom Jkoss Schneider	GRUPE ATLANTIC FUJITSU RIELLO GenDimplex Hitachi

HVAC: Heating, ventilation, and air conditioning

* All OEMs have been categorised based on publicly available information on the open availability of APIs and their backing of certain communication protocols.

HEM loads competitor landscape

Synopsis

This report summarises the competitor landscape in the European markets for Home Energy Management (HEM) and wider HEM loads (inverters, batteries, EV chargepoints, heat pumps, air conditioners, etc.).

It also covers the installed base and sales forecasts for HEM loads in five key countries (including Germany, France, Italy, the Netherlands and the UK), as well as the main activities of different players in these markets regarding HEM.

We plan to expand the list of countries in future research.

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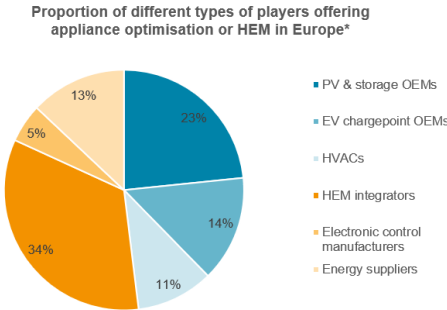
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Executive summary (2/3)

Who is innovating in the HEM market?

The types of competitors in the European HEM market are becoming increasingly diverse as more opportunities open up.

- One third of the players offering appliance optimisation or HEM solutions in the market today are HEM integrators. They often offer customers, either directly or through partners, a HEM service package compatible with different types and brands of HEM loads.
- An increasing number of HEM loads OEMs are also developing HEM platforms around their legacy products. However, due to challenges such as interoperability, only a few solutions are currently available to optimise multiple loads.
- Energy suppliers are also active in this market through partnerships with OEMs and HEM integrators.



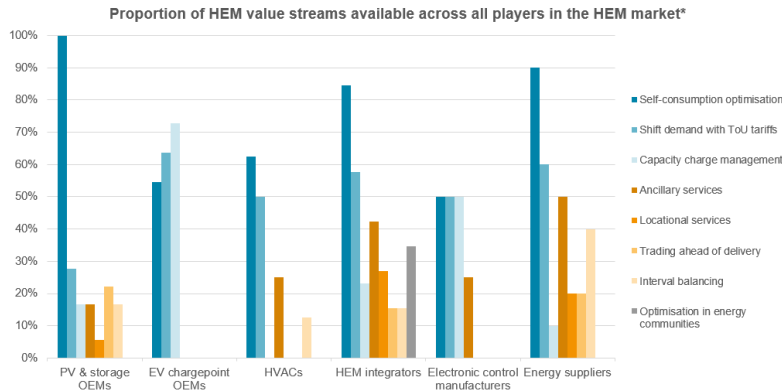
*Including 77 appliance optimisation or HEM companies in Europe (find definitions of appliance optimisation and HEM [here](#)).

Executive summary (3/3)

Which HEM value streams are being created by these players?

Integrators and energy suppliers are generally involved in broader value streams, covering both home and system use cases.

The availability of HEM value streams is determined by the readiness and openness of different markets.



*Including 77 appliance optimisation or HEM companies in Europe (find definitions of appliance optimisation and HEM [here](#)).

PV self-consumption optimisation

Synopsis

This report provides a summary of the 2022 residential solar PV (<10 kW) and self-consumption market in Europe (including 13 countries: Belgium, Czech Republic, Germany, Spain, Finland, France, Italy, the Netherlands, Norway, Poland, Portugal, Sweden and the United Kingdom).

- The report provides statistics on residential PV annual installations, installed base and projections up to 2030 in the countries covered.
- It also analyses the key trends within the residential PV market and calculates the payback times for PV investments in different countries.
- Finally, the report analyses how HEMS can optimise the use of different household energy assets in order to improve PV self-consumption.

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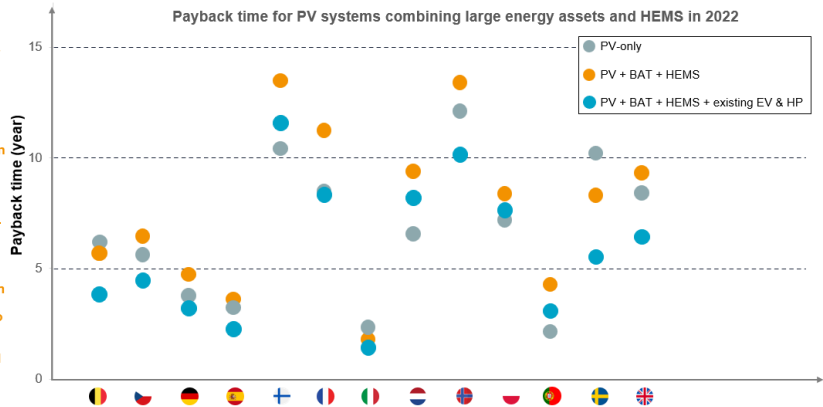
Executive summary (2/3)

HEM shortens the payback time of PV (plus storage) investment

The payback of PV investment has been reduced across Europe, due to increasing electricity prices in 2022, and government subsidies.

However, some markets still have payback of more than ten years, especially when batteries are added, which is a barrier to customers' willingness to invest.

HEMS could shorten the payback of PV (with or without batteries) by ~15% on average, which is roughly a gain of 6 to 18 months, depending on the system size and load type.



*Only the upfront costs of PV system, battery and HEMS are included in this model.

HOME ENERGY MANAGEMENT

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Executive summary (3/3)

Three key steps for HEMS to optimise PV self-consumption

Visualisation	Automation	Monetisation
<p>Visualising the home energy flow at device level:</p> <ul style="list-style-type: none">■ A dashboard that breaks down the flow of PV generation between whole household consumption, grid injection and battery storage (if present), is the most common feature of customer-facing PV Apps.■ A HEMS visualises the consumption down to individual load levels as it connects and controls more set points of the different loads. This is very different from other visualisation solutions based on CT clamps, optical readers, smart meters, etc.■ Beyond visualising energy flows, HEMS could potentially show additional energy and appliance data such as energy bills, appliance operation status, weather conditions, etc. in order to help customers better understand the benefits they get from optimising self-consumption.	<p>Improving the use of PV while meeting the customer's lifestyle needs:</p> <ul style="list-style-type: none">■ PV generation is concentrated in peak sun hours. A HEMS could turn on as many appliances as needed during this period, which helps to maximise the use of free electricity.■ When an EV is plugged in, HEMS can charge it during peak generation hours with excess PV power. If the consumer has set the time for when the vehicle is needed, the power output can be maximised to fully charge it on time.■ Similarly, HEMS can operate heat pumps or hot water tanks at full power during peak generation hours, and in energy saving mode during off-peak hours. Excess power can then be stored in the form of hot water.■ With a battery installed, PV electricity can be stored for use during low production hours, minimising changes in user consumption patterns and improving the self-consumption rate.	<p>Managing import / export tariffs and requirements to further monetise PV:</p> <ul style="list-style-type: none">■ Maximising the use of free electricity from PV is the most important approach to monetise PV systems in markets where net-metering doesn't exist.■ When customers subscribe to a dynamic retail tariff and net-billing (exporting at wholesale prices), HEMS can choose to import or export electricity based on real-time tariffs to benefit from price differences.■ As the PV market grows, some markets are considering limiting PV output to address local network congestion (e.g., Germany used to limit small systems to 70% of peak capacity connected, a law that expires from 2023 but still applies to previous systems). HEMS help prosumers meet grid regulations by balancing generation and consumption.

HOME ENERGY MANAGEMENT

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Contact us



Leon Gielen

Head of Business Development Asia

+31 (0) 617935006

leon.gielen@lcp.com

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