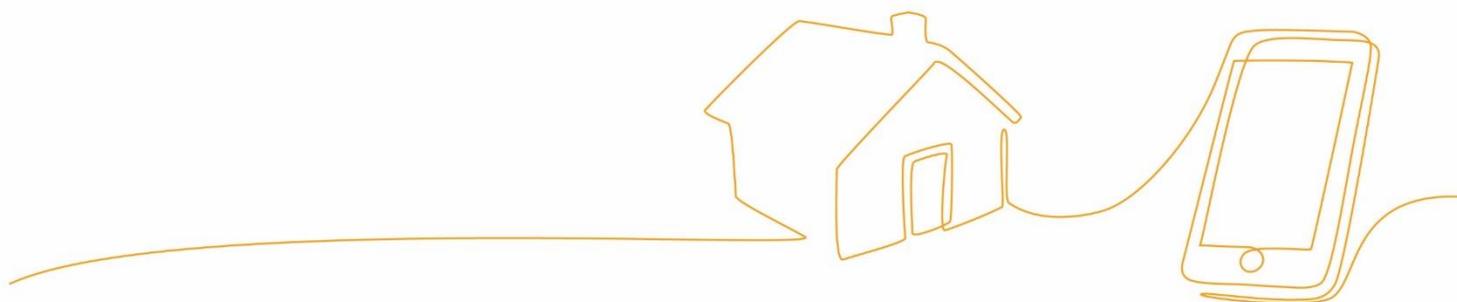




Accelerating the energy transition with Home Energy Management

Why the HEM market is at a tipping point in Europe



Delta-EE New Energy Whitepaper

Report written by: Arthur Jouannic arthur.jouannic@delta-ee.com
Alix Weil alix.weil@delta-ee.com
Ricardo Lopez ricardo.lopez@delta-ee.com

Report reviewed by: Jon Slowe jon.slowe@delta-ee.com

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Delta-EE is a leading European research and consultancy company providing insight into the energy transition. Our focussed research services include Connected Home, Electrification of Heat, Electric Vehicles, New Energy Business Models, Digital Customer Engagement and Local Energy Systems. We also provide consultancy for clients including networking companies and policymakers. Delta-EE's mission is to help our clients successfully navigate the change from 'old energy' to new energy.

Delta address and contact details

Edinburgh: Floor F Argyle House, Lady Lawson Street, Edinburgh, EH3 9DR, UK +44 (0)131 625 1011

Cambridge: Future Business Centre, Kings Hedges Road, Cambridge, CB4 2HY +44 (0)1223 781 605

London: Sustainable Workspaces, 25 Lavington Street, London, SE1 0NZ

Paris: 2 Boulevard de Strasbourg, 75010, Paris, France. +33 6 51 33 73 74

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Executive summary

1

Home Energy Management (HEM) sits at the intersection of the energy transition and digitalisation. It couldn't exist without both, and both are accelerating. The pace is such that HEM will become a must-consider, for anyone who wants to be successful in new energy in the home. We predict that the market for HEM will grow significantly in the short term, and likely boom in the medium and long term, creating strong opportunities for a wide range of companies across Europe.

A decade ago, a lot of companies had been trying to position themselves in the HEM market. Not everyone is left from this time – many were far too early. Some of those who survived are now in a really strong position to grow. However, competition is growing from various industries, including the battery, electric heating, utility or even the automotive industry. Everyone wants to have a piece of the cake and more than 50 companies now have offerings in the European market, a number that keeps growing every year.

Today in Europe, over 20 million homes are equipped with large electrical loads, which include electric heating, battery, EV, PV etc. Only ~300,000 of these are connected to a HEM system today, but we expect that more than 2 million new HEM will be installed by the end of 2023.

The market will mostly be driven by a few countries initially. The Nordics are quite innovative when it comes to optimising dynamic electricity tariffs and large electric loads. Germany – the dominating PV and battery market in Europe – will see a strong growth as electricity prices are amongst the highest in Europe and as PV feed-in-tariffs stop. Other countries will follow but at a slower pace, at least initially.

All signs are positive, but a lot of questions – such as interoperability and standards – still remain unanswered. For now.

Setting the scene

2

Electrification of heat. Electrification of transport. Distributed generation and storage in the home. Access to residential demand side flexibility. Emergence of community peer to peer business models. Slow down of feed-in tariffs. Acceleration of smart meter rollout. Dynamic time of use tariffs made available to customers. Increasing electricity prices. Digitalisation of appliances in the home.

New energy in Europe is creating a wide range of opportunities for anyone involved in products or services linked to energy. As this space develops, there are clear needs to balance and optimise energy generation and energy consumption. Historically this balance has been top down, at national level using large power plants. We're in a transition to a new paradigm where this balancing will be done bottom up – using millions of assets in homes. Energy management is therefore becoming a crucial element of the energy transition, whether it is in buildings, in the grid or even across energy communities.

This whitepaper analyses why the HEM market is at such a tipping point, and the likely outcomes in terms of market size. It is structured in 5 distinct parts:

1. A Growing penetration of large electrical loads in the home
2. A rapidly evolving regulatory framework favouring the use of HEM
3. The increasing accessibility of different value streams
4. Companies are bringing new innovations to the HEM market
5. The size of the HEM market and the future trends

Why the HEM market is at a tipping point in Europe

1: A Growing penetration of large electrical loads in the home

The range of appliances used by the industry to optimise the energy flows in the home is widening. Accessible to HEM for retrofit, they have the potential to develop self-consumption, improve energy usage and give new access to electricity market values.

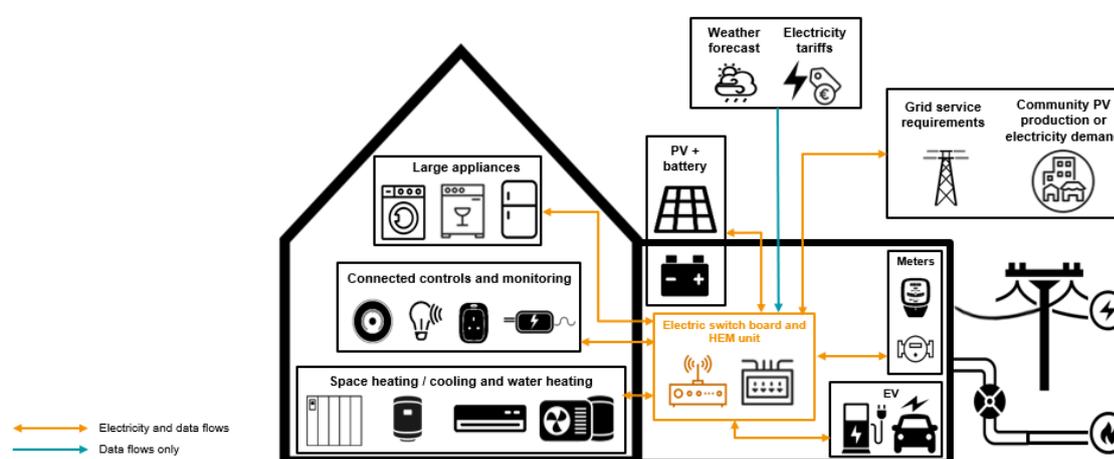


Figure 1: HEM as a central point of the home of the future

The penetration of large electricity appliances in households is steadily growing across Europe, leading to a significant potential for HEM solutions. For instance, almost 600,000 residential EV charging points are already spread across Europe; a number which will increase with the rapid uptake of EV. This trend is particularly apparent in the UK and Norway, where government incentives for eMobility are important.

Similarly, electrified heating solutions already equip around 20M households in Europe – reaching more than 50% penetration in some countries. The potential for HEM in these cases is therefore already large, and will grow higher as governments are pushing for more electrified or decarbonised heating. The Nordics and France, leaders in electrified heat, will have their HEM potential grow significantly on the back of that.

Lastly, with new trends in connectivity helping, white goods, batteries and PV can become part of a wider HEM ecosystem. By 2023, we expect the percentage of batteries interoperable – and consequently accessible to HEM – to have reached more than 70%. Countries with significant PV and battery markets today will therefore represent a large uptake in HEM. This is the case of Germany with 6% of households equipped with PV, and potentially Belgium if the net metering is removed over time.

2: A rapidly evolving regulatory framework favouring the use of HEM

Regulatory frameworks impact the uptake of relevant technologies for HEM and the overall attractiveness of each European country. Among energy related frameworks, the availability of dynamic time-of-use tariffs (ToU), the access to the flexibility markets, the state of smart meters rollouts and the end of PV feed-in-tariffs in some countries, could particularly drive the interest in HEM.

Smart meters rollouts are now almost accomplished in the Nordics, Italy, Spain and the Netherlands, even if now some countries are rolling out a second generation of smart meters. The other European countries, except for example Germany, will achieve theirs in the coming years enabling more granular data on energy usage. Smart meters will be enablers rather than pure drivers, as their presence will improve the performance and availability of HEM solutions, accelerating their uptake.

The availability of dynamic ToU tariffs allows end-users to access wider financial values from HEM. The Nordics are the most advanced markets for ToU tariffs in Europe and represent the highest relative HEM uptakes currently, a trend which will persist in the future. As more countries offer ToU tariffs, HEM sales are expected to progress significantly.



Figure 2: Availability of dynamic ToU tariffs across Europe

After years of financially appealing feed-in-tariffs to kick start the PV market, **governments are gradually removing these incentives**. It means customers will have unappealing export tariffs and would rather benefit from self-consuming the electricity generated on their roof. A combined installation of a battery and a HEM system will optimise self-consumption and provide a lot of savings to customers, particularly in countries where electricity prices are high (e.g. Germany).

Lastly, the opening of the flexibility markets to residential loads will enhance the benefits carried by HEM solutions. The UK, France and the Nordics have already opened their markets, increasing their potential for HEM in the next few years.

3: The increasing accessibility of different value streams

Home Energy Management is a route to unlock home energy values, such as optimisation of self-consumption, of dynamic electricity tariffs, or even capacity charges for countries partly billing customers on their base load.

Home value streams provide direct value to the customer by reducing electricity import from the grid, especially at times when it is more expensive. Self-consumption of PV is the most common and simple value stream accessed; players such as energy suppliers, battery and electrical appliances manufacturers are already active in this market. This value can be maximised if combined with a battery to store the excess of electricity generated from around 30% to 70%. An emerging value stream for the customer is the automated demand shifting reacting to dynamic time-of-use tariffs, which will become more relevant with the availability of these tariffs across Europe.

However, as energy management is becoming a crucial element of the energy transition – whether it is in buildings, in the grid or even across energy communities – the home part of energy management cannot be taken in isolation to the rest of the energy industry. There are clear crossovers between optimising the energy flows in the home and optimising those in the electricity system and in communities.

Home Energy Management can be a route to unlock access to different value streams and companies are starting to add electricity system values to their offerings (e.g. Sonnen). On the other hand, companies who focus on electricity system values, start to go the other way and offer home energy optimisation values (e.g. Tiko).

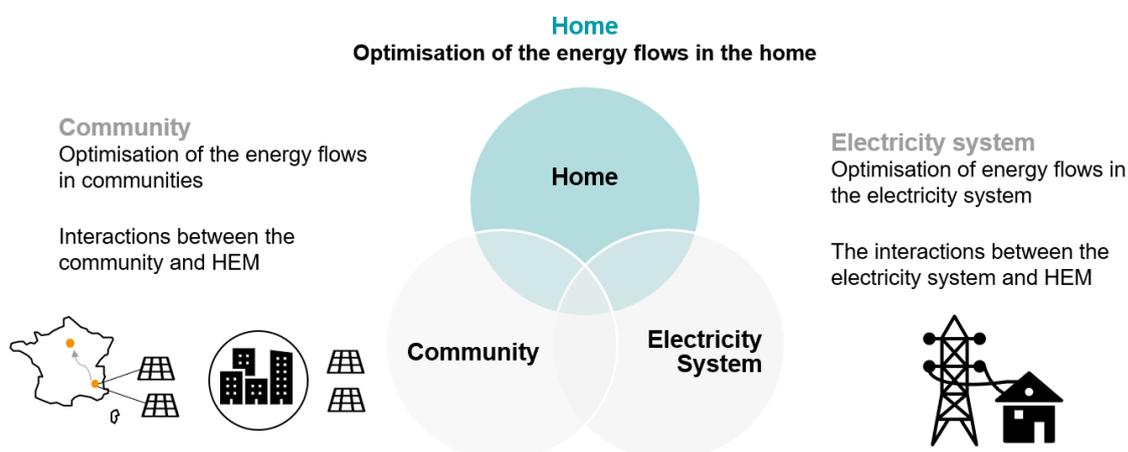


Figure 3: Energy Management value streams can be found across the home, the electricity system and the community

Here are some examples of values which will provide optimisation of the energy flows in combination with other parts of the energy system:

Electricity Systems are becoming increasingly complex to manage and balance due to growth of electrical loads (e.g. EV and electric heaters). As a result, TSOs are starting to procure ancillary services from residential assets, DSOs services as well and suppliers & generators. The latter can, as well, trade in the wholesale market. HEM solutions can facilitate the electricity system to capture value based on residential Demand Response. These values are available to

aggregators who can, sometimes, share the value with the customer. Wholesale markets will become more attractive as price volatility increases.

Community P2P value streams are accessible to national or local communities to maximise self-consumption of solar PV and it is created when customers sell their self-generated PV to others. Consumers are attracted to the idea of consuming locally-generated energy – HEM could potentially optimise these values in the future, as currently there is no HEM offer for this value stream.

Will we see a world where flexibility or community offerings will drive the HEM market? Or is it more likely that HEM focused companies will gradually move on to the electricity system and community values? The jury is out. But one thing is certain: each value stream will influence the other in more significant ways over time.

4: Companies are bringing new innovations to the HEM market

By playing a part in “optimising energy flows in the home”, a lot of companies can claim to be offering HEM. But in reality, HEM has a long and complex value chain, which even varies based on the use case offered. Those providing flexibility services will be more complex than optimisation of self-consumption for example.

We define this value chain as three main parts, as shown in figure 4, each of which have several elements within. Most companies only do one or a few parts of the HEM value chain and focus on innovating within this.

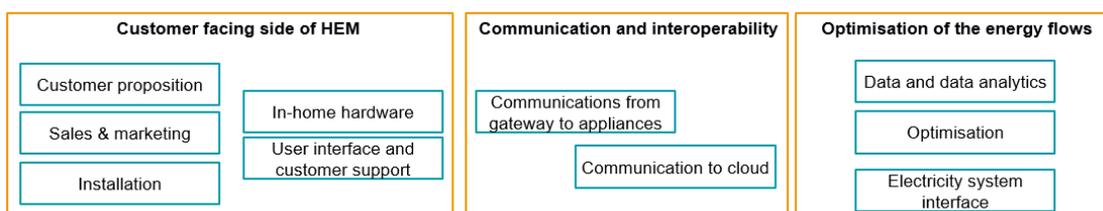


Figure 4: HEM has a long and complex value chain

Some companies will focus on the customer facing side of HEM. These will be innovative in their marketing and business model. Often these are the companies who already have a relationship with the customer, either by selling products (e.g. PV, EV Chargepoint etc.) or by offering services (e.g. energy supply, installation etc.). Energy suppliers such as Fortum or EDP, and product manufacturers such as NIBE and Vaillant are good examples of this.

Some companies will be communication and / or interoperability specialists. Their role is to ensure data flows between the HEM, the gateway, the appliances and the cloud. They will also often look up appliance manufacturer APIs and integrate the functionalities available to their platform. Connected home companies such as GEO and Passiv Systems are typically those specialising in this, but others such as Greencom Networks will have a dedicated team working on this (although these companies might also be working on more parts of the value chain).

Finally, the ‘actual’ optimisation of the energy flows is done in the background by companies specialising in this, who often aim at providing a white label platform on a B2B model for other companies involved in HEM. Tiko or Kaluza are good examples of such companies.

Overall, we found that over 50 companies are somehow active in the HEM market, some of which have a strong legacy in energy. This is the case of many energy suppliers, HVAC manufacturers or electricity OEMs, which are now diversifying their offer to include HEM products. Most aggregators or tech companies, have appeared more recently in this market, focusing their business models solely around HEM and sometimes positioning themselves as enablers. Enablers offer products or services to major companies, avoiding these ones to cover the whole HEM production chain. This is for instance the case of Tiko, who is doing a mixture of aggregation and PV self-consumption optimisation. Tiko aims at being a leading tech provider for companies playing in HEM and flexibility. Similarly, Kaluza, an OVO Energy company, focuses on providing software services to those who want to play in the HEM and flexibility markets.

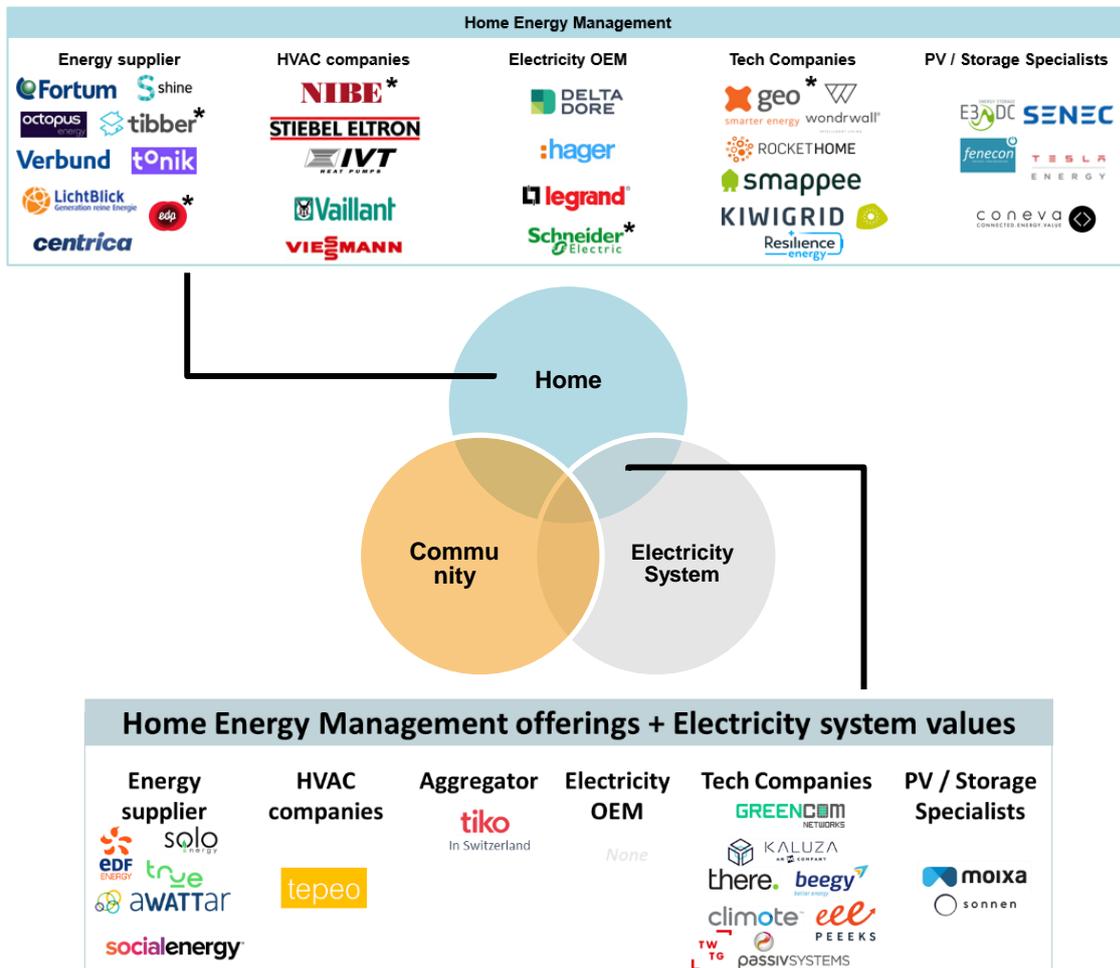


Figure 5: A non-exhaustive list of companies active in HEM, by type of company

5: The size of the HEM market and the future trends

The direction of travel of the European HEM market is clear – strong growth. There are many uncertainties though affecting exactly how the market will grow. Our bottom-up estimate gives a most-likely growth rate of 25%, on average, for the next five years, from hundreds of thousands by the end of 2019 to millions of homes equipped with HEM systems by 2023. A big part is due to the electrification of heat in Europe: high penetration of electric-based heating or cooling for space and hot water and the possibility of controls being retrofitted onto these systems. The increasing need for self-consuming PV is driving the battery market in countries like Germany and Italy, and it means HEM will have a role to play to help customers maximise their installation. Finally, the booming EV market could create enormous opportunities for the HEM market, as this will become one of the most important electric loads in the home. One of the biggest uncertainties is actually linked to the speed at which the EV boom will happen in Europe, and our forecasts are rather conservative compared to the impact EVs could have on HEM.

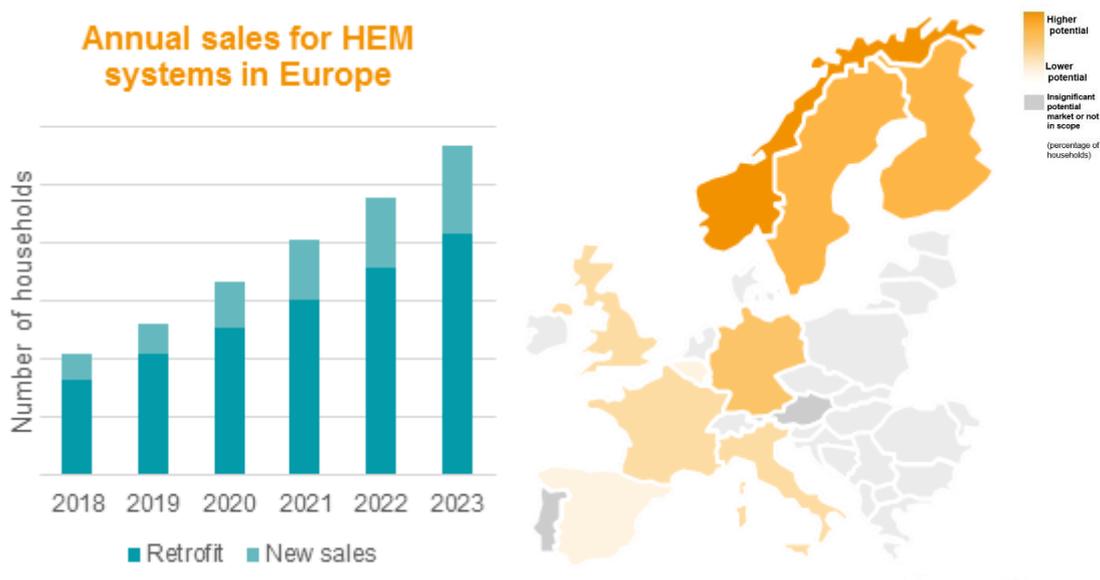


Figure 6. Forecast of annual sales of HEM systems in Europe (left) and Potential by 2023 country by country (right).

One key consideration for companies involved in this market is which customers are likely to purchase a HEM system. Will it be those who already have a large electric load installed? Or those who are planning on buying / replacing this appliance?

In our views, the installed base of over 20M of electric loads is very significant, and a big part of it can be retrofitted creating a big opportunity for HEM. Therefore, we believe retrofit systems will retain the main customer target for HEM systems compared to those being sold with a large electric load (new sales). However, cross selling HEM with installations of new technologies is expected to be a key part of the HEM sales channel going forward, and the percentage of HEM sales coming from a cross sell is likely to increase over time. The proposition and business model are much cleaner, and a cross sell of HEM in a multi-thousand Euro purchase can be more easily accepted by the customer.