Disintermediation

Detailed Case Studies

July 2018

Contents

1. Enyway	
Case Market	Germany
Case Overview and Background	
Short Description	A p-to-p marketplace for green energy generated by prosumers and small scale local distributed producers. Genuine disintermediation since each producer has a supplier agreement with each consumer. Enyway acts essentially as a coordination platform and can also handle as necessary a variety of supplier obligations on behalf of its producers that traditional suppliers would usually have.
When was it Initiated	Mid November 2017
Commercial Drivers	Local small-scale renewable energy has a premium value for some customers and therefore for the producers of it. In Germany the feed-in system for renewables was replaced by an auction system for all except the smallest scale production (including also households). However, the small-scale production can opt-out of the feed-in tariff and move to a 'feed in premium' scheme whereby the energy is still sold on wholesale markets by the producer and then the producer receives a top-up from the grid operator based on a proportion of the official auction reference price (essentially the difference between the auction price and the general wholesale market price). While the smallest (household) production is tending to remain on the feed-in tariff, small-scale production of the kind mostly joining the enyway platform is gradually opting out from the feed-in tariff to the feed-in premium scheme, since it is incentivised to earn additional money by selling its green energy above the market price (to those who want to pay more for such energy) and still be compensated by the top-up. The greater the level of premium it can earn in the market, the more it will earn for its production. The enyway platform capitalises on and helps accelerate the transition to the feed in premium, by making it much easier and more valuable for all participating parties; it allows those who produce qualifying green energy to interact with those who are willing (often) to pay more for such energy. Enyway does not act as an intermediary in terms of handling feed in premium payments – this is still maintained directly between grid operator and producer. This said, enyway believe, that their marketplace offers a solution for energy producers after the phase out of all feed-in-tariff and feed-in-premium systems (including auctions). New producers can already today be viable without state funding, when using their marketplace. The existing producers on the marketplace do still use the feed-in-premium-system, but enyway think this can and will change in the near future.

	Following the changes to Germany's renewable energy support regulation with the move away from feed-in tariffs, such marketplaces are growing in attractiveness to generators and consumers can get to know their energy producer directly. This means green electricity becomes more than a label, it gets a face and an individual behind of it, giving the commodity a personality. The marketplace model offers transparency and trust, in a world where similar marketplaces like AirBnB are already known and accepted in other sectors.
Detailed Description	
Key Features of Interest	• Peer-to-Peer Platform • Marketplace for small scale, local (including residential), renewable production • Producers market and price themselves through the platform, and act as suppliers. • Consumers choose and make a supply agreement with a producer. Each producer, however small, becomes a supplier. • enyway's platform and support enables and simplifies the whole process for the producers / suppliers. • Fits in with the existing German energy market structure and regulation. • Supported by an innovative incentive scheme and offers a solution after support systems are needed.
How it Works	A peer-to-peer marketplace for green energy generated by prosumers. Spin off from a leading German new entrant green energy company, LichtBlick. Anyone with a green electricity generation device, be it wind, solar or water etc., however small, can register and set up a profile on the Enyway site and then offer their green electricity to other (pro)consumers. These producers become suppliers and set their own energy component prices. Enyway helps them set their prices. Producers are able to sell their energy at a premium to finance their production units. Enyway are in the background to ensure that all the regulatory and other compliance issues that a producer and supplier need to handle are taken care of (e.g. provision of obligatory information and documentation, balancing etc.) Producers also need to opt out of the feed-in tariff system (where they would provide energy to their local grid company) and instead provide their energy to a third party, thereby moving from the feed-in tariff system to a 'feed-in premium' system. Very small producers are typically not technically equipped to do that (they need equipment to control the production and provide data) and enyway can help them with that, although enyway's producers are mostly

	not the very smallest (Typically in the range of 80Kw-2MW depending on the generation type). Customers choose one provider (most customers prefer to buy from local producers that they have some affinity with) and legally there is a supply agreement between the two parties. Customers choose based on the producer's personal profile. Appeals to less price-conscious customers – may not be cheapest market tariffs available but some cost savings occur through enyway "cutting out the middle-man" (energy retailer). Any excess demand is made up from other green sources. Typically, 30-70% will come from the selected provider. This varies by technology, with the proportion of total demand being met by the selected provider typically highest when that provider is a hydro site, lowest when a solar site and somewhere in between when a wind site. Their target is to enable customers to buy form multiple producers, to enable a 100% fulfilment of demand in each case but currently under German law, this is not possible since any given consumer can only have an agreement with one producer. One route around that would be for multiple producers to have agreements with each other and jointly supply to customers through one single agreement. Another possibility would be if one producer had several different production units of different kind (PV/Wind/Water) which could be combined in one solution to reach a higher percentage. That is a complexity enyway has not yet addressed, but it is an option for them for the future. Smart meters are not essential, but smart meters offer consumers the ability to change their behaviour through the feedback insight that it would enable. Enyway is also now assisting a crowdfunding process to offer consumers the chance to invest in new generation units that they could then consume energy from. Consumers are asked to invest the amount of money that would roughly correspond to the amount of energy that they would consume (e.g. €500-€1000).
How Successful is it	
Uptake	30 producers. Information is not available for the number of consumers.
Key benefits for customers and society	• Empowers prosumers and local communities to generate, price, serve and consume what they want, from whom they want, and how they want. • Genuine disintermediation. Small scale local producers become suppliers. • Green benefit from uptake of renewables through the model. • Model provides a route to a viable green investment return without reliance on subsidies – it mitigates against regulatory risk. • Cost saving potential for customers through cutting out the middle man.
Other Benefits	

	Supports local, small scale prosumer renewable generation growth (provides an additional revenue stream to fund renewable investments).
Negative impacts and Risks for Customers	We are not aware of any substantial issues. The German consumer organisations and consumer protection agencies have been extremely positive towards enyway and have not identified any concerns. Customers are still protected by the supplier of last resort if necessary. If a producer's generation is halted temporarily for any technical reason, the producer (as a supplier obliged to provide for 100% of the customer's needs) will use the alternative procurement agreements / trading arrangements which enyway have set up. This is a risk to the producers.
Which customers are / are not likely to benefit	The main beneficiaries are small prosumers and local communities that produce renewable energy. As the model grows and if regulatory issues are addressed, this model could expand to benefit even smaller residential prosumers. The model benefits all consumers who want local renewable energy. The model enables energy communities in general, reducing the role of centralised energy and the traditional energy producers and suppliers.
Other customer protection issues	None that we are aware of.
Data Management Issues	
Access to customer data	No special data is required from consumers. Only the usual data that would be required to sign up any new supply customer. Generators handle their own data. The platform links customers to the producers and therefore enables regular data transfer but does not use any customer data except for processes that are linked to their energy contract. At present, no smart meter data is required or used as part of the service.
Supporting and Challenging Regulations and other Issues	
Key regulations underpinning model	In the short-term, the model is assisted by the feed-in premium scheme as described above, where proof of direct marketing to third parties is required to access premium payments (a feature of German subsidy programmes for the past 10 years has been that producers must sell their production on wholesale markets. Proof of such direct wholesale market transactions is required to access feed-in premium payments). However, ultimately, enyway see the marketplace as a way forward without a subsidy scheme for future electricity production.
Key regulations and other issues that cause challenges	Several barriers exist if each producer is to become a supplier: • The process of becoming a supplier (setting up and registering etc.) and other operational requirements (e.g. electricity tax, monitoring

	obligations etc.) involves a level of complexity, understanding and manual involvement that is a barrier to small producers • Current regime where customers choose a single supplier reduces level of choice; this model works best where a customer can take supply from multiple suppliers at any time An alternative would be to create a central supplier to whom each of the producers sell their power, but this would present a set of additional challenges to ensure the same level of transparency and choice for the consumer.
Other issues	There is a need for an abundance of small scale, local, renewable generation and customers who value it.
Relevance to GB	
Benefits for customers	Essentially the same as for Germany: • Increased consumer choice through genuine disintermediation. • Prosumers and local communities would be empowered to generate, price, serve and consume what they want, from whom they want, and how they want. • Additional financing of local, small scale renewable generation would provide more opportunities for community energy schemes and more local energy for consumers to choose from. • Cost saving potential for customers through cutting out the middle man.
Risks and negatives for customers	We do not see any risks for consumers.

Any reasons why it could not be transferred to GB	• Our understanding is that the GB market would generally be suitable for this model in terms of producers and consumers in principle wanting to take part.
	• The German Feed-In Premium Scheme appears to be a highly incentivising scheme for this kind of offering, where it both acts like a contract for difference and incentivises direct marketing to third parties. This Feed-In-Premium is similar to the FiT CfD used for GB low-carbon generation
	• The obligations on suppliers in GB are significant relative to German market, which could increase the effort required on the part of the supplier support platform, which is a core part of the Enyway model[1]. For instance, differences include:
	  ○ **Licensing**: In GB retailers must be licensed and follow the licensing agreement. In Germany there is no licence as such, but it is important to announce your business activities to the regulatory authority agency (BNetzA);
	  ○ **Energy efficiency**: In GB once a supplier has more than 250,000 accounts they must:

[1] This is based on our own analysis, and confirmed by enyway.

	▪ contribute to the Energy Company Obligation (an energy efficiency programme); ▪ provide eligible customers with the Warm Home Discount (a fixed amount off their energy bill every winter); and ▪ manage customers' feed-in-tariff payments e.g. if they have solar PV on their roof. In Germany there are no such provisions or detailed energy obligation schemes for suppliers. However, there are general provisions with respect to the implementation of the Energy Efficiency Directive. The supplier must offer, as technically feasible and economically reasonable, a tariff which provides an incentive to save energy or control energy consumption, in particular load variable or daytime dependent tariffs. Suppliers must offer at least one tariff, for which the data recording and transmission is limited to the statement of total energy consumed within a certain period); ○ **Vulnerable customer care**: In GB suppliers must keep a log of all vulnerable customers and have policies in place to help them. In Germany no log or special services are required as far as we know. Furthermore, there is no document that we know of describing obligations towards vulnerable customers. In fact, we are not aware of energy regulation specifying (for competitive suppliers) any special rules on accessibility for vulnerable customers (e.g. pensionable age, disabled, chronically sick) relating to requesting bills, debt repayment plans, issuing of pre-payment keys, or disconnections. Processes to meet the needs of vulnerable customers might include for example bills in braille or text relay service. In Germany, this is only facilitated to the extent that there are special rules for the basic service provider (Basic Supply Ordinance: Grundversorgungsver-ordnung), but these are not as extensive as GB requirements; and ○ **Digital offerings**: There are more obligations in GB that may hinder a supplier going fully digital (a key objective for many new models). For instance, in GB suppliers must be accessible by phone and customers must be allowed to pay cash (e.g. at a post office). In Germany there is no such phone access requirement and the law requires only that the supplier has to offer two different forms of payment options.
How significant are the barriers or costs to implementation of this approach in Great Britain?	Barriers around supplier registration and operations are significant to the direct implementation in GB, and alternatives (e.g. a separate supplier platform for such small producers) may be costly to instate. Any barrier to entry arguments cited by small suppliers entering the GB market would also apply in this case.
Sources:	Interview with representative of enyway

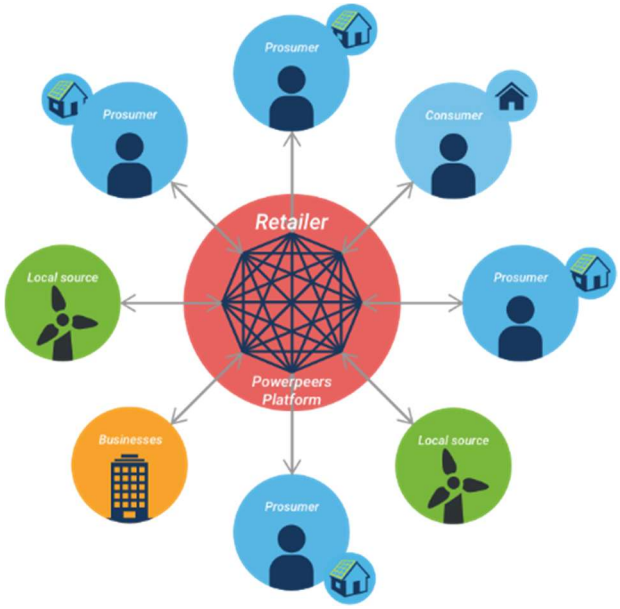
2. Elektrizitätswerke Schönau eG (EWS)	
Case Market	Germany
Case Overview and Background	
Short Description	A very forward thinking cooperative utility company buying and selling the renewable energy of their members and other communities and like-minded producers. Established through the local community taking control of their electricity network and supply after the nuclear catastrophe in Chernobyl in 1986. One of Germany's largest renewable energy cooperatives, with 6500 cooperative members, supplying energy to 190,000 customers across Germany. The only green electricity supplier in Germany who also operates energy grids. Developing many new advanced community energy solutions.  Picture © EWS: Co-founders of EWS
When was it Initiated	1986
Commercial Drivers	• Value to cooperative members (the cooperative is owned by its members) • Aim is to sell 100% Green Electricity (with a focus on supporting additionality / no affiliation with owners or operators of nuclear or coal power stations)
Detailed Description	
Key Features of Interest	• A community business that has grown from a small company serving a few thousand local customers, to a large cooperative. Germany's largest renewable energy cooperative supplying energy to 190,000 customers across Germany. • A cooperative utility company that is owned by its 6500 members even though the community only has 2400 inhabitants. • Also owns the local electricity, gas and some heat networks in the region, although this is not essential for the rest of the model per se.

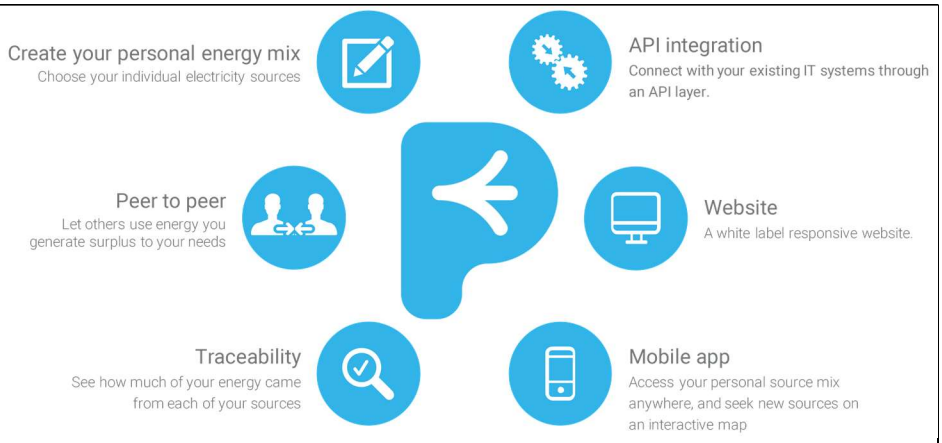
	• Buys energy from and sells energy to its members but also buys from other suitably green sources from Germany, Austria and Norway (never from companies that are affiliated with the operators or owners of coal or nuclear power stations). • Supports other communities through buying their renewable generation but also through supporting democratisation of energy: EWS enables local communities to produce, consume and market their own energy and thereby to be more independent of traditional large energy suppliers. Furthermore, EWS also supports other local energy communities on energy savings. • They are now developing (together with an IT company), peer-to-peer + batteries + PV + energy managements on a local level.
How it Works	• Their own energy is produced in the region of Schönau (PV, Hydro) and elsewhere (e.g. Wind in Germany, Hydro from Austria and Norway). • They own the network because before liberalization of the supply market in Germany, this was a pre-requisite to selling own-energy. This network ownership may however enable additional local grid offerings in future. • Being a utility (network company and supplier) they also need to have all the usual utility capabilities, including being a balance responsible party. They cooperate with some Stadtwerke (municipal utilities) to achieve this. • In essence they are like a fully green Stadtwerk, but they are owned and entirely controlled by the citizens of the municipality and other members rather than owned by the municipality and controlled by politicians.
How Successful is it	
Uptake	• 6500 cooperative members • 190,000 Energy supply customers
Key benefits for customers and society	• Localisation of energy ownership and control • Revenue from owning the grid and supply business (profit sharing). Some profits are made but most is reinvested into various decarbonation projects (e.g. energy efficiency) conducted by other actors with similar goals. • They not only build their own community and cooperative, but also help those of others (e.g. BürgerEnergie Berlin, the largest energy cooperative from the German capital), thereby spreading the democratization of energy • A platform for larger scale peer-to-peer based community self-sufficiency.
Other Benefits	• A model that focuses primarily on delivering environmental benefits to communities, independently of other institutions who are typically involved in centralised models. • A greater focus on local, additional renewable energy solutions.

Negative impacts and Risks for Customers	• All reports we have seen have been very positive. However, this kind of model requires an engaged community, or at least the engagement of a significant number of people. It requires substantial effort from the community. Without such, the model cannot work. In addition, to become a member one has to buy a share of the cooperative. In the case of EWS, the cost of a share is 100 €. One person can buy max. 10 shares. Some customers may see this commitment as a negative cost. • As returns are reinvested, there is an additional level of investment risk in generation assets that a customer would not normally be so directly exposed to.
Which customers are / are not likely to benefit	All community members are included in the cooperative and all members have an equal say in decision regardless of the number of shares they hold ("one person one vote").
Other customer protection issues	None that we are aware of.
Data Management Issues	
Access to customer data	No special data is required from consumers and there is no use of smart meters as yet. This may change with the smart meter roll-out in Germany which is driven by the implementation of the digitization of the energy transition act.
Supporting and Challenging Regulations and other Issues	
Key regulations underpinning model	• Cooperatives need to be permitted within a favourable regulatory environment. • Long-term predictable renewable incentives are needed to enable suitable credit positions for further investment. • For the future offerings planned by EWS, smart meters will be required (more precise information on what is being consumed). • To replicate the model, Communities were able to take control of their local energy network business, either through ownership or obtaining a licence to operate, although this is not strictly necessary for the model to work per se. • An incentive regime was needed for the early development of the model. The former feed-in tariff system as well as priority access and dispatch of renewables in Germany was therefore a key driver for energy communities such as EWS to grow. The phasing out of these regimes as renewables have become established means that such regulation is no longer necessary and is paralleled in the evolution of GB renewable subsidies.
Key regulations and other issues that cause challenges	There is a need for some compensation for the investment risk taken by cooperative community energy companies. The recent German move to an

	Auction based tendering system means that there is a focus on the cheapest bid. This is challenging for some smaller community actors and presents an increased risk. Some exemptions have been given to local energy communities, but it is not considered sufficient. There has also been an unintended consequence whereby some large companies have apparently abused what is seen by some as a flawed definition of 'community' and set up community companies to take advantage of the exemptions. The lack of guaranteed subsidies (e.g. a feed-in tariff system) or the absence of a minimum carbon price on the national level of at least €40 was also mentioned as a risk factor.
Other issues	No other issues were identified.
Relevance to GB	
Benefits for customers	The main benefits relate to greater consumer choice through a community model: • Localisation of energy ownership and control, providing more consumer choice • More rapid growth of community energy and local sustainable energy. Ultimately it would lead to more energy self-sufficiency of local community schemes. • Community Revenue through a cooperative model. • A platform for larger scale peer-to-peer based community self-sufficiency.
Risks and negatives for customers	Exposure to investment risk for communities, especially if the mechanism for making a return on investment relates to renewable subsidy schemes that are competitively tendered and therefore provide less long-term certainty.
Any reasons why it could not be transferred to GB	Our understanding is that the GB market would generally be suitable for this model. Community schemes already widely exist in GB, but nothing on this scale. The full model including network control could not be transferred, however, although the network ownership part of the model is not critical to its success - owning the network does not reduce the barriers to the rest of this case even though without ownership EWS would have had to deal with a local network company instead of their own business within their own network area. In fact, only a small proportion of EWS' customers and producers are within the limits of the network that they own and the regulatory complexity of dealing with network companies is considered not greater in GB than in Germany. Indeed, there are far more network companies in Germany for suppliers to deal with than in GB. The only reason that EWS owns network is that prior to liberalization in Germany in 1998, grid ownership was a prerequisite to sell green electricity because of the model of the integrated supplier. Since liberalization it has become more difficult to get the grid concession but owning the grid is not needed anymore to roll-out a model like the EWS one. In fact, there are similar

	energy community, green electricity suppliers today (e.g. Greenpeace energy) who do not own a grid. So, the EWS-model may also work without owning the grid. **A note on grid ownership:** In Germany, for every grid that an organisation owns, that organisation is required to hold the concession. Without the grid concession there is no network ownership. Since the concession process is a challenging one, dealing with more networks would have meant more work for EWS. Over the last years EWS obtained concessions for other networks in the Schönau region but all of them are small. In general, therefore, while the network business is still important to EWS, compared to the other business areas of the EWS group (sales, generation), it is of minor importance. In fact, only a small proportion of EWS' customers and producers are within the limits of the network that they own.
How significant are the barriers or costs to implementation of this approach in Great Britain?	Cost is the most significant barrier to adopting this model – an initial investment to set up the community initiative and for it to reach scale would be needed. Network ownership barriers are not significant, as it is not critical to the success of the model.
Sources:	Interview with representative of EWS

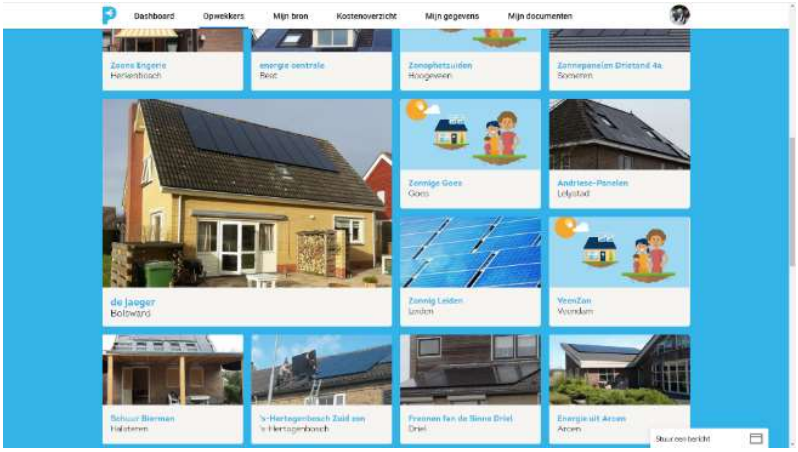
3. Powerpeers	
Case Market	The Netherlands
Case Overview and Background	
Short Description	A peer-to-peer residential community trading/retail platform. It enables customers to choose other households and small generators to purchase their energy from.
When was it Initiated	2016
Commercial Drivers	A for profit business. There are two parts to the business. A supplier and an IT business that can white label the platform for other providers in other markets.
Detailed Description	
Key Features of Interest	Powerpeers is a private many-to-many peer to peer residential community trading/retail platform that enables customers to know and choose exactly which peer they buy their energy from or sell their energy to.  The platform is disintermediating in that it replaces the supplier with a platform that essentially links customers to energy from individual household producers as well as other decentralised and centralised renewable sources of energy. The Powerpeers platform is responsible also for balancing, settlement, billing and other retail compliance responsibilities. The customer no longer needs to buy from a traditional supplier.

<table>
<tr>
<td></td>
<td>


Owned by the Swedish and International utility, Vattenfall.

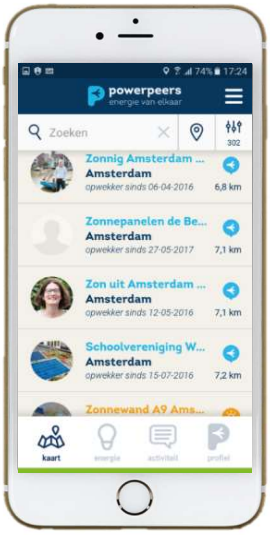
Future plans to link to IOT, Blockchain, Grid optimisation, Micro-grids, other markets and more.
</td>
</tr>
<tr>
<td>How it Works</td>
<td>
Producers (prosumers) register for the system and provide a clear description of themselves and generation (for transparency and promotion).

Customers can choose up to 10 peers. The customer can select based on geography, energy type or specific description, and can choose whichever producer they wish as long as they still have availability of supply. Customers can also de-select and re-select on a daily basis.



The shortfall in supply between what those 10 peers can provide and what the consumers require, in terms of consumption, is made up from local and national renewable energy sources (all trading and balancing is by Powerpeers). Peer-to-peer sales makes up approximately 10-50% of energy consumed by customers using this platform.

The platform essentially digitalises every kWh and provides near-real-time matching of sources to consumption, and because the platform can show exactly where the energy comes from, and how much, there is no need for energy certificates.
</td>
</tr>
</table>

	Producers require a smart meter with 15-minute readings. Consumers do not need smart meters, although smart meters would support a more real-time process for Powerpeers and enable additional functionality for the customer. With the addition of a technological gadget, which Powerpeers sells to consumers, consumption readings can be made every second. It is a modular platform designed as global solution, intended to work in all electricity markets.
How Successful is it	
Uptake	3000 household producers and many 000's of consumers.
Key benefits for customers and society	Many consumers like to buy their energy from a small or local generator, from a relative, friend, neighbour or acquaintance, a local school or club. They may also want to choose a specific type of renewable generation, or just some generation that is somehow more in line with their preferences for how energy production should be. This kind of platform enables consumers to do just that. To buy energy from whomever they want and buy whatever energy they want. The platform increases transparency of energy generation. Customers can be sure of what kind of energy they are buying and from whom, and they can be sure that that energy generation is matched real time to their consumption (or consumption profile).  Prosumers are given a premium for their sales through the platform and combined with the sense of community and other psychological incentive / reward for what they do, they are therefore additionally encouraged to become prosumers. This in turn results in greater societal involvement in energy generation, financial rewards and CO2 reduction. It is a platform for future models and community offerings, both actual and potential, ranging from e.g. current community energy sharing schemes, to future demand response-based flexibility and disaggregated appliance supply.

	
Other Benefits	The platform is understood to be highly scalable, as long as a good balance is maintained between those who want to produce and those who want to consume. It provides real insight and provenance of where energy is produced on a 15 minute basis (which can be extended even to real-time). This model provides a potential future route to traditional suppliers who want to retain a key role in a more decentralised future. They can continue to act as a supplier while democratising the ownership of assets and empowering communities.
Negative impacts and Risks for Customers	No major issues have been identified, but Powerpeers is a private platform, and although it is available for licencing, there are those in the industry who say that public or open platforms would be better than private as part of a mass future national or international roll-out.
Which customers are / are not likely to benefit	At this point in time, prosumers benefit most from a financial perspective, since Powerpeers provide them with a financial bonus for every kWh that a prosumer shares via the Powerpeers network. Households with larger roofs will benefit the most. Low income families and/or families without roofs (for now) will benefit the least, but with regulatory change, a broader set of society could benefit (see below sections on suggestions for regulatory change).
Other customer protection issues	No customer protection issues have been identified.
Supporting and Challenging Regulations and other Issues	
Key regulations underpinning model (in opinion of	The starting point for this model, as set out by the operators of the model, is that prosumers should be allowed to sell their energy to whomever they want, whenever they want.

model operators)	
Key regulations and other issues that cause challenges	• **Micro-generation ownership model**: Some households own and produce clean power (e.g. solar) on their own rooftop. For others, they may only be able to own assets remotely (e.g. 'Tele-panels'). This link between property and own generation ownership has the potential to limit the ability of such models to grow and limit full participation of all consumers. This has the potential to form a barrier to full implementation, which may then need a review of mechanisms that facilitate remote ownership or leasing of solar panels; • **Price formation:** The ability of individual households to market their own generated clean power at their chosen price (besides paying for the network connection and usage) can be used to ensure price signals are provided within communities. So long as platforms are able to develop to provide this, there are no regulatory barriers that should be able to prevent this; and • **Accounting for any "net" imbalance:** In one sense these models are clubs where members can exchange electricity; where the production and demand in the club does not balance, the net will have to be bought or sold from the wider market. This is possible if the club is also a Supplier with the energy exchanges in the "club" being account for in the "Supplier Volume Allocation (SVA)" part of central settlement. However, there are some restrictions which could form barriers to implementation: – **GSP Group**: The "club" can operate within each GSP Group (broadly the geographical area of each licensed electricity distribution company) at a lower cost level and with fewer regulatory requirements. This is because at the GSP level, there is a simpler, consistent approach used to estimate the half-hourly demand of those customers that are not metered half-hourly and avoid additional charges arising from using the transmission network. To extend the club outside of this geography would therefore have implications on cost and practicality, which form a natural barrier to doing so; – **CVA generation**: There are limits on which generation can be settled through SVA, rather than CVA. It only applies to generators with a capacity of <50MW (lower in Scotland) that are embedded within the distribution network and are exempt from generation licensing obligations; and – **Export meters**: Where domestic customers want both to buy and sell electricity through the club (prosumers – that both produce and consume), they will need an export meter recognised by central settlements. Without such a meter, the central settlement will ignore any sale of electricity by that prosumer through the club – and deem that the relevant energy needs to be purchased from the wider wholesale market. The role of the platform provider must include similar tasks to those of suppliers in order to ensure security of supply (for example when a customer consumes more than expected). Whether the platform provider is best placed to take on this role may be a question for Ofgem to consider, with potential either to reduce barriers to obtaining a supply licence for this specific arrangement, or to formulate a strategy that would involve existing supply licensees adopting some role.
Relevance to GB	
Benefits for customers	All of the above-mentioned benefits would appear to be equally relevant to the GB market.

Risks and negatives for customers	Does not really benefit vulnerable customers and benefits mostly those with generation capability (under current model of proprietary ownership of assets. Also see 'Key regulations' section above for further discussion on micro-grid ownership and 'Tele-panels' for possible solution & level-playing field).
Other pros and cons	N/A
Any reasons why it could not be transferred to GB	The challenges in GB are considered the same as for The Netherlands, therefore no insurmountable barriers (see key regulations in previous section)
How significant are the barriers or costs to implementation of this approach in Great Britain?	Powerpeers offers its solution as white-label to other energy supply companies in GB, so it would seem that there are no real barriers offering it in the GB market at least via existing GB suppliers. The effective need for the platform to be a supplier and the relatively onerous obligations relating to being a supplier in the GB energy market may, however turn off some new entrants, though this is not proven.
Sources:	Interview with CEO of Powerpeers

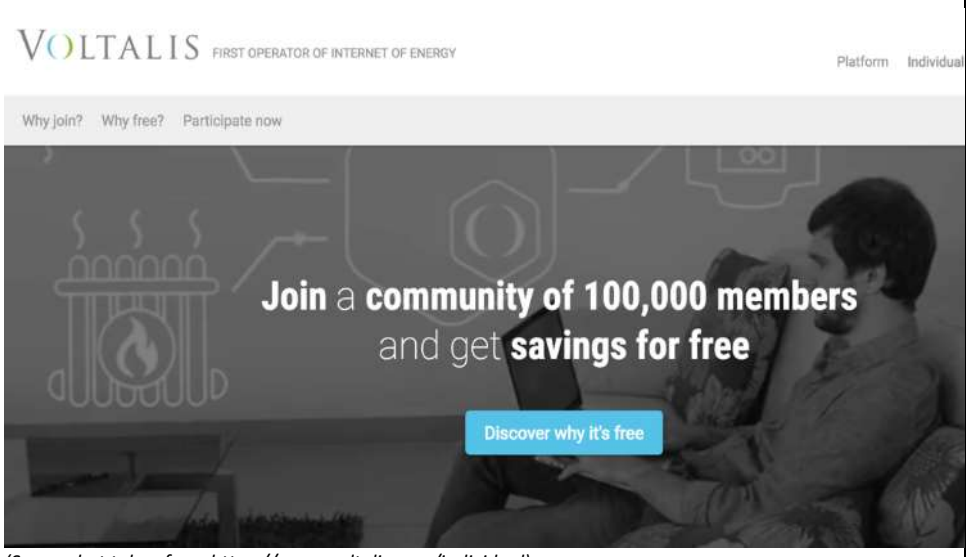
4. Tibber	
Case Market	Norway, Sweden
Case Overview and Background	
Short Description	A home automation and optimisation model that combines elements of prosumer, direct wholesale pass through, trading and peer-to-peer. A retailer which enables the customer to be more sustainable, independent and more directly connected with the market, producers and other prosumers / consumers.
When was it Initiated	2017
Commercial Drivers	Driven by a vision to take commercial advantage of the emerging digitalisation of consumer behaviour in the energy industry through the use of a software solution. To reinvent the way the utilities and the energy industry interact with the consumer. Saw a commercial opportunity within the apparent gap in the market relating to early adopters in the market, resulting from the slowness of the existing utilities to respond to the changing market environment. Revenue comes from the sale of subscriptions to the service, margins on the sale of smart infrastructure, and the monetisation of demand side flexibility (currently only to TSOs). Tibber became a retailer through necessity more than choice. In order to provide the pass-through service to the customer there is effectively no alternative than to become a retailer.
Detailed Description	
Key Features of Interest	Tibber is a digital energy company with a smart platform that aims to reduce energy consumption through smart technology in consumer's homes. It is a solution that links together the technologies already in/at homes, (including PV, EVs and smart homes technology), with advanced analytics to inform customers, automate technology and simplify purchasing processes to lower customers' energy costs and make their homes more sustainable and self-sufficient. Acts as the retailer for the customer but makes money only from a subscription fee plus the actual cost of energy. No profit is made from the sale of kWh (they pass through the wholesale cost); Tibber does not benefit from consumers using more energy, but rather from them saving energy and cost. Furthermore, because they are a balance responsible party, they have nothing to lose from demand response aggregation. Specifically, Tibber provides consumption feedback and insight to customers and automation to ensure that the home uses energy in the most efficient and timely way and enables the customer to coordinate their energy usage in

	response to wholesale energy price fluctuations. Customers can also buy directly from producers (bilateral contracts) and sell their excess energy to other Tibber customers. The service is therefore effectively a platform for the customer to become an active prosumer / consumer and purchaser /seller of energy in order to save money and reduce their CO2 footprint. If customers do not have the necessary smart infrastructure in their home (e.g. smart thermostats or other smart devices for the home), Tibber will sell it to them, making money from the margins on the re-sale of the smart infrastructure. All energy is purchased directly from renewable producers and all energy purchases are originated. Batteries will be added to the platform as soon as the business case makes sense.
How it Works	Customers can either purchase smart infrastructure devices from Tibber (current product range starts at €100) or can connect the smart infrastructure that they have to the platform. Tibber has identified a large number of 'power-ups', devices that Tibber can be connected up to the platform. Tibber then applies advanced algorithms to grid mathematics and machine learning in order to optimise the consumption of the devices towards the energy price and the different markets that Tibber is operating in (e.g. for smart thermostats Tibber does demand response programmes and price optimisations whereby the home is heated when energy price is low and saving when the energy price is high; for EVs charging is done when the energy price is low). All of this service (excluding the devices) is provided within the subscription fee.
How Successful is it	
Uptake	N/A – too early to find meaningful data
Key benefits for customers and society	• Energy consumption optimisation and cost reduction. • Encourages and provides enhanced value for prosumers. • Greater cost-reflective pricing • Improved customer energy efficiency awareness and behaviours, and generally more engaged customers • Enables communities and peer to peer elements • Greater customer self-sufficiency and sustainability • Greater consumer choice through presenting an alternative to the present retail energy model.

Other Benefits	Catalyst for distributed flexibility and demand response capabilities without the conflicts of demand side aggregators.
Negative impacts and Risks for Customers	None that we are aware of – early stage model therefore too early to find meaningful data
Which customers are / are not likely to benefit	Lower income and smaller household customers (especially those without PV or EVs) will benefit significantly less, but most customers could benefit from affordable home energy optimisation.
Other customer protection issues	None that we are aware of (discussion on data management notwithstanding, below).
Data Management Issues	
Access to customer data	In order to attract customers and digitally recruit them, there is a need to access users' data (with their permission) in a simplified digital manner for the purpose of analytics in order to show the customer the value of the offering (build and show the customer story and journey) and in order to onboard them. In Norway data access is therefore considered relatively easy since there is a central data repository (data is accessible for any customer from the associated grid company's database via links from the repository) as well as central and automated processes for handling customer data. Specifically, there is presently a central registry connecting all decentralised grid databases in the country. It is called "Nubix" and its was mandated by the regulator in Norway that all grid companies connect their databases to it. Any supplier can search in that registry with specific customer details: 1. You need to enter a postal code 2. You need to enter two more specific details about the customer and you can choose from: Name, adress, birthdate or meter number. Results obtained include: • Name • Address • Metering point ID • Measurement method • Active / Not Active • Last meter reading • Grid owner This is enough to perform supplier switching since almost none of the norwegian homes have binding time and are free to switch within 14 days. If the country has a lot of fixed term contracts, the binding time would also be needed. Other information about the nature of the contract can also be useful.

	One thing that is missing in this model is access to historical consumption / measurement data from the grid company, enabling data searches for data that can be used for analytics. If that would be possible, Tibber considers the Norwegian data access model would be sufficient for almost all cases. In Sweden data is obtained manually. There is a need to send a power of attorney and that takes time and more cost. However, in Sweden (unlike Norway, where the roll-out is partial and on-going) there is 100% smart meter roll-out and third parties can get access to hourly measurements. Sweden and Norway are both awaiting data hubs that will further improve access to data. Key success factors for the model of data access are therefore: timely availability on request of (above-mentioned) essential information; cost effectiveness; and consistency. Approaches such as Green Button are considered sufficient for this purpose, even if there might be more advanced approaches out there. It is considered most important to ensure the right to access to the data rather than prescribing the process of access per se. **How Critical are Smart Meters?** If Tibber were allowed to use their own measurement to extract consumption data from smart devices which would be acceptable for billing or trading, and be settled on that, that would be sufficient, but since that is not presently allowed, there is no alternative but to use smart meters.
Supporting and Challenging Regulations and other Issues	
Key regulations underpinning model	Access to customer and (ideally) historical consumption data Mandated smart metering
Key regulations and other issues that cause challenges	Integration issues are at the core of the challenge facing the success and transferability of such offerings, not least relating to the monetisation of the value of the demand resource for the energy system. Specifically, the Tibber model sits in landscape that is not standardised, either in terms of the regulatory model for demand side utilization, or in terms of the broader market characteristics. Each market has a different stack of technologies to control, and different levels and means of connectivity between devices. Different markets have different compliance issues, different means of collecting metering data etc. and a different network operator approaches to harnessing the value of home energy management. At the moment, for instance it is not possible sufficiently to monetise the value of batteries in the Nordics, because there are so many DSOs and so much fragmentation of DSO tariffs and approaches to the integration of batteries and garnering of value from batteries for the energy network (including different propensities to pay for battery-based flexibility). Such models (players who want to be at the heart of the control of home energy) therefore

	need to work on a regional scale and then expand out, region by region. In the Nordics, regulation does not currently provide a framework and consistency in the way DSOs can/should utilise and pay for the value afforded by such demand resource services (without hindering innovation and competition). At the TSO level, there exists a clearer framework.
Other issues	The model benefits heavily from high uptake rates for EVs (as in Norway) solar (as in Sweden) and smart home (as in Finland and Sweden), as well as from higher electricity consumption levels in general (as in Norway and Sweden).
Relevance to GB	
Benefits for customers	All of the above-mentioned benefits would appear to be equally relevant to the GB market in general.
Risks and negatives for customers	Does not benefit vulnerable customers so much and benefits mostly those with generation and or EVs. Affordable enough to be applied to low income and vulnerable customers, however.
Other pros and cons	Demand response programmes are more advanced in GB than the Nordics, and as such this kind of model may be able to garner more value from flexibility in the GB demand response context. GB deployment of smart meters is complex and places more responsibility on retailers, vs other market examples. This could hinder the ability of players to enter the GB market from international markets
Any reasons why it could not be transferred to GB	The key concern is insufficient smart meter deployment and access to customer and consumption data. The model would also benefit from a faster adoption rate for EVs.
How significant are the barriers or costs to implementation of this approach in Great Britain?	It would seem that this model can be transferred to the GB market, but the level of data access seems to be a significant barrier. In a market where EV load, solar and smart meter adoption are lower, it may also be a less attractive model to employ.
Sources:	Interview with CEO of Tibber

5. Voltalis	
Case Market	France
Case Overview and Background	
Short Description	A free consumer device installed in the home of consumers to monitor flexible devices, thereby reducing consumer consumption and providing flexibility to the energy system. The consumer receives a free gateway with which an aggregator (Voltalis) can provide the customer an energy service without having to go via their supplier. The potential of this gateway and relationship, and the way it is introduced into the home at no cost to the customer, presents an interesting disintermediating offering.  *(Screenshot taken from https://www.voltalis.com/individual)*
When was it Initiated	N/A
Commercial Drivers	• The business model is based on the revenue that can be drawn from the flexibility of demand being sold in electricity markets, as an alternative to generation. The more value that there is for flexibility, and actual market access to fully compete with generation, the bigger the deployment driver.
Detailed Description	
Key Features of Interest	• Installation of a device (Voltalis sends installer) in consumer's homes that monitors and manages flexible devices. • Consumer pays nothing and is paid nothing but is rewarded by free services and gains in terms of reduced consumption (flexibility leads to avoided consumption). • The consumer is treated as a 'member' (not a 'customer'). • Voltalis earns from selling the flexibility to the energy system.
How it Works	

	• Device also unofficially functions as a smart meter, metering all appliances' energy consumption every 5 minutes (or any other chosen time step). • Controlled appliances: electric heating & cooling, water boilers, EVs, water pumps, etc.
How Successful is it	
Uptake	• 100,000 Residential customers in France have allowed (opt-in) the installation.
Key benefits for customers and society	• Customer saves energy and therefore money. This is because the energy consumption is optimized (avoiding wasted energy use), not just reduced, and only a minor share of energy that is avoided for flexibility is shifted to later consumption (i.e. demand management that can lead to overall demand reduction). • Customer engagement and awareness without need for behavioural change • Other customer value propositions: smart home with various additional services, collective improvement for energy transition, reduced CO2.
Other Benefits	• More granular consumption data (every 5 minutes, sub metered per appliance/type of use) available to consumer in real time, free of charge • Home as a flexibility resource is unlocked • Lower system costs
Negative impacts and Risks for Customers	• Customers' consumption is under the control of a third party. It could be perceived that there is a risk of inconvenience or lack of control for the customer, but our understanding is that the customer does not notice any inconvenience and can take back control if they would like through pressing a button on a device.
Which customers are / are not likely to benefit	• The main beneficiaries are terraced and detached homes that have higher consumption and more controllability (electric heating, water boilers) and (in future) EVs. • Any consumers with similar "flexible loads" are able to participate (from social housing flats to shops, malls, offices, public buildings etc.).
Other customer protection issues	• The main potential customer protection issues are customer control and customer data protection. We are, though, not aware of any concerns relating to these issues for the case business. Protections are in place, both legal (in the terms and conditions) and technical (e.g. end to end encryption of data collection).
Data Management Issues	
Access to customer data	• Voltalis provides 5 minute consumption data, using the technology that is installed i.e. in real time and detailed per appliance / type of use. This is more granular than any smart meters. However, this also means that customers' consumption data is accessible to Voltalis. Customers all opt-in however, are

	aware of the use of their data for the purpose of providing the service, customer data is not distributed beyond Voltalis and is carefully protected. With any such interface, however, there is always a risk of unauthorised access to the data.
Supporting and Challenging Regulations and other Issues	
Key regulations underpinning model	• Data access and interactions between supplier and aggregators
Key regulations and other issues that cause challenges	• There is a belief that the model would be more successful when able to participate in all markets (i.e. not only capacity, ancillary and reserve markets). There is an argument for instance, that Demand flexibility could reduce costs for all through lowering the wholesale market price, if demand response could be sold into the wholesale market as an equal to generation. The most expensive peak generators would not need to be dispatched to the same extent[2]. Therefore, while demand aggregation comes at a cost (need to operate DR, install devices, develop software, etc.) if it could be delivered more cost-efficiently than generation, it could reduce market prices, and thus costs for all consumers (not only those consumers who participate). • International examples show differences in how this has been regulated[3]. For example, this structure of allowing forward market participation is already essentially in place in the US (albeit in a pool-based system where day ahead and gate closure timeframes are coincident and such markets are typically regulated to avoidable (fuel) costs) and other countries are going in this same direction both in Asia (e.g. Singapore) and now the EU. In contrast, in France current rules require consumers or third-party aggregators to compensate a customer's supplier for financial losses of revenues due to consumption being reduced when demand response is sold in the market (losses resulting from suppliers buying demand response rather than energy in advance to support demand that then does not take place or is shifted). This severely damages the business case for demand response and curtails the ability to extract any value from the forward market; Voltalis have stated that the only reason that DSR providers have been able to grow capacity in such a market has been through state subsidies. • In the Clean Energy Package, the European Commission proposed to forbid any such charge on Demand Response, albeit there was some opposition from generators at EU level as well as nationally, just as there was when FERC opened all markets to demand response based on the net benefits entailed to consumers. • Voltalis' metering devices are accepted as official metering devices for the purpose of settlement of demand response volumes delivered. As such, they are certified and audited by RTE (the French TSO) so that there is no need to wait until roll out smart meters before it can provide additional disintermediating services that entail such settlement elements regarding DR sales (as opposed to billing of electricity consumed, which is made only on the basis of DSO meter).

[2] In France, Voltalis' home market, peak generation tend to set prices in spot markets, and bilateral PPAs are also signed and pricing tends to be driven by the spot market. The price incentives that exist for DSR therefore arise from close to real time peak generation prices. Network operators are able to transact directly with DSR providers through the instruction of balancing services in such scenarios.
[3] A fuller discussion of this point is included in our Lot 2 report.

Other issues	No other issues identified.
Relevance to GB	
Benefits for customers	• Customer engagement and awareness without need for behavioural change • Savings for customers • Product applicability to mass market (Voltalis estimate their product is relevant to 1 in 5 'real' homes in GB)
Risks and negatives for customers	• As with all consumption data interfaces, there is a risk of unauthorized access to customer data.
Other pros and cons	Pros: • Easy customer adoption leading to greater choice • Home as a flexibility resource is unlocked • Lower overall system costs from accessing flexibility Cons: • Customers' desire for such products will be linked to their trust in controlling technology in their homes.
Any reasons why it could not be transferred to GB	There are a few provisions necessary to ensure DR can really participate in the market, that are not yet in place in GB. To some extent these are the same as in France, but the combination of these challenges would make it difficult for Voltalis to enter the GB market. • There should be no need for prior consent from a consumer's supplier, and no obligation to inform them of demand aggregator participation nor delivered volumes (all these would be anti-competitive). N.B. legislative changes being introduced under Project Terre would include the designation of a Secondary BMU where the demand aggregator can operate as a Virtual Lead Party – this may alleviate the issue as it allows the demand aggregator to avoid all supplier obligations • Voltalis believes that they need access to more markets (e.g. day ahead) to attain sufficient value. • Proof of DR delivery (i.e. compliance check) should be organised with a neutral third party certifying DR volumes achieved, on the basis of the best available data (be it from the consumer's meter or any submeter used by aggregator, subject to audits by the said third party). Such a third party could be Ofgem or, some party under Ofgem's control, such as the ISO/TSO. Another issue in GB is the lack of trust by energy consumers of the energy industry in general. Consumers may not feel so willing to allow a third party to install such technology in their home, for control or data privacy concern reasons.

How significant are the barriers or costs to implementation of this approach in Great Britain?	It would be difficult to know the extent of the barrier of consumer trust in advance. However, this relates to extent of uptake, rather than a regulatory barrier or cost barrier, and is outside the scope of this document.
Sources:	Interview with representative of Voltalis: Pierre Bivas

6. Sonnen	
Case Market	Germany, Australia
Case Overview and Background	
Short Description	An offering that offers consumer with a compatible Sonnen battery (if they do not have one they can buy it from Sonnen), or battery + rooftop PV combination, and a very low flat rate (all-in fixed amount per month) electricity tariff by utilizing the value of the flexibility afforded by the battery for the energy system. The customer buys their Energy from the battery provider / aggregator, Sonnen, and as such this is therefore a disintermediating service.
When was it Initiated	2015 (Germany), 2018 (Australia)
Commercial Drivers	• To profit from providing a positive use case to the consumer, in terms of lowering their energy bill, is the key commercial driver of this model. This is achieved through increasing the self-consumption of customers and through capturing the value of flexibility. • The money Sonnen earns from the flexibility they acquire from the battery, enables them to offer a lower and highly competitive flat rate price to consumers, a model enhancing the financial reward to customers sufficiently to make the use case attractive to customers. • The more value from flexibility that there is in the system, the more Sonnen can earn and the lower and more competitive the tariff price that they can offer to the consumer, beyond the value that self-consumption alone can deliver. To some extent the greater the challenges facing the transmission and distribution system (relating especially to flexibility-related issue), the greater the value of flexibility. The ability to sell flexibility to the wholesale market, as in Australia, is also a major bonus. • Other key commercial drivers include average size of rooftop solar installations, the suitability of the environment for solar (how much sun), levels of consumer energy consumption and the price of energy in the market. Put simply, if there is more sun, if there is more PV on the roof, if customers' consumption is greater, and if energy prices are higher, then the more attractive the value of self-consumption. For all these reasons, Australia is considered an optimal market, even though the Sonnen model is more established in Germany. In Germany, substantial levels of roof-top solar, a national loan scheme, relatively expensive electricity (Europe's largest domestic energy bills) and a positive mindset from communities and municipalities have all contributed to the positive business case.

Detailed Description	
Key Features of Interest	• The customer buys their energy from a battery provider / flexibility aggregator • The customer needs to have a compatible battery • The customer receives a long-term, highly competitive flat rate tariff • The value of the flexibility afforded by the battery is used to subsidise the flat rate tariff • Works best in combination with rooftop PV panels
How it Works	• Sonnen installs a control system that ensures the battery is used whenever flexibility is required. If the consumer also has rooftop solar, then the rooftop solar will be used as much as possible to fill and battery and will supplement the battery when flexibility is required. • Sonnen flat monthly cost is small, e.g. €50 in Germany. For this price the consumer will receive all the energy they need from the grid. If the consumer has rooftop solar, the cost will be lower since less energy will be required from the grid if they can consume from own generation at times of fully charged batteries.
How Successful is it	
Uptake	Full details are not available, but customer accounts are in excess of 10,000.
Key benefits for customers and society	• Subsidization of battery costs, enables and accelerates the uptake of batteries. • Reduced energy bills in the long-term. The savings will increase as battery prices fall and the value of flexibility increases. • More predictable energy costs. • Increased savings and self-sufficiency for those consumers with roof-top solar as well as the batteries.
Other Benefits	• Enhanced uptake and utilisation of batteries within the energy system leads to greater demand-response and system flexibility, which should in turn lead to lower system (especially network) costs. • The savings are greatest in Australia due to the commercial drivers mentioned above.
Negative impacts and Risks for Customers	• Consumers, as with all such investments, take on a risk associated with the investment. They are however insulated from wholesale price risks, since Sonnen takes that risk.
Which customers are / are not likely to benefit	While so far larger and wealthier customers have tended to benefit most from the offering, it is considered especially suitable for social housing, since once the infrastructure is installed, consumers will have small and predictable (more

	manageable and without bill shock) bills (whether those bills are paid by the customers or a social body of one kind or another).
Other customer protection issues	None that we are aware of.
Data Management Issues	
Access to customer data	• Real-time consumption data and real-time information on the status of the battery is a pre-requisite for the service. Smart Meters or a Sonnen measurement devices are used (although the Sonnen device is not accepted for settlement), depending on what is available and most suitable in each given location and situation. • Sonnen additionally collects information from the consumer such as the type of PV panel, its size and the consumers' historical consumption profile.
Supporting and Challenging Regulations and other Issues	
Key regulations underpinning model	Access to as much flexibility value as possible, relating to transmission and distribution. Returning the value back to customers is then in the form of reduced tariff rates.
Key regulations and other issues that cause challenges	Within Germany, there are no regulatory issues of key concern. There are, however, some key concerns with the regulatory environment in GB, as explained below.
Other issues	A positive mindset towards and availability of distributed and community solutions from central and local government / municipalities, as in Germany, is considered important.
Relevance to GB	
Benefits for customers	• Subsidization of battery costs, enables and accelerates the uptake of batteries. • Reduced energy bills in the long-term. The savings will increase as battery prices fall and the value of flexibility increases. • More predictable energy costs. • Increased savings and self-sufficiency for those consumers with roof-top solar as well as the batteries. • Potential application to social housing (see the explanation in "How successful" section above)
Risks and negatives for customers	• Consumers, as with all such investments, take on a risk associated with the investment. They are however insulated from wholesale price risks, since Sonnen takes that risk. • One relevant risk relates to the costs being optimised by third party. One of these costs relate to the capital cost of the battery – and how quickly the battery life is used up. Each time the battery is "cycled" (i.e. charged and discharged), it uses up part of the battery life. There

	is a risk that a third party will maximise its revenues by cycling batteries to provide flexibility services, whilst not considering the cost of this in terms of reduced battery life. We do not have information on whether this is an issue in the case of Sonnen.
Other pros and cons	Pros • Enhanced uptake and utilisation of batteries within the energy system leads to greater demand-response and system flexibility, which should in turn lead to lower system (especially network) costs. • Potential for additional benefits when connected to electric vehicle load. Cons • The scale of success of this offering is heavily driven by the cost of batteries and the impact that has on battery uptake. It is also dependent on the rate of uptake of solar. • Except for social housing schemes or where social financing or support etc. is provided, the beneficiaries will mainly be affluent consumers with access to roof space, at least for the foreseeable future. • Scale of benefits in Australia with high solar potential may not be fully transferred to GB where solar potential is lower, rooftop-PV installations are typically smaller, energy prices and electricity consumption is lower and network issues are not as substantial.
Any reasons why it could not be transferred to GB	It is already being introduced. Fundamentally, there is nothing preventing the implementation of the Sonnen model in GB. However, as with platforms marketing flexibility, similar challenges may exist in accounting for any net imbalance. Where Sonnen wishes to market flexibility elsewhere, the net will have to be bought or sold from the wider market. This is possible if Sonnen acts as a supplier to other parties with whom they can trade, with the energy exchanges being accounted for in the "Supplier Volume Allocation (SVA)" part of central settlement. However, there are some restrictions: • **GSP Group:** The "club" could only operate within each GSP Group (broadly the geographical area of each licensed electricity distribution company). Moving away from this would undermine the approach used to estimate the half-hourly demand of those customers that are not metered half-hourly; • **CVA generation:** There are limits on which generation can be settled through SVA. It only applies to generators with a capacity of <50MW (lower in Scotland) that are connected to a distribution network; and • **Export meters**: Where domestic customers want both to buy and sell electricity through the club (prosumers – that both produce and consume), they will need an export meter recognised by central settlements. Without such a meter, the central settlement will ignore any sale of electricity by that prosumer through the club – and deem that the relevant energy needs to be purchased from the wider wholesale market.

How significant are the barriers or costs to implementation of this approach in Great Britain?	The challenges in GB are, however, larger than in many of the other markets where Sonnen is operating, such as Germany, Australia and Italy. For instance: • Financial Incentives for domestic level storage in GB are low. In addition to the less suitable (than Germany and Australia for instance) commercial conditions mentioned above, fiscal incentives are also low. In Germany the feed-in premium scheme provides some degree of cost-benefit certainty for customers. In Italy for instance, customers can receive a tax deduction when they install a battery. Financing models take advantage of this. This is not the case in GB. In GB, there is no replacement yet for the exiting feed-in tariff and although customers who install a battery to new PV pay only 5% VAT, those who do so to existing PV have to pay 20%. This means around GBP 1000 for a typical battery installation. This lowers the business case for around one million households in GB and means that battery installers prefer to focus on new solar installations. • Battery installations in GB presently have to apply to / inform DNOs of the installation. While for most installations this is merely a notification process, in the case of larger domestic installations, an application process can be required which not only can lead to uncertainty in the investment, but also in some cases additional technical costs before approval. Anecdotal evidence also indicates that some gatekeepers in the process are unclear as to the rules (probably an issue of dissemination). The outcome can be a negative user experience and hesitancy from some customers and installers. A possible solution would be regulation supporting the principle of the right for domestic customers to install batteries for reasonable domestic use, without the need for approval or additional cost (though notification to the DNO is essential) for type-tested battery products. • Smart meters are not essential for the Sonnen offering but are considered beneficial due to the data provided. The present delays in the roll-out of SMETS 2 smart meters is therefore a negative in the GB market, as it is in Germany, and in parts of the Australian market. • However, a major recent investment in Sonnen has shown that investors believe in this model, also in GB; the Sonnen model is considered highly scalable; and the economics of the model are improving all the time as solar and battery technology continues to lower in cost. These factors, combined with the ongoing growth of community models that utilise storage; the imminent growth of the EV market; and the increasing need for grid flexibility in GB; indicate that the above-mentioned barriers are not insurmountable.
Sources:	Interview with the CEO of Sonnen.

7. PJM Statistical Demand Response	
Case Market	United States, Pennsylvania, New Jersey and Maryland Interconnection
Case Overview and Background	
Short Description	The PJM Market allows the usage of statistical sampling to reduce the cost of measuring demand side response. This only applies to residential customers where load is reduced in response to a defined stimulus (referred to as Direct Load Control Technology). The most common example relates to remote switching of air-conditioning units: • A scheme is operated by a demand side management company, that has met the requirements of PJM. • The defined "stimulus" is the generation of a signal to reduce load (e.g. by switching the unit off, or reducing its temperature setting) • A control module is added to customers' air conditioning units that responds to the (centrally generated) signal. • For some of those control units (a sample), the unit will also meter the consumption of unit on a minute by minute basis. • The estimated demand reduction for the population of customers based on the observed (minute by minute) response of the sample, and evidence that the "stimulus" event occurred.
When was it Initiated	This is a long-standing (<8 year) part of the market for PJM
Commercial Drivers	This remedy lowers the cost of measuring demand side response for demand reduction schemes, where customer load is reduced in response to a defined stimulus (Direct Load Control Technology
Detailed Description	
Key Features of Interest	The use of statistical sampling to reduce the cost of measuring demand response reduces cost of demand side participation for domestic consumers
How it Works	Under this approach, Demand Aggregators are responsible for establishing the sampling approach for the measurement of demand response and getting that approved by PJM. The PJM Rules require that this sampling approach is based on: • Measuring the actual response of a sample of those customers that are on the relevant scheme; • Extrapolating the response of the sample to the response of the population of customers on that scheme; • Calibrating the measurement and extrapolation approach on an (at least) annual basis, such that the error will be less than ±5%, with a 90% confidence level.
How Successful is it	
Uptake	

	The overall level of demand management contracted through PJM is 2,365MW in a system with a peak demand of 151GW. (1.5% of peak). 16% of this is provided by residential customers (378MW or 0.3% of peak).
Key benefits for customers and society	• Reduced cost of participation for domestic demand side management meaning that more demand side management becomes available to the market • With more demand side management available, overall costs of energy provision fall (as demand side measures displace more expensive generation options)
Other Benefits	• N/A
Negative impacts and Risks for Customers	• None that we have found. We have discussed this with aggregators and retailers in the US market, as well as a US academic that comments on this sector. In each case, they view the scheme as effective, and one which has not been susceptible to gaming.
Which customers are / are not likely to benefit	In general, this will apply to customers with load that can be remotely switched. For GB – this will predominately be those that use electricity for one of: • Space heating; • Water heating; or • Charging of vehicles. This differs from the North East US, where the peak demand is in the Summer, and many residential customers use electricity to power heat pumps for both cooling and heating their properties.
Other customer protection issues	None that we are aware of.
Data Management Issues	
Access to customer data	• This has not been relevant to this case, although we note there is nothing in the codes or elsewhere that explicitly states that a customer's data must be treated as confidential.
Supporting and Challenging Regulations and other Issues	
Key regulations underpinning model	• This is explicitly enabled through the rules of the PJM, notably PJM Manual 19: Load Forecasting and Analysis. • The closest equivalent to these manuals for GB would be the Balancing and Settlement Code (BSC) and its supporting documents.
Key regulations and other issues that cause challenges	None Identified
Other issues	None Identified

	A positive mindset towards and availability of distributed and community solutions from central and local government / municipalities, as in Germany, is considered important.
Relevance to GB	
Benefits for customers	• Potential increased demand side participation by domestic consumers.
Risks and negatives for customers	• None Identified.
Other pros and cons	• None Identified.
Any reasons why it could not be transferred to GB	• None Identified
How significant are the barriers or costs to implementation of this approach in Great Britain?	• In energy, capacity and ancillary service markets, ultimately all measurement is performed through meters at individual site level. • This means that payment against a statistical sampling of sub-sites from a DSR portfolio is not possible • Changes would be required through amendments to the Balancing and Settlement Code, Capacity Market Code, Framework Agreements for ancillary services and associated Metering Codes of Practice • It is worth noting that energy market participation is being opened up through continuing work on implementing "Project Terre", which is being run by Elexon under mod P344. While this will not change metering requirements such that the PJM model could be adopted, it will allow for further discussion on asset level metering and DSR baselining methodologies in future. These discussions could be used to explore what level of sub-site metering would be needed in future.
Sources:	1. Discussions with Peter Cramton, Professor of Economics at University of Cologne and University of Maryland 2. Discussion with US and EU Demand Aggregator 3. https://www.pjm.com/-/media/documents/manuals/m19.ashx 4. http://www.pjm.com/about-pjm/who-we-are/annual-report.aspx 5. http://www.pjm.com/about-pjm/who-we-are.aspx 6. https://www.elexon.co.uk/wp-content/uploads/2017/03/BSC-Systems-Roadmap-Companion-Document-v3.0-PUBLIC.pdf 7. https://www.elexon.co.uk/wp-content/uploads/2018/04/GB_BSC.pdf 8. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/629953/capacity-market-amendment-rules-2017.pdf 9. https://www.emrsettlement.co.uk/documentstore/workingpractice/wp1-overview-emr-settlement.pdf 10. https://www.elexon.co.uk/mod-proposal/p344/ 11. http://www.pjm.com/-/media/markets-ops/dsr/2018-demand-response-activity-report.ashx?la=en

	12. https://www.pjm.com/-/media/markets-ops/dsr/2018-demand-response-activity-report.ashx