

Market Analysis and Business Plan for Residential Energy Efficiency Services

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July 2016

Abstract – the aim of this study is to develop a market analysis for the energy efficiency residential sector and to propose a business plan for the company *Enerbyte*, *Smart Energy Solutions* to move from a B2B to a B2C business model. The work is divided in four main blocks: First, an introduction to the energy retail market with some important influencers such as smart meters and prosumers is presented. Second, an overview of the company is provided in order to present the actual market of *Enerbyte* and the product delivered. Then, a competitor analysis has been developed with the objective to analyse the products offered by the companies serving residential consumers with energy efficiency solutions. Additionally, a comparison between B2B and B2C companies is presented in order to identify the main differences between them. Finally, a business plan has been proposed based on a B2C model. A strategic decision has been made to focus the business model on a niche market composed by prosumers and the most appropriate geographical markets have been identified considering several parameters such as number of prosumers and smart meters data access.

Keywords – Energy Efficiency, Residential consumers, Prosumers, Smart meters, B2B, B2C

I. INTRODUCTION

1. Traditional energy retail market

Figure 1 shows a simple scheme of the whole process to transport electricity from the power plants to residential homes. Electricity is produced in power plants managed by *Generators*. After the electricity is produced, it is immediately transported. At this stage, all the electricity coming from

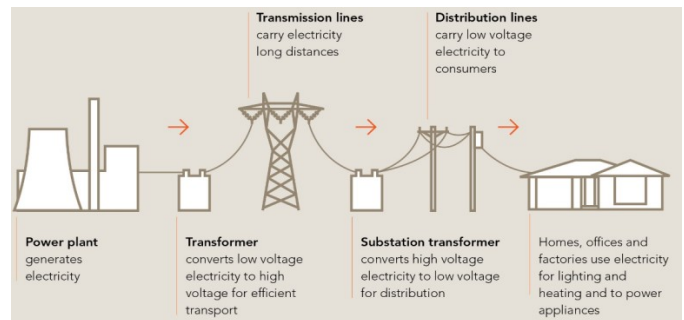


FIGURE 1. TRANSPORT OF ELECTRICITY [1]

different energy sources is merged in the same transmission lines. To decrease losses during the transportation, electricity is converted to high voltage. The management of high voltage transmission lines is done by the *Transmission System Operator (TSO)*. Finally, to distribute the electricity among end consumers, the voltage is decreased and electricity is distributed through the distribution lines. This part of the system is managed by the *Distribution System Operator (DSO)*. However, the electricity is not delivered to consumers directly. The figure that sells electricity to end consumers is the *Retailer* which has previously bought the electricity from the pool market.

Furthermore, there are two more important figures involved in the energy value chain. On the one hand, there is the *System Operator* which is an independent stakeholder with the objective to assure an efficient management of the system. His main duty is to balance the production with the demand. On the other hand, *Regulators* should also be considered because of its influence. This is the figure that sets the regulatory framework. Figure 2 illustrates the position that each figure occupies in the energy value chain.

In general, the same scheme can be applied to all electricity retail markets across Europe. However, each country has its singularities and there exists important differences in the

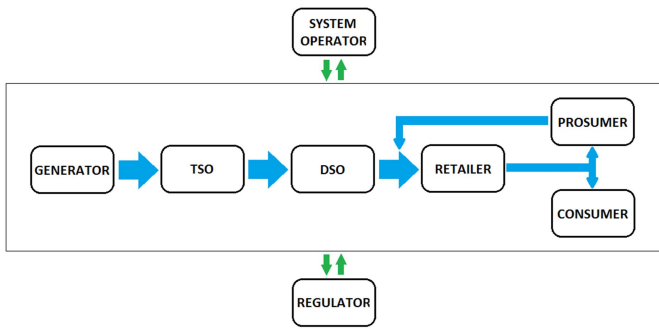


FIGURE 2. THE ENERGY VALUE CHAIN AND THE EMERGENCE OF PROSUMERS

legislation of each market that affect significantly the possibilities of emerging business around it.

Such differences could be the degree of liberalization of the market, the competitiveness within each stakeholder, the role of the market operator or the bargaining power of regulators [2]. Depending on these parameters, the pain suffered by each figure is different and the businesses emerged from it are viable or not.

For example, on the one hand, a potential business could be to provide a solution to DSO's (or even to the System Operator) in order to allow them managing the demand more efficiently. However, to make this business viable, DSO's should have some motivations to manage the grid more efficiently. These motivations could be caused by several facts: DSO's needs to increase the capacity of the grid or regulators are incentivising grid efficiency with economic schemes. If none of these problems exist, a business addressed to DSO's would not be viable. On the other hand, the will of retailers to invest in customer engagement solutions is directly linked to the fear they are facing for losing customers. This fact depends a lot on the competitiveness of the retail market.

2. Smart meters

A smart meter is an electronic device that measures energy consumption (electricity, gas or water) in intervals of hours or minutes. The data collected by smart meters is transmitted to utilities for billing purposes. However, the possibilities offered by the evolution of smart meters are wider and they can be applied for many purposes [3].

Smart meters can be used for the benefit of utilities, but also for consumers. On the one hand, utilities and system operators (DSO's and TSO's) can use the information to manage the grid system more effectively. The main example of such applications is the use of smart meters in demand response programs. On the other hand, consumers can also take advantage of smart meters information.



FIGURE 3. TARGET ON SMART METERS DEPLOYMENT BY 2020 [4]

For example, consumers can allow third parties specialized in energy efficiency to access their consumption data in order to receive recommendations on how to save energy.

To start a business within the energy efficiency residential market, it is very important to know the level of smart meters deployment in each country and the exact process to access to the data generated.

The percentage of smart meters rollout is illustrated in Figure 3 together with the absolute number of smart meters to be installed.

Besides this, the difficulties to access smart meters data may become the main problem for companies willing to explode that information in some countries. In general, the directives are on the road to facilitate access of third parties in order to enhance functionalities for the benefit of consumers [5]. However, the legislation across countries is very different. Figure 4 identifies the possibilities of access to smart meter data by third parties.

The information presented in Figure 3 and Figure 4 give an insight of which European markets are more interested to start a business based on the data generated by smart meters. If the biggest markets are compared with the ones having data access, one can obtain the most suitable ones.

Finally, after selecting some candidates, it is also important to consider the process to access that data because it varies in each country. For example, a significant difference results from the location where third parties have to extract the data from. This can be managed through the utility web portal or through a central data hub.

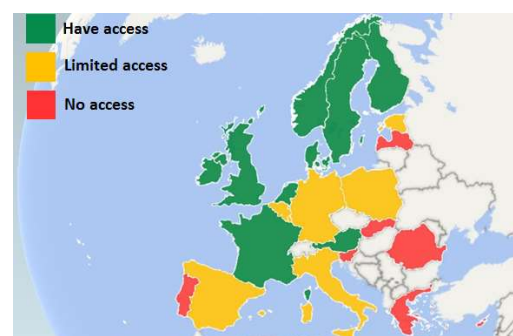


FIGURE 4. THIRD PARTY DATA ACCESS [4]

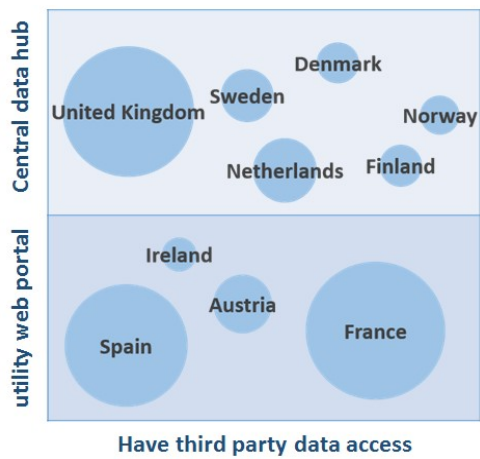


FIGURE 5. DIFFERENCE ON WHERE TO EXTRACT SMART METERS DATA FROM [4]

3. New players: Prosumers

The electricity market has suffered several changes in the recent years and it is still in a constant evolution. A clear innovation within the energy market is defined by the emergence of a new figure: the prosumers. The identification of such community is done because they are players operating both in the demand side and in the production side.

Figure 2 illustrates what is the position of prosumers into the energy value chain when they act as producers and consumers. However, it is important to distinguish two different types of prosumers: prosumers connected to the grid and prosumers off-grid. The second type of prosumers is not connected to the grid and thus, they cannot inject electricity.

Consequently, if electricity cannot be injected into the grid, batteries are needed to support a remote system: store the excess of energy produced when the demand is low and consume energy when the production is low. This type of prosumers is more common in countries with low electrification rates, where distributed energy systems are the only mean to access electricity. Nevertheless, this paper focuses on prosumers connected to the grid (Figure 2) because it is the most common in developed countries.

The growth of the community of prosumers is an opportunity for emerging business around energy management. Prosumers represent a new figure to address energy management tools with singular characteristics and special requirements. As a result, one of the many features analysed in the competitor analysis will be the presence of services specifically designed for prosumers.

Prosumers are not difficult to identify, but capturing them is a big challenge. Several prosumers characteristics have been identified in [7]:

TABLE 1. NUMBER OF PROSUMERS ESTIMATION IN 2013 (DEV. BY THE AUTHORS)

	PV cumulative capacity 2013 [6]	Residential segment 2013 [6]	PV Residential capacity 2013	Minimum number of prosumers
Austria	613	40%	245.2	24520
Belgium	2983	60%	1789.8	178980
Bulgaria	1020	2%	20.4	2040
Czech R.	2175	62%	1348.5	134850
Denmark	548	98%	537.04	53704
France	4673	22%	1028.06	102806
Germany	35715	14%	5000.1	500010
Greece	2579	14%	361.06	36106
Hungary	22	36%	7.92	792
Italy	17928	16%	2868.48	286848
NL	665	70%	465.5	46550
Poland	7	12%	0.84	84
Portugal	278	32%	88.96	8896
Romania	1151	2%	23.02	2302
Slovakia	524	4%	20.96	2096
Slovenia	212	1%	2.12	212
Spain	5340	2%	106.8	10680
Sweden	40	40%	16	1600
UK	3375	22%	742.5	74250

- Prosumers are early adopters of technologies.
- The salary of prosumers is 15% higher.
- Prosumers use solutions to keep in touch with family and friends such as social networking.
- Prosumers are interested in entertainment.
- Prosumers want to be connected and serviced always and everywhere.
- Despite being technology lovers, they appreciate simplicity in solutions.
- Prosumers are mainly smartphone users, but they also use frequently tablets and laptops.

Furthermore, the number of prosumers has been estimated by using the PV capacity in 2013 from [6]. The capacity of grid connected PV residential systems vary from 2 to 10 kWp. Then, one can divide the PV power installed in residential sector by 10 kWp in order to obtain the estimation of the minimum number of prosumers in each European market. Results are presented in Table 1.

II. COMPANY PRESENTATION

This study has been developed with the collaboration of the company *Enerbyte*, *Smart Energy Solutions SL*. Consequently, this block of the project is intended to introduce the solution offered by *Enerbyte* and the markets where the product is currently being applied.

1. Description of the product

Enerbyte presents his product as a Virtual Energy Advisor and compares it with a GPS for energy efficiency. The software developed is designed to collect hourly consumption data from smart meters and deliver personalized energy savings tips. Moreover, the input data is also enriched by the information that users want to introduce about their home.

The business model is based on delivering the service to residential customers through utilities or smart cities.

The service informs the residential consumer about his energy efficiency level compared to his neighbours. Moreover, it uses gamification strategies such as gratification badges or efficiency rankings in order to engage the users into the platform. Hourly electricity prices are also included in the platform and recommendations about the cheapest time periods for turning on appliances are provided.

An important characteristic of the solution proposed by *Enerbyte* is the incorporation of a community within the platform. This tool allows users to interact and share questions and answers. Moreover, it can be used to promote the community achievement of social trends (for example, reducing energy poverty in the community).

2. Current market presence

Enerbyte is involved in several projects mainly in the country of Spain, but also in other European countries (see Figure 6). Most of its customers are smart cities; however, it is also collaborating with one utility.

The market presence is dominated mainly by the Spanish market despite the non-favourable regulation of its energy market for starting businesses around energy services for the residential sector.



FIGURE 7. PRODUCT PRESENTATION OF ENERBYTE

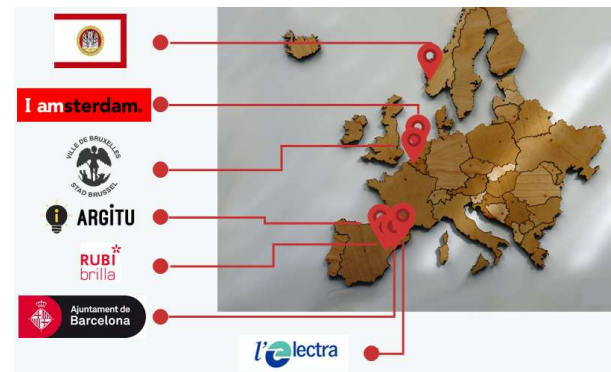


FIGURE 6. CURRENT PROJECTS OF ENERBYTE IN EUROPE

As a result, the vision of the company is at European level because other markets are considered more suitable for this type of solutions. Consequently, the company has been selected by the EU to replicate his experience with smart cities in Spain to other European cities: Brussels (Belgium), Amsterdam (Netherlands) and Bergen (Norway).

Enerbyte has started operating in 2014 with a pilot project of 100 households in the city of Rubí and it is expected to achieve the value of 1 million of users by 2017.

III. ECOSYSTEM

The aim of this section is to analyse in deep most of the companies offering energy management services to residential users. The objective of such analysis is to understand how the energy efficiency solutions are performing in the residential market, and the main differences between Business to Business (B2B) and Business to Customer (B2C) solutions.

The competitor analysis is based on 40 companies from around 14 countries across the world and it is developed around the characteristics of their product and the type of business. The research has been based on the information available in their official websites, in LinkedIn and in some papers from scientific journals.

1. Market findings

The majority of companies offering energy management services for residential consumers were founded during the last 10 years. As a result, it can be concluded that most of competitors within this business are start-ups working to achieve a dominant position in the market.

Figure 8 gives a more detailed insight on the number of companies founded during the last 10 years.

This fact is explained by the emergence of Big Data in the same years and the wide range of applications.

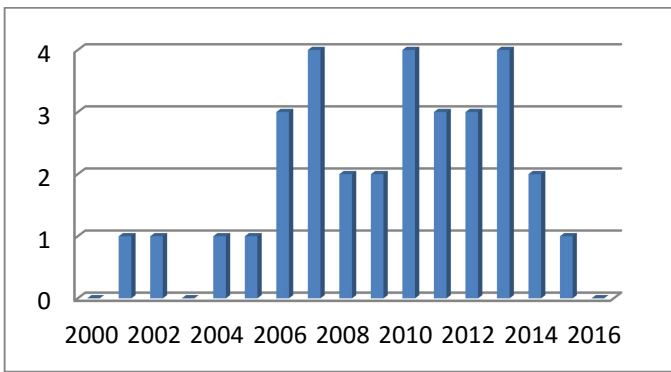


FIGURE 8. NUMBER OF COMPANIES FOUNDED SINCE YEAR 2000 (DEV. BY THE AUTHORS)

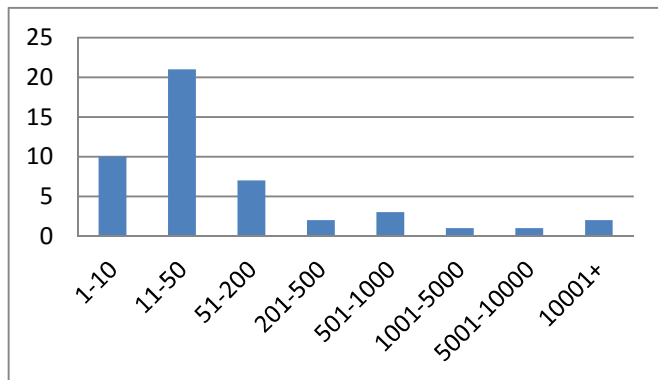


FIGURE 9. NUMBER OF EMPLOYEES (DEV. BY THE AUTHORS)

To confirm these conclusions, it has been plotted the size of each company in terms of number of employees (see Figure 9). As it was expected, most of the companies are in the category of 11-50 employees. Moreover, the second position is occupied by companies with 1-10 employees. This fact demonstrates that the companies in the market are mostly start-ups or SME's (Small and Medium Enterprises) because the market is new and fresh. Furthermore, the fact that the dominant category is 11-50 employees, together with the early year of foundation shows that most of the companies have been successful and thus, the energy management market continues to offer high potential opportunities.

2. Characteristics of B2B companies

- Three B2B approaches have been identified: 100% utility, smart cities and communities, and other industry.
- The utility approach is the most shared in B2B companies and the most successful one until the moment. However, some companies are approaching new markets such as smart cities or community buildings due to the high competition.
- Most of the companies are "Free of Hardware". The incorporation of hardware is seen as a drawback for this type of solutions.

- The concept of "Energy Bridge" is introduced. The main characteristic is that it allows delivering disaggregation information.
- The main features from the platforms of those B2B companies "Free of Hardware" have been compared and analysed (see Table 2).
- Comparison tools are widely implemented in the market. However, the quality of the comparison may become a crucial aspect.
- There are different types of community concepts. On the one hand, some companies allow sharing information through social networks. On the other hand, some companies allow interaction between users within the scope of friendly competitions organized by them. There is a high degree of potential improvement in this feature (*Enerbyte* is an example).
- Gamification and rewards are widely used. This is a very effective way to interact with users in a friendly environment.
- The presence of a marketplace is usually linked to virtual reward points. It represents an adequate place to exchange such rewards.
- The marketplace can provide a new revenue stream for interested companies.
- Prosumer services are not yet a priority in B2B solutions. This fact demonstrates that, in general, utilities have not yet integrated such possibilities into their business model. However, such service can have a strong influence in the future as the number of prosumers is expected to grow.
- Including gas and heating services depend on the energy sources provided by the utility.
- The degree of implementation of gas smart meters is not as extend as electricity smart meters.

TABLE 2. FEATURES OF "FREE OF HARDWARE" AND "100% UTILITY FACED" COMPANIES (DEV. BY THE AUTHORS)

	OPower	Intelen	ONZO The customer in focus	MeterGenius	bidgely	Greenely	SMART energy	BEN Energy
Comparison	✓	✓	✓	✗	✓	✓	✓	✗
Community	✗	✗	✗	✗	✓	✓	✓	✓
Gamification Rewards	✓	✓	✗	✓	✗	✓	✓	✓
Prosumer	✗	✗	✗	✗	✓	✗	✗	✗
Gas/Heating	✓	✗	✓	✓	✗	✗	✗	✗
Disaggregation	✗	✓	✓	✗	✓	✗	✗	✗
Marketplace	✓	✓	✗	✓	✗	✗	✓	✗

- Being able to deliver disaggregation information requires investing in R&D tasks. This service is not widely implemented in the market. However, it may represent a competitive advantage in the future.

3. Characteristics of B2C companies

- Some B2C companies have diversified their channels towards B2B channels in order to reach residential consumers. Three channels have been identified: utilities, smart cities and communities.
- The principal finding is that the majority of B2C companies incorporated hardware into their solutions. This fact is due to difficulties in having access to smart meters data.
- B2C companies use submetering devices connected to the home electric box in order to monitor electricity consumption. Other typical hardware devices are: IHD's (In Home Displays), smart thermostats and smart plugs.
- Some solutions gather many diversified areas which define the concept of smart home: security, heating and lighting.
- B2C companies that do not incorporate hardware in their solutions are not a reference nowadays. Nevertheless, not including hardware depends a lot on the difficulties to access smart meters data. Having this ability will provide a very advantageous position in front of competitors, mostly in terms of price.
- Comparison tools are not widely implemented in B2C solutions. As a result, enjoying of a strong ability regarding this feature is a good strategy to be distinguished in the B2C market.
- Community tools are not widely implemented in B2C solutions. Communities in this market are more difficult to be built because they do not enjoy of a high amount of initial users (like in B2B solutions).
- Gamification and Rewards are not widely implemented in B2C solutions. This fact may be due to the usual link of virtual rewards with demand response programs which are only interested by utilities.
- Nevertheless, including such services may be seen by B2C companies as a strategy to keep the users active within the platform.
- A marketplace can be a suitable new revenue stream for B2C solutions.
- The link between marketplace and reward points is not observed in this case.

TABLE 3. MAIN FEATURES INCLUDED IN B2C EEM SOLUTIONS (DEV. BY THE AUTHORS)

	Plugwise	enrube	efergy	wattio	smappee	NAVETAS	CURRENT	neurio	ecostyle	eGREEN	SolarCity	myenergy
Comparison	✗	✗	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓
Community	✗	✗	✗	✗	✗	✗	✗	✗	✓	✓	✓	✓
Gamification Rewards	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗	✓	✓
Prosumer	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗
Gas/Heating	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✗	✓
Disaggregation	✗	✓	✗	✗	✓	✗	✗	✓	✓	✗	✗	✗
Marketplace	✗	✗	✗	✓	✗	✓	✓	✗	✓	✗	✗	✓

- The incorporation of a marketplace together with gamification and reward points are services not widely implemented in B2C companies.
- Prosumer services are generally implemented in B2C solutions. This is the main difference with B2B companies.
- Gathering several energy consumptions in one platform is very attractive for residential consumers.
- Offer such diversity of services is a very effective strategy to attract new users.
- Disaggregation is not still a reality. However, the increase of savings provided by this ability may represent a common service in the future.

IV. BUSINESS PLAN

1. Strategic position

The two visions proposed for succeeding with a B2C model in the residential sector are:

- Vision 1: increase the number of users in the broad market by rethinking the features of the product in order to be more attractive or consider new channels.
- Vision 2: segment the market and focus on smaller, but more profitable groups.

On the one hand vision 1 could be associated with the *Differentiation* corner. Include unique features in the platform or improve the quality of existing ones in order to attract more users by differentiating from competitors. In parallel, innovate on the type of channels to meet residential consumers. Several approaches such as create brand through advertising, develop innovative capabilities or invest in R&D are suggested in [8] to achieve this position.

On the other hand, vision 2 would be located in the *Niche* corner. A niche strategy is based on generating rents from

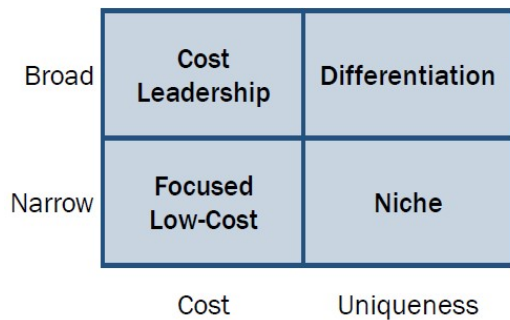


FIGURE 10. GENERIC COMPETITIVE POSITIONS [8]

higher consumer willingness to pay by targeting a small premium segment of the market. In this case, the approaches proposed in [8] are to gain knowledge and expertise in specific fields, and to build brand loyalty.

Considering the previous aspects from each strategy option, the move to a niche market (vision 2) has been selected due to several reasons:

- Investment is considered higher in the differentiation corner because the marketing tasks become very significant. The biggest problem when focusing the broad residential market in a B2C model is the difficulty to get known across residential consumers and consequently, it is needed to put most of the efforts in marketing and advertising campaigns.
- The low state of maturity is a drawback to develop new features, because companies would never know how the market would receive their innovations.
- Selecting a specific group in the broad market provides more control and knowledge on their requirements. Thus, features are more effectively designed.
- Moving to a niche market is seen as more disruptive move within the residential energy efficiency market. It is crucial to select the most appropriate group or groups.

As a result, it has been decided to focus the product specifically on the market composed by prosumers for three main reasons:

- Prosumers are more technology users than conventional consumers [7]. Residential energy efficiency solutions are completely technology focus and therefore, prosumers are more attracted by these solutions.
- Their salaries are 15% higher and their willingness to pay is also higher [7].
- The prosumer market has increased rapidly in the last years and it is expected to follow the same track in the future [6].

2. Market value

From Table 1 the total minimum number of prosumers in Europe at the end of 2013 was about 1.467.326 residential solar systems. This value is calculated considering a common size for residential systems of 10 kWp. However, to obtain a range comprising the number of prosumers in Europe the maximum number of prosumers is estimated with a size of 2 kWp.

The maximum number of prosumers in 2013 was 7.336.630 residential solar systems. Moreover, considering the estimated rate of growth forecast for PV capacity in Europe, one can estimate the increase of number of prosumers. It is considered that the percentage of residential PV in the complete PV capacity will not be increased neither decreased in the following years. The residential segment has developed more rapidly than the other segments in some countries such as Belgium, Denmark, UK or Greece. However, at European level the residential segment had only increased 1 point of percentage between 2012 and 2013 [6].

Then, the same rate of growth for residential sector and the whole PV capacity has been used to forecast the number of prosumers in the coming years.

To estimate the value of the market in monetary terms, it is needed to quantify the money associated with the value delivered to the customer.

The value that can be delivered to prosumers varies from one country to another. For example, in those countries where prosumers are allowed to inject and sell the excess of energy into the grid, they can benefit of energy management tools in order to choose whether to inject the excess into the grid or into a personal battery pack. In these cases, the potential economic savings would be higher than in those countries where prosumers cannot sell the excess of energy into the grid.

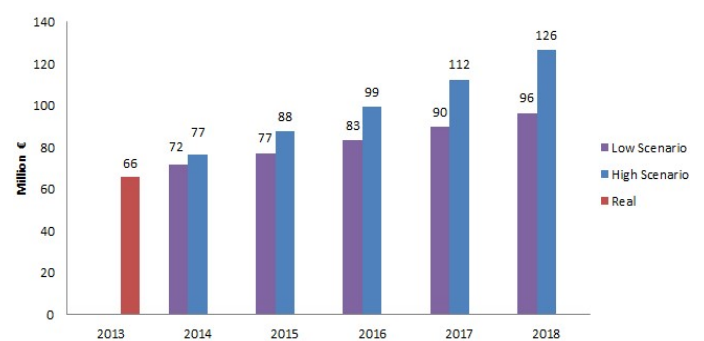


FIGURE 11. ECONOMIC VALUE OF THE PROSUMER MARKET UNTIL 2018 (DEV. BY THE AUTHORS)

However, it has been concluded that, in general, prosumers can receive more benefits than conventional consumers of energy efficiency management services. The main argument to support the previous affirmation is that all the services that can be delivered to conventional consumers can also benefit prosumers. Consequently, to estimate the value of the market in monetary terms, it has been considered that each prosumer would assume a monthly minimum cost of 1.25 €. This is the price presented in [9] that utilities are paying to *MeterGenius*.

Considering this price, the graph in Figure 11 is built in order to show the total value of the market and its expected growth until 2018.

Furthermore, it is important to highlight that the Average Revenue per User (ARPU) and the Customer Acquisition Cost (CAC) are very difficult to quantify in such innovative market.

3. Selection of the geographical market

Next step is to analyse the most suitable countries for delivering energy management services taking into account the previous decisions. Several considerations can be applied to select the best country to enter. On the one hand, the availability of smart meters and the process to access their consumption data is critical. On the other hand, the number of prosumers is something to consider when selecting the best market to enter. Moreover, the competitiveness of the retail market and the legislation for solar energy should also be considered because both parameters influence on the willingness of society to become prosumers.

To quantify the best markets, a value matrix has been built with the following parameters and delivering marks from 0 to 3 to each field. In addition, each parameter has been pondered depending on the importance given to it. The adjudicated values are presented in Table 4. The results have been scaled to the range 0-10 and are presented in .

The countries of Sweden, Finland and Spain can be discarded nowadays mainly because their low number of prosumers. Therefore, the remaining countries (UK, Netherlands, Germany, France, Denmark, Italy and Belgium) should be considered because their punctuation is equal or higher than 7. In other words, any of these markets would be appropriate to enter with an energy management solution for prosumers. Furthermore, there are only three countries with an excellent punctuation (higher than 9): UK, Netherlands and Denmark.

4. Product description

The general philosophy followed here is based on the idea of providing an energy efficiency management solution as a social entertainment tool.

Offering this type of services from a more technological point of view is considered as the main drawback for scaling up the business and reaching a high number of users.

The first decision to be made is regarding the penetration of hardware. In this case, it has been concluded that the best strategy is to **not include any type of hardware** in the solution proposed.

Comparison tools should be included in the solution because their presence in B2B solutions demonstrates its importance and moreover, it could be seen as a distinction with competitors in the B2C market.

Nevertheless, the quality or level of detail from such comparison tools has been identified as the main potential competitive advantage with similar products.

It is considered very important to include a **Community** because of its big potential. This feature is not widely implemented in B2B neither in B2C companies and therefore, it may provide a valuable competitive advantage.

Enerbyte is already offering a community that enables communication between users as one of the features in his energy efficiency solution. Consequently, it is important to keep and continuously improve this feature as it provides the main competitive advantage of the company.

Gamification is considered key for providing entertainment and keeps the user active. It is important to focus gamification from the social point of view. A clear example of it is the organization of friendly competitions to reach community energy savings.

TABLE 4. MATRIX VALUE TO SELECT THE BEST GEOGRAPHICAL MARKET (DEV. BY THE AUTHORS)

	Number of smart meters	SM Data access	Number of prosumers	% of Prosumers	Solar Policy	Retail compet.
UK	3	3	1	1	3	3
Sweden	1	3	0	0	0	2
Netherlands	2	3	1	2	3	2
Germany	2	1	3	2	2	2
France	3	2	2	1	2	1
Denmark	1	3	1	3	3	2
Finland	1	3	0	0	0	2
Spain	3	2	0	0	0	1
Italy	3	1	3	2	2	1
Belgium	0	1	2	3	2	2
Ponderation	2	3	2	2	3	1

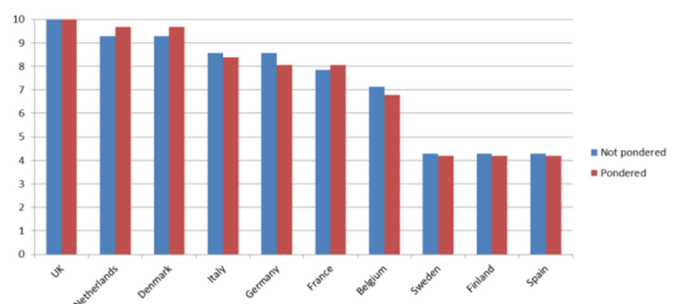


FIGURE 12. GRAPHIC RESULTS OF THE MATRIX VALUE (DEV. BY THE AUTHORS)

The presence of a **Marketplace** is a great opportunity to enable the exchange of virtual points with products. This provides a motivation for users to gain points through gamification activities and it is expected that the link between gamification and marketplace may become the success of both features. Moreover, it provides a new revenue stream for the company getting a commission for each purchase.

Two main types of services have been distinguished to be included in the marketplace. On the one hand, energy related products and entertainment products have to be included. On the other hand, other services informing and comparing the available pricelists of energy supplies can be offered.

Disaggregation could be offered as a premium service because of the added value that can be provided from it.

Besides this, it has been detected that, at present, the majority of disaggregation solutions require the installation of some hardware in order to collect more accurate (frequent) data from smart meters.

Some features will be specifically for prosumers. The main one is the *monitoring of electricity production* which is enabled by collecting the data from smart meters. This is already a common feature in the majority of residential PV systems. However, the available solutions only provide monitoring and, in this case, the significant values will be delivered from it.

Furthermore, another crucial feature specific for prosumers has been identified that enables to deliver many services out of it: *forecast of energy production*. The estimation of the electricity produced by solar panels can be obtained by applying weather conditions, physical models or neural networks [10]. This service will visualize energy consumption, production and forecast at the same time. However, what is innovative from this solution will be the **artificial intelligence** provided from the previous data in order to change the energy management rules in advance and decrease even more energy consumption.

With this information, many services specific for prosumers can be delivered. For example, for those prosumers having batteries they can receive information to manage efficiently the charging and discharging cycles of the batteries. They can receive the best times whether to inject excess electricity into the grid or into their batteries. The same is applied for those prosumers having electric cars with electrical chargers at home. In this case, they can know the best time to charge their vehicle looking for lower prices in the energy market.

5. *Business Model Canvas*

Finally, a Business Model Canvas is built considering all the information presented previously.

Customer Segments: the solution is aiming to serve residential consumers that can consume and produce electricity at their home. This group is a segmentation of the broad residential market and they are commonly referred as prosumers.

The customer is concerned about being energy efficient in order to save energy and to save money. Moreover, he/she wants to share achievements and knowledge with similar users.

Value Propositions: the solution offers artificial intelligence services from monitoring the home electricity consumption and production. Examples of such services are: best times of consumption, best times of battery charging, best times of grid injection, comparison with similar users, channels to communicate, and interact with the community of users.

Moreover, the platform includes a marketplace where users can access to entertainment and energy related products.

Channels: the best channels to reach prosumers have been identified:

- All types of online advertising are effective because prosumers are high technology users. This channel will represent the main Customer Acquisition Cost (CAC).
- Some utilities are starting to offer solar packages for electricity self-generation. Recommending our solution to these new prosumers is an effective channel and well-receive by utilities. Therefore, this channel will not increase the CAC.
- PV systems suppliers.
- Enerbyte is already working with smart cities in a B2B model. However, smart cities or public institutions willing to promote energy efficiency can become a good channel to reach prosumers. This channel will not increase the CAC because smart cities will be equally interested.
- Pear to Pear (P2P) recommendation. It is expected that contented users will recommend the product to new prosumers and they will be virtually rewarded for such favourable activity.

Customer Relationships: the relationship with the customer segment should be completely digitalized, because it is the most usual way to communicate. However, it is important to remember that despite they are technology lovers they also appreciated simplicity in their solutions.

Therefore, the communication with the customer can be done through email or through the community provided by the platform.

Revenue Streams: the revenue streams proposed are divided in two:

- Monthly payments for joining the platform and having access to energy efficiency services. Furthermore, premium versions with an extra fee will also be considered for some features. The features proposed for the premium version are those associated with big economic savings: disaggregation services and electricity production forecasting.
- Commissions from the marketplace: purchase of energy related or entertainment products and a commission for new energy supply contracts done through the marketplace.

Key Activities: the software development is one of the main activities. It is vital that the technology works always well and is presented in a simple way. The software development should be covered by an expert developer team. Furthermore, it is important that the team is supported by another group specialized on behavioural science. This complement will assure to keep the platform simple for the user and will design the features to be included in the platform.

In parallel, considerable efforts should be dedicated to commercial tasks to meet new users. In order to get known among the prosumers segment, the company should have presence in congresses, conferences, blogs, websites, all related with distributed energy producers.

Key Resources: on the one hand, the developer team is considered a key resource in order to build the adequate product. On the other hand, as it has been stated previously, the access to smart meters data is crucial to be able to deliver energy efficiency services without incorporating hardware. As a result, smart meters data is also considered the key resource.

Key Partners: key partners will vary across different countries. The most important ones are related to the crucial challenge previously mentioned: the access to smart meters data. Depending on the legislation of each country, the data generated by smart meters is stored differently and managed by different public or private companies. All the figures involved in the process to access smart meters data should be identified for each country and therefore, they are considered key partners for delivering the service.

Moreover, official prosumers groups (institutions, magazines, congresses, etc.) are considered key partners because it is crucial to be present in all the activities organized by them in order to get known among the prosumers community.

Cost Structure: the cost structure is composed by the salaries required to build the necessary team and the expenses associated with the channels used (online advertising and B2B channels). In some cases, a fee will need to be paid to utilities and public institutions for having access to their customers.

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