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Project Title:

New Buildings Energy Renovation Business Models incorporating dual energy services

NOVICE

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Collaborative Project

Aggregators Questionnaire

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Task	Task 3.1: Regulatory Framework and Market Analysis for ESCOs and Aggregators
Lead beneficiary	KIWI
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Dissemination level		
PU	Public, fully open, e.g. web	**X**
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No & name	**Task 3.1: Regulatory Framework and Market Analysis for ESCOs and Aggregators**				
Status	Final	**Due**	M7	**Date**	09/02/2018
Author(s)					
Description of the related task and the deliverable in the DoA	Task 3.1: Identification of market structure and potential, policy barriers, gaps mapping The purpose of this task is to identify the market structure and potential of the dual energy services scheme. The market potential will be evaluated based on end-user consultation through interviews and surveys with the relevant stakeholders. If the survey questions result in the collection of personal data the appropriate data management measures would be taken to ensure data confidentiality. The European market will be analysed in terms of size, maturity and potential in order to identify the current state of the market for ESCOs and Aggregators. The research will initially focus in countries where the ESCOs and Aggregators have strong presence and will identify any geographical gaps (i.e. countries where the Aggregator business model is mature but the ESCOs business model is not and vice versa). Desktop based research focused on market reports, publications from relevant bodies and conferences will identify any policy barriers that might arise from collaboration between ESCOs and Aggregators. The research will identify the gaps in the business models of the two entities and identify ways of bridging these gaps under the dual energy services scheme. A report will summarize the findings of this task and will highlight the barriers for a dual energy services scheme in Europe. A second report will emphasize the policy gaps currently present for the roll out of the dual energy services scheme and will provide recommendations and guidelines for policy makers and regulatory bodies.				
Comments					

V	Date	Authors	Description
1.0	31/08/2017	Mircea Bucur	
1.1	05/02/2018	Mircea Bucur, Adiele Ejiofor Taiwo Lawal	Added opportunity index Added country profiles Added abbreviation list
1.2	28/02/2018	Mircea Bucur	Minor text edits

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2 EXECUTIVE SUMMARY

This report aims to summarise the current state of the market for both ESCOs and Aggregators, explain the common business models at European level and identify potential gaps in legislation, regulatory environment or service uptakes that will prevent a combined business model to be successfully formulated and deployed.

The report uses two sources of primary research conducted by the consortium – 2 online surveys conducted with ESCOs and Aggregators carried out between August – December 2017 and one stakeholder's workshop organised in London in January 2018. As there are a number of primary research studies throughout Europe mapping both ESCOs and demand Side response market as standalone markets, this report will not address any of these individual market assumptions and forecasts but will rather focus on the potential, drivers and success probabilities of the combined business model.

Based on the results from the online surveys and stakeholders' workshop, a number of key themes have been identified. These themes were used to select criteria for evaluating the current status of ESCO and DSR markets and to create a European opportunity index for the combined business model. The index splits the countries into 3 categories: (i) ready for business, (ii) good potential and (iii) needing improvement. In addition, individual country analysis was carried on for the countries in the tier (i) and tier (ii) groups.

The conclusion section summarizes some of the key findings and recommendations:

1. The consortium will focus on countries from the ready for business group to identify the project demonstrator and to build the full business model as these market currently offer no significant restrictions and the best potential for the NOVICE model. For countries in the good potential group, the consortium will focus on gap bridging recommendations and simplified versions of the business model that takes into account existing market conditions. For countries in the 3rd band, the consortium will focus on barrier removal recommendations for regulators and other relevant stakeholders.
2. The most significant barriers affecting country-wide markets are the regulatory barriers allowing DSR services participation into the markets and those limiting access to finance for ESCOs. The consortium will focus on removing those barriers where project partners' expertise can create a significant impact, such as reducing the perceived project risk, providing robust commercial models and deployment plans, drafting model contracts / third party agreements, and identifying the best combination of assets / building typologies suited for the NOVICE model.
3. Further SWOT analysis on the NOVICE model will have to be carried out for at least one country sample from each group in the opportunity index. This will provide further insights into where the consortium should focus the actions to ensure a maximised impact in line with the project objectives.
4. An increased effort on raising awareness about the opportunities offered by the NOVICE model is needed. There is sufficient evidence that both ESCOs and DSR model are not sufficiently exploited at the moment and one of the reasons is end-users lack of awareness about the potential benefits.

3 METHODOLOGY OVERVIEW

In order to measure interest from both ESCOs and Aggregators towards the potential of a combined business model, two separate surveys were designed and circulated to a number of market participants, mainly from ESCO and DSR sectors. The number of responses reflects somewhat the disparity between the market size and maturity of the two markets: we had 24 responses from ESCOs and just 7 from DSR players. Based on this input we were able to assess and prioritise a number of key issues that could either enable or delay the adoption of a combined business model:

1. Regulatory framework
2. Current market size
3. Market dynamics
4. Access to project finance or any other form of finance
5. Market awareness for both services

Inspired by ITU Digital Opportunity Index that maps the entire world and measures attractiveness of the Digital markets in each country based on a number of criteria, we created a Smart Energy Model Opportunity Index (SEMO) that aims to rank the most developed national energy markets in Europe based on the opportunity they provide for the creation of a combined ESCO and DSR business model. This analysis and report should be a starting point for the consortium and potential partners interested in exploring this business model so as to understand:

- Which countries offer the best chances for the new business model to succeed
- What are the current gaps in legislation and market awareness that might have a significant impact in the successful deployment of the new business model
- What are the current market dynamics and what opportunities and risk do they offer / pose on the new business model

There are a couple of key reports that have been extensively used as a primary source of data for this analysis. The first one is the “Explicit demand response in Europe – Mapping the Markets 2017” Published by the Smart Energy demand Coalition in 2017 [1]. This report maps the current status of the explicit demand response services in Europe doubled by an analysis of the regulatory framework at European level but also in each individual country. The second one is “Energy Service Companies in EU – Status review and recommendations for further market development with a focus on Energy Performance Contracting” published in 2017 by the Joint Research Centre, the European Commission’s science and knowledge service and aims to provide evidence based scientific support to the European policymaking process [2].

As such, we have developed a weighted score matrix for the most developed countries in both markets and then proceeded to map these criteria for each country and rank them based on the level of opportunity they provide for the deployment of a new business model combining ESCO and DSR for building retrofitting projects.

For the avoidance of doubt, we used the ESCO definitions provided by the JRC: “A natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises and accepts some degree of financial risk in so doing. The payment for the services delivered is based (either wholly or in part) on the achievement of energy efficiency improvements and on the meeting of the other agreed.”

For consistency, on the DSR analysis we kept the same criteria and scoring method as EDC. The development of the DSR market is analysed in 4 main areas:

1. **demand response access to markets:** This area includes to what extent demand is allowed as a resource within the different national electricity markets (i.e. wholesale, balancing, ancillary services, Capacity Mechanism, strategic reserves, etc.).

2. **Service providers access to markets:** This area involves the clarification of involved parties' roles and responsibilities, allowing for direct access of consumers to independent service providers, alongside the retailers. In particular, it focuses on progress towards fair and standardised arrangements between BRPs/retailers and aggregators. A standardised relationship between independent aggregators and BRPs has been classified as a key market enabler. A standard framework should enable third-party aggregator access to the consumer independent of bilateral retailer consent and resolve risks to the BRP/retailer caused by demand response activations by an independent aggregator.

3. **Product requirements:** This area refers to the requirements of the different products/programmes (e.g. minimum bid limit, symmetric bid, maximum number of activations, notification time, duration, etc.), assessing whether these enable demand-side resources to participate

4. **Measurement and verification, payment and penalties:** This area refers to standardised and transparent regulation on how demand response events should be measured. It looks at the definition of baseline methodologies in a harmonised and fair manner. It covers questions such as whether the requirements for measurement are proportionate to small consumer capabilities, taking into account the associated costs. It examines whether the pool of loads can fulfil the measurement requirements as an aggregate, or if these take place individually at a per-consumer level. It also examines whether payments for providing demand-side flexibility are fair, transparent, and attractive. Apart from studying whether the financial conditions are healthy, including whether penalties for non-delivery are reasonable or discourage customer participation.

We extended this set of criteria with another 4 areas measuring maturity and development of the ESCO market.

5. **ESCO market longevity:** This area looks into for how long this market existed in a particular geography. While the ESCO market has less regulatory restriction, the overall market maturity and uptake is reflected by the number of year companies have operated in the market

6. **ESCO relative market size:** This area measures the number of ESCO / 100.000 inhabitants as a relative size of the market.

7. **ESCO relative market value:** This area measures the average ESCO revenue / 100.000 inhabitants as a relative value of the market

8. **Access to project finance and other form of finance:** A key aspect of ESCOs ability to operate in any geography is how easy they can finance their project. This is reflected both in the

market reports and our ESCO survey. As such, the availability of project finance in a particular geography can be either an enabler or a restrictor for the development of ESCO models.

To match the original scoring for the criteria 1-4, we have ranked the criteria in the 5-8 section and extrapolated values to keep the scale consistent. We used this eight-dimension analysis to compile country scores for overall ranking but also to generate web maps of the combined ESCO and Aggregator markets so that we can spot and analyse significant gaps between the two markets but also gaps within each market. The web maps were used as a basis for individual country profiling.

4 MAPPING NOVICE MODEL POTENTIAL ACROSS EUROPE

4.1 NATIONAL MARKETS RANKING

Based on the methodology described in the previous chapter, we have produced an opportunity index for the NOVICE model. It is important to understand that the main function of this index is to indicate which national markets provide the best grounds for the NOVICE model today. The results are presented in Table 1

	DR access to markets	Service providers access to markets	Product requirements	M&V, payments and penalties	ESCO market development	ESCO market size	ESCO market value	Access to finance	Total
France	5	5	5	3	5	4	5	4	36
Germany	3	1	3	3	5	5	5	4	29
Austria	3	1	5	3	5	4	4	3	28
United Kingdom	5	3	3	3	3	3	4	4	28
Ireland	5	5	3	1	3	3	3	3	26
Belgium	3	3	5	3	3	3	2	3	25
Denmark	3	1	3	3	4	3	4	3	24
Finland	5	1	3	5	3	3	2	2	24
Sweden	3	1	3	3	2	3	3	3	21
Italy	1	0	1	1	5	4	5	4	21
The Netherlands	3	1	3	3	3	3	2	2	20
Poland	1	1	1	1	2	2	2	2	12
Spain	0	0	1	0	3	2	2	2	10
Portugal	0	0	1	0	2	2	2	2	9

Table 1: NOVICE opportunity index

4.2 COUNTRY PROFILES

4.2.1 France

France DSR market overview

France has had an active DSR market since 2003 when large industrial companies began taking part in the balancing mechanism. The first pilot tests for DSR commenced in 2007 and were aimed at introducing aggregated residential load to the demand response mechanism. This has progressed steadily and for the first time on the 1st of July 2014, an industrial consumer provided its energy reduction as a FCR or Primary Reserve (SEDC, 2017). This programme, together with secondary reserve (aFRR) has been accessible for load participation since 1 July 2014.

In most European member states there is no clear Framework for the role of independent aggregators and relationships between independent aggregators, BRPs and suppliers are not always well-defined (Verhaegen & Dierckxsens, 2016). The French demand side response market is arguably one of the most developed in this regard and according to Bertoldi, Zancanella and Boza-Kiss, (2016) France is one of the only countries which has opened both the ancillary services markets and wholesale market to demand response and independent aggregators.

The relationship between aggregators and retailers/BRPs has been regulated since 2013 when a standardised framework was put in place. Since 2014, there has been no need for consumers or aggregators to contract with a BRP to provide its flexibility to the markets. This helps to facilitate entrance to the market and France is one of only 3 Member States (Finland, GB and France) where residential consumers are engaged in demand side services. It is also one of only a few countries in Europe successfully employing critical peak pricing of tariffs to promote demand response (SEDC, 2017).

The French TSO (RTE) has been actively adjusting the programme's requirements to better fit the capabilities of the demand response market. The NEBEF ('Notification d'echange de Blocs D'effacement) which launched in 2014 is an example of this. It is a mechanism which introduces into the French energy code, articles enabling the selling of demand reduction in energy markets and in the balancing mechanism (Enedis, 2015).

A few obstacles do however remain with regards to the DSR market and act as potential barriers. The high mandated sourcing cost of the retailers for example continues to impede growth within the wholesale markets as almost all revenues earned must be paid back to the retailer by the aggregator and consumers (Van Nuffel & Yearwood, 2017).

Regulatory changes that could impact the market and solve this problem are thereby being tested with a draft decree of the Energy Transition Law that is being scrutinised by the Conseil d'Etat (Court of administrative justice). This law could provide for a new financial settlement framework whereby a significant part of the payment to retailers with curtailed customers will be charged to retailers rather than to demand response providers.

The TSO in France RTE has adapted its products to demand response and these have been improved further to be aggregation-friendly, i.e. to allow aggregation irrespective of the type of network, metering, electricity retailer, BRP, etc. The markets have also made significant progress adjusting technical modalities and market entry requirements to facilitate consumer participation. Consequently, the number of MW of demand side response have more than tripled between 2013 and 2015, making France one of the more attractive DSR markets in Europe (Bertoldi et al., 2016).

Currently the business case for demand response in France is very strong and thanks to the legal framework put in place and currently being improved upon France is considered one of the most suited markets for DSR. The issue of compensation will however have to be addressed as too high a share of demand response benefits are allocated to retailers and suppliers to the detriment of aggregators.

France ESCO market overview

The French ESCO market is considerably large and growing at a significant rate. The market has had quite a long time to develop due to the long tradition of outsourcing energy service contracting which dates back to the 19th century. This means that the French ESCO market may be the biggest in Europe (Vreeken, 2012).

The total number of ESCO type companies in France is currently estimated to be around 350. Of these 350 only around 10 ESCOS offer guaranteed agreements and Energy Performance Contracts. These 10 companies are made up of 4 energy suppliers and 6 other companies (JRC, 2017). However, Duplessis *et al.*, (2012) argue that the number of ESCO companies and the volume of ESCO projects in France are underestimated by international analysts due to the market specifications which include the vast volume of management projects often containing minor clauses for guaranteed energy savings or comfort supply.

The long tradition of outsourcing energy service contracting in France also means that the country is well known for its 'chauffage' contracts which have been in use for more than 60 years. Under this type of contract, an ESCO takes over the operation and maintenance of the client's equipment and sells the output (e.g. heating, cooling or lighting) to the client at an agreed price. The consumer is guaranteed a percentage saving (5-10%) off their regular energy bill while providing an agreed comfort level (Coppens, 2013). The more efficiently the ESCO can manage energy use, the greater their earnings.

EPC's in France have also been gaining in popularity since 2009 and according to the French NEEAP (European Parliament, 2014) have experienced a significant rise over the past few years. Generally, the traditional target sector of ESCOS for EPC's in France has been the public building sector. This may be because there are a number of public policy initiatives which make it easier for ESCOs to operate (JRC, 2017). This is coupled with the fact that Energy contracting is limited in the French industry mostly because industrial partners do not represent a long-term reliable client (JRC 2012). Regardless of this, in recent years the residential sector has also witnessed EPC based projects which have been implemented in certain social housing cases (MILIN *et al.*, 2012) showing the development and potential growth of the ESCO market over time.

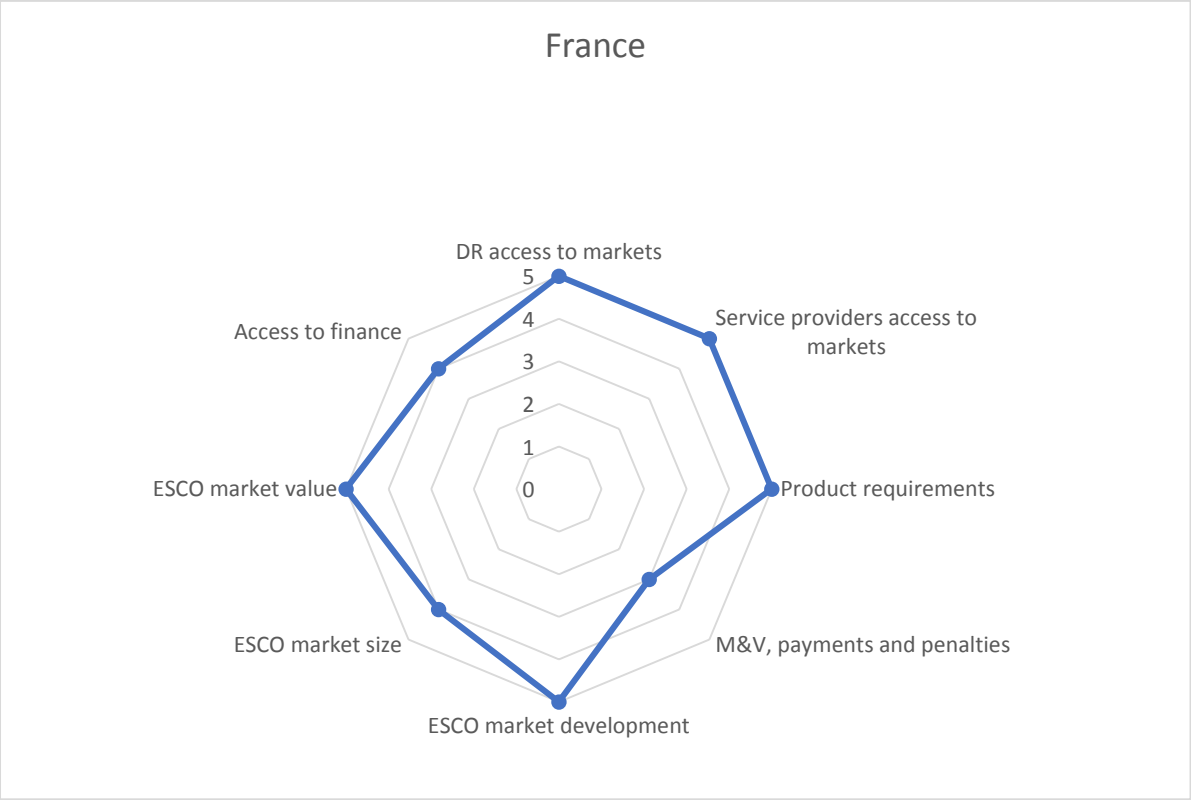
The ESCO market in France even though well-developed still possesses a lot of potential and was estimated by Duplessis *et al.*, (2012) to have one of the highest additional market potentials open to Energy Efficiency services in Europe (19.63 – 464.2 million euros per year).

Potential for combined business model

Although both DSR and ESCO market have sufficient room for improvement, there are currently no significant gaps that would prevent the new business model to emerge. The only concern at the moment is the service providers' access to markets for DSR services, however this is improving and

we can assume the new business model would gain traction with players who are already active in the market place.

The French DSR and ESCO market are currently some of the most developed in Europe and therefore provide ample opportunity for a successful implementation of the new business model. Though there is some room for improvement for example with regards to the complex nature of the contracts instituting energy efficiency services and the proving of short-term investment case for both DSR and ESCO services, there are no significant barriers which may impede the emergence of the new business model.



4.2.2 **Belgium**

Belgium DSR market overview

The Belgian DSR market is still in its developmental stages and has undergone substantial steps by implementing various changes in product requirements which would ensure its ancillary services are open to demand response. Secondary reserve in Belgium is not yet open to demand response but DSR can participate in the primary and tertiary reserves as well as in the interruptible contracts programme which allow consumer load to be interrupted by direct control of the utility system or consumer at times of seasonal peak and are classified under the tertiary reserve (Diamond, 2002).

Though the Belgian market has taken steps towards making its market more accessible and open to demand response the main restricting factor lies with the need of independent aggregators to obtain prior agreement of the consumers retailer/BRP to engage in demand response services (Bertoldi et al., 2016). This acts as a major inhibitor and discourages independent aggregators from setting up demand response services.

This is further complicated by the fact that the wholesale markets are closed to demand response which frustrates large industrial consumers who would like the ability to earn from their flexibility without penalty. Capacity issues in the Belgium market make energy costs of such industrial consumers a burden and they would like to lower these costs (SEDC, 2017). Qualified participants can only participate in the wholesale market if they satisfy the necessary conditions i.e. contracting with a BRP or becoming a BRP. Therefore, presently residential customers connected to the distribution grid cannot participate in the market in an explicit way and customers cannot choose who their aggregators will be as this requires bilateral contracts between BRP and aggregator. The BRP are further able to exercise the legal right not to cooperate with a different service provider.

Although demand response isn't traded on the Belgium wholesale market, large single electricity consumers can enter into price sensitive demand bids in the power exchange Epex Spot (Belpex, 2013). This remains low however due to legislative barriers which include the fact that independent aggregators need a contractual agreement from a consumer's retailer/BRP or that they become BRPs themselves. It is however difficult and expensive for an aggregator to become a BRP and the penalties in the case of imbalance are quite substantial, sometimes getting as high as £4.00/MWh. All this creates significant entry barriers both for consumers and aggregators in an otherwise open market. Consequently, the volume of energy traded in the spots market Epex is very small in comparison to the amount traded on the largely centralised Belgium system and only a few large industrial parties like large steel or chemical industries trade on the Spot market (SEDC, 2017). The challenge thereby for larger demand response participation is to give customers wider access to the Spot market.

A further challenge to be addressed to make DSR more accessible is the role of DSOs in the Belgium market. DSOs in Belgium do not use demand response but like many other DSOs in Europe focus mostly on capital expenditure investments to ensure network security. Even though DSOs don't themselves participate in demand response they cooperate with the Belgian TSO (Elia) to provide the possibility for consumers connected to their distribution network to participate in demand response. However, they legally reserve the right to block or interrupt demand response services if there is a capacity issue.

Stakeholders report that it takes about 6 months for DSOs to approve requests to participate in any new DSR program and this can be a disincentive or barrier. Nevertheless once the process in place is approved for individual consumers it is completed in a matter of weeks.

The challenge in the Belgium market will be to give more access and possibility for demand response to participate. Legislation which will formalise the role of the independent aggregator and establish their right to access consumers directly without permission of the consumer's BRP is expected to be implemented soon. This will go a long way in expanding the market and making it more accessible. With such changes being instituted the DSR market in Belgium is expected to grow and attract more parties.

Belgium ESCO market overview

The energy service market in Belgium is considered stable and moderately-sized with some growth expectations coming mainly from both EPC and ESC projects. These projects are facilitated by the public ESCOs and facilitators. Most private ESCOS have been focused on private building owners and industry but there is certainly a necessity for public market and project facilitators to accompany public building owners.

At last count in 2014, the number of ESCOs in Belgium were at 10-15 companies, of which 6 are large (daughter companies of large international companies) and 5-7 are small or medium sized enterprises (Boza-Kiss et al., 2017). There are also three public ESCOs which provide a platform for third party financing by providing advance payments and getting repaid annually from the accrued savings. The general model used by these three ESCOs (Fedesco, VEB, Infrax and Eandis) has been referred to as an "integrating organisation" whereby public entities are contracted directly and then they in turn subcontract their tasks to smaller, private suppliers like equipment installation companies, engineering companies etc.

The current market size for Energy Performance Contracts (EPC) is estimated to be around 1 – 5 million Euros with further growth still expected and public ESCOs being the main driving force behind this growth with their role being mainly to act as ESCO market facilitators.

With increased awareness amongst public authorities the demand for EPC projects have increased gradually creating an avenue for ESCOs to occupy a space in the energy market. The number however is still low, and more awareness will be needed to improve the number of projects significantly from the last count of 5 running projects in the last 3 years (Boza-Kiss et al., 2017). Part of the reason the number remains low is due to the lack of enough and well disseminated best practice examples which makes it difficult to convince potential clients of the benefits.

Other factors to improve the uptake of EPC projects and in turn increase the role of ESCOs in the Belgian market would have to include removing the remaining market barriers. These barriers include the lack of subsidies for EPC investments and the general organisational complexity of the country. This is because the three regions in Belgium have their own energy efficiency policy measures and approaches towards the ESCO market. In general they implement EU directives differently making it difficult to have a cohesive comprehensive framework for being active in all three regions which ESCOs usually attempt to do (Government of Belgium, 2016).

Financial barriers also create a further hindrance to the development to the market especially because EPC projects are largely unproven and have a long payback time span making it unattractive to investors.

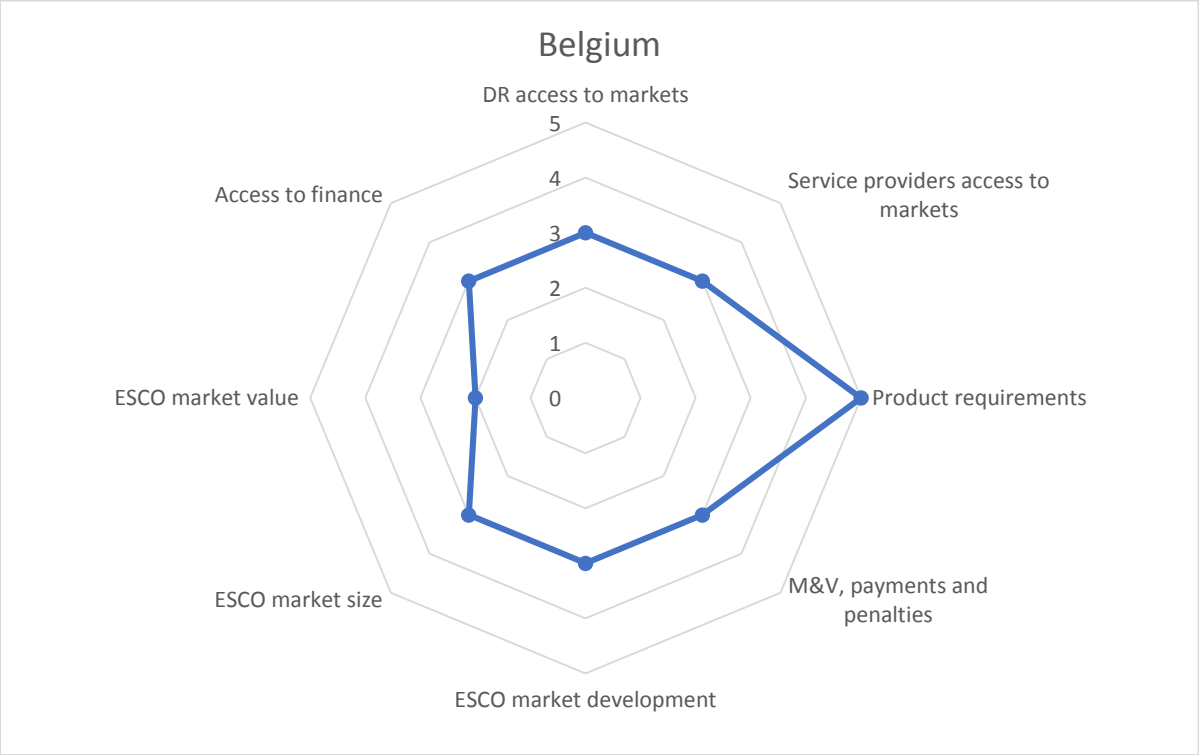
These issues are mirrored across all three regions of Belgium to varying degrees and are coupled with other barriers which combine to restrict access to the ESCO market. For example, in Flanders, there is a difficulty for ESCOs to enter into contracts with SMEs and the Wallonia ESCO market shows a variety of issues including variability in energy prices, complexities associated with public procurement and large size of EPC projects necessary to make the project profitable (Hal, Dulski, Stutvoet, & Steenhuis, 2015).

The status of ESCOs in the Belgian legislative and policy framework may constitute the most inhibiting factor against the growth of the ESCO sector. The legal framework for the ESCO sector in Belgium is not yet developed and EPC is not defined by law in spite of the provisions of the EED (JRC 2016). For this market to reach its full potential these barriers need to be addressed.

Potential for combined business model

Both the Belgian ESCO and DSR market are presently stable with projected growth expectations. This bodes well for the implementation of the new business model. Increasing knowledge of EPCs, energy savings and confidence in the long term financial benefits of ESCO projects will go a long way in stimulating market growth. However, for this potential to be achieved certain measures have to be

taken to ensure the long-term stability and viability of the market and most especially this includes eliminating any major barriers found in the market. Measures to enable this include: administrative adaptation of subsidy schemes, development of an output-oriented energy efficiency policy and support of the tendering process of EPC projects in the public sector. With improvement to these barriers the new business model is expected to be successful in the Belgium market.



4.2.3 **Ireland**

Ireland DSR market overview

Ireland is a small market that was one of the first to address the RES driven need for flexibility. The initial Irish demand response scheme was phased out in early 2013 after the country's TSO, Eirgrid, modified the Electricity Market Rules to allow demand response providers enrol as demand Side Units (DSU) in the Single Electricity Market (SEM). The first DSU became operational in 2012.

The new demand response programme enables easier access to the market but the prequalification process for the DSUs could do with some improvements which would make it more accessible. The Short-Term Active response (STAR) programme however, which is the interruptible loads programme is adequately designed, providing minimal barriers to entry as it has no minimum bid size making it very accessible (Bertoldi et al., 2016).

Ireland has ambitious targets of ensuring 16% of its country's total energy consumption comes from renewable energy sources by 2020 and these have been laid out in the "Delivering a Secure, Sustainable Electricity System" (DS3) programme (EirGrid, 2014). For this to be achieved, 40% of the country's energy generation will have to come from renewable energy sources. Consequently, the need for flexibility is anticipated to increase, creating more business prospects. This will further be influenced by the opening of the balancing markets for DSU's in 2018 and the launch of the new Integrated Single Electricity Market (I-SEM) also in 2018. The aim of the new markets is to integrate

the whole island's electricity market with European electricity markets, enabling the free flow of energy across borders, thereby delivering increased levels of competition and encouraging greater security of supply and a decrease in prices (EirGrid, 2016).

The opportunity for DSUs to offer ancillary services was introduced in October 2016 within the framework of transitioning to I-SEM. This will provide a significant growth opportunity for assets with appropriate characteristics. Furthermore, with the enabling of more participation in the I-SEM, demand-side participation will increase significantly through a more diverse product range.

I-SEM is in its final phases of development by the commission for Energy Regulation and the Utility Regulator of Northern Ireland. They have settled on a volume-based Capacity Mechanism using reliability options. Whereas the current SEM is an ex-post balancing market the I-SEM will comprise of two ex-ante markets for physical energy trading (Day ahead and Intraday), an ex-post Balancing Market, a capacity mechanism and a Forwards Market (SEDC, 2017).

demand response in Ireland currently participates in a number of markets including the balancing and ancillary services market which opened to demand response on 1 October 2016 as part of the DS3 programme "Interim Arrangements" (SEDC, 2017). DSR is also present in the wholesale market where it gets involved from the point of view of bidding and dispatch but demand response providers do not earn an energy payment for this. Lastly DSR is active in interruptible contracts where Eirgrid's STAR scheme provides short-term reserves to the transmission grid, using under-frequency relays at industrial sites. There is however no volume-based Capacity Mechanism currently existing in Ireland at the moment but a price-based capacity provision currently exists in the wholesale market.

Currently the DSO in Ireland has the right to limit the physical access of a site to demand response but not the financial access meaning that a site may be limited to curtailing load and/or using generators at certain times but not prevented from offering these services to the market. This means customers get availability payments even if the DSO deems that system constraints prevent them from being dispatched (SEDC, 2017).

To make DSR more attractive improvements could be made in the tariff pricing scheme as currently the tariff scheme does not incentivise DSR. The scheme is close to flat and does not reflect congestion or real time need. The ex-post pricing mechanism also makes it difficult for implicit demand side measures to be involved in the market given the lack of actionable price signals.

Another barrier which needs to be addressed and currently prevents free entry into the DSR market is the complex technical and prequalification requirements which each individual unit in each pool of loads must fulfil. Consumers have to go through the arduous technical prequalification measures which they may not have the ability or knowledge to fulfil. The prequalification process is also very costly and discourages consumers from participating in the DSR market.

A positive for independent aggregators in the Irish market is that aggregators do not require the BRPs agreement prior to load management. This means the aggregator works as a service provider for demand sites gathered to fulfil the DSU requirements. Aggregators have to report their availability to the TSO and they act as power plants with the ability to dispatch when needed.

The Irish market is therefore a viable place with prospects for DSR. Aggregation is allowed, and the minimum bid size is 4MW for DSUs. Due to the small market size however it may be better if this is reduced to encourage participation.

Ireland ESCO market overview

The Energy Services Companies (ESCOs) market in Ireland is still in its introductory stages but shows promise with the early signs of potential growth. There have been significant developments in recent years and measures have been put in place by the Irish Government which look promising with regards to stimulating expansion of the market. The Sustainable Energy Authority of Ireland (SEAI) have also been instrumental in partnering with the Government to implement key measures which will make the market more attractive. These actions include the government's commitment to secure €35 million as seed capital for investments in the Energy Efficiency Fund, which should help establish a fund of over €70 million when matched with private sector investments (Hayden, 2016). The fund aims to enhance the level of finance available in the market and allow players to materialise opportunities that exist in the public and commercial sectors.

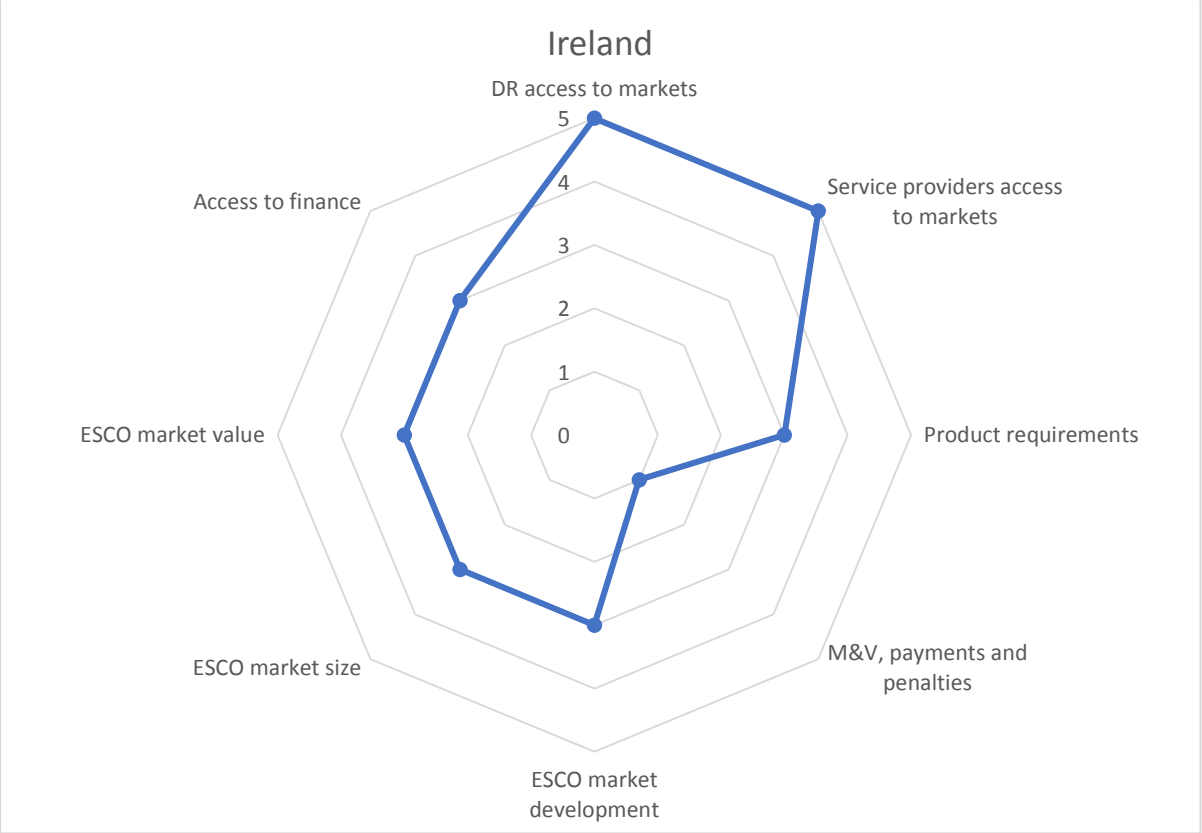
The value of the Irish ESCO market is not accurately known with figures ranging from 100million euros to 1billion Euros. The number of ESCOs in the country is also not currently known with a study by the SEAI in 2005 finding only 2 organizations (Hayden, 2016) and a study in 2007 estimating between 13-15 small local energy service supplier companies (Bertoldi & Rezessy, 2007). There are however a number of companies who don't explicitly identify as ESCOs but act as Energy service providers without any energy performance contracting.

It is currently not clear the extent to which EPCs are currently used on the market and the Irish government set up the National Energy Services Framework in 2013 which is a three-pronged approach to delivering Energy Performance Contracting. The National Energy Services Framework also provides guidance and support for energy supply contracts. This guidance deals with assisting development of local energy supply contracts with a focus on sustainable energy. The introduction of the National Energy Services Framework is expected to standardise the approach to ESCO procurement and a number of dissemination activities were prepared in the period 2013-2014 in order to provide best practice guidance to public and private sector client organisations when procuring energy services.

The ESCO market in Ireland still could do with a lot of improvement. This could begin by setting up an association to represent the interest of ESCOs (currently being done by the SEAI) (Boza-Kiss et al., 2017). There is still considerable potential for energy savings in Ireland in both the public and private sector and growth in the ESCO market is key to accessing these energy savings.

Potential for combined business model

Both the DSR and ESCO market in Ireland show admirable stability with constant improvement. This Bodes well for the potential of the new business model to thrive in this environment. Minor improvements will need to be made to ensure optimal efficiency, but the research shows no significant barriers to the success of this model in the Irish market.



4.2.4 **United Kingdom**

UK DSR market overview

The United Kingdom was the first country to open several of its markets to consumer participation in Europe. Unfortunately, in recent years it seems that the stakeholder process between providers, BEIS, Ofgem and National Grid has not been as effective as would be expected in a mature market. As a result, the DSR market is not as functional as it could be due to various operational and procedural requirements. This makes the market difficult to access and reduces the potential number of demand-side MWs even as national generating capacity continues to decline.

Almost all ancillary services programmes in the United Kingdom are open to demand response and aggregated load even though the design is currently not optimal for customer participation. There is also an issue with transparency as comprehensive data regarding the share of demand response in the various balancing services programmes is not available. Many services are procured not through open markets but rather through bilateral contracts or through tenders in which the buyer, National Grid, has a great degree of discretion. This lack of information make participation very risky for new entrants.

The SO is however determined to reduce risk in the DSR market and is taking steps towards achieving greater transparency. National Grid launched a new stakeholder-backed initiative called Power Responsive, with the goal of stimulating participation of flexible technologies in the electricity system. The Power Responsive report (Power Responsive, 2017) gives greater detail as to the various demand side response participants engaged in the non-BM. The report shows that onsite generation constitutes the majority (about 67%) of demand side flexibility technology which participates in DSR. This is followed by load response (28%), generation for export only (3%) and Energy storage (1%).

The relationship between the BRP and aggregator in the UK is not yet fully resolved. Due to this, aggregators are unable to access the Balancing Mechanism or wholesale markets as it requires a bilateral agreement from the BRP/retailer. On the other hand, aggregators can access balancing services and the capacity mechanism as there is no prerequisite for an agreement between the retailer and aggregator. This means that the retailer (rather than the aggregator) is exposed to imbalance payments or costs resulting from customers actions (SEDC, 2017). In November 2016 Ofgem issued a call for evidence to inquire if a framework allowing independent aggregators access to the balancing mechanism should be initiated (Ofgem & Aurora Energy, 2016). The results showed wide support for such a framework and a willingness by Ofgem to institute the desired measures (Ofgem, 2017)

The Association for Decentralised Energy (ADE) has also developed a voluntary industry led code of conduct for aggregators and suppliers. The proposal focuses on five areas i.e.

- sales and marketing;
- proposals and pre-contractual information;
- contract;
- technical due diligence and site visit;
- and complaint

and will aim to be implemented in 2018 (Association For Decentralised Energy, 2017). The Association for Decentralised Energy (ADE) also undertook a self-reporting survey of aggregators and suppliers, to offer a more comprehensive picture of DSF participation in different markets (reserve, frequency response, capacity, wholesale and network cost avoidance). This considered the assets delivering flexibility, the sectors participating and the regional spread of activity across GB.

While National Grid has engaged in streamlining the participation requirements for balancing services and increasing transparency, DR still faces significant regulatory and operational challenges which limit the viability of the UK market for demand response providers.

The capacity mechanism, introduced at the end of 2014, did not place demand-side resources on an equal footing with generation. In the first market only one demand-side aggregator, of the approximately 15 in the market, secured a contract within the new market in the first auction. The most recent auction performed better with independent aggregators securing various MW of capacity and coal losing out. However a combination of low clearing price and de-rating factor means that battery storage finds it hard to compete with only 11% of projects securing capacity in the T-4 auction (Stoker, 2018b) and storage making up less than 2% of the capacity procured via the T1 auction (Stoker, 2018a).

The opportunity for demand response is in principle higher than ever. However, due to poor policy development and design choices, that opportunity has not yet been realised. And as pointed out in the Energyst research most of those who do not provide DSR would be interested in doing so if the route to the market was much clearer, if the complexity was reduced and the rewards were more certain and if it did not affect core business (The Energyst, 2017).

UK ESCO market overview

The UK energy services market is a growing and competitive market with increasing promise to become a leader in the European market. This has been largely due to the government's dedication to support its development which has come as part of the implementation of the UK Energy Efficiency Strategy. Financial facilities and programmes such as Salix and public programmes, such as RE:FIT and CEF in the public sector have contributed towards the positive environment within the market (JRC *et al.*, 2017). Its large experience in project financing and more innovative spirit of enterprises has also led to a flourishing ESCO industry.

There are estimated to be more than 50 active ESCOs in the UK market (JRC *et al.*, 2017). The major players are generally subsidiaries of large international control equipment companies, oil companies, and electricity utilities. The market has also seen the emergence of SMEs into the energy services market. This includes many small companies who offer more than one service and consider themselves to be ESCOs (e.g. consulting plus finance). It is estimated that there are between 20 and 25 companies that offer EPCs in some form and 22 were participating in the public procurement frameworks.

The use of EPCs is a rising trend in the UK with a number of successfully completed EE projects in the public and private sector and more EPC projects planned for the future. So far EPCs have been carried out across a wide range of public buildings in different sectors including local authorities, the NHS, schools, further education and universities (Department of Energy and Climate Change, 2015). It is estimated that there have been around 100 new projects between 2014 and 2016 representing a major growth of the market. Projects are mostly contracted with public buildings, schools, public hospitals, leisure facilities. So far the public sector is leading in terms of realisation of EE projects through contracting and the use has grown in recent years due to support by central and local governments.

A model EPC has also been developed by the Greater London Authority RE:FIT EPC programme. The RE:FIT model is designed to cover measures that allow public bodies to reduce energy consumption, make substantial cost savings and/or provide energy generation along with the necessary requirements to support such a measure within an EPC (Mckinnon, 2016). The programme has so far had an excellent track record of achieving guaranteed savings which is a core motivating factor of EPC contracts.

Research undertaken by the Building Research Establishment has estimated that the UK's ESCO market value is around £180 million (Department of Energy and Climate Change, 2015) and estimates the cost effective potential for investment in carbon abatement in the entire UK public sector to be £1.66 billion. This shows the significant economic benefits that could be realised from this market by making energy efficiency a mainstream activity.

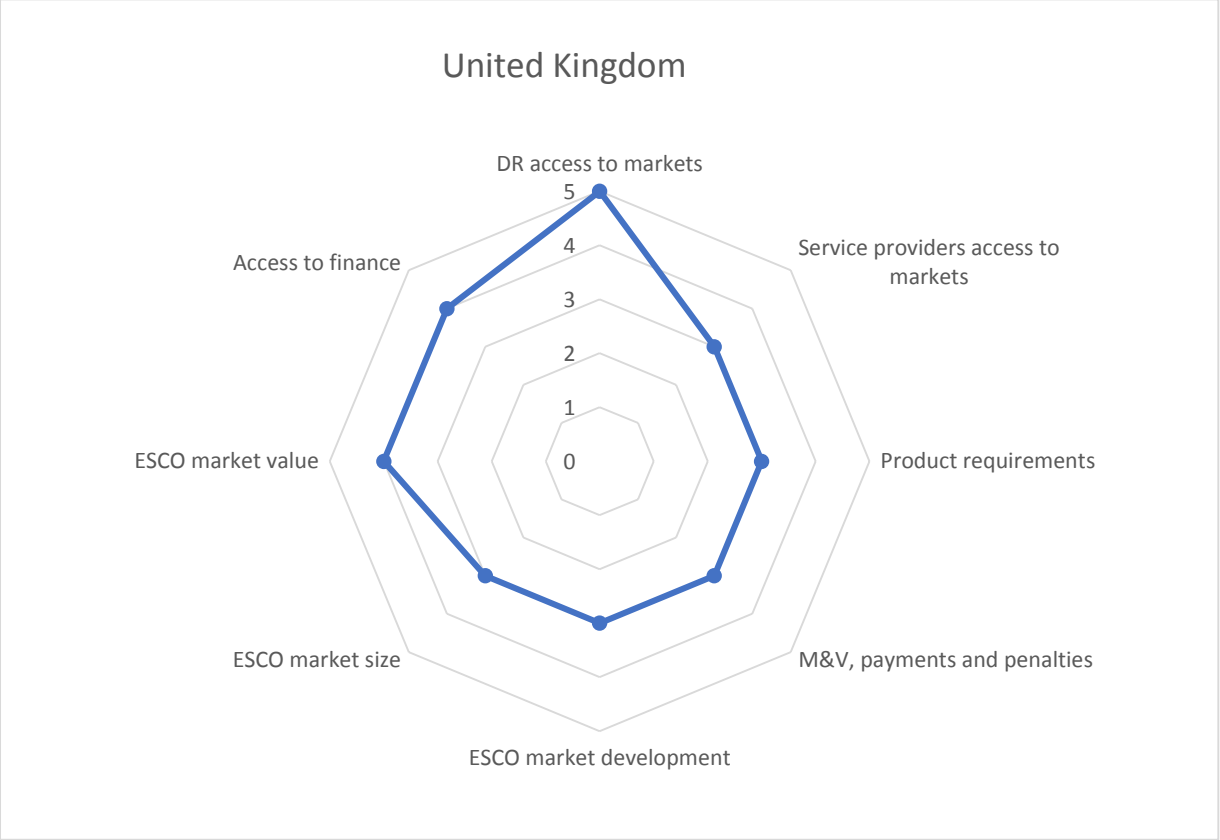
There are however a number of key barriers identified by (JRC 2016) which impede market growth. This includes;

- Lack of information,
- Split incentives,
- Undervaluing energy efficiency and
- Lack of capacity and skills to deliver EPC and to contract EPC by clients.

While the ESCO market in the UK is dynamic and growing there are still considerable steps that need to be taken for it to realise its full potential. The UK government has been pro-active in implementing measures to spread awareness and encourage investment in the sector. Further steps are necessary to reduce barriers to entry and support the growth of the market.

Potential for combined business model

The UK has some of the most developed markets for participation in both DSR and energy efficiency. Continuous improvements are being trailed and implemented to facilitate ease of entry into both markets. Though ample room for improvement still exists in both markets and necessary steps have to be taken to ensure both markets are ideal for investment and growth there are no substantial barriers which will prevent implementation of the new business model in the UK.



4.2.5 Germany

Germany DSR market overview

Germany has planned to achieve 35% of renewable electricity supply by 2020 and will be reducing nuclear power supply by 2022 (Federal Ministry of Economics and Technology, 2011). Germany has started to increase its use of more decentralised energy generation such as wind, solar, biomass and biogas; which has increased its need for de-centralised flexibility. This is due to scenarios in which

variable generation from wind and solar plants will supply a majority of total demand in the grid are estimated to happen more frequently in coming years. (SEDC 2017)

Germany's demand-side response market has several types of products; Primary Reserve (600MW), Secondary Reserve (2000 MW) and Spot Market trading (c.220TWh). Primary and Secondary Reserve are both ancillary service, were as Spot Market Trading is a wholesale market. Both Primary and Spot Market Trading are open to demand response and battery storage participation (Harper, Zhang, Stewart, & Wong, 2017). The Primary Control Reserve has a pre-qualification for TSOs with the performance at least equal to minimum bid size. In 2013, a programme for interruptible load services, with demand response offering to reduce or interrupt demand at short notice for a fixed minimum duration, and extended until 2022. The extended programme now uses weekly auctions, reduced minimum bid size to 5MW and allowing for load pooling (Harper et al., 2017).

Market regulation within Germany has created significant barriers for the vast majority of demand response programme types for both those provided by retailers and independent aggregators. The German Federal Ministry for Economic Affairs and Energy (the BMWi) is addressing of the barriers to demand response through having a broad discussion forum and consultation on the policy conditions for the future of generation and supply of electricity, its use in heating, transport and industry, and the transport of electricity across the grids. This broad discussion forum will help to inform policy decisions of the new government, elected in September 2017 (SEDC 2017).

A number for markets are closed for demand response, either due to legislation not allowing DR (such as network grid reserve) or by being closed in practice due to being highly generation-biased product design (such as proposed design for a capacity reserve). Another barrier for German demand response is the lack of framework and incentives for DSOs to procure distributed flexibility as a service rather than investing in expansion or reinforcement of their networks. Another barrier for Germans DSR market growth is the lack of a standardised role for third-party aggregators, as it requires a number of contractual relationships between BRPs, retailers and third-party aggregators (SEDC 2017).

Germany ESCO market overview

The German market for energy services is considered as the biggest and most developed in Europe, with a history of more than 20 years. There are approximately 500 companies offering contract based energy services of various sizes different types of services and contracts. The majority of companies are providing services based on energy supply contracts. Approximately 55-60% of companies are energy supply companies, 30-35% are energy service providers (ESCOs) (Boza-Kiss et al., 2017).

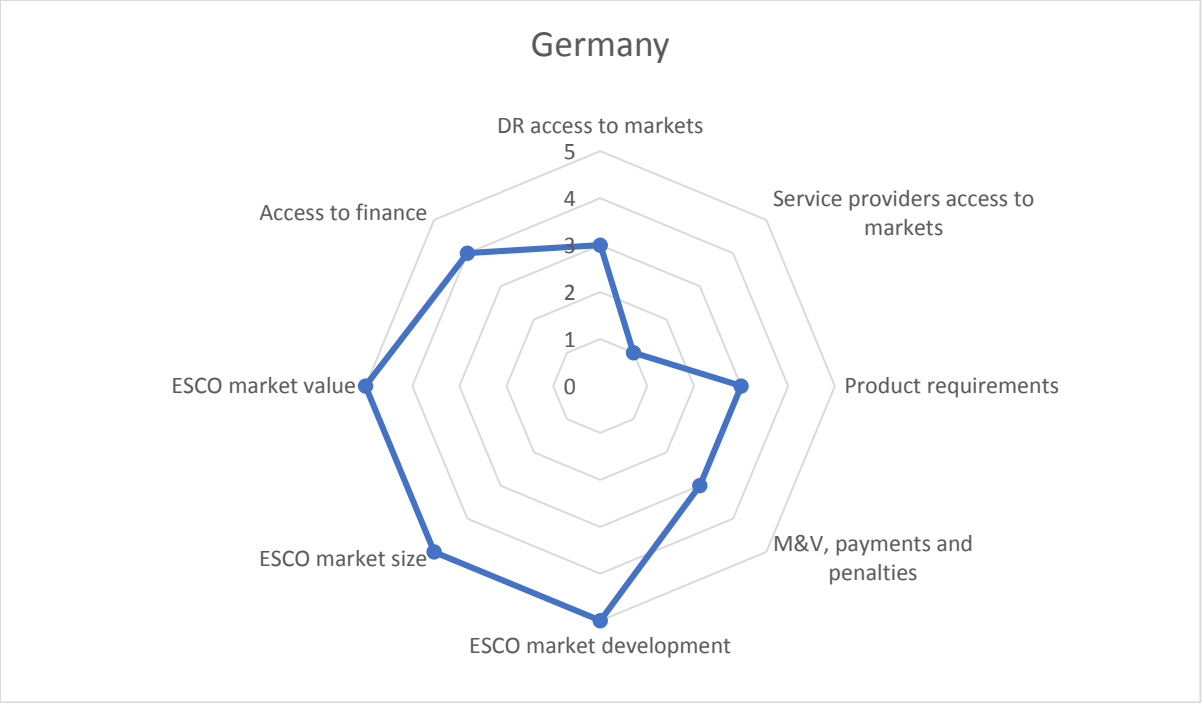
Two-thirds of ESCO companies in Germany are SMEs with less than 250 employees. 25% of energy service providers have energy service contracting as their core business with energy services accounting for more than 30% of their revenue. For 60-70% of companies, energy services account for approximately 5% of their revenue. For Germany's ESCO market, half of the companies earn less than €500,000 annually, while only a few larger ESCOs earn more than €10 million per year from energy service contracting. (Boza-Kiss et al., 2017)

The annual revenue of contracting market for energy services is approximately €3-4 billion and the market volume was €1.6-2 billion in 2010. In 2012, the Association of Heating Suppliers, represented 86% of all contracts for energy services in Germany, 9% EPCs, 2% financing contracting and 3% from energy management contracting (Boza-Kiss et al., 2017).

There are a number of associations for German ESCOs and energy supply companies such as Association of Heat Suppliers (VfW-Verband für Wärmelieferung), ESCO Forum in ZVEI (Zentral Elektronik- und Elektronikindustrie e.V.), Arbeitsgemeinschaft für sparsame Energie- und Wasserverwendung (ASEW), Energieeffizienzverband für Wärme, Kälte und KWK e.V. (AGFW) and Bundesverband Kraft-Wärme-Koppling e.V. (B.KWK) (Boza-Kiss et al., 2017). These associations represent the interest of energy suppliers and ESCOs in Germany.

Potential for combined business model:

Both the German DSR and ESCO market is highly developed and has the potential for a dual business model. The demand-side response market will need to overcome its market regulation issues, which it is retroactively addressing through informing policy decision with broad discussion forums for future of the generation and supply of electricity. With further development of the DSR market through improvement in access to markets, this bodes well for the potential of a combined business model in the future with the already highly developed ESCO market.



4.2.6 Sweden

Sweden DSR market overview

Sweden energy flexibility comes mainly from hydropower plants in northern parts of the country (SE1 and SE2), while thermal plants are sometimes activated in the south of Sweden during times of peak demand. In 2014, the installed capacity of hydropower resources was 16,155MW (40%), nuclear power was 9,528MW (24%) and wind power was 5,420MW (13.7%). Sweden electricity production and usage of hydropower in 2014 was 64.2TWh (42%), whereas thermal energy resources 13.3TWh (9%) (Byman, 2016). Sweden's predominant use of variable energy production resources shows the potential demand for flexibility from TSOs or DSOs. Aggregation of DSR and demand response

participation is legally possible in Sweden. However, wider demand response participation would be possible with the definition of roles and responsibilities between players, therefore allowing for consumers to choose their demand response service provider while protecting all market participants. (SEDC 2017)

Sweden's primary, secondary and tertiary reserves are legally open to demand-side resources and aggregation. Demand-side participation is still limited in Sweden, regulation changes are required to allow for wider demand-side participation. Most demand-side resources participate in the strategic reserve and in the Regulating Power Market (RPM). The BRP must be an independent third party aggregator, and have obtained a contractual agreement from consumers' retailer/BRP to participate in the market. This relationship between competitors hampers the market potential of demand-side resources in Sweden. (SEDC 2017)

A limiting barrier for Sweden's demand-side participation is the product requirements for demand response. The minimum bid size for the secondary and tertiary reserve is a significant barrier to wider demand-side participation. Demand-side resources also participate in the spot market. The main issues from market participants in demand response are both the access to and product requirements in the primary and secondary reserves.

Further development of Sweden's demand-side response market is needed but together with the other Nordic countries, Sweden is currently addressing the issue of the role of independent aggregators participating in the balancing markets. For TSOs in Sweden, there is also a need for electronic systems at the RPM level in order to activate specific loads, as current system is done via telephone calls. (SEDC 2017)

Sweden ESCO market overview

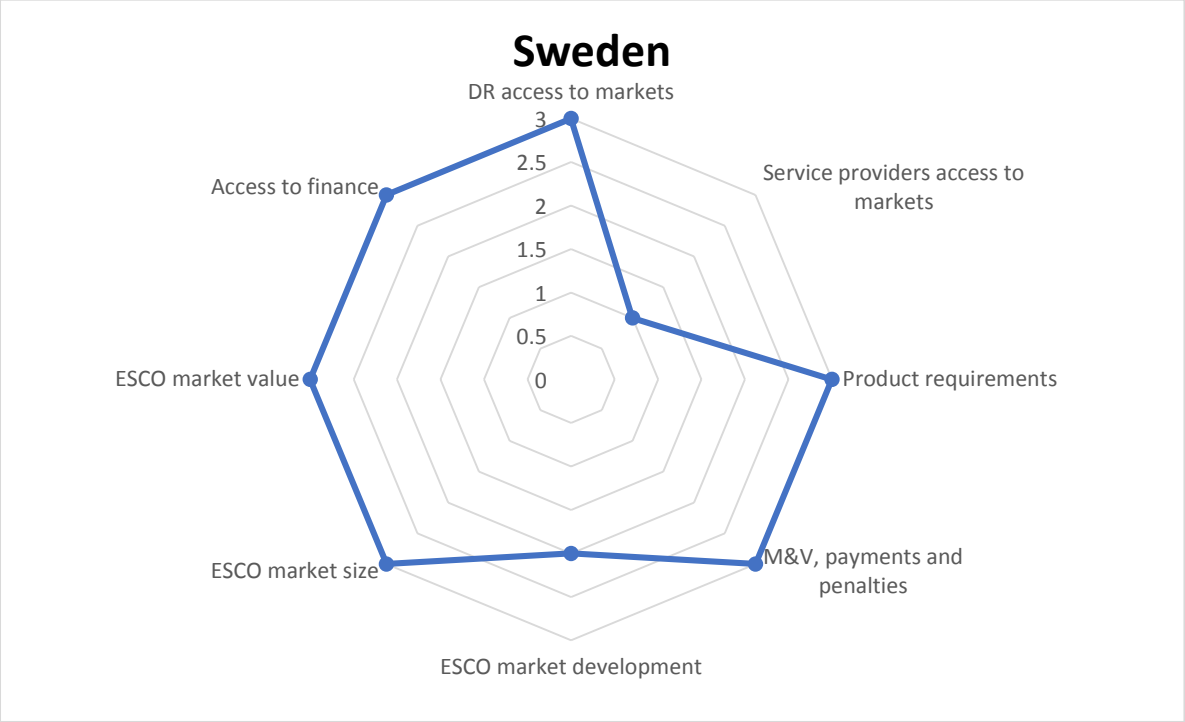
The energy services market in Sweden is a moderate size and is in the preliminary stages of energy performance contracting. There was practically no ESCO activity in Sweden in 2000 after two upsurges in the 1980s and early 1990s were unsuccessful in establishing the ESCO concept sustainably. The Swedish ESCO market rapidly grew from 2004 due to a number of success factors such as successful promotion, channelled policy strategy, and increasing public concern for climate change. The rapid growth in Sweden's ESCO market was driven primarily by a strong demand from the public sector (Wargert, 2011).

In 2009, there were 27 energy service providers operating in Sweden, including international ESCOs with operations in several other countries such as ABB, Honeywell and Siemens (Stenqvist & Nilsson, 2009). In 2013, 5-6 EPC providers were active, primarily in the public and governmental sector (Norden, 2013). Chauffage (also known as Comfort Contracting) is growing business model in Sweden, mainly used by municipal energy companies (Warget, 2011). Chauffage-type contracts involve outsourcing of the service and maintenance organisation, which is a growing trend and driver for the model. There are 3-4 suppliers of heat and/or electricity that specialise in Chauffage-type contracts and 3 others offer ESCs (Wargert, 2011). The ESCO market in Sweden was estimated to be €60-80 million with a market potential of €300 million per year (Boza-kiss & Bertoldi, 2014).

There is no registered ESCO association in Sweden; however, "EnergiEffektivisirungsFöretagen" association includes many ESCOs, so covers the ESCO interests on the Swedish market.

Potential for combined business model

Both the Swedish DSR and ESCO market have room for development and improvement, but no significant gaps that would prevent the new combined business model from emerging. Sweden's DSR market requires regulatory changes to see wider demand-side response participation and improvements in access to primary and secondary reserve to reach its full potential.



4.2.7 Italy

Italy DSR market overview

Italy's electricity market has experienced rapid growth of renewable generation and a decrease in electricity consumption. Italy relies mostly on hydropower and gas resources for its electricity flexibility needs, and there is no framework in place for consumer participation in the balancing market. However, the interruptible contracts programme, a dedicated demand response programme separate from the balancing market, is available.

The average size of interruptible loads is approximately 4GW, with a minimum participation size of 1MW. However aggregation of loads is not permitted. The payments for interruptible contracts programme are attractive and related mostly to availability payments rather than utilisation. The programme has been called on very few times during the last years. Although contracts to access the new capacity mechanism were expected be tendered at the end of 2015, the process has not be implemented in Italy yet. It is anticipated that demand response will feature in the new regulations governing the capacity mechanism.

Italy's expected opening of balancing products to demand-side resources could lead to a rise of load participation. The potential for Italy's demand-side improvement is shown in the recent 2016 legislation (AEEG, 2016) as the Italian NRA (AEEGSI) defined the initial phase of the Balancing Market

Reform (RDE-1). This new agenda, implemented at the start of 2017, has opened the market to demand response, distributed generation, RES and high-performance co-generation. Other drivers include, regulation of the access mechanisms to the demand response, balancing mechanism and reserve markets (including aggregation); reform balancing pricing; and revised geographic zone division.

Italy ESCO market overview

Italy's ESCO market is still considered to be one of the most developed and largest within Europe. The ESCO projects including EPC in Italy have been present for decades, although the market has been developing in an uneven pattern (Boza-Kiss et al., 2017). The EPC market has grown during 2014-2016 (Boza-Kiss et al., 2017), although the development of the European ESCO sector is less evident and experienced a rather stagnant period. There are still areas for further expansion, in terms of possible projects and sectors.

The Italian ESCO market has a large number of associations and industry groups. These include independent associations such as AssoEsco and FederEsco and representatives of utility suppliers and technology providers involved in Confindustria (Federation of Industrial Enterprises). Due to the large number associations for the ESCO market in Italy, the representation of ESCOs is not unified enough. (Boza-Kiss et al., 2017)

The first ESCO projects were primarily in the public sector, and mainly aimed at setting up cogeneration plants in hospitals using third party financing. The public sector in Italy is less capable to engage in ESCO contracts than in other European countries because this sector is characterised by many barriers.

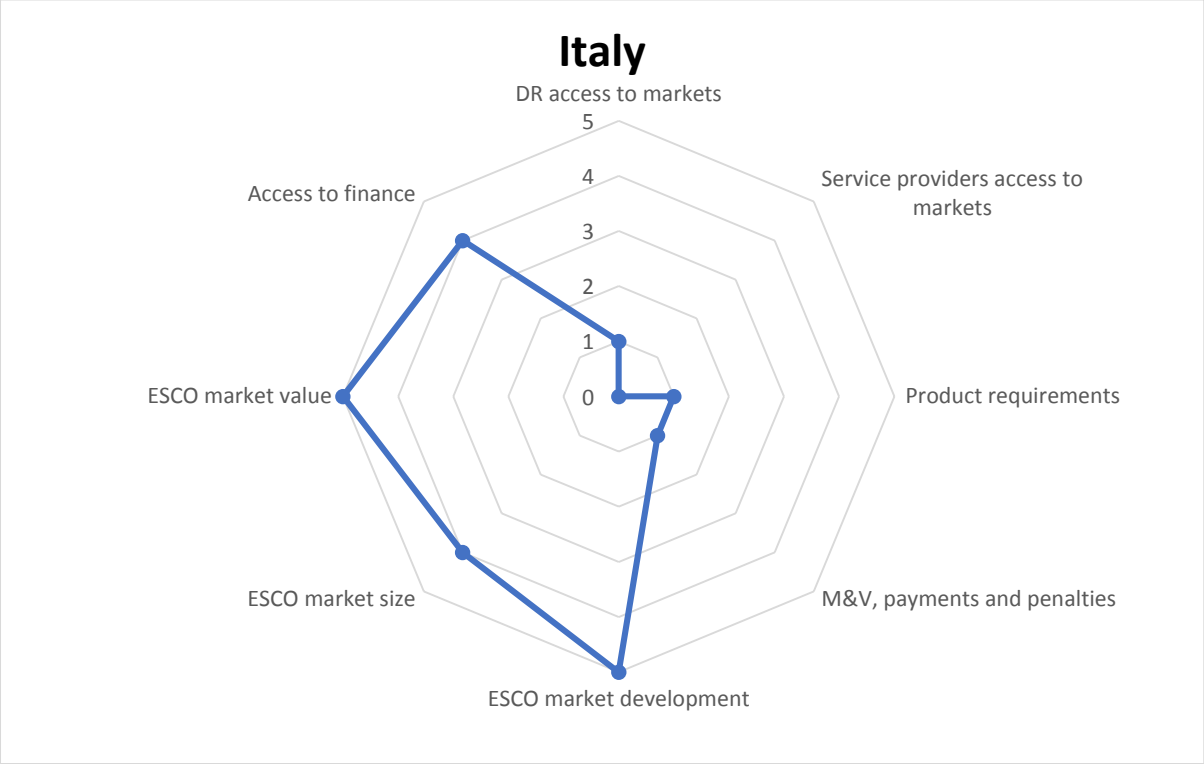
Italy's ESCO market is mostly focused on the industrial sector (Santo, 2015), due to the barriers for public sector projects and the high yields delivered by the White Certificates programme when applied to medium/large size energy recovery projects in manufacturing plants (JRC 2015). 84% of the ESCOs don't offer integrated service (Santo, 2015). Italy's ESCO market is limited in the residential sector and is not attractive to ESCOs, mostly due to the high transaction costs and relatively smaller sized projects. (Boza-Kiss et al., 2017).

The Italian ESCO market is one of the biggest in Europe with a market size of €500 million in 2013, with a potential market size evaluated at €1-10 billion a year (Boza-kiss & Bertoldi, 2014). Market players have identified institutional barrier as the most essential barrier to overcome and are unsatisfied with the government policy supporting EPC (JRC, 2017). A financial barrier for Italy's ESCO market is late payments by clients and insufficient capitalisation, particularly in public sector due to high bureaucracy and procedures delaying payments. This can cause issues of liquidity for ESCOs with multiple projects in parallel. There is also a lack of involvement of financial sector, as many banks don't have the technical knowledge to participate in ESCO Projects. Therefore, it is difficult to gain access to loans with commercially viable terms and rates of interest. (Santo, 2015)

Potential for combined business model

Italy has one of the most developed and stable ESCO markets in Europe with some areas for further expansion in the residential and financial sector. Italy's DSR market is less developed but has a high potential for growth due to rapid growth in renewable generation. The development of demand-side

response supportive government legislation and framework to allow for wider access to the DSR market, which is already in the process of being developed through the initial phase of the balancing reform (RDE-1). The potentially rapid growth in DSR market and already developed ESCO market could be combined for the new business model.



4.2.8 Denmark

Denmark DSR market overview

The demand response market in Denmark is still quite limited due to having no significant demand for flexibility from TSOs or DSOs. This lack of demand for flexibility is due to Denmark having a well-developed electricity market with sufficient capacity compared to other European markets, so the price for flexibility products remain low. However, with Denmark increasing its use of variable resources such as wind and solar power, flexibility will be taken into consideration to prepare for the challenge of balancing electricity production. (SEDC 2017)

Denmark's electricity consumers are allowed to participate in all the ancillary services. However, due to the lack of development of the demand-side business model and regulatory barriers for independent aggregators to develop innovative DSR businesses, Denmark's demand-side response aggregation only takes place through retailers, and there are no independent aggregators in Denmark's DSR market (SEDC 2017). The balancing programmes are designed with a focus on the characteristics of generators and accommodating production units and not demand response units. This has led to only the largest consumption units being able to participate in balancing programmes. The tertiary reserve is the most accessible programme for DSR participation.

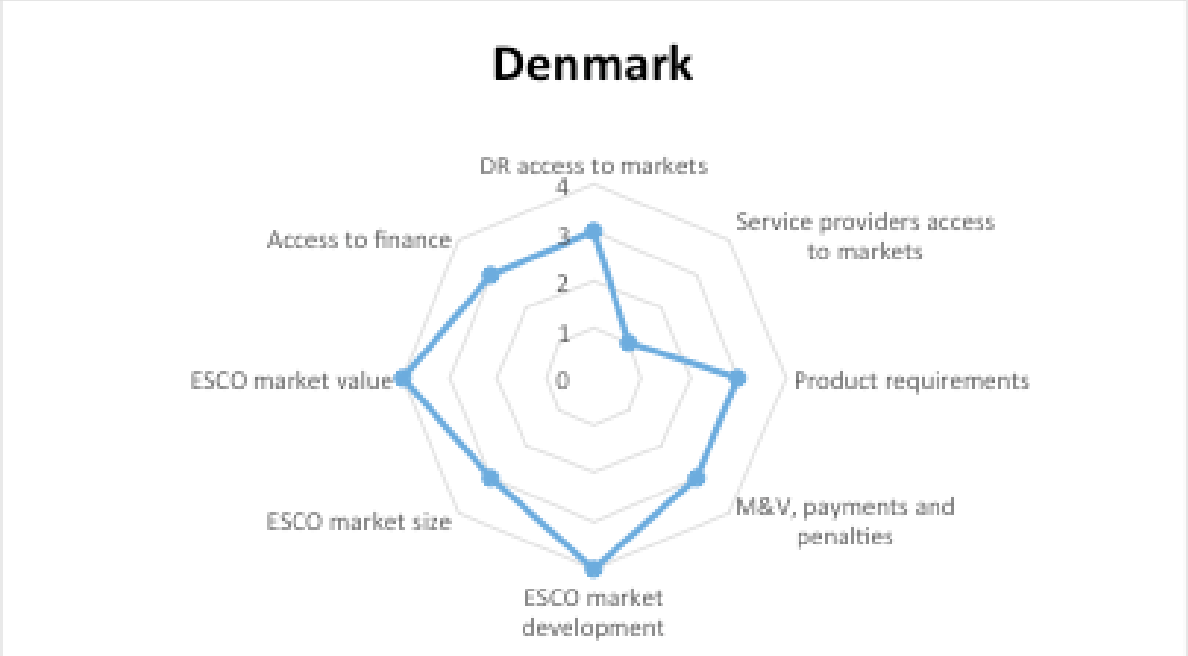
Denmark ESCO market overview

Denmark's energy services market is relatively less developed with energy contracts spreading in the last ten years. The development of the sector in Denmark was driven by the public sector's objective to improve the energy performance of their building stock. With the lack of expertise to achieve the aim by Denmark's municipalities, this lead to involvement of external parties such as ESCOs (Boza-kiss & Bertoldi, 2014). The development of Denmark's energy services market benefitted from Danish municipalities learning from learning from Swedish and German municipalities and meeting with ESCO suppliers (Ole, Rohr, Balslev, & Version, 2013).

Denmark's energy service market is dominated by private ESCOs, which have experience from contracting in other European countries, mainly Sweden. A single Swedish ESCO supplier (Schneider Electric) has approximately 50% of Danish energy service market (Ole et al., 2013). As of 2013, there were approximately 15-20 active companies offering EPC in Denmark, which has decreased slightly to 6-10 active EPC providers as of 2016 (Boza-kiss & Bertoldi, 2014). The Denmark ESCO market was estimated to be €8-25 million and has grown to €140-150 million in 2013 (total investment volume) and potential of the energy service market is expected to be €1-7 billion (Boza-kiss & Bertoldi, 2014).

Potential for combined business model

Although Denmark's DSR and ESCO are less developed and limited and have significant areas for improvement, there are currently no significant gaps that would prevent the new business model from emerging. The DSR market is very much limited due to lack of demand for flexibility, but there could be future development with increasing use of variable resources. The potential of the DSR market will be dependent on developing a sustainable business model that provides access to the markets with supportive legislation.



4.2.9 Austria

Austria DSR market overview

Austria has made progress enabling demand response within the Balancing Markets, however, the overall structure remains complicated (and therefore expensive) to navigate. Business development in the area is also still slow. In 2014, several amendments were made to the preconditions for the prequalification to ease the aggregation of demand resources and, open the balancing market to demand response and new technologies. In addition to existing pooling possibilities, various measures were implemented with regards to technical entities. There have also been changes made to increase the participation of consumers. However, a demand response provider still has to have a bilateral agreement with the BRP for the BRP's sourcing costs, which creates an obstacle for entering the market.

The most attractive markets for demand response are, from a technical point of view, the tertiary control (relatively low entering barrier due to low technical requirements) and from an economic point of view, secondary control (high prices and a number of activations).

Currently the business case for demand response in Austria is relatively weak. Aggregators can only attract customers with large amounts of flexible load and/or backup generation (e.g. industry) to contribute to a pool. Smaller resources are still reluctant to participate due to low revenue streams.

As such, a level playing field for all flexibility providing devices in all valuation mechanisms of flexibility (regardless of size and grid connection, e.g. DSO) is needed. The participation of new market players and new forms of demand units in existing and new pools, such as aggregators is an important factor for the observed reduction of Austrian balancing costs.

Further planned measures in Austria include the optimisation of (real time) data exchange between the DSO, TSO and other market participants (i.e. to support pooling of units from third-party aggregation); improvement in exchange of data for more effective market operation such as the harmonisation of (aggregated) exchange of schedules for activation in other balancing perimeters; and the enhancement of market rules/grid codes (such as new arrangements on independent aggregation currently in contracts between market parties). Additionally, market processes for using measured values (Smart Meter measurement 15 min/daily) for imbalance settlement are in preparation to support all forms of flexibility valuation (balancing, imbalance settlement, participation in ID/DA markets).

Austria ESCO market overview

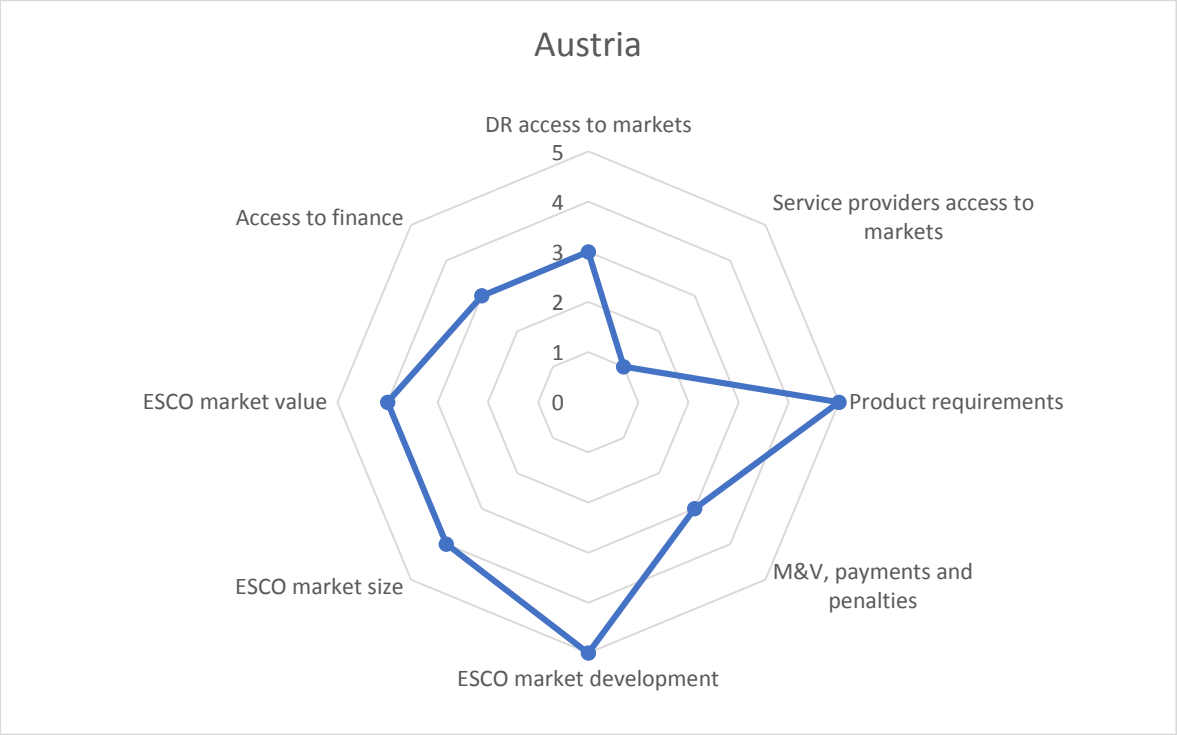
The Austrian ESCO market is considered to be a well-established market. As of 2015 around 40 companies provided energy services, of which 15-20 are EPC providers (JRC 2016). 13 of the ESCOs provide energy services as a core business, 9 are energy suppliers and 10 are technical building systems companies offering energy services within their portfolio (Windsprenger, et al., 2014). This is a minor decrease in the number of companies compared to previous years; evident on the national level, but does not translate to an overall decrease of the market size. In addition there are major regional differences, and for example, the EPC market in Upper Austria has been increasing. Most active ESCOs on the Austrian market are small- and medium-sized enterprises.

The Association of "Austrian Energy Efficiency and Performance Contractors" (DECA) 49 was established in 2013 on the basis of the Umbrella Organisation of Energy Service Contractors. The 31

members (as of June 2016) consist of companies and organisation such as ESCOs, planning offices, energy advisors, other associations active in energy and real state field and banks. Its aim is to promote energy services, represent their members' interests, (especially in the processes of the development of policy and legal framework for energy services), cooperate with research organizations and create networks with similar associations.

Potential for combined business model

Although both DSR and ESCO market have room for improvement, there are currently no significant gaps that would prevent the new business model from emerging. The only concern at the moment is the service providers' access to markets for DSR services, however this is improving and it can be assumed that the new business model would gain traction with players who are already active in the market place rather than new entrants.



5 STAKEHOLDERS CONSULTATION – KEY FOCUS AREAS

As part of the consortium's efforts to understand the current market landscape as well as the key focus areas for the NOVICE model, a workshop was hosted in London in January 2018. There were 4 main areas that emerged as important for both ESCOs and Aggregators through the surveys we ran with both groups in month 6-8 on the project: market drivers, barriers, regulations and use cases. Our workshop invited stakeholders from a wide range of backgrounds: ESCOs, aggregators, academia, facilities management, local government and regulators to express their views on how each of these topics can impact the NOVICE business model. The participants were given an insight into overall project scope and the particularities of the NOVICE model. The results are summarised below. These findings were also validated by data from the 2 surveys that were conducted with aggregators and ESCOs.

5.1 MARKET DRIVERS

In the context of NOVICE proposed business model, it is important to understand not only what the market drivers behind each component of the service are but also the market drivers impacting on both. Closely monitoring trend changes but also forecasting the speed of change for these drivers will allow the consortium partners and business partners interested in deploying the NOVICE model to make strategic decisions about the marketing mix – product placement, positioning, and pricing, building relevant customer value propositions. The following points were identified as the main drivers for the decision makers and potential buyers:

- Additional revenue stream from DR to add to EE / savings from the traditional ESCO model.
- CSR agenda – most of EE and some DR services can serve a wider green agenda and commitments to support the environment.
- Some newer backup solutions such as battery storage can serve both for EE and DR while still fulfilling their primary backup role.
- Increasing energy prices will force more companies to look into deploying EE through ESCOs or deploying DR for additional revenues to offset the increasing costs of running the business
- Regulatory changes at EU level requiring mandatory energy audits and upgrade strategies which in turn can trigger EE actions
- Improving the value of the real estate: Buildings that are more efficient and that have more modern controls suited for DR tend to command higher prices both on the rental market and when selling the property
- End-user might face a simplified process while contracting ESCO and DR services from a single company

5.2 BARRIERS

Identifying current barriers for each component of the business model will give the consortium the background needed to make recommendations going forward to the policy makers, regulators and to the broader stakeholders' ecosystem in general. This will also help potential users of the NOVICE

model to strengthen their marketing mix by proactively addressing some of these points while constructing the customer value proposition e.g. demonstrating how the combined model is minimizing the operational risk on the client side by taking into account all business as usual scenarios defined by the customer. The following points have emerged as key barriers:

- Regulations restricting ESCO/ DR services in certain markets are creating significant barriers for the NOVICE model.
- Risk management – one important criteria used by end-users when contracting ESCO/DR services is minimizing risks and preserving BAU scenarios and very often DR/ESCO models are perceived as risky / intrusive.
- Access to finance – there is evidence that the past 4 years has witnessed a drop in the number of new ESCO projects in the EU.
- Trust – typical agency issue where end-users will not trust that their best long-term interest are being pursued by ESCO/Aggregator.
- Balance between ESCO and DR model as implementation of EE measures typically reduces the potential for turndown services.
- Expected synergies between the ESCO and Aggregator models might not be realized.
- Revenue volatility for DR services might be difficult to integrate into long term ESCO business models.

5.3 REGULATIONS

Regulation emerged as a key topic as demand side response services in particular can be severely restricted in certain markets if the right legal framework is not yet in place. While there are coordinated efforts at European level to align legislation in all EU member states, this also depends on the energy profile in individual countries and their capacity needs, which makes the progress slow. While ESCOs are less affected in general by the regulatory framework, they might still face significant impact on the financial side. Key aspects to be considered for the implementation of the NOVICE model are highlighted bellow:

- Current regulation impacting ESCO and DR is very fragmented at EU level
- Regulation around DR has a stronger impact on the NOVICE model as some European markets completely exclude DR services at the moment and changes are usually lengthy and slow
- Finance regulations have some impact on ESCO models as they allow or prohibit the off-balance sheet finance of energy projects
- Planning permissions can potentially boost the model by introducing stricter requirements for energy efficiency in buildings
- Lack of strong industry / group representation in relation to regulatory bodies to promote the interests of ESCOs and aggregators
- EE subsidies are either being removed or changing, with adverse effect on ESCO model
- Not enough public information around energy supply contracting and demand response services

5.4 USE CASES

Finally, the potential use cases for the NOVICE model were considered from a multiple angle perspective: ideal type of assets that potential customers may have under operation, ideal type of buildings from the monitoring and control perspective, ideal type of market vertical, as well as how an ideal demonstration project for the NOVICE model should look:

- Assets: HVAC systems, BEMS, BMS, thermal store, heat pumps, smart lighting systems, EV chargers, battery storage systems and integrated RES, CHP, backup generators
- Buildings: commercial (offices), hospitals, data centers, hotels, university campuses, large residential estates
- Sectors: health care, hospitality, local government, housing associations, retail
- Project demonstrator focus: identify a building working with an ESCO on an EE project planned for the next 12 month and step in to identify potential for DR and investigate synergies in deploying the combined model.

The type of assets usually used for energy efficiency interventions validates the assets selected for the use case as seen in Figure 1. Similarly, the sectorial approach is also reflected in the online survey we have conducted with ESCOs and Aggregators – Figure 2.

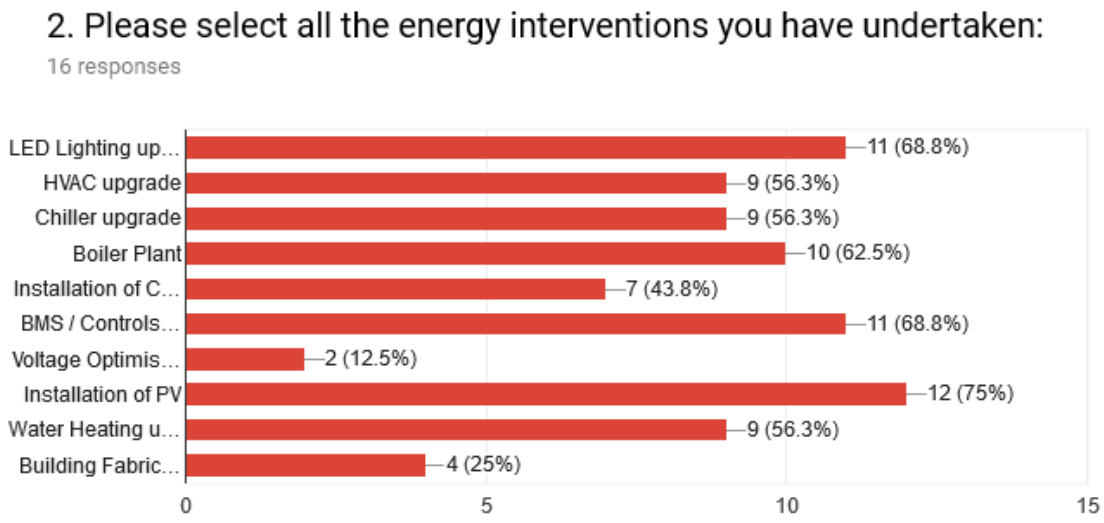


Figure 1: Assets used in ESCOs intervention

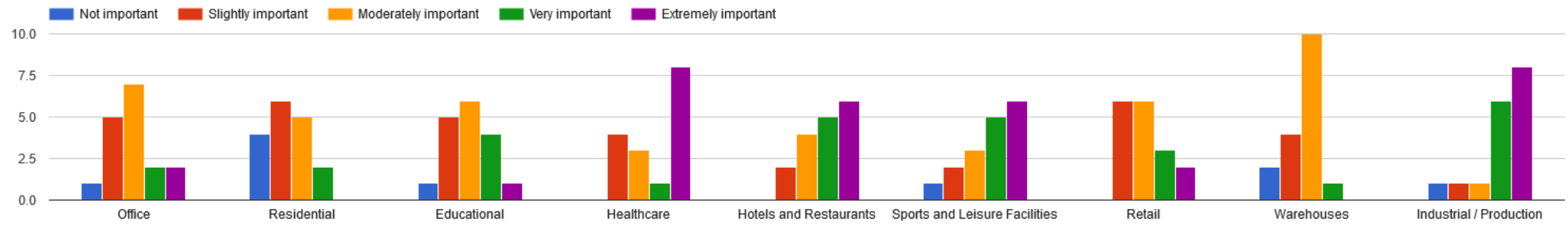


Figure 2: Type of buildings by sector - ESCO survey

6 CONCLUSIONS

1. Based on the initial market research on both ESCO and DSR markets at European level we have compiled an opportunity index for the NOVICE model. This splits the European landscape into 3 bands: (i) ready for business; (ii) good potential; (iii) needing improvement. The consortium will focus on countries from the ready for business group to identify the project demonstrator and to build the full business model as these markets currently offer no significant restrictions and the best potential for the NOVICE model. For countries in the "good potential" group, the consortium will focus on gap bridging recommendations and simplified versions of the business model that takes into account existing market conditions. For countries in the 3rd band, the consortium will focus on recommendations that remove barriers for regulators and other relevant stakeholders.

2. While the type of barriers identified for the NOVICE model cover regulatory, technical and commercial aspects, the most significant ones affecting country-wide markets are the regulatory barriers allowing DSR services participation into the markets and those limiting access to finance for ESCOs. The consortium will focus on removing those barriers where project partners' expertise can create a significant impact, such as reducing the perceived project risk, providing robust commercial models and deployment plans, drafting model contracts or third party agreements, identifying the best combination of assets and building typologies suited for the NOVICE model.

3. Further SWOT analysis on the NOVICE model will have to be carried out for at least one country sample from each group in the opportunity index. This will provide further insights into where the consortium should focus the actions to ensure a maximised impact in line with the project objectives.

4. An increased effort on raising awareness about the opportunities offered by the NOVICE model is needed. There is sufficient evidence that both ESCOs and DSR model are not sufficiently exploited at the moment and one of the reasons is end-users lack of awareness about the potential benefits. Similarly, regulators have ignored certain technical aspects of providing DSR services that might significantly increase the market size potential and uptake. A coordinated effort is needed at country level but also European level to ensure the industry voice is heard and accounted for.

7 ABBREVIATIONS

BM Balancing Mechanism

BRP Balance Responsible Party

DNO Distribution Network Operators

DR Demand Response

DS3 Delivering a Secure, Sustainable Electricity System

DSO Distribution System Operator

DSR Demand-Side Response

DSU Demand Side Unit

EE Energy Efficiency

ESCO Energy Service Company

EU European Union

FCR Frequency Containment Reserve

FRR-A/aFRR Frequency Restoration Reserve – Automatic

GW Giga Watt

I-SEM Integrated Single Electricity Market

kW kila Watt

MW Mega Watt

NEBEF Notification d'Échange de Blocs d'effacement

NEEAP National Energy Efficiency Action Plan

RES Renewable Energy Systems

RTE Réseau de Transport d'Électricité

SEM Single Electricity Market

SME Small and Medium Sized Enterprise

STAR Short Term Active Response

SWOT Strengths, Weaknesses, Opportunities, Threats

TSO Transmission System Operator

UK United Kingdom

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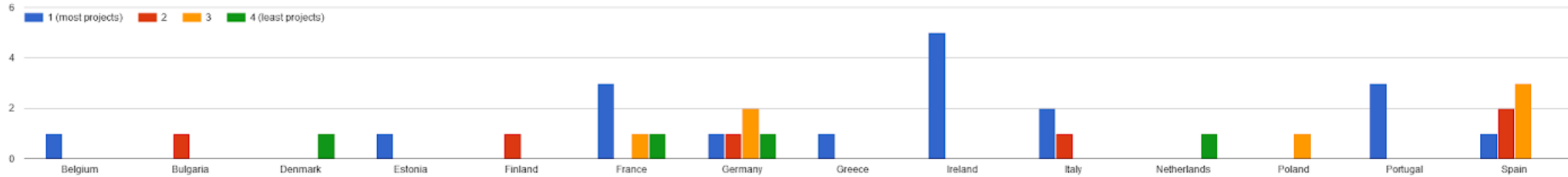
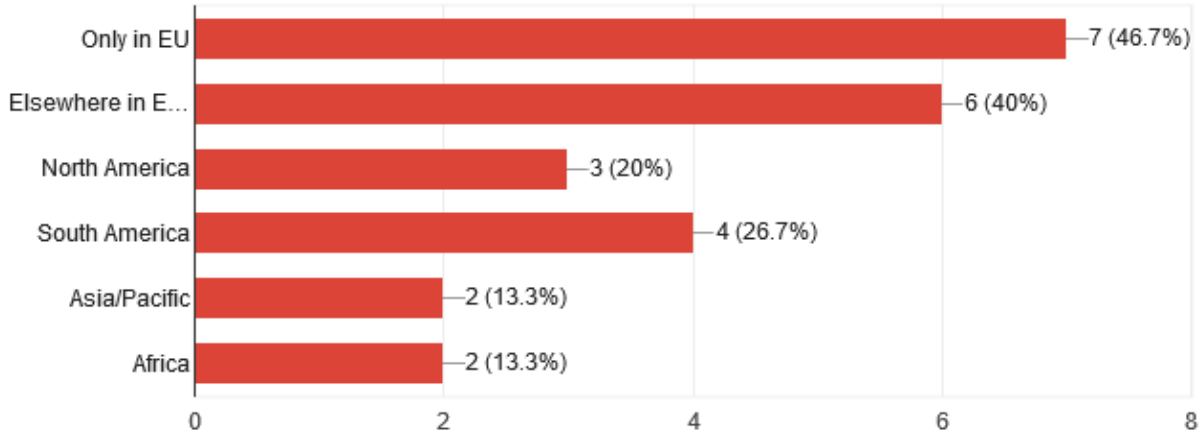
9 ANNEX 1 – ESCO SURVEY

1. Please list the 4 EU countries in which your company carries out the most projects (rank from 1 to 4):



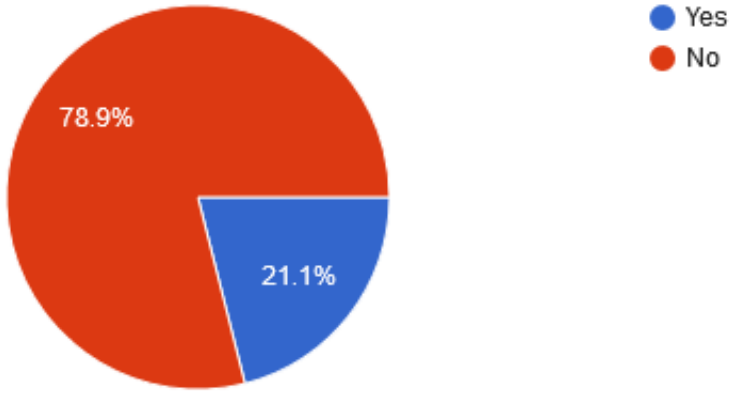
2. Please select where else your company operates (click all that apply):

15 responses



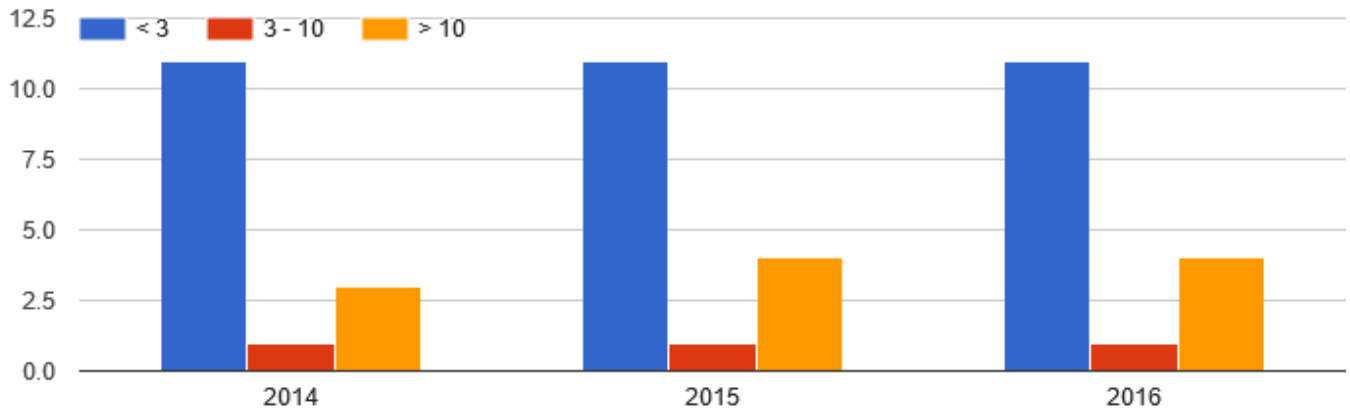
3. Is ESCO the primary activity of the company?

19 responses



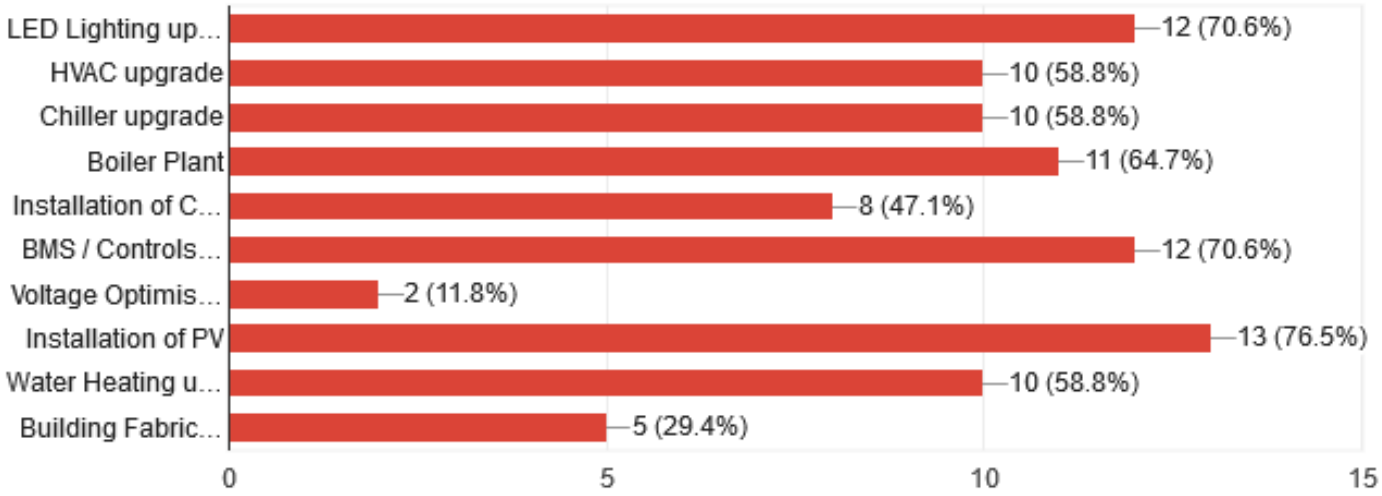
B. Building upgraded under EPC

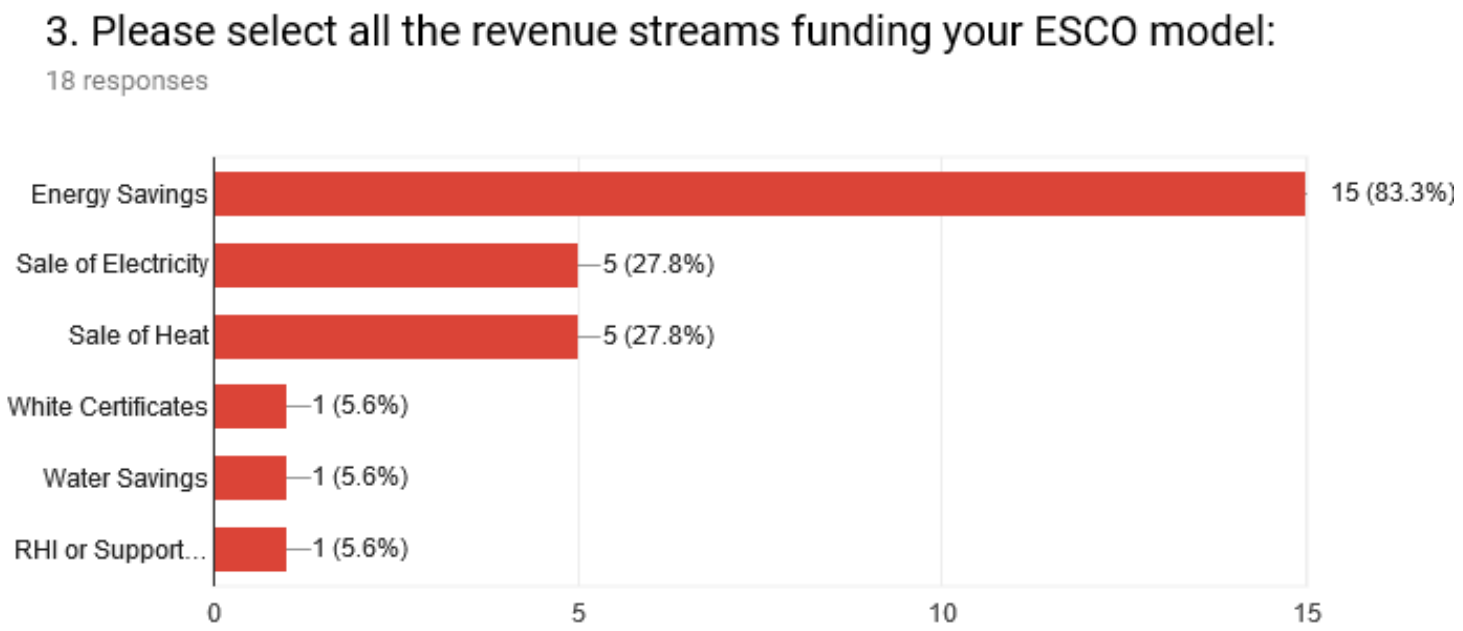
1. How many buildings have you upgraded under EPC (Energy Performance Contracting) in the last three years?



2. Please select all the energy interventions you have undertaken:

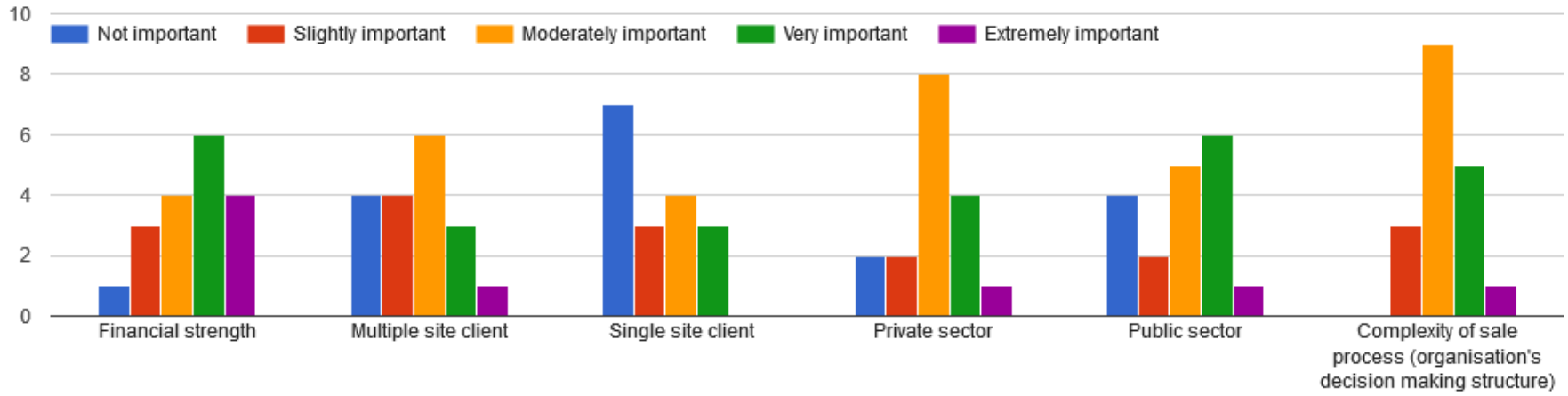
17 responses




3. Please select all the revenue streams funding your ESCO model:
18 responses
Energy Savings
15 (83.3%)
Sale of Electricity
5 (27.8%)
Sale of Heat
5 (27.8%)
White Certificates
1 (5.6%)
Water Savings
1 (5.6%)
RHI or Support...
1 (5.6%)
0
5
10
15

C. Customer and site profiling

1. In terms of profiling customers please rate the importance of the following criteria:



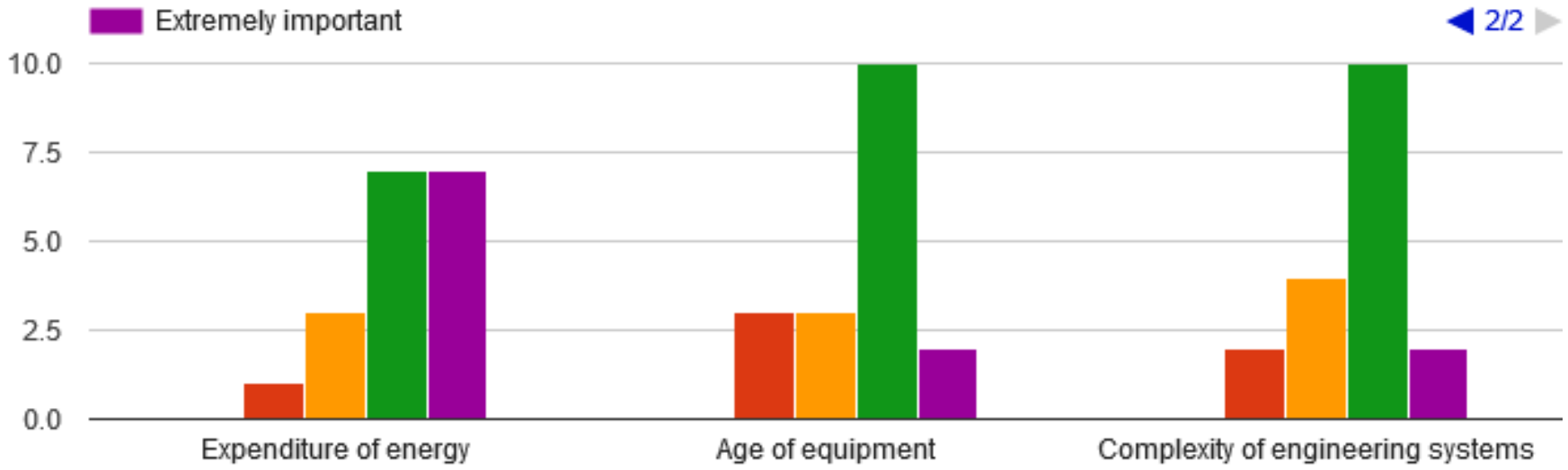
2. Please add any additional key criteria you believe to be important in profiling customers:

2 responses

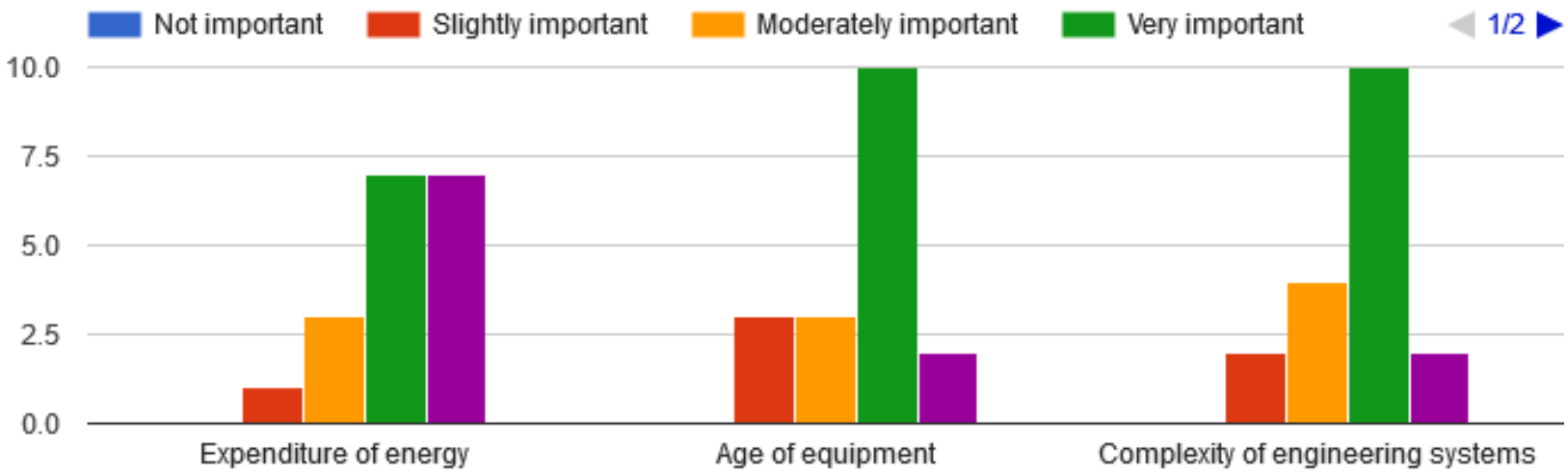
Need to be in business long term with good future prospects

Potential for a long cooperation

3. In terms of profiling site selection please rate the importance of the following criteria:



3. In terms of profiling site selection please rate the importance of the following criteria:

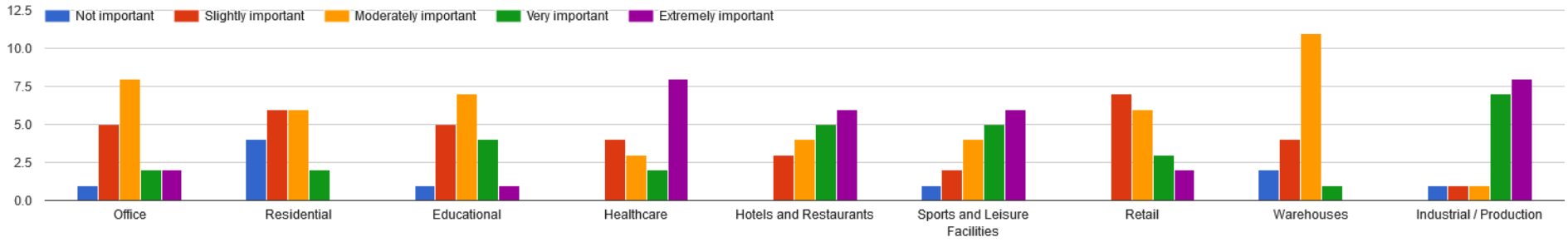


4. Please add any additional key criteria you believe to be important in profiling site selection:

2 responses

Waste heat VS Required heat Balance
profile of energy consumption during the day

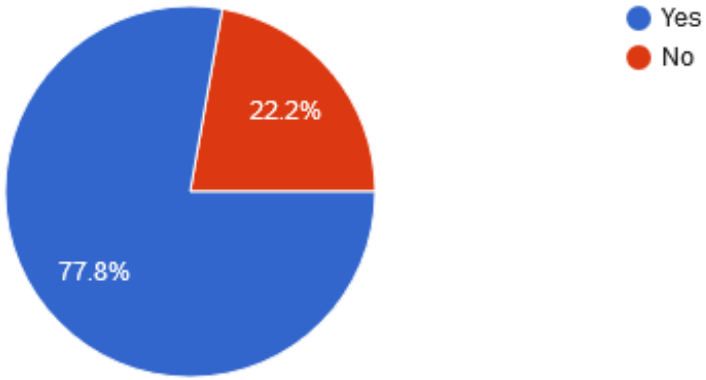
5. In terms of profiling site selection , please rate the importance of the following building types:



D. Project Finance

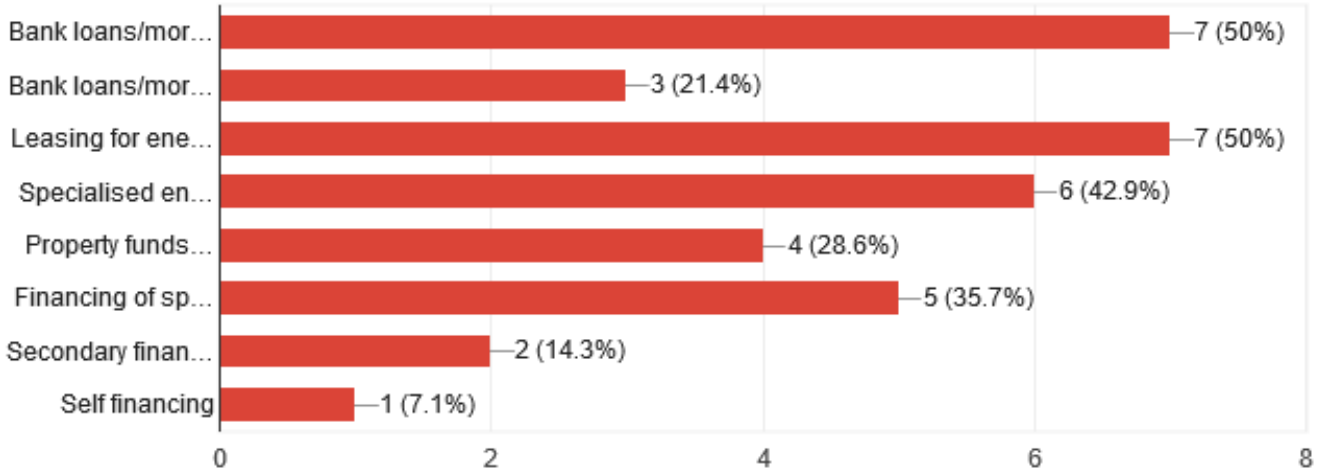
1. Do you use third party finance in your projects?

18 responses



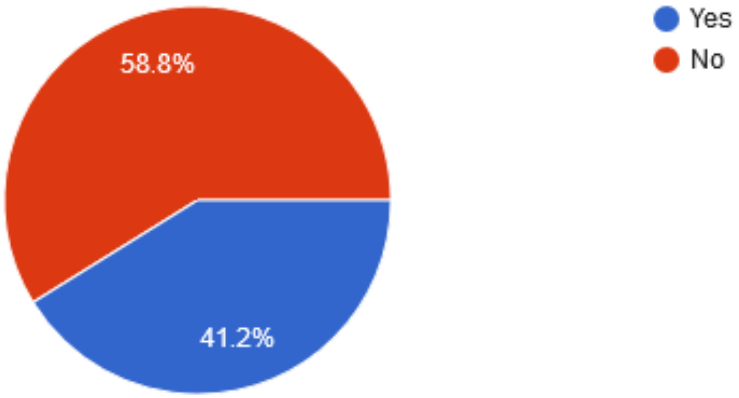
2. What kinds of financing have you used (click all that apply)?

14 responses



3. Have you found project finance to be a barrier to processing contracts?

17 responses



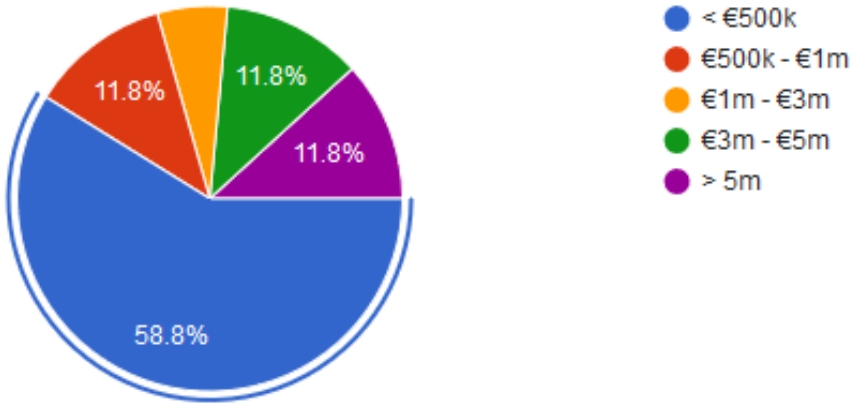
4. If you answered "Yes" in the previous question, please explain how project finance has been a barrier to processing/executing contracts:

7 responses

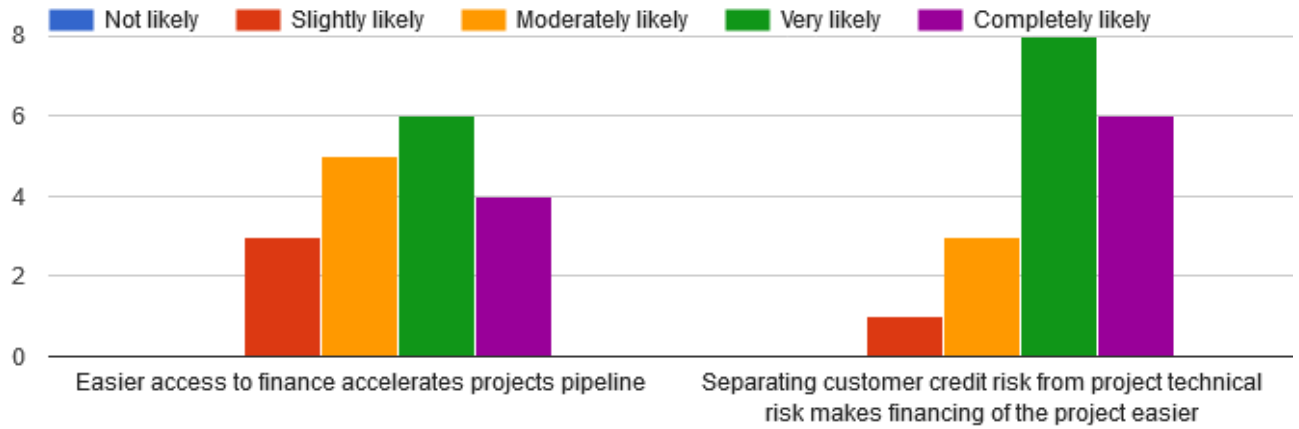
Some projects even not started because lack of finance
Without finance some projects aren´t executed. Sometimes finance takes to much time to be aproved; that delays the execution of the project, with significative opportunity cost.
banks know little about energy efficiency technologies in the industrial field
Domestic banks are very interested just for discussing. They totally lack of any internal ability or motive to examine, understand and promote financing of EPCs. European banks are more serious but hesitant to define a specific set of rules on the "worthiness assessment" of a project and the risks they are willing or not to take. At the same time it is too challenging to submit projects for bank reviewing, for customers who cannot be assured that there is actual financing. Contract execution requires a clear presentation of rules and requirements to all interested parties. There is not much available.
Banks in Ireland give different responses to receptiveness of financing depending on person talked to. No consistency.
Not clear who is active in this area
size of the company limits access to funds

5. What levels of finance would you typically be seeking?

17 responses



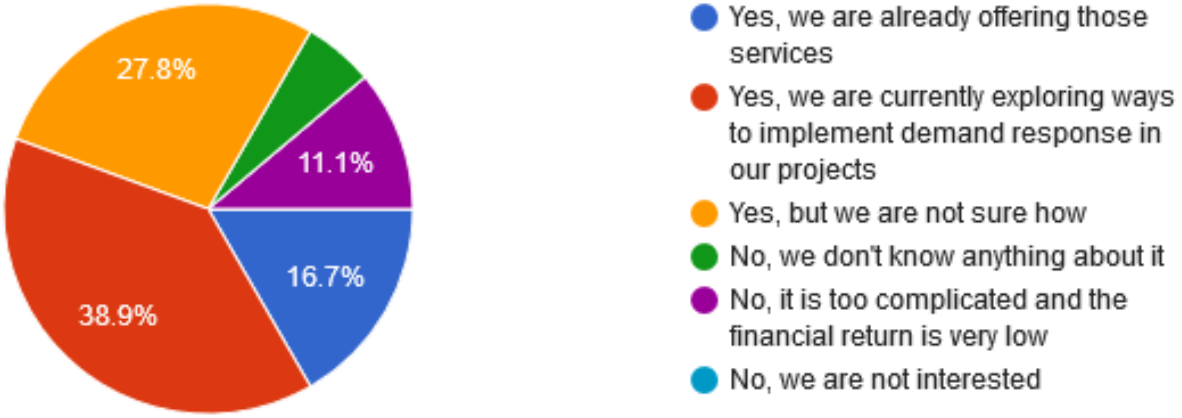
6. Please rate the likelihood of the following:



E. Affinity to Collaborate with Aggregators

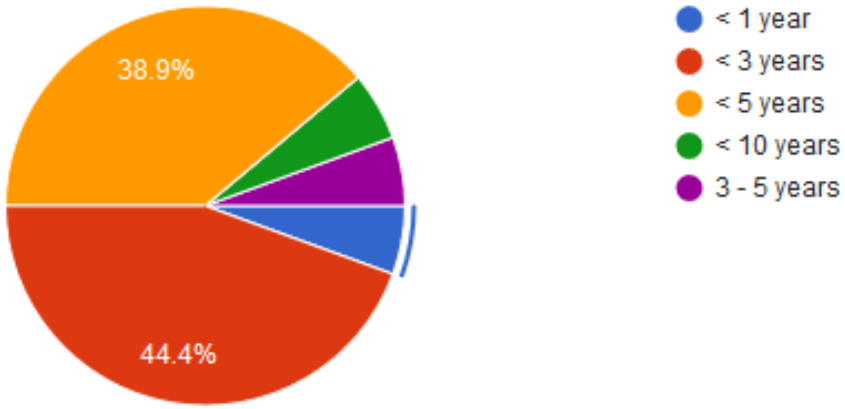
1. Have you considered expanding the services that you are offering to your clients to include demand response?

18 responses

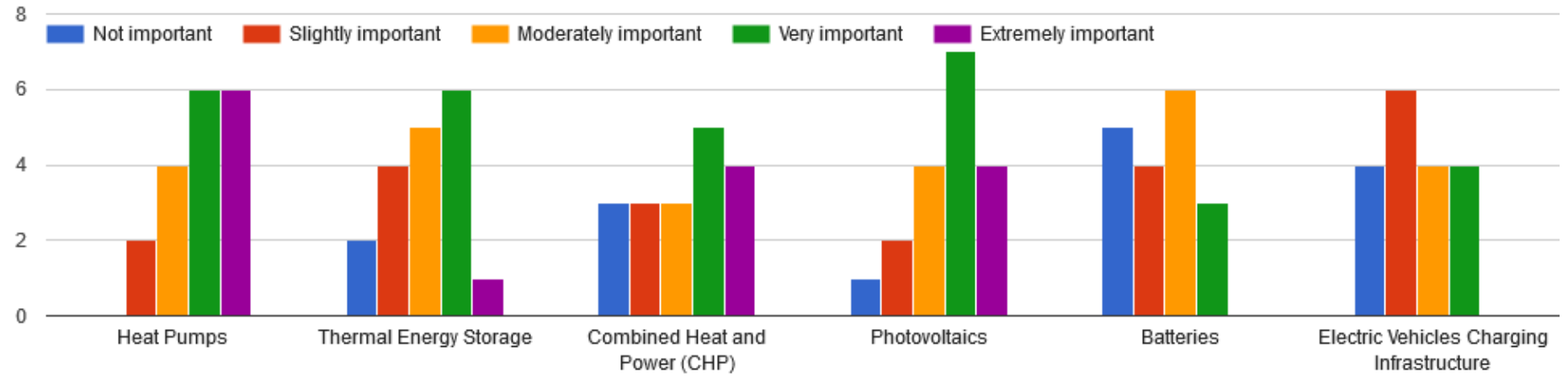


2. If you were to add a new service to your offering to a client, what would be your expected maximum payback period in order for such a service to be attractive?

18 responses

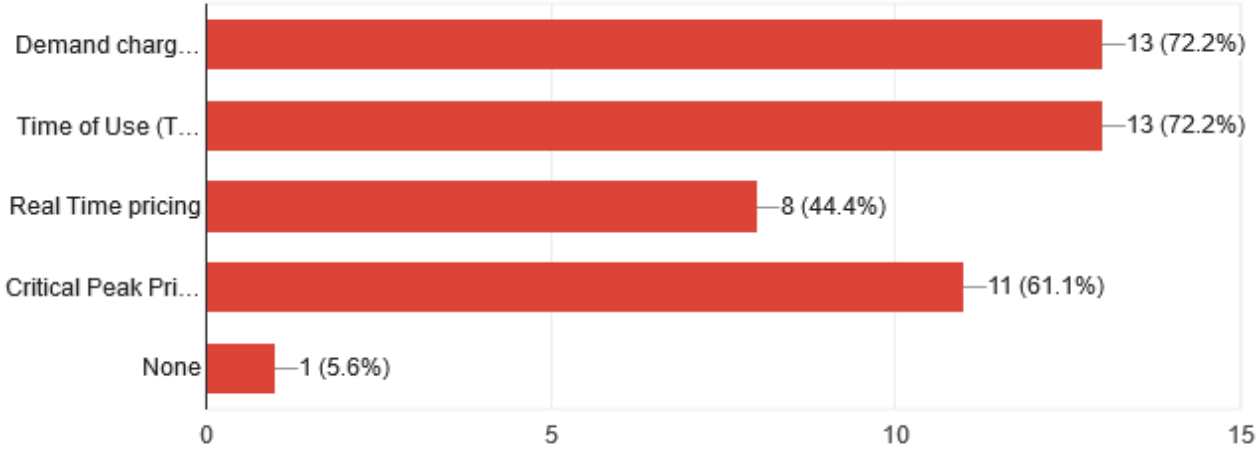


3. In terms of upgrading the equipment of buildings can you rate the importance of the following technologies with respect to the consideration they are getting in your projects?



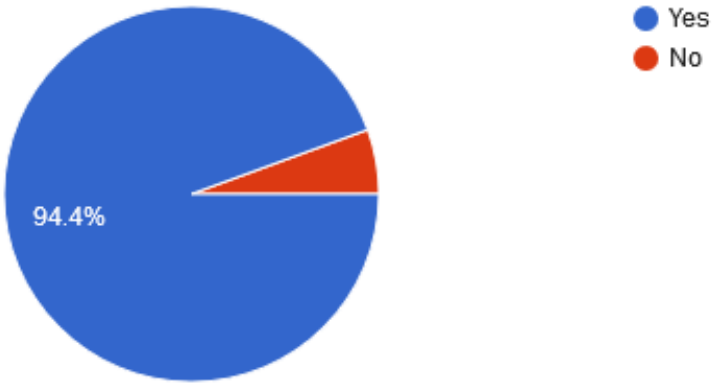
4. Considering the imminent roll our of smart meters and subsequent offering of time varying (dynamic) tariff...rs in order to lower their energy bills?

18 responses



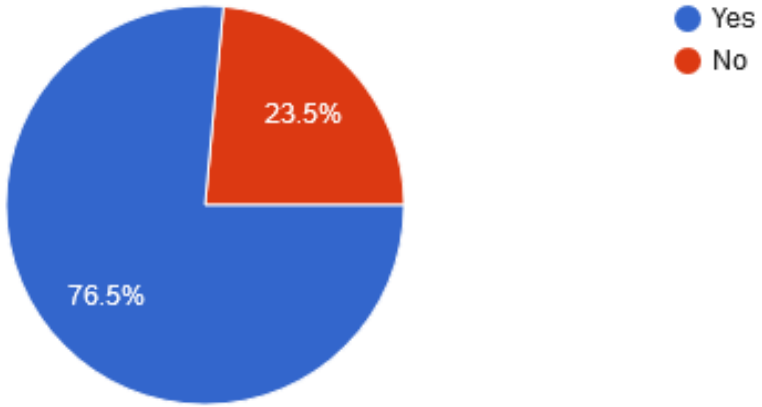
5. Would you be interested in learning more about how to combine energy savings and demand response services in building renovation projects?

18 responses



6. Would you be interested in having an assessment done of the financial benefits from combining energy savings...novation project from your portfolio?

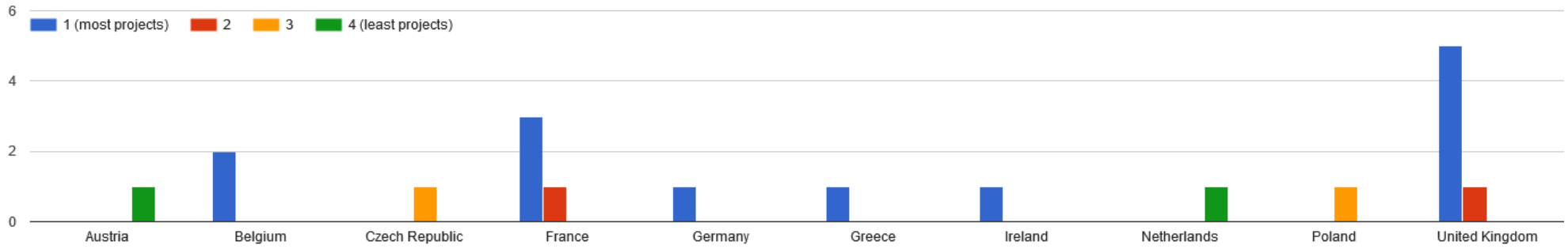
17 responses



10 ANNEX 2 – AGGREGATORS SURVEY

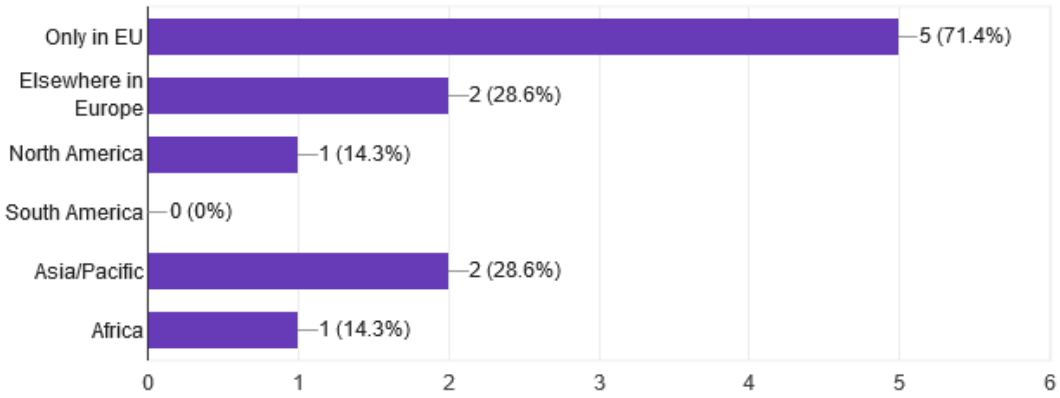
A. Demand Side Response Market Activity

1. Please list the 4 EU countries in which your company carries out the most projects (rank from 1 to 4):



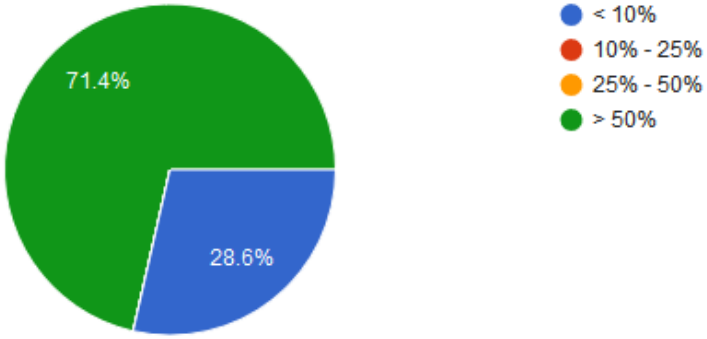
2. Please select where else your company operates (click all that apply):

7 responses



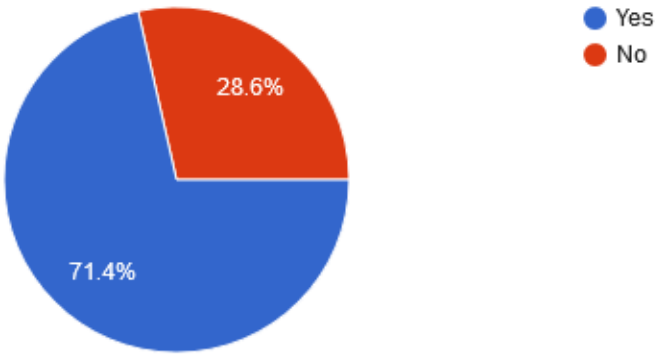
4. What percentage of your business does the Demand Side Response activity represent?

7 responses



3. Is Demand Side Response the primary activity of the company?

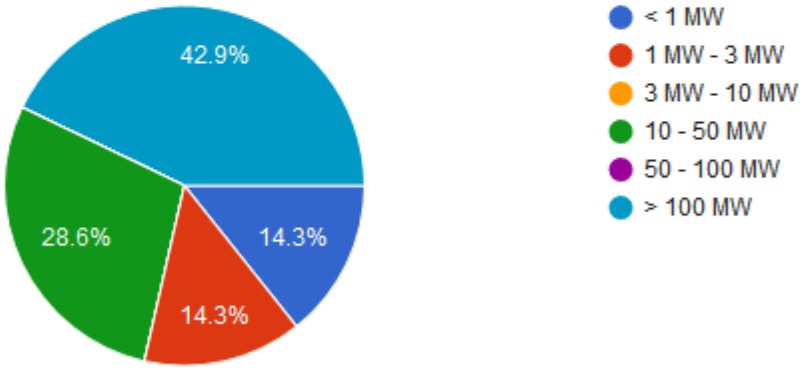
7 responses



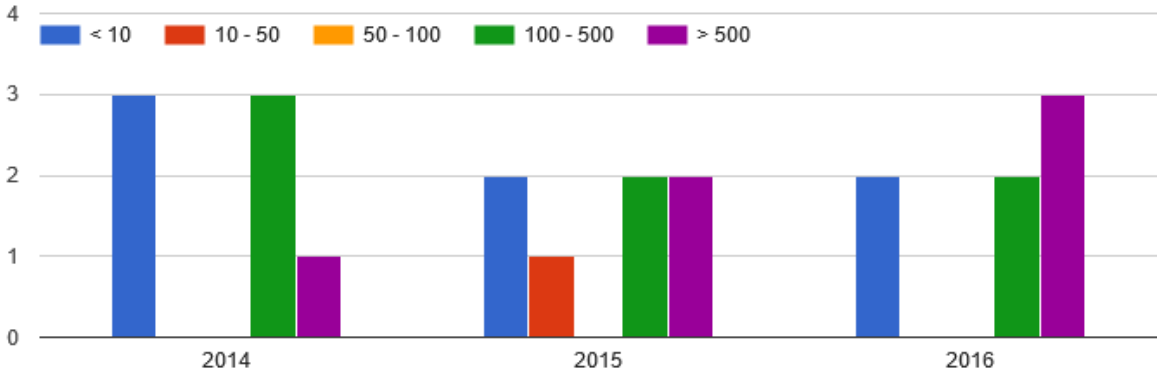
B. Demand Side Response portfolio

1. What is the total capacity you have enrolled in commercial programmes at the moment?

7 responses

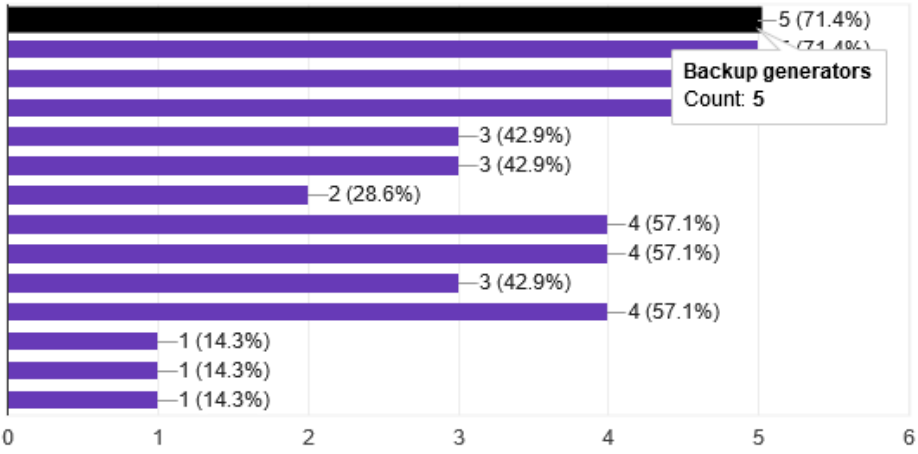


2. How many sites did you have in operation the last three years?



3. Please select all type of equipment you are currently using in Demand Side Response programmes:

7 responses

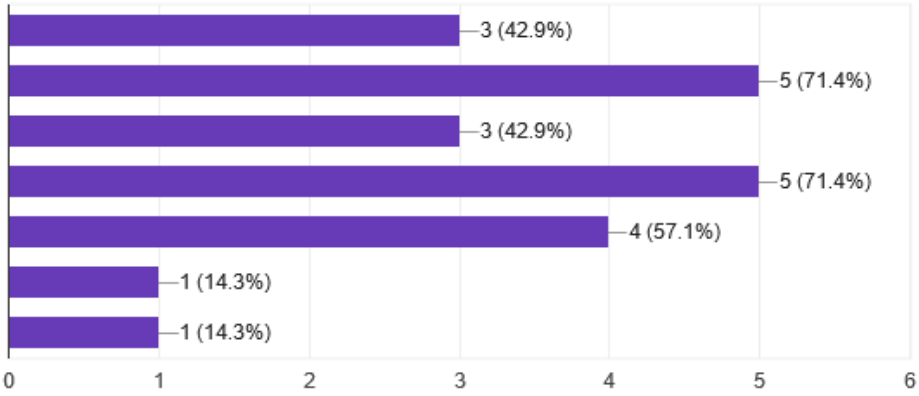


Legend:

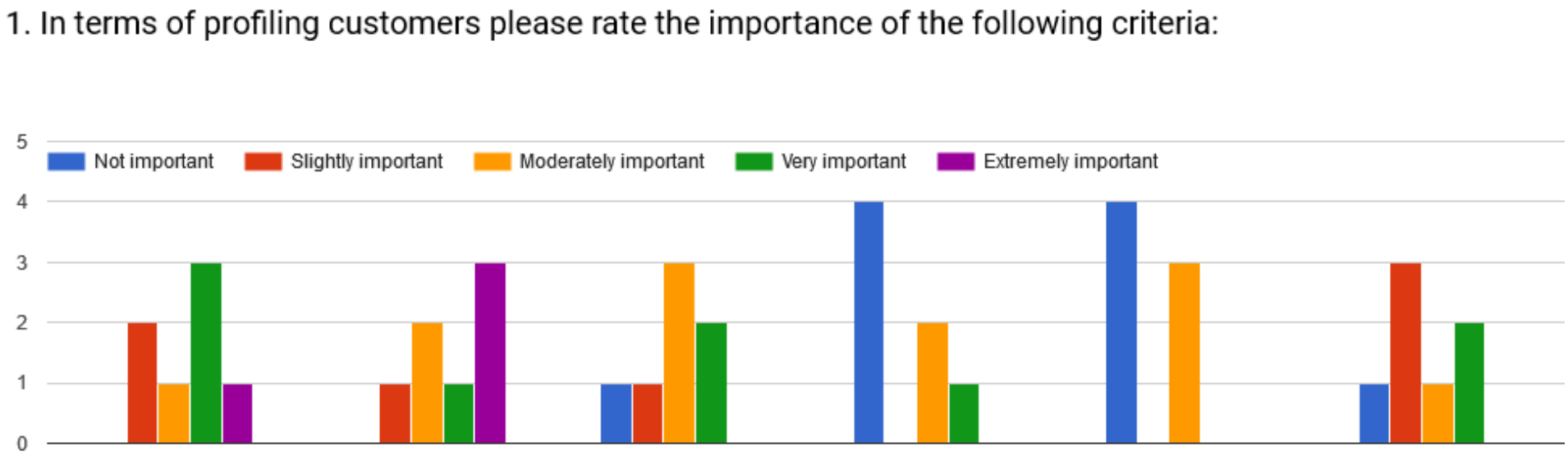
1. Backup generators
2. Energy Storage Systems
3. Combined Heat and Power (CHP)
4. HVAC systems
5. Chillers
6. Heat Pumps
7. Standalone generators
8. Water pumps
9. Immersion heaters
10. Refrigeration – commercial
11. Refrigeration – industrial cold store
12. Lighting

4. In what type of commercial programmes are you active at the moment?

7 responses



C. Customer and site profiling



Legend:

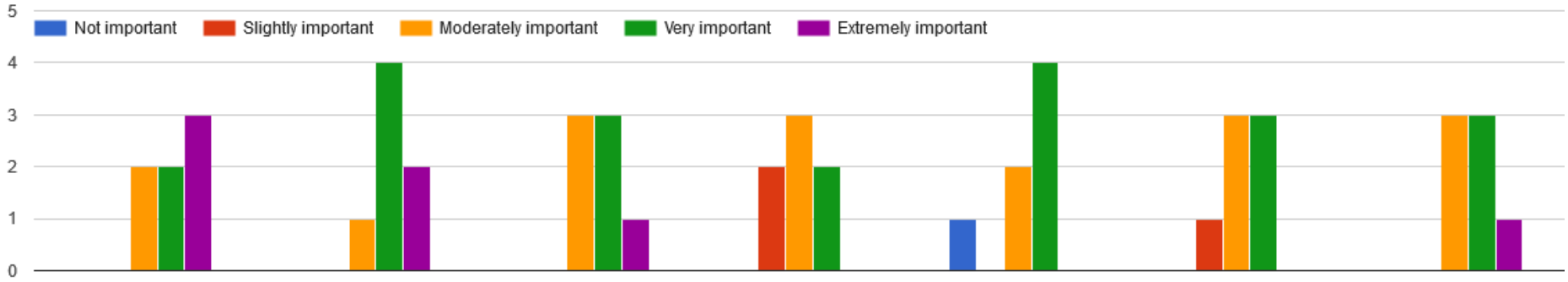
1. Complexity of the sales process (i.e. complex decision making process)
2. Multiple site client
3. Type of grid connection
4. Private sector
5. Public sector
6. Financial strength

2. Please add any additional key criteria you believe to be important in profiling customers:

1 response

Regional criteria

3. In terms of profiling site selection please rate the importance of the following criteria:



Legend:

1. Total site energy consumption
2. Individual asset energy consumption
3. Asset peak load profile

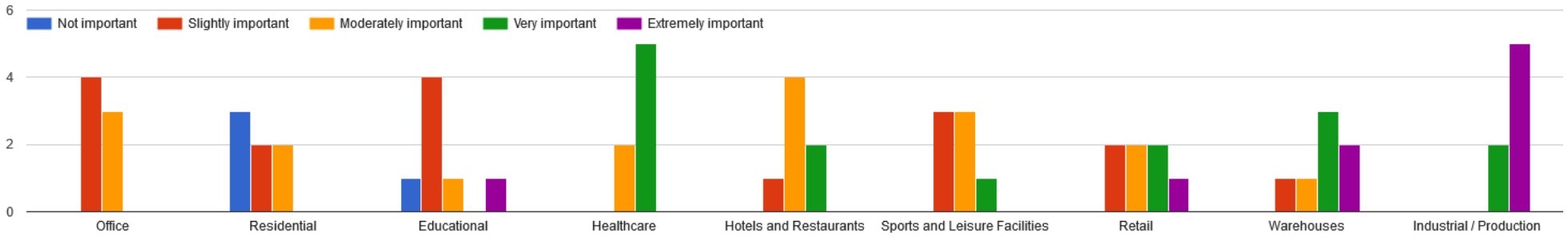
4. Type of grid connection
5. Level of site automation (i.e. existing BMS / PLCs)
6. Age of equipment
7. Business as usual requirements

4. Please add any additional key criteria you believe to be important in profiling site selection:

0 responses

No responses yet for this question.

5. In terms of profiling site selection , please rate the importance of the following building types:



6. Please add any additional building types you believe to be important

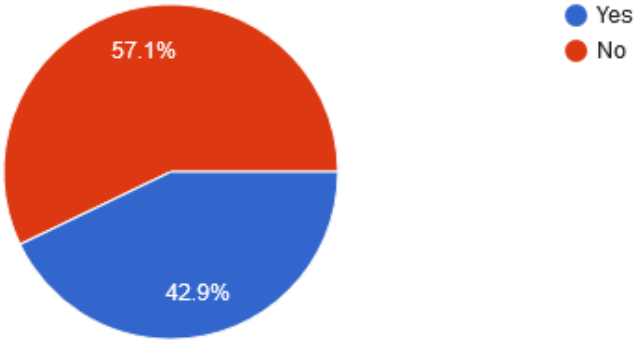
1 response

Data centers

D. Project Finance

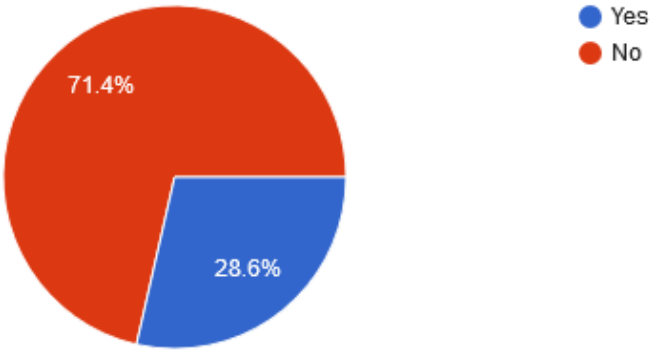
1. Do you use third party finance in your projects?

7 responses



2. Have you found project finance to be a barrier to processing contracts?

7 responses



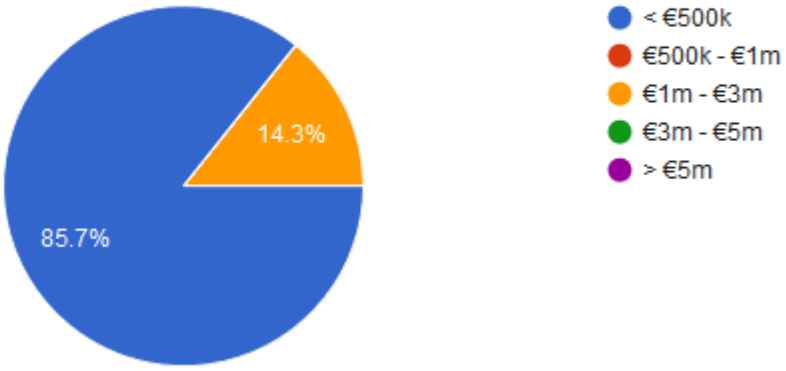
3. If you answered "Yes" in the previous question, please explain how project finance has been a barrier to processing/executing contracts:

1 response

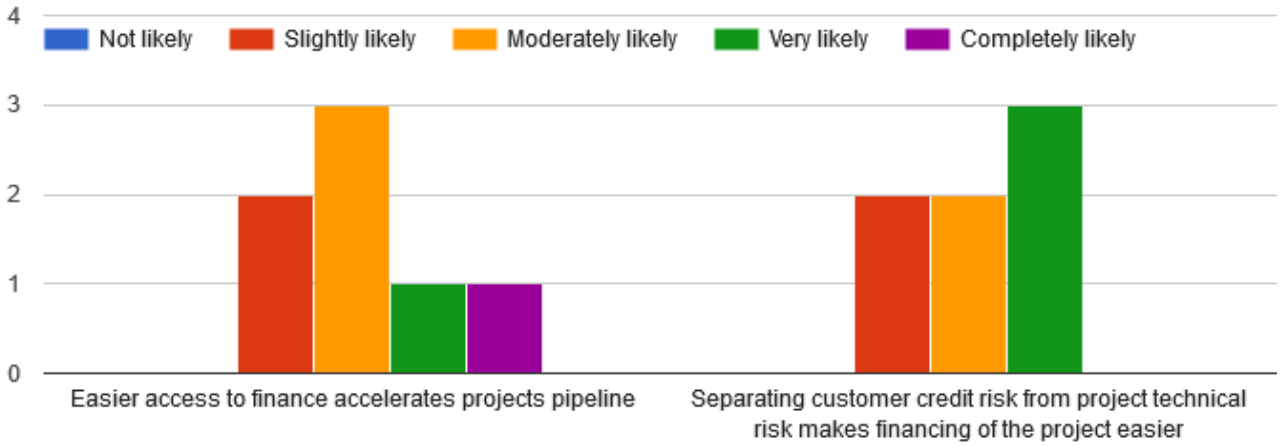
Clients are not willing to place capital for EE projects

4. What levels of finance would you typically be seeking?

7 responses



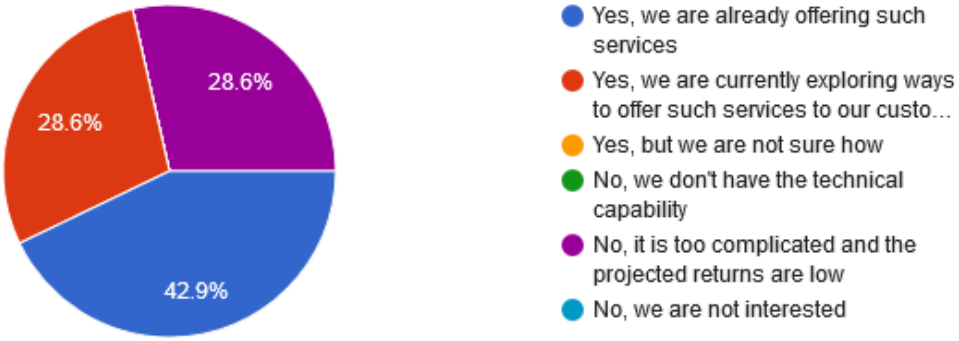
5. Please rate the likelihood of the following:



E. Affinity to collaborate with ESCOs

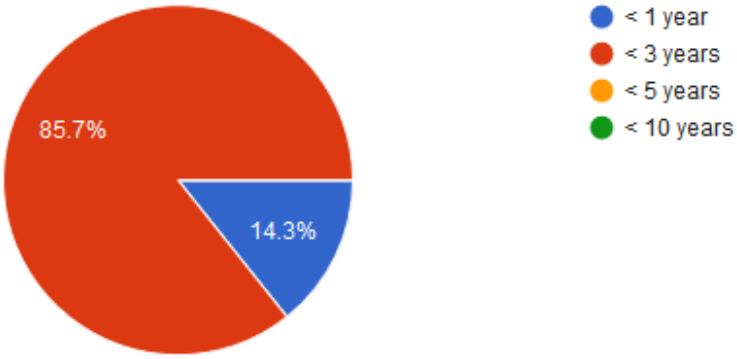
1. Have you considered expanding the services that you are offering to your clients to include products like energ...al services outside Demand Response?

7 responses

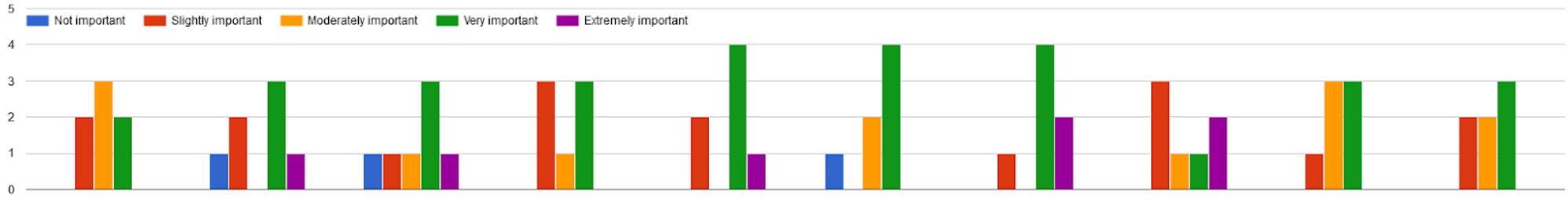


2. If you were to add a new service to your offering to a client, what would be your expected maximum payback period in order for such a service to be attractive?

7 responses



3. In terms of upgrading the equipment of buildings can you rate the importance of the following technologies with respect to the consideration they are getting in your projects?



Legend:

1. Heat Pumps
2. Thermal Energy Storage
3. Standalone generators
4. Backup generators
5. Combined Heat and Power (CHP)
6. Photovoltaics
7. Energy Storage Systems (ESS)
8. Electric Vehicles Charging infrastructure
9. HVAC systems
10. Chillers

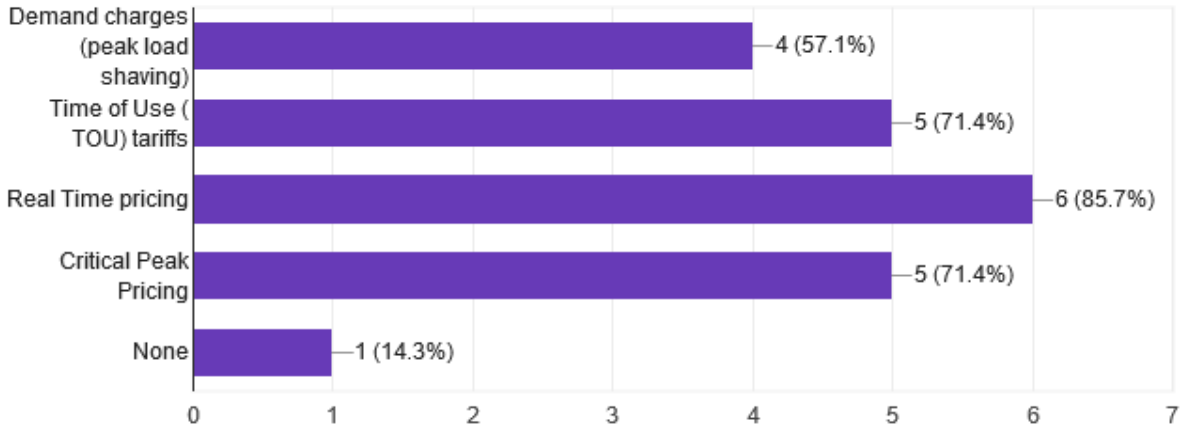
4. Please add any other type of building equipment / technology that can impact essentially the Demand Response services you are providing in building sites:

0 responses

No responses yet for this question.

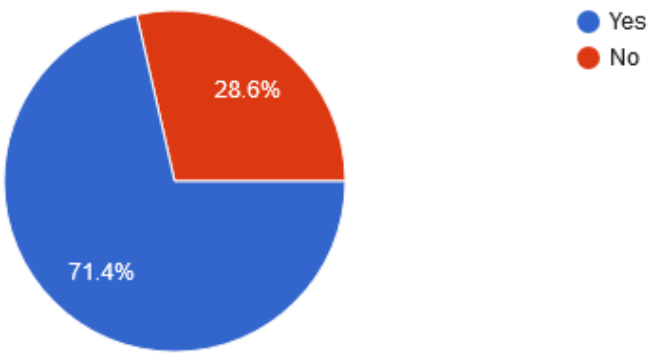
5. Considering the progress of the smart meters roll out and the subsequent offering of time varying (...th existing Demand Response services?

7 responses



6. Would you be interested in learning more about how to combine energy savings and demand response services in building renovation projects?

7 responses



7. Would you be interested in having an assessment done of the financial benefits from combining energy savings...novation project from your portfolio?

7 responses