Bridge Customer Engagement Working Group

Bridge Findings and Recommendations

Report 2015-2017

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V0.1	2017.24.11	TNM	Initial draft
V0.2	2017.28.11	AV + LJM	Added introduction
V0.3	2017.20.12	TNM	Compiled draft
V0.4	2018.04.01	TNM + MBa + MBi	Added content chapters 1 and 3
V0.5	2018.10.01	TNM + DP	Added content chapter 2
V1.0	2018.12.01	TNM + JN	Added content chapter 4 – final draft
V1.1	2018.16.01	KC	Detailed review
V1.2	2018.29.01	SD+MW +KC+TNM	Proofreading, references and merging
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V1.4	2018.08.02	TNM+KF	Small adjustments and inserts
V 1.5	2018.19.07	DTJ	Small adjustments and inserts
V 1.6	2018.10.10	DTJ	Small adjustments and inserts after review
V 1.7	2018.11.10	DTJ	Final review

Contents

Introduction

BRIDGE is a European Commission initiative which unites Horizon 2020 Smart Grid and Energy Storage Projects to create a structured view of cross-cutting issues which are encountered in the demonstration projects and may constitute an obstacle to innovation.

The BRIDGE process fosters continuous knowledge sharing amongst projects thus allowing them to deliver conclusions and recommendations about the future exploitation of the project results, with a single voice, through four different Working Groups representing the main areas of interest: Data management, business models, regulations and customer engagement.

The “Customer Engagement” Working Group in the general framework of the Bridge Initiative has been running for more than two years. The experience gained during this first period enabled the group members to restructure both the process of working together in a collective manner and the domain knowledge covered by “Customer Engagement” that will be used to capture and structure the lessons learned.

A revised co-working process shared by the Bridge projects

A key constraint of the Bridge initiative is to manage properly the inflow and outflow of the contributing projects. Downstream: special care should be brought to projects close to completion that will quit the initiative by June 2018, to gather their valuable inputs during their last months within Bridge. Upstream: new entrants will be progressively introduced to “how we work together” and to the experience of previous projects.

The revised co-working process will ensure such continuity throughout the time horizon of the Bridge initiative.

A second lesson from the first period consisted of shortening the procedure leading to the creation of collective intelligence in the field of Customer Engagement: instead of having all the member projects contributing to all the topics, smaller groups, active in a few focused topics with more rhythm and local facilitation are foreseen. This required segmenting the knowledge available into several building blocks and assigning interested projects to these blocks. A facilitator for each of the subgroups was to manage the process at the required pace.

The revised co-working process was prepared prior to the November 2017 workshop by the WG rapporteur and chair and the support team. During the workshop, the co-working process was adjusted to take into account these two related constraints: the in-out flow (integration of new comers and particular attention to the projects close to their term) and the segmentation of the domain (the active sub-groups).

Segmenting the domain of knowledge covered by “Customer Engagement”

Defining more precisely the scope of “Customer Engagement” was necessary for organizing the working process. This required two complementary actions: (i) to define the unit of knowledge that will be handled by the WG, (ii) to revisit the initial itemization of the domain knowledge in a few homogeneous blocks, thus fixing the parallel workflows.

Both actions were performed during the November workshop: The first action was to agree on the terminology: the unit of knowledge is called a “key feature” and a key feature consists of an issue, a solution or a contextual item. The second action resulted in a methodology proposal: the 11 questions

composing the questionnaire used to build the Year 1 report were re-organised in four thematic clusters (A, B, C, D). The rationale of these clusters is detailed below.

Relevant segmentation criteria derived from the 11 questions were selected to organize consistent and complementary building blocks. A systemic process approach inherited from a change management rationale was used: consider an initial situation with no "customer engagement" in their energy-related activity and a final situation where massive populations of customers are engaged in their energy activities such as consumption, consumption deferral, generation, storage, awareness of options, etc.). A transition process emerges within which R&I projects could produce procedural knowledge on ex ante/ ex post analysis and KPI. This constitutes one of the clusters. We named it the **Customer Engagement Cycle.**

A second natural cluster involves understanding barriers to project/programme implementation and the specific needs of a wide range of customers in their energy-related activity. Segmentation and regulatory context play key roles in that understanding. The second cluster is therefore called **Barriers to implementation and customers' analysis.**

A series of R&I projects focus on activating and speeding-up the Customer Engagement Cycle. They constitute the third cluster called **Drivers for Speeding-up the engagement.**

Finally, a generic issue is related to the wording and the way valuable knowledge will be stored and retrieved. Definitions and best practices compose the fourth cluster dealing with knowledge management. The expected output will constitute a handbook of Customer Engagement that could be named **"ABC book of Customer Engagement".**

The four clusters could be jointly represented in this 3-sided view: The Cycle as the bottom of the triangular conceptual view, the barriers on the left, the drivers on the right and the common knowledge in the centre.

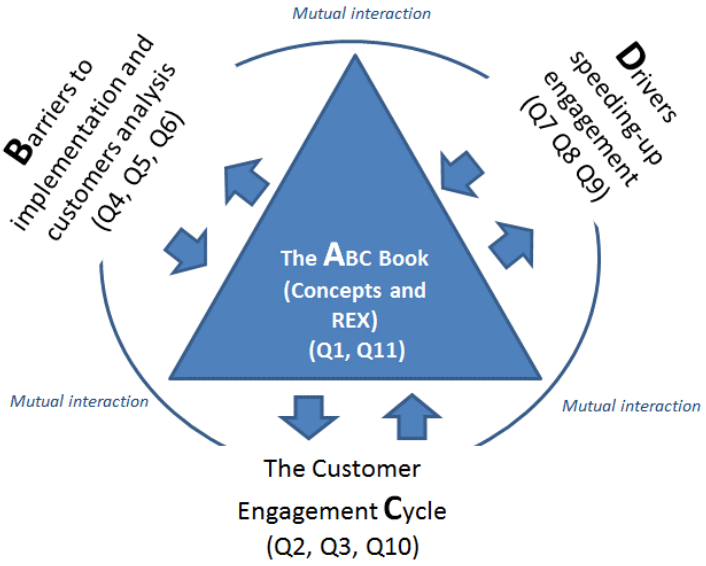
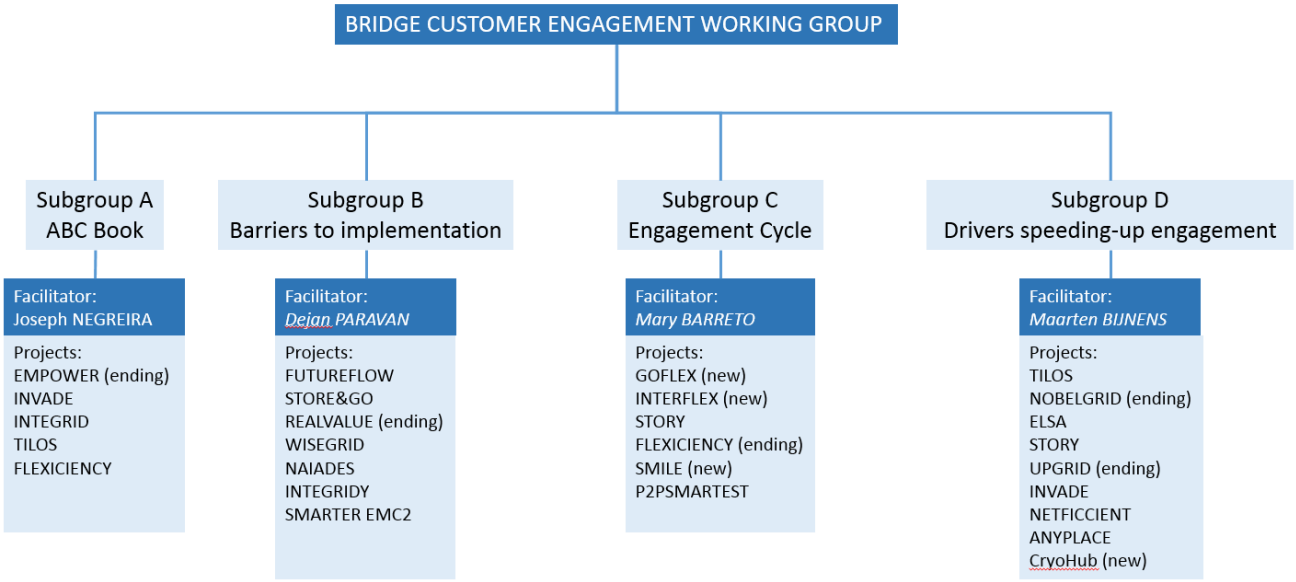


Figure 1: The four clusters of the Customer Engagement WG organized in a mnemonic way

All Bridge Customer Engagement projects have been allocated according to that framing.

The resulting breakdown of the WG is the following:



A continuous production of valuable knowledge from the dispersed projects' foreground on "Customer Engagement"

The third lesson learned from period 1 deployment relates to the format and content of the final output. There will be a change from the report format used in year 1 to a document having multiple purposes, not all of which are fully clarified yet. Among them one could mention:

- a report on process, continuously updated
- a communication document with recommendations
- a reference document compiling common key features from different Bridge results, etc.

It is expected that the desired format and content will be clarified in the coming months. For the moment, and for the sake of effectiveness, and upon the guidance of the EC, the WG proposes to produce the following documents for the current and the next period:

- End of 2017: Bridge Customer Engagement Second Year
- First quarter 2018: A communication document based on the Second Year report.

We assume:

- The starting point is the foreground/knowledge developed by the Bridge projects selected in the WG.
- The overall goal consists of making a series of recommendations to the EC in relation to the Customer Engagement field of knowledge.

As a result of the 3 lessons learned in period 1, the WG will thus deploy its activity over three spaces:

- Knowledge space of Customer Engagement. The unit of knowledge is called “key feature”. A key feature is an issue, a solution or a contextual item.
- Value space, which will measure how far a piece of knowledge (i.e. a key feature) is from a policy recommendation. It consists in a kind of roofing of the knowledge space retaining the most valuable key features which will constitute “best available recommendations”, final outputs of the work.
- Working space, which is positioned in-between the previous two and within which individual projects interact and produce key features.

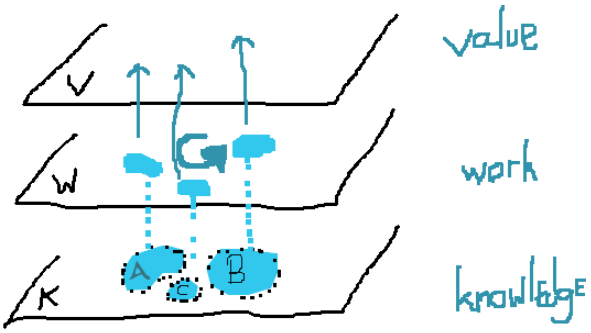


Figure 2 : Overall view of the three parallel spaces

While the knowledge space and the working space have been structured in previous sections thanks to the four clusters, the value space will result from continuous selection of the most valuable key features.

The general approach will therefore consist of transforming a series of observations made from results of individual projects into the collective Knowledge of the WG, and then into intentional knowledge at policy level as agreed Bridge recommendations.

Executive Summary

This report concludes the first cycle of work conducted by participants in the Working Group on Customer Engagement. It brings together the insights and experiences of the many projects involved in the working group, which are presented in more detail in the four chapters below.

The four chapters constitute the re-arrangement of the first 12 key topics identified by the working group. As described above in the introductory chapter this re-arrangement has given the group an opportunity to focus on two key observations that are common to all the participating projects; namely that (1) customer engagement needs a dynamic and flexible framework to function and (2) customer engagement should be structured in a cyclic manner where feedback loops and iterations are possible.

Overall the group recommends the following points to be considered for incorporation in future calls and projects:

1. **Address Customer Values and Their Context**

   A key learning point and 'best practice' guideline from across all projects, is that a successful business case depends on understanding what constitutes value for the end-customer. In this respect, strengthening the role for social sciences as an integrated part of new funding calls would be highly recommended.

2. **Process for Understanding What Customers Value**

   Customer values become more sophisticated and complex due to their involvement and engagement with a project. Putting in place a process that allows the interactions and engagement strategies with end-customers to evolve should be developed in the early phases of the project.

3. **Classifying / Segmenting Customers**

   The diverse values that end-customers hold and the context in which they live means that they respond differently to the approach adopted by the project. The project should therefore develop a system that can classify or segment end-customers, that goes beyond the identification of basic consumption levels. It is a recurring finding from all projects, that segmentation should have been done as part of the project to understand why the same approach can have different outcomes for different customer segments/groups.

4. **Engage End-Customers Early**

   Involve participants in the project at the early stages to explain what is going to happen and how people will be involved. This approach creates better results and can be part of a learning loop, where pilot customers give continuous feedback to the project.

5. **Rebalance the Technical Focus of Calls**

   It is observed that the emphasis of the current calls is focused on technical solutions and the installation and running of effective pilots. Not much room has been given for research into different implementation views and the preferences of end-consumers. Space to develop best practice platforms for customer engagement would be highly beneficial.

The findings related to the four chapter are summarized below:

1. The Customer Engagement Cycle

Customers frequently state that they place a high value on costs, convenience and security. However, customer feedback suggests that these values are assigned priority levels. And the priority levels are dynamic and subject to change, depending on when they are being evaluated. As such, this chapter highlights the importance of taking into account the following value chain in order to promote better customer engagement: 1) Involve the customer as a starting point, to understand who you are talking to; 2) Engage the customer through a clear process of benchmarking, personal incentives and segmentation; 3) Evolve the customer relationship by creating a feedback loop where end-user communication grows, supported by advanced feedback, information and education.

In terms of the key lessons learnt, projects reported that customers place a high value on energy costs, both in terms of stable prices and the possibility of earning money through participation in energy related projects. Customers appreciate environmental gains in the sense that projects allow them to contribute to increased use of renewables, optimizing their ongoing efforts and by making them feel they are part of larger environmental friendly movements. Customers value comfort in the sense that they want convenient solutions that either bring more comfort or maintain current levels. Customers value technological solutions that are easy to grasp, understand and easy to learn.

Customers' engagement levels varied between projects, primarily due to factors such as the levels of awareness, interaction with energy providers and whether the technology was innovative and offered opportunities to learn.

The main findings for successful actions within BRIDGE projects have been the use of Information leaflets (cost, better design and controllability), awareness and education campaigns and user-friendly solutions with a gradual involvement of customers in the projects.

Performance indicators are primarily assessed through surveys, questionnaires and other communication channels. For Research and Innovation Smart Grids and Storage projects the indicators mostly focus on environmental concerns and social driving forces assessed through the levels of awareness and willingness to support low carbon technologies. Specific performance indicators for customer engagement identified include customer satisfaction, acceptance, consumption reduction, and number of surveys responses.

This section concludes with three main recommendations for introducing the Customer Engagement Cycle in future calls, namely:

1) introduce a dynamic view on Customer Engagement through three steps encompassing Involve, Engage and Evolve value chains;

2) a clear definition of project specific KPI's that use mixed approaches and evaluation methods when addressing customers whilst also providing them with feedback, and finally,

3) learn from projects failures as an opportunity to collect experience that new projects can use to better succeed in their own endeavours.

2. Barriers to Implementation and Customers Analysis

When dealing with customer engagement in demand response projects, **the most important lesson learnt is the need to listen to customers.** Starting projects without listening to the customer can result in services being rejected because they are incompatibilities with the customers' wishes or beliefs and may have other shortcomings. Second, regulations play an important role and need further improvement. Chapter 2 provides an analysis of the potential barriers to implementation and customer involvement in demand response projects and programmes related to regulations.

BRIDGE pilot projects tend to have a relatively low level of customer engagement especially with domestic users when compared to solar and battery projects that have the opposite experience. Domestic users tend to enrol in projects with an open mind, but subsequent engagement decreases with time. Therefore, many Bridge projects face declining customer engagement over time, which is not necessarily true for industrial customers. Since projects have little or no customer segmentation or profiling, and are mostly still on-going, we cannot yet answer whether customer segmentation is of crucial importance for successful completion of project goals? Projects highlighted a lower importance of distinguishing between vulnerable and educated customers, as the focus is on listening as well as providing a variety of useful and simple information in order to have effective communication.

Market segmentation provides information on customers' needs and marketing resources. When combined with other characteristics or dimensions, it is possible to develop several different types of customer profiles. Useful information is provided by, for example, geographical and demographic segmentation and actively envisioning the customer's perspective (i.e. stepping into the customer's shoes). Since all work refers to final customers and their engagement, future projects should take into consideration the end customers' needs or else risk providing less than satisfactory service. The suggestion is that segmentation should not replace direct ways of interaction and dialogue with customers but should rather provide a more diversified customer engagement strategy. In BRIDGE, a common point for all pilot projects is to only include customers that are willing to cooperate. This reduces time wasted on passive customers and improves research effectiveness. Regarding the social dimension, social and educational backgrounds are important because they provide information on the most appropriate ways of communication, which are key for improving the customer engagement of different profiles. Some projects recognized that for vulnerable customers, economic value is of great importance and, regardless of social dimension, all customers like simple and visually appealing communications.

As far as regulatory barriers are concerned, BRIDGE recognized the following issues: lack of dynamic tariff systems; no access for small consumers to take part in demand response programmes; no possibility for selective grid cost pricing; obstacles to accessing consumption data; lack of standardized processes and other/market-related obstacles.

Finally, Chapter 2 ends with suggestions for methodology suitable for the selection process of targeted agents for future projects.

3. Drivers for Speeding-Up Engagement

Across all projects four key elements are being observed as main features for driving customer engagement in energy related projects:

a. **Map and profile your customers:** If you do not know whom you are talking to, you are talking to no one.

b. **Deploy drivers:** There is no single driver that has the capacity to make a decisive impact.

c. **Ongoing customer engagement:** A good planning that manages expectations; maintains the effectiveness of drivers; foresees barriers and ways to overcome them; develops a personal follow-up course; and offers appropriate communication and feedback channels is necessary for the engagement cycle.

d. **Engaged "energy citizens" ex-post are promoting agents and social influencers for new projects.** A good engagement cycle with positive attitudes ex-post can be used to drive engagement for new projects.

4. About Definitions and Best Practices

Terms like user, consumer, customer, citizen, etc. are often used in the EU H2020 funded projects and in the market without a specific analysis or appropriate intentionality. This can lead to confusion or misunderstanding amongst stakeholders as the concepts and roles of each profile may differ depending on the concrete objectives of the individual projects. This kind of confusion is also generated when indistinctly using terms like seller, provider and supplier.

The harmonization of a common terminology that fits well with the market is highly relevant, and can support the objectives of the BRIDGE Initiative. This is the objective of the two-initial sections of *Chapter 4. About definitions and Best Practices*. Some projects introduce variant or additional terminology that fits better in their concrete objectives, but a common view should be kept in a transversal way for everybody to have a better understanding and take better advantage of the different projects and BRIDGE Initiative's outcomes.

The last section of Chapter 4 presents a list of best practices, lessons learnt and recommendations coming from the different projects involved in the BRIDGE Initiative. The variety of project concepts, pilots and demonstrations meant that the feedback received by the working group was a bit messy. The feedback has been categorised into 4 concrete phases in the project time-line:

a. During the call text generation,

b. Before the customer engagement,

c. During the customer engagement and

d. After the customer engagement.

Customer engagement should be taken into consideration when the Commission prepares the call text and allow a specific budget for guarantying their participation in an efficient manner. The projects should propose a customer engagement plan, designed with appropriate KPIs, that includes adequate communication actions and a set of participation activities that maintain the interest and involvement of the customers during the projects' life. Once the pilot or demonstration is finished, additional actions are necessary to generate a positive experience for the customers, leading to further exploitation opportunities and research projects.

1. The Customer Engagement Cycle (T2, T3, T10)

1.1 Understanding customer value, setting goals and measuring them

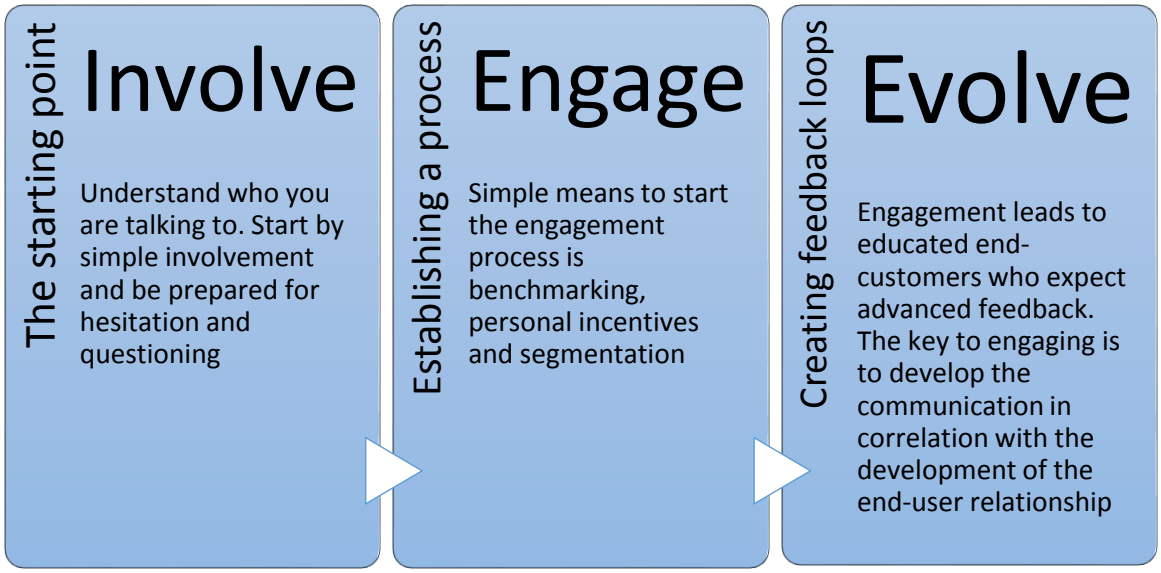
As mentioned above, customers tend to initially place a high value on costs, convenience and security. However, the project results show that through active customer engagement and feedback these values can change.

Projects have observed that disengaged end-customers are largely concerned about their energy usage in relation to paying bills. In this respect the focus of their interest is on the price of energy. The well-known term “bill-shock” describes the sudden focus on energy usage that occurs when people receive their energy bill.

They are also concerned about their daily life and comfort, in particular heating and cooling since these two elements are responsible for the highest share of the energy bill. That being said, most people are unwilling to compromise on their usage of electronic equipment, have little concern for standby, are happy using old equipment and are generally (despite all efforts) somewhat ignorant of energy effective solutions (Pothitou et al., 2016, 2017).

Finally, people tend to think about energy when it is not there. Europe has a high security of energy supply, but this means that in areas where energy stability is not good, confidence in the electricity supplier is very low. The number one priority amongst customers is to secure a reliable supply of energy.

With this basic knowledge, it is possible to convey a simple value chain to create customer engagement:



1.2 Project key learnings

Customer values are orientated towards economic, comfort and technological issues.

The economic values noted by projects cover a range of issues including monetary incentives (Flex4Grid); the price of electricity (INTERFLEX); the cost of participating in the project (Nobel Grid) and potential additional earnings (FutureFlow project). Economic gains / savings can be the primary trigger for participation in a project (GOFLEX, RealValue, Store&Go) as can cost reduction (STORY and TILOS). In the STORY project, the economic value that customers realise is not limited to electricity but also covers heat, carbon emissions and waste handling. In addition other processes can be optimised such as curtailment, less dependency on fossil fuels and more effective grid connections.

Environmental values that customers consider important include the exploitation of local energy from domestic renewables that can be used by the grid or enable it (Flex4grid, TILOS and Nobel Grid), electricity that is environmentally friendly (INTERFLEX), the investment of green energy labels (Nobel Grid), a motivation for concerned customers (GOFLEX and Store&Go), being connected with ongoing and similar national events (RealValue) and outweighing economic benefits (STORY).

Comfort values can override other issues and become non-negotiable (Flex4grid and GOFLEX). Comfort is also seen as information that is understandable (INTERFLEX), easy to use and providing better living conditions (Nobel Grid), as a result of new appliances, and it can come from sense of improved control over temperature and timing or fewer problems with excessive heat charge (RealValue) and it provides minimal interruptions (STORY and TILOS).

Technological values relate to access to information that is not excessively detailed or technical (INTERFLEX). It is about access to new technology they can test themselves, learn, use and adapt especially if they are early adopters or users with engineering backgrounds (Nobel Grid and FutreFlow). This might be relevant for only a few people (GOFLEX project) and the responses are mixed as some experience connectivity problems but are willing to adopt new technology (RealValue and Store&Go), the possibility to understand and get engineering experience in the storage domain, or even improve grid at residential or industrial environment (STORY).

Other values that customers appreciate are collective actions with their peers involving the adoption of new equipment, focus groups or other activities (Nobel Grid and RealValue), energy justice that challenges the power of big energy corporations (Nobel Grid), independence, self-sufficiency and autonomy for prosumers (GOFLEX and TILOS), reliability in supply, safety and security of services for industrial customers (GOFLEX), image and reputation as translated by the ability to show they are innovation friendly, future oriented and a protector of the environment (GOFLEX).

The level of customer engagement in the projects has not met expectations due to the low incentives being offered (Flex4grid, INTERFLEX, FutureFlow). Other projects reported that the engagement met their general expectations (GOFLEX, RealValue, TILOS), although some projects still need to collect more data to evaluate this aspect (Nobel Grid). At the same time while interest is high, active engagement is sparse (Store&Go), even though in some projects residential customers show higher levels of commitment than industrial customers (STORY).

1.3 Topic 2: What customers value (ex-ante)

Five projects conduct research on how customers value energy and energy services[1] covering various indicators. An example is the RealValue project that asked customers how satisfied they have been with their storage heaters, what they expect from their improved and ‘smart’ heaters, and whether they have difficulty in paying their fuel bills. The Flexiciency project looked at issues on energy

[1] The Flexiciency project only research how customers value energy in the Swedish Demonstration.

consumption changes, better knowledge of energy efficiency and better understanding of energy consumption. In both the UPGRID and TILOS project, people were asked if they would change their energy consumption behaviour.

Some projects also looked at the role of the economy, environment, comfort and utilities on consumer views. Economic impacts on energy consumption and reduced energy costs were addressed five times in different projects. Reduced energy costs can be perceived through changes in behaviour that lead to lower consumption, lower demand during peak hours and avoiding infrastructure upgrades. One exception is the Flex4Grid project that also addressed the sale of energy to the grid (e.g. concerns about return on investment time; type of contracts for selling their energy).

Two projects (Flex4Grid and TILOS) addressed people's awareness of energy/environmental labels when purchasing new appliances. The ELSA project looks at the direct environmental impact of energy storage, using life cycle analysis. In terms of safety, customers identified security of supply and minimal interruptions as important issues in their answers. TILOS has asked specifically about perceptions of power outages at the island in terms of duration and frequency. When consumers were asked about how they value their utility, Flex4Grid indicated that *'People prefer local energy providers because they perceive them easier to solve problems and support local economy'.*

Projects also looked at the general levels of interest amongst residential customers on energy and energy consumption.

- In the **RealValue** and **UPGRID** projects, levels of engagement were initially very low. The low level of engagement in RealValue was due to the lack (or absence) of control over their heating (so no way of engaging operationally). Later in the project, some customers were happier with their new heaters, partly because their engagement was better: they understood the new controls and were getting a better heating service. Others found it hard to understand the new, more complex controls and needed assistance. Information leaflets and online information helped up to a point, but there was also a need for in-home personal guidance for customers so that they could learn how to use their new technology through practice.
- For the **UPGRID** Project, low engagement was due to the *'lack of awareness and low level of interaction between customers and energy service providers'*.
- Other projects that experienced high levels of engagement include NOBEL GRID, Flex4Grid, and TILOS.
- The **STORY** project mentioned other values related to energy consumption '*the experience of having state-of-the-art technology in the house; technical: get engineering experience in the storage domain; strategic: understand the potential of storage'.*

1.4 Topic 3: Assessing the effectiveness of customer engagement (ex-post)

Most projects will assess the effectiveness of customer engagement in the coming months using follow up interviews (May 2018, June 2018, December 2019) (Flex4grid, INTERFLEX, Store&Go, Story, Nobel Grid, TILOS). Customer feedback is an important indicator to evaluate results as well as the connection to community actors such as schools and municipalities (GOFLEX). In some cases customers are not familiar with ICT or technology related applications. Efforts were then essential at installation phase, where customers needed help to operate the equipment being installed at their home as they had limited ability or knowledge (RealValue). However, the evaluation of effectiveness showed that this is of secondary importance in a demonstration project (RealValue).

The S3C project identified the main success factors for customer engagement as:

- Reinforce the end user perspective in the project design
- Develop viable business models
- Co-creation
- Gamification; roll out smart grids towards the general public

- Develop novel stakeholder coalitions
- Connect smart grids to smart cities, smart living and sustainable lifestyles
- Develop an overarching storyline to achieve a sense of urgency about smart grid

Three projects have conducted research on the effectiveness of their approach to customer engagement. Their main findings are summarised in table 1 below:

Table 1: Main findings on the effectiveness of selected approach to customer engagement

Project	Main findings
RealValue	The first information leaflet aimed at Irish customers focused on smart storage heating and encourage them to sign up to RealValue. It was designed around the concept of 'balance' and used yoga images. It had limited success, arguably because it was too conceptual and assumed a level of understanding that was not present in the minds of most readers. The project has since adapted the information leaflets that focus on costs, improved heater design and controllability.
Flexiciency (Italy)	The main lessons learnt centre around (a) helping customers understand the global benefits and scope beyond saving money, (b) educate customers through training and support materials on solutions (c) adopt user-friendly technological solutions, (d) use a step by step approach gradually providing customers with new advanced features, (e) support and encourage customers both during the installation phase and afterwards.
Flexiciency (Spain)	Customers are more open to engage when they get some tangible benefits from the project. It is important that they know the project in detail.

1.5 Topic 10: Performance indicators: price – stability – interruptions, etc.

1.5.1 Key performance indicators

Performance indicators being used for customer engagement include:

- participation rates through user engagement and acceptance,

- number of households participating in the pilots,

- reduction of peak loads (Flex4grid, Flexiciency)

- customer satisfaction (Flex4grid, Flexiciency);

- maximum power in kW;

- flexible price (Nobel Grid);

- level of self-generation in %;

- number of new PV installations;

- number of new battery operators

- number of prosumers that provide energy data (GOFLEX).

From reviewing the Performance Indicators of the participating projects, it is clear that even indicators of customer engagement are mainly associated with technical measures such as numbers of interactions or number of responses for a given task. Hence since Performance Indicators represent a type of Measure of Performance to evaluate progress toward strategic EU policy goals to provide

actionable knowledge, they should be directly associated with those goals. In the context of the EC Task Force for Smart Grids, strategic goals are:

1) Progress toward the deployment of Smart Grid Services

2) Progress toward the achievement of Smart Grid Benefits and in the present case from the customers' view.

The existing indicators represent in this respect only partially what could be expected to measure customer engagement. Suggestions on how to improve these indicators will be done in the end of this chapter.

The exhaustive list of KPIs is provided in Annexe.

1.5.2 High level content

Useful performance indicators are characterised by attributes such as being **specific** to the variety of goals emerging from the different Research and Innovation (R&I) projects. Indicators should be revised appropriately, based on long-time observations that address **time-bound** criterion. Projects should scan data that is necessary to build an assessment of energy consumption behaviour changes covering cultural dimensions of change, classification and segmentation according to customer types, residential, industrial, etc., and price and costs as driving forces. Projects contributing to ***experience based knowledge*** can support the use of performance indicators through surveys, questionnaires and other communication channels of customer engagement.

Smart Grids and Storage R&I projects handle differences on deployment starting point (interruptions and instabilities or solid grid connections) while having a common vision and a variety of goals compatible with the Energy Union Policy. Environmental concerns and social driving forces will be valued with performance indicators to identify the differences connected to geographical areas. Measurements are performed with regard to the levels of awareness and willingness to support low carbon technologies, whilst communicating the results to stakeholders and constituents. Citizens are at the heart of the sociotechnical transition with their active participation in R&I projects, focused both on individuals as well as local communities that can shape new business models extracting value from EU HORIZON 2020 Smart Grids and Storage projects.

1.6 Recommendations for introducing a Customer Engagement Cycle in future calls and projects

There are three key recommendations in relation to the Customer Engagement Cycle and future calls and projects.

1. **Introducing a dynamic view of Customer Engagement**

   There is a need to introduce a more dynamic view of customer engagement as described in the Involve, Engage, Evolve value chain. This will require an additional and specific focus in future calls to allow social sciences approaches to understand what drives customer engagement and how this is sustained.

2. **New projects should use customer KPI's as a strategic tool**

   Customers/Stakeholders should be the starting point for project design. Moreover, clear definitions of the baseline and desired targets for every project related to the customers should be created. Every project should develop specific KPI's for their customer engagement; i.e.: how will projects measure the development of habitual changes, customer engagement and the acceptance of new technologies. It also requires a focus on how to deliver real value for customers and a methodology of how to provide feedback on the strategic KPIs being collected and in this respect, it requires that projects be evaluated using both qualitative and quantitative methods.

3. **Learn to love failed projects**

   Are projects allowed to fail? When it comes to delivering knowledge on what creates customer engagement in energy savings there is new ground to cover and not so much material to build upon. Deriving key learning points from projects that might fail is essential for future projects to create new learning and knowledge.

2. Barriers to implementation and customers analysis (T4, T5, T6)

2.1 Customer engagement issues

The needs, beliefs, culture, location and social dimension of customers being engaged in a project can be very diverse. They have different value systems, different drivers for engagement and different levels of knowledge, skills and abilities. Given this context, projects that want to engage customers and get their feedback need to develop processes for direct communication and interaction.

Engagement can be inhibited by a lack of:

1. communication
2. resources
3. trust
4. time
5. clarity
6. user-friendly technology and processes.

Customer engagement can be significantly improved through addressing these shortcomings. This is particularly true in relation to active customers (electricity distribution and supply, demand response, self-consumption, e-mobility), where addressing deficiencies and associated regulatory barriers can have a dramatic impact on the future of the electricity system.

Four steps that address customer engagement difficulties and help break down barriers are:

1. Acknowledge customer presence and analyse their context.
2. Ask end customers to identify barriers. Provide a safe way for them to share their observations; acknowledge and reward their contributions.
3. Conduct a thorough review of the project's policies, processes and practices; identify those that are not designed with the customer in mind.
4. Act on the findings.

The starting point for customer engagement in different fields is to listen and then communicate. This can empower the customer/consumer, give them control, and endorse a customer-centric, two-way dialogue. Putting customers first and using a common and easily understandable language to communicate and engage end-users in projects creates greater involvement. This enhances the ability of project personnel to learn and become more effective in realising their goals.

2.2 Project key learnings

Barriers to active customer engagement in pilot projects (that are still ongoing) become clearer after the first project phase. Some projects face low residential customer participation. Many projects also face declining customer engagement over time. In some cases, demo sites are still in the construction phase and results are not yet present. Declining engagement over time is not necessarily true for industrial customers (FutureFlow). On the other hand, customer engagement in solar and battery fields is higher (INTERFLEX, TILOS).

Domestic users are usually open-minded and enrol in pilot projects but later show low active contributions. From information acquired from the ongoing projects, we do not see in-depth analysis of cultural and geographical dimensions (segmentation, profiling). Some projects do not have

customer segmentation and from second round of all completed questionnaires that we received, information showed that no one of the pilot projects used or developed new segmentation since the last questionnaire.

Information that is prepared for end customers (especially for households) must be kept simple. For example, STORE&GO found that terminology around energy efficiency is usually considered an 'elite sport' as upfront investments are often required. Simple and visually appealing communication is key to empower customers and increase their active enrolment in the ongoing projects.

Another barrier is related to the fact, that some technologies are either very little known or still not developed to attract the attention of customers. An example is specific storage technologies, which is important to develop and introduce, but to which there is a built-in scepticism, e.g. the storage technology from the CryoHub. It is one of the few innovation actions focusing on the importance of cold energy segment (cooling and refrigeration) as part the EU energy system. CryoHub develops cryogenic energy storage for renewable refrigeration and power supply by converting industrial refrigerated food warehouses from simple energy consumers to intelligent energy hubs. Thus, CryoHub increases the RES share in the refrigeration sector and enhances the sustainability of both electrical grids and refrigerated warehousing. The customer engagement issues faced within the project originate from the strong conservatism in the sector and the prudence of many food cold chain operators to play a new role of active actors on the energy market.

Finally, some projects have dedicated significant resources to tackle regulatory issues as they are highly relevant for implementing activities and the exploitation of results.

2.3 Topic 4: Analysis of cultural and geographical dimension (segmentation, profiling), early adopters, etc.

Market segmentation is an approach to identify and manage diverse customer needs and to target marketing resources. The basic premise of segmentation is that different group preferences and needs can be best managed by grouping similar customers together into market segments. Segmentation can be performed based on a number of different characteristics and profiles:

- Demographics (age, gender, marital status, employment, income, socio-economic status)
- Cultures (ethnicity, religious, beliefs, consumption behaviours)
- Attitudes (acceptability towards different concepts and ideas).
- Psychological (motivations, personality, interests, opinions)
- Value perceptions (perceived functional, economic or social value of using energy efficiently)
- Psychographics (lifestyle, knowledge, activities)
- Behavioural (desired product benefits, price sensitivity, brand loyalty, environmental sensitivity)
- Geographical (residential density, climate)

Segmentation is a well-known tool used in many projects, often in combination with other characteristics or dimensions to develop several different types of customer profiles. To make a clear distinction between the different approaches to segmentation employed in the different projects, they are presented in this chapter.

2.3.1 Definitions

Segmentation: is a marketing strategy which involves dividing a broad target market into subsets of consumers, businesses, or countries that have, or are perceived to have, common needs, interests, and priorities, and then designing and implementing strategies to target them.

Segmentation criteria: defining segments required to identify criteria (geographical, functional, cultural etc.), in a certain order and up to a certain degree of detail (typically 1 to 3 segmentation levels).

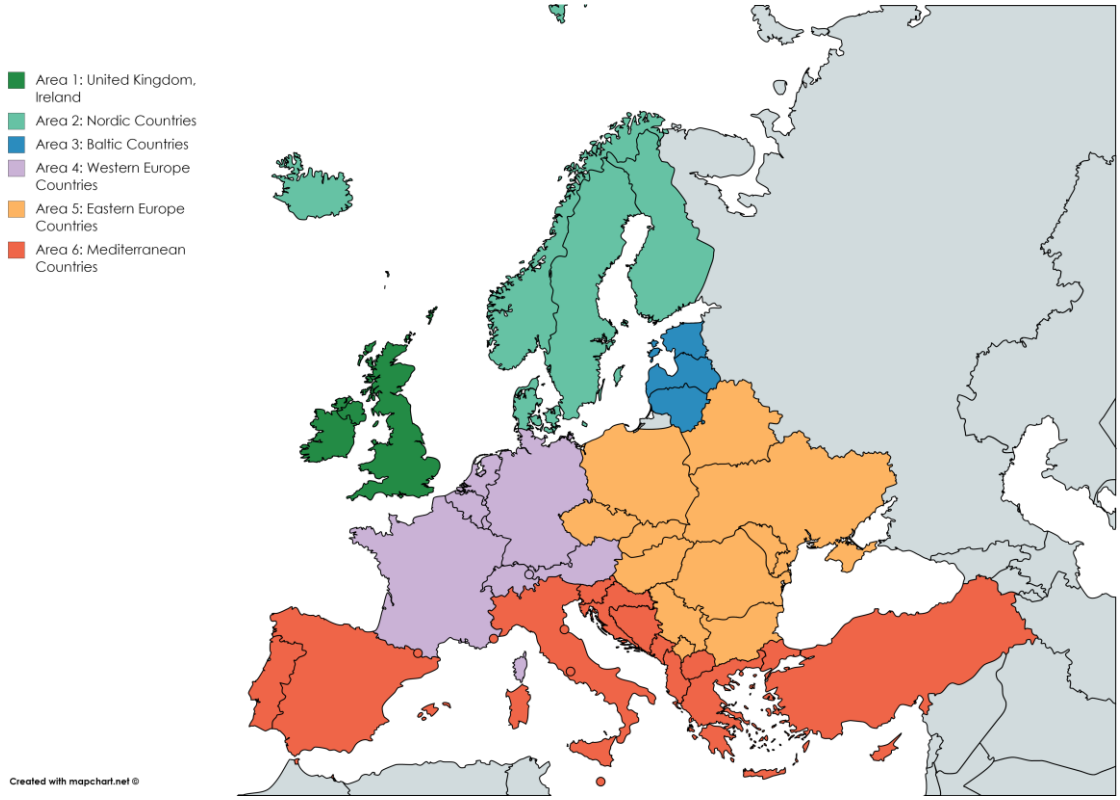
Profiling: the recording and analysis of a person's psychological and behavioural characteristics, to assess or predict their capabilities in a certain sphere or to assist in identifying categories of people.

Cultural dimension: is a model by Hofstede describing six dimensions of differences and/or value perspectives between national cultures:

- Small versus Big Power Distance (the degree of inequality among people that is considered normal)
- Individualism versus Collectivism
- Masculinity versus Femininity
- Preference for Structured versus Unstructured Situations
- Long-term versus short-term orientation
- Indulgence versus Restraint (with respect to free or restrained gratification of basic human drives)

Geographical dimensions of energy - Region: For anything relating to energy consumption, it is usual to consider Nordic, Central Europe and South Europe.

Geographical dimensions of energy - Area: for the purpose of analysing Customer Behaviour, each Region should be divided according to cultural differences, historical reasons and the organization of the Energy Sector. A possible geographical segmentation is shown below:



Area 1. United Kingdom and Ireland. The market is more unbundled than in most European Countries. Participants in the market and their responsibilities are different to any other. The annual churn rate (customer switching between suppliers) is around 20%. The climate is mild and the quality of insulation in buildings is low on average.
Area 2. Nordic countries, with a very efficient common energy market, and extreme winter climatological conditions. Higher building standards.
Area 3. Baltic Countries. Nordic region (but markets still in evolution).
Area 4. Western Europe countries.
Area 5. Eastern Europe countries.
Area 6. Mediterranean countries. Extreme summer climatological conditions and isolated energy markets.

Early adopter or lighthouse customer is an early customer of a given company, product, or technology (Rogers, 1962). Typically, this will be a customer who, in addition to using the vendor's product or technology, will also provide considerable and candid feedback to help the vendor refine its future product releases, as well as the associated means of distribution, service, and support. According to a theory called Diffusion of Innovations (DoI) formulated by Everett Rogers, early adopters make up 13.5 percent of the population.

2.3.2 High level content description of the proposed segmentation process for Customer Engagement

Goal:

- Only use the standard market segmentation profiles if they are applicable for energy Customer Engagement. If they are not, select other profiles.

***Milestones**:*

- To validate the proposed areas. Check for documentation
- Are the Areas corresponding to culturally specific behaviour?
- Are the segmentation profiles equivalent for any cultural group within Europe?
- Define and select the segmentation profiles for the purpose of the Customer Engagement analysis
- Apply the selected segmentation profiles to the analysis

Customer profiling should take into account a wide range of geographical, transactional, demographic and survey data to better understand end user's needs and to reengineer services. This allows projects to identify and use the most appropriate service channels for different target groups, and to proactively provide services that will meet their needs. This will ensure that services are designed and implemented in ways that recognise the specific needs of different groups of customers.

Standard market segmentation profiles might not cover all complexity related to the subject of energy. In such cases, other profiles need to be generated and utilized.

A good technique for creating a customer profile is to start by imagining an individual (household or industrial customer or electricity provider) who represents this group.

When the subject is energy and if we take power consumers into consideration, e.g. households, we could segment them by location, number of people in individual household, main fuse and power charge, if they use refrigerators, air conditioners, heat pumps, electric car, their age, employment, beliefs, interests, income, lifestyle, attitudes etc.). Segmentation profiles are not necessarily subject to a cultural group within Europe, since households' habits and individual lifestyles are not the same.

Location is important when segmenting customers for electricity consumption because when production and consumption happen in the same location, efficiencies are possible around lower cost, complexity and dependence on transmission and distribution systems. As regulation might change and once location-based automatic selection incorporates into systems, geo-location priority will be important.

Prosumers are becoming an integral part of the power system and the market as adequate metering data provided by smart meters enables development of services for them. Segmentation is therefore an important step in BRIDGE projects since all work that is done refers to final customers and their engagement. If we do not take their needs into consideration, we cannot provide a good service.

2.3.3 Segmentation in BRIDGE projects

Here we are looking at the segmentation approaches adopted by projects such as customer survey, desktop research or others (Figure 3). The most frequently used approach is desktop research (in four projects). For example, publicly available census data was used in the RealValue project to identify areas of electrically heated properties in Ireland. This allowed the project to target messaging and deploy resources more effectively. Customer surveys are used in two projects (Flexiciency and UPGRID). Three projects use also other approaches, for instance Flexiciency used load curve to segment customers (Italian demo) and contracted power and features of buildings (Swedish demo). There are also four projects that do not have customer segmentation.

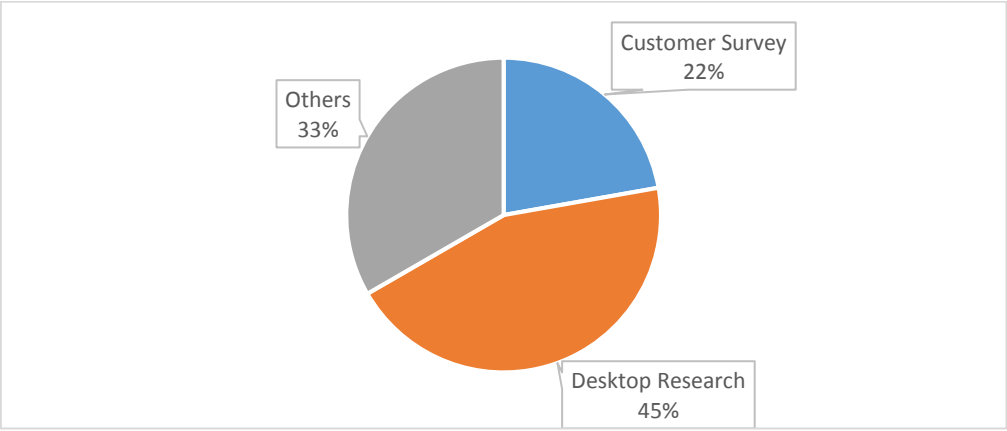


Figure 3: Segmentation approach

The areas that segmentation models focus on are shown in Figure 4. The most frequently addressed area is consumer type (in six projects). Consumption level and social factors are considered in two projects, respectively. Four projects considered other areas to fulfil the target of the research project; for example, the Flex4Grid project considered whether technical requirements were met and whether customers only consume or also produce energy.

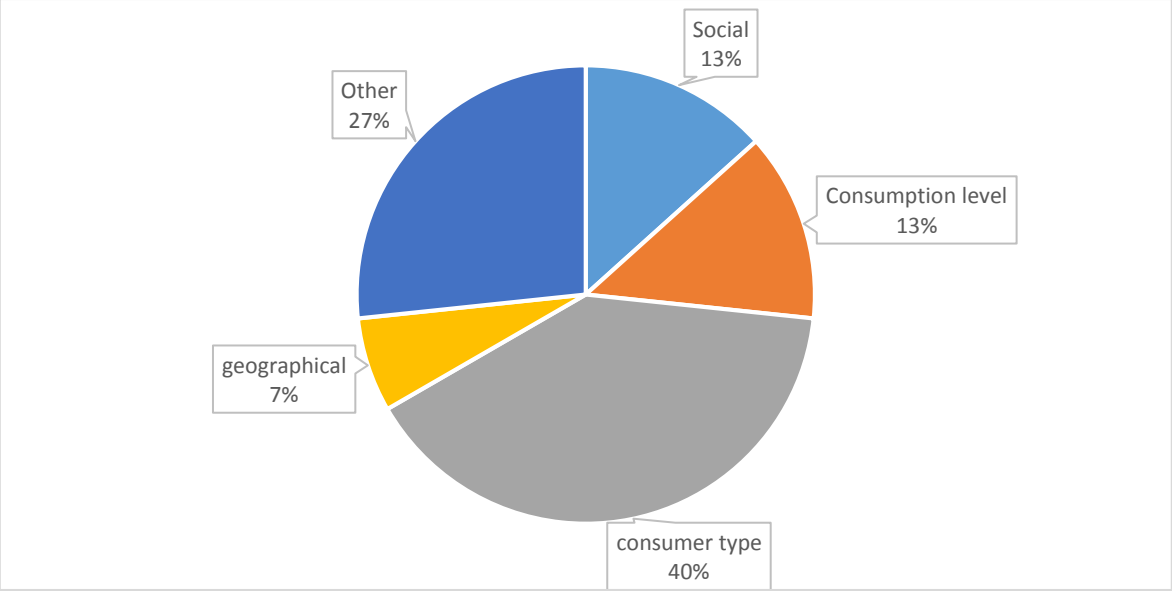


Figure 4: Focus areas in the segmentation model

There is no consensus on the most relevant segmentation model.

The S3C project summarized segmentation models into two broad groups: the generic segmentation model and the designated segmentation model.

A number of projects have applied the designated segmentation model. For example, the RealValue project considered geography and demographics as the most relevant segmentation characteristics as they can be helpful to identify recruitment targets. Flexiciency (Italy) considered that social, consumption and consumer type are most relevant for the Group 1 customers as the aim of the project is to increase people's awareness on energy consumption, which in turn could lead to a more effective way of using energy; while for the Group 2 customers, load curves are the most relevant segmentation models as they will receive dynamic pricing offerings based on their load curves. For the Flex4Grid project, the broad segmentation into energy consumer and energy prosumer is the most relevant segmentation model for the reason of different effects by these two groups on distribution networks. Apart from the project specific factors, generic segmentation using general factors such as demographic, behavioural and geographical factors are also mentioned in the responses.

Segmentation was used by projects in different areas. In most cases, segmentation was used at the **recruitment stage** in order to select suitable candidates for the research (e.g. RealValue, Flexiciency, Flex4Grid and FutureFlow). It was also used for **dissemination** (e.g. Flexiciency and UPGRID). Flex4Grid also used segmentation to devise and apply suitable incentives for **customer engagement**. We can see segmentation being used also in **evaluation stage**, as S3C introduced a project called Linear in order to assess why some consumers had performed better than others and how it related to their attitudes and perceptions. The answers are similar to the areas that people would recommend the use of segmentation. On the other hand S3C suggested that '…segmentation does not replace direct ways of interaction and dialogue with customers – thus segmentation should be part of a more diversified customer engagement strategy'.

The majority of projects believe that segmentation is a valuable tool. In some cases, it is too early to draw conclusions on the effectiveness of segmentation. At the same time, TILOS project found the effectiveness of segmentation is not significant. The reason for that is the peculiar sample covering almost 100% of an isolated (island) population but being relatively small overall.

Regarding the most appropriate kind of segmentation for customer engagement, the answers are dependent on each product. All types of segmentation are mentioned, including consumer type, consumption level, consumer behavioural, customer satisfaction, type of building, contracted power,

energy consumer, energy prosumer and so on. Therefore, the decision on which segmentation is appropriate is project specific and needs to be considered carefully during the design and implementation phases.

In the first round of questionnaires, segmentation proved to be very diverse between projects. With the second questionnaire we can add some more specific information discussed below. In the second questionnaire participants were asked to provide information on what is the primary goal of using segmentation in their project. They were also asked:

a. What are the most important learnings from working with segmentation in your project?
b. Did you use or develop new segmentation since the last questionnaire – if yes, what kind of segmentation?
c. If segmentation is addressed, is it a core or a peripheral activity in your project?

From the ongoing projects, we received feedback that the primary goal for segmentation is to find the most appropriate end-users, i.e. those from which an active response can be expected. Active users are precisely those from whom the project can obtain the most useful information that can be used for further analysis to deliver quality reports. The common point for all would be to engage with the active users in the pilot project. Segmentation reduces time waste and increases research effectiveness.

GOFLEX concluded that it is challenging to find segmentation rules that fit for all trial sites (Greece, Switzerland, Germany) because of differences in the local conditions (load profiles, climate and legal situation). As mentioned above, segmentation is specific to individual projects and overall generalization is not possible. For most projects, segmentation is a peripheral activity and only for Carbon Coop (UK) and GOFLEX is it a core activity. For Carbon Coop (UK), the different segments identified showed different priorities, e.g. they require different messages methods of engagement. In addition, some end user segments appear to require direct involvement in the development of the project – not just as passive customers.

2.4 Topic 5: Social dimension (educated customers / vulnerable customers)

The social dimension is relevant for understanding values, norms, rules, and roles, which are all significant influences on human behaviour, emanating from the cultural dimension.

As electricity customers have more choice on how they manage their energy use today than at any previous time and the number of available options continues to rise, we have to be aware of what types of products and services customers want and how they interact and view a broad suite of new technologies and options.

Customer-centred organisations feel comfortable in sharing knowledge with their customers. Education becomes part of their value proposition, which works as a customer retention strategy. Educated customers will also tell others about the value of the company or organization addressing them. It is also important for consumers to be aware of all possibilities associated with participation in different programmes. Many want to participate, but if they do not know how, this becomes a barrier.

Vulnerable customers (for example elderly, disabled, chronically ill, etc.) need special attention. If a service provider has this type of information about its customers, it can implement additional measures to improve customer engagement (e.g. obtaining special arrangements with respect to the use and positioning of meters or specific communication methods, etc.). Moreover, vulnerable customers may have special treatment in extreme conditions (e.g. protection from disconnection if they have outstanding bills during winter months).

2.4.1 Engagement with residential customers from a range of social and educational backgrounds

OBJECTIVES example from a BRIDGE project

In the RealValue project, objectives were to develop:

- An outline of aspects of the customer 'information environment'. What do customers usually know already (about home, appliances, household routines and preferences)? What might they want or need to know in order to understand and manage their energy use in an evolving energy system?
- Outline what the utility/network may want from the customer e.g. for network management, to meet regulatory requirements.
- What are likely characteristics and needs of vulnerable customers; how do they differ from other customers?
- How can these needs be met in the best way in an engagement program?
- Use RealValue as a case study attempt to match utility/network and customer requirements, including vulnerable customers, technology design, installation, back office support and third-party support.

DESIRED OUTCOMES: an overview of education-related considerations for customer engagement; definition(s) and discussion of vulnerability; guidelines for engagement with vulnerable customers.

Profiling in the energy sector is useful for defining the end customer's behaviour and energy use. In this regard, social and educational backgrounds are important. After applying profiling for residential customers, the service provider should check the communication approach (homogeneity or variability) for improving customer engagement in those profiles. In Ghuneim's typology of engagement, customers are defined by degrees of engagement, ranging from low, medium, high and highest. In each of these profiles, customer's behaviour is important, e.g. are they the only adopters or are they on higher scale (socializing, networking) and what is their energy use at individual household.

For instance, if we have information, that highly educated customers are more likely to be early adopters and are much more engaged in contributing towards good causes. The pilot project should target those customers, because they will provide more valuable information. Moreover, consumers cannot be easily segregated by their energy consumption as that may be due to a wealthy 'Passivhaus' (zero emissions house) - standard property or due to energy poverty.

A social-psychological model of energy-use behaviour that draws on behavioural and social research can be used to explain processes and behavioural change related to energy conservation behaviour. There are two interacting sets of factors: psychological factors that refer to how information is processed by individual decision makers and positional factors that relate to characteristics of the decision makers' situations that support or constrain action. Suggestions for maximising the effectiveness of informational appeals to conserve energy by convincing the consumer that a pay-off will result from the use of energy conserving devices are discussed. It is suggested that the adoption of a conservation attitude is influenced by the vividness of the argument to conserve energy, the credibility of the source, the understanding and retention of the message, and the degree to which an individual is able and willing to install conservation devices in their home. Alternatives to informational appeals through mass media to encourage energy conservation are recommended.

Depending on the company goals of the addressing party, one should consider whether you want to target vulnerable customers (which might not have high energy consumption or ability to make decisions on energy usage) or only empower those who indeed are high consumers of energy and educate them how to be more rational. Ideas might emerge on how high energy consumers might help those customers in need, so they can both benefit.

2.4.2 Social dimension in segmentation in BRIDGE projects

Not many projects addressed social dimensions in their work packages. One project (UPGRID) focused on the social dimension of customers, however, no findings were mentioned in relation to vulnerable customers. Another project (RealValue) focused on the social dimension indirectly in order to develop appropriate communications. The project reported on the main communication channels to reach vulnerable customers (such as leaflets, doorstep interaction with the supplier, bills, and the installation visit), main barriers in communication (emphasis on communicating without listening first). The project further elaborated how this can be a significant barrier. In short, one should have a common language in which to communicate. Another project (WiseGRID) has networking and communication activities within its Description of Work (DoW) related to different targets (from domestic consumers to large businesses). TILOS has a specific case study on vulnerable Syrian refugee families among its energy users but no definite results have yet emerged out of that context.

With regards to the acceptable success rate when communicating to vulnerable customers, RealValue found it difficult to understand what lies behind the question. It said *'If it relates to basic health, safety and affordability, then no communication failure is acceptable.'*

For the questions on differences between vulnerable and educated customers in communicating energy related matters, RealValue raised the point of a proper definition of vulnerability. A dictionary *[OED] definition of vulnerable: 'in need of special care, support, or protection because of age, disability, or risk of abuse or neglect'. Based on that, communications with vulnerable customers need to take some account of what form their vulnerability takes: do they have difficulties with hearing, seeing mobility? Are they anxious, confused, addicted? Do they have serious money problems? It would be very difficult to tailor written customer communications to each individual, so it could be best to concentrate (a) on simple, clear wording in any written communication; (b) offer personal face-to-face contact with a trusted person to sort out problems; and (c) evaluate regularly (annually, say) how effective communications are in building understanding and engagement.'*

From the first questionnaire, it appeared as if only two projects looked at energy poverty and associated vulnerability. Since then, these terms have been getting a lot of attention. In the second questionnaire, we asked projects to provide additional information, e.g. whether this has influenced the scope of their project at all. Questions were:

a. Did your project consider the social dimension of customers in order to engage them in energy related matters?
b. What do you find are the main differences in communicating about energy related matters between vulnerable customers and others?

2.5 Topic 6: Analyse regulatory framework and identify policies that hinder or encourage customer engagement

Seven projects analysed regulatory barriers for engaging customers on energy related issues (NOBEL GRID, Flexiciency Sweden, Flex4Grid, GOFLEX, WiseGRID, FutureFlow and TILOS). The main barriers include regulatory constraints around introducing a dynamic tariff, lack of access for small consumers (e.g. households) to take part to demand response programmes or selective grid cost pricing (locational marginal pricing for allocation of grid costs is not present). Also there are obstacles for accessing consumption data (difficult or no access to customer port of the smart meter, the personal data act) and lack of standardization processes and other/market related obstacles including weak legal frameworks for energy collectives.

INTERFLEX, WiseGRID, NOBEL GRID, TILOS and GOFLEX have concluded, that there are no regulations or incentives that integrate households in demand response programmes. There is no

regulation that establishes how customers could be compensated by the benefit they provide with flexibility to the operation of the grid. On the other hand, some markets do allow demand response in the ancillary service market, however, technical requirements might be so demanding and restrictive that it makes participation economically unattractive for small customer segments (e.g. Austria, FutureFlow).

Second, in most markets the net tariff is based on the "postcode" principle (all customers in a defined region and of a specific consumption characteristic have the same network tariff price). If a consumer changes behaviour, DSOs have no instrument to award this change by applying different tariffs (although a temporary pilot dynamic tariff schemes was approved by a national regulator and is used in one site in the final pilot – Slovenia, Flex4Grid). As a result, some sort of locational marginal pricing for allocation of network costs will need to emerge. The same issue will arise if peer to peer trading is introduced. If two neighbours exchange electricity, application of standard (postcode) network tariff does not reflect associated costs. Many projects also discovered barriers when trying to apply dynamic pricing (Flex4Grid, GOFLEX, FutureFlow, TILOS).

The next obstacle is customer data related to energy consumption. In some cases, the end users (households) are not allowed to access their smart meter, therefore the project partners had to install an additional smart meter to measure the end user data at pilot sites (NOBEL GRID). Similar obstacles exist when it comes to accessing customer data at the customer port of the smart meter (also when smart meters have been rolled out). Another barrier when it comes to data is the management of personal data, which is still not adequately regulated (e.g. is 15min consumption profile a personal data or not).

Other barriers are the inability of cooperatives to sell energy to their members (NOBEL GRID) and confusion about what a DSO can and cannot do due to unbundling (INTERFLEX). GOFLEX also stated, that the installation of storage and power-to-X technologies is poorly supported by current regulations. As a result, security of investment is in question.

For most of the projects, regulations play an important role for implementation activities at a later stage, i.e. exploitation of results. However, there are still some projects that have no plans for research on regulatory barriers. The reasons for this are that the regulation aspect is not part of the research project, they are not aware of any regulatory barriers or regulatory barriers are not seen as a particular problem.

2.6 Recommendations for improving engagement prospects in future calls and projects

It is difficult to foresee all difficulties and barriers that a specific R&D project will encounter. Nevertheless, we suggest that in future calls, project applications include a list of expected barriers to effective engagement, with a proposed strategy for tackling them. Having this in mind, projects can be designed and evaluated effectively.

Note that national regulators could have a degree of flexibility to introduce regulatory change tailored and limited to a specific R&D project. This could improve the chances of success for R&D projects. It would also give regulators the opportunity to gain insight into new possibilities and of testing the viability of regulatory changes – a sort of 'regulatory sandbox'.

2.7 Introducing a methodology for future projects

To facilitate and gain adequate customer engagement in future projects, we propose the following methodology for selecting targeted agents (middle actors, users, etc.). The method is transversal and

potentially applicable to any smart energy project. The main prerequisite for a segmentation with an added value is to define **motivations:**

1. Identify the purpose (what do we want to achieve)
2. Categorize motivations (economic, environmental, societal, etc.)
3. All combinations shall produce the targeted agents
4. Do the segmentation

Next, the target audience can be mapped in three dimensions "smart energy space", through the conceptual model developed by researchers in Oxford to illustrate possibilities for demand response[2]:

1. **Technology** (storage, IT, connectivity, RES, smart metering, physical characteristic of the buildings, appliances, smart homes, etc.)
2. **Activities** (commercial based, residential uses, industry activities…)
3. **Service expectations**
   - Level (Low, Medium High)
   - Nature (quality, intermittency, conform)

By 3D mapping, a stakeholder can characterize its specific target audience.

Finally, the following potential issues should be addressed:

1. **Capacity to act:** Example: capacity to act can refer to time, income, technological awareness, current regulatory frameworks as a constraint, etc. The value is a better understanding in order to generate the enablers. It can be applied to any agent.
2. **Which enablers have to be activated first?** Example: monetary incentives, technology with guidance, regulation, regulatory awareness, affordability and existence of relevant financial instruments, etc. The value is activation of targeted agents. It can be applied to any agent.
3. **Which regulatory topics have to be modified (in the short-term/mid-term)?** Example: allow net-metering, implement flexibility market, incentivize self-consumption, introduce dynamic pricing of distribution costs, allow community of prosumers, define clear rules in terms of smart metering, etc. The value is to clarify and make consistent progress of technology and habits with rules to share the value between agents.

[2] McKenna, E., Higginson, S., Grunewald, P. and Darby, S.J. (2017) Simulating residential demand response: Improving socio-technical assumptions in activity-based models of energy demand. *Energy Efficiency* DOI 10.1007/s12053-017-9525-4

3. Drivers for speeding-up engagement (T7, T8, T9)

3.1 Working with drivers for Customer Engagement

3.1.1 Definitions

A clear and precise definition of “a driver for customer engagement” is not easy to find. One might even suggest to start with defining Customer engagement in itself. In the following the term Customer Engagement means the complex ways people are addressed, educated, nudged and driven towards changing their perception and doings towards energy savings.

The concepts of business drivers[3] and consumer-driven[4], can be helpful here. A driver for customer engagement is a factor that contributes to increased engagement in a project. Drivers are factors that meet customer expectations and needs. Resources that customers own or have access to and that are useful for the R&I project should be taken into account.

These primary factors can be considered as **customer drivers.** They are derived from (1) expectations and needs in relation to energy consumption and supply, (2) motivations to change a behaviour (e.g. monetary incentives, discomfort) and (3) intrinsic customer values that correlate with core values of the proposed R&I-project (e.g. ecological awareness and concern as a ‘value driver’ to adapt energy consumption and choose new systems for energy supply).

Secondary factors can be seen as **required drivers** or as an absence of barriers. For example, cooperation in projects and participation in educational sessions on energy technology require time-investment. Participants who do not have this time to invest experience a barrier to participation; thus, available time is a required driver for participants and its lack can be seen as a barrier.

Within the Bridge working group, the **dimension of speed** was added to this definition. What are the factors that can speed-up the willingness to engage in an R&I-project? The evolution of engagement during the process (e.g. the rate of change of values & drivers at the start, during the project and after the project) will be addressed in Chapter 1 about the engagement process.

3.2 Engaging customers through information, education & training

Areas in which the projects focuse to engage customers are shown in Figure 5. The most frequently addressed area is the awareness of energy and energy use (in eight projects), which is followed by education on energy use (in six projects), participation in flexibility and/or demand response programs (in six projects), consumption feedback (in five projects), and sustaining energy curtailment (in four projects).

[3] A business driver is defined by (investorwords.com) as a factor that contributes to the growth of a particular business. Read more: http://www.investorwords.com/1586/driver.html#ixzz4ztrNZNRd

[4] consumer-driven: influenced by the actions and needs of consumers (www.businessdictionary.com/definition/business-drivers.html4)

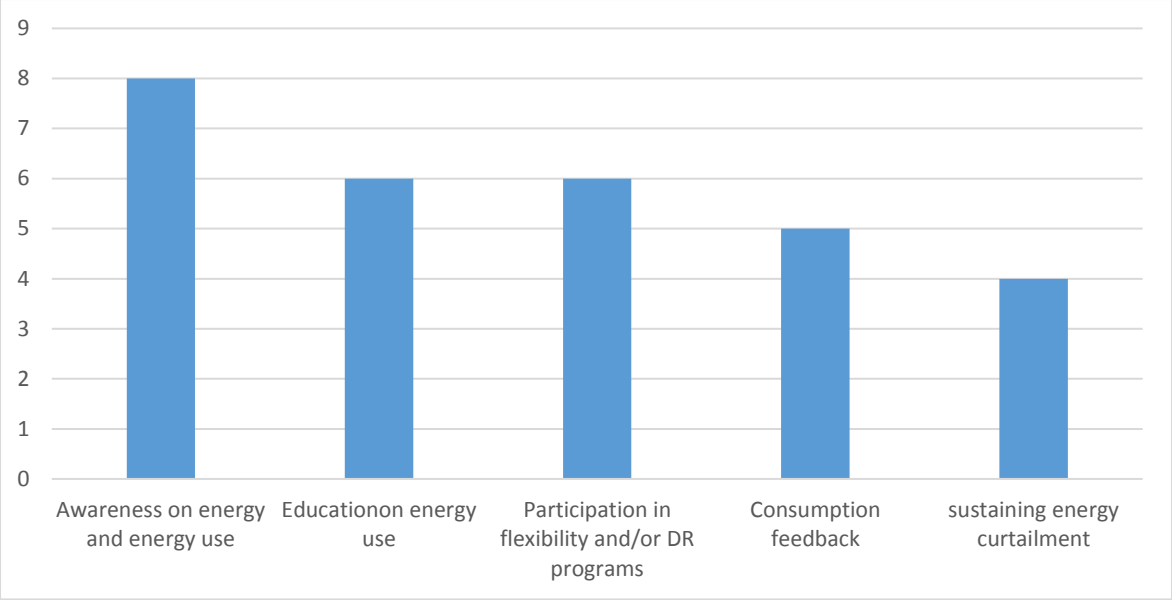


Figure 5: Projects focus areas on customer engagement

As stated in section 1, both education and training support each phase of the value chain of the customer engagement cycle. In the involvement phase, information and training could bring hesitations and questions. In the engagement phase, the benchmarking gives them new insights and, in the follow-up, it gives more advanced feedback.

3.2.1 Benchmarks, Incentives and feedback

When you want to start an engagement and educational process for the end-customer to realize energy savings and establish lifestyle changes, the experience across the projects shows that there are three main measures, which have the highest success rate for a successful implementation:

First of all, people need to be aware, that there is a potential benefit in energy saving. Traditional benchmarking has repeatedly proven to be among the best ways to achieve this. Messaging has to be relevant towards customers and less dictating allowing people to draw conclusions by themselves. It does, however, help to show, that peers that they trust or know – and which are similar to themselves are having a much lower energy consumption than they actually have. Prizes and competitions are the best tools to incentivise kick-starting of the engagement process. In this respect benchmarking can be used as a tool to create challenges among peers, friends or neighbourhoods to achieve a certain target. With competitions as a starting point, there is a good success rate of getting people involved – but there are two main challenges. There must be a clear target. What happens when the target is achieved? You cannot continuously save 20 % on your energy bill.

Secondly the target must be continuously monitored and communicated – which leads to the feedback loop; people are constantly being exposed to communication campaigns and become desensitised as a result. One thing however people might be less tired of is, talking about themselves and their achievements. Hence, confirmation on changes in energy behaviour needs to take account for that and encourage the customer for having done a great job and recommending how it can be further improved.

Table 2: Steps to introduce effective engagement of energy customers

Project	Steps to introduce effective engagement of energy customers
RealValue	Listen to the customers. Assume nothing to start off with. Talk with them about their homes and businesses, how they keep warm, what they do each day.'
NOBEL GRID	Measure consumption (and production) and smart application'
Flexiciency (Italy)	Group 1: provide them with exhaustive training and supporting material; provide them with feedback about their consumption; provide them with help if needed; Group 2: Concrete examples of potential benefits; Feedback & Survey; Compensation'
Flexiciency (Spain)	'Show them potential benefits.'
Flexiciency (Sweden)	'Educate customers in energy efficiency, and make them feel that they contribute to a better environment, as well as being in charge of their energy costs.'
Flex4Grid	Enable monitoring of own consumption at household level in some cases at appliance level; enable customers to remotely control appliances; in some cases apply different network fee tariffs for peak and off-peak periods; announcement of peak periods at least 24 hours in advance'
P2P-SmarTest	1. Creation of a strong value proposition by increasing the revenues and decreasing the investments. 2. Consumer participation can be increased through intermediation and collective schemes 3. Besides, there are several drivers that come directly from the way of implementing the P2P Trading: a) Define standard products to be traded and standard contracts between the Market-maker and the prosumers; b) Establish feasible procedures for the Measurement and Verification process; c) Establish a simple and transparent procedure for the settlement process; d) Establish a Market Design with current market players instead of new incomers to minimize the required investment and compensations'.
Story	Identifying stakeholders and 'decision-makers' related to the demo; identifying evaluation criteria used by decision-makers; selecting and co-developing Stakeholder Evaluation criteria between demo leaders and decision-makers'
UPGRID	We are adopting a service approach to customer engagement, in the sense that we are exploring how customer engagement can be fostered by enabling customers to co-create value with smart energy services. According to service logic approach, instead of developing isolated incentives to behavioural change, we take into account the customer interactions and relationships to explore integrated smart energy services that engage customers by enabling them to co-create value. Last September we presented the paper "Bringing a service perspective to customer engagement with smart energy services". This paper represents the first step toward the studies involving the customer engagement with Smart Grids from the Service Research perspective, aiming to contribute with concepts and insights to introduce effective engagement of energy customers (please see the paper attached).'
WiseGRID	1. Comfort level 2. Demand response campaign penetration 3. Active participation in EV demand flexibility'
TILOS	Allow control of high energy consuming appliances in households; demonstrate links between household energy behaviours and overall system operation for avoidance of brown outs etc.

One other answer from the UPGRID project is that they would involve the communication department to help in the dissemination and educational actions; also one should try to define from the beginning strategies to ensure necessary access to interaction channels to conduct the studies with consumers.

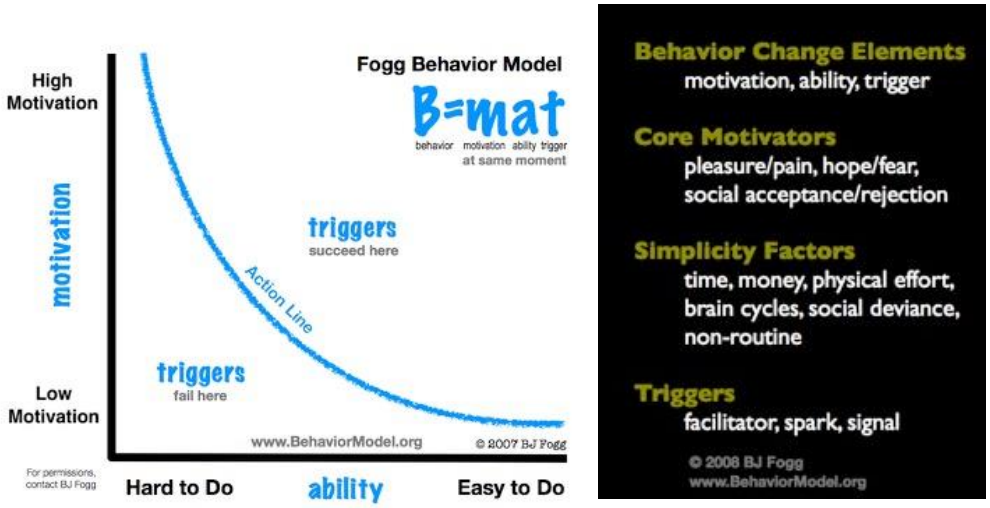
3.3 Topic 8 & 9: Main drivers for Customer Engagement

3.3.1 Drivers for behavioural change

The participation in a R&I-project from the customers perspective can be seen as a behavioral change process regarding their energy consumption and way of supply. A model that provides a clear overview and a simple approach to behavior change is the one from Dr. BJ. Fogg.

Fogg Behavior Model (FBM)

This model shows that three elements must converge at the same moment for a behaviour change to occur: Motivation, Ability, and Trigger.



It is easier to achieve a behavioural change:

- that requires very little time,
- that costs very little money,
- that requires little physical effort,
- that is not mentally fatiguing,
- that is socially acceptable,
- that are routine.

In this section, a closer look will be taken at the following elements:

- Core motivators: does the value proposition and its drivers can create a high motivation?
    - **Monetary incentives** leading to feeling of “pleasure” by maximizing self-interest. But also as simplicity factor if up-front investments are required

- **Comfort:** experienced as “pleasure” or “pain” in case of discomfort
- **Pro-environmental attitudes:** as aspiration of hope for next generations or fear for the future.
- **Social acceptance:** being part of a project, a community. How innovators and early adopters (Rogers' innovation-diffusion model) can drive others by social influence.

- Simplicity factors: do the customers have the right ability to participate and engage?
  - **Physical effort:** what kind of physical effort is required by the R&I-project: a considerable time investment or other practical and organisational issues?
  - **Brain cycle**: what kind of mental effort and investment is demanded? Does the project confront the customers with complex knowledge, technology and other complicated features?
  - **Non-routine:** Do customers have to change a lot of routines? How high is the level of change, how can the new routines be installed and facilitated? How can customers be supported in this change process?

3.3.2 Monetary incentives as driver for behavioural change

Monetary incentives can take different forms; the first is the gain from the declining variable cost of energy supply (i.e. the energy bill); the second is a grant or subsidy to lower the initial barriers for up-front investments done by the customer. While the second is perfectly predictable, the first is difficult to predict because it is influenced by the performance of the new energy supply system but also by the price for the “traditional” energy (beneficial delta could drop).

1A. Lower variable energy cost

Verbong, Beemster and Sengers (2013) start from the following assumption:

> *The ‘homo economicus’, as a rational actor that pursues self-interest, is susceptible for beneficial price stimuli.*

Therefore, reduced costs through energy savings and the potential gain in flexible pricing should be a driver for behavioural change in energy consumption and the associated supply. However, empirical evidence suggests that the economic benefits alone, are not sufficient to induce behavioural change.

2A. Lower the barrier of up-front investments

Up-front investments at the customers expense are (or certainly can be) a barrier for them to engage in R&I-projects. It impacts cash-flow and financial balance (for companies and professional users). It contains risks (uncertain ROI) and involves effort for financial administration.

The monetary incentives for up-front investments could also imply administrative effort and some uncertainty. This impacts also the efficiency of the incentive.

Project key-learnings on monetary incentives

The **Goflex project** noted that the economic value is the primary trigger for prosumers and customers to participate
For some of the partner-projects under **NobelGrid** umbrella, money saving is agreed upon as one of the two main drivers for customer engagement. This is the case for Ecopower (Belgium); ASM Terni (Italy); and Alginet (Spain). Also in **Simris from the Interflex project** the economic value is stated as key. Although it has been stated more as a required driver or barrier. If the variable energy cost will increase due to the new energy supply methods, this will become an irreconcilable barrier.
In the **STORE&GO** project an intermediate conclusion was made that the importance of monetary incentives can vary also according to their profile. For customers with a commercial profile monetary saving is the most significant driver to change energy behavior. While for Residential customers monetary savings are equally important as social preferences.

A final finding from the **GoFlex project** is that the monetary incentive is not only employed as engagement tool by the concerned organizer of the R&I-project but also by energy traders and competitor "energy" projects. Meaning that that the customer need for maximizing his economic benefit is also met by other propositions. A value proposition merely based on this driver could therefore not be sufficiently appealing.

Recommendations for ensuring effective drivers in future calls and projects

It is highly recommended to consider monetary incentives in the projects value proposition to engage customers. While the drop of variable energy cost is a desired outcome by customers lowering the barriers raised by up-front investment can facilitate participation.

The importance as driver is demonstrated by different projects. But the weight can vary according to the profile of your customer. The projects mention cultural differences and commercial intentions as possible influencers of the weight of monetary drivers. However, other factors could impact the extent to which customers are driven by economic incentives. Therefore, for predefined targets, an early stage pre-screening about the sensitivity on economic benefits is suggested. When engagement is targeted toward a large population with a reasonable participation rate, segmentation between high and low monetary sensitivity is advisable, according to the benefits the project can offer.

Screening other offers from energy traders, or suppliers from other energy solutions aimed at your target can be monitored and compared to evaluate the potential impact of monetary incentives.

Although monetary impact is of high importance to customer engagement, it is not the exclusive driver.

3.3.3 (Dis)comfort as core motivator for behavioural change

Comfort and discomfort in relation to the pyramid of Maslow, corresponds to energy supply as a mean to foresee physiological needs. With the current energy supply these physiological needs are widely met. Change in the energy supply system by an R&I-project could create fear for future discomfort. This fear can be a barrier for participate in projects.

One could restrict the term comfort to: *the use of advanced technology to control and manage electricity use*. From this point of view R&I could offer comfort improvement. Gangale, Mengolini and Onyeji identified this type of comfort improvement in their study (2013; consumer engagement in smart-grid projects in Europe) as one of the motivational factors for engagement. Nevertheless, they observe that this type of improved comfort is only relevant to technology enthusiasts and it might have limited value for other segments.

Physical effort and routine breaking as forms of discomfort. If participants have to spend a lot of their spare time on the project (e.g. installation time, reporting, problem solving) or change routines (end-users have established a large number of routines based on the current energy supply), this is also perceived as discomfort. Therefore, "spare time availability" can be a driver for engagement, while its lack is a barrier.

Project key-learnings on comfort

In the **INTERFLEX2** they saw end-consumers focussing on comfort as one of two primary conditions for engagement.

The GoFlex-project even states that a loss of comfort is fatal for the customer engagement and will cause customer drop out.

Flex4Grid: According to the Flex4Grid comfort can override economic value as driver if ADR events continue longer than "bearable".

For some partners of the **NobelGrid** comfort as factor is less important than other drivers. This is the case for Alginet (Spain), ASM Terni (Italy) and Carbon Coop (UK) consumers. The latter, for instance, value more the environmental values, and in particular products that benefit health and improve internal air quality (as Manchester has a particularly damp climate). In the case of Ecopower (Belgium) end users do value comfort in terms of easiness-to-use and improved life conditions.

TILOS project reports that the prospect of comfort has been a strong engagement factor and it somewhat balanced the inherent risks the participants have to take by entering in the project.

Recommendations for ensuring effective drivers in future calls and projects

Based on the research projects' findings it is difficult to make recommendations about "improved comfort" as a possible driver. A first obstacle for making such an unambiguous conclusion is that the term "comfort" may be interpreted in different ways. A second is that the weight of it as driver seems to diverge between different projects.

On the other hand, loss of comfort (i.e. discomfort) seems to be a distinct barrier for customer engagement and can cause major drop-outs. In this context comfort is an important driver as people do not appear to be willing to compromise their living standards to reduce their energy bill.

3.3.4 Pro-environmental attitudes as core motivator

It is widely accepted that the ideology of consumption is embedded within the dominant social paradigm of Western industrial societies (Kilbourne, McDonagh, and Prothero, 1997), and that it is an obstacle in the transition towards sustainability (Assadourian, 2010). In the energy realm, the average consumer is increasingly exposed to messages relating to the consequences of energy use on the environment and on climate change. Different surveys on environmental concern of energy consumers provide evidence that, together with traditional concerns such as reliability and tariffs, they attribute high value on broader environmental and social issues (Gangale, Mengolini and Onyeji, 2013; Ngar-yin Mah et al., 2012).

Pro-environmental attitudes and behaviours are generally influenced by underlying personal values and beliefs (Steg et al., 2005; Stern et al., 1995), implying that individuals may act on a sense of personal obligation and invest in what they believe in. Moreover, ethical consumption can be identified as part of what motivational research calls 'personal projects', 'personal strivings' or 'life tasks' (Harré and Bullen, 2010). Ethical consumers pursue, according to Valor et al. (2012), for moral reasons the goal of constructing themselves as a virtuous person. From this viewpoint, ethical consumers could be strongly driven to engage in energy efficient practices.

Pro-environmental attitudes deriving from resistance to unfairness and abuse of power

Emotions play a potentially significant role in many respects (Cass and Walker, 2009; Schweizer-Ries, 2008). One of the consequences is resistance to what individuals perceive as unfair or abuse of power. The previously mentioned increasing presence of consumer resistance movement is a clear illustration of this situation, a movement that is affecting public opinion (Holt, 2002), because environmental concern is growing, reflected in the societal claim for cleaner sources of energies and more efficient use of resources.

However, this claim has not always led to transformation of the traditional utilities which are often found to resort to corporate branding instead of product innovation (Rutter et al., 2017). In fact, certain about the "corporate takeover" (Monbiot, 2013), citizens are not turning to traditional firms, and resistance and countercultural movements such as the accountability movement are often born out of the distrust in big companies (Bendell, 2004). If customers feel that external interests are monopolizing most of the benefits from the electricity produced or that they are not involved in the development process, they may feel unjustly treated and, in turn, take part in oppositional activism. And, from that feeling, they are organizing among themselves to produce and/or buy energy, giving rise to new developments and changing the business-as-usual model.

Project key-learnings on pro-environment

Within the **Nobel Grid**-project Ecopower (Belgium), ASM Terni (Italy) and Alginet (Spain) consider this value as "very important" for the majority of their end users. In Italy, for instance, some SMEs, associations and public offices invest in "green energy labels" certifying the use of green energy produced locally in their premises.

Carbon Coop (UK) quotes this as "core" for our end users, as they are strongly motivated by acting collectively and locally on climate change. Many see their involvement in this project as enabling more renewable energy generation on the UK grid and in their own homes. Next to their support for the general interest, they highly encourage products that benefit health and improve internal air quality. They do this because it is closely related to the improvement of their "personal" environment since Manchester has a damp climate.

In Simris of the Interflex-project pro-environment attitudes and belief are amongst the 3 main drivers for the engagement.

For the **REAL-VALUE** project the weight of pro-environmental attitudes as customer driver was not so high. Although German participants link what they are doing with the national discourse and goals of the Energiewende.

According to the **GOFLEX**-project financial freedom and independence is a condition sine qua non but not sufficient for pro-environmental attitudes to bloom. Only when the environmental beliefs are strongly pronounced they can play an important role in customer engagement.

Recommendations for ensuring effective drivers in future calls and projects

Contribute to a sustainable environment and so the general interest surely can add up to customer motivation to engage in R&I-projects. For some segments, the pro-environmental attitudes and beliefs can be key drivers. But they are never a unique driver and they do not work for all segments. The differences between segments could be attributable to the deviation in personal economic situation and geographical location. Even though the latter could also be due to the national or regional welfare level.

To conclude the integration of environmental claims in the value proposition is sensible and desirable. Grasping the specific nuances important to your target group will require a preliminary qualitative research.

3.3.5 Social acceptance created by R&I-acceptance

The digital revolution has made possible this transformation, as consumers can easily form tribes with one another, exchange with one another or co-create with firms (Cova and Cova, 2002); thus, transforming symbolic systems in the energy market.

These new "logics" change the role of individuals within energy systems, "from the rather passive and individualistic notion of an 'energy consumer', towards a more participative and communitarian notion of an **'energy citizen'**" (Devine-Wright and Devine-Wright, 2009).

In other words, the dominance of generation assets driving the one-way energy flow to a large number of energy captive customers is now balanced by a paradigm where energy consumers could play an active role in the energy system and thus, become 'energy citizens'.

Therefore, the concerned R&I-projects can offer opportunities to customers to become "energy citizens". Furthermore, there is a social trend of increased consumer assertiveness, demand for interactivity and co-creation in respect to almost all consumer domains including energy supply. On the contrary, customers focus this assertiveness on a select number of domains based on their values, beliefs and consumer preferences. Meaning that there is a potential group of potential active "energy citizens", but that others do not invest in active participation in the energy system.

These initial "energy citizens" (innovators and early adopters of Rogers' 'diffusion of innovation'-theory) can play a crucial role in starting a social trend or movement. Social norms may become a powerful driver of costumer engagement change as it takes place within a dynamic interactive, creative experiential processes through human interactions (Vargo and Lusch, 2008). People engage in behaviours influenced by the perceptions of others doing so (McNamara and Grubb, 2011) for different reasons, such as the fear of social sanction, or because of the benefit obtained from conforming to an identity (Akerlof and Kranton, 2000). In the case of energy conservation, Alcott (2009) finds that information on neighbours Alcott (2009) sanction, or because of the benefit obtai through three pathways: the possible utility derived from being showed as more frugal; the inclination to contribute to public goods when the others do so.

Beyond social learning, Stürmer and Kampmeier (2003) highlighted the importance of group identification as a determinant of community volunteerism and local participation: "The perception of a shared collective identity fosters group members' willingness to engage in mutual social influence; thus, facilitates the development of collective decisions and collective norms guiding collective behaviours". From this approach, a new discourse is raising incorporating notions of community led, controlled owned renewable energy development (Walter and Devine-Wright, 2007).

Moreover, in an era where Northern countries are characterized by a dominant individualism and the consequent fragmentation of society (Firat and Venkatesh, 1993), signs of a reverse movement are also visible in the form of an emerging "tribalism"(as Cova and Cova, 2002) : In the energy arena, this movement is favouring the engagement of individuals in community-defined practices. Additionally, the web 2.0 technologies have significantly empowered consumers that belong to communities, producing different values from the functional when involved in energy consumption such as linking values (Cova and White, 2010).

Recommendations for ensuring effective drivers in future calls and projects

The feeling of belonging and co-participating in a R&I-project can be a driver for participants to initially engage and subsequently to remain in the project (see customer engagement cycle). The social interaction initiated by the R&I-project can become substantial on other levels and even last after the project ends. Therefore, managing the interaction between participants and the exchange of the results is crucial to instigate the community feeling.

3.4 Recommendations for the implementation of drivers in future calls and projects

There are several drivers that seem to be applicable in R&I-projects to engage customers:

1. Monetary incentives:
   a. Lowering variable cost of energy supply
   b. Lowering or avoidance of up-front investment
   c. Reducing financial risk

2. Assurance of comfort
   a. Assure the same level of current energy comfort
   b. Foresee adequate solutions and guarantees in case of potential discomfort

3. Pro-environmental attitudes
   a. Driver for ethical customers
      - Concern for climate change and future generations
      - Concern for fairness and resistance against abuse of power

4. The use of social influencer(s)
   a. Positive results from former projects
   b. Engaged innovators and early adopters (as instigators of social trends)
   c. Community: feeling of belonging as a starting driver, but also as an ex-post benefit with potentially contagious effect on future projects.

5. Education, training and communication:
   a. Supports the value chain of customer engagement cycle
   b. Improves cognitive abilities to simplify behavioral change
   c. Benchmarking as tool for social influence
   d. Nudging, personal encouragement and feedback loops as tailor-made driver

A sole and unique driver to convince all types of participants and customers is utopian. A deployment of a whole range of drivers is more likely to be successful.

3.5 Introducing a methodology for future projects

The integration of a broad range of drivers in a tailor-made action-plan is advisable. The methodology introduced in 2.7 about segmenting by motivations partly covers this.

1. Identify the purpose and target (who are the participants that you want to engage? what is the potential pool to recruit? what is your target on participation rate?)

2. Map your potential recruitment pool on core motivations and simple factors:

   a. What is their:
      - Sensitivity regarding monetary incentives
      - Risk aversion
      - Investment capacity

   b. What are their current personal investments in energy:
      - Importance of the issue
        - Time spent and invested in the issue (active customers vs passive)
        - Financial investments made in energy area

c. What is their ethical profile?

d. To what extent does the target group have the ability to engage:
   - Do they have the time to invest in the project? (e.g. pensioned people have more time available compared to working households)
   - Do they have technological knowledge that helps to engage easier in the project? (e.g. engineers are more likely to be tech savvy)
   - What is their attitude towards change?

Depending on the size of your target group this can be done by qualitative focus groups or looking for potential determinable predictors (e.g. already invested in PV, engaged in ethical associations, neighborhoods faced with comfort issues in energy supply)

3. Start your communication and action plan by approaching the targets that have the highest innovator potential. Those target groups, segments or specific individuals that score high on the mapping are the most likely to participate; to be innovators.

4. Build an action and communication plan for recruitment that integrates all drivers and that can be tailored towards target groups with different profiles.

   a. Manage expectations

   b. Speak the language of the customer and focus on the (set of) drivers relevant to them

   c. Look for opportunities to lower their barriers, to counter aspects that cease motivation and undermine the potential drivers.

4. About definitions and Best Practices (T1, T11)

4.1 Topic 1: Definitions for customer, consumers, prosumers, engagement, etc.

4.1.1 Consumer vs. customer

The difference between a consumer and a customer is difficult to describe since aside from both terms being used frequently in the field of business, they are often used in a similar context, which adds up to the confusion. A customer is a person or an organization that buys something from a shop/store or business (Oxford University Press, 2010). These two definitions mean that a customer refers to a person who buys goods and pays the price for them but a consumer is the user of those goods. It is also possible that a customer and a consumer are the same person, if the person purchases goods for themselves (Key Differences, 2015).

Table 1: Key features of Customer and Consumer

Key features	Customer	Consumer
Meaning	The purchaser of goods or services is known as the customer	The end user of goods or services is known as a consumer
Resell	A customer can be a business entity, who can purchase it for resale	N/A
Purchase of goods	Yes, by definition	Not necessary: the consumer is just a user of a product/service not necessarily purchased by him/herself
Purpose	Resale or consumption	Consumption
Subject	Individual or organization	Individual, family or group of people

Customer is also known as buyer or client whereas the Consumer is the ultimate user of the goods. Customer can be an individual or a business entity while a Consumer can be an individual, a family, or a group of people. Customer pays the price of the product or service and may be in place to recover it, in case the purchase took place on behalf of another party. Conversely, Consumer does not necessarily pay the price of the product, like in case the goods are gifted, donated or subsidised. The customer purchases the goods for resale or to add value or for his personal use or on behalf of another party. In contrast to Consumer, who purchases the goods for consumption only.

4.1.2 Role vs. Actor

Similar to the terms of consumer and customer, also the terms of role and actor have different meanings. However, these terms are often used interchangeably leading to misunderstandings. A role is defined as grouping of responsibilities in the smart energy system, the definition of goals, requirements and features lead to the definition of use cases (DKE, 2015). On the contrary, an actor is an individual or legal entity in the energy system as a service user or a technical actor in the physical energy supplying system (DKE, 2015). The CEN-CENELEC-ETSI Smart Grid Coordination Group

also refers to an actor in interaction with the system they play a role into. An actor is shortly defined as an entity that communicates and interacts. By extension of the first definition, an actor can be people, software applications, systems, databases and even the power system itself (CEN-CENELEC-ETSI Smart Grid Coordination Group – Sustainable Processes, page 9, 2012).

4.2 Basic terms in the field of consumer engagement

Aggregator: role that offers services based on the aggregation of:

- energy production from different sources (generators) and acting towards the grid as one entity (DKE, 2015)

The flexibility of a portfolio of flexible devices and/or decentralized generation and manages this flexibility. The aggregator bundles the small amounts of flexibility to qualify as grid or market-oriented services. Depending on the market configuration, the aggregator may have different tasks and responsibilities (S3C project (FI.Energy-2012- 308765), deliverable D1.1 , section 3.5.2, 2013).

Battery Owner: Entity that owns one or more batteries (FINSENY project (FI.ICT-2011-285135), deliverable D5.1, page 18, 2011).

Buildings: consumer of electricity, which is a private or business building (FINSENY, 2011).

Building owner: role of a person (or legal entity) who owns a structure with a roof and walls, such as a house or factory (Oxford University Press, 2015).

Community / residential district: one of the areas which a country, town or state is divided into for purposes of organization, with official boundaries: a tax/postal district, a school district etc. (Oxford University Press, 2010).

Consumer: role of the energy user for electricity, heat/cold and chemical energy (e.g. gas) classified in industrial consumers, consumers providing transport systems, consumers for a commercial entity or commercial building and residential consumers (DKE, 2015). In this sense, a consumer could be assimilated to the one who consumes energy in a refereed supply system. Under specific circumstances, other terms such as member (e.g. of a cooperative), beneficiary or stakeholder may be preferred to consumer or customer, indicating a more active role in the system.

Customer: role of recipient of electricity, heat/cold and chemical energy (e.g. gas) of a supplier, seller, or vendor via a financial transaction or exchange for money a purchase of goods or services (Encyclopaedia of Health Care Management, Customer, Reizenstein, 2004).

Distributed Energy Resource (DER) owner: The DER owner Distributed Generation owner (DG owner) operates a Distributed Energy Resource, which is connected to the Microgrid (FINSENY project (FI.ICT-2011-285135), deliverable D3.1, page 16, 2011).

Distribution system operator (DSO): role for operating regional distribution grids of electricity supply, who plans, builds and maintains distribution infrastructure responsible for regional grid access and integration of renewables, regional grid stability, load balancing and connections to grid users (generators and consumers) at distribution grid level (DKE, 2015). Furthermore, a DSO is responsible for its interconnections with other systems and for ensuring with other systems and for ensuring the long-term ability of the system to meet reasonable demands for the distribution of electricity or gas. That definition is provided for by art. 2 n. 6 Dir 2007/72/EC with regards to electricity and by art. 2 (6) Dir 2007/73/EC with regards to gas (https://userwikis.fu-berlin.de/display/energywiki/distribution+system+operator, Freie Universität Berlin, 2011).

End consumer: role of the energy user for electricity, heat/cold and chemical energy (e.g. gas) classified in industrial consumers, consumers using transport systems, consumers for a commercial entity or commercial building and residential consumers (DKE, 2015).

End user: any user connected to the energy distribution grid, which consumes and/or generates energy (S3C, 2013).

End user engagement: all forms of communication that aims to initiate interaction with end users. In smart grids: end user engagement aims to promote an active role of end users in smart energy projects, for example by providing feedback information about energy consumption, installation training about energy management devices and automated appliances, project communication to inform end users about project matters monitoring and project evaluation (S3C, 2013).

Energy Service Company (ESCO): company that offers energy services which may include implementing energy-efficiency projects (and also renewable energy projects) and in many cases on a turn-key basis. The three main characteristics of an ESCO are: 1) ESCOs guarantee energy savings and/or provision of the same level of energy service at lower cost; 2) The remuneration of ESCOs is directly tied to the energy savings achieved; 3) ESCOs can finance, or assist in arranging financing for the operation of an energy system by providing a savings guarantee (ec.europa.eu/jrc/en/energy-efficiency/eed-support/energy-service-companies, Joint Research Centre, 2016).

Electric Vehicle (EV) user: person that uses the electric vehicle (EV) at a specific point in time (whether in a professional or private capacity). A sub-definition of the EV User would be: Individual EV User (IVU): uses the same vehicle all the time (by either buying or leasing it or getting it for individual use from an IMP); shared EV User (SVU): uses a given set of vehicles on demand together with other users (e. g. in a car sharing partnership, using a car rental system or a company car pool) (FINSENY project (FI.ICT-2011-285135), deliverable D5.1, page 18, 2011).

Electric Vehicle (EV) owner: entity owning the car. This could be a person in which case the car is privately owned or it could also be a car sharing or car rental organization. An example car sharing company would be an Enterprise Fleet Operator (EFO), which runs a company's car fleet (FINSENY project (FI.ICT-2011-285135), deliverable D5.1, page 18, 2011).

Facility management: organizational function, which integrates people, place and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business (ISO 41011:2017(en), 3.1.1, International Organization for Standardization, 2015).

Facility manager: role for maintenance of an organization's buildings and equipment (Oxford University Press, 2015). In addition, a facility manager is a person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives (International Organization for Standardization, 2015).

Factory consumer: role of business or institutional organisations that buy products and services either to use or to make other goods and services (Sumathi, et al., 2008). See also end consumer and industrial consumer.

Home dwellers: represents all categories of individuals who live in a home permanently, irrespectively of their gender and status as owners, tenants, family members, etc. A few home dwellers are aware of energy issues and may wish to monitor their energy use in order to possibly proactively change their behaviour to conserve energy (i.e. voluntarily restrict their use of energy). Presenting this as a specialized role is meant to emphasize that it should not be expected that the majority of home dwellers will be doing this. By contrast, generic home dwellers could benefit from and accept energy efficiency services that would optimize the use of primary energy while keeping the same level of energy service (or even improving the energy service) and for technically savvy who may wish to control. An even more "special" category of home dwellers will engage in proactively controlling their energy use for optimizing for cost, e.g. shifting use of appliances to take advantage of variable prices. Again, singling these out as specialized type of users is meant to emphasize that the majority of users will not be doing this routinely and will instead expect the system to control energy use on their behalf, manual control being only an option (extension in use case parlance) (FINSENY, 2011).

Intermodal Services User (ISU): individual who uses (public or private) services to get from location A to location B with the best means of transport (FINSENY, 2011).

Industrial consumer: large consumer of electricity in an industrial / manufacturing industry (FINSENY, 2011).

Municipalities: a town, city or district with its own local government (Oxford University Press, 2010).

Prosumer: The term "prosumer" characterizes the combination of the terms "producer" and "consumer" (DKE, 2015).

Small and medium- sized enterprises (SMEs): the most common factors for defining SMEs are number of employees and turnover/balance sheet total. There are different national definitions of SMEs, but to be defined as an SME at EU level a company should have less than 250 employees and a turnover which is equal to or less than €50 million or a balance sheet total which is equal to or less than €43 million (S3C, 2013), (European Commission, 2006).

Smart citizen: The smart citizen considers the development of smart grids as an opportunity to realise 'We-centred' (or intrinsic) needs and motivations. Examples of 'We-centred' values include affiliation (to have satisfying relationships based on mutual trust and respect with others); self-acceptance (to feel confident and autonomous in relations with others); community (to be able to 'improve the world' through community action. Applied to end user engagement in smart grids, the 'smart citizen' is mainly interested in 'community' aspects (S3C, 2013).

Smart consumer: represents the most passive role an end user could play in a smart grid. This ideal-typical end user is mostly interested in lowering their energy bill, having stable or predictable energy bills over time, and keeping comfort levels of energy services at least on an equal level. The overall convenience or 'ease of use' of the socio-technical interventions used in smart grid projects is also of major importance to the smart consumer (S3C, 2013).

Smart energy behaviour: the behaviour, which allows an end user to assume the role of their choice (as a smart consumer, customer, or citizen) in smart grid projects or the smart grid. Energy use and / or production behaviour that minimizes environmental impact and supports the functioning of the smart grid. Such behaviour typically entails energy efficiency (using no more energy than is needed); flexibility (e.g. shifting energy demand to times of relative energy surplus); and sustainable energy generation (e.g through photovoltaic cells or other means) (S3C, 2013).

Supplier / Retailer: role as grid user who has a connection to distribution or transmission grid and a contract for access with TSOs or DSOs and who provides services for energy delivery, energy efficiency, dynamic price concepts as well as for aggregation of demand and supply (DKE, 2015).

Tenant of the building: role of a person who pays rent for the use of a room or building to the person who owns it (Oxford University Press, 2010). See also end user and end consumer.

Transmission system operator (TSO): role for operating interregional transmission grids of electricity supply. TSO also plans, builds and maintains transmission infrastructure and is responsible for overall grid stability, load balancing within a control area, interconnections between control areas and connections to grid users (generators and consumers) at transmission level and for connection of the DSOs within the own control area (DKE, 2015).

Transportation consumer: consumer of electricity providing transport systems (FINSENY, 2011).

4.2.1 Definitions within the BRIDGE projects

Definition of energy customers is missing as a task in most of the projects, except of four projects, ELSA, Flexiciency, S3C and UPGRID. One of the examples of energy customer definition is given in S3C. The project defines customer types from a sociological point of view and based on the different roles they have within the energy system. Three customer types are defined (smart consumer, smart customer and smart citizen) based on their motivations, values, attitudes, and other factors.

Similar to the answers in the definition of energy customers, only four projects (ELSA, Flexiciency, Flex4Grid, and UPGRID) segment customers as part of a Work Package. The segmentation of energy customers is based on different criteria. For instance, the Flexiciency project uses two different groups of customers in its Italian demonstration. In Group 1, clusters are defined on the basis of their profiles (e.g. level of education, contractual power, type of customer, etc.) and are used in the evaluation phase of the project to find a correlation between customer's behaviour and their profile. In Group 2, clusters are defined on the basis of their load curves and are used to send custom DR offers. The Flex4Grid project has two customer segments: energy consumer and energy prosumer; while ELSA project addresses two groups of customers – private costumers and enterprises. In the UPGRID project, socio-demographic information is used to segment customer. Socio-demographic information is also used in the TILOS project, which use age to segment customers.

The definition of customer group has a direct impact on the specific actions in communication based on understanding the differences between customers. For instance, the Flexiciency project (Sweden) indicated that 'the different types of customers will have different needs; therefore, different communication strategies will be performed for each type of customer.' The same project in Italy provides tailored DR offers to different customer groups. In the Flex4Grid project, different communication channels are adopted to energy consumers and energy prosumers. Exhibitions at fairs, communication newsletters and energy journals are used to communicate with energy consumers; while a direct approach is used to communicate with prosumers.

4.3 Learning from Best Practices

The different projects included in the BRIDGE initiative have dealt, deal or will deal with customers or end-users' engagement during their pilots and/or demonstration activities. Previous experiences are valuable both for the policy-makers and for the projects.

In that respect the different feedbacks, lessons learnt and recommendations received are better presented depending on their momentum along the project execution.

During the call text generation

- It is highly recommended to provision/allow some funds for rewarding actions
- A user-centred approach should be requested in the call text, involving the customers in the requirement identification, technological design and development and the execution of the pilots.
- The inclusion of the social dimension should not be an add-on but a well-resourced, integral part of the programme giving a higher priority to engagement/knowledge transfer and its evaluation. The social acceptance of the actions has to be targeted.

Before the customer engagement

A feasible and realistic customer engagement plan must be elaborated in the initial phase of the projects, which takes into consideration at least the following aspects obtained from previous experiences:

- Comfort seems to bear the highest value for energy customers generally. However, economic value may be able to override it for a limited amount of time. After a rather short period, comfort prevails again.
- Try to join forces with the municipality, customers' associations, neighbourhood associations…
- Involvement of local schools is highly recommended
  - besides those customers that have already made up their minds to get active (own PV, storage, ...) it is very challenging to raise the interest of the public.
  - including schools by starting education and lecturing actions on research relevant activities gives a premium opportunity to address many families at the same instance.
  - After raising the interest of the pupils, they will take the ideas home and ask their parents on why, how and more about energy projects the parents are much easier addressable.
- Mailing actions to the public or a public event to collect candidates for participation in the project.
- Make a clear goal for the collaboration and then make a "customer journey" where the consortium gets to know the customer and their needs– not to develop something that the customers will not use, or communicate in a format that the customer does not understand.
- Have a good documents' structure, plan what documents to use for exchange with customers.
- Plan and establish a single point of contact with customers.

During the customer engagement

- Communication with key stakeholders (like the municipality, public authorities, the neighbours, etc.) should be done in an early stage.
- It is important to stimulate long-term thinking with customers, establishing a vision with them (cf. return on investments).
- Organization of workshops with customers requires long time and a lot of individual actions is often required to convince them to participate.
- Be patient, inclusive, collaborative, go the extra mile!
- Communication should be based on confidence, transparency and respect.
- It is challenging to identify the real needs of the customers, they have their own language and it is important to align with them, make things understandable.
- Always try to set-up "win – win" scenarios for the customers/prosumers.
- Evaluate customers' requirements as early as possible, to gain commercial and technical impact.
- Start to inform your customers on the upcoming project activities as soon as possible and keep them posted.
- Do not contact customers too frequently to avoid customer fatigue. Prefer clear communication with specific information.
- One of the project challenges is to maintain the interest of engaged customers while preparing the pilots, this waiting time could be up to 18 months.

- When there is an urgent problem, provide immediately assurances and solutions.

After the customer engagement

- Implement a clear status information towards the customers, keep them informed with the project results and additional future activities that may interest them.
- Reward them as promised/agreed.
- Include the customers posted with the projects' final communication events and post-project news and information related to the project.

5. List of References

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6. ANNEXE

Key Performance Indicators used for the project in general and for customer engagement

Project	KPIs used for the research project in general	KPIs for customer engagement
NOBEL GRID	• kWmax: low capacity for max 2 hours, max 40 times a year; • Flex Price: kWmax + price related to cost; • Coop Balance: kWmax + engagement to lower consumption if the production is low	ALL
Flexiciency (Italy)	The B2C services deployed within the demos are only one aspect out of the whole scope of Flexiciency, which aims to demonstrate a more complex concept. The aim of the project is to show that the deployment of services based on electricity data accessibility - namely advanced monitoring, local energy control and flexibility of aggregated customers - can be accelerated thanks to an open European Market Place (EU MP) facilitating interaction among all the electricity stakeholders. These services will be either B2C - offered to the end users of electricity by regulated or unregulated players in the energy market - or B2B - exchanged between the aforementioned players. Therefore, the total number of KPIs defined within the project is 30, belonging to 4 families: B2C KPIs (N. 10 KPIs); B2B KPIs (N. 3 KPIs); MP interaction KPIs (N. 6 KPIs); economic and business potential KPIs (N. 11 KPIs)	Group 1 – Reduction in electricity consumption; Customer satisfaction KPIs Group 2: Load management KPIs; Uptake rate KPIs
Flexiciency (Spain)	The total number of KPIs defined within the project is 30, belonging to 4 families: B2C KPIs (N. 10 KPIs); B2B KPIs (N. 3 KPIs); MP interaction KPIs (N. 6 KPIs); Economic and business potential KPIs (N. 11 KPIs)	Consumption reduction, customer satisfaction, load management
Flexiciency (Sweden)	Change in energy consumption (kWh); Home appliance steering: Number of override/number of installation; Number of technical help desk requests/number of installation; Participant satisfaction with the services tested[5].	Participant satisfaction with the services tested
Flex4grid	Project visibility: Number of visits of the project website per year; Number of press releases; Number of social media channels supported on regular basis; Number of events (workshops, seminars, etc.) attended; Number of events (workshops, demonstrations) (co-) organised. Knowledge impact creation: Number of project clusters joined; Number of contacts to projects of the smart grids domain; Number of research articles and presentations. Performance of pilots: TRL of the Flex4Grid system; Participation rate, showing user engagement and acceptance; Average grade of user satisfaction; Amount of households participating in the pilots; Reduction of peak loads. Economic impact: Cost cuts for DSOs after market purchases by load balancing: 30%; Estimated average revenue per user (ARPU) for aggregator; service providers: 20€ / customer / year; Reduction of electricity bill of prosumers: 20%; Number of new services based on the activity	Participation rate, showing user engagement and acceptance; Average grade of user satisfaction; Amount of households participating in the pilots; Reduction of peak loads: 3%
P2P-SmarTest	Basically, KPIs for communications	None

[5] Note that the Flexiciency Sweden described different KPIs at project level, comparing with Flexiciency Italy and Flexiciency Spain

STORY	Emissions reduction per year, per kWh; Avoided emission cost; Generator operation savings; Relative congestion savings; Optimized grid capacity; Reduced Ancillary service cost; Reduced electricity losses; Reduced outages; Increased generator's availability; Enhanced power quality'	STORY envisages co-developing 'KPIs' through the demonstration sites, with the participating customers. These have been coined as 'stakeholder evaluation criteria', and will be based on a bottom-up process. '
TILOS		'Number of local people joining our events; number of people responding to our surveys; number of households accepting our smart meter and DSM kits.'
WiseGRID	The total number of KPIs defined within the project is 52	- Comfort level - Demand response campaign penetration Active participation in EV demand flexibility