D2.1

Value Propositions for Market Actors

Funded by the European Union. Views and opinions expressed are, however, those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

D2.1	Work Package No.	WP2	Task/s No.	Task 2.1
Work Package Title	Market actors' value propositions, engagement and legal & ethics compliance			
Linked Task/s Title	Value proposition for market actors			
Status	Final	(Draft/Draft Final/Final)		
Dissemination level	PU (public)	(PU-Public / SEN- Sensitive, limited under the conditions of the Grant Agreement / Classified R-UE (EU Restricted) / Classified C-EU (EU Confidential) / Classified S-EU (EU Secret)		
Due date deliverable	2023-08-31 (M12)	Submission date	2023-09-13	
Deliverable version	v1			

Document Contributors

Deliverable responsible Ruiz Posada, Leonor

Contributors	Organisation	Reviewers	Organisation
Valor, Carmen	Comillas	Diana Monetta	RSE
Moreno, Karina	Comillas	Giorgia Lattanzio	RSE
Ruiz, Leonor	Soulsight	Ferdinanda PONCI	RWTH
Villar, Jose	INESCTEC		
Rose Matthews	SIN		
Paul Tobin	SIN		

Document History

Version	Date	Comment
Version 0.1	2023.01.30	Conceptual Framework
Version 0.2	2023.02.28	Review of past projects

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Version 0.3	2023.08.15	Co-creation of Value propositions
Version 0.4	2023.08.20	Conclusions
Version 0.5	2023.08.25	Document format and review
Version 0.6	2023.08.31	Document revised after reviewer's comments
Version 1.0	2023.09.13	Document format by the PMO

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Table of contents

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

List of Tables

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

List of Figures

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

1. Executive Summary

Creating targeted value propositions adapted to different market actors is fundamental to enticing their willingness to integrate resources to co-create value in flexible markets. This task will define and test value propositions for market actors, including DSO, TSO, Aggregators and consumers (distinguishing between small load providers - such as residential or commercial consumers-and large load providers, such as town councils). The value propositions identified in this task will then be used (1) to guide the consumer engagement strategy, (2) to define the value chain services and business models, and (3) to define the feasible and viable value that each service can deliver.

We draw from Service-Dominant Logic and its application to the energy industry to understand the role of Value Propositions in market making. The S-DL foregrounds the role that value propositions have in market making insofar as they enable service exchanges; to create value, each actor promises value to another actor that can only reject or accept this promise of value. This central tenet of S-DL provides the theoretical anchor of our approach: markets will develop if customers accept the value propositions crafted by offerors. Consequently, developing value propositions that create value for customers and are thus likely to be accepted is assumed to be a foundation for the emergence of flexibility markets.

To define the value propositions, we apply the Value Propositions Canvas, a much-accepted framework for the design of value propositions. Specifically, following the Value Proposition Canvas (Osterwalder et al., 2014), we define value proposition as composed of three parts:

1. Definition of the benefits obtained (gains),
2. The costs incurred (pains), and
3. The distribution of gains among market actors (customer jobs).

Having explained the theoretical and analytical framework guiding this work, we now turn to the method used to craft the value propositions. Consistent with S-DL tenets, value propositions are customer-centred and should be based on the value expected and desired by customers. Thus, understanding customers is fundamental. For this, although a combination of methods was used in this task, they are all inspired by a human-centered methodology (also known as design thinking). This methodology is appropriate for complex problem-solving that puts people (users) at the centre of the process or analysis to design users, from users and *with* users. Through the methodology phases (understand, design and validate), we uncovered the real user motivations that will provide the foundations of user-centric value propositions.

In the "understanding" stage, four main activities were carried out. First, understanding the contexts and the services willing to be tested in the Demonstrations envisioned in these projects (hereafter Demos); second, a literature review of the state of the art of drivers and barriers for demand-response and flex provision; third, a review of value components as explained in past EU projects to identify a pool of value propositions and to describe their three parts; forth, qualitative research through in-depth empathy interviews with the actors involved in the service value chain and with demo Leaders. Empathy interviews were appropriate as the task required active listening to consumers and a non-judgmental stance on the interviewer's part to unveil users' unsolved needs, value sought and existing pains. Beyond iterating the identified value propositions, this

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

research aimed to understand the engagement drivers that will feed T2.2. As outcomes of this research, we present a **comprehensive mapping of gains, pains and jobs of all actors interacting in flexibility markets**. Based on the Value Proposition Canvas (Osterwalder et al., 2014), a comprehensive mapping was conducted to identify all actors' gains, pains, and jobs. Separate canvases were developed for each actor, encompassing consumers and grid actors. The consumer canvases were further categorised into user types: end-consumer, Electric Vehicle owner (EV hereafter), and energy community. Additionally, the grid actors were represented by the Transmission System Operator (TSO), Distribution System Operator (DSO), and Aggregator. This mapping exercise enabled a deeper understanding of each actor's needs, motivations, and challenges, enabling a more holistic approach to addressing their specific requirements within the context of the value proposition.

A key finding of the research is that t**here is a "No size fits all '' value proposition.** Users differ in the pains, value sought, motivations, levers and barriers in each demonstration or country and across resources. Archetypes are formalized to capture this variability. For each of them, we explain the factors that negatively and positively modulate the willingness or ability to use their resources flexibly or participate in flex provisions. This is why key barriers, different forms of value sought, insights per type of users, per type of resource and differences in each Demo pilot were explained in this document. Value propositions are also adapted to each archetype so that these archetypes can be used by Demos to segment their user base.

Based on these findings, at the “design”, we iterated from data to value framework to eventually define a value proposition for each market actor, each service and each archetype. The results of the design stage is offered in the form of a Value Propositions Framework, a customizable value proposition development that will enable Demo Pilots to identify their service and the value proposition offered, per service, type of user, and equipment of user. The Value Proposition Tool was validated with the consortium partners to refine the initial set of value propositions further.

Value propositions must work as a tool for engagement and business model design. As Value Proposition's ultimate goal is to help Demo pilots understand their users to design a successful engagement strategy, besides having written this deliverable, a value propositions framework was developed to serve as a comprehensive guide and valuable tool for Demo Pilots of BeFlexible, providing them with the necessary guidance, insights, and information to effectively comprehend the value they can offer and the fundamental tasks consumers must undertake to provide or engage in flexibility services. They can also structure the business models as they help explain how users want that relationship to be.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

2. Introduction

This WP is focused on identifying new actors' requirements for the enhancement of Minimum Viable Products (MVP) from different consortium members, which accommodate future and emerging markets and regulatory frameworks (WP1) and boost novel flexibility-centric business models (WP7) across and beyond the energy value chain.

The objectives of this WP are to:

1. Ensure there is a relevant offer to each market actor to be involved in a flexible solution with the definition of meaningful value propositions.

2. Define a plan to engage customers from the beginning, considering the recruiting, onboarding, and servicing challenges with the proposition of customer engagement strategies.

3. Establish a legal and ethical framework that secures data privacy providing market actors with a safe environment to exchange resources (energy, information, services, etc.).

This deliverable presents the results that enable meeting the first objective. We first present the theoretical framework that grounds this deliverable: Service-Dominant Logic and the Value Proposition canvas as the primary tool used to articulate value propositions. Then, we present the review conducted on EU-funded projects on flexibility provision. This review helped unveil the consumer gains, pains, and customer jobs that will be the basis for proposing meaningful value propositions. Next, we explain the qualitative research conducted in Spain, Italy, and France. The analysis of the interviews with potential users and experts was fundamental (1) to devise the archetypes of users and value propositions; (2) to identify new services; and (3) to outline the tool for customising value propositions that is the primary outcome of this deliverable.

3. Conceptual Framework

3.1. Service-Dominant Logic: A theoretical perspective to understand the co-creation of value

The strategic definition of value proposition draws from the fundamental tenets of **Service-Dominant Logic (S-DL).** This meta-theory explains how markets are formed and unfold by foregrounding the importance of actors, networks, and their relationship dynamics to create, deliver and capture value.

S-DL was articulated by Vargo and Lusch (2004) as a new paradigm for the study and management of customer relationships. It was proposed in opposition to the Good-Dominant Logic (G-DL) that, at the time, pervaded the marketing discipline and practice. Vargo and Lusch (Greer et al., 2016; Lusch and Vargo, 2006, 2014; Lusch et al., 2007; Vargo and Lusch, 2004, 2008, 2016) articulated this paradigm through a set of 11 foundational premises (FPs) (Table 1). Three of these foundational premises are relevant to this research: FP1: Service is

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

the fundamental exchange basis; FP10; Value is phenomenologically determined by the beneficiary and FP6: Value is always co-created.

Table 1. Foundational premises and axioms of service-dominant logic

Axiom1	FP1	Service is the fundamental basis of exchange.
	FP2	Indirect exchange masks the fundamental basis of exchange.
	FP3	Goods are a distribution mechanism for service provision.
	FP4	Operant resources are the fundamental source of strategic benefit.
	FP5	All economies are service economies.
Axiom2	FP6	Value is co-created by multiple actors, always including the beneficiary.
	FP7	Actors cannot deliver value but can participate in the creation and offering of value propositions.
	FP8	A service-centred view is inherently beneficiary oriented and relational.
Axiom3	FP9	All social and economic actors are resource integrators.
Axiom4	FP10	Value is always uniquely and phenomenologically determined by the beneficiary.
Axiom5	FP11	Value co-creation is coordinated through actor-generated institutions and institutional arrangements.

The first FP of SDL is that **all exchanges are exchanges of service**. Service is "the application of specialised competencies (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself" (Vargo and Lusch, 2004: 1). This definition of service implies that any offer is created by the application of knowledge and skills (the so-called operand resources) often resulting in the formation of goods (operant resources) (Vargo and Lusch, 2004: 2). This is also the case of energy services: flexibility provision demands the application of knowledge and skills such as identification of times where consumption should be shifted or the use of an app to manage self-production and/or consumption of energy to couple it with the grid demands. The value in this exchange is not encapsulated in the app but in the knowledge that the app provides to users and in the skills that the consumer brings forward in using the app. In a nutshell, markets can be depicted as an ongoing process of application of knowledge and skills; we call "service" to each specific combination of knowledge and skill application. It is also important to emphasise that no difference is established between goods and services in the S-D logic. All offerings are service offerings, although they may have varying degrees of materiality. Notwithstanding, services can be "serviced" or "productised" to be sold to consumers.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

The second crucial foundational premise is that the application of knowledge or skills is made for a purpose: **actors enter into exchanges to achieve a form of "value" or a form of "gain"**. This value or gain is phenomenologically determined by beneficiaries: two individuals may seek and obtain different gains in exchange. To illustrate, the value or gain of having PVs installed may be, for some consumers, a reduction in bills; for others, a possibility to trade their surplus, a reduction in carbon emissions, the participation in a community, the sharing with disadvantaged neighbours, or the security of supply. Moreover, the same actor may seek and/or obtain different forms of gain in different exchanges, and the gains sought may change over time. One may initially be enticed to install PVs to reduce emissions and later enjoy the reduced bills as a gain. Whereas functional gains have been traditionally emphasised, actors may seek other forms of value or gains. This is especially the case with energy services. For instance, consumers install PVs, buy EVs, or use energy monitoring apps to obtain different forms of value, such as having greater comfort (hedonic value), reducing their bills (economic value), nurturing resilient and self-sufficient communities (social value), gain status or project an identity (identity value), understand how energy works (episteme value) or reduce their emissions (environmental value). A more parsimonious taxonomy applied in the energy domain is the E3 framework that identifies three broad forms of value or gains: economic, experiential, and environmental (Kim et al., 2011), whereby experiential includes functional, hedonic, social and episteme value.

The final central axiom of SDL is that **value is always co-created**. Traditionally, markets were depicted as a unidirectional flow of goods from one actor (producer) to another actor (consumer). When the consumer used the product, the value was destroyed or terminated. This is the notion of value-in-exchange: Value is realised when the consumer buys the product. This view of value-in-exchange typical of a Good-Dominant Logic has traditionally guided the energy markets (Wunderlich et al., 2013): energy was unidirectionally transferred from producers to consumers; when consumers used the energy, its value was destroyed, and consumers paid the price for energy received.

However, it is apparent that the value of energy does not lie in the kWh bought but, in the effects, or gains that these kWh procure, insofar as they enable the realisation of other activities. Consumers value the uses that energy affords: heating, washing, or lighting. Moreover, still, these are instrumental in obtaining other gains, such as comfort or status or family protection. It is apparent that energy markets are better understood as guided by a value-in-use notion: Value is produced when the consumer uses the energy to do something else, namely, watching a movie, bathing their babies, or driving their cars. The activities enabled by energy produce gains for consumers (hedonic, ethical, environmental), and these are the ultimate gains that consumers seek in energy.

When value is understood as value-in-use, it is clear that **value is always co-created**. Energy does not create value as a result of the producers' application of knowledge and skills; rather, to produce its effects, the consumer needs to do something on their side to realise or enact the value-in-use. They need to plug in the TV, switch it on and find a good movie to watch. These so-called "consumer jobs" are fundamental to realise the value. Whereas in a Good-Dominant Logic, only the jobs of producers seem relevant to produce Value, S-DL foregrounds that all actors participating in an exchange need to carry out some jobs to produce value. Alternatively, said otherwise, the deployment of an electrical grid would be useless if consumers would not switch on an appliance. The co-creation of value is even more apparent in the so-called Home Energy Management Services (HEMS), or energy-related services facilitated by Smart Technologies. Flexibility provision services are part of HEMS ("HEMS enable energy consumers to check their home energy

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

consumption via different channels (e.g., home display, Internet portal) and eventually their production in real-time to modulate demand according to load- and time-based tariffs (indirect load control), to automatically curtail or increase demand in peak or low-load times (direct load control), or to use marketplaces for in-home consumer technologies or related support services", Wunderlich et al., 2012: 358).

Value co-creation demands that consumers apply specific competencies, want to exercise control over process/output, have the physical capacity, and enjoy the co-creation activities (Lusch et al., 2007). Alternatively, as other authors put it, co-creation demands consumer engagement (Payne et al., 2008). As we will discuss later, resource integration demands consumer engagement (Brodie et al., 2011; Grönroos & Voima, 2013); however, not all consumers are capable or willing to engage. This is a fundamental observation in the case of flexibility markets, and we will abound on this in section 2.3.

Value co-creation is an intentional activity (Neghina et al., 2015); therefore, it can be planned: actors involved can be identified, and the jobs to be done to realise value can be depicted. As we will see, the value proposition canvas explained in the next section is one way of planning the co-creation process.

When we accept that value is co-created, the distinction between producers and consumers blurs. This has also been the case in the energy industry: traditionally considered consumers or recipients of energy can now be suppliers of energy. In each service, the assemblage of assemble actors-roles-skills will be different (Payne et al., 2008; Ramaswamy & Ozcan, 2018). Consider, for instance, selling to the grid the energy produced with household PVs. In this case, the consumer is the producer and other energy actors buy the energy produced. In flexibility provision, we may find the same actors with the same roles; however, the skills necessary to produce energy and sell it to the grid are different from the skills necessary to provide flexibility.

The **primary mechanism whereby value is co-created is called resource integration**. The resources that can be integrated are not only material resources but fundamental knowledge and skills (organisational and consumers' knowledge and skill). In the example above, to sell the energy generated by PVs, consumers need to integrate equipment (PVs, submeters) and their knowledge (when they will have a surplus of energy to be sold). More formally, resources can be classified into five types (Hunt & Derozier, 2004): (i) physical (raw materials or physical products); (ii) human (skills and knowledge of customers and employees); (iii) organisational (routines, cultures, and competencies); (iv) informational (knowledge about markets, competitors, and technology); and (v) relational (relationships with competitors, suppliers, and customers).

From a different point of view, resources can also be classified as static - resources available today-or dynamic (Baron & Harris, 2008; Fryberg, 2013) -resources that can be available tomorrow. This distinction is based on the understanding that even though a service system may lack some resources (e.g., customers may lack skills to integrate resources), these resources can be developed, for instance, through consumer learning (Hibbert et al., 2012), or they may be borrowed or taken from other actors. This is because actors may own resources or have access to them (Edvardsson et al., 2012) from other networks, or they may be public-common-goods (Greer et al., 2016).

If the value is co-created, we cannot say that companies offer "value" as value is realised or performed when consumers apply their own (or others) resources. **Companies can only supply value propositions that, when**

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

accepted by users, will create value as long as resources are integrated. Value propositions are thus fundamental as they represent the first step in the value co-creation process.

Resource integration can be defined as "the incorporation of an actor's resources into the processes of other actors" (Gummesson & Mele, 2010, p. 192). The interactive and collective value creation process encapsulated in S-DL draws attention to the mobilisation and use of resources by actors that are integrated "across and through networks" (Caridà et al., 2019, p. 67). Service systems can be understood as constellations or configurations of resources (Edvardsson et al., 2012).

Resource integration is said to occur in three stages (Caridà et al., 2019): *matching, resourcing,* and *valuing*. *Matching* concerns the fitting of existing resources: Value will be created if consumers have the necessary resources or are willing or capable of finding access to them*, and resourcing* concerns the integration of actors' resources (e.g., resourcing would be switching on the TV; at this moment, the resources of energy suppliers and the resources of consumers are integrated). During *valuing*, actors assess the process and determine the value outcomes (the expected value or gains have been realised or not); this assessment will provide feedback and affect subsequent processes of resource integration. In the case of flex provision, matching concerns the identification and management of actors' resources (e.g., users need to have a heat pump and the skills to manage the automatisation tool); resourcing occurs when we integrate a smart algorithm with their installed devices so that the users' and ESCO's resources increase synergistically in the smart management of energy for flex provision. In the valuing stage, users will assess whether such value has been created, and if so, they will be inclined to maintain or even increase resource integration.

Resource integration may fail at the matching stage when actors do not want to or cannot integrate resources. Matching requires actors' engagement (Brodie et al., 2011), and it is apparent that some actors are unwilling to engage in the energy system. Several reasons may explain their reluctance, such as anticipation of risks, perceptions of limited value or mistrust in actors (Blut et al., 2020; Heinonen et al., 2013). Also, matching and resourcing require some dedication of time, skills and effort from consumers. Consumers need to plan and manage their practices to match and integrate resources. This planning and application of resources may create anticipated or actual stress. Consumers are requested to invest their own resources in resource integration so that if the created value does not compensate for this emotional and time/cost investment, they are likely to experience burn-out and abandon the service system (Blut et al., 2020; Heinonen et al., 2013). This explains why not all consumers want to engage in value co-creation: they may show an array of emotional reactions from apathy to ambivalence to outright annoyance at being asked to perform certain activities to integrate resources. For instance, think of the annoyance experienced by customers for having to use digital banking. Also, a lack of trust among actors may explain the reluctance to integrate resources, as the expectations about future value creation could be more precise or even deemed unlikely.

In addition to lack of willingness, actors may lack the necessary resources (and also may lack opportunities to access them) and may lack the necessary abilities to manage them (Anderson et al., 2016; Bruce et al., 2019; Hibbert et al., 2012; Laud et al., 2019). This may be especially the case in expert systems, such as energy service systems (Hibbert et al., 2012).

Also, the absence of clear expectations from each actor, the absence of information or limited trust among the actors may halt this stage (Järvi et al., 2018). As noted by Mele et al. (2018), the *resources* of actors are

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

not given; rather, actors must first become aware of and appropriate these *resources*; actors must realise that these resources are necessary and that actors have them or can acquire them and use them to obtain value. Institutional arrangements shape not only the actual resources that are available to actors but also the actor's perceptions that she possesses and can effectively use these resources. If users do not (perceive to), have the resources, the value creation process will be halted at the matching stage. In the case of flex provision, it is apparent that consumers are not aware of the flex resources of their equipment. Informing them of the potential for flex provision of their equipment may be a necessary condition to ensure value co-creation.

Even having the resources, if for lack of willingness or lack of ability, actors do not play their defined roles and the jobs associated with these roles, Value will not be realised or can be co-destroyed (Zhang et al., 2018). Co-destruction occurs if resources are disintegrated (Mele et al., 2018). For instance, if consumers do not respond to the grid signals, the value will be destroyed. Disintegration, in turn, is often due to opportunism or misbehaviour, including negligent integration of resources (Järvi et al., 2018) or misunderstandings or disagreements/on how to integrate resources (Laud et al., 2019). In sum, value creation may not occur if resources are not successfully integrated, accidentally or intentionally (Bruce et al., 2019; Yin et al., 2019). To illustrate, if the consumer distrusts the smart system in the case of direct load control and maintains it in manual mode, the system cannot control the appliances to obtain flex, and value will not be realised. This route halts the second stage in value creation (resourcing).

During the valuing stage, if users assess that value was not created or destroyed for them, they will engage in value destruction activities (e.g., negative WOM, retaliatory actions against other actors, or simply abandonment of the service system) (Järvi et al., 2018; Plé, 2017). When the integration or application of resources by one actor in the service system is considered inappropriate by another, the valuing stage will be negative for this actor. So, the so-perceived, negatively affected party will try to restore their resources through coping behaviours that will destroy Value for the entire system (Laud et al., 2019; Yin et al., 2019; Zhang et al., 2018). For instance, if consumers are not adequately compensated for their flex provision, they will nurture unfair perceptions and may retaliate by not responding to subsequent signals (Gebauer et al., 2013). This halts the third stage in resource integration and value and creates a negative feedback loop in the service system, making actors less willing to integrate resources again.

In sum, value no-creation is likely to occur when actors perceive or lack the necessary resources or when they do not want or are not able to halt the resources. In contrast, value destruction is likely to occur when:

1. Actors have disparate goals, and power imbalances are not corrected by the governance system, so that one actor engages in opportunistic behaviour.

2. Actors may not benefit equally from value co-creation (uneven value sharing creates perceptions of injustice, and this may lead to revenge and value destruction).

3. Interactions negatively influence other actors and contradict, cancel out or nullify value creation in other value networks.

4. Actors may have disparate information, or there may be social disagreements about the governance/institutional order that should be implemented.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

These conditions are more likely to occur if these factors are present in the service system (Vafeas et al., 2016): absence of trust among actors, inadequate communication among actors, power/dependence imbalance, inadequate coordination mechanisms and inadequate human capital.

If consumers are not willing or capable of integrating resources and if this is not remedied, the value will not be created. Often, we confuse consumers' agency with enhanced well-being, and we overlook that consumers may lack agency or may not be willing to exercise it; resource integration not only demands having a skill, but it is a laborious and ongoing interaction process with other actors (Anderson et al., 2016) and users may not be willing to invest in this process. Alternatively, said otherwise, if they lack the ability or money to install PV panels and they do not have the ability or money to trade their surplus energy, their well-being would be affected. However, demanding that the consumer acquires this expertise by herself (to "responsibility" the consumer) may be a misguided expectation. In S-DL, lack of willingness or ability on the actors' side is seen as a failure of the whole system and must be remedied by the system; it is not the sole responsibility of the consumers, and the whole network must integrate resources for value to be created (Anderson et al., 2016).

We propose to identify ex-ante the barriers to resource integration and to propose pain relievers in the value proposition that can enable the resource integration process so that value is eventually enacted. This task is facilitated by the development of value propositions that adequately address the pains that consumers will encounter in the resource integration process.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

3.2. Business Model Canvas and Value Proposition Canvas

The "Business Model Canvas" is a tool to describe how an organisation creates, delivers, and captures Value (Osterwalder et al., 2014). The "Business Model Canvas" and "Value Proposition Canvas" are perfectly integrated, with the latter being like a plug-in to the former that allows going deeper into the analysis of how value is being created for customers. Thus, this analysis may serve as the basis for the Business Models defined in WP1 (Deliverable 1.2) and is anchored on the basic tenets of S-DL defined above.

Figure 1 shows the “Business Model Canvas”, which focuses on helping organisations to create value for their business and is used to describe a business model in terms of its value proposition, customer segments, channels, customer relationships, revenue streams, key resources, key activities, key partners, and cost structure (Osterwalder et al., 2014).

1. Customer Segments: Identify the specific customer segments that each value proposition is addressing—for example, residential consumers, commercial consumers, DSOs, TSOs, and aggregators.
2. Value Proposition: Define the unique value that each value proposition is offering to its target customer segments. This could include functional and emotional benefits that address specific customer needs and pain points.
3. Channels: Identify the channels through which each value proposition will be delivered to its target customer segments, for example, through advanced metering infrastructure, energy management systems, or online marketplaces.
4. Customer Relationships: Define the type of relationships that each value proposition aims to establish with its target customer segments. They can include self-service, automated, or personal assistance.
5. Revenue Streams: Identify the revenue streams that each value proposition aims to generate. This could include sales of renewable energy or trading of surplus energy.
6. Key Resources: Identify the key resources each value proposition requires to succeed. This could include advanced metering infrastructure, energy storage solutions, or online marketplaces.
7. Key Activities: Identify each value proposition's key activities to create value for its target customer segments. This could include the installation of advanced metering infrastructure, energy management, or energy trading.
8. Key Partners: Identify the key partners that each value proposition must work with to succeed. This could include suppliers of advanced metering infrastructure, energy storage solutions, or online marketplaces.
9. Cost Structure: Identify the costs associated with each value proposition. This could include the costs of advanced metering infrastructure, energy storage solutions, or online marketplaces.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

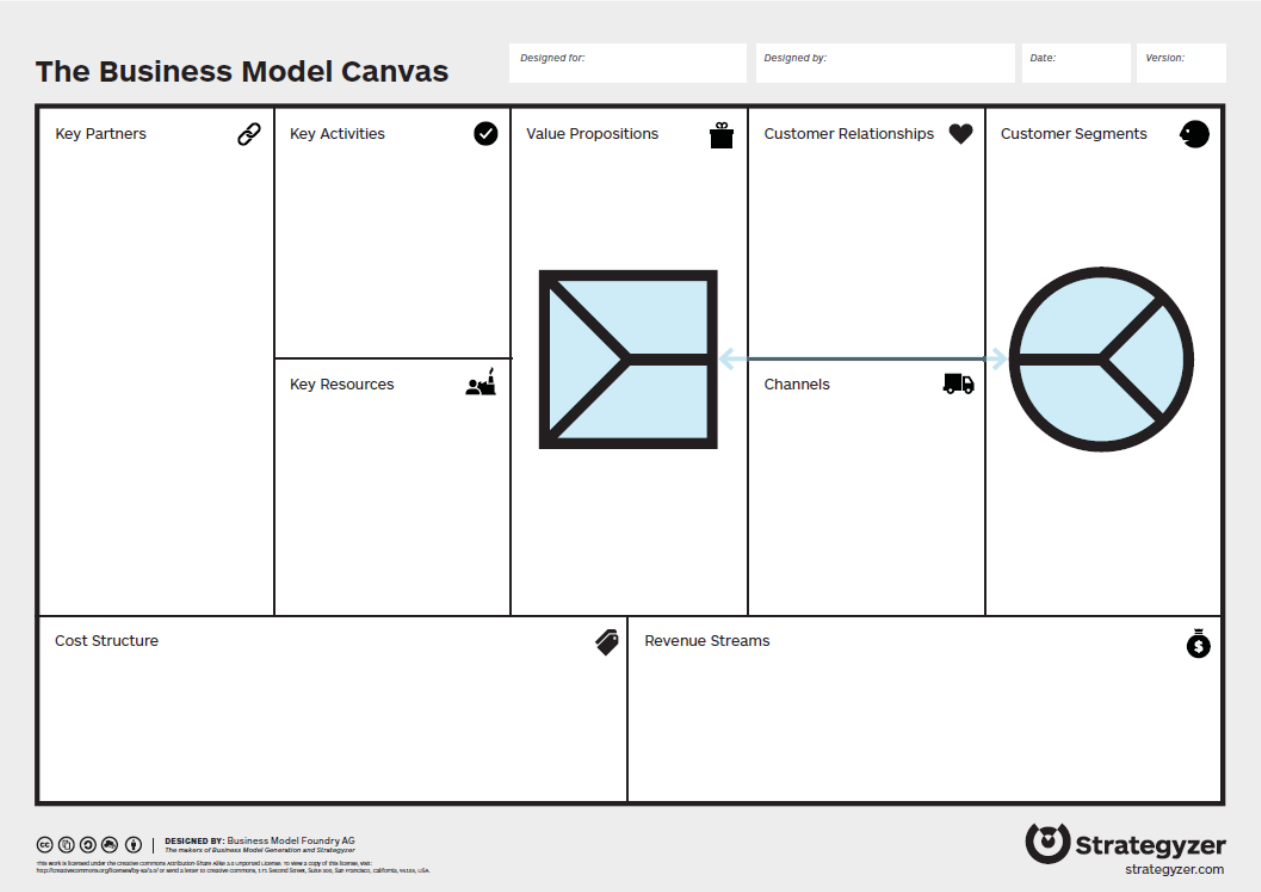

Figure 1. The Business Model Canvas Source: Osterwalder et al. (2014)

In contrast, the value proposition canvas presented in Figure 2 helps organisations to create value for their customers (Osterwalder et al., 2014). The purpose of the value proposition statement is to summarise how a particular product/service can benefit customers. It is a short explanation of what pains and/or gains the product/service addresses and how it provides value to the customer (Pell, 2022).

The Value Proposition Canvas is used for three primary purposes (Broderick, n.d.):

1. To define the target customer profiles by empathising with customers and discovering the jobs they are trying to get done, their pains when trying to get jobs done and what they believe they are gaining.

2. To understand the value that the product/service offers and how it increases gains and relieves pains.

3. To visually explore and iterate value based on the insights to achieve product/service and market fit.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

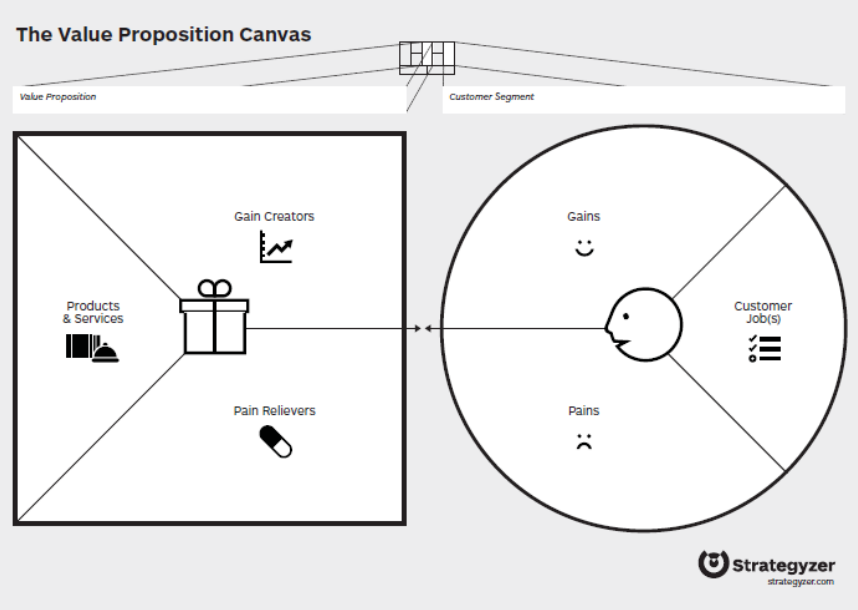

Figure 2. The Value-Proposition Canvas Source: Osterwalder et al. (2014)

The Value-Proposition Canvas has two sides (Osterwalder et al., 2014; Pell, 2022)

1. The Customer Profile (Figure 3) depicts the customer beliefs and feelings towards the service examined, usually collected by means of empathy interviews. This information is then used to understand the gains, pains, and jobs to be done that the value proposition should address.

2. The Value Map (Figure 4) describes how value is created for that customer, specifying the components of the value proposition that could create or increase these gains and things that could alleviate these pains.

3. Fit is achieved when there is a correspondence between the value proposition and pains/gains.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

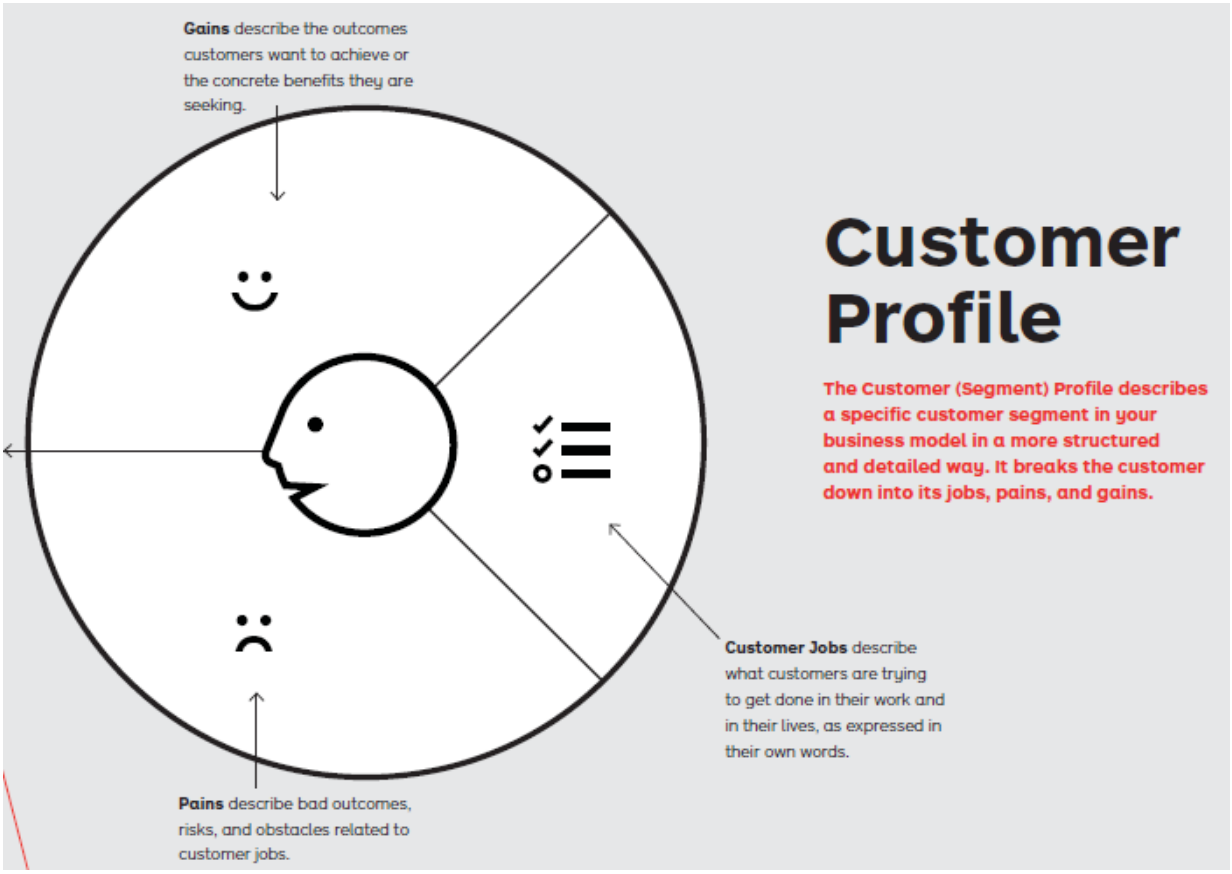

Figure 3. Customer Profile Source: Osterwalder et al. (2014)

Specifically, the Customer Profile map comprises the following elements (Broderick, n.d.). First, the customer's jobs are the list of activities this actor must complete to obtain value, and they are usually divided into:

1. Functional jobs: tasks or actions they are trying to complete
2. Social jobs: how someone wants to be perceived by the society
3. Emotional jobs: emotional states that are sought, such as comfort

The second element, customer pains, are any problem, dislikes, obstacles, risks, negative experiences or undesirable outcomes prior to, during and after trying to get a job done. Consider, for instance, a business traveller during the check-in at a hotel. To unveil the pains in this process, they may ask questions such as What are the main difficulties customers are having? Are customers creating workarounds? What mistakes frequently occur? After capturing all the customer pains, they should be ordered in terms of severity.

Finally, the customer gains are the required, expected, desired or unexpected outcomes. An example of a customer gain in the case of a business traveller might be that they expect free Wi-Fi now but require a good

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

night's sleep. Questions that may help uncover gains might be: What could make their life easier? What does success look like? Or how might we help them increase their perceived status? Gains are thus similar to the value sought as defined by S-DL.

Once the pains and gains are identified, they can be ranked for each of the archetypical profiles identified.

Figure 4. Value Map Source: Osterwalder et al. (2014)

Given that consumers differ in their resources, value sought and circumstances, prior to developing the value propositions it is necessary to thoroughly identify customer profiles. Once archetypical profiles are identified, value propositions can be described for each of them. The value proposition should specify how to relieve the pains and increase the gains. Again, we can differentiate three components in the value map.

First, products and services link directly with the customer's jobs, pains, and gains. Products and services should help customers to get specific jobs done and, in the process, address (create value) for some (often not all) pains and gains. Bear in mind that the products and services may create value in isolation or as bundles of existing offerings.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Second, pain relievers are descriptions of how the products and services offered reduce the customer pains that prevent getting the jobs done satisfactorily. The description should explicate how products and services might reduce fear, eliminate mistakes, or stop frustrations.

Finally, gain creators describe which benefits and outcomes customers expect or wish. Consistent with SDL, benefits may be of different kinds, from functional to ethical. To define robust value propositions, an important step is to consider how the offering might compete against existing value propositions, outperform customer expectations, or surprise customers with better value.

The definition of value propositions should consider the institutional constraints and conditions of a particular market. For this, we turn our attention to the flexibility markets in the next section.

4. Review of past research projects

The ensuing section accentuates demand-side management services. While flexibility services ought to be technically neutral, spanning both generation and storage, the thrust of this report is distinctly tailored to the end consumer, be they residential, industrial, or commercial. This approach stems from the objective to offer an exhaustive analysis from the consumer's viewpoint. The success of such projects hinges upon the proactive engagement of clients, a pivotal aspect that necessitates unwavering attention.

4.1. Particularities of flexibility markets

Flexibility or demand response services are based on the ability of an end-user to purposely deviate from a planned/standard generation or consumption pattern (USEF, 2018) in response to economic or environmental signals (Albadi & El-Saadany, 2008; Abdollahi et al., 2012). Flexibility provision can include actions like shifting certain appliances to times of the day when electricity is cheaper or more abundant or using on-site generation, such as solar panels, to offset the need to draw electricity from the grid. Flexibility also involves final consumers providing flexibility to the electricity system by voluntarily changing their usual electricity consumption in response to price signals or specific requests, which can be done either manually or automatically, depending on service technical requirements (e.g., speed). In contrast to energy efficiency, which aims at using less energy while still providing the same service or level of comfort, demand response is mainly about shifting consumption to a different point in time (electric, n.d.). This entails temporarily decreasing or increasing standard consumption patterns, which can sometimes lead to energy savings. Figure 5 summarises these ideas (Parrish et al., 2020).

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

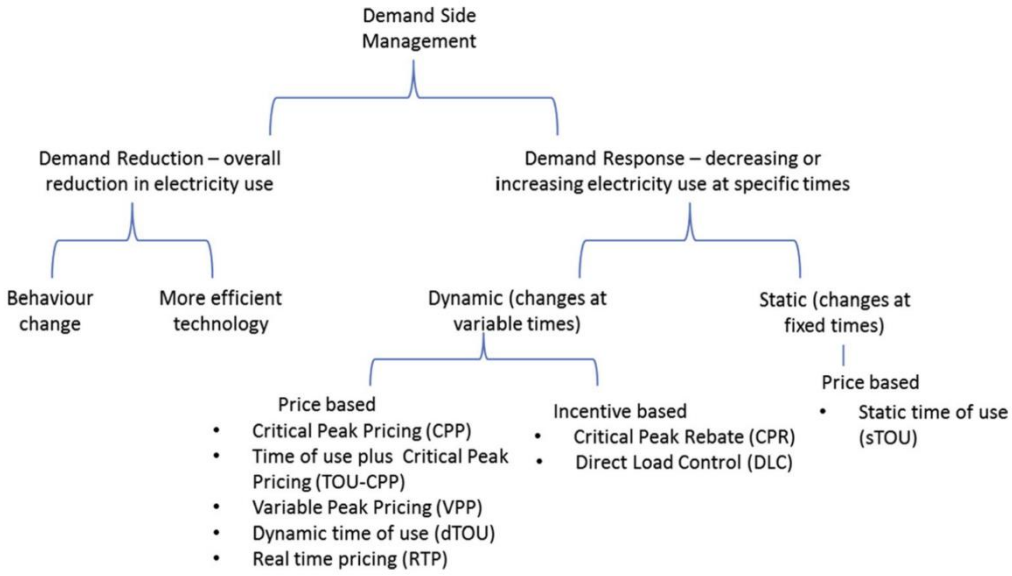

Figure 5.Classifications of demand reduction and demand response Source: Parrish et al. (2020)

These schemes of demand response can be classified into two types, implicit and explicit flexibility (Freire-Barceló et al., 2022). Implicit flexibility (also known as price-based) refers to consumers choosing to be exposed to time-varying electricity prices that reflect the value and cost of electricity in different time periods. Consumers can then decide to shift their electricity consumption away from times of high prices to reduce their energy bills. Examples of implicit demand response include time-of-use pricing, critical peak pricing, and real-time pricing (eurelectric, n.d.; USEF, n.d.).

Explicit Demand Response, also known as incentive-based, is a system where consumers receive rewards for adjusting their consumption upon request. This request is typically triggered by high electricity prices, the flexibility needs of responsible parties, or constraints on the network. In this scheme, the results of demand response actions are sold on electricity markets, either directly by large industrial consumers or through demand response service providers. Depending on the service technical requirements, consumers may enter into a contract with an aggregator or directly with an actor interested in flexibility, such as a DSO or TSO. When this actor requires flexibility, the consumer (or Flexibility Service Provider - FSP) is notified and must deliver the agreed-upon amount for a specific time. Failure to comply may result in penalties (eurelectric, n.d.; USEF, n.d.). In explicit flexibility, end-users receive specific economic and/or volume signals to modify their power consumption or generation, in addition to regular electricity prices and tariffs (e.g., $1/kWh for a reduction of consumption from 6 pm to 9 pm on a given day). Reactions to these flexibility signals can be activated manually or automatically. The choice of one or the other usually depends on the end-user preferences and the particular service (e.g., fast-response products generally require automation). The latter requires some local controller that, for example, switches on/off certain appliances in response to flexibility signals subject to comfort or process-related constraints; however, this controller role can be automatised and played out by an algorithm. This form of flexibility provision, also called direct load control (DLC), has been tested internationally in the context of different implicit and explicit flexibility provision programs with

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

varying levels of acceptance (Darby & McKenna, 2012; Fell et al., 2015). Fell et al. (2015) show that explicit flexibility programs based on DLC (in which appliances are limited during certain hours of the day) are more popular among residential consumers than implicit time-of-use tariffs.

Flexibility markets unfold in complex networks (Chandler & Vargo, 2014) where actors compose different dyads and triads where resources are integrated. Industrial consumers may offer their flexibility to system operators (DSOs and TSOs) directly or to aggregators who then bundle energy units from industrial consumers (and possibly other types of consumers and producers) and offer them to system operators. Moreover, different market designs for flexibility procurement may lead to additional dyads and triads. For instance, flexibility providers (industrial consumers and/or aggregators) may operate in combined flexibility markets in which both TSOs and DSOs are buyers simultaneously. Another possibility is that flexibility providers participate in different markets organised by TSOs and DSOs separately.

Additionally, different markets may exist for a single system operator. This could be the case for a TSO, for instance, that may organise a market to procure flexibility to solve network congestion and another market to balance generation and demand in real time. Finally, a hierarchy of markets may be set in place. For example, a flexibility provider offers flexibility to the DSO local congestion management market first. The bids that the DSO does not use are then automatically forwarded to the TSO congestion management market (CEDEC et al., 2019; Gerard et al., 2018).

Flexibility markets are nested into existing electricity markets. The value processes underlying this market will thus be affected by other concurrent value processes in the electricity market. Some market actors (notably, industrial consumers, DSOs and TSOs) need to adopt new roles that coexist with the previous ones (CEER, 2015; evolvDSO); thus, depending on the value process, actors, roles and resources are flexibly assembled (Ramaswamy & Ozcan, 2018). To illustrate, in flexibility markets, an industrial firm acts as an energy provider to system operators. However, the same company simultaneously acts as a consumer of energy, in other instances, by withdrawing electricity from the grid and paying producers and networks for its consumption. Flexibility markets demand that actors perform a different role (Plé, 2016). This role change demands new resources (e.g., industrial consumers may need energy generation resources such as photovoltaic panels) or that actors use their existing resources differently (e.g., use their industrial machinery and operations for energy production) (Angizeh & Parvania, 2019; Kuiken et al., 2018). Additionally, industrial consumers need new competencies to perform this role, such as understanding the operations of flexibility markets or the ability to design interruptible industrial operations (Hamwi et al., 2021; Ma et al., 2018; Roth et al., 2020). Similarly, DSOs need to change their approach to grid management, moving from the "fit-and-forget" approach to active management of the grid (Hadush & Meeus, 2018; Ruester et al., 2014). This requires organisational changes, such as developing capabilities for market design and operation, as well as market platforms, communication and monitoring equipment (Giulietti et al., 2019; Laaksonen et al., 2021). The new role performed by TSOs in this market requires new uses of resources and new resources, such as a different relationship with DSOs (CEDEC et al., 2019), including the sharing of the system's operation and responsibility with the DSOs (IRENA, 2019; Roos, 2017).

Not only do actors change their roles in value processes, but also other roles are also necessary for this market. Aggregators of industrial demand are a case in point (Blomgren et al., 2021). Such a role may be played by existing retailers or by incoming actors, such as ESCOs (Lampropoulos et al., 2018). Aggregators

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

tapping into ICT developments (i.e., cloud services, artificial intelligence or IoT) offer flexible provision services (Siano, 2014) to both industrial consumers and system operators.

Interpreting flexibility markets from S-DL, we defend that markets for flexibility-based services are different to other markets in that they do not result from entrepreneurial behaviour in niches (Ottosson et al., 2020); rather, they are policy-driven markets (Quitzow et al., 2014) or pushed by policymakers onto regime actors (DSOs and TSOs). These markets are seen as fundamental for the achievement of the decarbonisation of electricity systems (Di Silvestre et al., 2018).

Despite their importance in enabling the energy transition, policy-pushed markets have a more considerable failure potential as the structural tensions are significant (Johansson et al., 2020; Tóth et al., 2018). These new markets demand the formation of service ecosystems in which different actors jointly co-create value (Fichter & Clausen, 2021; Ottosson et al., 2020; Vargo & Lusch, 2004). Actors will be coupled through value-creation processes (Akaka et al., 2012; Chandler & Vargo, 2011; Lusch et al., 2010) whereby they will integrate their resources to co-create Value (Mustak & Plé, 2020; Plé, 2016). These actors and their interactions are heavily modulated by the institutional arrangements governing the energy and electricity markets. These institutional norms may constrain the resources of actors, curtail the integration of resources, or the realisation of positive outcomes (Valor et al., 2021). More importantly, contrary to other markets, flexibility (and energy markets more broadly) can limitedly self-adjust due to the regulation governing actors' roles and interactions. Actors in the ecosystem have limited agency to change the value co-creation processes to ensure that value is realised for actors over time (Vargo & Luchs, 2008). Or said otherwise, energy ecosystems are tightly coupled service systems (Mustak & Plé, 2020) guided by contracts that "explicitly formalise and specify the terms and conditions of the actors' association" p. 310), with precise specifications and clear power centres. In tightly coupled systems, actors tend to experience limited agency or limit other actors' agency (Mele et al., 2018; Mustak & Plé, 2020). If regulation limits actors' agency, the process of resource integration is curtailed, and thus, the value will not be created: if regulation does not enable actors to ensure their resources and/or to integrate resources with other actors, the adverse outcomes may outperform the benefits. Not only may the agency of actors be curtailed, but in tightly coupled systems, benefits may not be distributed equally among actors. Then, the so-perceived losing actors will be less likely to fit resources as they anticipate net deficits from the interaction (Kleinaltenkamp et al., 2012; Tóth et al., 2018).

In sum, flexibility markets are different to other markets in that they are pushed onto some actors (DSOs and TSOs). They demand the formation of specific service ecosystems where actors can interact and integrate their resources to co-create value. In these ecosystems, actors will perform new roles for which they need to acquire or access other resources, and new actors will have to be admitted (Burton et al., 2016). Thus, the electricity ecosystem is subject to a process of "servitisation" (Baines et al., 2009) whereby actors need to move along a product continuum from less to more sophisticated services. This move requires the reconfiguration of fundamental elements of the product–service offering, organisation and value network (Baines et al., 2009). The servitisation process evolves in stages; flexibility markets in most EU countries are still in the exploration stage. In this stage, fit with demand, technology and resources and capabilities is defined and tested. Actors examine whether consumers will demand these services, whether the technologies enable the development of these services and whether organisations are able to redeploy and reconfigure their resources, including their routines, shared norms and values (Kowalkowski et al., 2017). Then, service offerings are tested or piloted in sandboxes. If the outcomes of these are positive, the value of

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

servitisation is demonstrated, and market actors progress to the next stage (Expansion). Servitisation processes are plagued with tensions that may destabilise the ecosystems (Burton et al., 2016).

To alleviate these tensions, relationships in the value chain need reconfiguring. Since actors' interactions depend on the value propositions coupling actors, acceptable value propositions will contribute to system stabilisation (Kohtamäki et al., 2019). The pricing strategy and structure are part and parcel of these value propositions. When actors accept the value propositions, they will enter into resource integration processes that will result in the co-creation of value for all actors in the ecosystem. Since flexibility markets are enacted by complex service ecosystems where several actors take part, the value propositions should be tailored to each of the dyads or triads of actors that will have to interact to perform the service (e.g., consumers-aggregators, consumers-energy communities-aggregators; consumers-DSOs; DSOs-TSOs). Figure 6 and Figure 7 depict potential interactions in this service ecosystem.

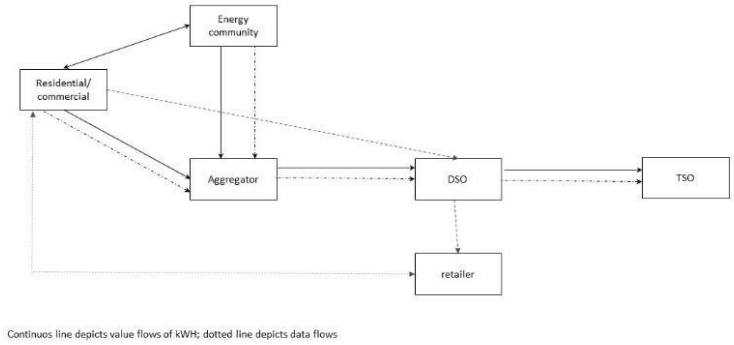

Figure 6. Value flows among service system actors (residential and commercial consumers)

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

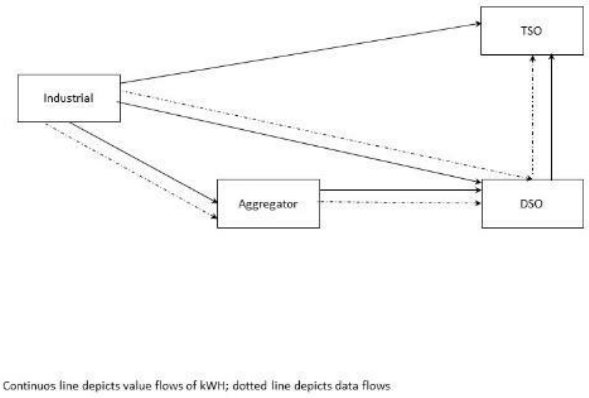

Figure 7. Value flows among service system actors (industrial consumers)

Whereas TSOs and DSOs are pushed by policymakers to define, test and exploit flexibility services, consumers voluntarily participate in them. Thus, we defend that value propositions should prioritise consumer acceptance because their acceptance is a necessary condition for the unfolding of flexibility markets. Consumers will only demand these services when value is created for them, so Value Propositions need to ensure that gains are more significant than pains; otherwise, consumers will not accept the value propositions offered to them and will not engage in value co-creation processes.

To orient the specific content of value propositions, the conceptual perspective is complemented with two models drawn from digital servitisation scholarship. Digital servitisation complements S-DL as it provides a more granular and applied view of how value systems unfold to provide smart solutions or configurations of products, services, software and analytics.

In their review of business models based on digital servitisation, Kohtamäki et al. (2019) found that these business models varied along three dimensions. These three dimensions constitute three fundamental components of the value propositions of smart solutions. These components are solution customisation, solution pricing, and solution automatisation. First, value propositions should allow customising the service and adapting it to the needs of customers. This customisation is enabled by the use of analytics and increases the effectiveness and efficiency of value propositions. Second, the pricing model will influence the valuing subprocess in resource integration and eventually modulates the value capture or Value sharing in the value systems. Digital servitisation expands the pricing models that can be used and enables the use of algorithmic pricing, personalised pricing approaches for customer segments. Finally, the use of analytics allows embedding monitoring, optimisation and automatisation functions that may increase the value provided to customers either by increasing the gains or by reducing the pains associated with the jobs to be done.

The second model aims to redress a fundamental problem that consumers encounter when assessing service value propositions and specifically digital services: their abstraction and limited materiality make it

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

difficult for consumers to assess them. Against this backdrop, Wirtz et al. (2021) proposed a model of productisation of services to facilitate the understanding and acceptance of value propositions in service systems insofar as they are packed and presented to consumers as well-defined and object-like "products". This concretisation is enabled by three features: specification, branding and pricing.

Specified means that a service has a "defined value proposition" and "specified service characteristics" (Wirtz et al., 2021, p. 415). This demands a specification of what the service will do for the customer (gains) and how this will be achieved (jobs done). To do that, value proposition designers need to break down the service into separate units and recombine them into solutions, proposing different configurations tailored to the customer's needs. Then, specification implies both concretisation and modularization of value propositions.

Branding reduces intangibility by labelling each value proposition and attaching to them a visual identity or logo. This semantic and visual naming also makes the value proposition more concrete and enables consumers to visualize what these value propositions entail mentally.

Pricing consists of concretizing the costs consumers will incur in order to obtain the gains. In the case of flex provision, pricing is the compensation or incentives provided for consumers to engage in flex provision. Thus, pricing or compensation will concretize the gains that consumers may obtain by providing flexibility. Pricing should specify rate fences or pricing attached to different configurations depending on Value tiering or gains offered to consumers (e.g., different rates for different amounts of flex provision).

4.2. Methodology

To examine how value propositions have been defined in other European and non-European projects, a review of projects was carried out. The methodology implemented to develop the review was divided into four stages, following the key stages of systematic reviews (Tranfield et al., 2003): selection, gathering, analysis, and conclusions.

Selection. Projects that consider the flexibility of the electricity market, either explicitly or implicitly, and that have carried out pilots in different countries to evaluate the behaviour of all sector players were taken into account. The title, objectives and abstract of each project were used to decide if the project met the inclusion criteria. EU-funded projects that focus on flexibility were selected from the BRIDGE database (European Commission - BRIDGE, n.d.). To broaden the review, several projects from the United States were taken into account, using as central databases those mentioned by Parrish et al. (2020) in their review of the barriers to flexibility. Specifically, the US Department of Energy and US Electric Power Research Institute (EPRI) Studies were considered. Searches with the keywords "demand response" on the US Department of Energy web page (US Department of Energy, n.d.) allowed retrieving a large number of reports. Under the general program: "Demand Response and Time-Variable Pricing Programs", the Federal Energy Management Program developed profiles of demand response and time-variable pricing programs throughout the United States. These profiles are grouped regionally by state: Western States, Northeastern States, and Southeastern-Midwestern States. These projects have not been coded in detail like the European projects, but their results have been taken into account when drawing conclusions about the profiles of the different actors. In addition,

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

an additional EU-funded project was added, as it was referenced by other projects (FEVER). Following this procedure, 30 potential projects were selected.

Gathering. For each project, all deliverables focusing on service definitions or reporting research with consumers were downloaded and read in their entirety. Specifically, deliverables focused on these topics were entirely read: Definition of services and demo requirements, Definition of Use cases, Definition of Business Models, Definition of Value Propositions, and Stakeholders consultation.

Analysis. All projects were coded for nine codes that reflect the value proposition components, namely:

1. Project name
2. Services offered
3. Target to whom the services are offered
4. Value propositions for each service
5. Jobs to be performed as a customer
6. Expected gains
7. Gains creators
8. Expected pains
9. Pain relievers

It is important to note that not all projects had identified value propositions. In some cases, only the tasks expected from actors were found, but not the gains or pains; in these cases, the analysts made a reasonable and plausible assumption of these pains and gains also based on the information provided by other projects.

Additionally, we also coded projects for (1) completion (whether the project had ended or not), (2) Bridge classification (Table 2), and (3) orientation (distinguishing between grid-oriented projects, consumer-oriented projects, and grid- and consumer-oriented projects).

Then, results were integrated using the value proposition canvas method for each market actor, namely consumers -distinguishing between end-consumers, energy community, and EV owners-DSO, TSO, and aggregators. Table 3summarizes the pool of projects classified according to these codes.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Table 2. Bridge classification codes

1	LC-SC3-ES-3-2018-2020 - Integrated local energy systems (Energy islands)
2	LC-SC3-ES-4-2018-2020 - Decarbonising energy systems of geographical Islands
3	LC-SC3-ES-5-2018-2020 -TSO – DSO – Consumer: large-scale demonstrations of innovative grid services through demand response, storage and small-scale (res) generation
4	LC-SC3-ES-1-2019 - Flexibility and retail market options for the distribution grid
5	DT-ICT-10-2018-19 - Interoperable and smart homes and grids
6	LC-SC3-EC-3-2020: Consumer Engagement and demand response
7	LC-SC3-ES-6-2019 - Research on advanced tools and technological development
8	LCE-07-2014 - Distribution grid and retail market
9	LCE-02-2016 - Demonstration of smart grid, storage and system integration technologies with the increasing share of renewables: distribution system

Table 3. Overview of projects coded by Bridge and Orientation

PROJECT	BRIDGE 2021						BRIDGE 2020			NOT INCLUDED IN THE BRIDGE	ORIENTATION
	1	2	3	4	5	6	7	8	9		
ONGOING PROJECTS											
Renaissance											
React											
balance-plus											
Fever											
Parity											
Platone											
InterConnect											
ACCEPT											
BRIGHT											
Hestia											
Iflex											

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

ReDream											
Sender											
TwinERGY											
CLOSED PROJECTS											
CoordiNet											
FlexGrid											
Flex4Grid											
Flexiciency											
NobelGrid											
P2P-SmarTest											
SmarterEMC2											
GoFlex											
InteGrid											
InterFlex											
DRIVE											
FLEXCoop											
PV-Prosumers4Grid											

Legend

	ORIENTATION
	Consumer
	Grid
	Not Include
	Mix

4.3. Key findings

Next, we present the main findings for each value proposition, differentiating across actors to whom the proposition is offered.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

The role of regulation as an overarching determinant for value propositions

Energy flexibility regulation plays a crucial role in shaping the value propositions for various actors in the energy market, particularly for Distribution System Operators (DSOs) and Transmission System Operators (TSOs). The regulation of the Aggregator is also a key factor in the definition and implementation of certain value propositions. In some countries, the lack of regulation for the Aggregator limits the development of value propositions.

The role of aggregators in coordinating distributed energy resources and their importance in energy market liberalization and DER integration towards carbon-neutral energy systems is being examined in the European framework. The investigation aims to show how new European policies envision the future electricity network and reevaluate the role of aggregators, considering current market situations and recent research (Kerscher & Arboleya, 2022).

Even when there is growing interest in prosumer flexibility, and it is apparent that a trend towards increased electrification of end-use sectors, regulatory and market design are hindering the full exploitation of prosumer flexibility. In the coming years, these areas will be essential research topics (Gough et al., 2020).

Currently, DSOs do not make use of energy flexibility services to lower their need for network investments, except in the case of Italy (ARERA, n.d.) and Great Britain, which has proactively adjusted their legislation to encourage operational investments over Capital Expenditure (CAPEX) investments. This represents a missed opportunity to upgrade the DSO function and reduce investment costs across Europe.

Existing regulations may also present challenges for these actors. For example, as explained by Flexiciency, the EU regulatory framework does not currently allow DSOs to benefit from demand response programs. Generally speaking, DSOs are typically seen as natural monopolies and, thus, subject to regulation to prevent them from abusing their market power. As such, their participation in demand response programs may be limited to ensure that the interests of customers are protected. This has limited the rollout of flexibility solutions promoted by DSOs. However, DSOs have carried out pilots to investigate technical solutions, and their findings could be used to support a larger-scale evolution of the regulation.

In summary, at present, DSOs are entitled to acquire flexibility services as stipulated by EU Regulation 2019/944. Moreover, member states ought to provide incentives to encourage DSOs to purchase such services. It is contended that it remains appropriate to prevent DSOs from directly providing these services for various acknowledged reasons, including the potential exercise of market power and subsequent market distortion. The implications of these factors are of such magnitude that they cannot be readily dismissed. Therefore, DSOs should primarily direct their efforts towards delineating services and products in such a manner that the ensuing benefits (to the system, to consumers, and so forth) are equitably apportioned among the relevant stakeholders. Furthermore, these services and products ought to maintain technological neutrality, thereby allowing both generation and loads (subject to fulfilling criteria) to participate, either directly or through aggregation, contingent on factors such as minimum flexibility power and geographical constraints.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Consumers

Before explaining the components of value propositions identified in past projects, it is necessary to define the flexibility services found. Flexibility services refer to the ability of a power generation or consumption asset to adjust its input or take-off in response to changes in the power system's demand or supply. Ancillary services refer to services offered by the energy provider that are not directly related to energy consumption. For example, an ancillary service is the EV is a source of ancillary services to keep the community well-balanced and potentially self-sufficient (InterConect). Non-energy services refer to services that are not directly related to the generation or consumption of electricity, such as data management. An example of non-energy services is found in InterConnect: the green progress bar service, which allows users of a pilot to see the commitment and progression of the building or entire site towards specific ecological KPIs (InterConnect). These services focus on the overall customer experience insofar as they go beyond energy use, and they also focus on data use and services associated with environmental performance, *inter alia*. The creation of value is also provided by the combination of data and services across different sectors, such as combining energy services with mobility and health (BRIGHT Consortium).

It is essential to differentiate between three profiles of consumers when considering value propositions, as the services and offerings will differ for each group These profiles include end consumers, energy communities, and Electrical Vehicle (EV) owners. Electricity end-users can be grouped into three categories: industrial, commercial, and residential. A significant portion of research focuses on the residential sector, highlighting that actual flexibility to the system may be limited by social practices. Studies on the industrial sector have also examined barriers to realizing its full technical potential, with criticality and technical requirements of production processes identified as crucial constraints (Valor et al., 2021). In contrast, there is significantly less research on the commercial sector (Cardoso et al., 2020).

This document is based on the study of the final consumer, within which the prosumer can be included. Other actors are not taken into account, such as commercial and industrial consumers participating in demand response. Nevertheless, the literature mentions that financial benefits are the primary motivation for consumers but suggests that there is an opportunity to communicate non-financial benefits to increase participation. It also highlighted the need for further assistance with barriers that prevent participation, including awareness of demand response programs with flexible requirements, to help market participants develop interventions and better engage consumers in demand response (Lashmar et al., 2022).

Another consumer profile, Electric vehicles (EVs), have the potential to provide flexibility to the electrical grid through prosumer flexibility services such as vehicle-to-grid. The amount and timing of this flexibility will depend on various factors, including charging regimes and the number of EVs within a specific area. Stationary energy storage systems and EV-to-grid technology can shift energy across time and space, which can help manage the issue of geographical clustering of EVs. Additionally, optimised charging of fleets of EVs can support the local distribution grid with demand response actions, such as peak shaving, valley filling (Gough et al., 2020), which are used also for providing ancillary services.

Consumers must perform specific tasks to co-create services related to flexibility in energy consumption. These tasks can be classified as functional, social, or emotional in nature. For example, to provide functional flexibility, consumers may need to adapt their consumption to align with local energy production or install

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

equipment that allows for direct load control and remote management of energy use. Additionally, some consumers may need to make investments in equipment such as PV systems or retrofit their homes to be able to perform the necessary tasks. Once a management system is set to automatic mode, the tasks required of consumers may become less extensive.

Regarding functional jobs, different activities should be accomplished by customers to enable flexibility. This is because flexibility provision may be enacted in different ways, as the differences between implicit and explicit flexibility described above show. Scheduling consumption to be correlated with local production may be done by means of time-use-energy prices; in this case, the consumer's job is to adapt the consumption to hours where there is sufficient production and refrain from consuming in the hours where supply is scarce. Prosumers, i.e., consumers that have self-producing technologies, can provide flexibility by coupling their consumption with their production peaks and/or by making sure the energy is available to the grid when it is needed (just-in-time delivery). If automatised flexibility is implemented, then the customer jobs comprise installing the set of devices that enable direct load control and enable the automatic mode so that the building production/consumption can be handled remotely (ReDREAM). In addition, using local storage can provide the dwelling with backup energy in case of a power cut, making the system more resilient (BRIGHT, Hestia, InterConnect, Sender).

Again, customers need to have the necessary devices enabling interoperability and intercommunicability with flexibility recipients. In the case of electric-vehicle users, the main job is to charge the vehicle at the time(s) more suitable for the grid. This also implies, in some cases, adapting their consumption patterns. Thus, depending on the way flexibility is enacted, consumers would need to adapt their consumption patterns and/or their equipment. In some cases, it is necessary to make an investment, such as installing PV systems or retrofitting a house, as a preliminary step to be able to do the other required jobs for flexibility provision. In direct load control, consumers would also need to install sub-meters and smart appliances, install a management app, understand how it works, and use it. To do this, they must allow sharing of data and, in some cases, provide feedback (BRIGHT, Hestia, InterConnect, Sender). It is important to emphasise that in direct load control, consumers need to carry all these jobs at first, but once the management system is set into automatic mode, the provision of flexibility would require the performance of lesser functional jobs.

In relation to social jobs, consumers may gain some social distinction by differentiating themselves from others: flexibility is an innovative and transformative service, and adoption is still limited. Being a pioneer or an early adopter of this service may provide some social differentiation. In addition, some flexibility provision services operate in the context of communities. Thus, another social job is to create or join a community. A crucial social job for these community managers is to make each of its members feel that they are part of a larger project. Finally, regarding emotional jobs, one of the most repeated ones is the feelings of excitement and pride that accompany the belief in changing the world, carrying out actions that contribute to a better present and future, and being in sync with personal values (BRIGHT, Hestia, InterConnect, Sender). Another emotional job is to self-regulate the anticipated anxiety often elicited by the jobs to be done to co-create the services (ReDREAM).

End-users participate in flexibility markets with the expectation of gaining multiple types of benefits. The most cited motivations are financial and environmental. Among these, financial benefits are typically considered the most important (Parrish et al., 2020). This can include economic compensation, discounts on

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

bills, or other incentives such as reward programs that offer redeemable points or cryptocurrencies (BRIGHT, Hestia, InterConnect, Sender). This emphasis on financial benefits is understandable, as the primary goal of smart-energy technologies is to achieve monetary and energy savings (Hestia).

Environmental gains are the second mentioned gain; specifically, climate change mitigation was the second main motivation that would make respondents from all social strata participate in a demo (survey results of SENDER). The environmental benefits of DR and flexibility services have been used in marketing and communication campaigns of projects (BRIGHT, Hestia, ReDREAM, Sender) to motivate households to participate in the provision of flexibility. Owners of electric vehicles may report another potential gain that is projecting an identity of environmentally concerned with the accompanying increased status that such social identity conveys (White & Sintov, 2017). Studies find that environmentalist symbolism is the strongest predictor of adoption, while innovator symbolism predicts willingness to lease/buy an EV. Additionally, it finds that seeing EVs as environmentalist and social innovator symbols partially mediates the relationship between concern about climate change and EV adoption intentions. These results have implications for EV marketing and policy and suggest that emphasising the potential for EVs to reinforce specific self-identities may be a more promising strategy to increase adoption rates than emphasising instrumental attributes such as fuel efficiency (White & Sintov, 2017).

In addition to functional gains such as comfort and security, which are only mentioned in a few of the reviewed projects (only in Hestia and ReDREAM), there are other potential benefits that have not been thoroughly studied. These benefits include community resilience, improved infrastructure, and the ability to share resources with less fortunate households. Furthermore, a variety of other motivations for participation in demand response programs have been identified (Parrish et al., 2020). Some of these include the opportunity to gain access to free or discounted technology, increased control over energy usage and bills through access to more information, and the belief that participating in demand response can be enjoyable or interesting. Social motivations also play a role, such as the desire to share participation with neighbours, to educate children to be more environmentally conscious, and the desire to help improve the reliability of the electricity system. Additionally, demand response programs with a local focus that foreground local resilience or self-sufficiency can provide additional motivation for participation.

Several gain creators are identified in the analysed projects. Innovative technologies may play a part as Gain Creators insofar as they may enable consumer participation and reduce transaction costs. One of these technologies is blockchain, with which a transparent system can be implemented to validate energy transactions between flexibility providers. This system may sustain another form of value, that is, peer-to-peer sharing or trading. Blockchain technology is a potentially game-changing enabling technology with a promising level of maturity that can incentivise small-scale consumer and prosumer participation in energy markets (Kanakadhurga & Prabaharan, 2022). This technology has been tested in CoordiNet, in which a

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

blockchain-based platform was implemented and deployed to enable the Validation of a P2P marketplace using smart contracts.[1] at the Västernorrland/Jämtland pilot sites.

The introduction of blockchain technology promises significant advancements in system operations and the provision of flexibility services. A salient benefit is the streamlining of supply-demand balance and the bolstered coordination between transmission and distribution systems (DSO/TSO). Gridchain, a blockchain-centric pilot software crafted by PONTON, exemplifies this drive. It facilitates real-time grid management, encompassing both system balancing and congestion management, tailored for the smart grids of the future. Its objective is twofold: fostering enhanced collaboration among TSOs, aggregators, and DSOs, and devising strategies to tackle grid congestion challenges.

Also, the creation of loyalty programmes, whereby flexibility providers get discounts or prizes for their participation, could be a gain creator. This type of programme demand partnering with non-energy actors, and such sort of cross-sector partnerships have been limitedly explored in Europe. Specifically for EV owners, a gain creator would be a reward program with benefits, special discounts, and events that give them a sense of status for their participation in the program. It is essential to clarify that this is only possible at the initial stages of market development since, as flexibility markets gain popularity and become mainstream, the sense of status that comes from being a pioneer could be lost or eroded. Other functional or economic gain creators have been tested in past projects, such as greater convenience in EV charging or reduced prices. For instance, Interconnect aims to test the use of commercial charging incentives in supermarkets (i.e., opportunistic charging to take advantage of surplus PV while shopping) as a potential gain creator for EV owners.

Regarding the pains, change of habits, perception of reduced comfort, and limited understanding about what flexibility provision entails are the most mentioned. One of the most repeated anticipated pains is the disruption involved in changing habits that the provision of implicit flexibility entails (Flexiciency, HESTIA, Platone). Some household practices are more challenging to change, such as showering, whereas others are easier to postpone or reschedule (e.g., washing clothes). Also, dinner times are challenging to change, as findings in research in Italy and France (HESTIA) showed. One possible explanation is cultural norms around food preparation and consumption, as a practice that brings together household members and is of particular importance in these two countries. Another interesting finding of this project is the limited intention to shift the hours in which ICT devices are used at home for leisure purposes. Consumers may anticipate pains in changing these routines, which may limit the value perceived in implicit flexibility provision, but they may not affect the provision of explicit flexibility.

Another pain is the perception of reduced comfort, which may influence participation in flexibility markets (Hestia). Comfort is an accumulation of aspects, such as thermal comfort, familiarity with the space, and the ability to relax. The centrality of comfort implies that heating a home is a non-negotiable practice; consequently, consumers will anticipate pain if flexibility provision is perceived as a compromise of comfort

[1] *"Smart contracts are simply programs stored on a blockchain that run when predetermined conditions are met. They are typically used to automate the execution of an agreement so that all participants can be immediately certain of the outcome without any intermediary's involvement or time loss. They can also automate a workflow, triggering the next action when conditions are met."* https://www.ibm.com/topics/smart-contracts

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

temperatures. It is essential to understand that while heating is a background practice, often invisible as it is done automatically in a large percentage of homes (particularly in Holland, HESTIA), it is considered an important element of control and could potentially interfere with people's comfort. Again, this pain is more significant when flexibility is not done in the form of direct load control with smart algorithms that maintain the desired temperature while gaining kWh for flexibility provision.

Limited understanding or misconceptions about flexibility provision can be a significant pain for consumers and energy market participants (Flexiciency). The complexity of energy markets and the mistrust stemming from past crises can make it difficult for users to engage with and understand flexibility provision fully. This situation could also generate concern about using personal data (TwinERGY). The literature on demand response has also identified these several key challenges and barriers to adoption, such as a lack of understanding of DR and its system value, general complexity, and lack of appropriate market structures. DR also faces consumer-related barriers, such as those related to difficulties in shifting practices and limited information (Good et al., 2017).

Similar pains can be assumed to occur among energy communities, but there are two specific pains worth explaining. First, the regulation of energy communities is still under development in many countries. This limiting or non-existing regulation is one of the main pains identified in past projects. That was explained in section 4.2.1 due to it being a similar pain for all the actors. A second pain in energy communities is the sense of injustice that can be perceived among the members of the community, where some of them may feel that they are making a more significant effort than the rest of their peers. This can generate a lack of commitment from some of the members and complaints from others. However, it is important to remark that there needs to be more research on evaluating the flexibility potential of these communities (Gough et al., 2020).

Regarding the pain relievers, change of habits and loss of control can be relieved with direct load control systems, as this flexibility provision model enables automatic control of appliances (e.g., within a smart-home solution), and thus maximise the customer comfort and minimise the effort requested from them. Not only will these systems demand less effort from consumers, but they also create less disruption of their daily routines, may increase energy awareness and literacy and may empower consumers to be more active in the market (Platone, ReDREAM). Consumers typically want their energy usage to be optimised automatically (Kowalska-Pyzalska, 2018).

When direct load control is not feasible, a possible pain reliever is the identification of energy-consuming moments or practices that can be flexible without disrupting the household routines. Also, it is recommended to co-create with participants solutions that ensure to achieve the expected thermal comfort while providing flex to the system. Receiving feedback on their energy consumption by using an app or web application enabling households to monitor their energy consumption could relieve these anticipated pains for the possibility of identifying these moments through the analysis of the obtained data (Hestia). To identify potential intervention points, the researchers will analyse data on heating times and usage patterns to identify patterns and trends. They will also conduct surveys and interviews with participants to gather information on their comfort preferences and barriers to changing their heating habits. By co-creating scenarios with participants that align with their comfort preferences and goals, the researchers can help them identify ways to achieve thermal comfort while also reducing energy consumption. Additionally, providing householders with access to an app or web application that allows them to monitor their energy consumption

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

in real time can help them become more aware of their energy use and make more informed decisions about when and how to adjust their heating (Hestia).

Considering the pain of misunderstanding or misconceptions, it is necessary to consider certain pain relievers, such as simple and concise explanations that can be delivered via short video tutorials or FAQs (ReDREAM). Maximising the benefits for consumers and prosumers requires providing them with the knowledge and framework for decision-making (Gough et al., 2020). In addition, any application or device must be intuitive and user-friendly, as one of the main requirements for participation is the ease of use. In fact, ease of use was, together with comfort, one of the most important requirements found in the study conducted in the context of SENDER. Emphasising that participation requires neither much work nor much time (and designing procedures and devices that meet this condition) is a fundamental pain reliever for users.

It is also essential to adopt measures that increase transparency and educate consumers about flexibility provisions. This can include providing clear and concise information about the benefits and risks of flexibility provision and ensuring that personal data is protected and used responsibly. Additionally, involving stakeholders in the design and implementation of flex provision programs can help to build trust and increase engagement. Overall, addressing the pain points related to understanding and mistrust of flex provision is crucial for the successful deployment and adoption of flex provision in energy markets (Parrish et al., 2020) (SENDER, ReDREAM).

Prosumers should have easy access to their energy-related data to make informed decisions when choosing a supplier or provider (PARITY). Additionally, customers should have control over how their personal data is used by third parties in accordance with the General Data Protection Regulation (GDPR). This includes the right to access, correct, and delete personal data, as well as the right to object to its processing. By protecting the privacy of consumers through GDPR compliance, individuals are empowered to make informed decisions about their energy usage and how their personal data is used (Kapassa et al., 2021).

Regarding pain in energy communities, an important pain reliever could be elaborating mechanisms to coordinate members as part of a broader governance system that allows the community to distribute rewards and punishments if the members do not contribute equally to flexibility provision.

Figure 8, Figure 9 and Figure 10 consolidate all the results found across three distinct value proposition canvases, each crafted for the different types of consumers mentioned.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

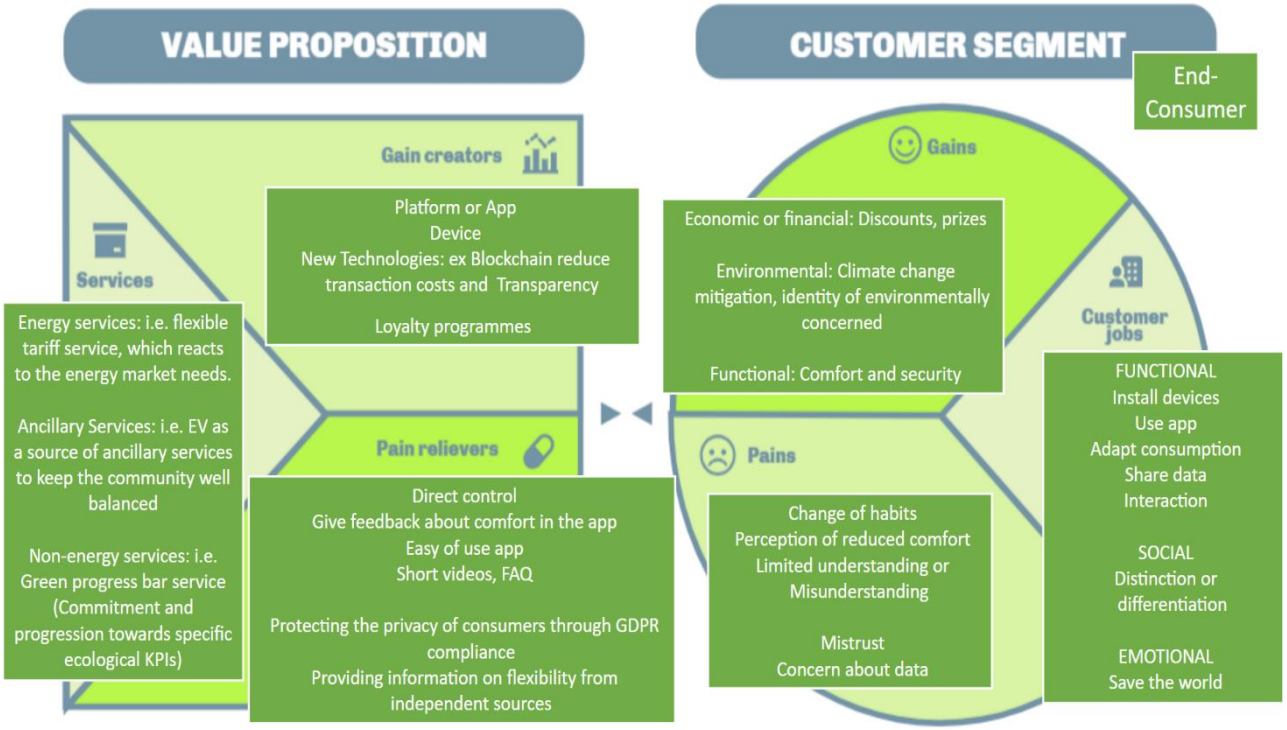

Figure 8. Value Proposition Canvas: End-Consumer summary

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

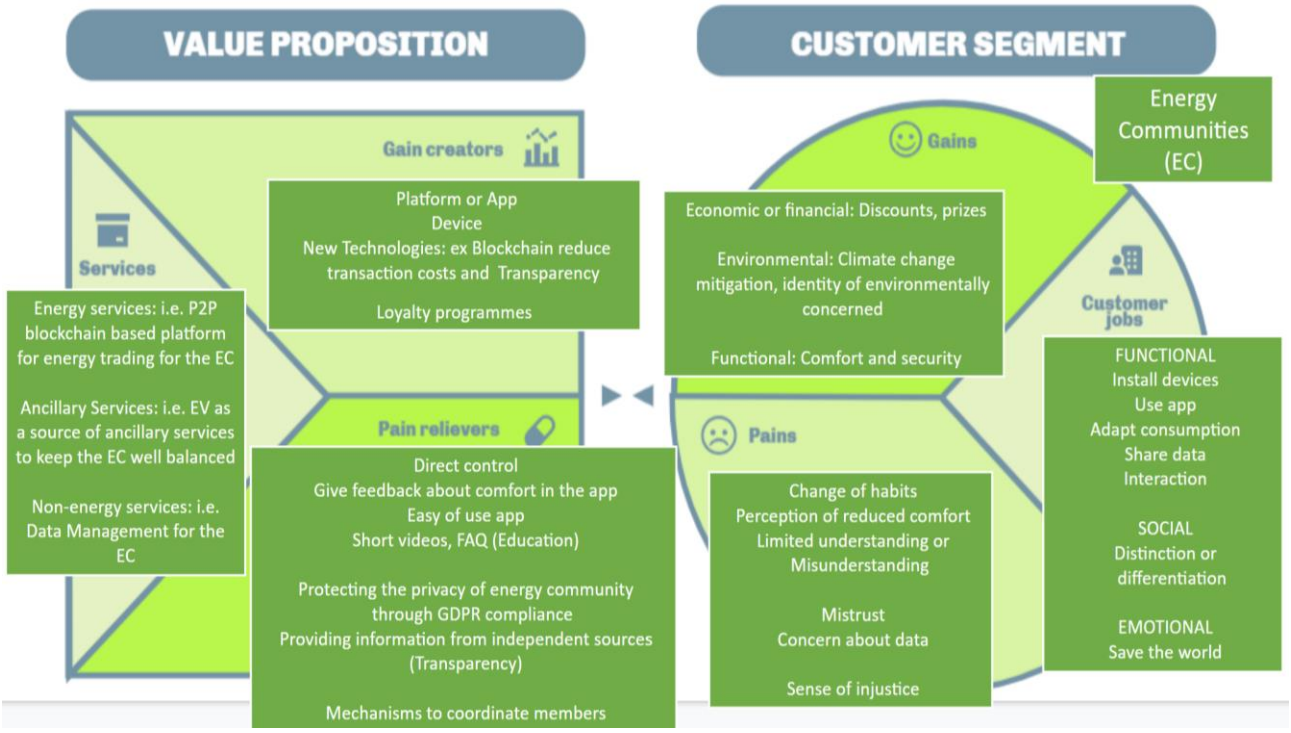

Figure 9. Value Proposition Canvas: Energy Communities (EC) summary

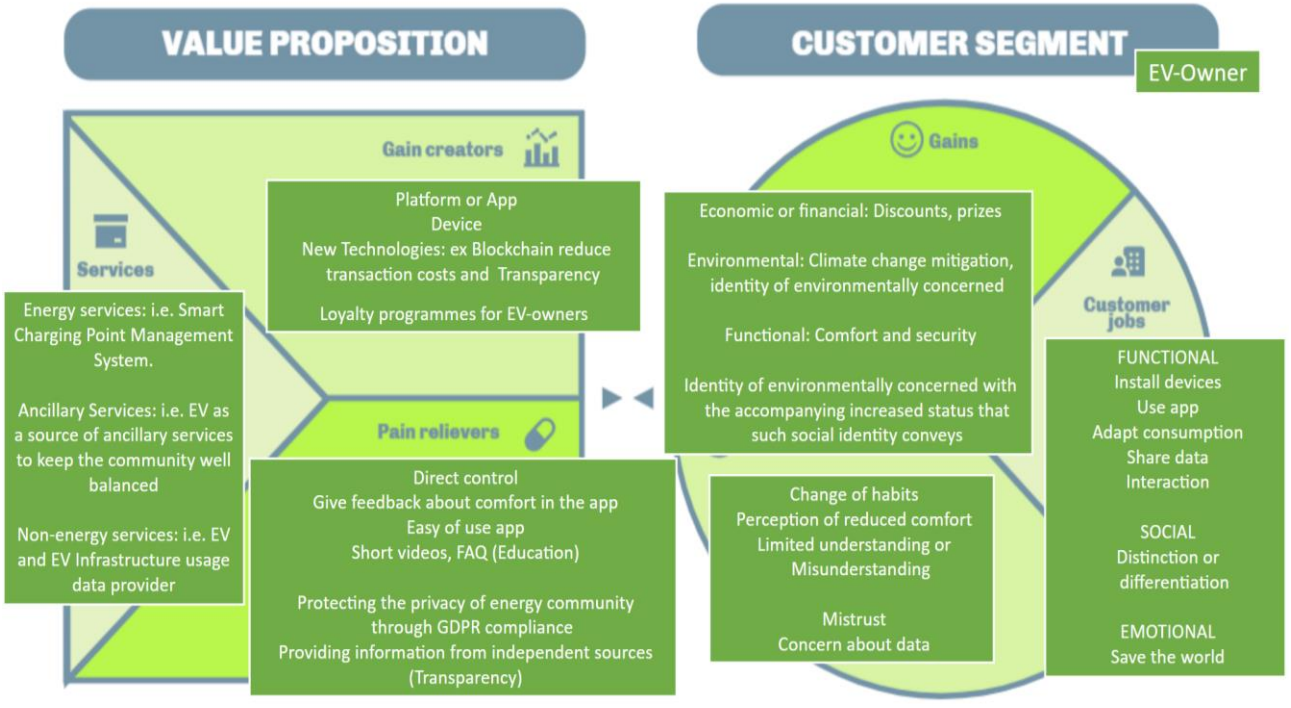

Figure 10. Value Proposition Canvas: EV-Owner summary

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Other grid actors

The analysis of DSOs and TSOs starts with profiling. These actors have several jobs to do in the grid. The mission of DSOs is to operate and manage distribution networks safely and securely. They are also responsible for developing the distribution grids to ensure the long-term ability of the system to deliver high-quality services to grid users and other stakeholders of the electric power system. Similarly, TSOs are responsible for guaranteeing the security and the continuous electric supply and for planning, constructing, and maintaining the transmission grid. Moreover, TSO-DSO coordination is required to make these tasks scalable, and both actors are responsible to develop a scalable framework.

Different services enabled by flexibility provision may facilitate the performance of these jobs. In contrast to the value propositions defined in the previous sections, the services are more standardised here, and the gains/pains of DSOs and TSOs are also similar. This may explain why past projects agreed on the value propositions defined for these actors (see Table 4).

Table 4. Main services for DSOs and TSOs

Services for DSOs	Services for TSOs
• Congestion Management • Voltage Control • Grid observability	• Congestion Management • Balancing services • Grid observability

The main services that flexibility provision may offer to the DSO can be grouped into three types.

- Congestion management. Congestion occurs when distribution (or transmission for TSO) networks fail to transfer power based on the load demand. These problems are managed using congestion management methods, which play an essential role in current deregulated power systems (Yusoff et al., 2017).
- Voltage Control. Voltage control is performed to maintain the voltage level on the system within acceptable limits for proper equipment operation. Voltage variations occur under the average daily and seasonal changes in load level, whereas abnormal system conditions can lead to more severe variations. An additional benefit of voltage control is the ability to reduce distribution losses (Annestrand, 2003).

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

- Grid observability. Observability can be defined as temporal, geospatial, and topological awareness of all grid variables and assets. Any combination of a system state and inputs can also determine the system state using only the measurement of system outputs. Grid observability could be crucial to reliability, resilience, and operational excellence in modern distribution grids (Mataczyńska et al., 2022).

These services provide flexibility to mitigate grid issues such as congestion, voltage threshold violations, and transformer ageing. Each of these can be provided in manifold ways, thus augmenting the granularity of the service provision to grid actors. For example, Coordinet proposes two different services to enable voltage control, called Steady State Reactive Power (provision of voltage control under normal operation of the system) and Dynamic Reactive Power (provision of voltage control under system disturbance)

The services offered to TSOs can also be summarised in three large groups. The term TSO-level refers to services that (often, not always) are location agnostic. Congestion management operates as described above respectively on the transmission grid. Two services specifically offered to TSOs are:

- Balancing services. Balancing services are the mechanisms to ensure the grid comfortably operates at the correct frequency. To successfully implement balancing services, the grid operator incentivises energy-intensive companies with additional revenues for adjusting their power consumption (National Grid UK Balancing Services | GridBeyond, n.d.).
- Grid observability. According to Art 2 (48) of 217/1485 SOGL regulation, "observability area" means TSOs' transmission system and relevant parts of the distribution systems and neighbouring TSOs' transmission systems, on which TSOs implement real-time monitoring and modelling to maintain operational security in its control area including interconnectors.

Each of these services can be delivered with more granular or fine-grained offerings. To illustrate, CoordiNet proposes two different ways of balancing services, Fast Frequency Response or FFR (rapid injection of power or reduction of demand in a timeframe of a few seconds), and Frequency Containment Reserves or FCR (active power reserves available to contain system frequency after the occurrence of an imbalance).

Continuing with the value proposition analysis, DSOs and TSOs will have a series of gains, performing the jobs described above and using the specified services. These gains can be classified as functional, economic, environmental, and social. Functional gains are related to compliance with technical and operational issues of the network and are frequently mentioned in past projects, albeit with different wordings. For both DSOs and TSOs, these gains occur as a result of reduced stress on the grid (voltage/congestion/transformer ageing), thus achieving safe and efficient operation, grid stability, and enhanced security (EUniversal, InteGrid, NobelGrid, Renaissance). Alternatively, said otherwise, the services will allow using flexibility to optimise grid management (Ebalance-plus). As a result of flexibility services, DSOs, for example, can monitor and assess the operational behaviour of the networks and, if available, the DERs' protection system (Fever).

Part of this optimisation will be achieved through better forecasting enabled by the data obtained. Electric load forecasting is implemented by energy-providing companies to predict the power and/or energy needed to meet the demand and supply equilibrium. Forecasting accuracy is of great significance for a utility

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

company's operational and managerial loading (Techopedia, n.d.). It supports power generation planning and development planning of an electric power system. Accurate electric load forecasting is significant for power systems' economical, safe, and reliable operation (Wen et al., 2018). Through a smart grid prognosis tool and fed with the data obtained from users, DSOs will be able to forecast potential problems in the network. They will be more capable of performing the appropriate preventive actions (NobelGrid).

Regarding the economic gains, flexibility services to DSOs and TSOs should result in reduced “wear and tear'' on the grid infrastructure and on mitigation of hardware investments (FLEXCoop). Thus, the main economic benefit of flexibility services for these system operators (SOs) is the delay or avoidance of investment in network reinforcement infrastructure (CoordiNet, balance-plus, Fever, Integrid). This will directly impact the Cost of Energy Not Supplied (CENS), which will, in turn, save penalties in case of poor voltage quality, distribution facilities cost avoidance (CoordiNet, balance-plus, Fever), and improve the efficiency of their operational costs (NobelGrid). In addition, SOs may receive regulated income as grid managers (charges for the grid connection) (EUROPEAN PARLIAMENT, n.d.). This also facilitates market development and consequently increases the economic benefits of DSOs and TSOs. It is important to specify that economic benefits are intertwined with the establishment of an apt remuneration scheme. In this scheme, flexibility service providers are compensated based on prices derived from a comprehensive cost-benefit analysis. Given that flexibility incurs its own costs, the remuneration structure must be judiciously crafted to ensure it doesn't become prohibitively expensive.

Although environmental gains are not considered or quantified in most projects (they are considered potential gains for the final consumer), they can be deducted through the gains described above. Among the environmental gains, flexibility provision to the grid will avoid the construction of new lines, fewer materials, and less transportation of resources related to the construction of new transportation and distribution lines will be used, thus generating less environmental impact. This contributes to the optimal use of resources. Of course, it contributes to reducing carbon emissions by expanding the share of renewable sources without jeopardising the grid's stability. Optimal network management also reduces emissions due to a higher quality of service offered and lower energy losses in transportation and distribution.

Finally, correct TSO-DSO coordination will lead to a cheaper, more reliable, and more environmentally friendly consumer electricity supply, achieving functional, technical, environmental, and social gains (FlexGrid) at the grid level.

The leading gain creator in most analysed projects is the platform offered to DSOs and TSOs. These platforms are customised in each project and adapted to the services offered. They are generally digital interface services, in which the provider supplies the apps and web applications to allow the interaction between the local platform and the members of the community; they also provide the maintenance service for the platform, and, finally, they provide the updates for the platform (Renaissance). An example of such a platform is the FLEXGRID platform, which provides a tool for minimising DSO's CAPEX and OPEX. Also, it provides a tool for advanced B2B interaction between one or more large-scale Energy Service Providers (ESP) which offer services to TSOs. The ESP can optimally use FLEXGRID's intelligence to plan and schedule its large-scale flexibility assets. Another form of gain creator is the services to operate the platform. In this case, a third party offers the service, and the company does not need to invest in training its personnel. However, this gain

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

creator has not been found in the projects, but it can be seen both as a gain creator and a pain reliever in cases where the company does not have trained personnel to operate the platforms.

Finally, in relation to potential pains actors might face when utilising the services, these challenges can be categorised as functional, organisational, economic, and regulatory, as elaborated in section 4.2.1. The most frequently cited functional challenge or pain is uncertainty in operations. As DSOs integrate flexibility, TSOs might grapple with diminished predictability concerning future grid conditions. This could further complicate their task of ensuring a secure supply. The onus of ensuring this security will be jointly shouldered by both

TSOs and DSOs, (Integrid). While TSOs don't require detailed insights into distribution networks, the necessities for supply security across various timeframes are articulated during the transposition of the EU Network Code SO GL (which is beyond our focus) and within coordination frameworks pertaining to ancillary services, a core aspect of BeFlexible.

The lack of standardisation and interoperability of technologies and communication protocols can create challenges in coordinating and controlling different energy sources and loads. This situation can lead to difficulties in integrating different energy carriers and technologies and in communicating and controlling the behaviour of consumers. This can also lead to difficulties in making sure that different devices and systems can communicate with each other and share data effectively, which can make it harder to predict and control consumer behaviour and optimise the performance of the energy system as a whole (Vahid-Ghavidel et al., 2020). Related to this, achieving complete observability or monitoring of the grid is probably not possible because the cost of achieving it would be too high (Integrid). It is important to notice that the term 'observability' is traditionally aligned with the responsibilities of the TSO, whereas 'monitoring' typically falls within the purview of the DSO. It's crucial to understand that 'observability' does not equate to exhaustive monitoring of the network. At its core, observability means having the capability to access power (P), reactive power (Q), and voltage (V) values for all pertinent nodes with the necessary temporal frequency and precision, contingent on the specific scope of the observability in question.

Regarding the economic pains, a significant initial investment is necessary to adapt the current systems. This pain is even more acute when economic incentives for DSOs are not in place, so there is no appropriate DSO revenue regulation. So far, there is not an integrated market for trading flexibility at the distribution grid level, and there are difficulties in defining local markets (unit size, liquidity) (FlexGrid, InterConnect, NobelGrid). Markets for trading flexibility are already in existence; however, their characteristics vary significantly across countries. Consequently, there isn't a one-size-fits-all model. The approach to understanding these markets hinges on whether the focus remains solely on the projects under investigation or if there is an intention to delve into a broader exploration (Chondrogiannis et al., 2022).

These pains should be relieved to encourage these actors to participate in the flexibility market. It is important to note that pain relievers are not evident in most of the projects. TSO-DSO cooperation becomes essential as a pain reliever in functional pains. To ensure an efficient and secure functioning of the grid and efficient market facilitation, effective and efficient coordination regarding data management between TSOs and DSOs is critical, which demands a standardisation of TSO – DSO data exchanges. Increased importance and amount of data will require more standardisation of formats; working with a clearly defined set of standards would improve data handling (Fournely et al., 2022). First, at the national level, TSOs and DSOs should agree on a

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

harmonised set of relevant data formats and protocols to exchange information (FlexGrid, InterConnect, NobelGrid) (ENTSO-e, n.d.). In the longer term, both actors should promote further harmonisation of all electricity data formats at the EU level, closely involving market parties and regulators. The cost of a potential transition to new data formats and protocols should be recognised by the National Regulatory Authority (NRA) and recovered on time. For this, clear roles and responsibilities need to be defined in the market design, considering all interactions and efficient and reliable data exchanges between TSOs and DSOs arising from this coordination (ENTSO-e, n.d.).

Accurate data access is essential for the market to function correctly and for the relevant market players to compete fairly. Therefore, it is essential to ensure data access and data sharing are available while at the same time adhering to General Data Protection Regulation (GDPR) guidelines to protect consumer privacy. Although data collection is not the primary responsibility of DSOs, it is still necessary for them to gather information. If the data needs to be transmitted to multiple participants, DSOs might be reluctant to do so as it would require additional effort. Therefore, suitable regulations should be implemented to securely share information between DSOs and aggregators (Kapassa et al., 2021).

A significant challenge mentioned in utilising flexibility in power systems is uncertainty, for example, the difficulty in estimating the amount of power that can be ramped up or down and how long it can be sustained at the DSO or TSO level. (MacDougall et al., 2013) present methods for estimating these characteristics using quantifying formulas, which they validate through simulations of thermal electric devices based on real-world installations. They also discuss the benefits of this knowledge for various stakeholders, such as Virtual Power Plant (VPP) operators, who can use this information to aid TSOs in balancing the system in cases of over or underproduction. In these cases, simulation could be a pain reliever.

Good observability could be achieved with a combination of the input from several sources of measurements: Advanced Metering Infrastructure (AMI), smart meters, pseudo-measurements like load profiles, and for accuracy, maybe the most relevant one can be micro-PMUs (Phasor Measurement Devices) that can measure the parameters of the grid (InteGrid). Smart metering is necessary for allowing households to participate as small, flexible providers (Fournely et al., 2022). In some cases, the use of several sources of measurement could be a pain reliever.

Beyond the value propositions, the definition of Use cases and Business models adapted to the needs of these actors are essential to achieve correct communication, operation and remuneration for both DSOs and TSOs. Innovative Business Models based on artificial intelligence, which can be exploited to achieve economic and operational benefits through efficient interaction and the design of such an integrated marketplace, are being tested in several projects (balance-plus, FLEXGRID, InteGrid, ReDREAM).

¡Error! No se encuentra el origen de la referencia. consolidates all the findings derived from a single value proposition canvas that combines the perspectives of the two distinct actors discussed in this section: DSO and TSO.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

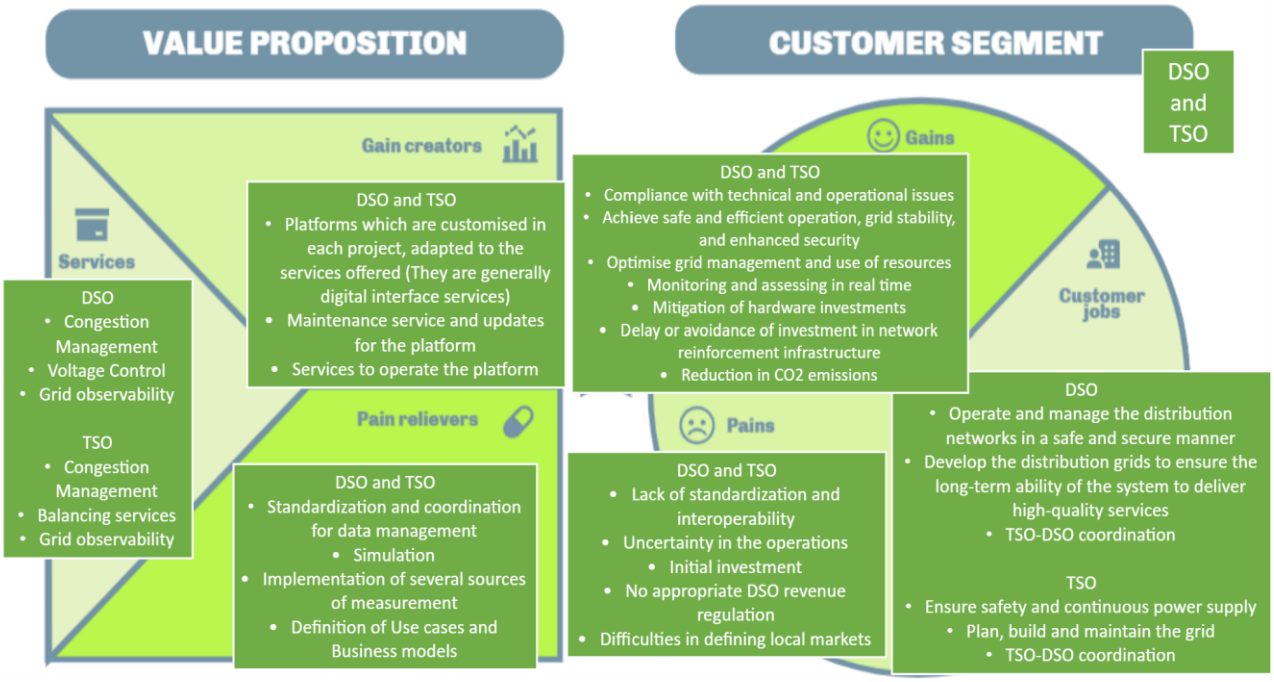

Figure 11. Value Proposition Canvas: DSO and TSO summary

Aggregator

Aggregators are entities that bring together multiple small energy consumers, such as households or small businesses, but also generators and storages, on spot market (BRP) and ancillary services market (BSP); and negotiate with electricity providers or grid operators on their behalf. By pooling the demand of multiple small energy consumers, aggregators can amass the minimum power or energy necessary for participating in the market, negotiate more favourable terms with electricity providers or grid operators and enable these consumers to participate in demand-side flexibility programs (Forouli et al., 2021). The services for Aggregators are a range of services such as energy services, i.e., aggregation services for consumers enabling the participation of the consumers in the electricity market, optimisation of consumption and production for prosumers; ancillary services, such as balancing services for the grid; and non-energy services, such as data management services.

Regarding the jobs, different activities can be considered for this actor. An aggregator connects consumers/prosumers, retailers, and DSOs. In terms of energy demand, an aggregator can set up an agreement with several consumers, based on which it can temporarily reduce their electricity consumption when there is a high electricity demand. An aggregator could also be operating the reverse action and increase the consumption of an electricity consumer when electricity prices are favourable. These jobs demand direct load control systems (ReDREAM).

In Energy Communities (ECs), participants such as natural persons, municipalities, and SMEs can be involved. Within this framework, entities like independent aggregators might operate, potentially functioning as a

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Virtual Power Plant (VPP). These aggregators can represent a group of consumers involved in self-generation, facilitating the sale of their surplus electricity. It's pivotal to differentiate between aggregation for participation in the spot market and participation in the ancillary services markets. Energy communities have the potential to engage across all markets, including through aggregation mechanisms.

Furthermore, aggregators will support energy providers and network operators by providing flexibility trading. Having available flexible capacity on the market is needed to counter-balance the increasing share of intermittent generation resources in the transition towards a low-carbon economy or optimizing energy markets through providing cost-efficient and flexible capacity in energy peak situations. Finally, the Aggregator needs to develop a digitized business experience to maximize profits and end-user gains. It must also face competition at the retail level to derive economically sustainable business models (balance-plus, Platone, RENAISSANCE). Starting from peer-to-peer exchange of energy flexibility, a broader circular economy system could be implemented involving the exchange of services and goods among peers and reinforcing the concept of local communities, reinforcing microgrids in opposition to a single grid.

Continuing with the value proposition analysis, the Aggregator will have a series of gains, performing the jobs described above and using the specified services. These gains can be classified as functional, economic, environmental, and social. Regarding the functional gains, they can benefit from the data they collect on the energy consumption patterns of their clients and potentially use that data to develop new products or services (Forouli et al., 2021).

Regarding the economic gains, their incomes are based on a margin on purchasing or selling energy, and the costs are the purchase or selling of energy and the new smart grid technology required (cost for the deployment of an adequate infrastructure for monitoring and control). The Aggregator maximizes its profits by dynamically orchestrating distributed flexibility resources from its end users to optimally participate in several energy markets (balance-plus, Platone, RENAISSANCE). They can benefit from the revenue generated by their services, such as balancing services, optimisation of consumption and production, and enabling the participation of consumers in the electricity market (Forouli et al., 2021). This optimisation in the use of energy resources derives in environmental gains, which, although not generally considered in the projects, help reduce GHG emissions.

Considering the socioeconomic gains, in different interviews, participants expressed their ideas about how the Aggregator can act as a technical facilitator to enable energy flexibility in local communities, thus elaborating on the concept of Renewable energy communities (REDII, n.d.) as a starting point of a more virtuous cycle from a socioeconomic perspective (Platone).

The main gain creator in most of the analysed projects is the platform offered through them and the adequate business model. According to P2P-SmarTest, the suitable business model for an aggregator is a platform model, where on one side, the Aggregator allows consumers/prosumers to buy and sell electricity from peers or traditional suppliers. In contrast, on the other side, an Aggregator collects consumers'/prosumers' energy consumption and behaviour data. The most influential gain creator that DRIvE provides, for example, is the technical and functional capabilities of the Multi-Agent Platform developed by CEA, which optimises ESCOs' multi-sided business model. In essence, it enables the aggregators to effectively exploit the active participation of Local Energy Communities to aggregate flexibility for the provision of commercial services to

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

energy market stakeholders while ensuring maximum value of the prosumer's flexibility. Drive platform offers an integrated solution for servicing different ancillary services, facilitating the entrance of aggregators in the electricity market with a single platform to bid in all the different ancillary markets. In another example, aggregators may use the balance-plus platform as a Virtual Power Plant (VPP), which provides a business opportunity to trade energy flexibility from prosumers with market players. The balance-plus platform can help aggregators fit aggregated loads to flex products on the energy market (DRIvE, balance-plus, Platone).

Finally, regarding the pains actors could experience while using the services, they can be classified into functional, organisational, economic, and regulatory. Regarding functional pains, problems of interoperability and intercommunicability with suppliers and buyers of flexibility provision without a standardised communication and operational system are mentioned as an essential pain (FlexGrid). The lack of standardisation of market access interfaces is a problem (FlexGrid). It is a functional pain due to the lack of standardisation in the market, making it difficult for aggregators to communicate with different electricity providers and grid operators. Also, the need for real-time data for certain services, for example, balancing, complicates the situation (FlexGrid). This can limit their ability to negotiate favourable terms and participate in demand-side flexibility programs (Forouli et al., 2021).

One of the main pains is that aligning regulatory needs to facilitate market operation takes a long time. For example, an independent aggregator interviewed in FlexGrid acknowledges that service provision to DSOs and TSOs will be a viable business in the future but not in the short term. He mentioned the wide variation of national market rules and designs as a significant barrier, as aggregators are limited in replicating their tools. Aggregators must navigate a complex regulatory environment (Section 4.2.1), with different rules and regulations in each country, making it difficult for aggregators to operate across multiple countries and jurisdictions (Forouli et al., 2021).

Considering the economic pains faced by aggregators, several key pain points have been identified, including uncertainty, financing, and market design. The uncertainty of customer demand for energy at specific times can create high risks for aggregators, making it difficult to predict and plan for their energy needs. Additionally, aggregators often struggle to secure adequate financing to develop and maintain the infrastructure and operations necessary to manage and distribute energy effectively. Market design can also pose a significant challenge for aggregators, particularly in markets where large utilities or generators hold significant market share, making it difficult for aggregators to compete and access the market. These challenges have been highlighted in recent research by Forouli et al. (2021), who have studied the barriers faced by energy aggregators in different markets.

These pains must be alleviated to encourage these players to participate in the flexibility market. Regarding economic pains, the proposed business models must be financially sustainable for aggregators and final energy consumers, which also demands establishing good pricing strategies and finding other sources of revenues that sustain the operations until a critical mass is reached (balance-plus, Platone). Additionally, they can pursue strategic partnerships with other companies, such as utilities or generators, to gain access to necessary financing and resources.

Prediction tools for aggregators are considered another pain reliever. Estimating the available flexibility of consumers is very important for aggregators. Underestimating the available flexibility reduces the revenue of

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

aggregators in the ancillary services markets, and overestimating the available flexibility can impose high costs due to their inability to meet their flexibility obligation. Aggregators must use forecasting methods that help them estimate the flexibility available from all consumers and DERs. Also, aggregators should bid on the flexibility market. Anticipating the behaviour of other market players in the flex market and the amount of flex the market will request at different times of the day will help them make a more accurate offer to the market and increase their profits (balance-plus, Platone).

Standardisation is a crucial pain reliever for the success of demand response solutions and data acquisition. Lack of standardisation can lead to interferences between different components of the system. To ensure consumer engagement, clear and easy-to-understand procedures and offers are necessary. Standardised services that can be easily compared with each other should be offered. Additionally, a limited supply of green energy and integration with the power grid can create technical issues (Kowalska-Pyzalska, 2018).

Finally, it is essential to mention the benefits that the role of the Aggregator can generate for the rest of the actors in the energy market. Aggregators can provide several benefits for the small energy consumers they represent. By pooling the demand of multiple small energy consumers, aggregators can negotiate more favourable terms with electricity providers or grid operators, such as lower electricity prices or access to demand-side flexibility programs. Aggregators can also provide a range of services to their clients, such as balancing services, optimisation of consumption and production, and enabling the participation of consumers in the electricity market. This can help small energy consumers to manage their energy usage and costs better and potentially reduce their overall energy expenses. Additionally, aggregators can help improve the electricity grid's overall efficiency and stability by coordinating the demand of multiple small energy consumers and enabling them to participate in demand-side management programs that can help to balance the supply and demand on the grid (Forouli et al., 2021). Figure 12 summarizes all the findings for the aggregator.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

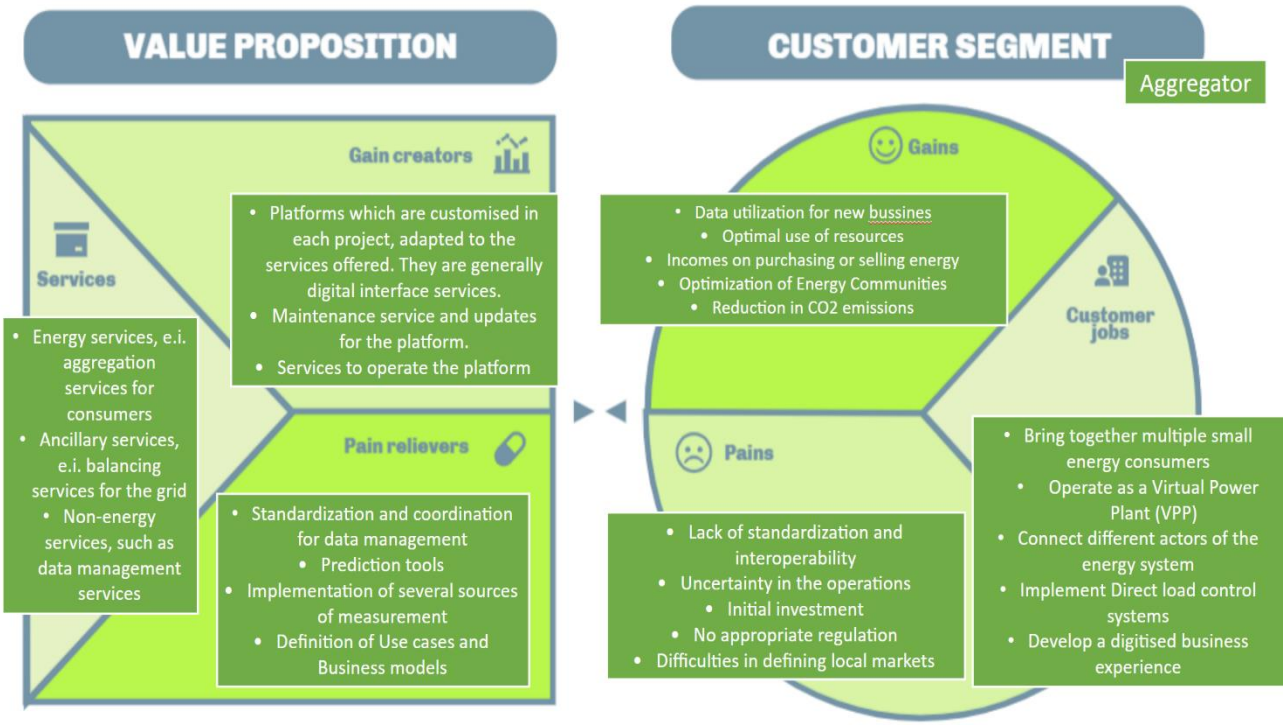

Figure 12. Value Proposition Canvas: Aggregator summary

5. Value propositions

5.1. Introduction

BeFlexible project relies on general services that will be tested in four different demo locations. The types of services established in the Grant Agreement are consumer-centric and grid-centric services. The initial development of Value Propositions is based on consumer-centric services as they have much more variations in motivations, ways to apply the service and barriers to their implementation. Value propositions are also developed for grid-centric services.

In addition to developing value propositions, the goals of the research were to

a) Develop the value propositions of the existing services that will be tested in the Demo Pilots.

b) Identify new services and develop their corresponding value propositions

c) Gain insights to develop the engagement strategies that can act upon the identified motivations, emotions, pains and gains.

d) Give inputs for the business model development; the tool will operationalize this by specifying the grid benefits and providing business models for each service.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

To be clear about the differentiation between engagement strategies and business models, the **engagement strategies will answer the question of what users want** in exchange for providing the required services, and the **business model will answer how the system organize to** provide them.

Figure 13. Value Proposition Relation with engagement strategies and business models

The Value propositions are contextualised to the service tested. Interviews with Demo leaders and service providers were carried out to understand the services proposed and to get a first understanding of users. This sketch of users extended to the suggestion of profiles of users that should be interviewed to understand each demo's contextual conditions better. The developed tool or value proposition framework was validated by means of validation workshops with demo leaders and other academic project partners.

We outlined value propositions that could be adapted to user archetypes and user equipment. This is accomplished by defining value propositions tailored to equipment and emphasising how the value proposition could be adapted to each of the identified archetypes. Archetypes apply to residential consumer, industrial, commercial or public buildings as principal actors.

Demo pilots have different target users categorised in the archetypes identified. A critical dimension for the differentiation of archetypes is technology use. The different technological readiness of users was found to be a critical condition for the provision of flexible services. Another critical dimension is their engagement with energy and the new services/technologies enabling the energy transition. This dimension explains a distinct willingness to engage with the energy market.

Our proposal of value propositions is depicted in a Value proposition tool that serves as a guide and a tool for Demo Pilots (and other partners of BeFlexible) to understand and choose the value they can offer to users and the jobs that consumers have to do to co-create flexibility-based services.

Value propositions and engagement

Developing unique value propositions for each service/resource and type of user is the basis for an engagement strategy development since understanding the motivations, emotions, barriers, economic and non-economic incentives and jobs that users need to do will help us customise each value proposition and its concretisation to the user archetypes. Some of the components of the value propositions, such as customer

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

jobs and pain relievers, can be used as levers or serve to orient messages and activities in any of the phases of the engagement strategy, which are recruitment, participation and continuance. The value propositions facilitate the outline of an engagement strategy because they explain **what the user wants in return for flex provision.**

The motivations and barriers to engagement can be emotional, functional, experiential or social (Table 5). The proposed tool of value propositions unveils all these singularities for each profile and Demo pilot. They are vital to understanding how users want to relate with energy, how they want to interact with other actors and what type of value they expect from this relationship. To illustrate, in the formulation of the engagement strategies, the value proposition tool could be used to:

a) Contextualise the resource needs

b) Identify the type of user with the archetypes

c) Adapt the recruitment messages according to their needs

d) Maintain users by creating ongoing value centred on their main motivations

e) Avoid situations where users feel friction (barriers)

f) Try to mitigate consumer pains

Table 5. Barriers, levers and motivations for flexibility acquisition services

Barriers	Levers	Motivations/values sought
Initial investment Energy market instability and mistrust Technology development Energy prices Lack of information Complex subsidies Price unfairness	City strategies Gas replacement Economic subsidies Regulations	Savings Efficiency Self-consumption Convenience Grid self-sufficiency Comfort Reduced carbon emissions

Value propositions and business models

As explained in Section 2, business models are grounded on value propositions; on the basis of value propositions, the customer side of the model is defined, including the pricing or revenue strategies. Value propositions modulate pricing decisions: when consumers perceive significant gains, the pricing (or, in the case of flexibility provision, compensation) is less relevant; in contrast, if gains are lesser than pains, pricing

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

has to act as a compensatory element (i.e., value < pricing > value). Value propositions for business models explain **how the users want to receive the value offered.**

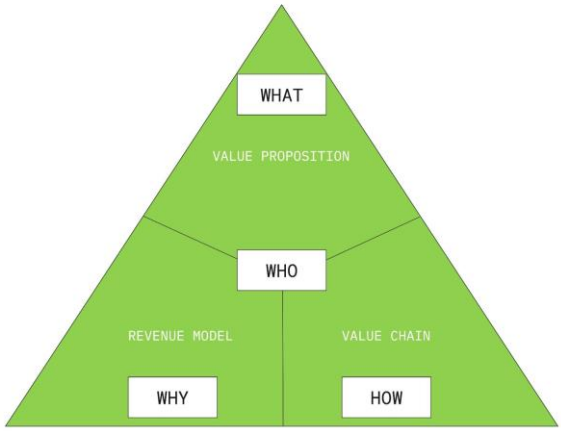

Figure 14. The business model triangle

A value proposition is the starting point of the value chain development and the revenue model, which are the basis of the business model configuration. The value chain explains the series of steps in creating a product or a service where the user's perspective is vital to design consumer-centrically, and the revenue model explains how the service provider will charge/compensate users while using their product or service. A consumer-centric perspective for defining value creation and revenue streams is vital to the service's success.

However, pricing is at the core of the value propositions, as flexibility is based on an economic benefit. Although different non-economic benefits can be proposed, user participation in flexibility markets is based on a transactional motive in which pricing strategy and business models are crucial to participation since other motives are insufficient for users to provide flexibility.

Energy management is oriented to efficiency, and efficiency usually translates into monetary savings. Pricing is salient for consumers when discussing their energy consumption/production and often is the crucial lever for users to participate or not in a flexible service. If the price offered for users in exchange for their behaviour change is not enough (as it is in most of the Demo pilot's countries), users are reluctant to participate in flex provision.

Also, for other users, the type of tariff they enjoy modulates their willingness to co-create some flexibility services. For example, users with a flat tariff are often less interested in the behavioural change underpinning flexibility. Moreover, users who do engage in behavioural change expect to be compensated either with monetary or non-monetary incentives. Economic and non-economic incentives should be considered when designing a flexibility service as they condition both the acceptance and participation of consumers in flexibility services. Non-economic incentives can substantially impact energy consumption and perception of energy, sometimes more than economic incentives. These non-monetary incentives are increased comfort or health, learning or enhanced knowledge, social interactions or lower carbon footprint, to name a few. These

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

incentives generally respond to a call to action where users are asked to do a job or change their behaviour in exchange for any of the abovementioned incentives.

Service product and productisation

A much-repeated barrier to user participation in flex provision is their limited understanding of flexibility services. Because energy is an intangible resource and often perceived as a commodity, it is challenging to make clear the benefits users will get in return for their flex provision. Indeed, the value proposition tool proposed in this deliverable aims to clarify and depict a transparent value exchange between users and the energy provider.

As section 3.3 explains, flexibility services can be presented to consumers with a productisation or a servitisation strategy. Productisation facilitates the understanding and acceptance of value propositions as they are packed and presented to consumers as "object-like" products. We observed that productisation of flexibility provision could be more accepted by consumers as the concretisation and material embeddedness of the service makes it more clear, less risky and more understandable. To illustrate this, users can be approached with a serviced offer of a smart charging tariff or with a productised offer of a device that ensures that their car is charged when they need it with noticeable savings. Similarly, the "digital batteries' are an example of a productised offer: a service (a discount for your produced and non-consumed energy) is presented as a specified and material product (battery) and branded (digital batteries). The benefit for consumers is clear (savings based on non-used energy), and the flexibility provision embedded in this offer needs to be clearer and more explained. We have found other examples of productisation vs servitisation in the research. The main difference between the two lies in whether the offer is encapsulated or not into a digital or material device and consumers are informed of the gains this device creates (productisation) or whether consumers are informed of a material-less gain that can be presented in the form of tariff or subscription service.

5.2. Research Objectives and Methodology

The objectives of the research enabling the co-creation of value proposition, as defined in the BeFlexible Grant Agreement, are:

- Archetypes development and identification to easily segment the variety of consumers targeted in the demos so that value propositions can be matched to these archetypes.
- Identify the form of value that should be foregrounded (be it economic, environmental, community or social, among others)
- Uncover other features of Value Proposition that prove effective at overcoming resistance to participate.
- Identify economic and non—economic incentives (environmental or social) for sustainable engagement of consumers in flexibility products.
- To finally define the targeted value propositions, a match with the customer-centric services deployed in each demo to deliver a relevant value for each market actor in collaboration with the services providers and WP3 leaders.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

To meet these goals, the research followed a human-centred methodology (also known as design thinking). This methodology is appropriate for complex problem-solving that puts people (users) at the centre of the process or analysis to design *for* users, from users and *with* users. By gaining first a deep understanding of users and their context, it is then possible to design products or services that adapt to the reasons and conditions user's demand. Through the methodology phases (understand, design and validate), we will be able to uncover the real user motivations that will provide the foundations of user-centric value propositions.

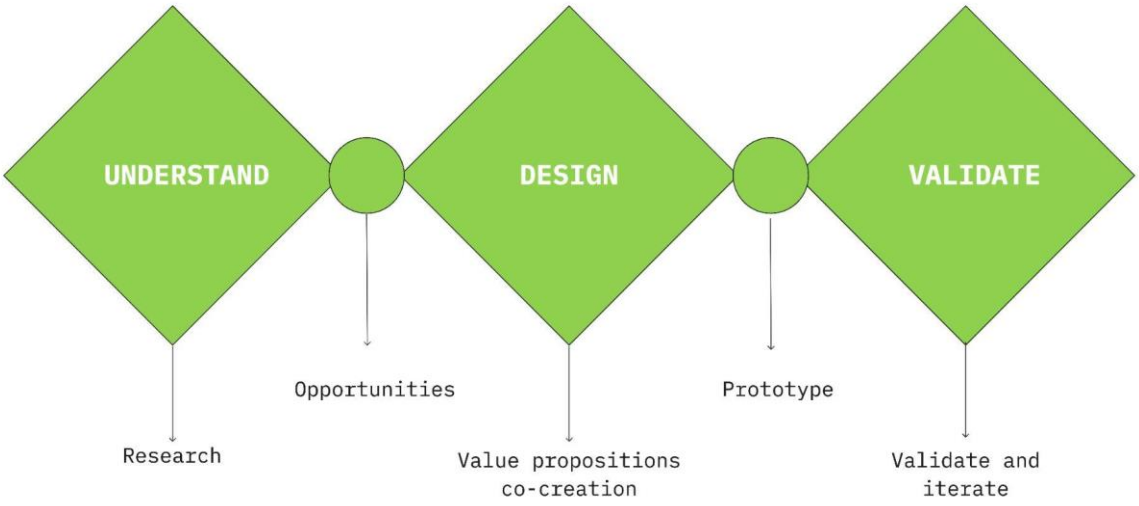

Figure 15. Human-centred design methodology

With the input of the value proposition review (section 3), a qualitative method was implemented comprising two main activities: interviews with experts and interviews with users. First, to understand the context of the demonstrations and the services proposed and tested in each demo, interviews were held with the actors involved in the service value chain and with demo Leaders. This allowed us also to understand the readiness stage of each service. Second, we held in-depth interviews with users in three demo countries (Italy, Spain and France) to obtain an initial understanding of their needs, perceptions, jobs and emotions. In-depth, empathy interviews are more appropriate than surveys at the discovery or understanding stage since the main objective is to uncover unmet needs and motivations. Empathy interviews also create a safe space for users to feel more secure in revealing their experiences and desires. This technique demands open-mindedness, active listening and a non-judgemental stance from the interviewers.

These interviews were oriented to understand 1) the motivations, barriers and levers of users in order to participate in flex services; 2) the different forms of value sought in flex services and how they related to their resources and equipment; and 3) the possible value exchange desired or compensation expected.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

For this, a semi-structured conversation guide was used. We identified blocks of questions or topics to be covered in the interview, but they were asked in a different order depending on the development of topics during the conversation. The conversation guide comprised four main sections (See annex 2).

- Section I: Perceptions and relationship with energy in general
- Section II: value perceived in energy
- Section III: Perceptions of the energy market
- Section IV: Existing resources or equipment and relationship with them

The interview guide was adapted to the Swedish context in view of the differences in the profile of informants. The interview guide used in Sweden can be found in Annex 3:

- Section I: Your Business
- Section II: Energy Markets
- Section III: Flexibility Services

Together with Timelex, a consent form was created that ensured informed consent and data protection, thus complying with the GDPR requisites. This consent form was translated into local languages. The personal data gathered from the interviews were included in a separate file and only accessible by the data processor in Soulsight and the local researcher in Italy. The rest of the analysts had only access to anonymised transcripts.

Following the ethics of empathetic research techniques, we started by describing the project so that users understand what it entails. The introduction also aimed to create a space of confidence for users to express freely their thoughts about the topics to be addressed. The introduction followed this structure:

- We explained the objectives of the conversation
- We explained the BeFlexible project
- We explained what an empathy conversation is and that there are no correct or wrong answers.
- We explained the consent form and its main contents (anonymity, non-commercial use of information)
- Permission to record the interview was sought as this facilitated the interviewer's active listening.
- We asked them to introduce themselves as a way to initiate the conversation.

We used purposive sampling to identify archetypal profiles of users that matched the context of each demo. Users represented the four profiles targeted in this project: residential, commercial, industrial and public building users. To find users that matched the profiles, we searched for possible informants in coordination with the Demo leaders. The primary sampling criteria was possessing key equipment such as EVs, PV panels, aerothermal systems, electric heating and cooling, among others.

Table 6. Type of user on each Demo Pilot

Spain	France	Italy	Sweden

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Residential consumer Residential with holiday homes Commercial Public building Iberdrola offices City council	SAP employers Residential	Residential consumers living in a condominium Consumers with PV in a detached or semi-detached house Manager of EV charging points Industrial	Residential property owner Commercial property owner Property developer Municipality Industrial with warehouse/logistics Industrial customer with sensitive processes

We conducted 27 interviews that included people from three of Demo Pilots (Spain, France and Italy). The interviews lasted between 45 and 60 minutes. The number of informants reflected the pilot size (e.g., 17 Spanish informants, as there are four demos in Spain). In Spain, 3 interviews were held on-site at the headquarters of Iberdrola in Madrid. The other 14 were held online. These interviews covered residential users, experts, public buildings, one industrial and two commercial users. These profiles matched the expected users of the Spanish demo.

In France, 5 interviews with SAP workers were held, as the services tested in this demonstration target SAP workers and SAP offices. In addition, we co-hosted user workshops on site at the SAP laboratory in Sophia Antipolis, presenting the pilot demo opportunities to potential users and asking for their direct feedback. French interviews were conducted online. In Italy, due to language restrictions with residential users, a local researcher facilitated 5 online interviews. Soulsight did another online interview with an industrial user.

In Sweden, the understanding of service users is relatively advanced based on market research conducted by E.ON and their user summaries are included in this document (see Findings). However, the key customer in the Swedish Demo is not the end user but the Flexibility Service Provider (FSP) who should be contracted to fulfil the users' needs in partnership with the DSO. We therefore interviewed a key market player with experience operating in the target area to understand their perspective.

Table 7. Interviewees' profile

Pseudonym/user	**Gender**	**Profile**	**Description & building type**	**Equipment**	**Country**
Antoine	M	Residential	Very conscious, living in an old	PV, EV	France

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

			house in downtown Nice		
Marion	F	Residential	Homeowner. Working for SAP for 20 years. 4 inhabitants, but their daughters are students, so they spend time away.	PV, EV	France
Henri	M	Residential	Very environmentally conscious. High income.	PV, EV	France
Pierre	M	Residential	Sells everything of his production to the grid	PV	France
Lois	M	Residential	Researcher, user, energy expert	All electric house. No EV or PV	France
Giacomo	M	Residential	Lives in an apartment with 3 bedrooms, with wife and 2 daughters	FV on the roof + home energy storage	Italy
Serena	F	Residential	2 floor-apartment, living with 2 sons	FV on the roof + home energy storage	Italy
Sandra	F	Residential	120-130 mq2 apartment. She lives with her 2 sons	FV plug and play + home energy storage	Italy

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Diego	M	Residential	100 mq2 apartment. He lives with his partner and 2-year-old daughter	FV plug and play + home energy storage	Italy
Gianni	M	Industrial	Head of Technical Area. Research of manufacturing companies about flexibility	No resource	Italy
Francisco	M	Residential	Expert in smart solutions. Early adopter. Detached house.	EV, PV, HC, aerothermal systems	Spain
Gerardo	M	Public building	Energy expert working in a utility.	No resource	Spain
Abel	M	Residential	Living with a partner in an individual house in a condominium	Solar water system, swimming pool	Spain
Veronica	F	Residential	Mother of teenagers	EV	Spain
Antonio	M	n/a	Large-scale renewables manager	No resource	Spain
Rafaela	F	Residential	Young, no family in charge.	EV	Spain
Santiago	M	Residential	President of a community of 59 homes with self-consumption	EV, PV, Aero	Spain

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

			and geothermal energy.		
Pedro	M	Residential	Communal charging point user. Living in a condominium.	EV	Spain
Alberto	M	Residential	He lives in an estate with jointly used solar panels and hypothermia.	EV+ PV production for community use	Spain
Paloma	F	Residential	Retired and lives in a detached house.	EV	Spain
Nicolás	M	Residential	Detached house, living with a partner.	Solar water system, swimming pool	Spain
Asier	M	Commercial	Owner of a rural business.	PV in cheese factory and home	Spain
Rodrigo	M	Residential	Individual house with 10 PV and swimming pool	PV + swimming pool	Spain
Public Building	M	Public Building	Town Hall	Still no resources available	Spain
Cristian	M	Residential	Newly renovated house. All electric. Living with a partner. Just married.	HC + all electric	Spain
Priscila	F	Residential	Rented house	HC + gas, living in Valencia (hot weather)	Spain

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Jose	M	Public Building	Technical responsible for energy resources	HC + PV + water depuration system	Spain
Mikael and Peter	M	Industrial	Flexibility service provider		Sweden

The interviews conducted in Spain, Italy and France were analysed separately by three researchers, and discussions were held to discuss the findings. The analysis was oriented to identifying the pains, gains and customer jobs, pain relievers, gain creators and value sought by each informant. The archetypes and value propositions were identified by going back and forth from interviews to services. Then, Soulsight crafted the tool that was refined with Comillas researchers in a set of iterative analyses. The Swedish case was used for triangulation. A fourth researcher familiar with the demo context validated the Findings for this demo context and add the particularities of the flexibility service providers that are the target user of this demonstration.

Finally, the tool was validated with project partners. Co-creation sessions were held online with these experts to validate the structure and content of the tool so as to ensure that it was valuable and easy to use by demo leaders, there was consistency between the services, value propositions, grid benefits and business models, and it was comprehensive, and we left nothing out. Specifically, the validation sessions were held with four partners.

- Validation 1 held with INESC TEC due to their knowledge on the grid-side and their expertise in business and use cases development.
- Validation 2 was held with Comillas to validate the general overview and understanding of the document as well as the grid-side value propositions.
- Validation 3 was held with Italian Demo leaders.
- Validation 4 was held with Spain and France Demo leaders.
- Validation 5 was held with the Iberdrola client's team.
- Validation 6 was held with Terna as the Aggregator's representative.

5.3. Findings

This section presents the central insights of the research and validation process for the Value propositions design. More specifically, it summarises the differences and perspectives on pains, value sought, motivations, levers and barriers in each demonstration or country across resources. Variability in these variables was the basis for outlining the BeFlexible archetypes.

Anticipated pains on flexibility adoption and experience with the resources

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Even when thinking about flexibility, there are many factors that negatively modulate the willingness or ability to flexibly use their resources or to participate in flex provisions. These are vital barriers that service providers need to mitigate to create positive experiences for market actors.

Emotional pains. Users report emotions such as frustration, unfairness, worry or fear when anticipating flex provision; these emotions are even more acute when the gains are deemed insufficient for their effort. For example, when technology does not meet their expectations, they feel frustration, and this generally happens when users strive to use and connect their devices and also when they are not offered information to guide their choices in the proper format or quantity.

> *There comes a time when you know more than the person who comes to install you.* User, Spain

Also, when users do not perceive economic gains, they express feelings of unfairness. The polarisation of the benefit they give to the grid vs the one they receive is a generalised concern. Users perceive that the savings are not fairly distributed and that the compensation they get is marginal, which elicits this perception of unfairness.

> *We bought a washing machine and dishwasher to program and use them in the lower cost ranges. But the benefit is negligible. The incentive was not enough.* User, Italy

Some of the most environmentally concerned interviewees express frustration that whatever effort they made in any consumption domain (i.e., mobility, travel or food) is unlikely to make any difference to the environment.

> *I have a personal interest in being careful in the consumption of energy and water. Ecology is important to us; we try to make efforts. Although it is useless, we try to do something.* User, France

> *What I do for now is a drop in the ocean (ex: I do the washing machines because it's sunny).* User, Italy

Market instability due to the energy crisis was expressed by interviewers as fear of price rises and lack of stability to decide how to manage their resources. In resources like the EV, instability breeds rejection and comparison with gas.

> *I was sceptical of electric cars when I used it, and now I like it a lot. I would like to stay with EVs, but of course, if the price of electricity is high and fluctuating, it is impossible.* User, France

Contextual and cultural pains. Contextual influences negatively affect flexibility adoption, precisely lifestyle conditions such as the type of family or people sharing the house or working conditions.

> *I, too, have limits; if I work from home, I have to keep the light on, the pc on, and the cooling/heating on.* User, Italy

> *One thing that unfortunately I cannot reduce is flights, both for work and for travel.* User, Italy

Yet, lifestyle may be either a blocker or a lever for flexibility, resource adoption and experience. For instance, the type of building inhabited is a fundamental issue for interviewees to solve, as in Europe, most users live in condominiums where space or other constraints limit the ability to install electrical equipment.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

> *If I were autonomous and could produce as much energy as I consume, it would be ideal. It can also be done, but not with an apartment.* User, Italy

The need for a cultural shift remains relevant, as expressed by some interviewees. The need to make energy new behaviour a convincing, not an option, is crucial for almost all users. This was also expressed by public building managers that struggle to balance their goal of lowering the environmental performance with the comfort of the building users.

> *On a cultural level, it is a brutal change; we want to change a very high energy consumption society.* Public building, Spain

Technical pains. Flexibility provision includes a technological component as users need to interact digitally with energy through their resources. The installation and use of their resources require a high level of technology readiness; for this, users need to have a lot of information and knowledge to know what and how to install their resources and how to make the best use of them.

> *Another issue is that you have to know a lot to install exactly what you need and not screw it up. Installers, in general, do not know what they are installing, they know how to install it, but they do not adapt to people's needs. They repeat the same installations changing the size and little else.* User, Spain

Another technological constraint concerns connectivity problems or defects in the devices that were more bothersome because informants do not want to spend time managing energy.

> *The monitoring system is not well understood. For weeks the app didn't work. If it works without bothering me, that's fine, but I'm not wasting my time on it.* User, Italy

For some resources like the EV, informants complain about charging points. Many charging points are still hard to understand, they are not always working correctly, and the support service for charging points is not real-time or at the level of an insurance company.

> *There is no immediate response to any problem with the recharging point. The service is not in real-time. It has taken weeks or months for them to come and check the installation.* User, Spain

Due to the high increase and demand of solar panels, in some Demo Locations like Italy and Spain, the lack of installers remains a pain for users as they have to wait long for their resources to be installed.

> *It seems unbelievable that there isn't a market for these things. I struggled to find suppliers, but you can't find anyone available to install it.* User, Italy

For the most technologically advanced users, the lack of transversality or connection across devices in order to make the most of them and maximise their use makes users intend to manually connect them and understand the data from their different sources.

> *I have many installations that I have done myself, I have meters on the switches, and I know exactly what I produce, consumption, how much goes into the swimming pool, how much to the house, and how much to the electric car.* User, Spain

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

When sharing assets and resources in a community, the technological limitations for individual use become complex and demand managing options and communal decision processes for users to become individual energy producers.

> *With panels, we don't want to flex because we consume all of it. There are many options for flex in housing because of everything we have, but it is more complicated if the production is communal.* User, Spain

Economic pains. As explained earlier in this document, the economic benefits of flexibility provision are essential for users to perceive value in exchange for their participation. After the research, we can assume that in the whole four Demo Locations, existing economic incentives for the energy fed into the grid are not relevant for users. This leads to a situation where users prefer to maximise their self-consumption, store energy or share it before "giving it to the grid" or "wasting it" as the economic benefit is irrelevant; worse, it is considered unfair.

> *The price they charge you per kW/h is about 10 times higher than the price they pay you when you discharge to the grid. It is not attractive. If I had a solar farm, yes, but for self-consumption, it is not attractive.* User, Spain

> *I don't think it's profitable to be flexible like this. I am doing self-consumption with what I generate, the best thing would be to put it in batteries, but before putting it into the grid, I keep it in a battery to charge other things.* User, Spain

> *When you buy from the network, the price is of a specific type, but when you sell to the network, there is a big difference; this is a bit unfair. I have a seller-buyer who manages my system for me. It would be more logical for me to decide when and how much to sell and buy. Instead, there is an advantage for the supplier who buys at a lower price.* User, Italy

> *Selling energy to the grid is paid little, and I don't even find it fair.* User, Italy

Although it is preferred to use the energy produced in the household rather than selling it to the grid, some users prefer to gain this little than waste it.

> *It's a change, but it's not difficult; it's easy. It's not easy to optimise every kW, but as soon as you start selling, you don't lose it.* User, France

Another relevant topic in the economic pains is the different alternatives that users in the Demo locations have to acquire flexible resources as they represent a high economic investment for the majority of users. Subsidies exist in all countries; however, some countries are not stable (France), not easy to acquire (Spain), or nearly present (Italy).

> *I got the charging point because they gave subsidies. It was easy to apply for it, but we still haven't seen a penny for a year and a half after the expense of the charging point.* User, Spain

In Sweden, we collated barriers or pains that flexibility service providers (FSPs) themselves perceive that new entrants or new offerings face in the flexibility service market:

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

- **Market Immaturity and Volatility.** The Swedish energy market is perceived as immature and lacking stability. Volatile pricing makes it challenging for new entrants to establish a predictable business case and assess risk accurately.
- **Limited Available Assets.** While there is a demand for flexibility services, the number of available assets for participation is low. This scarcity makes it difficult for new entrants to find suitable opportunities for engagement.
- **Complex Market Structure.** The existing market structure is not conducive to smaller entities' involvement in Local Flexibility Markets (LFM). Regulations and legislation may restrict participation from certain entities.
- **Lack of Flexibility in Balancing Market.** The balancing market lacks the required flexibility, leading to challenges in responding to market fluctuations effectively. This lack of adaptability limits opportunities for new entrants to offer valuable flexibility services.
- **Grid Connection Challenges.** New organizations face difficulties securing grid connections, which are crucial for their operations. This can lead to delays, additional costs, and complications in starting operations.
- **Permitting Issues.** Obtaining the necessary permits can be an issue for new entrants. While larger established companies already hold permits for its assets, newcomers may encounter obstacles in this area.
- **Risk and Incentives.** The perceived risk associated with load alteration and offering flexibility services acts as a deterrent. The incentives offered may not always align with the level of risk involved, making it less appealing for new players.
- **Infrastructure Underutilisation.** Existing infrastructure is not being fully utilized due to a mismatch between asset specifics and market needs. New entrants must navigate this challenge and strategically align their offerings with demand.
- **Market Size Limitations.** Inadequate market size restricts opportunities for aggregation, and some entities are forced to connect directly to the Transmission System Operator (TSO). This can limit the scalability and growth prospects for new entrants.
- **Long-Term Commitment.** The requirement for long-term commitment and contracts is essential for stability but can be challenging to establish in a market with volatile conditions. This uncertainty affects new entrants' ability to make profitable long-term investments.
- **Competition and Accessibility.** The accessibility of batteries as a solution to volatility presents both an opportunity and a challenge. While batteries can mitigate volatility, widespread adoption can lead to increased competition and reduced differentiation.

Different forms of value expressed (gains and benefits)

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

The way users understand the benefits they will obtain for their flex provision or behaviour change is fundamental to designing ad-hoc value propositions and for engagement strategy development.

Monetary savings. The relationship between energy and economic consumption is present in all types of users interviewed. User efforts are generally oriented toward reducing the economic impact of energy, mainly due to the instability of energy prices of the last few years and the countries' efforts to shift to renewable energy resources.

> *I have made a rough calculation, and I can save about 1,300 euros per year up to 1,500 euros. Apart from the convenience of entering with my car wherever I want, not paying for parking, additional savings on this and little else, that's my main decision.* User, Spain

Users are willing to change their behaviour not only to save money on their bills, but they also need to feel that their participation and effort are fairly rewarded.

> *The point is not just to lower the bill. The possibility of affecting one's savings is very low because it does not depend only on the will of the individual. Distribution and taxes are what actually make up the electricity bill.* User, Italy

Efficiency. Efficiency is often measured as the reduction of energy bills; however, other forms of efficiency were expressed, showing that informants think of efficiency as a lack of waste. This is the form of value that drives them to house insulation, energy production optimisation with their home appliances, use of the appliances in the suggested cheap or valley tariffs, as less energy use in general and through smart use of their energy activities.

> *The house is old, and as the walls are big, we did to double the walls with insulation and plasterboard, so we are like in a house within a house and with that, we improved the efficiency.* User, Spain

> *The consumption of the lights is nothing compared to opening the windows when the heating is on.* User, Italy

The value of efficiency is associated not only with savings but also with a reduced environmental footprint and wiser use of energy.

> *Carbon footprint does not only concern the energy produced at home. I think, and I want to teach my sons, that this thing is not an option; it must be our way of life in the world.* User, Italy

Comfort. Comfort is a form of experiential value mentioned by almost all users; although they seek comfort in all resources, it is emphasised in heating and cooling. This form of value is so important for consumers that they are not willing to trade it off for participating in energy flexibility activities or changing habits. An important comfort element is the house temperature; interviewees were not willing to relinquish control since a good temperature implies caring for their close others.

> *My comfort level is 19 degrees; for example, when my father comes over, I have to change it. He usually has his house at 26 degrees in winter.* User, France

For instance, in public buildings, comfort remains a crucial factor and issue to solve when participating in flexibility. The need for a cultural shift regarding the societal perceptions of comfort is mentioned by French and Italian households as well as in Spanish public buildings.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

> *The problem of saving energy does not lie with those of us in the sector; it lies with the 2,500 civil servants who, as soon as you move something, make a big fuss and go to human resources and complain.* User Public Building, Spain

> *We don't mind lowering the heating and wearing sweaters; we don't have to be in T-shirts during winter.* User, France

Even though users are usually willing to change their behaviour in exchange for the value they seek, family well-being is not something they would put at risk. Family comfort is thus a form of value that should be protected.

> *For the clothes, it is complex because you need to hang the clothes after the machine ends, but yes, we try to be careful in that respect as much as we can without disrupting the family balance.* User, France

Convenience. Convenience emerges as another form of value sought by users: they are not willing to go through any stress or discomfort while using their resources or while providing flex. Even the most engaged profiles expressed their need to ease the processes involved in energy management (use of devices, information processing).

> *If the progress concerns the city or the neighbourhood, it's okay. But if it becomes an extra concern, I'm a family man; it becomes difficult to manage.* User, Italy

> *I would like to automate the parameters, but only if it were effortless, I have a neighbour who is all day looking at prices as if it were the stock market, and I am not all day looking at that.* User, Spain

Also, other ways of convenience, such as access to the city centre and not paying parking rates, are a way to perceive convenience and a form of value for some profiles, especially for EV users.

> *I drive everywhere, and I find it excellent, very convenient not to have parking meters, to be able to drive all over Madrid without restrictions, parking at the door is highly convenient for me.* User, Spain

Episteme value. This form of value reflects the value associated with learning and the acquisition of knowledge. Interviewees express the desire to be part of a transition and to understand their role in an energy transformation as instrumental for achieving environmental goals. For this, a high level of understanding of how the energy market works is needed so that participation can gain a higher level of engagement, fairness and transparency.

> *I believe that transparency and clarity would help a lot. If I'm selling you something, I'd like to understand when I sold you and how much you paid for it.* User, Italy

Informants recognise that flexibility can provide benefits for all citizens when describing the way their individual energy behaviour affects the social perception of energy possibilities and social transition. For instance, French informants declared that their choice of participating in the energy market and using renewable resources is a way for the rest of the users to start gaining knowledge on the possibilities, but also it is our responsibility when deciding how to use our energy.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

> *If you donate energy, you reduce someone's interest in reducing their consumption, and for me, that's not a good thing; I think people have to learn to reduce their consumption, not just look at the price.* User, France

Also, the technical information regarding their devices and the way to operate them is something users are looking forward to finding in their experience with their resources.

> *Another issue is that you have to know a lot to install exactly what you need and not screw it up.* User, Spain

Status. As the acquisition of renewable energy resources implies a high investment due to generalised high prices, the possession and possibility to acquire electrical equipment such as EVs or PVs was expressed as adopting a hierarchical position over others. Regardless of their environmental concern, only wealthy informants are able actually to act and do something.

> *Environmental concerns can only be afforded by some people because it costs money. Even if other people care, they can't afford it.* User, Spain

> *The price of installations has to come down. And I also believe that the first to install are the people who have the money, but unfortunately, it is the people who care the least about the environment or consume energy in other ways.* User, France

Moreover, some users, specifically the more environmentally-concerned users, defended that there should be ways to actually acquire new resources and use energy in a different way.

> *Practical examples are needed to show that you can do things without having to have money as a punishment, like a normal working person.* User, Spain

Exemplarity or admiration. The value of being worthy of imitation is a value sought by users. Especially target users like public buildings (universities) are driven by this form of value as they want to present themselves as exemplars of new ways of producing and consuming energy. Elicitation of admiration in others coexists with feelings of pride, another gain for users for engaging in energy management.

> *A very reputed institution like ours has to be at the forefront of these issues, not only in teaching. We offer engineering, and being at the forefront of ecology and environmental issues is very much present.* Public building, Spain

Exemplarity expressed by public administrations reveals the same sense of responsibility and desire to be perceived as a role model or early adopter.

> *Administrations are supposed to be a driving role and example to generate these changes, and sometimes it is the other way around.* User, Public Building, Spain

> *If we want to raise public awareness, it is essential that the public administration gets on with it. I can't imagine any older person with devices to manage demand if it is not made very easy for them, neither old nor young.* Expert, Spain

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Social. Social value is created when users feel they are part of something bigger than themselves; this generally occurs by improving the welfare of their communities. The community is a blurry concept that can be defined as local, national or even the entire world.

> *What drives me are values and ideals because they bring benefits to the planet and to the community.* User, Italy

> *The production of solar panels we invested in goes directly to the building's electricity costs in the common areas. It does not go to individual houses; it's a benefit for all.* User, Spain

The social value also appears when interviewees express their desire for change at a community level. This change certainly implies accepting one's environmental responsibilities, being an example and leaving a positive legacy to future generations.

> *Making a choice of this kind makes you feel an active part in safeguarding the planet. By now, our society is fragmented.* User, Italy

> *It is also true that the new generations will be able to change something in this sense. A tradition is already coming from good as a possession to sharing, with all the sharing services.* User, Italy

Environmental. Environmental value is a crucial value form for all users, especially for French and Swedish informants expressing that their main motivation for acquiring new resources, changing their behaviour or participating in flexibility responds to a need to reduce energy consumption, to consume energy in a different way but also to see energy as part of a more extensive list of things to do for the environment. Usually, these users have a green lifestyle that is extended to their choices of food choices, transportation or other domains of their consumption.

> *My motivation is totally environmental. I'm not interested in money; I do it out of conviction.* User, France

Environmental value can be presented in different ways, such as reduced carbon footprint or lower carbon emissions, gas reduction, electricity independence, energy diversification, etc.

> *My motivations are ethical, reducing my emissions while cooperating to reduce global emissions.* User, Italy

> *I think in kW per hour; I don't care about the money. I look at my consumption and try to reduce it as much as I can.* User, France

Insights per type of user

Residential. Residential users understand that energy is something they need to deal with, but existing technological solutions are perceived as insufficient for meeting their needs. There is a high dependency on community organisation forms, type of houses, subsidies and type of compensation they get for their flex provision. For instance, energy is perceived not only as lighting, but it is also related to insulation and other non-energy topics such as mobility, food and leisure. The most advanced profiles seek to enhance their energy production into their house consumption by integrating their devices technologically; however, integration is still below their expectations. Physical constraints regarding the possibilities of resource installation are still

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

an issue to solve if participation from users is expected. Residential users need some degree of control as they are willing to participate in flexibility services only if comfort and family balance is not sacrificed.

> *For the clothes, it is complex because you need to hang the clothes after the machine ends, but yes, we try to be careful in that respect as much as we can without disrupting the family balance.* User, France

Commercial. In the case of commercial profiles, monetary savings drive their relationship with energy. The risk possibility is less salient than among industrial consumers, but they still require high degrees of control and simplicity. As renewable resources are part of their business activities and require an investment in time, anything related to energy management has to be economically relevant in order to compensate for their dedicated time. Commercial profiles generally have many tasks to perform, and energy management is perceived as an extra burden. Their primary motivation for flexibility provision is economic; they may invest in equipment as the payoff times are shorter than for residential consumers. Nonetheless, they also complain about the initial investment and limited subsidies. For some commercial profiles, the value of being green or reducing their environmental footprint also provides value.

> *Another issue is that you have to know a lot to install exactly what you need and not screw it up.* Commercial, Spain

In Sweden, three subtypes of commercial users are identified:

- *Property owners wanting long-term sustainable solution homes*. They care about their sustainable brand, feel local responsibility and are looking for a stable partner for long-term energy solutions. They already have solutions in place (e.g., for property management) and want to create optimised integration. They engage in local balancing and ancillary services. They are curious about energy sharing and optimisation.
- *Developers at the forefront increasing property value*. They want to build properties that are attractive on the market, both from a sustainability and cost perspective. They want to be at the forefront, for example through environmental certification and a good rating. They are looking for a partner who can help them future proof their properties, but also facilitate access to land.
- *Smaller property owners with flexibility resources*. A small real estate company, a condominium association or a larger homeowner who has invested in solar cells and/or batteries and who wants to improve their investment calculation. It can also be a group of energy users who want to create an optimised solution together.

Industrial. Similar to commercial, industrial profiles perceive flex provision as risky for their operations. Different from commercial, industrial profiles cannot put their production lines at risk. This is the most important topic for these profiles as they find themselves with little room to *maneuver*. For industrial profiles, energy saving, and batteries are essential to ensure the mentioned risk reduction. Regarding flexibility services, they are sometimes hard to settle in Industrial profiles due to the low revenue obtained in exchange. Also, these profiles need to address many internal blockers to participate in flexible markets. For instance, in Italy, it appears to be hard to get industrials involved due to the existence of intermediation. The leading

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

industrial resource is wind energy, not PV or others. Their main form of value sought, in addition to economic value, is compliance with regulation or obtaining environmental gains in the case of Italy.

> *The typical industry is not directly involved in the decision process in energy topics. An external consultancy that decides from the point of view of energy.* User, Spain

In Sweden, industrial users include those with warehouses and logistics who have low margins and a strong focus on lowering their costs, in combination with the opportunity to take advantage of assets such as large roofs with space for photovoltaic cells and a fleet of vehicles that could be electric. It also includes industrial customers who are reliant on a stable electricity supply and require flexibility and ancillary services that allow them to shore up their security, i.e., through batteries or fuel cells.

Public building. Public buildings aim to be perceived as role models or exemplars. Regulation is also a clear motive for which they are interested in the energy transition. More specifically, the University buildings interviewees expressed the responsibility of being considered as an example and demonstrating coherence with the core values and mission of the University. Exemplarity can also be projected internally so that being an energy moral exemplar is used as a means to mitigate the internal frictions emerging after the calls for behavioural change. As one of the informants said, if governmental institutions expect users to change their behaviour, they have first to change themselves.

These actors also recognise frustration due to internal regulations and bureaucratic processes; they demand unblocking these administrative-legal barriers to enable their participation in flex provision.

> *Unblocking legal-administrative barriers. This is our focus in 2023. These are semi-artificial barriers, technical excuses, but they are not the main problem. You don't even have to take a year and four months to change a normal transformer with 4 postponements because you start to think that there is something wrong. We will do it in a month and a half.* Public Building

More specifically, in Sweden, Public Buildings owned by municipalities are driven by net zero carbon emission building goals for both residential and commercial (office) premises.

Table 8. General insights per type of user

	Residential	Commercial	Industrial	Public building
General	They understand that energy is something they need to deal with, but technology is not meeting their needs. There is a high dependency on community organisation forms, type of houses,	As renewable resources are part of their business investments and are considered an investment on time, everything related to energy management has to be economically relevant in order to invest time in it.	Industrial profiles have processes that are sensitive to interruptions and thus need a secure electricity supply. Electricity consumption is high, and flattening power peaks can be very attractive.	Public buildings want to be perceived as exemplars and role models. They are also encouraged by regulations to manage energy consumption better.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

	subventions and economic call.	Commercial profiles generally have many tasks, so energy management can not be an extra burden.		
Risk & Control	Residential profiles have a low sense of risk except for comfort. They are not willing to compromise their comfort and require control.	Although the risk possibility is present is less than industrial. Commercial profiles require control and simplicity.	Industrial profiles have a high-risk perception; they are not allowed to put their production lines at risk for any reason. They need much control over their energy supply.	As residential consumers, they need to have some control in case users complain.
Value sought	Economic, social or environmental	Economic	Environmental (and compliance with regulation)	Environmental and exemplarity (and compliance with regulation).
Resources	Resources are used to mitigate electricity prices, make their houses more efficient and make a difference in energy use (green lifestyle).	Resources are generally part of the business investment, and payoffs time are shorter than for residential users.	Resources are hard to integrate. Energy saving and batteries are essential to minimise risks.	Resources are used to test new ways to engage with energy. Generally managed by an external manager.
Flex services	Flex services are limited by the acquisition of resources and should help them to save money or carbon emissions.	Flex Services should help them save money and make their business more efficient.	Flexibility services are hard to settle in Industrial profiles due to the perceived limited revenue and high risk.	Flexibility services are difficult to adopt due to internal blockers.
Blockers	Cultural, social, technological and economic blockers.	Time management, technological and economic blockers	Internal blockers and risk management studies. Intermediation.	Internal blockers

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Institutional arrangements and collective perceptions

This section represents a summary and an overview of collective perceptions gathered and expressed by Demo Pilot informants as well as institutional arrangements that complement fundamental parts for obtaining a holistic, particularly for engagement strategy development, as contextual and general perceptions are key to developing tailor-made engagement strategies. Please note that these singularities express the perspective of those interviewed and can coincide with a more generalised country perspective or not.

Interviewees in the different Demo Pilots expressed nuances such as the amount of information needed to know what and how to install, the way they understand energy not as an isolated thing to solve but part of their lifestyle and environmental options such as mobility, food, energy consumption decrease and energy diversification. Also, the high investment in equipment was expressed by all informants, and the ones participating in flexibility already expressed why it is not economically attractive, highlighting the need to make more fair participation with a base of transparency. In Table 9, a summary of the main insights per country was developed to understand how these changes across Demo Pilots.

Table 9. Institutional arrangements and collective perceptions

	France	Italy	Spain	Sweden
Environmental value expressed	Strong	Strong	Medium	Strong
Economic value of flex provision participating in flexibility)	Limited	Limited	Limited	Strong
Perceptions of subsidies	Unstable subsidies	Not so many subsidies	Subsidies but hard to access	Not so many subsidies
Trust in conventional market actors	Limited	Limited	Limited	Medium
Community sense	Medium	Strong	Low	Medium
Social responsibility	Strong (be an example)	Strong (through the community)	Medium	Strong (for commercial actors)

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Insights per resource

Resources analysis is fundamental as flexibility options depend entirely on the availability of resources. Proposing flex provision on the basis of the experience of users with these resources may help develop effective value propositions. This section aims to give a general overview of the barriers, levers and motivations of users while using a possible resource to provide flexibility (a summary is provided in Table 10).

Table 10. General barriers, levers and motivations per resource and cross-country

	EV	PV	HC
Barriers	Uncertainty (electric sector) Type of house Lack of trust in the energy sector Charging point issues Concerns around car autonomy Power shortages while charging Energy prices and limited economic incentives	Initial investment Type of house Estimate energy production/consumption Lack of tech knowledge Subsidies uncertainty Required a minimum of 2kw of production to take part	Lack of digitalisation Too many choices create perplexity and paralysation Energy prices instability Weather peaks in regions
Levers	City access & economic benefits Saving Zero emissions	Economic subsidies Amount of options Tax reductions Self-sufficiency	Savings Efficiency Get rid of gas/self-sufficiency. Energy diversification
Motivation: Value sought	Congestion zones regulation Environmental Convenience	Savings Social Efficiency Status	Comfort Savings Environmental

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Electric Vehicle. The possibility of acquiring an electric vehicle is economically limited due to the high prices of electric vehicles to which it must be added the acquisition of a charging point. The analysis of users on this resource is that it certainly has to provide comfort and convenience to mitigate the pain of energy prices instability, the lack of technological infrastructure and the autonomy limitations.

> *The very high entry price, the price of cars is crazy, it can't be that it is easier to produce an EV and it is 10,000 euros more expensive than a combustion car. Absolutely stupid; that's margin for the car companies who don't want to lose margin.* User, Spain

Regarding the charging points, users demand more and better infrastructure, but also digitalisation and data transversality, as they consider it a challenging task to find charging stations. Moreover, a fundamental pain reported by users is the difficulties in the usage of different charging point providers: users have to download different applications and give their personal and economic data every time on many platforms. This also poses limits to the diffusion of EVs, as older drivers find it even harder to complete this task. Some users expressed the poor condition of the chargers or their fears that these chargers would damage the car.

> *I've loaded it at public charging points, and they have many drawbacks.* User, Spain

Also, in some countries like France, depending on the subscription, the charging prices change, which creates uncertainty about the actual price paid for charging.

> *There are many "modes". Like if you pay the monthly subscription, your price is one; if you don't, the price is other; if the CP is not from Tesla is different, and you pay another price, so it is really complex.* User, France.

Another frequent pain reported by EV owners is their fear of battery damage. Using different chargers or not being able to set a limit to the percentage of charge negatively influences their willingness to use their EVs for flex provision.

> *Flex "vehicle to grid" The problem I see is that you can age the battery. I would do it if there is a leasing service in which the owner knows that if something happens to the battery, he is not responsible. I think the battery market is moving towards a leasing system where the owner of the vehicle is responsible for the battery.* User, Spain

Services such as battery leasing, car leasing or battery insurance could mitigate this fear.

> *I would flex with my car only if they gave me an additional warranty on the battery. In a financial product, you assume the risk, and that's it. With certain specifications, I let you play with my battery, but if in 4 years it loses X per cent, you change it; if it hasn't, we both win. A kind of insurance.* User, Spain

Also, the electric vehicle market instability was mentioned by interviewees expressing their concern about technological progress, knowing that the market will move fast while leaving their cars obsolete or less efficient in a short period of time. This uncertainty also drives users towards renting.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

> *I took the leasing because I thought that with the evolution of the electric car market, which from one year to the next is advancing in terms of autonomy and batteries, then I will see how it evolves, and if I buy one that is more advanced, I will buy one that is more advanced.* User, Spain

In contrast, a fundamental gain reported by users is the elimination of carbon emissions and fumes. This immediate and observable benefit creates a greater environmental attachment with EVs than with other resources such as PV panels.

> *I think the strongest environmental component is the electric car. You see it in real-time and on a daily basis.* User, Spain

In some cases, such as in Spain, city regulations that limit the city centre as a no-emissions zone limiting car access except electric mobility options push the acquisition of electric vehicles for greater convenience.

> *The initial decision was out of necessity because my car could no longer enter the centre of Madrid (emission cars), and I live on the outskirts of Madrid, and I am pretty dependent on my car.* User, Spain

PV Panels. Current events have raised users' awareness of the need for self-sufficiency in energy production and of the possibilities and roles that users can have in the energy market. More specifically, PV panels are the first option for almost all types of users (residential, commercial, industrial and public buildings) to start participating in the energy market by producing their own electricity. Also, this resource is heavily pushed. In this sense, the main motivation for users of this resource is the savings on the electricity bill and building efficiency.

> *PV is economically attractive because of the benefits of electricity prices.* User, France

Although users are keen to install and use PV panels as their main resource for electricity generation, they recognise that the decision-making process is stressful: it requires much knowledge to know what to install, how much, and with what provider or technology. The fact that installers just measure square meters and energy consumption to indicate what to install creates the feeling of a lack of personalisation, and users fear that should they need more energy in the future, the installation may not cover their demands.

> *Installers, in general, do not know what they are installing, they know how to install it, but they do not adapt to people's needs. They repeat the same installations changing the size and little else.* User, Spain

Regarding the information they receive about their energy production and consumption, the data provider is generally the inverter on which platform users can see their generation and consumption at specific dates and times. However, users expressed their frustration as this data is not connected with the rest of their devices; for this, they cannot know the consumption of each electrical equipment, and if they want to know it, they must do the calculation on their own.

Also, users encounter a physical barrier for installing PVs, namely the space available at their dwellings. For instance, users with detached houses in the suburbs have more space and opportunities to install PV panels compared to those living in condominiums. Despite these difficulties, some users are keen to try alternatives suitable for apartments, such as installing PVs on their balconies.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

> *This is why we entered the Plato project; we have a solar panel on the balcony; if I had space, I would put more. I would like more energy autonomy. Installing solar panels isn't for everyone.* User, Italy

The obsolescence of their equipment also creates fear in this case. This fear is a blocker for some users when thinking long-term and planning their energy consumption.

> *The day will come when panels will be so efficient that we will only need a small one to supply the entire building.* User, Spain

A sense of status was expressed by interviewees when they report the feeling of being an example as a motive for adopting PVs or EVs. Similarly, they recognize that acquiring these resources is consistent with their socioeconomic status.

Heating and cooling. Thermal comfort is one of the fundamental values to provide in residential, commercial and public buildings. Moreover, heating and cooling accounts for a large part of the billing and users fear that the situation will only get worse. Having said that, we could not find that comfort is equated with a given temperature; rather, thermal comfort is a subjective experience that depends on the user, their context and their lifestyle. Moreover, thermal comfort seems to be a non-compensatory form of value, so consumers are not willing to trade it off for other forms of value. This is especially the case of residential users cohabiting with small children or older people.

> *In the summer, it is very hot here; I don't know how much it is worth to be able to sleep. I wouldn't be cold or hot for money.* User, Spain

> *My comfort level is 19 degrees; for example, when my father comes over, I have to change it. He usually has his house at 26 degrees in winter.* User, France

Nonetheless, in some countries, this sense of thermal comfort is changing, and users are finding alternatives such as wearing more clothes or diversifying energy for heating in winter.

> *We don't mind lowering the heating and wearing sweaters; we don't have to be in T-shirts during winter.* User, France

Regarding digitalisation, interviewees recognised that this equipment is the least digitalised and the one providing one of the worst user experiences: heating and cooling equipment usually has a screen that indicates the inside temperature, the outside temperature and some extra data. The need to cross this information with non-energy data such as air quality, traffic or rainfall possibilities would make users to have more interaction with this resource and, therefore, possibilities to optimise it and make more efficient use of it.

> *We miss some digitisation, even when we don't have a solar panel. It would be great if we would be given a smart metre with an adapter so that we are able to monitor, set thresholds and modify them depending on my experience. I wish the information would be more transparent.* User, Spain

Although generally, users want to get rid of fossil-fuel-powered heating and cooling; environmental value is less salient for this equipment compared to EVs and PVs. Instead, energy savings and billing stability are the two most mentioned reasons for this equipment.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

The archetypes

Concept of archetypes. An archetype or a *persona* is a characterisation of a user that represents, communicates and illustrates a group of users in a market or domain. Archetypes or personas can be characterised on the basis of qualitative traits, such as emotions or personality, or quantitative, such as the amount of energy devices they can acquire. Because they depict real users' essences, they are widely used in product positioning and service development.

Developing archetypes is fundamental as these archetypes guide marketing decisions, such as the creation of products and services tailored to the target market. We developed archetypes in the context of BeFlexible so that they can inform the development and design of new flex services for users with the different devices tested and with the objectives of each Demo Pilot. These archetypes will help us understand the specific needs, motivations, barriers and emotions of users in order to design products and services according to their needs and validate services that already exist while increasing the engagement of users with them.

Two dimensions are used for archetype segmentation. Two characteristics were used to create the archetypes:

1. Technology use: Many of the energy-flexible solutions require some technological and digital development and adoption.
2. Energy engagement: In order for users to flex, they need to have some engagement with energy transition and engage with energy in a certain way.

With these two criteria, we outlined four main archetypes: the adopter, the gadget, the eco and the comfy. The two dimensions and the corresponding archetypes emerged during the interview as fundamental characteristics that could explain the variability observed in the experiences, pains and gains of users, as explained below (see Figure 16).

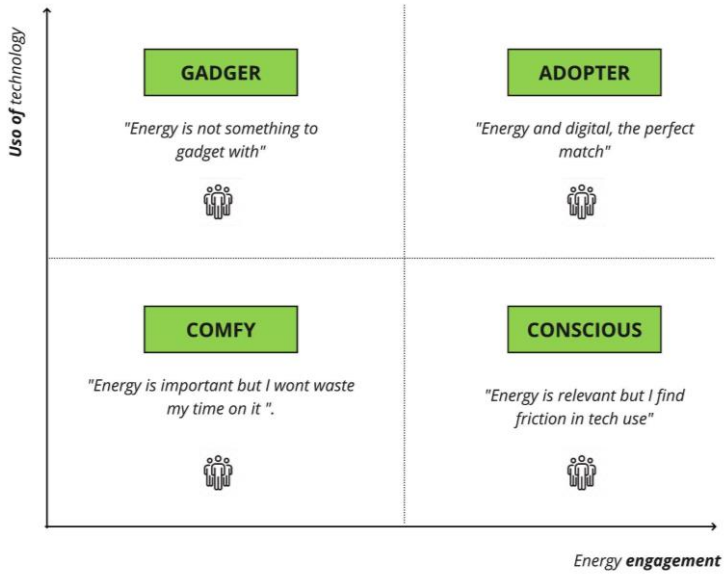

Figure 16. Archetypes segmentation

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

With the variables of segmentation explained before (technology use and energy engagement), the possibilities of mapping these archetypes according to their possibility of acquiring resources and their willingness to flex were possible and enabled us to understand how archetypes differ in their flexibility options (Figure 17).

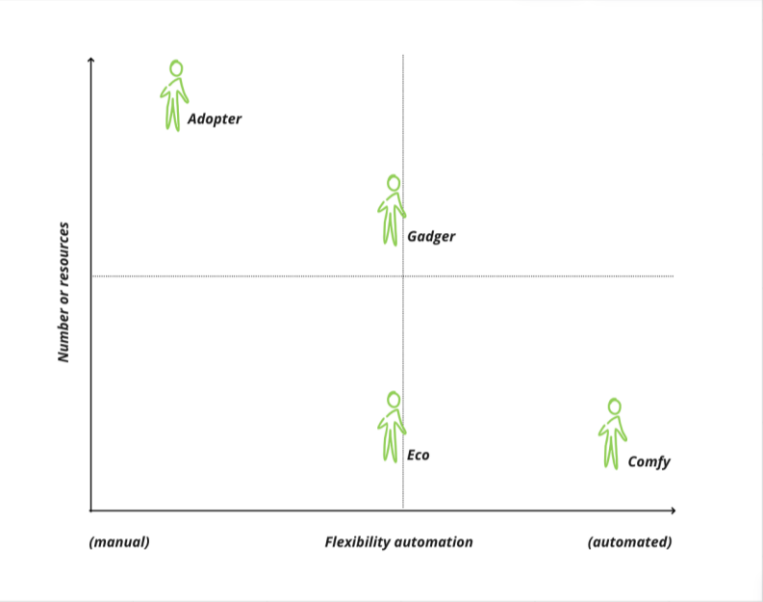

Figure 17. Flexibility alternatives for each archetype

Identification of archetypes. The description and grouping of users into these archetypes arose from the conversations in the four pilots where, in addition to the motivations, barriers and levers for possible participation in flexibility services, certain data were validated, such as their use of technology, their appreciation and use of data, preferences for flex provision and pricing strategies.

After the interviews, we were capable of segmenting users into archetypes and describing them according to several characteristics, namely their willingness to flex, energy engagement, technology adoption, preferred type of flex and compensation, data usage and sensibility and resources for flex provision (Table 11), as well as their motivations, barriers and needs (Table 12).

Table 11. Archetypes description

	Adopter	Gadger	Eco	Comfy
Description	Adopters perceive energy and digital as the perfect match. They are	Gadgers find excitement in technology, but energy is the most	Energy is just one of the many things that can be done for the	Energy is important but not very salient for them. They want

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

	proud of being the early adopter; moreover, they feel that they are ahead of technology. They seek unified and integrated data and devices to optimise their efficiency.	exciting thing to "gadget" with; however, it allows them to interact with different devices and try to make the best of them. They love data even if it is not disaggregated.	environment. They are not very into technology, but they accept it when it enables them to decarbonise or degrow their lifestyle. Distrust in the sector.	to make a difference but are not willing to make a great effort. They will not trade off comfort for other forms of value.
Technology use	High	High	Medium	Low
Energy engagement	High	Medium	High	Low
Explicit flexibility type	Lean towards automatisation, although they like to understand the smart algorithm and be able to participate in programming and setting up the system.	Lean towards automatisation, as they are not much into energy, with some override choice over the system.	Automatisation as long as they can set up the parameters. Because they are willing to change their practices to decarbonise their lifestyle, they may lean towards implicit.	Entirely automatised. They don't want to know or be onto it; their main gain is the bill savings.
Pricing preference	Variable: Be compensated according to the energy I feed into the grid	Mixed: A fixed amount and a variable amount depending on the energy you feed into the grid.	Discount: Incentives are not that important for them, but self-sufficiency.	Fixed: a fixed amount of money. They expect a large enough incentive in return for their efforts.
Data	High data use. They see data as an ally to make the most of their	High use of data. They enjoy receiving energy data to be sure	They find it hard to share data, especially with large companies.	Only receive the basic data to see their performance and savings. They

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

	resources. Willingness to give data to the grid.	they are doing it well but do not need to interact with this data. They give data, but they need to know what for.	They enjoy seeing their production and make changes in their behaviour to couple with their production consumption; they feel they are contributing to change.	have no problem sharing data if this makes their life easier and more comfortable.
Resources	Many important resources	One main resource, many gadgets	One or two important resources	One (and this is enough)

In order for Demo Pilots to be able to implement the archetypes for their engagement strategy, barriers, motivations and levers of each archetype are also described. This will complete the understanding of users and archetypes for the flexibility services implementation.

Table 12. Needs, barriers, levers and motivations per archetype

	Adopter	**Gadger**	**Eco**	**Comfy**
Needs	They need to make the best of the resources they have. Technology early adopters, they are ahead of the market. Data homogenisation to make market decisions. Personalised data, real information, lots of figures.	They need to be capable of installing new things and start making them coordinated. They need economic incentives to change their behaviour for money.	Data homogenisation to improve their behaviours They think of real self-efficiency and no grid dependency, so for them to participate, they need a clear (social or economic) proposal.	Basic data to give security They need to be sure everything is working correctly, and they are achieving their goal with the minimum effort. They need security, and they want no surprises.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Barriers	Limited availability of their envisioned technology solutions Technology still does not meet their needs	Equipment investment As data is not unified and devices are not connected, they do not get to see the real benefit.	Trust in the energy system and big operators Lack of information to take the best decision A barrier to flexibility is that they are minimal about money, so they need another compensation	Understand the market sector. So much information and so many devices make annoying the experience Complex relationship with energy
Motivations/values sought.	Maximise optimisation. Make the most of their resources. Efficiency Episteme Exemplarity	Efficiency of devices and equipment. I feel that it is working correctly. Efficiency Status	Non-energy motivations: be change-makers. Demonstrate that a sustainable transition is possible. Environmental, social, exemplarity	Reduce their bill without complexity. Do something for the world with the minimum effort (easy social commitment) Monetary savings Convenience comfort
Quotes	*There comes a time when you know more than the person who*	*One of the fundamental reasons is to get closer to technology. I am an engineer, and I*	*I think in kW per hour; I don't care about the money. I look at my consumption and try to reduce it as*	*I called a company that instals the charging point and manages the subsidies; they do it all for you. They*

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

	comes to install you.	*like to keep up to date.*	*much as I can.*	*installed it in two days and did all the paperwork.*

6. The Value Proposition Framework

6.1. Introduction

So far, we have described the perceptions of consumers about the pains, gains and jobs. Moreover, we have classified customers into four archetypical portraits according to the differences in the pains, gains and jobs. Whereas the previous section identifies the components of value propositions and go in depth into them, this section connects the components into full-fledged value propositions. The proposed Value Proposition framework will serve as a comprehensive guide for Demo Pilots of BeFlexible. It will provide them with the necessary guidance, insights, and information to effectively understand the value they can offer, and the essential tasks consumers must undertake to provide or engage in flexibility services. By leveraging this tool, Demo Pilots can enhance their ability to deliver compelling value propositions, align with consumer needs, and drive the successful adoption of BeFlexible's services. The framework is operationalized by means of a workable and customizable tool. Hereafter we will use the terms Framework and tool interchangeably.

Overall, this framework empowers Demo Pilots with the necessary resources to navigate the complexities of providing flexibility services, ensuring they can effectively communicate the value of BeFlexible's offerings and meet consumer expectations.

This tool encompasses a wealth of information about the value propositions work conducted in WP2. The services are categorised into two distinct sections: consumer-centric services and grid-centric services. Within the consumer-centric services, a clear distinction is made between the services proposed in the Grant Agreement and a concise compilation of new services that have emerged from the extensive research carried out across the four Demo locations. The framework's inclusion of the established services proposed in the Grant Agreement and the newly discovered services derived from on-the-ground research ensures a holistic and up-to-date perspective. This comprehensive approach supports Demo Pilots in tailoring their value propositions to meet consumers' diverse and evolving needs.

A single general value proposition per service was included to make the framework more parsimonious. However, it is important to note that multiple value propositions may be associated with a particular service. For example, virtual batteries have been associated with the value proposition of "optimising buildings"; however, they could also be linked to the value proposition of "selling/sharing flexibility". Nonetheless, the framework incorporates only the most representative value proposition for each service for clarity and simplicity.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

6.2. Value propositions canvas per profile overview

This section summarises the value proposition canvas per profile of the user. Specifically, the gains, pains and jobs were depicted with the gain creators and pain relievers for residential, commercial and industrial consumers. This canvas integrates and synthesises the research findings and serves as the basis for developing the value proposition tool.

Residential profile

Table 13. Value proposition canvas residential user

CUSTOMER SEGMENT	**VALUE PROPOSITION**
Gains	**Gain creators**
House optimisation: make the most of resources Self-sufficiency: independence from the grid Savings and/or extra income "Play" with energy production/consumption Gain knowledge Comfort, peace of mind, no hassles Green supply of energy	Flexible tariffs customised to consumer needs Real-time information about energy production/consumption and targeted advice Unified and integrated digital solutions to operate and make the most of equipment 24/7 customer support Targeted benefits (less emissions, money, non-monetary rewards) Integrated management of equipment for enhanced optimisation Be aware if something is going wrong in an appliance/building Less time and hassle in equipment or house management
Pains	**Pain relievers**
Deterioration of equipment Management of multiple devices Ongoing attention to energy prices to efficiently	Security or assurance on expected savings, consumption or equipment protection Solution standardisation and personalisation

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

manage energy needs Dependency on internet connection Distrust (especially providers) Difficulties in understanding energy consumption data; non-user-friendly interfaces Changing or absent regulation High prices of equipment (long pay-off period) Imbalances in the buying-selling energy price	Easy-to-understand, real-time information Proactive client service Financing or credit schemes
Customer jobs	**Products and services**
Manual adjustments or practice changes to align consumption and production In-depth analysis of market options and market prices to optimise house energy consumption Thorough understanding of energy systems, new assets or equipment and market prices Change practices to obtain energy savings Integrate and compare information provided by different sources and shown in different devices/outlets Automatisation to couple production with energy-consuming resources Manage multiple device-specific apps	Real-time, integrated & easy-to-understand energy information Integrated devices or single-point energy management devices 24/7 customer support that proactively provides targeted energy solutions Equipment leasing and other access-based solutions Home/building failure detection alert system Easy-to-implement house systems Flex service providers that offer customised value (savings, credits or other rewards) Virtualisation or advisory tools that help make the most of energy production

Commercial profile

Table 14. Value proposition canvas commercial user

CUSTOMER SEGMENT	**VALUE PROPOSITION**

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Gains	**Gain creators**
Full use of assets for value creation and support services (flex and frequency market), value as economic, reputation or environmental. Optimisation for price, power, or carbon emissions. Get a connection (the right level at the right time). A clear roadmap for organisational transition. Start with the monetary benefits that give effect to the rest.	Tariff and carbon optimisation. Arbitrage. Self-sufficiency. Easy-to-do and fast power management. Carbon optimisation and most efficient/effective use of the grid. Extra revenues from flex provision. Visualisation of the value created/impact measure. Transactions, carbon optimisation. Agreement on power management to enable faster connection.
Pains	**Pain relievers**
Getting capacity from new connections and securing the property. Manage increased energy costs Uncertainties around energy transition, future regulation and technologies Provision of integrated solutions in one point or by a single provider business for us economically less potential? Technically more challenging! Increased costs and less clear economic benefits Conflicting priorities or goals	Suppliers that can integrate and manage different solutions Automated control systems Energy monitoring and reporting Training and Education Financing or credit schemes
Customer jobs	**Products and services**
Transition to electrification (equipment replacement) and green operations (efficiency and decarbonised)	Resource integrator with automatised digitally enabled solutions. Energy savings (batteries).

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Manually optimising energy costs Dedicated analysis and management of energy for flex provision, optimisation, and community integration. Becoming more integrated into the energy system and delivering flexibility. Sharing energy locally. Gaining control and transparency/advice through digitalisation. Separate procurement on digital control.	Flexibility through software as a service. Provision of locally focused services (e.g., sharing energy locally).

Industrial profile

Table 15. Value proposition canvas industrial user

CUSTOMER SEGMENT	**VALUE PROPOSITION**
Gains	**Gain creators**
Shorter payback time on investment Business-related benefits from energy efficiency and reduced climate impact Increased revenues for flex provision Oversized network subscriptions may be utilised for the installation of solar cells. Opportunity to benefit from lower prices overnight.	A single solution that provides multiple benefits: green production, energy efficiency, decarbonised production and consumption and flex provision
Pains	**Pain relievers**
Uncertainty of potential costly disruptions in production (productivity losses and increased costs) Limited funding/budget or aid for investment in	Probe pains adjacent to uninterruptible power and proposed investment. Control assurance over operations Advisory tools for asset integration and

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

equipment Slow decision-making or paralysis due to intermediation Limited control or autonomy over energy management Low level of interaction with energy suppliers Limited advice from energy suppliers	optimisation Real-time and easy-to-understand energy
Customer jobs	**Products and services**
Installations of equipment and procedures to hedge against short power outages and ensure uninterrupted power supply Ongoing improvements in environmental performance Unblock internal constraints to modify energy parameters	Energy storage Energy management optimisation and solution integration

Public building

Table 16. Value proposition canvas public building

CUSTOMER SEGMENT	**VALUE PROPOSITION**
Gains	**Gain creators**
Be perceived as a pioneer and trendsetter Increased energy efficiency Greater control over energy consumption	Visualisation of the value created/impact measure Transactions, carbon optimisation Flex control over temperature
Pains	**Pain relievers**
Difficulties in (but strongly pressured) to meet regulatory goals. Lack of planning to meet the energy goals.	Training plan. Models and clear procedures for testing and implementing new energy services/solutions.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

No externalities accounting in a possible new model. Limited budget for training and awareness-raising. Long and difficult internal procedures to try new energy services or test new solutions.	Energetic accountability (measure in KW depending on your energy consumption). Gamified approaches with bonuses for teams for meeting energy targets.
Customer jobs	**Products and services**
Explore solutions to meet objectives Ongoing dedication to internal and external training and awareness-raising	Energy building audits and personalised solutions Full-service flex installation

Flexibility Service Providers

Table 17. Value proposition flexibility service provider (Sweden)

FINANCIAL SERVICE PROVIDERS	**VALUE PROPOSITION**
Gains	**Gain creators**
Revenue Generation Risk Mitigation Infrastructure Utilisation Reduced Volatility Futureproofing	Participating in the flexibility service market offers opportunities for revenue generation through various revenue streams. Long-term contracts and diversified offerings can provide a stable income source. Flexibility services can help mitigate market risks associated with volatile pricing and demand fluctuations. Long-term commitments and stable contracts can offer protection against market uncertainties. Being part of the flexibility service market allows better utilisation of existing assets. Through dynamic modelling and timing of asset usage, resources can be optimally used to match market

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

	needs. Utilising energy storage solutions, such as batteries, can help store energy during periods of low prices and release it when prices are higher, thereby reducing price volatility and optimizing revenue. Engaging in flexibility services demonstrates a forward-looking approach, aligning with the increasing need for flexibility in the energy sector. It allows companies to adapt to evolving market demands and regulations.
Pains	**Pain relievers**
Unpredictable future Diverse Revenue Streams Clear Incentives Fixed Contract Durations Improved Market Structures Support for Permitting Enhanced Infrastructure Planning	Offering long-term contracts that provide stability and commitments independent of day-to-day market conditions could attract participants. This would allow companies to plan and invest with confidence. DSOs could create opportunities for various revenue streams beyond standard market participation. This might include offering flexibility services in combination with other value-added services. Providing clear and appropriately aligned incentives for load alteration and flexibility services can encourage companies to actively participate. Higher incentives may motivate them to alter their energy consumption patterns. Offering contract durations that align with different business strategies and risk appetites, similar to the UK's approach, could make participation more attractive to entities with varying needs. DSOs could collaborate with regulatory bodies to revise market structures to better accommodate the participation of smaller entities in Local Flexibility Markets.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

	Offering guidance and assistance in navigating the permitting process would ease the entry of new players into the market, streamlining the establishment of new offerings. DSOs could conduct thorough assessments of market needs and optimise infrastructure planning to ensure that assets are strategically located and utilised according to market demands.
Customer jobs	**Products and services**
Grid connection Collaboration and education	Simplifying and expediting the process of securing grid connections for new entrants would remove a significant barrier and encourage more organisations to provide flexibility services. Collaborating with FSPs in providing education about the benefits and mechanisms of flexibility services could create awareness and drive interest in market participation.

6.3. The Value Propositions tool

The Value Proposition tool is described here but can be found in the accompanying Excel document Value Propositions Framework. The Demos can navigate through the document, filter information, understand user perspectives, identify value propositions, and gain insights into consumer- and grid-centric services. This comprehensive approach empowers them to understand the various elements composing the value proposition and make informed decisions regarding the value propositions and services offered by BeFlexible.

Each module of the tool is found in the corresponding sheet. Each module serves a distinct purpose and offers valuable insights into the services, resources, consumer perspectives, and value propositions within the BeFlexible framework. By navigating through these modules, partners can access the relevant information needed to understand, analyse, and effectively utilise the provided framework. The first module provides guidelines for using the tool. First, the acronyms used are explained.

Table 18. Acronyms used in the Value Proposition Tool

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

ACRONYMS	
DESCRIPTION	
HVAC	Heating, ventilation, and air conditioning (HVAC)
EV	Users with electric vehicles and or charging points
PROS	PV generation, consumption, EV (batt) and HVAC (prosumer)
P	Provider
R	Resource

Meet your target users. This module explains user archetypes based on their technology adoption and engagement with energy. It can be applied to all users (residential, commercial, industrial, and public buildings), enabling a better understanding of their personality traits and preferred approaches.

This information allows partners to tailor their engagement and communication strategies to resonate with each archetype. This targeted approach allows them to effectively address the unique needs, motivations, and preferences of different customer segments. Whether it's residential customers seeking energy-saving solutions or industrial customers aiming for cost optimisation, understanding their archetype helps them craft relevant messages and offers more likely to resonate with them.

Table 19. Examples of archetypes depiction in the Value Proposition Tool

GADGERS		**CONSCIOUS (ECO)**	
Gadgers find excitement in technology, but energy is the most exciting thing to gadgets with; however, it allows them to interact with different devices and try to make the best of them. They love data even if it is not disaggregated.		*Energy is just one of the many things that can be done for the environment. They are not very into technology, but it is a way to make a difference. Distrust in the sector. Energy is more about less consumption and is part of a degrowth concept.*	
TECHNOLOGY USE	High	**TECHNOLOGY USE**	Medium
ENERGY ENGAGEMENT	Medium	**ENERGY ENGAGEMENT**	High
FLEX TYPE	More explicitly, as they are not very into energy, they prefer some kind of automation, but not 100% as they still enjoy gadging	**FLEX TYPE**	Explicit with some manual terms to modify. They enjoy changing behaviour.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

PRICING PREFERENCE	Mixed: A fixed amount and another depending on the energy you feed into the grid.	**PRICING PREFERENCE**	Discount: Care little about financial matters as he knows s/he will not get rich from it. S/he prefers to be independent than to receive bonuses.
DATA	High use of data. They enjoy receiving energy data to be sure they are doing it well but do not necessarily interact with it. They give data, but they need to know what for.	**DATA**	S/he finds it hard to share data, especially with the "big guys", but likes to look at his production and adapt their behaviour; s/he feels s/he is doing something for a change.
RESOURCES	High. One important energy resource but most of all, energy gadgets at home.	**RESOURCES**	Medium. One or two important resources.

Get a full overview. This module provides a comprehensive overview of all the information contained in the document. They can utilise this tab to filter and locate a specific resource or service they are interested in testing or a particular type of value they wish to offer. By selecting a specific item, they can explore all the relevant information.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Table 20. Example of Value Proposition for service in the Value Proposition Tool

										CORE VALUE SOUGHT BY					
		P	R	SERVICE	USER	TYPE OF VP	USER JOBS & PAINS	USER REAL QUOTES	SERVICE VALUE PROPOSITION	*VALUE FOR ADOPTER*	*VALUE FOR GADGER*	*VALUE FOR ECO*	*VALUE FOR COMFY*	GRID BENEFITS	BM SUGGESTION
GA SERVICES	1	TV	HVAC	Optimisation of thermal consumption considering self-consumption, peak shaving and ToU tariffs	All	Optimise Building	Users need to manually look into different resources to establish different parameters, losing time	"You waste much time looking at what is going on in the house making manual adjustments; I waste time"	Don't waste time managing your home's energy; set your parameters and guarantee your well-being	Make the most of equipment / building	Efficiency	Low emissions	Simplicity with automation	Increase grid flexibility Prevent/alleviate grid constraints Reduce/postpone grid reinforcements Boost RES production	Energy management system (as a product or as a service)

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Understand users. This module complements the archetypes and shows the user's needs, challenges, and aspirations vis-à-vis a specific service. It provides insights into consumer jobs and pains, illustrated through user quotes. By reading about the jobs, pains, and real consumer quotes, they can gain valuable insights into the foundations of the value propositions.

Table 21. Example of module Understand user in the Value Proposition Tool

		P	R	SERVICE	USERS	TYPE OF VP	USER JOBS & PAINS	USER REAL QUOTES
GA SERVICES	1	TV	HVAC	Optimisation of thermal consumption considering self-consumption, peak shaving and ToU tariffs	All	Optimise Building	Users need to manually look into different resources to establish different parameters, losing time.	"You waste much time looking at what is going on in the house making manual adjustments; I waste time".

Offer them value. This module offers insights into delivering value by providing a general value proposition. To allow for archetype customisation, it also depicts the core value sought by each archetype, which would enable personalisation or adaption of the value proposition to each profile of users. This module helps partners understand the main value proposition for a service and its variations for each type of user, particularly focusing on their core target audience.

Table 22. Example of core and variations of value propositions in the Value Propositions Tool

CORE VALUE PROPOSITION						
	Save time managing your building energy. Set your parameters and ensure your well-being.	Charge anywhere, anytime, saving time, taking care of your battery and ensuring your autonomy.	Transform your building into a smart energy partner speeding up the adoption of low-carbon technologies.	Be a part of the future as a smart energy partner. Lower your energy bills while accelerating the adoption of low-carbon technologies.	Control your energy consumption with smart & real-time data. Join the energy revolution, contribute to a greener future and stay informed.	Join the energy revolution while taking care of what matters most to you.
ADOPTER	*Make the most of equipment/ building*	*Battery care*	*Optimise smart building*	*Be a pioneer*	*Take control*	*Battery & home care*

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

GADGER	*Integration & Play*	*Efficiency & Control*	*Optimise building*	*Savings & Play*	*Information to play*	*Play & Care*
ECO	*Low emissions*	*Low emissions*	*Low-carbon technology*	*Circularity*	*Less consumption, trust*	*Take care of the environment*
COMFY	*Simplicity with automation*	*Simplicity with automation*	*Smart simplicity*	*Effortless & Savings*	*Simplicity & Comfort*	*Simplicity & Comfort*
	TYPE OF VP					
	Optimise Building	Optimise EV	Better infrastructure	Sell/Share flexibility	Info/advice	Protection of assets and people

Grid-centric services. This module presents a comprehensive overview of the grid-centric services that will be implemented within the project. It provides a holistic view of the jobs and values that underlie or enable these grid-centric services. With this module, partners can better understand these specific services' essential tasks and values.

Table 23. Example of grid-centric services in the Value Propositions Tool

	TYPE AND VALUE PROPOSITIONS				
Type	Congestion management	Voltage control	Balancing Services	Grid Observability	Other DSO/TSO
VP	Get a reliable and uninterrupted power supply. By optimising the operation of the existing power infrastructure, we eliminate congestion points, reducing power outages and costs while ensuring enhanced system reliability for a seamless power experience.	Enjoy a reliable power supply without worrying about harmful fluctuations. With our voltage control solutions, we balance power generation and consumption, ensuring optimal voltage levels.	Get a seamless power experience with a constant supply-demand balance with our real-time balancing services. Trust us to provide a reliable power supply for all your needs.	Get a safe and reliable electrical system. With our advanced monitoring and measurement technologies, we ensure comprehensive grid observability, providing you with a secure and stable power environment.	

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

7. Conclusions

We have grouped the main conclusions of this deliverable into three key insights: no size fits all, make it easy and rewarding, and make it fair.

NO SIZE FITS ALL APPROACH

Resources should be affordable. To think of flexibility, the need to increase the number of resources is fundamental for flexibility to be significant; however, for most users, not only residential but also commercial and industrial, the investment that currently has to be made in resources is quite high.

Domotics can expand user flexibility. Technology is not ready for what users are demanding. Flexibility is the last step in a series of processes that need to happen technologically, infrastructurally and economically to get us closer to the user organically participating and staying motivated in energy flexibility actions. Things like surplus managers, batteries, automation and integration of resources in the home are relevant and in demand for users.

MAKE IT EASY AND REWARDING

Resources should be integrated. That is why it is important that in this Deliverable, we have highlighted the things that influence user behaviour regarding flexibility. Before thinking about flexibility options with the home temperature, the user needs to automate the parameters and ensure their comfort but always with some control over the system. The control or feeling of control is fundamental because even showing interest in establishing some behavioural change towards flexibility, being able to modify it or having control was almost unanimous in all countries and, more specifically, in some profiles such as industrial, commercial and public buildings.

Contextual facts matter the most. Such as the lifestyle, whether you live in a very hot or very cold region, affects the adoption of new resources and the willingness of profiles to participate in flexibility.

MAKE IT FAIR

The relationship must be fair and transparent: Flexibility is not economically profitable for almost any user in exchange for the jobs they have to do. It is fundamental to establish a new relationship model around flexibility. Now that the user will be part of the electricity market, we have to change the mentality and start seeing him as an economic partner with whom we have to establish fair, transparent and commercial relationships. The user must be seen as a professional. It is insufficient to have lower bills or some incentives; they need to be considered actors in the electric market.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

8. References

Abdollahi, A., Moghaddam, M.P., Rashidinejad, M., & Sheikh-El-Eslami, M.K., 2012. Investigation of Economic and Environmental-Driven Demand Response Measures Incorporating UC. *IEEE Transactions on Smart Grid* 3, 12–25.

Akaka, M.A., Vargo, S.L. & Lusch, R.F. 2012. An Exploration of Networks in Value Co-creation: A Service-Ecosystems View, In Vargo, S.L. & Lusch, R.F. (Ed.) *Special Issue – Toward a Better Understanding of the Role of Value in Markets and Marketing* (*Review of Marketing Research, Vol. 9*), Emerald Group Publishing Limited, Bingley, pp. 13-50.

Albadi, M.H., & El-Saadany, E.F., 2008. A summary of demand response in electricity markets. *Electronic Power System Research*, 78, 1989–1996.

Anderson, L., Spanjol, J., Jefferies, J. G., Ostrom, A. L., Nations Baker, C., Bone, S. A., ... & Rapp, J. M. 2016. Responsibility and well-being: resource integration under responsibilisation in expert services. *Journal of Public Policy & Marketing*, 35(2), 262-279.

Angie, F., & Parvania, M., 2019. Stochastic risk-based flexibility scheduling for large customers with onsite solar generation. *IET Renewable Power Generation*, 13 (14), 2705-2714.

Annestrand, S. A. 2003. Power Transmission, High-Voltage. In *Encyclopedia of Physical Science and Technology* (pp. 35–55). Elsevier.

ARERA. (n.d.). ARERA - Avvio di procedimento per l'adozione di provvedimenti in materia di metodi e criteri di regolazione tariffaria basati sulla spesa totale (ROSS-base) per la determinazione del costo riconosciuto per i servizi infrastrutturali regolati dei settori elettrico e gas. Retrieved 4 September 2023, from https://www.arera.it/it/docs/21/271-21.htm

Baron, S., & Harris, K. 2008. Consumers as resource integrators. *Journal of Marketing Management*, 24(1-2), 113-130.

Blomgren, E. M. V., De Zotti, G., Ebrahimy, R., Kani, A. P., & Madsen, H., 2021. Behind-the-Meter Energy Flexibility Modelling for Aggregator Operation with a Focus on Uncertainty: Data presentation.

Blut, M., Heirati, N., & Schoefer, K., 2020. The dark side of customer participation: when customer participation in service co-development leads to role stress. *Journal of Service Research*, 23(2), 156-173.

Broderick, V. (n.d.). *The Value Proposition Canvas: Ultimate Guide and Download*. Retrieved January 14, 2023, from https://vaughanbroderick.com/value-proposition-canvas-customer-centric-innovation/

Brodie, R. J., Hollebeek, L. D., Jurić, B., & Ilić, A. 2011. Customer engagement: Conceptual domain, fundamental propositions, and implications for research. *Journal of service research*, 14(3), 252-271.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Bruce, H. L., Wilson, H. N., Macdonald, E. K., & Clarke, B. 2019. Resource integration, value creation and value destruction in collective consumption contexts. *Journal of Business Research*, *103*, 173-185.

Burton, J., Story, V., Zolkiewski, J., Raddats, C., Baines, T. S., & Medway, D. 2016. Identifying Tensions in the Servitized Value Chain: If servitisation is to be successful, servitizing firms must address the tensions the process creates in their value network. *Research-Technology Management*, *59*(5), 38-47.

Cardoso, C. A., Torriti, J., & Lorincz, M. 2020. Making demand side response happen: A review of barriers in commercial and public organisations. In *Energy Research and Social Science* (Vol. 64). Elsevier Ltd.

Caridà, A., Edvardsson, B., & Colurcio, M., 2019. Conceptualising resource integration as an embedded process: Matching, resourcing and valuing. *Marketing Theory*, 19(1), 65-84.

CEDEC, EDSO, ENTSO-E, Eurelectric, GEODE, 2019. TSO-DSO Report: An Integrated Approach to Active System Management.

CEER. 2015. The Future Role of DSOs. A CEER Conclusions Paper.

CEER. 2016. CEER Position Paper on the Future DSO and TSO Relationship. Brussels.

Chandler, J. D., & Vargo, S. L. 2011. Contextualisation and value-in-context: How context frames exchange. *Marketing theory*, *11*(1), 35-49.

Chondrogiannis, S., Vasiljevska, J., Marinopoulos, A., Papaioannou, I., & Flego, G. (2022, October 7). Local electricity flexibility markets in Europe. JRC Publications Repository. https://doi.org/10.2760/9977

Darby, S. J. 2020. Demand response and smart technology in theory and practice: Customer experiences and system actors. *Energy Policy*, *143*, 111573.

Darby, S. J., & McKenna, E. 2012. Social implications of residential demand response in cool temperate climates. *Energy Policy*, *49*, 759-769.

Di Silvestre, M.L., Favuzza, S., Riva Sanseverino, E., & Zizzo, G., 2018. How Decarbonization, Digitalization and Decentralization are changing key power infrastructures. *Renewable and Sustainable Energy Reviews*. 93, 483–498.

Directive (EU) 2019/944 of the European Parliament and of the Council of June 5 2019, on common rules for the internal electricity market, 2019. Official Journal of the European Union.

Edvardsson, B., Skålén, P., & Tronvoll, B. 2012. Service systems as a foundation for resource integration and value co-creation. In Vargo, S.L. and Lusch, R.F. (Ed.) Special Issue – Toward a Better Understanding of the Role of Value in Markets and Marketing (Review of Marketing Research, Vol. 9), Emerald Group Publishing Limited, Bingley, pp. 79-126.

ENTSO-e. (n.d.). *TSO-DSO DATA MANAGEMENT REPORT*.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

eurelectric. (n.d.). *DEMAND RESPONSE everything you always wanted to know about*. Retrieved January 13, 2023, from https://cdn.eurelectric.org/media/1940/demand-response-brochure-11-05-final-lr-2015-2501-0002-01-e-h-C783EC17.pdf

European Commission - BRIDGE. (n.d.). *Home | Bridge*. Retrieved January 14, 2023, from https://bridge-smart-grid-storage-systems-digital-projects.ec.europa.eu/

EUROPEAN PARLIAMENT. (n.d.). EU Regulation 2019/943 Art. 18 (2) and (8) Redesign tariff taking into account the development and introduction of flexibility services—Buscar con Google. Retrieved 4 September 2023, from https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R0943&from=EN

Fell, M. J., Shipworth, D., Huebner, G. M., & Elwell, C. A. 2015. Public acceptability of domestic demand-side response in Great Britain: The role of automation and direct load control. *Energy research & social science*, 9, 72-84.

Fichter, K., & Clausen, J., 2021. Diffusion of environmental innovations: Sector differences and explanation range of factors. *Environmental Innovation and Societal Transitions*, 38, 34-51.

Forouli, A., Bakirtzis, E. A., Papazoglou, G., Oureilidis, K., Gkountis, V., Candido, L., ... & Biskas, P., 2021. Assessment of Demand Side Flexibility in European Electricity Markets: A Country Level Review. *Energies*, 14(8), 2324.

Fournely, C., Pecjak, M., Smolej, T., Turk, A., & Neumann, C.(2022. Flexibility markets in the EU: Emerging approaches and new options for market design. *2022 18th International Conference on the European Energy Market (EEM)*, 1–7.

Freire-Barceló, T., Martín-Martínez, F., & Sánchez-Miralles, Á. 2022. A literature review of Explicit Demand Flexibility providing energy services. *Electric Power Systems Research*, *209*, 107953.

Fyrberg Y., A. 2013. 'It's not us, it's them!'–Rethinking value co-creation among multiple actors. *Journal of Marketing Management*, 29(9-10), 1163-1181.

Gebauer, J., Füller, J., & Pezzei, R., 2013. The dark and the bright side of co-creation: Triggers of member behaviour in online innovation communities. *Journal of Business Research*, 66(9), 1516-1527.

Gerard, H., Rivero Puente, E.I., Six, D., 2018. Coordination between transmission and distribution system operators in the electricity sector: A conceptual framework. *Utility Policy* 50, 40–48.

Giulietti, M., Le Coq, C., Willems, B., & Anaya, K., 2019. Smart consumers in the Internet of energy: Flexibility markets and services from distributed energy resources. Centre on Regulation in Europe asbl (CERRE).

Gough, M., F. Santos, S., Javadi, M., Castro, R., & P. S. Catalão, J. 2020. Prosumer Flexibility: A Comprehensive State-of-the-Art Review and Scientometric Analysis. *Energies*, *13*(11), 2710.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Greer, C. R., Lusch, R. F., & Vargo, S. L., 2016. A service perspective. *Organisational dynamics*, 1(45), 28-38.

Gummesson, E., & Mele, C., 2010. Marketing as value co-creation through network interaction and resource integration. *Journal of Business Market Management*, 4(4), 181-198.

Hadush, S.Y. & Meeus, L., 2018. DSO-TSO cooperation issues and solutions for distribution grid congestion management, *Energy Policy*, 120, 610-621,

Hamwi, M., Lizarralde, I., & Legardeur, J., 2021. Demand response business model canvas: A tool for flexibility creation in the electricity markets. *Journal of Cleaner Production*, 282, 124539.

Heinonen, K., Strandvik, T., & Voima, P., 2013. Customer dominant value formation in service. *European Business Review*, 25(2), 104-123.

Hibbert, S., Winklhofer, H., & Temerak, M. S. 2012. Customers as resource integrators: toward a model of customer learning. *Journal of Service Research*, 15(3), 247-261.

Hunt, S. D., & Derozier, C. 2004. The normative imperatives of business and marketing strategy: grounding strategy in resource-advantage theory. *Journal of Business & Industrial Marketing*.

IRENA. (2019). *The future role of distribution system operators – Innovation Landscape Brief*.

Järvi, H., Kähkönen, A. K., & Torvinen, H. 2018. When value co-creation fails: Reasons that lead to value co-destruction. *Scandinavian Journal of Management*, 34(1), 63-77.

Johansson, P., Vendel, M., & Nuur, C., 2020. Integrating distributed energy resources in electricity distribution systems: An explorative study of challenges facing DSOs in Sweden. *Utility Policy*, 67, 101117.

Kanakadhurga, D., & Prabaharan, N. 2022. Demand side management in microgrid: A critical review of key issues and recent trends. *Renewable and Sustainable Energy Reviews*, 156, 111915.

Kapassa, E., Touloupou, M., & Themistocleous, M. 2021. Local Electricity and Flexibility Markets: SWOT Analysis and Recommendations. *2021 6th International Conference on Smart and Sustainable Technologies (SpliTech)*, 1–6.

Kerscher, S., & Arboleya, P. 2022. The key role of aggregators in the energy transition under the latest European regulatory framework. *International Journal of Electrical Power & Energy Systems*, 134, 107361.

Kim, Y. S., Cho, C. K., Ko, Y. D., & Jee, H. 2011. E3 value concept for a new design paradigm. In *DS 68-2: Proceedings of the 18th International Conference on Engineering Design (ICED 11), Impacting Society through Engineering Design, Vol. 2: Design Theory and Research Methodology, Lyngby/Copenhagen, Denmark, 15.-19.08. 2011* (pp. 314-322).

Kleinaltenkamp, M., Brodie, R. J., Frow, P., Hughes, T., Peters, L. D., & Woratschek, H. 2012. Resource integration. *Marketing Theory*, 12(2), 201-205.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Kohtamäki, M., Henneberg, S. C., Martinez, V., Kimita, K., & Gebauer, H. (2019). A configurational approach to servitisation: Review and research directions. *Service Science, 11*(3), 213-240.

Kowalkowski, C., Gebauer, H., Kamp, B., & Parry, G. (2017). Servitisation and deservitization: Overview, concepts, and definitions. *Industrial Marketing Management, 60*, 4-10.

Kowalska-Pyzalska, A. 2018. What makes consumers adopt innovative energy services in the energy market? A review of incentives and barriers. *Renewable and Sustainable Energy Reviews*, *82*, 3570–3581.

Kuiken, D., Más, H. F., Haji Ghasemi, M., Blaauwbroek, N., Vo, T. H., Van der Klauw, T., & Nguyen, P. H., 2018. Energy Flexibility from Large Prosumers to Support Distribution System Operation—A Technical and Legal Case Study on the Amsterdam ArenA Stadium. *Energies*, 11(1), 122.

Laaksonen, H., Khajeh, H., Parthasarathy, C., Shafie-khah, M., Hatziargyriou, N., 2021. Towards Flexible Distribution Systems: Future Adaptive Management Schemes. *Applied Sciences* 11, 3709.

Lampropoulos, I., van den Broek, M., van der Hoofd, E., Hommes, K., & van Sark, W., 2018. A system perspective to the deployment of flexibility through aggregator companies in the Netherlands. *Energy Policy*, 118, 534-551.

Lashmar, N., Wade, B., Molyneaux, L., & Ashworth, P. 2022. Motivations, barriers, and enablers for demand response programs: A commercial and industrial consumer perspective. *Energy Research & Social Science*, *90*, 102667.

Laud, G., Bove, L., Ranaweera, C., Leo, W. W. C., Sweeney, J., & Smith, S., 2019. Value co-destruction: a typology of resource disintegration manifestations. *Journal of Services Marketing*. https://doi.org/10.1108/JSM-01-2019-0022

Lusch, R.F. & Vargo S.L. 2006. Service-Dominant Logic: Reactions, Reflections, Refinements. *Marketing Theory* 6(3), 281-288

Lusch, R. F., Vargo, S. L., & O'Brien, M. 2007. Competing through service: Insights from service-dominant logic. *Journal of Retailing*, *83*(1), 5-18.

Lusch, R. F., Vargo, S. L., & Tanniru, M. 2010. Service, value networks and learning. *Journal of the academy of marketing science*, *38*(1), 19-31. https://doi.org/10.1007/s11747-008-0131-z

Ma, Z., Asmussen, A., & Jørgensen, B. N., 2018. Industrial consumers' smart grid adoption: influential factors and participation phases. *Energies*, 11(1), 182.

Mataczyńska, E., Poland, D., Rodríguez, J. M., & Spain, I.-D. 2022. *Grid observability for Flexibility Acknowledgements*.

Mele, C., Nenonen, S., Pels, J., Storbacka, K., Nariswari, A., & Kaartemo, V., 2018. Shaping service ecosystems: exploring the dark side of agency. *Journal of Service Management*.

Mustak, M., & Plé, L., 2020. A critical analysis of service ecosystems research: rethinking its premises to move forward. *Journal of Services Marketing*, 34(2), 399-413

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

National Grid UK balancing services | GridBeyond. (n.d.). Retrieved January 14, 2023, from https://gridbeyond.com/what-we-do/balancing-services/

Neghina, C., Caniëls, M. C., Bloemer, J. M., & van Birgelen, M. J. 2015. Value co-creation in service interactions: Dimensions and antecedents. *Marketing theory*, *15*(2), 221-242.

Osterwalder, A., Pigneur, Y., Bernarda, G., & Smith, A. (2014). *Value Proposition Design*.

Ottosson, M., Magnusson, T., & Andersson, H., 2020. Shaping sustainable markets—A conceptual framework illustrated by the case of biogas in Sweden. *Environmental Innovation and Societal Transitions*, 36, 303-320.

Parrish, B., Heptonstall, P., Gross, R., & Sovacool, B. K. (2020). A systematic review of motivations, enablers and barriers for consumer engagement with residential demand response. *Energy Policy*, *138*, 111221.

Payne, A. F., Storbacka, K., & Frow, P. 2008. Managing the co-creation of value. *Journal of the academy of marketing science*, *36*(1), 83-96.

Pell, A. 2022. *Pains and gains: How to give your customers what they want | Zapier*. https://zapier.com/blog/pains-and-gains/

Plé, L. 2016. Studying customers' resource integration by service employees in interactional value co-creation. *Journal of Services Marketing*, 30(2), 152 – 164.

Plé, L. 2017. Why do we need research on value co-destruction? *Journal of Creating Value*, *3*(2), 162-169. https://doi.org/10.1177/2394964317726451

Plé, L., & Chumpitaz Cáceres, R., 2010. Not always co-creation: introducing interactional co-destruction of value in service-dominant logic. *Journal of Services Marketing*, 24(6), 430-437.

Quitzow, R., Walz, R., Köhler, J., & Rennings, K., 2014. The concept of "lead markets" revisited: Contribution to environmental innovation theory. *Environmental Innovation and Societal Transitions*, 10, 4-19.

Ramaswamy, V., & Ozcan, K., 2018. What is co-creation? An interactional creation framework and its implications for value creation. *Journal of Business Research*, 84, 196-205.

REDII. (n.d.). The REDII: Strengthening the role of RECs to support increased ambition on renewable energy - REScoop. Retrieved 4 September 2023, from https://www.rescoop.eu/toolbox/the-redii-strengthening-the-role-of-recs-to-support-increased-ambition-on-renewable-energy

Roos, A., 2017. Designing a joint market for procurement of transmission and distribution system services from demand flexibility. *Renewable Energy Focus,* 21, 16-24.

Roth, S., Schott, P., Ebinger, K., Halbrügge, S., Kleinertz, B., Köberlein, J., ... & von Roon, S., 2020. The challenges and opportunities of energy-flexible factories: a holistic case study of the model region Augsburg in Germany. *Sustainability*, 12(1), 360.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Ruester, S., Schwenen, S., Batlle, C., Pérez-Arriaga, I., 2014. From distribution networks to smart distribution systems: Rethinking the regulation of European electricity DSOs. *Utility Policy* 31, 229–237.

Siano, P., 2014. Demand response and smart grids—A survey. *Renewable and sustainable energy reviews*, 30, 461-478.

SmartEn, 2021. EU Market Monitor for Demand Side Flexibility 2020. Smart Energy Europe. March 29, 2021.

Techopedia. (n.d.). *What is Load Forecasting?* Retrieved January 15, 2023, from https://www.techopedia.com/definition/30629/load-forecasting-electric-power-engineering

Tóth, Z., Peters, L. D., Pressey, A., & Johnston, W. J. 2018. Tension in a value co-creation context: A network case study. *Industrial Marketing Management*, *70*, 34-45.

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British journal of management, 14*(3), 207-222.

US Department of Energy. (n.d.). *Department of Energy*. Retrieved January 14, 2023, from https://www.energy.gov/

USEF, 2018. Flexibility Platforms, White Paper. Main authors: Hans de Heer en Willem van den Reek.

USEF. (n.d.). *Crash course on Energy Flexibility*. Retrieved January 13, 2023, from https://www.nweurope.eu/media/12326/crash-course-4-energy-flexibility.pdf

Vafeas, M., Hughes, T., & Hilton, T. 2016. Antecedents to value diminution: A dyadic perspective. *Marketing Theory*, *16*(4), 469-491.

Vahid-Ghavidel, M., Javadi, M. S., Gough, M., Santos, S. F., Shafie-khah, M., & Catalão, J. P. S. (2020). Demand Response Programs in Multi-Energy Systems: A Review. *Energies*, 13(17), 4332.

Valor, C., Lind, L., Cossent, R., & Escudero, C. (2021). Understanding the limits to forming policy-driven markets in the electricity sector. *Environmental Innovation and Societal Transitions*, *40*, 645-662.

Vargo, S. L., & Lusch, R. F. 2014. Inversions of service-dominant logic. *Marketing theory*, *14*(3), 239-248.

Vargo, S. L., & Lusch, R. F. 2016. Institutions and axioms: an extension and update of service-dominant logic. *Journal of the Academy of Marketing Science*, *44*(1), 5-23.

Vargo, S. L., & Lusch, R. F., 2004. Evolving to a new dominant logic for marketing. *Journal of Marketing*, 68(1), 1-17.

Vargo, S. L., & Lusch, R. F., 2008. Service-dominant logic: continuing the evolution. *Journal of the Academy of Marketing Science*, 36(1), 1-10.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

White, L. v., & Sintov, N. D. 2017. You are what you drive: Environmentalist and social innovator symbolism drives electric vehicle adoption intentions. *Transportation Research Part A: Policy and Practice*, 99, 94–113.

Yin, J., Qian, L., & Shen, J. 2019. From value co-creation to value co-destruction? The case of dockless bike sharing in China. *Transportation Research Part D: Transport and Environment*, *71*, 169-185.

Yusoff, N. I., Zin, A. A. M., & Khairuddin, A. bin. 2017. Congestion management in power system: A review. *2017 3rd International Conference on Power Generation Systems and Renewable Energy Technologies (PGSRET)*, *2018-January*, 22–27. https://doi.org/10.1109/PGSRET.2017.8251795

Wirtz, J., Fritze, M. P., Jaakkola, E., Gelbrich, K., & Hartley, N. 2021. Service products and productisation. *Journal of Business Research*, *137*, 411-421.

Wunderlich, P., Kranz, J., Totzek, D., Veit, D., & Picot, A. (2013). The impact of endogenous motivations on the adoption of IT-enabled services: the case of transformative services in the energy sector. *Journal of Service Research*, *16*(3), 356-371.

Zhang, T., Lu, C., Torres, E., & Chen, P. J. (2018). Engaging customers in value co-creation or co-destruction online. *Journal of Services Marketing*, *32*(1), 57-69.

9. Appendix

9.1. France

Energy is part of an environmentally friendly lifestyle

"I have a good average carbon consumption; I also do not eat meat; I try not to travel on aeroplanes, only one travel at a time. I do many sports. It's part of a whole, and I don't do it for the network; I do it out of conviction."

High sense of responsibility for the environment and the community

"Compensated? No, I am not interested in being compensated; it is a personal decision and a responsibility we all have to make".

Lack of stability in government subsidies and economic grants

"Grants are very fluctuating; sometimes you have to run because they are very rushed, but then the budget runs out, and it's difficult to get and hire; it's not easy for people, and that's why nobody applies for them".

Gas and nuclear rejection

"I would like to get rid of the main blocker, which is gas, but I can't put everything into electricity. You have to diversify energy".

"I prefer energy to gas. We try to take away as much fossil energy as possible".

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Perceive energy diversification as a smart solution to the energy crisis

"We also have a fireplace now. We already had one, but it was open and very inefficient; now we have closed it (an insert), and the new one is actually so big that it has to be a good complement to the heating system".

Energy cooperatives remain an option when choosing energy suppliers

"When we were in the cooperative, even though it was a bit more expensive, we could afford it. It was a way to pay more for people that are investing in renewable energy".

So many business model options make it hard to choose

"There are many "models" like if you pay the monthly subscription, your price is one; if you don't, the price is other; if the CP is not from Tesla is different, and you pay another price, so it is complex to know what you will pay".

Keen to change habits such as house temperature

"In winter, we are never more than 19 degrees. If it is for the benefit of the network, I don't see it as bad".

"We don't mind lowering the heating and using sweaters; we don't have to be in T-shirts during winter".

Energy consumption reduction as a form of efficiency

"If you donate energy, you reduce someone's interest in reducing their consumption, and for me, that's not a good thing; I think people have to learn to reduce their consumption, not just look at the price".

Economic constraints when participating in flexibility

"The only thing that is not right is that when I sell energy, I have to pay taxes again; I pay double taxes".

I used to produce almost half of the energy, and they paid me money for all the electricity and heating, so I sold it 4 times more than I bought it, and that's why I sold almost all of it, but now as it doesn't pay off economically, I only see it for my consumption.

High investment when acquiring new resources

"The price of installations has to decrease. And I also believe that the first to install are the people who have the money, but unfortunately, it is the people who care the least about the environment or consuming energy in other ways".

"Right now, the prices of the cars are very high, and the ecology of their production can be discussed".

Market and prices instability perceptions

"The last time I was In Italy, I was charging the car, and it was more expensive than fuel cars".

9.2. Italy

High community and planetary sense

"When I go out, I go out in electric; it seems to me a contribution to the condominium".

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

“Surely the ecological fact, using solar energy. If everyone did this, it would be great. I put a little pressure on the condominium".

“Making a choice of this kind makes you feel an active part in safeguarding the planet”.

“What drives me are values and ideals because they bring benefits to the planet and to the community.”

The need for incentives to participate, of any type but clearly communicated and fair

"I hope there is a change of pace. Otherwise, we're going nowhere. But if there are no incentives, people don't move".

"Communication must be simple, effective, and the incentive must be tangible".

Unfair feelings when participating in flexibility

"Selling energy to the grid is paid little, and I don't even find it fair" User, Italy.

Lack of transparency and trust in energy providers

“All those offers that present themselves as a discount, then if you investigate, they are not a real discount".

The point is to have transparency in the relationship between the individual and whoever manages energy.

"I don't trust big institutions very much. To be honest; I would have jumped on an off-grid optic. I don't trust the rich and powerful. I find the energy community thing very interesting".

"I believe that transparency and clarity would help a lot. If I'm selling you something, I'd like to understand when I sold you and how much you paid for it".

Relationship of energy with other environmental actions and carbon footprint” Changing *habits, such as consuming little water, but I see little sensitivity in this sense”.*

“In general, I try to do so that my carbon footprint is low; I try to make certain choices. When I can, I almost always get around by bicycle".

Options to adapt environmental house initiatives

“An important fact for me: how much your house gives and retains heat”.

"I planned a rainwater recovery system for the bathroom drains. The company told us that it had never done it and, therefore, it could not be done. This is something that should be in every condominium".

Ethical motivations are present:

“*The ethical one, reducing my emissions and global ones”.*

"For me, the ethical incentive works enough, do something for the community. I don't know how well it works in the average population".

“My motivation was an ethical issue, out of respect for certain instances. Living in the environment and making the energy issue one of my priorities”.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Difficulties in managing energy in buildings are complex due to neighbourhood bylaws. *In condominiums, it is always difficult to agree on prices. A policy of serious incentives that overcomes these difficulties of agreements within condominiums is always an ongoing dispute.*

Gas dependency reduction

"The idea was, with the panels, to gradually detach from the gas, replace with an induction cooker and also replace the gas boiler with a heat pump. I expect that there will also be an economic return".

"I also eliminated the energy supply through gas. I redid a new system, being able to do it architecturally without too much damage to the building and without too much expense. I eliminated everything that ran on gas".

Although investments are high, it is not perceived as a blocker

"I made a huge expense that I'm going to recover through tax benefits partially".

Energy reduction as an environmentally friendly lifestyle:

Energy is a good investment when trying to make a social and environmental change

"I believe that anyone who has liquidity and has money stuck in the bank, I say "put on solar panels" because within 6-7 years you will return from the investment and then only have to earn from then on".

9.3. Spain

Lack of market development, stability and adoption

It's going to be hard for people to switch to electric mobility. There are hardly any charging points. They are people who are very much in the loop, but they are not the majority. On top of that, you see that the car is expensive and that there are no major advantages.

I took the leasing because I thought that with the evolution of the electric car market, which from one year to the next is advancing in terms of autonomy and batteries, then I will see how it evolves.

High economic investment

Environmental concerns can only be afforded by some people because it costs money. Even if other people care, they can't afford it.

It was quite a heavy investment for a house where there are only two of us, a normal house.

The very high entry price, the price of electric cars, is crazy; even though it is easier to produce an EV, it is 10,000 euros more expensive than a combustion car.

The hardest thing is that economically it needs to be very clear because it is an investment that represents much money.

Cities regulation is a lever for acquiring some resources

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

The initial decision was out of necessity because my car could no longer enter the centre of Madrid (emission cars), and I live on the outskirts of Madrid, and I am quite dependent on my car.

Economic call not sufficient; flexibility is not economically interesting

There are a series of fixed costs associated with the distributor that you have to pay. For going out to the grid and coming back in, you have to pay "tolls."

The profitability of feeding energy into the grid, I think, is crumbs

Resources connectivity and digitalisation were demanded

I don't have data, and neither is everything unified, less than we would like

You waste much time looking at what is going on in the house and making manual adjustments.

One issue is that I can't separate the carload from the consumption of the rest of the house on the bill. I think this is important in order to optimise

Self-consumption and grid independency

I try to ensure that my energy does not go to the grid; the best thing is to optimise consumption inside the home. In the end, it is not economically worth it; the best thing to do is to optimise consumption inside the home.

I want to be independent of the network rather than receive prices or bonuses.

I don't think it's profitable to be flexible like this. I am doing self-consumption with what I generate, the best thing would be to put it in batteries, but before putting it into the grid, I keep it in a battery to charge other things.

Rejection of flexibility participation due to economic call

For going out to the grid and coming back in, you have to pay "tolls", which, if you consume everything inside the home, you save them.

The price they charge you per kW/h is about 10 times higher than the price they pay you when you discharge to the grid. It is not attractive. If I had a solar farm, yes, but for self-consumption, it is not attractive.

The electricity company profits from the panels because even if the user saves on the bill, they make a profit with what they resell.

You have to deliver 3 times the light that you have consumed.

Demand technological progress

At the moment, the batteries are not very developed; there are adapters, but everything is very changeable.

Although I usually charge it at home because the public ones are kind of screwed up, and they can block or screw up your car.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

The issue of surplus managers is important and very interesting, but it is not yet well developed and with a simple device.

Home automation is at the computer level, not at the home assistant user level.

Lack of knowledge on what to instal and energy data in general

Another issue is that you have to know a lot to install exactly what you need and not screw it up.

To this day, even the bill is still not understood, no matter how hard we have tried to explain it.

It takes knowledge. I asked for several quotes, but I saw that they were not well calculated and so I had to do it myself. And I made an Excel page to get all the values I needed.

In the beginning, it was difficult to understand it; it took me months, now I understand it, but it is impossible to grasp it if there is no one to explain it to you.

Installers' role in energy personalisation

Installers, in general, do not know what they are installing, they know how to install it, but they do not adapt to people's needs. They repeat the same installations changing the size and little else.

If you want to do it right, you have to know a lot because if they don't install what they want you to install, they will make a calculator for square meters and consumption that is not really efficient and is not the real thing.

Subsidies are an option but sometimes hard to access

I got the charging point because they gave subsidies. It was easy to apply, but we still haven't seen a penny for a year and a half after the expense of the charging point.

The subsidies are good, but we installed the panels a year and a half ago, and we still don't see the money from the subsidy.

9.4. Sweden

The following is a write-up of notes from an interview with two representatives from a German state-owned utility operating in Sweden as an energy flexibility service provider, highlighting their perspective on the energy markets. The company's core focus is on security of supply and energy trading, involving a mix of hydro, thermal, nuclear, and gas assets. Notably, the company employs innovative solutions, such as hydro battery hybrids, to combine energy from dams with battery speed for increased efficiency and reduced maintenance.

The company's involvement in the energy market extends to the SWITCH project, where they seek to generate revenues from their assets, notably a 700 kW facility. While the company aspires to find aggregation opportunities, the current local market size requires direct connection to the Transmission System Operator (TSO). The interviewees acknowledged their legacy assets, some over 50 years old, which offer low capital expenditure.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Regarding future plans, the company aims to enhance its environmental profile by greening its asset portfolio. The growing demand for flexibility and capacity in electricity utilisation is emphasised, and the UK's more active Transmission System Operator (TSO) role is contrasted with EU countries. In Germany and Sweden, market limitations hinder smaller entities from participating in the Local Flexibility Markets.

The current Swedish energy market is, not uniquely, deemed to be immature and lacking stability, making investments challenging due to volatile pricing. The interviewees mention efforts to secure contracts for mitigating market risks. While batteries hold promise for reducing volatility by storing energy during low-price periods, the challenge lies in balancing wide accessibility with their benefits.

The company underscores the need for flexibility and foresight in a dynamic market. They have overcome permitting obstacles but acknowledge grid connection as a challenge for new entrants. The company advocates for better infrastructure utilization aligned with market needs, leveraging dynamic modelling and flexibility, particularly for timing asset usage.

From their perspective, the company desires long-term contracts with various revenue streams and a commitment to non-voluntary markets. They value diversity and flexible contract durations, as seen in the UK's approach. The interviewees express interest in having incentives for load alteration and the ability to split services, suggesting that diversification is key to managing market volatility.

In conclusion, the company's representatives view the Swedish energy market as in need of maturity and stability. They highlight the potential of flexibility, dynamic modelling, and battery storage to address challenges. Their forward-looking approach emphasizes long-term contracts, diverse revenue streams, and infrastructure optimisation, with a keen focus on mitigating risks associated with market fluctuations.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

10. Annex

10.1. Annex 1. EU-funded projects included in the review

Below is a selection of selected projects, with a brief description of them.

PROJECT	NAME	DESCRIPTION	DATE
ONGOING PROJECTS			
Renaissance	Renewable Integration and SuStainAbility iN energy CommunitiEs	Leading smart grid solution providers and research groups join forces to integrate a range of consumer-focused innovations into existing service platforms. The project will support Industry leaders ABB (analytical and design tools) and ATOS (energy management platform) to deliver services with a clear market focus that are widely replicable across Europe. The suite of tools will be demonstrated in real-life pilots in Belgium, Greece, France and the Netherlands. RENAISSANCE aims to demonstrate highly replicable design and management approaches for integrated local energy systems that achieve high participation of local consumers (15-20%), exceed at local level EU targets for renewable energy sources (37-80%) while decreasing the energy price for community members (5-10% below current market prices). The methodology and each of the pilots will cover key energy vectors (electricity, heat, transport), involve different actors (households, SMEs, institutions), and valorises flexibility services within and between communities and with DSOs. In total, over 1.000 households and 50 companies will be connected in a system that totals 30752MW capacity. Main innovations include multi-actor multi-criteria of technical design, geo-locations, and interoperable management platform. To demonstrate replicability and open the role to market, the approach will be applied to 10 more locations across the globe - including in India, the US, the UK and Poland.	05/2019 - 10/2022

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

React	Renewable Energy for self-sustAinable island CommuniTies	A boost of island energy security Islands are highly dependent on mainland energy markets, but the transfer of energy is inefficient and costly. Achieving a secure and reliable supply of energy is a priority. In this context, the EU-funded REACT project will develop the large-scale deployment of renewable energy sources (RES) and storage assets on islands in order to contribute to the decarbonisation of local energy systems. Its overall aim will be to create a holistic cooperative energy management strategy at the community level. Specifically, REACT will deliver a scalable and adaptable cloud-based Information and Communication Technology platform for RES and storage-enabled infrastructures by combining both conventional and renewable systems and enabling synergies between different energy networks and microgrids.	01/2019 - 06/2023
ebalance-plus	Energy balancing and resilience solutions to unlock the flexibility and increase market options for the distribution grid	Power sector resilience solutions As the backbone of society, electricity is currently delivered to consumers via complex networks or grids. Thus, smart grid and storage solutions are needed to ensure efficiency. The EU-funded balance-plus project will increase the energy flexibility of distribution grids, predict available flexibility and increase distribution grid resilience and design. It will test new ancillary models to promote new markets based on energy flexibility. The concept is based on the outcomes of a previous European FP7 R&D project (e-balance), which developed an energy-balancing platform tested in 43 neighbouring households with smart appliances and PV power inverters. The balance-plus project will introduce an energy-balancing platform that will control a variety of technologies (developed during the project) with the goal of increasing energy flexibility.	02/2020 - 07/2023
Fever	Flexible Energy Production, Demand and Storage-based Virtual Power Plants for Electricity Markets and Resilient DSO Operation	Flexible Energy Production, Demand and Storage-based Virtual Power Plants for Electricity Markets and Resilient DSO Operation FEVER implements and demonstrates solutions and services that leverage flexibility towards offering electricity grid services that address problems of the distribution grid, thus enabling it to function in a secure and resilient manner.	02/2020 - 07/2023

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

		The project encompasses technologies and techniques for the extraction of energy flexibility from energy storage assets and implements a comprehensive flexibility aggregation, management and trading solution. In addition, a DLT-based flexibility trading toolbox will be implemented, enabling autonomous peer-to-peer trading. FEVER also implements goal-oriented applications and tools that empower DSOs with optimal grid observability and controllability. FEVER will carry out extensive demonstration and testing activities in multiple settings.	
Parity	Pro-sumer AwaRe, Transactive Markets for Valorization of Distributed flexibilITY enabled by Smart Energy Contracts	Flexibility market platforms based on blockchain and IoT pave the way for smart energy grids. Transactive energy is a new kind of energy market operated by consumers, which will change the way energy is generated and consumed. Blockchain technology would serve as an ideal platform for the transactive electricity market, helping to ensure that diverse assets on the grid work together. It also allows the IoT to share information efficiently, reliably and securely. The EU-funded PARITY project is working on a local flexibility market platform that seamlessly integrates IoT and blockchain technologies. The solution also includes active network management tools to address the present 'structural inertia' of the distribution grid. PARITY's solution is expected to increase grid durability and efficiency, facilitating penetration of renewable energy sources in the electricity energy mix beyond 50 %.	10/2019 - 03/2023
Platone	PlatformA for Operation of Distribution Networks	New management platform for the modern grid Modern power grids are moving away from centralised, infrastructure-heavy transmission system operators (TSOs) towards distribution system operators (DSOs) that are flexible and more capable of managing diverse renewable energy sources. DSOs require new ways of managing the increased number of producers, end users and more volatile power distribution systems of the future. The EU-funded PlatOne project is using blockchain technology to build a platform to meet the needs of modern DSO power systems, including data management. The platform is built with existing regulations in mind and will allow small power producers to be easily certified so that they can sell excess energy back to the grid. The platform will also incorporate an open-market system to link with traditional TSOs.	09/2019 - 08/2023

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

InterConnect	Interoperable Solutions Connecting Smart Homes, Buildings and Grids	A step in effective energy management The EU energy market is conditioned by digitalisation. New rules and technological developments allow the proliferation of energy service providers in the EU member states, with users having full knowledge and control over their appliances. However, interoperability represents a serious problem, as a change of provider could mean the replacement of installations. The EU-funded InterConnect project proposes effective energy management using a resilient and practical ecosystem that is user-centric and market-driven. The project involves a range of specialised stakeholders, including advanced technology actors, manufacturers, providers and energy users. Via seven pilots, they will showcase an effective digital market for ensuring energy efficiency at reduced costs that is beneficial to end-users.	10/2019 - 09/2023
ACCEPT	Active Communities & Energy Prosumers for the Energy Transition	A digital toolbox for energy communities Grid integration of variable renewable energy sources poses major challenges with respect to system stability due to demand-supply imbalances. Energy communities are emerging as a promising element to promote citizen involvement in the energy transition. However, ICT tools are required to extract and optimise the flexibility of residential energy resources to create financially viable operations based on citizen needs. The EU-funded ACCEPT project intends to develop and deliver such a digital toolbox that allows energy communities to offer innovative digital services and access revenue streams that can financially support their functions and secure their sustainability and effectiveness. The ACCEPT framework will be demonstrated and validated in four pilot sites in Greece, the Netherlands, Spain and Switzerland, involving more than 3 000 people and 750 residences.	01/2021 - 06/2024
BRIGHT	Boosting DR through increased communIty-level consumer engaGement by combining Data-driven and blockcHain technology Tools with social science approaches and multi-value service design	Maximising the role of demand response in the power sector Today's energy market is humming to a new beat – one that is electrified with larger renewable energy sources and more opportunities for demand response (DR). The EU-funded BRIGHT project will work to maximise the potential of DR at the consumer level, harnessing the potential of blockchain technology to deliver data-driven cross-stakeholder and cross-domain energy fingerprinting services. Specifically, it will design a co-creation process that lifts individual consumers to centre stage in order to deliver a DR that is multi-layered, community-centred, cross-domain, adaptable and multi-timescale.	11/2020 - 10/2023

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

		It will also combine user experience design driven by social science for user behaviour motivations that may include monetary and non-monetary incentives. Moreover, BRIGHT is focused on the use of digital twins for improved consumer predictability as well as artificial intelligence data-driven energy and non-energy services.	
Hestia	Holistic dEmand Response Services for European residenTIAl communities	A new grid reality for residential consumers Ensuring secure and affordable energy supplies to EU citizens is a top priority and the purpose of an integrated energy market. This is especially true in a world that is becoming increasingly connected and where energy consumers demand innovative technologies. It is within this energy ecosystem that the EU-funded HESTIA project is developing a cost-effective solution for the next-generation demand-side response services. It aims to leverage consumer engagement, energy and non-energy services while engaging with residential consumers, who represent an untapped sector. The key will be to encourage residential consumers to engage in flexibility sharing and grid balancing. According to HESTIA, user-personalised services will help lay the foundation for an open marketplace and new grid reality.	11/2020 - 10/2023
Iflex	Intelligent Assistants for Flexibility Management	Groundbreaking software to improve energy management. Consumer response is a crucial factor for the economy. It allows consumers to influence prices through demand and thus lower or increase them and is based on the needs, wants and economic capabilities of the public. It is also especially important for the energy sector. Unfortunately, consumer response and demand response cannot easily influence demand for the energy sector. The EU-funded iFLEX project aims to change this, not only by making it easier for consumers to participate in demand response but also by increasing its reach and effect. It plans to achieve this by developing an innovative software agent that allows for better management of energy and demand response by acting between energy systems and various stakeholders.	11/2020 - 10/2023

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

ReDream	REAL CONSUMER ENGAGEMENT THROUGH A NEW USER-CENTRIC ECOSYSTEM DEVELOPMENT FOR END-USERS ASSETS IN A MULTI-MARKET SCENARIO	More power to the people The energy market is rapidly transforming, and so is the role of the consumer. Yesterday's passive consumers are central actors in today's energy markets. As new prosumers, energy markets can benefit from their generation, consumption and storage capabilities. The EU-funded REDREAM project will enable the effective participation of consumers and prosumers in the energy market. It will develop a strategy for the creation of a value generation chain based on a revolutionary service-dominant logic paradigm in which service is exchanged for service. The project will collect the demand response tools and energy/non-energy services capable of enabling consumers to participate in the energy market. The results will assist in the generation of a new concept of a connected ecosystem.	10/2020 - 09/2023
Sender	Sustainable Consumer engagement and demand response	Turning energy consumers into collaborators As the EU moves towards sustainable energy, co-creation is the future of the energy service market. This entails a shift in the balance of power, turning customers into a new generation of collaborators and putting them at the heart of the energy sector. The EU-funded SENDER project will develop energy service applications for proactive demand response (DR), home automation convenience and security mechanisms. By engaging customers in a co-creation process, the project will shift DR from a reactive to a proactive approach. Consumer data will be collected and processed to identify typical consumption patterns, mirror them by digital twins (DTs) based on artificial intelligence technologies and aggregate the DTs' supply/demand characteristics.	10/2020 - 09/2024
TwinERGY	Intelligent interconnection of prosumers in positive energy communities with twins of things for digital energy markets	Innovative tools for the digital energy market A digital twin (DT) is a digital replica of a physical asset, process, or system. The digital twin can be used to test new ideas or model scenarios in real time without interrupting physical asset operations and user processes. The EU-funded TwinERGY project will introduce a new digital twin framework for the energy market. It will incorporate the required intelligence for optimising demand response at the local level without compromising the well-being of consumers and their daily	11/2020 - 10/2023

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

		schedules and operations. The project will ensure that a wide range of consumers/prosumer interests will be represented and supported in the energy marketplace. Key use cases will be trialled in four pilot regions, and the project will develop, configure, and integrate an innovative suite of tools, services and applications for consumers.	

PROJECT	NAME	DESCRIPTION	DATE
CLOSED PROJECTS			
CoordiNet	Large-scale campaigns to demonstrate how TSO-DSO shall act in a coordinated manner to procure grid services in the most reliable and efficient way	Procuring electricity more reliably and efficiently through greater consumer participation If distribution system operators and transmission system operators coordinated in a beneficial way, consumers would enjoy a cheaper, more reliable and more eco-friendly electricity supply. The EU-funded CoordiNet project will determine to what extent this is possible by carrying out 10 pilots in demonstration sites in Greece, Spain and Sweden, together with market participants and end users. It will define and test a suite of standardised products and associated important parameters for grid services. This will lead to a unified, pan-European electricity market that enables all market participants to supply energy services while unlocking new sources of revenue for consumers offering grid services.	01/2019 - 06/2022
FlexGrid	A novel smart grid architecture that facilitates high RES penetration through innovative markets towards efficient interaction between advanced electricity grid management and intelligent stakeholders	Flexibility to energise future grid architecture. A holistic power system architecture includes all electrical equipment, customer plants and the market. All merged into one single structure; this ensures a reliable, safe and economical smart power system operation. The EU-funded FLEXGRID project will propose a holistic future smart grid architecture to boost interaction and integration of innovative models and meet future energy market requirements. The project will also develop flexible business models through the use of artificial intelligence that can be exploited by today's energy service providers (ESPs) and renewable ESPs (RESPs) to ensure economic and operational advances. On the one hand, ESPs become more competitive and sustainable, and RESPs will exploit their production without risk.	10/2019 - 09/2022

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Flex4Grid	Prosumer Flexibility Services for Smart Grid Management	The advent of distributed power sources, such as photovoltaics and windmill plants, gave rise to energy prosumers (producers-consumers), which generate and consume electrical energy. Energy demand and energy generation by prosumers are volatile and can impact the grid infrastructure and stakeholders, but they can be flexibly adapted to thwart those impacts. Flex4Grid aims at creating an open data and service framework that enables a novel concept of managing flexibility of prosumer demand and generation, utilising cloud computing for power grid management and opening DSO infrastructure for aggregator services. The system will be built from existing ICT components developed by the consortium partners over many years in research projects on IoT and Cloud computing. This high maturity allows Flex4Grid to aim for a system prototype of TRL 7, which guarantees a maximum impact and competitiveness in the area of the smart grid challenge. The Flex4Grid system will include: a) a data cloud service with anonymised interface and advanced security and privacy mechanisms for data exchange and service management, b) prosumer generation and demand flexibility, and c) a more viable business model to accelerate the deployment. The major innovations are: a) opening the market for new entrants by secure and privacy-enabling third-party cloud data and energy management services, b) actionable common and multilevel data management and analytics services for Smart Grids, and c) the use of co-creation to bring end users into the value-creation process. System validation will be carried out in real-world pilots in three live electricity networks with different scenarios ranging from deployment during smart meter roll-out and retrofitting to large-scale operation and federated demonstration of multi-site pilots.	01/2015 - 03/2018/

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

Flexiciency	Energy services demonstrations of demand response, FLEXibility and energy effICIENCY based on metering data	Four major Distribution System Operators (in Italy, France, Spain and Sweden) with smart metering infrastructure in place, associated with electricity retailers, aggregators, software providers, research organisations and one large consumer, propose five large-scale demonstrations to show that the deployment of novel services in the electricity retail markets (ranging from advanced monitoring to local energy control, and flexibility services) can be accelerated thanks to an open European Market Place for standardised interactions among all the electricity stakeholders, opening up the energy market also to new players at EU level. The proposed virtual environment will empower real customers with higher quality and quantity of information on their energy consumption (and generation in the case of prosumers), addressing more efficient energy behaviours and usage through advanced energy monitoring and control services. Accessibility of metering data, close to real-time, made available by DSOs in a standardised and non-discriminatory way to all the players of electricity retail markets (e.g., electricity retailers, aggregators, ESCOs and end consumers), will facilitate the emergence of new markets for energy services, enhancing competitiveness and encouraging the entry of new players, benefitting the customers. Economic models of these new services will be proposed and assessed. Based on the five demonstrations, while connecting with parallel projects funded at EU or national levels on novel services provision, the dissemination activities will support the preparation of the Market Place exploitation strategies, as well as the promotion of the use cases tested during the demonstration activities.	02/2015 - 01/2019
NobelGrid	New Cost-Efficient Business Models for Flexible Smart Grids	NOBEL GRID will develop, deploy and evaluate advanced tools and ICT services for energy DSOs cooperatives and medium-size retailers, enabling active consumer involvement –i.e., new demand response schemas – and flexibility of the market – i.e., new business models for aggregators and ESCOs. Through the dual-use of telecommunication networks and validating the integration of renewable generation presence and demand response systems, NOBEL GRID will offer advanced services to all actors in the retail markets of the electricity system in order to ensure that all consumers will benefit from lower prices, more secure and stable grids and low carbon electricity supply. The project results will be demonstrated and validated in real-world environments with the active involvement of all the actors and based on the new business models defined during the project.	01/2015 - 06/2018

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

P2P-SmarTest	Peer to Peer Smart Energy Distribution Networks (P2P-SmartTest)	The P2P-SmartTest project investigates and demonstrates a smarter electricity distribution system integrated with advanced ICT, regional markets and innovative business models. It will employ Peer-to-Peer (P2P) approaches to ensure the integration of demand-side flexibility and the optimum operation of DER and other resources within the network while maintaining the second-to-second power balance and the quality and security of the supply. The proposed project will build upon the extensive experience of the consortium on Information and Communications Technologies (ICT), especially ICT for the Energy Sector, Smart Grids including Distributed Energy Resources (DER) integration, MicroGrids, CELLs, Virtual Power Plants, power system economics, electricity markets and business models. The project comprises 7 work packages (WP), of which 5 are technical WPs. Apart from project management (WP1) and dissemination and exploitation (WP7), the P2P-SmartTest project defines and demonstrates the suitable business models (WP2) for peer-to-peer based distributed smart energy grids, quantifies the value from significantly increased system interaction and integration, and assesses the required development in ICT and power networks in conjunction with commercial and regulatory frameworks to enable P2P trading realising its full potential. WP3 shall develop and demonstrate the distributed wireless ICT solutions capable of offloading the required traffic of different applications of energy trading, network optimisation, AMR data and real-time network control, to name a few. In WP4, the optimisation mechanisms of energy flow in the P2P context shall be defined, as well as market design solutions. To properly operate the distributed network, WP5 shall integrate the necessary network operation functions for resilient distribution system operation. The results of WPs 2-5 will be integrated into the demonstration and validation environment in WP 6 to provide real-life results of distributed energy system designs.	01/2015 - 12/2017
SmarterEMC2	Smarter Grid: Empowering SG Market Actors through Information and Communication Technologies	Power systems undergo massive technological changes due to the ever-increasing concerns for environmental and energy sustainability. The increase of RES and DG penetration is one of the main goals in Europe in order to meet environmental targets. However, these goals will require new business cases and must be based on innovative ICT tools and communication infrastructure. In parallel, following the M/490 EU Mandate, CEN, CENELEC and ETSI proposed a technical report describing the Smart Grid Reference Architecture and the Smart Grids Architecture Model (SGAM) framework. A key objective of new Research and Innovation projects should be to provide solutions and ICT tools compatible with the SGAM and the standardisation activity in Europe. Such new projects should also support the standardisation activity by proposing additions or changes related to their objectives. Another key issue to address is whether the existing telecommunication infrastructure is sufficient to support mass scale the new business cases and Smart Grid services. SmarterEMC2 implements ICT tools that support Customer Side Participation and RES integration and	01/2015 - 12/2017

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

		facilitate open access in the electricity market. These tools take into account the SGAM as well as the future structure of the Distribution Network as described by the relevant EU bodies and organisations. The project supports standardisation activity by proposing adaptation to data models of market-oriented standards (IEC 62325-351) and field-level standards (IEC 61850). Moreover, the project is fully dedicated to achieving maximum impact. To validate the proposed technologies, the project includes 3 real-world pilots and large-scale simulations in 3 laboratories. The former will demonstrate the impact of Demand Response and Virtual Power Plants services in real-world settings, while the latter will reveal the ability of the communication networks to support massive uptake of such services.	
GoFlex	Generalised Operational FLEXibility for Integrating Renewables in the Distribution Grid	The GOFLEX project will innovate, integrate, further develop and demonstrate a group of electricity smart-grid technologies, enabling the cost-effective use of demand response in distribution grids, increasing the grids' available adaptation capacity, and safely supporting an increasing share of renewable electricity generation. The GoFlex smart grid solution will deliver flexibility that is both general (across different loads and devices) and operational (solving specific local grid problems). GOFLEX enables the active use of distributed sources of load flexibility to provide services for grid operators, balance electricity demand and supply, and optimise energy consumption and production at the local level of electricity trading and distribution systems. Building on top of existing, validated technologies for capturing and exploiting distributed energy consumption and production flexibility, GOFLEX enables flexibility in the automatic trading of general, localised, device-specific energy as well as flexibility in trading aggregated prosumer energy. Generalised demand-response services are based on a transparent aggregation of distributed, heterogeneous resources to offer virtual power plants and virtual storage capabilities. The sources of load flexibility include thermal (heating/cooling) and electric storage (electric vehicles charging/discharging). A backbone data-services platform offers localised estimation and short-term predictions of market and energy demand/generation and flexibility in order to support effective data-driven decisions for the various stakeholders. Smart-grid technologies, such as increased observability and congestion management, contribute to the platform. Over 36 months, GOFLEX will demonstrate the benefits of the integrated GOFLEX solution in three use cases, covering a diverse range of structural and operational distribution grid conditions in three European countries.	11/2016 - 02/2020

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

InteGrid	Demonstration of INTElligent grid technologies for renewables INTEgration and INTEractive consumer participation enabling INTEroperable market solutions and INTErconnected stakeholders	InteGrid's vision is to bridge the gap between citizens, technology and the other players in the energy system. The project will demonstrate how DSOs may enable all stakeholders to actively participate in the energy market and distribution grid management and develop and implement new business models, making use of new data management and consumer involvement approaches. Moreover, the consortium will demonstrate scalable and replicable solutions in an integrated environment that enables DSOs to plan and operate the network with a high share of DRES in a stable, secure and economical way, using flexibility inherently offered by specific technologies and by interaction with different stakeholders. To achieve these objectives, a complementary partnership covering the distribution system value chain has been established. The consortium includes three DSOs from different countries and their retailers, innovative ICT companies and equipment manufacturers, as well as customers, a start-up in the area of community engagement and excellent R&D institutions. InteGrid's concepts and approaches are based on these two elements: 1. the role of the DSO as a system optimiser and as a market facilitator and 2. the integration of existing demonstration activities in three different regions allowing to move from single solutions to integrated management at a larger scale while focusing on the scalability and replicability considering current and evolving market (and regulatory) conditions. The three conceptual pillars – proactive operational planning with DER, business models for flexible DER, and information exchange between different power system actors – offer an opportunity to maximise the economic, societal and environmental gains from the combined integration of DRES and flexible DER. A market hub platform coupled with smart grid functions and innovative business models will open opportunities for new services and an effective roll-out of emerging technologies in the short term.	01/2017 - 10/2020
InterFlex	Interactions between automated energy systems and Flexibilities brought by energy market players	Five DSOs (CEZ distribute, ERDF, EON, Enexis, Avacon) associated with power system manufacturers, electricity retailers and power system experts propose a set of six demonstrations for 12 to 24 months. Within three years, they aim at validating the enabling role of DSOs in calling for flexibility sources according to local, time-varying merit orders. Demonstrations are designed to run 18 separate use cases involving one or several of the levers increasing the local energy system flexibility: energy storage technologies (electricity, heat, cold), demand response schemes with two coupling of networks (electricity and gas, electricity and heat/cold), the integration of grid users owning electric vehicles, and the further automation of grid operations including contributions of micro-grids. The use cases are clustered into three groups. Three use cases in Sweden and the Czech Republic address the enhancement of the distribution network flexibility itself. Five use cases in France, Germany and Sweden demonstrate the role of IT solutions to increase drastically the speed of automation of the distribution networks, which can	01/2017 - 12/2019

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

		then make the best use of either local single or aggregated flexibilities. Ten use cases in the Czech Republic, France, The Netherlands and Sweden combine an increased network automation and an increased level of aggregation to validate the plausibility of local flexibility markets where both distributed generation and controllable loads can be valued. The replicability of the results is studied by the DSOs and industry with an in-depth analysis of the interchangeability and interoperability of the tested critical technology components. Dissemination targeting the European DSOs and all the stakeholders of the electricity value chain will be addressed by deployment roadmaps for the most promising use cases, thus nourishing the preparation of the practical implementation of the future electricity market design, the draft of which is expected by the end of 2016.	
DRIVE	Demand Response Integration tEchnologies: unlocking the demand response potential in the distribution grid	Addressing call topic area 3 (DR Technologies), DRIvE links together cutting-edge science in Multi-Agent Systems (MAS), forecasting and cyber security with emerging innovative SMEs making first market penetration in EU DR markets. In doing so, near-market solutions are strengthened with lower TRL and higher risk functionalities that support a vision of an "Internet of energy" and "collaborative energy network." From the research side, MAS will move closer to real-time operations and progress from a limited number of assets toward decentralised management of a larger number of assets providing DR services to prosumers, grid stakeholders and DSOs. The research will deliver a fully-integrated, interoperable and secure DR Management Platform for Aggregators with advanced hybrid forecasting, optimisation, fast-response capabilities and enhanced user participation components in a standard-compliant (Open ADR) market-regulated (USEF) manner, empowering a true cost-effective mass-market (100's millions of heterogenous assets). The project features 5 pilots across 3 countries consisting of a stadium, wind farm, 7-floor office, and tertiary & residential buildings within medium-large districts, resulting in over 25 MW of potential flexible capacity. Direct engagement of 100 households and 2 tertiary buildings (over 1,000 persons) is attained, and replication to over 75,000 persons is possible. The pilots will be running in a real DSO environment with the real engagement of grid players. Overall, DRIvE will make available an average of 20% of the load in residential and tertiary buildings for use in DR, resulting in up to 30% cost-saving (price-based DR) and also maximising revenue for prosumers (incentive-based DR).	12/2017 - 11/2020

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

		The Drive will also allow a minimum 25% increase in renewable hosting capacity (distribution grid) and up to 30% of an overall reduction of CAPEX and OPEX costs for DSOs. The project is female-led, and three women serve in management structure positions of responsibility.	
FLEXCoop	Democratising energy markets through the introduction of innovative flexibility-based demand response tools and novel business and market models for energy cooperatives	FLEXCoop introduces an end-to-end Automated Demand Response Optimisation Framework. It enables the realisation of novel business models, allowing energy cooperatives to introduce themselves in energy markets under the role of an aggregator. It equips cooperatives with innovative and highly effective tools for the establishment of robust business practices to exploit their microgrids and dynamic VPPs as balancing and ancillary assets toward grid stability and alleviation of network constraints. Optimisation in FLEXCoop applies to multiple levels. It spans local generation output, demand and storage flexibility, as well as the flexibility offered by EVs to facilitate maximum RES integration into the grid, avoidance of curtailment and satisfaction of balancing and ancillary grid needs. This is achieved via automated, human-centric demand response schemes with the participation of appropriately selected residential prosumers. To enhance prosumer acceptance, the FLEXCoop innovative services will feature non-intrusiveness, comfort and well-being preservation, non-violation of prosumer daily schedules as well as maximisation of benefits through transparent and open participation in markets. It will also guarantee easy switching between DR service providers, vendor lock-in avoidance, customised DR service contracts and objective settlement and remuneration, thus establishing an energy democracy context and empowering prosumers to become active energy market players. FLEXCoop brings together a wide range of baseline technologies to build an open and interoperable DR optimisation framework, including a fully-fledged tool suite for energy cooperatives (aggregators) and prosumers involved in the DR value chain, ensuring: (i) DR stakeholders' empowerment and transformation into active market players, (ii) end-to-end interoperability between energy	10/2017 - 01/2021

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

		networks, energy management systems and devices and (iii) the realisation of new business models for energy cooperatives.	
PV-Prosumers4Grid	Development of innovative self-consumption and aggregation concepts for PV Prosumers to improve grid load and increase the market value of PV	The aim of the PV-Prosumers4Grid project is to develop and implement innovative self-consumption and aggregation concepts and business models for PV prosumers that will help integrate sustainable and competitive electricity from PV in the electricity system. The benefits of the PV-Prosumers4Grid action will be, therefore, threefold: • To identify the necessary regulatory changes and the business opportunities for PV prosumers and grid operators • To further support the deployment of PV systems for electricity generation with a focus on physical and financial grid interactions • To provide PV Prosumers (households and industries) with competitive and sustainable electricity Innovative self-consumption and aggregation concepts and business models for PV generation are extremely needed nowadays. At the time, many EU Member States had drastically reduced measures to support the development of the RES sector further, even though several projects have clearly demonstrated the need to maintain the policies to support RES until when consolidated competitiveness has been achieved. Such competitiveness for variable RES will depend on the ability of the existing or future electricity markets to provide them with adequate revenues, whatever the size of the plant. In addition, the variable aspect of PV doesn't allow them by nature to bid on the market at chosen times, with a possible and already visible impact on the market prices. The consequence could be that under such conditions, their competitiveness will become more difficult to achieve unless the consumers could become more responsive to price signals and allow them to displace the load.	10/2017 - 03/2020

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

		Moreover, the new state aid guidelines published in April 2014 by the European Commission are pushing for further integration of renewable sources into the electricity markets, which will require RES to cope with market integration, more constraining grid codes and balancing regulations.	

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

10.2. Annex 2. General conversation guide

Before starting the conversation:

1. Sign the Data Protection Agreement (GDPR)
2. Ask for permission to record the conversations and take pictures/videos
3. Introductions (name, where do they live (location and type of house))
4. Short explanation about the project
5. Short explanation about the activity

What we want to understand:

Identify consumer archetypes considering:

1. *Main motivations & drivers for flexibility involvement*
2. *What actors perceive as value*
3. *What would motivate them to participate and stay (engagement).*
4. *Practices at home/business and home/business life*
5. *Internal or external barriers*
6. *Their level of adoption and predisposition about flexibility*

SECTION I: ENERGY

- Tell us a little about how your house/business/building works and how you use energy
- Who handles the energy issue at home/business? (Invoices, company, reviews, etc.)
- What things you miss regarding energy at your house/business

SECTION II: VALUE PERCEIVED FROM ENERGY

- How is your relationship with energy and what is most important to you? *(Savings, efficiency, environmental impact, not having problems, etc.)*
- What installation/equipment do you have related to energy and how do you use them on a daily basis?
- Do you save at home/business on something in particular? How do you invest those savings? What motivates you to do it?
- If you could save a lot of your energy, what would you invest in it? Would you?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

- If you could change one thing about your home/business in terms of energy management, what would it be?
  (It can be physical, attitudinal / behaviour, of a relative)
- How much are you willing to change your habits of energy consumption? Why would you do it? What do you ask in exchange? What things do you think would prevent it and what things make it easier for you?
  (e.g.: in exchange for savings, less impact, change the appliance, put the washing machine on other hours, etc.)

SECTION III: THE ENERGY MARKET

- What is your perception of how energy works today? (Myths and truths)
- What is your perception of the energy market in general?
- How would you feel if they told you that you can be an active part of the energy market (buy, sell energy and provide services)? Why?
- Why would you sell or why wouldn't you sell energy? share it?

SECTION IV: THE RESOURCES

- What led you to take the leap to acquire * [energy asset]? (motivation)
  - How long did it take you to make the decision?
  - What were your doubts or barriers?
- How do you use your * [energy asset]
- How do you monitor the * [energy asset] and how often? Is there a service that you do not manage through an app, or you do it only via phone or web?
- What do you think of having the option of participating in the energy markets and obtaining an economic benefit from it?
- Is there any information you would like to have in real time about your home/business? And which is not? And specifically about energy?
- What is your position regarding sharing your data consumption?

IF PV PANEL

- How do you manage your energy production, what do you use it for and how do you use it? If you have or had overproduction, what would you do with it?
- How much would you more or less like to receive as a minimum for your flexibility to the grid?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

- If you were paid a financial incentive to stop using the energy you generate and give it to the grid when it is needed, would you do it? How much money would motivate you to do it?
- Would you want a discount per month or something variable or a mix? Would you want a bill discount or an additional payment?
- Are you familiar with virtual batteries and are you interested in this model?
- How much would you more or less like to receive as a minimum for your production?
- Would you like any non-financial benefits? For example, would you give a few kWh to the grid in exchange for a control and optimisation system for your electrical appliances?
- What if you were given a discount to buy electrical equipment, e.g., a heat pump?
- What about giving away or donating the energy to someone else? For example, to your family or friends or someone in your community in need?
- What other product or service do you think you need?
- What if there were penalties? For example, for pledging to give energy and then not giving it.

IF EV

- How do you manage the charging of your electric car? How do you use it?
- If you had the possibility to charge or not depending on energy prices, would you be willing to do so? Why?
- Would you want it to be automated or would you want to be involved in it?
- If you were asked to interrupt or accelerate the charging of your car due to the need of the grid, would you do it? How much to delay the charging, 30 mins, 1 hour, 2 hours... or accelerate it?
- Would you want a discount per month or something variable or a mix? Would you want a bill discount or an additional payment?

IF YOU CHARGE AWAY FROM HOME.

- If you were sent notices to charge at a particular location because of a network requirement, would you do it? What if they were to deduct part of the cost of charging? How far in advance would they have to give you notice?

IF FEAR OF BATTERY DAMAGE IS MENTIONED

- Do you know about battery leasing and are you interested?
- What other product or service do you think you need?
- What if, for giving flex, you were given a discount to buy electrical equipment, e.g., a heat pump?
- What if you could give or donate this incentive to someone else? For example, to your family or friends or someone in your community who needs it?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

- What if there were penalties? For example, for pledging to give energy and then not giving it.

IF HEAT PUMP OR HEATING AND COOLING

- If you were paid a financial incentive to stop using electric heating/cooling for a period of time and give it to the grid when needed, would you do it? How long would you be willing to turn off the air/heating? How much money would be motivating to do it? Would you want a discount per month or something variable or a mix?
- Would you be interested in a non-financial benefit? For example, would you turn off the air/heating a few hours a week, to give kwh to the grid in exchange for having a system to monitor and optimise your electrical appliances? Would it help you to make the process automatic and to see if appliances are consuming too much and need to be replaced or to see if everything in your house is in order?
- What if there were penalties? For example, for committing to give energy and then not giving it.

10.3. Annex 3. Conversation guide Sweden

Before starting the conversation:

1. Sign the Consent Agreement
2. Ask for permission to record the conversations and take pictures/videos
3. Introductions (name, role, experience with flexibility markets)
4. Short explanation about the project
5. Short explanation about the activity

ABOUT YOUR BUSINESS

- Tell me about your business
  - What assets / services does it provide?
  - What kind of pricing models are preferable?
  - Where does it operate? (Skane and where else?)
  - How long has it been operational?
  - What are your business's ambitions and goals?
  - What part can new flexibility services play in your business?
- What is your (actor) role?
  - Job title

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.

- Responsibilities
- Length of service
- Team

THE ENERGY MARKET

- How would you describe the current state of the energy market in Sweden?
  - How has it changed over time?
  - What are the important things to know now?
  - Any predictions for the future?
- What are the main opportunities for businesses to participate in the energy markets?

FLEXIBILITY SERVICES

- What flexibility services are you aware of?
- Which of these have you been involved with already?
  - What has been successful?
  - What has been challenging?
  - What lessons would you take from these challenges?
- Which of these might you consider expanding to take part in?
  - In what ways?
- What has been the biggest benefit to Uniper in taking part in flexibility services?
- What has been the biggest barrier to taking part?
- What should a DSO like E.ON consider when setting up flexibility markets?
  - What would be more attractive to your company (Uniper)?
  - What options would you like to see made available?
  - What would incentivise your company to consider taking a larger role?

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union. Neither the European Union nor the granting authority can be held responsible for them.