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FLEXCoop

Democratizing energy markets through the introduction of innovative flexibility-based demand response tools and novel business and market models for energy cooperatives

WP2 - Stakeholders Requirements, Business Models and Architecture Design



FLEXCoop

D2.7 – Emerging Business Models, Associated DR Strategies and Standard Contracts Templates – Final Version

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EXECUTIVE SUMMARY

The electricity sector is at the beginning of a new era, from commodity-oriented business models to a set of new digitally-enabled services which will support a dynamic grid based on renewable resources. Demand-side flexibility services are at the cornerstone of these new models, supporting (collective) self-consumption, aggregation for system operation services (T&D) or the balancing of retailer's portfolio. Digitalisation also brings forward the possibility to develop services platforms such as local flexibility markets or electricity services marketplaces.

This represents a set of new opportunities for electricity market actors where cooperatives and Citizen Energy Communities may have an important role to play due to their ability to mobilise citizens beyond commercial offers.

Making these new services more tangible for cooperatives also means having a look at contracts. BEUC proposed a set of best practices reviewing rewards, data protection and contract termination which can guide new cooperatives aggregators in this aspect. When it comes to the marketplace, this aspect entails a different set of contractual relationships which could appear as an opportunity to collaborate among cooperatives.

Two FLEXCoop case studies illustrate the new opportunities offered by flexibility services to energy cooperatives. First, Som Energia, a cooperative retailer based in Catalonia, aims at using demand-side flexibility to propose self-consumption maximisation to its members with PV panels and reduced retail electricity prices to its other members. This supports a long-term vision where the cooperative would master demand-side services to support self-consumption and services to the grid.

Second, ODE Decentraal, now merged in Energie Samen, is the national federation of Dutch energy cooperatives. Together with its members Escozon and Endona, they are aiming at performing aggregation of loads as resources to use on the TSO's balancing reserves. This is part of a long-term vision where independent aggregation could support production cooperatives in the Netherlands selling firm resources and increasing the value of their collectively produced electricity.

A set of annexes illustrates more in depth the contractual aspects of FLEXCoop services and provide some insights on practical lessons learnt by cooperatives throughout their installation experience.

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ABBREVIATIONS

aFRR	automatic Frequency Regulation Reserves
BEUC	<i>Bureau Européen des Unions de Consommateurs</i> , the European Consumer Organisation
BRP	Balance Responsible Party
BSP	Balancing Service Provider
CEC	Citizens Energy Community
DER	Distributed Energy Resources
DSO	Distribution System Operator
ESCO	Energy Service Company
EV	Electric Vehicle
E-mobility	Electric mobility
NECP	National Energy and Climate Plan
OSB	Open Smart Box
PV	Photovoltaic
REE	Red Electrica de España, the Spanish TSO
RES	Renewable Energy Source
SME	Small and Medium Enterprises
T&D	Transmission and distribution
TSO	Transmission System Operator

1. INTRODUCTION

This report is the second iteration on *FLEXCoop Business Models, Associated DR Strategies and Standard Contracts*. It aims at clarifying the opportunities and challenges of innovative DR-related business models for co-operatives. It targets mostly energy co-operatives and their members; as well as energy start-ups and SMEs together with any citizens curious to understand the economic mutations and the new services involved in the transition to a 100% renewable energy system. We hope this report to be concise, explicative and illustrated enough for this purpose.

2. AN OVERVIEW OF DEMAND-SIDE FLEXIBILITY RELATED BUSINESS MODELS

The decentralisation of the energy system implies a fundamental change not only in the management of the system but also in the economics of the sector.

In a context where more and more electricity comes from distributed resources, a set of new services are emerging to ensure that RES energy can be produced and consumed locally at an affordable price. Demand-side flexibility services are a cornerstone of these services ensuring that electricity is consumed when the most efficient for the system.

Demand-side flexibility is a key resource at all stages of the energy value chain.

The ability of consumers to shift consumption is an essential feature of a renewable resources-based electricity system. Flexibility can come from production (e.g. solar curtailment), consumption (e.g. modified heat pump operation) or storage (e.g. charging batteries at strategic times). This flexibility from various assets can be combined or “aggregated” to offer different services to the grid.

This flexibility capability can be valorised through a set of key services:

- For its capability to balance the grid like generation, for (increasing injections as the same effect as decreasing withdrawals);
- as a tool to manage grid congestion through “peak clipping”;
- or as a key feature of (collective) self-consumption, increasing energy consumed behind-the meter.

The following diagram illustrates these different services, their related service providers, their users and the benefits to citizens.

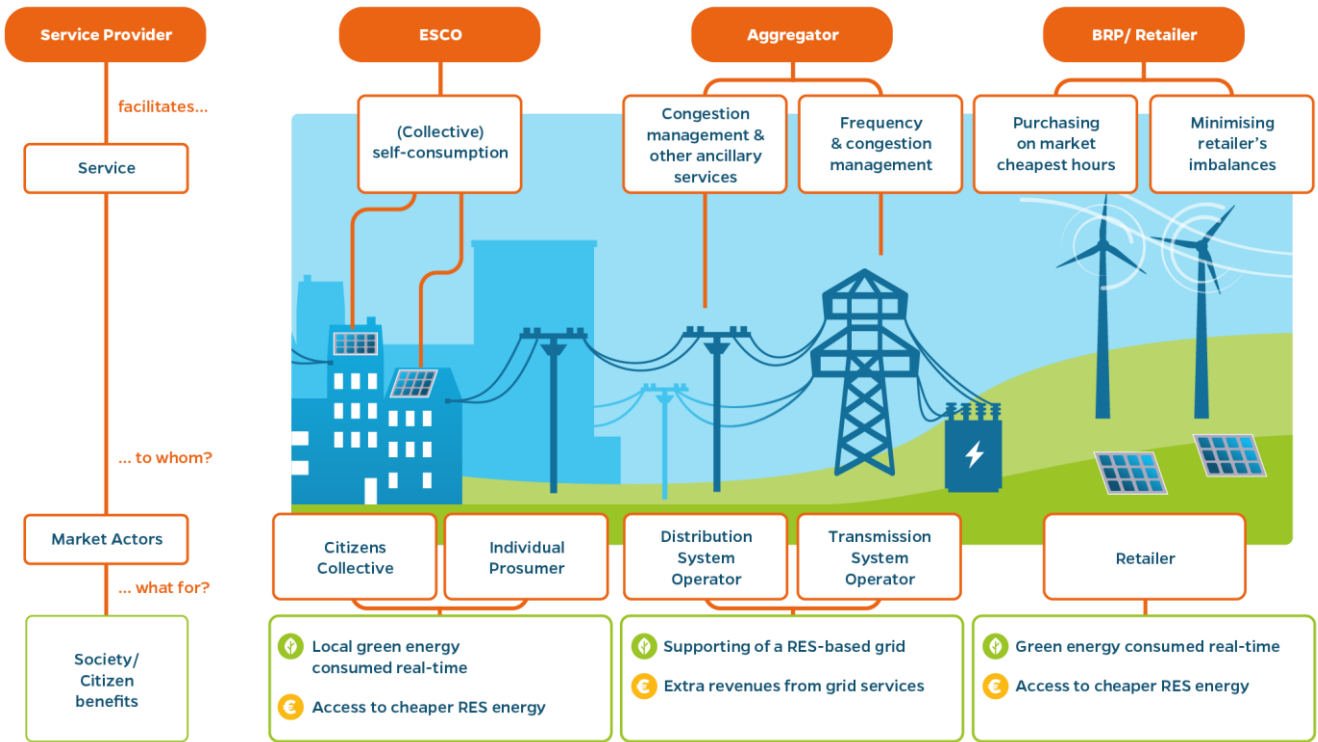


Figure 1: Overview of Demand-side flexibility services

These different services can be related to business models described in the first iteration of this report: BM1: Energy efficiency, comfort and self-consumption monitoring; BM2: Consumption optimisation of co-op resources; BM3: Participation into balancing and ancillary services; BM4: Micro-grid-as-a-service; BM5: Neutral platform for aggregator-prosumer matching

The interrelation of these business models between themselves and the involved actors is described in the diagram below.

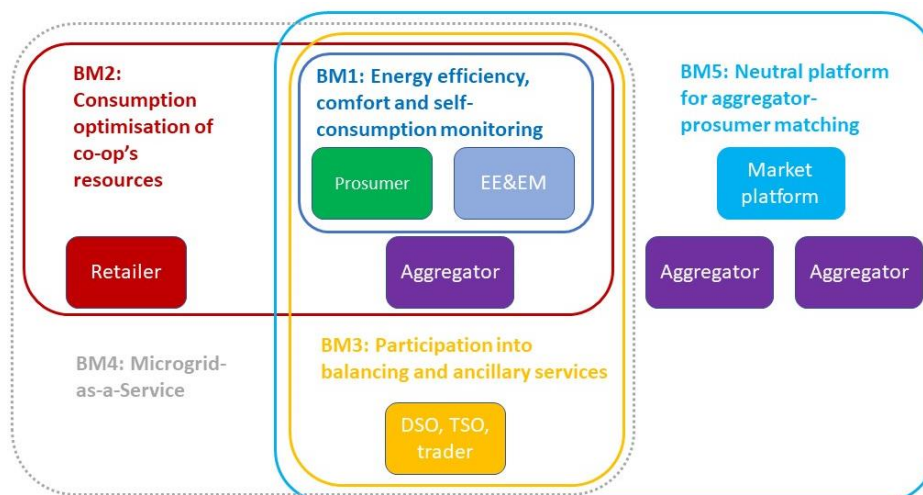


Figure 2: Overview of Demand Response business models as described in FLEXCoop D2.4 (first iteration)

“BM1: Energy efficiency, comfort and self-consumption monitoring” is common into all models and will not be addressed as a specific business model in this report.

“BM2: Consumption optimisation of co-op resources” is related to two different services: (i) self-consumption optimisation (section 2.1) and (ii) purchasing cheaper electricity on the wholesale market and minimising imbalances (section 2.3). These two services are further deepened within the Case study 1 (section 5) related to Som Energia’s experience as FLEXCoop pilot.

“BM3: Participation into balancing and ancillary services” is described in section 2.2 Aggregation for system operation services and corresponds to the experience of Energie Samen and its members developed in the Case study 2 (section 6).

“BM4: Microgrid-as-service” was not developed in the first iteration of the report. A micro-grid¹ may be understood at different scale.

- It can be related to aggregation taking over local grid management activities. In that case it may relate to congestion management and local flexibility markets (section 2.4.1) or to a specific case of BM3.
- It may also be understood at building level, in that case it relates to collective self-consumption (section 2.1)
- Finally, it can refer to the operation of a whole area e.g. campus, military base or industrial site. This is out of scope for cooperative operation.

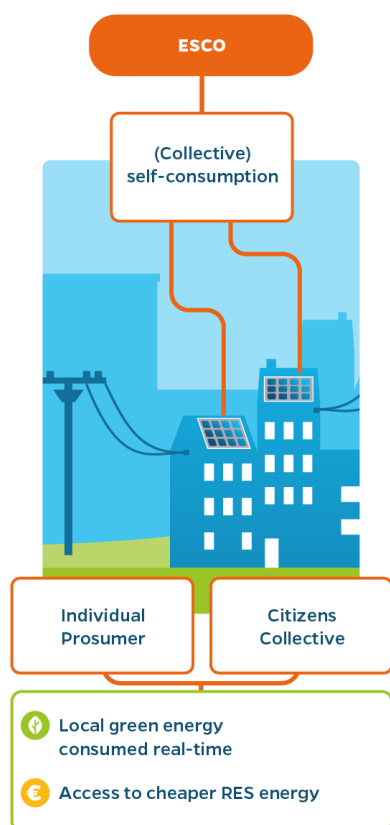
“BM5: Neutral platform for aggregator-prosumer matching” is described in section 2.4.2 and entails the vision for FLEXCoop Marketplace with different possible developments.

The different services featured in this diagram are further described in the following sections.

¹ “A microgrid is a localized group of electricity sources and sinks (loads) that typically operates connected to and synchronous with the traditional centralized grid (macrogrid), but can disconnect and maintain operation autonomously as physical and/or economic conditions dictate.” (source: Berkeley lab , <https://building-microgrid.lbl.gov/about-microgrids>, retrieved 30 March 2020)

2.1 (Collective) self-consumption

Description. Self-consumption is the ability to consume electricity generated on-site, or in close proximity. It involves the capability to generate electricity locally (e.g. solar photovoltaic) and to consume this electricity either by consuming at time of generation or using storage. Self-consumption can take place at individual level (single house), or at collective level in multi-tenant building, or through “virtual connection” to a remote generation facility.



Role of the service provider. An Energy Service Company (ESCO), can facilitate self-consumption by automating appliances, installing metering equipment, and making sure electricity is consumed when generation is available, e.g. heating water during the day when the rooftop PV installation generates instead of at night. Adopting this scenario, an ESCO can extend its role by installing generation equipment and maintaining it.

Revenues come from the maintenance fees paid by the prosumer for the provision of self-consumption as a service.

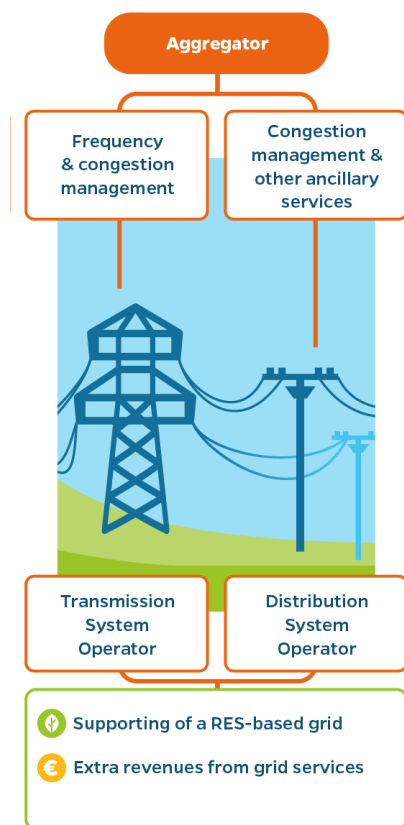
Interaction between market actors. The flexibility service benefits directly to the consumer. The consumer still needs a supply contract to complement needed energy on a daily and seasonal basis. Full energy autonomy may not be interesting as it might represent a significant duplication of assets (oversized generation, storage, etc.) and would isolate these assets from the grid, whereas they can be used as distributed resources in a decentralised system.

Benefits to the citizens. By actively installing appropriate equipment and appliances and consuming their own self-generated electricity, consumers transform their house into active generation and balancing units and become concrete actors of the energy transition.

Moreover as the price of RES electricity production and control equipments fall, (collective) self-consumption may provide more and more competitive electricity and enable citizens to benefit from cheap renewable energy.

2.2 Aggregation for system operation services

Description. New communication technologies and coordination among system actors are now enabling a set of small connected units (generation, storage, consumption) to be operated simultaneously and to act as one pooled resource to support the grid should it be at local level (distribution grid) or at the overall system level (operated by the TSO).



Role of the service provider. An aggregator is a market actor who combines multiple customer loads or generated electricity in order to sell them as one single resource on electricity markets. The aggregator may be different from the retailer.

Interaction between market actors. The aggregator is an intermediary between on one end the consumer who owns the flexible resources and on the other end the system operator who may use consumption flexibility to better manage its grid. The aggregator enters in a contract with both parties: bilaterally with the consumer and through the different schemes in place with the system operators. The aggregator may provide the TSO balancing and ancillary services as a BSP. It may also contract with a DSO through dynamic grid fees, emerging bilateral contracts² or through local flexibility market (see section 2.3.1).

Revenues come from the services sold to third-parties, i.e. from the TSO-operated balancing reserves and may come in the future from similar services run for DSOs.

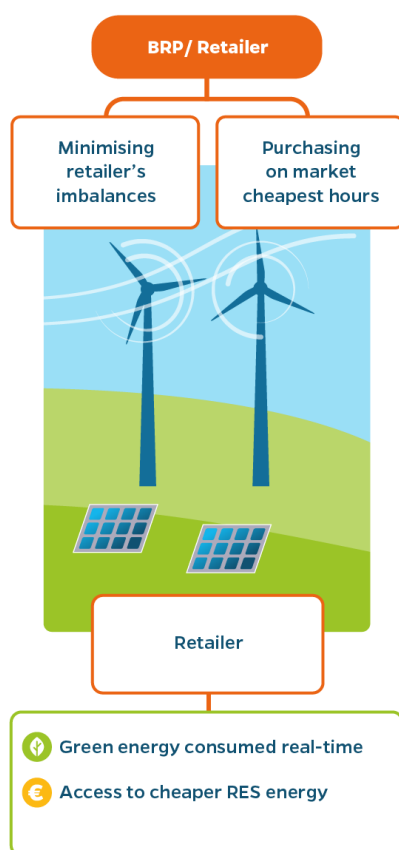
Benefits to the citizens. Participating into flexibility services is an opportunity to actively support the management of the grid, providing the new resources needed to balance a renewable based electricity system and to help reduce the investment needed into the local grid to support an increasing number of DERs.

Moreover, this active participation can be financially valorised and provide additional revenue (or services, depending on the service provider offer) to the consumer.

² See the experience of the Dutch project Gridflex in Heeten. In this pilot, the cooperative Endona jointly operates a PV farm and a set of residential salt batteries. The objective is to minimise the traffic at the local substation level, activity for which the cooperative is offered a reduced grid fee by Enexis, the local DSO. More information is available at: <https://gridflex.nl/>

2.3 Retailer-aggregator

Description. Electricity may be sourced on the market or directly from the retailer generation portfolio. In both cases consumer flexibility is an important tool to use electricity when it is the most abundant and therefore the cheapest.



Role of the service provider. The retailer is the intermediate between the end-user and the production of electricity. In its supply offer, the retailer may propose the automation of appliances to facilitate consumption at time of generation. The role of retailer and smart solution provider may be split. In that case, the retailer may send different price signals (dynamic pricing) and an ESCO may automate and operate appliances to match the cheapest prices.

Interaction between market actors. The retailer may use flexibility to match upfront the foreseen cheapest hours on the wholesale market (it would require price forecast) or to match its own generation (generation forecast is here needed). Additionally, consumption flexibility may be used in both cases closer to real time operations to avoid imbalances.

Additional resources could be valorised on the market, e.g. on the imbalance market when possible or on the wholesale market. The latter would require scarcity prices to valorise flexibility which is not the case yet in European markets.

Revenues come from the savings realised on the electricity purchase on markets and reduced imbalances. Demand-side flexibility can be a strategic tool to take on board balance

risks, including taking full balance responsibility.

Benefits to the citizens. Subscribing to a “flexible” supply offer may be the opportunity to consume electricity when abundant and therefore, also when the most RES-electricity is available. Additionally, it is an opportunity to enjoy the cheapest resources and to support the retailer in balancing its portfolio and again save on prices.

2.4 Electricity services platforms

New service providers are emerging in the energy market. These are platforms which aim at optimising transactions through digital services. The sections below focus on these new intermediaries.

2.4.1 Local flexibility markets

As described above, the main third-party users of flexibility may be system operators. Institutional discussions between TSO and DSO are taking place [3], [4]. In the meanwhile several experimentations are taking place. The Florence School of Regulation [5] has reviewed four ongoing experiences in this domain: Piclo Flex (GB), Enera (DE), GOPACS (NL) and NODES (Nordics). The review below is based on the descriptions made in the INTERFACE deliverable 2.4., together with our own review of IREMEL (ES).



Enera³ is a joint project between the power exchange EPEX SPOT, the TSO TenneT (Germany) and two German DSOs. The platform aims at preventing uneconomic wind energy curtailment. The first flexibility delivery took place in Feb. 2019.



GOPACS⁴ is the result of the cooperation between the Dutch TSO and the four national DSOs. GOPACS is an intermediary between network operators and trading platforms. An additional locational tag enables trading platforms to make their bids available on GOPACS.



IREMEL⁵ is a joint project between the power exchange OMIE in collaboration with IDAE (Ministry for the Ecological Transition). The aim is to set up a market platform helping DSOs to procure flexibility for congestion management purposes. IREMEL has no pilot yet.



Nodes⁶ is a joint venture between the power exchange Nord Pool and the utility Agder Energy (Norway). It supports BRPs and system operators in procuring flexibility intraday. One pilot helps a Norwegian DSO to manage growing loads; another pilot enables a German DSO to prevent uneconomic renewable energy curtailment.

³ Press release, “ *enera project: EWE and EPEX SPOT to create local market platform to relieve grid congestions*”, available at <https://www.ewe.com/en/media/press-releases/2018/02/enera-project-ewe-and-epex-spot-to-create-local-market-platform-to-relieve-grid-congestions-ewe-ag>

⁴ More info at: gopacs.eu

⁵ More info at: www.omie.es/es/proyecto-iremel

⁶ More info at: nodesmarket.com



Piclo⁷ is a British software company that launched Pico Flex in 2018, a separate platform for DSO flexibility needs. Six DSOs are Pico Flex members. The first flexibility delivery took place in 2019.

Table 1: Description of the main flexibility markets initiatives

Description. Local Flexibility Markets are platforms to enable the provision of local consumption flexibility to support the distribution grid. They are tools to make a better use of the distribution grid and therefore reduce the needs for grid investment. Flexibility markets are firstly addressed to DSO for congestion management but may include peer-to-peer trading or local markets. The illustration below is proposed by Regen⁸.

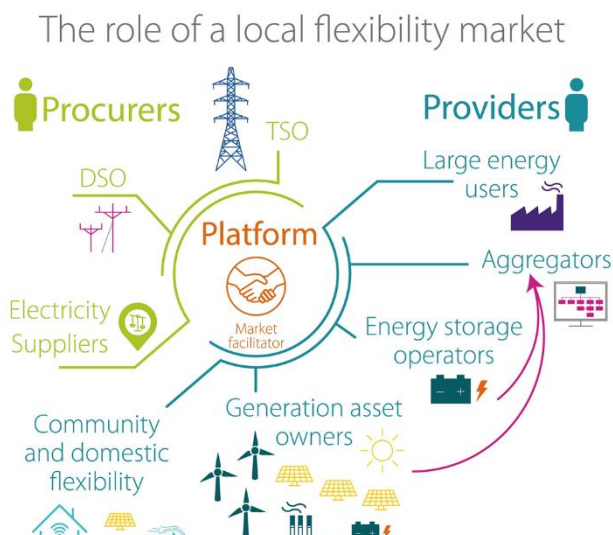


Figure 3: The role of a local flexibility market according to Regen

Role of the service provider. In this case the service provider is the platform itself, which ideally is independent from market parties and acts as market facilitator. It provides an interface which may act as a one-stop-shop for flexibility providers and users. It enables the standardisation of flexibility products (Pilco Flex, Enera, GOPACS, planned in IREMEL) and may be integrated in the sequence of electricity market (GOPACS, NODEs, planned in IREMEL).

Interaction between market actors. The platform may address different services and therefore may require the coordination between TSO and DSO (GOPACS, Enera, NODEs) for avoiding

conflictual order or doing joint procurements, but also coordination among several DSOs (6 in Piclo Flex, 4 in NODEs, also planned for the 3 others). Whereas ENERA and Piclo Flex are specific to system operators, GOPACS and NODEs enable BRPs to procure flexibility on the same platform.

Benefits to the citizens. In the long run these platforms will be essential to run a decentralised energy system with major flows of energy, withdrawals and injections, at distribution grid level.

⁷ More info at: picloflex.com

⁸ Regen, *The role of a local flexibility market*, 2018, available at <https://www.linkedin.com/pulse/local-flexibility-markets-five-steps-part-three-role-market-hyman/>

Making sure that all distributed assets can contribute to the stability of the grid will be key to ensure the transition to RES at an affordable cost. These platforms also represent a new opportunity for citizens to valorise their assets (through aggregators) at local level and to earn new revenues or services through the broader offer from aggregators whose activity is facilitated by these platforms.

2.4.2 Flexibility services marketplace

One of the challenges for residential flexibility is the size of the assets. It requires a lot of these small units to obtain a volume that is big enough to be meaningful for the management of the grid. The FLEXCoop flexibility marketplace aims at massifying the availability of residential assets. This role is further described below.

Description. The flexibility service marketplace is a platform which enables prosumers with flexible assets to easily contract with aggregators looking for residential resources. It consists of a registry of available assets that can be searched by aggregators; together with standard contracts that support online transactions. This way the platform acts as a one-stop-shop making more offers and resources available in a standardised manner.

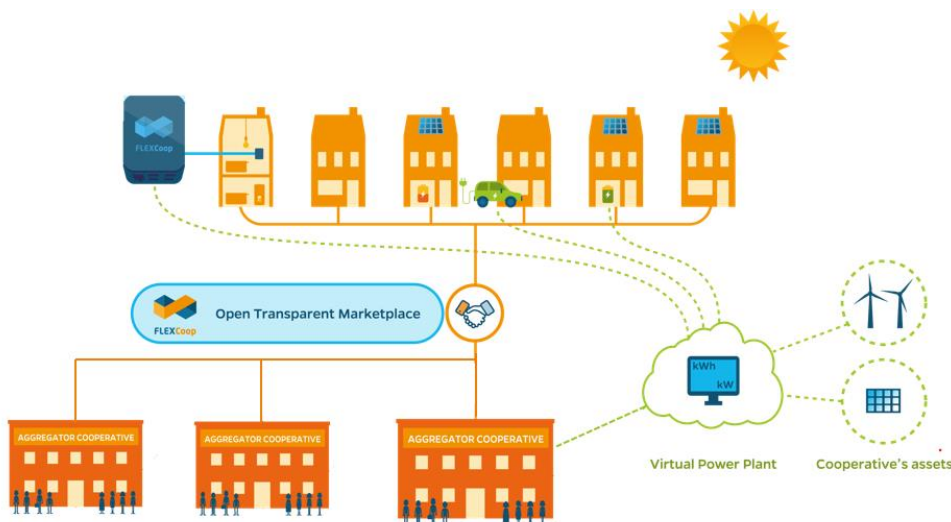


Figure 4: The role of the flexibility service marketplace

Role of the service provider. The platform is the intermediary between prosumers and aggregators. With prosumers, the platform facilitates the availability of prosumers devices by providing them a set of standard ‘connect and control’ equipment. With aggregators, the platform provides them with the matching tools to control devices and pool them in aggregated loads which can be dispatched within the limits of the consumer comfort preferences.

Interaction between market actors. The platform acts as an intermediary between assets owners and aggregators. After that, each aggregator may opt for different strategies to valorise the residential resource in its portfolio (for balancing reserves, BRP portfolio balancing, etc.)

Benefits to the citizens. The platform acts as a simplifier and makes more easily available the

benefits of aggregation to citizens both in terms of contribution to the energy transition as in terms of direct (financial) benefits.

3 ADDED VALUE OF CO-OPERATIVES OR CITIZENS ENERGY COMMUNITIES

All of these business models can be performed by cooperatives as well as conventional market actors. The section below provides the many reasons why cooperatives or other CECs may have an advantage in providing self-consumption or aggregation services.

CECs and energy cooperatives

Citizen Energy Community (CEC): New legal concept defined in the Electricity Directive (2019/944) as : “ a legal entity that: (a) is based on voluntary and open participation and is effectively controlled by members or shareholders that are natural persons, local authorities, including municipalities, or small enterprises; (b) has for its primary purpose to provide environmental, economic or social community benefits to its members or shareholders or to the local areas where it operates rather than to generate financial profits; and (c) may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services.”

Renewable energy cooperative (REScoop): Citizen initiative which is active in the renewable energy or energy efficiency sector and which respects the seven principles of the International Cooperative Alliance, namely (i) Open and Voluntary Membership, (ii) Democratic Member Control, (iii) Members' Economic Participation, (iv) Autonomy and Independence, (v) Education, Training, and Information, (vi) Cooperation Among Cooperatives and (vii) Concern for Community.

CECs and REScoops share similar features. Energy cooperatives may be understood as a subset of Citizen Energy Communities with additional requirements

3.1 Cooperatives and CECs are tailored tools to mobilise citizens around ethical concerns

Energy transition and sense of community. Many end-users may engage into flexibility services more for ethical reasons i.e. contributing to the energy transition or improving lifestyle in their neighbourhood rather than for economic benefits. Cooperatives and CECs in general better match this purpose and provide citizens with a way to aim at a shared goal rather than seeking financial profit.



Collective action supporting aggregation. An aggregator pools loads from a big number of small participants in order to get big enough to participate in the markets. The sense of community and collective efforts are part of the foundations of cooperatives and CECs.

3.2 Cooperatives and CECs empower citizens to act on their energy future

Independence and control. The CEC offers to the participants a sense of control and power over their energy consumption. Through its democratic governance model, it allows for private consumers to be represented and taken into account while decisions about their environment, community, houses are being taken.



Building infrastructure to support local development. The participants in the CEC look to own infrastructure to support needed services rather than source it otherwise. Participants are building collective equity in their community that will then be used for a wide range of energy and non-energy related actions.

3.3 Cooperatives and CECs can be facilitator of technical services

Trust. A cooperative or CEC may represent a trusted partner to support the technical and administrative hustles of self-consumption or aggregation. The cooperative also represents a trusted partner to handle consumer data.



Active members. Cooperatives and CECs members are (by default) more active in the energy transition and in general in the energy sector. Having more early adopters on its basis would facilitate the enrolment process.

Facilitated market interactions. A cooperative or CEC may act as the needed collective body for organising the service when such a body does not exist (e.g. collective self-consumption at neighbourhood level). This is an opportunity to gather several end-users with more resources, more assets and who can then be a higher-scale interlocutor for service and technology providers.

Citizen Energy Communities, and cooperatives in particular are an opportunity to overpass some energy market shortcoming. These initiatives provides the opportunity for collective action at the relevant scale for decentralised energy project. Moreover, their on-commercial approach may be a key asset to address the energy transition challenge, which is not an individual comfort issue, but rather a collective challenge including future generations.

4 KEY FEATURES OF FLEXIBILITY CONTRACTS

Flexibility offers, including self-consumption and aggregation, are new opportunities that come with rights and obligations. The following section aims at clarifying the needed features of such contractual relationships.

4.1 Key features for flexibility contracts

The EU consumer association BEUC has been working on flexibility contracts for several years⁹ and has recently come with a report dedicated to flexibility contracts [2]. In this report, BEUC has analysed the offers of six flexibility service providers after 3 sets of criteria:

- (i) Tariffs and rewards,
- (ii) Data protection and
- (iii) Switching and termination.

Based on this review, the consumer association has highlighted key recommendations for flexibility offers, most of which are fully relevant for FLEXCoop (except the ones directly related to dynamic pricing).

BEUC recommendations for providers of new electricity offers are summarised below.



Figure 5: BEUC report cover, “Fit for the Consumer”, 2019

Offers

- Provide clear and **complete information on offers**, including how the tariff and rewards levels are set. All information should be provided in the same place before the customer commits to the services.
- Inform consumers if flexible electricity offers are adequate for their consumption patterns, and look out for any signs of **vulnerability**.
- Inform consumers about the **material necessary** (e.g. Internet connection with wi-fi) to benefit from the offer.
- Provide clear, **accessible and up-to-date tariff levels regularly**. Communicate using mediums that work and at the moments that are most relevant to consumers.
- Evaluate frequently your tariffs and support consumers. **Provide consumers with tools to save money**, and to protect themselves against bill shocks. This should include the provision of additional services that are useful for optimising electricity consumption (e.g. platform consumers can use to monitor their consumption in real time).
- **Allow consumers to pay bills by instalments** whenever the amount to be paid exceeds the average charged in the past.

⁹ See BEUC reports on Smart metering (2012) and on flexible electricity use (2017), available on BEUC’s website: <http://www.beuc.eu/publication/reports>

Privacy

- Ensure full **compliance with GDPR**, in particular:
 - Be clear **what data** is collected, **who has access** to that data, **for which purposes** it is used, **how is it protected** and **for how long is it stored**.
 - Design services following the principle of **privacy by design** and ensure that no more data than necessary is collected and that it is not kept for longer than necessary.
 - Respect consumer **rights to access their data**, request its deletion, correction and their portability.
- Promote and follow **best practices in privacy protection** that go beyond mere compliance with GDPR, such as:
 - **Always ask for consent** for the use of data **for any marketing related practices**, even if they could be considered a legitimate interest under GDPR.
 - Ensure that **consumers can** easily view and directly **control which third parties have access to their data**.
 - Ensure **privacy related information is easily accessible and gathered in one single place**, instead of scattered across the privacy policy, terms and conditions, etc, to make sure the consumer can get a good overview of how his/her data will be used and assess this prior to entering into any contract with the service.

Switching

- Allow consumers to **easily terminate the contract** and switch.
- **Limit termination fees**. Early termination fees for a fixed term contract should be linked to an advantage that was given to the consumer (a discount, a promotion on the energy price). In such cases, energy companies should be obliged to demonstrate the real cost to be able to charge termination fees. The fee must be reasonable and proportionate to the advantage given to the consumer.
- **Be clear about the duration of the contract and termination**. In case of tacit renewal, the consumer should be able to terminate the contract monthly and free of charge after the agreed contract period.

4.2 Key features of contract management through a flexibility services marketplace

An flexibility services marketplace is an intermediary between prosumers (or active consumers¹⁰) and aggregators. It acts as the facilitator of their transaction which implies pre-

¹⁰ “active customer’ means a final customer, or a group of jointly acting final customers, who consumes or stores electricity generated within its premises located within confined boundaries or, where permitted by a Member State, within other premises, or who sells self-generated electricity or participates in flexibility or energy efficiency schemes, provided that those activities do not constitute its primary commercial or professional activity;” Electricity Directive (2019/944), art. 2(8).

requires and should ensure that there is enough liquidity on this marketplace, i.e. that a substantial offer is present on both sides.

For the smooth operation of such a market place, (i) prosumers should be able to make visible and available their flexible assets; (ii) aggregators should be able to “connect” to these appliances and to valorise them as part of their portfolio. The answer found by FLEXCoop to this situation is to offer: (i) to prosumers, standardised tools enabling prosumers appliances to be automated and controlled from a distance; (ii) to aggregators, standardised tools enabling aggregators to monitor and control appliances. The figure below summarises the main benefits and obligation for participants of such a platform.

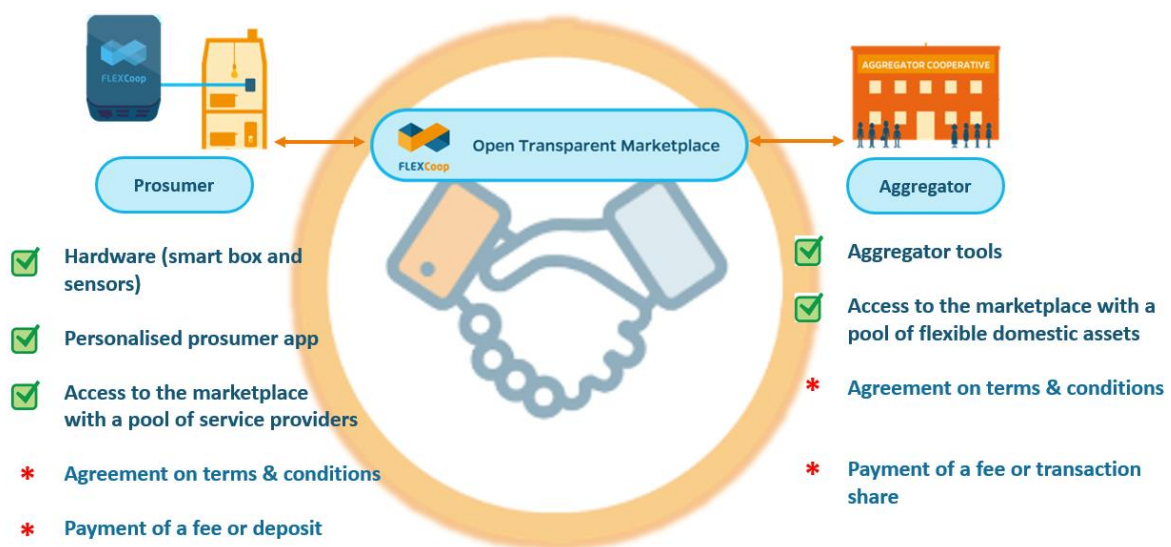


Figure 6: Overview of contractual benefits and obligations for flexibility services marketplace participants

Granted interoperability VS needed big scale deployment. One difficulty of such model is that, while it ensures the full interoperability and the whole integration of the flexibility services, it relies on a big scale deployment of unique solution on both prosumer-side and aggregator-side. On a longer term, it could be expected that the adoption of a set of standards on communication and DR operations could enable active aggregators to join FLEXCoop independently of the adoption of the aggregator tools.

Simple intermediary or full one-stop-shop? The depth of interaction of users and the Marketplace is also a challenge. On one side, it can be tailored to provide a simple communication channels, enabling the broadest visibility to aggregator’s offers. On the other side, it can be designed to act as a full one-stop-shop, offering standardised contracts ‘aggregator-marketplace’ and ‘prosumer-marketplace’, thus receiving payments from aggregators and remunerating prosumers. This last option is a lot heavier in terms of services to develop. However, if well designed, it could act as a levy to grant simplicity and attract new users. Additionally, it may act as an enabler for data privacy with all private data possibly retained at marketplace level only (and not shared with aggregators).

In a cooperative context, this model hold the benefit of supporting cooperatives as new-starters in the DR sector. Moreover, such solution facilitates the collaboration within the co-operative sector and could be adopted at different scale (from local to national and regional in the long-run), facilitating this way the up-scaling of services, as illustrated in the figure below.

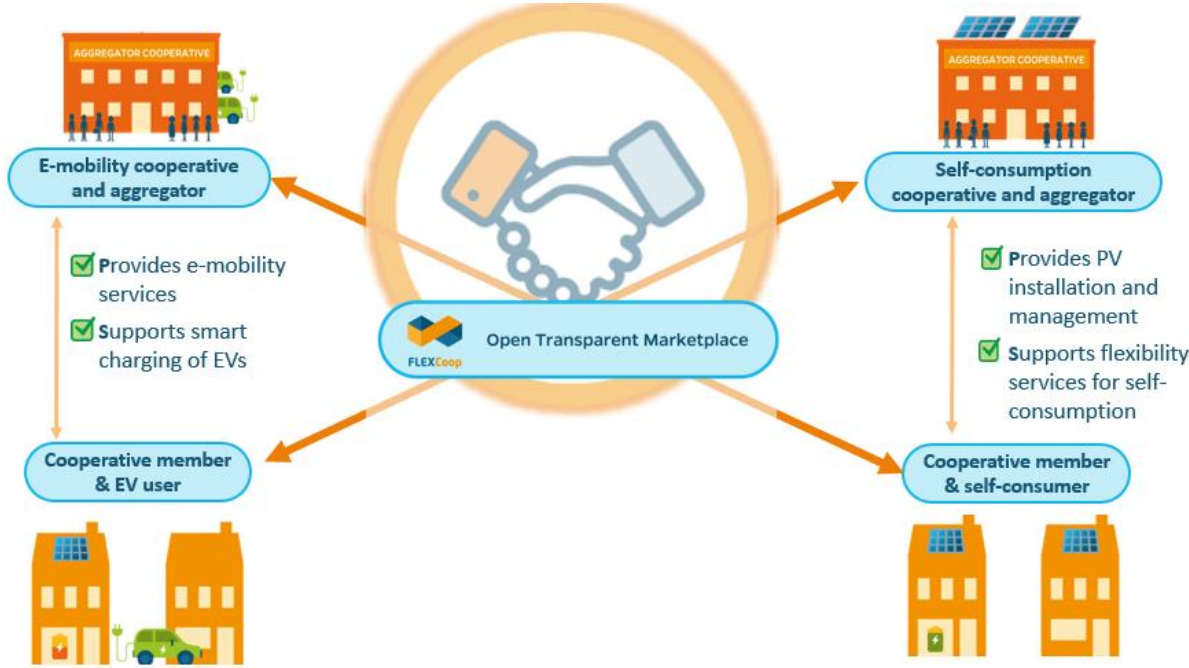


Figure 7: Possible cooperation among cooperatives through the electricity services marketplace

One can imagine a close future where cooperatives will add demand-side flexibility services to their offer. In the illustration above, an e-mobility cooperative puts EVs at the disposal of its members and also supports smart charging of EVs to minimise the cost of charging. Another cooperative support citizens willing to produce and self-consume their own electricity. Both cooperatives using a fully compatible solution would enable economies of scale and while the sharing of a joint marketplace would enlarge both the pool of assets and services for cooperatives and their members.

The commercial and contractual relationship that would link cooperatives to the marketplace may vary according to different models. This could mean full externalisation to a third-party service provider, or the partial internalisation of the service through the contracting with a central cooperative entity, e.g. a national federation.

5 CASE STUDY 1: SELF-CONSUMPTION MAXIMISATION AND WHOLESALE MARKET SOURCING OPTIMISATION FOR A SPANISH CO-OPERATIVE RETAILER

Som Energia is leading one of the two pilots of FLEXCoop. It is a cooperative retailer and self-consumption facilitator (PV panels collective purchase). The flexibility solution enables the

cooperative (i) to purchase more resources at chip hours as well as use more energy at peak-generation times from its own RES power plants and (ii) to maximise the consumption of local solar resources for prosumers. This section introduces the cooperative and its context together with the short-term opportunities for demand-side flexibility services as well as the longer-term ones. It finally describes the main features of such a business model using business model canvas.

5.1 Brief introduction to Som Energia

Som Energia is the largest energy co-operative retailer in Spain, founded in 2010 in Girona (Spain) with the objective to supply green energy to its members. It now counts 65,000+ members and 112,000+ contracts.

Most of Som Energia's electricity is bought on the wholesale market, however the retailer has a growing portfolio mainly made out of solar PV power plants and has recently started to invest into wind generation. Their current annual generation capacity is 17 GWh. This production represents the average volume of electricity used by approximately 6800 homes (on average 2,500 kWh/year and household). The long-term objective is to produce all the energy consumed by its members.

Complementarity, in coherence with its foundation values, Som Energia incentivise self-generation through collective purchases of solar PV installations. Each collective purchase is co-organised by the local volunteer groups and the dedicated staff. A collective purchase consists of gathering around 100 members in a specific area, which brings them to a stronger position in order to get better prices. However, the participants will also benefit from the cooperative support, experience and knowledge on the field. Moreover, it is designed as a turnkey solution, so the participant doesn't need to care about all the installation details and deployment. On average the installed power is 3 kWp and around 10% of those prosumers are also installing batteries. So we can conclude that Som Energia is building up a **Prosumers Energy Community**.

In parallel, since 2018 Som Energia is delivering the InfoEnergia service to every cooperative member. This innovative service provides free energy efficiency advice through personalized seasonal reports, in order to foster energy efficiency among its members.

In summary, Som Energia is helping its members to self-produce their energy as well as to be more efficient on the energy usage. As a result, more and more members are buying a reduced amount of energy to the cooperative, which means less retailing activity at the cooperative level. From one side this is very in line with the Som Energia ideals, but from the other side this leads to rethink the cooperative business model: a retailer cooperative may switch from being a *commodity supplier* to transform itself into a *service provider*.



Figure 8: Inauguration of the 1.5MW La Florida PV plant in Lora del Rio (Sevilla) in December 2019

Complementary business model: collective purchase of solar panels

Som Energia plays the role of collective purchase and installation facilitator with its members.

Why to self-consume?

- 100% renewable
- Distributed Energy
- Citizens ownership
- It is more efficient: no transport, no distribution, no market
- Economic savings
- Change the energy model



Obrim les inscripcions a l'Impuls Solar Vallès per a 100 cobertes d'autoproducció

Impuls Solar Vallès Compra colectiva · 4 mayo, 2018
Som Energia Terrassa, Som Energia Sabadell, Campañas · 12 Comentarios · 5.898 Views



Objectiu 115 Participants (111/115)

Why a collective purchase?

- Better offer
- Quality guarantee
- Turnkey solution
- Collective action in cooperative spirit

Each joint purchase goes through the same process:

1. The social base of a given area shows interest
2. A Promoting Group is formed among Som Energia's members (1 or more local groups)
3. Som Energia organises a call for Engineering where different service providers compete
4. Once the price, materials and engineering of the installations are determined, Som Energia proceeds to open the registration
5. Pre-study and technical/advise visits
6. Executions of work, legalization and commissioning
7. The inverter manufacturer provides monitoring services. The user signs a guarantee with the engineering company

Why a call for Engineering?

- Dissemination
- Transparency

It allows to adapt to the needs of the promoting group, which may value different parameters: proximity, price, social economic organization...



Obrim el Concurs d'Enginyeries per a 100 Cobertes d'Autoproducció al Vallès

Impuls Solar Vallès Compra colectiva · 21 marzo, 2018
Som Energia Terrassa, Som Energia Sabadell, Campañas · 5 Comentarios · 2.673 Views

Amb l'arribada de la primavera iniciem la primera experiència de compra col·lectiva d'instal·lacions d'autoproducció solar d'electricitat de Som Energia, a les comarques del Vallès. Busquem empreses instal·ladores que vulguin presentar una oferta "claus en mà".

Table 2: Short explanation on the collective purchase model

5.2 Legal context

The new Royal Decree 244/2019 has established a fully new regulatory framework for self-consumption, aiming at boosting its development in Spain. A key new add is the simplified compensation category, which consists of a kind of monthly economic net balance. This regulation also allows shared self-consumption and to share surpluses with other supplying points under the same LV transformer or within 500m. This new context establishes the basis for new business models around self-consumption.

Additionally, quite new regulation is about to come in the upcoming years:

- The Spanish Government is preparing a new grid tariff structure. The domestic sector is deeply affected, where all contracts with <15 kW will have three different time slots with different grid tariffs. This results in a new price signal for domestic users to move loads to hours with less electricity demand.
- Electricity Balancing Guidelines has been transposed to the national legislation. So, aggregation of demand, generation or storage has been allowed with a minimum threshold of 1 MW.
- Spain still has to transpose key concepts such as Citizen Energy Community (CEC) and Renewable Energy Community (REC), even though it is expected to be highly meaningful for energy cooperatives in order to define possible business models around flexibility and aggregation.

In conclusion, Spain is progressively adapting its legal framework in order to incorporate more and more renewables into the grid and also to define new ways of managing its intermittence. However, it is still not fully clear whether the participation of aggregated domestic loads will be economically viable.

5.3 Short-term opportunity

Short term opportunities of the self-consumption optimization and sourcing optimization on wholesale market (BM2) are two-sided:

Campaign after campaign, Som Energia counts each time more self-generating members. Currently Som Energia has 300 prosumers and they expect to add 1,000 prosumers along 2020. In coherence with its values, the cooperative would like to offer services to help members consume most of this “locally and self-produced” energy. According to the EU, demand-side response could raise up from 30% to 65-75% the self-consumption rate. Moreover, the simplified compensation schema for self-generators in Spain shows a clear economic signal to the domestic prosumers based on the price differences between the energy exported into the grid and the energy imported from the grid.

And for the vast majority of its “simple consumer” members, Som Energia is looking for a way to better valorise its present resources, bought on the wholesale market, by enabling its members to consume more when energy is cheap, avoid peak hours and reduce imbalances cost.



Figure 9: “Impuls Solar Vallès”, the first collective purchase from Som Energia, 2018.

The figure below illustrates the two types of services offered.

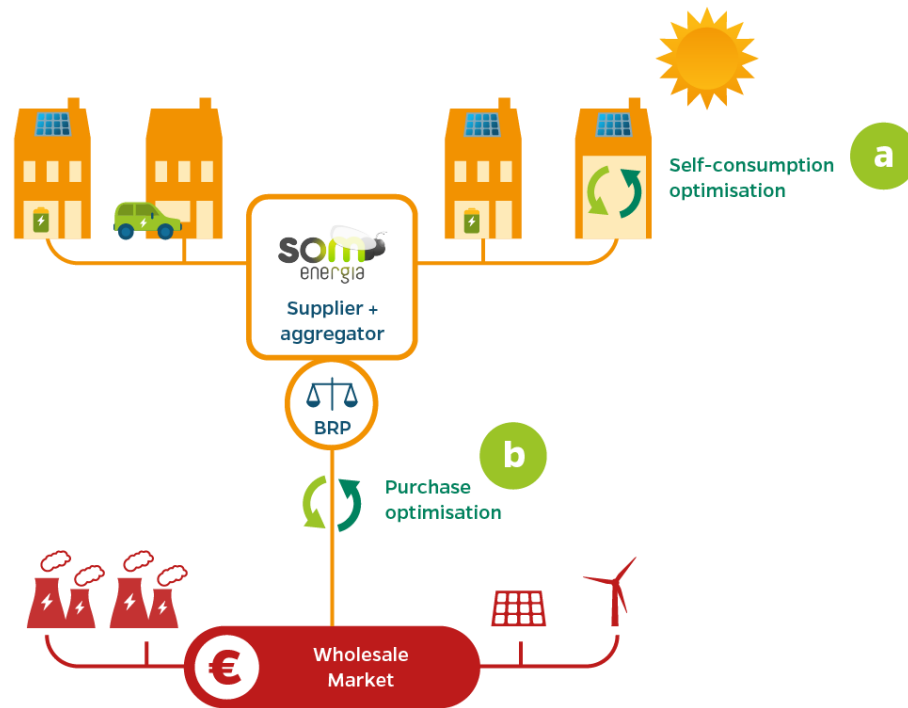


Figure 10: Consumption optimisation of co-op resources

The contractual details related to these 2 offers can be found in Annexes 2 and 3. ‘*Time is Money*’ stands for the offer related to appliance automation for wholesale market sourcing optimisation. ‘*More Sun Energy at Home*’ stands for the offer related to self-consumption maximisation.

5.4 Long-term vision

Spain has great potential in producing most of its electricity from solar resources. However, to achieve this, electricity demand will have to follow production more closely. This is vision is increasingly shared by most market actors in the country: large or domestic photovoltaic producers, TSO and DSOs, as well as public administrations.

With more and more cooperative-owned or member-owned variable RES assets in its portfolio, the business model of Som Energia could change from a “**commodity supplier**” to a **service provider** in charge of managing a RES asset-based system. Being able to manage flexible demand could become a key skill for Som Energia and enable the co-op to manage its portfolio of “prosumers” and own RES generation taking part of or full balance responsibility.

In parallel, according to the REE roadmap flexibility markets (RR, aFRR and mFRR) will be gradually opening to aggregated RES by using the corresponding european platforms (TERRE, MARI and PICASSO). In this context, if Som Energia starts understanding how to use flexibility for optimise self-consumption and wholesale market sourcing, when those markets get mature, Som Energia as an aggregator cooperative will have the knowhow and the technical capabilities to better valorise the flexible RES from its portfolio.

Overall, Som Energia should be able to drive the self-production take off in Spain, the new grid tariffs structure, together with the Energy Communities frame in order to start moving from the commodity supplier to a service provider.

3 Questions to Eduard Quintana, Head of electricity market at Som Energia



What's the key opportunity demand-side flexibility services represents for you?

The opportunity for Som Energia is to become less dependent on external producers, but also to increase the resilience of the cooperative itself and of its members. In this process, Som Energia might become a reference for prosumers.

What's the key challenge to offer these services?

Aggregation technologies lacks standards and are not broadly accessibility. Moreover, Som Energia has to invent a business model with the cooperative values at its centre.

What's the longer-term vision for Som Energia?

Som Energia main objective is to change the energy model. Flexibility has revealed to be one of the energy transition cornerstone. Som Energia should master these services with a special focus on its members, thus on the domestic sector.

5.5 Business model: high-level features

The *optimisation of cooperative resources* business models entails a set of services: self-consumption optimisation at individual level (1) and wholesale market sourcing optimisation at cooperative level (2). These two models, are developed in the following sub-sections.

5.5.1 Self-consumption optimisation at individual level

From a cooperative point-of-view these services require the following elements:

- **Partners:** To access the **hardware and software** needed to support the service, i.e. the FLEXCoop solution or alternative one, including tools for prosumers (smart box, prosumer app), and aggregators tools (VPP formulation).
- **Activities and resources:** To develop self-consumption optimisation services require **PV forecasting skills**, as well as to develop **appliance communication and control skills** (HVAC, DHW, batteries, etc.) This represents a whole field of new know-how and ICT-related activities.
- **Value proposition:** Som Energia will be able to propose to members with PV panels to be able to **consume most of their self-generated electricity** by using thermal storage and without investing into additional storage systems, getting the most benefits from their assets.)

- **Customer segment:** This new offer address the situation of **consumers with PV panels**.
- **Customer relationship and channel:** This offer would entail a **stronger relationship with consumers** through the appliances control and the app, it also requires **specific trust** for consumers to provide control. Generally speaking, it addresses the situation of **tech-friendly consumers** or the ones interested into the **energy transition** and who are able to overcome the barrier of having dedicated tools and services for electricity.

The figure below sums up these additional features into a business model canvas¹¹:

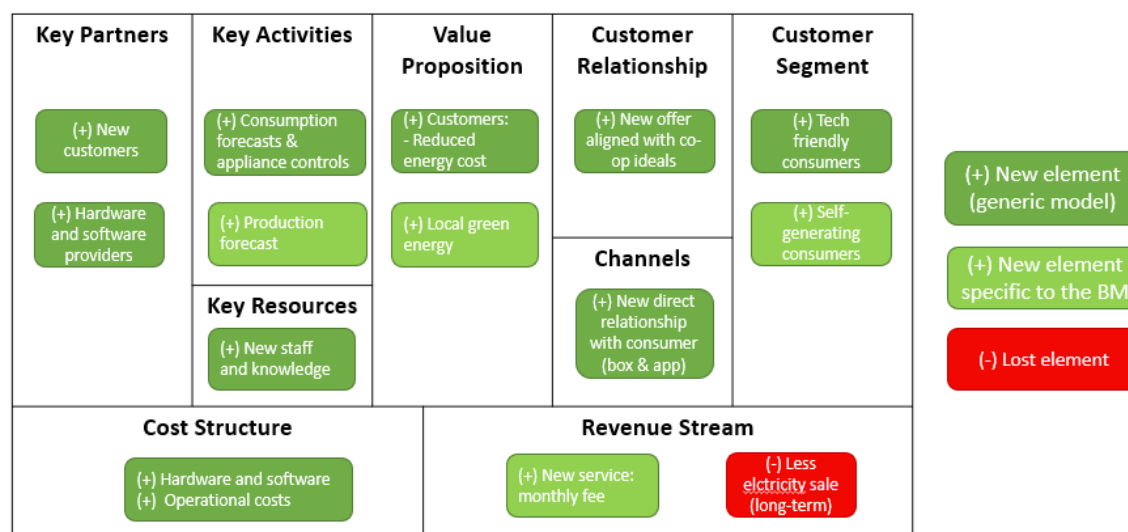


Figure 11: Additional features related to the self-consumption optimisation business model

5.5.2 Wholesale market sourcing optimisation at cooperative level

From a cooperative point-of-view these services require the following elements:

- **Partners:** (*Same as above*) To access the **hardware and software** needed to support the service, i.e. the FLEXCoop solution or alternative one, including tools for prosumers (smart box, prosumer app), and aggregators tools (VPP formulation).
- **Activities and resources:** To develop market sourcing optimisation services require **market monitoring and trading skills**, as well as to develop **appliance communication and control skills** (HVAC, DHW, batteries, etc.) This represents a whole field of new know-how and ICT-related activities.
- **Value proposition:** Som Energia will be able to propose to all members to **get cheaper energy and to take part in the transition of the whole system** to renewables¹².

¹¹ This approach was inspired from BestRES, *D3.2 Improved Business Models of selected aggregators in target countries*, 2017, available at: <http://bestres.eu/about-project/results/?res=2>

¹² Though a bit different in its implementation, a similar outcome might be achieved through implicit demand response tools triggered by dynamic prices.

- **Customer segment:** This new offer address the situation of **all consumers** in a context of increasing competition on “green” and “dynamic” offers.
- **Customer relationship and channel:** (*Same as above*) This offer would entail a **stronger relationship with consumers** through the appliances control and the app, it also requires **specific trust** for consumers to provide control. Generally speaking, it addresses the situation of **tech-friendly consumers** or the ones interested into the **energy transition** and who are able to overcome the barrier of having dedicated tools and services for electricity

The figure below sums up these additional features into a business model canvas¹³:

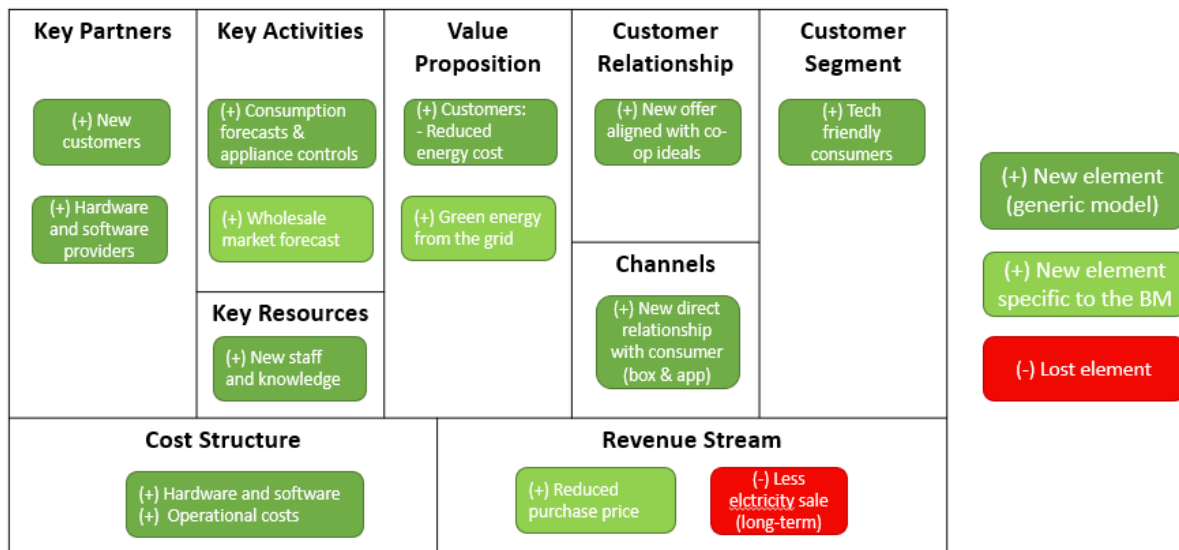


Figure 12: Additional features related to the wholesale market sourcing optimisation business model

The ability for Som Energia to embrace these business models depends on many unknowns: the price and the accessibility of the needed resources an partners’ services, together with the delta between self-generated electricity and retail electricity prices on one side and volatility of market prices on the other side.

Moreover the relation to consumers and members would require a significant pedagogical effort that may slow down the progression of the adoption process, but this does not a represent a major hassle for cooperatives.

6 CASE STUDY 2: PARTICIPATION INTO ANCILLARY SERVICES FOR A DUTCH COOPERATIVE GENERATOR AND SERVICE PROVIDER

Energie Samen is leading one of the two pilots of FLEXCoop. It is the national energy cooperatives federation and participates together with Endona, a local cooperative which owns a solar PV farm and is a retailer on experimental basis. The flexibility solution enables Endona

¹³ This approach was inspired from BestRES, D3.2 Improved Business Models of selected aggregators in target countries, 2017, available at: <http://bestres.eu/about-project/results/?res=2>

to complete its revenues by becoming a BSP and envisage balancing its own portfolio as a possible future retailer. This section introduces the federation and its involved cooperative members, their context together with the short-term opportunities for demand-side flexibility services as well as the longer term ones. It finally describes the main features of such a business model using business model canvas..

6.1 Brief introduction to Energie Samen and its participating members

Energie Samen is the Dutch federation of energy cooperatives, it is the outcome of the recent merger (November 2018) of 5 major national energy cooperative actors. It is the voice of 600 represented citizen initiatives and provides them with various support services. The cooperative landscape in the Netherlands is made out of a lot of citizen-owned wind turbines, some other RES production initiatives like PV but also heat networks. There are only a few cooperative suppliers, the main one being Om which is an integrated part of Energie Samen.



Figure 13: Loeck Tomassen from Endona and Dominique Doedens from Escozon, 2019, © Ronny Te Wechel

The cooperatives involved into FLEXCoop are Endona and Escozon, in the municipality of Heerten. Endona owns a solar PV farm and sells generated electricity to Energie Van Ons, a co-op supplier specialised into local energy projects. Endona is also involved in a national research project, Gridflex, exploring the provision of services to the DSO. Escozon supports Endona with technical and commercial advices.

6.2 Legal context

Currently, the Netherlands is the second largest gas producer in Europe. In April 2018, the Dutch government decided to close the Groningen field, that provides close to 90% of the gas consumed in the Netherlands by 2030, due to earthquake risks. So a major energy consumption shift to electricity is highly expected.

The Energy Agenda presented by the Dutch Government in December 2016, plans the heat transition and aims at a nearly CO2 neutral economy in 2050:

- It plans the disconnection from the gas network of two million households by 2030. This would mean that 50,000 houses every year must be transformed from a gas heated house to another way of heating until 2030.
- New buildings must be gas-free from now on, gas DSO's obligation to connect users to the gas network will be deleted from the current regulation.
- From 2035 on, it is also expected that no fossil-fuel cars may be sold in the Netherlands.

Moreover, several pilots taking place in regulatory sandboxes are taking place in the Netherlands. The Gridflex and the FLEXCoop pilot is for example taking place into such a regulatory sandbox in Heeten.

6.3 Short-term opportunity

Endona, like most Dutch co-ops, has a lot of involved citizens, aware about the energy transition and willing to take part. Setting up an independent aggregator offering flexibility services is a good way to complete Endona's offer. Endona aims at earning new revenues from the provision of balancing reserves to the TSO (aFRR) and offering its members to contribute to the stability of the system in a context of national debate on the preminent role of gas and on renewable electricity as an alternative

Endona is entitled to act as supplier in the context of Heeten regulatory sandbox. A key question is the integration of these services within the ones of a possible retailer, after the end of the sandbox.

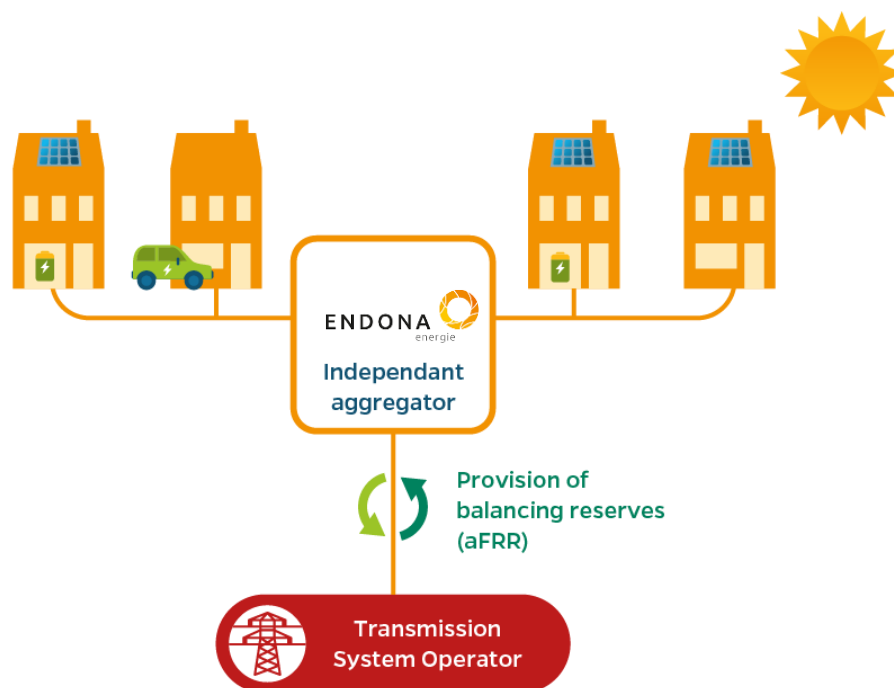


Figure 14: Provision of balancing reserves by independent aggregator

The contractual details related to these 2 offers can be found in Annexes 2 and 3. 'Money for Flex' stands for the offer provided by a retailer as part of the supply contract. 'Savings for Flex' stands for the offer provided by and independent aggregator.

6.4 Longer-term opportunity

The Netherlands cooperative environment favours the dilemma related to offering flexibility services by independent aggregator or by a integrated retailer. On one side, the independent

aggregator model appears attractive in the Dutch cooperative environment. Beyond the case of Endona, an independent co-op aggregator could target co-op members all over the country to build a significant flexibility reserve. This flexibility could be useful to production cooperatives, for them to provide firm offers to suppliers or traders and increase the price at which electricity is sold.

On the other side, in the longer run, the activity could complement or merge with the ones of a co-op retailer to support collective self-consumption of the co-op resources. Both options have been explored within the contractual aspects detailed in Annexes 2 and 3.

3 Questions to Siward Zomer, Cooperative Director at Energie Samen



What's the key opportunity demand-side flexibility services represents for you?

We are a cooperative of cooperatives. We help our members from start to finish. In a few years our members will need a whole range of flexibility services.

What's the key challenge to offer these services?

The most difficult part is now to get capital for the investments needed to build up these services. It is not clear when the markets of flexibility will be viable to ensure profitable business models. Especially as cooperatives that now work mostly on developing their regular business in the production and energy reduction, innovative flexibility services seem still far away and not a priority for them to invest in at the moment.

What's the longer-term vision for NL cooperative sector ?

Our long term vision is to ensure cooperative ownership throughout the value chain of energy, from production to consumption and everything in between. Flexibility will be an important part in this vision.

6.5 Business model: high-level features

- The business model related to participation into *balancing and ancillary services* requires the new features summarised below. **Partners:** To access the **hardware and software** needed to support the service, i.e. the FLEXCoop solution or alternative one, including tools for prosumers (smart box, prosumer app, and aggregators tools).
- **Activities and resources:** To **develop Balancing Service Providers (BSP) activities** and to get into commercial agreement with the TSO, as well as to develop **appliance communication and control skills** (HVAC, DHW, batteries, etc.) This would represent a whole field of new know-how and ICT-related activities.

- **Value proposition:** Endona would be able to propose **new revenues** (if it opted for sharing BSP revenues) or **new energy services** (monitoring or energy efficiency)
- **Customer segment:** This new offer would address the situation of **tech-friendly consumers** or the ones interested into the **energy transition** and who are able to overcome the barrier of having dedicated tools and services for electricity.
- **Customer relationship and channel:** This offer would provide a **stronger relationship with consumers** through the appliances control and the app, it also requires **specific trust** for consumers to provide control over their equipment.

The figure below sum up the additional features related to the independent aggregator business model canvas¹⁴

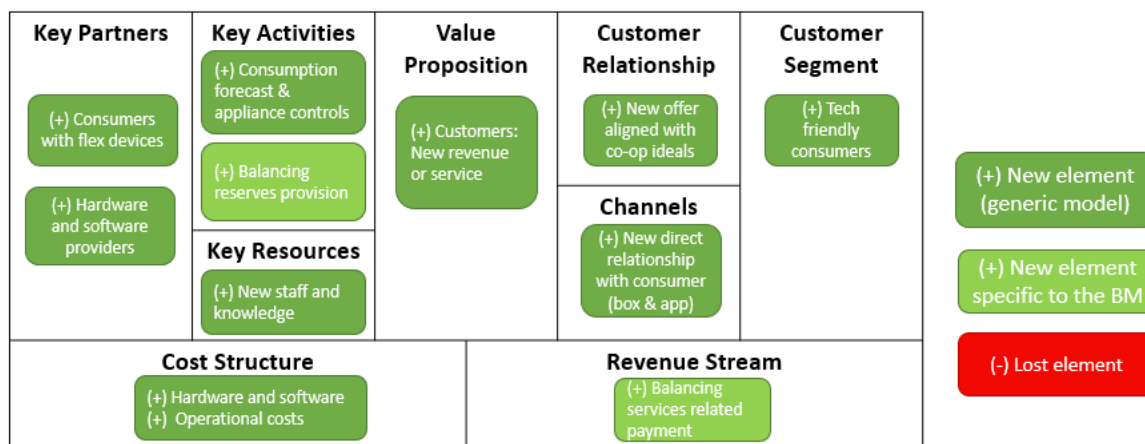


Figure 15: Additional features related to participation into balancing reserves business model

Integrated retailer VS independent aggregator. If the service was to be provided as an integrated “supply + aggregation” offer, this would mean:

- a simple value proposition, with no need for 2 different contracts...
... but a dependency between supply and aggregation offers and higher difficulty for consumer to switch services;
- the possibility for the retailer to use flexibility for its own portfolio balancing...
... but a significantly bigger business to run where aggregation may become just a side activity;
- less dependency on the new and volatile aggregation market...
... but a step into a the highly competitive retail market with small margins

Market uncertainties. The ability for Endona or other Energie Samen members to embrace this business model depends on many unknowns: the price and the accessibility of the needed resources and partners’ services, together with the market prices offered for providing services to the grid.

¹⁴ This approach was inspired from BestRES, *D3.2 Improved Business Models of selected aggregators in target countries*, 2017, available at: <http://bestres.eu/about-project/results/?res=2>

A key question is the ability to support direct revenues to the users, or choosing alternative value proposition, e.g. proposing monitoring and energy saving services which seems common practice in the market today.

Moreover, the relation to consumers and members would require a significant pedagogical effort that may slow down the progression of the adoption process, but which is not a hard hassle for cooperatives.

7 LEARNING FROM SUCCESSFUL SMART ENERGY SERVICES COMPANIES

In order to learn from established market players in Europe, FLEXCoop got in touch with established residential Demand Response

7.1 Interview with Tiko

Tiko was initially established in 2012 as an independent aggregator, result of a joint venture between SwissCom, the historical communication company in Switzerland, and Repower, one of the major Swiss utility. After the successful development of its residential demand response solution and several partnerships with retailers across Europe (like Energie Direct in France or Sonnen in Germany), Tiko was acquired by Engie in 2019 and continues its development throughout Europe. Tiko is today one of the few leading companies in the residential demand response market in Europe.

7.2 Interview with Centrica Energy Solutions

REstore was created in 2010 as a Belgian start-up. Specialised in fast-reacting and highly reliable demand response, REstore developed and independent aggregator services for industrial and commercial customers being able to valorise their loads in primary reserves. REstore notably contracted with ArcelorMittal (steel), Praxair (industrial gases), Sappi (paper) and Barclays (bank). REstore successfully expanded in Germany, France and the UK, and in parallel, developed an innovative residential demand response solution. REstore was acquired by Centrica, one of the UK major utilities, in November 2017 and became Centrica Energy Solutions. The company now benefits from Centrica's worldwide business to continue its expansion.

For the purpose of this report, Tiko and Centrica Energy Solutions shed some light on their business models. We are very grateful these two companies accepted to answer our questions and warmly thank them. These interviews are available below.

FLEXCoop ‘Business models’ interviews

Learning from successful smart energy services companies

Stefan Doerig, Head of Regulatory and Public Affairs, tiko Energy Solutions AG



1. Your offer. Could you introduce your key service and what you are bringing to your customers?

At tiko we understand ourselves as enablers. We enable companies, communities and households to be at the forefront of the energy revolution. For that purpose, we developed a smart Energy Management System for households and combined it with a unique Virtual Power Plant. The Energy Management System helps end-users to save energy, raise awareness and enhance self-consumption without losing comfort in their homes. The Virtual Power Plant allows aggregators to integrate all kind of generation assets and small loads, and to deliver a full spectrum of energy services to grid operators and energy providers.

2. Your customers. Who are your customers and how do you reach out to them? (If your main services are B2B, how do your customers interact with their customers by using your product?)

We are not looking for customers, but for accomplices. We find these among energy providers and grid operators, but also in the housing, e-mobility, or cleantech industries, and in cooperatives. Our flexible and modular technology enables innovative business models to gain money and efficiency, while enabling consumers to gain insight and control over their energy consumption.

Do they need specific equipment? Which residential equipment is the most valuable through your services?

We believe that everybody should be able to participate in the energy revolution right away. Therefore, tiko allows you to connect all types of electrical devices, such as heating systems, coolers, PV installations, batteries, or e-car charging stations, independently of their brand or age. All existing devices, and not only internet-ready ones, can be managed through apps and web-based applications.

3. Resources. What are the core skills of your company?

At tiko we combine the passion and agility of a start-up with the experience and reliability of an established company. We have always laid a strong focus on cybersecurity. Our technology is fast (< 1 second frequency response), secure and completely versatile.

What are the key resources and partners you rely on? In particular, have you developed your own hardware tools?

Our hardware and software technologies are developed 100% in-house. This enables us to match the highest quality and security standards and to guarantee a robust, seamless operation. The integrated approach also allows us to fully customize our solutions to fit different requirements and to be fully independent of a special brand of appliances.

4. Costs and revenues. What are the key market indicators for you? (Wholesale electricity peak prices? “grid parity” e.g. retail prices VS LCOE for rooftop PV? Other?)

The *value* of decentralized flexibility for the system depends on various factors, like the penetration of renewables, grid constraints, electricity prices, etc. The *price* of flexibility however is highly dependent on flexibility markets, their rules and incentives. Market design and regulation matter. Presently, we are confronted with a multitude of barriers, hindering decentralized flexibility to unfold its full potential. Fortunately, the tide has changed with the Clean Energy Package and the future looks much brighter now.

How do you think the market will evolve in the coming 10+ years in terms of costs and revenues?

The massive uptake of electric vehicles, heat pumps and other electric appliances in the coming years will pose tremendous challenges for the networks, especially at distribution level. Relying only on expensive grid investments to cope with this challenge is not an option. Therefore, the demand for local flexibility will grow rapidly, making according business models increasingly attractive.

5. Some figures. Please share some company figures with us...

Date of company’s creation: 2012

Number of customers: 8.000 connected households in Switzerland, 20 clients B2B worldwide

Number of employees: 62

And finally... Would you have any advice for citizens initiatives who would like to explore these services by themselves?

Together we are stronger! When you are in a citizen’s initiative you share our belief, that the energy revolution needs to come from the people, for the people. If you also believe that demand side flexibility offers an excellent opportunity for active citizens to drive the energy transition and benefit from it, then we should talk.

FLEXCoop ‘Business models’ interviews

Learning from successful smart energy services companies

**Wim Vaasen, Head of Optimisation NL,
Centrica Energy Solutions**



1. Your offer. Could you introduce your key service and what you are bringing to your customers?

Creating sustainable, innovative and profitable solutions for customers who face the challenges that come along with the energy transition is our core business. By offering a wide range of specialised technologies such as Demand Side Response (DSR), EV infrastructure, battery storage, LED lighting, heat pumps etc. Centrica Business Solutions helps organisations to adopt the right technology that does the job.

2. Your customers. Who are your customers and how do you reach out to them? (If your main services are B2B, how do your customers interact with their customers by using your product?)

Centrica Business Solutions manages the largest Virtual Power Plant (VPP) in the world consisting mainly of industrial customers. In parallel, vast amounts of R&D flow into our established DSR technology making VPP soon accessible to residential users. We conclude partnerships with manufacturers who engineer our technology on appliance level so we can connect residential flexibility to our VPP. The benefits of these solutions are captured in the commercial offering from our client to his end users.

Do they need specific equipment? Which residential equipment is the most valuable through your services?

Our partnerships have focused on residential storage solutions, heat pumps, electric boilers and the EV charging infrastructure. In general, I would say the most valuable equipment for our clients and us is the one that scales very quickly and enjoys a large degree of flexibility in time of use.

3. Resources. What are the core skills of your company?

Commercial entrepreneurship, advanced data analytics and continued R&D in our technology is a great mix of ingredients that helps us discover and develop such various partnerships in different regions in the field of DSR. Centrica Business Solutions, part of Centrica plc, operates

on a global scale and therefore our DSR division is involved in many developments on EU- and worldwide level. Thanks to this, we can move innovative ideas around fast.

What are the key resources and partners you rely on? In particular, have you developed your own hardware tools?

In a spirit of co-maker ship, Centrica Business Solutions develops, together with our partnering manufacturers, the relevant tech solutions on device level. Connecting a flexible asset to our VPP is essentially installing a micro-chip or computer device in the appliance (battery, heat pump, e-boiler, etc) with a network connection to our cloud based VPP software. The hardware part is usually engineered by our partners.

4. Costs and revenues. What are the key market indicators for you? (Wholesale electricity peak prices? “grid parity” e.g. retail prices VS LCOE for rooftop PV? Other?)

In the first place Centrica Business Solutions is a provider of a technology that enhances residential equipment with DSR capabilities from our VPP platform. The key factors that determine the profitability of our technology on individual appliance level are the prices for TSO ancillary services, congestion management services, electricity wholesale prices and the relative movement of such prices.

How do you think the market will evolve in the coming 10+ years in terms of costs and revenues?

The decentralisation of energy production as well as the increase of renewable electricity production and the electrification of industry and mobility demands more from grid operators. This is costly and puts upward pressure on user tariffs. Technological solutions such as the ones we offer enable market participants to take control of their energy transition in a cost optimal and sustainable manner.

5. Some figures. Please share some company figures with us...

Date of company’s creation: 2017

Number of customers: 6,070

Number of employees: 12,000

And finally... Would you have any advice for citizens initiatives who would like to explore these services by themselves?

Managing scarce resources carefully is generally a wise thing to do. Technological solutions that allow us to contribute on a residential level to this goal are available and it makes sense to adopt this. Let’s find out together how we can create a smart energy transition in the most optimal way. We’d love to take up our end of the bargain with you.

8 CONCLUSION

Demand side flexibility represents a whole set of services that can support many purposes and be the basis for different business models. It includes purchase optimisation and balancing for retailers/ BRP, participation to balancing reserves and other ancillary services as (independent) aggregators or maximisation of (collective) self-consumption for individual prosumers and collectives of citizens.

They will be key in the coming years for successful cooperatives as well as for any electricity market actors. They will require cooperatives to acquire new sets of knowhow and technology which is a challenge for grassroots organisations, however the direct involvement of their members also represents a key asset for them to be successful in these new businesses.

Moreover, the development of technologies, services and related platform could make the needed tools more and more affordable. From the ability of technology and service providers to appreciate the dynamics of cooperatives and CECs on one side, and the capacity of cooperatives to understand and realise the potential of these new technology on the other side will depend a significant part of our energy future.

9 ANNEX 1 - REPORT ON PILOTS FIELD EXPERIENCE

The following list presents some of the difficulties and obstacles pilots faced along the deployment.

Limits to appliances controllability

- Physical control is easier in DHW tanks (smart plugs) than HVAC. Air to air HVAC are easier to control than air to water HVACs.
- Some heat pumps (mainly new air to water units) have cloud services solution that might allow certain controllability without installing extra controllers. This is cheaper at the moment (low annual fee) but might turn to an expensive solution if the manufacturer chooses to increase the cloud fee. It is more resilient to install its own equipment.

Connection discontinuity

- Spanish users tend to switch off wifi during night hours. This results in data losses due to the fact that OSBs do not store data.
- There is no edge computing. If we lose connectivity the OSB is not able to store data nor has any type of control over the flexible devices. Limited analyses/computing capacity would be very advantageous.

Home and appliances diversity

- In Spain it is relatively common to have separate split units for each room. This means we should install one controller for each split unit, which results in a cost increase
- Some early adopters already have customised solutions that might not be compatible with full controllability.

Interactions with end-users

- Difficulties to explain to users how flexibility would work and what represents for them.
- The initial plan was that one single visit was enough for installing all devices, but the reality is that in most of the users we had to perform second visits or even third visits. Some of the reasons are: HVAC got broken and the users chose to install an electric radiator instead; OSB broken because strong storm and should be replaced, adding extra multi-sensors, user mistake at selecting bulb types, HVAC controllers (Intesis Box) defective.

10 ANNEX 2 - FLEXCOOP DETAILED CONTRACTUAL FEATURES

This table is the sums up the main contractual steps to be implemented for Energie Samen and Som Energia pilot offers to be proposed on the FLEXCoop Marketplace.

The table lists (top-down) the different steps through which the user can subscribe to one of the 4 offers (each with a colour, steps which are common to more than one are kept white).

Energie Samen’s offer include “Money for Flex” (participation into balancing services through independent aggregator) and “Savings for Flex” (same service provided by an integrated retailer). Som Energia’s offers include “More sun energy at home” (Self-consumption optimisation) and “Time is money” (wholesale market sourcing optimisation)

Steps	Question	Participation into balancing market		Self-consumption optimisation and wholesale market sourcing optimisation		Extracted parameter
(0) Information on the offer	Offers names and presentations	<p>“Money for flex” Get paid when you help to stabilise the grid</p> <p>How much? Nothing! We take our share and give you the rest</p> <p>What do I get? Financial reward based on your monthly (?) contribution</p> <p>+ monitoring app</p> <p>Terms and conditions</p>	<p>“Savings for flex” Get discounted electricity when you help to stabilise the grid</p> <p>How much? Nothing! It’s all included in your cheaper retail contract</p> <p>What do I get? heaper electricity</p> <p>+ monitoring app</p> <p>Terms and conditions</p>	<p>“More sun energy at home” Consume more of your own solar energy at home</p> <p>How much? Nothing! We will also use a bit of you flexibility to help us buy cheaper electricity</p> <p>What do I get? More sun energy + reducing your PV payback period</p> <p>+ monitoring app</p> <p>Terms and conditions</p>	<p>“Time is money” Consume at the right time and reduce your bills</p> <p>How much? Nothing! It’s all included in your cheaper retail contract. We will also use a bit of you flexibility to help us buy cheaper electricity</p> <p>What do I get? Reduce your energy bills</p> <p>+ monitoring app</p> <p>Terms and conditions</p>	
(1) Pre-selection	Do you have a retail contract with one of our registered supplier aggregator?	<i>Not applicable</i>	<p>yes -> great! proceed to next steps!</p> <p>no -> sorry, this is not available for you</p>	<p>yes -> great! proceed to next steps!</p> <p>no -> sorry, this is not available for you</p>	<p>yes -> great! proceed to next steps!</p> <p>no -> sorry, this is not available for you</p>	Existing_retail_contract

(2) Pre-selection	Do you have a roof-top PV system installed?	Not applicable	Not applicable	yes -> great! proceed to next steps! no -> sorry, this is not available for you	Not applicable	Existing_PV
(3) Prosumer identification	Please fill you prosumer ID and login provided by your Cooperative the DER registry	ID: XXX Login: ***				prosumer_ID
(4) Offer selection	Select the offer	BM3_offer1 (retailer)	BM3_offer2 (non-retailer)	BM2_offer1(PV)	BM2_offer2(no PV)	contract_t emplate
(5) Asset selection	Which asset(s) do you want to include?	Please tick the assets to be included: *Asset1: (tick box) *Asset2: (tick box) (You can modify these assets within the Prosumer app)		Tick the assets to be included: *PV (pre-ticked) *Asset1: (tick box) *...	Please tick the assets to be included:...	asset_id
(6) Option selection	Which of the option do you want to subscribe to?	1. Comfort mode (description) 2. Eco Mode (description)		Not applicable		option_ref
(7) Notification settings	How often do you to be notified?	- every DR event - daily report - weekly report (default) - monthly report - never				notification
(8) Submissi	Do you confirm you want to subscribe to this contract?	Your contract will enter into force X days after valdiation. We will send you a confirmation. I agree all info is correct (tick box)				contract_date
(9) Validation		"Your contract has been approved"				start_date

CONTRACT MANAGEMENT _ Prosumer			
(10) Contract	Your contract status	Your contract is being reviewed by the aggregator Your contract has been accepted by the aggregator and will start on DD/MM/YYYY Your contract is operational since DD/MM/YYYY	contract_status
(7) Notificatio	How often do you want to be notified?	See Step (7) above	
(12) Contract	Your contract status	Your contract is active Your contract is suspended on your demand Your contract has been suspended due to anormal activity	activity (active/on hold)
(13) Terminate	Do you want to put an end to this contract?	Cancel End contract now	contract_status
(14) Access to data	There are many aggregators who can help you valorise your devices in different manner. Do you want them to propose you tailored offers?	Let aggregators contacting me. I agree to provide access to the following data to receive targetted offers: - available devices - historical consumption/ generation data	Available_data
(15) Prosumer	An aggregator sent you an offer	- Review - Ignore	Prosumer_campaign_reaction
CONTRACT MANAGEMENT _ Aggregator			
(15) Prosumer raising campaign	Status of your last campaign	Contract offers: - pending: XX (--> action) - ignored: XX (--> clicked "ignore") - reviewed: XXX (--> clicked on "review offer") - accepted: XX (--> reviewed offer and subscribed)	Prosumer_campaign_reaction

11 ANNEX 3 - MAIN CONTRACTUAL FEATURES FOR THE MARKETPLACE OFFER ‘GET CONNECTED. BECOME PART OF THE ENERGY SOLUTION’

FLEXCoop is an online platform connecting active consumers with flexible assets on one side and aggregators with demand-side flexibility services to offer on the other side. The marketplace is essentially a communication and digital service with no direct link to the electricity market, but enabling aggregators and prosumers to “connect” and easily exchange services.

In order to be able to exchange on the platform aggregators and active consumers should agree with terms and conditions of the platform. These terms and conditions are not detailed here. Only high level features are provided:

11.1 High level contract features for aggregators

This more complex part may be negotiated bi-laterally in order to:

- Introduce the aggregator tools and the FLEXCoop Marketplace, their use and the commercial terms of exploitation;
- Clarify the compatibility and the added value of the Aggregator services for the platform. The marketplace manager may play a role in granting the quality and complementarity of services provided on the platform.

11.2 High level contract features for prosumers

In the following we are presenting the key points for the contractual process

1. Presentation of the overall service

This section should present the service as a platform to get access to a broad range of demand-side flexibility services, through a range of service providers also registered on the platform. Presentation on the functioning of communication and control for appliances and the access to the marketplace with a large pool of service providers

2. Presentation of the FLEXCoop tool suite for prosumers

Presentation of FLEXCoop hardware (OSB, sensors) Prosumer App and related features (access to personalised space and the marketplace)

3. Technical requirements and needed equipment to benefit from FLEXCoop services

Details regarding internet installation needed and related practicalities for the good functioning of the OSB and sensors. Clear guidelines on compatible appliances, etc.

4. Installation

Process for installation of the FLEXCoop solution, including communication (email, phone, SMS), when will the installer come, how long does the installation take. Any pre-requisites (e.g. preparing wi-fi connection codes or access to electric board).

5. Rates and payment

Details on fixed fee (e.g. hardware, installation) and subscription fee, if any (the maintenance may be supported by revenues from the aggregator side)

6. Term and termination

Details on termination policy, engagement if any, termination fees and return of material.

7. Liability

Clarifications on the limit between the platform's responsibility and the service providers ones in case of end-users discontent.

8. Data privacy policy and rights

Presentation of the type of data that are used, data accessible to service providers on the platform and any other third-party, how long data are kept.

The first set of contracts provide access to the marketplace as a third-party market facilitator, then aggregators and prosumers can contract bilaterally. This second set of contracts is described below.

12 ANNEX 4 - TERMS AND CONDITIONS FOR THE FOUR DIFFERENT FLEXCOOP OFFERS

12.1 Retailer aggregation offer '*Time is Money*'

1. Energy supply and appliance automation: '*Time is Money*'

With the *FLEXCoop 'Time is Money'* contract, you enter into an open-ended contract with *the Supplier-aggregator* for the supply of electricity and daily management of your flexible appliances. The electricity under the '*Time is Money*' contract is procured on wholesale market taking advantage of low-prices period. The equivalent amount of Guarantees-of-Origin certificates is procured from renewable energy source electricity producer from Spain.

The '*Time is Money*' contract applies to residential consumers equipped with the FLEXCoop communication and control solution.

2. Rates and payment

2.1 Changes in variable delivery costs: four times a year

- The variable delivery costs (the tariffs per kWh) associated with the '*Time is Money*' contract are influenced by market developments.
- *The Supplier-aggregator* can adjust the variable delivery costs on January 1 and July 1 of each year. *the Supplier-aggregator* will inform you 4 weeks in advance.
- In case of unforeseen changes in market conditions, *the Supplier-aggregator* may also adjust the delivery costs at different times.

2.2 Notice of changes in variable delivery costs

- In the event of changes on January 1 and July 1 you will be personally informed of the new delivery costs 30 days prior to the change.
- Also in the event of unforeseen interim changes as referred to in article 2.1, the *Supplier-aggregator* will inform you personally 30 days prior to change.

2.3 Payment terms and conditions

The payment terms and conditions attached to the supply of electricity by *the Supplier-aggregator* are:

- You will receive every month an invoice for the supply, which must be paid within 14 days.
- In the event of late payment of an invoice, you will be reminded twice, free of charge, of the timely payment of the outstanding invoice.
- You can opt for payment by direct debit or for self-payment by bank transfer.

3. Term and termination

3.1 Term

The contract enters into force for an indefinite period of time.

3.2 Start delivery

The delivery will start at the moment your contract with your old supplier legally ends or on the date validated on FLEXCoop Prosumer App by the Supplier-aggregator.

3.3 Termination of contract

- You can terminate this contract by informing *the Aggregator* via the Prosumer App or via your new supplier. Termination is free of charge.
- The notice period is 14 days

3.4 Exclusion

In case of repeated malfunctioning of the FLEXCoop solution due to end-users mis-use (e.g. overriding FLEXCoop actions or disconnection of FLEXCoop tools), the Aggregators retains the right to put an end to the contract unilaterally.

4. Privacy

The Aggregator may use personal data when delivering its service or product. We will not sell this information to third parties or send you e-mail messages on behalf of third parties. The data used by the FLEXCoop solution and made available to the aggregator are the following ones:

- End-user name, Address, Contact details
- Environment: Occupancy; Indoor temperature/ humidity/ illuminance/ air quality;
- Energy behaviour: HVAC/ Lighting/ DHW control actions; Energy consumption/ production; Hot Water draw;
- Location: Country; Postal code.

12.2 Retailer automation offer ‘More Sun Energy At Home’

1. Energy Management Service: ‘More Sun Energy At Home’

With the *FLEXCoop 'More Sun Energy At Home'* contract, you enter into an open-ended contract with *the Aggregator* for the daily operation of your flexible appliances . The automation service under the *More Sun Energy At Home'* contract maximises the consumption of self-generated electricity from your roof-top PV equipment.

The '*More Sun Energy At Home'* contract applies to residential consumers equipped with the FLEXCoop communication and control solution and with connected PV panels.

2. Rates and payment

2.1 Service fee

The Aggregator service related to the '*More Sun Energy At Home'* contract is based on a fixed monthly fee.

In case of tariff changes, the Aggregator will inform you personally 4 weeks prior to change.

2.2 Payment terms and conditions

The payment terms and conditions attached to the automation service by *the Aggregator* are:

- You will receive every month an invoice for the service, which must be paid within 14 days.
- In the event of late payment of an invoice, you will be reminded twice, free of charge, of the timely payment of the outstanding invoice.
- You can opt for payment by direct debit or for self-payment by bank transfer.

3. Term and termination

3.1 Term

The contract enters into force for an indefinite period of time.

3.2 Start delivery

The delivery will start on the date validated on FLEXCoop Prosumer App and supplier.

3.3 Termination of contract

- You can terminate this contract by informing *the Aggregator* via the Prosumer App. Termination is free of charge.
- The notice period is 14 days

3.4 Exclusion

In case of repeated malfunctioning of the FLEXCoop solution due to end-users mis-use (e.g. overriding FLEXCoop actions or disconnection of FLEXCoop tools), the Aggregators retains the right to put an end to the contract unilaterally.

4. Privacy

The Aggregator may use personal data when delivering its service or product. We will not sell this information to third parties or send you e-mail messages on behalf of third parties. The data used by the FLEXCoop solution and made available to the aggregator are the following ones:

- End-user name, Address, Contact details
 - Environment: Occupancy; Indoor temperature/ humidity/ illuminance/ air quality;
 - Energy behaviour: HVAC/ Lighting/ DHW control actions; Energy consumption/ production; Hot Water draw;
 - Location: Country; Postal code..
-

12.3 Retailer aggregation offer “Savings for Flex”

1. Energy supply and appliance automation: ‘Savings for Flex’

With the *FLEXCoop ‘Savings for Flex’* contract, you enter into an open-ended contract with *the Supplier-aggregator* for the supply of electricity and daily management of your flexible appliances. The automation service under the ‘*Savings for Flex*’ contract enables your appliances to join the aggregator’s pool of loads and offers the users discounted bills thanks to his/her contribution to ancillary services.

The ‘*Savings for Flex*’ contract applies to residential consumers equipped with the FLEXCoop communication and control solution.

2. Service fee and remuneration

The Supplier-aggregator service related to the ‘*Savings for Flex*’ does not change the terms of your electricity supply contract.

The earnings will appear on the monthly bill and will be automatically discounted.

3. Term and termination

3.1 Term

The contract enters into force for an indefinite period of time.

3.2 Start delivery

The delivery will start at the moment your contract with your old supplier legally ends or on the date validated on FLEXCoop Prosumer App by the *Supplier-aggregator*.

3.3 Termination of contract

- You can terminate this contract by informing the *Supplier-aggregator* via the Prosumer App or via your new supplier. Termination is free of charge.

- The notice period is 30 days

3.4 Exclusion

In case of repeated malfunctioning of the FLEXCoop solution due to end-users mis-use (e.g. overriding FLEXCoop actions or disconnection of FLEXCoop tools), the *Supplier-aggregator* retains the right to put an end to the contract unilaterally.

4. Privacy

The Aggregator may use personal data when delivering its service or product. We will not sell this information to third parties or send you e-mail messages. send on behalf of third parties. The data used by the FLEXCoop solution and made available to the aggregator are the following ones:

- End-user name, Address, Contact details
 - Environment: Occupancy; Indoor temperature/ humidity/ illuminance/ air quality;
 - Energy behaviour: HVAC/ Lighting/ DHW control actions; Energy consumption/ production; Hot Water draw;
 - Location: Country; Postal code.
-

12.4 Independent aggregator offer ‘Money for Flex’

1. Appliance Automation Service: ‘Money for Flex’

With the *FLEXCoop* ‘Money for Flex’ contract, you enter into an open-ended contract with *the Aggregator* for the daily operation of your flexible appliances . The automation service under the ‘Money for Flex’ contract enables the user’s appliances to join the aggregator’s pool of loads and offers the users additional revenues thanks to his/her contribution to ancillary services.

The ‘Money for Flex’ contract applies to residential consumers equipped with the FLEXCoop communication.

2. Rates and payment

The payment terms and conditions attached to the automation service by *the Aggregator* are:

- You will receive every month a report of the month activity, together with the amount of earned money.
- The related amount will be directly transferred to your account within 14 days after the report.

3. Term and termination

3.1 Start and Term of the Contract

The contract enters into force for an indefinite period of time.

3.2 Start delivery

The delivery will start on the date validated on FLEXCoop Prosumer App.

3.3 Termination of contract

- You can terminate this contract by informing *the Aggregator* via the Prosumer App. Termination is free of charge.
- The notice period is 30 days

3.4 Exclusion

In case of repeated malfunctioning of the FLEXCoop solution due to end-users mis-use (e.g. overriding FLEXCoop actions or disconnection of FLEXCoop tools), the Aggregators retains the right to put an end to the contract unilaterally.

4. Privacy

The Aggregator may use personal data when delivering its service or product. We will not sell this information to third parties or send you e-mail messages. send on behalf of third parties. The data used by the FLEXCoop solution and made available to the aggregator are the following ones:

- End-user name, Address, Contact details
- Environment: Occupancy; Indoor temperature/ humidity/ illuminance/ air quality;
- Energy behaviour: HVAC/ Lighting/ DHW control actions; Energy consumption/ production; Hot Water draw;
- Location: Country; Postal code.

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