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TOWARDS A CONSUMER-CENTRIC AND SUSTAINABLE ELECTRICITY SYSTEM

A white paper on a consumer-centric market design to unleash competition behind the meter

In short:

- Elia in Belgium was several years ago at the forefront of the introduction of a market design for industrial demand side response. We believe the Consumer-Centric Market Design can be just as successful.
- Existing and new suppliers will be able to provide better services to their customers, allowing those customers to reap the benefits of the flexibility embedded in their appliances.
- The Consumer-Centric Market Design will offer the energy sector an incredible opportunity. It will allow the efficient integration of more renewable energy, consumers to reap the benefits from their investments and society to fully decarbonise.

Breaking down barriers to better services

Dear Reader,

The adoption of electric vehicles (EVs) and heat pumps is accelerating, opening the door to new ways for consumers to interact with the electricity system.

The electrification of heating and mobility are crucial for enabling Europe's transition to a net-zero society. In addition, the flexibility that is embedded in the use of electrical appliances such as car batteries and heat pumps could play an important role in maintaining the balance in a system that contains a high amount of intermittent renewables and a decreasing amount of thermal generation.

The technologies needed to encourage demand side participation - such as digital meters, cloud computing and the Internet of Things - are available today. They could offer end consumers the opportunity to capitalise on moments when there are high amounts of renewables in the grid. However, the large-scale participation of retail demand side flexibility is not yet happening.

One key reason for this is that the current market design includes several barriers which prevent the active participation of small flexibility assets.

The Consumer-Centric Market Design (CCMD) which is outlined in this white paper addresses these barriers. Once it has been rolled out, existing and new suppliers will be able to provide their customers with better services, allowing them to reap the benefits of the flexibility embedded in their appliances.

Several years ago, Elia in Belgium was at the forefront of the introduction of a market design for industrial demand side response. This created a new ecosystem of flexibility aggregators and allowed industrial consumers to monetise their flexibility. We believe the CCMD can be just as successful. The very positive feedback we have received about it so far echoes our own enthusiasm.

In order to make the CCMD a reality, we are collaborating closely with actors across the value chain and stakeholders from across society as a whole. Throughout 2021, we will focus on addressing any remaining questions about it. After undergoing a phase of testing, the CCMD should be ready to be rolled out as early as 2023 or 2024.

The CCMD will offer the energy sector an incredible opportunity. It will allow the efficient integration of more renewable energy, will allow consumers to reap the benefits of their investments in flexible assets (such as heat pumps, EVs, solar PV and electrical boilers) and will support the decarbonisation of society.

I hope many of you will share our enthusiasm for it. Enjoy the read!

CHRIS PEETERS, CEO ELIA GROUP

Key takeaways

A CONSUMER-CENTRIC MARKET DESIGN WILL MAKE A FLEXIBLE AND MANAGEABLE ELECTRICITY CONSUMPTION THE NORM

The energy sector is undergoing deep structural changes. There has been a sharp rise in intermittent renewable energy generation, which is continuing to soar. Moreover, centralised power plants are being replaced by smaller, dispersed and local generation sources. As the share of intermittent and decentralised renewable power production grows, demand will need to be made more flexible. Indeed, the 'Clean energy for all Europeans' package outlined new rules for a consumer-centred energy transition, whilst the Green Deal aims (amongst other things) to empower consumers and give them more choice and flexibility. The need for a paradigm shift towards a market where consumption follows production is becoming increasingly clear.

Recent social, technological and policy developments have now converged to form a window of opportunity for unlocking the potential that lies in demand side participation. Electrification is spreading, encompassing the mobility, construction, industrial and heating sectors. Additionally, digitalisation is allowing the massive deployment of electrified and connected appliances that can be remotely steered and monitored (such as electrical vehicles and heat pumps). Moreover, consumer expectations are changing: increasingly, they are searching for tailor-made solutions and more traceability. The energy-as-a-service market is set to gradually replace the energy-as-a-commodity market.

These developments have created the potential for flexible and manageable electricity consumption to become the norm. Unleashing this potential will lead to greater operational security and more efficient markets, whilst supporting decarbonisation and increased comfort for consumers.

THE CURRENT MARKET DESIGN LIMITS THE RAPID DEPLOYMENT OF CONSUMER-ORIENTED SERVICES

Although consumers are currently able to switch suppliers relatively easily, it is almost impossible for them to access services offered by third parties 'behind the meter'.

Indeed, under the current market design, suppliers and Balancing Responsible Parties (BRP) have legal obligations regarding the connection points that fall within their commercial perimeters. Suppliers are therefore responsible for all offtakes and injections behind each connection point.

This implies that complex workarounds are necessary for third parties to be able to offer flexibility or energy services behind the meter; one way for competition to emerge behind the meter, for example, is through a supply split, which involves the installation of additional certified meters.

The current market design is far from ideal when flexibility and the provision of energy services are considered: it is complex, time-consuming, costly, and often requires additional layers of hardware. Both providers and consumers face hurdles which often outweigh the benefits brought about by new services.

THE CURRENT MARKET DESIGN ONLY NEEDS TWO CHANGES TO BECOME CONSUMER-CENTRIC

The Consumer-Centric Market Design (CCMD) is a market model which will place consumers at its heart, giving them the full freedom to choose services from different providers at appliance level. Its goal is to unlock active demand participation and flexibility whilst fostering innovative business models behind the meter. In other words, the CCMD will not only allow competition 'for the meter', but also competition 'behind the meter'.

Two changes to the current market design are proposed under the CCMD. The first of these is the development of a so-called 'Exchange of Energy Blocks' hub, through which the exchange of energy would occur on a fifteen-minute basis between consumers and other market parties. The second is the introduction of a robust price signal, which would reflect system conditions in real time, and give consumers a reference for their consumption and the value of services offered by third parties.

These changes will, of course, affect the roles and responsibilities of Balancing Responsible Parties, suppliers and service providers. The physical balancing obligation which applies for all connection points in the portfolio of a BRP must therefore be eased, since this constraint is incompatible with consumer freedom and unnecessary under a real-time market that involves decentralised financial responsibility. The precondition for easing this constraint is real-time pricing, which guarantees appropriate incentives to stabilise the system. A settled balancing system, which has reached a target state and has proven to be reliable, is therefore necessary.

The proposed CCMD is aligned with EU policy and is achievable in practice. Since it builds on the current market design, it entails an evolution - not a revolution - of current market arrangements.

Disclaimer: the proposed market model is about unleasing competition behind the meter and is not about adequacy. In other words, the assumption made in our paper is that markets are overall adequate and if not, adequacy issues need to be tackled via capacity remuneration mechanisms. The proposed Consumer-Centric Market Design is compatible and complementary with any type of capacity remuneration mechanism and is not a substitute of any kind.

1. The vision

a consumer-centric market design to unleash competition behind the meter

Evolution in market model design

A small evolution is needed to put consumers at the centre and design an electricity market which is fit for purpose

In recent years, European transmission system operators (TSOs), distribution system operators (DSOs), policymakers and other stakeholders have made great efforts to open up short-term markets to demand response and bring additional flexibility into the system. However, as the share of intermittent renewable energy sources grows – and the share of centralised power plants shrinks – a step change is needed in terms of active demand side participation and flexibility, especially at residential level as well as from small industries and services.

Recent social, technological and policy developments have created a window of opportunity for unleashing the full potential of active demand. While the electrification occurring throughout all sectors of the economy (mobility, industry, building and heat) creates potential patterns of flexible and manageable electricity consumption, capturing this potential seems to be increasingly within our reach through the rapid roll-out of smart meters, the Internet of Things and greater connectivity everywhere across Europe. This is accompanied by deep, powerful social and political changes which are leading to further decentralisation in the sector. Increasing numbers of residential and corporate consumers are willing to be more actively engaged in looking for more traceability, choice and diversification in energy use, at the best possible price.

However, active consumer participation will not develop at a speed fast enough to meet the goal of decarbonisation, unless the consumer journey is made simple and attractive by leveraging all the possibilities that new digital and clean technologies offer.

Today's centralised market organisation is built around suppliers optimising consumption and injections at the connection point. It is not easy to allow grid users to engage with third party service providers for services offered behind the meter at the appliance level. Significant complexity and barriers which prevent the market behind the meter from being opened up to service providers persist. As a consequence, consumer engagement – and innovative approaches and related business models – are being hampered. This leads to complex, patchy solutions which are not capable of meeting the decarbonisation challenge.

Tomorrow, as connected appliances will allow behind the meter optimisation without the need for installing any additional hardware, energy-as-a-service contracts offered by new types of players will emerge. These contracts will gradually increase their market share and will come to be more widely used than traditional retail contracts. Building a true service market 'behind the meter', where households can easily switch from one service provider to another, is key.

A market design reorganised around consumers is needed to facilitate and accelerate their active participation. This requires putting demand on an equal footing with supply and releasing flexibility potential by relaxing some of the current centralised market design hurdles.

This white paper is structured as follows:

1. **Presentation of the vision: a Consumer-Centric Market Design (CCMD) to open up the market behind the meter and trigger innovation on the way to decarbonisation.**
2. **Changes which need to occur to make this vision real, building on the current market design.**
3. **The compatibility and potential for integration with the CCMD within the current European market.**
4. **Conclusion.**

The latest policy, social and technological developments create a window of opportunity for unleashing the potential of active demand participation . . .

The fact that the share of intermittent renewable energy sources (RES) is growing makes the need for flexibility increasingly pressing. Recently updated European forecasts predict that renewables will account for 55% to 60% share of the electricity produced in 2030[1]. Germany has even pledged to source 100% of its energy supply from decarbonised sources by 2050. Flexible consumption and RES development are two sides of the same coin: since the modulation of most supply-side clean technologies faces limitations, deep change is needed in terms of demand side participation and flexibility - especially from residential level and small industries and services - to deliver on ambitious decarbonisation objectives at a reasonable cost.

In the meantime, policy, society, and technology are aligning to release of the potential which lies in new active demand. Rapid electrification of the end uses of energy (such as mobility, buildings and industry) creates potential sources of flexible and manageable electrical consumption. Capturing this flexibility potential is increasingly within our reach as growing digitalisation allows assets to be remotely monitored and steered. The rapid roll-out of regulated smart meters by DSOs and TSOs everywhere across Europe together with – on a much bigger scale – the Internet of Things (IoT) and greater connectivity will play a key role in boosting the development of active demand participation.

This comes together with powerful social and political changes, which are leading towards more decentralisation. A growing number of residential and corporate consumers are willing to be more actively engaged and are looking for more traceability, choice and diversification in their energy use. All this needs to be made available at the best possible price.

Building on these advances, European institutions introduced the Clean Energy Package, which pushes for more consumer empowerment, and the revised Directive 2018/2001 on promoting the use of RES, which is paving the way for renewable energy communities. The European Green Deal also sets out ambitious decarbonisation targets for for carbon neutrality in 2050, which encompass customer empowerment and the affordable integration of large shares of RES into the power system: *"Consumer policy will help to empower consumers to make informed choices and play an active role in the ecological transition."*[2]

Decarbonisation
-55%
GHG emissions by 2030

Renewable electricity
65%
of total electricity production by 2030

Offshore wind
60GW
by 2030

1 EC, 2018, 2050 long-term strategy. EC, 2020, Impact assessment of stepping up Europe's 2030 climate ambition.
2 European Commission (2019), Communication for the European Green Deal.

European barriers in retail energy markets - European Commission (February 2021)

"European retail energy market liberalisation is now well into its third decade in the most mature markets [...]. In theory at least, the European retail energy market is a place where new suppliers and providers of retail services can enter the market and compete relatively freely and on equal terms for customers in the market; [...]

FIGURE 1: ELIA E-MOBILITY STUDY

" In the coming decade, electric mobility will provide the fastest and most impactful lever for abating climate change "

Elia, Accelerating to net-zero: redefining energy and mobility

3 enablers for overcoming existing barriers to EV uptake

1. physical and digital infrastructure
2. open data access
3. market rules enabling new consumer services

More than 80% of charging will happen at home or at work.

Maximum effort put into providing smart charging infrastructure in these market segments, supplemented with fast charging facilities along major transport routes.

Smart charging (electricity price optimisation) will **reduce the annual electricity cost for EV drivers by €30 to €55 by 2030** (excluding taxes, levies and grid tariffs).

Smart charging of the projected 1.5 million EVs in Belgium and 10 million EVs in Germany will **reduce the overall CO_2 emissions of the power system by 600,000 tonnes** a year and generate around €500 million of additional social welfare by 2030.

> The time has come to revisit the premises of our electricity market design to support an efficient energy transition: digitalisation offers the possibility of greater customer engagement, which would ultimately benefit all through reduced system costs. The fundamental pillars of this new market design are well identified in the white paper from Elia, which puts forward simple innovative concepts such as the "exchange of energy blocks", the removal of some of the current barriers to innovation, and real-time price signals. This white paper is an important contribution to the policy and academic debate and provides a pragmatic approach for the evolution of the EU electricity market design".

FABIEN ROQUES, ASSOCIATE PROFESSOR PARIS DAUPHINE UNIVERSITY / FLORENCE SCHOOL OF REGULATION

What is preventing us today from delivering consumer-oriented services?

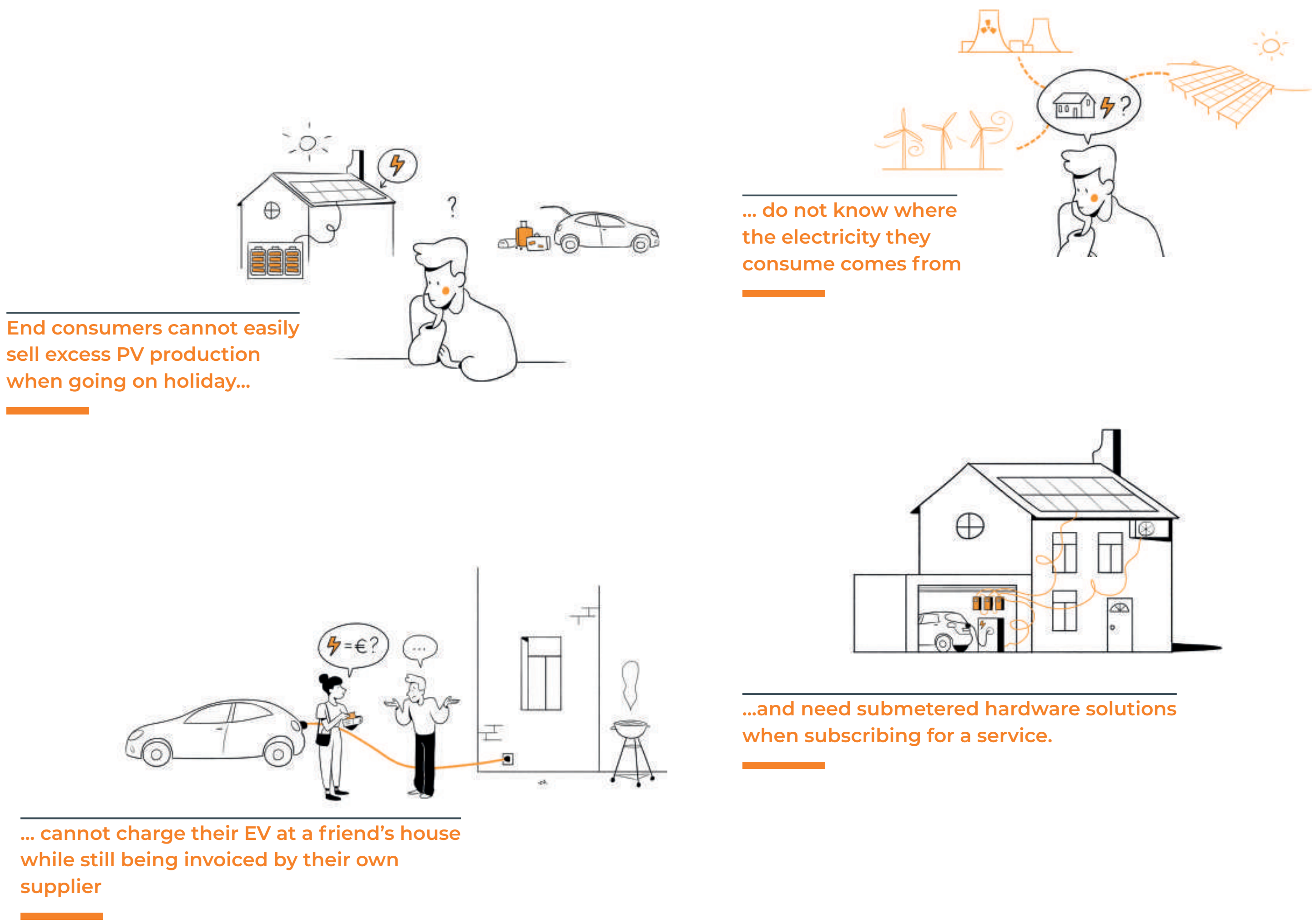
Today, consumers cannot easily access competitive energy services which are tailored to their needs

Active consumer participation and competition behind the meter will not develop at a speed fast enough to meet the goal of decarbonisation unless the consumer journey for accessing energy services is made simple and attractive, by leveraging all the possibilities that new digital and clean technologies can offer.

The design of and access rules for the current market model, which is centrally organised, were largely defined using a one-sided approach which focused on the supply side, as large centralised plants traditionally provided the bulk of the operational flexibility required to run the power system. End consumers – except the larger ones such as big industrials – are typically not considered to be active participants as they were historically not able to actively respond to prices, given the fact that smart meters, connected appliances and exposure to real-time pricing were not yet available.

In practice, stringent access rules translate into onerous financial constraints and physical balancing requirements. The allocation of energy volumes between market parties relies on a heavily regulated hardware-based metering approach. These factors are now becoming barriers to maximum participation and the opening up of the market behind the meter to third parties, slowing down the development of innovative and differentiated services.

FIGURE 2: LIMITED CONSUMER EXPERIENCE

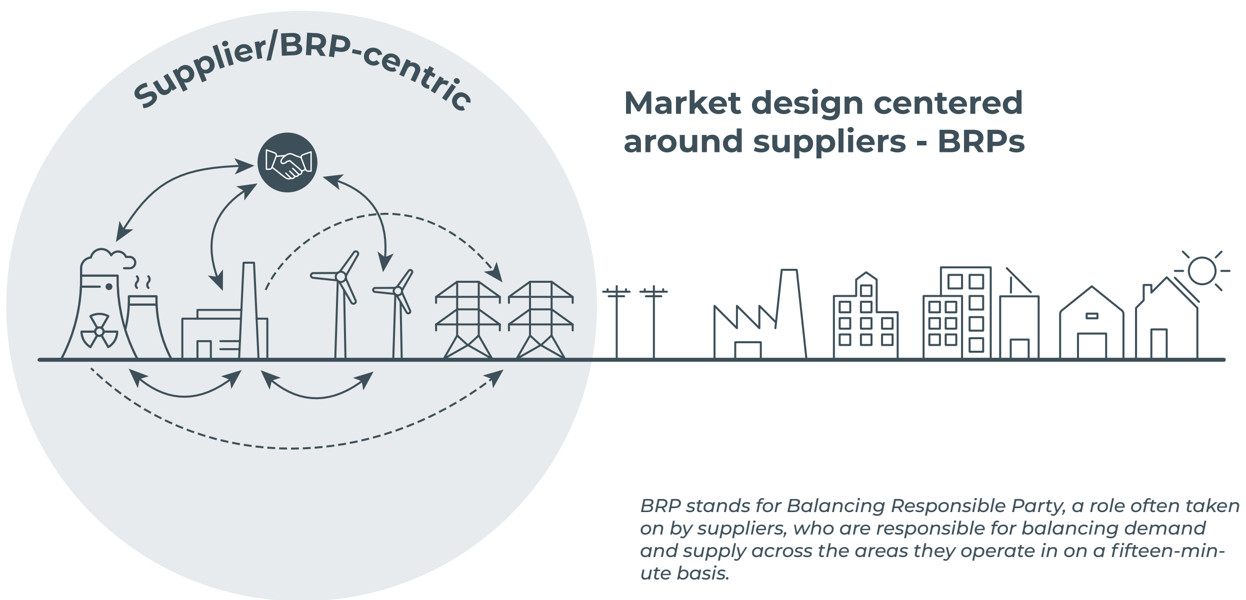


The benefits remain largely inaccessible under the current market organisation

The bottom line is that end consumers cannot easily access the panel of innovative services behind the meter unless (i) these services are offered by their main supplier; (ii) access points are duplicated, by installing more than one regulated smart meter in every household; or (iii) complex administrative arrangements[3] are implemented to neutralise all the impacts of the services provided by third parties on the main supplier. This often results in relatively high transaction costs and barriers which prevent end consumers and independent service providers from engaging with new services.

This is all the more damaging as social and technological developments have created an unprecedented window of opportunity for releasing the potential of active demand participation and competition behind the meter.

FIGURE 3: CURRENT POWER MARKETS ARE CENTRED AROUND GENERATORS AND SUPPLIERS, RATHER THAN CONSUMERS



BRP stands for Balancing Responsible Party, a role often taken on by suppliers, who are responsible for balancing demand and supply across the areas they operate in on a fifteen-minute basis.

3 Patchy ad hoc solutions are being deployed across Europe to get round these barriers and increase demand side response (DSR). Examples include the Transfer of Energy (ToE) in Belgium or Notification d'Échange de Blocs d'Effacement (NEBEF) in France, virtual allocation points on the DSO grid and so on. Most of the time, however, these workaround solutions based on the current market model create even more complexity.

Our vision

A consumer-centric market design to create value for all and trigger innovation for decarbonisation

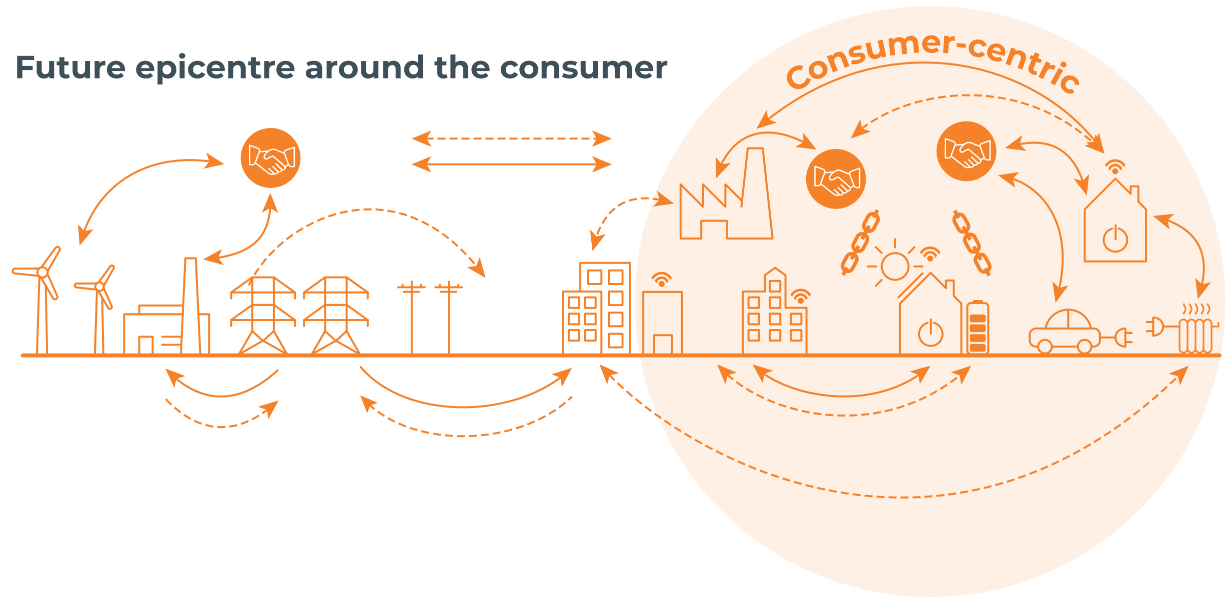
Now more than ever, a consumer-centric market design (CCMD) is needed to facilitate and accelerate the active participation of consumers. This requires putting demand on an equal footing with supply and releasing the potential for flexibility by relaxing some of the current centralised market design hurdles.

The proposed vision relies on opening the door to much simpler, fundamental and unbiased market access conditions for all. It provides every single consumer with the right to use multiple services and exchange energy freely and easily with others, without any constraints (such as heavy submetering requirements and obtaining consent from their main supplier). This comes along with implementing adequate financial incentives to efficiently manage individual consumption in real time.

The proposed CCMD aims to unlock innovation. It is not prescriptive, but rather an agile and adaptive software-based framework enabling new business models and services which fit heterogeneous consumer expectations. It aims to lower barriers to market entry behind the meter for third parties, thus avoiding a lock-in with one single supplier.

Because the CCMD offers an agile framework, current business models and contractual arrangements can continue to exist alongside it. They might also be supplemented or replaced by more innovative arrangements – depending on consumers' needs and expectations.

FIGURE 4: PARADIGM SHIFT TO FOCUS ON THE CONSUMER



On the path towards decarbonising society, the power system's focus is switching from centralised conventional generation to a more renewable, more decentralised and less controllable power mix. To deal with this, a paradigm shift is required. Going forward, it will be necessary to adapt consumption to available generation, rather than adapting generation to the consumption, as it is currently the case.

We believe that releasing consumer participation through the CCMD will open the door to new opportunities and create significant value:

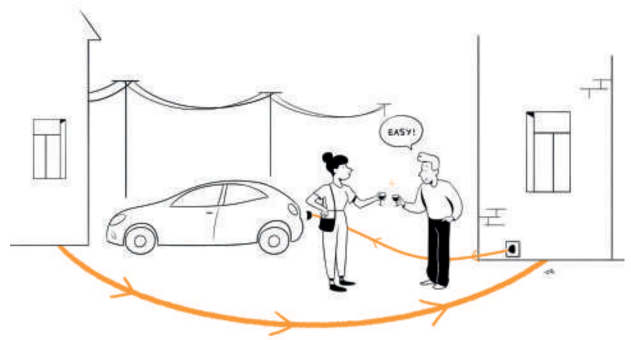
- consumers will be empowered as innovation and differentiation in services is made easier in areas such as mobility, heat and traceability and choice of supply origin;
- innovative energy services will allow energy consumption to be optimised, while global power system optimisation resulting from consumer participation will bring wholesale prices down;
- as low-cost flexibility will be available in the system, operational security can be maintained at a very high level – at an equivalent or even lower cost – while more and more renewable energy sources will be integrated, thus making it effective in terms of cost and decarbonisation.

If a prompt shift towards a consumer-centric market design does not occur, there is a risk that market organisation will lag behind system transformation, turning opportunities into burdens for the power system and consumers. The consequence will be the slowing down of innovation and decarbonisation.

FIGURE 5 : AN ENHANCED CONSUMER EXPERIENCE

End consumers can sell excess PV production whilst away on holiday...

...can decide which electricity sources they want to buy their electricity from



...can charge their EVs anywhere they want and receive one consolidated energy bill from their supplier

...and, thanks to the Internet of Things, which ensures connectivity between their different appliances, no additional submetering hardware is needed.

Transforming and streamlining the customer experience for all

Thanks to third parties providing easier access to energy services, the CCMD has the potential to transform the experience for all consumers – corporate or residential – regardless of their income, where they live, whether they are tenants or landlords, and whether they are tech-savvy or not. The following individual stories of Mary, John, Susan and the Accenco company show how easy and straightforward the customer journey could become.

Mary is a residential consumer who owns various energy appliances

Let us imagine we are in the suburbs of Bordeaux, France, in 2025. Mary owns several connected and flexible appliances (an electric car, a heat pump, solar panels, a battery etc.). Mary is highly connected and wants the best deals in terms of energy prices without having to closely manage her energy consumption.

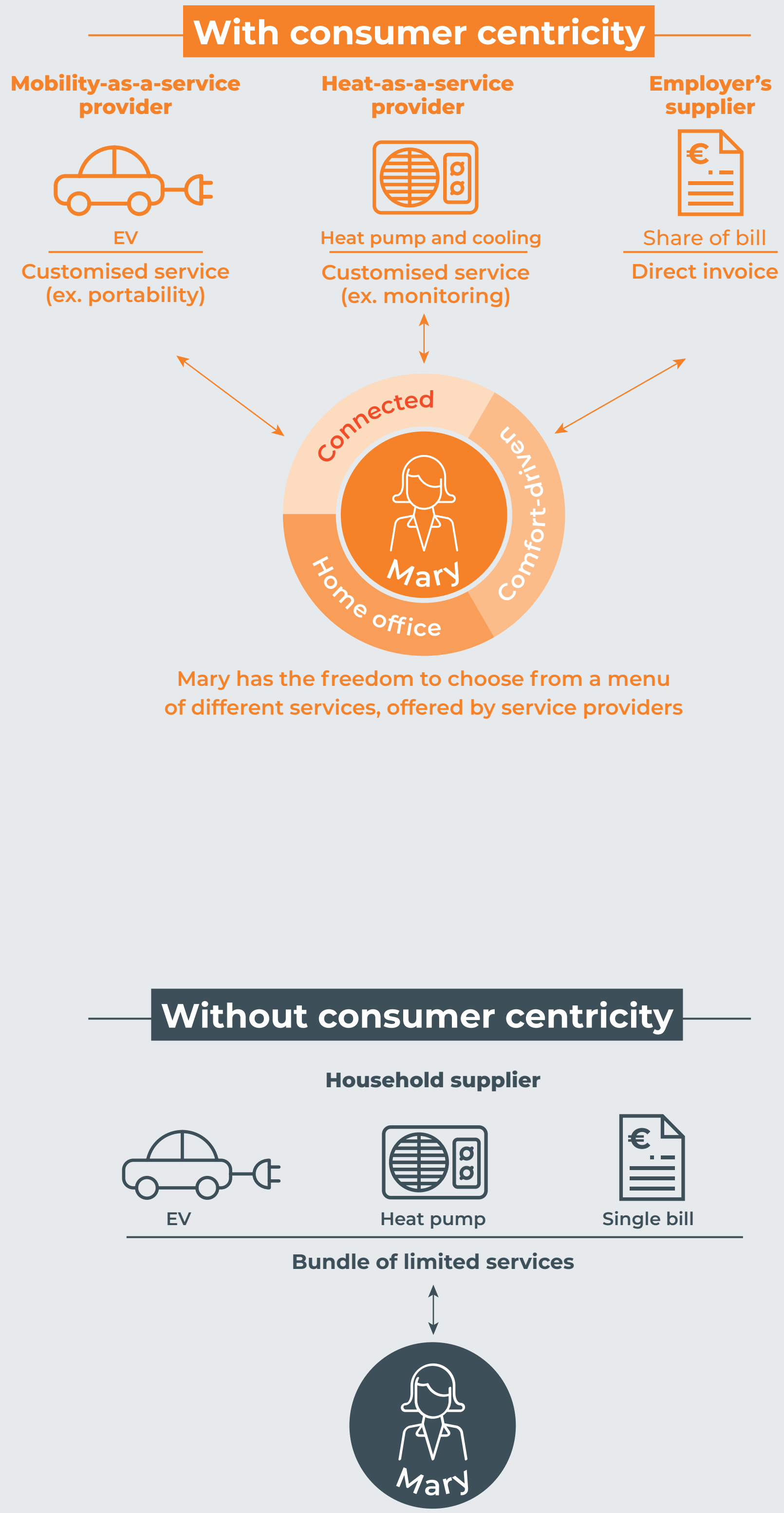
Consumer centricity increases convenience and reduces the risks for Mary. In addition, because heat and mobility service providers optimise the charging/heating pattern of her appliances according to the market price and system conditions, consumer centricity benefits the entire power system.

Finally, even though Mary is highly connected, she is protected from her data being used unlawfully or unfairly, since each of her service providers comply with stringent data protection rules, which ensure privacy by design and privacy by default.

20°C

+/- 2 °C all year round in accordance with her needs

FIGURE 6: SERVICES TAILORED TO MARY'S NEEDS



Mary has contracts with several service providers.

- Heating and cooling services maintain Mary's home temperature within a set range of 18-22°C all year round.
- Mary has a dedicated electricity service provider for her electric vehicle, which provides charging services wherever she charges it: at home, at a friend's house, or at a public charging point. The pre-agreed conditions make the billing and payment convenient and predictable.
- Mary often works from home. The power consumption related to her professional and mobility needs is directly invoiced to her employer's supplier.

Such arrangements relieve Mary from significant uncertainty (e.g. unplanned device maintenance and replacement costs), performance risk (e.g. related to the efficiency of the device), behaviour risks (e.g. excessive demand for heat) as well as risks related to the energy price (e.g. through a monthly fixed fee model for heat or mobility services).

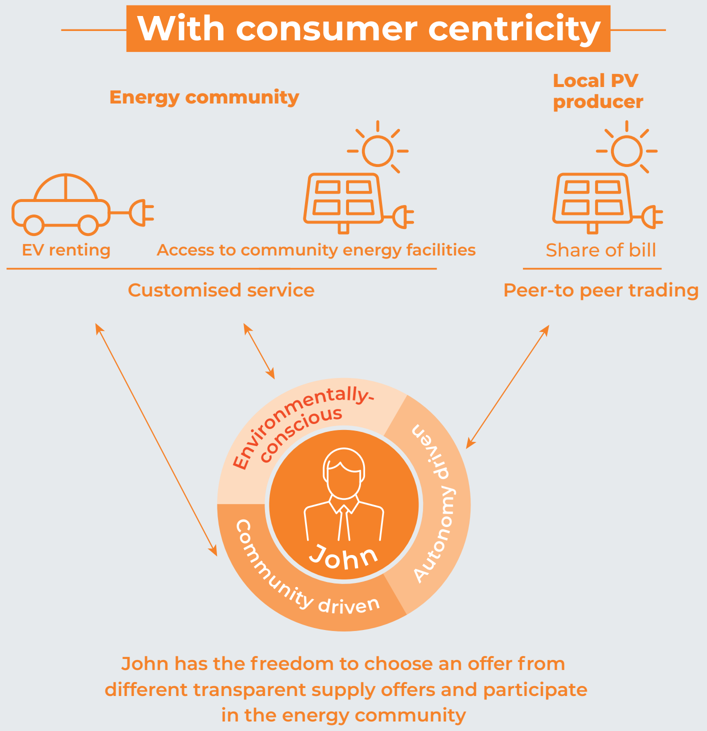
Mary would have no other choice than to engage with available services offered by her supplier, which might not align with her expectations.

John is an environmentally-responsible consumer with limited opportunities for acquiring new appliances of his own

John lives in an apartment in the centre of Berlin, Germany. He has limited direct access to connected devices, and does not own an individual heat pump, solar panel, or battery. However, he is interested in environmental issues and the sources from which the energy he uses originate. An increased sense of autonomy and resilience are other important drivers for him – he wants to take responsibility for his own energy consumption and his environmental impact.

Not only would consumer centricity increase John's comfort and satisfaction, it would also be beneficial for the entire system (in terms of RES development and integration, increased flexibility etc.). This is because participation in energy communities and green sourcing contributes to triggering investments in RES and matching consumption with local RES generation.

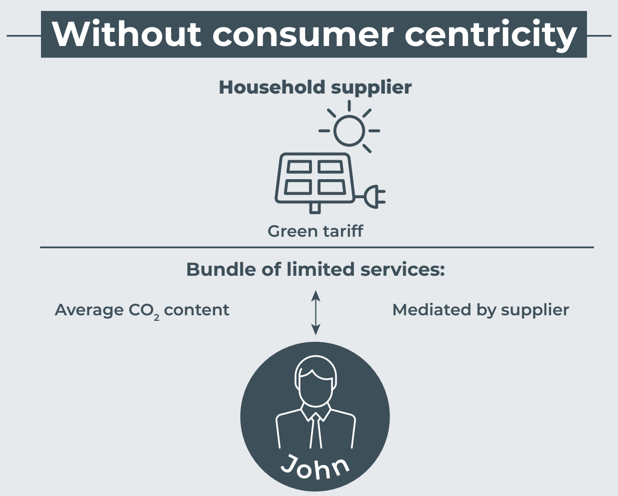
FIGURE 7: CONSUMER CENTRICITY FOR JOHN



John sources his power exclusively from renewable and identifiable sources in real time, on a 15-minute basis.

To do so, he participates in a local energy community which brings together consumers and renewable energy producers, including prosumers. Members of this community exchange with other members to source their energy needs. Financial arrangements within the community are freely and bilaterally agreed. This includes a monthly subscription to share access to community energy facilities, such as rooftop solar panels or nearby wind farms, batteries, or electric cars.

Regardless of his living situation, this energy community is a very easy way for John to participate in the energy transition. He can have a direct impact on the development of the local power system and its shift towards renewable sources. It doesn't matter which direction John's roof is facing, or whether his landlord has given him permission.



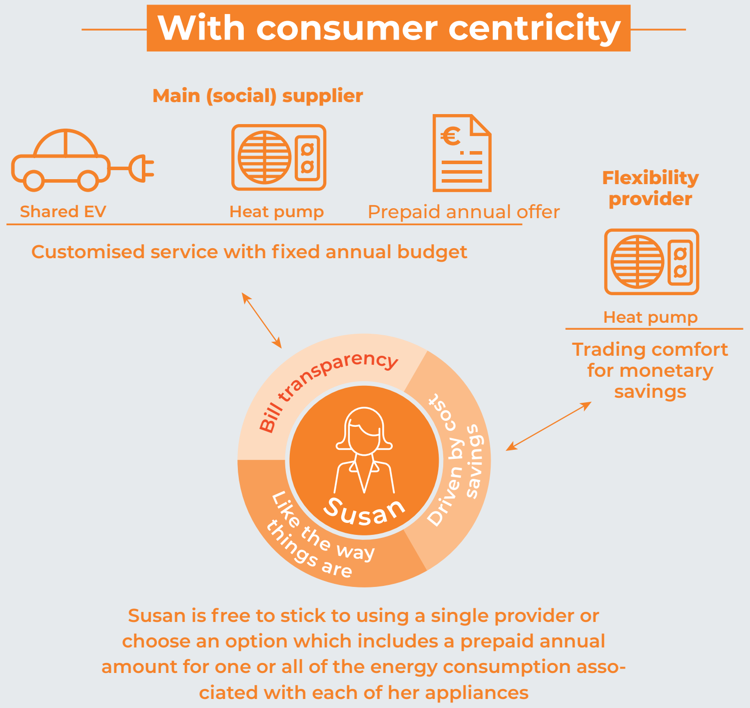
John needs to rely on his supplier to arrange green supply without clear traceability with regards to the source of his electricity.

Susan is a consumer with limited financial resources who is primarily looking for price security

Susan is a so-called 'vulnerable' consumer. She has difficulty obtaining or understanding information about the energy market, is rather risk –averse, and is reluctant to change her consumption patterns. She faces challenges with buying, choosing, or accessing new products and services which suit her personal situation. She qualifies for a social (or reduced) tariff, and wants to be able to anticipate how expensive her energy bills will be.

With consumer centricity, Susan enjoys increased protection thanks to policies and regulations aiming to reduce energy poverty, including ad hoc energy efficiency schemes and targeted advice to help customers choose between different service providers. Not only does this increase Susan's comfort and reduce the financial risks she might face, it also benefits the entire system thanks to her participation in these flexibility services.

FIGURE 8: IMPROVED BUDGET CONTROL FOR SUSAN

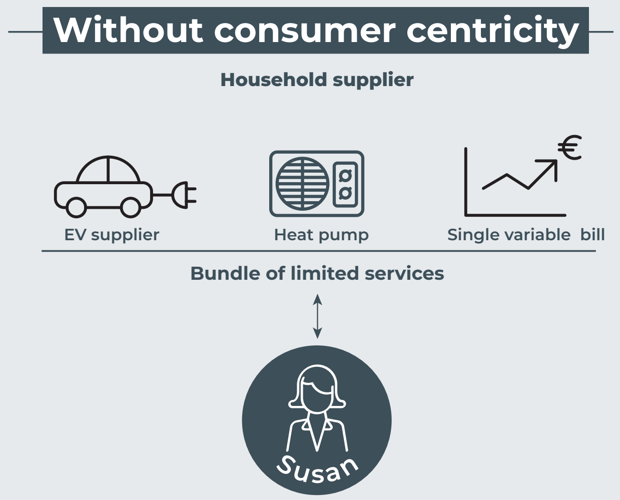


Susan chooses to continue with a traditional peak/off-peak tariff with her supplier and can still benefit from a subsidised social tariff.

In order to manage her budget more easily, Susan can also use prepaid energy cards sold at local shops, such as post offices and supermarkets.

To further reduce her energy bill, a flexibility service provider makes her a transparent offer to trade some of her flexibility for monetary earnings (by valorising her flexibility on the balancing and wholesale markets). Finally, Susan shares an electrical vehicle with the local community and benefits from a reduced social charging fee, regardless of the location, which is integrated in her final monthly invoice by her main supplier.

This could even be done under pre-agreed conditions supervised by the authorities, which aim to guarantee a sufficient level of service.



Susan has a traditional peak/off-peak tariff with her supplier and is eligible for a subsidised social tariff.

She relies on her supplier to provide advice for reducing her consumption or valorise her flexibility resulting in direct cost savings.

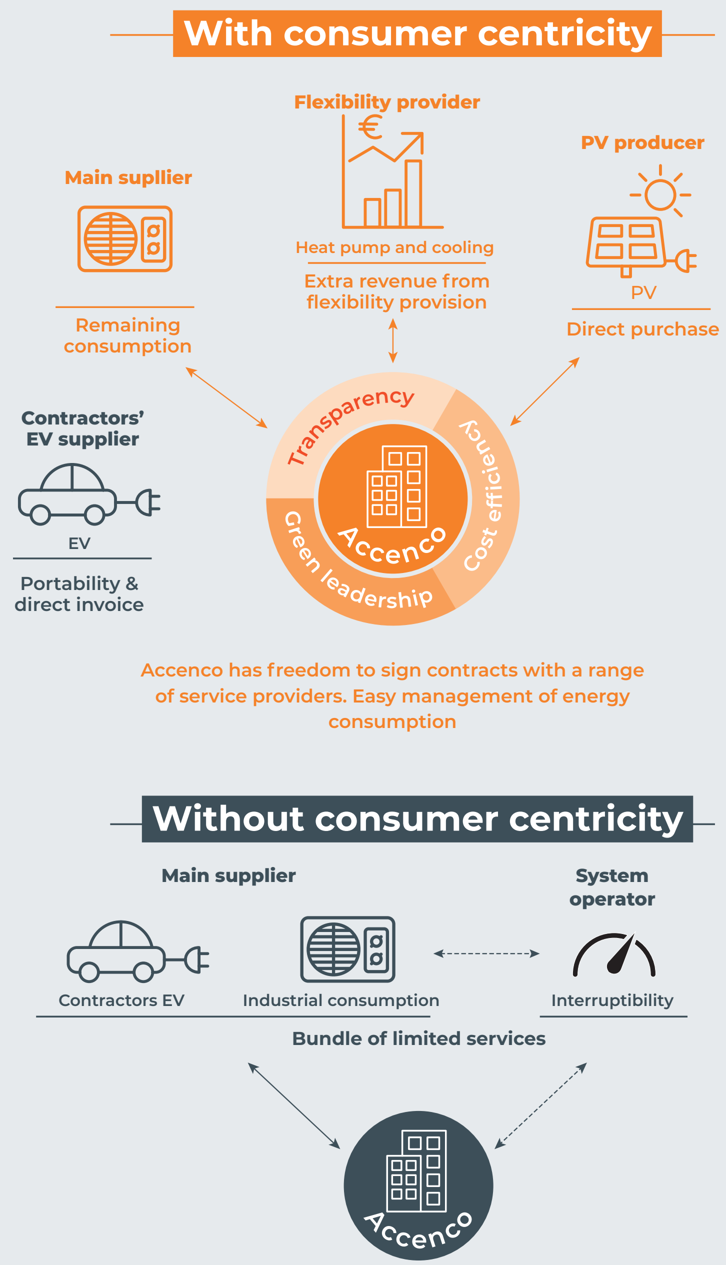
When needed, Susan rents a car (EV) but then faces administrative costs linked to an EV charging card which she rarely needs.

Accenco is an industrial SME which sources green power for its energy-intensive/flexible processes

Accenco is a small industrial business with on-site distributed energy generation and storage (rooftop solar panels and behind the meter batteries). Accenco's primary concerns are (i) hedging energy costs and grasping the benefits of its investments, which requires participating in offering services to the grid, wholesale market participation by selling previously stored excess RES energy, or managing flexibility to provide demand response without downgrading industrial efficiency; (ii) demonstrating green leadership. As Accenco's clients are keen to make sure their products use only RES, Accenco wants to be able to show that RES generation matches its electricity demand on a fifteen-minute basis.

Not only would consumer centricity improve and diversify Accenco's business model by making it more robust, it would also benefit the entire system though better RES integration and increased flexibility.

FIGURE 9: CONSUMER CENTRICITY FOR AN INDUSTRIAL USER



Since the generation of its on-site facilities is not sufficient or stable enough to power its industrial processes, Accenco signed contracts with several other industrials and energy producers, via power purchase and sale agreements, to account for the remainder of its annual consumption and to manage excesses. Contractual arrangements are made very easy under the CCMD.

Instead of signing a simple interruptible contract with the TSO, Accenco asked a service provider to manage all aspects related to its flexible industrial processes, harnessing value from all power markets.

On-site EV portability is made easy and Accenco can offer visitors and business partners the opportunity to connect their EVs to the charging points in its company car parks.

Power purchase agreements are not easily accessible for Accenco, given the time and skills they necessary to set them up properly.

Similarly, participation in energy markets is not straightforward for Accenco, which is not an expert in such matters. The company mainly offers services to the grid via an interruptibility agreement with the system operator, which is a simple way to harness partial value from its flexible industrial process.

> "This white paper is a welcome addition to the ongoing debate on how to future-proof electricity markets. We need to evolve towards a market design in which consumers can be more easily serviced by innovative business models. As the paper nicely illustrates, under the current market design, new players have to take over the supplier gateway or have to work with submeters, and/or special regulatory regimes that allow them to operate next to the supplier. The paper includes a proposal for a single and lighter regime based on an "Exchange of Energy Blocks", which could reduce the transaction costs of innovative services and could enable new services. As with all new ideas, the details of implementation will be important to make sure that the potential benefits for consumers can materialise. This is an appealing proposal that warrants further discussion".

LEONARDO MEEUS, PROFESSOR AT THE VLERICK BUSINESS SCHOOL AND THE FLORENCE SCHOOL OF REGULATION

> "Customer centricity is the core of our business activities. This involves for us both end consumers and independent producers of 100 %
> green electricity. We connect them directly via a market place, where every consumer can choose their favorite producer. This approach supports the renewable producers with additional revenues and shall facilitate the investment in new assets. The consumer has full transparency and knows where their money goes o. We think that such concepts are key to enable a higher identification with the energy transition".

LDR. RICHARD LOHWASSER, CEO, LITION

> "At sonnen, we are challenging the existing energy system: we want to shape the future of energy to make sure it is clean, distributed, networked and affordable. We do this by putting our customers at the centre of what we do and enable them to connect with others through our virtual power plant. Our customers are in fact prosumers. Through the use of our smart renewable energy solutions and services, they form an energy community and hence actively contribute to accelerating the global energy transition. At sonnen, we believe that our customers play an extremely vital role in dealing with the challenges we all face due to climate change".

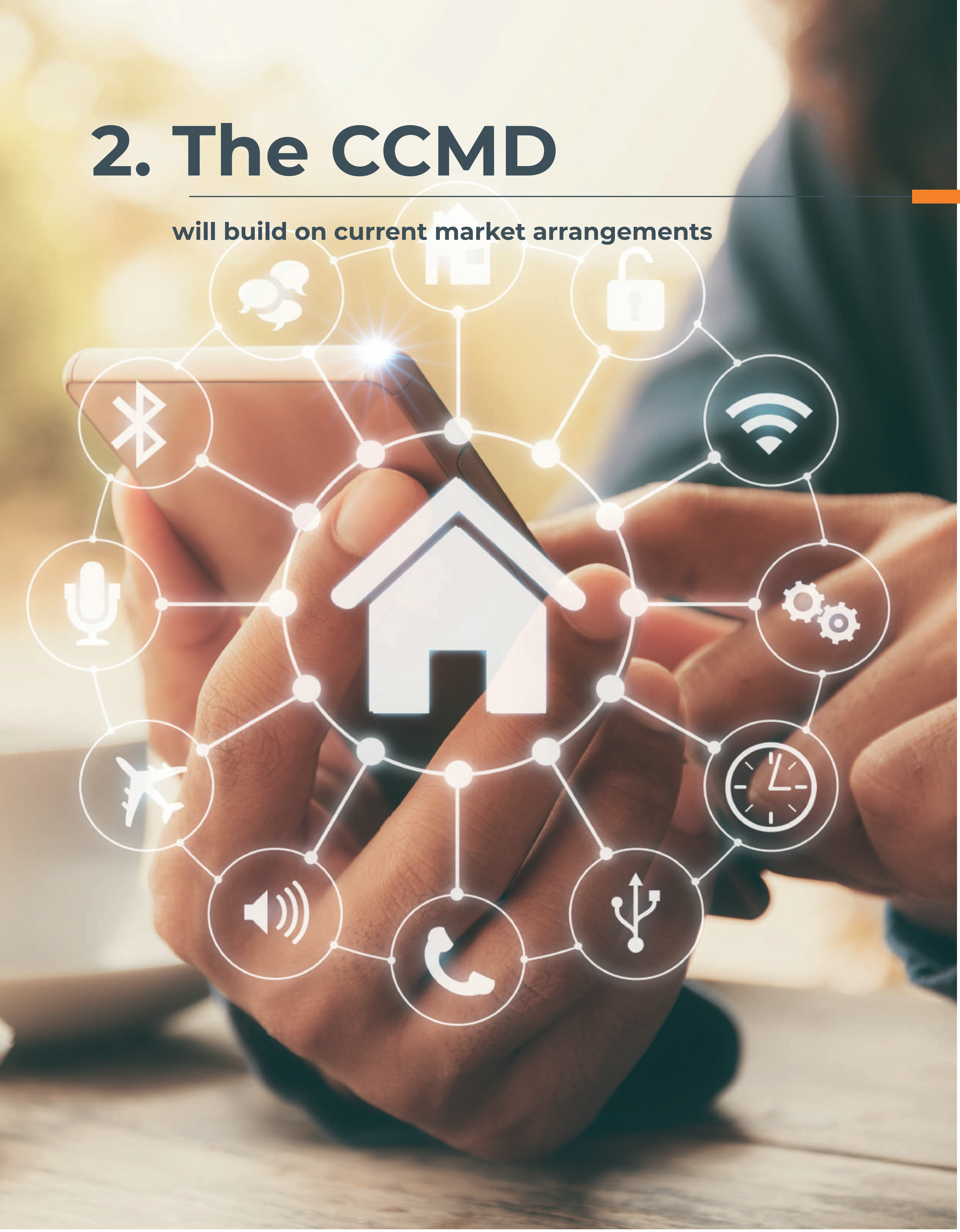
STEPHAN LINDNER, LEITER VPP-TECHNOLOGIEABTEILUNG, SONNEN

> "Febeliec welcomes this initiative by Elia aiming to activate flexibility available with residential and commercial consumers. At the same time, Febeliec insists on the need to maintain a reliable and correct day-ahead price signal, one of the cornerstones of the energy-only market."

PETER CLAES AND MICHAËL VAN BOSSUYT, FEBELIEC

2. The CCMD

will build on current market arrangements



Introduction

The beauty of the proposed CCMD is that through only small changes in market design, the customer can be put at the very centre of it, so unleashing competition behind the meter.

Under today's centralised market organisation, market design and access rules have largely been defined with a one-sided approach focusing on the supply side, as large centralised plants traditionally provided the bulk of the operational flexibility required to run the power system. End consumers – aside from the larger ones, such as big industrials – are typically not considered to be active participants, as they were historically not able to actively respond to prices before the arrival of smart meters and real-time pricing.

In practice, stringent access rules translate into onerous financial constraints and physical balancing requirements, which naturally resulted in a market organisation built around the supplier. These factors are now acting as barriers to maximum participation and the opening up of the market behind the meter to third parties, slowing down the development of innovative and differentiated services.

Hence, a market design reorganised around consumers is needed to facilitate and accelerate their active participation. This transition to a consumer-centric market design is illustrated in Figure 10 below.

The proposed changes are quite straightforward. They consist of providing end consumers with the freedom to choose which service providers or suppliers they want to sign contracts with on or behind the access point. This can be done simply by:

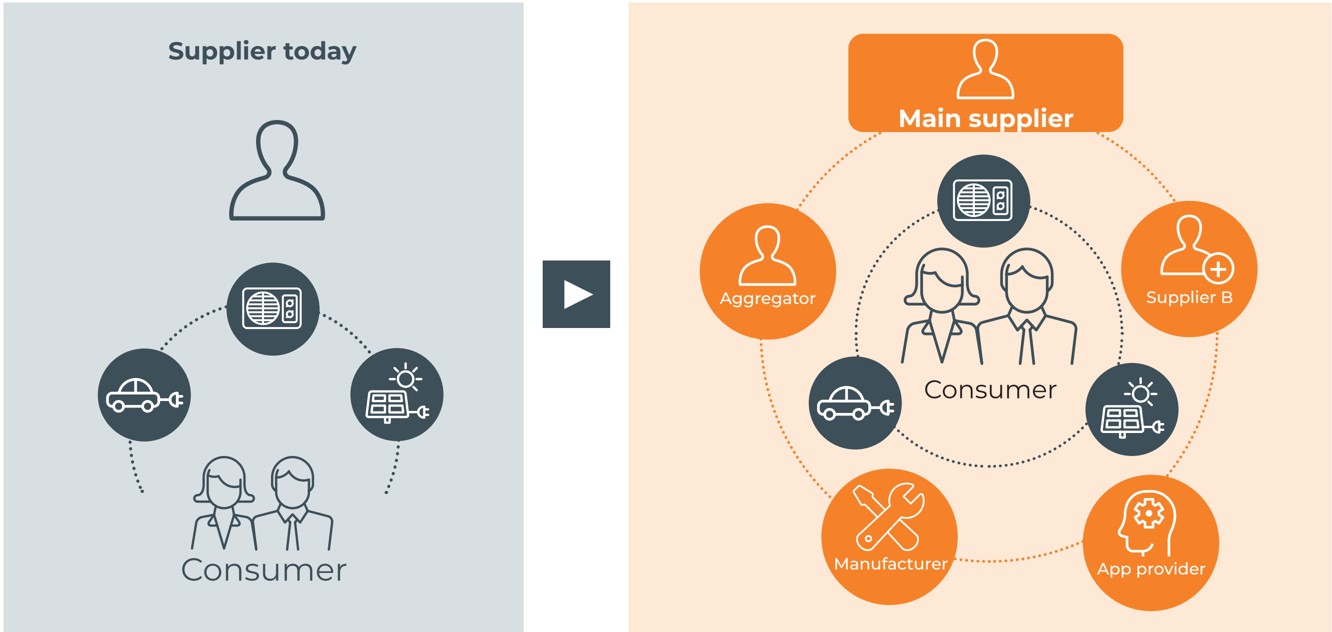
a. allowing the decentralised exchange of energy on a 15-minute basis between consumers and various suppliers and service providers; and

b. implementing a robust price signal that reflects system conditions in real time, which consumers use as a reference for consumption optimisation, decentralised trading and for estimating the value of services offered by third parties.

The points below will be addressed in the following section:

- **what barriers persist in the current market organisation and where they come from;**
- **how a consumer-centric market design can offer a more practical and viable alternative;**
- **what the proposed model can offer different stakeholders;**
- **opportunities for reform.**

FIGURE 10: TOWARDS A CONSUMER-CENTRIC MARKET



What barriers exists under the current market organisation and what causes them?

The specific obstacles to active consumer participation under the current market organisation are as follows:

- In many markets, consumers cannot engage with third parties for the delivery of services behind the meter if not approved or facilitated by the main supplier.
- The current one-size-fits-all certification approach to monitoring and settlement often results in unnecessary regulations and hardware-intensive solutions behind the meter (when compared with the possibilities offered by tailored digital solutions made possible by connected appliances).
- When this is possible, the workaround needed to enable consumers to engage with services delivered by third parties while preserving the role and responsibility of the supplier/BRP is complex. In practice, this requires neutralising all the "impacts" of the services provided by independent third parties, by correcting the supplier's portfolio and financially compensating it after the fact.

"For us at Volkswagen, the best customer experience always comes first. An increasing amount of customers are turning to electric cars and installing PV systems, wondering how these assets can be intelligently connected as they do so. Flexible storage (offered by assets including electric vehicles) and volatile generators (which include PV systems) are ideally matched and, together, can contribute to an energy system which is more sustainable overall than the one which currently exists. We have the technological means to use these assets today, but in order to be able to deploy them, we need a market design that enables the effective and smart integration of small, decentralised energy assets into the system. With the right framework, we will be able to create and offer our customers energy products and services which are both more transparent and sustainable. The Volkswagen Group stands by its commitment Way-To-Zero".

DR. NIKOLAI ARDEY, EXECUTIVE DIRECTOR INNOVATION, VOLKSWAGEN GROUP

a. Consumers cannot easily engage with third parties for the delivery of services behind the meter

Under the current model, the supplier is responsible for all of the consumption behind the access point.

As a result, end consumers cannot easily access the panel of innovative services behind the meter unless:

- these services are proposed by their main supplier; or
- access points are duplicated by installing more than one smart meter per household, which results in unnecessary costs, time and discomfort for the consumer (see Figure 11); or
- complex administrative arrangements are implemented to neutralise all the impacts on the main supplier caused by the services provided by third parties, which may result in high transaction costs and may act as barriers to new independent service providers or end consumers engaging in new services.

Therefore, the current market model encourages the bundling of energy services with the supply contract (which is currently by far the most straightforward solution) or with the supplier's commercial partners only.

This creates new issues for vendors, who may be locked in, as energy services and mobility services become increasingly common and consumers have to compromise. Indeed, in this case, switching to another supplier would also mean giving up all energy services which are under contract with the current supplier, possibly also replacing behind the meter appliances and hardware. This could quickly become a barrier to consumer switching and to the smooth functioning of retail markets. Such issues could undermine all past efforts to develop retail competition.

b. The current "one-size-fits-all" approach to monitoring results in heavily-regulated hardware-intensive solutions behind the meter, especially when compared with the potential that lies in tailored software/digital solutions

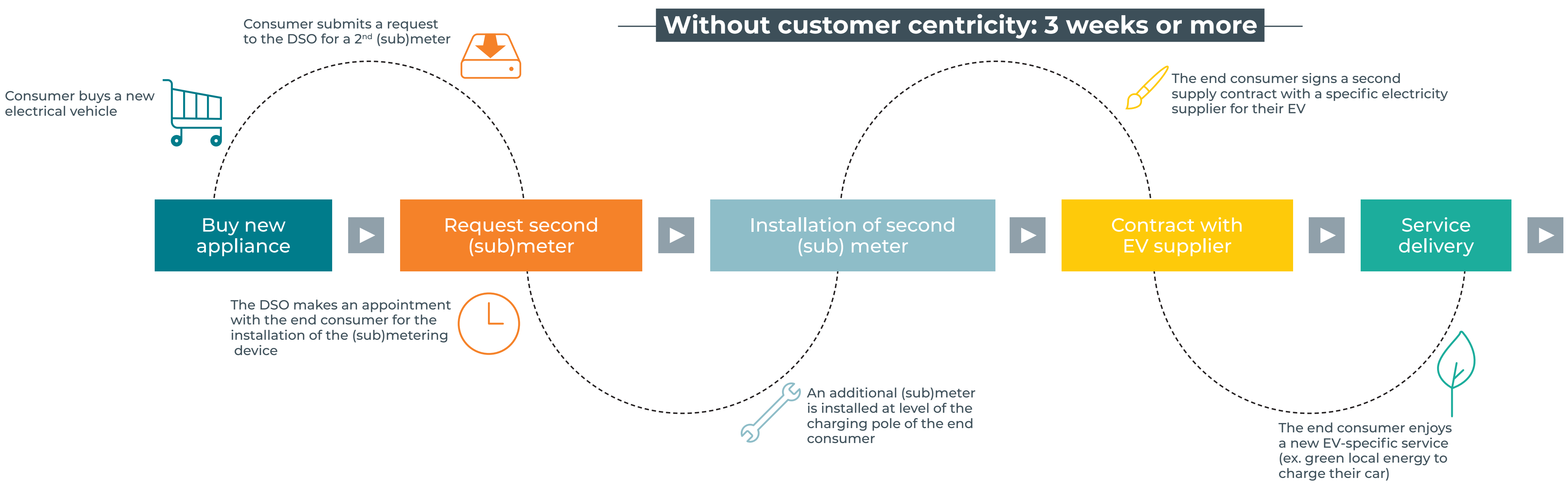
The allocation of energy volumes between market parties currently only relies on the certified metering data provided at each access point. This means that under the current model, implementing supply split and the provision of independent energy services often requires the duplication of access points and the installation of more than one regulated meter per household (also called submetering).

Besides, arrangements involving the additional installation of regulated metering infrastructure imply additional disadvantages for end consumers, including administrative burdens, additional costs, additional time lost and discomfort (see Figure 11 below). This often results in relatively high transaction costs and prevents end consumers and independent service providers from engaging in new services, possibly exceeding the benefits associated with these services.[4] It is clear that the consumer journey needs to be simplified to unlock the full potential of flexibility.

"Let's first use what we have at hand, instead of increasing the system cost by adding storage solutions. Smart homes, buildings and EVs are the cost effective solution, offering a big chunk of the flexibility we require. I am happy that Elia shares this view in the roll-out of their customer-centric market approach".

SMAPPEE

FIGURE 11: THE CONSUMER BUYING JOURNEY FOR ACCESSING INDEPENDENT SERVICES IS CURRENTLY COSTLY AND TIME-CONSUMING



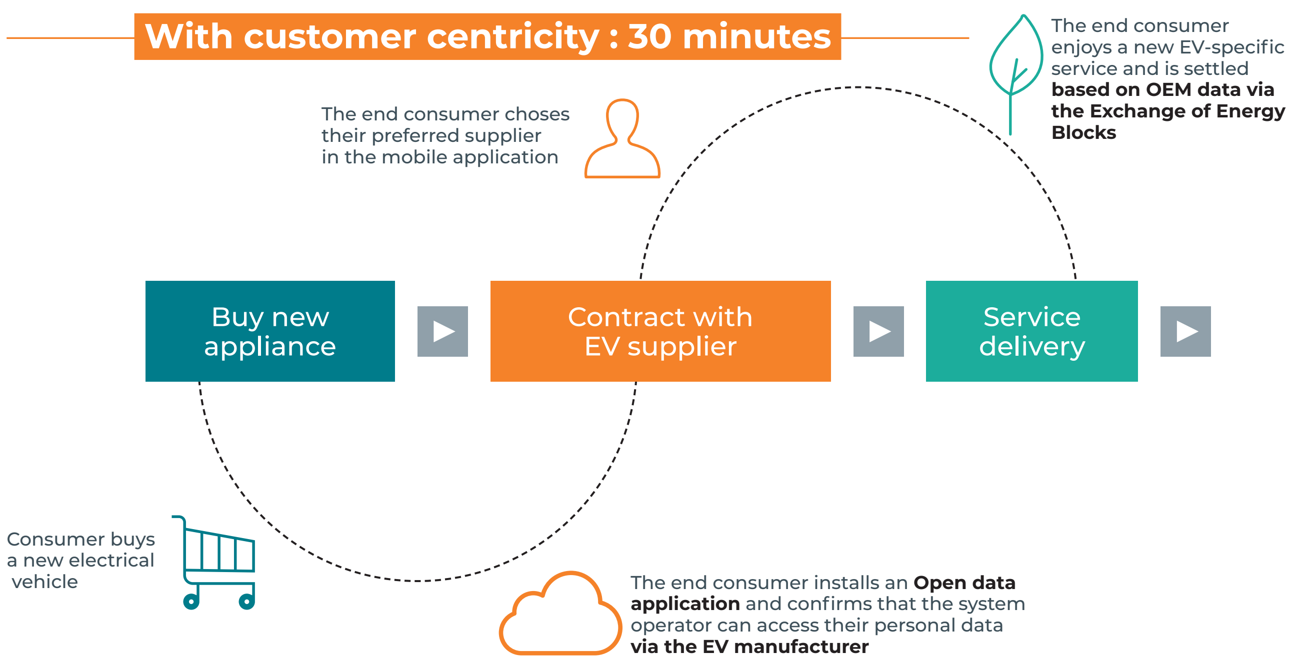
Depending on each country's regulations / processes for metering and defining access points, setting up a submeter to start benefitting from third party services can take longer than a few months and can cost hundreds of euros.

4 Our studies show that smart charging will reduce the annual electricity cost for consumers by between €30 and €55 by 2030 (see Elia, Accelerating to net-zero: redefining energy and mobility).

This is even more damaging because hardware-intensive metering solutions (which are based on the duplication of certified meters) have often become redundant, given the potential which lies in software and digital solutions behind the meter. By combining smart metering data – which will remain central – with the metering embedded in connected appliances, alternative approaches to metering consumption which are adapted to different uses could be provided. For instance, the need for portability in EV charging could be solved by embedded metering and software-based solutions. The KBC use case developed by Elia (see appendix 2) with various corporate partners illustrates how decentralised exchange of energy consumption data enables simple EV charging management and portability. In a similar project with Elia Group subsidiary 50Hertz and other TSOs in Germany, charge point developer and operator ubitricity demonstrated how smart metering data can be used to easily shift charge events between suppliers with low operative effort.

In a nutshell, even though the role of regulated smart metering will be key, a different approach to metering can be used behind the head meter, with a range of solutions made possible without the need for multiplying access points and certified meters.

FIGURE 12: A STREAMLINED CONSUMER BUYING JOURNEY UNDER THE CCMD



The actual time (and cost) it takes to set up a new service will depend on the appliance concerned, the need for certification/trust and the service provider.

> “User centricity means to provide seamless climate and energy solutions instead of “just” single hardware products. Concepts like our electricity tariffs, tailored to match our hardware offering, help our users towards a fully optimised energy supply, by reducing complexity for instance. This shall be both cost-efficient and environmentally sustainable. We are looking forward to seeing how the market design can be changed to facilitate such services”.

DR. HANS SCHERMEYER, PRODUCT OWNER ENERGY SERVICES, VIESSMANN

c. *The workaround needed to engage with third party service providers is complex*

Almost every supplier has the legal and financial obligation to keep their portfolio balanced at any time. Suppliers with this fundamental role are called balancing responsible parties or “BRPs”[5] and they act as the cornerstone of the current market design. In practice, balancing responsible parties are liable for any imbalance costs and penalties, meaning it is essential to give them sufficient control over their portfolio. In this framework, end clients cannot be served by different suppliers and/or flexibility service providers without coordination with their supplier/BRP.

Some initiatives already exist across Europe for facilitating the participation of consumers and third parties, such as independent flexibility service providers (FSPs) under the current ‘centralised’ market organisation. However, these remain patchy and can result in complex BRP/FSP interactions and efficiency losses. In other words, today’s market is characterised by different regimes aimed at achieving flexibility accommodating consumer needs; these include peer-to-peer trading, collective self-consumption or energy communities. Each regime has its own specific modality for preserving the role of the supplier/BRP.

This results in complex and fragmented frameworks for service providers (see Figure 13 below).

FIGURE 13: GROWING FRAMEWORK COMPLEXITY AND FRAGMENTATION, DRIVEN BY PATCHY AND AD HOC REGIMES

	Today					
Service	P2P trades	Flexibility services	Energy communities	PPA	EV portability	...
	▼	▼	▼	▼		▼
Regime	P2P regime	Tansfer of Energy	Specific regime for energy communities	Ad hoc PPA solutions	Ad hoc EV portability platform	...

Growing complexity in terms of regimes is coupled, in Europe, with each country’s own set of rules, resulting in a myriad of solutions.

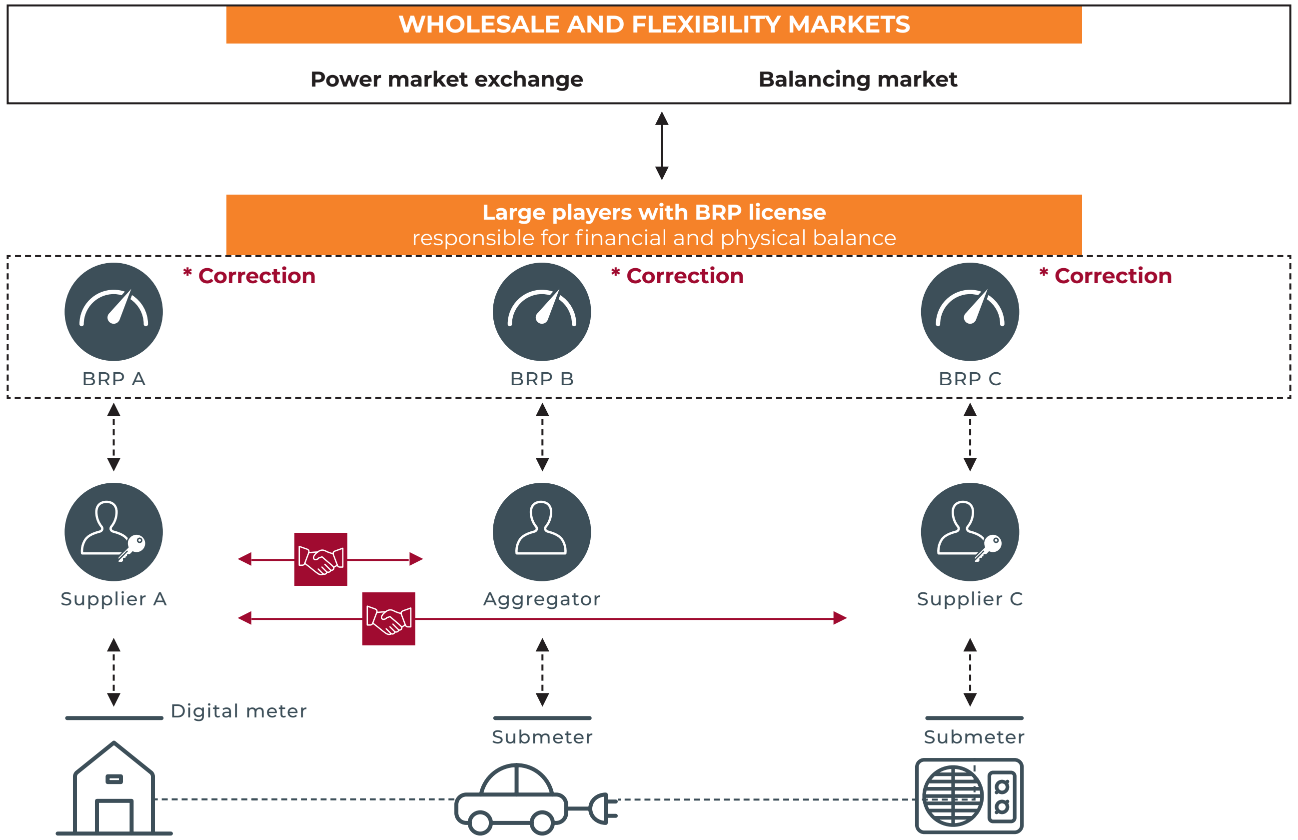
> “A new world is being established through digitalisation (including through the Internet of Things); decarbonisation (including of the mobility, heating and cooling sectors); and widespread use of decentralised energy resources. Active consumers have the right to be given access to new services “behind the meter” for appliances they own. Importantly, electric vehicles and heat pumps will boost developments in demand response, guaranteed green injections, decentralised self-generation, etc. A wider choice of services can be offered while still allowing consumers to stick to the traditional ‘single gatekeeper’ provider model if they so wish. This wider choice of services, offered by the proposed ‘Consumer-Centric Market Design’, enables commercial value propositions and encourages peer-to-peer trading and energy communities. European wholesale centralised markets opened in 1990. Retail centralised markets opened after 2000. We are now beyond 2020: the time has come to facilitate EU ‘consumer-centric’ decentralised markets”.

PROFESSOR J-M GLACHANT, DIRECTOR FLORENCE SCHOOL OF REGULATION

5 A distinction exists between suppliers and BRPs. The supplier is the party who has the license to sell electricity to the end-consumer and the BRP is the party who trades electricity on the wholesale market and ensures the physical balance of his portfolio. Suppliers can take over the role of the BRP or are associated to a BRP. Also other market parties can be BRP. For example, some European network operators are responsible to balance losses on their network via energy purchases.

For instance, in order to reconcile BRPs with independent FSPs, several European countries such as Belgium and France[6] have implemented "transfer of energy" arrangements (ToE), which offer end consumers the possibility of optimising their flexibility on the market (through an FSP), without needing to secure prior agreement from their supplier. This does, however, require the neutralisation of all the "impacts" on the supplier and its BRP, by correcting the former's portfolio with the "transferred energy" (which requires the use of "baseline" techniques to estimate what the consumption would have been without the activation of flexibility by a third party) and by compensating the supplier financially, through either a pre-agreed FSP-supplier price or through a default price set by the regulator. As a centralised mechanism, this is complex and can deter potential service providers from putting it in place (see Figure 14 below).

FIGURE 14: COMPLEX ADMINISTRATIVE AND TECHNICAL ARRANGEMENTS NEUTRALISE THE IMPACTS ON THE MAIN SUPPLIER OF SERVICES PROVIDED BY THIRD PARTIES



The current transfer of energy framework requires an agreement on the transfer price between the supplier and the third party service provider. Also, additional rules and agreements exist that clarify, amonst other things, how the exchange of data between parties will be carried out in order to correct the balancing perimeters of each service provider's BRP.

Such an approach at the household level will likely entail growing complexity, as new regimes will have to be designed to answer to consumer needs. Indeed, in cases where there are multiple services or services attached to several appliances, the "corrections of energy" would need to be calculated based on the metering and baseline per appliance. The practical feasibility, accuracy, and robustness of such an approach raises complex questions which might result in barriers to the development of demand side flexibility and competition for retail services. Moreover, the contractual complexity and administrative burden of ToE arrangements may impose significant entry and transaction costs on FSPs, hampering competition and innovation. From the consumer's perspective, all this can become complex and tedious, as contractual discussions between the supplier and service provider can potentially result in delays for implementing the services, and ultimately push consumers to switch to a different supplier or opt for another service provider.

6 NEBEF scheme in France

The growing balancing challenge in Belgium

Keeping the grid balanced in Belgium is currently based on three pillars: (i) BRPs balancing their own portfolios; (ii) TSOs activating energy on the balancing market; and (iii) market participants reacting to real-time price opportunities.

Offshore wind generation capacity reached 2.3 GW at the end of 2020 and by 2030 the plan is to increase this capacity to 4 GW. Such an increase will bring new challenges regarding the ability to operate the electricity system and ensure reliable supply.

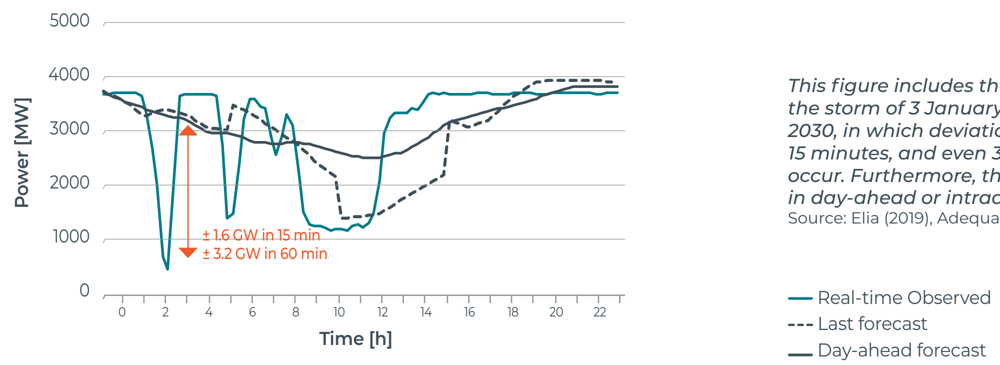
Because offshore wind power is highly concentrated in Belgium, storms can generate very large variations (ramps) in wind power output (due to cut-off and cut-in of large units) over 15 and 60 minutes. Currently, the power loss caused by a storm is often more than 1,000 MW (over the duration of the storm), while a severe storm might even cause a power deviation of more than 2,000 MW (see Figure 15 below).

As offshore wind capacity grows, it becomes clearer that growing flexibility needs can't be solved by simply increasing the volume of operating reserves (which would greatly increase the financial burden on the consumer). Containing the volume of reserves – and the system management costs ultimately borne by consumers – is possible, provided the whole market reaction is exploited at all voltage levels.

Enhanced price signals and broader consumer participation have the potential to be a more efficient way to manage the balancing of the system, as they will ensure that market players are encouraged to proactively manage their own portfolio balance (including delegating this responsibility to another party).

For more details on the Belgian flexibility challenge, see the Elia adequacy and flexibility study for Belgium 2020-2030 and MOGII system integration study[7].

FIGURE 15: OFFSHORE WIND POWER DEVIATIONS DUE TO STORMS IN BELGIUM HIGHLIGHT THE NEED FOR FLEXIBILITY



This figure includes the extrapolation of data from the storm of 3 January 2018 and its application to 2030, in which deviations larger than 1.6 GW in 15 minutes, and even 3.2 GW in 60 minutes, can occur. Furthermore, these drops are not predicted in day-ahead or intraday forecasts.
Source: Elia (2019), Adequacy study 2020-2030

The quickly evolving context will make the current BRP model unsustainable

The current BRP model, which partly relies on physical balancing obligations, is the result of a trade-off between the benefits of portfolio mutualisation and the ability to keep control of it. In the 1990s, at the time of unbundling and liberalisation, the choice was made to empower market players that owned the plants and had the levers to balance their portfolios efficiently.

With the emergence of decentralised production, increased autonomy for households, and changes in consumer preferences, it is uncertain whether suppliers and BRPs will still be able to balance their consumers' portfolios efficiently if they lack information and control. In any case, the benefits of giving part of the responsibility to large BRPs operating large-scale controllable power plants are likely to be reduced, given the development of decentralised supply and demand side controllable resources.

Hence, the proposed market model adapts incentives to make sure balancing responsibilities are allocated efficiently in the evolving context. It seems necessary to relax the physical balancing obligation constraint, as it will not be as relevant for the system and is not compatible with consumer freedom. Of course, a broad reallocation of balancing responsibilities needs gradual adaptation, but it is believed that the two changes described in the next section (the Exchange of Energy Blocks and default reference to real-time pricing), are key to achieving that transition.

7 Both studies are available on www.elia.be

Two key building blocks delivering major benefits, with limited changes to the current design

Building on current market arrangements whilst limiting the changes required

The beauty of the proposed Consumer-Centric Market Design lies in the fact that small changes in design will lead to the customer being put at the very centre of the market, so releasing the potential of decentralised flexibility and competition behind the meter.

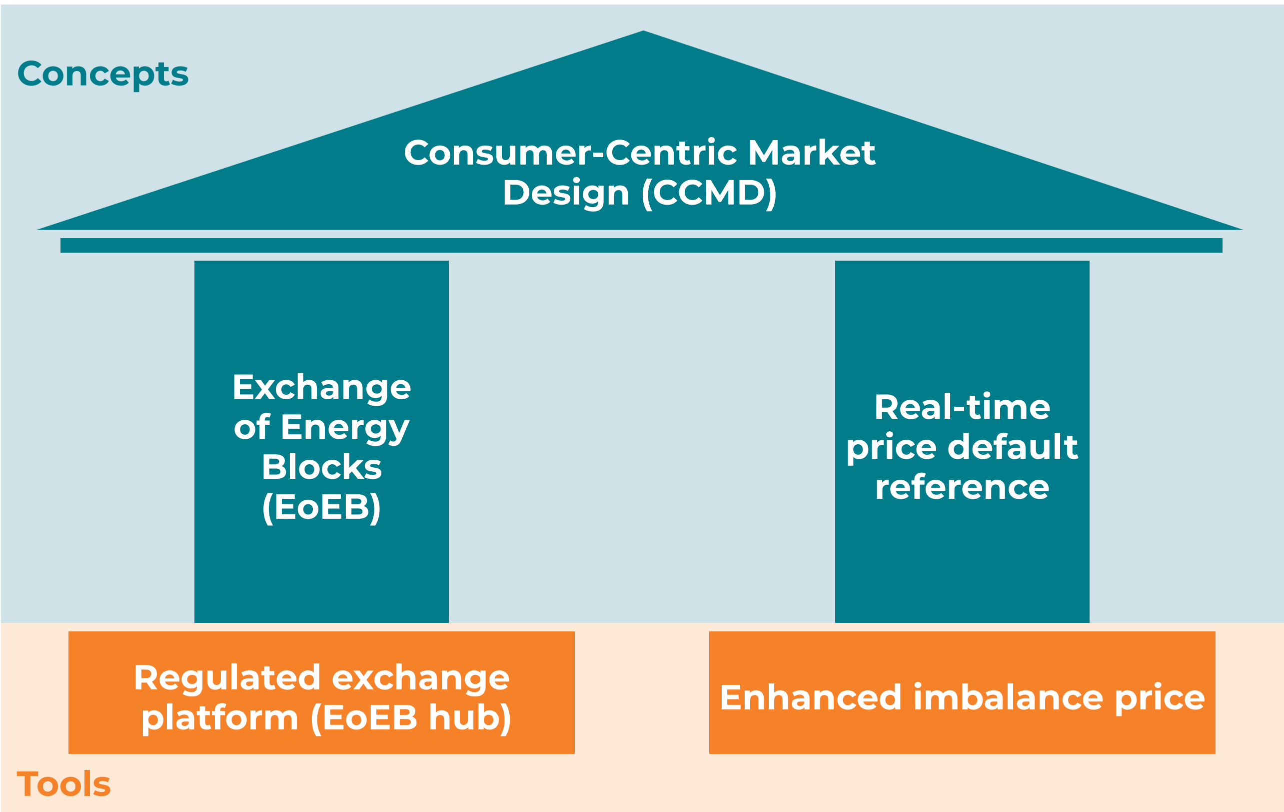
The proposed changes are straightforward. They consist of providing end consumers with the freedom to choose which service providers or suppliers to sign contracts with behind the access point. In practice, this means that consumers won't need to delegate all responsibilities to one single party before they get access to the electricity grid. This can be done simply by:

a. allowing the decentralised exchange of energy on a 15-minute basis between consumers and various suppliers and service providers; and

b. implementing a robust price signal which reflects the system conditions in real-time, which consumers can use as a default reference for consumption optimisation, decentralised trading or for estimating the value of services offered by third parties.

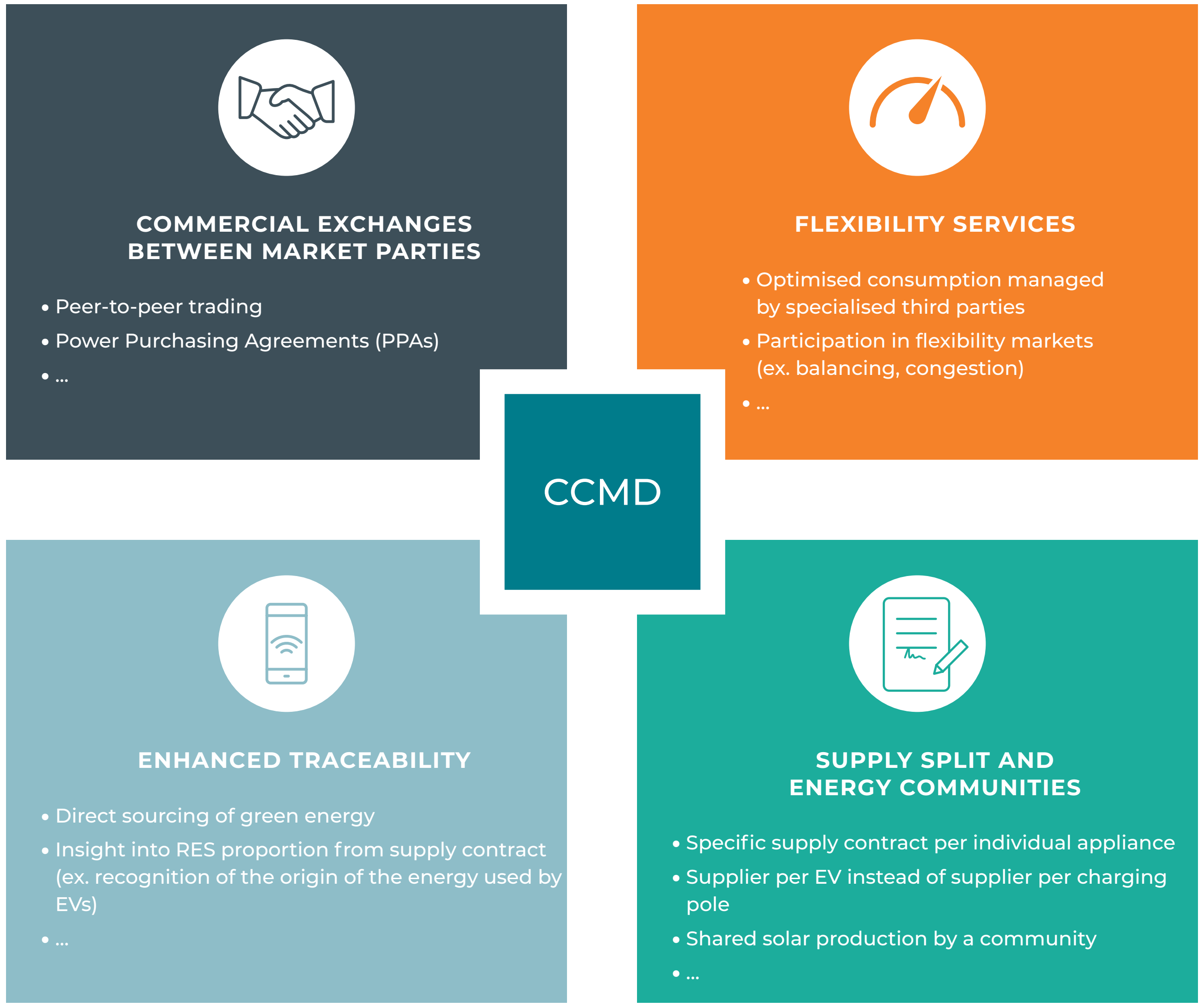
These two enablers are summarised in Figure 16 below. The tools allowing their practical implementation are outlined later in this paper.

FIGURE 16: CCMD KEY BUILDING BLOCKS



These two pillars, a real-time pricing reference and the exchange of energy blocks on a 15-minute basis within a single hub, are changes to the current market design that will provide a unique framework for multiple decentralised services. These changes will make it possible to move away from the current patchwork of complex ad hoc solutions.

FIGURE 17: A UNIQUE FRAMEWORK THAT ENABLES THE DEVELOPMENT OF VARIOUS CONSUMER-CENTRIC SERVICES

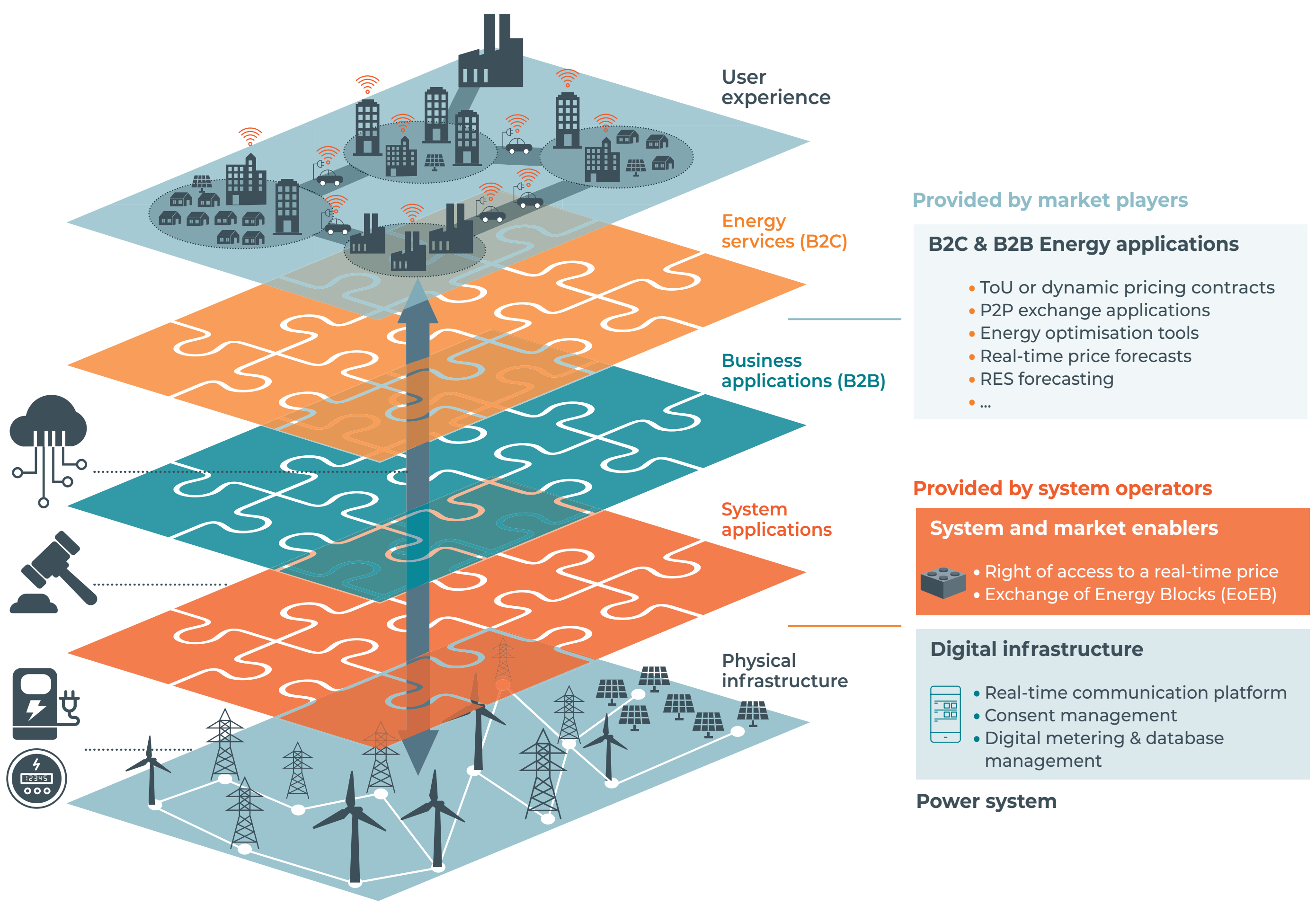


> "All our products focus on the customer. We value practical solutions that meet their personal needs and bring mobility and energy together. With concepts like Vehicle-to-Grid and our battery storage systems, we want to unleash the potential of decentralised flexibility and revolutionise the world of energy. That provides added value for both the customer and the energy system. We welcome adaptations to the market design that facilitate our services."
>
> **DR. MICHAEL SCHREIBER, HEAD OF VIRTUAL BATTERY PLANT, THE MOBILITY HOUSE**

The emergence of a new ecosystem that fosters innovation

If the provision of independent services behind the meter is simplified, a new ecosystem of commercial applications, services and market players will naturally emerge. This will work hand in hand with (i) the digital infrastructure hat collects, stores, processes and broadcasts all relevant data, while ensuring data security and privacy, and (ii) the regulated market design, which allows the decentralised exchange of energy blocks and real-time pricing (Figure 18).

FIGURE 18: THE INFRASTRUCTURE WHICH WILL ENABLE THE CONSUMER-CENTRIC MARKET DESIGN



> An open and inclusive approach to innovation should ensure the replication and scalability of commercial offers that enable every European to benefit from playing an active part in the digital and green transition. In a consumer-centric system, end users should have the choice to react to real-time prices and be rewarded to unleash their flexibility. It is a win-win, for consumers and for the system as a whole".
>
> **MICHAEL VILLA, SECRETARY GENERAL, SMARTEN**

The decentralised exchange of energy on a 15-minutes basis: 'Exchange of Energy Blocks' ('EoEB')

The concept

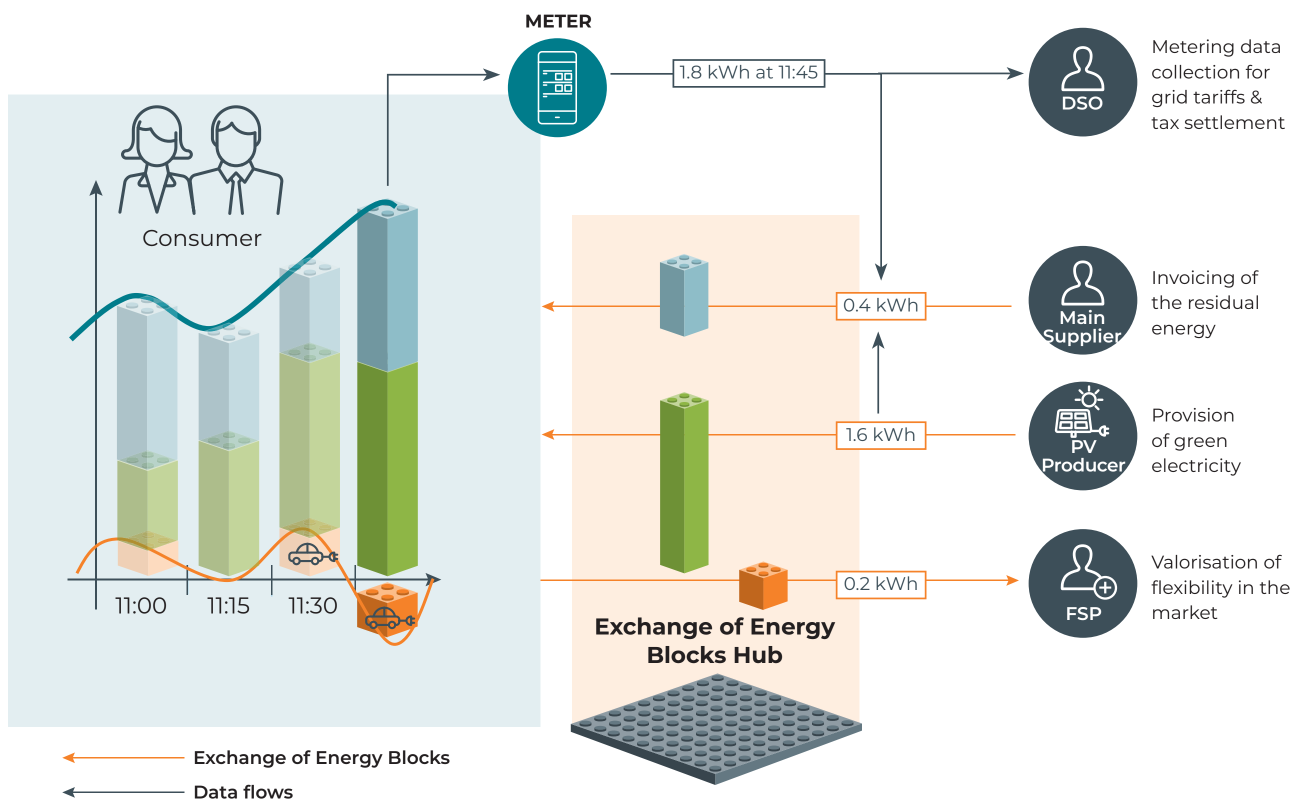
The EoEB consists of the decentralised exchange of power on a 15-minute basis between consumers and any other market party (including different suppliers and service providers), giving them new degrees of freedom for managing their electricity offtake and injection. This will allow commercial energy transactions to take place between all market players, from existing suppliers and new entrants through to prosumers and flexibility providers.

From a technical point of view, it should be noted that the regulated platform or Exchange of Energy Blocks (EoEB) hub, which supports the exchange of energy blocks, is a software-based solution that does not require any certified metering. Nevertheless, in order to facilitate transactions, parties can voluntarily decide to use additional private or embedded metering to reinforce trust.

From an organisational point of view, a legal and regulated framework which determines the EoEB hub access rules for consumers and service providers needs to be established. Furthermore, privacy and security should be guaranteed.

The EoEB hub acts as a single register for commercial energy exchanges, whether they consist of the usual supply/offtake relations or whether they are the product of various flexibility optimisations. The 15-minute energy needs of consumers will be met by several transactions carried out via the hub, depending on their commercial arrangements with third parties. The hub will record the energy block offtakes and injections occurring on the consumer's access point, making it possible to easily determine provider contributions in relation to the consumer's residual consumption (see Figure 19 below).

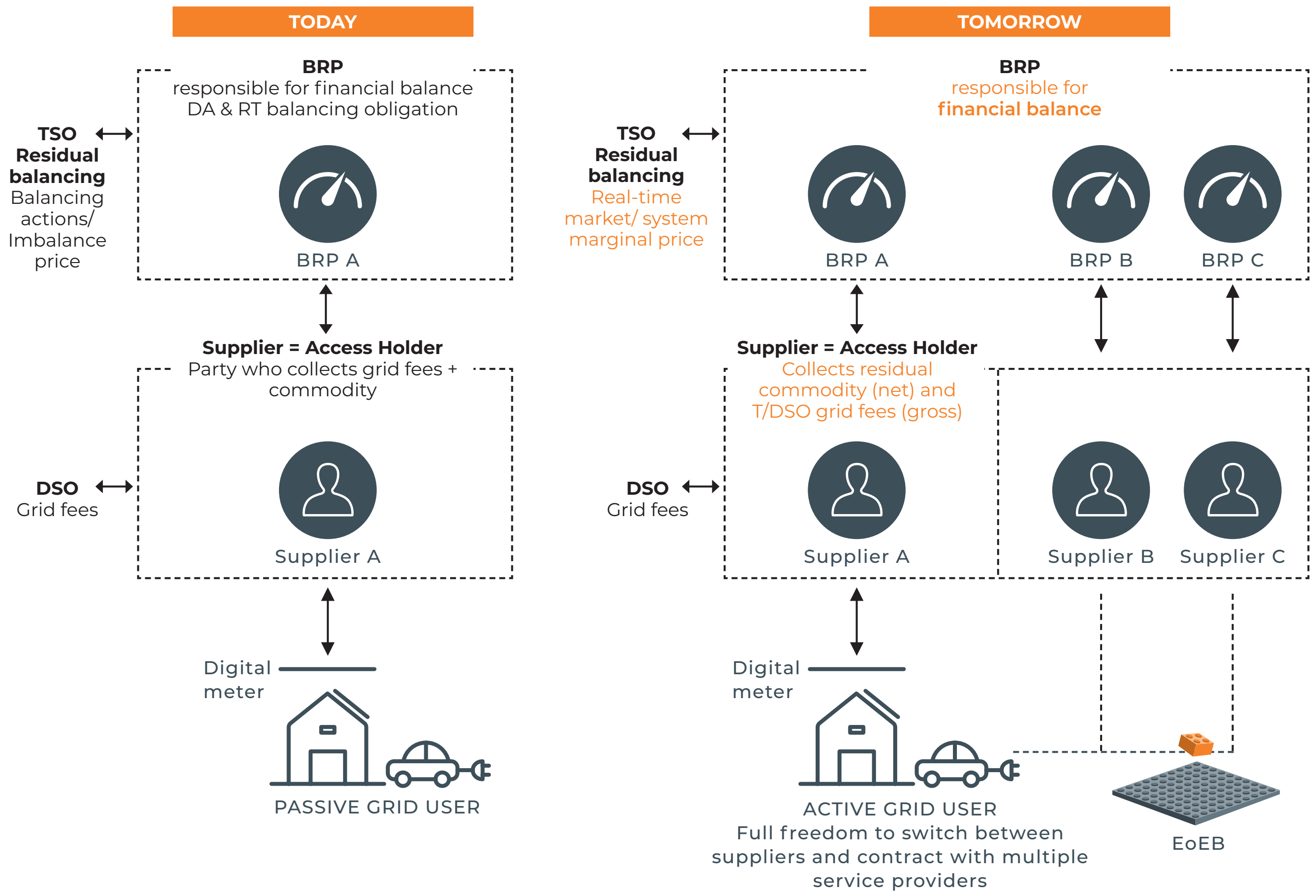
FIGURE 19: STACKING OF ENERGY BLOCKS TO MEET DEMAND WHILE SHARING INFORMATION WITH ALL PARTIES IN REAL TIME



This graph shows how energy exchanges undertaken via the EoEB hub allow Mary, every 15 minutes, to take advantage of her EV's battery to provide the system with flexibility for a profit or charge at the best possible value, while sourcing the majority of her consumption from a nearby solar farm. Every 15 minutes, the offtakes recorded at her access point are corrected with the energy already sourced on the EoEB hub and settled with her main supplier, as outlined in her contract.

The sum of all 15-minute transactions undertaken per grid user will be used to adjust the digital metered energy recorded at the connection point. This 'corrected metering' will be used by the main supplier (the access holder of the connection point) for the invoicing of the residual energy not sourced via the EoEB hub. However, grid tariffs, levies and taxes will be calculated and settled based on the physical meter, without any corrections being undertaken. The figure below explains in more detail how the mutually agreed transactions via the EoEB hub will be considered in the settlement process.

FIGURE 20: EoEB HUB ACTS AS A SINGLE REGISTER FOR ENERGY EXCHANGES HAPPENING BEHIND THE REGULATED METER



Moving away from a model where all energy exchanges happen ahead of the meter in the balancing responsible party's perimeter, the EoEB allows some of a consumer's energy needs and (possibly some of a prosumer's energy production) to be allocated to different parties. The regulated meter will allow prosumers to settle their outstanding balance, which will result from their purchases and sales via the EoEB hub, while it continues to be used as reference for all invoicing not directly related to energy (network, taxes, etc...) to be allocated to different parties using commercial submetering solutions.

What this will enable

Together with an ecosystem of commercial business models and applications built upon the regulated layer, the EoEB hub will unlock or facilitate several functionalities which will offer innovative and differentiated services to end consumers. It is the software infrastructure which allows local commercial transactions, physical reallocation and metering corrections to occur and on which new services can be built.

Consumers will be able to move beyond the restrictions of the current model and enter into commercial relationships with third parties of their own choice (neighbours, family, RES producers, energy community members and so on). Sourcing energy from different sources without requiring any additional submetering will be facilitated by a simple supply split. Elia Group is currently testing such a supply split coupled with solar and battery optimisation through the Yuso/Smappee use case (see annex).

Next, the EoEB hub provides a generic solution to enable independent energy services. This can contribute to the spread of flexibility services at all voltage levels. For countries with existing ToE arrangements, the EoEB will serve as a handy alternative, as it does not require any bilateral agreement between FSPs and suppliers as explained in Annex 1 of this note. For countries which have not yet implemented ToE arrangements, it is a simpler and more straightforward solution to allow independent FSPs.

Finally, the EoEB will offer parties the possibility of directly sourcing energy from specific assets on a 15-minute basis. However, this will need to be implemented together with the certification of, for example, 24/7 green supply, local supply, or any other specification. Indeed, a P2P trade is not enough to guarantee how the energy was produced, since in exchanging an energy block with one's neighbour, it can be sourced on the market and sold again.

Practical implementation

This hub can be made accessible to consumers very simply through a dedicated mobile app (developed by a commercial third party), coupled with an online payment system. This makes it a very economical solution.

However, some restrictions surrounding exchanges are likely to be needed, especially for residential grid users, in order to manage counterparty risk. Such boundaries would be in place to clearly define how large 'sourcing needs' can be in terms of total transacted volume, thereby avoiding (for example) large-sized speculative transactions as well as operational errors or misuses. Such restrictions might relate to the connection size, or to any other physical reality of the user.

Moving away from the current one-size-fits-all approach, which is based on regulated metering, the certification models for transaction validation and settlement on the hub can be defined by the market players themselves. They can be adapted and tailored for each energy service to strike the right balance between (i) the need for certainty and trust[8]; and (ii) the need for low-cost and agile software-based solutions, which make innovative business models profitable.

However, in order to reinforce trust – and make sure entry barriers and transactions costs remain low, for end consumers and service providers – it could be useful to develop certain standards for the necessary software-based solutions developed by commercial parties, and to streamline certain prequalification or certification processes.

Due to its similarity to existing arrangements, implementing the hub is unlikely to require the extensive revision of current TSO/DSO procedures and tools. Indeed, the proposed EoEB hub is an extension of the current BRP hub, through which BRPs exchange energy. It remains a mechanism to net out energy volumes settled at the imbalance (or real-time) price. This BRP hub simply needs to be made accessible to any party, as explained below.

The EoEB hub will contribute to creating a new ecosystem of commercial applications, services and market players. The consumer experience will move from being a time-consuming hardware-based administrative process, to a streamlined process involving digital contracts. In addition to allowing "competition for the meter" (as is currently the case), **it will allow "competition behind the meter", for the benefit of the consumer.**

No consumer will be forced to engage in transactions via the EoEB hub or to actively manage offtake and injection on a 15-minute basis to source their needs. Most consumers will likely continue sourcing their needs through a traditional contract signed with their supplier. Yet, for those who want them, the EoEB hub is the first building block towards tailored solutions for every consumer.

8 A high level of trust is needed for the provision of balancing services, less might be required for those services that have a limited financial or system impact.

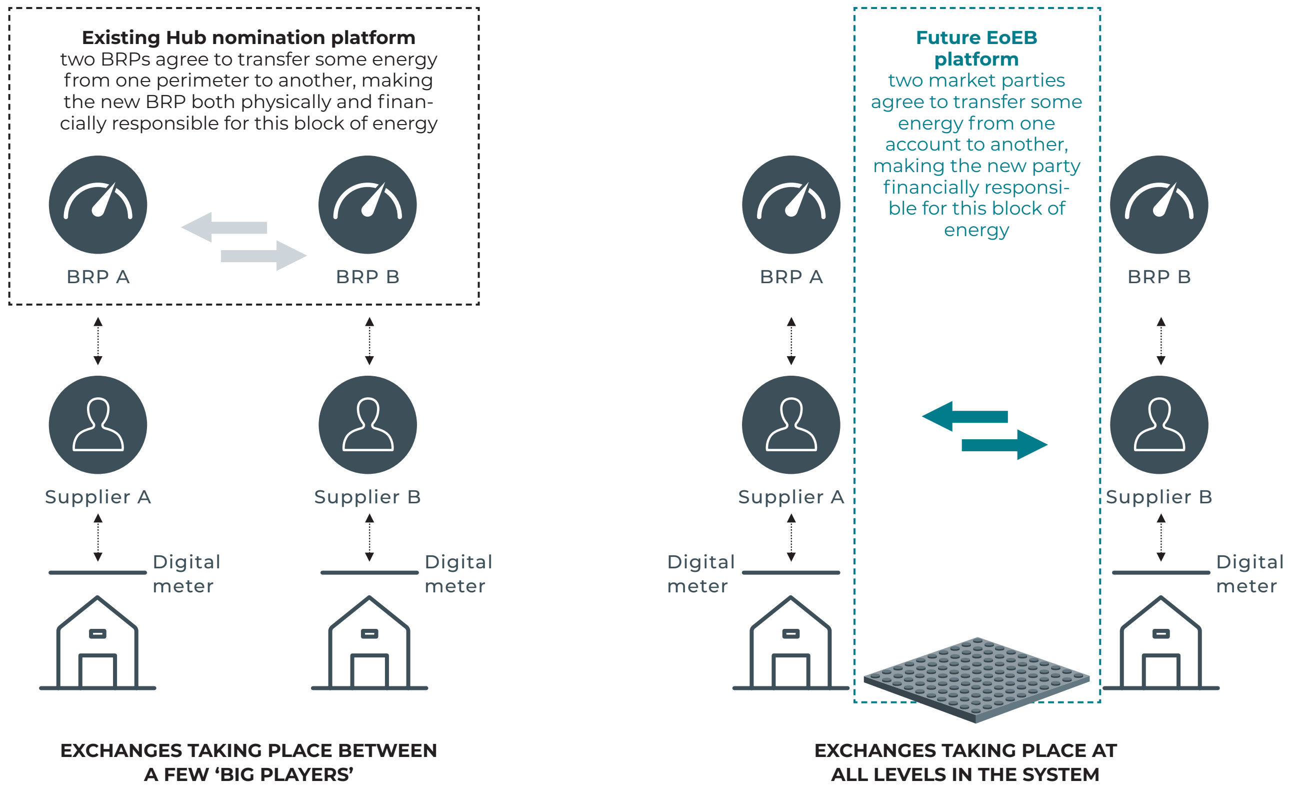
The EoEB hub as a natural extension of the BRP hub

Today's TSOs foresee a hub where BRPs can exchange positions in the market.[9] An exchange carried out through this hub would simply be a mutual agreement between two BRPs to exchange the real-time pricing exposure of a certain volume of energy for a predefined set of 15-minute intervals. It should be noted that bilateral transactions and exchanges could become active on this hub.

No metering would be needed to facilitate these transactions. Mutual matching would be validated by a neutral third party and would be covered in the settlement.

As highlighted earlier, the proposed EoEB hub could be considered as an extension of the current BRP hub. The centralised BRP hub allows the exchange of energy between licenced players, registering the position of their portfolios before and after the transaction. This hub simply needs to be made accessible to all parties willing to trade energy with one another, as shown in Figure 21 below.

FIGURE 21: EoEB HUB IS AN EXTENSION OF THE CURRENT BRP HUB



9 According to the Commission Regulation (EU) 2017/2195 of 23 November 2017 establishing a guideline on electricity balancing (EBGL), Article 2 – Definitions: "(16) *'position' means the declared energy volume of a balance responsible party used for the calculation of its imbalance*"

A price signal reflecting system conditions in real time

The concept

The principal goal of a real-time price reference is to reveal to end consumers the true value of flexibility and hedging products offered by commercial parties. Conversely, third parties have no financial or legal responsibilities, unless contracted as a service by the household.

The CCMD market model offers the possibility of exposing consumption to a real-time price reference. Consumers opting for this will receive the right signals and financial incentives to contribute to balancing the system.

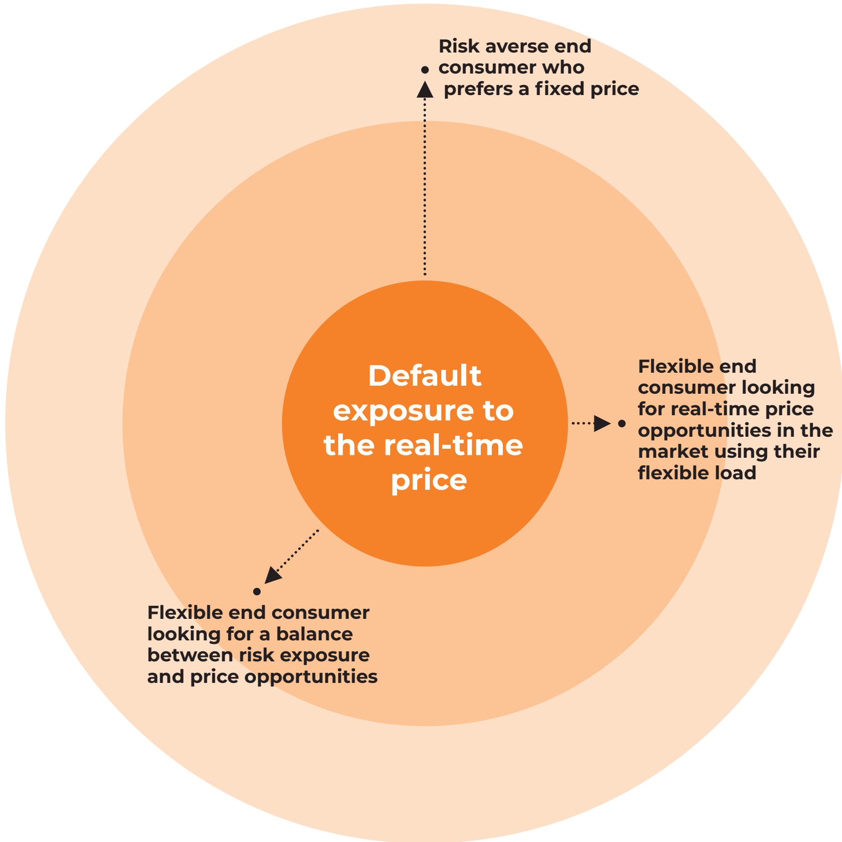
Consumers will, however – just like today – still be able to opt for a fixed-price contract with third parties if they do not want to be directly exposed to real-time pricing, as illustrated in Figure 22. We expect most end consumers to adopt different hedging strategies, such as traditional fixed-price or peak/off-peak contracts offered by their supplier, fixed-price services, participating in an energy community with shared generation or storage asset ownership, and so on.

Consumers who deliberately choose real-time pricing should be protected from excessive energy bills, for instance with insurance. Moreover, a clear and transparent communication around the risks involved when entering into certain contracts will be necessary.

As system balancing will largely rely on decentralised reactions to the real-time price, it is key that this price signal will reflect the system conditions in real time: it should at least reflect the marginal value of real-time energy for the system, and potentially account for other objectives in the form of possible price adders.

The price will need to give appropriate incentives to stabilise the system at any time and in all market situations. Past experience shows that it is particularly difficult to predict the interaction of price signals and market reactions when market rules are changing. Therefore, relaxing the physical balancing obligation can only be implemented in a settled balancing system, which has reached a target state and proven reliable.

FIGURE 22: CONSUMERS WILL BE ABLE TO OPT FOR DIFFERENT CONTRACTS BASED ON THEIR PERSONAL PREFERENCES



Depending on their aversion to risk and individual flexibility capacity, consumers will choose different settlement mechanisms for different shares of their offtakes. We expect very few consumers to choose to settle the entirety of their consumption as a RT price

What this will enable

In line with the evolving context, it is becoming increasingly clear that incentives need to be adapted to make sure that balancing responsibilities are allocated efficiently. The starting point of the proposed market model is that balancing responsibility needs to be enlarged and broadened to all market participants, given that individual customers will have the tools to efficiently manage their individual balance. This will be possible through the real-time price reference, which will be accessible to all market participants. It will allow consumers to define their desired individual approach towards demand management and hedging, thereby unleashing further demand flexibility which will enhance the power system's efficiency and reduce costs for the benefit of all consumers.

However, this will affect the exposure, roles and responsibilities of the BRPs and suppliers in the market. Obviously, BRPs cannot by default assume balancing responsibility for clients with unpredictable and uncontrollable behaviour (which is expected to be the case even without the CCMD). It therefore seems that the physical balancing obligation constraint, which is currently applied to BRPs for all connection points, will need to be relaxed. This constraint is not compatible with consumer freedom, and is redundant in relation to decentralised financial responsibility in the real-time market.

FIGURE 23: A REAL-TIME PRICE REFERENCE REVEALING THE TRUE VALUE OF FLEXIBILITY TO CONSUMERS

“I share Elia Group's vision that facilitating access to the market for a more diversified set of participants and increasing the range of services on the basis of reliable price signals will bring more value to end consumers. I hope that Elia Group's vision will be adopted in many countries in order to ensure scale for the development of innovative solutions, in the interest of end consumer”.

RALPH DANIELSKI, CEO, EPEX SPOT

The role of the main supplier will adapt to end user's risk profile

Given the freedom that end consumers can engage with multiple energy and flexibility services via the EoEB hub, it is clear that the role of the main supplier will change. Given the freedom that end consumers will have to engage with multiple service providers, it is possible to believe that the access point's main supplier might be exposed to increased sourcing risks. This will not be necessarily true, as the risk taken to hedge all or part of the end user's energy consumption against the real-time price will vary significantly from one user to another. The main supplier will adapt their services and fees to the profiles of consumers within its portfolio.

To illustrate this, let us consider four users who have decided to sign contracts with a supplier for their residual physically metered consumption.

Consumer A has entrusted their main supplier with their entire household's consumption. This user does not engage in any P2P exchange and has a single service provider, which is also their main supplier. This reflects today's situation.	**Consumer A** has not changed their consumption pattern: the risk level is the same. Their supplier still prices the service equally, and all things being equal, the user's bill is the same as their current bill.
Consumer B has entrusted their main supplier with covering their entire consumption, except the consumption of their electric vehicle. The latter is paid for by a mobility-as-a-service contract with the EV manufacturer.	**Consumer B** signed a contract with a dedicated service provider who covers the EV's offtake at all times. As a result, the residual household's flows become more predictable for the main supplier. Therefore, the main supplier is able to reduce its risk premium for this user.
Consumer C has entrusted their main supplier with supplying all of the residual consumption, but from time to time this consumer participates in trades (with other peers, service providers) while keeping the main supplier informed.	**Consumer C** shares with their main supplier ex ante information on the transactions they perform with third parties so their load remains predictable. The main supplier could charge a small risk premium but does not necessarily need to do this.
Consumer D has entrusted their main supplier with supplying all of the residual consumption metered at their access point, and they simultaneously participate in numerous trades with a range of different third parties (peers, service providers, suppliers).	**Consumer D** has signed contracts with several third parties which significantly decreases the predictability of their residual load. Hence, the main supplier applies a higher risk premium to the end consumer. However, as the end consumer their flexibility is monetised, this premium is expected to be offset by savings on other elements of their energy bill.

ACER in the smartEn report

“The 2019 Energy Retail and Consumer Protection volume of the ACER Market monitoring report recognises the importance of the active energy consumer, relying on near real-time information. Such information can lead to increased switching rates, which drives increased competition between suppliers, and thus places downward pressure on the price that the energy consumer ultimately pays.

This downward pressure will be important as electricity consumption patterns change: the penetration of electric cars is proliferating, there is an increased focus on renewable heating and cooling, and so forth. [...]

This warrants a closer look at price dynamics and whether market frameworks remain fit for purpose, in addition of course to how network tariffs will further evolve.”

Practical implementation

The real-time price will be an extension of the existing imbalance pricing based on the system marginal price (SMP). In countries where the imbalance price is based on the SMP, the current imbalance scheme could be used as a sound basis for the real-time price calculation. Some changes would be needed in countries where imbalance pricing is not yet fully aligned with those principles (for example those relying on average pricing). Besides, the real-time price will be compatible with any adder that may be used to keep the system imbalance signal in check and to reflect local system conditions and/or policy objectives (such as the alpha component in Belgium,[10] the German scarcity component[11] and so on.)[12]

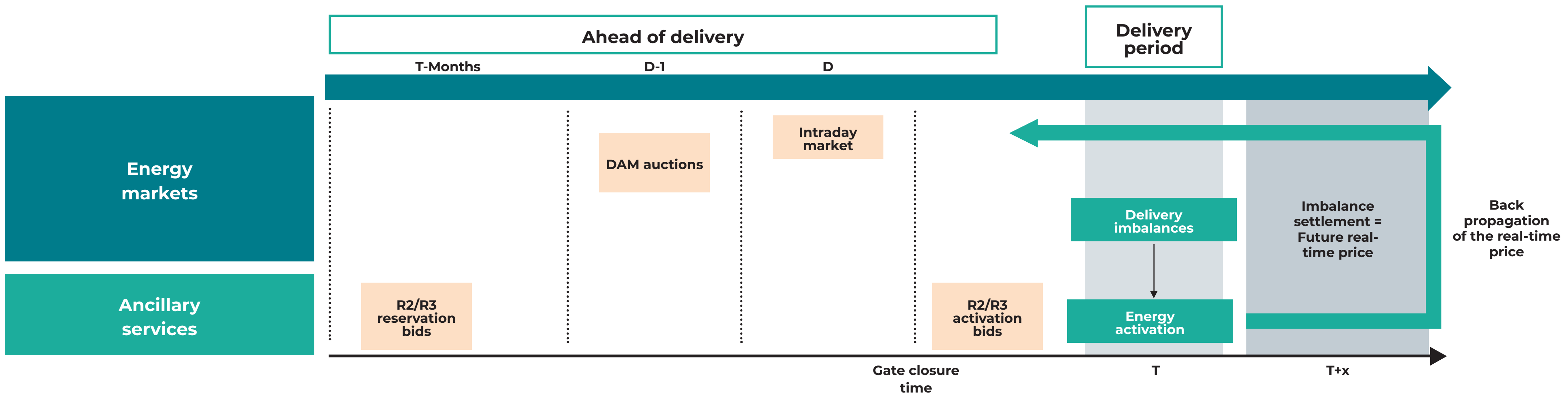
The real-time price will back propagate to earlier time frames. The real-time price will not fundamentally change the way market parties hedge: today, market parties are subject to a legal balancing obligation, but they can hedge on the intraday, day-ahead and forward markets to avoid being exposed to the volatile imbalance price. Back propagation of the real-time price will work in the same way as today (see Figure 24 below), but it should improve thanks to the increased liquidity of the real-time market.

The way the wholesale markets are organised will remain unchanged. The real-time market will indeed be largely built on the existing suite of forward, spot, and balancing markets developed over the last 20 years. A gradual shift in trading and liquidity closer to real time is expected, with service providers using current markets to offer hedges for end consumers against real-time price risks.

The rationale behind the real-time price as an extension of existing imbalance pricing

The starting point for the real-time price will simply be the current imbalance price, which would need to gradually account for implicit market reaction, as soon as the share of the implicit reaction becomes significant.
Under the CCMD, not all consumers are expected to provide their price sensitivities via explicit bids and offers, as they remain free to offtake or inject without specific constraints or risks (other than being settled at real-time prices). Hence a model fully based on explicit bids and offers might not be optimal.
Therefore, it might be necessary to estimate the demand and price sensitivity of consumers. In case only the consumers' uncovered demand and price sensitivity are predicted and while the other grid users (including service providers' controlled assets) are still expected to submit bids and offers, the real-time price calculation will simply be an extension of the current imbalance scheme.

FIGURE 24: BACK PROPAGATION OF REAL-TIME PRICE TO SPOT PRICES



From the price of energy used in real time to balance the power system by the TSO, to the forward price of energy years before delivery, arbitrages between timeframes will allow sending the right economic signals to players in all markets.

Illustration of the intertemporal arbitrage concept:

If a wind farm operator anticipates a high price difference between the real-time market (€70/MWh) and the spot market (€40/MWh), they will decide to not sell energy in the spot market, but do so in the real-time market instead. This choice will increase the prices in the spot market (since there is less supply), while the real-time prices will decrease (since there are fewer balancing activations). If market participants are able to perfectly anticipate price resilience, they will practice arbitrage until spot and real-time prices equalise (in our example, the arbitrage of 200 MW will equalise the prices at €50/MWh). The market actors therefore assume a large level of transparency in the market, so that the prices and resilience can be forecasted efficiently.

10 In Belgium the alpha component aims at implementing an adder on top of the real-time price above certain system imbalance thresholds to ensure swift reaction from the market to bring the system back to balance. Doing so increases overall balance quality which in turn keeps reserve needs under control (and hence lowers system costs).
11 The German scarcity component is applied in quarter-hours, when the average system imbalance accounts for at least 80% of the allocated positive or negative balancing reserve. It settles a minimum imbalance price when the system is short and a maximum imbalance price when the system is long. Its absolute value increases with higher system imbalances.
12 See Decision No 18/2020 of the European Union Agency for the Cooperation of Energy Regulators THE EUROPEAN UNION AGENCY FOR THE COOPERATION OF ENERGY REGULATORS of 15 July 2020 on the harmonisation of the main features of imbalance settlement

Delivering gains for all stakeholders

By opening up the market behind the meter and unlocking new applications, the proposed CCMD creates opportunities for all stakeholders: service providers, suppliers, distribution and transmission system operators, small and large consumers, policymakers, and regulators. These gains are summarised in the table below.

FIGURE 25: HOW THE CCMD COULD BENEFIT DIFFERENT STAKEHOLDERS

Stakeholder	
Independent service providers/ aggregators	• Proposed model could become a generic EU solution for independent flexibility BSPs and service providers, in particular new entrants from other sectors (the heating, technology, telecommunications, retail and other sectors, for example) • Alternative solution to split supply • Lower entry barriers and innovation made easier • Creates a new market behind the meter, which is accessible to third parties
DSO	• The proposed model is compatible with local redispatch managed by the DSO, or local flexibility platforms, allowing for efficient local congestion management • Data visibility with regard to what is happening • Agile model which can be delivered fast
TSO	• Proposed model will facilitate demand side response (DSR), increase flexibility and improve system operation in general • Easier integration of renewable energy sources, more visibility on grid • Compatible with any congestion management model
Suppliers	• Opportunity for end consumers to engage in new services with other suppliers, opening up new markets behind the meter
Small consumers	• Very easy to engage in innovative services (energy-as-a-service, mobility-as-a-service, heat/comfort as a service) with multiple third parties, with low entry barriers, freedom of choice • Opportunity to directly exchange energy with other consumers or renewable energy producers, and to engage in energy communities • Consumers are still offered alternative contracts (e.g. fixed-prices contracts) so that they are not directly exposed to the real-time price • System optimisation will contain wholesale prices
Large / industrial consumers	• Proposed model will facilitate DSR, increase revenues from flexible demand • System optimisation will contain wholesale prices • Green power sourcing made easier, especially at small scale
Policymakers/ governments	• Proposed model will facilitate DSR, alleviate system tension and contain price • It will be easier to reach energy and climate targets • Consumers are still offered fixed-price contracts • Compatible with public service obligations and tax measures with track and trace made easier • Proposed model is an evolution (not a revolution): it can be easily built based on existing market arrangements
Regulators	• Increased competition on the wholesale market (every individual becomes a market participant) and the retail market (avoids supplier lock-in with competition for services behind the meter) • Increased transparency • Proposed model is an evolution (not a revolution): it can be easily built based on existing market arrangements

This list of stakeholders, opportunities and benefits is far from exhaustive, as all the possibilities and advantages offered by the proposed model have yet to be revealed and exploited.

Conclusion

The proposed paradigm shift towards a market where consumption follows generation is neither an organisational nor a technical revolution. We believe this consumer-centric market model can largely be built based on the existing market's organisation. In order to implement it, a few barriers will have to be removed and some of the constraints designed under a different context will need to be relaxed; these should be replaced with economic signals that will ensure a more efficient market and system operation, fit for meeting the challenge of decarbonisation head-on.

3. Compatibility and integration

with current European market features

Introduction

This section explores the CCMD's compatibility with current European market features and challenges. The list and the assessments do not aim to be exhaustive. Further additional aspects[13] will be explored at a later stage.

The topics explored in this section cover:

a. Compatibility of the CCMD with the Electricity Balancing Guideline and the Clean Energy Package

b. Compatibility with local congestion management schemes

c. Compatibility with cross-border trading

d. High-level assessment of other aspects

The compatibility of the CCMD with the Electricity Balancing Guideline and the Clean Energy Package

An assessment of the Electricity Balancing Guideline reveals that the CCMD is aligned with its main principles and spirit, as stated in Article 3 of the Guideline:

i. facilitating the participation of demand response including aggregation facilities and energy storage while ensuring they compete with other balancing services at a level playing field and, where necessary, act independently when serving a single demand facility;

ii. facilitating the participation of renewable energy sources and support the achievement of the European Union target for the penetration of renewable generation.

However, specific stipulations in the Guideline might require a flexible interpretation, in particular with regard to Art.17§1[14]. Further discussions with regulators are required in order to determine whether a modification of the Guideline is required in order to enable the implementation of the CCMD.

The proposed design is also in line with the guiding principles of the Clean Energy Package, in particular regarding consumer empowerment and the promotion of the use of RES as a method for paving the way for renewable energy communities. The directive on common rules for the internal market for electricity[15] states that "*Member states shall ensure that, where a final customer wishes to conclude an aggregation contract, the final customer is entitled to do so without the consent of the final customer's electricity undertakings*". Where aggregation means "*a function performed by a natural or legal person who combines multiple customer loads or generated electricity for sale, purchase or auction in any electricity market*". All service providers who will use the EoEB hub will, in fact, be offering aggregation services.

Article 15 of the same directive also foresees a framework for active consumers. Those consumers are entitled to operate directly or through aggregation. The same article also outlines that active consumers shall be "*financially responsible for the imbalances they cause in the electricity system; to that extent they shall be balance responsible parties or shall delegate their balancing responsibility in accordance with Article 5 of Regulation (EU) 2019/943.*" This is clearly in line with the CCMD, under which consumers could be exposed to the real-time price and could delegate this real-time pricing risk to third parties. Notwithstanding the above assessment, it is important to consider that the directive needs to be incorporated into national laws. A further assessment is needed for each Member State.

13 For example the national legislation with respect to metering requirements requires further exploration

14 Art 17. §1 "In real time, each balance responsible party shall strive to be balanced or help the power system to be balanced. The detailed requirements concerning this obligation shall be defined in the proposal for terms and conditions related to balancing set up pursuant to Article 18."

15 Directive (EU) 2019/944 of the European Parliament and of the council of 5 June 2019, Article 13

The compatibility of the CCMD with local congestion management schemes

The issue

Local congestion management is used here to refer to congestion which is internal to a price zone, as opposed to cross-zonal issues which are addressed in the following subsection.

Local congestion management is a central issue, especially in power markets dominated by intermittent RES generation (e.g. across Germany's transmission network today). Hence, it is key that the proposed CCMD is compatible with proposed congestion management schemes at the transmission and distribution levels. The same requirement also applies for management of reactive power and voltage stability which are also local issues. For the sake of simplicity only local congestion management is illustrated in this section but most of the principles described here bellow are also valid for the management of reactive power.

Procuring flexibility to solve local congestion is a complex topic which stakeholders (including TSOs and DSOs) discuss intensively. No one-size-fits-all solution has yet been defined or agreed upon. Several solutions may be used to manage congestion:

a. **price signals** developed by consumers and triggering implicit market reactions (reviewed price zones, local price incentives such as penalties and adders, network tariffs differentiation, etc.);

b. **other mechanisms based on explicit activation** (redispatch, either cost-based or market-based) with intervention by the TSO or DSO.

These carry advantages and drawbacks in terms of cost, short-term and long-term efficiency, market power and so on.

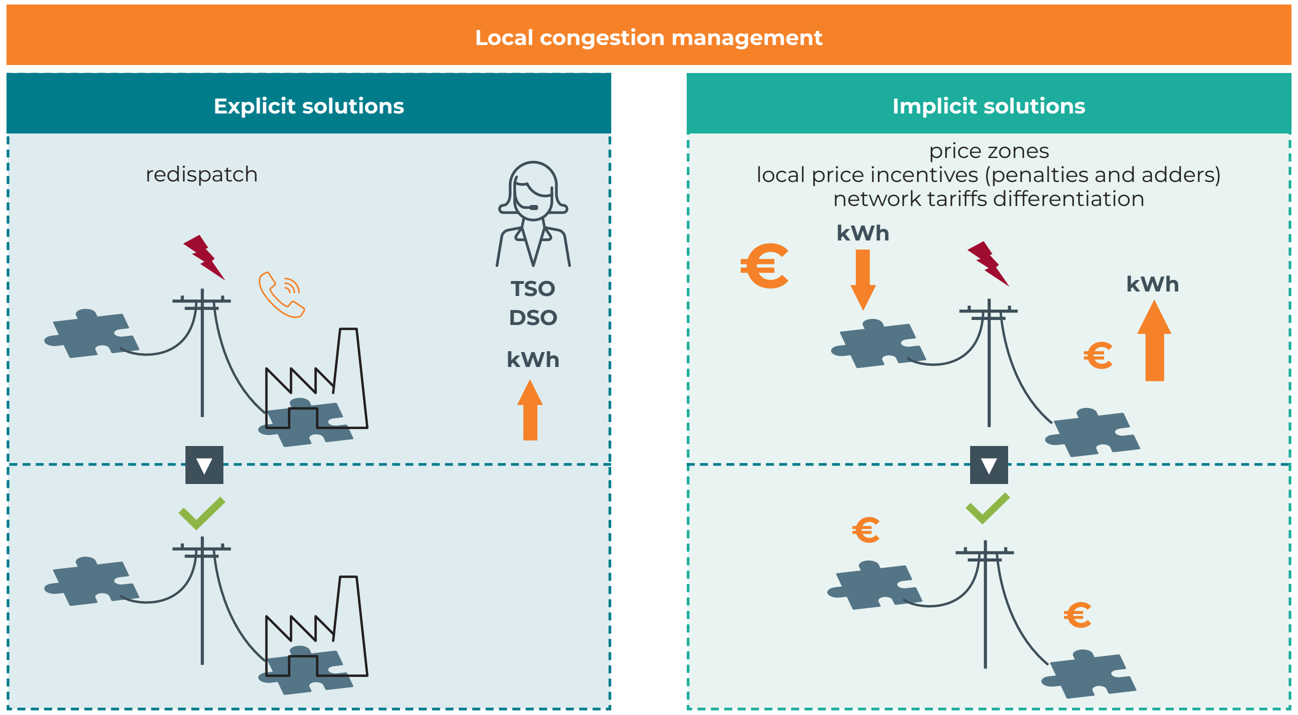
The table below outlines the fundamental differences that the CCMD triggers when compared with the status quo. Note that not all of the issues implied by such schemes are addressed below; further investigation is required.

Compatibility

The key principle is that the CCMD focuses only on the settlement of the electricity as a commodity. This implies that any congestion management scheme that does not affect the commodity price (which is the case for the vast majority of schemes currently being implemented across Europe) is by construction compatible with the CCMD.

The operation of the CCMD and its compatibility with different mechanisms is outlined below.

FIGURE 26: SOLUTIONS TO LOCAL CONGESTION ARE EITHER IMPLICIT OR EXPLICIT



Network tariffs

One possible method is to act on the distribution grid tariffs. This solution includes many different possibilities, such as dynamically setting the tariffs according to whether consumption or injection alleviates or aggravates congestion at a given moment.

As the CCMD solely focuses on the settlement of the electricity as a commodity (and not on tariff-related aspects), any tariff-based incentive scheme is by construction fully compatible with the CCMD.

Capacity-based procurement

Another possible method for flexibility procurement is to rely on "capacity-based mechanisms", where flexibility is procured ex ante by the system operator to ensure that the needed flexibility can be activated when required.

Such procurement mechanisms imply that the reserved capacity (the commitment coming from the flexible asset at the right location to be available at the right moment) is remunerated, but does not directly impact the commodity value: it is a payment for the commitment, not for the actual delivery. However, the activation/delivery of procured flexibility may or may not attract further remuneration.

In the former case, reservation contracts that stipulate that there is no explicit remuneration for the energy in case of activation are by construction not directly impacted by the commodity value (even though the bidders may indirectly include any possible opportunity costs related to their commitments in their bid prices). The latter case (remuneration for activations) will be discussed in more detail below.

In conclusion, the procurement of flexible capacity ahead of delivery itself is fully compatible with CCMD.

Remunerated explicit activations

When local congestions are managed via activations of local flexibility which are explicitly triggered by system operators (whether such a flexibility has been reserved ahead of delivery or not), the high-level principle is that some selected assets are instructed to modify their consumption or production patterns to resolve local congestion.

Such activations are remunerated and, by definition, this needs to differ from the remuneration otherwise obtained on the wholesale market. As the objective is to modify the consumption or production pattern that the asset would have followed, the wholesale price incentive can no longer remain the driver. The same applies under the CCMD, where flexibility explicitly activated for congestion management is not to be remunerated with the real-time price.

Setting the remuneration scheme for local congestion management is a complex topic, but – since a specific remuneration needs to be applied in any case – it remains fully independent from the aspects addressed in this paper. This is why the CCMD is not prescriptive about the way local congestion management is tackled. However, it should be noted that one of the key advantages of the CCMD approach - namely, the ease with which blocks of energy can be exchanged - can be fully exploited in order to provide flexibility services on a larger scale to help manage congestion.

Local price incentives, penalties and 'adders'

A further possible mechanism for operating local congestion management is to directly act on the commodity price itself, by adapting the settlement prices of certain assets based on the locational commodity value. This can take various forms, such as defining a dedicated local price, or complementing the zonal price with "adders" or "penalties".

In effect, such approaches boil down to defining new price zones, and can therefore be addressed in the same manner as cross-zonal trading (see below).

Connection agreement and rule-based approach

Flexibility can also be improved through connection agreements or other rule-based approaches. As a principle, imposing technical requirements (e.g. last measure solutions, non-firm connections, etc...) on new participants is independent of other incentive-based approaches, and therefore not impacted by market design variations.

Conclusion

The CCMD was not specifically designed as a tool to solve local congestion issues. However, the CCMD is at worst neutral in this respect (because flexibility is procured in ways that do not affect the commodity itself) and also has potential to help out.

Indeed, because the EoEB hub facilitates the way the stakeholders involved in a local transaction settle their financial and physical positions, it can also create interesting opportunities for developing more efficient mechanisms to manage congestion.

Given that it is compatible with any congestion management scheme, the CCMD provides the required flexibility to adapt to each national situation.

The compatibility of the CCMD with cross-border trading

The issue

Efficient cross-border trading is a cornerstone of the European internal electricity market, as it fosters the integration of electricity wholesale markets, competition, and efficiency gains to the benefit of European consumers and industries. It is key that the proposed CCMD is compatible with cross-border trading, accounting for physical limitations in cross-border capacity.

The rationale for the EoEB hub is that any transaction offsets a positive and a negative settlement of a given volume at the real-time price, and is thus neutral in financial terms for the system. It therefore implies a single real-time price – the grid users of the transaction are in the same price area. The possibility of using the EoEB functionality across different price zones is discussed below .

Roaming services

As the EoEB hub will be an extension of the BRP hub, the working assumption is that there is one single EoEB hub per price zone which enables the exchange of energy among all grid users within the zone. Each price zone has a distinct EoEB hub.

The consequence is that it is not possible to directly exchange blocks of energy between grid users across price zones, because they are using different EoEB hubs.

However, there is a straightforward way to indirectly achieve the same result, by introducing the notion of “electricity roaming services”. Such a roaming service would consist of a “shipping service” across the different price zones (between grid users attached to different EoEB hubs), and could in principle be offered by any market party which has an account on several EoEB hubs. See examples below.

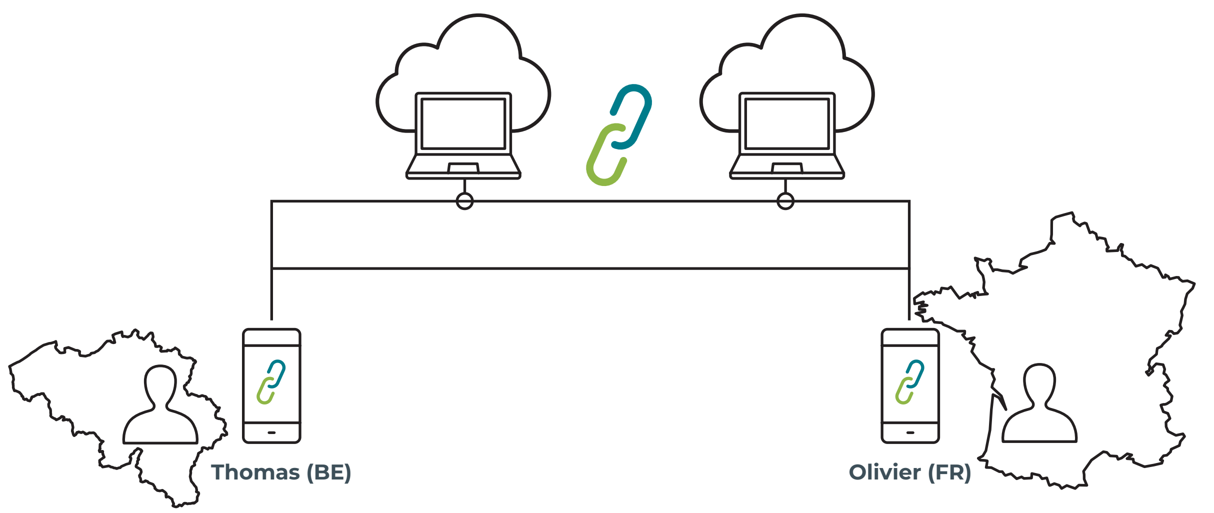
Example 1:

Thomas, based in Belgium, can now sell energy to Olivier, who is based in France, using the same smartphone app. Both Thomas and Olivier have given the app access to their EoEB hub and bank accounts (the app operates in both countries). Because they do not reside in the same price zone, the value of the energy sold by Thomas can no longer be valued at the same price by Olivier. The energy exchange no longer simply offsets their settlement at the same real-time price. However, the price difference can be fully captured by the app during the financial settlement, by charging (positive or negative) roaming fees for such cross-zonal transactions (see Figure 27).

Example 2:

Similarly, Yves in Belgium can now use his E-mobility app to charge his electric vehicle when he is travelling abroad, as long as the app is available in the countries where he will charge it. The settlement mechanism of the charging points remains exactly the same (the consumed energy is deducted from their electricity bills). To get access to this service, Yves acquires a “25kW EU-wide roaming scratch card” which compensates for the price differential, following the pricing policy that the E-mobility company has developed.

FIGURE 27: CROSS-BORDER EoEB TRANSACTION



A commercial app which has access to the EoEB hubs and bank accounts of both Thomas and Olivier offers a roaming service across Belgium and France.

Price differential risks

By definition, cross-zonal energy transactions imply a risk related to the price differential. Such a risk can be managed in multiple ways.

In its simplest form, the risk is simply borne by the end user. This means that the cross-zonal (positive or negative) price differential is simply retroceded to the end users as a pass-through. In the first example on the previous page, when Thomas sells energy to Olivier, the app operator can retain the difference between the Belgian and French real-time prices. In this case, the price differential risk is fully borne by the end users (Thomas and Olivier).

Alternatively, financial hedging is conceptually easy to develop: a service provider may include in its offers a premium to cover roaming charges – such a premium being calculated based on historical patterns and expected volatility. In the second example on the previous page, when Yves purchases the “25kW EU-wide roaming scratch card”, the price of the card has been computed such that it provides the E-mobility supplier with decent price-differential risk coverage.

Most importantly, hedging cross-zonal prices is also possible via the currently existing transmission capacity allocation mechanisms. Depending on the hedging horizon, acquiring financial or physical transmission rights (FTRs and PTRs) or taking day-ahead/intraday positions in the relevant markets enables a physical position of the EoEB hub accounts to be secured.

For example, a roaming service provider can buy in one market and sell in another at the day-ahead or intraday stage, which creates an open physical position against the power exchange. This position can then be closed via EoEB transactions. As a result, the day-ahead/intraday price differential is secured and will not be influenced by further real-time price variations.

Conclusion

The implication of the above is that the existing transmission capacity allocation mechanisms do not need to be adapted to enable EoEB transactions across price zones. This is essential, because implementing changes to the current schemes (which work well) would likely take a significant amount of time, but reap little benefit.

It may, however, be that for some reason the available mechanisms and products don’t cover all the hedging needs. In this case, newly developed financial products may easily emerge. For example, “contracts for difference” (swaps to cover a given price differential) may be offered for trading by commercial entities (typically power exchanges) in case market need arises.

Importantly, the risks underlying such new hedging products could often be (either partially or fully) covered by existing tools. For example, creating a “synthetic BE->GE contract for difference” would be straightforward: a long position in FTRs could be taken in one direction, whilst a short position would be taken in the other. This supposes that some companies, such as financial players and utilities, could facilitate transactions and play a market maker role in case supply and demand for such products are asymmetrical.

Note that the exchange of energy blocks implies a physical delivery. Cross-border exchange of energy needs to account for physical transmission capacity constraints.

High-level assessment of other aspects

CCMD compatibility with capacity remuneration mechanisms

Many European countries currently face – or expect to face – adequacy issues in the short- to medium-term. System adequacy measures the ability of a power system to cope with its load in all the steady states it may operate under standard conditions. Adequacy relies on the ability of the generation assets to cover the peak load, taking into account uncertainties in the generation availability and load level.

In order to trigger investment in capacity and deal with such adequacy issues, several Member States have already implemented capacity remuneration mechanisms (CRMs) such as capacity markets or strategic reserves. CRMs are support schemes that remunerate available capacity during periods of system tension.

The CCMD proposed in this paper is about unlocking flexibility for system operational purposes and is not about dealing with adequacy issues.

As CCMD solely focuses on the settlement of the electricity as a commodity (and not on tariff-related aspects), any scheme that remunerates available capacity is by construction fully compatible with the CCMD. Moreover, the CCMD is complementary with CRMs, as both tackle different issues. In other words, the proposed CCMD is not a substitute for CRMs and should not be considered as such.

Licencing and credit risk management

The issue

A key advantage of the new model is that becoming a real-time market player is fundamentally easier than becoming a BRP, and any party willing to take an active role in the power market will be entitled to do so. This includes any residential grid user willing to diversify its sourcing or services.

Even though everyone will be able to actively engage in the market and trade energy, different situations need to be taken into account to make sure the market runs efficiently and safely, without imposing excessive barriers and creating excessive financial risks.

It is therefore important to clarify the roles and responsibilities of the different participants in the model, by distinguishing those – such as households or small professionals – performing only small-scale physical trades (from access point to access point), from those performing financial and trading activities.

Different licences and market access contracts need to be designed for each situation. They should be tailored to strike the right balance between (i) the need to manage credit/counterparty risks and (ii) the need for agile solutions, making small consumer participation easy, and innovative business models behind the meter profitable. Requesting excessive collateral or imposing undue limitations on end consumers will be an obstacle to their participation. The management of credit risks might thus have to be adapted accordingly.

Credit risk management

For practical reasons related to credit and operational risks, some strict limitations are likely to be needed, especially for transactions related to residential grid users. The rationale for such boundaries would be to limit the total transacted volumes to what relates to "sourcing needs", and thereby for example avoid large-sized speculative transactions as well as operational errors or abuses. Such restrictions might relate to the connection size, the maximum consumption of devices or to any other physical reality of the user.

When consumers access the real-time market via third parties (which is expected in most cases), it is suppliers – together with other service providers – who bear the credit risk of end prosumers. As discussed above, the lack of predictability related to the behaviour of certain clients may increase the credit risk exposure of suppliers. Hence, they may be subject to more advanced credit management schemes (such as bank guarantees).

In contrast with the current design, under our proposed model, larger volumes may be "cleared" through the real-time market. Under the current design, only deviations against a balanced portfolio are sourced on the real-time market. This implies that the entity in charge of settlement (e.g. the TSO) potentially becomes exposed to larger credit risks (in total larger volumes are cleared, and spread over more counterparties). The management of such risks might thus have to be adapted accordingly. These higher risks can be mitigated by a shorter invoicing cycle and a modification of required financial guarantees.

Tax framework

The emergence of prosumers, decentralised energy exchanges and energy communities may pose tax and wealth redistribution issues between different categories of consumers. Even though this is not specific to the proposed CCMD, impacts should be carefully considered by policy makers.

Clarifying redistribution principles and taxation rules is key to reinforcing the confidence of consumers engaging in new energy consumption and exchange models, and enhancing the predictability of the service providers' business models.

For instance, just as today's consumers selling or buying second-hand devices are exempt from tax, it should also be made clear whether the same principle applies for prosumers selling self-generated excess energy to other consumers.

At the same time, misuses should be avoided, as it could erode the tax base and pose budget issues for states. To this end, rules and boundaries can be implemented in order to limit the total exempted volume in terms of what relates to acceptable excess residential generation under a certain threshold, and thereby for example avoid excessive misuse by commercial entities.

CCMD compatibility with public service obligations

Today's public service obligations and schemes (for example related to energy poverty, such as social tariffs, or renewable energy support such as offering feed-in-tariffs (FiT)), are essential for ensuring that power market functioning is aligned with (social) energy policy objectives.

As the CCMD solely focuses on the settlement of electricity as a commodity, public service obligations and schemes are by design compatible with the CCMD. For instance, under the CCMD, suppliers offering social tariffs or FiT can still be compensated for any related cost.

Besides, the CCMD and innovative energy services may help develop new forms of public services and solidarity. For instance, instead of benefitting from a social tariff (in €/kWh) that still exposes households to significant climate and performance risk, vulnerable households could benefit from heat-as-a-service at a special fixed yearly fee, ensuring a minimum level of comfort regardless of the weather.

4. Conclusion

CCMD implementation is within our reach

Considering its compatibility with European legislation, the very positive feedback received in relation to both completed and ongoing use cases, and the limited changes needed to be applied to the current market design, we believe CCMD implementation is within our reach. Indeed, it could be implemented as soon as 2023 or 2024, providing all stakeholders work hand in hand to make it happen.

With this goal in mind, Elia Group intends to consult and engage with all stakeholders in 2021, to develop a comprehensive view of the remaining questions and issues to address.

It is our goal for the CCMD to be used across Europe. Elia Group wants to partner with allies who are keen to make it a reality as soon as possible - whether they are based in Belgium and Germany, the countries we operate in, or any other European country.

5. Appendices

Appendix 1 - The EoEB as an alternative to transfer of energy

Today, third party flexibility provision requires the following:

1) certified submetering for the electric vehicle;

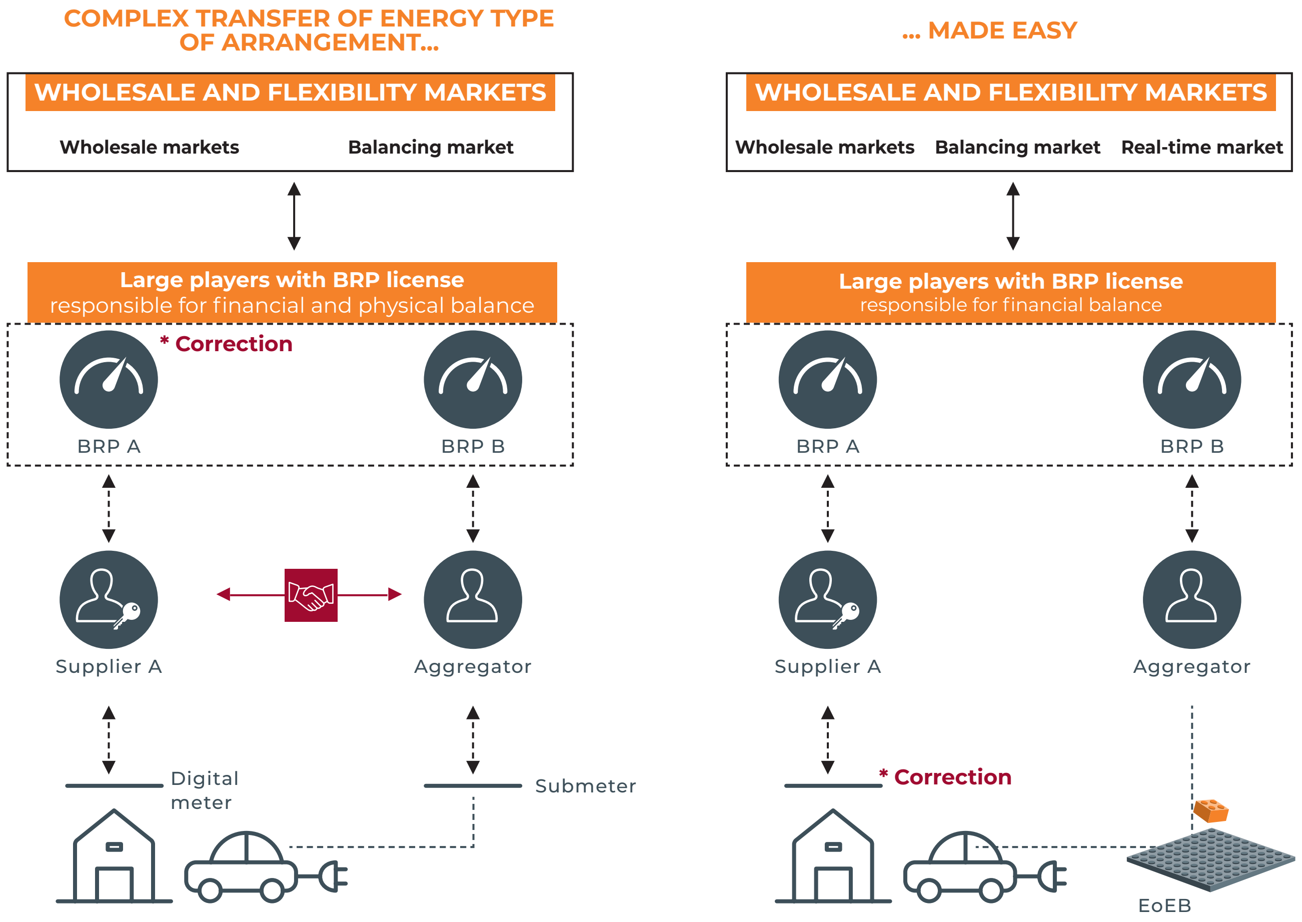
2) a transfer of energy agreement between Supplier A and the aggregator;

3) a financial compensation between the aggregator and the supplier for the sourced but not sold energy;

4) the correction of the perimeter of the BRP with the delivered volume of flexibility.

In the future, no agreement will be needed, as service providers will connect their information system to the EoEB hub. The EoEB will facilitate the local correction of the flexibility volume that was valorised in the balancing market or wholesale market by the third party aggregator.

FIGURE 28: EoEB HUB IS A SIMPLER ALTERNATIVE TO TRANSFER OF ENERGY



Appendix 2 - Making it possible to deliver true consumer-oriented services

Various use cases conducted by Elia Group with partners in Belgium and Germany demonstrate that the CCMD is not simply a theoretical exercise – it is within reach for practical application. The use cases outlined on these pages highlight the diversity of ongoing initiatives around the CCMD, gathering together various types of participants such as residential and industrial customers, energy communities, building owners, renewable energy developers and service providers.

These use cases show that consumer-centric solutions are ready to address the current challenges faced by consumers and market players, and thus create value for stakeholders and society.

An overview of each use case undertaken by Elia Group is provided below.

- E-mobility's need for portability and flexibility management was tested with KBC and ubitricity. The trial demonstrated that the EoEB hub allows the allocation of EV charging to suppliers other than the one attached to the charging pole (Figure 29).
- Green energy sourcing and active participation in energy communities were tested through COCITER's project. The trials showed that the EoEB hub allows the tracking, tracing and direct sourcing of energy from a variety of stakeholders and local green power producers (Figure 30).
- Smart building consumption optimisation and green sourcing were trialled through the Yuso/Smapee project (Figure 31).

FIGURE 29: SIMPLE PORTABILITY AND FLEXIBILITY MANAGEMENT SOLUTION FOR EV USERS

Set-up

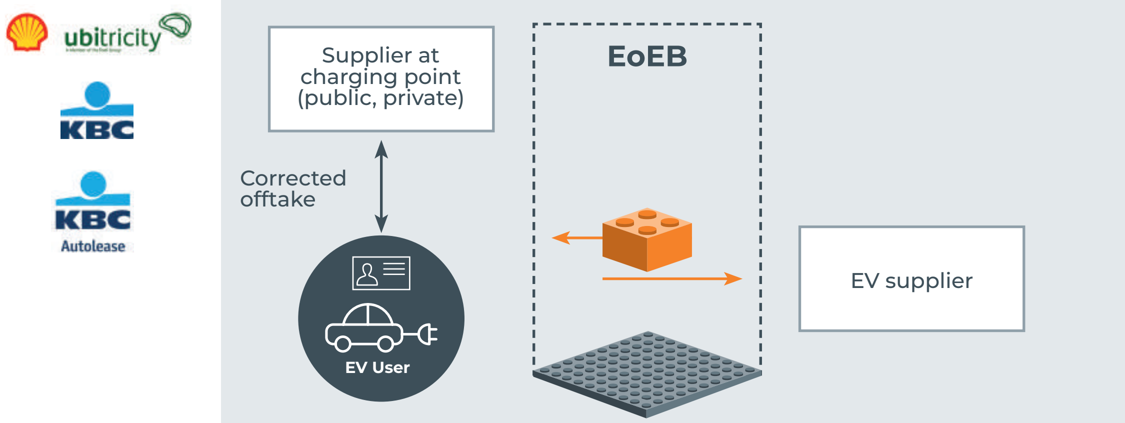
Use Cases:

1. **ubitricity use case:** this demonstrates how smart metering data can be used to easily shift charge events between suppliers with low operative effort
2. **KBC, KBC Autolease, Newmotion:** illustrates how the EoEB enables leasing companies to build an integrated value proposition (leasing contract including charging cost regardless of the location)
3. **DNB Brussels airport:** demonstrates how charging events carried out at public charging points are attributed to their own energy supply contracts

Functioning

1. **ubitricity use case:** Charging data is processed by the CPO and relayed to the energy market operator. This way, the load can effectively be split up between the different EV suppliers instead of it being entirely attributed to the charge point supplier
2. **KBC Autolease use case and DNB BA use case:** all charging sessions are reallocated via the EoEB to the correct EV supplier, so users can effortlessly charge anywhere

Note: additional financial flows from the EV supplier to the CPO are possible, to reimburse the latter for providing the infrastructure



Next steps

- ubitricity: Test the concept of TSO as operator of virtual balancing areas
- Continue working on enabling a free choice of EV energy supplier at any charging location, allowing consumers to optimise the charging behaviour of the EV

Project benefits

- EV supplier can manage the entire EV consumption over long periods of time, allowing the valorisation of flexibility and the provision of mobility needs
- No complicated post-processing for charging pole supplier, which bills corrected metered data to charging pole operator

FIGURE 30: ENABLING DIRECT ACCESS TO ENERGY COMMUNITY ASSETS AND GREEN SOURCING

Set-up

Who: Comptoir Citoyen des Energies (COCITER), CLEF, Courant d'air

Roles of each party:

- **COCITER:** energy provider which sources its energy from renewable energy communities (like Courant d'air and CLEF)
- **CLEF and Courant d'air:** cooperatives that develop green energy (wind, PV, hydro)
- **Citizens:** members of the public who buy shares in energy cooperatives that produce green energy

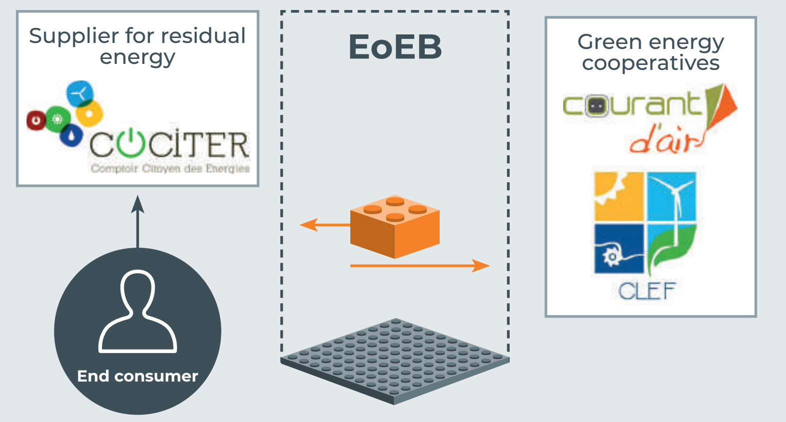
Functioning

Today (without the EoEB)

- End consumers receive dividends from these shares, but they can't directly buy the energy produced by the same community
- Communities sell their energy to COCITER (via a BRP) and Cociter sells it to end consumers

Tomorrow (with the EoEB)

- End consumers buy shares in a community (Courant d'Air, CLEF) that produces green energy and directly supplies the green electricity produced to its community members.
  - > The EoEB enables transactions to be carried out between energy cooperatives and end consumers



Next steps

- COCITER to investigate the possibility of it playing the role of aggregator in providing the EoEB service to communities
- Financial and administrative impact study to be carried out

Project benefits

- Citizens benefit directly from the green energy production means they have invested in (traceability)
- EoEB helps market players to build a more complete and attractive value proposition (including traceability of green energy), hence boosting the development of green energy

FIGURE 31: OPTIMISING SELF-CONSUMPTION AND LOCAL GREEN SOURCING MADE EASY

Set-up

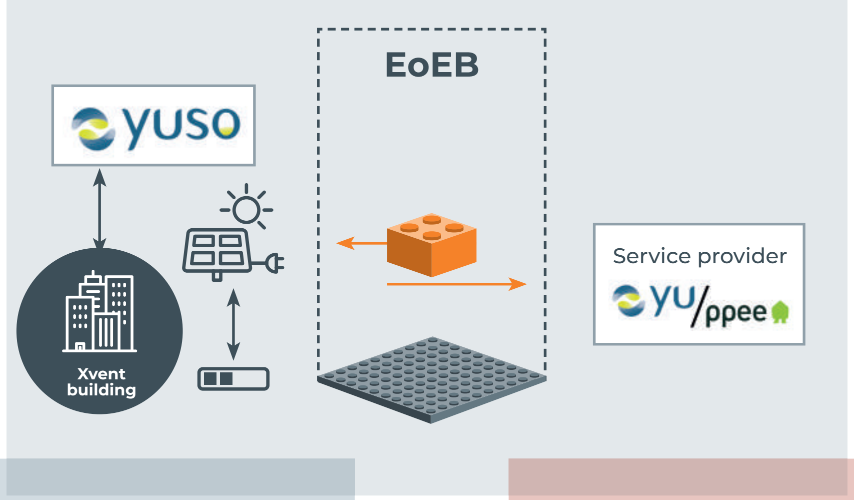
- **Who:** SMAPPEE, YUSO, X-vent

Roles of the Parties:

- YUSO is supplier/BRP of Xvent building
- Xvent building has dynamic price contract with YUSO (based on day-ahead prices)
- Yuppee is a third party service provider, responsible for the optimisation of the Xvent website

Functioning

- **Phase 1**
- Yuppee manages on-site self-consumption through PV & batteries and performs additional optimisation based on imbalance prices
- When imbalance prices are low, Yuppee charges the battery; when imbalance prices are high, stored energy from the battery is used for on-site consumption
- **Phase 2**
- Yuppee performs exchanges via the EoEB from one building with excess PV production to Xvent's battery



Next steps

- Part of IoE Energy Ecosystem 2.0 - ODYSSEE
- By connecting prosumers and consumers through P2P transactions, excess green generation is matched in real-time with local consuption. To achieve 100% real-time green consumption, the assets are steered to balance available green generation and consumption and are optimised in the market

Project benefits

- Optimisation due to the battery leads to substantial financial savings
- Enhanced traceability when overproduction of PV at one site is matched with increased consumption at the other
- System operators benefit from a local balance between supply and demand