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D2.5 A Cost-benefit Analysis of the Energy Management Service Provider's Roles

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Abstract for dissemination (PU)

In a broad sense, the costs and benefits of a certain measure can be assessed from both economic and legal perspectives. Economic and legal cost-benefit analyses differ fundamentally in purpose, methodology, and normative orientation. They both are relevant to a cost-benefit analysis of the role of an energy management service provider (EMSP). This deliverable first clarifies the various contexts and approaches to applying economic and legal cost-benefit analyses. It then identifies and classifies the costs and benefits created by introducing an EMSP while also determining which categories of costs and benefits are relevant to economic and legal cost-benefit analysis. On this basis, our analysis respectively applies economic and legal cost-benefit analytical frameworks to evaluate whether it is efficient and proportionate to introduce a separate market player for energy management services.

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List of abbreviations

BRP	Balance Responsible Party
EMS	Energy Management System
EMSP	Energy Management Service Provider
EV	Electric Vehicle
FSP	Flexibility Service Provider
IFSP	Independent Flexibility Service Provider
LFP	Local Flexibility Provider
ToE	Transfer of Energy
TSO	Transmission System Operator
UFP	Universal Flexibility Platform
WTA	Willingness to Accept
WTP	Willingness to Pay

1 General introduction

Cost-benefit analysis can be conducted in an economic and a legal sense. Economic cost-benefit analysis can be used in the economic analysis of law with a view to evaluating the economic efficiency of an initiative or regulatory action. In contrast, legal cost-benefit analysis derives from the principle of proportionality, which assesses whether the measure is disproportionate to the resultant restrictions and burdens (i.e., the proportionality *stricto sensu* inquiry). The two types of cost-benefit analysis differ fundamentally in purpose, methodology, and normative orientation. They both are relevant to a cost-benefit analysis of the role of an energy management service provider (EMSP), especially when introducing a separate market actor engaged in energy management services.

Given this, this deliverable first defines economic and legal cost-benefit analyses, clarifying different contexts and approaches of applying them (Section 2). It then identifies and classifies the costs and benefits created by introducing a separate EMSP (Section 3). This step aims to determine which categories of costs and benefits will be relevant to economic and legal cost-benefit analysis. On this basis, our analysis respectively applies economic and legal cost-benefit doctrines to evaluate whether introducing a separate market player for energy management services is efficient and proportionate (Section 4). Section 5 concludes the main findings of this deliverable.

2 Defining cost-benefit analysis

Cost-benefit analysis is important in policy and law, which is used to evaluate the consequences of legal provisions, governmental or regulatory decisions and initiatives.¹ Both legal and economic cost-benefit analyses are relevant for assessing the impact of introducing a new market actor providing energy management services. With the rise of Law and Economics, which applies economic tools and methods to evaluate legal rules, economic cost-benefit analysis has been applied as a key methodological tool to assess the impact of a given project, policy, or intervention.² The economic cost-benefit assigns monetary or utility-based values to costs and benefits, aiming for efficiency or welfare maximization.³

¹ For more details about the history of cost-benefit analysis use in evaluating economic effects of regulatory proposals and governmental decisions, see R. O. Zerbo, 'Cost-benefit analysis in legal decision-making' in F. Parisi (eds) *The Oxford Handbook of Law and Economics: Volume 1: Methodology and Concepts* (Oxford University Press 2017) 363-364.

² T. S. Ulen, 'The changing methodologies of law and economics' in T. S. Ulen (eds) *Methodologies of Law and Economics* (Edward Elgar 2017) 1-4; T. J. Miceli, 'The Use of Economics for Understanding Law: One View of the Cathedral' in T. S. Ulen (eds) *Methodologies of Law and Economics* (Edward Elgar 2017) 21-26; S. Farrow and R. O. Zerbo, *Principles and Standards for Benefit-Cost Analysis* (Edward Elgar 2013) 33.

³ It aims to allow the law to pursue economic efficiency and indicates the potential changes of the rules by demonstrating that more efficient ones exist. See Miceli, *ibid.*, 22.

In contrast, legal cost-benefit analysis, particularly as embedded in the principle of proportionality,⁴ does not aim at economic efficiency.⁵ Instead, when assessing a regulatory action's alignment with the principle of proportionality, it assesses compatibility with constitutional values, human dignity, and the structure of legal rights while considering the resultant administrative burdens and obligations.⁶ The values for the weighing are not economic but normative, notably including constitutional values, legal rights and obligations or administrative burdens.⁷

Overall, although both forms of cost-benefit reasoning operate under the logic of balancing, they differ significantly in purposes, underlying values (i.e., what they consider 'costs' and 'benefits') and the methods for assessments. Against this background, before assessing the various impacts of introducing the EMSP and enabling its activities, it is essential to clarify the distinct contexts in which economic and legal cost-benefit analyses apply, as well as the different approaches they adopt.

2.1 Economic cost-benefit analysis

Major doctrines or evaluative approaches discussed in the literature include utilitarianism, Pareto Efficiency, Kaldor-Hicks Efficiency (Potential Pareto Improvement), and Wealth Maximization. They are outlined in the following:

- **Pareto Efficiency:** Pareto Efficiency (or Pareto Optimality) is a core concept in welfare economics, named after economist Vilfredo Pareto. An allocation of resources is Pareto efficient if some agents are better off and no agent is worse off.⁸ However, Pure Pareto Efficiency is rarely achievable in real-world cost-benefit analysis because most regulatory or policy changes benefit some entities while imposing costs on others.⁹ As a result, Pareto Efficiency is more of a conceptual benchmark rather than a practical standard in real-world cost-benefit analysis.¹⁰ Given that most regulations, reforms, or policies produce winners and losers,¹¹ most cost-benefit analyses in law and economics use the Kaldor-Hicks approach, as explained next.

⁴ Complying with proportionality is key to ensuring administrative legality of a measure or action. The principle of proportionality is an important principle of EU administrative law. In Belgian law, while not always codified in a single legislative provision, this principle is embedded in the core principles of careful decision-making or good administration, which requires authorities to thoroughly investigate facts and consider relevant interests before making decisions, ensuring meticulous and fair administrative processes. Moreover, the principle of proportionality is a fundamental concept of EU law. It is codified in Article 5 of the Treaty on European Union (TEU), which states that the content and form of Union action shall not exceed what is necessary to achieve the objectives of the Treaties. This principle thus influences Belgian legislation, especially in areas, such as energy law, where EU law is transposed into national law. See P Craig, *EU Administrative Law* (2nd edition, Oxford University Press) 590, 627-628. Regarding the principle of careful decision-making in Belgium, see K Leus, 'Het zorgvuldigheidsbeginsel' in A Coolsaet and S De Somer (eds) *Administratieve Rechtsbibliotheek, 1. Beginselen van behoorlijk bestuur* 193-233.

⁵ See Section 2.2 for more details.

⁶ See e.g. R Alexy, *A Theory of Constitutional Rights* (Oxford University Press 2002); K Möller, *The Global Model of Constitutional Rights* (Oxford University Press 2015).

⁷ Ibid.

⁸ A Mas-Colell, M D. Whinston, J R. Green, *Microeconomic Theory* (Oxford University Press, 1995) 309; A W Katz, *Foundations of The Economic Approach to Law* (Foundation Press 1998) 10.

⁹ R A. Posner, *Economic Analysis of Law* (Aspen Law and Business 1998) 12-13.

¹⁰ Ibid.

¹¹ OECD, *Cost-Benefit Analysis and the Environment*, available at <https://www.oecd.org/content/dam/oecd/en/publications/reports/2018/06/cost-benefit-analysis-and-the-environment_g1g8b70e/9789264085169-en.pdf>.

- **Kaldor-Hicks efficiency:** The Kaldor-Hicks approach acknowledges that some will lose but aims for overall welfare gain. For this reason, compared to Pareto Efficiency, Kaldor-Hicks efficiency is far more applicable in the economic analysis of law.¹² According to Kaldor-Hicks efficiency, a project or regulatory action is efficient if those who benefit could, in theory, compensate those who lose, even if compensation does not actually happen.¹³ As already highlighted, it allows for winners and losers, as long as the net social gain of introducing a legal or policy change is positive.¹⁴ This doctrine can be applied to assess the efficiency of introducing a new entity engaged in energy management and measures enabling their activities.
- **Utilitarianism:** Utilitarianism is a philosophy primarily associated with thinkers like Jeremy Bentham and John Stuart Mill.¹⁵ Its core principle is that the best action is the one that maximizes overall happiness or welfare.¹⁶ This approach evaluates actions or policies based on their consequences, especially their impact on total social utility (happiness, pleasure, or welfare).¹⁷ Utilitarianism provides the philosophical foundation for cost-benefit analysis.¹⁸ Yet, the direct application of Utilitarianism to assess the impact of law and policy is subject to several limits, as pointed out by prior studies.¹⁹ For instance, Posner highlighted that Utilitarianism, especially in philosophy, focuses on subjective happiness or pleasure, which is difficult to measure or observe objectively.²⁰ This makes it impractical for legal decision-making. In comparison, economics offers a more objective and administratively feasible standard to assess a certain measure or action since it does not require controversial moral judgments.²¹ The emphasis of economics is on incentives, efficiency, and predictability, not maximizing happiness per se.²² Therefore, indeed, cost-benefit analysis, particularly in economic and legal policymaking, draws heavily from utilitarian logic. Yet, Utilitarianism and cost-benefit analysis differ in method and scope, and the economic analysis is more suitable to assess the impact of a certain legal measure or decision. Given this, the economic approach to law, instead of philosophical utilitarianism, will be applied in the cost-benefit analysis of introducing the EMSP.
- **Wealth Maximization:** Wealth Maximization is a normative principle proposed primarily by Richard Posner in Law and Economics. It is one of the core ideas distinguishing economic analysis of law from the above-mentioned classical Utilitarianism.²³ This principle evaluates legal rules or policies based on their capacity to increase total societal wealth (market-based valuation). Wealth Maximization shapes economic cost-benefit

¹² Zerbe (n 1) 358.

¹³ Ibid., Zerbe, 361; Posner (n 9) 13; OECD (n 11).

¹⁴ Ibid., OECD.

¹⁵ J Bentham, *An Introduction to the Principles of Morals and Legislation* (Clarendon Press 1907) Chapter I; J S Mill, *Utilitarianism* (The Floating Press 1861) Chapters 1 and 2.

¹⁶ Ibid.

¹⁷ A W Katz, *Foundations of The Economic Approach to Law* (Foundation Press 1998) 2.

¹⁸ R Cooter and T Ulen, *Law and Economics* (6th ed, Pearson Education, 2011) 3.

¹⁹ R A. Posner, 'Utilitarianism, Economics, and Legal Theory' (1979) 8 *Journal of Legal Studies* 103; C R. Sunstein, *The Cost-Benefit Revolution* (MIT Press 2018) Introduction.

²⁰ Ibid., Posner.

²¹ Ibid.

²² In terms of the methods, economics uses willingness to pay (WTP) or willingness to accept (WTA) as proxies — without claiming to measure internal happiness. See Zerbe (n 1) 357-360.

²³ As mentioned above, Posner defends wealth maximization (or efficiency) as the appropriate normative criterion in legal analysis. See Posner (n 19).

analysis in three ways. First, it focuses on efficiency. A legal rule or policy is desirable if it increases the total monetary value (benefits > costs), regardless of how gains and losses are distributed.²⁴ Second, benefits and costs are often monetized based on people's willingness to pay (WTP) to obtain something or their willingness to accept (WTA) compensation to give it up.²⁵ Third, it evaluates the cost and benefit from a systemic perspective. Wealth Maximization looks at aggregate gains and losses across the whole system, not just individual impacts.²⁶ As stressed above, compared to Utilitarianism, Wealth Maximization provides a more pragmatic approach to conducting an economic analysis of law.

Given the aforementioned limitations of Pareto Efficiency and Utilitarianism, we mainly use the doctrines of Kaldor-Hicks efficiency and wealth maximization to conduct the economic cost-benefit analysis of introducing the EMSP and enabling its activities. In the next section, we will explain cost-benefit analysis in a legal sense, which is embedded in the principle of proportionality.

2.2 Legal cost-benefit analysis

The legal form of cost-benefit analysis stems from the proportionality test²⁷ which evaluates whether a certain measure is proportionate to the restrictions thereby involved, even if the measure is necessary and suitable for the attainment of the desired objective.²⁸ The difference from the above economic efficiency frameworks is that proportionality incorporates normative judgments about the weight of principles and rights.²⁹ It evaluates the consequences of a measure from the perspective of constitutional values, rights, obligations and administrative burdens, which cannot be easily monetized.³⁰ In other words, the values weighed by the proportionality test are normative, not economic.³¹

The proportionality *stricto sensu* test weighs the intensity of the rights infringement or burdens (the 'cost') against the importance of the public objective pursued by the measure (the

²⁴ R. A. Posner, *Economic Analysis of Law* (9th edition, Aspen Publishing, 2014) 13; R. Cooter and T. Ulen, *Law and Economics* (6th ed., 2012) 48.

²⁵ Yet, in practice both costs and benefits are often measured solely by the WTP on grounds that the WTA is more difficult to measure. See Zerbe (n 1) 358-359.

²⁶ Posner (n 19); Steven Shavell, *Foundations of Economic Analysis of Law* (Belknap Press 2004) 2.

²⁷ The concept of proportionality is most fully developed within German law. In its modern German formulation, the consensus appears to be that proportionality involves three factors, namely suitability, necessity and proportionality *stricto sensu*. The first two elements of the classical German formulation have been found in CJEU's case law and there are many cases where the judicial analysis begins and ends with a consideration of suitability and necessity. Yet, there has been greater uncertainty as to whether proportionality *stricto sensu* is also an integral part of the proportionality test applied at the Union level, which examines whether the measure was disproportionate to the restrictions thereby involved. There is, it should be acknowledged, little evidence that the CJEU will raise the third limb of proportionality of their own volition. The court, however, addresses the third part of the test when the applicant contesting the legality of the measure puts arguments couched in those terms. In other words, the community courts do accept that this can be regarded as a proper part of the proportionality analysis, but the onus is on the applicant to raise arguments that place the matter before them. See *C-331/88, The Queen v Minister of Agriculture, Fisheries and Food and Secretary of State for Health, ex parte: Fedesa and others* [1990] ECR I-4023, 1990; *C-183/95, Affish BV v Rijksdienst voor de keuring van Vee en Vlees* [1997] ECR I 4315, 1997; *T-13/99 - Pfizer Animal Health v Council* [2002] ECR II-3305, 2002; *C-426/93, Germany v Commission* [1995] ECR I-3723, 1995. While the court is willing to consider the *stricto sensu* proportionality inquiry, the depth of the court's inquiry in this respect differs markedly. See Craig (n 4) 656-657, 670.

²⁸ *Ibid.*, Craig, 591; Alexy (n 6) 66.

²⁹ *Ibid.*, Alexy, 66 and 401; A. L. Bendor and T. Sela, 'How proportional is proportionality?' (2015) 13 *International Journal of Constitutional Law* 530.

³⁰ M. Cohen-Eliya & I. Porat, *Proportionality and Constitutional Culture* (Cambridge University Press 2013) 29-30.

³¹ A. Barak, *Proportionality: Constitutional Rights and Their Limitations* (Cambridge University Press 2012) 323.

‘benefit’). When assessing compliance with the proportionality principle, a measure is only considered proportional in the strict sense if the burden it imposes on the individual is not clearly disproportionate to the benefit it brings to the public interest.³² To comply with the principle of proportionality and thereby ensure the legality of measures supporting the introduction of the EMSP, our analysis in Section 4 below will assess whether the expected benefit exceeds the potential burdens or restrictions imposed on stakeholders.

2.3 Summary: Different impacts considered by legal and economic analysis

In a broad sense, the costs and benefits of a certain measure can be assessed from both economic and legal perspectives. Both economic and legal cost-benefit analyses inform the design of legal and regulatory frameworks by indicating the impact on efficiency or aggregate wealth and rights and obligations, respectively. Due to their differences in purposes and approaches, they are applied to assess different categories of impacts.

Economic cost-benefit analysis focuses on efficiency, which is only applied to assess the potential economic costs or benefits of introducing the EMSP. The legal cost-benefit analysis stemming from proportionality is concerned with the impact on rights and obligations as well as administrative burdens. It is thus only relevant when introducing the EMSP creates impacts on rights, obligations and administrative burdens on other stakeholders.

Before using these two analytical frameworks, we will identify and classify the expected benefits and costs of introducing the EMSP and the relevant enabling regulatory framework.

3 Identification and classification of expected costs and benefits

In the following, Section 3.1 first outlines the role of the energy management system and the entity responsible for operating this system in the ECOFLEX project to determine the subject of the cost-benefit analysis. Section 3.2 then identifies the expected benefits and costs of the initiative of introducing the EMSP. Section 3.3 then categorizes the relevant costs and benefits and determines which of them have an impact on economic efficiency and which can affect rights, obligations or burdens of stakeholders.

3.1 The initiative to be assessed

The core of the ECOFLEX project focuses on unlocking the potential of flexibility services through the development of a universal flexibility platform (UFP) and an Advanced energy management system (EMS). The Advanced EMS, as one of the innovations proposed by this project, is to improve energy management systems and facilitate flexibility trading. Compared to a classical EMS, the Advanced EMS is capable of computing potential flexibility valorisation based on forecast and communicating with the UFP to facilitate local flexibility’s participation in flexibility markets. For electric vehicle (EV) applications, the Advanced EMS can also include an EV scheduler (as demonstrated in the project). In ECOFLEX, as shown in Figure 1, the UFP serves as a bridge for customers to flexibility markets, which facilitates flexibility valorisation for a local flexibility provider (LFP) with both the Advanced and classical EMS. As envisaged by ECOFLEX, the UFP plays a bridging role by (i) aggregating

³² Ibid.

fragmented EMS data from different devices and platforms, (ii) standardizing the data formats and communication protocols so that (I)FSPs (including suppliers and independent flexibility service providers³³ or aggregators) can access a unified view of available flexibility assets, and (iii) enabling real-time coordination between end-user EMSs and (I)FSPs.

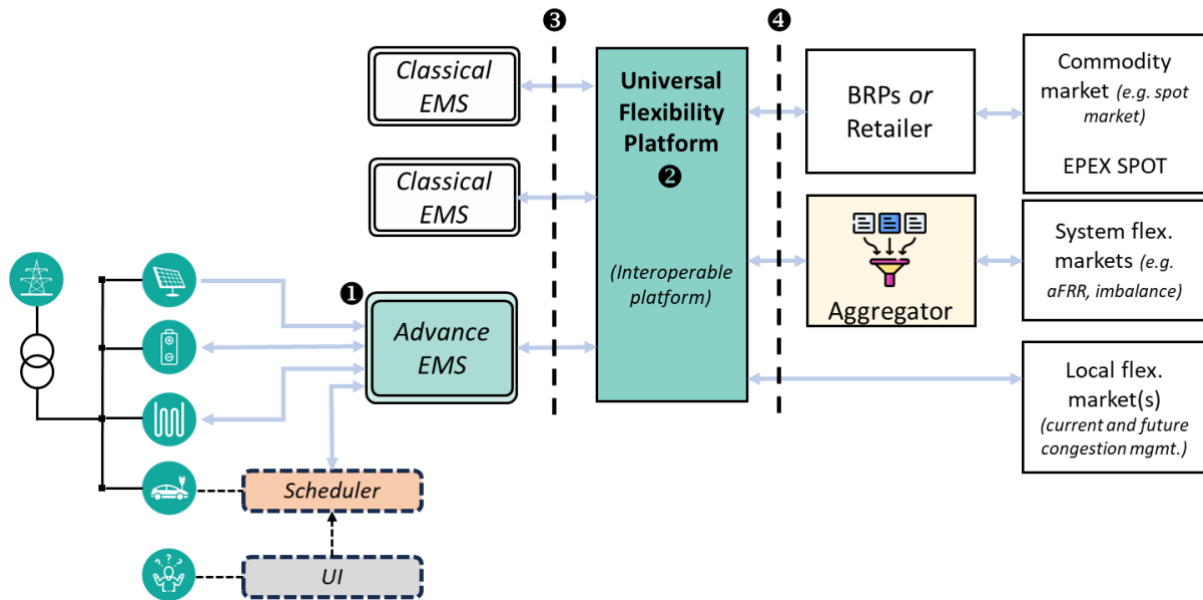


Figure 1. ECOFLEX Ecosystem

More specifically, as elaborated in Deliverable 2.2 of ECOFLEX, the (advanced) EMS, controlling a site and offering some flexibility, has three roles in the ECOFLEX ecosystem as follows:

- (i) Computing potential flexibility valorisation: The Advanced EMS does so by computing optimal setpoints (based on the baseline) for various controllable assets, taking into account the behavioural uncertainty and variety of customer and community requirements.
- (ii) Providing a tool that allows the user to monitor, control and optimize the managed system that offers some flexibility (i.e., able to modulate the energy demand in some way).³⁴

³³ The role of flexibility service providers can be played by any entity providing flexibility, including suppliers. Independent flexibility service providers (IFSPs) act independently from suppliers. The IFSP's activation of final customers' flexibility can affect these customers' suppliers and suppliers' balance responsible parties (BRPs), notably when the activation lowers consumption. Data are exchanged between IFSPs and suppliers (as well as suppliers' BRPs) to address impacts on suppliers' revenues and their balancing position. At the federal level, the Transfer of Energy (ToE) regime is used to address the impact of valorizing flexibility with IFSPs on suppliers and their BRPs, which contains elaborate data exchange requirements. The IFSP's market participation is a key element of the existing legal framework for facilitating flexibility. Both IFSPs and FSPs are relevant to this cost-benefit analysis since they are key market actors engaged in flexibility trading and can be affected by introducing independent EMSPs.

³⁴ Deliverable 2.2 gives an example. An EMS can be used to monitor a consumption site that has a battery energy storage system (BESS). The EMS can then charge/discharge the BESS depending on external factors such as market prices and forecasts (e.g. when (i) the battery is empty, (ii) there is local production, or (iii) market prices are expected to be very high in

(iii) Exchanging data with the UFP via two-way data communication between the EMS and the UFP:

- The EMS sends flexibility-related information (including flexibility potential and available flexibility that can be offered),³⁵ measurement³⁶ and forecast³⁷ data to the UFP;
- The EMS receives information to react to flexibility requests accordingly: it is the responsibility of the EMS to fetch the information about setpoints,³⁸ flexibility requests, and (price) signals,³⁹ from the UFP for scalability and availability purposes.

Overall, the role of the advanced EMS is to address the limitations of classical EMSs, which typically operate in isolation, focused only on local objectives such as maximizing self-consumption of on-site solar generation. Classical EMSs lack the capability to communicate with external actors, such as aggregators or higher-level platforms, and cannot provide key functionalities like baselines. (I)FSPs often have poor visibility or limited direct connection to these fragmented EMSs, which makes it hard to aggregate flexibility at scale and valorize them efficiently. In contrast, the advanced EMS integrates algorithms that account for external factors such as grid conditions (e.g., DSO-level congestion), market signals, and EV charging demands. It enables dynamic interaction with third-party actors like (I)FSPs, allowing for greater participation in flexibility markets—something traditional EMSs are not equipped to support.

The cost-benefit analysis about the role of independent EMSPs may vary depending on whether the UFP is involved. It should be noted that in ECOFLEX, despite the important role of the UFP, its use case is limited. There thus exist scenarios with and without the UFP, as detailed next.

■ Scenario without the UFP

(I)FSPs can access flexibility-related data cost-effectively without the UFP in the following cases: (i) when they provide EMSs to end users, or (ii) when end users own advanced EMSs and, under national rules established pursuant to Article 23 of the EU’s Electricity Directive, authorize (I)FSPs to access data from the EMS. At the same time, in these cases, the role of EMSP is either played by end users or (I)FSPs, which can be suppliers and IFSPs of end users.

the next hours, then the battery is charged to cover energy needs in expensive market price hours). An EMS is therefore par excellence a tool able to exploit the flexibility of a system.

³⁵ Each EMS can inform the UFP about the flexibility it can offer. Each flexibility potential message contains the baseline/nomination (i.e. what the EMS needs) either as a power value for successive periods of time (i.e. what the EMS constantly needs during any point of time during the period) or an energy volume for periods of time (i.e. what the EMS need to have been supplied at the end of the period) as a list of value, value type and period (‘from’ and ‘to’ time points). Each EMS can inform the UFP about available flexibility it can offer. Each of these messages should contain offers of flexibility for one or several periods of time. In practice, a flexibility offer consists in two lists: one of a power increase for a given period (‘from’ and ‘to’ time points) and a price, and another one of a power decrease for a given period (‘from’ and ‘to’ time points) and a price. See Deliverable 2.2.

³⁶ Measurements of the actual power consumed/produced by the asset monitored by the EMS must be sent to the UFP.

³⁷ Similarly to measurements, forecasts are submitted to the UFP for both offtake and injection with the same data format.

³⁸ Given submitted flexibility potentials with technical constraints, UFP can inform the EMS of the setpoints that the EMS should follow, as a constant power value for periods of time.

³⁹ In addition to flexibility-related signals supporting ECOFLEX goals, other information can be sent to EMS such as energy prices (in €/MWh) or abstract signals (no unit) in order to steer indirectly flexibility.

Introducing independent EMSPs, acting as an alternative to existing EMS solutions, may bring costs and benefits different from the following case, where the UFP is needed.

■ Scenario with the UFP

When (I)FSPs do not provide EMSs to end customers, EMSPs operate independently from them. The EMS naturally represents a separate layer, as shown in Figure 1. Independent EMSPs already exist, and thus, unlike the first scenario, the cost-benefit analysis will only evaluate the impact of their roles designed by ECOFLEX. In ECOFLEX, the roles of independent EMSPs include flexibility asset control, computation and data exchange, as mentioned above, while (I)FSPs remain responsible for market participation.⁴⁰ In this scenario, the UFP's key value lies in providing connectors that allow (I)FSPs to interface with various EMSs, whether classical or advanced, without the need to install their own hardware or develop new connectors themselves. Indeed, (I)FSPs could develop similar technical middleware with standardized communication protocols to improve interactions with EMSs. However, this approach is not profitable, as margins from small-scale flexibility—particularly from residential users—remain limited. The UFP reduces the incremental cost of integrating end users with low flexibility capacity, making them more attractive to (I)FSPs and unlocking flexibility potential across both commercial and residential sectors. In this case, as mentioned above, the UFP exchanges data between independent EMSPs and (I)FSPs. As shown above, in the scenario with the UFP, the independent EMSP's roles are designed around their interactions with the UFP, which can have an impact on the cost and benefit, as detailed later.

In the following sections, the cost and benefit of introducing independent EMSPs or enabling their activities will be evaluated in scenarios both with and without the UFP.

3.2 Potential costs and benefits

This section identifies the expected costs and benefits of introducing the EMSP in the context of EU and Belgian law.

3.2.1 *Expected benefits*

In the no-UFP scenario, when (I)FSPs operate EMSs and play the role of EMSPs, introducing a separate energy management layer and an independent entity responsible for operating the energy management system may facilitate consumer empowerment, further unlock the potential of demand flexibility, and enhance flexibility trading efficiency. However, these are not unique benefits of introducing a separate EMSP, but rather general advantages of using an EMS. Whether used by end users themselves or (I)FSPs, the EMS can deliver these benefits.

Admittedly, final customers' access to energy management services can contribute to consumer empowerment and flexibility provision simultaneously. As evidenced by the advanced EMS's case where an 'EV scheduler' is present (we refer to Deliverable 4.1), the EMS is also designed to enable flexible resources (EVs, heat pumps, batteries, smart appliances) to be coordinated and aggregated efficiently. As detailed in Deliverable 2.2, the EMSP controls and optimizes the managed flexibility assets with diverse tools, including automated energy management and

⁴⁰ Deliverable 2.2 states that 'Based on the ECOFLEX scope, flexibility is valorized on flexibility markets only via aggregators.'

smart charging. Its engagement with final customers can facilitate customers' access to these energy management services, further unlocking non-fossil flexibility, which is now stressed by EU law.⁴¹ The EMSP can also further empower energy consumers by facilitating their understanding, acceptance and use of technologies required to provide demand flexibility. However, a question to be asked is whether introducing a separate legal role for an (independent) EMSP is the precondition for bringing added value in consumer empowerment and flexibility provision. The answer is no, because as long as (I)FSPs use the EMS and provide end users with energy management services, they can also optimize customers' flexibility portfolios and facilitate the valorization of demand flexibility. This fact raises questions about the necessity of introducing a separate market actor to operate the EMS, particularly in light of the resultant costs and complexity.

Moreover, the independent EMSP may support the TSO's data management in flexibility trading. The Belgian transfer of energy (ToE) regime is taken as an example. The TSO, under the ToE regime, is obligated to collect, calculate, process and transfer the information necessary for the calculation of the volume of demand flexibility.⁴² The baseline⁴³ is the basis for the calculation of the delivered flexibility volume at a delivery point.⁴⁴ The data provided by EMSPs, as mentioned above, includes that about the baseline. Such data can be offered to the TSO to support its calculation of the volume of demand flexibility. Similarly, facilitating flexibility data management is not a unique value provided by independent EMSPs, but a general benefit of EMS operation.

In the scenario where (I)FSPs do not implement EMSs, independent EMSPs defined by ECOFLEX can bring specific benefits. It should be highlighted that these specific added values are closely linked to their interactions with the UFP. As addressed above, in ECOFLEX, the primary roles of independent EMSPs include exchanging data with the UFP, which enables (I)FSPs to interact with flexibility assets efficiently. Their communication with the UFP constitutes a key component of building the standardized interface between flexibility assets and (I)FSPs. Independent EMSPs with tasks of communicating data with the UFP can help reduce the (I)FSPs' costs to access data from various EMSs and thereby enhance market participation of small flexibility assets, notably from commercial and residential sectors, where flexibility potential remains largely untapped.

Equally, independent EMSPs in the use case of the UFP can also assist system operators' flexibility data management. However, this added value is not specific to these EMSPs. Moreover, in ECOFLEX, the data relevant to defining the baseline are communicated to the UFP instead of the TSO. This implies that the EMSP's contribution to optimising the TSO's data management is conditional: regulatory changes are needed to build coordination mechanisms between the UFP and the TSO.

⁴¹ Regulation (EU) 2024/1747 of the European Parliament and of the Council of 13 June 2024 amending Regulations (EU) 2019/942 and (EU) 2019/943 as regards improving the Union's electricity market design (2024 Amendment to the Electricity Regulation) recital 46, Article 2.

⁴² Federal Electricity Law, Art. 19ter; Rules for the organization of the Energy Transfer [Regels voor de organisatie van de Energieoverdracht] (hereinafter the 'ToE Rules') Section 7.4.

⁴³ Baseline means that the power on a quarter-hourly basis, on the basis of which the energy volume that the final customer would have purchased if no activation of demand flexibility would have taken place.

⁴⁴ ToE Rules (n 42) Section 10.

Table 1 gives a summary of the above analysis of expected benefits provided by independent EMSPs in two different scenarios.

Table 1 Benefits brought by independent EMSPs in different scenarios

Scenarios	Benefits
(I)FSPs access flexibility-related data cost-effectively without the UFP	General benefits: Empowering consumers, unlocking the potential of demand flexibility, and supporting system operators' data management
The UFP is deployed to enhance communication between EMSs and (I)FSPs	<p>Specific benefits: Through interacting with the UFP, reducing (I)FSPs' costs of valorizing flexibility from small consumers and further leveraging flexibility from commercial and residential users;</p> <p>General benefits: supporting system operators' data management</p>

3.2.2 Expected costs

As noted in Section 3.1, the roles of independent EMSPs proposed by ECOFLEX fall into two categories: (i) data collection and exchange, and (ii) monitoring and managing the flexibility assets of end customers. Some of the data collection functions are separated from (I)FSPs, introducing additional data exchanges between independent EMSPs and (I)FSPs and leading to extra costs.

Introducing independent EMSPs can bring both direct and indirect costs. Direct costs mainly include the costs of (i) adapting IT platforms and software to support this new role in data exchange, billing, and related processes, and (ii) adjusting existing legal frameworks and the relevant enforcement costs.⁴⁵ Enabling EMSPs' activities could also create impacts on other stakeholders, which mainly incur 'indirect costs', i.e., incurred in related markets or experienced by consumers, government agencies or other stakeholders that are not directly targeted by the initiative or the relevant regulation.⁴⁶ Direct costs can be raised in scenarios both with and without the UFP, despite some differences shown in Table 3 below.

Indirect costs include transaction costs and indirect compliance costs.⁴⁷ First, introducing independent EMSPs can raise transaction costs, i.e., costs of renegotiating contracts.⁴⁸ To access energy management services and services of aggregating and valorizing demand flexibility, consumers need contracts with both the independent EMSP and the (I)FSPs, which

⁴⁵ EC, 'Better regulation' toolbox, Chapter 8, available at <https://commission.europa.eu/law/law-making-process/better-regulation/better-regulation-guidelines-and-toolbox_en>.

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ Ibid.

can raise transaction costs. These costs are particularly relevant in scenarios where (I)FSPs also provide EMSs to end users or can easily access data from end users' advanced EMSs.

Second, enabling activities of independent EMSPs implies the need to structure their relationships with existing stakeholders. This requires adjustments to existing legal frameworks, which can incur both direct costs (as mentioned above) and indirect compliance costs (i.e., costs related to other stakeholders' compliance with legislation).⁴⁹

Existing laws and regulations may have to undergo several changes. First, as mentioned above, in ECOFLEX, the independent EMSP's roles include collecting data on flexibility potential, reporting available flexibility, monitoring real-time consumption and generation, providing measurement, and forecasting. The independent EMSP's roles in forecasting and flexibility-related data collection and exchange create a partial overlap with existing (I)FSPs.⁵⁰ The emergence of independent EMSPs can, on the one hand, change the current business models of (I)FSPs. On the other hand, once the above data collection roles are assigned to independent EMSPs, (I)FSPs no longer have full control of data on flexibility potential and availability. They instead rely on (independent) EMSPs for accessing data that is key to offering flexibility services and complying with the ToE Rules and system operators' flexibility procurement rules.⁵¹ A concern arises about neutral and efficient data access. If (I)FSPs cannot access these key data in a non-discriminatory and efficient manner, the level playing field and flexibility market efficiency could be undermined. To prevent potential impacts on competition and market efficiency, the legislature would have to consider regulating the EMSP's relationship with (I)FSPs. The law should have to clarify the EMSP's obligations to provide non-discriminatory, standardized, and transparent access to flexibility data for (I)FSPs.

Another regulatory adaptation is concerned with the relationship between the TSO and the independent EMSP. As mentioned in the previous section, in the ToE context, independent EMSPs can take up the tasks of providing data on available flexibility and baseline to the TSO. However, enabling its role in these respects requires adaptations of existing regulatory frameworks, including the ToE regime. Furthermore, in the scenario where the UFP is deployed, the UFP serves as the central node for processing and exchanging data from the independent EMSP to other market actors. This implies the additional need to clarify coordination between the UFP and the TSO to harness the EMSP's benefits of supporting flexibility data management. The TSO notably faces additional costs to comply with new arrangements that govern its communication with the UFP.

Introducing the independent EMSP and adjusting existing laws and regulations can also raise enforcement costs, which are associated with activities linked to the implementation of an initiative, such as monitoring and inspections. Monitoring the independent EMSPs' compliance with requirements on non-discriminatory data access, for instance, can cause enforcement costs.⁵²

⁴⁹ Ibid.

⁵⁰ Such overlaps are limited and mainly lie in flexibility-related data collection and reporting since in the ECOFLEX project, EMSPs merely manage data and assets for consumers, but do not trade flexibility in the market.

⁵¹ In addition to the ToE Rules, the (I)FSPs (in the balancing market context, balancing service providers, 'BSPs') must use and exchange several categories of data with Elia (the TSO), especially regarding activation and metering. See e.g. Terms and Conditions for Balancing Service Providers for manual Frequency Restoration Reserve (T&C BSP mFRR).

⁵² EC (n 45).

Lastly, a concern is that the introduction of the independent EMSP may further complicate existing arrangements for valorising demand flexibility, notably data exchange mechanisms, thereby increasing other stakeholders' administrative burdens and transaction costs. As the prior study indicated, institutional complexity is one of the challenges of the ToE regime, which calls for due attention to such complexity and the resultant implications for market entry of aggregators, notably those small ones.⁵³ We should thus specifically consider whether the introduction of the EMSP in the ECOFLEX context can exacerbate institutional complexity. It should be noted that whether introducing the EMSP can complicate the current flexibility market processes and increase data exchange burdens on other stakeholders depends on the specific design. The ECOFLEX design does not significantly increase this risk. As previously discussed, the EMSP's primary responsibility is to forecast and provide data on flexibility potential and availability, rather than flexibility activation data, which (I)FSPs must communicate to the TSO.⁵⁴ Therefore, (I)FSPs remain the sole party offering the data used for addressing the impact on suppliers and their BRPs. In terms of implementing compensation between (I)FSPs and suppliers and correcting balancing perimeters of balance responsible parties (BRPs), the TSO does not need to exchange data with the EMSP. Moreover, in the ECOFLEX design, the EMSP does not interact with suppliers and their BRPs. Suppliers and BRPs are not subject to additional burdens of interacting with the EMSP.

However, (I)FSPs may face extra transaction costs given that the independent EMSP controls baseline and metering data in the scenario where the UFP is applied. As stated in Deliverable 2.2, the independent EMSP also provides metering data to the UFP. A key question arises as to what extent this data provision constitutes a key input that (I)FSPs need to offer data on flexibility activation. The activated flexibility volume is determined based on the difference between baseline consumption (what would have happened without activation) and actual metered consumption during activation. To calculate and report the actual volume of activated flexibility as required by the ToE and system operators' flexibility procurement rules,⁵⁵ the (I)FSP needs to engage with the UFP to access the data on baseline and actual metered consumption data. This step can incur additional transaction costs compared to the existing data access process.⁵⁶ Furthermore, to avoid overlaps, the roles of the independent EMSP and the (I)FSP in determining and validating the activated flexibility volume should be clarified, and the (I)FSP's right to access the required data should be defined, which requires regulatory adaptations. To summarize the above analysis, Table 2 lists the major expected costs brought by independent EMSP.

⁵³ T Chen and F Vandendriessche, 'Enabling independent flexibility service providers to participate in electricity markets: A legal analysis of the Belgium case' (2023) 81 Utilities Policy 101496.

⁵⁴ In accordance with the existing ToE rules, (I)FSPs or independent aggregators are required to offer data on activation of demand flexibility (i.e. volume, Delivery Points used, start and end of the activation period). For details, see ToE Rules (n 41) Sections 7.1 and 14.2.

⁵⁵ For instance, under Terms and Conditions for Balancing Service Providers for manual Frequency Restoration Reserve (T&C BSP mFRR), BSPs inform the TSO of the mFRR Energy Bids (A combination of a volume (in MW) and a price (in € /MWh)), mFRR Supplied (actual power delivered during activation), Deviations from baseline if no activation occurred despite being scheduled.

⁵⁶ Under Article 20 of the Electricity Directive, if final customers request it, data on the electricity they fed into the grid and their electricity consumption data shall be made available to them, in accordance with the implementing acts adopted pursuant to Article 24, through a standardised communication interface or through remote access, or to a third party acting on their behalf. According to this provision, (I)FSPs can access metering data from data management entities, such as system operators designated by national law (the DSO in Flemish law, for instance).

Table 2 Summary of potential costs brought by independent EMSPs

Cost categories		Causes
Direct costs	Adjustment costs	<ul style="list-style-type: none"> • The existing law and regulation face adaptations to (i) define the role of the independent EMSP and the UFP, and (ii) their relationships with the TSO/DSO and (I)FSPs, notably with respect to data access and exchange; • IT platforms and software are to be adapted
	Enforcement costs (additional burdens on regulators)	Monitoring the compliance with the adjusted or newly-introduced rules, notably ensuring (I)FSPs' access to data controlled by independent EMSP (including those on flexibility potential and availability, baseline and measurements)
Indirect costs	Transaction costs	<ul style="list-style-type: none"> • Final customers need energy management service contracts and flexibility service contracts. They may also need to renegotiate the existing flexibility service contracts with (I)FSPs. • Given that the independent EMSP controls the data on measurements, baseline, and the volume of activated flexibility, to fulfill obligations stemming from the ToE regime and flexibility procurement rules, the (I)FSP needs to additionally engage with the EMSP or the UFP
	Indirect compliance costs	The TSO/DSO faces new costs to comply with new arrangements that govern their communication with the independent EMSP or the UFP

On the basis of Table 2, Table 3 further summarizes the costs incurred in different scenarios. Introducing independent EMSPs or achieving their roles in both scenarios involves common costs, primarily related to legislative changes, ICT adaptations, as well as rule-compliance enforcement. Cost differences arise from whether (I)FSPs already provide EMSs to end customers and whether the EMS operates as a separate layer, as addressed in Section 3.1 above.

Table 3 Costs brought by independent EMSPs in different scenarios

Scenarios	Scenario-specific costs	Common costs
(I)FSPs access flexibility-related	<p>Indirect costs:</p> <ul style="list-style-type: none"> • End-user contract negotiation/renegotiation. 	<p>Direct costs:</p> <ul style="list-style-type: none"> • Legislative changes to recognize independent EMSPs

data cost-effectively without the UFP	<ul style="list-style-type: none"> • (I)FSPs’ additional interactions with independent EMSPs to access data (including those on flexibility potential and availability, baseline and measurements). 	<p>and define their relationships with (I)FSPs and TSOs/DSOs.</p> <ul style="list-style-type: none"> • IT platform and software adaptations. • Enforcement of data access rules.
The UFP is deployed to enhance communication between EMSs and (I)FSPs	<p>Direct costs:</p> <ul style="list-style-type: none"> • Legislative changes to define the role of the UFP and its relationship with other stakeholders <p>Indirect costs:</p> <ul style="list-style-type: none"> • (I)FSPs’ additional interactions with the UFP to access metering data. 	<p>Indirect costs:</p> <ul style="list-style-type: none"> • Compliance costs for system operators.

3.3 Classifying the costs and benefits

After identifying the costs and benefits of introducing the independent EMSP, this section categorizes the costs and benefits. It indicates which of them are relevant to legal cost-benefit analysis and which are pertinent to economic cost-benefit analysis. Table 4 presents the impacts on the achievement of legislative objectives and on the stakeholders’ rights and obligations, which will be examined in the proportionality test in Section 4.1. Table 5 lists impacts on efficiency, which are the focus of economic cost-benefit analysis in Section 4.2.

When the benefits are general (e.g., they arise from applying the overall concept like an EMS, rather than specifically from adopting the initiative (e.g., introducing an independent EMSP), but the costs are specific (i.e., tied directly to the initiative), the cost-benefit analysis should be structured carefully to avoid overstating the value of the initiative. Aside from other steps elaborated in the next section, the existing cost-benefit analysis methodologies stress the need to clearly distinguish between general or systemic benefits and initiative-specific added value.⁵⁷ Such distinction is important to reveal whether the initiative in question shows net added value over the baseline (i.e., the ‘no-policy-change’ or ‘status quo’ scenario that represents what would happen in the absence of the proposed initiative).⁵⁸ Therefore, Tables 4 and 5 distinguish general and initiative-specific impacts.

Table 4 Impacts relevant to legal cost-benefit analysis

⁵⁷ EC (n 45).

⁵⁸ Ibid; EC, Better Regulation Guidelines, November 2021, available at <https://commission.europa.eu/law/law-making-process/better-regulation/better-regulation-guidelines-and-toolbox_en>.

Impacts		Initiative-specific impacts?
Benefits	Contributing to legislative aims of consumer empowerment and promoting demand flexibility	No, in the scenario without the UFP; Yes, in the scenario with the UFP
Costs	The TSO may have a new obligation to communicate data with the EMSP or the UFP. (I)FSPs' free access to flexibility-related data can be affected. The regulators have additional burdens to monitor the EMSP's compliance with non-discriminatory data access	Yes, in both scenarios

Table 5 Impacts relevant to economic cost-benefit analysis

Impacts		Initiative-specific impacts?
Benefits	Improving the efficiency of flexibility data management	No, in both scenarios
	Lowering the (I)FSP's costs of commercializing small-scale flexibility; facilitating flexibility provision	No, in the scenario without the UFP; Yes, in the scenario with the UFP
Costs	Adjustment costs incurred by adapting existing legal frameworks; Transaction costs faced by final customers and (I)FSPs; Costs of complying with adapted rules	Yes, in both scenarios

4 Economic and legal cost-benefit analysis

In this section, we will first conduct a cost-benefit analysis in the legal sense, which is embedded in the principle of proportionality. The analysis aims to examine whether introducing the independent EMSP is proportionate. We then discuss whether doing so is cost-efficient. Given the lack of empirical data, we present only qualitative analyses for the economic analysis.

4.1 Cost-benefit analysis in the legal sense: Proportionality test

As set out above in Section 2, among others, the proportionality test considers the impacts of an initiative or measure in the proportionality *stricto sensu* inquiry. This inquiry examines whether introducing the independent EMSP creates burdens on other stakeholders disproportionate to the desired objective. As elaborated in Section 3.2 above, either introducing independent EMSPs or enabling their roles in scenarios with and without the UFP can bring additional obligations or burdens on the TSO, (I)FSPs and regulatory authorities. Such burdens could be partially alleviated by ensuring that (I)FSPs can access flexibility-related data controlled by the independent EMSPs in a neutral and efficient manner. To this end, the key lies in the role of the UFP. In the ECOFLEX project, the UFP provides a central node of ‘enabling any EMS to communicate with various aggregators’. The regulatory framework can further define its role as a neutral platform responsible for flexibility data management, including processing and exchanging data between EMSPs and (I)FSPs.

Despite this, if the law allows the initiative of separating some data collection roles from (I)FSPs, (I)FSPs face additional burdens to obtain flexibility-related data from the UFP to meet the requirements of the ToE Rules and system operators’ flexibility procurement rules, as noted in Section 3.2.2. Compared to the desired aims of further unlocking the potential of demand flexibility and empowering consumers, requiring the (I)FSP to engage with the UFP to access flexibility-related data might not create clearly disproportionate burdens.

However, in scenarios where (I)FSPs already access EMS data cost-efficiently without the UFP, introducing independent EMSPs imposes additional burdens on stakeholders. These burdens might not be disproportionate to the desired objectives, including promoting non-fossil flexibility and consumer empowerment. However, there exist less burdensome or restrictive alternatives, i.e., allowing (I)FSPs to provide EMSs to end users or enabling end users to operate advanced EMSs themselves.

4.2 Economic analysis

The economic cost-benefit analysis assesses whether or not a project is worthwhile by measuring gains or benefits against costs.⁵⁹ As addressed in Section 2 above, Kaldor-Hicks efficiency and wealth maximization apply the systemic approach, which focuses on total impacts on social welfare (including the impact on different stakeholders). When benefits are general rather than specific to the initiative, while costs are directly linked to its introduction, the cost-benefit analysis methodologies recommended by the EC and OECD call for evaluating such impacts by comparing the proposed initiative against a baseline or ‘status quo’ scenario.⁶⁰ More specifically, a baseline is defined as the ‘no-policy-change’ scenario, including existing national, EU, and global policies.⁶¹ It represents what would happen in the absence of the proposed initiative.⁶² Benefits and costs of any initiative are assessed incrementally, namely relative to this baseline.⁶³ This is necessary to isolate the specific added value of the initiative (e.g., introducing independent EMSPs) from the general or systemic trends (i.e., the use of the EMS). If the proposed initiative does not deliver net benefits, namely, its benefits do not exceed

⁵⁹ Zerbe (n 1) 357.

⁶⁰ OECD (n 11); EC (n 45).

⁶¹ Ibid., EC.

⁶² Ibid.

⁶³ Ibid.

its costs relative to the baseline, then its net present value (NPV) would be negative.⁶⁴ When NPV is negative, this means ‘the future benefits are not sufficient to compensate the costs incurred’. Hence, the concerned initiative would not be preferred or justified.

Applying the methodology to our case, the first step is to define clearly what would happen without the specific initiative but with the general application. In the scenario without the UFP, the baseline is the status quo, where the EMS can be operated directly by (I)FSPs or end users without an independent EMSP. Based on the findings of Section 3 above, it can be found that general benefits (e.g., greater consumer engagement and flexibility provision) also occur in the baseline situation. Yet, introducing independent EMSPs has not produced benefits directly attributable to this initiative. This implies that the initiative does not bring net added value over the baseline. By contrast, as shown by Section 3.2.2 above, final customers, (I)FSPs and system operators face some transaction costs and compliance costs incurred by engaging with the independent EMSP and the required adaptations of rules. These are net additional costs compared to the baseline. They exceed net additional benefits, which hardly exist. On the grounds of the negative cost-benefit analysis assessed relative to the baseline, it can be argued that introducing independent EMSPs and changing existing laws and regulations to support their activities is unjustified in economic terms.

In the use case of the UFP, as explained above, there already exist EMSPs operating independently from (I)FSPs. The cost-benefit analysis is centered around the roles assigned to the independent EMSPs. Within the status quo scenario, there is no standardized and interoperable platform between EMSs and (I)FSPs. Consequently, (I)FSPs face high costs to engage with small consumers across various EMSs, which hinders them from valorizing small-scale flexibility. However, as shown in Section 3.2.1, such costs can be lowered by requiring independent EMSPs to exchange data required for flexibility trading through the UFP. Compared to the baseline scenario, the independent EMSPs interacting with the UFP can bring net added value.

On the other hand, as shown in Section 3.2.2, enabling the EMSP’s role in enhancing flexibility provision can result in net additional costs compared to the baseline, primarily due to the technical and legislative adaptations required for efficient interaction between independent EMSPs and (I)FSPs via the UFP.

Moreover, enabling the role of independent EMSPs within the UFP use case requires clearly defining the UFP’s role and its relationships with relevant stakeholders. This brings into focus the costs of developing and operating the UFP, as well as how those costs are recovered. As noted in Section 3.1, the platform is currently unprofitable for (I)FSPs, which suggests that the DSO may be designated to develop and operate the UFP, with associated costs socialized through grid tariffs.

The detailed cost-benefit analysis of mandating the DSO to provide the UFP is beyond the scope of this deliverable. Yet, several legal concerns associated with the UFP are worth mentioning. As detailed in Deliverable 7.4, under EU electricity law, the tasks of DSOs should, in principle, not go beyond the activities defined by the Electricity Directive and the Electricity Regulation. Operating the UFP to enhance interactions between (I)FSPs and EMSPs is not

⁶⁴ Ibid.

specified by EU law. The regional rule-maker may justify the additional obligation for the DSOs by invoking Article 31(10) of the Electricity Directive, which permits Member States to allow DSOs to perform activities other than those provided for in this Directive and in the Electricity Regulation, where such activities are necessary for the DSOs to fulfil their obligations under this Directive or Electricity Regulation, provided that the regulatory authority has assessed the necessity of such a derogation. Operating the UFP can support the DSO in mitigating grid congestion, for example, by transmitting congestion information to EMSs. This activity can therefore be considered necessary to fulfill the DSO's obligations for network operation under EU electricity law. However, the regional legislator should also consider the impact of mandating the DSO to operate the UFP on the development of similar platforms. The cost and benefit of providing similar products may change over time, making them profitable for market actors to offer. To minimize the impact on free markets, the approach adopted by Article 36 of the Electricity Directive can be applied. First, the DSO's investment in the UFP is only allowed after the regulator has established that the market cannot provide it in a cost-efficient and timely manner.⁶⁵ Second, the regulatory authorities should perform, at regular intervals or at least every five years, a public consultation on the existing UFP in order to assess the potential availability and interest in investing in such platforms.

Overall, whether the benefits brought by independent EMSPs outweigh the costs depends on the volume of flexibility capacity unlocked by the EMSP–(I)FSP interaction via the UFP. Despite the above-listed costs (including those incurred by the UFP), given the significant potential of flexibility from smaller-sized end users, notably in household and commercial sectors, fostering independent EMSPs to cooperate with the UFP may lead to positive net social gain.

5 Conclusion

This deliverable identified the costs and benefits of introducing the independent EMSP and the relevant measures needed to enable its activities. Several findings are worth highlighting. First, in the design of ECOFLEX, the introduction of the EMSP may not cause significant burdens on stakeholders affected by demand flexibility activation, notably suppliers and their BRPs.

Second, the cost-benefit analysis about the role of independent EMSPs varies depending on whether the UFP is involved. Thus, we evaluated costs and benefits in two scenarios respectively: (i) (I)FSPs can access flexibility-related data cost-effectively without the UFP, and (ii) (I)FSPs do not provide EMSs to end customers and the UFP is used to enhance their interactions with independent EMSPs. In the first scenario, the benefits of introducing independent EMSPs are general, which arise from applying the EMS, rather than specifically from introducing third-party EMSPs. By contrast, we find that the costs are specific to the introduction of independent EMSPs. When costs are initiative-specific while benefits are general, to objectively assess the impact of the initiative, the baseline should be considered in the cost-benefit analysis. Without additional legal measures supporting the activities of independent EMSPs, the (Advanced) EMS can today be applied by end users or (I)FSPs, as

⁶⁵ A tendering procedure is required in this process. When other parties, following an open, transparent and non-discriminatory tendering procedure that is subject to review and approval by the regulatory authority, have not been awarded a right to own, develop, manage or operate this platform, or could not deliver those services at a reasonable cost and in a timely manner, the DSO can operate this platform.

has been done in practice, which represents the baseline. Compared to the baseline, our analysis shows that introducing EMSPs does not bring net added value but additional costs, and cannot be considered justified in economic terms.

In the second scenario, EMSPs already operate independently from (I)FSPs. The cost-benefit analysis focuses on the roles that ECOFLEX assigns to independent EMSPs. Our analysis demonstrates that their roles in exchanging data with the UFP can reduce (I)FSPs' costs of valorizing flexibility from small consumers and further leveraging flexibility from commercial and residential users. Such roles bring net added value compared to the status quo scenario. However, realizing these roles in closely interacting with the UFP comes with costs, incurred by technical and legislative adaptations. Such adaptations, as highlighted above, also comprise those enabling the UFP. Whether the benefits brought by independent EMSPs outweigh the costs depends on the volume of flexibility capacity unlocked by the EMSP–(I)FSP interaction via the UFP. Despite direct and indirect costs, given the significant potential of flexibility from smaller-sized end users, notably in household and commercial sectors, fostering independent EMSPs to cooperate with the UFP may lead to positive net social gain.

Third, in this deliverable, aside from economic cost-benefit analysis, we also evaluate the impact of a specific initiative from the perspective of proportionality. In the scenario without the UFP, introducing independent EMSPs indeed imposes additional burdens on stakeholders. These burdens might not be clearly disproportionate to the desired objectives, including promoting non-fossil flexibility and consumer empowerment. However, such additional burdens or obligations can be avoided by implementing the previous solutions, i.e., allowing (I)FSPs to provide EMSs to end users or enabling end users to operate advanced EMSs themselves. In the scenario with the UFP, compared to the desired aims of further unlocking the potential of demand flexibility and empowering consumers, requiring the (I)FSP to engage with the UFP to access flexibility-related data might not create disproportionate burdens.

In conclusion, when (I)FSPs can interact with EMSs efficiently by either providing EMSs to end users or accessing data from end users' advanced EMSs through the user's authorization, it is not recommended to introduce independent EMSPs. By contrast, when the (I)FSPs' interactions with EMSs are inefficient or costly and the UFP is needed, independent EMSPs with tasks of exchanging data with the UFP can lead to a positive cost-benefit analysis. Enabling their activities can be considered proportionate as well.

Q&A linked to the CBA version 3.0

Q1: Why is a single data platform, the UFP, necessary?

From our understanding, the Advanced EMS developed in the project already performs several interoperability functions, notably computing and aggregating fragmented data from different appliances and helping final customers to make optimal decisions to manage flexibility assets and valorize available flexibility. Is this interpretation accurate? Through the Advanced EMS, it appears that aggregators or FSPs can have a unified view of an individual end user's flexibility potential. Once a final customer installs the advanced EMS and enables data access by the aggregators, the aggregators can harness the data required for flexibility valorization. However, if the UFP is introduced, would this add further steps in data exchange, increasing transaction costs and system complexity?

Rémy: *Your interpretation of the advanced EMS is correct, indeed it can do everything you mentioned. However, the advanced EMS would be limited to one brand, communication protocol and so on. Moreover, this would result in a fairness problem where only end users that have an advanced EMS could participate to the markets. To tackle this, the UFP would be the universal platform where 'simple'/ already existing and installed EMSs can communicate, exchange data and be controlled, in order to participate in flexibility.*

The need for such a platform has also been highlighted by discussions and interactions we had with DSOs (in our case Fluvius).

The advanced EMS manages the end users assets, while the UFP aggregates multiple EMSs to create a pool, and interacts to an aggregator. In other words, it is similar to an aggregator with the difference that aggregators will not interact with end users due to their limited scale.

Antonio: *Remy is correct: For communication between Aggregators and EMSs, a technical middleware that is agnostic of protocols on each side (= universality) is a key element. An open-source and standardized protocol for communication can be seen as another answer to the same problem.*

Such a platform may not be unique unless held by a public actor with an open data strategy. An operator is required to operate a platform and takes its human/financial costs. The operator can be a DSO, an aggregator, a TSO, ... or a new actor depending on targeted use cases. I do not see a private actor such as an aggregator operating a platform and offering the capabilities to one of its competitors for free.

Q2: What is the unique contribution of the UFP compared to the no-UFP scenario?

In addition to the above questions, the added value of the UFP is also unclear to us. In the current scenario (i.e., without the UFP), aggregators have already used data from final customers (including their EMSs) to valorize flexibility. This leads us to ask: What specific value does the UFP bring to the system? Could you kindly provide a one-page explanation of its core functions and benefits in clear, non-technical language?

Rémy:

- @antonio please provide this;

- *Aggregators currently have to install boxes and so on to communicate with the assets of the final customers, note that we're speaking of assets with power exchanges in the range of hundreds kW up to MW. Which makes it for an aggregator a feasible business case. The cost for an aggregator to do the same at residential end users is too high. Hence, the UFP would enable this by unlocking low-voltage assets flexibility such as small batteries. (I'm aware that players such as thermovault already provide flex. at residential customers by steering boilers, but to my knowledge this is not yet done for batteries or electric vehicles)*

Antonio: I refer to slides 31 to 33 of https://vub.sharepoint.com/:p:/r/sites/ECOFLEX/_layouts/15/Doc.aspx?sourcedoc=%7BB151D8B6-704D-4384-96D8-6D83AD68448F%7D&file=ECOFLEX%20_GA05_presentation.pptx&action=edit&mobileredirect=true.

- Use case "Increase Flexibility Potential" : *A current major concern of DSOs is to manage congestion. DSOs can reinforce their grids, but this is costly and time-consuming. To avoid that, an alternative for large production assets, DSOs can limit the injection (production) to the grid when this can cause congestion. However, DSOs do not already have efficient ways to modulate the energy demand (eg. residential customers that both offtake and inject to the grid). Such a platform can thus offer a way for the DSO of requesting flexibility to many endpoints with various flexibility potential before limiting the renewable energy production.*

Example: There is more wind than expected or less demand than expected (same result), wind turbines should be limited to avoid congestion. Here the idea is to let the DSO share the flexibility request (increase your demand or reduce your production) to every EMS connected to the UFP (eg. consequence: EMSs offtake from the grid rather than consuming from their local storage systems) or specific groups (eg. a street, a neighbourhood, ...) . The UFP feedback to DSO can be in such a way that there is no need to limit the wind turbines anymore or not to the same extent. Breaking the flexibility request between numerous EMS can help achieve the targeted goal.

- Use case "Flexibility through incentives"

The communication is also the key to induce adjusted behaviours that are not directly linked to congestion management (use case 1). In the hands of an energy supplier, this platform can be of value to share (price) signals that will trigger (e.g. automatically via an EMS) some demand adjustments and help to balance supplier portfolio and be adapted to future market structures.

Example 1: Domestic consumption is split from eV consumption. Two different supply contracts are defined and the eV charging is subject to price volatility (eg. spot prices). This allows for flexibility optimization in order to benefit from lower energy costs.

Example 2: Energy suppliers have in their portfolio some energy surplus that is typically sold to the market (eg. from production assets or residential PV surplus). Signals can be used to stimulate the synchronisation between the production and the consumption within the portfolio, improving the portfolio balance of the supplier.

- Use case "Technical Middleware": As understood from Flexcity, the value lies in the connector(s) that make it possible to communicate with various EMSs without installing their own physical hardware or developing a new connector on their end. The incremental cost to add a residential end user with low flexibility capacity needs to be low enough to let residential end users be interesting to consider.

Q3: To explore these questions further, would it be possible to arrange a video call sometime in June? We would greatly appreciate your insights to help align D2.5 more effectively with the broader project context.

Rémy: *I suggest you to discuss this directly with Antonio and Carlo (from Flexcity), as they will have a better view on the markets than I do: carlo.caracciolo@veolia.com*

Antonio: *My time is limited in June for personal reasons, so July would work best for me.*

Follow-up questions:

Q4: It seems that all data from EMS systems should be exchanged to the UFP before the aggregators access it. Does that mean the advanced energy management systems provided and controlled by FSPs should also exchange data with the UFP? Do you think this is redundant? If yes, does that mean FSPs who provide advanced EMS to end-users do not need to transmit the data to the UFP?

Antonio: *In Ecoflex scope, UFP is indeed seen as an intermediary between EMS and all flexibility valorization markets, incl. the aggregator which is another intermediary to valorize flexibility in Elia's flex markets for instance.*

Q5: If an end user owns the advanced EMS, what is the added value of transmitting the data to the UFP instead of directly authorizing FSPs to access the flexibility-related data? If there is no added value in this case, it is not justified to enforce end users to exchange data with the UFP instead of their FSPs. Assuming there is no added value, can we conclude that only classical EMSs need to exchange data with the UFP? In other words, it appears that the UFP's specific added value is merely enabling classical EMSs to communicate with FSPs, or enhancing FSPs' communication with residential users' flexibility assets. Do you agree?

Antonio: *Multiple aspects:*

1) If FSP (aggregator) is implementing an advanced energy management system (eg. Flexbox of Flexcity) and/or monitoring and the only flexibility valorization is through the FSP, then there is a limited/no (added) value for the UFP discussed scope.

2) Flexcity mentioned that for small players, although they could implement an EMS on site, it is not profitable to do so. Therefore added value is probably to have a standard interface where any EMS can communicate (scope of FSP is therefore excluding EMS). In this case, UFP can be this standard layer. FSP could provide a similar standard interface if they align with each other.

3) *Added value in ability to access multiple flexibility valorization sources and with no ability/interest/competence to develop their own EMS.*

Q6: How should the data communication between the UFP and FSPs be organized? Assuming that an end user has already concluded with an FSP, should the UFP only share flexibility-related data with that FSP? Or, could other FSPs also access the data? This has not been resolved by the current design of the UFP, while it is highly relevant to potential adjustments of existing laws and regulations when it comes to operationalizing the UFP.

Antonio: *In my view, it is very limiting to only consider UFP in interaction with FSPs=Aggregators.*

- 1) *There is an identified FSP actor (= aggregator) to use the UFP.*
- 2) *Only flexibility-related information is exchanged with the UFP. UFP should not replace the EMS nor a monitoring system.*
- 3) *In other use cases, the UFP may be operated by DSOs for example (already accessing metering data for instance) and this is a way of exploiting flexibility by sending, for instance, setpoints to avoid network congestion. In this case, FSP are not involved, and if involved should not access these data without contractual link (= actually it is the responsibility of the EMS to not valorize twice the same flexibility and if some flexibility is reserved for the agg. to not react to DSO).*

Q7: The last question is about interactions with the smart metering system. In Flanders, basic smart meter functions are provided and managed by the DSO, whereas additional functions can be added through dongles from other suppliers. Could the UFP serve as a tool to unlock flexibility for customers who only require basic functions? Would (advanced) EMS systems then be the ones to provide additional or enhanced functions? Is this truly something that only a unique party or the DSO can provide—or could the market handle this? Wouldn't it be possible to enable these functionalities by simply adding a dongle to the smart meter in a cost-efficient manner? What is your view on this approach?

Antonio: *Yes, this is an alternative replacing, for instance, Flexbox or a way of being on-site if physical hardware is required (sometimes required) to make assets "controllable". However, some DSOs already open their SM systems via API to collect measurements so physical hardware does not seem required to access these data.*