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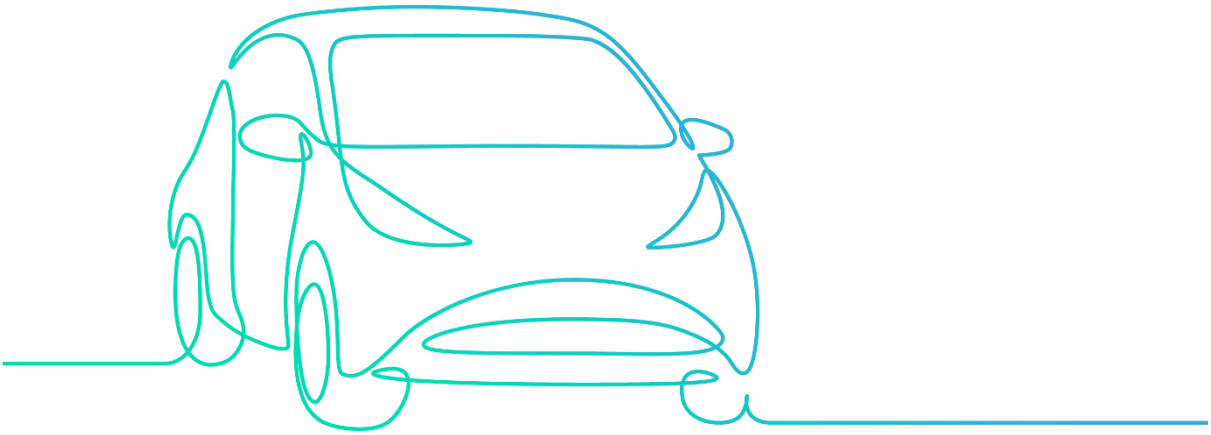

Key contractual elements between EV owner and aggregator

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Deliverable

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Analysis of key contractual elements for EV owner-aggregator contracts

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Statement of Originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation or both.

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Executive Summary

The main goal of V2Market is to develop a service for the full integration of V2G in European countries as soon as the regulation is ready.

In this context, based on the previous work carried out by the V2Market consortium, the contractual relations and tools between the key actors, as well as the legal determinants and key aspects involved in the creation of standardized contract elements for V2G contract arrangements have been identified.

The first part of the present work has focused on exploring the fears and doubts of both EV owners and aggregators, as well as the respective motivations, which have been considered with a view of developing contractual guidelines conducive to the mitigation of the first and potentiation of the latter.

On the second part, the key issues previously identified have been classified into “static” or “variable”, in an effort to provide a valid starting point to the desired standardization of the V2G contracts between the EV owner and the aggregator. Standardizing contracts offers several advantages, such as facilitating due diligence processes and ensuring consistency and clarity in important provisions and relevant clauses.

The V2G business model only works if the EV is connected to a suitable charger at specific times and intervals. In this regard it is very relevant to study incentive mechanisms for users to comply with these requisites, and how these incentives can be included in the contracts. Price-based activation criteria, volume and control-based clauses, and time-based criteria have been explored. Additionally, other types of incentives were considered, such as credits for ultra-rapid charging or savings on energy bills, along with the possibility of implementing gamification schemes.

Lasty, an overlook of how to integrate two types of contracts that allow the user to eschew the upfront costs of the V2G infrastructure, namely servitisation and EPC contracts, has been conducted. On one hand, EPCs allows the totality of the investment to be executed by a third party, but this contract modality is generally not available for individual owners; on the other hand, servitization is well suited to all types of clients, and although it “only” reliefs the EV owner from the investment in the battery, it has the advantage of being a valid option for individual owners.

Based on all the findings reunited in this report, a contractual guideline for EV owners / aggregators contracts has been produced and delivered.

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List of Acronyms

BRP
BaaS
DoD
DSO
EPC
EPIA
ESCO
EV
ICEV
M&V
OPEX
SoC
SWOT

TCO
TSO
V2B
V2G
VAT
Balance Responsible Party
Battery as a Service
Depth of Discharge
Distribution System Operator
Energy Performance Contract
Energy Performance Improvement Action
Energy Services Company
Electric Vehicle
Internal combustion engine vehicle
Measurement and Verification
Operative Expenditure
State of Charge
Strengths-Weaknesses-Opportunities-Threats
Total Cost of Ownership
Transmission System Operator
Vehicle to Building
Vehicle to Grid
Value Added Tax

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Background and objectives

The main goal of V2Market is to develop a service for the full integration of V2G in European countries as soon as the regulation is ready. The project intends to take advantage of the lessons learnt and the barriers identified in the few European countries that have V2G in place, namely Denmark, and use the forthcoming Spanish regulatory context as leverage for developing a more comprehensive business case for V2G for European markets, including several contractual possibilities for the end-user.

In this context, the contractual relations and tools between the key actors are of paramount importance, and the objective of the present work is to study the legal determinants and key aspects involved in the creation of standardized contract elements for V2G contract arrangements. The "static" parts of the contract will be identified while also assessing the key incentives for the aggregator and EV owner, which will serve as the "variable" parts of the contract tailored to each specific case. Additionally, this deliverable will take into account other important factors from work developed within the project in order to design an effective contract. Overall, the goal is to deliver a well-designed and tailored contract framework that meets the needs of both the aggregator and EV owners.

Approach

Previous work carried out by the consortium in V2M project addressed these main questions: *who*, *what* and *how*: *who* can the service be addressed to, *what* can be the characteristics of the service, and *how* can the service be rendered between all interested parties. The definition of the contractual guidelines that should be taken into consideration in implementing a successful V2G service builds upon all the previous stages of the project; as such, a short summary of the work done so far within the V2M project is perhaps beneficial to the correct understanding of the present report.

The first steps have focussed on the study of the markets. The Design Thinking Approach used the SWOT analysis technique and the Customer Journey Canvas method to start defining customer profiles and service characteristics; a series of focus groups with different stakeholders' groups and expert interviews have brought a wealth of insights into the complex nature of the challenges faced by the V2M project. All these inputs were then combined in the Value Proposition Canvas to identify possible value creation opportunities associated with different stakeholders.

In parallel with this marketing approach, a study of existing and potential electricity markets was also undertaken, resulting in a first step in the identification of the potential of V2G to participate in existing electricity markets, and in a subsequent step in the identification of the potential and opportunities for V2G within local distributed flexibility markets. The technical study of the electricity markets has enabled the identification of key elements for different business models, as well as legal, market and policy barriers and opportunities.

Building on the market studies, an economic study was then performed[1]. This study assessed the Total Cost of Ownership (TCO) of three alternatives – a standard diesel car, a standard

[1] *Economic Studies* report from the V2Market project

EV, and a V2G-enabled EV. The TCO was calculated for a total of six different scenarios, combining different outlooks for electricity and battery price evolutions over a total of 7 years.

A first definition of possible business models was carried out[2], defining a standard servitization contract and outlining the contracting elements needed to implement an EPC contract, either with public or private entities as end-clients. The last element of prior work to be taken into account was the report on the creation of the infographics[3] that represent the project, which building upon previous work introduces a very needed dichotomy between EV-owners and charging asset owners and operators, which had up to this point generally been included in the same "end user" category.

Finally, the present work on the key contractual elements results from a series of discussions between the partners in the V2Market consortium, representing the overall V2G value chain.

Based on all this work and also incorporating elements taken from the EN 17669 (EPC minimum requirements), from the standard servitization contract (LAUNCH) that was previously transposed and adapted to V2G by the V2Market project, and from an UK standard contract between an aggregator and a BRP, a compilation of the key issues has been effectuated, and subsequently analysed to extract the material with which to conform the contractual guidelines that are presented separately.

Analysis of key contractual elements for EV owner-aggregator contracts

Key aspects previously identified in the project

The work previously realized within the V2Market project has been parsed through to collect possible key issues regarding the contractual relationship between the Aggregator and the end user. More specifically, the "Design Thinking Structure" document as well as the "List of Participants", the "Analysis of Electricity Markets" and the "Economic Studies" documents have been examined. The raw material from the stakeholders focus groups and interviews has also been examined to look in more detail for all the issues raised by the intervenients.

The Aggregator and EV Owner perception

Drawing upon the methodologies and reports outlined in the 0 Approach section above, this section provides a concise overview of various aspects of V2G services from the perspectives of the EV owner (prospective user of the service) and Aggregator (prospective provider of the service).

In terms of general perceptions of V2G services, both users and providers concur on the crucial importance of accessibility and affordability. Additionally, potential users and providers of this service emphasize that the administrative processes involved in installing charging equipment and utilizing the service should be expeditious, straightforward, and non-deterrent.

[2] Servitisation contracts
[3] Infographic deliverable

EV Owner perception	
Battery degradation	EV owners may have concerns about the V2G services and how they may impact the condition of their batteries. There are fears that the charging and discharging of the battery may reduce its lifespan.
Cost and reliability of the service	EV owners may have doubts about the business model for V2G services and whether they will need to pay upfront costs for charging infrastructure and services. As this is a new service, they may also be unaware of the remuneration for their participation and the implications of joining the program.
Energy management	lack of knowledge about the control of the EV: mainly around battery management and energy availability. Range anxiety.
Lack of reliable and valuable information to decide	Not enough reliable data is available for EV owners to decide informedly on what is best for their individual circumstances.
New incomes	EV owners can perceive some revenues for their energy that can help to reduce the operational cost of vehicles and fleets and the investment cost in new vehicles. However, receiving recurrent income, regardless of its amount, could entail the obligation of registration with the tax authority and making quarterly VAT liquidations.
Air quality and Sustainability	Overall EVs have the potential to decrease the emissions produced by the mobility sector, contributing to the transition towards a cleaner and a more resilient energy system. Nonetheless, the generation of increased amounts of battery waste may dissuade environmentally and socially aware people from participating in V2G services.
Empowerment	Empowerment of the user in contractual agreements with energy retailers. V2G empowers end-users in prosumption, as it enables them to respond to signals (e.g., price) by shifting the charging of the EV to when prices are expected to be low and injecting power into the grid or a building when prices are high

Table 1 – V2G EV owner perception

Aggregator perception	
Regulatory Risk	The lack of regulation in the Spanish market for flexibility services and independent aggregators poses uncertainties for the implementation of V2G services. Although the national law recognizes the independent aggregator figure, there is no proper regulatory framework in place. Current regulations in Spain that refer to aggregators are strictly limited to balancing services and wholesale electricity markets.
Limited and difficult installation of charging infrastructure.	Although EV and EV infrastructures are expected to be massively deployed on a global scale in the coming years there is a lack of standardization of socket, connectors, and communication protocol for chargers.
Lack of experience to participate in electricity market	V2G cannot participate on the global electricity markets. Currently, the regulation only refers to the participation of aggregators in balancing services and wholesale electricity markets. In turn, these services are not yet incorporated in other existing (daily market, intraday, etc.) and future electricity markets (capacity, flexibility, etc.) where they could participate.
Standards and interoperability for V2G implementation.	Development of interoperability standards for communication and control between distributed resources is needed. Also, minimum standards for deploying bi-directional recharging facilities need to be redefined. E-roaming technology and interoperability agreements between final users, charging infrastructure operators and aggregators or electricity suppliers must be developed in order to allow any EV owner to provide their flexibility to the system at any charging point and receive compensation in exchange.

Table 2 – V2G Aggregator perception

Suitable Profiles of EV owner for the different variables

The profile or characteristics of EV owners presented variations in their interests, motivations, and availability to engage in vehicle-to-grid (V2G) services. Not all EV owners are equally suited for V2G services. In accordance with the "Economic Studies" report, the subsequent user groups have been identified as the most appropriate contenders for participating in V2G services:

- EV owners – families or individuals: residential EV owners may be inclined to contract V2G services, as to date EV owners on average do exhibit a substantial level of environmental awareness and of technological understanding.
- Private car fleet operators: Fleets are a great fit for V2G services because they can acquire a large number of vehicles with one contact point: the fleet operator. The operator is interested in optimizing energy-related expenditures for their fleets. For V2G to be efficient and cost-effective for fleets, the vehicles need to be parked for long periods of time. Therefore, it may not be convenient or cost-effective for on-road charging points where drivers want to charge quickly and continue their journey. Fleet owners or operators, with usually long stopovers, and whose mobility patterns are highly predictable may be an accessible and convenient user base for V2M services, such as large or heavy-duty fleets, companies that provide cars as part of their benefit package, rental car operator, last mile delivery companies. Large and heavy-duty fleets

are particularly suitable as they have larger batteries and exhibit highly regular mobility patterns. Fleets with long parking periods, such as airport trucks, also offer a significant opportunity for V2G services. Fleet-owning companies interested in cutting their carbon emissions may also find V2G services attractive. The key to engage fleets is to ensure that V2G services shall not endanger the well-functioning and reliability of the fleet.

- Public fleet operators: such as those managing city buses or government vehicles, have the advantage of being able to electrify a large number of vehicles at once, potentially creating a significant source of flexible power. By participating in V2G services, public fleet operators can optimize their energy usage by selling unused energy back to the grid when demand is high. This can help them reduce energy costs and generate revenue. Moreover, V2G can also help public fleet operators achieve their sustainability goals by reducing their carbon footprint.
  However, ensuring that the vehicles are parked for long enough periods to make V2G economically viable is a challenge. Public fleets that operate on a 24/7 schedule may not be able to park vehicles for long periods, reducing the amount of available energy that can be sold back to the grid. For instance, electric buses used in public fleets, by virtue of their operational requirements, may lack the necessary battery capacity to enable energy injection into the grid.

AMB Pilot

The project involves the development of standardized specifications for the public procurement of V2G (vehicle-to-grid) services. This will enable testing of the connection between the GIVe software provided by Nuvve, the existing electricity markets, and IREMEL (OMIE). The purpose of this testing is to demonstrate the technical feasibility of participating in the markets and managing the charging and uncharging of electric vehicles.

To carry out the testing, 15 Nissan Leaf vehicles with their respective chargers from various brands will be made available for charging. These vehicles will be distributed to different locations, including Molins de Rei, Esplugues, Sant Cugat, Sant Just, and TERSA. By doing so, the project aims to ensure that the software is user-friendly for electric vehicle users and to evaluate the acceptance of the service by end-users in a real-world setting. Also, the pilot will assess the potential of flexibility services that a fleet of these characteristics can provide to the electricity markets, as well as potential public-user patters.

Guaranteed energy after V2G according to driving pattern profiles.

Guaranteeing energy availability after V2G services can be challenging as there is a lack of robust and accurate information about the usage profile of EV for different owners. However, it is crucial to incorporate considerations of future mobility patterns to efficiently serve end-users presently and in the years to come.

One of the main concerns of EV owners when participating in V2G services is ensuring the availability of their vehicles for regular use without any impact on their mobility. Different driving patterns of EV owners may also impact their level of participation in V2G programs. For example, EV owners who primarily use their vehicles for short trips around town may be more likely to participate than those who take long trips that require a full battery charge.

To ensure sufficient mobility autonomy, EV owners want to retain a minimum battery charge of 20% to 30% and avoid battery degradation by keeping the charging level within a range of 20-80%. They also want to adjust the minimum level of battery storage based on their plans for the coming day and only require a 100% charge for very long trips.

In turn, to estimate and provide V2G services, the aggregator must have a comprehensive understanding of the diverse usage profiles of EV owners to effectively aggregate and bid in the market. Certain companies that provide V2G services in other European countries (interviewed during the Market Study), believe that a period of less than two years is inadequate for gathering comprehensive data on the overall V2G experience, encompassing aspects such as battery performance and consumer engagement with the product.

HOLALUZ Pilot

During the implementation phase of the project there has been one significant development in the regulatory environment that consisted in the announcement of regulatory sandbox test environments. This has called the attention of some of the project partners to the relevance and opportunity of adding a second pilot made up of residential clients. The main goal of this pilot is to gain a deeper understanding of the real conditions surrounding residential EV use, such as driving profiles and charging hours, and also to get a feeling for the market "appetite" regarding V2G.

- Pilot sample size: 20 single family homes with Smart-charger, PV self-consumption installation and EV.
- Working mode: V1G – unidirectional manageable charge. (similar to demand response).
- Objective: to test connexion incentives, to obtain user pattern profile data, to test potential V2G acceptance.
- User benefits / incentives / compensations: still to be further studied and defined.

Battery Degradation

As mentioned before, battery degradation is a key concern for EV owners, as it can reduce the lifespan of the battery and lead to costly repairs or replacements.

The battery degradation in V2G services can occur in two main ways: calendrical degradation and operational degradation. Calendrical degradation is caused by environmental factors such as temperature, humidity, and air exposure, and is independent of the charging/discharging pattern. Operational degradation, on the other hand, is influenced by the charging/discharging pattern and can be influenced by factors such as depth of discharge (DoD), state of charge (SoC), charging or discharging current, and frequency of charging cycles.

One strategy for mitigating battery degradation in V2G services is to operate the battery in the middle range of SoC, between 20% and 80%. This can help to avoid extreme states of charge that can lead to battery degradation. Another strategy is to use slow charging and discharging cycles. This can help to reduce the stress on the battery and prolong its lifespan.

Regarding battery degradation some manufacturers, such as Nissan, are claiming that in a real environment via monitoring and smart optimization of the charging cycles (charging/discharging) no major impact will be registered on the batteries' lifetime (meaning that it will not degrade faster than a normal usage of the EV battery).

As V2G technology continues to develop, it is important to continue researching battery degradation and exploring strategies for mitigating its effects.

Data and privacy

The implementation of V2G services raises concerns about data and privacy. One of the main issues is how to collect and distribute data securely. EVs that participate in V2G services often share data like legal identity, location, battery status, frequented stations, and expected usage with aggregators. While access to this information is necessary for V2G services to work properly, it must also guarantee the privacy and consent of the EV owner.

This data is vulnerable to cyberattacks, which could compromise personal data privacy, house security, and the smooth operation of the grid. Therefore, it's important to ensure that data is collected and distributed in a secure way.

Another challenge is related to the ownership of data. EV owners may worry about their data being misused or sold to third parties without their consent. This can increase potential threats such as information theft.

To address these challenges, it's essential to allow consumers to access their own consumption data and disclose it to third parties. This enables consumers to participate in demand management programs, play an active role, and save money on their electricity bill.

As it has already been identified during the study of the electricity markets, a "non-discriminatory data hub" providing "quasi-real time" access to data in line with Directive 2019/944, managed by an independent data operator that would give all suppliers or aggregators access to the same information in an harmonized format, would be a solution to the potential information asymmetry problem.

Additionally, aggregators must implement robust data protection policies and employ secure data storage and transfer mechanisms to protect the privacy and security of EV owners' data.

In conclusion, while V2G services offer many benefits, they also raise important challenges related to data and privacy. These challenges can be addressed through effective data protection policies and mechanisms to ensure consumer trust and confidence in these innovative technologies, while new services and actors might be required to extract all the potential benefits.

Relevant aspects to consider when elaborating a V2G contract.

Generalities

The project partners consider that the usage patterns of the EV constitute an important characteristic that should be reflected on the contract, seeing as these usage patterns have a major impact in the capacity of the EV to participate in the flexibility services. However, since real data from the pilot sites is still not available, the decision has been made to include in the guidelines a reference to the importance of knowing and provisioning for the possible different EV usage patterns. It is expectable that fleet EVs will present a much more homogenous and predictable usage pattern, and conversely it is also expectable that privately owned EVs will be available – i.e. parked and connected to the charger – for much longer periods. However, these expectations are too vague to warrant the definition of specific contractual items or actions.

Contract duration, defined as the length of the contract between the aggregator and an EV owner, is also a point to take into consideration, especially if there is the need to recover the investment in the bi-directional charger. Longer contract durations might be more attractive to the aggregator, and possibly also to the EV fleet owner, but there might be possible regulatory limits that need to be considered.

All commercial aspects, like for instance gamification of some aspects of the service, or the type of measures taken to incentive the user to connect the EV to the charger so as to allow its participation in V2G services, form part of the commercial strategy of the aggregator, and depend both on the characteristics of the aggregators' client pool and on the characteristics of the specific client as well. The guidelines will acknowledge the possible existence of these types of clauses, give some very generic recommendations on minimizing the possible impact of these mechanisms in the EV owners' taxes, and any other general advice.

All the standard and mandatory components of any contract, such as identification of the parts, object, scope, etc. will not be included in this collection of key aspects, but will nevertheless be included in the guidelines where applicable.

Penalties for non-compliance

V2G demands that several conditions are met before it can be activated. First and foremost, the EV must be connected to a V2G charging station at the time of activation; secondly it is necessary that the battery SoC before activation is compatible with the needs of the grid; and thirdly the battery SoC after activation must be compatible with the needs of the user. It is therefore necessary to associate the determination of the rights and obligations of each of the parties with a system of penalties for non-compliance of any of these conditions.

Battery

The user must be duly informed and protected from possible problems resulting from battery degradation that can be directly attributed to the provision of flexibility services.

A key contractual aspect is the ownership of the battery, with the corresponding warranty and maintenance. So if the battery is user-owned, determining all the possible limitations it the battery's manufacturer warranty as connected to the V2G operation is mandatory. On the other hand, if the battery is owned by a third party, e.g. through a servitization contract, it is important to define in the contract with the user the conditions for maintenance/replacement of the battery; the minimum level of service (battery degradation) should also be correctly specified.

Personal data

Regarding the protection of personal data, the main sources of V2G-related data are the charger and the EV itself. Access to some of this data, including potentially also personal data, is needed to correctly render the V2G services. These data should be clearly identified and the access, storage, use and communication to third parties of this information should be protected and regulated on a contractual level.

Voluntary participation, or opposition to the participation in a shared-data repository for market study purposes should be regulated at the contract level. The idea behind this datahub (which does not exist now), is to allow end-consumers to decide to share their information. If they agree, aggregators can see your behaviour and can make you offers or revise contractual conditions periodically, adjusting them to actual usage.

Participation in markets / services provided

Experts and stakeholders agree that detailing in the contract all the markets and services that the EV will take part in through the aggregator is counterproductive, in the sense that the information is not really useful to the end-user, and it could needlessly cut the aggregator off from participating in new markets or services without an amendment to the contract. Instead a general, openly non-exhaustive and non-exclusive description of the kind of markets and services in which the aggregator is currently participating and/or could participate is favoured.

Moreover, such overspecification introduces the risk that the end-user could demand additional information on the actual participation of "their" asset in the market(s).

The aggregators' right NOT to provide detailed information on the participation of each individual asset in markets should be set in the contract, as on the one hand it could be commercially sensitive information, and on the other hand it could be technically complicated/costly to determine on a case-by-case basis.

In the case of the battery ownership and associated costs being supported by the end-user, then the contract might foresee some kind of feedback or information on the market value of the services the EV takes part in through V2G, for the sake of transparency. On the other hand, if the battery ownership is on the aggregator's side, then it would make no sense to provide such information. In any case some experts argue that this would needlessly increase the complexity of the contract, and that the information would have little value to the end-user, since in any case a full breakdown of the aggregator's costs and benefits would be unavailable to the end-user, meaning they would have asymmetric and misleading information about the transaction, leading them to the conclusion that the agreement would always be biased against them.

A "gap" has been identified in the regulation, whereby it is not 100% determined whether in a future local flexibility market (at DSO level - distribution network) an entity will be able to exercise the role of aggregator without being a marketer.[4]

[4] A potential conflict of interest has been identified in the case where the aggregator is a marketer but NOT a BRP, since in this case its interest is to maximise energy sales, and in no case "energy returns".

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Compensation for the service provided

End-user compensation is one of the key aspects of the V2Market contract definition. Whether this compensation is financial or whether it takes the form of a free service or a discount, it should be clearly defined in the contract, as well as all the associated conditions. The end-user must be given on-demand real time information regarding compensation levels achieved and also regarding all the parameters that affect this compensation level and that may depend on them – such as availability, minimum required battery charge, etc. Compensation should depend on at least two separate terms – capacity compensation, that depends on the volume of energy effectively moved from or to the battery, and availability compensation, destined to retribute the time that the EV is made available, regardless of whether V2G services are activated or not.

It is essential to specify what the compensation for the service consists of for the user, as it may have tax implications:

- If the compensation is financial then it is likely to be considered extra income.
- If the user pays less for the charging and/or obtains any other benefit in kind due to the participation in V2G, this is not a revenue
- If, on the other hand, he has energy left over and gives it to the grid in exchange for income, then the user should be taxed on this.

Key "static" parts of V2G contracts

Clauses that by their very nature can be repeated with no substantial change between different instances of a contract referring to the same product / service, irrespectively of the underlying business model, applicable commercial clauses, or other customer-specific provisions, are suitable to be grouped together in the main body of the agreement and identified as "static parts". This constitutes the base of the contract standardization process, which brings several advantages, namely helping facilitate the due diligence processes, as it ensures that important provisions remain unchanged and consistent, and moreover that the respective clauses are easily located and recognised.

The following summary serves as an outline of essential provisions that may be included in the substantive provisions of a contract, regardless of any specific variables that may cause contracts to differ. It is important to clarify that this outline does not constitute a standardized contract but rather serves as an aid for the identification and elaboration of key provisions that should be considered during the drafting process of a contractual agreement.

- **Identification of the parties:** the main body of the contract may contain a first introductory section indicating both the data and references of the service provider (aggregator) and the end customer/client (ev owner/private fleet/etc), including company name, name and surname, legal address, tax identification number, ID number, etc.
- **Definitions and interpretation guide**: the contract should include at the beginning a first section defining all those concepts that are mentioned and are part of the contract, to avoid interpretation errors by the parties. This includes, for example, the definition of V2G services, battery, performance, charger, meter, services, equipment, availability, etc.

- **Aggregator (service provider's) and end user (subscribers) Obligations**: depending on the business model and the agreed service, the obligations of each party should be clearly detailed. By way of example, several aspects to be considered are summarised below:

Aggregator Obligations – service provider
▪ Guarantee the availability of service and support services. ▪ Define the types and extent of maintenance required, including preventive and corrective measures. ▪ Procure and maintain the necessary equipment for delivering the Services in both Vehicles and Facilities. ▪ Obtain the appropriate licenses, insurance, and permits to ensure fulfilment of obligations related to service provision. ▪ Ensure adequate insurance coverage. ▪ Possess the authority to dispose of, replace, and update equipment as necessary. ▪ Monitor various energy flows.
End user - subscriber
▪ Provide necessary Equipment, Facilities, and Vehicles, along with all required information including customer Data and security access information, to facilitate the provision of Services and maintenance by the Aggregator. ▪ Provide energy information such as energy bills and billing data required for the calculation of Service Fees. ▪ Ensure lawful ownership or possession of the Premises and Vehicle and restrict their use to Service provision. ▪ Procure and maintain all necessary licenses, consents, and permits to enable the Aggregator to fulfil its obligations. ▪ Ensure compliance of its network and systems with relevant specifications. ▪ Maintain lawful ownership or possession of the Facilities and Vehicle. ▪ Refrain from licensing, selling, renting, leasing, transferring, assigning, distributing, displaying, disclosing, or commercially exploiting the Services, or making them available to any third party. ▪ Keep the Equipment in its original location, i.e., the Facilities and Vehicle, and obtain prior consent from the Aggregator before attempting to move any part of the Equipment to any other location. ▪ Guarantee that the Aggregator personnel has appropriate physical access to the Facilities, Equipment, vehicles, etc. whenever required.

Table 3 – Aggregator and end-user obbligations

- **Charges and Payments terms:** The agreement should clearly specify the payment terms and schedule for the service. The payment could be based on the time of day, the amount of electricity supplied, the daily/monthly availability range or other factors. The details of how the remuneration itself works should be developed in the flexible part of the contract.
- **Term, suspension and renewal:** The entry into force of the contract shall be specified, as well as it's the terms of its continuation, termination and / or modification, including notice period for termination by either part, and the implicit actions.
- **Intellectual property rights:** It should be noted that the Contract itself does not transfer any interest in terms of Intellectual Property Rights. In other words, any Intellectual Property Rights that belong to or are licensed to either Party shall continue to belong to the

respective Party throughout the duration of the Contract and after its termination or expiration. Moreover, neither Party is allowed to utilize the other Party's Intellectual Property, except to the extent that it is reasonably necessary for the performance of the Contract.

- **Confidentiality:** Considering that each party will have access to the other party's confidential information to fulfil their obligations under the Contract, it is necessary to establish that the Supplier's data, service details, and the results of any performance testing conducted on the services are to be considered as the Supplier's confidential information. Moreover, it is important to acknowledge that the Customer's data is deemed confidential information belonging to the Customer.

  It is also essential to clearly define which information is considered confidential under the new contract, and what information was already known prior to the agreement or is publicly available. Once this has been established, the parties must agree on when the confidential information may be made available to third parties, such as in cases where a governmental entity or market regulator requires access to such information. Additionally, it must be expressly prohibited to disclose the confidential information without prior consent from the disclosing party.

- **Limitation of Liability:** The agreement should clearly define the liability and responsibility of each party in the event of damage or injury caused by the V2G system. This may include specifying the insurance requirements for all parties involved in the agreement.

- **Data Treatment / Subscribers Data - Access and Control:** The agreement should define the level of access and control that the utility company, the aggregator or any agent acting on their behalf has over the EV's battery. This may include determining when the EV can supply electricity, setting the charging rate, and ensuring that the battery remains within safe operating limits.

- **Data protection and Privacy:** Both Parties are required to ensure, at their own expense, full compliance with all applicable data protection legislation. Moreover, they acknowledge that as of the date of the Agreement, neither Party is acting as a processor on behalf of the other. However, if at any point during the Term, either Party has reason to believe that one Party is acting as a processor on behalf of the other, the Parties must engage in good faith negotiations to establish a separate data processing agreement that addresses the requirements specified by the Data Protection Act. Also, the agreement should address the data and privacy implications of the V2G system, including how data is collected, stored, and used, as well as any privacy or security concerns.

- **Force Majeure:** in contracts, it is important to specify the circumstances under which force majeure can be invoked. This refers to unforeseeable events beyond the control of the parties that may affect the performance of the contract. It should be clarified when and why certain actions may be taken in such situations. Force majeure refers to an external and unforeseeable event or circumstance that is beyond the control of the parties involved, and that renders the performance of contractual or non-contractual obligations impracticable or impossible. This constitutes a legal justification that exempts the parties from contractual or non-contractual liability, which is altered by the occurrence of such an event.

- **Services Failures:** the Aggregator is required to inform the end client if it is unable to provide the Services defined in the Terms of Service, whether in whole or in part. In case of any non-compliance with the Service by the Aggregator, this provision outlines the additional measures that the end client may take, including requesting more information or

modifying the service conditions. Furthermore, if the parties are unable to agree on rectifying measures, such as if the failure continues or the information provided is insufficient, such failure may be deemed a material breach of contract.

- **Assignment, assignation, sub-contracting and change in ownership:** It shall be specified that the Agreement is personal to the aggregator and the end customer, i.e. they may not assign, transfer, or encumber their rights and obligations under the Agreement without the prior written consent of the counterpart. If the aggregator subcontracts any part of the provision or obligations of the Services, it shall be fully liable for the acts, omissions, or defaults of any subcontractor (and its employees). If the aggregator's and/or the end customers' ownership, occupancy or use of any property or location changes, or may change, during the Term, they shall notify this immediately, and the parties reserve the right to choose to terminate the agreement in the event of breaches.

- **Complaints and Disputes:** the process for submitting complaints about a service or service provider must be clearly defined. Care should be taken to ensure that the means of submitting a complaint is easily accessible to all parties, within reason. This includes detailing the support services offered by the provider, including the medium/channel (such as mail or telephone), notification deadlines, response times, and subsequent complaint stages. Additionally, if the provider needs to file a complaint about the client's irregular activities, there must be a clear means for doing so. If a complaint is not resolved in these initial stages, the physical or virtual location where the dispute can be submitted should be specified according to the arbitration rules in place (for example, the Madrid Mediation and Arbitration Centre - CIMA). It's important to highlight that both parties must continue to complete their contractual obligations during the arbitration process unless they agree otherwise. Furthermore, in the event of a contractual termination, the dispute will continue to be resolved according to the same process.

- **Audit:** Throughout the duration of the Term and beyond, either party shall have the right to conduct audits on the usage and Service Fee records to ensure compliance with contractual obligations. To this end, it is crucial to include the obligation for the aggregator and the end customer to maintain such records during the Term and subsequent periods, as agreed upon by the parties.

- **Notices:** it is necessary to identify the designated medium for transmitting official notifications regarding the contract. This medium may include, for example, written communication, registered mail, or fax, as well as electronically signed documents. Additionally, it is important to establish the timeframe upon which the recipient is deemed to have received the notification, which may vary based on the selected communication channel.

- **Effects of the Expiry or Termination of the Agreement**: it is required that the contract stipulates the respective rights and obligations of the parties following the expiration of the contract. To summarize, the contract should regulate the disposal of equipment (including removal) and service elements, such as granting access permission to the end customer's vehicle for these purposes, and payment of any outstanding invoices. Additionally, the contract should specify the procedures for organizing the sale and transfer of equipment to a third party or to the customer if they are not the owner of the assets, as well as the destruction of all data related to the contract of both the end customer and the aggregator after the contract term concludes, and any additional document-keeping periods have also elapsed.

- **Nullity or Invalidity:** to maintain the continuity of the contract, it is important to note that if any provision or part of the provisions of the Contract becomes invalid, void, illegal, or unenforceable, only that particular provision will be considered deleted. This deletion will not impact the validity and enforceability of the remaining provisions of the Contract. If any provision affects the agreed-upon service, the parties must act in good faith and come to an agreement on a substitute provision to ensure that the original intention is upheld.

- **Third Party Rights:** the contract should reflect that is not intended to, and does not, give any person who is not a party to it any right to enforce any of its provisions.

- **Governing Law and Jurisdiction:** It is important to explicitly state the applicable legal framework that governs the contract and safeguards the interests of the involved parties. This includes specifying the relevant laws that impact or regulate the contractual obligations, as well as any claims, disputes or inquiries that may arise in relation to the contract or its enforceability.
  It is hereby declared that the contract and any related matter, whether contractual or non-contractual, shall be governed and interpreted exclusively in accordance with the law of a specific jurisdiction. For instance, the Spanish law, wherein both parties irrevocably consent to the exclusive jurisdiction of the courts situated in Spain.

Key incentives or "variable" parts for aggregator/EV owner contracts

On the other hand, clauses that vary according to the specific commercial aspects of the contract, that are determined by the conditions of the client or that reflect different levels of service "quality", for example, can be grouped together and identified as "variable" parts of the contract.

The variable parts included in a V2G agreement will depend on the specific needs of the parties involved and the regulatory environment in which they operate. They will need to accurately reflect the contract type[5], identify the relevant parameters, and establish the relative operational procedures.

From the aggregator standpoint, and in relation to the contract, it is of paramount importance to correctly assess and action the Key Incentives for the aggregator/EV owner, since ultimately these will determine the technical and commercial success of the whole operation. Stating the obvious, V2G is impossible if the vehicle is not connected to a suitable charger during the relevant time window, and is severely hindered if the vehicle's battery SoC deviates too much from the optimum level. These parameters cannot be guaranteed or mandated to be in an optimal state, but, through the Key Incentives, they can be made more likely to be in a near-optimal state through the actions of the EV user/owner/operator. These Key Incentives will be tailored to suit different individual owners, and as such the relative clauses will appear under the "variable" part of the contract.

[5] Taking for example the contract classification proposed by Esther H. Park Lee, Zofia Lukszo, and Paulien Herder in their research article "Conceptualization of Vehicle-to-Grid Contract Types and Their Formalization in Agent-Based Models" (Wiley Hindawi 2017)

The exact content and configuration of the variable part of the contract cannot be described here, as it depends on the aggregator's knowledge of the client, of the sector, and also on its own commercial strategy, but in general terms the following variables will be explored:

Price as activation criterion

The previously cited article restricts its analysis to the flows of energy from the vehicle to the grid, and so according to it the *price as activator criterion* definition is limited to "[the EV owner] defines a minimum price they want to receive for V2G.Therefore, the aggregator will use the vehicle only when they can provide this remuneration (e.g., market price is higher) and as long as there is enough energy in the vehicle". This definition will be extended and generalised in order to encompass more flexibility-related modes, by setting different price levels that mark the limits where the EV owner is willing to transition from one mode to the next.

Contract parameter	Description
Min. V2G price	Minimum price for activation, defined by owner
Guaranteed autonomy left	Minimum guaranteed battery SoC after operation
V2G remuneration	Remuneration for energy supply – could be as a credit for future energy purchases to avoid tax issues
Max. charging price	After the minimum autonomy has been secured, the charging will continue until the desired autonomy is reached only if the energy price is below the Max. charging price
Desired autonomy	Target SoC that is only reached if other conditions concur
Consumption-incentive price level	If the price of energy is at or below this level, charging will continue for as long as possible.

Table 4 – Contract parameters for price as activation criterion

Not all these parameters are mandatory, and neither is the list exhaustive. Depending on the contractual conditions the list can be extended, shortened, or modified. The objective is just to exemplify how the EV / grid energy flows can effectively be manipulated by manipulating energy buying and selling prices.

Volume-based clauses

In this contract modality, the parties agree on a *minimum volume* of energy to be provided annually/monthly by the EV owner for V2G. The compensation for the user can range from better economic conditions for its energy supply contract to additional services or bonuses. These contracts are well suited for EV owners who have very predictable use patterns and can be plugged in regularly, for example, some types of fleet vehicles.

Contract parameter	Description
Time interval	Time interval (start + duration) for availability
Max. energy volume	Maximum energy volume usable for V2G

V2G remuneration	Energy and capacity remuneration
Guaranteed autonomy left	Minimum guaranteed battery SoC after operation
Min. autonomy at plug-in	Calculated battery SoC needed before plug-in

Table 5 – Contract parameters for volume based criteria

In this case, the contract parameters proposed by Esther H. Park Lee et al. can be directly transposed to general V2G operation. As it is also noted by these authors, the compensation or rewards can be made in terms of the committed availability as well as on the actual energy flows engaged.

Control-based clauses

The third standard case is where the EV owner does not commit to a certain amount of electricity provided, but it cedes total control over the battery to the aggregator once it is plugged-in. This mode can be the basis for the pay-as-you-go and the Servitisation contract arrangements. This mode once again fits well with the description of the V2G-only analysis presented in the Esther Lee paper, since control is completely taken over by the aggregator. The only relevant parameters are those regarding general availability of the EV for V2G, owner remuneration and the minimum autonomy at the end of the specified interval. An additional parameter could be included here, to mitigate the user's range anxiety, specifying that a minimum autonomy level should be guaranteed at any given moment for emergency uses. The main drawback of this scheme is that the final user has low power over its own EV, and that the guarantee for emergency uses could be behind its needs.

Contract parameter	Description
Time interval	Plug-in time
V2G remuneration	Energy and capacity remuneration
Guaranteed autonomy left	Minimum guaranteed battery SoC guaranteed after operation
Minimum autonomy	Minimum battery SoC at any time during operation (subject to initial conditions)

Table 6 – Contract parameter for control based criteria

Time based criteria

This mode can be seen as a hybrid between the previous two (i.e. volume- and control-based). Under this mode the EV owner agrees to certain connection times where their vehicle will be plugged in and available for V2G services, as well as charged to an agreed-upon level. This type is very similar to the previous, with the main difference being that the user reward is an entirely free charging service or other bundled benefits.

Contract parameter	Description

Time interval	Time interval (start + duration) for availability
V2G remuneration	Free charging / bundled benefits
Guaranteed autonomy left	Guaranteed battery SoC after operation
Minimum autonomy	Minimum battery SoC at any time during operation (subject to initial conditions)

Table 7 – Contract parameters for time based criteria

General incentives / gamification / others

V2M operators typically avoid giving back direct revenues to the customers due to tax purposes, but this is entirely dependent on the regulatory framework and the commercial strategies of the operator. Obviously, a monetary reward would, tax considerations notwithstanding, be the most appealing for any user, due to the endless flexibility in the use of money. However, discarding this option as not realistic, other potential reward schemes could include credits for ultra-rapid charging or savings on the energy bill (when working with a supplier). In the case of servitization of the user mobility including V2G, the EV owner pays a "mobility fee" that can include lower prices for a given amount of km / month or yr. When applied to fleets, this has the advantages that it automatically translates to an OPEX reduction, while at the same time allowing all the mobility-related expenditure to be transferred to OPEX.

The V2G service can also be offered as a part of a bundle including other energy services, such as energy efficiency projects, renewable energy sources installation or deep energy retrofits.

For contracts and business models specifically targeting individual users/owners, the gamification of some aspects, including but not limited to, the availability of the EV – to incentive daily plugging-in – or the overall available time, can be a very efficient way to promote the user expected behaviour.

Integration of EPC and Servitisation schemes in the standardised contract

V2G services can be embodied in contracts of different nature, reflecting different business models and options. In general, it can be said that the V2G service involves an agreement between the EV owner and the aggregator, whereby

- The EV owner offers the use of his vehicle's battery to the aggregator according to an agreement,
- A battery is only useful to the aggregator if the car is plugged into a V2G-enabled charging infrastructure, and if the battery SoC is between specific values.
- The aggregator manages the EV's battery and offers flexibility services to the DSO,
- The DSO pays the aggregator for these services,
- The aggregator pays (economic premium, or offers discounts/economic benefits, etc.) to the EV owners based on the degree of fulfilment of their contract.

However, the initial investment required for EVs and charging systems can deter some customers from investing in V2G. To address this issue, contractual options such as Energy Performance Contracting (EPC) and Servitization agreements can help reduce the initial investment for the EV owner.

An EPC involves a contractual arrangement between an end customer and an Energy Service Company (ESCo), where the ESCo finances energy efficiency improvement measures and the customer pays based on the savings generated by the project. Two main EPC models include the shared savings and guaranteed savings models.

In the V2G service, the ESCo can make an investment that includes various components leading to energy and economic savings or environmental benefits. For instance, an ESCo can offer V2G services to a private or public fleet through an EPC contract where they invest in the fleet's refurbishment and energy retrofitting of owned buildings/facilities. The ESCo generates energy and economic savings from the project, and the customer repays the investment based on the savings obtained, with V2G revenues helping to reduce the fee or payback periods.

Based on the EN 17669 standard, EPC contracts should reflect at least the following information:

- Contractual energy baseline[6]
- Specification and description of the EPIA[7](s)
- M&V for energy efficiency[8] improvement and other improvement measures
- Beneficiary and energy service provider obligations
- Financing mechanisms
- Guaranteed savings
- Reporting for other improvement measures
- Duration
- Risk assessment, mitigation and allocation

In general, the EPC should specifically “specify reporting guidelines for financial, non financial, sustainability disclosure and property valuators” and also “meet the beneficiary energy performance requirements related to the expected service”. EPC “investments, operational costs and economic profit for the energy service provider are paid for in relation to contractually agreed level of energy efficiency improvement or other agreed energy performance criteria or financial savings”.

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[6] “a value for a reference period that appropriately represents the range of operating conditions ex-ante implementation of the EPIA(s). This enables changes in energy performance to be accurately represented by comparing the EnPIv(s) – Energy Performance Indicator Values – for the reporting and baseline periods.”

[7] Energy Performance Improvement Action – “action or measure or group of actions or measures, implemented or planned, intended to achieve energy performance (measurable result(s) related to energy efficiency, energy use, and energy consumption) improvement through technological, managerial or operational, behavioural, economical or other changes”

[8] “ratio or other quantitative relationship between an output or performance, service, goods, commodities, or energy, and an input of energy”

EPC must include adjustment / normalization factors for each of the baselines. A complete description and specification of the EPIAs must be included, as well as the detailed description of the methodology for the evaluation of the energy performance improvement (ex-post).

Another approach to reduce the initial cost of EVs in a V2G scheme is a servitization contract, Battery-as-a-Service (BaaS), where the EV owner buys the car without the battery, paying a fixed amount per unit of daily range or km driven as per the contract. The ownership of the battery remains with the technology supplier/aggregator, who covers all running costs, and the contract is based on a battery subscription plan. This servitization package removes the cost and status issue of the battery, making the proposition more affordable and accessible.

A servitization contract should reflect at least information regarding term, duration, the service provided, the Contracted Service Levels, the technical specification; description of the different elements of the payment mechanism; the commercial agreements amongst the parties as to the intensity of the service, and schedule and the breakdown remedies; data specific to the plan to be implemented at the subscribers' premises, and a framework in case the Service Provider wishes to propose a change to the Services, or if the Subscriber delivers a Change Request to the Service Provider.

In a hybrid servitization / EPC contract a technological asset is object of servitization (say lighting, for instance), and the retribution for this service includes a variable part as a function of the efficiency of the asset used in providing the service, so effectively creating a stimulus for the provider of the service to upgrade the assets to the latest and most efficient iterations available. Initially it was thought that a hybrid servitization / EPC contract could have benefits within V2G, but due to the nature of the technology involved, it is not feasible to offer the owner of a battery-servitised vehicle the incorporation of the latest and most efficient battery technologies available on the market, since the EV and its battery are functionally developed as a single product and consequently an EV cannot in general function with a battery of a technology different than the one it was conceived to include. Furthermore, on the off-chance that such compatibility would exist, the issues of the vehicle's warranty, roadworthiness homologation, etc. would still pretty much condemn this option.

Overall, EPCs and BaaS schemes can help reduce the initial investment required for V2G services and accelerate their development. It could be noted that while EPC allows the totality of the investment to be executed by a third party, this contract modality is generally not available for individual owners; on the other hand, servitization is well suited to all types of clients, and although it "only" reliefs the EV owner from the investment in the battery, it has the advantage of being a valid option for individual owners.

Monitoring and evaluation of key variables in V2G contracts and services

Monitoring of key V2G related variables have a strong dependence on the specificities of the contract form – simpler contracts have less parameters that need to be monitored and provided to the user, for instance a battery servitization contract could have as few as two – the contracted and remaining battery capacity for the day. On the other hand, complex contracts or with gamification in place might benefit from providing the user/EV owner with extra information.

User side perspective

Given the actual state of information technology, any user will expect at least a mobile app with real time (or quasi-real time) access to the main quantities and performance indicators of their contracted services. This app could act as the main interface between the user/EV owner and the aggregator, serving to share contractual information among them and even possibly to extend the contract items.

Additional parameters to be monitored and displayed would depend on the contract specificities. Nevertheless, and on a related topic, gamifying driving itself in order to stimulate "eco" driving has been tried before[9] and a similar approach might add some value especially to "professional" fleet drivers. By monitoring speed, acceleration, braking, lateral forces, fuel consumption, and the distance covered, a series of benchmarks could be set-up to train drivers in eco-aware driving. These same variables could be mandatory for example in the case of a Measurement and Verification plan attached to an Energy Performance Contract, only in this case they would be required both by the user and by the provider. Below there are some proposed variables the knowledge of which could be of interest to the user, together with a tentative subjective valuation of their relevance, where 1 means it could be needed to fulfil the contract, and 3 means it is good for gaming purposes or to enhance the users feeling of commitment and belonging.

Monitored variable	Relevance (subjective)
Battery SoC	1
Min Batt. SoC after V2G	1
Time to full charge	2
Time to min charge	2
Driving "quality" indicator	3

Table 8 – User side perspective monitored variables

Provider side perspective

The aggregator has a dual role, as provider of energy services to the user, as well as provider of flexibility services to the grid. In order to provide flexibility services to the grid, the aggregator needs to have access to the most updated information that they can get on the projected availability of the V2G resources, for a start. This is not something you can measure or monitor, but if the user has a suitable communication channel (or interface, could be the app that was referred to previously) and is sufficiently incentivized to do so – either by contractual incentives and penalties, by a clever gamification strategy, or by a combination of both – the user himself can be relied upon to communicate the expectable availability and any changes that might occur, at least to some extent. Then, once the EV is connected and available, the aggregator needs to keep track of the hourly energy charging / discharging power profile, the net amount of energy charged / discharged, and the net cost / income associated. The EV's battery SoC

[9] Cf. for instance "A Glass Of Water" app by Toyota

both before and after V2G is a very important variable that must be monitored since it is relevant both for providing services to the grid as well as for providing services to the user.

Monitored variable	Relevance (subjective)
Battery SoC	1
Projected EV availability	1
Actual EV availability	1
Energy charging / discharging power profile	1
Net energy charged / discharged	1
Net cost / income	2

Table 9 – Provider side perspective monitored variables

Integration of V2G and the ESCO model

In the standard ESCO model a set of energy saving measures applicable to a customer's assets is identified, studied and valued. The Energy Performance Contract (EPC) is the instrument of choice in implementing the ESCO business model. EPCs come in two main varieties:

- The Shared Savings EPC model

  In this model of EPC contract, the ESCO generally assumes the burden of financing the Energy Efficiency project and gets a payment from the customer that is at least partially a function of the achieved level of savings.

  One of the main advantages of this EPC model is that while energy savings are being achieved, the ESCO receives performance-based income for the project to operate.

- The Guaranteed Savings EPC model

  In this model of EPC, the client assumes the burden of financing the Energy Efficiency project, while the ESCO assumes the technical risk of guaranteeing a given level of savings for the client. The client pays the ESCO a fee that is calculated based on the guaranteed savings, and there is a system of bonuses and penalties to the ESCO in the case that the verified savings are significatively higher or lower than agreed upon, respectively.

The following figure illustrates graphically how V2G can potentially be integrated in the standard ESCO business model.

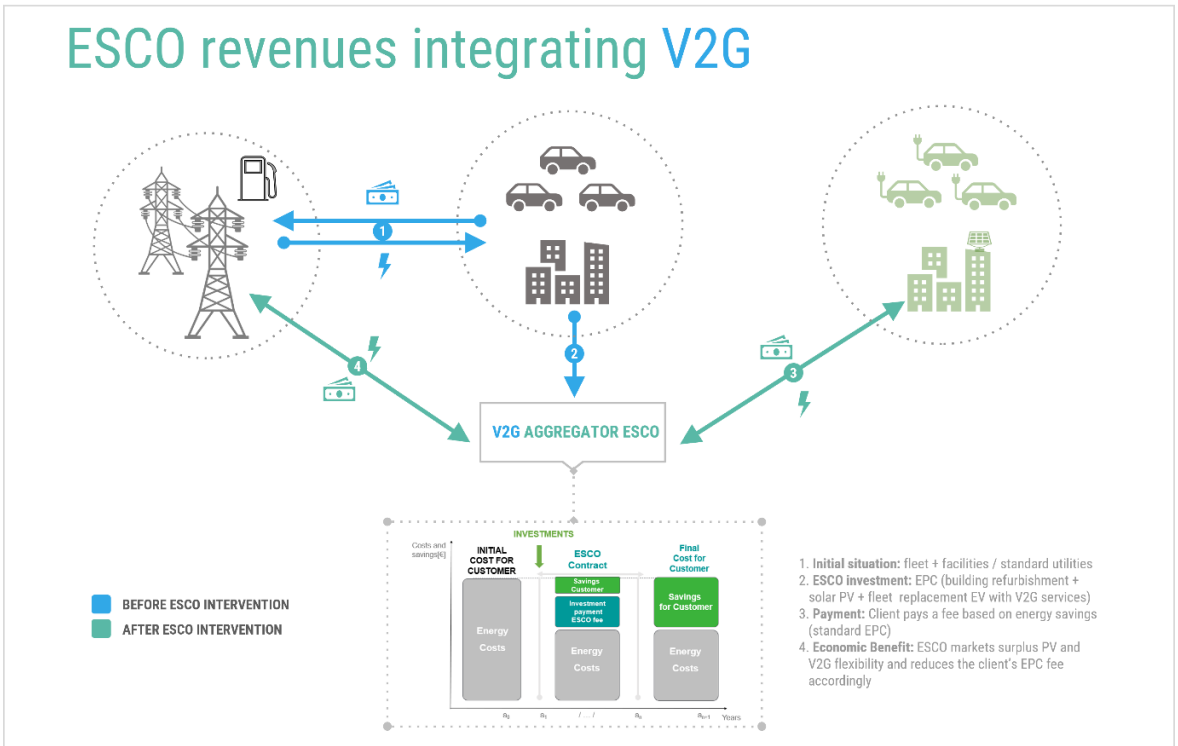

Figure 1 – ESCO revenues integrating V2G

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In both the Shared Savings and the Guaranteed Savings modalities, assuming that either the client already has a V2G compatible EV fleet, or that the fleet renovation, replacing ICEVs with V2G compatible EVs, is one of the energy saving measures, V2G can be included in the ESCOs Business Model as an additional revenue stream, as it is illustrated in the above figure (as an example):

- This represents the initial situation, in which the client has an outdated and inefficient ICEV fleet, and inefficient buildings and facilities.
- The client and the ESCO sign an EPC, through which the ESCO invests in Energy Efficiency Improvement measures on the buildings, PV on the rooftops and fleet replacement (making this a shared savings EPC).
- The client now pays the ESCO a percentage of the verified savings. Since the ESCO has additional revenue streams, the percentage can be lower, or the contract duration can be shorter – both advantageous to the client.
- The ESCO benefits from the sale of surplus PV energy, and from the sale of flexibility services through V2G, allowing it to offer better conditions to the client, which ends up being a competitive advantage allowing it to outperform the competitors.

Conclusions and Next Steps

Exploring the legal aspects and determinants involved in the establishment of standardized contracts for the V2G service is crucial for its development.

Both the EV owner and aggregator must address several questions before considering participation in this service. The EV owner's perspective highlights concerns related to vehicle battery degradation, service cost and reliability, insufficient information for decision making, limited availability of the battery for regular vehicle use, and data privacy. Conversely, from the aggregator's standpoint, regulatory uncertainty exists regarding the definition of their role and the markets in which they can offer flexibility services. Additionally, the lack of mass deployment of chargers and EVs, as well as a need for standardization of plugs, connectors, communication protocols, and interoperability standards at the network level to control and communicate distributed resources are additional barriers currently encountered.

Notwithstanding the challenges, new revenue streams for both parties, cost reduction of EVs, and citizen empowerment through participation in various markets are significant drivers motivating their engagement in the V2G service.

Standardizing contracts offers several advantages, such as facilitating due diligence processes and ensuring consistency and clarity in important provisions and relevant clauses. To accomplish this, clauses that remain largely unchanged across different contracts, irrespective of business or service models, are identified as “static parts” and grouped together in the main body of the agreement, forming the base of the contract standardization process. Those clauses were identified, serving as an aid for the identification and elaboration of key provisions that should be considered during the drafting process of a contractual agreement Conversely, clauses that vary depending on specific commercial aspects of the contract, customer conditions, or different levels of service quality are grouped and identified as "variable" parts of the contract. In this sense, various incentive mechanisms for users were analysed, including price-based activation criteria, volume and control-based clauses, and time-based criteria. Additionally, other types of incentives were considered, such as credits for ultra-rapid charging or savings on energy bills, along with the possibility of implementing gamification schemes.

EPCs and BaaS schemes can help reduce the initial investment required for V2G services and accelerate their development. On one hand, EPCs allows the totality of the investment to be executed by a third party, but this contract modality is generally not available for individual owners; on the other hand, servitization is well suited to all types of clients, and although it “only” reliefs the EV owner from the investment in the battery, it has the advantage of being a valid option for individual owners.

As illustrated through an example, V2G can potentially be integrated into the standard business model of ESCOs, generating new additional sources of revenue. Based on all this work and incorporating elements taken from the EN 17669 standard (EPC minimum requirements), from the standard service contract (LAUNCH[10]) that was previously transposed

[10] https://www.launch2020.eu

and adapted to V2G by the V2Market project, and from a UK standard contract between an aggregator and a BRP, contractual guidelines will be developed in separate reports.