

# AVERE

The European Association  
for Electromobility

## Harnessing the Potential of Vehicle-to-Grid (V2G): Recommendations for a Robust Legislative Framework for V2G Integration



# Introduction

Europe's energy system urgently requires enhanced flexibility to ensure the energy security of European customers now and in the future. Demand-side flexibility (DSF) offers a valuable opportunity for balancing the demand-supply dynamics and optimising the use of electricity infrastructure. In this regard, smart charging, which is also called V1G, is a form of unidirectional charging of an electric vehicle (EV) that optimizes the charging process based on the state of the grid or the price of electricity. By controlling the time and power from the charging source to an EV, V1G helps manage the congestion in the grid at the time of a peak in demand. While the implementation of the V1G technology does not require costly and complex investments, it also provides an immediate solution to the national grids that are currently under stress. On the other hand, bidirectional charging as another form of DSF allows EVs to function as energy storage capabilities alongside their primary transportation role. **By doing so, it plays a crucial role in energy flexibility.**

**As our energy landscape undergoes a paradigm shift, the revolutionary potential of bidirectional charging becomes increasingly prominent.** The most common application of bidirectional charging is vehicle-to-grid (V2G) technology, which enables EVs not only to draw power from the grid but also to inject surplus energy back into it during periods of peak demand. The collaborative efforts of EU-funded Horizon Europe projects such as SCALE and FLOW play a pivotal role in scaling up V2G technology, fostering innovation, and addressing the challenges associated with its widespread adoption. This collaborative approach is key to refining and standardizing V2G technology, making it more accessible to the mass market. Even though V2G should not be mandated, considering both AC and DC charging, until markets and technology become more mature, challenges to the widespread adoption of V2G persist despite recent legislative strides in the EU such as advancements in the Renewable Energy Directive (RED), Batteries Regulation, Alternative Fuels Infrastructure Regulation (AFIR), and the Energy Performance of Buildings Directive (EPBD). **Recognition of the remaining legislative barriers is crucial for unlocking the full potential of V2G and ensuring its seamless integration into our energy infrastructure.**

AVERE advocates for e-mobility solutions and recommends building a robust European legislative architecture that addresses regulatory gaps, incentivises investments, and creates an environment conducive to the widespread adoption of V2G technology. AVERE's recommendations in this position paper call on concrete actions to enable V2G technology to play a transformative role in achieving a sustainable, flexible, and interconnected energy future.

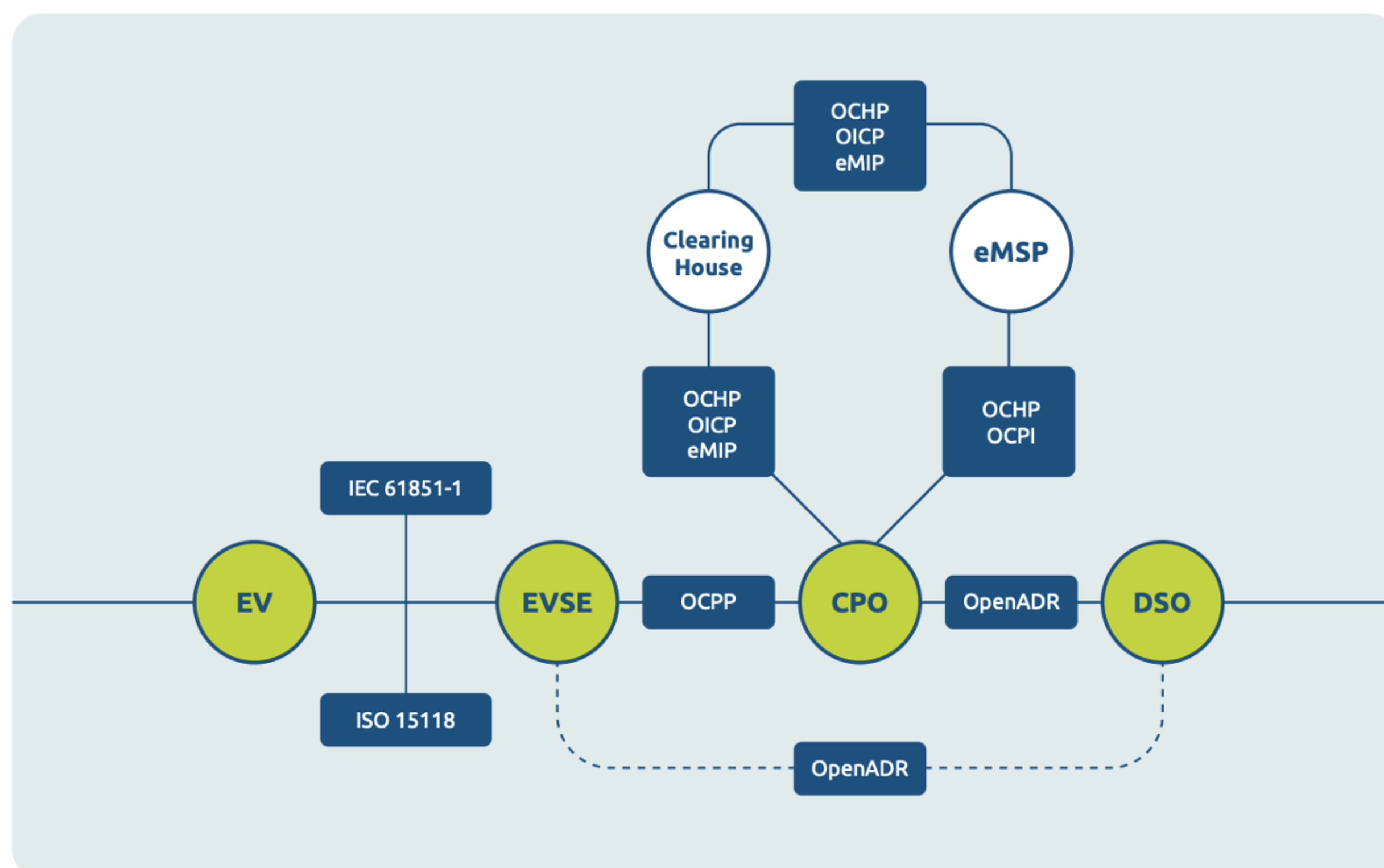
## **AVERE's Key Recommendations for Harnessing the Potential of Vehicle-toGrid (V2G):**

- 1.V2G should not be mandated, considering both AC and DC charging, until markets and technology become mature.
- 2.Data interoperability should be based on unified open standards and harmonized along the value chain.
- 3.Double taxation in the bidirectional charging of EVs should be prevented.
- 4.V2G services among customers and businesses should be encouraged through financial incentives.
- 5.Roll out of electricity meters should accelerate across the Union.
- 6.Equal access and participation to flexibility, such as grid codes for all types of bidirectional charging should be guaranteed.
- 7.An EU regulatory framework on cybersecurity should be legislated and its robust implementation for the V2G should be ensured.

## 1) Support Interoperability and Embrace Standards

An interoperable charging environment across Europe is a prerequisite for accelerating the uptake of EVs. **EV users must be able to use all charging stations regardless of their customer subscription with the service provider.** In the ever-evolving landscape of bidirectional charging, a critical challenge lies in the limitations of current communication standards to fully support the information and control requirements for both V1G and V2G. While ISO 15118-20 theoretically provides a framework for V2G support, the practical implementation by Electric Vehicle Service Equipment (EVSE) and Electric Vehicle Original Equipment Manufacturers (EV OEMs) remains constrained and goes beyond individual EVs and charging stations. The current deficiency in the communication standards can be overcome by adopting measures for harmonising and updating the communication standards across the EU energy system. The harmonisation of standards should include back-end operations, smart grids, and billing processes.

Achieving seamless roaming and billing at both national and EU levels further underscores the urgency for standardised protocols. Fortunately, existing standards such as OpenADR, Open Charge Point Protocol (OCPP), and Open Charge Point Interface (OCPI) offer a solid foundation, therefore, the EU legislative framework can already build on the existing standards rather than reinvent the wheel. **Upgrading the currently established standards of OpenADR, OCPP, and OCPI to create an EU-wide framework will ensure a more efficient and streamlined development process for the V2G technologies.** In order to navigate the complexities of implementing bidirectional charging, supporting interoperability and enabling collaborative efforts toward standardisation remain imperative to unlock the full potential of this transformative technology.



Overview of the most dominant standards and protocols related to EV charging

Source: SCALE project, Project Deliverable Report 1.2 - Stakeholder Analysis, page 85, 2022.

## Recommendations:

1. Make ISO 15118-20 communication protocol an EU-wide standard for vehicles and charging points;
2. Build on the existing OpenADR, OCPP, and OCPI standards to develop an EU-wide framework.

## 2) Tackle the Double Taxation Issue and Provide Incentives for Consumers to Use V2G

Encouraging the use of V2G not only goes through providing incentives but also through abolishing existing disincentives. A significant impediment to the widespread adoption of bidirectional charging schemes and similar flexibility services across Member States is the potential for double taxation, both in the current iteration and within the proposed revision of the Energy Taxation Directive. This issue particularly impacts facilities capable of drawing electricity from the grid and subsequently reintroducing it at a later time, encompassing various battery and energy storage systems.

**From a consumer perspective, this double taxation serves as a disincentive for the utilisation of V2G technology, as it results in a twofold cost for essentially not utilising the energy fed back into the grid.**

Such a scenario not only discourages consumer engagement but also hinders the development of prosumer business models that encourage consumers to actively contribute flexibility services to the energy system. On the supplier and system operator fronts, the double taxation issue in bidirectional charging imposes an unnecessary administrative burden.

To prevent impeding V2G services, it is imperative to avoid the meticulous tracking and taxation of each energy transaction as the methodologies for electricity pricing and grid tariffs should encourage behaviour that supports the grid. **Taxes and tariffs should be exclusively applied to the amount of energy effectively utilised by the end user, necessitating the implementation of proper metering to ensure fair and accurate billing.** This approach will safeguard against hindrances to the seamless operation of bidirectional charging services and promote the efficient and equitable taxation of energy consumption. As such, AVERE suggests some modifications as part of the Energy Taxation Directive's recast to ensure taxation plays an active role in incentivising V2G technology.

### Current European Commission proposal:

Art. 22.4: ...For the purposes of the first subparagraph, electricity storage facilities and transformers of electricity may be considered as redistributors when they supply electricity.

### AVERE's proposed amendment:

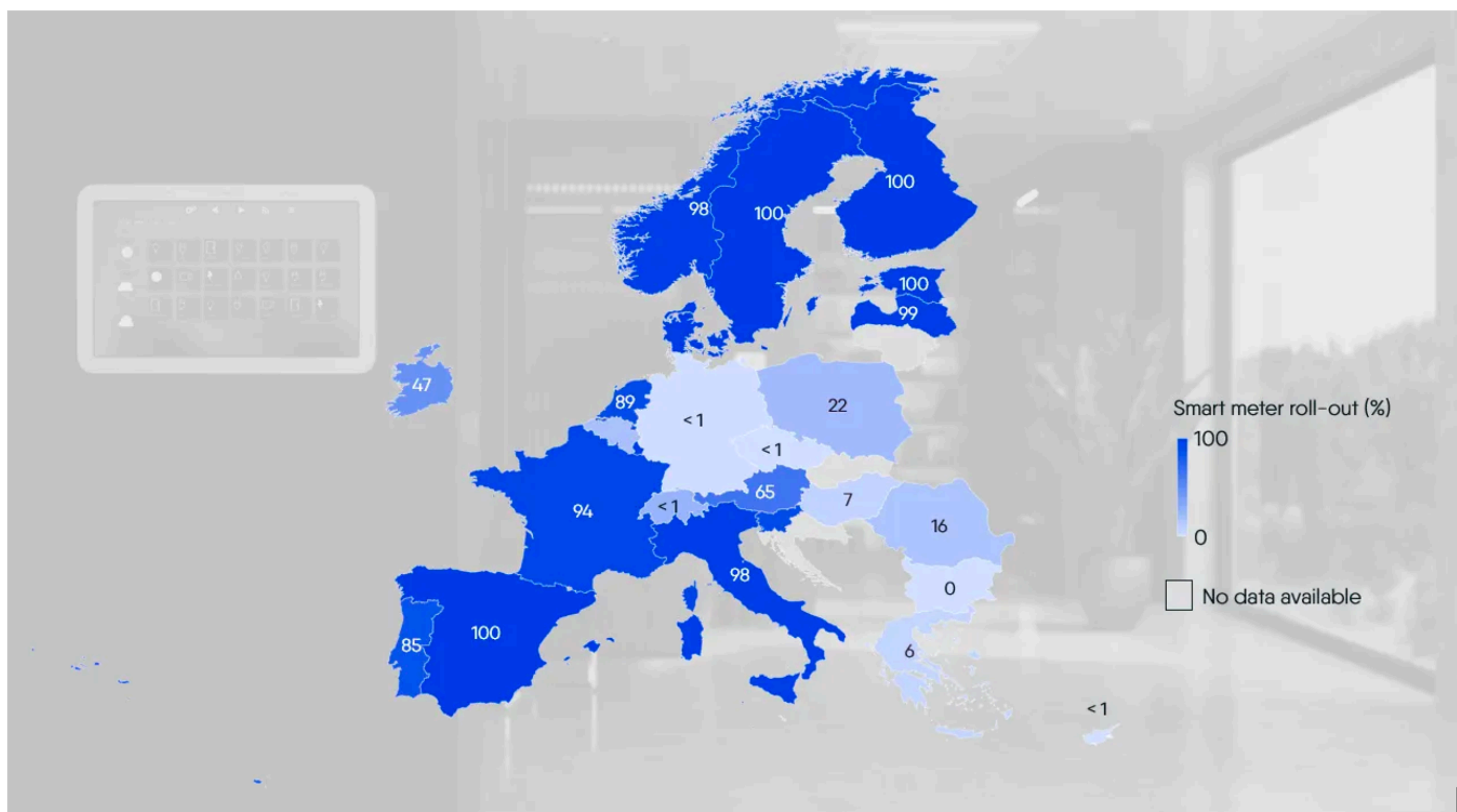
Art. 22.4: ...For the purposes of the first subparagraph, electricity storage facilities and transformers of electricity ~~may be~~ **shall be** considered as redistributors when they supply electricity. **Active customers (as defined in Directive (EU) 2019/944 Art. 2(8)), including electric vehicle or battery owners participating in bidirectional charging schemes and other customers providing flexibility services to the grid, shall be considered as redistributors, and as such shall be exempt from taxation on energy which they reinject into the grid.**

Apart from addressing the issue of double taxation as an obstacle to the use of V2G, **end-users should be incentivised through rewarding schemes to charge their vehicles during off-peak hours to reduce power grid congestion.** To encourage the use of V2G, it is essential that the Member States introduce dynamic tariffs for electricity used in charging EVs to encourage use of V2G among customers.

### Recommendations:

1. Modify the Energy Taxation Directive to ensure that battery electric vehicles participating in bidirectional charging are considered as redistributors and are exempt from taxation on energy;
2. Provide financial incentives such as dynamic tariffs for customers to use V2G.

### 3) Establish a Robust Electricity Metering System



Source: Eurelectric, Power Barometer 2023, <https://powerbarometer.eurelectric.org/>.

The seamless implementation of bidirectional charging hinges significantly on the establishment of a robust electricity metering system. Various Vehicle-to-Grid Integration (VGI) services rely heavily on data obtained from electricity meters measuring the power and energy exchange of the charger. Whether integrated into the chargers themselves or as a separate series electricity meter installed at the charging point, these electricity meters must adhere to stringent accuracy and precision requirements. Compliance with these requirements is contingent upon the specific service provided and aligns with the standards applied to settlement meters. However, the implementation of such high-precision metering systems introduces added costs and complexities, influencing the overall feasibility of bidirectional charging deployment. **Striking a balance between the need for accurate data for VGI services and the associated financial and logistical considerations is imperative to ensure a smooth and cost-effective roll-out of bidirectional charging infrastructure.**

In this regard, the Electricity Directive under the EU's Electricity Market Design package is a key European legislation that puts forth measures both for smart meters and data management. However, its transposition into national legislation in some Member States has been significantly delayed. This has caused immense disparities in terms of the roll-out of smart meters in the charging infrastructure across the EU. Thus, it is imperative for the widespread adoption of V2G technology that the existing European legislation is implemented on time. **In view of achieving the EU's climate objectives, AVERE calls on the European Commission to strictly follow infringement procedures for the Member States that have been delaying a timely transposition of the EU regulatory framework on the electricity markets.**

Beyond the deployment of metering devices, it needs to be ensured that the smart meters are approved under the Measuring Instruments Directive (MID). The MID describes the approval procedure for measuring instruments – including electricity meters. The use of MID can ensure that the meters used in charging stations are reliable and accurate enough to both document the delivery of flexibility services and be able to document the delivery of effect-based services such as frequency regulation. Moreover, the MID-certified meters are used to transfer, via the chosen communication protocol such as the OCPP, the energy consumption to the transactions recording system, so that it can be used as part of the final settlement of expenses. **As part of the integration of V2G-ready chargers into the EU's energy architecture, it is essential to ensure that these chargers are recognised by the MID to ensure their approval procedures in the Member States are seamless.** As part of the current discussions around the potential revision of the MID, AVERE suggests European decision-makers include V2G chargers in the scope of the revision of the MID.

#### **Recommendations:**

1. Implement, swiftly, the EU regulatory framework on electricity markets to ensure electricity meters are rolled out in all Member States;
2. Include V2G charging points in the scope of the revision of the Measuring Instruments Directive.

#### **4) Ensure Grid Operators Provide Flexibility Services**

Market participants need to depend on standardised regulations throughout the EU, encompassing market regulations, technical standards, and grid codes. This will ensure the establishment of an efficient single market for V2G services. As a consequence of standardisation of regulations, bidirectional charging, including V2G, will become an appealing choice for a broader user base, leading to an upsurge in the number of vehicles participating in Europe. Bidirectional charging stations enable the storage of electricity in vehicle batteries, allowing for injection back into the grid. This functionality offers flexibility and aids in balancing the grid. **Therefore, V2G technology is a very good example of the flexibility that electromobility brings to the energy system.** However, the services and mechanisms that would allow a grid operator to use the flexibility from EVs for grid investment deferral are still not mature. Whether the flexibility should be invoked through implicit or explicit price signals, bilaterally, or through a market is still not settled. There is also still no clarity at the EU level for how EV owners are to be reimbursed for providing flexibility services. Increasing the use of bidirectional technologies can be possible by incentivising measures that will encourage end-users to adopt V2G technology. **As part of these incentives, remuneration frameworks should be set up for the end-users to be reimbursed for providing flexibility services.**

Another major enabler for the uptake of V2G services is providing incentives to businesses for their use of V2G. Access to the market is crucial for the advancement of V2G technology, as it will allow utility companies to receive compensation for the flexibility and advantages they provide to the energy system. The V2G businesses must be allowed to participate in wholesale energy and balancing markets under an aggregation framework in force that adjusts market rules such as minimum bid sizes and metering requirements for V2G along with allowing multiple V2G service providers per connection point. **In order to harness the potential of V2G, Member States should fully implement, without further delay, the regulatory framework set by the Electricity Market Design which includes measures on non-discriminatory access to all electricity markets and the full recognition of independent aggregators as market participants.** Thanks to the opening of markets to V2G businesses, the stability, and reliability of the European grid will be supported by V2G services such as frequency regulation, voltage control, and spinning reserve among others.

Grid codes are essential for establishing trust between system operators and stakeholders, serving as a key instrument to guarantee the continuous security of power supply in a system. However, the regulations of the Agency for the Cooperation of Energy Regulators (ACER) establishing network codes on requirements for grid connection of generators do not include EVs and battery energy storage systems. As uniform grid codes will enable V2G technology by avoiding significant adjustments or obstacles on a country-by-country level, the ACER regulations on Network Code on Requirements for Grid Connection of Generators and Network Code on Demand Connection should be updated to include V2G. Furthermore, it should be ensured that internationally recognised open standards and protocols, namely OCPP, OCPI, OCSP, and ISO15118, are adopted across the EU.

Thus, the ongoing process of electrification of the European road transport sector can be transformed into a smart and advantageous endeavour for the EU energy system by establishing a regulatory framework that encompasses energy regulation, grid codes, and a market for bidirectional chargers and services in Europe. This shift would not only avoid becoming a burden on the energy system but also ensure that the benefits are extended to European societies as a whole.

#### **Recommendations:**

1. Establish a remuneration scheme/market to recognise the flexibility offered by V2G recharging points;
2. Update ACER's Network Code on Requirements for Grid Connection of Generators and Network Code on Demand Connection to include V2G.

### **5) Put Cybersecurity at the Forefront of V2G Deployment**

With the incorporation of EVs into the electrical grid via V2G technology, it becomes crucial to guarantee the safeguarding of vital infrastructure and confidential data. Even though V2G does not require additional cybersecurity requirements, the deployment of bidirectional charging in the EU requires a comprehensive approach to cybersecurity in order to safeguard against potential cyber-attacks with the capability to disrupt energy grids and cause widespread outages. Protecting sensitive data, implementing secure authentication and authorization mechanisms, and ensuring the integrity of communication channels are paramount in mitigating the risk of cyber threats. Continuous monitoring, intrusion detection, and stringent physical security measures are essential to prevent unauthorized access and tampering.

**Adherence to cybersecurity regulations, standards, and proactive collaboration among stakeholders is crucial for maintaining a resilient V2G ecosystem.** By staying informed about evolving threats, regularly updating software, and fostering collective defense initiatives, the EU can fortify the security of bidirectional charging infrastructure, serving as a bulwark against cyber-attacks and ensuring the reliability and continuity of energy supply.

The Cyber Resilience Act (CRA) of the EU introduces measures to enhance the cybersecurity of products in terms of hardware and software throughout their life cycle and improves the transparency of information towards the customers. It is important that the new EU legislations such as the CRA do not create a compliance burden on the Charging Point Operators (CPOs) and other actors in the e-mobility sector. The timely implementation of the CRA will help to strengthen the cybersecurity resilience of the charging infrastructure and V2G services in the EU. Building on the CRA, the Cyber Security Act (CSA) will help harmonise the European system for the cybersecurity certification of ICT products, services, and processes.

Similarly, the NIS2 Directive remarks the need to have products, services, and processes employed by essential entities to have the corresponding security certification. With the modernisation of the NIS2 Directive, the overall level of cybersecurity of the network and information systems will be improved in the EU. However, it remains unclear when it comes to enforcement of its provisions. It is important that the Member States do not introduce specific requirements different than the general EU framework. **In order to support a coherent implementation of the NIS2 Directive, the European Commission should publish a guideline for avoiding the fragmentation of the cybersecurity framework and the burden for CPOs.** Depending on the product or service under consideration, the cybersecurity of V2G is governed by different regulations namely Radio Equipment Directive Delegated Regulation and Cyber Resilience Act as well as different certifications such as EU Type Examination Certificate, EUCC, or European Cloud Services cybersecurity certification scheme under development currently. It is important to develop a tailor-made certification scheme at the EU level for the key components of the architecture.

While acknowledging these legislative acts to improve safeguarding the cyber-security of V2G technologies, the European decision-makers should, thereafter, accelerate the implementation of the current EU cybersecurity framework. Furthermore, in order to mitigate the risk of cyber threats and vulnerabilities, the future European framework for cybersecurity should regulate access control mechanisms such as multi-factor authentication, encryption of sensitive data, deployment of firewalls and other network security devices, intrusion detection and prevention systems (IDS/IPS), regular security auditing and testing, and maintenance of regular backups of critical systems and data. In order to do so, **AVERE recommends that the European Commission publishes a guideline on the implementation of the cybersecurity regulatory framework that takes into account the market dynamics.** Equally important, the European Commission should ensure the standardisation process of cybersecurity and enforce the standardised security certification requirements applicable to the components of the V2G architecture.

Simultaneously, the existing diversity in security standards poses a challenge to building robust cybersecurity capabilities, hindering the adoption of centralized network structures that could take advantage of economies of scale. A harmonised EU legislative framework for cybersecurity will greatly simplify networks and operations throughout Europe. Harmonising the cybersecurity requirements would enable CPOs to procure secure charging stations more efficiently. This streamlines the process of developing requirements, as they are readily accessible, potentially saving time and resources.



Additionally, it guarantees the practicality of these requirements, having been validated through market surveys and past tenders by different operators. Moreover, it cuts down on implementation expenses, as vendors are provided with a standardized set of criteria to adhere to, thus eliminating the need to repeatedly implement security measures.

**For a robust implementation of the cybersecurity framework in the EU, the Member States should ensure sufficient and adequate staffing of local and regional public authorities with relevant skills and qualifications.** Moreover, achieving the objectives of the EU's cyber-security legislation relies on the European Commission's effective monitoring of the Member States in regard to the national measures in place for enhancing the security of V2G technologies. Last but not least, the overarching issue at stake for a robust implementation of the cyber-security framework is the lack of clarification for the standards and norms that determine what is considered as secure or not.

Thus, the implementation of existing and upcoming EU regulatory framework on cybersecurity in a harmonised matter at the EU level is essential for V2G to obtain necessary access to vehicle data and enforce cybersecurity measures for vehicle owners. Additionally, consumers should have the right to provide consent for third-party access to their data.

#### **Recommendations:**

1. Legislate a harmonised European regulatory framework on cybersecurity;
2. Ensure a robust implementation of the EU regulatory framework on cyber-security.
3. Enhance upskilling and reskilling of public authorities on cybersecurity aspects related to the V2G services.

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