

## SBD Explores: Bi-directional Charging

### Unlocking the Potential: EU's initiatives for grid balancing and renewable energy

#### 10-minute Insight

Article 15 of Regulation (EU) 2023/1804 states that, by 30<sup>th</sup> June 2024 and every three years thereafter, EU member states shall assess how the deployment and operation of recharging points could enable electric vehicles to further contribute to the **flexibility of the energy system**, including their **participation in the balancing market**, and **to store renewable electricity**.

In this edition of SBD Explores, the implications of the Regulation for EV owners, energy consumers (including non-EV owners), automakers and charging equipment companies are discussed.

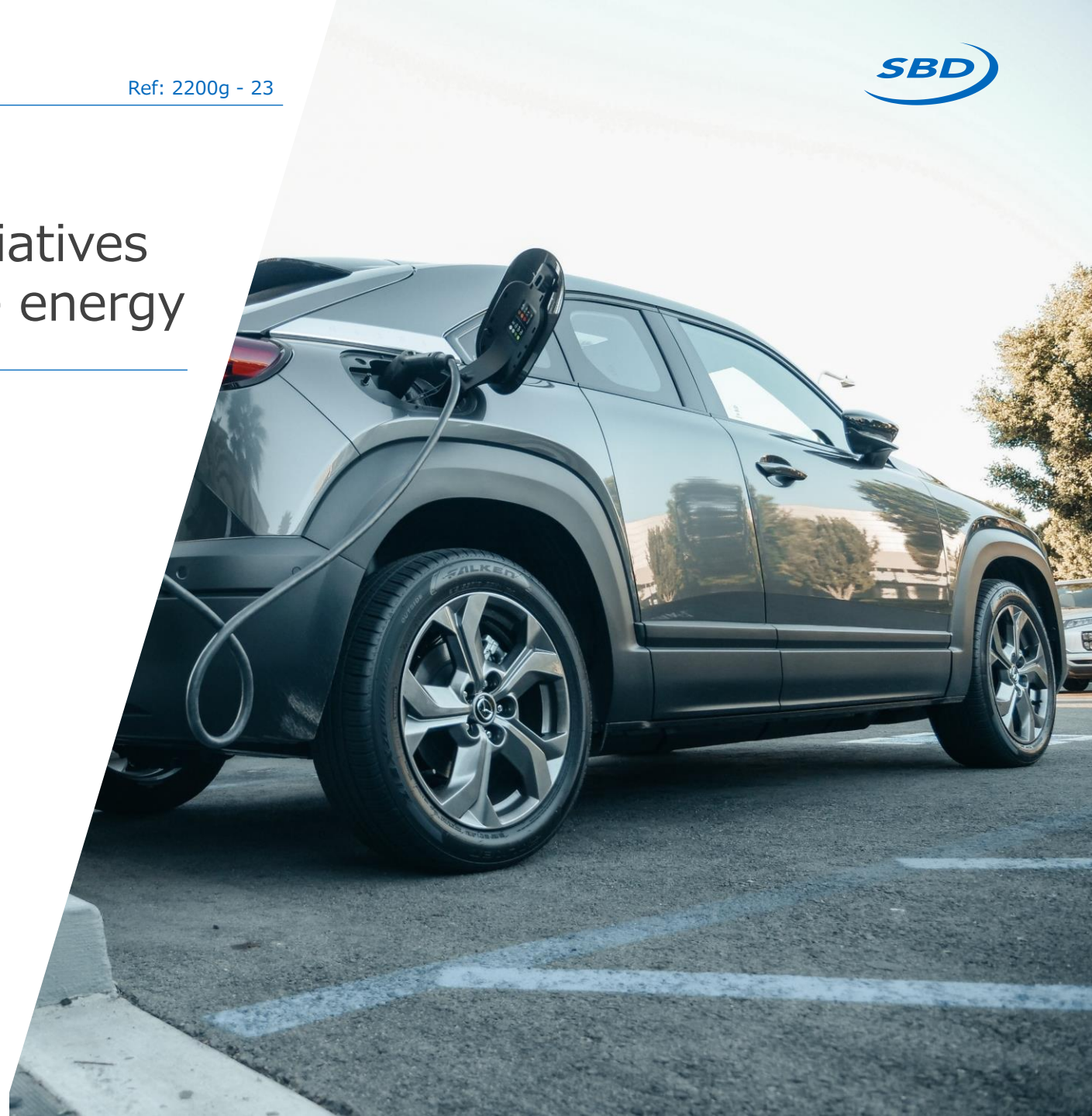
#### Target audience

Product planning Strategy

Marketing R&D Finance

#### Focus market(s)

EU



# What is happening?



Paragraph 3 of Article 15 of Regulation (EU) 2023/1804

3. By 30 June 2024 and every three years thereafter, Member States shall assess how the deployment and operation of recharging points could enable electric vehicles to further contribute to the flexibility of the energy system, including their participation in the balancing market, and to the further absorption of renewable electricity. That assessment shall take into account all types of recharging points, including those offering smart and bi-directional recharging, and all power outputs, whether public or private, and provide recommendations in terms of type of recharging point, supporting technology and geographical distribution in order to facilitate the ability of users to integrate their electric vehicles in the system. That assessment shall identify appropriate measures to be implemented in order to meet the requirements set out in this Regulation including those to ensure the consistency of infrastructure planning with the corresponding grid planning. That assessment shall take into account input from all stakeholders and shall be made publicly available. Each Member State may request its regulatory authority to carry out that assessment. On the basis of the results of the assessment, Member States shall, if necessary, take appropriate measures for the deployment of additional recharging points and include those measures in the national progress reports referred to in paragraph 1 of this Article. The assessment and measures shall be taken into account by the system operators in the network development plans referred to in Article 32(3) and Article 51 of Directive (EU) 2019/944.

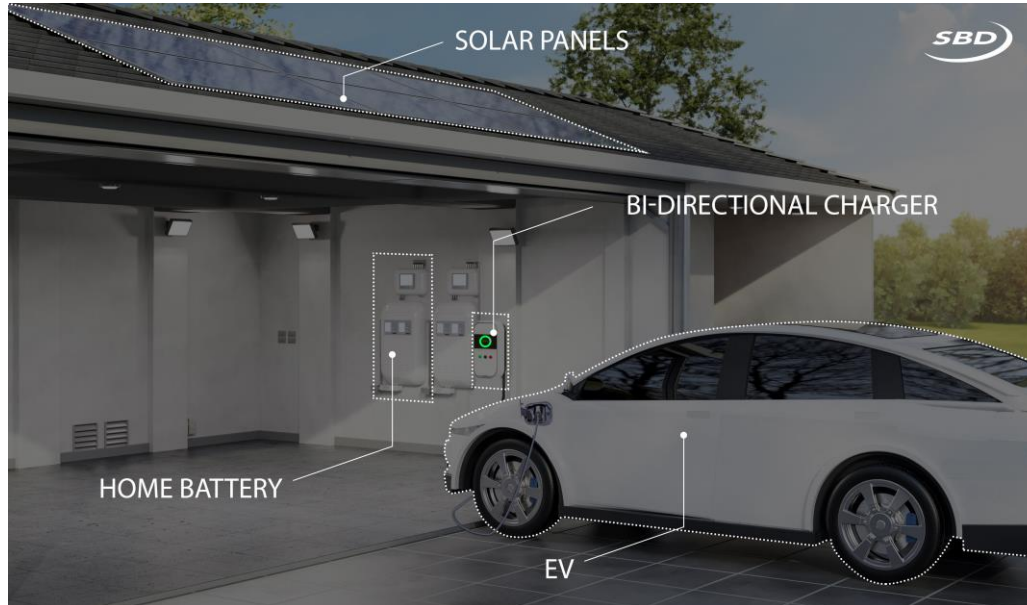
## Key takeaway

**Regulation (EU) 2023/1804 will apply from April 13, 2024. Article 15 of The Regulation requires member states to assess options for the integration of EVs with the power grid using V2G technology.**

The EU regulation establishes mandatory targets for the gradual deployment of V2G integration. It also establishes a reporting mechanism for current energy infrastructure. This mechanism includes an assessment of recharging point types, including smart and bi-directional options, as well as public and private power outputs. The assessment should include recommendations for recharging point types and geographical distribution.

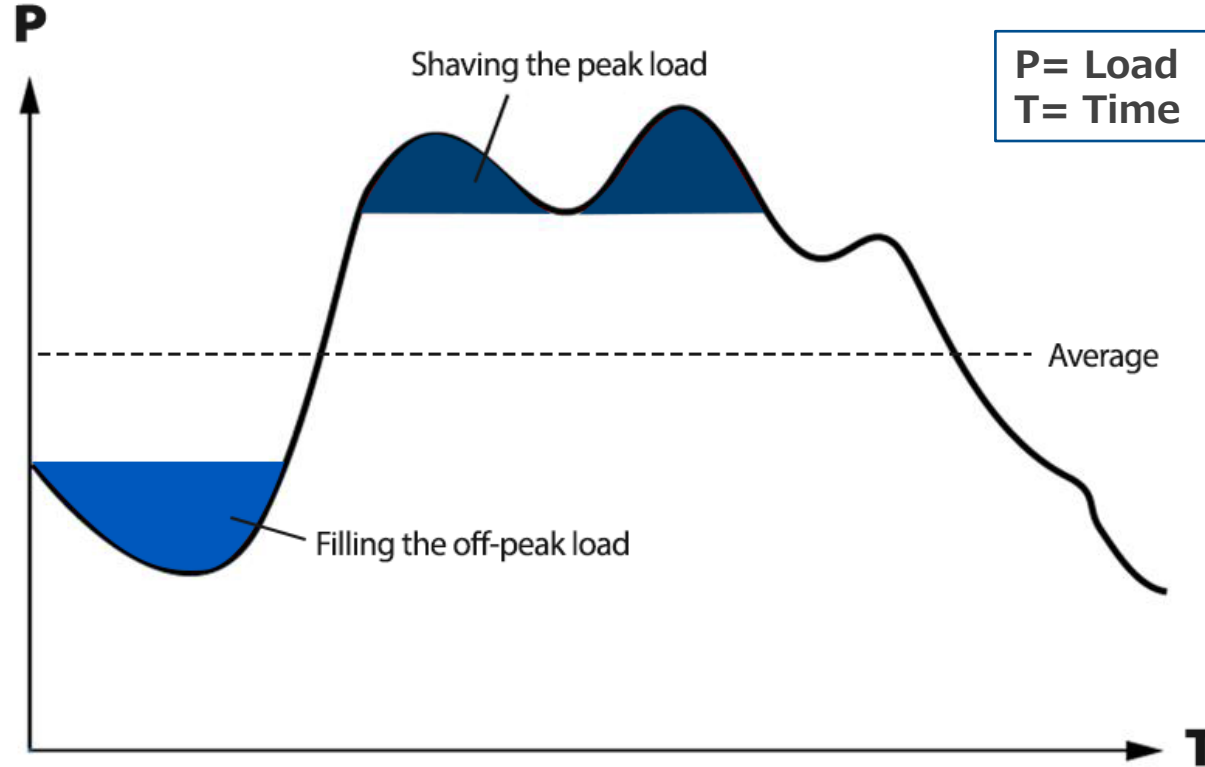
Each EU member state must assess and, if needed, expand recharging stations. Also, as outlined in Article 5 of The Regulation, charging station operators shall comply with “smart charging” capability for publicly accessible charge points built after April 13, 2024, or renovated after Oct 14, 2024. This capability could pave the way for future V2G integration.

While EV bi-directional charging capability gains momentum, some regulatory provisions remain in the draft phase. For example, California SB 233, was made inactive in September 2023.



Depiction of a Home Energy Management System capable of bi-directional charging and solar power generation, enabling off-grid and grid-support operation.

# Why does it matter?



## Key takeaway

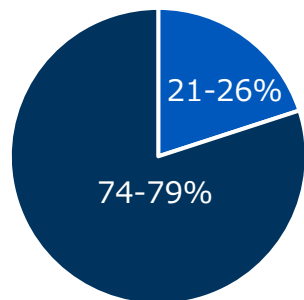
The peak demand for electricity is likely to increase as the number of EVs in use grows. If appropriate action is not taken, this could lead to increased infrastructure and energy costs.

Bi-directional charging, which includes V2L, V2H, V2B and V2G, could potentially reduce energy costs for all consumers, regardless of EV ownership, through grid balancing.

Grid balancing with V2G technology is the process of 'peak load shaving', where EVs charge during non-peak hours and discharge energy back to the home or grid during peak hours, thus bringing both peak and non-peak periods closer to the average.

Vehicle-to-Building (V2B) works in a similar manner to Vehicle-to-Home (V2H), but on a larger scale. Commercial and industrial facilities are often billed based on peak power consumption, rather than energy consumed. So, V2B has the most potential to decrease utility bills and smooth out the load on the grid.

The capacity of a handful of EVs is negligible but large fleets have the potential capacity to support the grid. If those batteries are charged with renewable electricity, then a positive climate impact can be made.



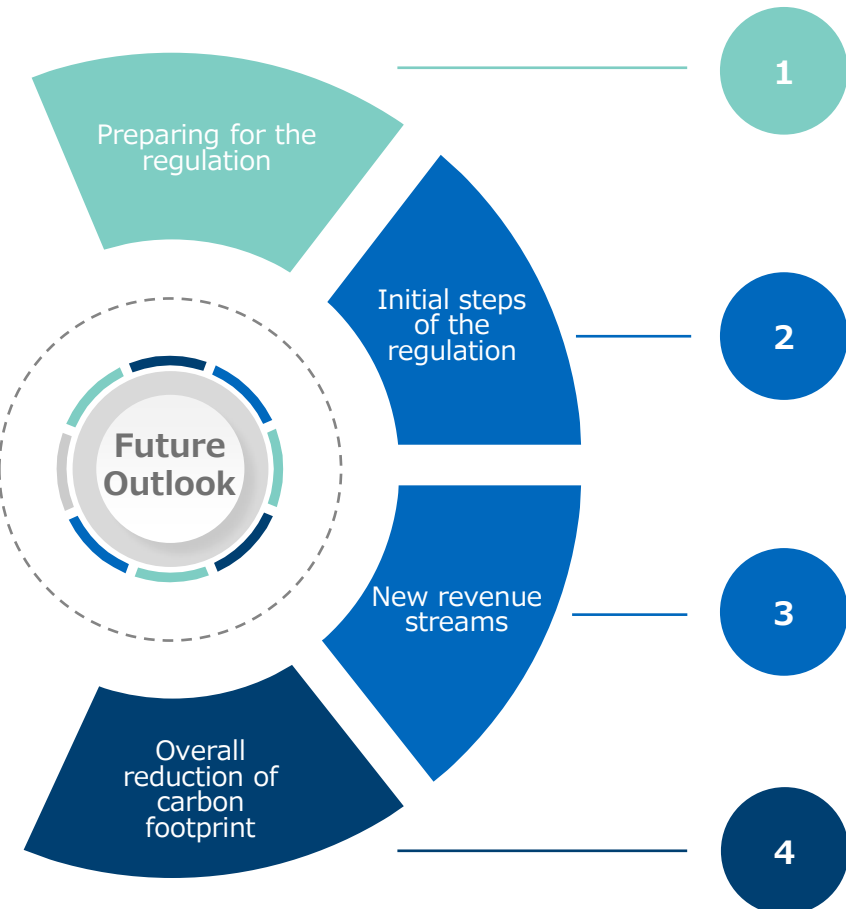
18-30 TWh  
by 2050



x6 million/year

By 2050, 21% to 26% of the global EV fleet could contribute to a grid capacity of 18 to 30 TWh through V2G technology, which is equivalent to the annual average power consumption of 6 million UK households.

Sources: [Nature Communications](#), [Ofgem](#)



1  
Currently, in the EU and the USA, only a few vehicles and charging stations offer bi-directional charging. Adoption is increasing, however. OEMs and charge point manufacturers have announced plans to support bi-directional charging.

2  
EU member states must assess how the deployment and operation of charging points could enable EVs to further contribute to the flexibility of the energy system. The assessment shall identify measures to meet the requirements set by The Regulation and shall take into account inputs from all the stakeholders.

3  
The outcomes of the assessment could lead to opportunities for new revenue streams and use cases, not only for EV owners but for OEMs, charge point operators, and Home Energy Management System companies through various partnerships and services.

4  
When V2G is effectively deployed it could potentially support renewable energy generation. The combination could help to reduce use of fossil fuel-based sources and thus reduce the overall carbon footprint of energy and transportation sectors. It could also reduce the need for stationary energy storage systems.

## Key takeaway

**Since the EU is one of the largest potential markets for EVs and renewable energy, Article 15 of Regulation (EU) 2023/1804 would likely have a global impact on automakers, home energy management companies, Electric Vehicle Supply Equipment companies and utility companies if effectively implemented.**

















As The Regulation matures, the European Commission will need to address details such as double taxation (electricity is taxed both when charging the vehicle's battery and when selling energy back to the grid). Additionally, the limited adoption of dynamic electricity pricing in Europe could make V2G less attractive to consumers.

The lack of standardization in V2G and V2H could be another challenge for The Regulation. As part of the assessment outlined in The Regulation, industry stakeholders should collaborate in an ongoing effort to establish consistent standards, protocols, and implementation timelines. This should allow any EV to seamlessly interface with any bidirectional charging station, utilizing a standardized connector that can communicate with any smart EV charging management system. Moreover, it should enable the supply of power to the grid through any utility, regardless of location.

# Who to watch out for?



## Major Players in Bi-Directional Charging

In Automotive Industry	In Charging Industry
 <p>Nissan was one of the pioneers in the bi-directional charging capability due to Japanese Government's energy security policies. Mitsubishi also has bi-directional charging capability in the Japanese market and Renault is planning to bring this feature to production by 2024.</p>	 <p>Nuvve is a pioneer in implementing V2G technology with EVSE and specializes in providing V2G energy management services to fleets. <a href="#">Dreev</a>, a joint venture between Nuvve and EDF, now offers V2G in Denmark, France, and the UK.</p>
 <p>Ford F-150 Lightning with extended range battery (131 kWh) is already capable of powering an average US house for 3 days.</p>	 <p>E.ON offers V2H, V2B and V2G services to fleet owners. Nissan has partnered with E.ON for its V2G services in the UK.</p>
 <p>Although Hyundai, Kia, and Genesis have bi-directional charging capability, they offer only a 3.6kW power output which is sufficient for powering only small appliances. However, Hyundai already has V2X pilot projects in progress, which will be brought to market in the future.</p>	 <p>ChargeScape (Logo not yet released)</p> <p>BMW Group, Ford Motor Company, and American Honda Motor Company have launched ChargeScape, a joint venture for V2G services, aiming to simplify integration between OEMs and electric utilities for EV consumers.</p>
 <p>Honda conducted a V2G pilot project in Germany using Honda e vehicles and successfully met the charging and discharging requirements to maintain a stable 50 Hz grid frequency.</p>	 <p>Tesla already has an energy division that sells energy generation and storage systems. This could potentially be leveraged once Tesla launches bi-directional feature in their vehicles.</p>
 <p>Tesla has announced plans to introduce bi-directional charging in their vehicles by 2025. Leveraging their existing home energy management system could give them a competitive advantage in the V2H ecosystem.</p>	 <p>dcbel is a home energy management company serving V2H consumers, with investment from Volvo.</p>
 <p>GM announced that they will have bi-directional charging as a standard feature for their Ultium platform based EVs by 2026.</p>	 <p>Panasonic Electric Works, a unit of Panasonic, has developed a V2H system that facilitates two-way flows between solar-powered homes and EVs.</p>
 <p>Volkswagen added bi-directional charging to ID.4 and ID.5 models. Volkswagen will also sell bi-directional, direct current wall boxes for V2H.</p>	 <p>Siemens Smart Infrastructure has collaborated with Ford on the 'Ford Charge Station Pro' wall box made for the Ford F-150 Lightning which features bi-directional charging capability.</p>
 <p>The Volvo EX90 and Polestar 3 offer bi-directional charging capability. Both models offer V2L, V2H and V2G capability.</p>	 <p>GM launched GM Energy, a company which offers Ultium home energy management products with bi-directional capability.</p>

### Key takeaway

**Early players in bi-directional charging enabled products from both automotive OEMs and EVSE companies will have an early player advantage in V2G or V2H as Regulation (EU) 2023/1804 matures.**

Nuvve has explored opportunities to incentivize V2G using school buses, as they are an ideal use case for bi-directional technology. School buses have large batteries, and their operating hours are limited to mornings and afternoons, allowing them to recharge when electricity prices are low and sell energy back to the grid during peak demand to offset costs.

Tesla and GM have an advantage in the V2G and V2H ecosystem as they already have home energy management companies under their respective umbrellas. BMW, Ford, and Honda are also following this pattern by launching a V2G service joint venture for its consumers. Volkswagen's commitment to V2G suggests that future vehicles will also feature this capability.

Bidirectional capability is progressing quickly on the vehicle side. Will charging infrastructure and the regulatory landscape be able to match this pace and realize the benefits that the technology promises?

# 1

## Evaluate

Evaluate the challenges and opportunities that emerge from the introduction of Regulation (EU) 2023/1804.

# 2

## Implement

Meet regulatory requirements when implementing bi-directional charging and create a competitive advantage for your customers.

# 3

## Explore

Explore any new revenue streams and opportunities that result from bi-directional charging.

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623 – Electric Vehicle Guide



217 – EV Charging & Infrastructure Guide

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