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Vehicle-Integrated Photovoltaics (VIPV) in EU CO2 Standards

Vehicle-Integrated Photovoltaics (VIPV) belongs within the compliance offset mechanism of regulation (EU) 2019/631 because it contributes to transport decarbonisation, eases pressure on the electricity grid, and strengthens Europe's industrial leadership in clean mobility.

asom Alliance for Solar Mobility

1. VIPV IS REDUCING PRESSURE ON THE GRID

As Europe accelerates toward transport decarbonization under Regulation (EU) 2019/631, as proposed to be amended by COM(2025) 995 [1], automakers face strict 2035 fleet-wide CO2 targets for cars and vans. Achieving these ambitious vehicle-level requirements depends overwhelmingly on the rapid, sustained rollout of electric vehicles, but keeping that momentum requires practical efficiency solutions. **VIPV is emerging as a key market-ready technological pathway to make that transition viable.**

By embedding solar cells directly into a vehicle's exterior, VIPV enables cars to harvest power straight from sunlight while on the move or parked. This clean on-board generation acts as a continuous boost to conventional plug-in charging rather than a replacement, noticeably easing demand on the electricity grid.

Europe is currently leading in VIPV mobility. Supporting this technology will strengthen Europe's industrial leadership in clean mobility, ensuring next-generation solar IP, R&D, and advanced automotive manufacturing remain anchored within the Single Market rather than ceded to foreign competitors. The European Commission-sponsored SolarMoves study [2], run as a Pilot Project and Preparatory Action (PPPA), evaluated the technology across varied European driving habits and solar conditions, confirming its high energy conversion efficiency.

2. SOLARMOVES: REAL-WORLD VALIDATION

The contribution of VIPV has been assessed not only through modelling but under real-world operating conditions. The Commission's SolarMoves project combined simulation, techno-economic assessment, and **field testing across more than 1.2 million kilometres of driving data collected throughout Europe**, monitoring passenger cars, vans, buses, and trucks equipped with solar technologies.

What SolarMoves measured	Result
Annual vehicle energy supplied by solar	Up to 50% (Southern Europe), ~35% (Central Europe)
Grid draw for a small car in Amsterdam	From ~160 to under 100 Wh/km
Reduction in charging frequency	Up to 76% depending on use and climate
EU-wide avoided grid electricity demand	Up to 27 TWh per year by 2030, combining VIPV with vehicle efficiency measures
Reduction in local grid infrastructure investments	20–25%

Source: European Commission, SolarMoves study, report MOVE/2022/OP/0003-04, DG MOVE, final version 22 December 2025.

One of the demonstration vehicles, a Lightyear 0 (M1), took part in a dedicated measurement campaign in the Netherlands. Over the test period, **the Lightyear 0 covered approximately 40% of its travelled distance using solar energy**—evidence that VIPV's contribution is not theoretical but already observed in everyday driving conditions.

SolarMoves is not an isolated finding. The IEA's Technology Collaboration Programme on Photovoltaic Power Systems (IEA PVPS, Task 17) independently tracks VIPV's technical maturity, concluding that on-board solar generation measurably reduces grid reliance [3]. Demonstrating that VIPV is a global priority rather than solely an EU initiative, international standardisation bodies are actively establishing global frameworks. Within the International Electrotechnical Commission (IEC), Technical Committee 82 established Project Team 600 (IEC TC82 PT 600) three years ago to draft the first international standards tailored to solar-powered vehicles. Structured across dedicated subgroups, with officers, members, and liaison bodies working to define precise technical values and measurement parameters, PT 600 is scheduled to submit an official draft standard to the IEC in Geneva in 2027 to pave the way for worldwide deployment [4].

Unlike upstream measures where emissions intensity can be difficult to verify across globally distributed supply chains, on-board solar generation can be measured in real time using existing vehicle telematics, consistent with the data-sharing architecture already defined under the Renewable Energy Directive (RED III) [5]. This is **designed to support robust, transparent compliance accounting without requiring material new technical infrastructure**, though a dedicated verification methodology will still need to be agreed with industry.

3. PROPOSAL FOR CO2 TARGETS FOR CARS AND VANS REGULATION (EU) 2019/631

Members of the European Parliament have put forward amendments to proposed CO2 targets for cars and vans regulation that would establish a clear regulatory framework for solar mobility by recognising its contribution to renewable energy generation, CO2 targets and by establishing a legal definition of Solar Electric Vehicle (SEV) [6].

We fully endorse this initiative by the MEPs and call on co-legislators to support these amendments to enable the uptake of VIPV as a complementary pathway toward transport decarbonisation and less pressure on the electricity grid.

Amendment	What it does
255	Adds a recital recognising VIPV as a pathway for on-board renewable energy generation, referencing the Commission's own research.
405	Introduces a legal definition of 'Solar Electric Vehicle (SEV)', the prerequisite for any credit mechanism to apply.
730	Allows manufacturers to count verified solar generation from EU-made vehicles towards their CO2 targets from 2028, within the existing 10% cap, not in addition to it.

The three amendments work as a complementary package: the recital sets out the rationale, the definition establishes which vehicles qualify, and the operative article provides the mechanism itself. None alters the ambition or the structure of the Commission's proposal; together, they extend an existing, technology-neutral principle to one additional measurable pathway.

CONCLUSION

VIPV has proven its real-world ability to significantly reduce grid demand and charging frequency, transitioning from an innovative concept into a field-tested solution for transport decarbonisation. As automakers face strict 2035 EU CO2 targets, formally adopting Amendments 255, 405, and 730 constitutes the pathway forward. By legally defining Solar Electric Vehicles and allowing verified on-board solar generation to count toward fleet targets from 2028, the EU can accelerate EV roll-out while easing pressure on the power grid and supporting European technology.

LIGHTYEAR

CONTACT@LIGHTYEAR.ONE

HTTPS://LIGHTYEAR.ONE/

SOURCES

[1] European Commission, COM(2025) 995 proposal amending Regulation (EU) 2019/631.
[2] European Commission, SolarMoves study, report MOVE/2022/OP/0003-04, DG MOVE, final version 22 December 2025.
[3] State-of-the-Art and Expected Benefits of PV-Powered Vehicles (Report IEA-PVPS T17-01:2021).
[4] International Electrotechnical Commission TC 82 Solar photovoltaic energy system.
[5] Directive (EU) 2023/2413 (RED III).
[6] European Parliament, ENVI committee, Amendments 255, 405 and 730 to the draft report on COM(2025) 995 (2025/0420(COD)).