

# Smart Charging – Key to unlocking Electro-mobility's potential

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A EURELECTRIC statement

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***EURELECTRIC is the voice of the electricity industry in Europe.***

*We speak for more than 3,500 companies in power generation, distribution, and supply.*

***We Stand For:***

***Carbon-neutral electricity by 2050***

We have committed to making Europe's electricity cleaner. To deliver, we need to make use of **all low-carbon technologies**: more renewables, but also clean coal and gas, and nuclear. Efficient electric technologies in **transport and buildings**, combined with the development of smart grids and a major push in **energy efficiency** play a key role in reducing fossil fuel consumption and making our electricity more sustainable.

***Competitive electricity for our customers***

We support well-functioning, distortion-free **energy and carbon markets as** the best way to produce electricity and reduce emissions cost-efficiently. Integrated EU-wide electricity and gas markets are also crucial to offer our customers the **full benefits of liberalisation**: they ensure the best use of generation resources, improve **security of supply**, allow full EU-wide competition, and increase **customer choice**.

***Continent-wide electricity through a coherent European approach***

Europe's energy and climate challenges can only be solved by **European – or even global – policies**, not incoherent national measures. Such policies should complement, not contradict each other: coherent and integrated approaches reduce costs. This will encourage **effective investment to** ensure a sustainable and reliable electricity supply for Europe's businesses and consumers.

***EURELECTRIC. Electricity for Europe.***

# Smart Charging – Key to unlocking Electro-mobility’s potential

## Why not just “connect and forget” ?

- The take-up of electric vehicles (EVs) is expected to speed up significantly in the coming years in Europe and across the globe. For Europe, the European Commission expects 14% of cars and Light duty vehicles to be electric in 2030<sup>1</sup>. With total cost of ownership of electric vehicles outperforming the total cost of ownership of internal combustion engine cars no later than 2018<sup>2</sup>, it is very possible that this take-up will happen even faster<sup>3</sup>.
- Electric vehicles are between 3 and 4 times more energy efficient than conventional combustion engine cars in a “tank-to-wheel” perspective. The additional electricity demand of a 100% electrified European car fleet has been estimated to add around 24% to Europe’s overall electricity consumption<sup>4</sup> (while saving around €1 billion per day in oil imports<sup>5</sup>).
- A EURELECTRIC study conducted in autumn 2014, using data from 11 Member States, found that the current electricity system in Europe can deliver sufficient energy to power a fully electrified European car fleet, provided that these vehicles are charged smartly.
- Depending on when and how EVs are charged, the needs for additional capacity, both in the electricity distribution network and on the generation side, may differ significantly. With uncontrolled charging, the 100% electrification of cars scenario could add around 21% (130 GW) to the European peak load in 2035<sup>6</sup>. This would mean significant strains for the electricity network and would also necessitate additional investments in generation capacity.

## What is Smart Charging ?

- Smart charging can be defined as follows: “Smart charging of an EV is when the charging cycle can be altered by external events, allowing for adaptive charging habits, providing the EV with the ability to integrate into the whole power system in a grid- and user-friendly way”<sup>7</sup>. Smart charging must facilitate the security (reliability) of supply while meeting the mobility constraints of the user.
- Different “levels” of smart charging are possible: starting and stopping the charging according to price signals or signals from the network operator is the simplest form of smart charging. Increasing and decreasing the power (kW) used during the EV charging process is at the next level of “smartness”. Some charging points are also able to provide bi-directional charging, which means that for short periods the EV battery could also release electricity and feed it back into the grid, the so-called “Vehicle-to-grid” or (V2G).
- Smart charging has to be regarded as an important aspect of energy management systems. These systems manage all significant loads at a metering point, optimising e.g. the EV, the Heat Pump, storage etc.

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<sup>1</sup> European Commission: Impact Assessment accompanying the proposal for the Energy Efficiency Directive (2016), p. 44. This corresponds to an estimated compound annual growth rate of around 37%.

<sup>2</sup> UBS Bank report cited in the Telegraph, <http://www.telegraph.co.uk/business/2017/05/19/electric-vehicles-cost-conventional-cars-2018/>.

<sup>3</sup> Globally, 33% of cars and other light vehicles can be electric in 2040 already, Bloomberg New Energy Finance: [Electric vehicle outlook 2017](#).

<sup>4</sup> EURELECTRIC: [Smart charging: Steering the charge, driving the change](#), March 2015.

<sup>5</sup> European Commission: Import and secure supplies, <https://ec.europa.eu/energy/en/topics/imports-and-secure-supplies>.

<sup>6</sup> See footnote 3. For the calculation of these numbers it was assumed that the additional load is spread uniformly across the load curve.

<sup>7</sup> CEN-CENELEC-ETSI Smart Grid Coordination Group: Smart Charging of electric vehicles in relation to smart grid, May 2015.

## What are the potential benefits ?

- Smart charging can make a decisive difference in avoiding additional network investments to accommodate future high penetration levels of electric vehicles. According to EURELECTRIC's smart charging study, the peak load could remain stable even in the 100% electrification of cars scenario, compared to the reference scenario<sup>8</sup>, if all EVs were charged smartly.  
This significantly limits additional investments needed for EV integration. At the same time, the utilisation factor of the electricity grid could improve by around 14%, leading to lower grid tariffs per unit usage<sup>9</sup> as well as higher social welfare.
- The average car in Europe is parked for around 95% of its lifetime<sup>10</sup> - and thus offers plenty of opportunity to leverage on its inherent flexibility.
- Depending on the EV driver's preferences, smart charging allows to financially profit from variable charging tariffs or participation in flexibility markets. Moreover smart charging allows to maximise self-consumption, when the EV driver is a prosumer and disposes e.g. of an own PV installation<sup>11</sup>.

## What must be done to make Smart Charging become a reality ?

- Bi-directional communication is needed to enable the smart charging process. The station communicates the mobility constraints of its driver<sup>12</sup> and also the current state of charge, while it receives information on current prices at wholesale market or on flexibility markets. The charging station can also optimise the charging process of several vehicles connected to it.
- Harmonised standards and protocols are required to make seamless communication between all actors involved possible.
- Moving towards a higher weighting for capacity costs in grid tariffs<sup>13</sup> provides a price signal to customers to help optimise the effective usage of network capacity and thus better reflects that usage of scarce grid capacity drives network costs, not the throughput of kWh through the network. Furthermore, dynamic tariffs that differ depending on the time of use can send the right signals for charging to happen in a grid-friendly way while imposing least costs on the consumer.
- Get the short term markets<sup>14</sup> fit for purpose: flexibility products should be designed in such a way that allows electric vehicles to participate in this market. Aggregated EV battery capacity could also participate in tenders for capacity mechanisms.
- The good news is: the technology is already there! Several companies across Europe offer smart charging stations, intelligent charging stations are finding their way into home energy management offers.

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<sup>8</sup> EU Energy, Transport and GHG Emissions Trends to 2050, Reference Scenario 2013, <https://ec.europa.eu/transport/sites/transport/files/media/publications/doc/trends-to-2050-update-2013.pdf>.

<sup>9</sup> kWh or kW or a mixture of both, depending how the grid tariffs are charged.

<sup>10</sup> Fortune: 'Today's Cars Are Parked 95% of the Time' <http://fortune.com/2016/03/13/cars-parked-95-percent-of-time/>.

<sup>11</sup> Studies have shown that EV owners can earn between around \$100 and \$2,500 per year, depending on the level of smartness and the capacity used and depending on in which market the vehicles participate. See International Council on Clean Transportation: [Literature review on power utility best practises regarding electric vehicles](#), February 2017, p. 21.

<sup>12</sup> For example: "The battery needs to be fully charged at 7am."

<sup>13</sup> For more detailed information on EURELECTRIC'S proposals on grid tariffs, see "[Retail pricing for a cost-effective transition to a low-carbon power system](#)", EURELECTRIC report (2016), p.12.

<sup>14</sup> Intraday and balancing markets as well as the markets for products for DSO and TSO congestion management.

EURELECTRIC pursues in all its activities the application of the following sustainable development values:

Economic Development

▶ Growth, added-value, efficiency

Environmental Leadership

▶ Commitment, innovation, pro-activeness

Social Responsibility

▶ Transparency, ethics, accountability



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