



SCALE



What is SCALE

- **SCALE (Smart Charging Alignment for Europe)** is a three-year Horizon Europe project that aims at preparing EU cities for mass deployment of electric vehicles and the accompanying smart charging infrastructure.

Preparing smart charging concepts for upscaling to mass-market-level

Innovating in Vehicle-to-Everything solutions

Deploying user-centric approaches

Advancing interoperable, standardized and open smart charging networks

Maximizing use of renewable electricity and reducing needs for grid reinforcement



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Demonstrations



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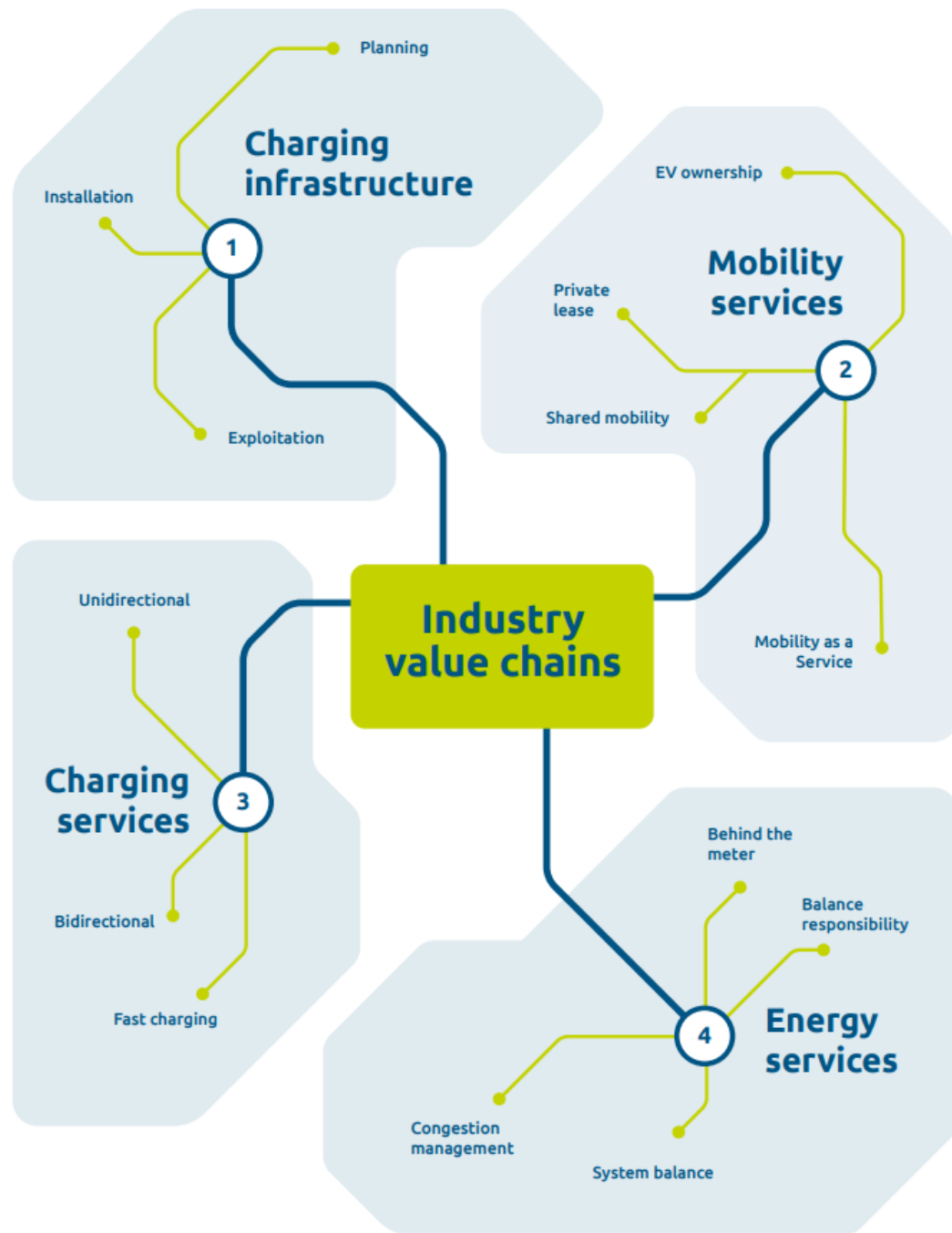
Partners

<p>OEMs</p>						
<p>E-mobility fleet & software</p>						
<p>Research & knowledge institutes</p>						
<p>Cities & associations</p>						
<p>DSOs & TSOs</p>						



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Different grid code; similarities!

- Adjust your behavior according to the grid frequency and voltage
- Listen to a stop signal if things go wrong
- Continue operation despite grid disturbance, if everybody stops, a cascade effect makes things worse
- Detect if the grid is down, do not feed back into the grid when it is down, and when the grid restores, reconnect with care



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Standardisation



Issues

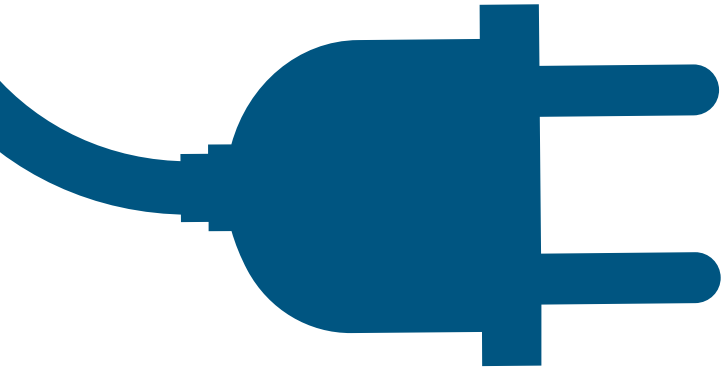


- Missing incentive for consumption behind the meter
- Price transparency will improve participation in Smart Charging initiatives
- Roll out a Smart Charging infrastructure with optimum capacity
- Offer regional grid operators the opportunity to make flexibility agreements
- Improve financial incentives
- Double energy tax
- Unclear who determines the use of the battery of the EV
- Hardware requirements
- Efficiency
- Cyber security
- Fully test electric cars before they plug into the grid
- Open standards
- Embed data required for Smart Charging and V2G



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V2x Alliance



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Thank you!

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Appendix



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Missing incentive for consumption behind the meter

- EV drivers who own a house with rooftop solar panels lack in some member states a financial stimulation make full use of self-generated renewable electricity, in combination with the storage capacity from their EV's to manage their own (peak) demand for electricity.
- In other European countries, the use of Feed-in tariffs promotes optimization of own consumption behind the meter.
- Patchwork of regulation is suboptimal



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Price transparency will improve participation in Smart Charging initiatives



- At the moment the structure of the underlying costs of electric driving is often unclear.
- The e-driver pays a contribution to the energy supplier (home charging) or to the Electric Mobility Service Provider (public charging), depending on the charging location but only sees this afterwards.
- As a result, e-drivers are unaware of costs made at a specific time.
- Lease drivers who often only use public charging points often have even less insights into their costs as the leasing company is responsible for payment.
- Greater transparency for e-drivers about the current costs of electric driving will ensure that they can better assess the financial benefit of a Smart Charging initiative beyond the meter.



Roll out a Smart Charging infrastructure with optimum capacity



- By connecting the charging station to the grid with the largest possible capacity connection, we can create maximum flexibility for Smart Charging.
- An electric car can be charged faster at times when this is desirable if there is greater capacity.
- Faster charging reduces the grid load at peak hours, provided that the correct Smart Charging regime is linked to this.
- Unfortunately, a higher capacity connection is more expensive than a lighter one. This is partly due to the difference in capacity that has to be reserved in the grid to meet the peak load.
- If grid operators can combine Smart Charging signals with the capacity rates that they are allowed to charge, then the e-driver will receive a much 'faster' charging station and we can use the electric car even better to request power when desirable .



Offer regional grid operators the opportunity to make flexibility agreements

- Take advantage of the abundant grid capacity, make smart charging mandatory in tenders
- By charging EVs at smart moments, for example at night or in the weekend, we can optimally use available grid capacity.
- Without Smart Charging, the further growth of electric driving will lead to greater peaks in power demand, while at the same time charging electric cars with Smart Charging offers a great deal of flexibility for managing the grid and for the use of solar and wind energy as it is produced.
- Options for making specific agreements for the use of Smart Charging to prevent peak overloads (congestion management) are currently limited legally, outside approved experimental conditions.



Improve financial incentives



- In most countries, EV-drivers currently pay a flat rate for their electricity consumption or have a day/ night rate.
- Smart Charging offers the opportunity to better align their electricity consumption with the availability of (sustainable) electricity by charging at times 'cheap' electricity is available. And if V2G is applied, it will be possible to resupply energy at a different time.
- Flexible rates for electricity use can provide a price incentive to better match consumption with supply. In practice, this is only currently applied on a small scale. Central governments, municipalities and provinces could pass on this incentive to e-drivers via tenders for the charging infrastructure. Cheaper charging when electricity prices are low.



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Double energy tax for V=G



- Every time an EV is charged again after discharging, it appears that energy tax has to be paid on the charged kWh.
- Double energy taxes are mainly a result of the lack of a definition of storage, as charging and discharging are defined as consumption and supply, respectively.
- A structural and harmonized solution would be to implement a European tax regulation stating that bi-directional charging qualifies as storage. In that way, it should not trigger energy tax. This can be implemented via (preferably) the Energy Tax Directive.



Unclear who determines the use of the battery of the EV

- Under current regulations, nowhere can it be found that the e-driver is the one who gives permission for the use of his electric car and under which conditions (time of departure, minimum battery capacity, et cetera.).
- Moreover, exceptions may be needed. For example, preventing local grid overload is more important than other factors, as currently we have few alternatives and we need to ensure grid reliability.



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Hardware requirements



- Hardware (settings) are often country-specific (like PV inverters)
- A charging station has a fixed location while an EV can visit multiple locations / countries.
- These safety requirements should be aligned on national, or even better, European level.
- A first set of technical requirements for Smart Charging Ready (in the Netherlands) is being prepared with all stakeholders and is expected to be published in Q1 2021



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Efficiency



- The business case of V2G and its potential to provide grid services is heavily dependent on the round-trip efficiency.
- There is a wide range of efficiency values used in V2G modelling studies:
 - different dates,
 - current rates
 - average states of charge
- Charging at lower ambient temperatures and lower current rates had a statistically significant adverse effect on the round-trip efficiency. Efficiency at high and low state of charge was found to be marginally lower than around medium state of charges.
- Regulation regarding standards on minimal efficiency is needed from a consumer- and system protection perspective.



Cyber security on devices



- A future-proof design with enough computational power and memory resources to be able to handle future algorithms and protocols, and firmware updates.
- The cryptographic algorithms and protocols of today's are well known and considered secure. However, it could be that a vulnerability is found which requires to switch to a different algorithm. The requirements, to follow the latest security advices, should be part of the requirements or regulation regarding roll out of charging infrastructure.
- Communication to and from the device(s) should be secured by encryption and digital signatures, for example by TLS.
- Resilience and system hardening. Charging stations should have unused interfaces disabled, and maintenance interfaces secured. The charging station should not crash when malicious messages are sent; the infrastructure should be able to detect a different format and handle it accordingly.



Cyber security on the public key infrastructure

- Develop a transparent, trusted, safe, simple, fast, cost-efficient and legal PKI that supports the level playing field in e-mobility.
- There is a need for an open standard and a level playing field between different regions and sectors.
- A neutral and independent referee in case of disputes.
- Therefore there is a role for an European Authority to oversee the governance of the PKI.



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Cyber security, protecting the e-driver and the grid

- As electric cars and Smart Charging become a crucial part of the electricity system, the exchange of data and measurements must also be safe and reliable.
- The system has to be completely secure to prevent access by unauthorized parties via hacks.
- The need for better (cyber) security matches consumer desires for an open market with freedom of choice in combination with a seamless service. The charging infrastructure needs to be defined by the regulator as a critical infrastructure.
- Tenders for public charging points need to commit to the cyber security requirements set.



Fully test electric cars before they plug into the grid

1. Currently, European type approval of electric cars is conducted by the certifying authorities, in particular with regards to vehicle safety.
2. Additional tests are performed on a voluntary basis, for example interoperability (being able to charge on all charging points), power quality (grid pollution) and Smart Charging (monitoring of control signals).
3. Every new electric car should be tested on all these aspects, not just on road safety.
4. Action is needed in the short term. The electric cars, vans, trucks and buses that are now being made and are being launched on the market will be on the road for many years to come. Currently, the average lifespan of a passenger car is around sixteen years.



Ensure open access and the use of open standards

- In a successful Smart Charging ecosystem, all kinds of devices can ‘talk’ to each other regardless of type or brand. Solar panels, home energy management systems, charging points for electric cars and back offices must all be able to communicate with each other problem-free.
- By using open standards a worldwide roll-out is possible and we can prevent lock-ins and further develop the system.
- This can be reinforced by requiring the use of open protocols in tenders for the new charging infrastructure.



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Embed data required for Smart Charging and V2G

1. Information on the state of charge (size of battery and the extent to which it is charged), the time of departure (or the time the consumer needs the battery to be fully charged), the type of electric car, the charging speeds (threshold values for the minimum and maximum power for charging) and e-driver preferences (for example, minimum range that must be available) is needed.
2. At present, access to this data (in particular the state of charge) has not yet been arranged and laid down in a technical standard.
3. Specific bilateral agreements must be made with car manufacturers to unlock the state of charge.



Conclusion

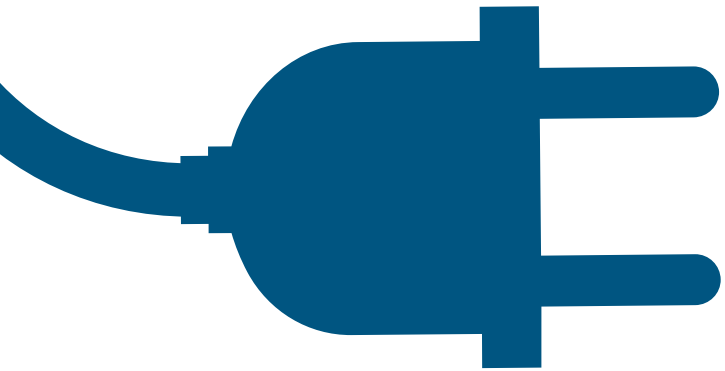


- Existing legislation and regulation in this field are inadequate to cope with the emergence of electric cars and locally generated sustainable electricity.



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