



# Effective EV charging infrastructure roll-out: What's in it for the grids?

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# Effective EV charging infrastructure roll-out: What's in it for the ~~grid~~ power system?

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## Who we are – the European power sector association

**Eurelectric** represents the electricity industry in Europe. We cover the **entire industry** from electricity generation and markets to distribution networks and customer issues.

Our members represent the electricity industry in over 30 European countries.

Our secretariat is based in Brussels where we coordinate all activities of Eurelectric. We draw on **more than 1000 industry experts** to ensure that our policy positions and opinions reflect the most recent developments in the sector.




# What if all cars in 2035 were electric?

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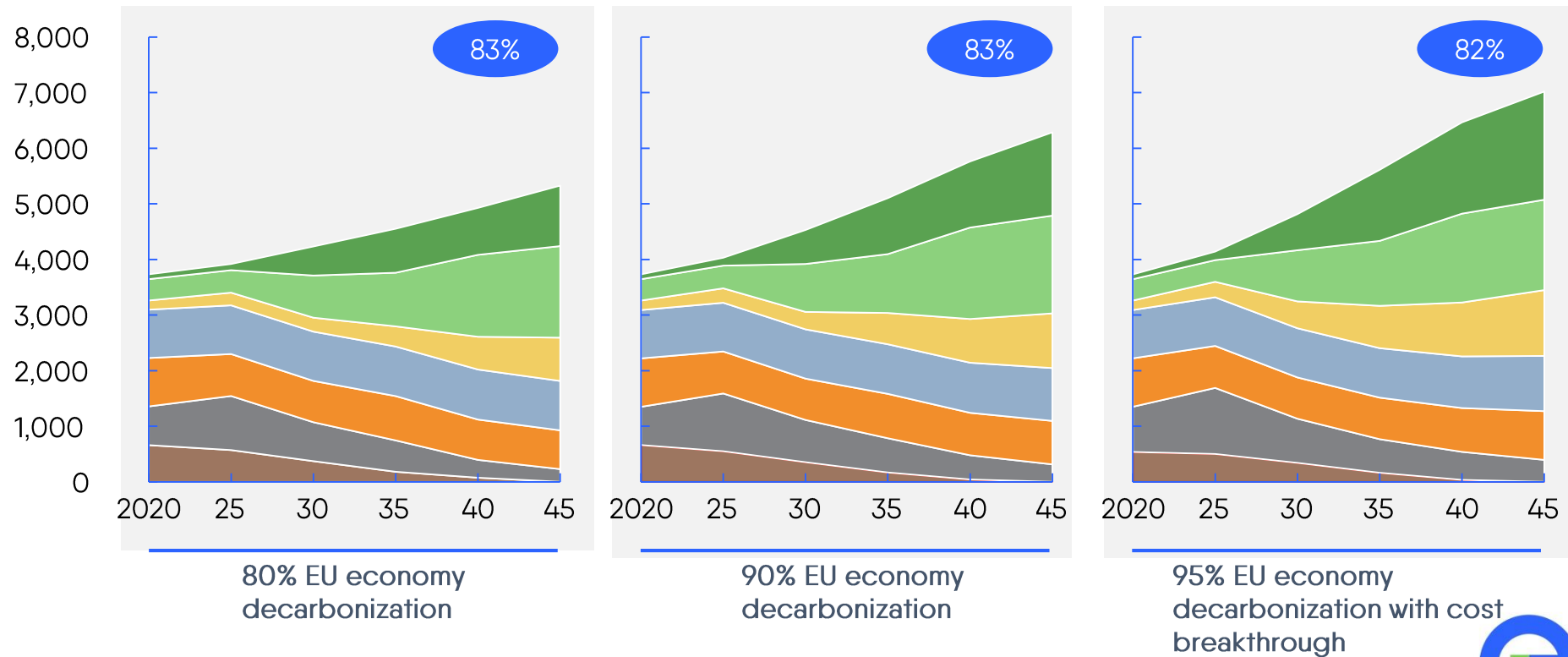
- The **impact on electricity demand** will be limited: In a 100% electric mobility scenario for Europe, the energy needs of EVs might represent no more than 10% to 15% of total electricity production.
- The **impact on peak demand**, however, can be much greater if the additional demand is not distributed smartly. For this, smart charging is key.
- The **impact on local distribution grids** might also be significant if not managed with smart charging

# In a carbon neutral electricity system the bulk of electricity is provided by renewables

Generation by fuel type, TWh

 Share renewables


■ Offshore wind  
 ■ Onshore wind  
 ■ Solar  
 ■ Hydro and other RES<sup>1</sup>  
 ■ Nuclear<sup>2</sup>  
 ■ Gas and other non-RES<sup>3</sup>  
 ■ Coal<sup>2</sup>



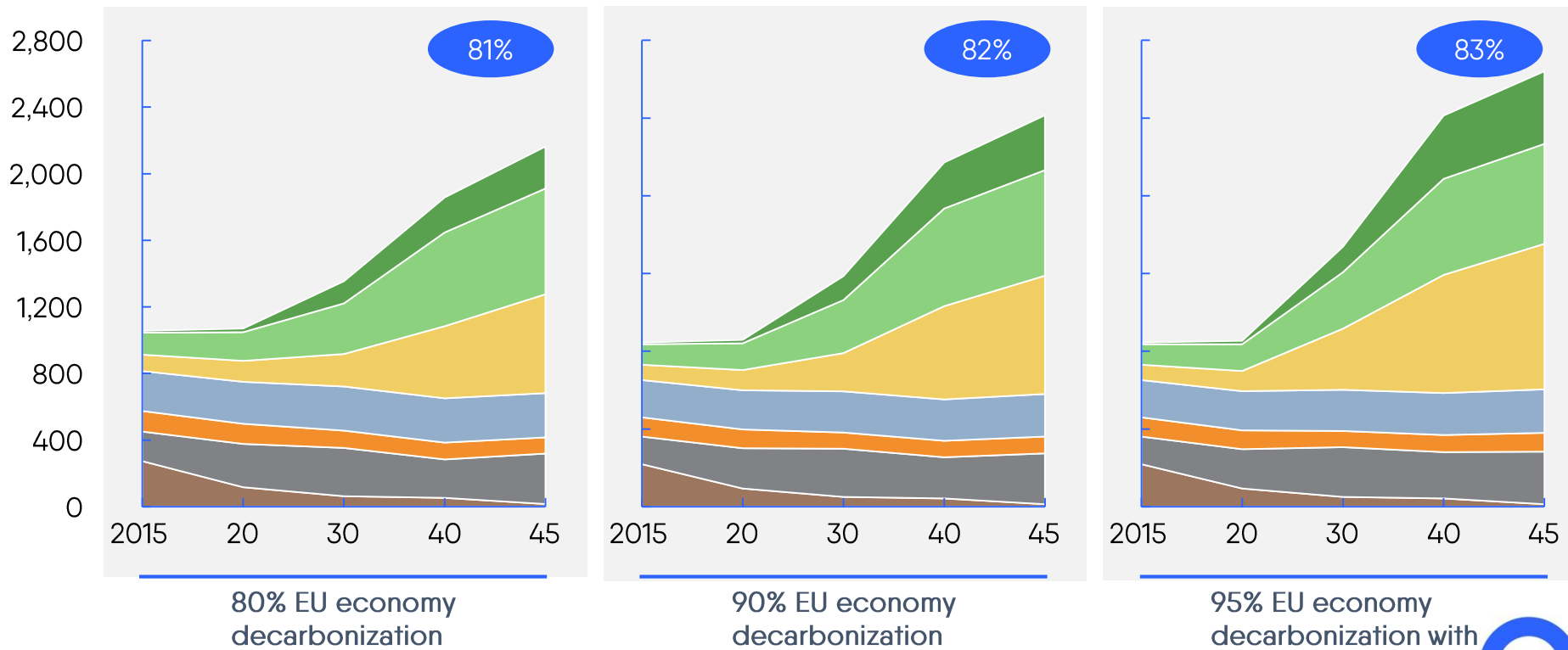
1 Includes also small amounts of geothermal, biomass and biogas  
 2 National policies on nuclear and coal phase out have been reflected  
 3 Up to 15% of gas capacity with CCS and other non-renewables

# Renewables account for ~80% of total installed capacity by 2045, while coal is phased out over the period

Capacity evolution by fuel type, GW

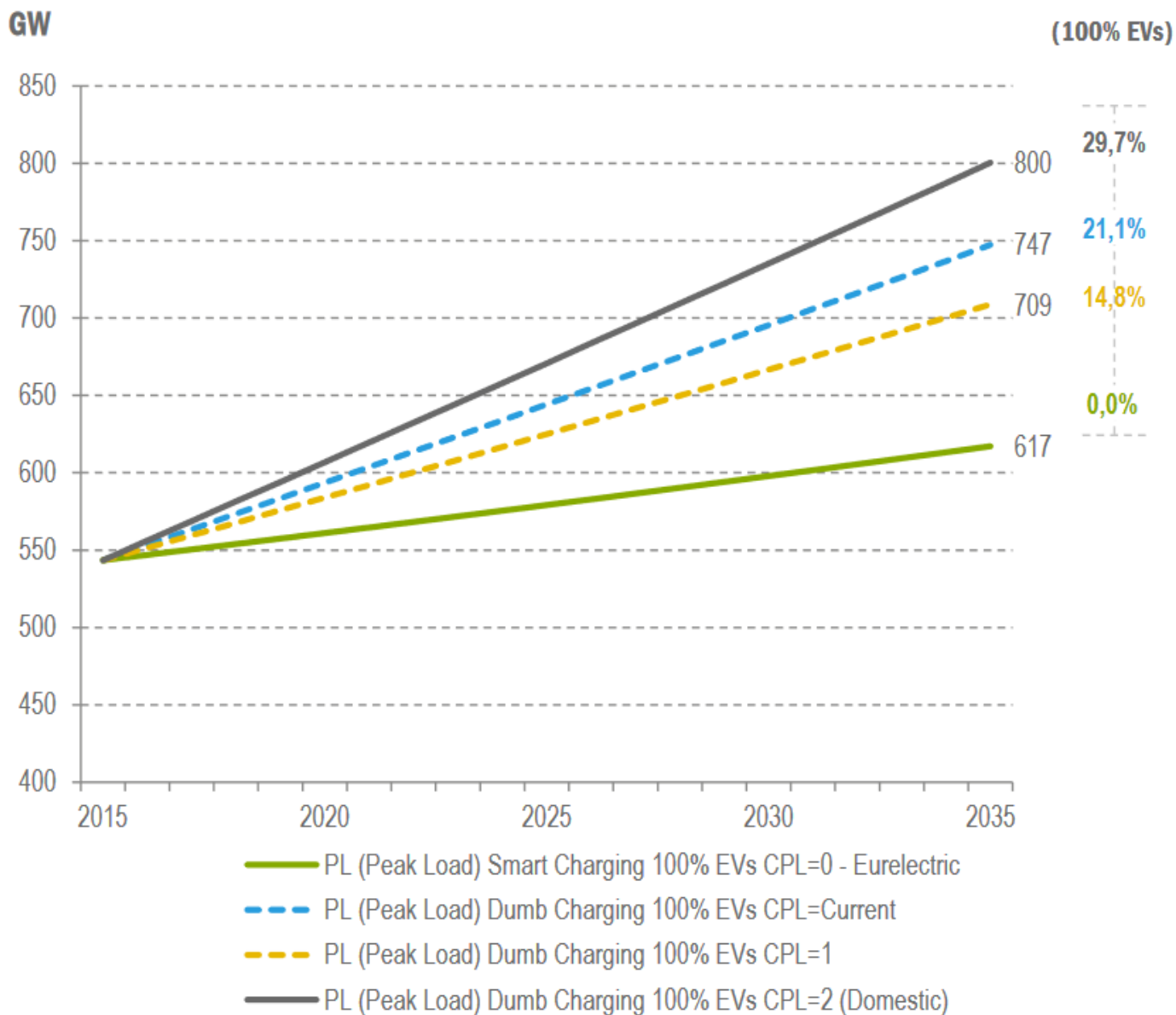
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 SOURCE: 2015 capacity from Enerdata





Observations with a 2035 perspective:

- Electricity generation in the EU-28 is estimated to surpass 4,000 TWh
- European peak demand is estimated to reach 617 GW.
- Assuming the hypothetical scenario of 100% car electrification, EV loads would add 92 GW to the load average and 130 GW to the peak load.
- In case the charging is uncontrolled, the additional demand from EVs raises peak demand by 21.1%.
- Smart charging has a potential to reduce the peak load to zero. At the same time, the utilisation factor will improve by 14.8%.



**Figure 14: European Peak Load (GW) evolution in case of 100% EVs by 2035 and potential of smart charging to reduce the peak load between 15% - 30%; Source: EURELECTRIC smart charging and e-mobility survey**

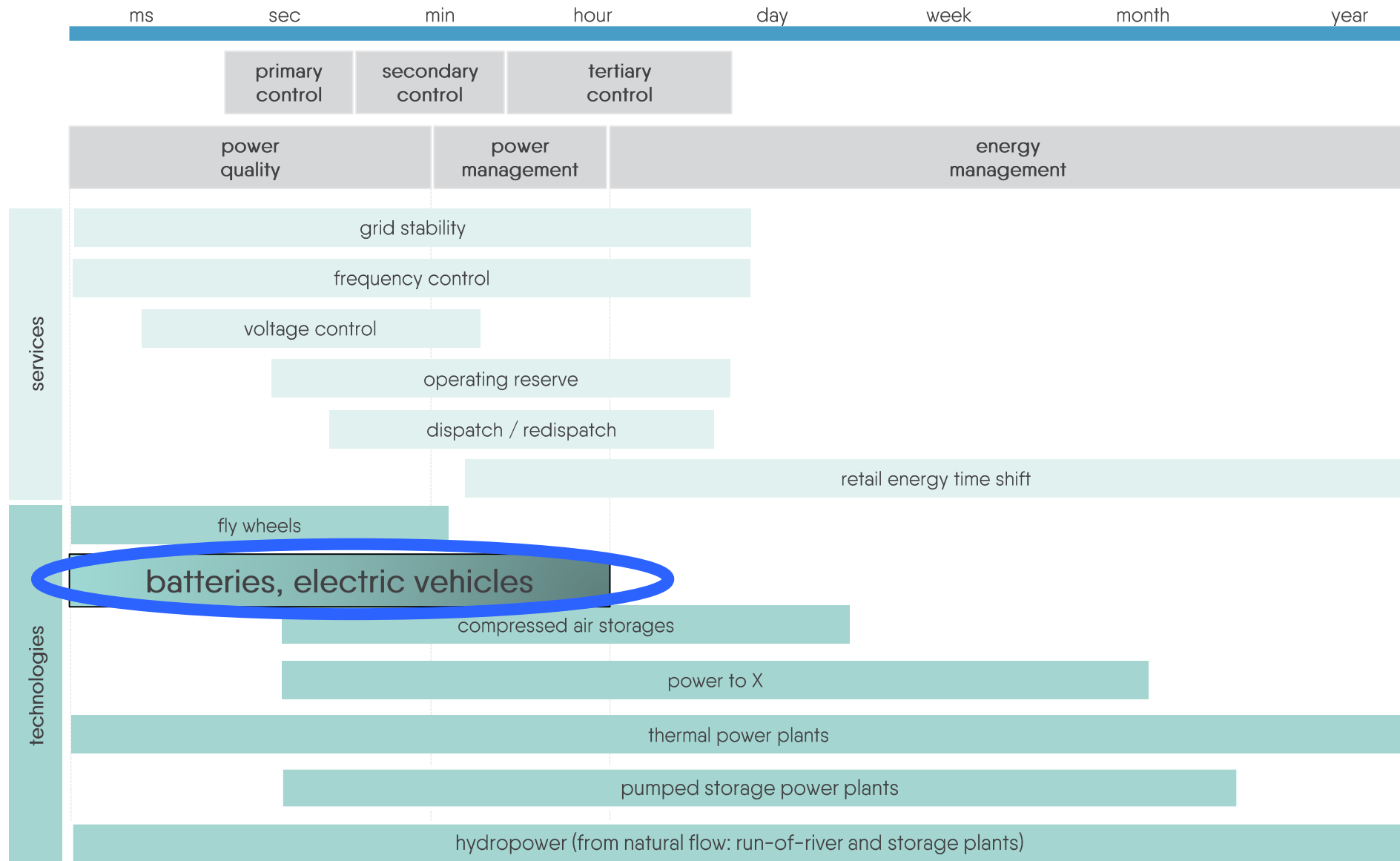


# So how do we make electric vehicles an integral part of the power system?

**Flexibility is key!**



# There is a plethora of flexibility services available for answering different needs. Electric vehicles are positioned to respond to many of these.



# Electricity Markets – it's now up to Member States

- From an electricity market design perspective, competitive balancing services and retail markets are still largely missing in Europe today.
- Recent legislative changes (i.e. Directive 2019/944) have taken a positive step forward by providing incentives for the procurement of flexibility services at distribution level.
- This has opened up a clear pathway to include electric vehicles in view of congestion management via load shifting and peak shaving, adding **an alternative to the costly physical grid reinforcement.**
- Member States and regulators need to fully implement provisions from the Electricity Directive, notably Articles 15(5), 32 and 41



*EVs can contribute to decarbonising the transport sector while facilitating the integration of VRE. If EV charging is adjusted to follow the availability of renewable energy sources, less flexibility from conventional power plants will be needed.*



SYSTEM FLEXIBILITY		LOCAL FLEXIBILITY	
Wholesale market	Transmission System Operator	Distribution System Operator	Behind-the-meter
<ul style="list-style-type: none"> <li>• Peak-shaving</li> <li>• Portfolio balancing</li> </ul>	<ul style="list-style-type: none"> <li>• Frequency control</li> <li>• (primary, secondary and tertiary reserve)</li> <li>• Other ancillary services (e.g., voltage management, emergency power during outages)</li> </ul>	<ul style="list-style-type: none"> <li>• Voltage control</li> <li>• Local congestion and capacity management</li> </ul>	<ul style="list-style-type: none"> <li>• Increasing the rate of Renewable Energy self-consumption</li> <li>• Arbitrage between locally produced electricity and electricity from the grid</li> <li>• Back-up power</li> </ul>

**Electrifying transport brings us closer to a more resilient power system of tomorrow!**



# Thank you!

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# Resources

- Eurelectric Decarbonisation Pathways study (2018)
- Eurelectric Smart Charging report (2015)
- Directive 2019/994