

Electrical Vehicle integration from the TSO perspective

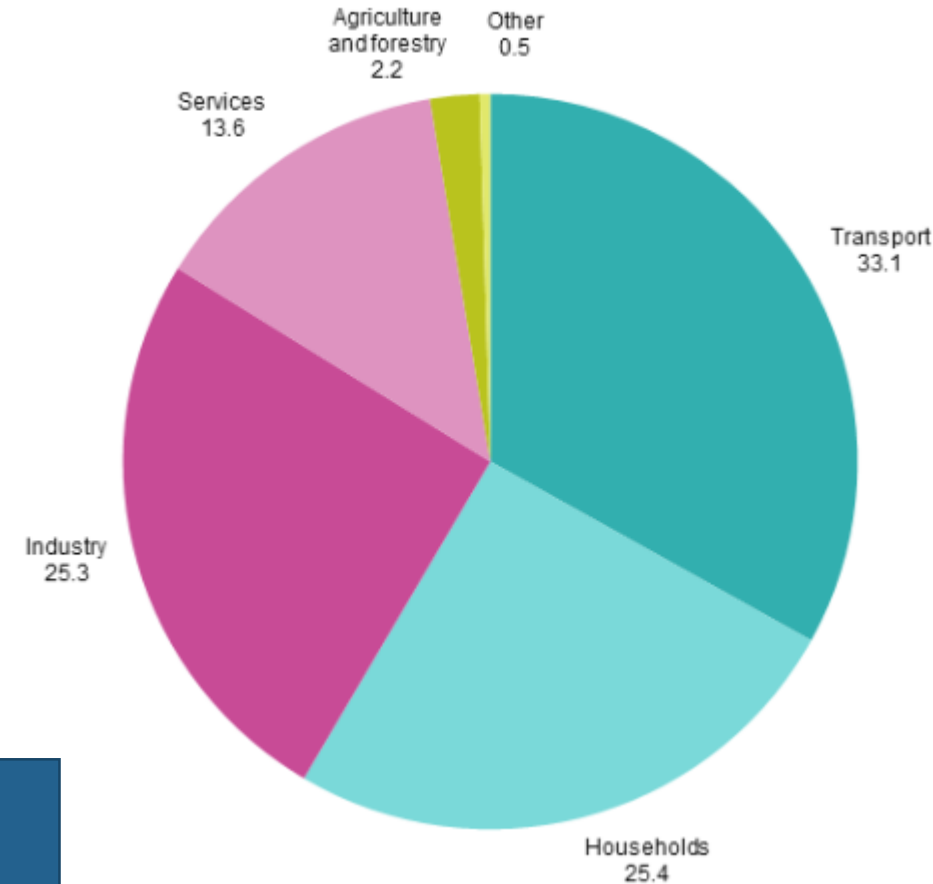
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European Green Vehicles Initiative
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The challenge of decarbonization: electrifying the transport

- The transport sector represents more than 33% of the EU total energy consumption producing the larger amount of CO₂ emissions:
- ✓ the development of electromobility is considered by most actors as one of the main elements of response to climate change.
- ✓ A proper energy mix in the power system is needed

Cleaner transport and sustainable mobility is key to achieve decarbonization objectives.



EU energy consumption

Note: figures do not sum to 100.0 % due to rounding.
Source: Eurostat (online data code: nrg_100a)

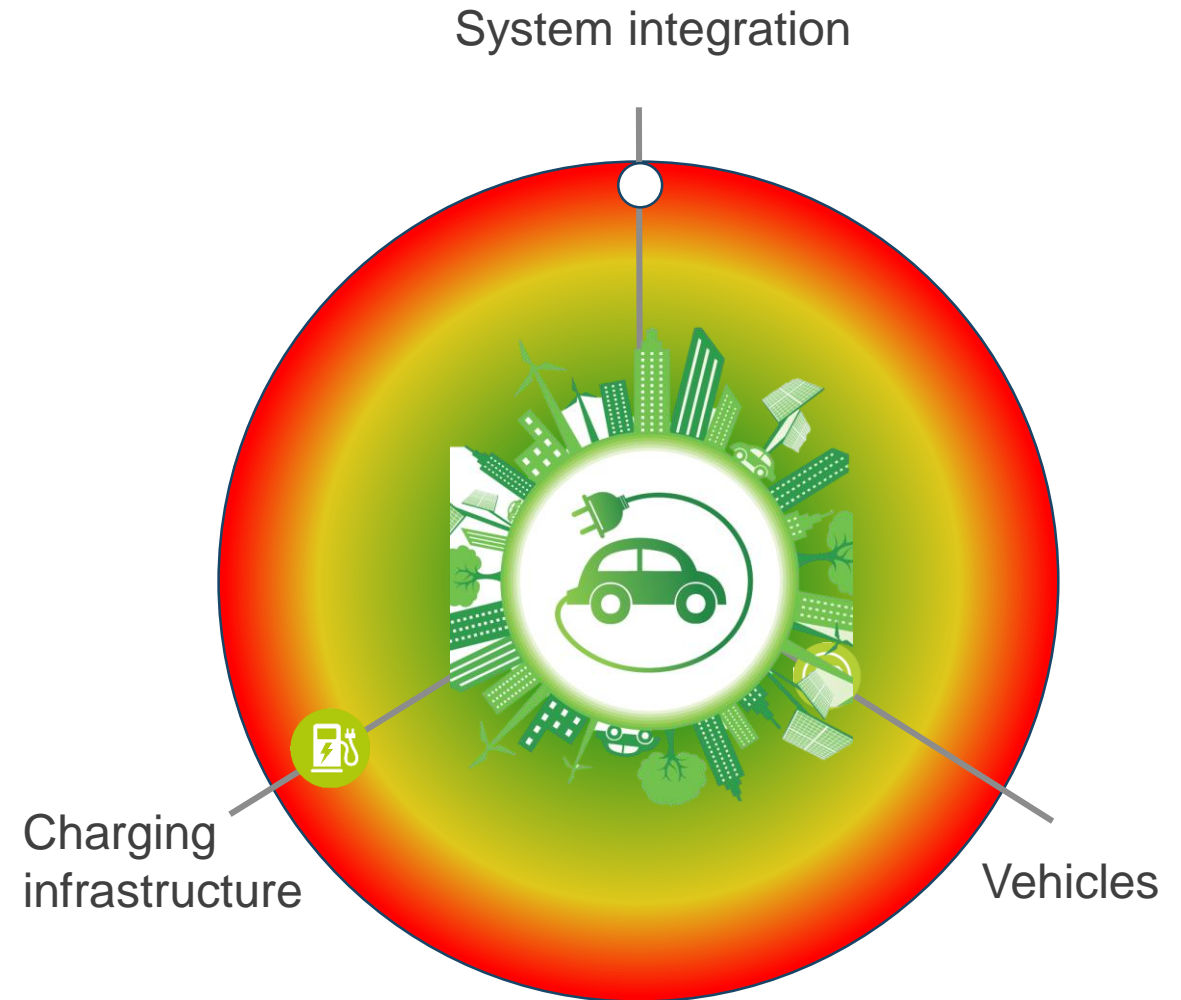
Drivers and enablers for EV development

- A push from industry to develop:
 - ✓ Electrical vehicles technology
 - ✓ Charging infrastructure allowing also long distance transport (high capacity).

EV and Charging infrastructure development led by industry to become world leaders.

- System integration:
 - ✓ Coping with the energy and capacity demand (Digital and grid)
 - ✓ Integrated system approach: TSO-DSO coordination and data exchange

Grid operators are enablers of the electrification in the transport sector



EV integration in the power system

Challenges



Congestion management

Provide spatial and grid signals to avoid grid congestions
Enable observability and controllability



Smart charging

To avoid costly adaptations both on networks and on means of generation.



Bidirectional power flow capability

To unleash the potential of the storage

Opportunities



Flexibility for the system

Balancing , Frequency control services, Voltage control and ancillary services, Capacity mechanisms, ...



Demand management

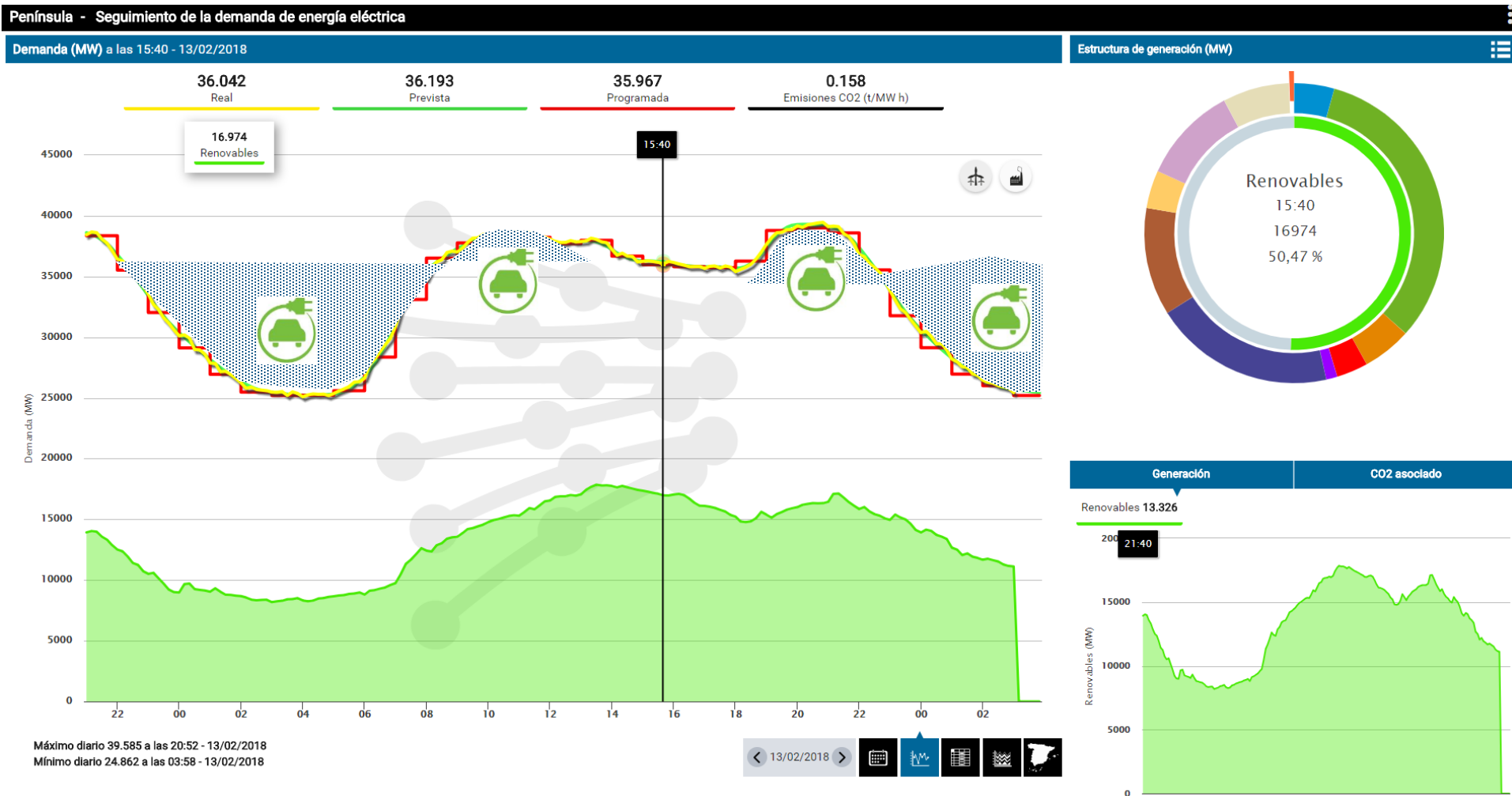
Peak shaving, filling the valleys, flattening the load demand curve,



Maximize RES integration

Avoid RES curtailment

Illustration of the Electromobility impact



The development of EV is an opportunity for the network and therefore the electrical system as a whole

Examples of initiatives on EV in the power system

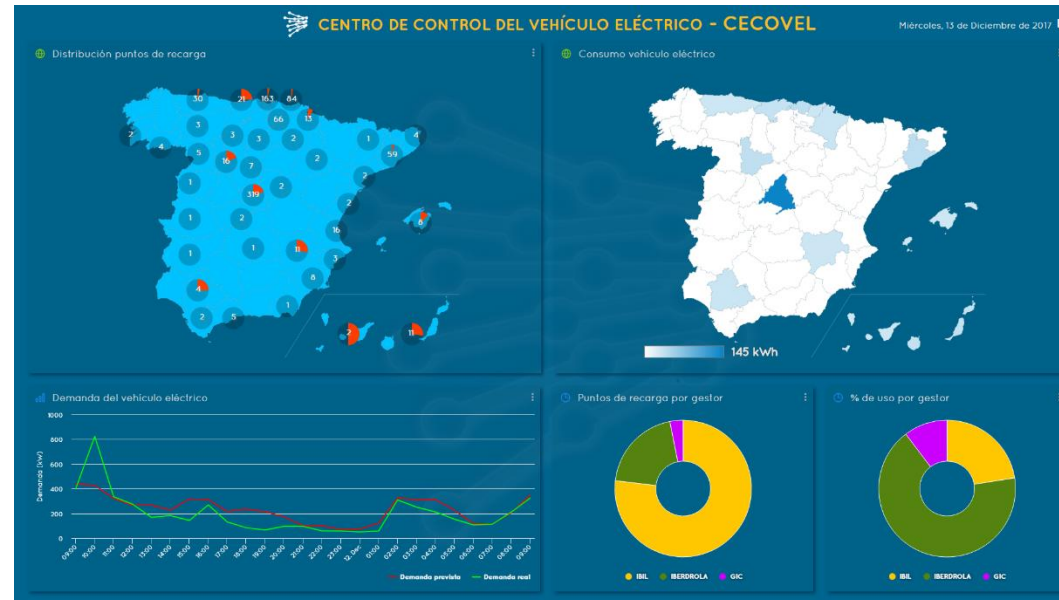
The system approach

European perspective
2030 – 2040 Scenarios



Electrical vehicle integration

Control center for electrical vehicle
ICT for observability and controllability



**RED
ELÉCTRICA
DE ESPAÑA**

V2G services
Blockchain



ENTSO-E 4.0



QUESTIONS?