



Integrating renewable energy and storage in EV charging

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Energy



Carbon



Waste



Water



Cities



Manufacturing



Financial Services



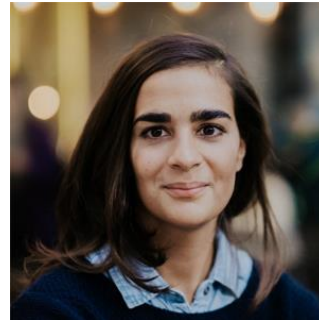
Supply Chain



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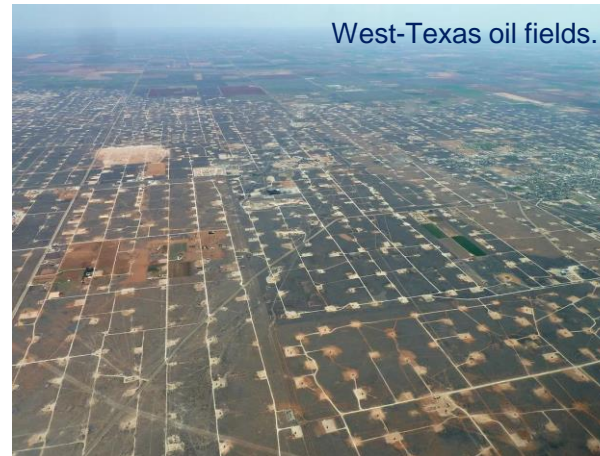
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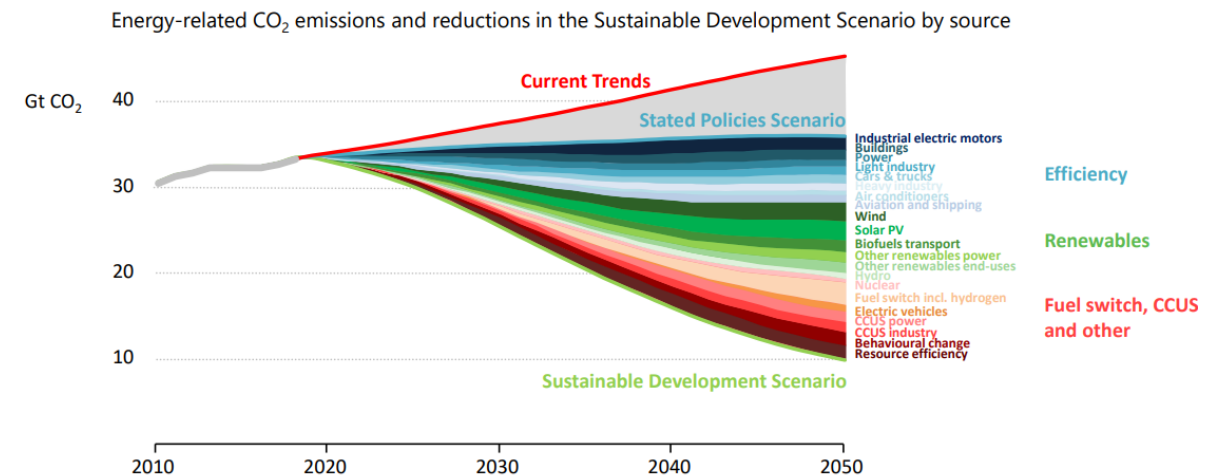


Why Electric Vehicles (EVs)?

- Sustainability
 - CO₂ reduction
 - All measures needed
- Energy efficiency
 - Well-to-Wheel
 - Life Cycle Assessment
- Air pollution
 - More lives lost than by traffic accidents
 - 2-6 % of EU GDP lost

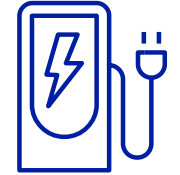
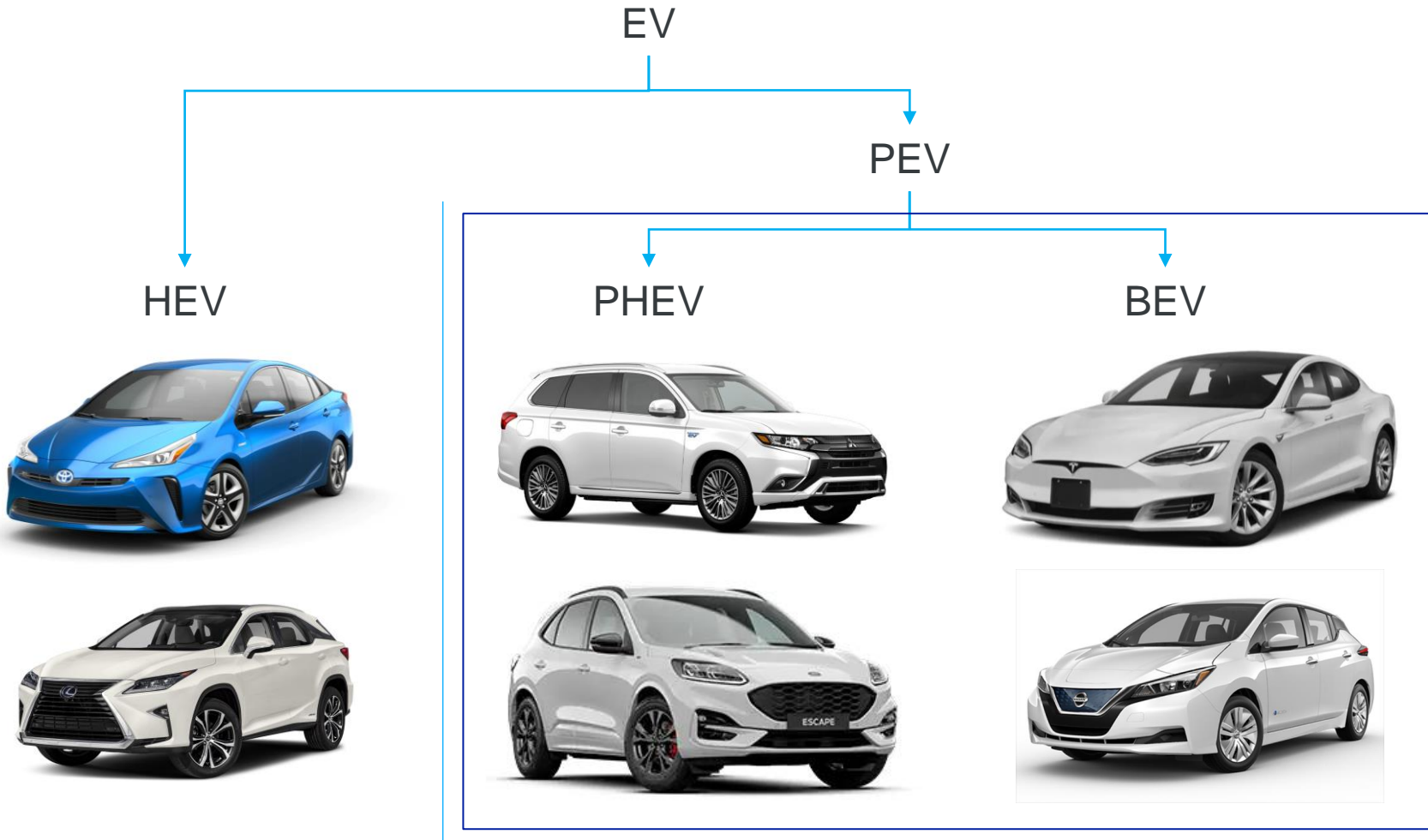


No single or simple solutions to reach sustainable energy goals

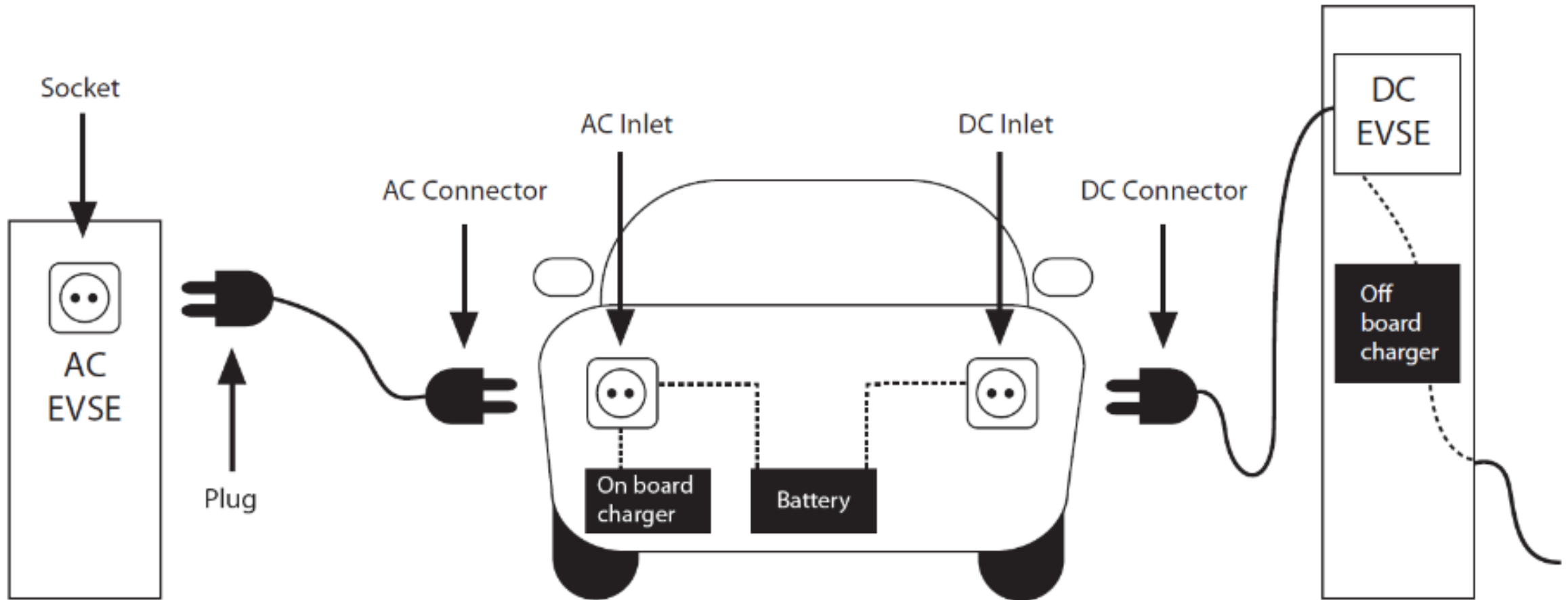


A host of policies and technologies will be needed across every sector to keep climate targets within reach, and further technology innovation will be essential to aid the pursuit of a 1.5°C stabilisation

Types of EVs



EV charging



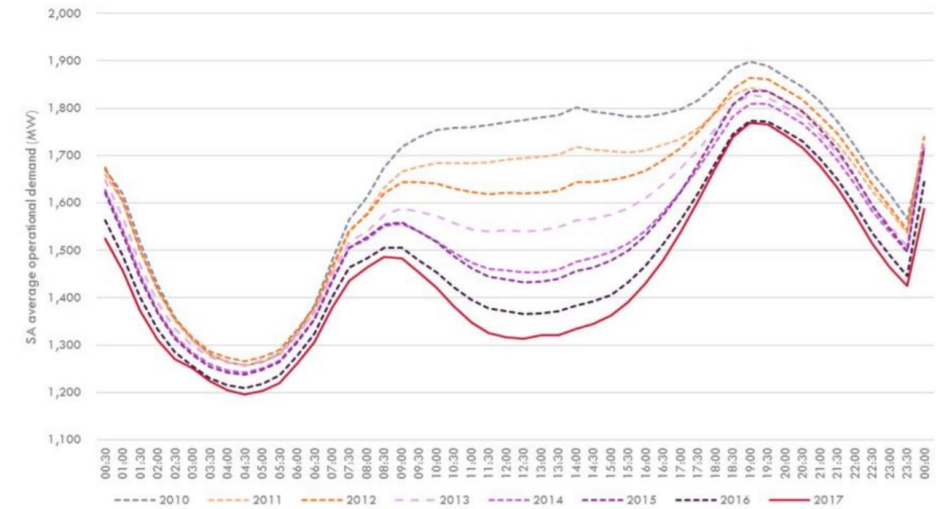
EV charging energy

- Passenger vehicles typically drive low distances:
 - Less than 40 km/day on average (AUS, EU...)
 - ≈ 8 kWh of electric energy to be recharged daily
- Plenty of time for home/work charging
 - 2.5 hours @ 3.3 kW charger
 - Low-power charging goes a long way!
- EV charging flexibility
 - Technology available
 - Controllable and automated
 - Different degrees of control and complexity

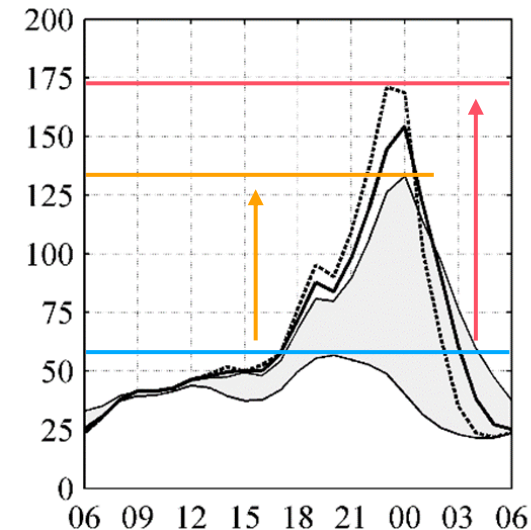


EV grid impact

- Increasing electricity consumption
 - 1 EV \approx 1 EU household's electricity consumption
 - 3 to 4 MWh/y
 - (15-20 thousand km/year)
 - **Charging flexibility**
- Impact on the overall electric system manageable
 - All cars electric \approx 30% increase in electric energy consumption
 - Gradual uptake
- Distribution grid impact high
 - Clustering of PEV users
 - High distribution grid load
 - Changing the grid load profile

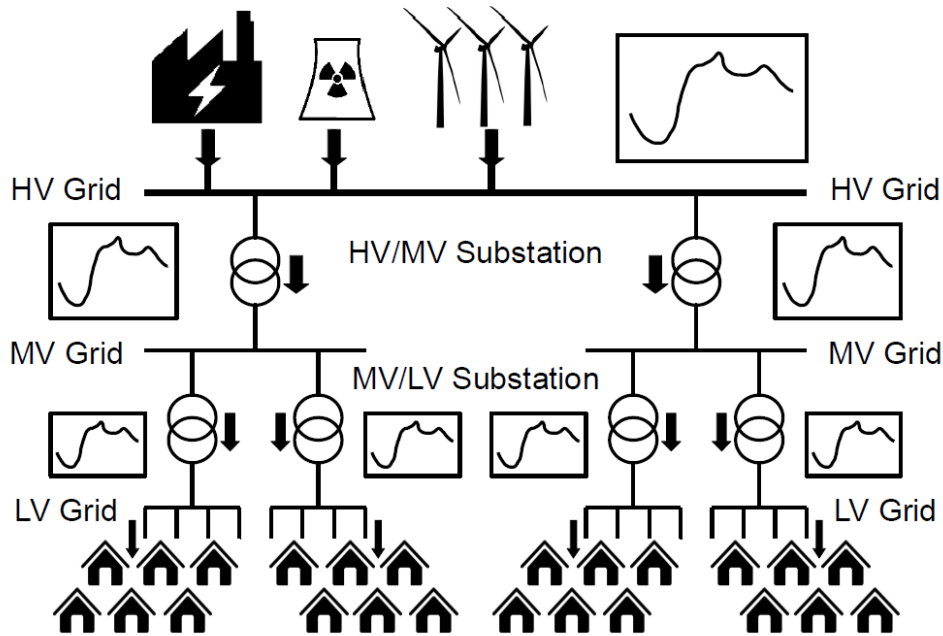


Evolution of average operational demand in South Australia due to rooftop solar PV (aemo.com.au).



Distribution grid peak load impact of EV charging for different scenarios.

The electric grid is evolving

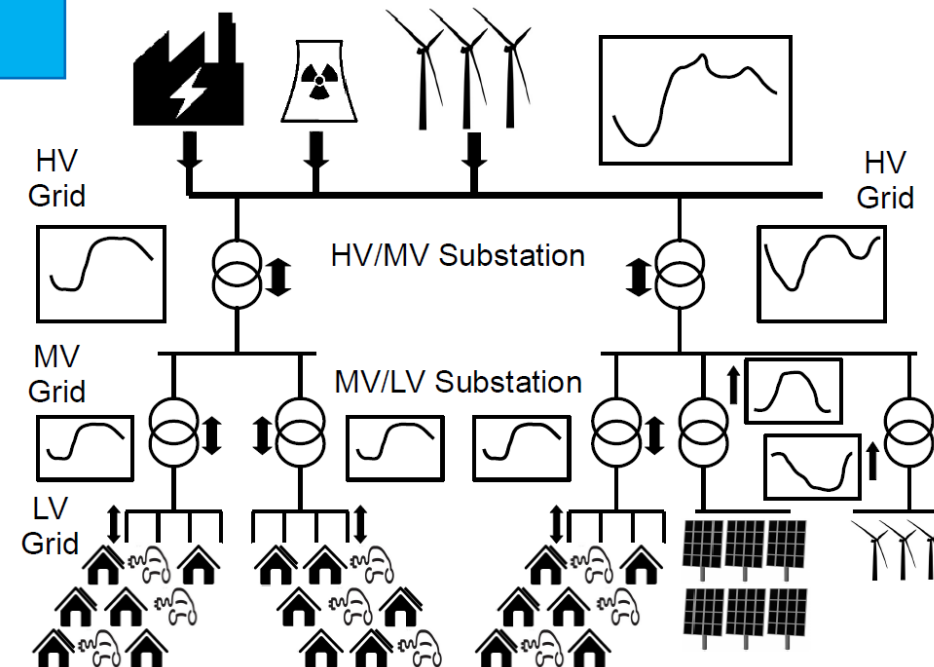


- Traditional grid

- Centralized power plants
- Power production follows load
- Top-down power flows

- The 'new' grid reality

- Centralized and decentralized power plants
- Flexible loads follow production
- Bidirectional power flows



The 'new' grid reality

- Renewable energy
 - Solar PV, wind energy...
- Energy storage
 - Battery energy storage
- Decentralized and centralized assets.



Smart EV charging

- Manage peak load
 - EV load + building load < Max load
 - Deferring infrastructure reinforcements
- Maximize renewable energy consumption
 - Synchronize EV charging with renewables
 - Increasing renewable energy share
- User-based prioritization
 - Each EV charged at departure time



Engie's Mobility Capabilities

Span infrastructures, customer experience and fleet solutions



Qualiphar



Marriott

Nature's Pride

AstraZeneca



Sample Clients



EV Charging Infrastructure

End-to-end service provision, from initial consultation and migration planning through design, installation and ongoing EV infrastructure maintenance and management.



Fleet Solutions

Clean vehicle suitability assessment and fleet management solutions to help electrify vehicle fleets while managing lifecycle costs.



Vehicle-to-Building or Grid Solutions

Development of V2G/B pilots and corporate programs to unlock additional value and resiliency from electric vehicles for commercial and grid applications.



eMobility Applications

EV Charging, Vehicle-to-Grid and end user applications to support eMobility solutions combined with insights from reporting and analytics.

Mobility at ENGIE

Leading EV Provider Across

55+ Countries Globally

2nd Largest

Provider of EV charging stations

Over 12,000 km

Of High-Speed Rail & Main Lines Electrified

75,000+

Installed Charging Stations Worldwide

900+ Million Electric kW

Charged in 2018



Thank You

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