Monitoring real-time upstream emissions of EVs during the recharge

ECE/TRANS/WP.6/2022/6

Preliminary analysis by the secretariat

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WP.6

15-17 June 2022

Harmonized regulation for Electrified vehicles

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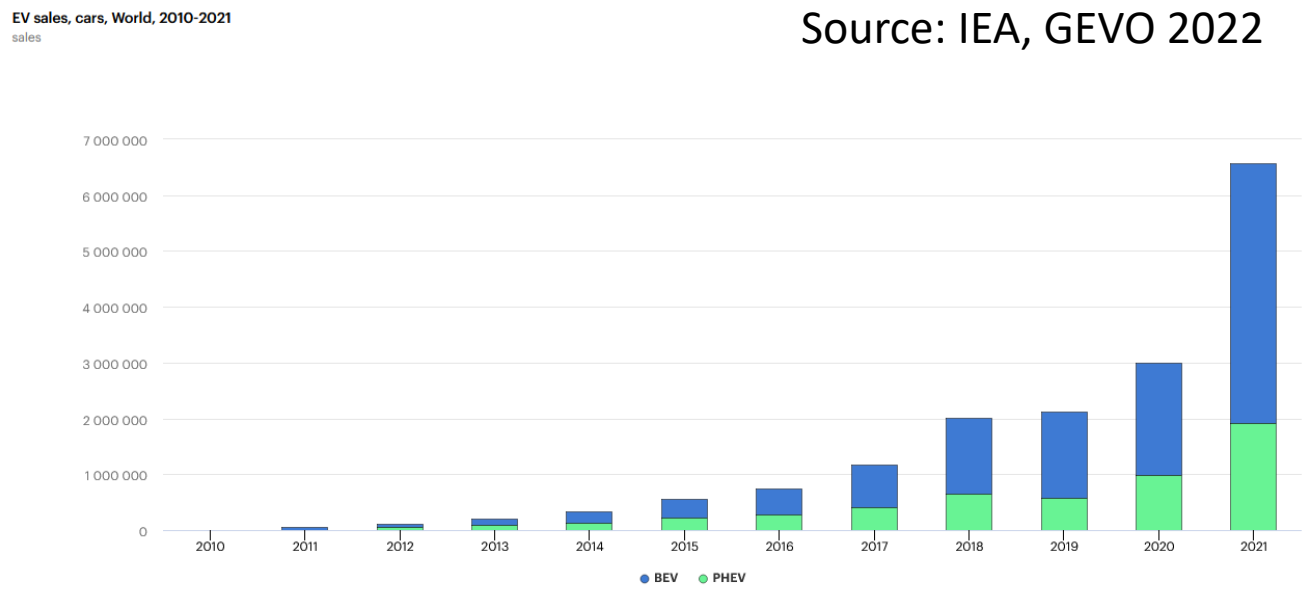
- Why looking at emissions from EVs
  - EV quickly gaining market share
  - Zero emission vs zero tailpipe emissions
- Allocation of electricity use and associated emissions to end-uses
  - Electricity use demand profile has an impact on generation and emissions
  - End user information to mitigate peak demand and reduce emissions
- Case study for the UK ; initial results
- Conclusions and Next steps

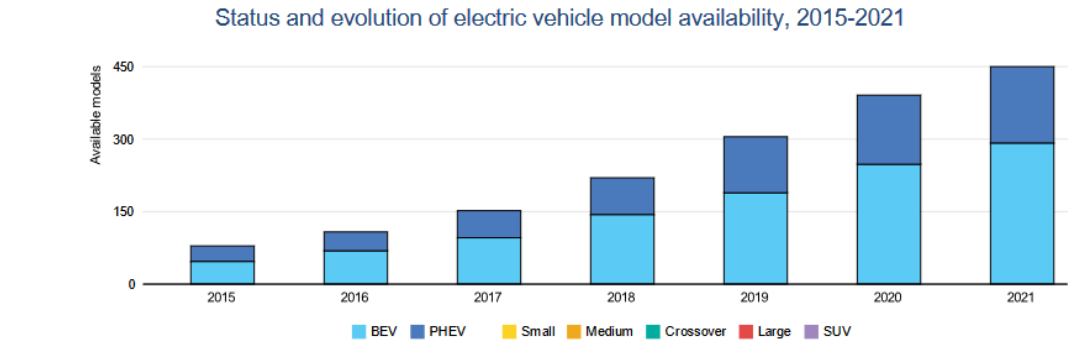
EVs growing quickly everywhere

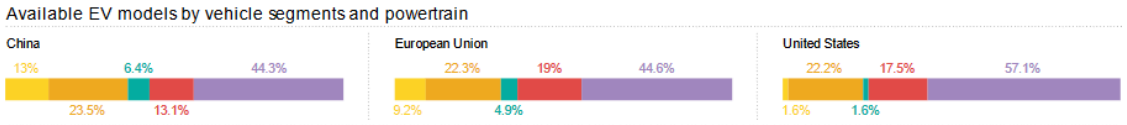
Clear political message for mid-/ long-term commitment

- EV sales almost doubling every year in the recent past, despite the pandemic
- Policies incentivizing EV sales for light duty applications
  - Fiscal incentives
  - Mandates
- Offer also increasing for light-commercial and heavy-duty applications

Source: IEA, GEVO 2022







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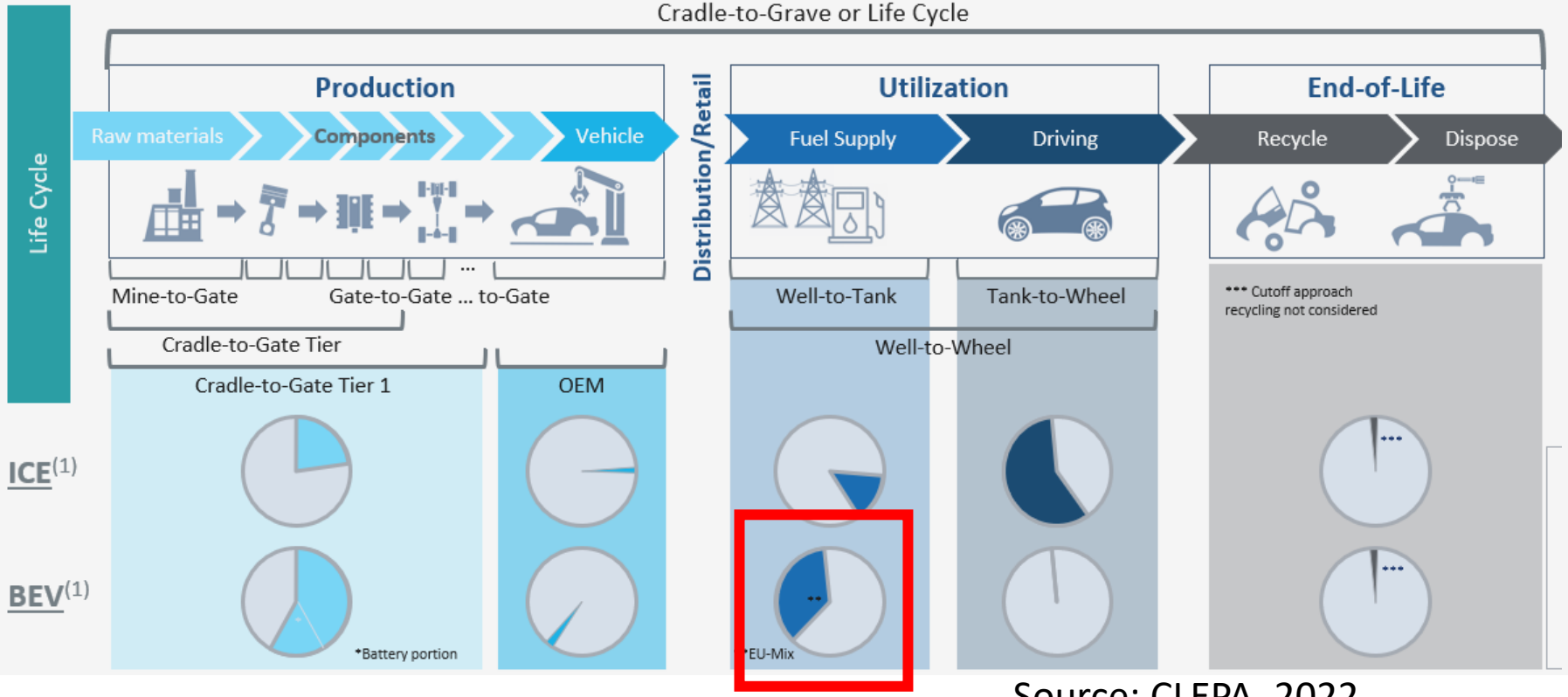
EV emissions during the use phase

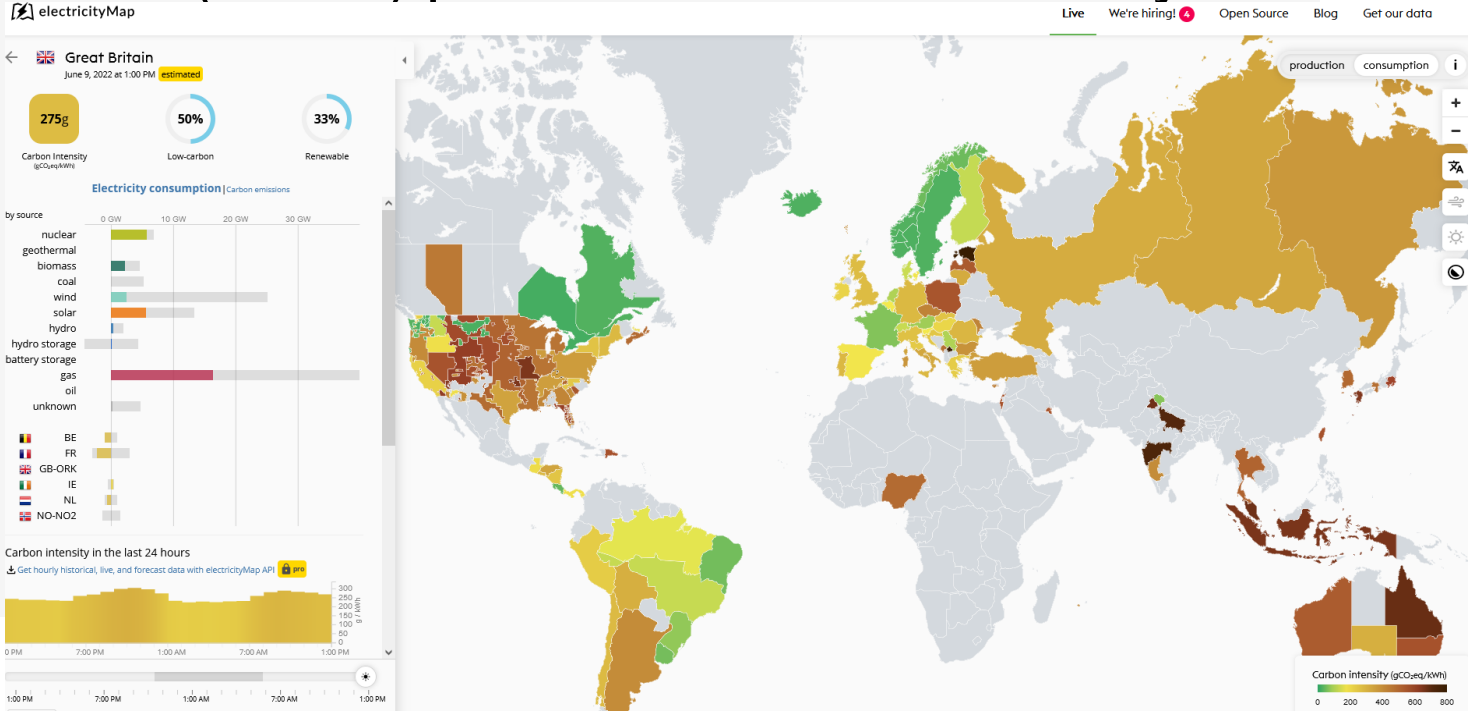
- EVs often referred to as zero emissions
  - Environmental impact shifting from end-use phase to upstream phases, from vehicle manufacturing and energy production



Source: CLEPA, 2022

Electricity generation emissions in emissions inventories

- In UNFCCC national GHG inventory reports, electricity is under energy industries, and transport a separate sector
  - Electricity emissions not allocated to end-uses
- Many Distribution Network Operators (DNOs) provide real time electricity mix and carbon content
  - Some are making a business out of this information e.g. electricitymap.org



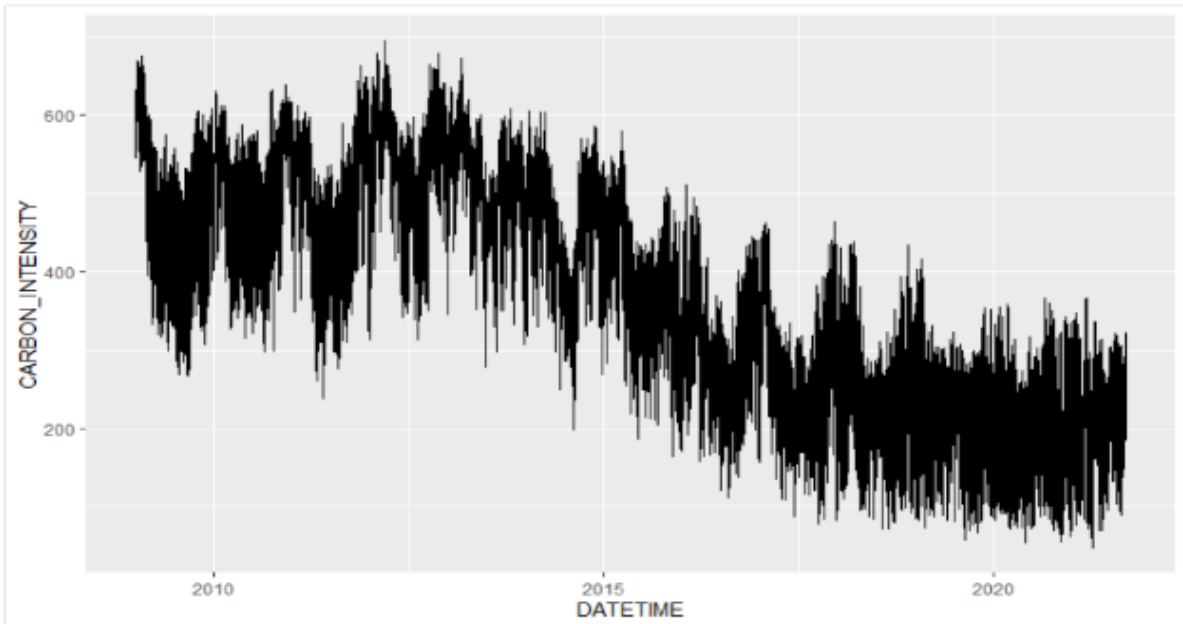
Exploring the potential for real-time determination of CO2 emissions during recharge

- Workshop organized between the Sustainable Transport and Energy Divisions of UNECE in May 2021: “Real-Time Upstream Emissions of Electric Vehicles During Recharge”
  - https://unece.org/sustainable-energy/events/online-workshop-real-time-upstream-emissions-electric-vehicles-during
- Stakeholders suggested to:
  - go beyond annual average to calculate EV electricity use emissions
  - explore the mitigation potential of EV recharge during low carbon intensity hours
- Secretariat developed a paper on the topic: ECE/TRANS/WP.6/2022/6
- Develop dedicated ForFITS module following ITC’s decision to support the work on future technology modelling, if resources available

Case study for the UK

- Publicly available data on electricity mix and carbon intensity in 30-min steps from 2009
- 2019 Study on charging behaviour from Element Energy

Figure 3
Great Britain carbon intensity of electricity (grams per kWh) over time



Source: National Grid

UK case study

- Peak demand in evenings also matches time of higher carbon content

Figure 2
Great Britain daily electricity demand, 2020 and seasonal averages

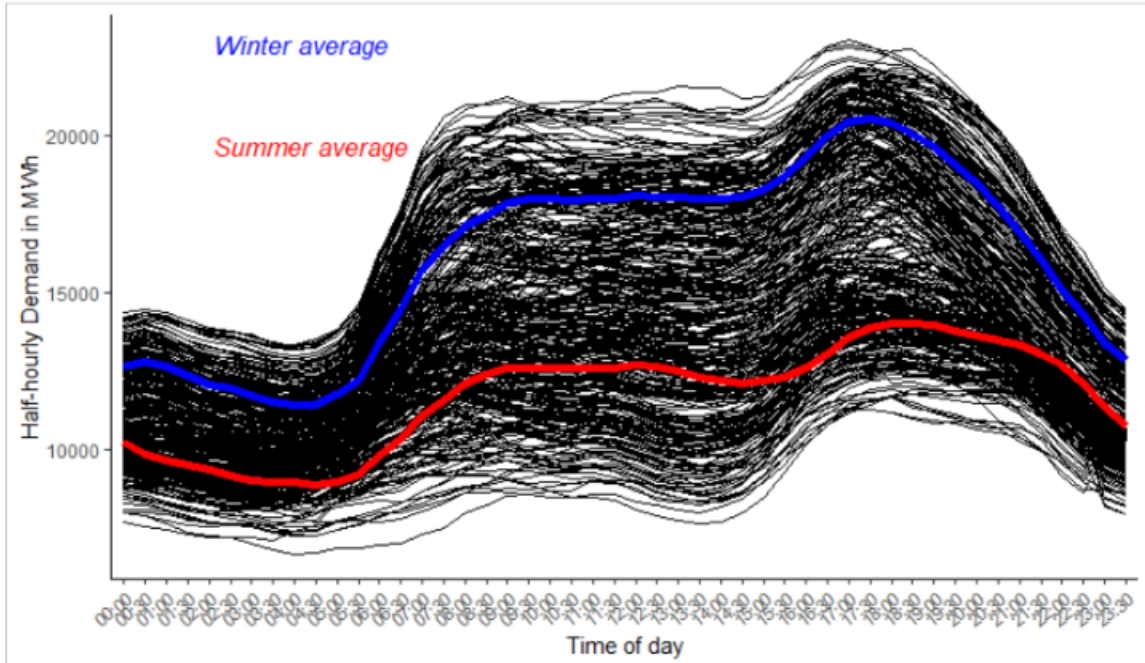
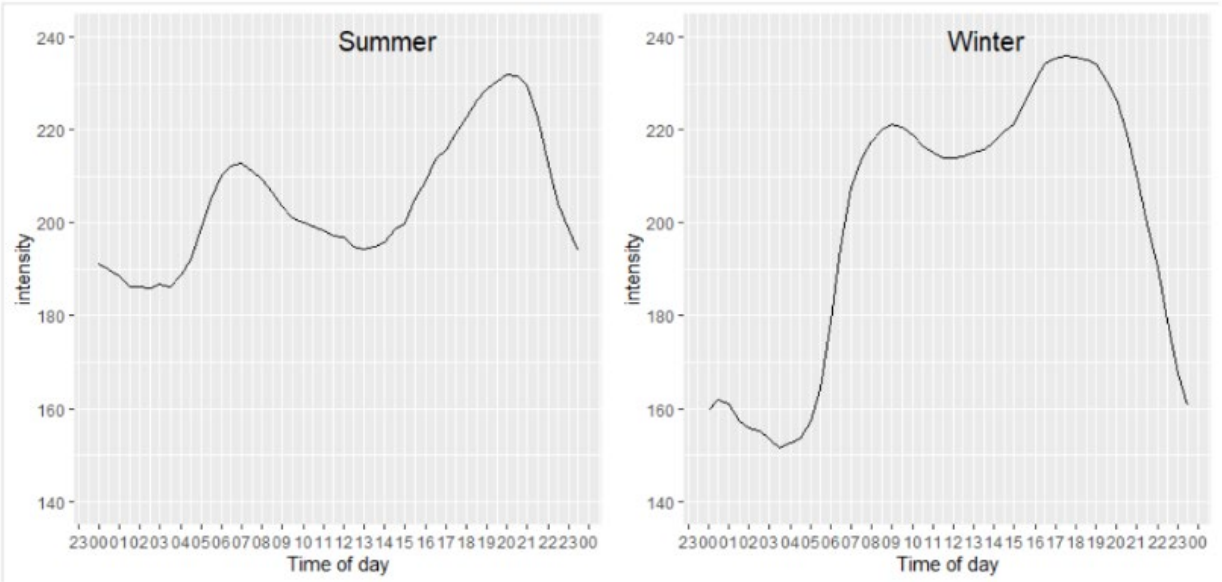


Figure 5
Great Britain CO_2 intensity in 2020, daily trends in Summer and Winter



Source: National Grid

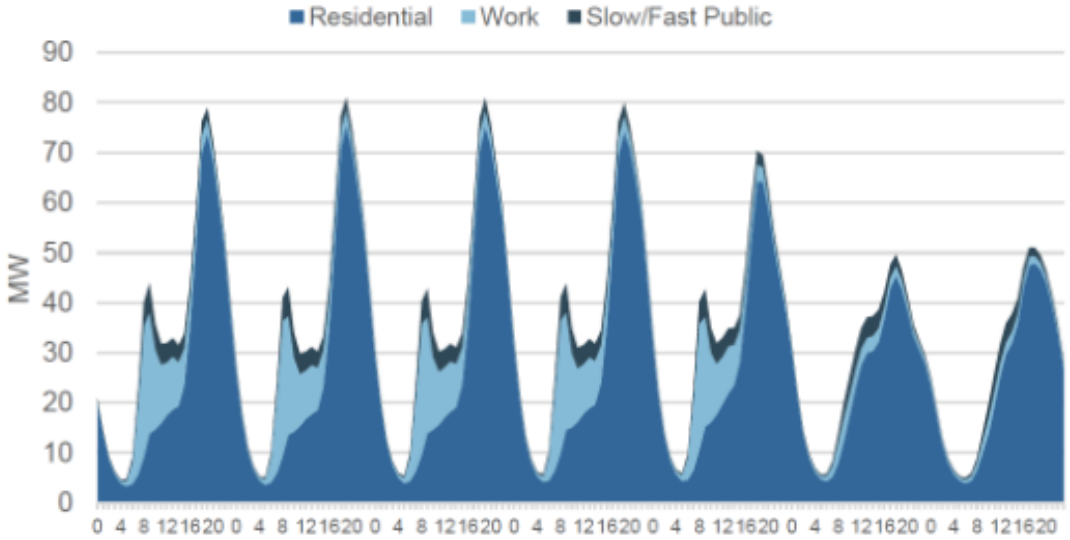
UK case study

- Recharging peak demand also in evenings

Further analysis to determine:

- Use of average annual carbon intensity underestimates real recharging behaviour
- CO2 mitigation potential if recharging occurs at lowest carbon intensity times

Figure 7
EV recharge weekly average demand profile in Great Britain



- Resources constraints at the secretariat

Conclusions and next steps

- Further analysis on mitigation potential of various EV recharging demand profiles
  - Dedicated module for our internal ForFITS tool
- Data collection on EVs and its ecosystem (number of EVs registered – battery size bins-, recharging infrastructure points – power bins-, real-time electricity demand from EVs,…) might be initiated now
- Start the development of reporting/monitoring mechanisms to be able to allocate electricity use to end-use sectors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Thank you!