International Transport Forum

Policy drivers and market development of vehicle electrification – Focus on Europe

Pierpaolo Cazzola, International Transport forum

Roads Australia EV Webinar – 16 September 2020

OECD

Where are we with electrification?

Electrification is central to deliver against key pillars of the clean mobility transition

- **Enhancing energy efficiency of vehicles**

  How? Electrification is a key enabler of low- and zero-emission vehicle technologies

  - **PHEVs, BEVs**
  - **FCEVs** (which are hybrids, and can be designed plug-in)

- **Decarbonising energy vectors/fuels**

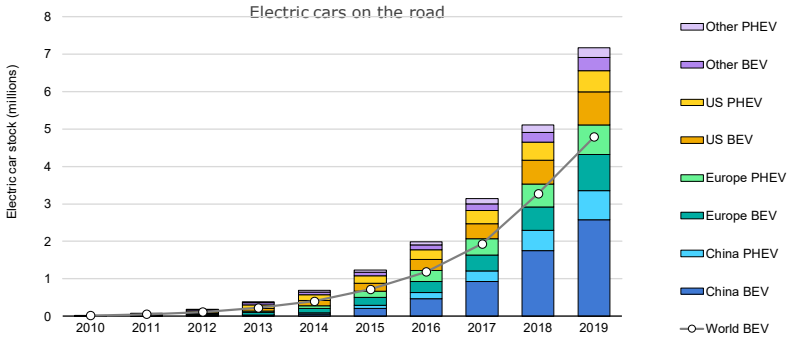
  How? Electrification (both through battery electric and hydrogen technologies) offers very significant opportunities to diversify the energy mix in transport, as well as important synergies for the increase of variable renewable energy integration in the power system

  - Transport is currently heavily dependent on oil products (>95% of energy demand in the sector), while **electricity is the most diversified energy vector currently available**
  - **Distributed energy storage** from EVs **can help accelerating the transition to low carbon electricity and hydrogen** thanks to the opportunity to better handle the variability of renewable energy sources (demand response, electricity storage)
  - Renewable electricity is one of the options that could enable low-carbon **hydrogen** and **power-to-X fuels**

EVs (PHEVs, BEVs)

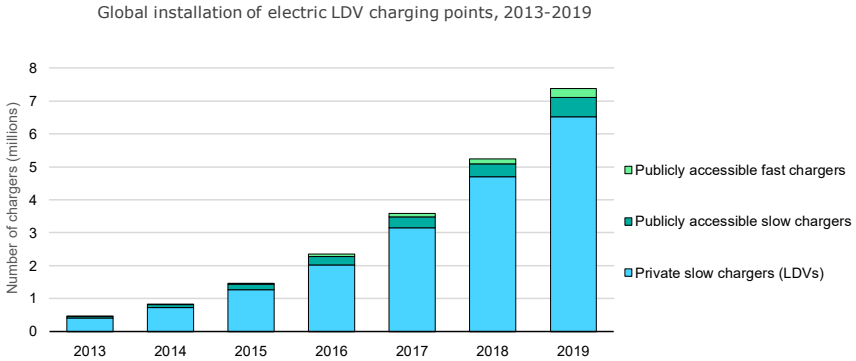
(1/2)

- **Currently expanding at a rapid pace**
  - In 2019, electric car fleet reached 7.2 million, up 2 million from 2018 (+buses and two-wheelers…)
  - China is the world's largest EV market, Norway has highest electric car market share



- **Policies playing a critical role in EV deployment**
  - Fuel economy standards coupled with incentives
  - Mandates
  - Economic instruments that help bridge the cost gap
  - Support for the deployment of charging infrastructure

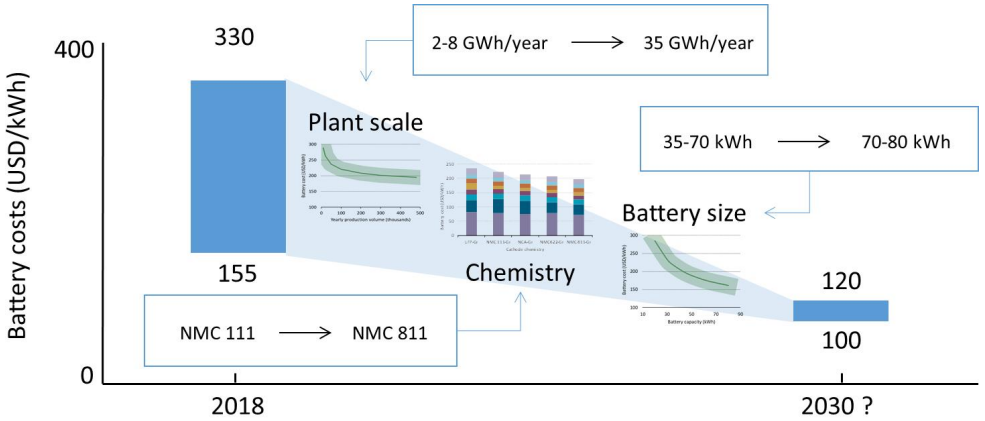
+ Strategic relevance for industrial development of battery technology value chain



Source: IEA Global EV Outlook 2020

EVs (PHEVs, BEVs) (2/2)

- **Technology advances are delivering substantial cost cuts**
  - Key enablers: developments in battery chemistry, expansion of manufacturing capacity and increase in pack sizes

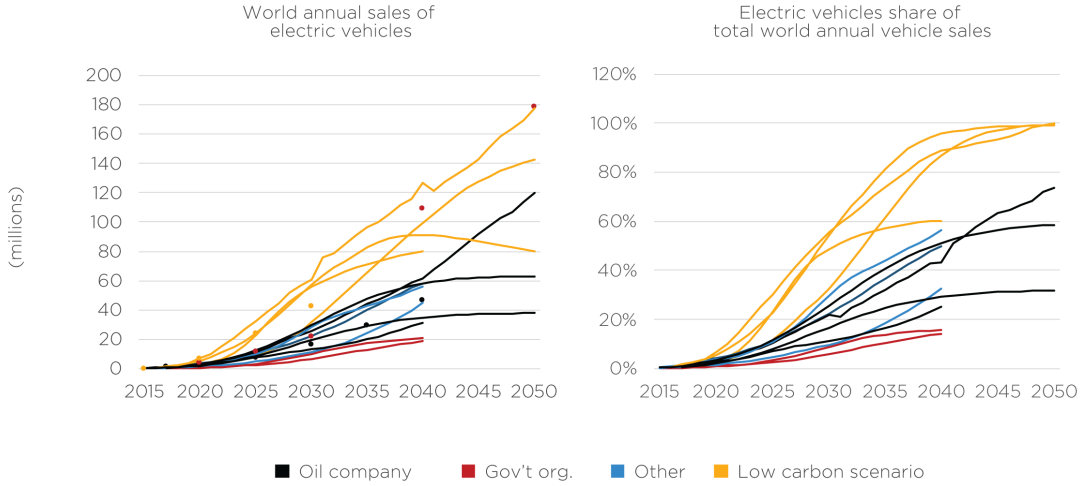


Source: elaboration from IEA Global EV Outlook 2018

- **Private sector response to public policy signals confirms upward trends**
  - Many OEM actively working on the development of new platforms and the diversification of the offer of models and powertrain configurations
  - Battery manufacturing sector witnessing major developments (and investments), with high frequency of announcements of large-scale battery manufacturing plants, despite Covid-19
  - Automotive sector crucial for scale increase

Projections: EV market

- **Positive outlook for the increased deployment of electric vehicles and charging infrastructure**
  - EVs and charging infrastructure expected to grow in all types of scenarios/projections from industry and governments
  - Multiple private sector announcements, consistent with 130 million EVs or more on the road by 2030
  - Coexistence of BEVs and PHEVs



Source: Columbia University, 2019

- **Role of supportive policy remains crucial for future developments**
  - Key markets for early deployment (due to market size, policy ambition, presence of OEMs…): China, Europe, United States, India, Korea and Japan

Focus on Europe

Europe is home to 25% of global EV fleet, EV market shares among the world's highest

Policy framework is supporting transition to e-mobility…

- Overall vision/ambition clearly outlined in the European Green Deal
- Centrality of electricity and batteries for the clean energy transition acknowledged
- Highest taxation on fossil fuels globally (especially in road transport)
- CO_2 emissions standard for LDVs to 2030 (incl. EV credits)
  - 2020-30: 37.5% improvement for cars and 31% for LCVs (OEM-specific targets)
  - Less stringent target for OEMs with high shares of low-emission vehicles (<50 gCO2/km)
- CO_2 emissions standard for trucks to 2025-2030
  - 15% reduction of CO2 emissions/km of trucks 2020-25 and 30% by 2030
- Country-level differentiated vehicle registration tax (e.g. France, Germany, Italy, the Netherlands, Norway, Sweden)
- Differentiated treatment of EV also for annual circulation tax (Germany) and other policies increasing EV value proposition (e.g. access restrictions and charges in urban areas)
- Clean Vehicles Directive (public procurement for clean LDVs, trucks and buses)
- Common rules for internal electricity market, positive for batteries (presence of market services such as grid balancing, aim to ease emergence of aggregators as new market players)
- Batteries part of EU industrial policy: European Battery Alliance, work ongoing on carbon content of batteries, critical materials and supply chain sustainability

EVs

What are the main challenges? And what could help solve them?

- **Closing the cost gap (major progress underway, but we are not yet there)**
  - Need for policy support to ensure that the adoption of EVs continues to scale up, enabling cost reduction thanks to mass production and technology progress
- **Ensuring that EVs become and asset rather than a liability for the power system**
  - Need to deploy charging infrastructure with effective business models
  - Importance to prioritize slow charging (home, workplace) and allow the participation of small electric loads in the power market to avoid exacerbating power demand peaks
- **Ensuring that the resource-intensiveness of battery technologies is addressed**
  - Need for policy action to give greater value to batteries produced through sustainable supply chains and ensure that their sustainable disposal (second-life, end-of-life/recycling performance-based requirements…)
- **Anticipating the challenges for the stability of governmental revenues from transport taxation**
  - Importance of adaptive feebates and fuel taxes based on carbon intensity
  - Relevance of distance and location based charges (which also takes into account congestion and cost of infrastructure, and can help address changes due to sharing/automation)

What to expect

- Europe likely to continue to be at the forefront of transport electrification
- Covid-19 was a major hit on the economy, but also led to a collective agreement to use resources to provide economic stimulus
- Several calls pointed towards the need to ensure that stimulus is used to "build back better", promoting energy efficiency and greater resilience (including for industrial development)
- Investing in an upgrade of the power grid and EV charging infrastructure is amongst the set of solutions that would allow boosting the economy in the near terms while leaving an heritage of assets for the future, and therefore well fit to respond to the Covid-19 challenge
- Given the better TCO of highly utilized vehicles and the greater tendency of fleet owners to take economic decisions based on economics, it is likely that fleets of urban vehicles (sufficient range for overnight charging) will be among the areas of dynamic adoption for EVs
  - Buses (already started), light commercial vehicles for urban deliveries, taxis, ridesourcing vehicles
- Electrifying large vehicles brings more benefits to comply with tailpipe GHG emission reduction per km, but electrifying smaller vehicles is cheaper
- BEVs and PHEVs can coexist (diverse usage profiles, important to manage development in battery supply)
- Aspects related with climate change mitigation, energy diversification, energy efficiency, industrial development, critical materials, resilience, supply chain sustainability will remain relevant in the policymaking framework
- Issues related with the stability of governmental revenues from transport taxation will also matter

International Transport Forum

Thank you

pierpaolo.cazzola@itf-oecd.org

OECD

Complementary slides

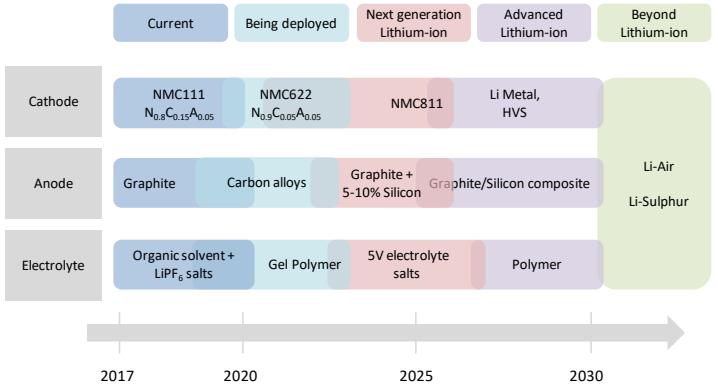
Focus on batteries

(1/2)

- **Dynamic environment, characterized by pro-active initiatives in industrial policy development**
  - Relevance of batteries for the energy technology transition
  - Importance of the automotive sector to increase scale and cut costs
  - Strategic importance of the battery technology value chain for industrial competitiveness
- **Li-ion expected as the technology of choice for the next decade**
  - Li-ion will continue to improve, thanks to several enhancements possible in battery performance
  - Other technology options will be ready after 2025, and scaled up in the following years

Country	Description
China	New energy vehicle (NEV) credit mandate requires OEMs to produce a minimum share of NEV cars (does not concern batteries only). Electric Vehicle Subsidy Program (does not concern batteries only).
European union	European Battery Alliance to promote the development of a battery industry in Europe.
Japan	METI's strategic commission for the new era of automobiles (long-term goal and strategy of Japan's automotive industry for tackling global climate change) (does not concern batteries only).
Korea	Government to increase support for R&D in the areas of chips and batteries to develop key technologies such as solid state, lithium-sulphur and lithium-metal batteries.
United States	US Department of Energy's Vehicle Technologies Office supports the development of battery and electric drive systems.

Source: elaboration from IEA Global EV Outlook 2019

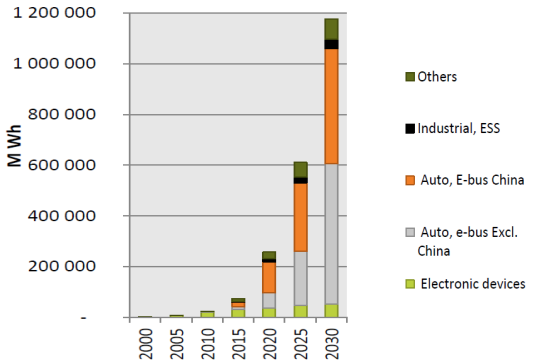


Source: IEA Global EV Outlook 2018

Focus on batteries

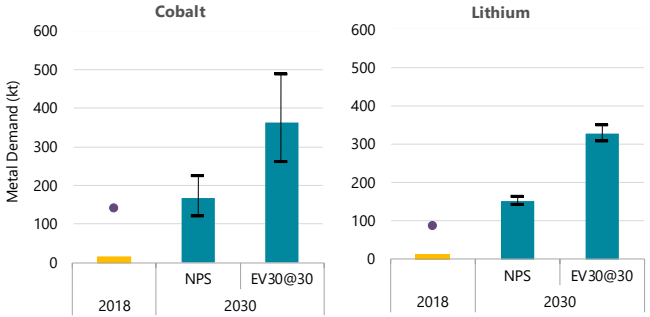
(2/2)

- **Automotive (car, buses) expected to become major driver of battery capacity additions**
  - Today, 1% of the automotive market accounts for 60% of the Li-ion battery capacity
  - Even a very small EV market in the automotive world will represent a huge market for batteries



Source: Avicenne energy, 2019

- **Annual demand for materials for batteries expected to significantly rise**
  - Supplies need to scale-up to enable the projected EV uptake, particularly for cobalt and lithium
  - Cobalt demand has the largest variation to the type of cathode chemistry



Source: IEA Global EV Outlook 2019

Batteries

Key areas that deserve near-term policy attention

- **Investments on battery production kick-started, but there is a need for more action**
  - Significant gap between g CO2/km objectives and current status
  - Primacy of major Asian players in battery manufacturing still very clear, EU market share still <1%
  - Need for more action on supply chain sustainability (embedded carbon, certification, second life, end-of-life)?
- **Industrial development: need for…**
  - Policy framework reducing investment risks
  - Attractive investment framework for extraction, refining and recycling activities
  - Development of specialized skills on applied process design and cell manufacturing
  - Attractive investment framework for investments in battery manufacturing
  - Support of research and innovation efforts on advanced battery technologies
- **Supply chain sustainability: need for…**
  - Reliable access to raw and processed material supplies
  - Traceability and transparency for sustainable sourcing of minerals
  - Minimize environmental impacts – including GHG emissions - occurring across the supply chain
    - Reduced embedded carbon content
    - Improve resource efficiency (second-life, end-of-life of batteries)