International Transport Forum | Global dialogue for better transport

Decarbonising transport

4 September 2019

Electricity system (r)evolution
What role for baseload and dispatchable technologies

Decarbonising Transport Initiative

OECD

Decarbonising transport

International Transport Forum

Pillars

- Manage travel demand
  - Reduce trip distances
  - Shift modal choice towards energy efficient modes
  - Maximise the capacity utilisation of vehicles
- Enhance energy efficiency of vehicles (road, rail, shipping, aviation)
- Decarbonise energy vectors/fuels
- Minimise emissions beyond vehicle use and energy/fuel production
  - Vehicle manufacturing and infrastructure construction

+ Need to place this in the broader framework of the SDGs
  - Importance of meeting multiple targets: co-benefits for safety, affordability, health/pollutant emission reduction, energy security, accessibility, connectivity, industrial development, economic growth…

Manage travel demand (passenger)

International Transport Forum

Key actions

- Avoid urban sprawl and promote compact cities
- Regulate/modulate the cost of transport to reflect full impact for all modes
  - Eliminate fossil fuel subsides, use fuel taxes and carbon pricing
  - Adopt pricing/charges and regulations sensitive to location, time and occupancy/capacity utilisation
- Capture and reinvest the value generated by public transport/rail infrastructure
- Increase the value proposition of non-motorised & public transport modes
- Promote shared mobility and ensure that it is steered towards complementarity with public transport (MaaS)

Why is this helping manage passenger transport demand?

- Greater proximity of origins & destinations, similar travel cost (managing rebound)
- Cost pressure, reduced barriers to access and greater appeal for NMT and public transport/rail

+ Better economics for public transport/rail, possibility to handle equity concerns

Manage travel demand (freight)

Key actions

- Regulate/modulate the cost of transport to reflect full impact for all modes
    - Eliminate fossil fuel subsides, use fuel taxes and carbon pricing
    - Adopt pricing/charges and regulations sensitive to location, time and occupancy/capacity utilisation
- Enable the use of high capacity vehicles
- Foster physical compatibility, asset sharing & collaboration in logistics
- Foster the adoption of digital technologies for route optimisation and trip chaining
- Capitalise on the experience of green freight programmes
- Avoid urban sprawl and promote compact cities

Why is this helping manage freight transport demand?

- Cost pressure (greater penalties/tkm for small or empty vehicles)
- Reduced physical barriers
- Greater opportunities for larger shipments

Enhance energy efficiency of vehicles

International Transport Forum

Key actions

- Adopt operational measures: regulate speed (including slow steaming), require periodical driver training
- Ensure that fuel-saving technologies are ready to scale up (testing, standardisation…)
- Promote the uptake of low- & zero-emission vehicles with economic incentives and regulations
    - Adopt fuel economy regulations/standards that are progressively more stringent over time
    - Adopt differentiated taxation & regulations (vehicle purchase taxes, road use charges, port and airport fees, access restrictions & waivers, sales share mandates) based on environmental performance of vehicles
- Enable EVs to become an asset rather than a liability to the electricity sector
    - Deploy digital processing and communications to the electricity grid (smart grids) and reform the electricity market to capture value from distributed energy storage on EVs and seize opportunities for demand response
- Develop criteria defining the sustainability of supply chain, adopt minimum standards, promote good practices
- Support/finance RD&D on innovative low- & zero-emission vehicle technologies

Why is this helping enhance energy efficiency?

- Reduced barriers, bridging the cost gap and direct impact of policies on increased market uptake/adoption
- Electric motors inherently more efficient, electrification enables zero well-to-wheel physical flows and emissions: crucial to decouple energy, GHG and economic growth

\+ Vast technology transition, with major opportunities for industrial development

Decarbonise energy vectors/fuels

Key actions

- Develop criteria defining the sustainability of transport fuels/energy vectors, adopt minimum standards, promote good practices
- Promote the use of low- & zero-emission energy vectors with economic incentives and regulations
  - Give priority to the dispatching of electricity from renewable energy sources
  - Introduce Low Carbon Fuel Standards to promote energy vectors with best environmental profile
- Support the deployment of refuelling/charging infrastructure
- Support RD&D on innovative low- & zero-emission energy vectors

Why is this helping decarbonise energy vectors?

- Reduced barriers, bridging the cost gap and direct impact of policies on increased market uptake/adoption
- Measures broader than electrification, well fit to have impact for long-distance modes

+ Fits with the broader context of the *energy transition* (e.g. renewables), with major opportunities for industrial development

Minimise emissions beyond vehicle use

Key actions

- Minimise material need per unit of passenger and freight transport service (pkm, tkm)
    - Promote shared and collective passenger transport modes and asset sharing in logistics
    - Discourage overbuilding of infrastructure, as well as parking oversupply
- Reward material efficiency in design, fabrication, use and end-of-life of vehicles and infrastructure
- Minimise energy and GHG emissions from vehicle and infrastructure construction

Why is this helping minimising emissions beyond vehicle use?

- Vehicle manufacturing and infrastructure construction are main sources of energy and emissions beyond vehicle use
- Asset sharing has impacts similar to management of travel demand in transport analogy
- Material efficiency has impacts similar to energy efficiency in the same analogy
- Consistent with 3R (reduce, reuse, recycle) paradigm for minimisation of waste and management of resource use

Making it happen

High-level considerations

- Best to look for win-win solutions, providing multiple advantages
    - Not only climate change mitigation: co-benefits for safety, affordability, health/pollutant emission reduction, energy security, accessibility, connectivity, industrial development, economic growth…
- Need to account for a life-cycle perspective when looking at transport…
    - Need to ensure that action on transport is mirrored by action in other sector (power generation, construction industry…)
- … and to look beyond transport
    - Major opportunities from synergies between transport-related technologies (e.g. EVs, electricity, hydrogen) and other sectors (e.g. from the integration of distributed energy storage in the electricity system)
- Need for a clear vision

International Transport Forum

Actions undertaken by the ITF

Decarbonising Transport Initiative

Progress tracking

- Evaluate how current mitigation measures contribute to reducing transport CO_2.

In-depth sectoral reports

- Analyse in detail effective policies for decarbonising transport sub-sectors.

Focus studies

- Analyse specific decarbonisation issues (e.g. specific transport modes).

National pathways

- Help countries define pathways to meet their transport CO_2 reduction ambitions.

Policy dialogue

- Organise global dialogue on transport and climate change through roundtables, policy briefings and technical workshops etc.
- Act as a conduit for transport sector input to climate change negotiations.

European Commission

IKI

THE WORLD BANK

Global Climate Action
United Nations Climate Change

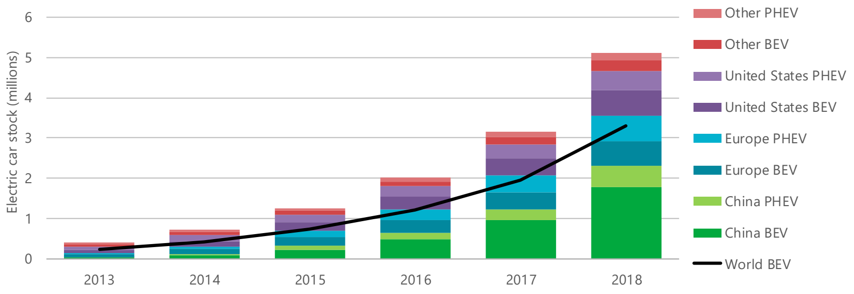
What is most relevant for today’s event?

Enhance energy efficiency of vehicles & decarbonise energy vectors/fuels

- Low- and zero-emission enabling vehicle and fuel technologies…
  - **PHEVs, BEVs**
  - **FCEVs and hydrogen**
  - Combustion technologies and **power-to-X fuels**
- … using low-carbon electricity
  - Renewables
  - Nuclear
  - Thermal plants with CCS

EVs (PHEVs, BEVs) (1/2)

- **Currently expanding at a rapid pace**
  - In 2018, electric car fleet exceeded 5.1 million, up 2 million from 2017 (+buses and two-wheelers…)
  - China is the world’s largest EV market, Norway has highest electric car market share



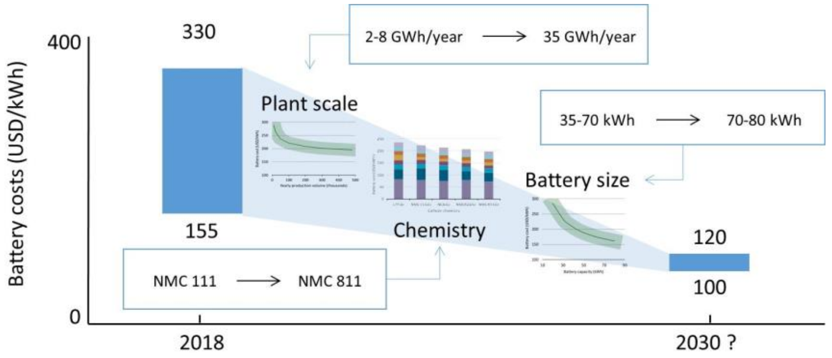
Source: IEA Global EV Outlook 2019

- **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

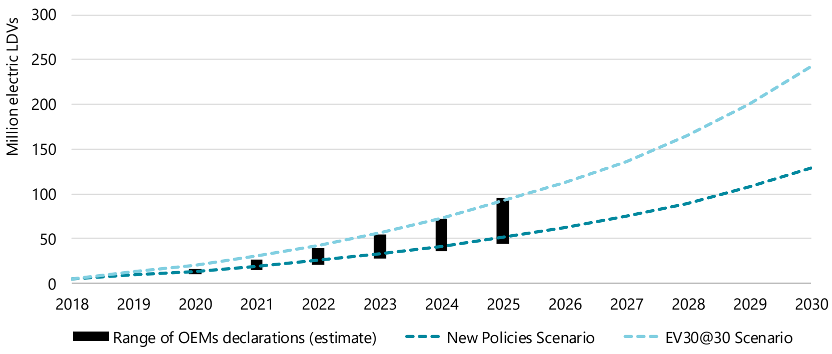
+ Strategic relevance for industrial development of battery technology value chain

EVs (PHEVs, BEVs) (2/2)

- **Technology advances are delivering substantial cost cuts**
  - Key enablers: developments in battery chemistry and expansion of manufacturing capacity
- **Private sector response to public policy signals confirms upward trends**
  - Many OEM voiced ambitious plans
  - Battery manufacturing also subject to major investments
- **Positive outlook for the increased deployment of electric vehicles and charging infrastructure**
  - IEA NPS: 130 million EVs by 2030 (excludes two wheelers), more in EV30@30



Source: elaboration from IEA Global EV Outlook 2018



Source: IEA Global EV Outlook 2019

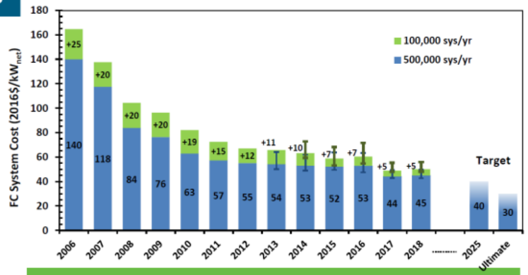
FCEVs, hydrogen, power-to-X fuels (1/2)

- **FCEVs currently deployed at much lower pace than PHEVs & BEVs**
  - 4 000 fuel cell electric cars sold in 2018; total stock of 11 200 units: **one order or magnitude difference with PHEV and BEV**, despite policy support
  - Growing interest for HDV market in China, which leads the global deployment of fuel cell electric trucks (400+ units)

- The US DOE indicates that **fuel cell technologies were already subject to substantial cost cuts** and that there is **good potential for more reductions with increases in production capacity**, despite durability issues

Fuel Cell Cost Status

- **$50/kW*** for 100,000 units/year
- **$45/kW*** for 500,000 units/year
- **$181/kW*** for 1,000 units/year
- **$210/kW†** for currently commercialized on-road technology at 1,000 units/year



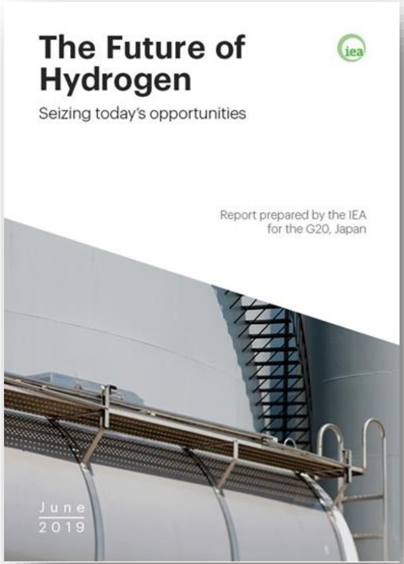
67% cost reduction since 2006

Cost analysis is not adjusted to account for durability

Preliminary Durability-Adjusted Cost:
$75/kW

Source: US Department of Energy, 2019

FCEVs, hydrogen, power-to-X fuels (2/2)



- **IEA Future of hydrogen report**
  - Most hydrogen supplied from natural gas and coal today
  - Most demand occurs in industrial applications
  - In transport, the slow development of hydrogen infrastructure is holding back widespread adoption
- Prospects?
  - **Interest** in hydrogen continues to be strongly **linked with climate change ambition**, but there are other co-benefits (energy security, air quality)
  - Future competitiveness of low-carbon hydrogen from natural gas with CCUS or from renewable electricity depends on gas and electricity price
  - Hydrogen, electrolysers and fuel cells are **one of the leading options for storing electricity over days, weeks or even months**
  - Hydrogen holds **long-term promise** beyond existing industrial applications
  - **Fleets, freight and corridors were identified as a key value chain for future hydrogen uptake in transport**
  - Potential also to use port facilities next to coastal industrial clusters to support international hydrogen trade by ship, use **hydrogen and hydrogen-based fuels for trucks and in the shipping sector**

Challenges beyond early adoption

- **Sustainability of supply chains (batteries & fuel cells/bioenergy)**
  - Major change in material/feedstock supply for vehicle manufacturing/fuel production
  - Impacts on availability of resources, land use, ramp-up in supply, geographical concentration, environmental (ecosystems, landscapes, emissions) and social pressure (child labour, corruption, economic impacts)
  - Growing importance of traceability and transparency of supply chains
  - Growing importance of end-of-life management (batteries & fuel cells)
  - Call for action to develop adequate policies: OECD due diligence guidance good place to start, for batteries and fuel cells; sustainability criteria (California, EU) for bioenergy

- **Ensuring the stability of governmental revenues from transport taxation**
  - Better efficiency, lower fuel use of EVs (and FCEVs), lower fuel use...
  - … making a case for location-specific and time-dependent road charges
  - Also important to handle potential impact of vehicle automation on transport demand (and infrastructure congestion)
  - Need for policy resilience
    - Flexibility mechanisms in transparent policy frameworks
    - Importance of location-specific, time-dependent a distance and location based charges (which also takes into account congestion and cost of infrastructure)
    - Major change in transport taxation, need for anticipation

Thank you