CALGARY 2022 CANADA

FEBRUARY 7–11 | 7–11 FÉVRIER | 7–11 DE FEBRERO

# Cleaner vehicles

## Achieving a resilient technology transition

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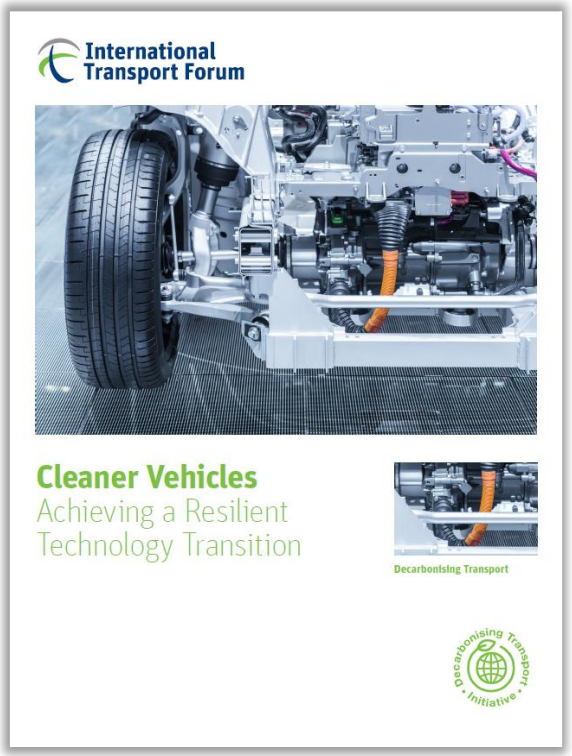
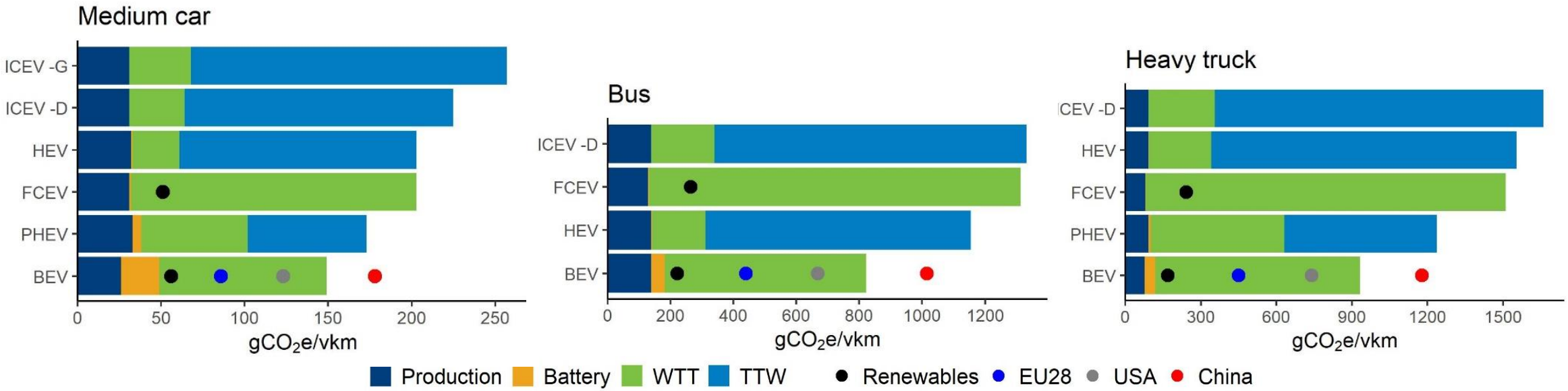
# What role can technologies and policies for road vehicles play to foster economic growth and sustainable development?

- Evaluate resource efficiency, energy use and GHG emissions over all lifecycle stages
- Focus on electric powertrains for light- and heavy-duty vehicles
- Synthesize experience from leading markets: Europe, East Asia and North America



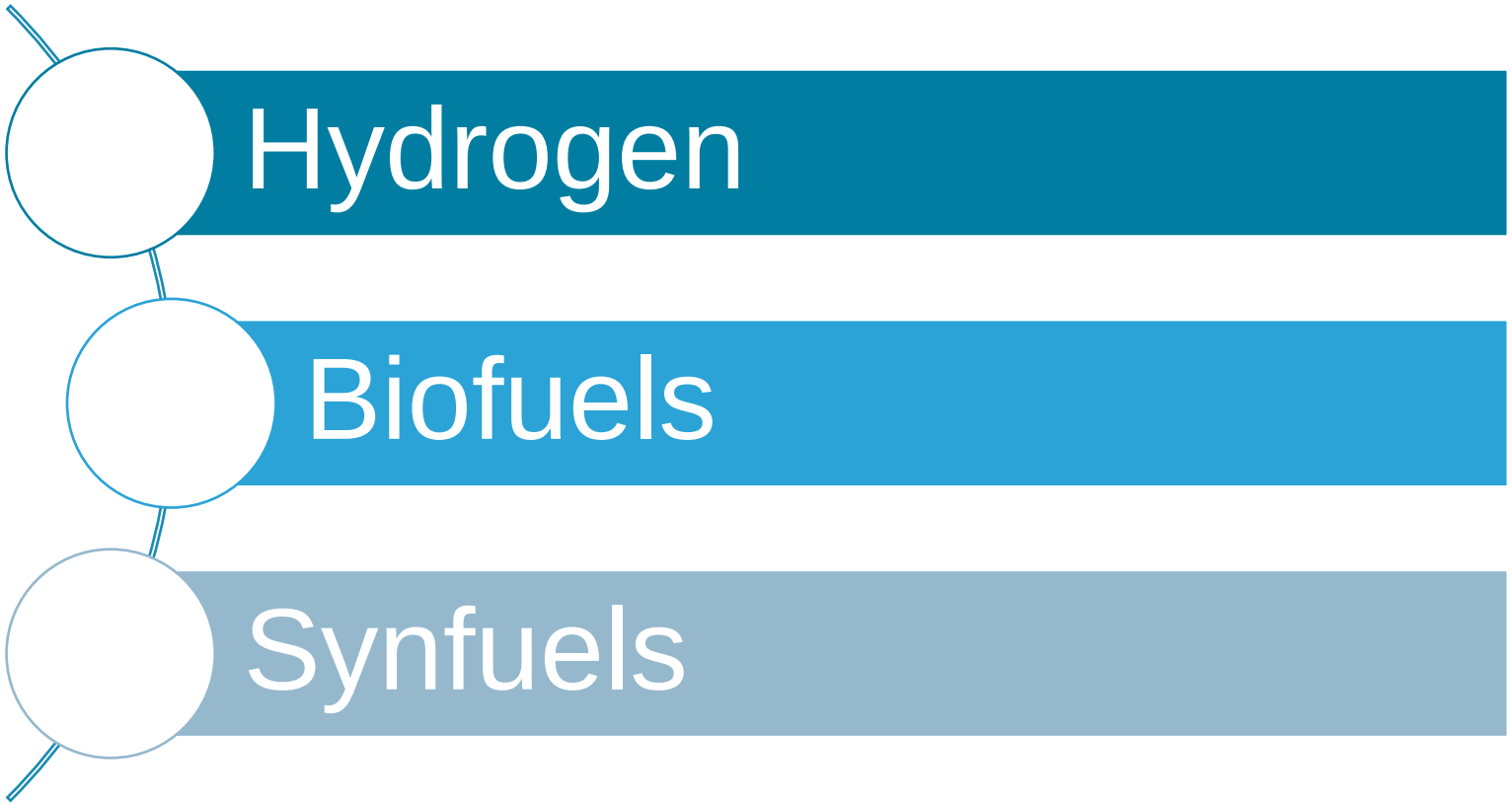
# Clean vehicle technologies

# Lifecycle GHG emissions intensity of vehicles, 2020




**Electrification cuts emissions** for cars and heavy-duty vehicles, Highest energy efficiency savings for battery electric vehicles

# What are the other alternatives?



# What are the other alternatives?

**Hydrogen:**
require fewer behavioural changes from consumers but:

- They need for economies of scale to drive costs down;
- They need primary forms of energy to be available at very low cost;
- They require complex handling for distribution

**Biofuels**:
well-to-wheel emissions differ widely across pathways;

- waste—based options best placed, but potential is limited;
- challenges in terms of cost-competitiveness for other pathways

**Synfuels**:
face a number of challenges:

- large thermodynamic losses,
- large amounts of low-carbon energy needed
- cost and scaling up remain challenging

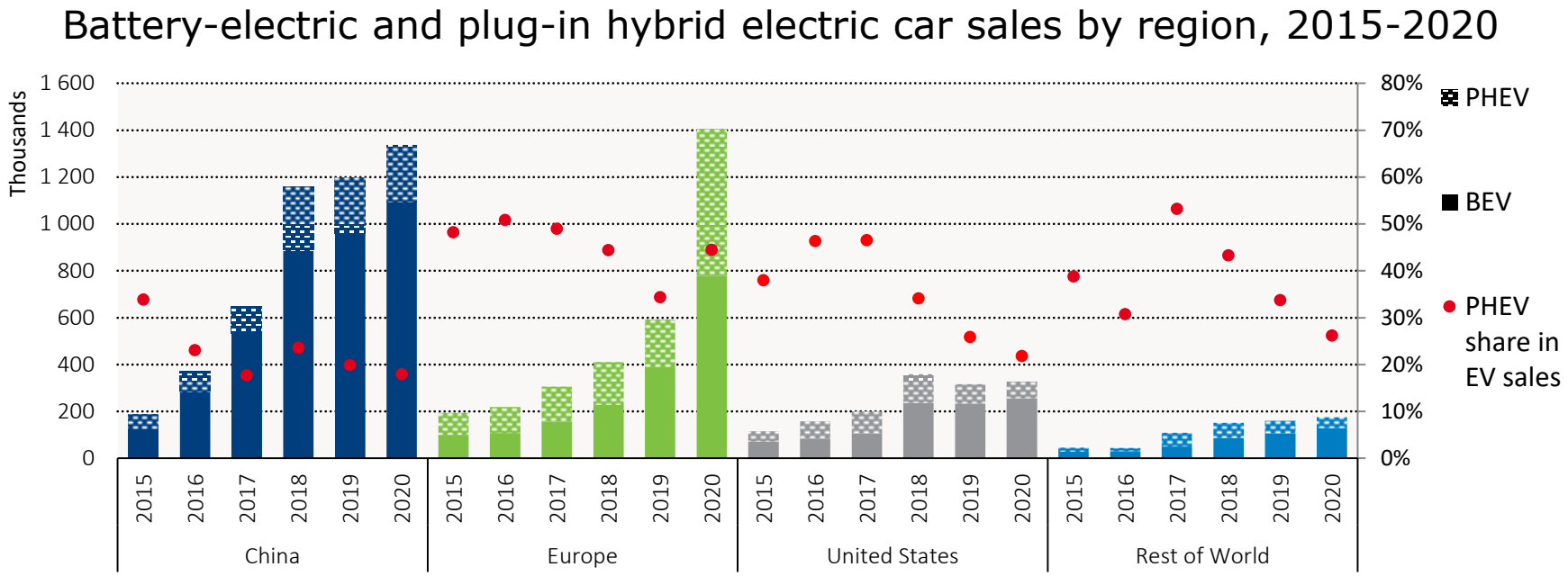
**Low-carbon pathways of these fuels likely better suited for modes with lower scope for direct electrification (shipping, aviation)**

# Clean vehicle adoption: Policy drivers, market response and future prospects

# Policies that drive market growth for EVs

- Technical standards and regulations
- A clear vision and integrated key targets
- An enabling environment on energy and carbon taxes
- Ambitious public procurement programmes
- Economic incentives
- Enforcing regulatory requirements
- Clearly define sustainable finance thresholds for clean vehicles and clean energy

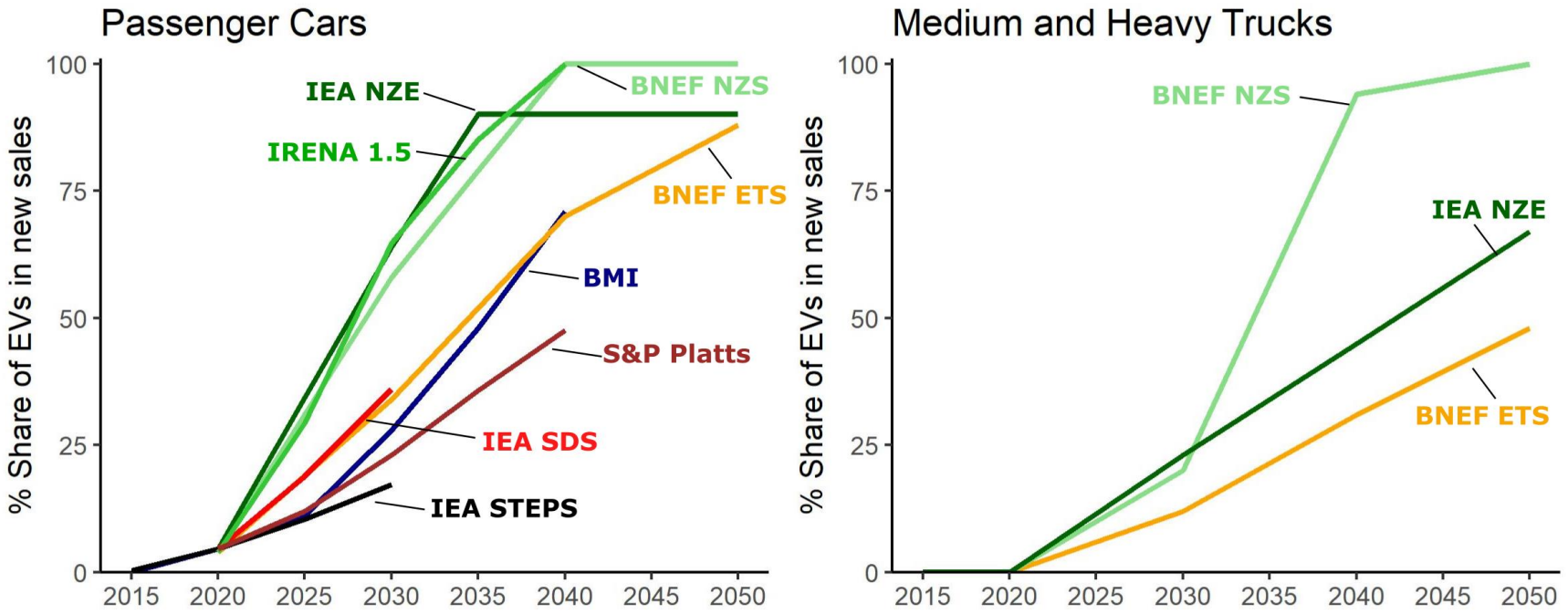
# 3 million electric vehicles sold in 2020, mainly in China, Europe & the United States




**Policy and technology characteristics/development succeeded to get EV sales up**, even in the pandemic year 2020

# Projections show EV uptake to increase strongly

Share of electric vehicles in global passenger car sales

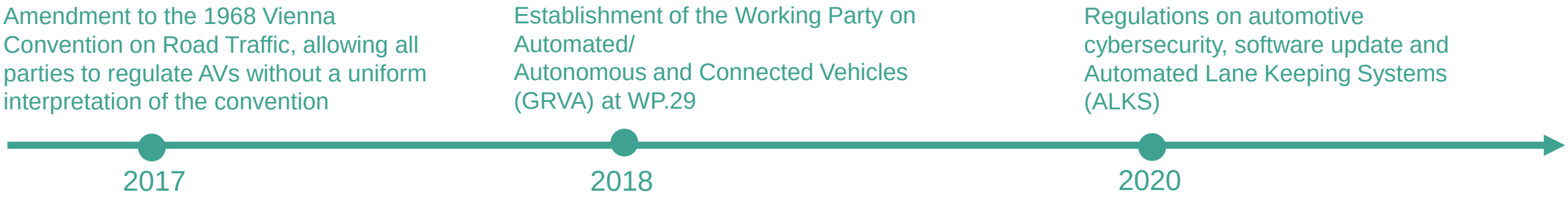



Several organisations point to a **strong outlook for EVs**
Reaching net-zero **requires very rapid EV adoption**

# Beyond clean vehicles: digital technologies, connectivity, sharing and automation

# Connectivity and digitalisation are major macrotrends

- Digital tech can increase competitiveness and consumer attractiveness
- Transport is no exception: intelligent transport systems, vehicle connectivity & automation
- Covid-19 accelerated the digital transformation trends




So far, economic opportunities have driven digital policy. With the risk of surge in activity and energy use and GHG emissions, the **transition must be managed from an environmental angle**

# Emerging policy challenges

# Policy actions increasingly important to foster a resilient transition to electric and digital

**Three reasons:**

- Significant economic opportunities
- Importance of automotive and energy industries
- Climate change mitigation and risks of delaying action

**Three challenges posed to a resilient transition:**

- Demand for new materials and related impact on supply chains
- Revenue losses from fossil fuel taxes as vehicle fleets decarbonise
- Impacts on jobs and skillsets as automotive technologies shift from carbon to electric and analogue to digital

# Changes in the demand for new materials

- A surge of EVs means **increased demand for lithium, graphite, nickel, cobalt, rare earth elements**
- Shortages are not likely in the long run, but **the pace of increase can be constrained by the time needed to scale up production**
- Production and refining of battery materials and REEs is **clustered in a small number of countries**

**Options exist both on the material supply and demand side to make the transition more resilient**

**Supply**

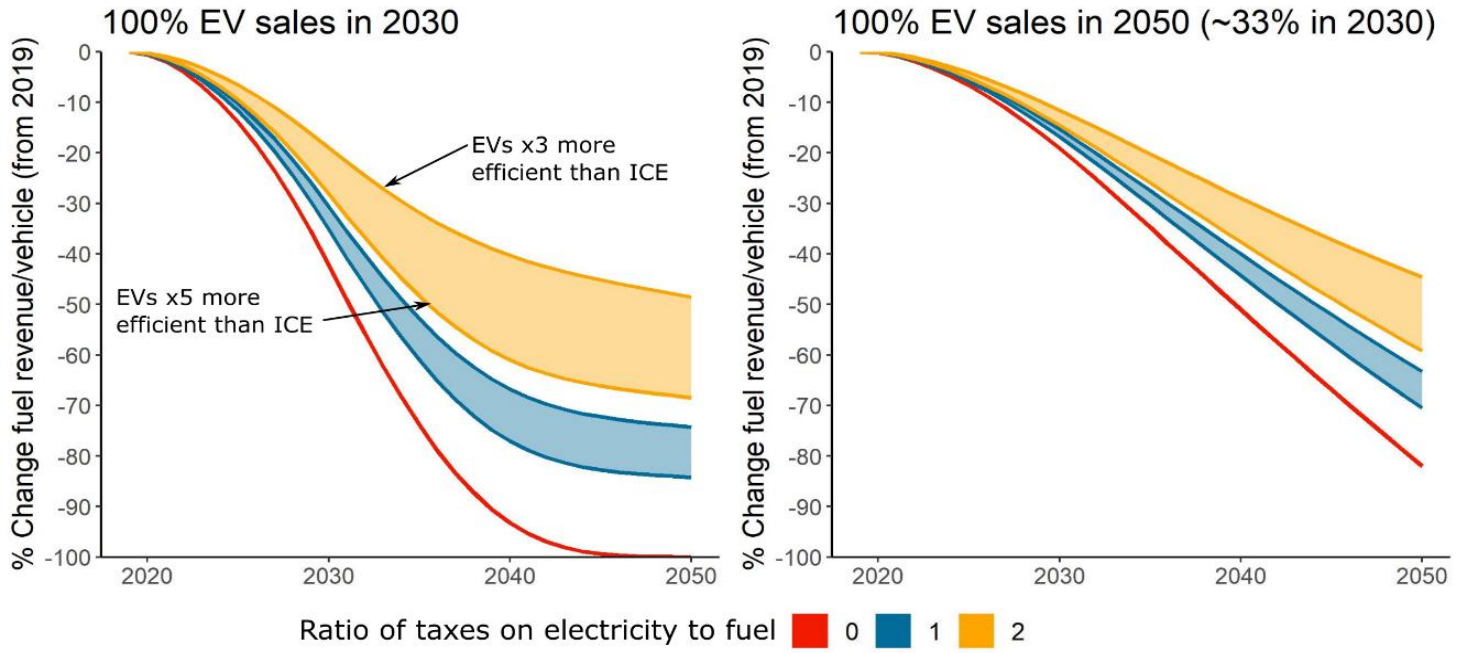
- Stockpiling,
- establishing reliable price benchmarks,
- battery recycling to reduce raw material extraction needs

**Demand**

- Maximising ratio of e-vkm per kWh of battery capacity and materials needed for infrastructure
- PHEV if driven in e-mode,
- ERS (smaller batteries),
- smaller vehicles

# Structural changes in taxation revenue

Percentage change in government revenues per passenger car by EV sales share, tax ratio and relative energy efficiency




Faster revenue decline with:

- Faster e-vkm increase
- Lower tax ratio
- Greater energy efficiency gap

**Need for tax reforms to safeguard government revenues**

**Road user charges offer the potential to make up for lost fuel-duty revenues and adequately price the use of vehicles**, switching the tax base from energy used to distance travelled

# Impacts on jobs

- Similar to other disruptions, the switch away from ICEs **transforms the needed labour skillsets and disrupts the structure of supply chains**
- Analyses generally point towards net employment increases overall, but this is indeed **not uniform across sectors and geographies**
- **Anticipating the change is important** to minimize adverse impacts and maximize opportunities
- Managing the transition to clean vehicles and clean energy will require a **holistic response:** support workers (protection for job losses, training, re-skilling) and respond to changes in the nature of jobs (science, technology, engineering and mathematics, ICT)

# What we recommend

- Maintain or introduce near- and mid-term **policy support for clean vehicles** and for the low-carbon energy they need
- Prioritise a transition to **direct electrification and renewable energy**
- Address challenges on **material efficiency and sustainable supply chains**

# What we recommend

- For a **resilient transition from fuel duties**, seize opportunities from increased connectivity and accelerating enabling regulation
- Include infrastructures for clean energy transport & distribution and digital connectivity of road transport in **Covid-19 recovery packages for a resilient transition**
- Prepare for transitions in **jobs and skillsets**
- Accelerate the development of **other low-carbon technologies**

# Thank you

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