

...not to bring solutions but to share problems!

Jornadas de Mobilidade Eléctrica Para um futuro sustentável

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03 de Junho, 2022



3–4 JUNHO 2022 – AUDITÓRIO MAGNO ISEP

3^{as} JORNADAS DE MOBILIDADE ELÉTRICA

PARA UM FUTURO SUSTENTÁVEL

The Black Swan

@Nassim Nicholas Taleb



Climate Changes

Covid 19

War



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Global needs on energy to Net ZERO

The EGD

Digitalization

The EU strategy on energy system integration (July 2020)

3 Approaches:

1. Reduce energy demand (*energy efficiency*)

2. Electrification

3. H₂ & Bioenergy

The first big energy shock of the green era

There are grave problems with the transition to clean energy power

Reduced investment in RE

Geopolitics issues

Flawed design of regulation (Energy Markets)

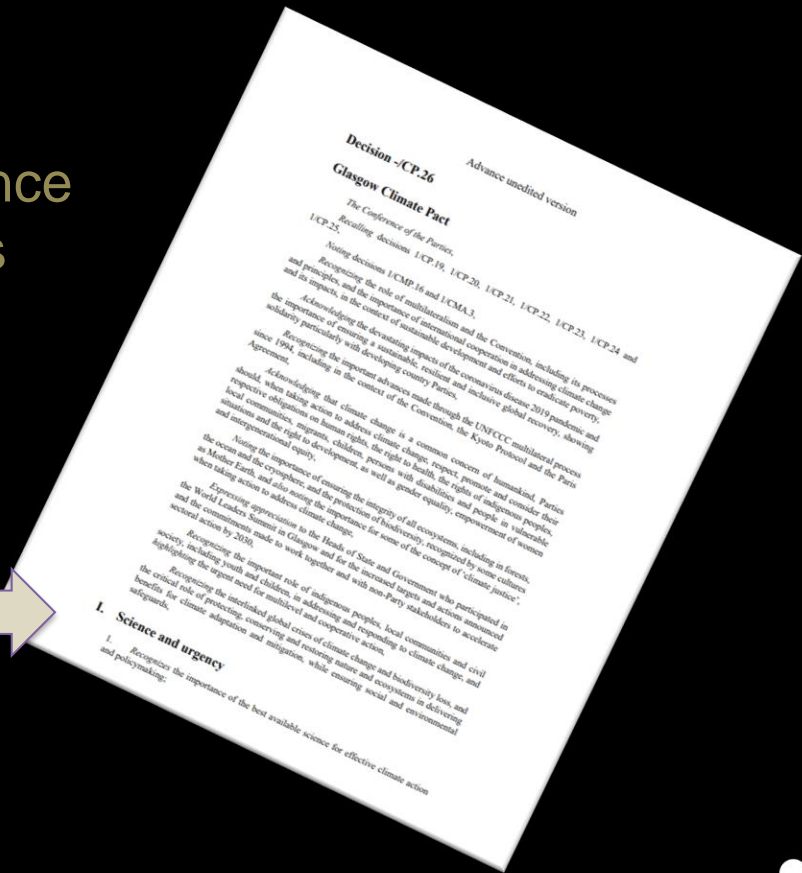
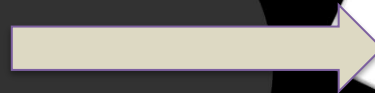


COP 26 | Science and technology role

Major focus and reliance on science and technology solutions towards deployment and development of renewable energy technologies

Glasgow Climate Pact

“Recognizes the importance of the best available science for effective climate action and policymaking”



Ambition

Enhancing action | revision every year

The US\$100billion/yr pledge for climate

Phasedown of unabated coal power

Phase-out of inefficient fossil fuel subsidies



Accelerating efforts

Halting and reversing deforestation

Tackling methane emissions

Ending overseas financing of fossil fuels by 2022

New cars sold by 2035 must be exclusively zero emissions



Russian invasion on Ukraine (@ The Economist)



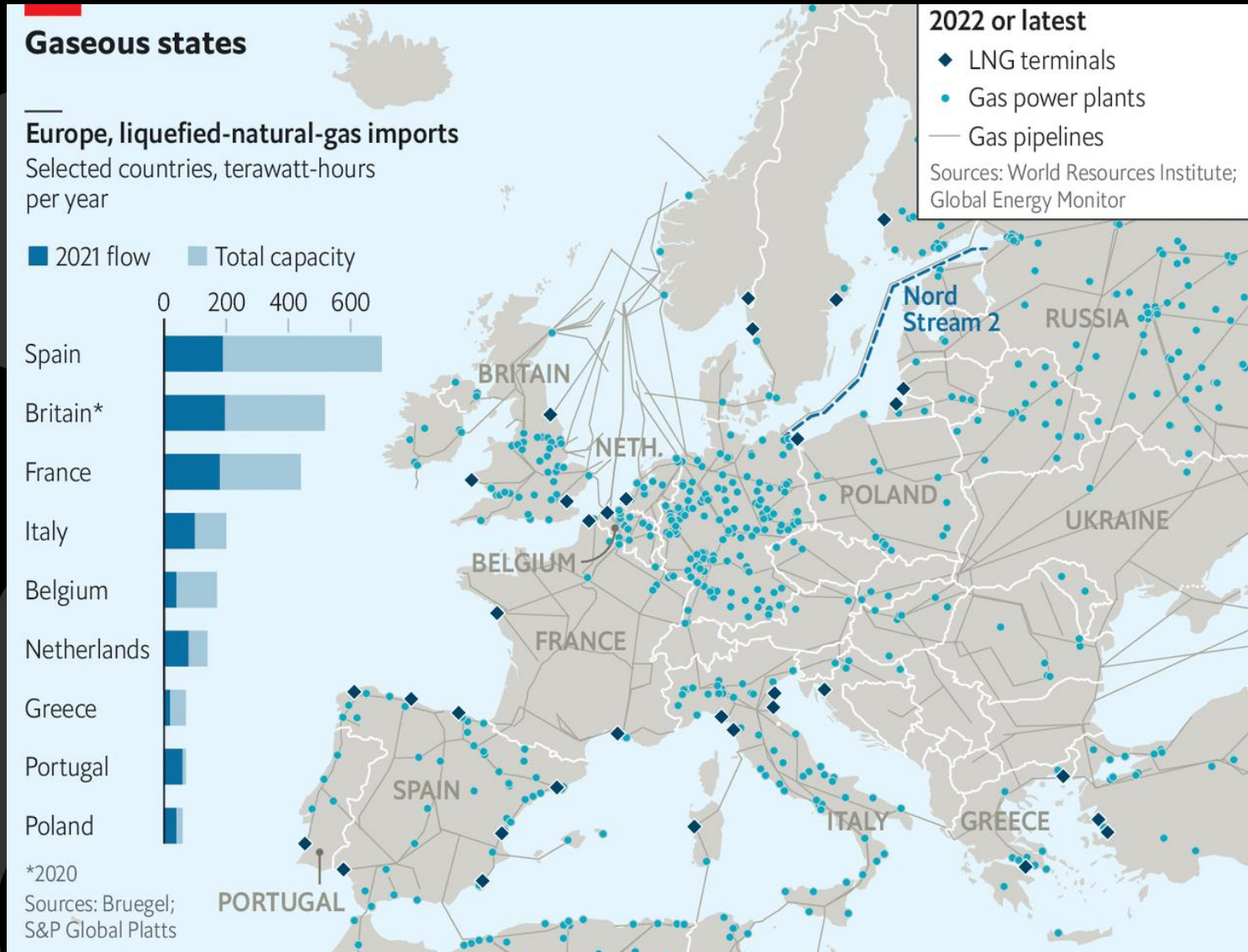
The Economist/Getty Images

KAL's cartoon

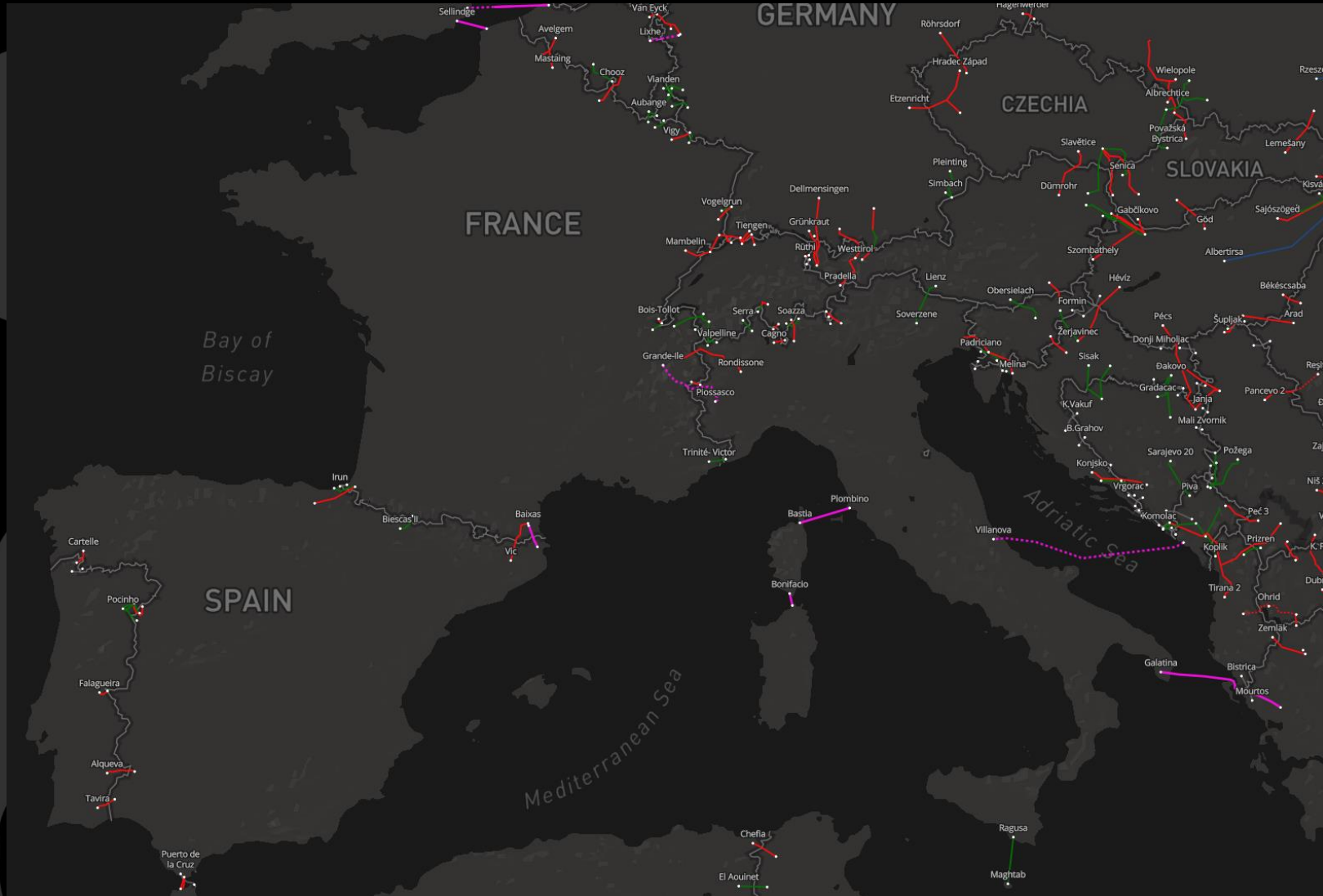


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LNG facilities (@ The Economist)



Electric grid connections @ENTSOE



Adrift over energy

Europe has yet to wean itself off Russian energy



KAL's cartoon



REPowerEU Plan

REPowerEU - A plan to rapidly reduce dependence on Russian fossil fuels and fast forward the green transition

#REPowerEU



REPowerEU – Update (1/2)

REPowerEU Plan – actions

Save, diversify, replace FF and smart

- **RES share increase to 45%** in the Renewable Energy Directive (currently under discussion)
- **Double PV target to over 320 GW of solar photovoltaic** newly installed by 2025
- **A European Solar Rooftop Initiative**
- **Double deployment of heat pumps**, installing 10 million units over the next 5 years
- **10 million tonnes of domestic renewable hydrogen production** and 10 million tonnes of renewable hydrogen imports by 2030
- **Boosting sustainable biomethane production** to 35 bcm



REPowerEU – Update (2/2)

- Save EUR 80 billion in gas import, EUR 12 bn in oil import and EUR 1.7 bn in coal import expenditures per year
- The MS need to increase their objectives and update their NECP and their RRP to unlock financial resources
 - **Additional investment of 210 billion euro** between now and 2027
 - Investments estimated at **EUR 10bn** by 2030 to import **sufficient LNG and pipeline gas** from other suppliers
 - Total investment needs to ensure the **security of oil supply** is expected to amount to up to **EUR 1.5 -2bn**
 - An **additional EUR 29 billion** for investments in the **power grid** by 2030





100 EU cities participating in EU Cities Mission



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100 EU Cities Climate-Neutral by 2030

- ▶ Initiative launched by the EC on 28 April – [Link here!](#)
- ▶ 100 EU cities will participate in the EU Mission for **100 climate-neutral and smart cities** by 2030.
- ▶ Spread across Europe and all sizes, at least one in each EU country. Together, they are home to **12%** of the EU's population.
- ▶ The Cities Mission will receive €360 million of Horizon Europe funding covering the period 2022-23, to start the innovation paths towards climate neutrality by 2030.
- ▶ The 100 selected cities will develop **Climate City Contracts**, which will include an overall plan for climate neutrality across all sectors together with related investment plans.



EC first industrial technology roadmap under the new ERA



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ERA Common Industrial Technology Roadmaps



- The Industrial Technology Roadmaps are a core action in the new European Research Area strategy
- They will address the way forward for R&I in the industry in key areas at European and national level.



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- ▶ The first roadmap focused on **common low-carbon industries**, and calls for full speed development and scaling-up in energy-intensive industries:
 - ▶ Creation of an **Industrial Alliance** for low-carbon technologies in energy-intensive industries
 - ▶ Facilitation of national sectoral and **cross-sectoral strategies or programmes**
 - ▶ Establishment of a community of practice to **facilitate FOAK projects installation for low-carbon industrial technologies**
 - ▶ Enabling further valorisation by exploring the opportunity to open up IP, widening the access to IP for licensing (e.g. patent pool) and knowledge transfer
 - ▶ Cooperation with European standardisation organisations (CEN/CENELEC) and industrial partnerships to identify and **fill standardisation gaps** for innovative low-carbon industrial technologies



Brine pools at a lithium mine in the Antofagasta region of Chile © Bloomberg

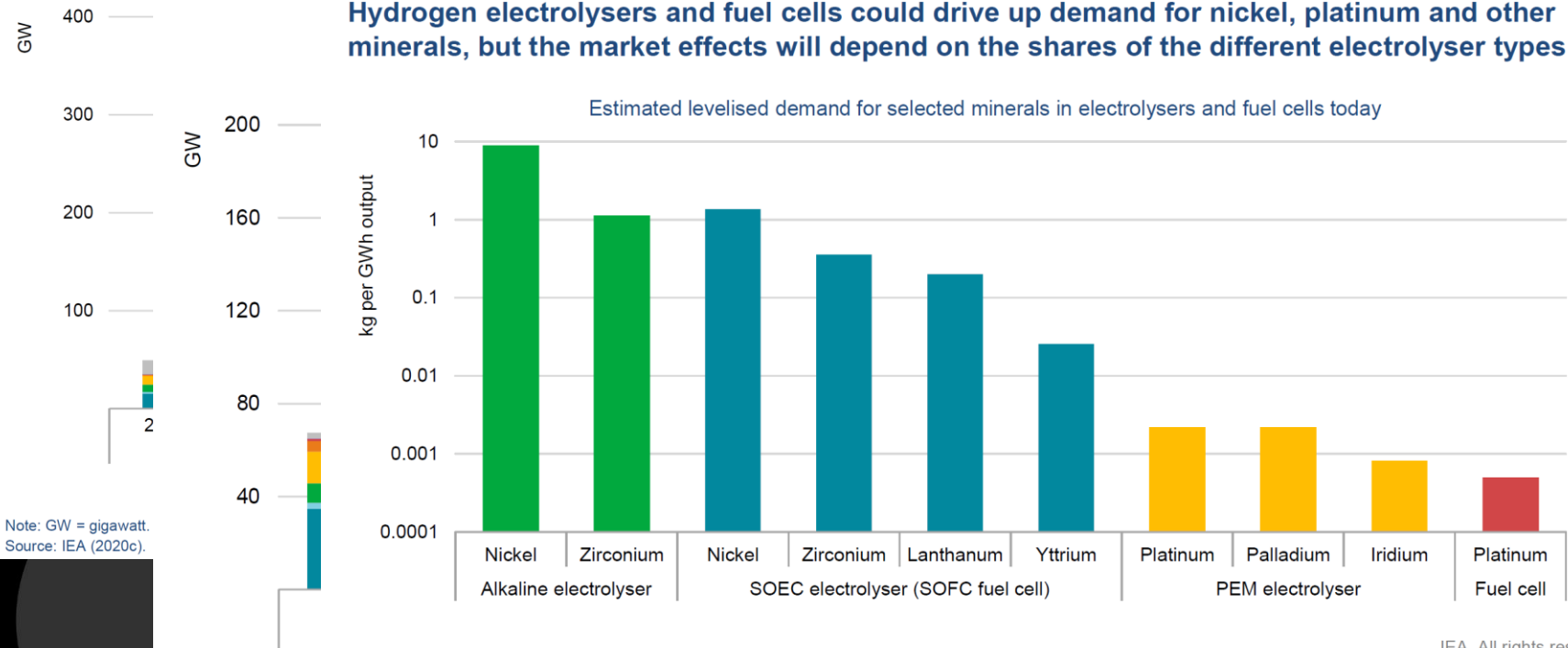


The need of critical materials

Solar PV: Annual deployment of solar PV triples in the SDS by 2040, driven by huge growth in emerging economies

Wind: Wind deployment is expected to accelerate over the coming decades, thanks to falling costs, policy targets and increased investor confidence

Hydrogen electrolyzers and fuel cells could drive up demand for nickel, platinum and other minerals, but the market effects will depend on the shares of the different electrolyser types



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Notes: PEM = proton exchange membrane; SOEC = solid oxide electrolysis cells; SOFC = solid oxide fuel cell. Normalisation by output accounts for varying efficiencies of different electrolysis technologies. Full load hours of electrolyzers assumed to be 5 000 hours per year.
 Sources: Bareiß et al. (2019); Fuel Cells and Hydrogen Joint Undertaking (2018); James et al. (2018); Kiemel et al. (2021); Koj et al. (2017); Lundberg (2019); NEDO (2008); Smolinka et al. (2018); US Department of Energy (2014; 2015).

Note: GW = gigawatt.
 Source: IEA (2020c).

Source: IEA (2020)



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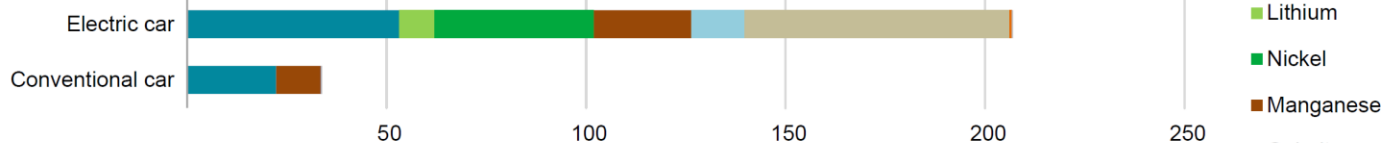


Energy Transition faces an increasingly challenging supply chain environment

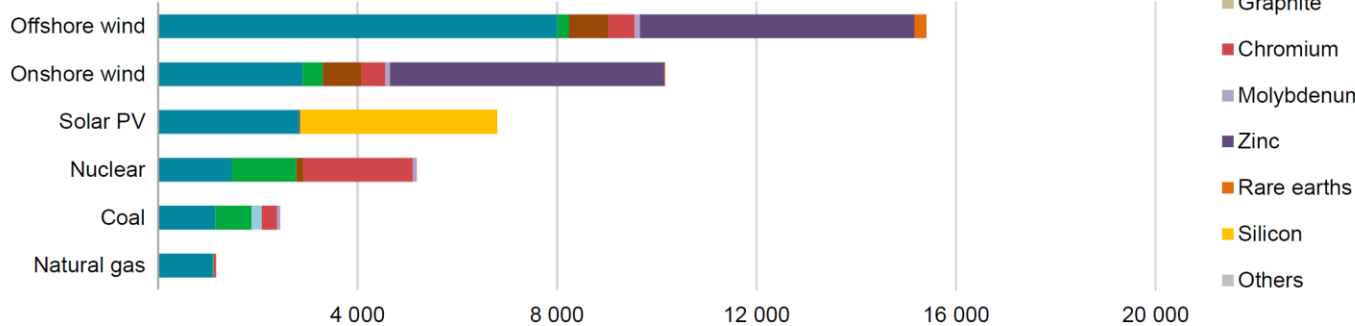
The rapid deployment of clean energy technologies as part of energy transitions implies a significant increase in demand for minerals

Minerals used in selected clean energy technologies

Transport (kg/vehicle)



Power generation (kg/MW)



IEA. All rights reserved.

Notes: kg = kilogramme; MW = megawatt. Steel and aluminium not included. See Chapter 1 and Annex for details on the assumptions and methodologies.

A 10-Point Plan to Cut Oil Use

Immediate actions in advanced economies can cut oil demand by 2.7 million barrels a day in the next 4 months.

Action 1



Reduce speed limits on highways by at least 10 km/h

Impact: Saves around 290 kb/d of oil use from cars, and an additional 140 kb/d from trucks.

Action 2



Work from home up to three days a week where possible

Impact: One day a week saves around 170 kb/d; three days saves around 500 kb/d.

Action 3



Car-free Sundays in cities

Impact: Every Sunday saves around 380 kb/d; one Sunday a month saves 95 kb/d.

Action 4



Make the use of public transport cheaper and incentivise micro-mobility, walking and cycling

Impact: Saves around 330 kb/d.

Action 5



Alternate private car access to roads in large cities

Impact: Saves around 210 kb/d.

Action 6



Increase car sharing and adopt practices to reduce fuel use

Impact: Saves around 470 kb/d.

Action 7



Promote efficient driving for freight trucks and delivery of goods

Impact: Saves around 320 kb/d.

Action 8



Using high-speed and night trains instead of planes where possible

Impact: Saves around 40 kb/d.

Action 9



Avoid business air travel where alternative options exist

Impact: Saves around 260 kb/d.

Action 10

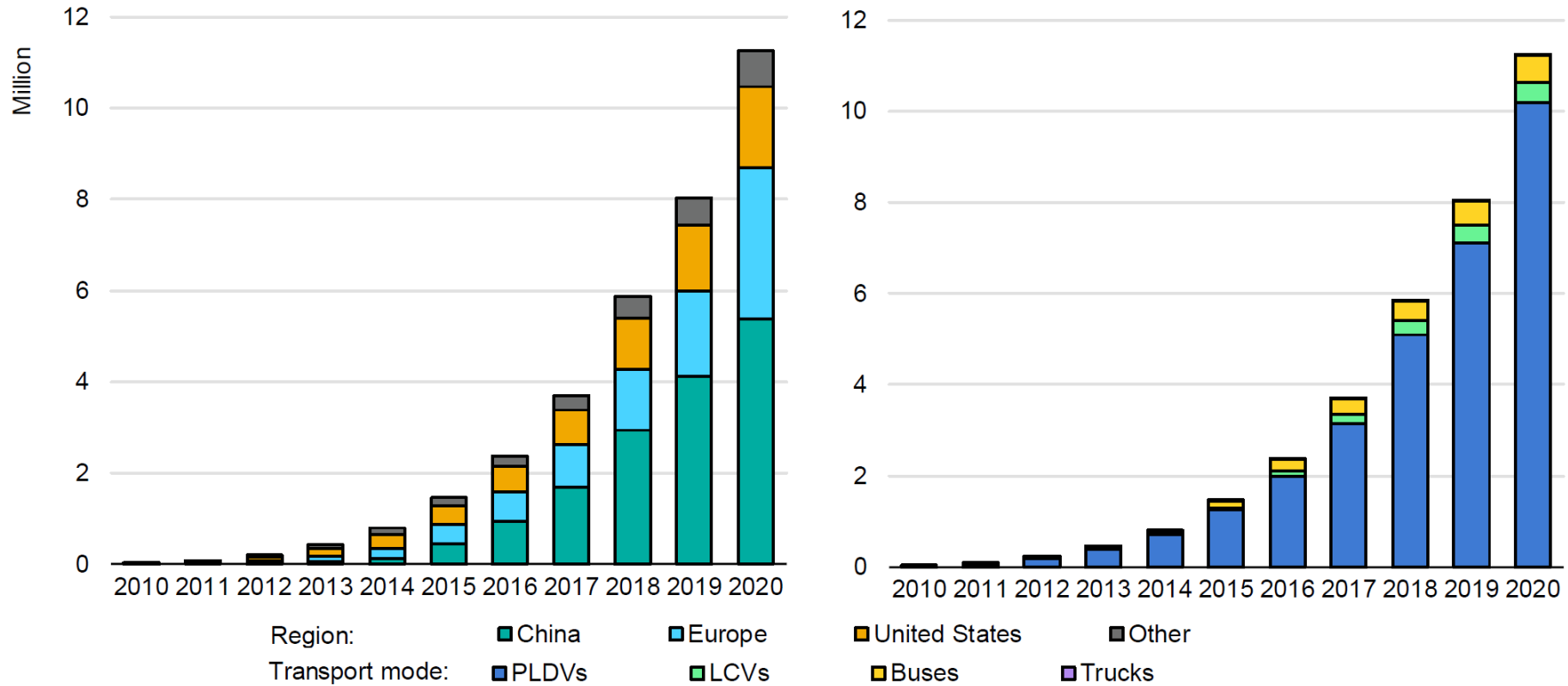


Reinforce the adoption of electric and more efficient vehicles

Impact: Saves around 100 kb/d.

Electric vehicles across all transport modes had steady growth over the last decade

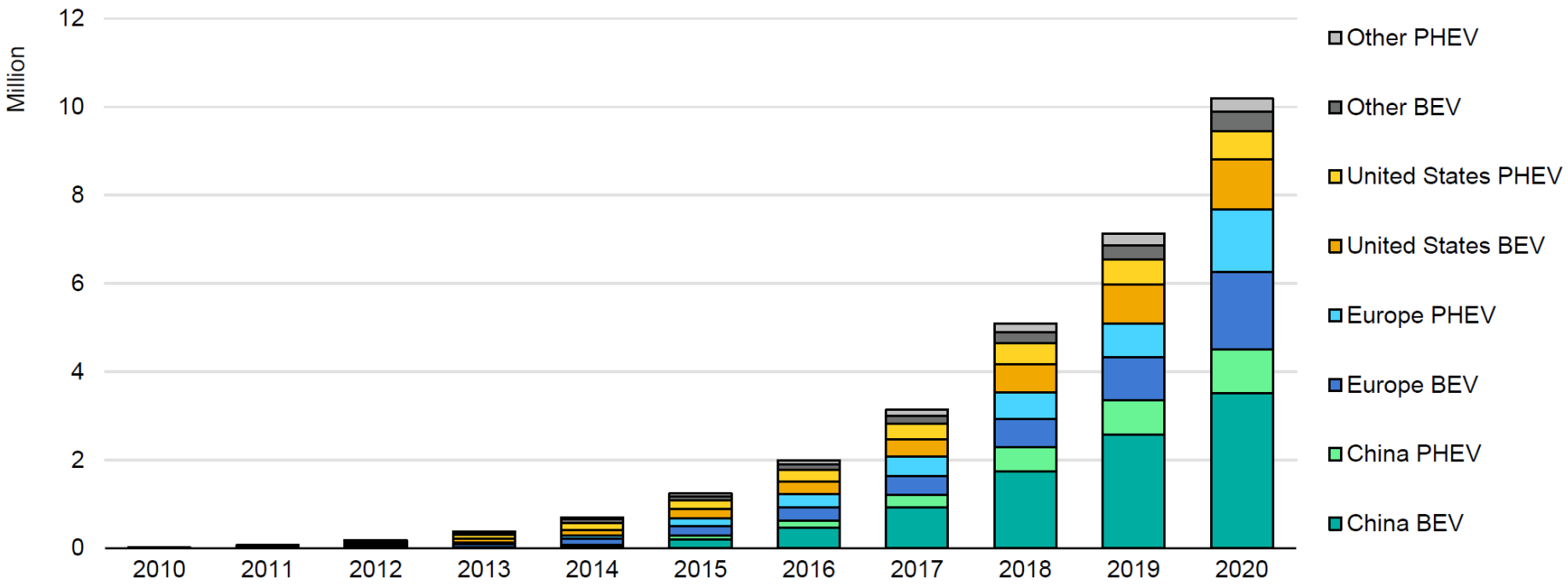
Global electric vehicle stock by region (left) and transport mode (right), 2010-2020



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More than 10 million electric cars were on the world's roads in 2020 with battery electric models driving the expansion

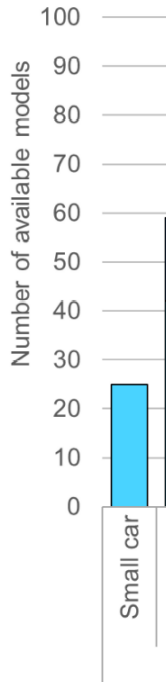
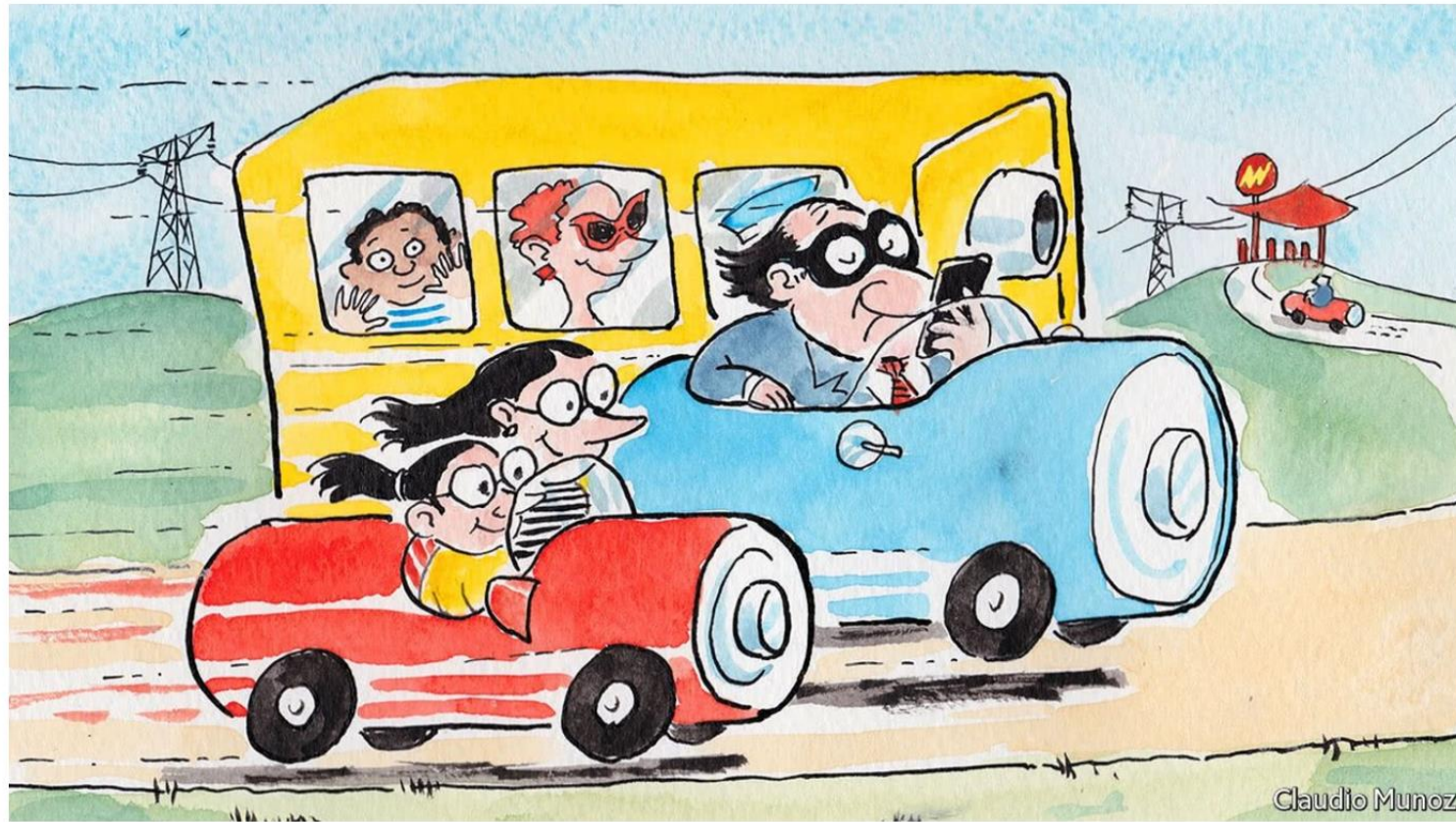
Global electric car stock, 2010-2020



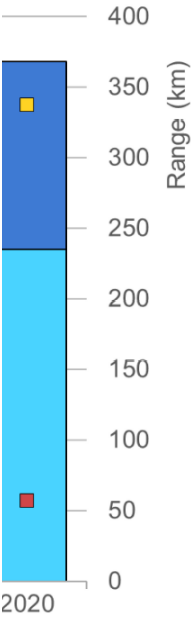
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A reliable network should not prove an insurmountable roadblock

More elec



2015-2020



/ Range

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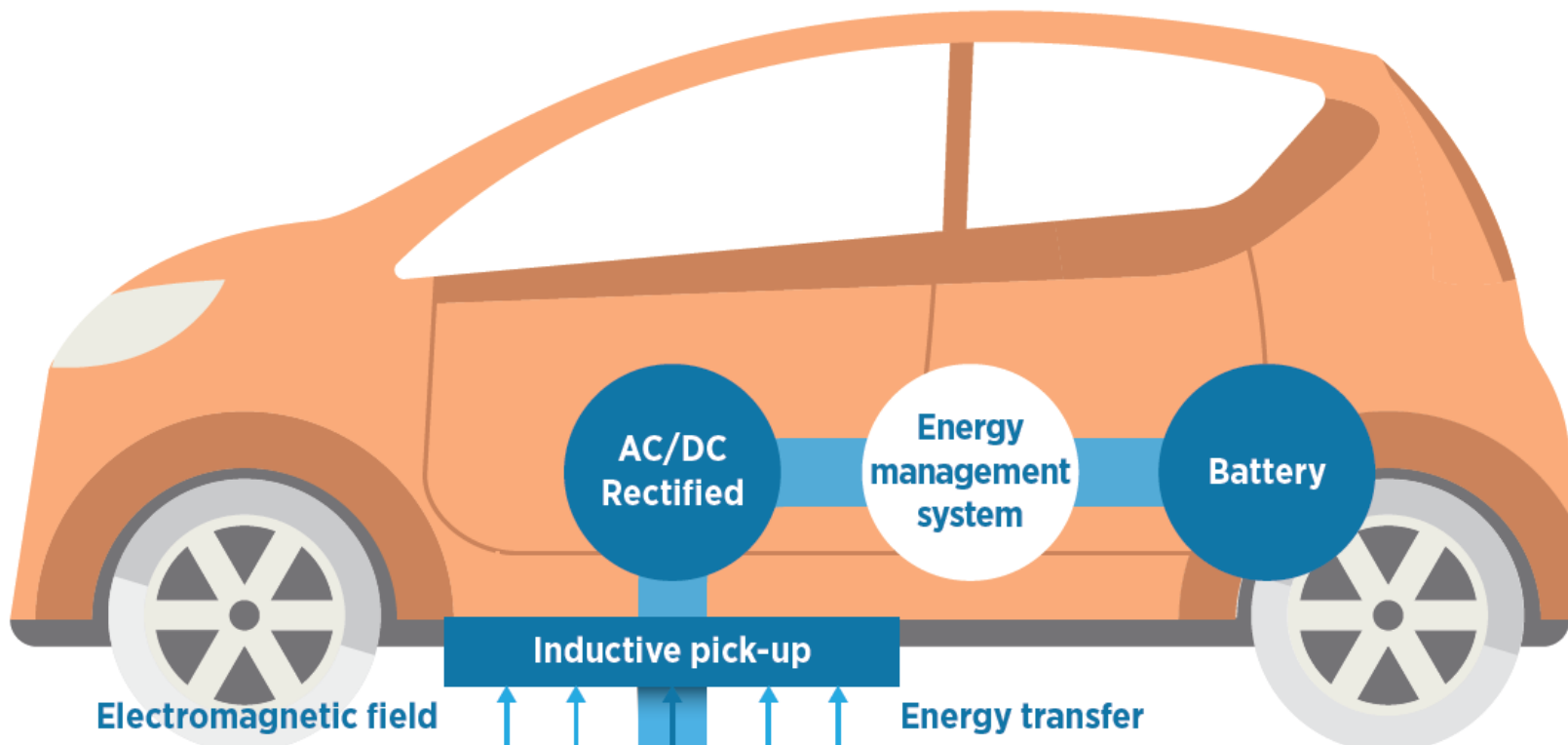


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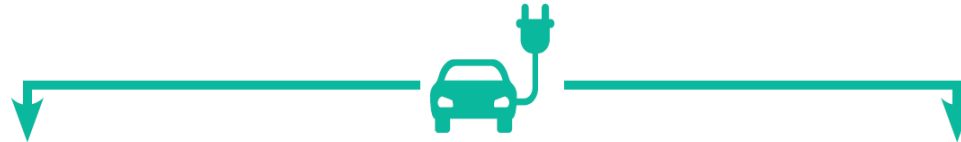


Fast and ultra-fast charging would be a priority for the mobility sector. However, slow charging is better suited for smart charging than are fast and ultra-fast charging. Furthermore, fast and ultra-fast charging may increase the peak demand stress on local grids. Solutions such as battery swapping, charging stations with buffer storage, and night EV fleet charging might become relevant in combination with fast and ultra-fast charging.





Possible EV revenue streams



SYSTEM FLEXIBILITY

LOCAL FLEXIBILITY

Wholesale market

- Peak-shaving
- Portfolio balancing

Transmission System Operator

- Frequency control
- (primary, secondary and tertiary reserve)
- Other ancillary services (e.g., voltage management, emergency power during outages)

Distribution System Operator

- Voltage control
- Local congestion and capacity management

Behind-the-meter

- Increasing the rate of Renewable Energy self-consumption
- Arbitrage between locally produced electricity and electricity from the grid
- Back-up power

REGULATION

- The barriers to EV adoption are progressively lowering as technology costs fall sharply. However, deploying and scaling EV charging infrastructure equipped for smart interaction with the electricity grid will remain key for the EV revolution as well as for maximising the synergies with VRE-based power systems.
- To bring new VGI business models from pilots to full deployment, smart energy service providers and aggregators will need to be able to stack value to incorporate EVs into their demand-response programmes, which could be especially relevant for fleet management.

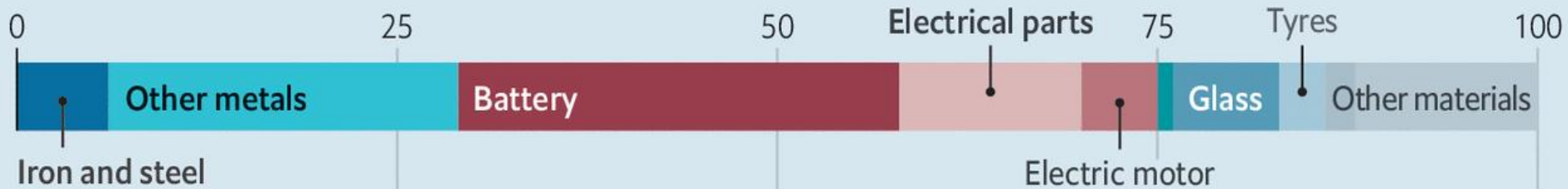


Old electric cars are a raw material of the future

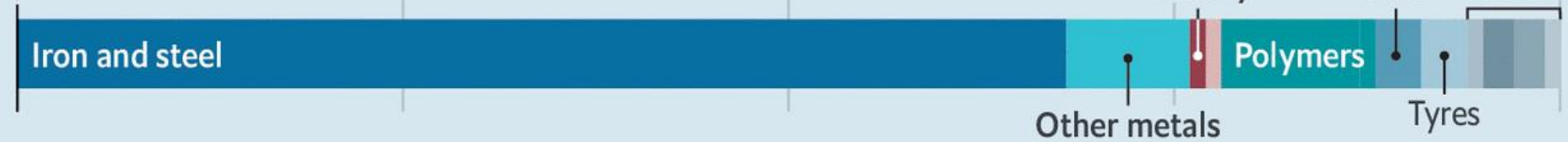
Pick'n'mix

Car materials at end of life, % of total by weight, 2021

Electric vehicle



Internal-combustion-engine vehicle



Source: University of Birmingham, "Securing Technology-Critical Metals for Britain"



Current zero-emission heavy-duty vehicle policies and incentives in selected countries

Policy Category	Policy	Canada	China	European Union	India	Japan	United States
Regulations vehicles	ZEV sales requirements			Voluntary to earn credits economy standards under fuel. Municipal vehicle purchase requirements.			California: new bus sales 100% ZEV by 2029. California and New Jersey: new truck sales up to 75% by 2035.
	Fuel economy standards	✓	✓	✓	✓	✓	✓
	Weight exemptions			2 tonnes over class.			California: 2 000 pounds over class.
Incentives vehicles	Direct incentives	✓*	✓*	✓*	✓	✓	✓*
Incentives fuels	Low-carbon fuel standards	✓*					✓*
Incentives EVSE	Direct investment	✓			✓	✓	✓*
	Utility investment						✓*

* Indicates implementation only at state/local level.

The alternative Fuels Infrastructure Directive

The proposed targets create a bias in the expected development of the new infrastructure oriented towards electrification

Subject to the proportionality principle between the fleet size and the power output of the infrastructure should not be limited to the electric recharging points and the principle expanded to all energies including hydrogen and LNG

Accelerate roll-out through better planning, permitting and procurement



Six key recommendations for a new, comprehensive approach to mineral security

- **Ensure adequate investment in diversified sources of new supply**
- **Promote technology innovation at all points along the value chain**
- **Scale up recycling**
- **Enhance supply chain resilience and market transparency**
- **Mainstream higher environmental, social and governance standards**
- **Strengthen international collaboration between producers and consumers.**



Several Challenges

The expansion of the battery industry can put strains on the material supply chain. Governments will need to set out clear policy frameworks and foster international collaboration to ensure that all the required investments are made on time and in an environmentally and socially sustainable way to ensure a growing EV industry.

As the share of EVs increases so will the need for charging infrastructure and electric grids. The current impetus in sales can only be sustained if ever larger shares of the population have access to convenient and affordable charging infrastructure. Governments will have to facilitate investment in this sector by minimising all market and non-market barriers to the roll-out of charging infrastructure.



WORLD ENERGY TRANSITIONS OUTLOOK 2022

IPCC / IPBES

1.5°C PATHWAY

IPCC 6th Assessment
Report



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