The battery volumes in use gap that needs to be to be filled requires action in both the transport and power sectors and throughout the battery supply chain. In road transport, the electric vehicle fleet in the NZE Scenario in 2030 is 50% bigger than in the STEPS, requiring steep increases in the volumes of batteries in use in advanced economies (+80%), China (+10%) and other emerging market and developing economies (+170%). Battery storage in the power sector needs to increase significantly beyond the STEPS in all regions: installed capacity rises to 1 200 gigawatt (GW) by 2030 in the NZE Scenario, requiring a 170% increase in annual capacity additions by 2030 compared to the STEPS.

3.2 Electric vehicles

EVs equipped with batteries play a crucial role to decarbonise road transport, contribute to energy efficiency goals, cut air pollution and reduce oil demand. Today EV uptake is concentrated in a few key markets – China, the European Union and United States. The accelerated EV deployment projected in the NZE Scenario depends on taking timely action to address the factors that hinder EV penetration in a number of emerging markets and developing economies beyond China. This includes scarce availability of low cost EV models and charging infrastructure, and absent or weak fuel economy standards.

3.2.1 Expanding EV adoption beyond key markets

Affordability is a crucial determinant of demand for EVs. The average retail price of EVs in the United States and Europe has increased since 2021 and hampered EV uptake (JATO, 2023). Yet, in China the EV price trend is downward, and today the least expensive new cars on the market are electric. These affordable electric car models, supported by no or low vehicle registration taxes, are boosting China's road transport electrification efforts and driving global battery demand. The increasing availability of affordable models is likely to increase EV sales, particularly in other emerging market and developing economies.

Insufficient grid infrastructure is an important barrier to advancing electromobility, especially in emerging market and developing economies other than China. Ensuring viable and equitable charging infrastructure often requires expansion of the electricity grid, especially in rural areas. Even in advanced economies like Australia, where urban grids can handle EV penetration levels of up to 80% without upgrades, already overloaded rural grids cannot support any additional load from EVs (IEA, 2023a). Large-scale adoption of EVs requires the roll-out of charging infrastructure with grid connectivity. In addition to conventional grid enhancements, renewables-based decentralised grids in combination with vehicle-to-grid technology could help to address the charging hurdle.

To sustain increased penetration of EVs in mature markets, policies that stimulate demand should transition to targeted measures that focus on production and purchase incentives for small EVs to enhance affordability for more consumers while also reducing material demand. Environmental standards, weight-based taxation and parking charges are measures that can incentivise both producers and consumers in this direction.

Europe: European Union regional grouping and Albania, Belarus, Bosnia and Herzegovina, Gibraltar, Iceland, Israel[5], Kosovo, Montenegro, North Macedonia, Norway, Republic of Moldova, Serbia, Switzerland, Türkiye, Ukraine and United Kingdom.

European Union: Austria, Belgium, Bulgaria, Croatia, Cyprus[1,2], Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain and Sweden.

IEA (International Energy Agency)**:** OECD regional grouping excluding Chile, Colombia, Costa Rica, Iceland, Israel, Latvia and Slovenia.

Latin America and the Caribbean (LAC)**:** Central and South America regional grouping and Mexico.

Middle East: Bahrain, Islamic Republic of Iran (Iran), Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic (Syria), United Arab Emirates and Yemen.

Non-OECD: All other countries not included in the OECD regional grouping.

Non-OPEC: All other countries not included in the OPEC regional grouping.

North Africa: Algeria, Egypt, Libya, Morocco and Tunisia.

North America: Canada, Mexico and United States.

OECD (Organisation for Economic Co-operation and Development)**:** Australia, Austria, Belgium, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Türkiye, United Kingdom and United States.

Southeast Asia: Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic (Lao PDR), Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam. These countries are all members of the Association of Southeast Asian Nations (ASEAN).

Sub-Saharan Africa: Angola, Benin, Botswana, Cameroon, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Ghana, Kenya, Kingdom of Eswatini, Madagascar, Mauritius, Mozambique, Namibia, Niger, Nigeria, Republic of the Congo (Congo), Rwanda, Senegal, South Africa, South Sudan, Sudan, United Republic of Tanzania (Tanzania), Togo, Uganda, Zambia, Zimbabwe and other African countries and territories.[6]

Country notes

[1] Note by Republic of Türkiye: The information in this document with reference to "Cyprus" relates to the southern part of the island. There is no single authority representing both Turkish and Greek Cypriot people on the island. Türkiye recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Türkiye shall preserve its position concerning the "Cyprus issue".

[2] Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Türkiye. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

[3] Individual data are not available and are estimated in aggregate for: Afghanistan, Bhutan, Cook Islands, Fiji, French Polynesia, Kiribati, Macau (China), Maldives, New Caledonia, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga and Vanuatu.

[4] Individual data are not available and are estimated in aggregate for: Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bonaire, Sint Eustatius and Saba, British Virgin Islands, Cayman Islands, Dominica, Falkland Islands (Malvinas), Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Pierre and Miquelon, Saint Vincent and Grenadines, Saint Maarten (Dutch part), Turks and Caicos Islands.

[5] The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD and/or the IEA is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

[6] Individual data are not available and are estimated in aggregate for: Burkina Faso, Burundi, Cabo Verde, Central African Republic, Chad, Comoros, Djibouti, Gambia, Guinea, Guinea-Bissau, Lesotho, Liberia, Malawi, Mali, Mauritania, Sao Tome and Principe, Seychelles, Sierra Leone and Somalia.

Abbreviations and acronyms

AI	artificial intelligence
APS	Announced Pledges Scenario
AUD	Australian dollar
BEV	battery electric vehicle
BMS	battery management system
BSS	battery swapping station
BTM	behind-the-meter
CCGT	combined-cycle gas turbine
CCUS	carbon capture, utilisation and storage
Co	cobalt
COP	Conference of the Parties (UNFCCC)
CO_2	carbon dioxide
CO_2-eq	carbon dioxide equivalent
CTP	cell-to-pack
DRC	Democratic Republic of the Congo
EMDE	emerging market and developing economies
EU	European Union
EV	electric vehicle
FID	final investment decision
FiT	feed-in tariff
GEC	Global Energy and Climate (model)
GT	gas turbine
GHG	greenhouse gases
Gr	graphite
HDV	heavy-duty vehicle
ICE	internal combustion engine
IEA	International Energy Agency

IRA	Inflation Reduction Act (United States)
LCO	lithium-cobalt oxide
LCOE	levelised cost of electricity
LDV	light-duty vehicle
LFMP	lithium-manganese-iron phosphate
LFP	lithium-iron phosphate
Li	lithium
LIB	lithium-ion battery
LME	London Metals Exchange
LMO	lithium-manganese oxide
MDV	medium-duty vehicle
MER	market exchange rate
NCA	nickel-cobalt-aluminium
Ni	nickel
NMC	nickel-manganese-cobalt
NZE	Net Zero Emissions by 2050 Scenario
OECD	Organisation for Economic Co-operation and Development
OEM	original equipment manufacturer
OPEX	operating expenditure
pkm	passenger-kilometre
PLDV	passenger light-duty vehicle
PPP	purchasing power parity
PV	photovoltaics
R&D	research and development
SHS	solar home systems
SSB	solid-state battery
STEPS	Stated Policy Scenario
SUV	sport utility vehicle
US	United States
USD	United States dollar
V2B	vehicle-to-building
V2G	vehicle-to-grid
VALCOE	value-adjusted levelised cost of electricity
VC	venture capital
VPP	virtual power plant
WEO	World Energy Outlook
ZEV	zero emissions vehicle

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