

# Decarbonising Europe and the changing renewables investment landscape

Ana Barillas

Head of Iberia, Aurora



# The EU has set an ambition of 55% reduction in greenhouse gas emissions from 1990 levels by 2030

## Fit for 55 marks Europe's climate moment of truth

*With Fit for 55, Europe is the global first mover in turning a long-term net-zero goal into real-world policies, marking the entry of climate policy into the daily life of all citizens and businesses.*

As time runs out to avoid [catastrophic climate change](#), the EU is stepping up its efforts to decarbonise Europe's economy. On Wednesday the commission launched its "Fit For 55" package of measures to [cut carbon emissions](#) 55 per cent below 1990 levels by 2030, on the way to net zero at mid-century.

The task is monumental but necessary. It is to Brussels' credit to have put together the first policy package by a [large jurisdiction](#) that measures up to the scale of the challenge.

## Electrifying Europe: EU 'Fit for 55' legislation will transform the automotive supply chain

By Daniel Harrison | 23 August 2021

## EU's green deal plans launched with 'make-or-break decade' warning

**Crucial period in climate and biodiversity crises flagged at European Commission as sweeping legal targets announced**



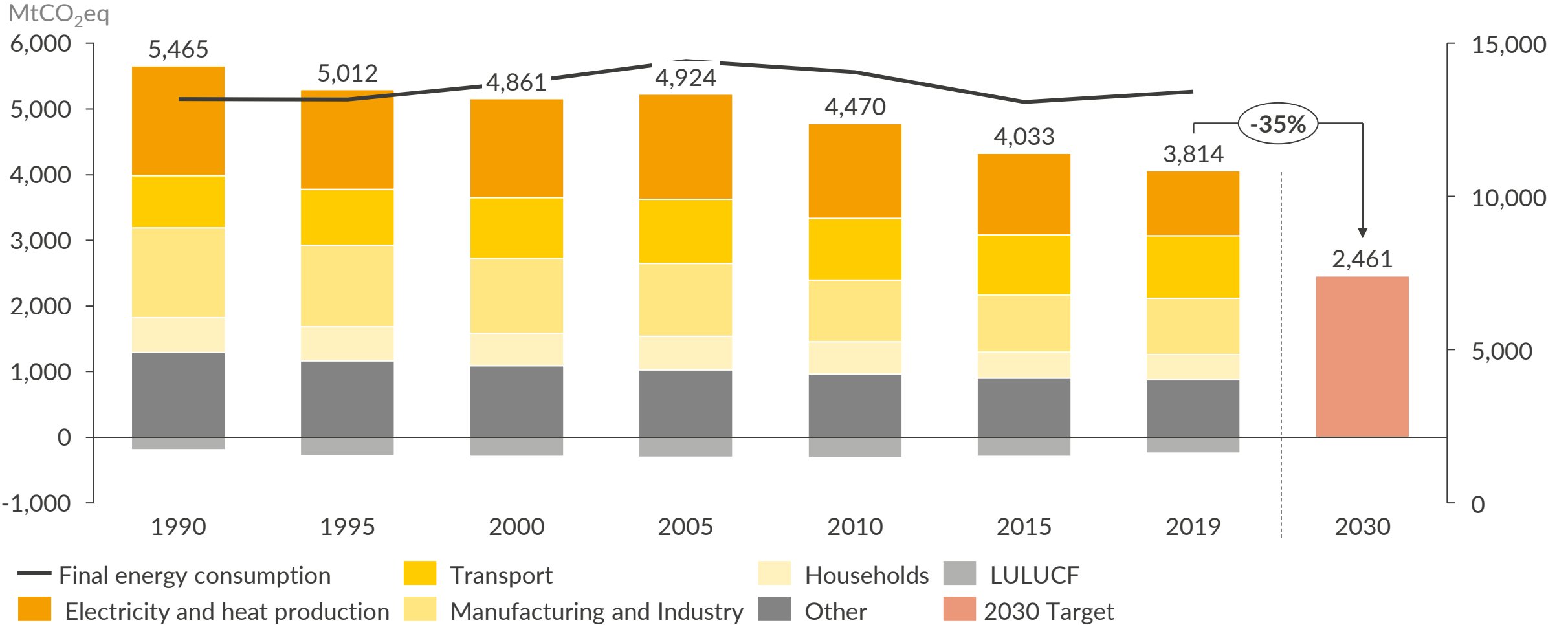
## 'Fit for 55' to encourage EU countries to prioritise offshore wind, driving decarbonisation

**Osborne Clarke**

▲ Wildfire, 2020, in the Khanty-Mansi Autonomous Area, western Siberia. Photograph: Denis Bushkovsky/TASS

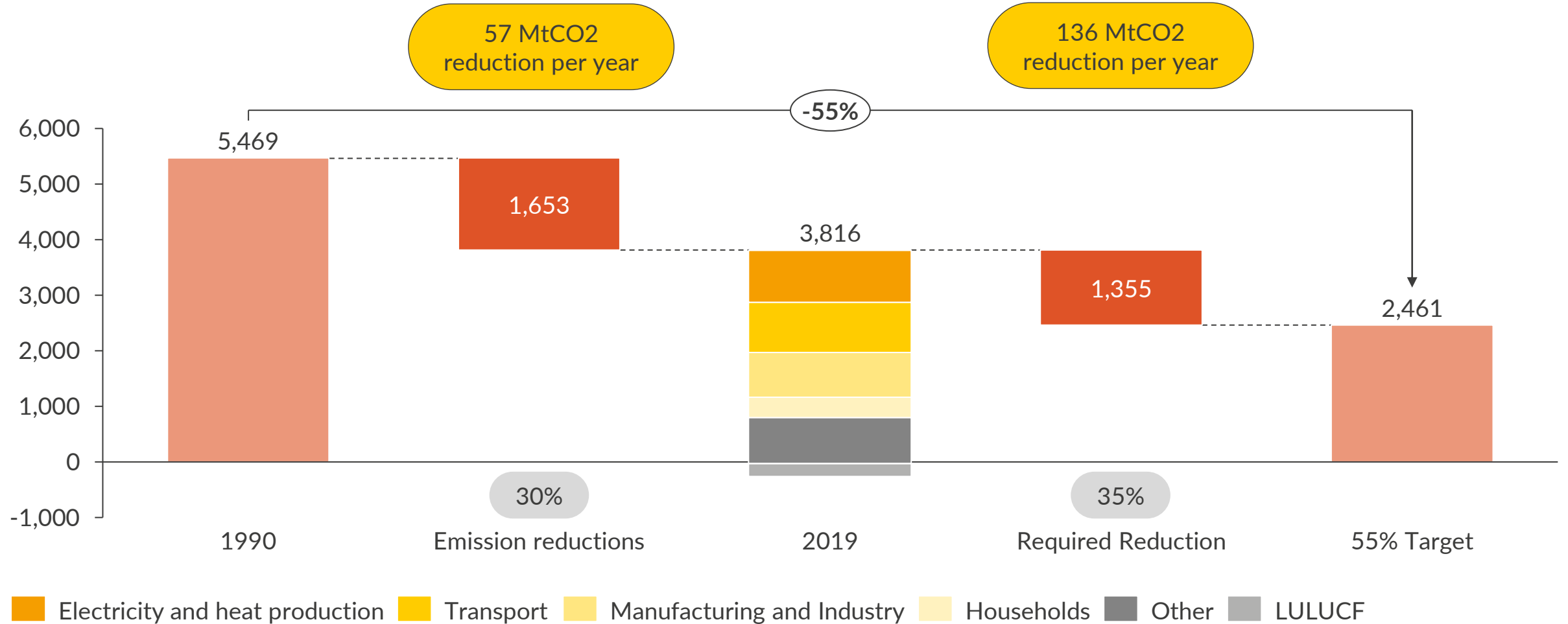
# CO<sub>2</sub> emissions have fallen steadily since 1990, but a 35% reduction is still required to reach the 2030 targets

EU-28 emissions 1990 - 2019 by sector



# A 30% reduction in emissions was achieved between 1990 and 2019, a further 35% reduction is now needed in a third of the time

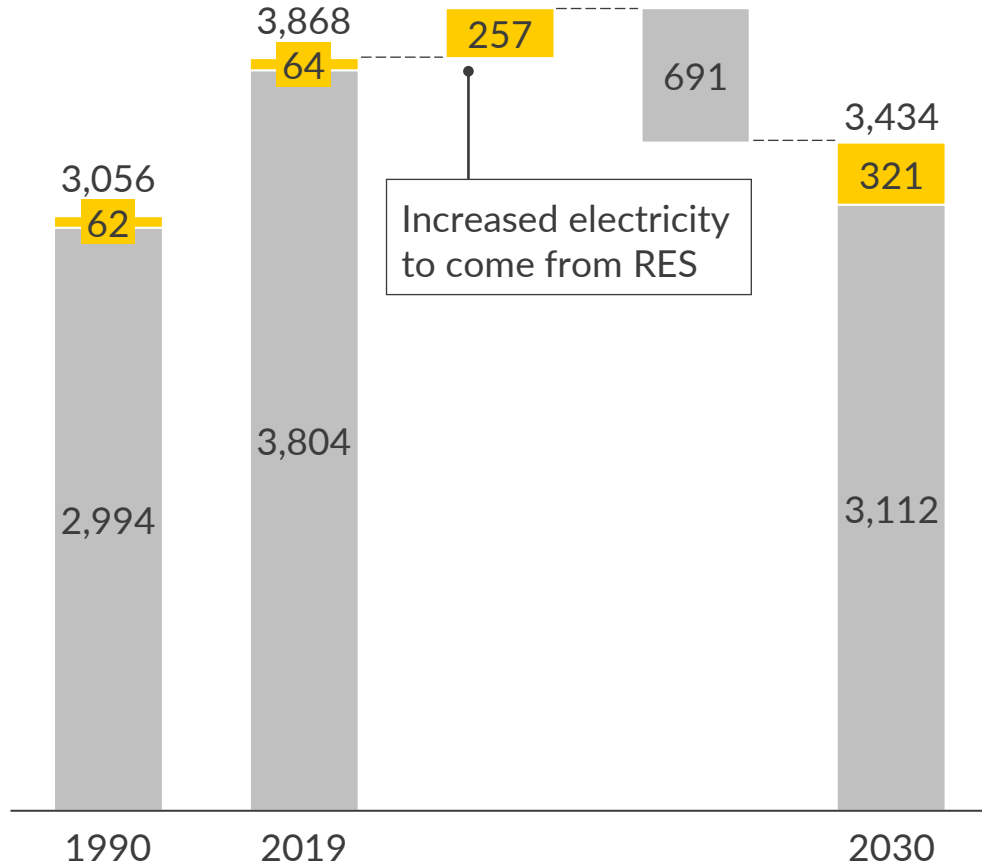
EU-28 GHG Emissions  
MtCO<sub>2</sub>eq



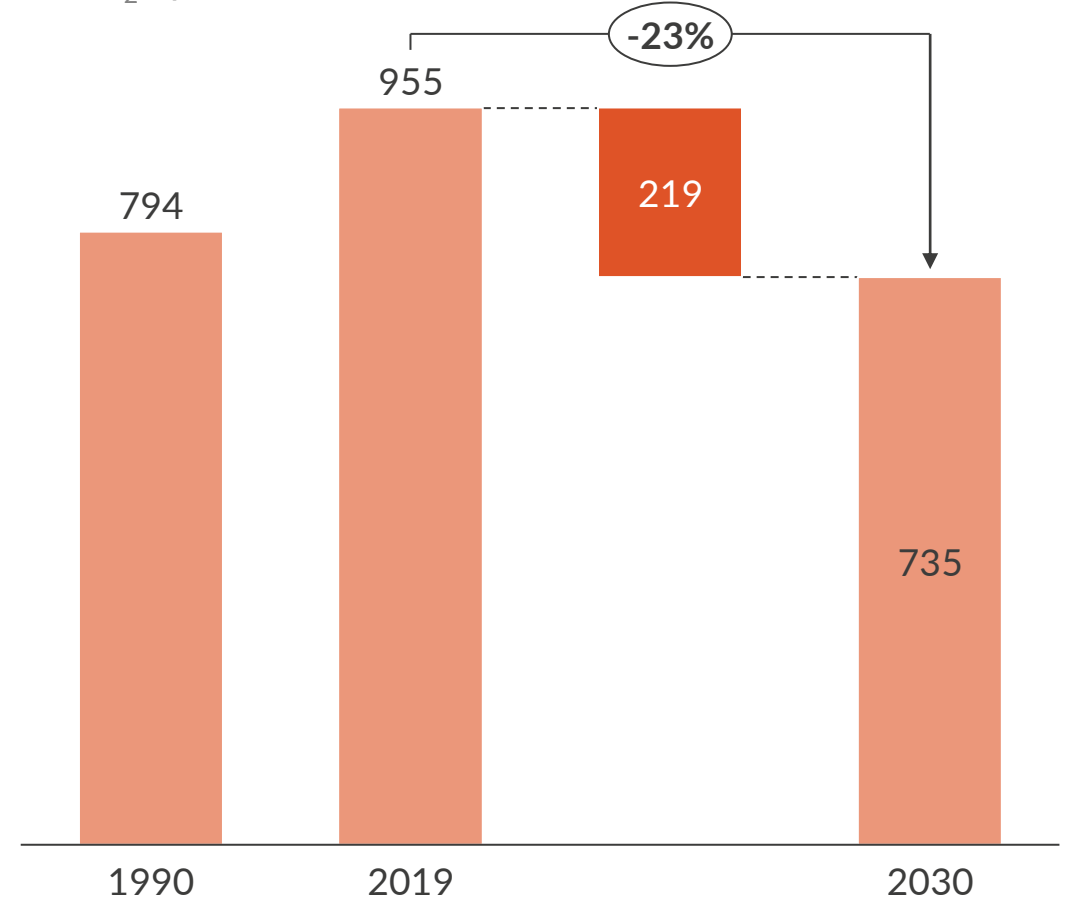


# Electrification has a pivotal role to play in decarbonising road transport, particularly passenger vehicles

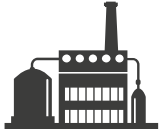
Final energy consumption in transport  
TWh



EU-28 GHG emissions from fuel combustion in transport  
MtCO<sub>2</sub>eq

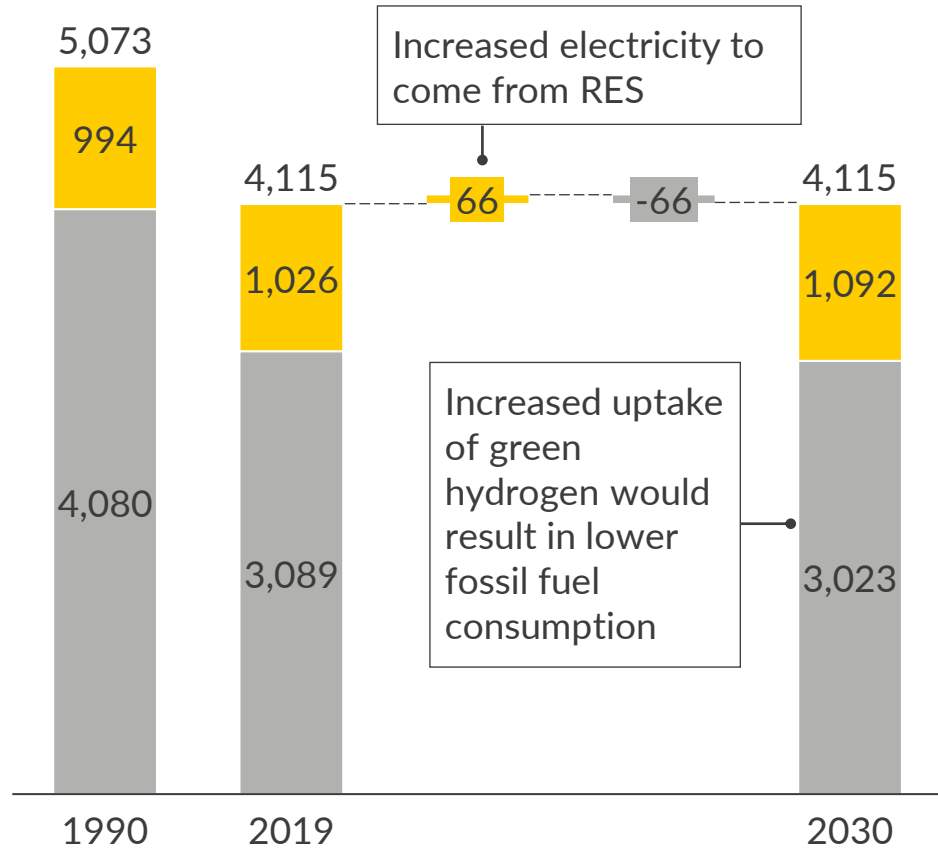


Electricity Fossil Fuels



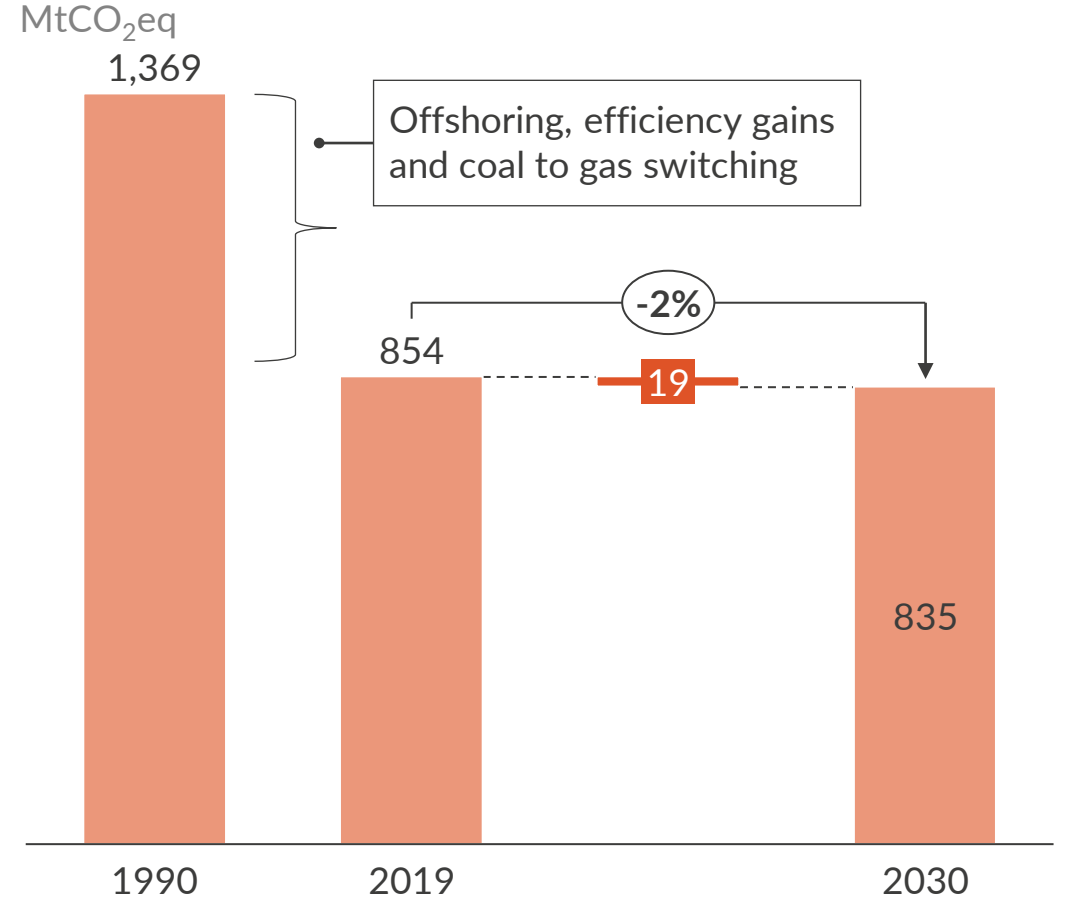
# Potential for direct electrification in industry over the next decade is fairly limited

Final energy consumption in industry (including feedstock)  
TWh



Electricity Fossil Fuels

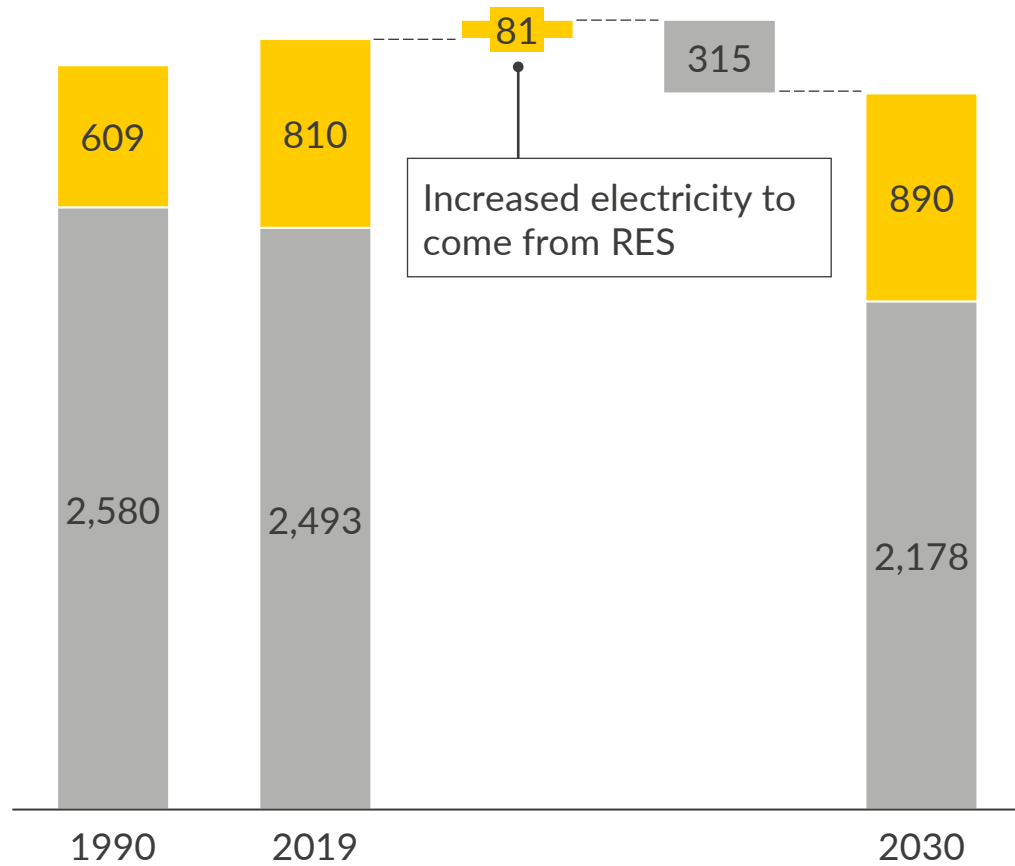
EU-28 GHG emissions from fuel combustion and feedstock in industry  
MtCO<sub>2</sub>eq





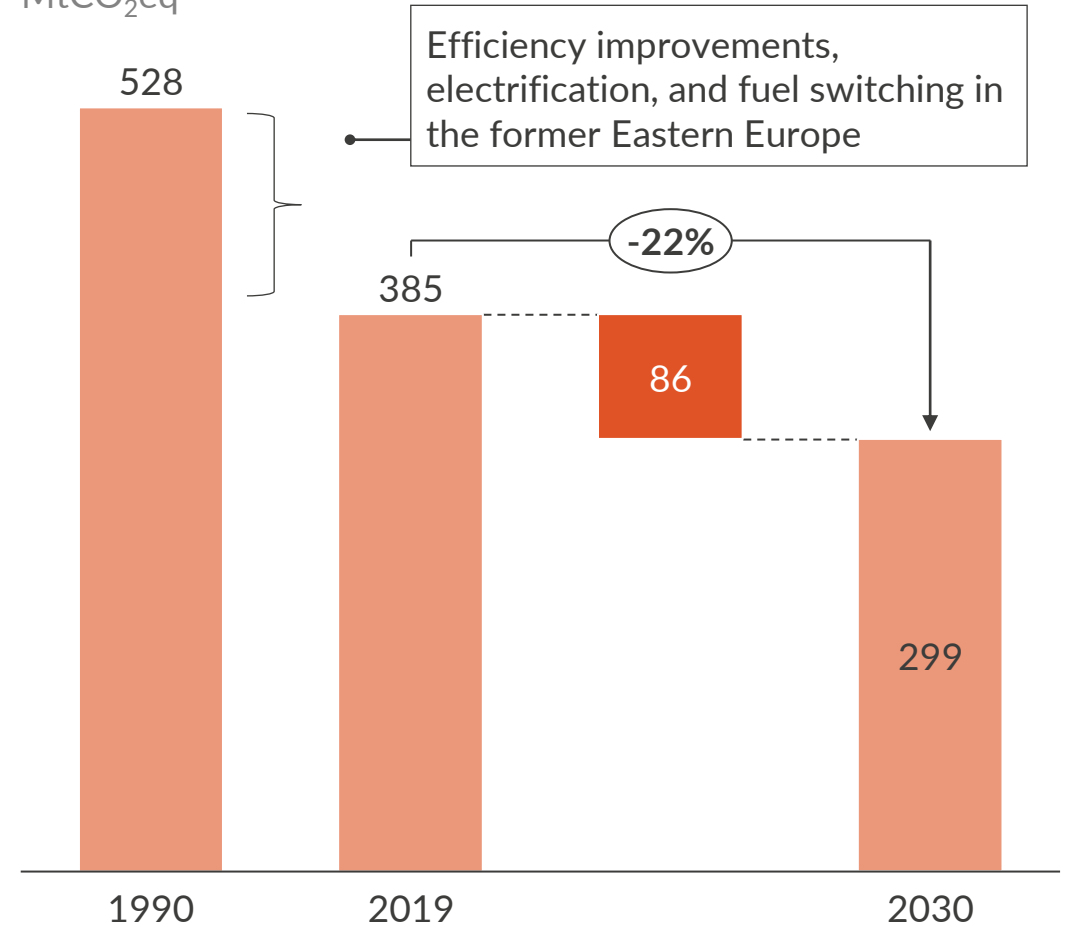
# The electrification of heating in household requires high heat pump adoption rates

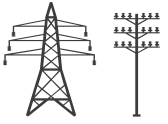
Final energy consumption in households  
TWh



Electricity Fossil Fuels

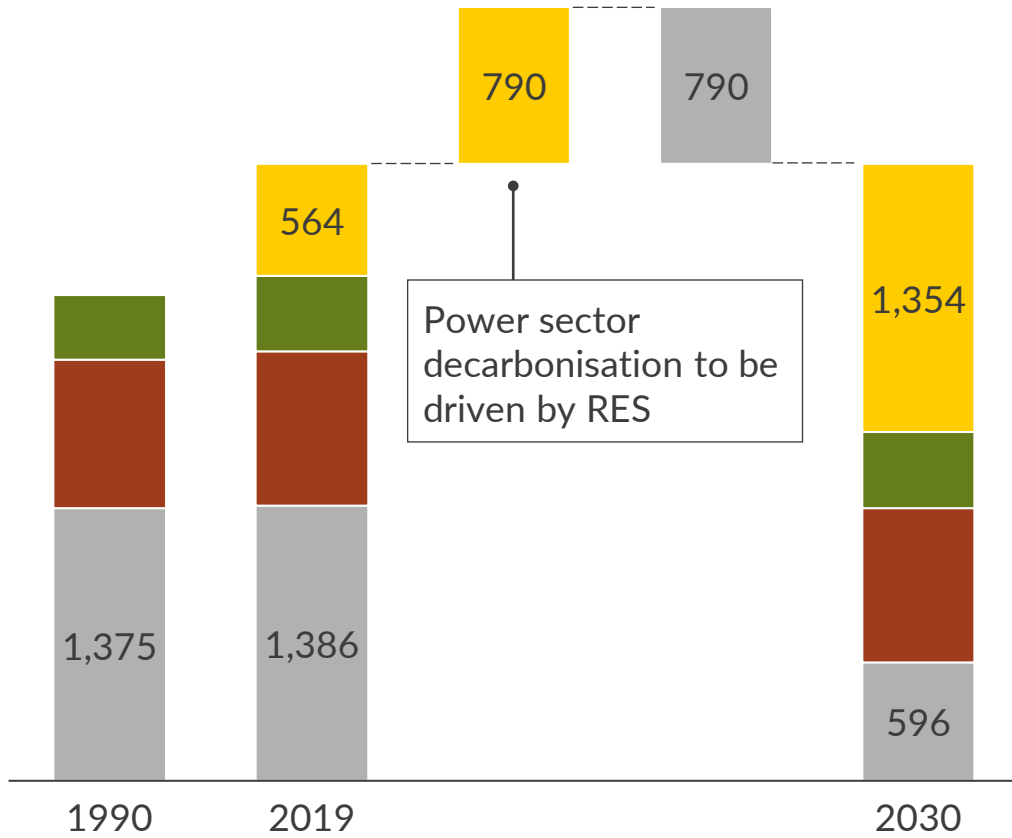
EU-28 GHG emissions from fuel combustion in households  
MtCO<sub>2</sub>eq



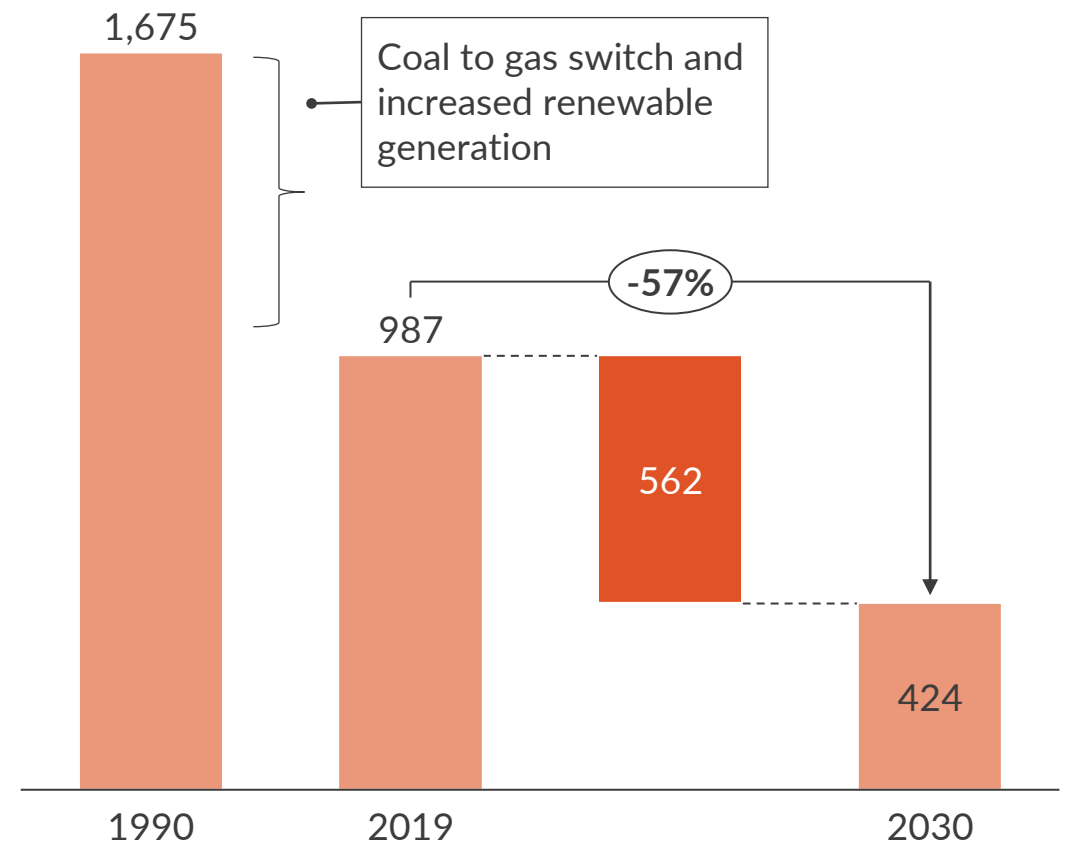


# Power generation has decarbonised faster and deeper than any other sector, but more rapid RES deployment is needed

Electricity production  
TWh



EU-28 GHG emissions from power generation  
MtCO<sub>2</sub>eq



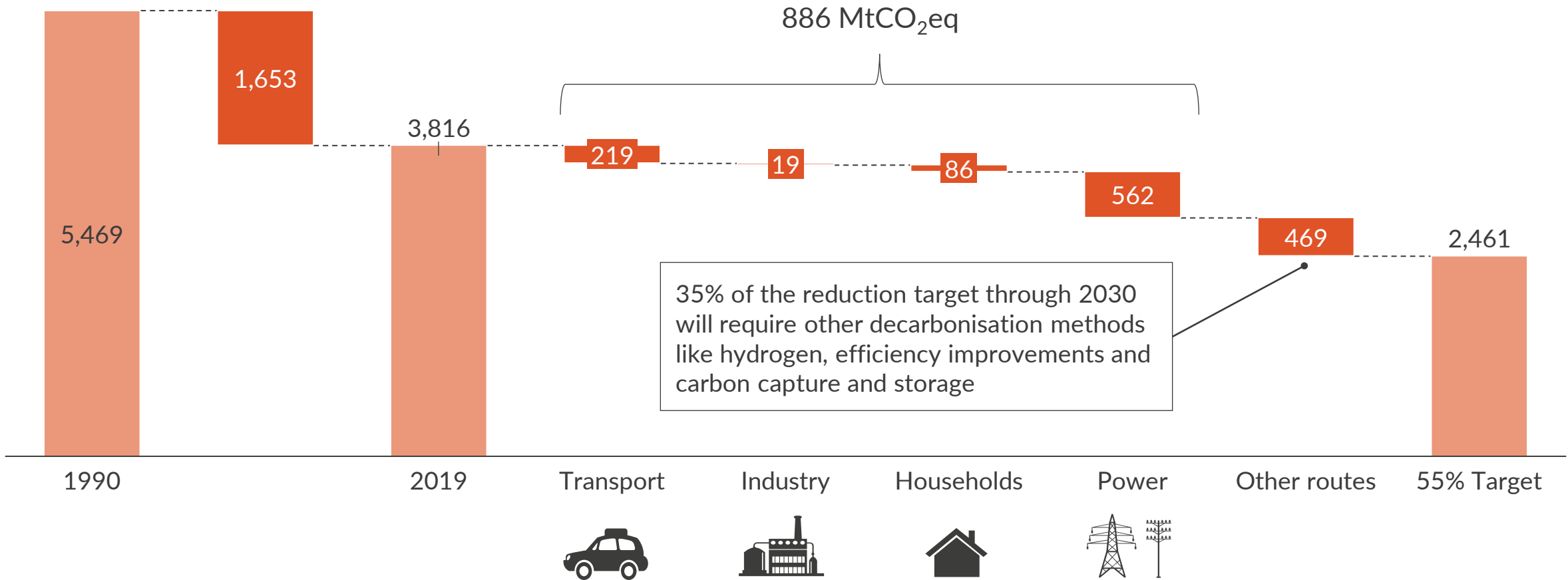
■ Wind/Solar 
 ■ Other RES<sup>1</sup>
■ Nuclear 
 ■ Fossil fuels

1) Other RES includes: Hydro, pumped hydro, geothermal, tide, wave and ocean



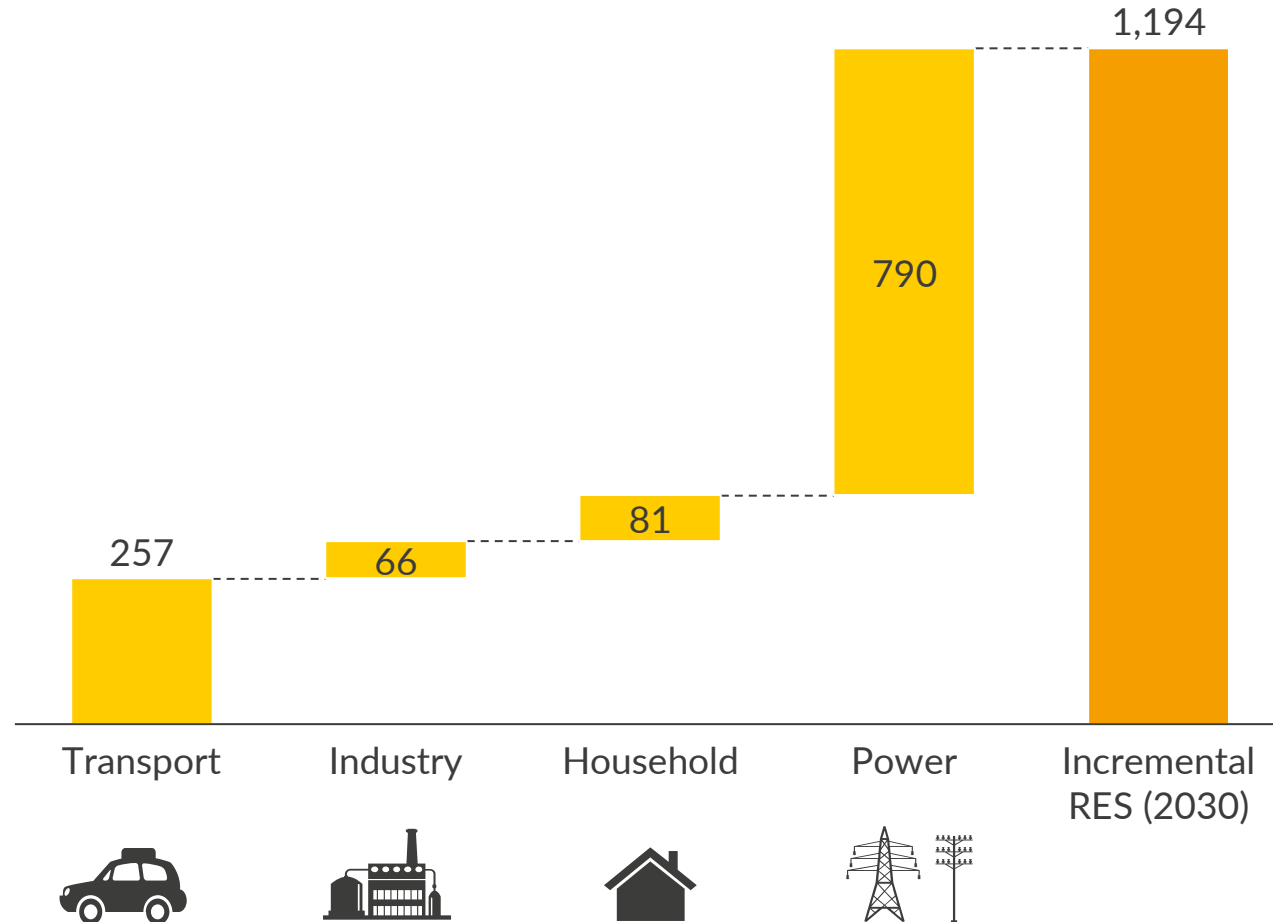
# While electrification can contribute close to 65% of the reduction target, other decarbonisation routes will be required

EU-28 GHG emissions  
MtCO<sub>2</sub>eq

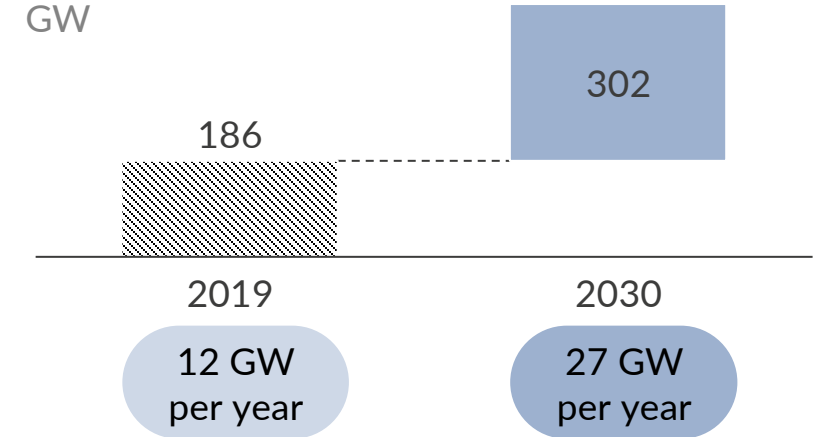


# Achieving the required growth in renewables entails a tripling of annual investment rates compared to the last five years

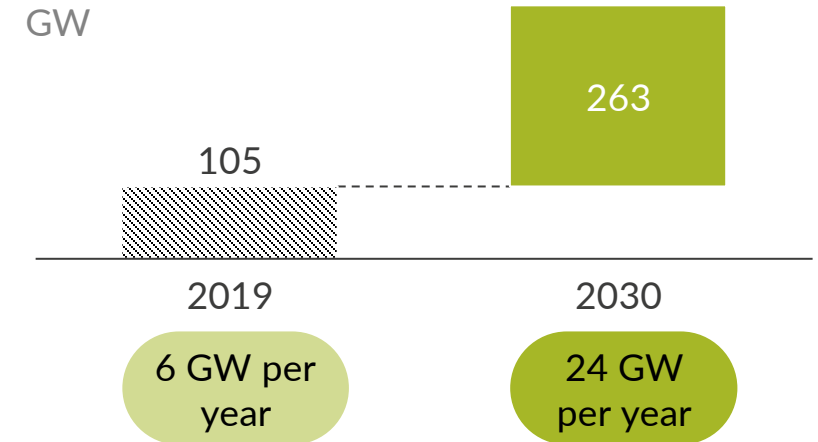
Additional zero-emission electricity generation required by sector  
TWh



Wind installed capacity  
GW

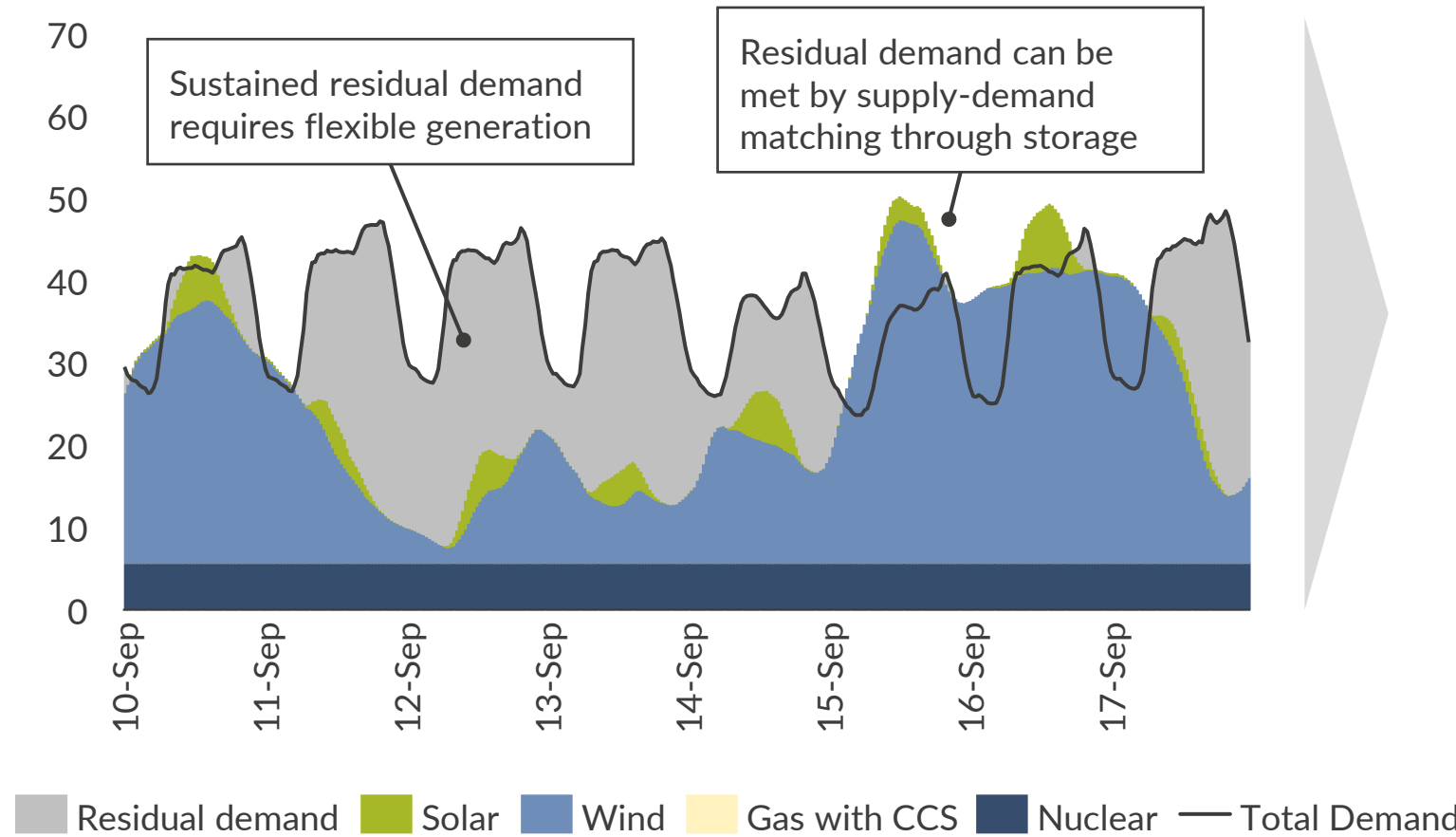


Solar installed capacity  
GW



# The growth of intermittent renewables also drives an acute need for flexibility, which will be partly met by batteries

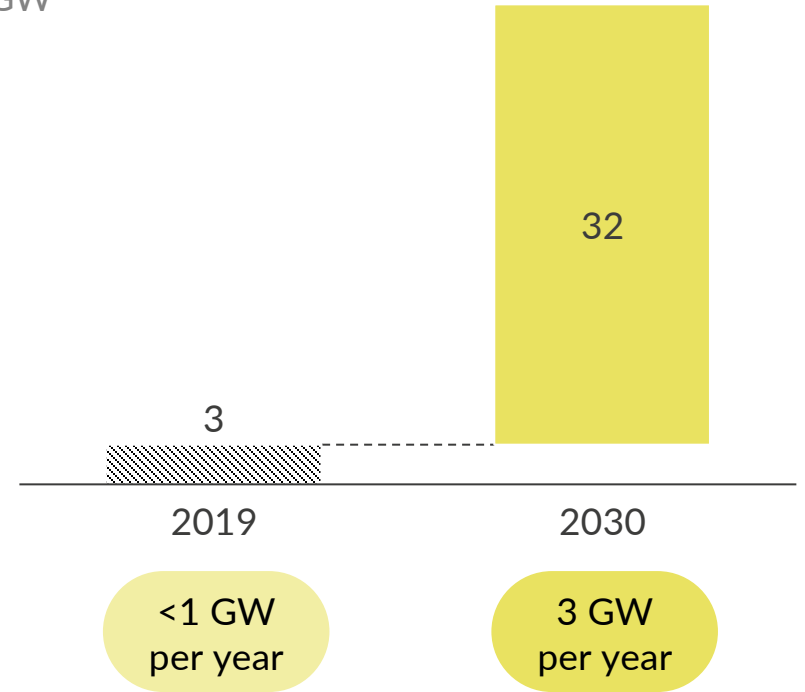
Illustrative power demand in two typical weeks, 2030  
GW



Battery to RES ratio  
 $GW_{bat} / GW_{RES}$

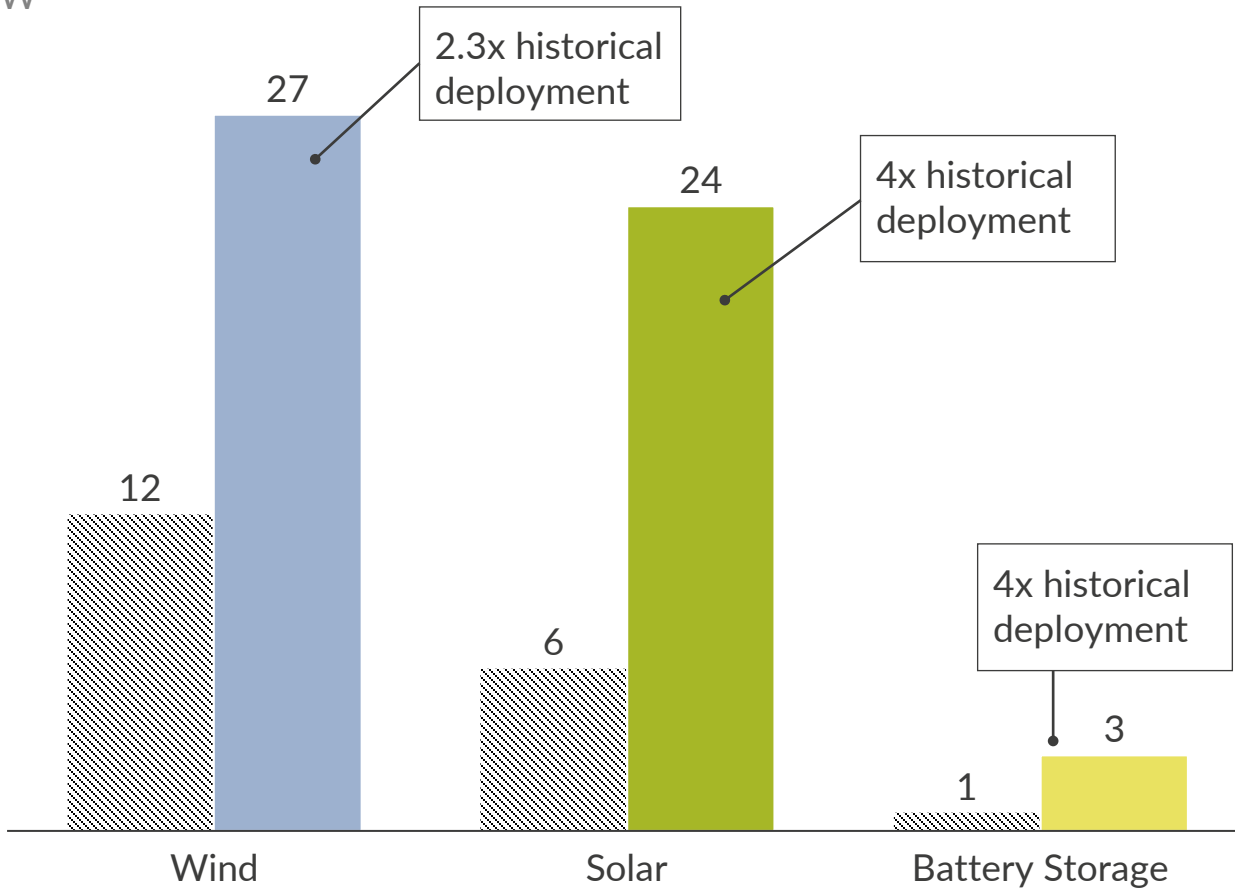
3 - 10%

Battery installed capacity  
GW

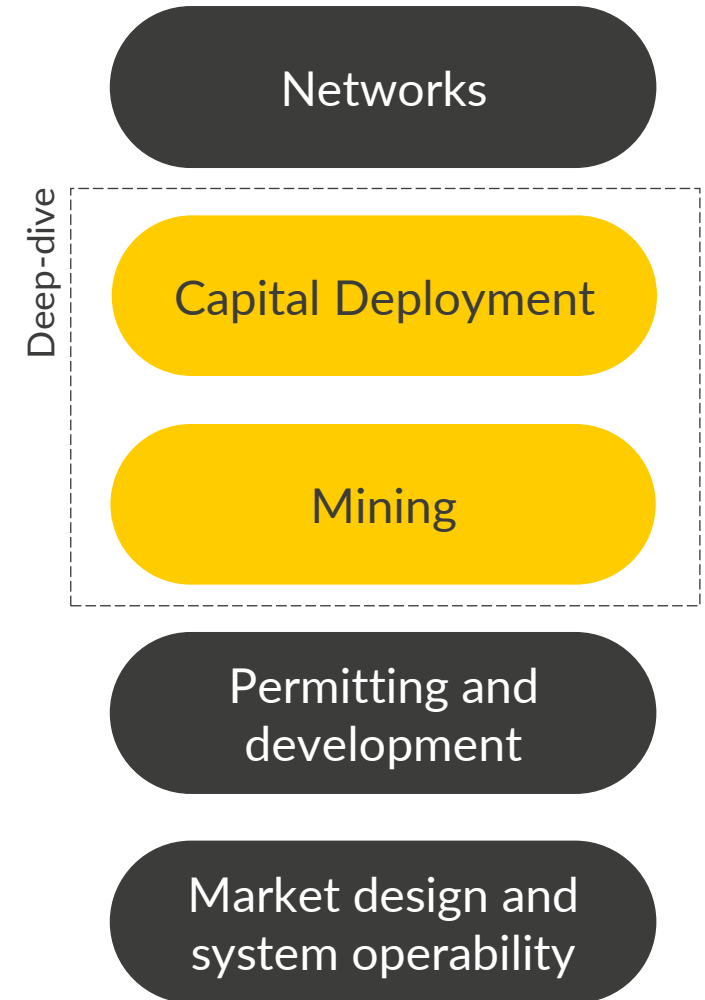


# This increase in RES and battery deployment will have widespread implications on other markets and industries

Annual additions  
GW

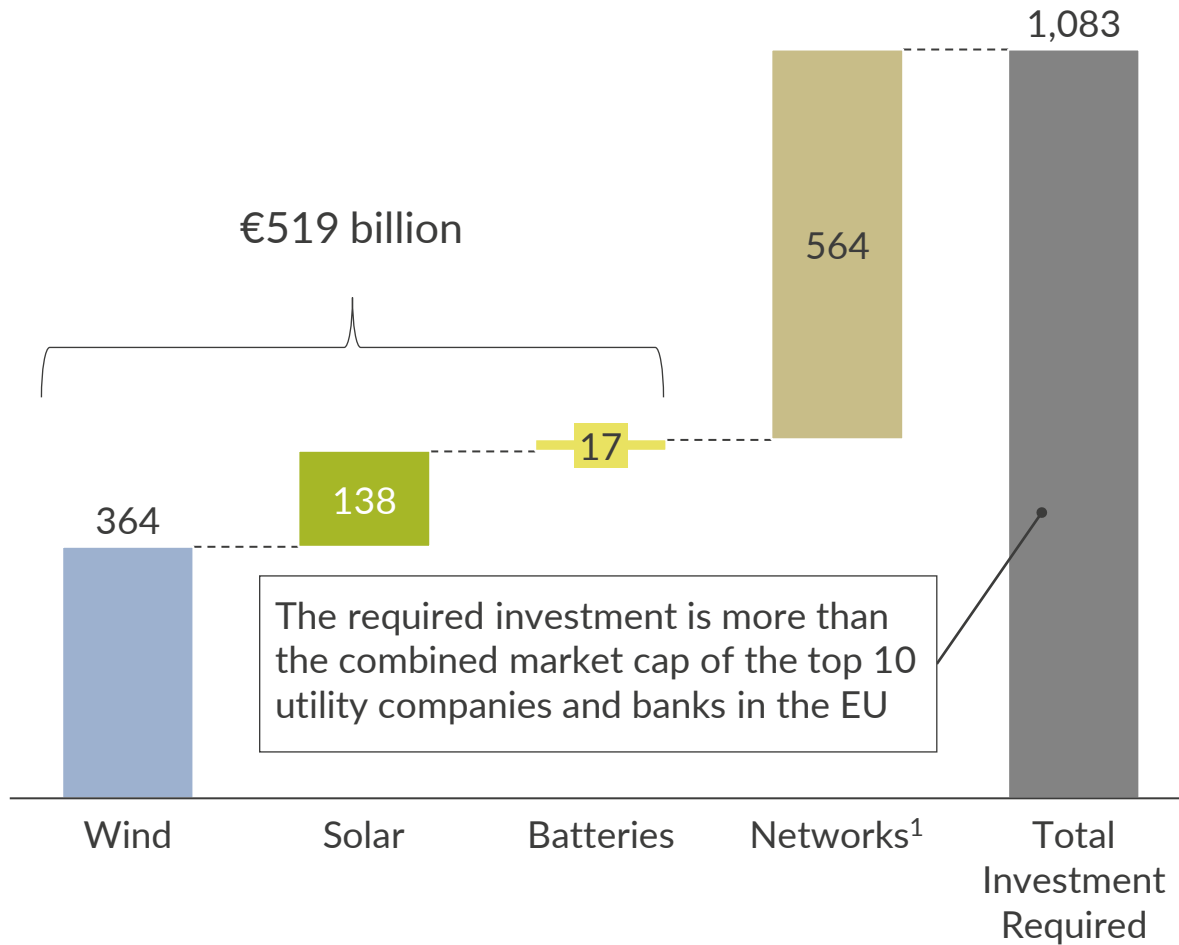


▨ Annual additions (2015-2019) ■ Annual additions (2020-2030)



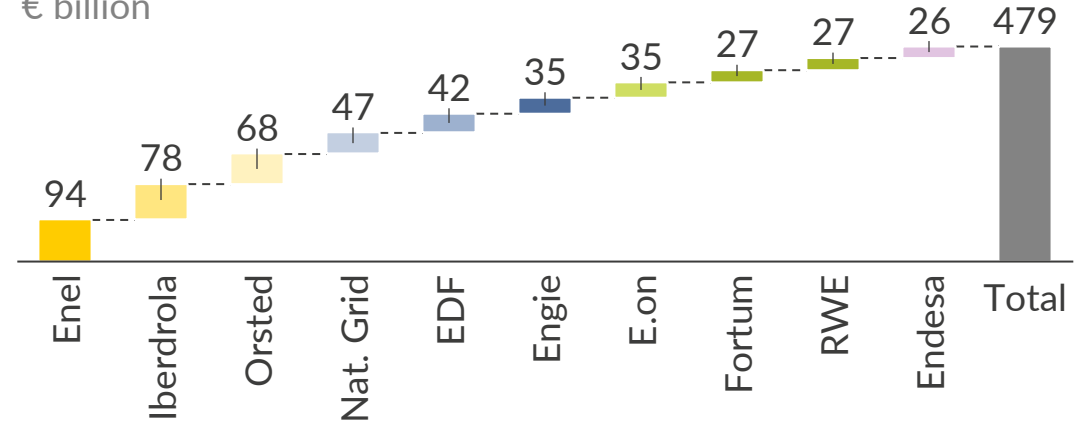
# Capital: enabling this renewable growth will require over a trillion Euros of investment over the next decade

Total CAPEX required (2020 - 2030)  
€ billion

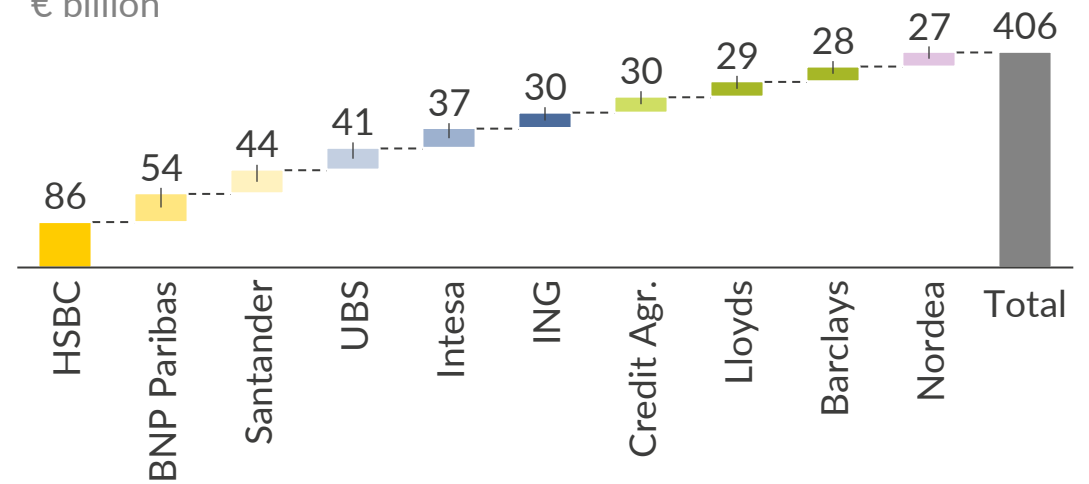


The required investment is more than the combined market cap of the top 10 utility companies and banks in the EU

Market capitalisation of the top 10 EU utilities<sup>2</sup>  
€ billion



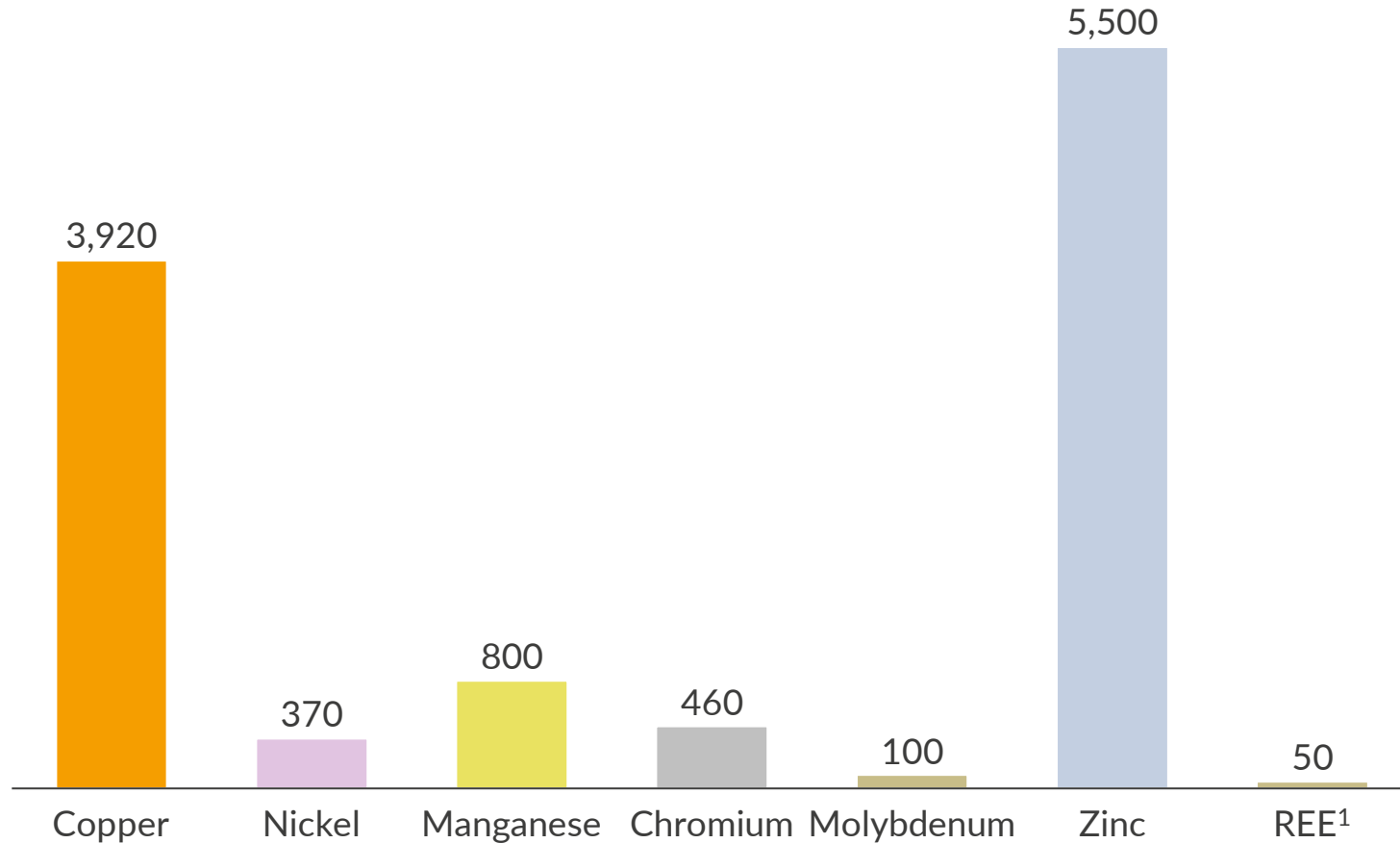
Market capitalisation of the top 10 EU banks  
€ billion



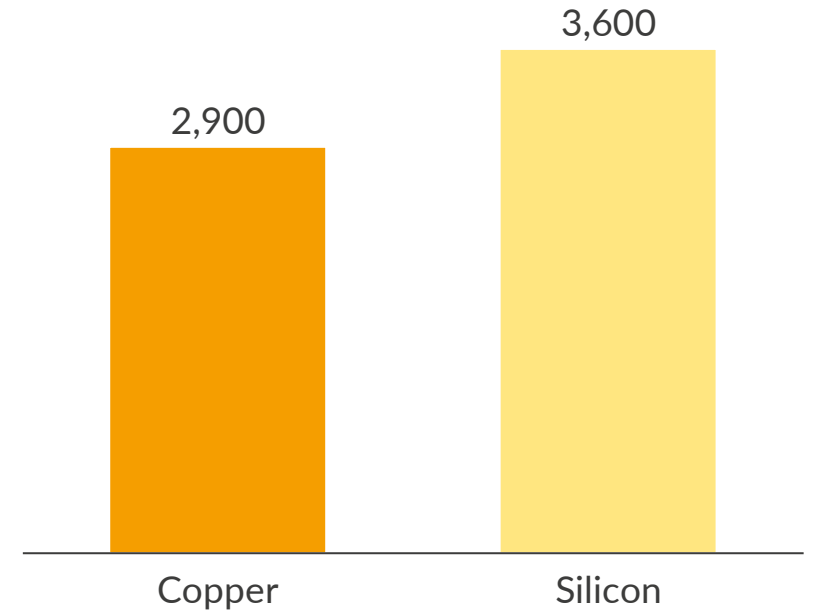
1) Assuming an average of 1 billion Euros per GW of renewables. 2) As of 1 September 2021

# Mining: renewable deployment also requires the mining of large amounts of minerals and rare earth metals

Critical minerals required per GW of wind capacity  
Tonnes/GW



Critical minerals required per GW of solar capacity  
Tonnes/GW

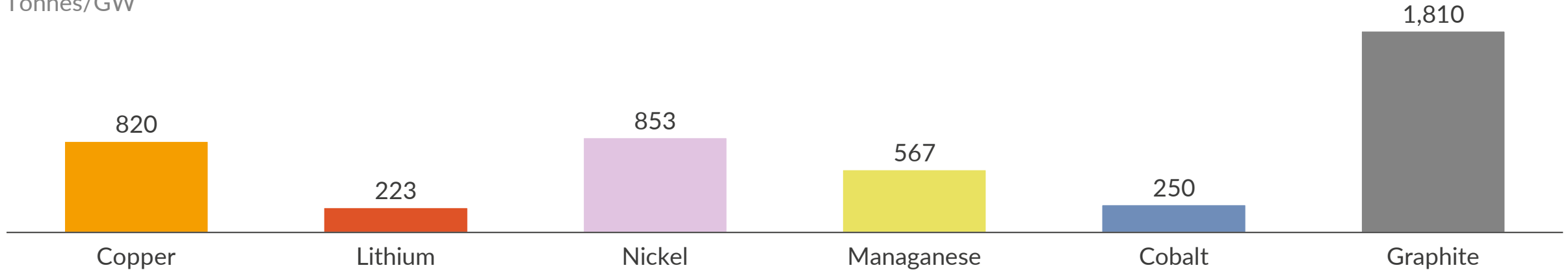


1) Rare Earth Elements

# Mining: batteries require a wide range of critical minerals for their production, many of which have seen price increases

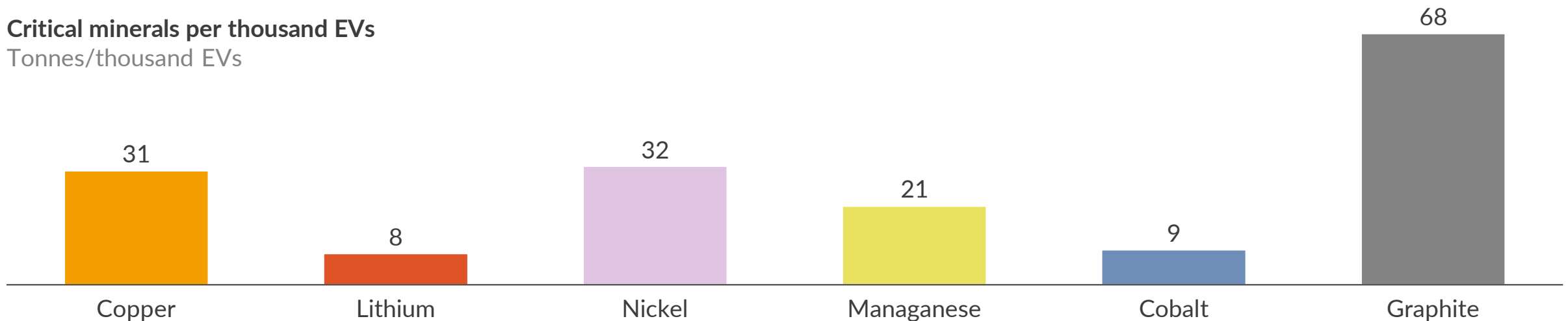
Critical minerals per GW batteries

Tonnes/GW



Critical minerals per thousand EVs

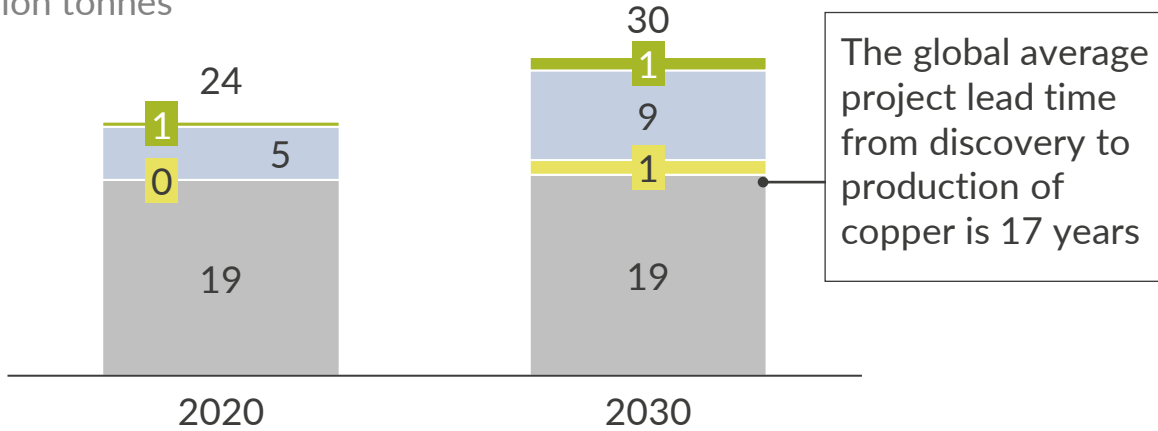
Tonnes/thousand EVs



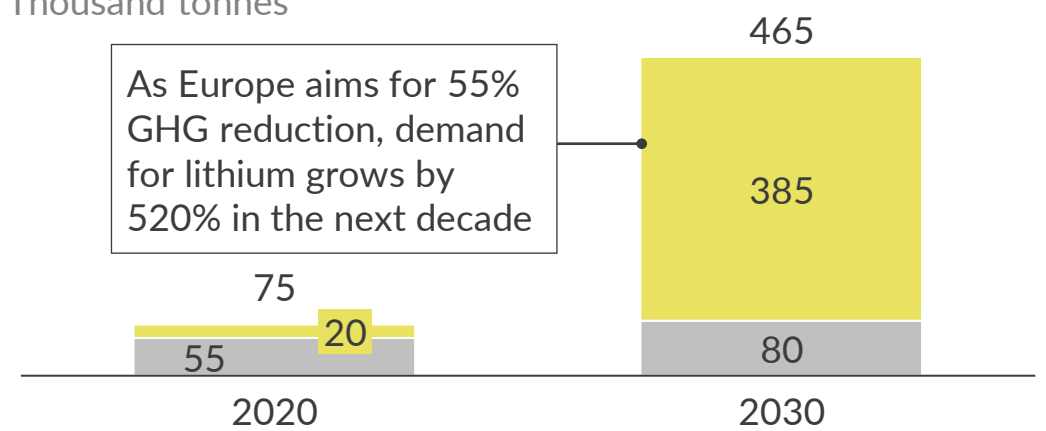
1) Assumes 2 hour duration battery.

# Mining: decarbonisation via electrification will increase global demand for critical minerals driven largely by demand from EVs

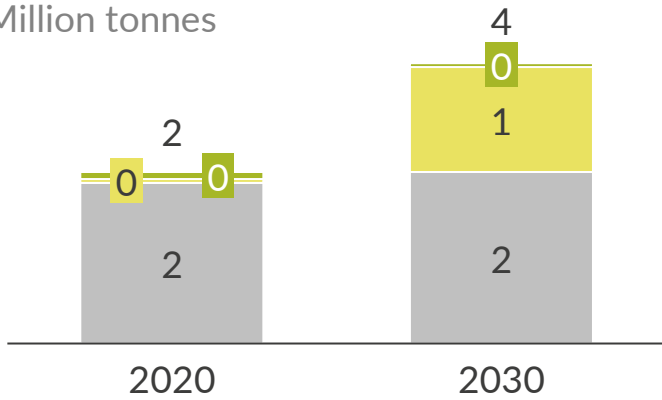
**Global copper demand**  
Million tonnes



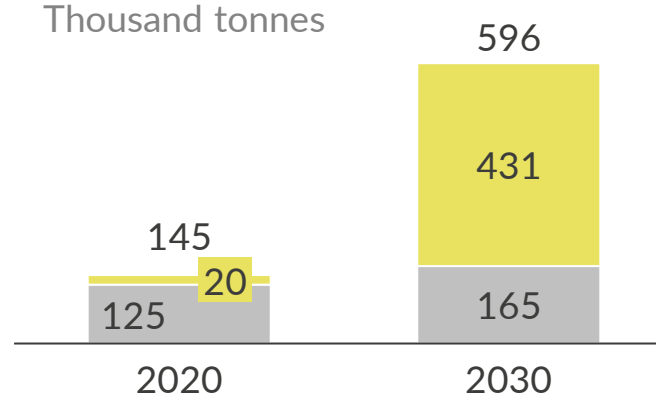
**Global lithium demand**  
Thousand tonnes



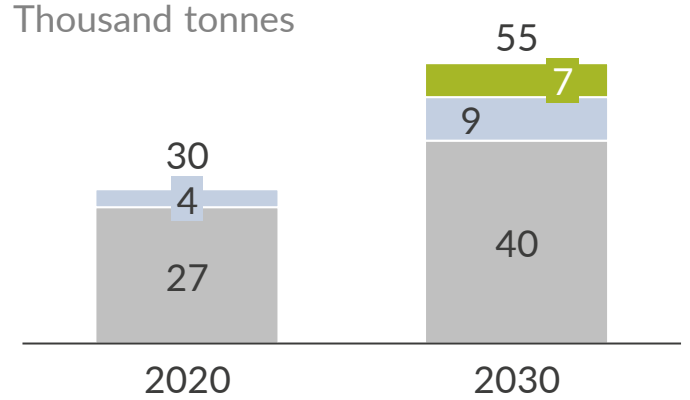
**Global nickel demand**  
Million tonnes



**Global cobalt demand**  
Thousand tonnes



**Global REE demand**  
Thousand tonnes



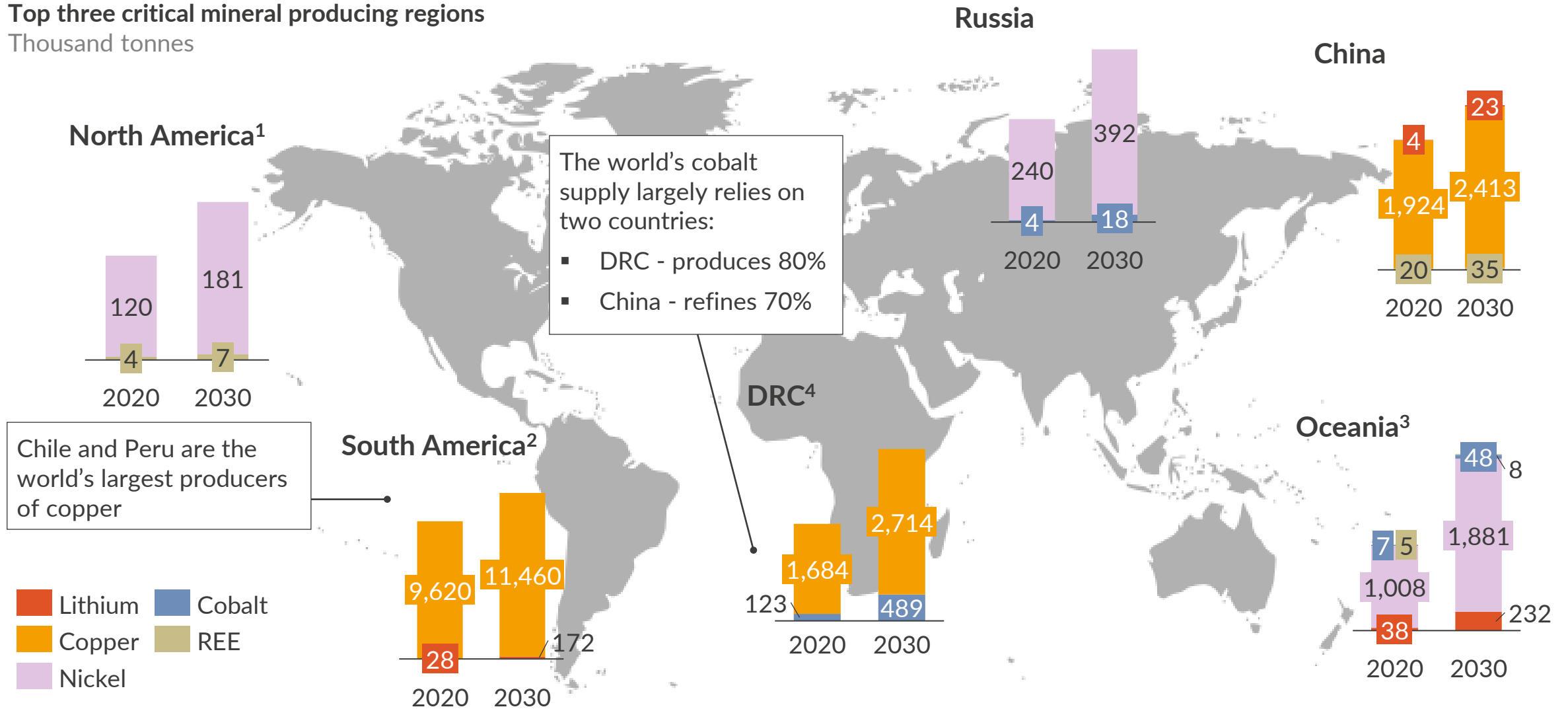
RES Networks EVs and battery storage<sup>1</sup> Other sectors

1) Assumes 2 hour duration batteries. 2) Assumes no recycling of lithium ion batteries by 2030.



# Mining: the impact of the mining industry is further complicated by geopolitical challenges

Top three critical mineral producing regions  
Thousand tonnes



1) North America includes: USA and Canada. 2) South America includes: Chile, Peru and Argentina. 3) Oceania includes: Australia, Indonesia and the Philippines. 4) Democratic Republic of the Congo.

# Europe's decarbonisation success so far is owed to renewables, but the investment landscape will become more challenging

## Networks

- Locational drivers will become increasingly important
- The required investment in network needs to be underpinned by robust RAB frameworks

## Capital Deployment

- Policy development will be needed for less-mature technologies
- Regulatory stability is paramount to ensure the required capital is deployed

## Mining

- The geopolitics of energy will evolve to include mining and solar and turbine manufacturing
- Investors will increasingly have to consider the wider renewable supply chain, and the ESG implications of related mining operations

## Permitting and development

- Permitting timelines have to be reduced to accommodate more rapid development
- Increased transparency and efficiency is required to attract international investors

## Market design and system operability

- Renewable growth will lead to increased system operability and security of supply challenges
- Markets need to be designed to send the right market signals, at the right time

Any further questions?

**Ana Barillas**

Head of Iberia, Aurora Energy Research

[Ana.Barillas@auroraER.com](mailto:Ana.Barillas@auroraER.com)

## General Disclaimer

This document is provided "as is" for your information only and no representation or warranty, express or implied, is given by Aurora Energy Research Limited and its subsidiaries Aurora Energy Research GmbH and Aurora Energy Research Pty Ltd (together, "**Aurora**"), their directors, employees agents or affiliates (together, Aurora's "**Associates**") as to its accuracy, reliability or completeness. Aurora and its Associates assume no responsibility, and accept no liability for, any loss arising out of your use of this document. This document is not to be relied upon for any purpose or used in substitution for your own independent investigations and sound judgment. The information contained in this document reflects our beliefs, assumptions, intentions and expectations as of the date of this document and is subject to change. Aurora assumes no obligation, and does not intend, to update this information.

## Forward-looking statements

This document contains forward-looking statements and information, which reflect Aurora's current view with respect to future events and financial performance. When used in this document, the words "believes", "expects", "plans", "may", "will", "would", "could", "should", "anticipates", "estimates", "project", "intend" or "outlook" or other variations of these words or other similar expressions are intended to identify forward-looking statements and information. Actual results may differ materially from the expectations expressed or implied in the forward-looking statements as a result of known and unknown risks and uncertainties. Known risks and uncertainties include but are not limited to: risks associated with political events in Europe and elsewhere, contractual risks, creditworthiness of customers, performance of suppliers and management of plant and personnel; risk associated with financial factors such as volatility in exchange rates, increases in interest rates, restrictions on access to capital, and swings in global financial markets; risks associated with domestic and foreign government regulation, including export controls and economic sanctions; and other risks, including litigation. The foregoing list of important factors is not exhaustive.

## Copyright

This document and its content (including, but not limited to, the text, images, graphics and illustrations) is the copyright material of Aurora, unless otherwise stated.

**This document is confidential and it may not be copied, reproduced, distributed or in any way used for commercial purposes without the prior written consent of Aurora.**

A U R  R A

E N E R G Y R E S E A R C H