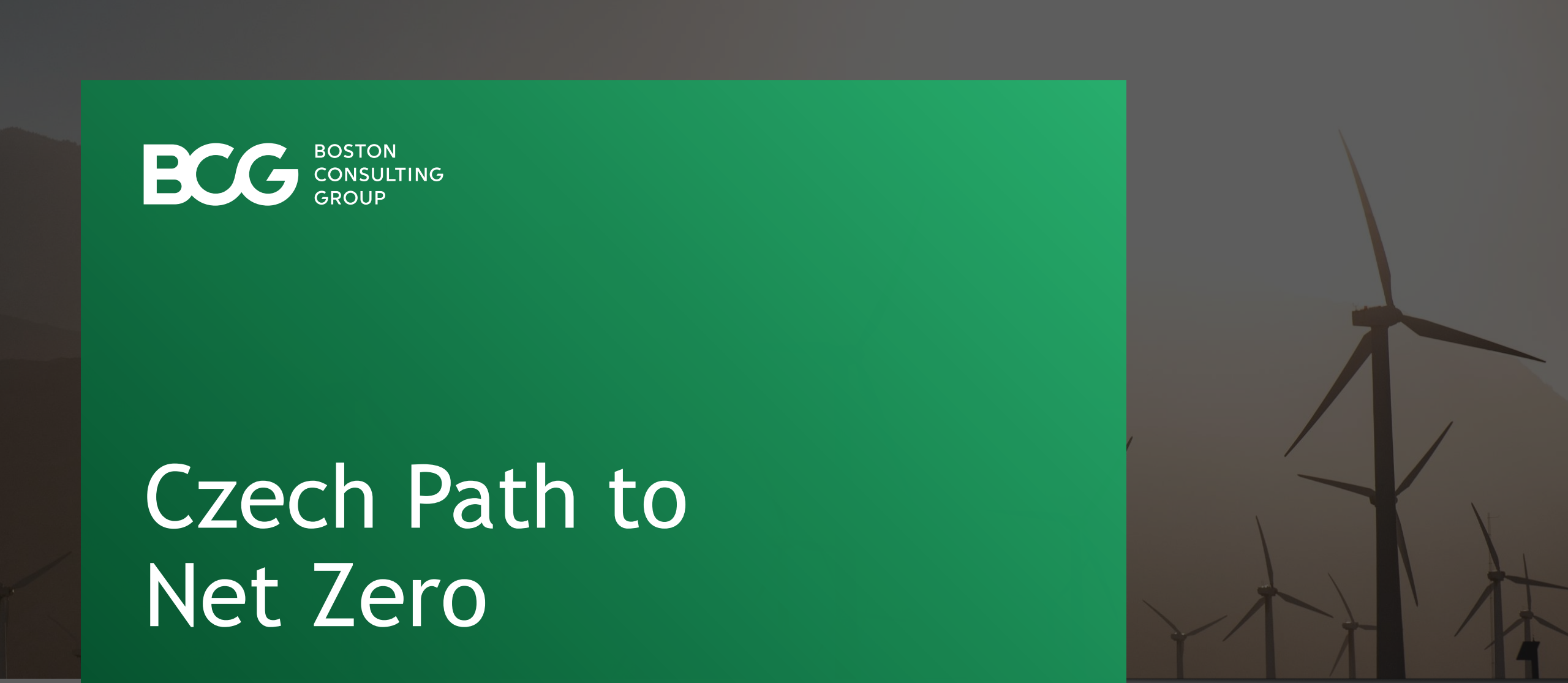
BCG BOSTON CONSULTING GROUP

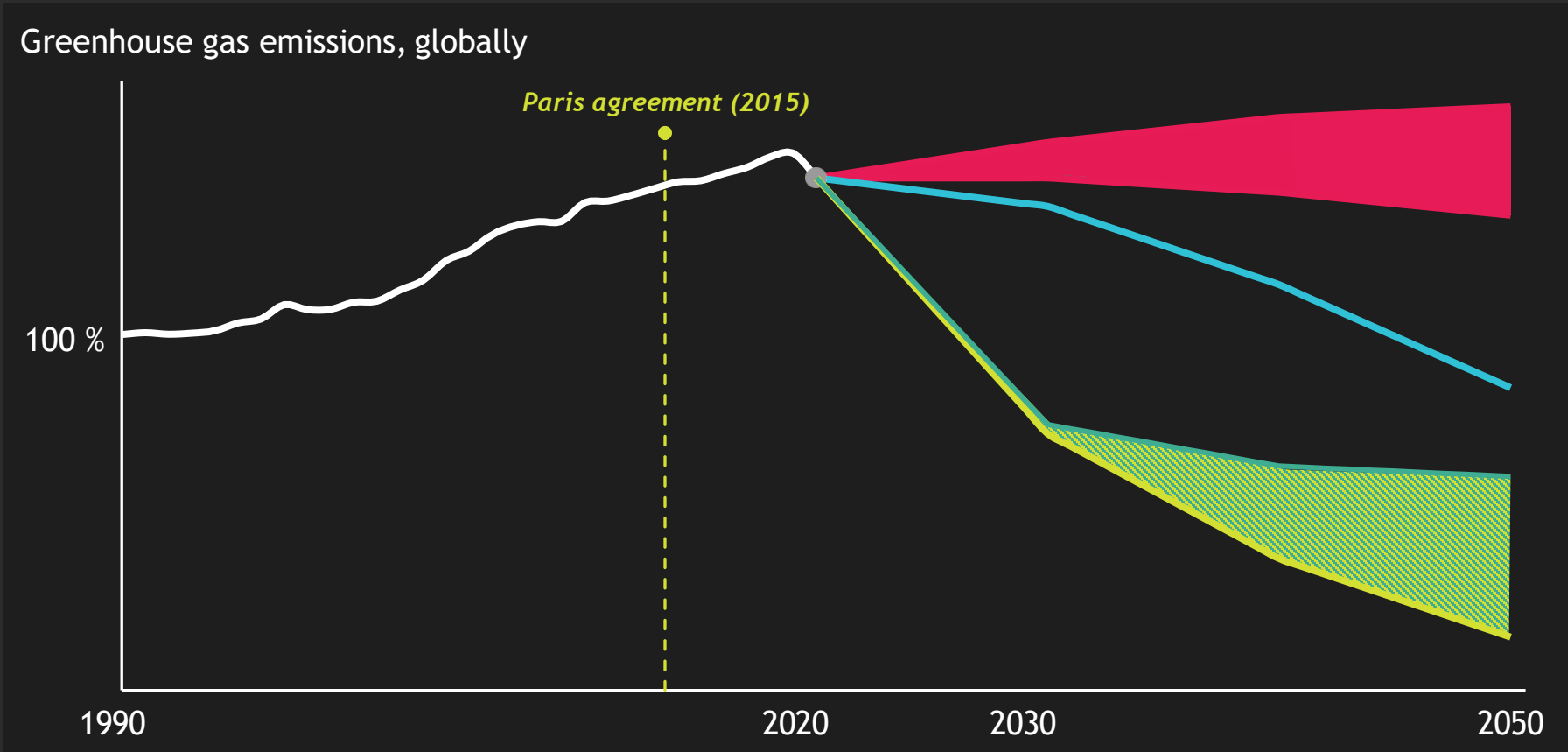
Czech Path to Net Zero

Presentation of a BCG report



THE ASPEN INSTITUTE CENTRAL EUROPE

We are very far off the safe pathway and need to act now



Current policies
~130-160 % of 1990 emissions

New pledges and targets (2.1-2.4°C)
~85% of 1990 emissions

Well-below 2°C path
~60% of 1990 emissions

1.5°C path
~15% of 1990 emissions

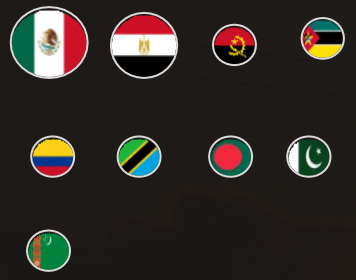
Source: IEA, Climate action tracker

However, majority of global emissions are covered by net zero commitments

No net zero commitment

20%

of emissions

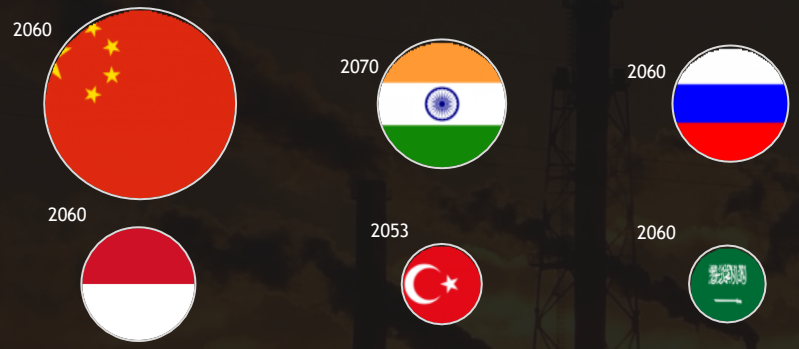


RoW without net zero commitment[1]

National net zero commitment after 2050

44%

of emissions



+8 countries

National net zero commitment by 2050

36%

of emissions

+30 countries

1. National commitments independently of target date and that are considered sincere (either in law, in policy document, officially declared or achieved)
Source: Net Zero Tracker; Climate Watch; ICOS, Ren21, Past Coal Alliance, ICCT, World Bank; Governments' websites; BCG analysis

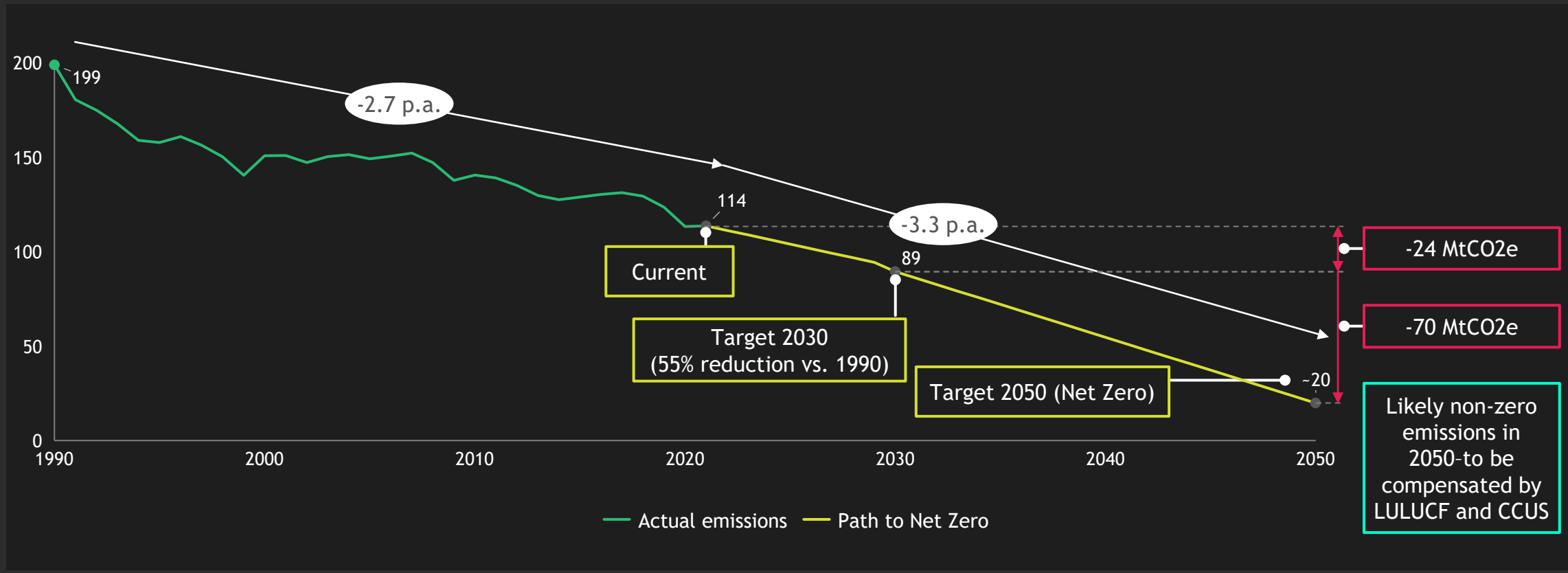
The following decade will bring the greatest industrial transformation of our time. (…) And those who manage to develop and manufacture the technology that will form the foundation of our future economy will have the greatest competitive advantage.

Ursula von den Leyen, World Economic Forum, 2023

How do we ensure that the path to neutrality will be an opportunity and not a threat for the Czech economy?

Czech GHG emissions have declined due to reduction of heavy industry, but the trend will need to speed up

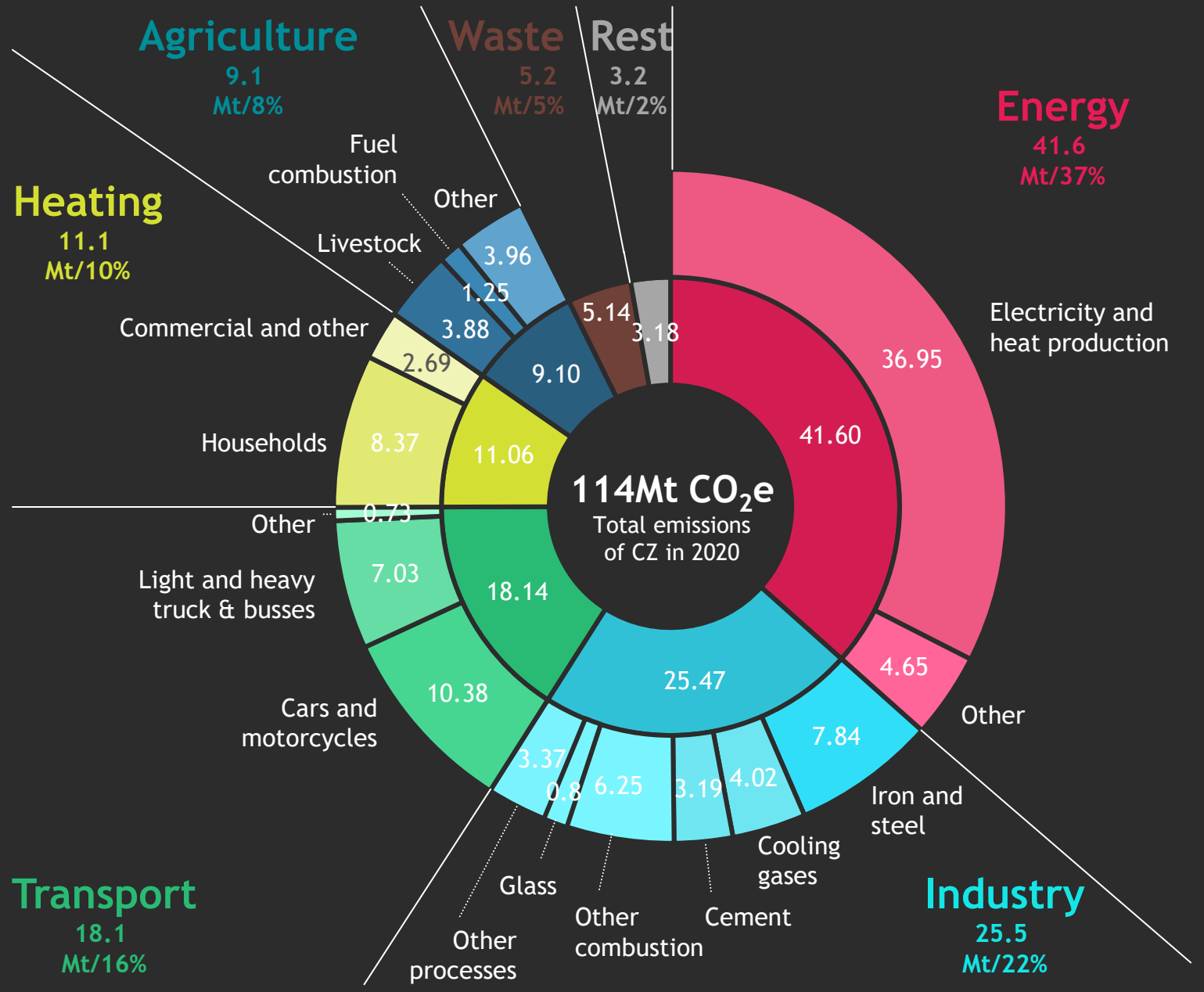
Total CZ GHG emissions and split by source sector (MtCO2 equivalent)



Source: BCG analysis

Energy, Industry & Transport represent 75% of all carbon emissions today.

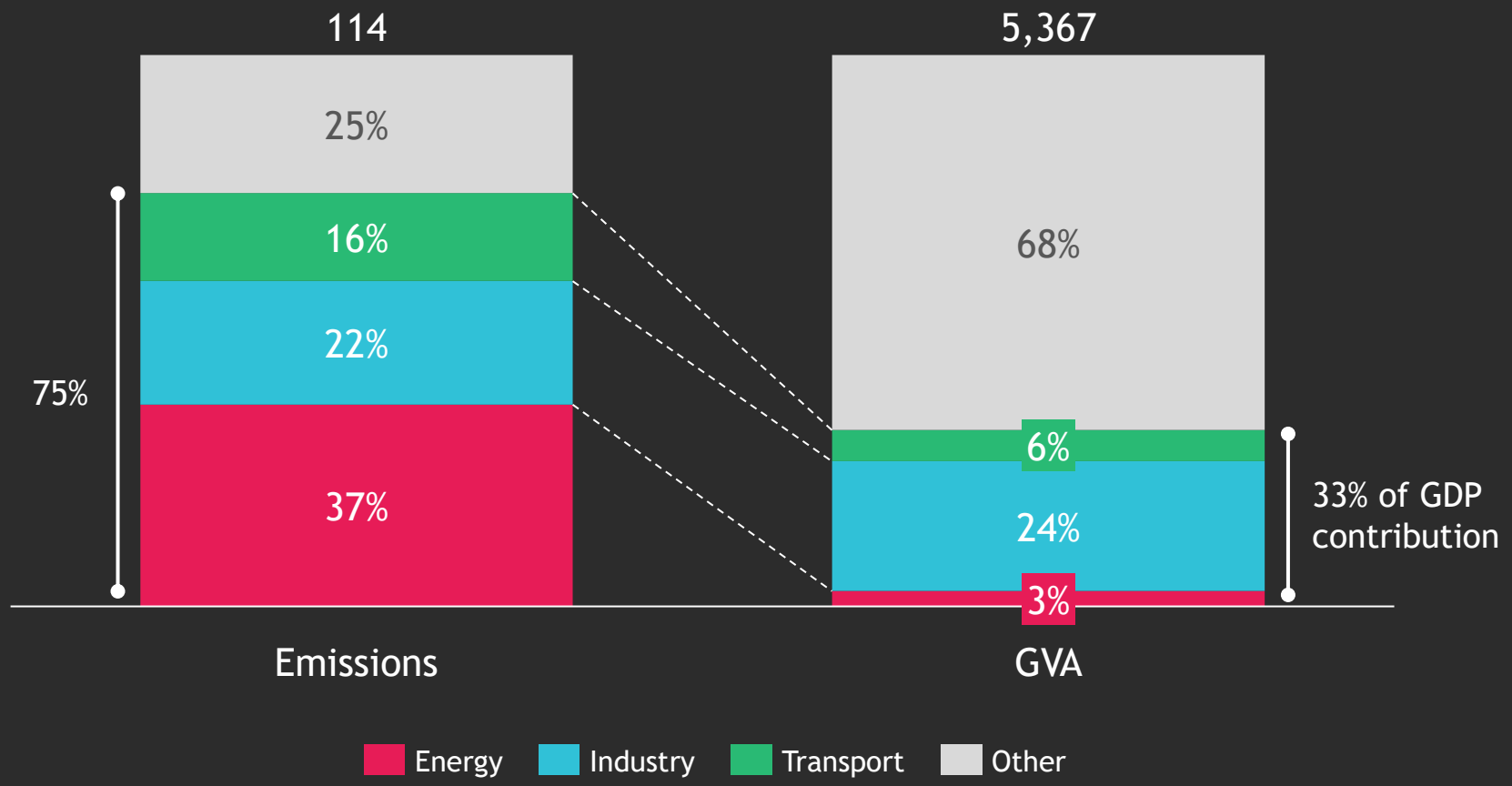
Successful path to net-zero targets is dependent on transformation of these sectors



Excluded LULUCF = Land use, land use change and forestry; Scope 1 perspective
Source: Faktaoklimatu.cz, Eurostat, Emissions Allowance Database (ETS system), CZSO, BCG Analysis; Data for 2020

1/3 of Czech GDP will be directly impacted through sectors responsible for 75% of emissions

GHG emissions ($MtCO_2e$), GVA[1] (B CZK), 2021

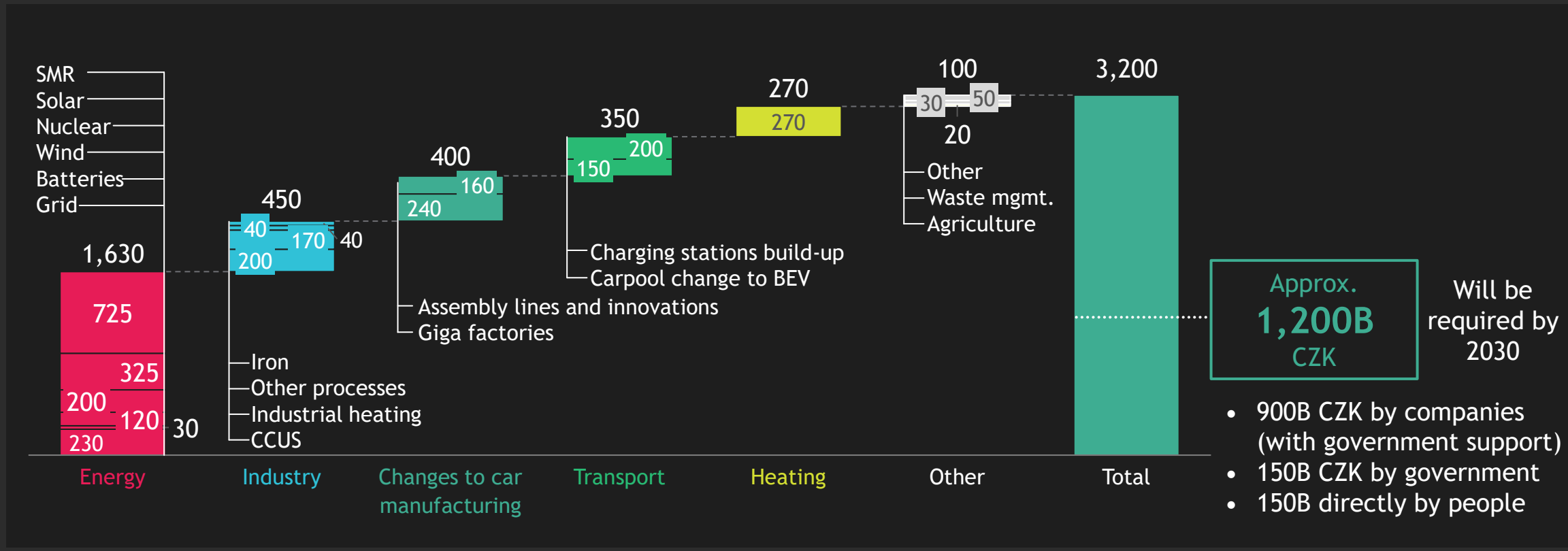


1. Gross Value Added (=economical measure of value add of sectors/companies, GDP – Gross domestic product measures entire economy, GDP = GVA + Taxes – Subsidies); Plot shows only GVA contributions to total GDP of 6,572B CZK
Source: Eurostat, Emissions Allowance Database (ETS system), CZSO, BCG analysis

We estimate that 3,200B CZK of investments will be required to achieve Net Zero in Czech Republic by 2050

Estimated Net Zero related investments by sector

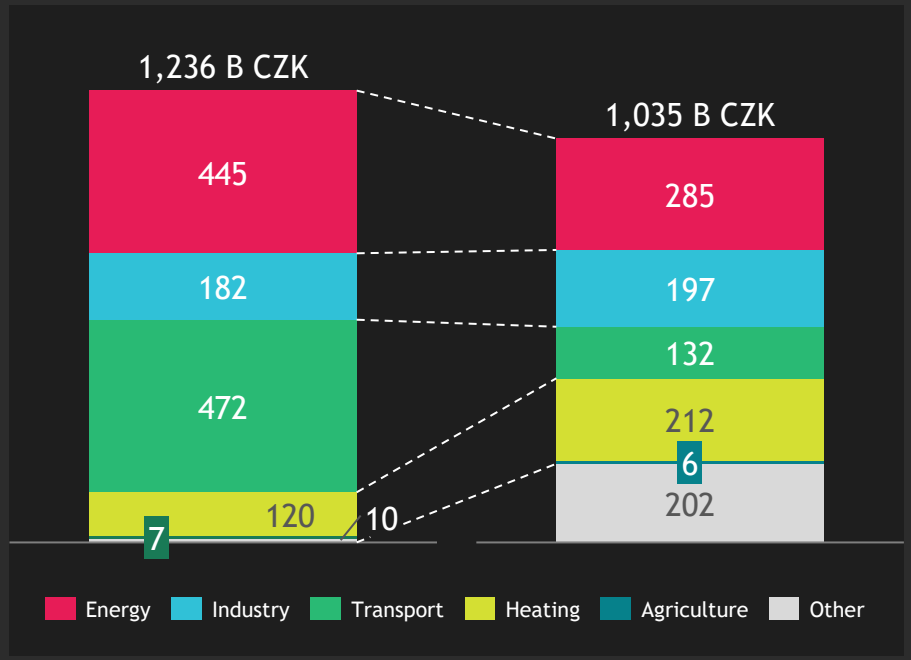
Billions CZK, cumulative by 2050



Source: BCG analysis

Public Funding can help finance ~85% from the required investment

Incremental investment needed (until 2030)



Public Funding (until 2030)

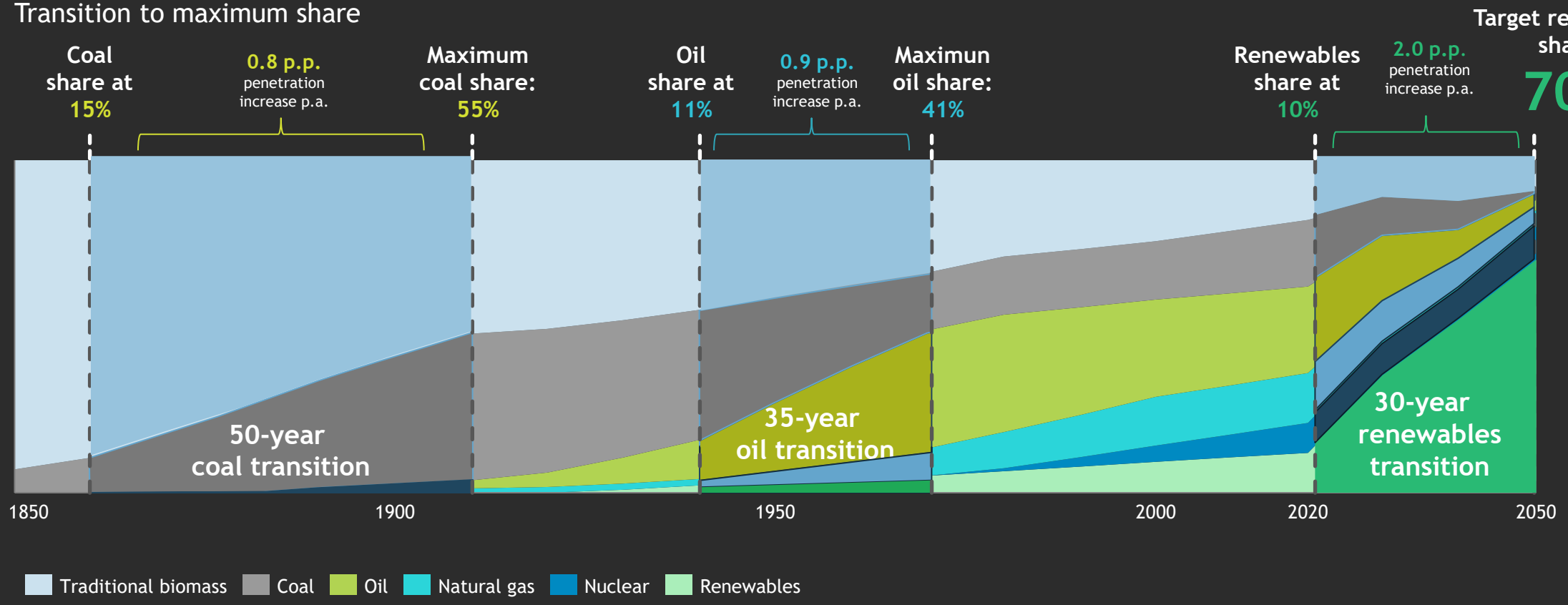
Programme name	B CZK available[1]	Funding sectors
Modernisation Fund	500	Energy, Transport, Heating
1 EU ETS	320	Energy, Transport, Industry
Czech Recovery Plan (Next Gen EU)	85	Energy, Transport
2 EU ETS	72	Transport

1. List not exhaustive
Note: LULUCF not accounted for because of lack of funding; ETS is accounting with 100 EUR price scenario
Source: Dotace EU, Národní plán obnovy, European Comission, MZP, BCG Analysis

Transition to Net Zero must happen ~2.5x faster than previous transitions and must reach 70% of total energy mix

Primary energy supply by energy source, 2050 estimates based on IEA net-zero scenario

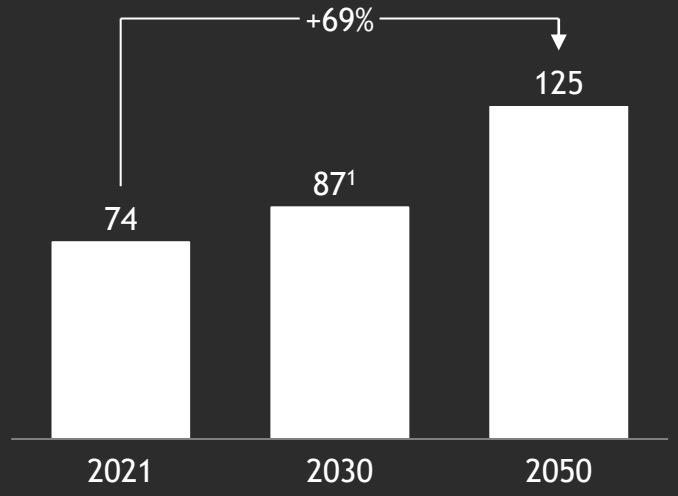
Transition to maximum share



Almost 70% expected increase of electricity consumption will need to be covered by Nuclear and Renewable Energy Sources

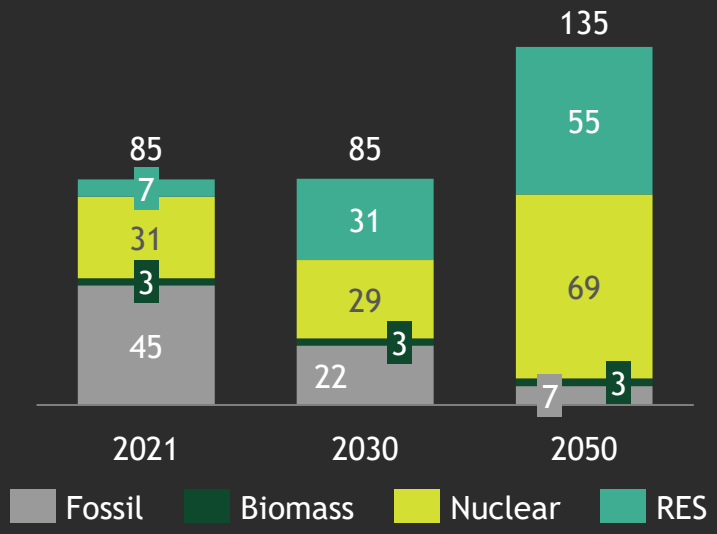
Consumption
TWh

Incl. consumption in electricity gen., losses in network, excl. export



Production
TWh, % increase vs. 2021

Up to 23TWh generation dedicated to hydrogen production[2]



1. Czechia to become net-importer in 2030, importing ~2TWh in 2030 2. Hydrogen production from a mix of renewables and Small Modular Reactors (SMR) – technology with low maturity;
Source: European Environment Agency, Eurostat, BCG Plexos model, BCG Analysis

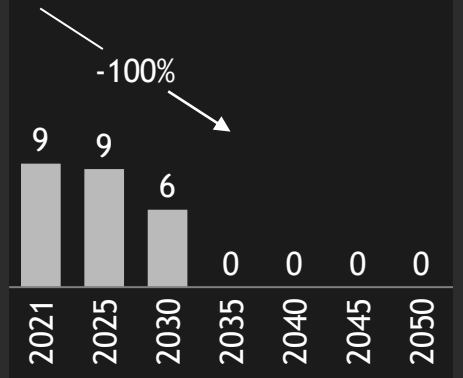
Energy transformation will be based on a mix of nuclear & renewables with battery storage as a balancing mechanism

Grid balance to be achieved by changes in the capacity of 5 key generation sources

GW

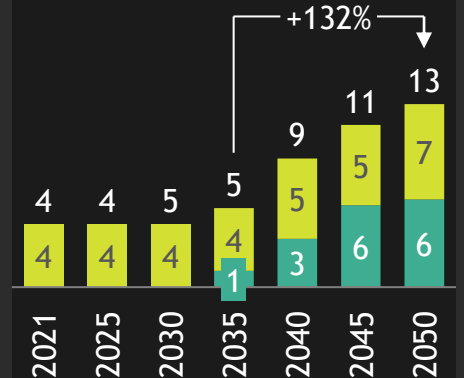
Coal (lignite)

Higher capacity to be retained until 2030 due to volatile power prices and slower RES build up speed



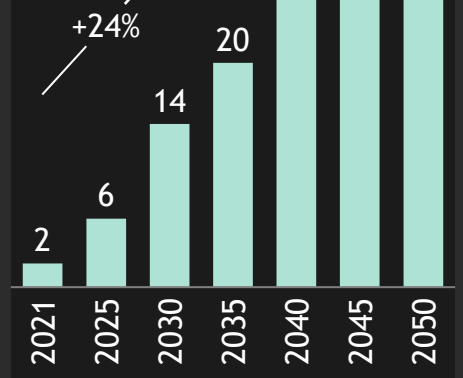
Nuclear

Expecting retention of current capacity and new traditional & SMR installation



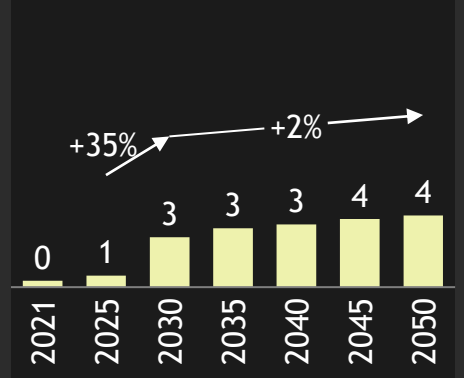
Solar

Solar increase as priority for net-zero



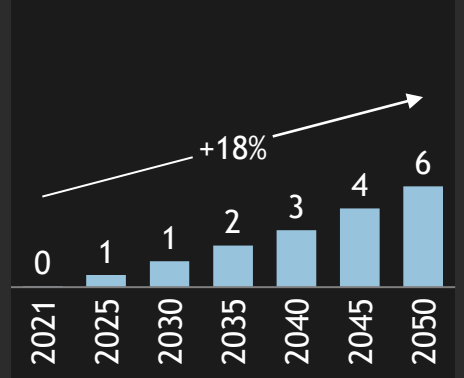
Wind

New wind capacity mainly dedicated to H_2



Battery storage

Enabler of green grid balancing - similar role to gas, stores excess production

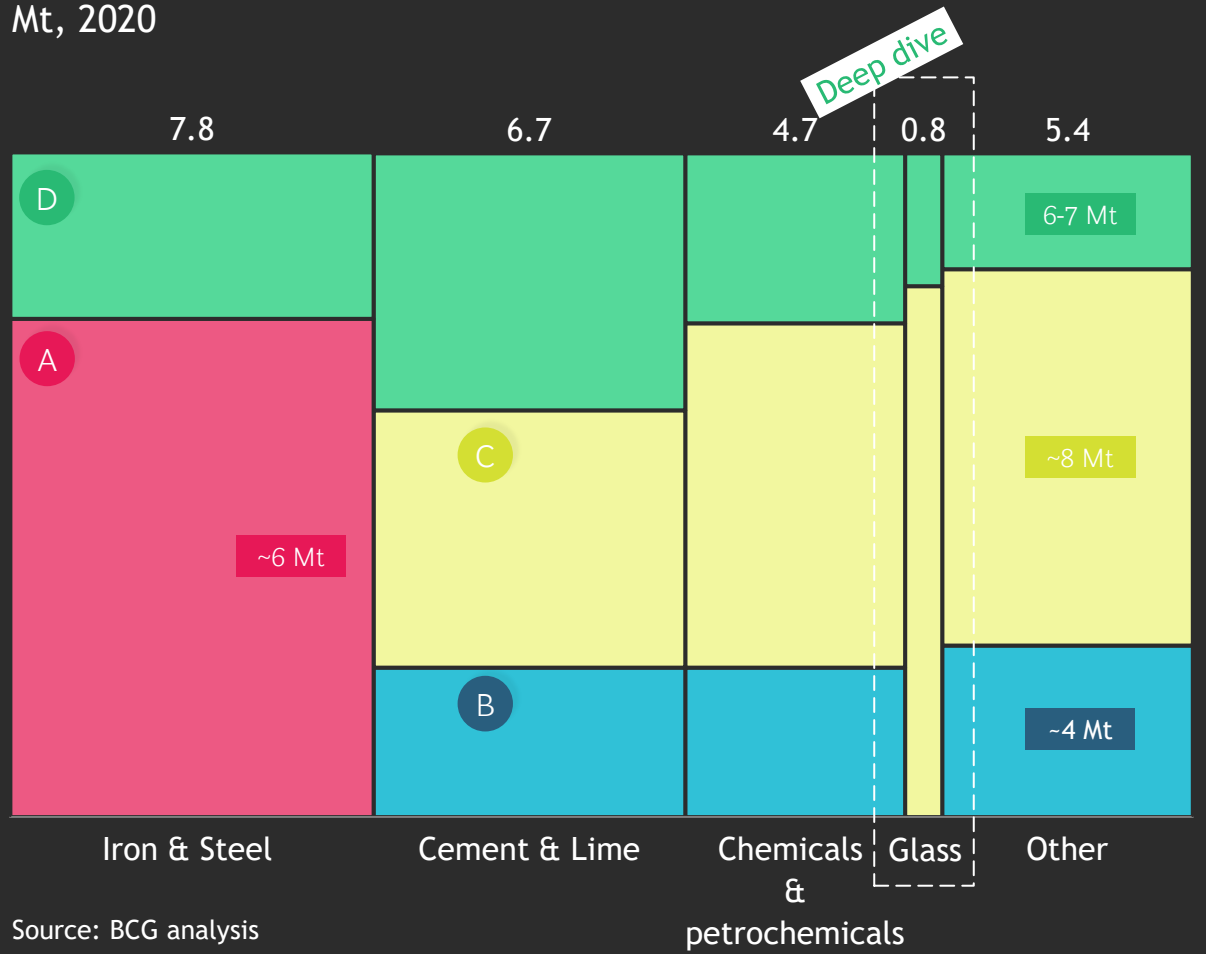


Sources: Eurostat, Czech government pledge, BCG Plexos model, BCG Analysis

Emissions in industry sector partially avoided by changing tech and electrification, rest of CO2 must be captured

CO_2e emission industrial split

Mt, 2020



Source: BCG analysis

A Electric Arc Furnaces deployment

Replacement of existing blast furnaces with EAFs technology (3/4 decided, 1/4 TBD)

B Cooling fluid replacement

Replacement cooling fluids with green alternatives, will happen organically - no additional investments needed

C Other Industrial heating replacement

Replacement of current industrial heating with heat pumps, biomass, electric resistance and hydrogen

D Carbon capture technology roll-out

Installment of carbon capture technology to capture remaining CO_2e emissions

Industrial heating efficiency improvements as key driver of emission reduction; yet sufficient tech n/a at scale

	CO2 reduction lever	Technology	CO2 impact	Feasibility
Industrial processes	1. Carbon capture	• Creation of an extensive transport & storage infrastructures for CCS/CCU	**15-25%** of today's CO2 emissions	• High cost of deployment, current tech not at scale
Industrial heating	2. Switch to CO2 neutral fuel	• Application of hydrogen / biomass & bio gas for high temperature heating replacing fossil fuels	**75-85%** of today's CO2 emissions	• Tech partially available, hydrogen flames less efficient for glass melting
Industrial heating	3. Electrification	• Shift to almost full-electric (~80%) melting in both small & large furnaces		• Cost of electricity & quality of melting as key barriers
Circular economy	4. Glass re-use & recycling	• Increased re-use of recycled glass in manufacturing processes bolstering the industry circularity • Higher saturation of glass containers for glass recycling reducing demand for glass	**5-15%** of today's CO2 emissions	• Effectively reducing demand for glass manufacturing output

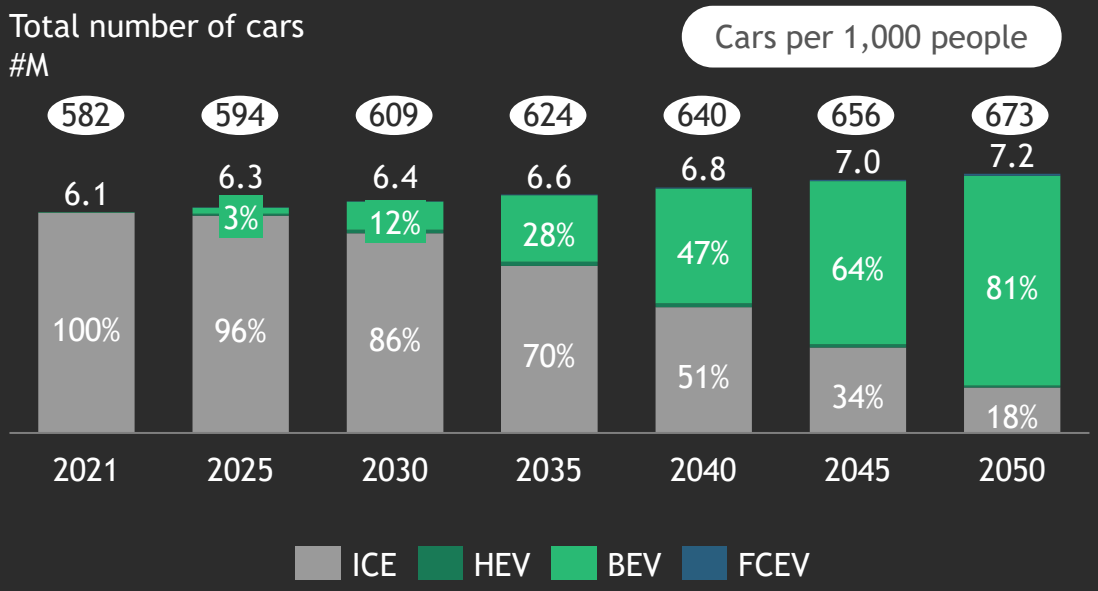
Source: Decarbonizing the glass industry: A critical and systematic review of developments, sociotechnical systems and policy options (Queen's University Belfast); The European glass sector contribution to a climate neutral economy (Glass Alliance Europe); BCG analysis

Czech Republic will have more than 80% of BEV cars in stock by 2050 which would require ~260k charging station in 2050

Stock of personal vehicles will continue increasing

By 2050, ~260k charging stations will have to be built

Total number of cars
#M



Total number of charging stations
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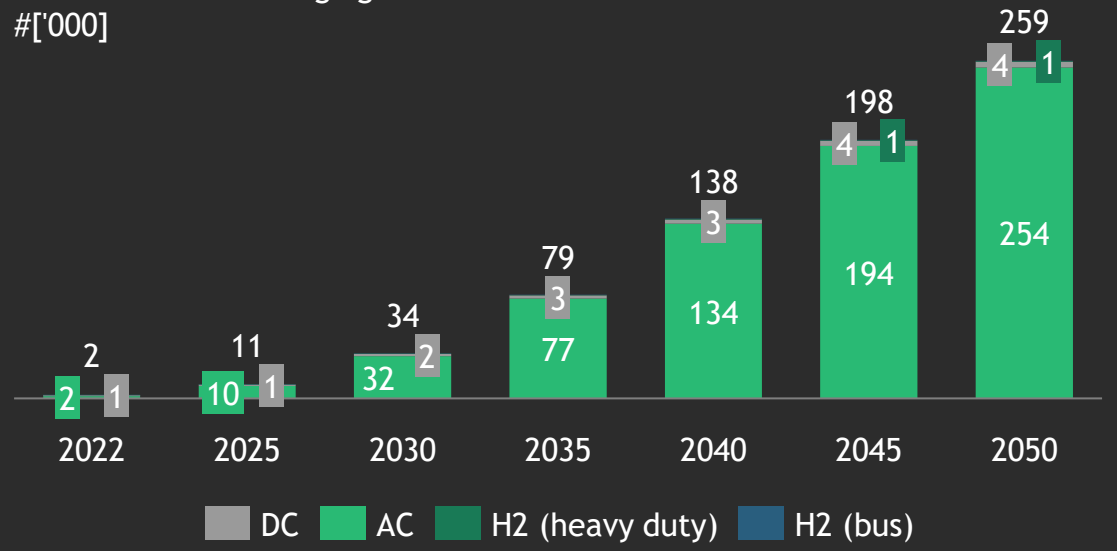


Source: Seznam veřejných dobíjecích stanic v ČR-MPO, Nationale Plattform Zukunft der Mobilität (2020), ICCT model scenarios, Transport & Environment (2020), BCG analysis

Securing electric engine & battery manufacturing capabilities essential to prevent car manufacturing sector decline

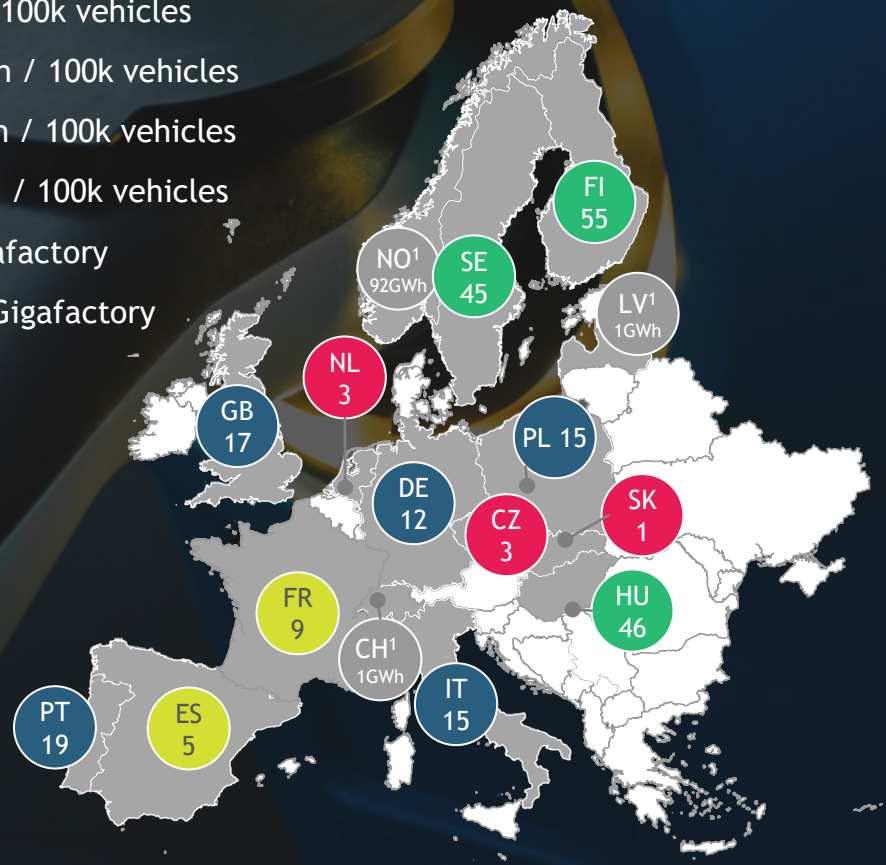
~550B CZK Current car manufacturing contribution to Czech GDP

1/3 (~180B CZK) Of this is linked to production of technologies used exclusively in ICEs

400B CZK Investment needed to prevent GDP loss in car manufacturing sector (~160B CZK on assembly lines changes; ~240B CZK build-up of two giga-factories for batteries)

Confirmed gigafactory capacity (in GWh) per 100k vehicles manufactured[2] in a given country by 2030:

- Capacity <5 GWh / 100k vehicles
- Capacity 5 – 10 GWh / 100k vehicles
- Capacity 11-20 GWh / 100k vehicles
- Capacity >20+ GWH / 100k vehicles
- Country with a Gigafactory
- Country without a Gigafactory



1.LV, CH & NO do not manufacture cars, however plan on opening gigafactories for Li-Ion batteries; 2. Number of cars manufactured held constant at 2022 levels

Source: CIC energiGUNE; Fraunhofer Institute for Systems and Innovation Research ISI; BCG analysis

Structural transformation also creates new opportunities for Czech industry

Key opportunities	Characteristics
EV Battery supply	Regional car manufacturers expected to shift to BEV which creates demand for regional battery manufacturing
H_2 components production	Rapidly growing market in H_2 generation creates opportunities to play in select parts of the value chain
Smart grid software	High share of RES in generation creates volatility. This needs to be managed by new, intelligent SW[1] solutions
SMR[2] technology	Adoption of SMR[2] technology expected in late 2030s, countries with nuclear generation can capitalize on know-how in EPC[3], O&M[4]
Heat-pump production	Growing segment of clean conventional heating alternative Czechia with opportunity to become EU hub

1. Software 2. Small Modular Reactor 3. Engineering, Procurement and Construction 4. Operations and Management
Source: BCG Analysis

Corporate climate leaders gain competitive advantage

Easier hiring, retention

40 %

of talent seek sustainability

Higher revenues

+4-25 pp

CAGR of sales growth for 'green' products

Save cash and carbon

~50 %

of emission reduction at net zero cost in key sectors

Lower regulatory risks

+2-12 pp

EBIT margin after EU Carbon Border Tax[1] for companies abating 55% of emissions

Cheaper financing

-100 bp

WACC for top quartile environmental performers in Europe

Higher value

+3 pp

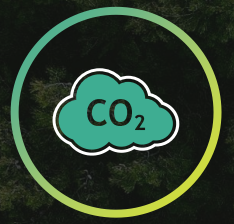
TSR for top quartile environmental performers globally

1. Based on a €75/tCO2 carbon price assumption for 2030
Source: EU announcements; BCG analysis

Key takeaways | Successful path to Net Zero requires an orchestrated effort of government, companies and public

We know what to do

We know what needs to happen, in what places, at what cost – and we have the funding



Government as an enabler

Government must set the framework and create the right environment for both companies and the general public

27 priorities defined

Companies showing partial readiness

Large companies are mostly ready; medium and small companies still more uncertain about the change – and will need support to understand, act and get funding

Public to be educated

Education and awareness campaigns vital to engage end-consumers in decarbonization efforts

Source: BCG Analysis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