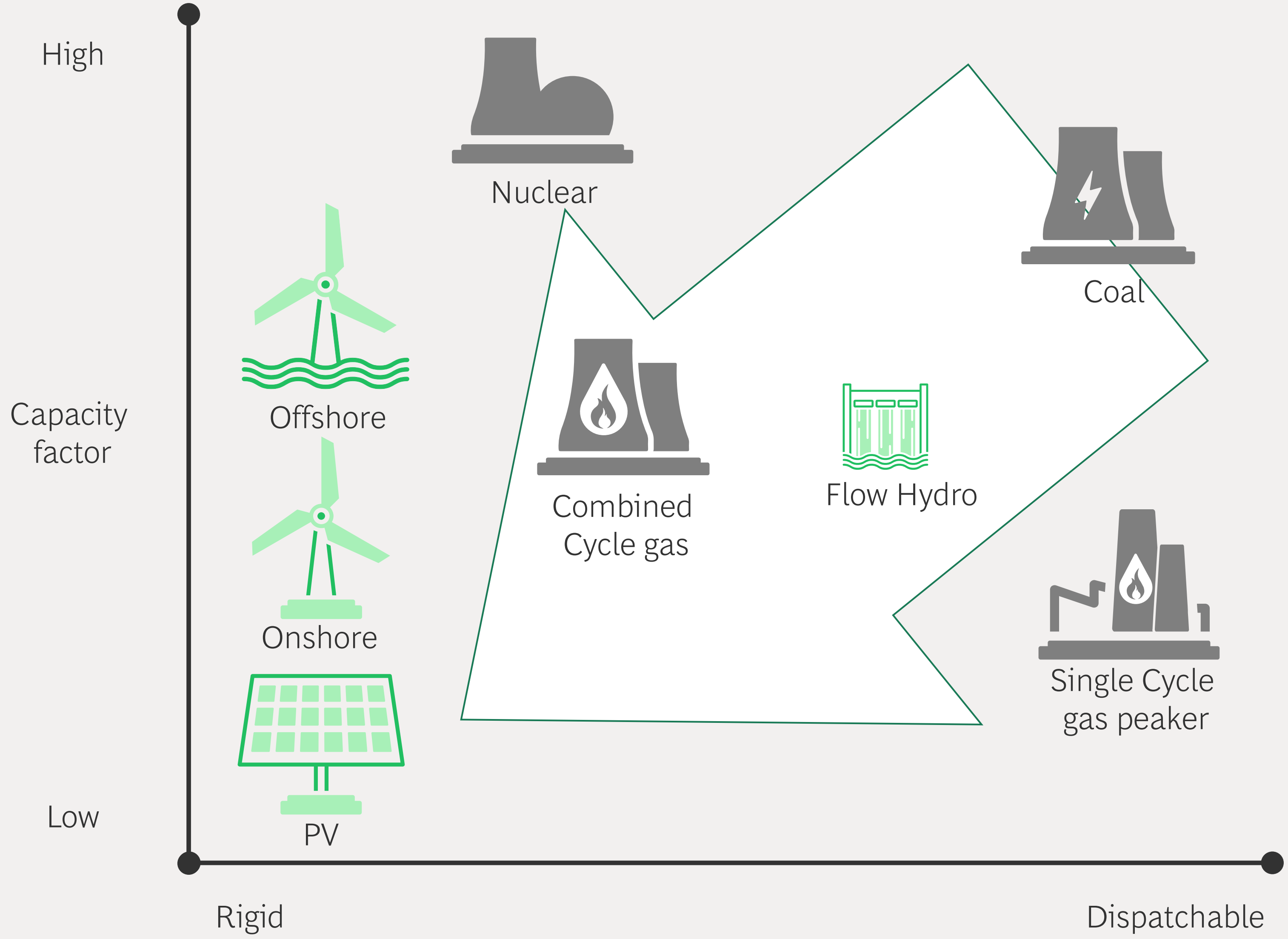
Energy transition

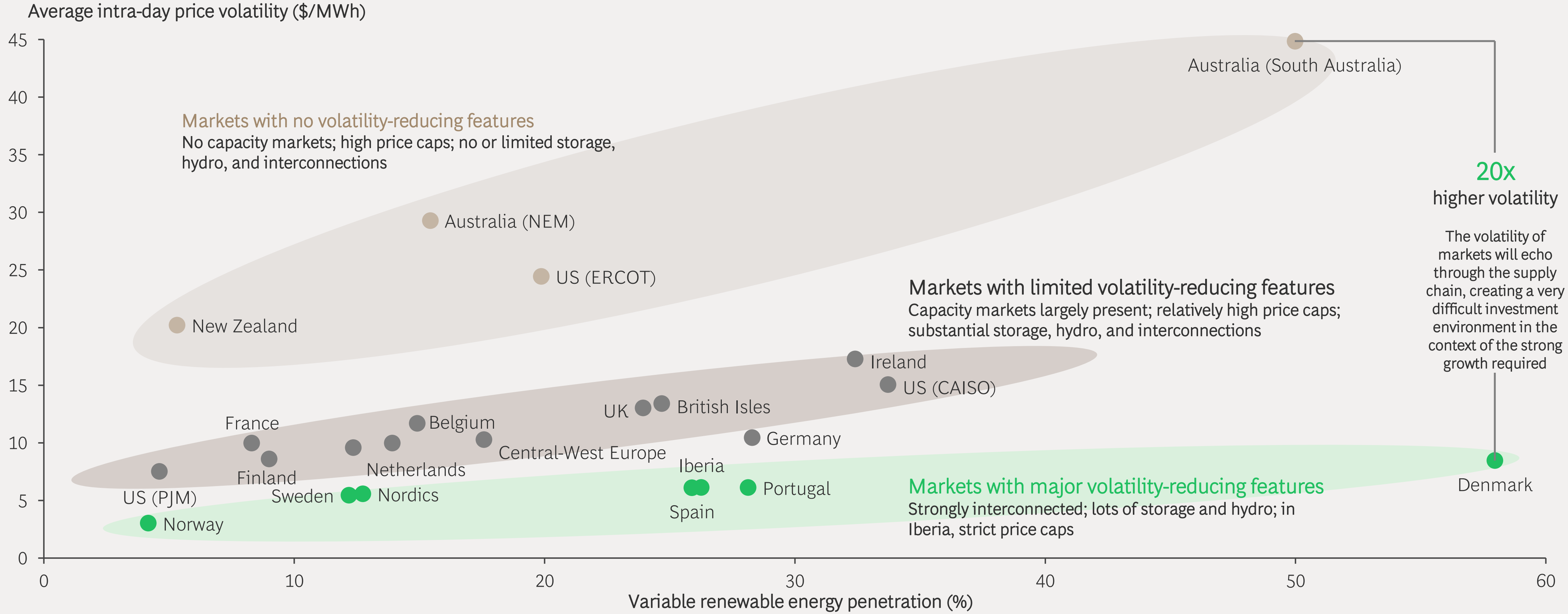
means moving from OPEX to CAPEX… and building stuff now

Source: BCG, Creative realization by Chat GBT

Power supply is becoming more rigid with lower capacity factor



More renewables typically mean more volatility—but to different degrees, depending on the market



Sources: ABB Velocity; AEMO; Australian government, Department of Industry, Science, Energy, and Resources; EIKON; EMI; ENTSO-E; Eurostat; EXAA; IRENA; Nordpool; OMIE; S&P Global; BCG analysis.

Note: Regional positions across individual markets are based on load-weighted average intra-day price volatility and variable renewable energy penetration. Central-West Europe includes Belgium, France, Germany, Austria, and Netherlands; British Isles includes the UK and Ireland; Iberia includes Spain and Portugal; Nordics includes Denmark, Finland, Norway, and Sweden. Calculations reflect hourly day-ahead prices for Europe, hourly average spot prices for Australia, hourly average wholesale prices for New Zealand, and hourly day-ahead locational marginal pricing prices for the different hubs within CAISO, ERCOT, and PJM, averaging the standard deviation for the different zones/hubs within a region (for regions consisting of multiple zones/hubs). CAISO = California Independent System Operator; ERCOT = Electric Reliability Council of Texas; NEM = National Electricity Market); PJIM = Pennsylvania-New Jersey-Maryland Interconnection.

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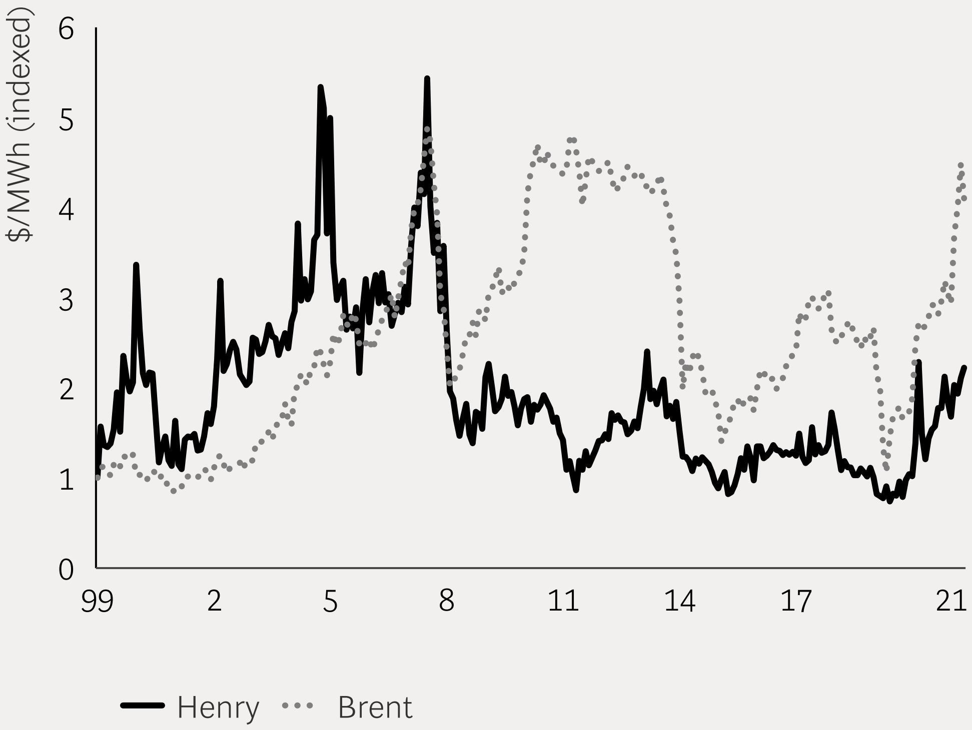
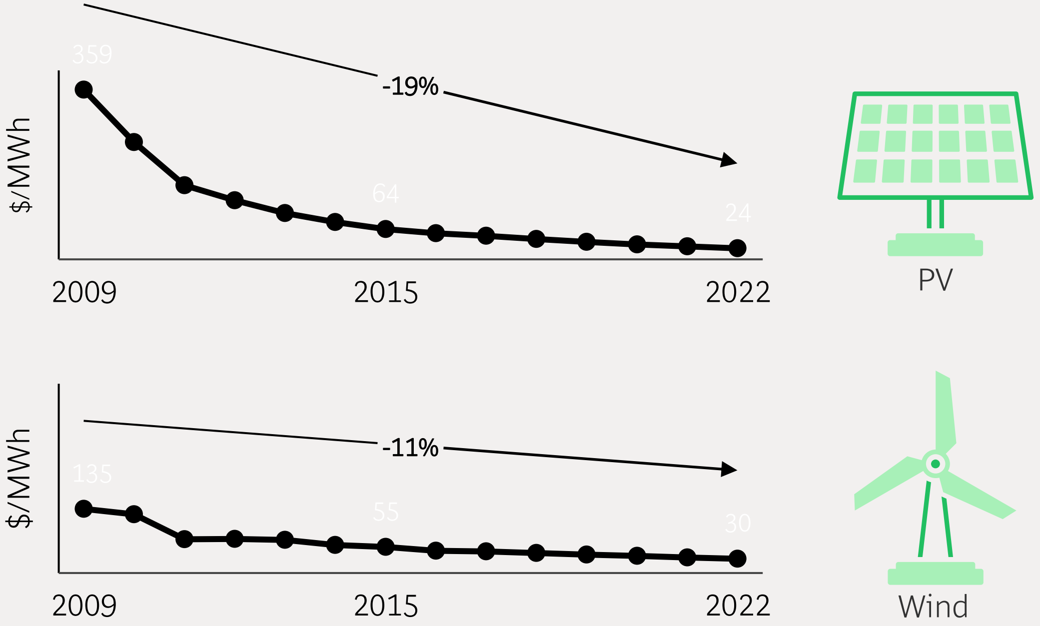
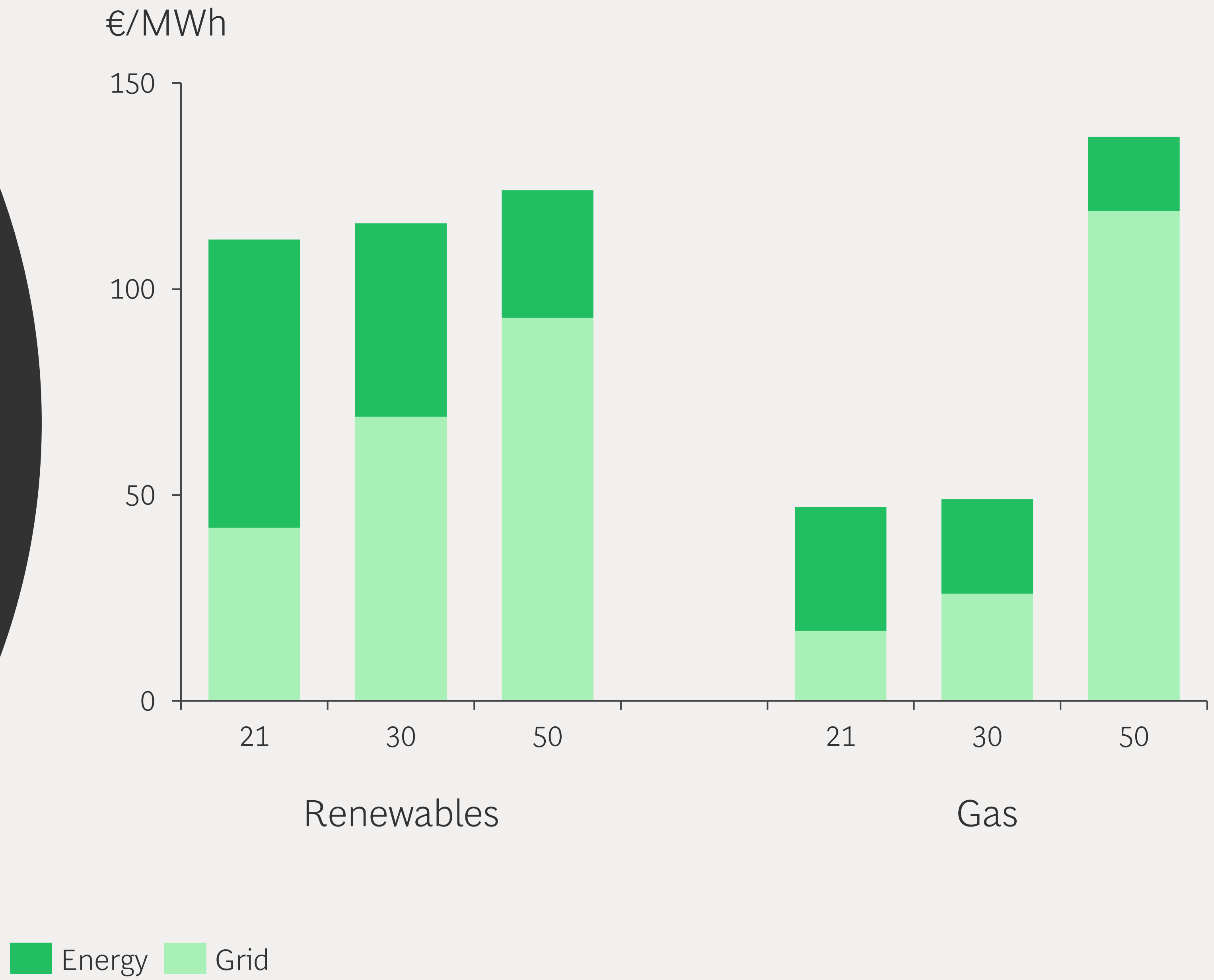
Thermal generation cost are commodity price driven and will remain volatile



Renewable generation costs are capex driven delivering continuously lower costs of generation

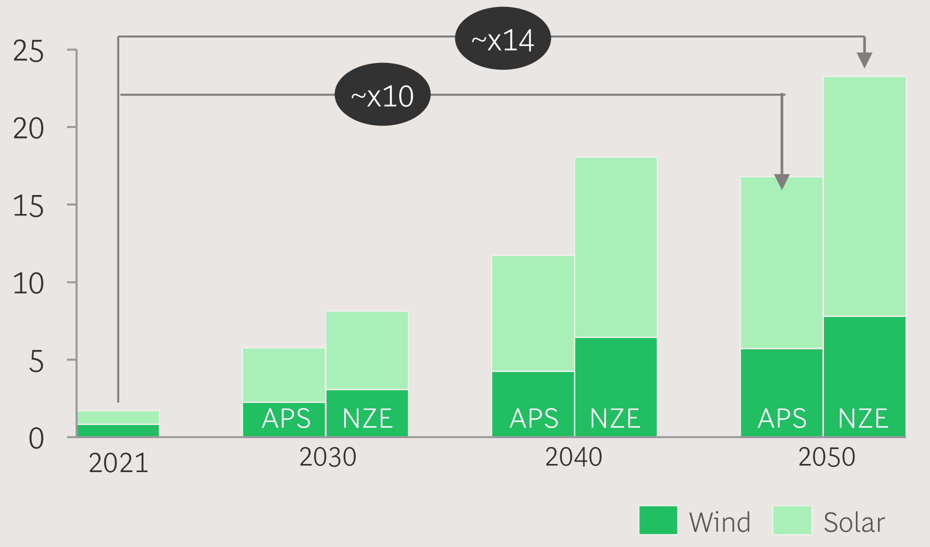


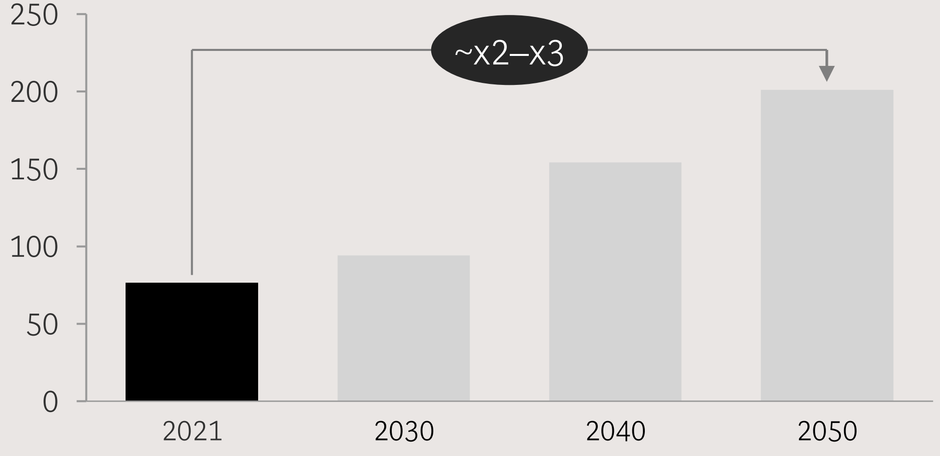
Energy transition comes with fundament-tal grid changes



We need to invest as much in our **electric grids** as in **new solar and wind capacity**

	World solar and wind capacity (TW)	Global electricity grid size in NZE (km millions)
Average annual investments:	**~$650 billion to $950 billion**	**~$700 billion to $900 billion**
Total investments through 2050:	**~$20 trillion to $30 trillion**	**~$21 trillion to $27 trillion**

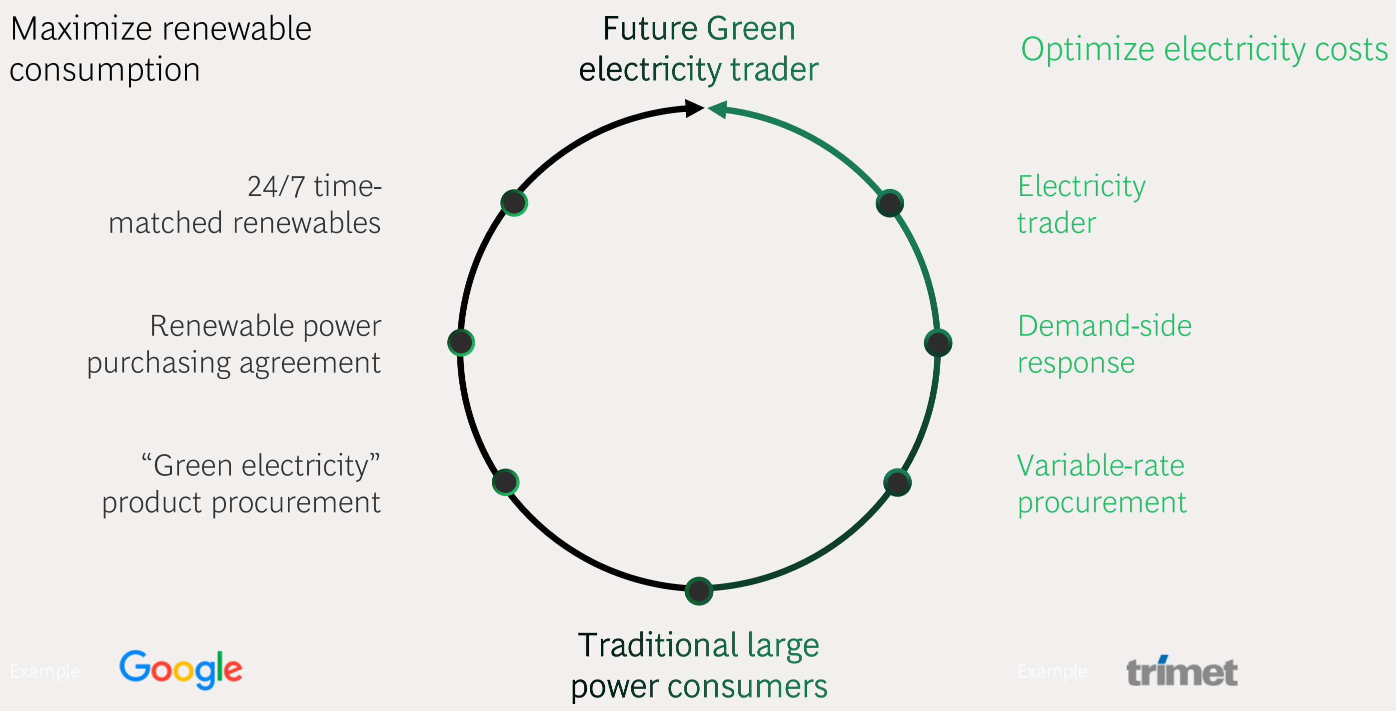




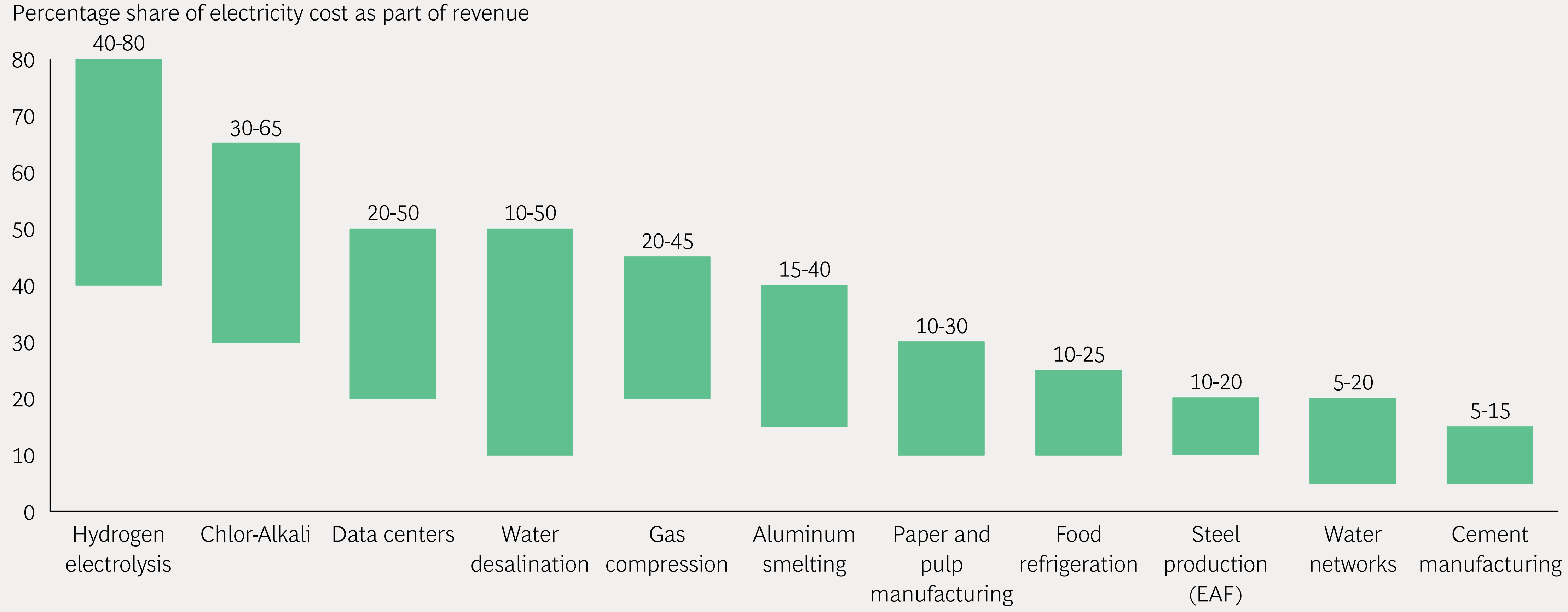
Sources: IEA; Bloomberg NEF; BCG CEI analysis.
Note: Total grid investments were calculated based on the basis of average annual required investments for the Net Zero Emissions by 2050 scenario from IEA.
APS = Announced Pledges scenario from IEA; NZE = Net Zero Emissions by 2050 scenario from IEA; TW = terawatts.

New economics of consumption globally

Some large consumers already adapting their operations… but very hard



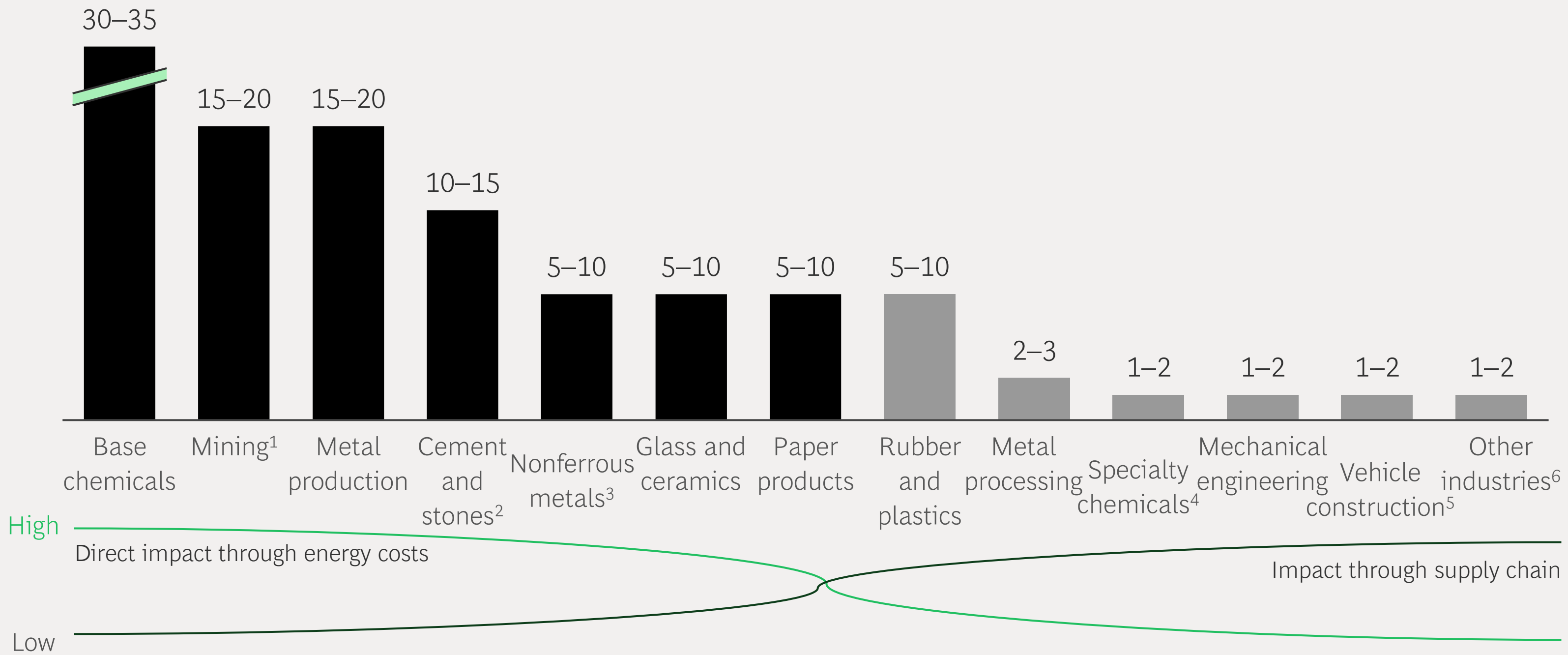
Opportunity for heavy industrial users to gain advantage by being flexible



The global industrial landscape will change as new centers of low-cost, low-carbon energy emerge

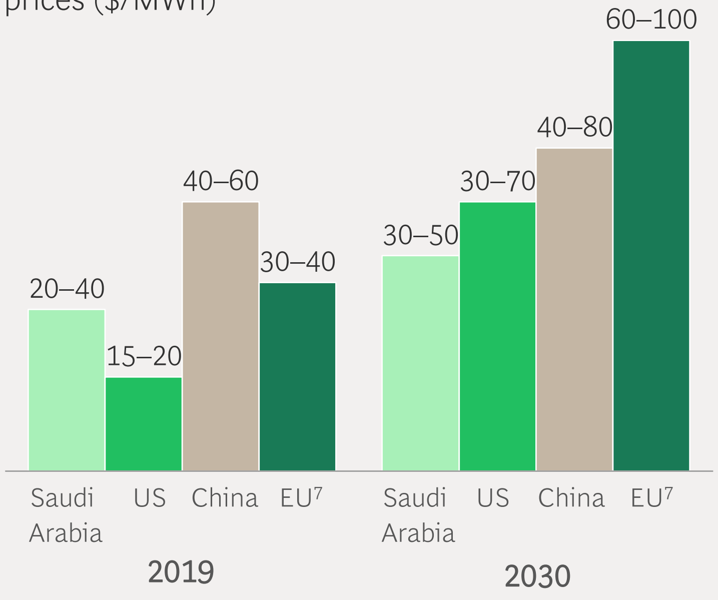
The heaviest electricity users are the most likely to relocate to the most competitive regions for energy supplies in the future

Energy intensity, 2019–2020, and energy feedstock costs as a percentage of revenue (%)



Regions have access to energy at vastly different costs

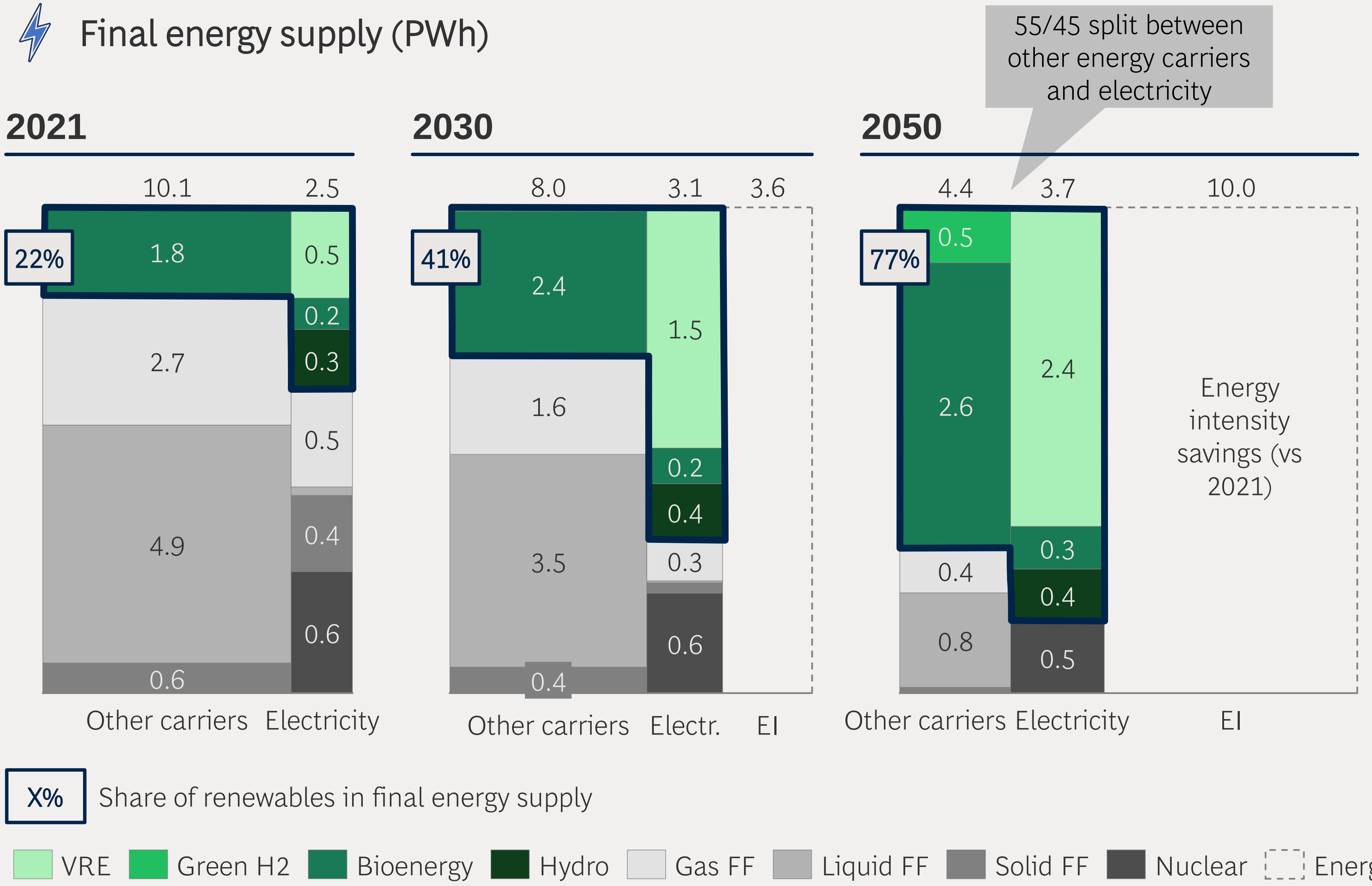
Average observed and expected electricity prices ($/MWh)



Sources: Destatis; Energiebilanzen; Refinitiv Eikon; Aurora Energy Research; Rystad; Nymex; Enerdata; International Center for Energy; International Energy Agency; BCG CEI analysis.
Note: Specific energy intensity depends on company size and tariff; values are rounded. Energy price ranges based on external scenarios and wholesale-price experts.
[1] Coal, stones, earth, and other. [2] Processing of stones and earth. [3] Includes foundries. [4] Includes pharmaceuticals. [5] Includes battery production. [6] E.g., extraction of crude oil and natural gas, food, tobacco, textiles, wood, printed matter. [7] Electricity costs in Germany were used for EU estimates.

EU energy mix to fundamentally change

Final energy supply (PWh)



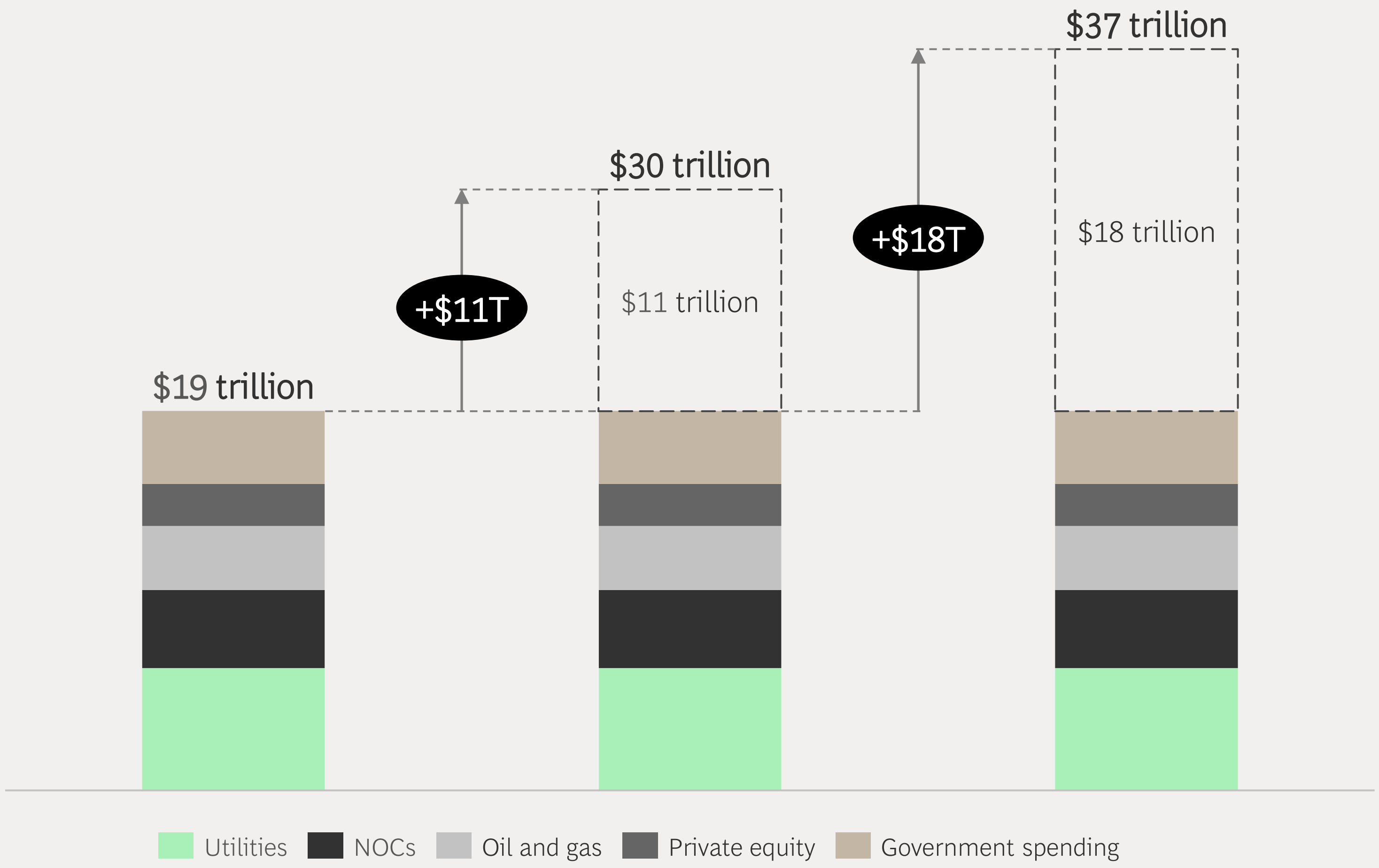
In 2050

- Electricity will make up 45% of final energy supply (compared with 20% currently)
- Renewable energy sources will make up 77% of final energy supply (up from 23% currently)
- Energy savings through reduced energy intensity will decrease energy consumption by about 50% compared to 2021

VRE—Variable Renewable Energy. FF—fossil fuels. H2—Hydrogen. Source: IEA Announced Pledges Scenario, BCG analysis

Required investments seem high...

The transition is expensive, but it will never be that cheap again



Sources: IEA, Net Zero Emissions by 2050; company-specified targets; modeled assumptions; BCG CEI analysis.
Note: The energy sector stated capex is modeled capex for the 270 largest energy companies, private equity, and existing direct government investment.
[1] Cumulative, committed investments, 2021–2030 by energy companies, energy-focused private equity investors, and energy-focused venture capital.

Draft

...but they are small compared to the costs of inaction

Climate Finance | Residual costs

Mitigation costs
Cost of emission reduction to mitigate impact on climate[1]

Adaptation costs
Cost of protection to mitigate impact from climate change[1]

Loss & damage
Cost from climate change related physical risks materializing[2]

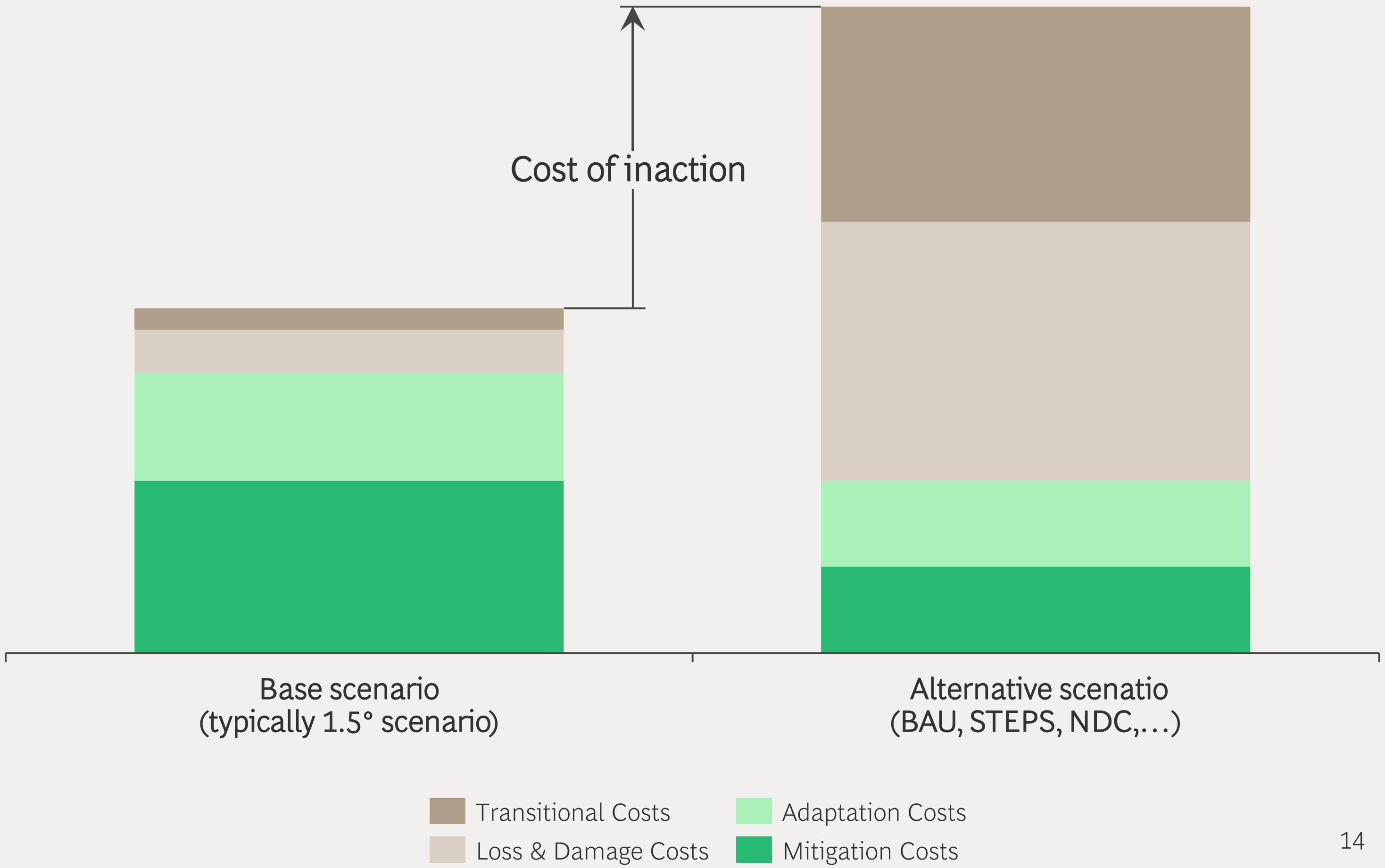
Transition costs
Cost from climate change related transitional risks materializing[2]

1. Based on World Wildlife Fund (WWF)
2. Based on Climatework Foundation, Network for Greening the Financial System (NGFS), 2023

Cost of inaction are the delta cost

The cost of inaction

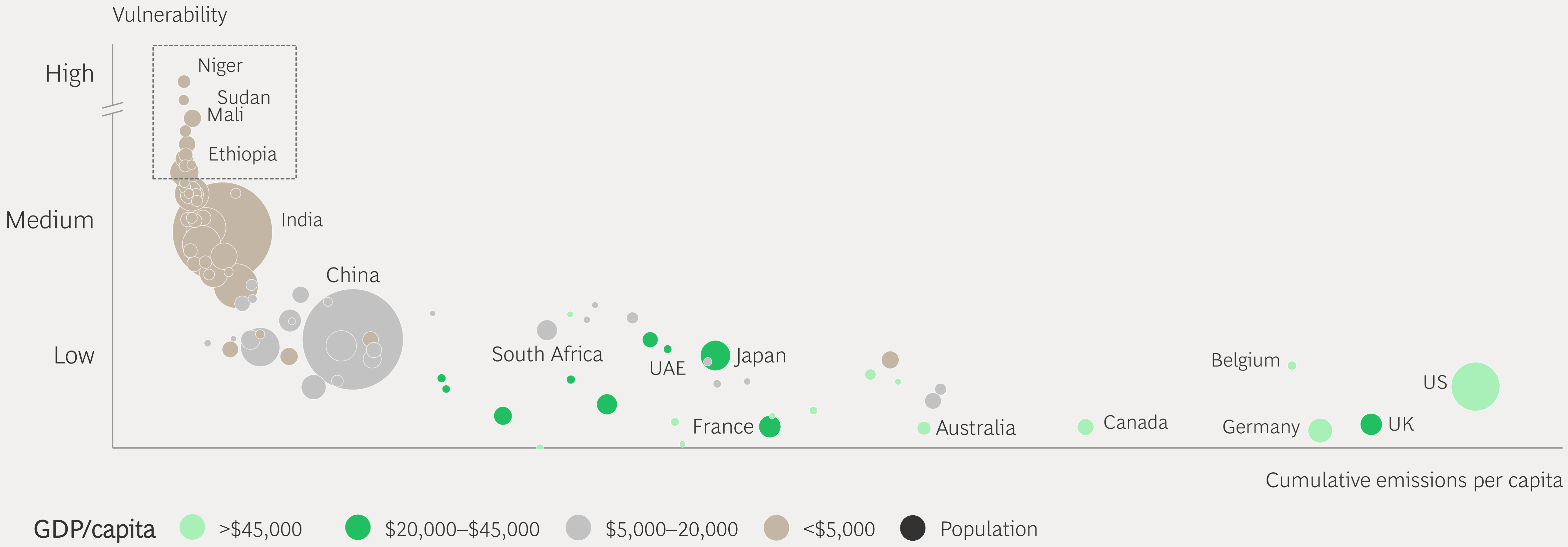
- Provide a delta value (like in an environmental impact assessment)
- Include residual costs which are a result of climate risks materializing
- Deliver the higher system cost resulting from less mitigation and adaptation now



Costs of inaction will impact us all

The poorest countries have contributed least to climate change are the most vulnerable to impacts

Cumulative CO2 emissions vs. climate change vulnerability



Source: World Risk Report, United Nations University Institute for Environment and Human Security (UNU-EHS); World Bank; Our World in Data; BCG CEI analysis.
Note: Bubble size represents population size. Population, GDP data, and cumulative emissions are as of 2020. Vulnerability relates to social, physical, economic, and environmental factors that put people or systems at risk of harm from climate change.

IPCC study shows existential threat due to inaction

1.5° Paris ambition

global warming by 2100

-8 % GDP

per capita in 2100, relative to no additional warming

+2 months of droughts[1]

2° Paris goal

global warming by 2100

-13 % GDP

per capita in 2100, relative to no additional warming

+4 months of droughts[1]

Key 'tipping points' may happen

4+° Current path

global warming by 2100

-30 % GDP

per capita in 2100, relative to no additional warming

+>10 months of droughts[1]

Holland, NYC,. . . flooded

Severe food crises risk[2]

6x wildfire area in US

. . .

1. Increase in avg. drought duration 2. Severe risk of close-to-annual occurrence

Source: UN Intergovernmental Panel on Climate Change (IPCC); Burke et al

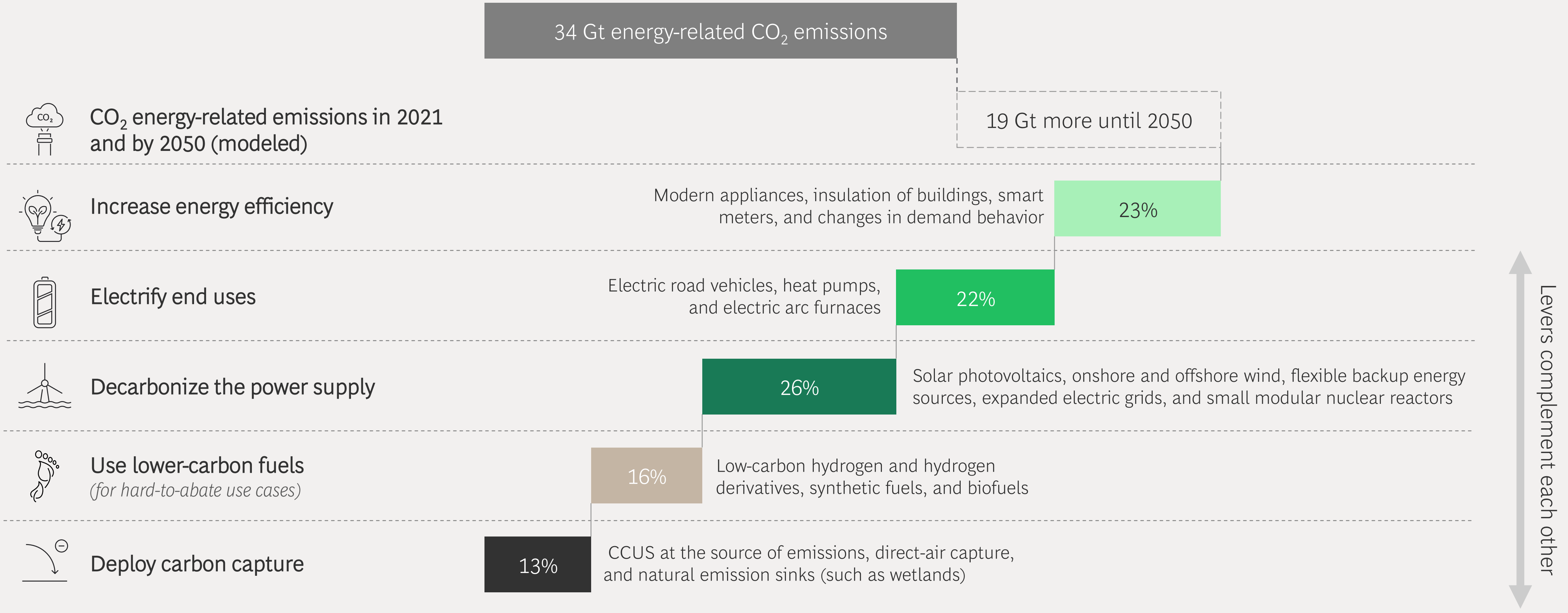
Energy transition means we need to build stuff… now!

We have the technologies → We need to embrace them and deployed them at scale

We have the money → We need new thinking that reward longtermism

We don't have much time left → But kicking the can down the road is much easier

Five technology levers can get us to a net zero energy system



Sources: IEA, Net Zero Emissions by 2050; BCG CEI analysis.

Over time, investing in a low-carbon energy supply can break many of the tradeoffs of the energy trilemma

For example, in the North Sea, by 2030, each additional gigawatt of offshore wind deployed has the yearly potential to…

Sustainability

…mitigate emissions of fossil fuel generation by up to

~1.5 million to 4 million tons of CO

Affordability

…reduce supply costs vs. fossil fuel generation by up to

~€350 million to €450 million[1]

Security

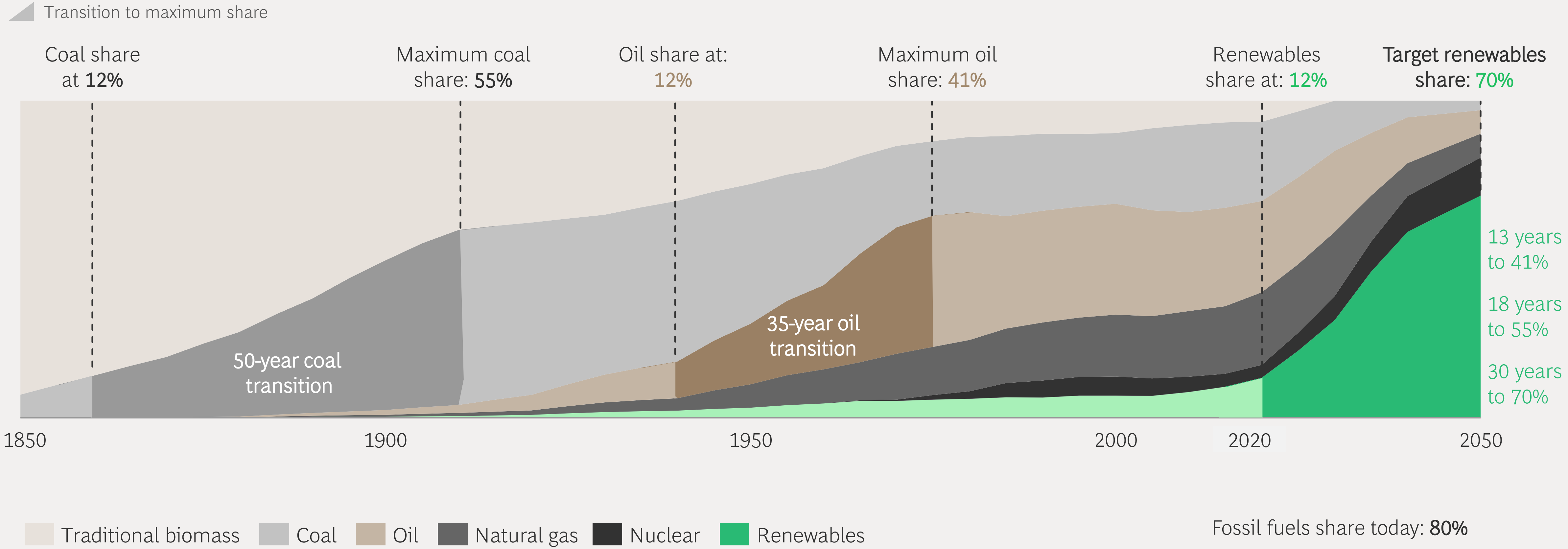
…reduce fossil fuel imports by up to

~10 full LNG carriers or >10,000 coal wagons

Sources: WindEurope; Wood MacKenzie; Orsted; ACER; BCG CEI analysis.
Note: Assuming an offshore wind capacity factor of 50%. The lower bound of impact in each estimate is for combined-cycle gas turbine natural gas; the upper bound is for coal. LNG = liquefied natural gas.
[1] Based on 2030 European projections for levelized cost of electricity (average of Wood Mackenzie [2021] and BCG's proprietary levelized cost of electricity model) with comparison to coal as the upper bound and comparison to natural gas as the lower bound.

Speed is of essence; this transition needs to happen at two to three times the speed of previous transitions

Primary energy supply by energy source[1]



Fossil fuels share today: **80%**

Sources: Vaclav Smil, "Our World in Data" (2017); BP Statistical Review of World Energy; IEA, Net Zero Emissions by 2050; BCG CEI analysis.
Note: Renewables include biofuels, solar, wind, and hydrogen, among others.
[1]2050 estimates based on the Net Zero Emissions by 2050 scenario from IEA.

Energy transition means we need to build stuff… now!

Source: BCG, Creative realization by Chat GBT

Thank You.

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Energy transition means moving from OPEX to CAPEX

Uhrzeit: 14:05 – 14:55 Uhr - Programmblock: Energiezukunft & Finanzierung
Moderation: Hanna Kordik, Die Press

Mag. Christian Knill
CEO, Knill Energy Holding
Nach dem Studium der Betriebswirtschaftslehre bekleidete Christian Knill verschiedene Managementpositionen in Unternehmen der KNILL Gruppe. Seit 2002 verantwortet er als geschäftsführender Gesellschafter den Energie Bereich (tätig im Bereich Energieübertragung und -verteilung) der KNILL Gruppe. Darüber hinaus engagiert er sich als Obmann des Fachverbands Metalltechnische Industrie in der Wirtschaftskammer.

Mag. Dr. Michael Strugl MBA
Vorstandsvorsitzender
VERBUND AG
Dr. Michael Strugl ist CEO der VERBUND AG, sein Ressort umfasst u.a. Corporate Development, Energiewirtschaft, Corporate Innovation und New Business. Zusätzlich ist Dr. Strugl Präsident von Oesterreichs Energie. Er war bis 2018 Mitglied der OÖ-Landesregierung und verantwortete u.a. die Bereiche Wirtschaft, Tourismus, Forschung, Energie, Technologie und Innovation.

Patrick Avato
Upstream Lead Europe, IFC, Weltbank
Patrick Avato leitet den Bereich "upstream and advisory" für den Infrastruktursektor in Europa und Kaukasus bei IFC. Sein Team berät und strukturiert Infrastrukturprojekte in den Bereichen Energie, Verkehr, Versorgung und Telekommunikation in der Region. Herr Avato hat einen MBA von der Universität Tübingen, Deutschland, und einen MA in Internationaler Wirtschaft von der School of Advanced International Studies (SAIS) der Johns Hopkins University.

MMag. Gerda Holzinger-Burgstaller
CEO & Privatkundenvorständin
Erste Bank Oesterreich
Gerda Holzinger-Burgstaller ist seit 2021 Vorstandsvorsitzende der Erste Bank Oesterreich. Sie verfügt über rund zwei Jahrzehnte Erfahrung in der Finanzbranche, davon 18 Jahre in der Ersten. Holzinger-Burgstaller hält Diplome in Wirtschaft und Recht der Wirtschaftsuniversität (WU) Wien.

Lars Holm (einführende Keynote)
Partner & Director
The Boston Consulting Group
Lars Holm ist Partner und Direktor bei Boston Consulting Group GmbH (BCG), wo er federführend die Reduktion von Emissionen vorantreibt. Holm hat einen Master in Elektrotechnik von der Technischen Universität München und einen Abschluss in Wirtschaftswissenschaften an der Akademie für Staatliche Dienste in Moskau.

Panel Le

- Wie kann die Energietransformation gelingen und gleichzeitig die Wettbewerbsfähigkeit erhalten werden? Wie können die damit verbundenen Risiken reduziert werden?

- Wie kann die Transformation finanziert werden und welche Maßnahmen sind für einen leistungsfähigeren Finanz- und Kapitalmarkt notwendig?

- Welchen Beitrag kann die europäische Ebene leisten, um die Transformation zu erleichtern, etwa durch einen gestärkten Kapitalmarkt - Stichwort Kapitalmarktunion? Welchen Beitrag kann die nationale Ebene leisten?

- Wie können KMU bei der Transformation besser unterstützt werden?

- Welche Auswirkungen haben die derzeit hohen Zinsen auf Investitionen in nachhaltige Projekte, insbesondere im Bereich der erneuerbaren Energien und der klimaneutralen Technologien?

- Welche politischen und wirtschaftlichen Maßnahmen sind angesichts der Auswirkungen hoher Zinsen auf Unternehmen, insbesondere in Europa, erforderlich, um die Widerstands- und Wettbewerbsfähigkeit europäischer Unternehmen zu stärken?


SAVE THE PLANET
GREEN ENERGY
TRANSSITION
NOW!

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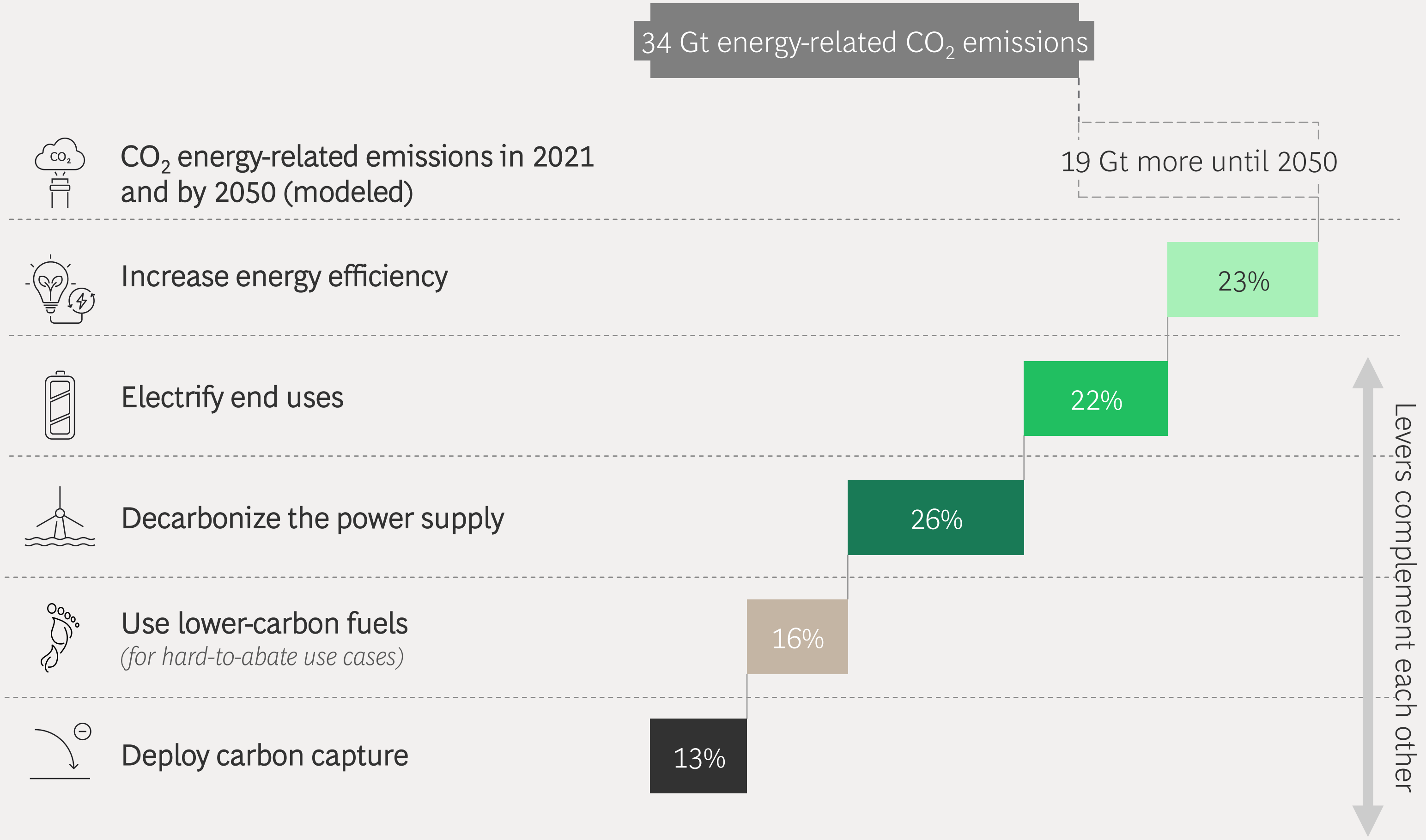
Five technology levers can get us to a net zero



Sources: IEA, Net Zero Emissions by 2050; BCG CEI analysis.