BCG

Executive Perspectives

US Inflation Reduction Act: Significant Cost Savings for Corporate Decarbonization

September 2022

Introduction to this document

The BCG Executive Perspective **Part 1 | US Inflation Reduction Act: Climate & Energy Features and Potential Implications** shared an overview of the US Inflation Reduction Act and implications on the energy, transportation, clean tech, and manufacturing sectors. It also included four action items for executives across industries to take full advantage of the policy's value to:

- Reduce costs
- Re-evaluate decarbonization plans
- Capture early mover advantage
- Pursue new value pools

This new Executive Perspective further investigates the significant opportunities that these incentives provide for industries across the economy to achieve cost savings and greenhouse gas emissions reductions

Future editions will investigate expected supply and other bottlenecks, the opportunity of new value pools created by these incentives, and international implications on US competitiveness for net-zero

The IRA helps most companies reduce operating costs and carbon emissions

1

The IRA provides significant opportunities to reduce operating costs as well as carbon emissions

- *Incentives can help lower absolute costs:* Incremental ~15%+ of emissions are cost-saving to abate, i.e., have positive returns today
- *Incentives can help lower carbon abatement costs:* Average industry abatement costs are up to 100% cheaper, though actual cost will vary by supplier and geographic footprint
- *As a result, companies must reconsider net-zero goals and timelines:* New incentives could shift immediate priorities, and companies can use initial savings to "fund the journey" to net-zero

2

However, acting fast is critical

- *Lock in available supply now:* Supply scarcity is expected due to large demand growth for key technologies and IRA domestic sourcing requirements; companies must act now to access needed supply
- *Plan ahead for future needs:* Decarbonization efforts have long lead times; work with suppliers to prepare for future needs and mitigate future bottlenecks

1.1 The IRA helps companies reduce emissions at significantly lower cost

*Note: **Values represent upper limits,** as analysis assumes all levers capture US incentives and reach technoeconomic cost estimates*

	... incremental emissions now cost-saving to abate due to IRA	... of emissions are cheaper to abate post-IRA	... abatement cost pre-IRA vs post-IRA ($/t CO_2e)	... cheaper average abatement cost
PHARMA	15%	56%	$60/t → $14/t	77%
AUTO	50%	63%	$36/t → $~0/t	~100%

Note: Only includes own and embedded emissions (Scope 1, Scope 2, and upstream Scope 3). Cost estimates are for 2030. Cost savings assume sourcing of each component to capture IRA incentives and may not be representative of value captured by end user due to market inefficiencies, global supply chain, or other factors

1.2 Background | Nine common decarbonization levers across industries

Illustrative

Mitigation Levers							Removal Levers	
Recycling/ circularity	**Efficiency**	**Renewable electricity**	**Renewable heat**	**Fuel or feedstock switch**	**Technology substitution**	**Regenerative Agriculture**	**CCUS[1]**	**Carbon Removal**
Reduce use of material and primary feedstock by reusing inputs	Improve energy, materials, or process efficiency, e.g., by optimizing transport distances	Substitute conventional fossil-energy based power generation with renewables	Substitute conventional fossil-energy based heat generation with renewables	Substitute current fuels or other inputs with lower or zero-carbon sources, e.g., switch to electric vehicles	Stand up new processes with lower emissions, waste, and material usage, e.g., green hydrogen	Invest in ecosystem protection and other carbon-minimizing land-use approaches	Capture process-related carbon byproduct and store or use them to prevent emissions	Removing remaining emissions out of the ecosystem, e.g., direct air capture (DAC)

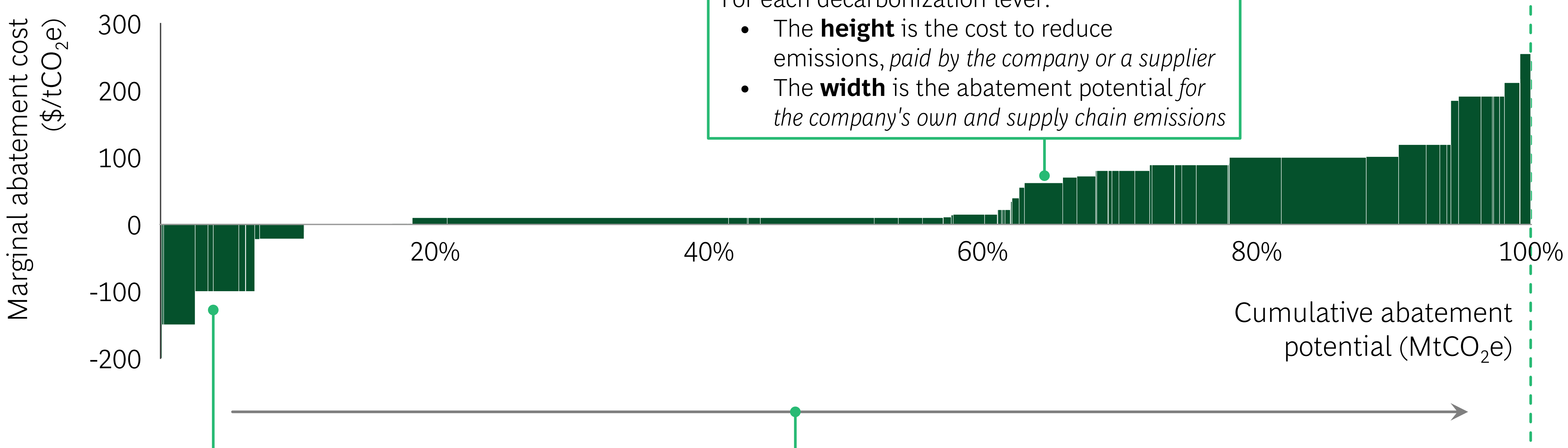
1.Carbon capture, utilization, and storage
Source: BCG analysis

1.3 Background | A marginal abatement cost curve (MACC) helps prioritize decarbonization levers by showing their cost and abatement potential

Illustrative

For each decarbonization lever:

- The **height** is the cost to reduce emissions, *paid by the company or a supplier*
- The **width** is the abatement potential *for the company's own and supply chain emissions*



NEGATIVE NET COST:
Implementing these levers will yield a net savings

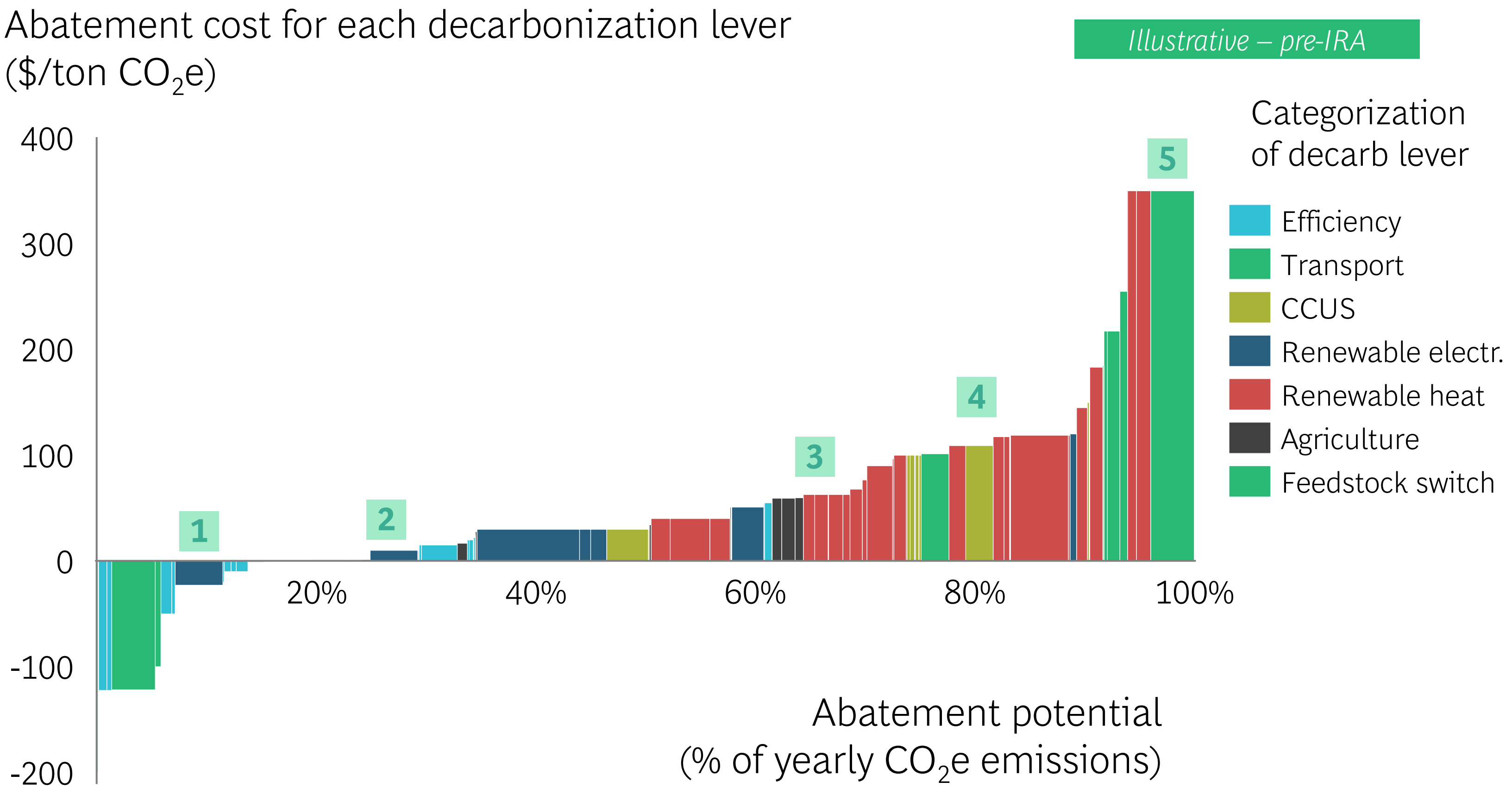
COST OF ABATEMENT:
Levers sorted by increasing cost; prioritize lowest cost levers first

100% ABATEMENT:
Abate all supply chain and own emissions (Scope 1, Scope 2, and upstream Scope 3)

Note: Downstream Scope 3 emissions not included

1.4 Example 1 | Pharmaceutical company abatement curve shows range of technologies required to abate emissions

Marginal abatement cost curve for illustrative pharmaceutical company



Note: Only includes own and embedded emissions (Scope 1, Scope 2, and upstream Scope 3). Abatement curve shown is an illustrative representation of typical curves within industry; specific company curves may vary
Source: BCG Decarbonization tool; BCG analysis

Example decarbonization levers

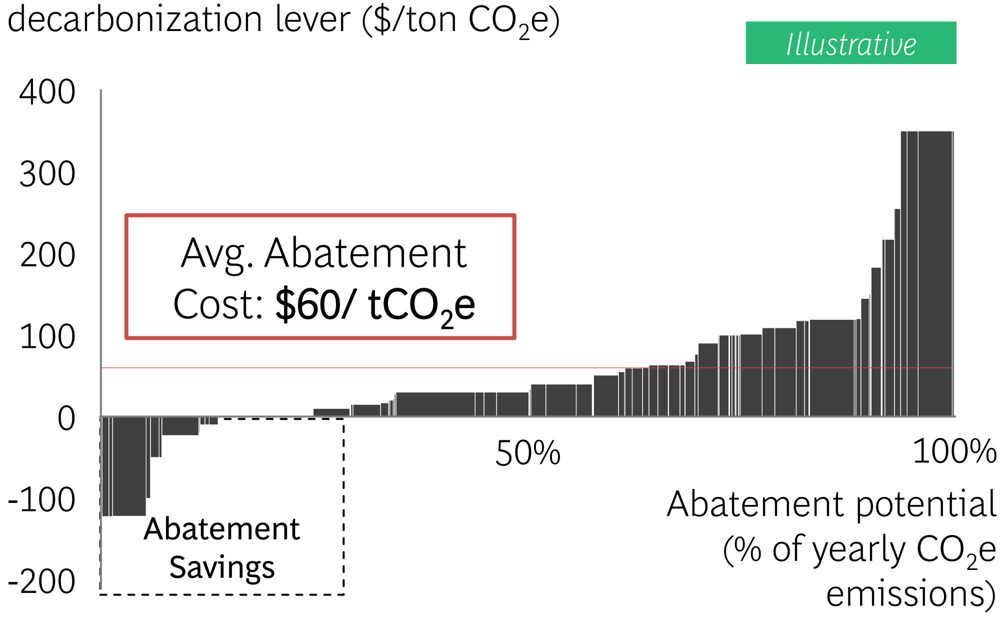
1. Switch to **renewable electricity** for finished drug manufacturing
2. **Switch to electric trucks** for on-road transport
3. **Restore cultivated organic soils** to increase carbon levels on soil
4. **Capture CO_2 (CCUS)** at aluminum processing plant where packaging material is produced
5. **Use sustainable aviation fuels** for air transport of products

1.5 Cost saving levers | IRA reduces abatement cost of more than half of pharma emissions

Marginal abatement cost curves for illustrative pharmaceutical company

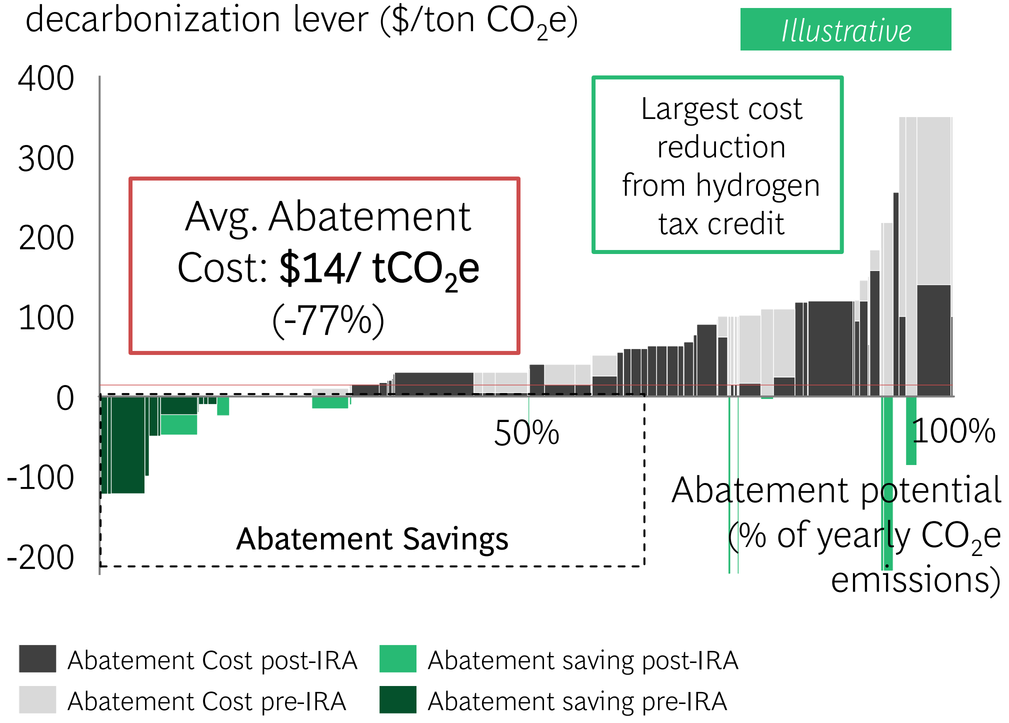
Pre-IRA

Abatement cost for each decarbonization lever (\$/ton CO_2e)



Post-IRA[1]

Abatement cost for each decarbonization lever (\$/ton CO_2e)



2.3x

More abatement savings post-IRA

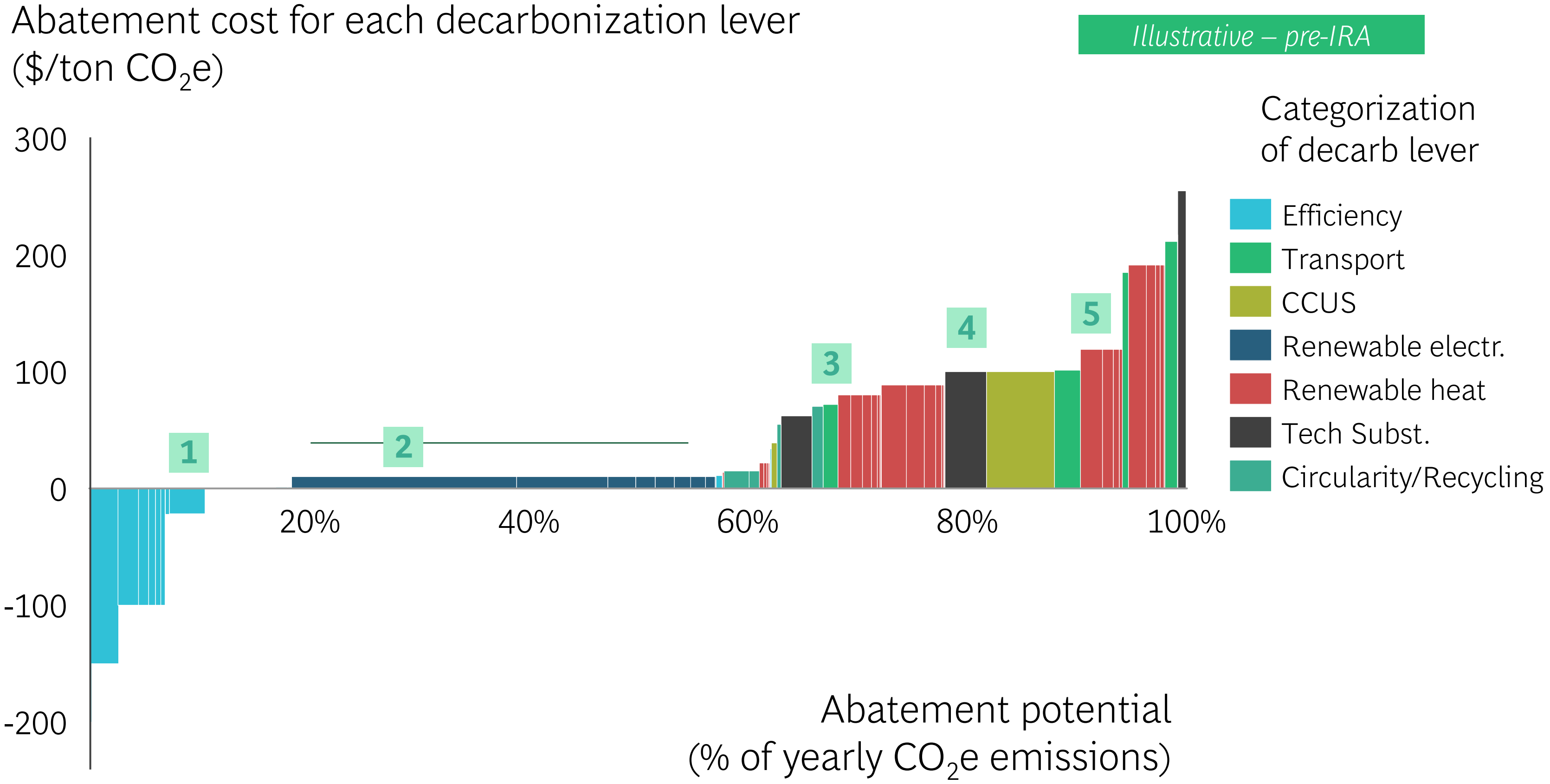
77%

Overall abatement cost reduction post-IRA

1. Cost savings assume sourcing of each component to capture IRA incentives and may not be representative of value captured by end user due to market inefficiencies, global supply chain, or other factors. Note: Only includes own and embedded emissions (Scope 1, Scope 2, and upstream Scope 3). Abatement curve shown is an illustrative representation of typical curves within industry; specific company curves may vary; Source: BCG Decarbonization tool; BCG analysis

1.6 Example 2 | After energy efficiency and renewable electricity, several techs required to reduce auto manufacturing emissions

Marginal abatement cost curve for illustrative automotive manufacturer



Note: Only includes own and embedded emissions (Scope 1, Scope 2, and upstream Scope 3). Abatement curve shown is an illustrative representation of typical curves within industry; specific company curves may vary
Source: BCG Decarbonization tool; BCG analysis

Example decarbonization levers

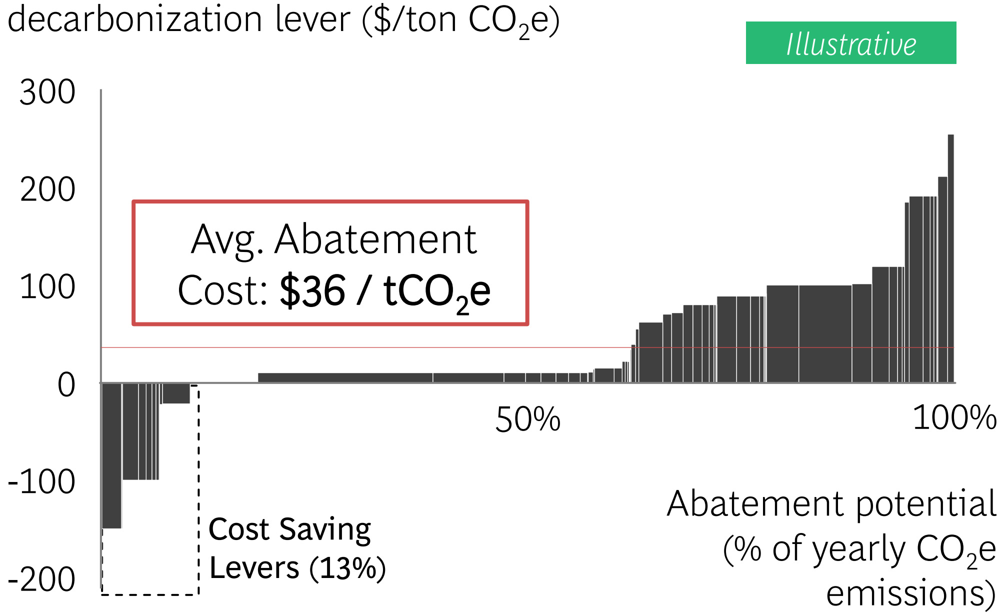
1. **Increase process efficiency** in new plastics production
2. Switch to **renewable electricity** for all manufacturing and assembly
3. **Switch to EVs** for remaining light commercial on-road transport
4. **Electrify and use hydrogen** for steel manufacturing
5. **Switch to biogas** for high-temp heat in aluminum production

1.7 Abatement costs | Post-IRA, carbon abatement is cost-neutral for auto manufacturer

Marginal abatement cost curves for illustrative automotive company

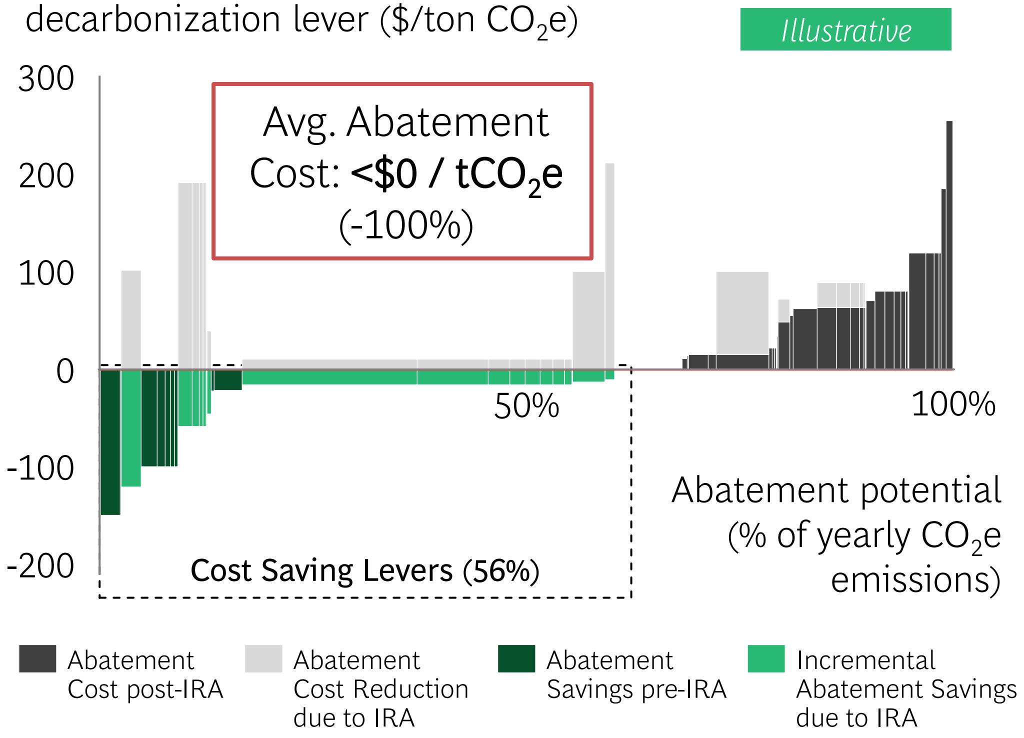
Pre-IRA

Abatement cost for each decarbonization lever (\$/ton CO_2e)



Post-IRA[1]

Abatement cost for each decarbonization lever (\$/ton CO_2e)



50%

Of emissions that are newly cost saving post-IRA

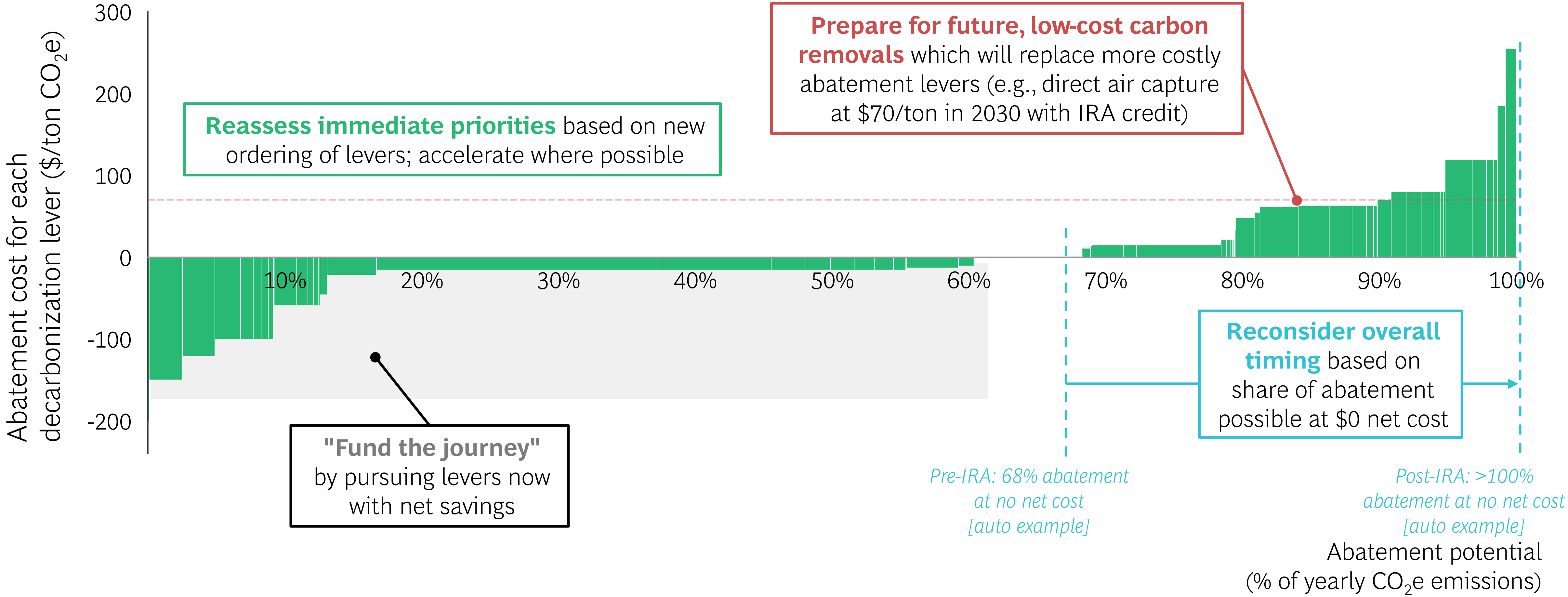
~100%

Overall abatement cost reduction post-IRA

1. Cost savings assume sourcing of each component to capture IRA incentives and may not be representative of value captured by end user due to market inefficiencies, global supply chain, or other factors. Note: Only includes own and embedded emissions (Scope 1, Scope 2, and upstream Scope 3). Abatement curve shown is an illustrative representation of typical curves within industry; specific company curves may vary; Source: BCG Decarbonization tool; BCG analysis

Prioritization | Cost changes shift prioritization of decarbonization levers, impacting decarbonization plans

Illustrative – Post-IRA



Note: Only includes own and embedded emissions (Scope 1, Scope 2, and upstream Scope 3). Abatement curve shown is an illustrative representation of typical curves within auto industry; specific company curves may vary
Source: BCG Decarbonization tool; BCG analysis

The IRA helps most companies reduce operating costs and carbon emissions

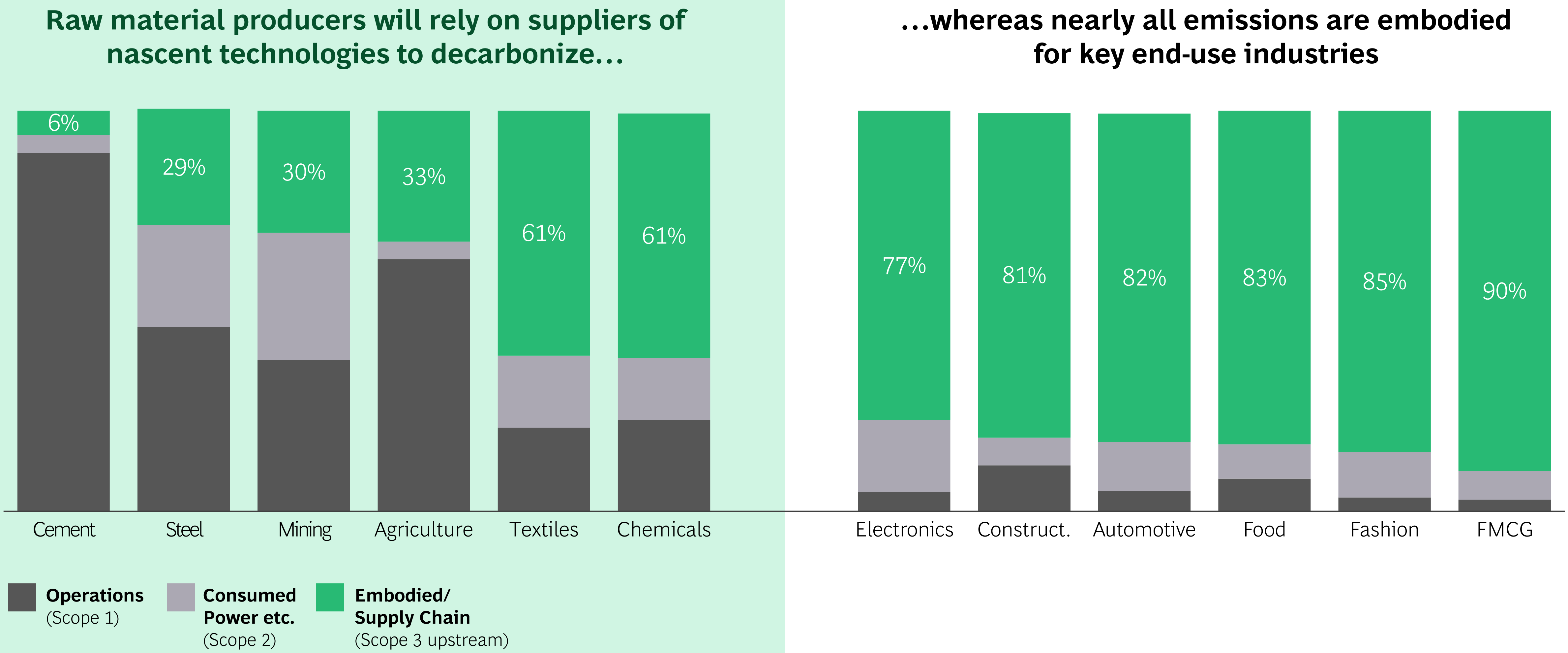
1 The IRA provides significant opportunities to reduce operating costs as well as carbon emissions

- *Incentives can help lower absolute costs:* Incremental ~15%+ of emissions are cost-saving to abate, i.e., have positive returns today
- *Incentives can help lower carbon abatement costs:* Average industry abatement costs are up to 100% cheaper, though actual cost will vary by supplier and geographic footprint
- *As a result, companies must reconsider net-zero goals and timelines:* New incentives could shift immediate priorities, and companies can use initial savings to "fund the journey" to net-zero

2 However, acting fast is critical

- *Lock in available supply now:* Supply scarcity is expected due to large demand growth for key technologies and IRA domestic sourcing requirements; companies must act now to access needed supply
- *Plan ahead for future needs:* Decarbonization efforts have long lead times; work with suppliers to prepare for future needs and mitigate future bottlenecks

2.1 Suppliers are key to address majority of emissions for end-use industries

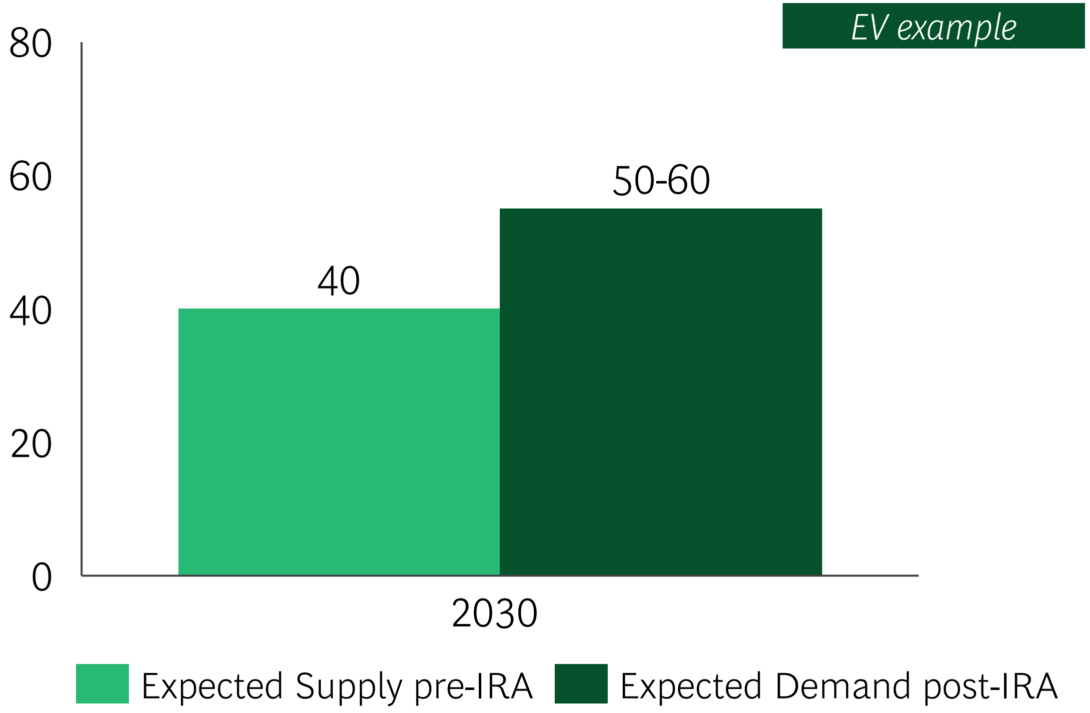


Note: Top companies selected based on number of reported Scope 3 upstream categories and industry fit; FMCG = fast moving consumer goods
Source: WEF Net-Zero Challenge report

2.2 Supply Scarcity | Demand is likely to outpace supply for both mature and emerging technologies in the near term, putting pressure on adoption

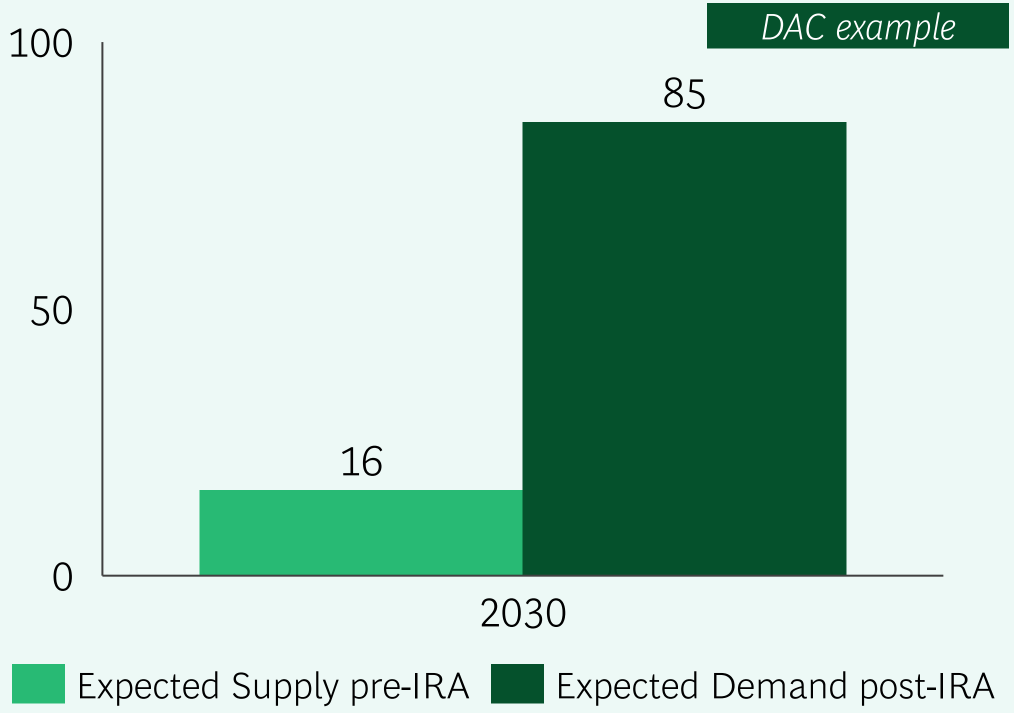
For mature climate technologies, increasing demand will outpace supply, particularly given domestic sourcing requirements

Electric vehicle sales (MM Units)[1]



For emerging climate technologies, existing scarcity is expected to worsen

Direct air capture (DAC) Capacity ($MtCO_2$)[2]



1. IHS Markit Sales and Production Data, BCG Analysis 2.2030 Demand based on IEA 1.5C Scenario

2.3 Long lead times | Start now to capture early value and de-risk the path forward

Long lead times typical…

Typical solar project timeline

Typical carbon capture project timeline

…and several risks to timelines

Supply chains
Increase in demand will put pressure on supply chains, creating a short-term squeeze on upstream capacity

Global trade flows
Domestic requirements and global regulations will affect trade flows in and out of the U.S., shifting supply/demand economics

Raw materials sourcing
Demand for batteries and other technologies will increase, depleting finite material supply

Domestic political uncertainty
Incentives could expire or change, requiring companies to act soon to get known value

Permitting
For projects requiring permits, lead times can be extremely long (although legislation may reform this process in near future)

These and other potential bottlenecks investigated further in future report

2.4 Engage Suppliers | Several ways to engage suppliers of new technologies and/or decarbonized materials

Demand signals

- **Form coalition of peers**, including industry or tech coalitions and pooled procurement
- **Make advanced market commitments** to purchase specific tech

WSJ NEWS EXCLUSIVE | BUSINESS

Solar-Power Developers Pledge to Buy U.S. Panels—If Someone Makes Them

Renewable-energy group offers to buy billions of dollars of U.S.-made solar panels over four years, but government support might be needed to get domestic manufacturing off the ground

Group of solar developers with pooled module procurement

protocol

DECARBONIZATION

Tech companies just made a bold climate commitment

A Big Tech coalition including Microsoft, Alphabet and Salesforce has said it'll buy everything from green steel to carbon dioxide removal in an attempt to clean up the climate.

First Movers Coalition signals demand for nascent climate technologies

REUTERS

ESG ENVIRONMENT

MAY 7, 2021 / 3:08 AM / UPDATED A YEAR AGO

South Pole, Mitsubishi eye up to $800 million of carbon removal credits by 2030

Mitsubishi-South Pole commitment to purchase carbon removal credits

Strategic investments

- **Invest in specific partners**, via concrete volume agreements or other partnerships
- **Provide capital** with lower expected return

TC

LanzaJet inks deal with British Airways for 7,500 tons of low-emission fuel additive per year

British Airways' offtake agreement for Sustainable Aviation Fuel

The Seattle Times

Business | Log In | Subscribe

Bill Gates raises $1 billion as corporate CEOs join race to fund clean-energy projects

Sep. 20, 2021 at 9:46 am | Updated Sep. 20, 2021 at 11:00 am

Breakthrough Energy Catalyst supports nascent climate tech

THE STRAITS TIMES

Sembcorp launches renewable energy certificate aggregator platform

Business ecosystem of renewable energy credits

Source: CDP; BCG

2.5 First movers are already acting to capture value post-IRA

Toyota adds $2.5 billion to its investment in a North Carolina battery plant.

August 31, 2022

First Solar says it will spend up to $1.2 billion to expand U.S. production.

August 30, 2022

PIEDMONT LITHIUM SELECTS TENNESSEE FOR NEW LITHIUM HYROXIDE PROJECT

September 1, 2022

VW and Mercedes-Benz ink agreements with Canada for raw materials vital to US battery manufacturing

August 23, 2022

Amazon signs green hydrogen supply deal with Plug Power

August 25, 2022

Tesla Supplier Panasonic Plans Additional $4 Billion EV Battery Plant in U.S.

August 26, 2022

Further reading

Sustainability Strategy & Innovation

The Next Generation of Climate Innovation

The Strategic Race to Sustainability

Creating Shareholder Value From C&S Commitments

The Challenges of a Sustainability Transformation

Companies Need to Integrate Climate into Their Strategies

MACCs

Net-Zero Challenge: The supply chain opportunity

Business Coalitions & Ecosystems

When a Business Ecosystem Is the Answer to Sustainability

How to Build a High-Impact Sustainability Alliance

Ecosystems for Ecosystems

Sustainable Resource Scarcity

Identifying Resource Scarcities in the Race to Sustainability

Solving the Puzzle of Sustainable Resource Scarcity

The Green Economy Has a Resource-Scarcity Problem

Glossary of key terms

Term	Definition
Marginal Abatement Cost Curve (MACC)	A MACC presents the costs or savings expected from different emissions abatement opportunities (or levers), alongside the potential volume of emissions that could be reduced if the opportunities are implemented. MACCs measure and compare the financial cost and abatement benefit of individual actions. They use the metric of dollars per tonne of carbon dioxide equivalent – usually represented as $/tCO2e.[1]
Direct air capture (DAC)	Direct air capture (DAC) technologies extract CO2 directly from the atmosphere. The CO2 can be permanently stored in deep geological formations (thereby achieving negative emissions or carbon removal) or it can be used, for example in food processing or combined with hydrogen to produce synthetic fuels.[2]
Scope 1 Emissions	Covers the emissions from operations under a facility's control, including onsite fuel combustion.[3]
Scope 2 Emissions	Covers the emissions from usage of electricity, steam, heat and/or cooling purchased from third parties.[3]
Scope 3 Emissions	Covers upstream and downstream value-chain emissions. Scope 3 upstream emissions, or supply-chain emissions (also called "Embodied Emissions"), cover procured products, transport of suppliers and business travel. For example, this covers emissions in the production of steel used in the car that an automotive original equipment manufacturer (OEM) produces. Scope 3 downstream emissions cover transport of products, usage of sold products and product disposal. For the same automotive OEM, this refers to the emissions from its cars being driven by customers.[3]

Sources: 1. How to read a marginal abatement cost curve, Climateworks Centre ; 2. IEA Direct Air Capture report; 3. Net-Zero Challenge: The supply chain opportunity, WEF in collaboration with BCG

BCG contacts

Chrissy O'Brien
MD & Senior Partner,
Sustainability in Healthcare Operations
Boston
OBrien.Christine@bcg.com

Cornelius Pieper
MD & Senior Partner,
Sustainability in Industrial Goods
Boston
Pieper.Cornelius@bcg.com

Alex Dewar
Partner
Decarbonization
Washington DC
Dewar.Alex@bcg.com

Wendy Woods
MD & Senior Partner
Vice Chair, Social Impact &
Climate & Sustainability
Boston
Woods.Wendy@bcg.com

Katherine Phillips
Project Leader
Decarbonization
New York
Phillips.Katherine@bcg.com

Tom Baker
MD & Partner
Renewables & Decarbonization
San Francisco
Baker.Thomas@bcg.com

Pattabi Seshadri
MD & Senior Partner,
BCG Global Leader - Energy
Dallas
Seshadri.Pattabi@bcg.com

Thomas Dauner
MD & Senior Partner,
BCG Global Leader - Industrial Goods
Stuttgart
Dauner.Thomas@bcg.com

Hubi Meinecke
MD & Senior Partner,
BCG Global Leader – Climate & Sustainability
Hamburg
Meinecke.Hubertus@bcg.com

Disclaimer

The services and materials provided by Boston Consulting Group (BCG) are subject to BCG's Standard Terms (a copy of which is available upon request) or such other agreement as may have been previously executed by BCG. BCG does not provide legal, accounting, or tax advice. The Client is responsible for obtaining independent advice concerning these matters. This advice may affect the guidance given by BCG. Further, BCG has made no undertaking to update these materials after the date hereof, notwithstanding that such information may become outdated or inaccurate.

The materials contained in this presentation are designed for the sole use by the board of directors or senior management of the Client and solely for the limited purposes described in the presentation. The materials shall not be copied or given to any person or entity other than the Client ("Third Party") without the prior written consent of BCG. These materials serve only as the focus for discussion; they are incomplete without the accompanying oral commentary and may not be relied on as a stand-alone document. Further, Third Parties may not, and it is unreasonable for any Third Party to, rely on these materials for any purpose whatsoever. To the fullest extent permitted by law (and except to the extent otherwise agreed in a signed writing by BCG), BCG shall have no liability whatsoever to any Third Party, and any Third Party hereby waives any rights and claims it may have at any time against BCG with regard to the services, this presentation, or other materials, including the accuracy or completeness thereof. Receipt and review of this document shall be deemed agreement with and consideration for the foregoing.

BCG does not provide fairness opinions or valuations of market transactions, and these materials should not be relied on or construed as such. Further, the financial evaluations, projected market and financial information, and conclusions contained in these materials are based upon standard valuation methodologies, are not definitive forecasts, and are not guaranteed by BCG. BCG has used public and/or confidential data and assumptions provided to BCG by the Client. BCG has not independently verified the data and assumptions used in these analyses. Changes in the underlying data or operating assumptions will clearly impact the analyses and conclusions.