US Inflation Reduction Act: Significant Cost Savings for Corporate Decarbonization

September 2022
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
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.

**RX PHARMA**
- 15% incremental emissions now cost-saving to abate due to IRA
- 56% of emissions are cheaper to abate post-IRA
- $60/t → $14/t abatement cost pre-IRA vs post-IRA ($/t CO₂e)
- 77% cheaper average abatement cost

**AUTO**
- 50% incremental emissions now cost-saving to abate due to IRA
- 63% of emissions are cheaper to abate post-IRA
- $36/t → ~$0/t abatement cost pre-IRA vs post-IRA ($/t CO₂e)
- ~100% cheaper average abatement cost

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

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

¹ Carbon capture, utilization, and storage
Source: BCG analysis
A marginal abatement cost curve (MACC) helps prioritize decarbonization levers by showing their cost and abatement potential.

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

Marginal abatement cost curve for illustrative pharmaceutical company

Abatement cost for each decarbonization lever ($/ton CO₂e)

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 CO₂ (CCUS) at aluminum processing plant where packaging material is produced
5. Use sustainable aviation fuels for air transport of products

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
1.5 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 CO₂e)

Post-IRA
Abatement cost for each decarbonization lever ($/ton CO₂e)

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

Marginal abatement cost curve for illustrative automotive manufacturer

Abatement cost for each decarbonization lever ($/ton CO₂e)

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

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
Cost Saving Levers (13%)

Abatement cost for each decarbonization lever ($/ton CO₂e)

**Pre-IRA**

Avg. Abatement Cost: $36 / tCO₂e

Abatement potential (% of yearly CO₂e emissions)

- Cost Saving Levers (13%)

**Post-IRA¹**

Avg. Abatement Cost: <$0 / tCO₂e (-100%)

Abatement cost for each decarbonization lever ($/ton CO₂e)

- Cost Saving Levers (56%)

**Marginal abatement cost curves for illustrative automotive company**

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

Reassess immediate priorities based on new ordering of levers; accelerate where possible

"Fund the journey" by pursuing levers now with net savings

Prepare for future, low-cost carbon removals which will replace more costly abatement levers (e.g., direct air capture at $70/ton in 2030 with IRA credit)

Reconsider overall timing based on share of abatement possible at $0 net cost

Pre-IRA: 68% abatement at no net cost [auto example]
Post-IRA: >100% abatement at no net cost [auto example]

Abatement potential (% of yearly CO₂e emissions)

1.8

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

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- **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.

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.
Raw material producers will rely on suppliers of nascent technologies to decarbonize…

…whereas nearly all emissions are embodied for key end-use industries

<table>
<thead>
<tr>
<th>Industry</th>
<th>Operations (Scope 1)</th>
<th>Consumed Power etc. (Scope 2)</th>
<th>Embodied/Supply Chain (Scope 3 upstream)</th>
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<tbody>
<tr>
<td>Cement</td>
<td>6%</td>
<td>29%</td>
<td>30%</td>
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<td>Steel</td>
<td>33%</td>
<td>61%</td>
<td>33%</td>
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<tr>
<td>Mining</td>
<td>61%</td>
<td>61%</td>
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<td>Agriculture</td>
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<td>Textiles</td>
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<td>Chemicals</td>
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<tr>
<td>Electronics</td>
<td>77%</td>
<td>81%</td>
<td>82%</td>
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<td>Construct.</td>
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<td>Automotive</td>
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<td>Food</td>
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<td>Fashion</td>
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<td>FMCG</td>
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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
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.

For emerging climate technologies, existing scarcity is expected to worsen.

**Electric vehicle sales (MM Units)**

- **Expected Supply pre-IRA**: 40
- **Expected Demand post-IRA**: 50-60

**Direct air capture (DAC) Capacity (MtCO₂)**

- **Expected Supply pre-IRA**: 16
- **Expected Demand post-IRA**: 85

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1. IHS Markit Sales and Production Data, BCG Analysis
2. 2030 Demand based on IEA 1.5C Scenario
Long lead times typical...

Typical solar project timeline

- Final investment decision
- Interconnection
- Constr.
- Operation

1 year

Typical carbon capture project timeline

- Design, development, permitting
- Construction
- Final investment decision
- Operation

...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

Strategic investments

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

Source: CDP; BCG
First movers are already acting to capture value post-IRA

First Solar says it will spend up to $1.2 billion to expand U.S. production.  
August 30, 2022

Toyota adds $2.5 billion to its investment in a North Carolina battery plant.  
August 31, 2022

VW and Mercedes-Benz ink agreements with Canada for raw materials vital to US battery manufacturing  
August 23, 2022

PIEDMONT LITHIUM SELECTS TENNESSEE FOR NEW LITHIUM HYDROXIDE PROJECT  
September 1, 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
## Sustainability Strategy & Innovation

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<td>The Next Generation of Climate Innovation</td>
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<td>July 12, 2022</td>
<td>The Strategic Race to Sustainability</td>
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<td>June 23, 2022</td>
<td>Creating Shareholder Value From C&amp;S Commitments</td>
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<td>January 2021</td>
<td>Net-Zero Challenge: The supply chain opportunity</td>
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## Business Coalitions & Ecosystems

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## Sustainable Resource Scarcity

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## Glossary of key terms

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<th>Term</th>
<th>Definition</th>
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<tr>
<td><strong>Marginal Abatement Cost Curve (MACC)</strong></td>
<td>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</td>
</tr>
<tr>
<td><strong>Direct air capture (DAC)</strong></td>
<td>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</td>
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<tr>
<td><strong>Scope 1 Emissions</strong></td>
<td>Covers the emissions from operations under a facility’s control, including onsite fuel combustion.³</td>
</tr>
<tr>
<td><strong>Scope 2 Emissions</strong></td>
<td>Covers the emissions from usage of electricity, steam, heat and/or cooling purchased from third parties.³</td>
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<td><strong>Scope 3 Emissions</strong></td>
<td>Covers upstream and downstream value-chain emissions. Scope 3 upstream emissions, or supply-chain emissions (also called &quot;Embodied Emissions&quot;), 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</td>
</tr>
</tbody>
</table>

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
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