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Carbon Capture Cost Trends & Projections Through 2035

A Strategic Analysis of CAPEX/OPEX Evolution and Investment Opportunities

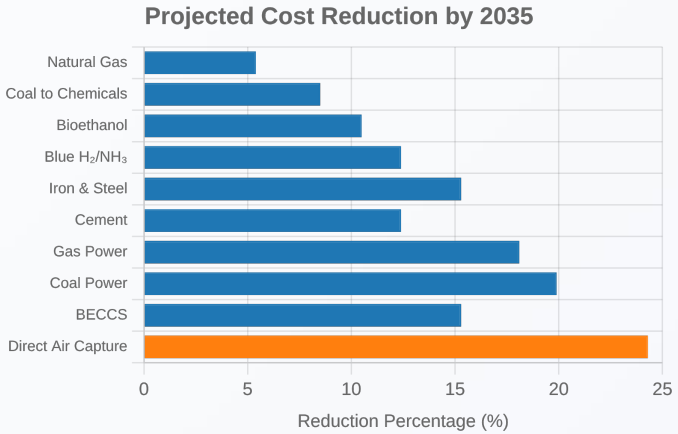
Executive Summary

Carbon capture costs projected to decline by **5-25%** across technologies by 2035, with direct air capture showing the steepest reduction trajectory (24.3%).

Four technologies already competitive at Paris Agreement carbon pricing ($50/tCO$_2$): natural gas processing, coal-to-chemicals, bioethanol, and blue hydrogen/ammonia.

The period **2025-2030** represents a critical window for investment decisions, with several technologies crossing key cost thresholds enabling widespread commercial deployment.

Strategic investments in carbon capture technologies today, particularly in near-commercial applications, will position stakeholders advantageously as carbon pricing mechanisms strengthen globally.



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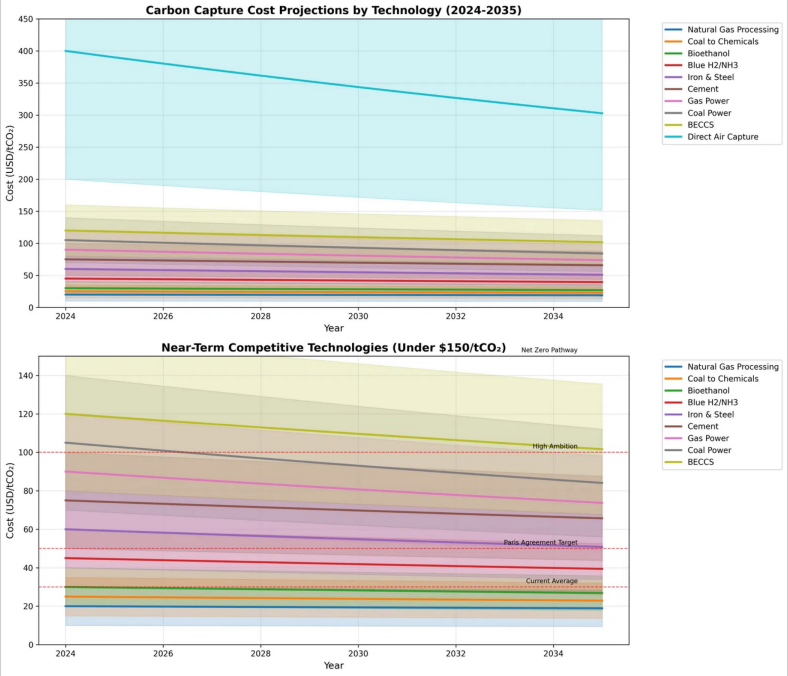
Technology Cost Projections (2024-2035)



Mature technologies (Natural Gas Processing, Coal to Chemicals) show modest cost reductions of 5-8%, maintaining their position as lowest-cost options.

Direct air capture shows the steepest cost reduction trajectory (24.3%), though remaining the highest-cost application.

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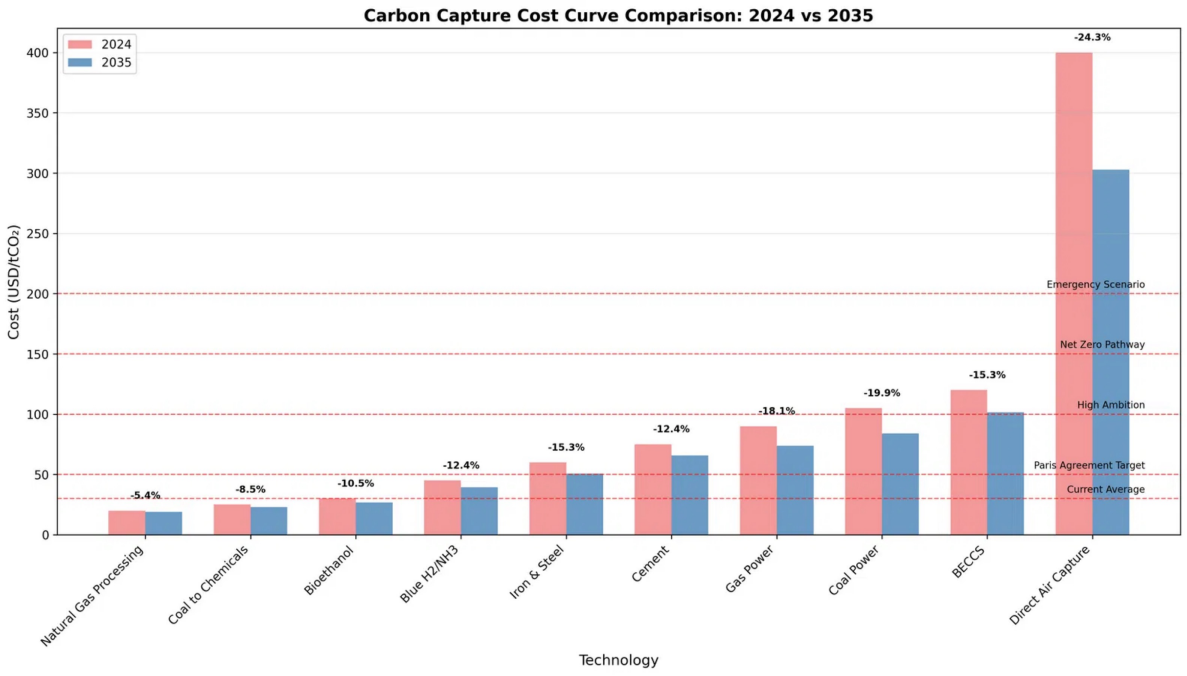
Cost Curve Comparison: 2024 vs 2035



All technologies show cost reductions, with the most significant improvements in **Direct Air Capture** (24.3%) and **Coal Power** (19.9%).

Relative positioning remains consistent, with natural gas processing maintaining cost leadership and direct air capture remaining highest-cost.

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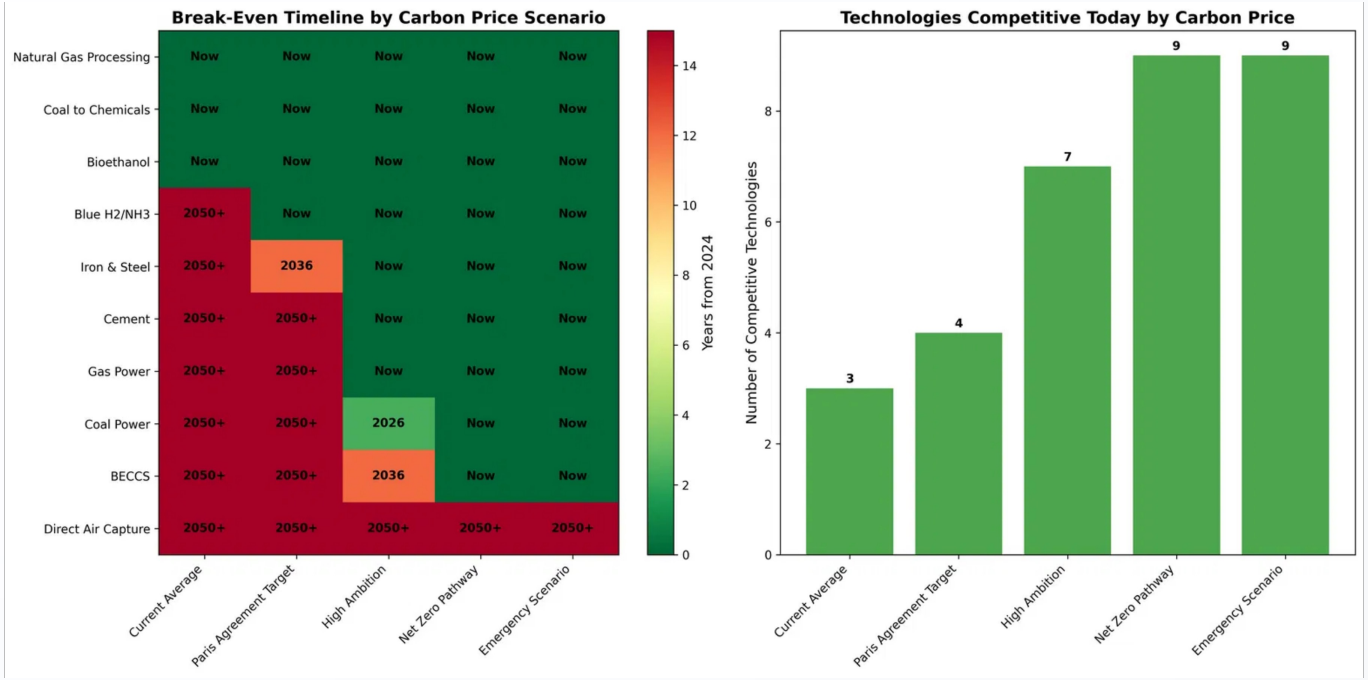
Break-Even Analysis & Carbon Pricing



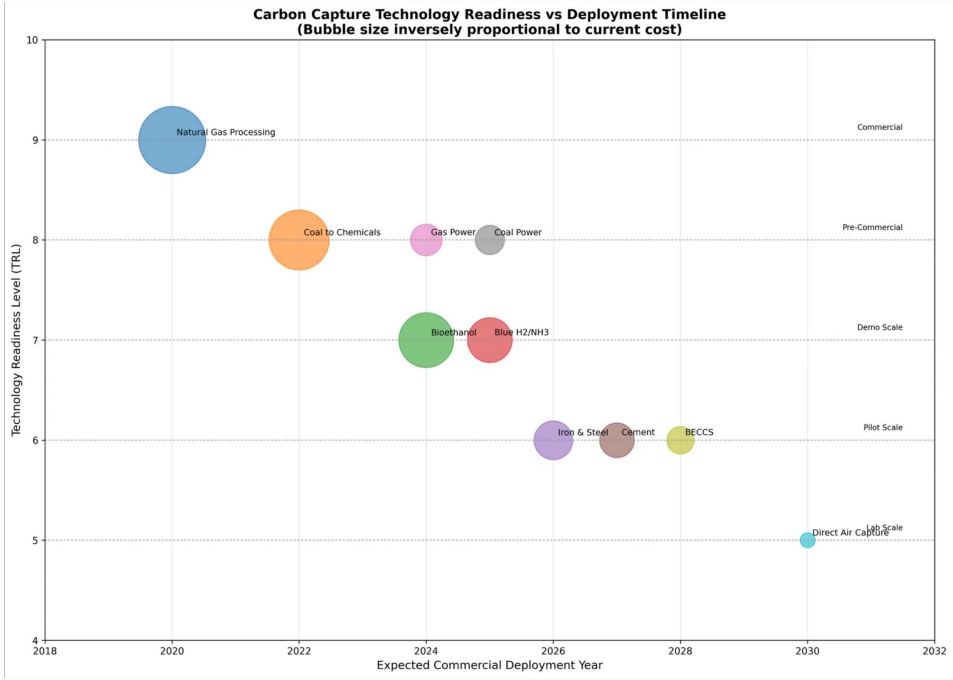
Competitive Today ($50/tCO$_2$):

- Natural Gas Processing
- Coal to Chemicals
- Bioethanol
- Blue

Emerging Competitiveness (2025-2030):

- Iron & Steel
- Cement
- Gas Power
- Coal Power

Technology Readiness & Deployment



Mature technologies (TRL 8-9): Natural gas processing and coal-to-chemicals applications are fully commercial with established deployment pathways.

Emerging technologies (TRL 6-7): BECCS and cement applications are in early commercial deployment with significant scaling potential.

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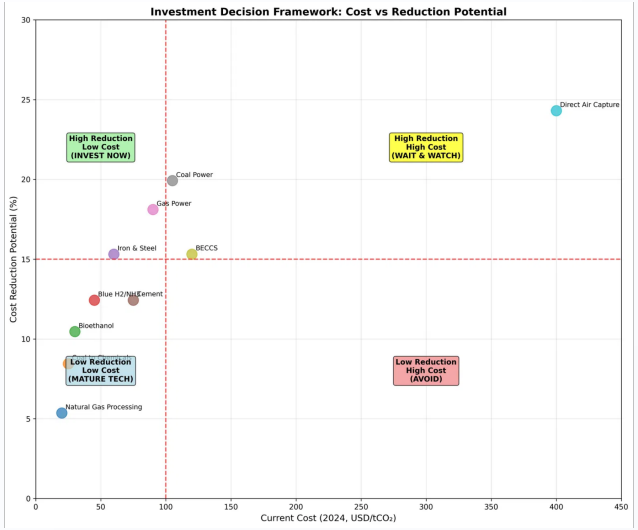
Investment Decision Framework



Invest Now (Low Cost, High Reduction)

Natural gas processing, coal-to-chemicals, bioethanol - immediate revenue opportunities with proven economics

Wait & Watch (High Cost, High Reduction)

Direct air capture - substantial improvement potential but requires careful timing and risk management

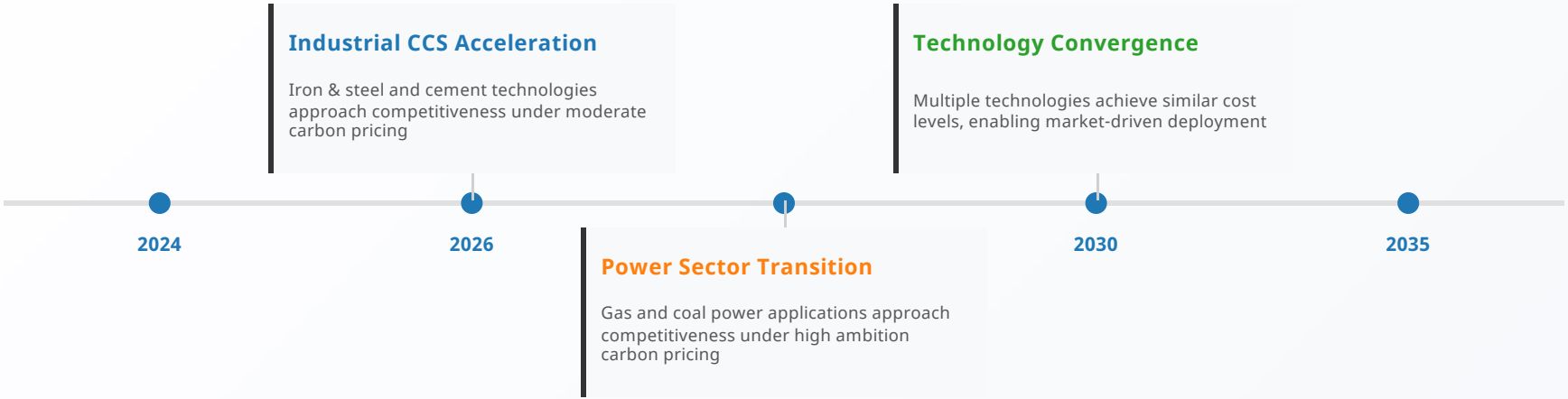
Strategic Positioning (High Potential)

Iron & steel, cement, gas power - significant cost reduction potential, approaching competitiveness

Mature Technology (Steady Returns)

Established applications - focus on operational optimization and market expansion

Policy-Relevant Inflection Points



Critical Decision Windows

- The **2025-2030** period represents a critical window for strategic investment and policy development
- Industrial applications cross key cost thresholds, enabling widespread commercial deployment

Market Development Inflection Points

- **Hub development** reaches critical mass (2026-2028), enabling shared infrastructure economics
- **Carbon pricing mechanisms** mature (2025-2027), providing investment certainty

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Strategic Recommendations

For Investors

- Prioritize **immediate opportunities** in natural gas processing, coal-to-chemicals, and bioethanol for near-term revenue generation
- Consider **strategic positioning** in iron & steel, cement, and gas power applications approaching competitiveness
- Maintain **selective exposure** to direct air capture for long-term value creation potential
- Implement **portfolio diversification** across technology categories and geographic markets

For Policymakers

- Develop **predictable carbon pricing** mechanisms with long-term escalation schedules
- Tailor **technology-specific support** based on competitive positioning and development needs

For Technology Developers

- Prioritize **energy integration optimization**, particularly for direct air capture applications
- Focus on **manufacturing scale-up** to achieve cost reductions through mass production
- Invest in **next-generation technologies** for step-change improvements in cost and performance

Critical Success Factors

The **2025-2030 window** is critical for establishing market position. Organizations that invest strategically during this period will be advantageously positioned for the broader commercial deployment phase.

Key Enablers

Success requires coordination between **technology development**, **policy support**, and **market preparation** to

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References & Additional Resources

Key References

- Energy Transitions Commission (2022). Carbon Capture, Utilisation & Storage in the Energy Transition
- International Energy Agency (2023). Energy Technology Perspectives 2023
- McKinsey & Company (2023). Global Energy Perspective 2023: CCUS outlook
- IPCC (2022). Climate Change 2022: Mitigation of Climate Change
- World Bank (2024). State and Trends of Carbon Pricing 2024

Case Studies

- Petra Nova CCS Project (Texas, USA)
- Boundary Dam 3 CCS Project (Saskatchewan, Canada)
- Shell Quest CCS Project (Alberta, Canada)
- Norwegian Full-Scale CCS Initiative (Norway)

Data Sources

- Global CCS Institute (2023). Global Status of CCS Report
- NETL (2020). Cost and Performance Baseline for Fossil Energy Plants
- ERIA (2022). CCUS Cost Estimation Case Studies
- Clean Air Task Force (2024). Carbon Capture Project Database

For More Information

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