

IDENTIFYING LEADERS IN CARBON CAPTURE

Partnering for Success



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WHAT TO EXPECT

01

This presentation will discuss the specific needs of data centers as they relate to carbon capture technology and innovation.

02

We'll view innovation through the framework of the Lux Innovation Grid.

03

We'll use the grid to assess which carbon capture technologies may suit data center needs and engage with the innovation landscape.

CARBON CAPTURE INDUSTRIES

**Cement
Manufacturing**

Chemicals Industry

Oil and Gas Industry

**Iron and Steel
Industry**

Power Generation



The world must add or replace 80 million km of grids by 2040, equal to all grids globally today, to meet national climate targets and support energy security.

- International Energy Agency



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**Cement
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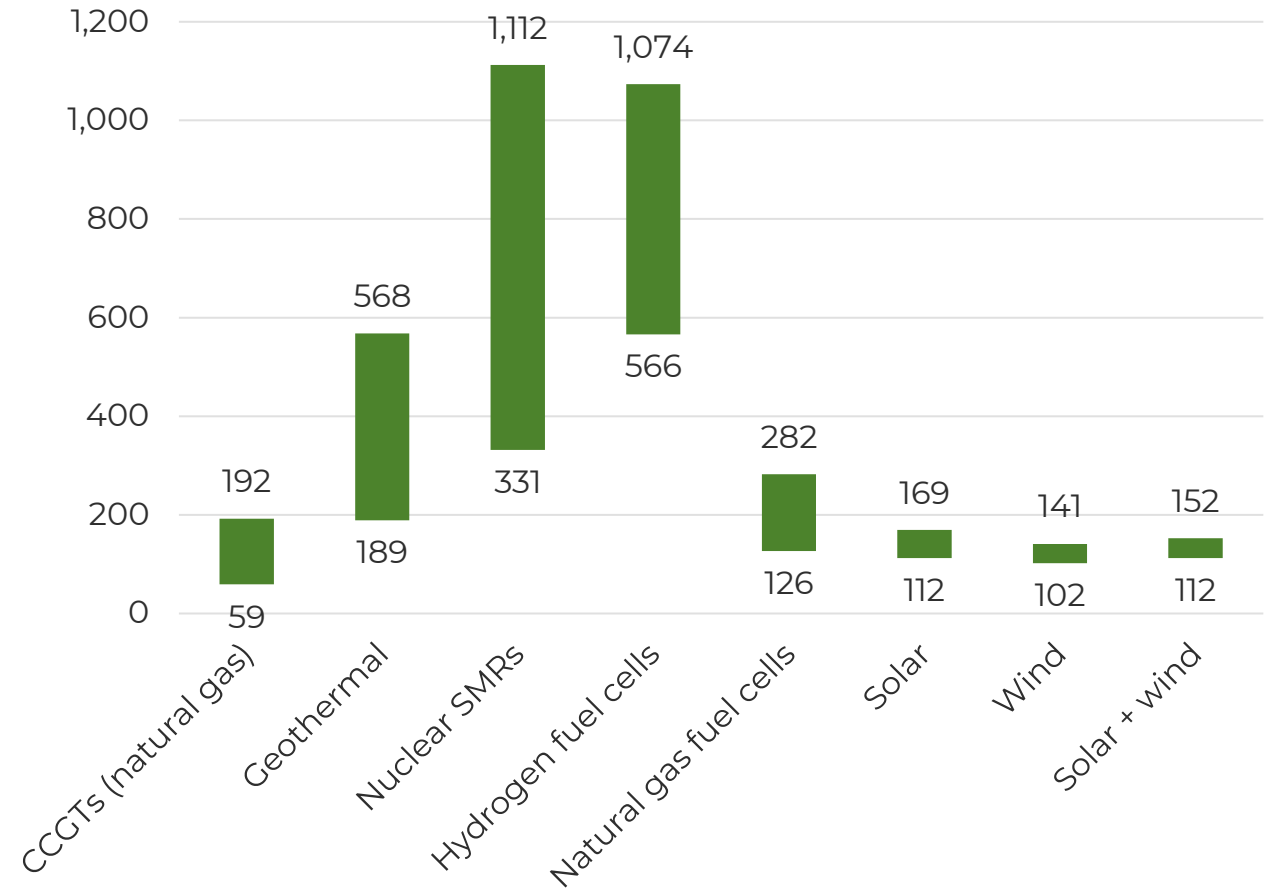
Power Generation



Data centers

NATURAL GAS AND CARBON CAPTURE

LCOE for Data Centers (USD/MWh)



NATURAL GAS SOLUTIONS IN THE WORKS



ExxonMobil expands its customer base by expanding carbon capture solutions for data centers.



GE VERNOVA



Chevron



GE Vernova, Engine No. 1, and Chevron join hands to provide energy independence to data centers.



Microsoft

Microsoft is mulling using natural gas combined with carbon capture technology to power its AI data centers.

CARBON CAPTURE DEMONSTRATION

The Siemens Energy logo, with "SIEMENS" in teal and "energy" in purple.The Worley logo, with "Worley" in blue and "energy | chemicals | resources" in smaller text below.

SLB Capturi has teamed up with Worley and Siemens Energy to support Uniper's low-carbon power initiative.

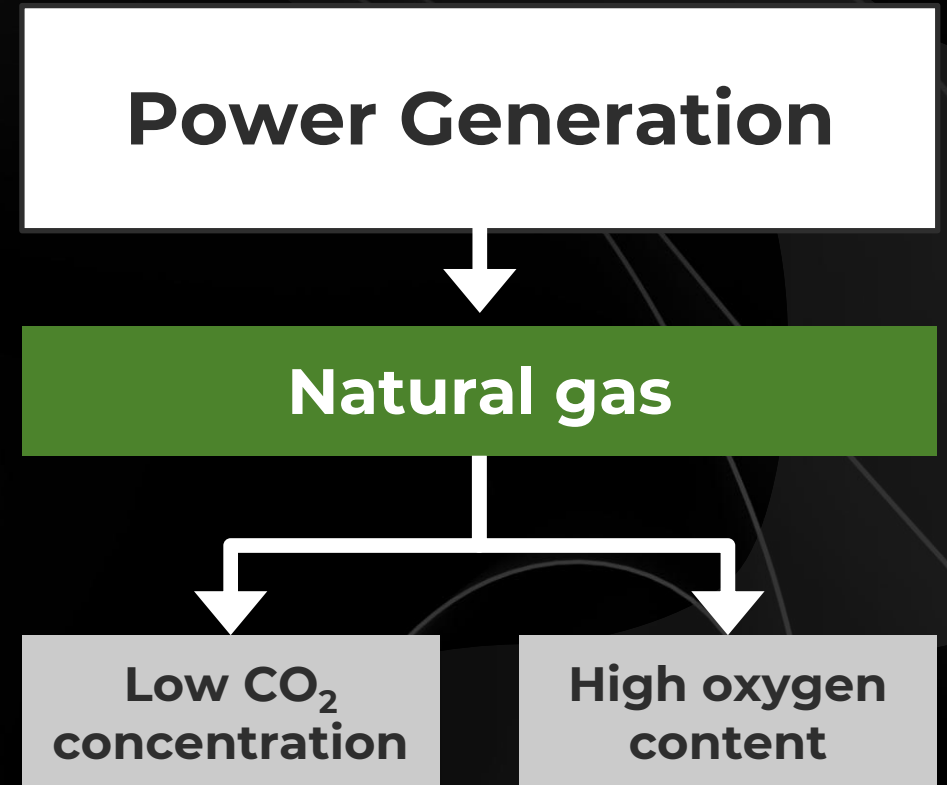
The Honeywell logo, with the word "Honeywell" in red.

Honeywell and SK E&S will collaborate to implement carbon capture technology in Korea and Southeast Asia.



The CANSOLV CO₂ Capture System is scheduled for another implementation by Shell in partnership with its collaborator Technip Energies, following the final investment decision for the Net Zero Teesside Power project.

LET'S ZOOM IN



CARBON CAPTURE TECHNOLOGY

Segmented by capture medium and desorption mechanism

- Amine solvent

Efficiency

Degradation

Energy Consumption

Cost

Corrosiveness

CARBON CAPTURE TECHNOLOGY

Segmented by capture medium and desorption mechanism

- Solvent
- Sorbent
- Membrane
- Cryogenic
- Electroswing

Efficiency

Degradation

Energy Consumption

Cost

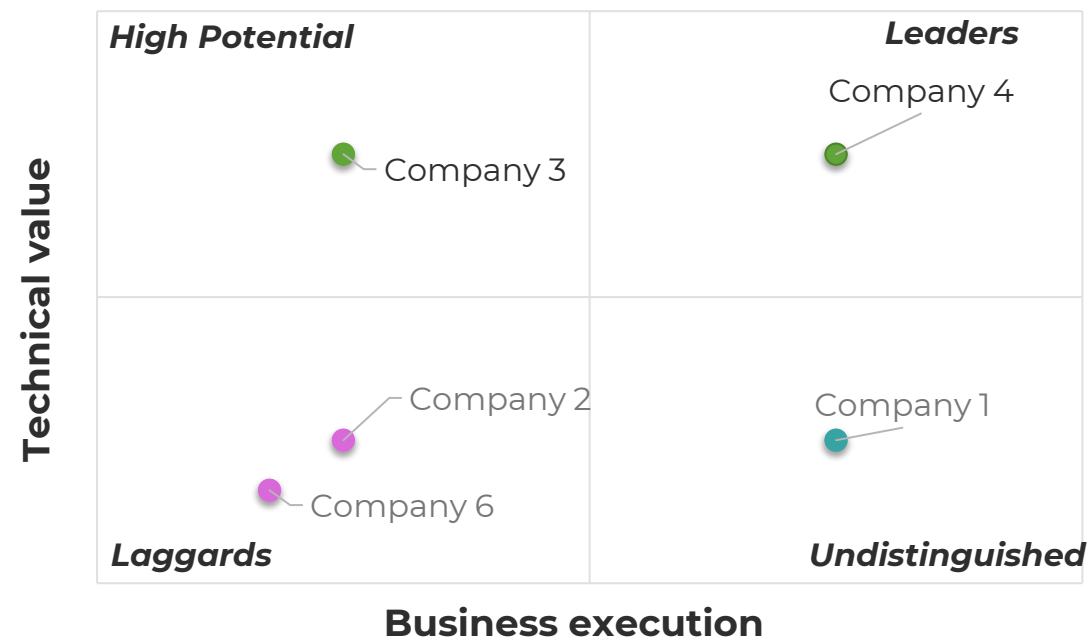
Corrosiveness



How do we deal with innovation?

LUX INNOVATION GRID

A prioritization tool to
identify leaders and
laggards



Bubble Color (Subcategory)

● Solvent ● Sorbent ● Membrane ● Cryogenic ● Electroswing

LUX INNOVATION GRID

Solution value

IP position

Addressable market

Competitive landscape

Technical value

Company 3

Company 2

Company 6

LUX INNOVATION GRID

Partnerships

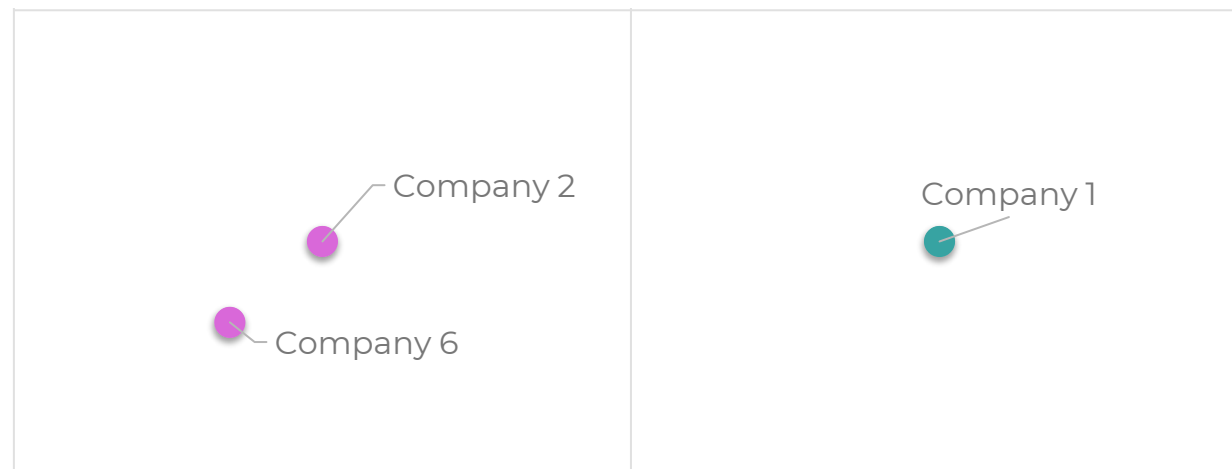
Momentum

Barriers to growth

Scale

Management team

Regulatory factors



Business execution

Innovator Assessment

Deep and balanced evaluation of important technology innovators based on primary research, including in depth interviews and an evaluative scorecard based on Lux's trusted methodologies



Carbon Clean

Amine solvent for CO₂ capture from flue gases.

INTERVIEWED BY



Mukunda Kaushik

Senior Analyst

Technology/solution value ⓘ



Addressable market size ⓘ



Competitive landscape ⓘ



Barriers to growth ⓘ



IP position ⓘ



Regulatory factors ⓘ



Management team ⓘ



Partnerships ⓘ



Momentum ⓘ



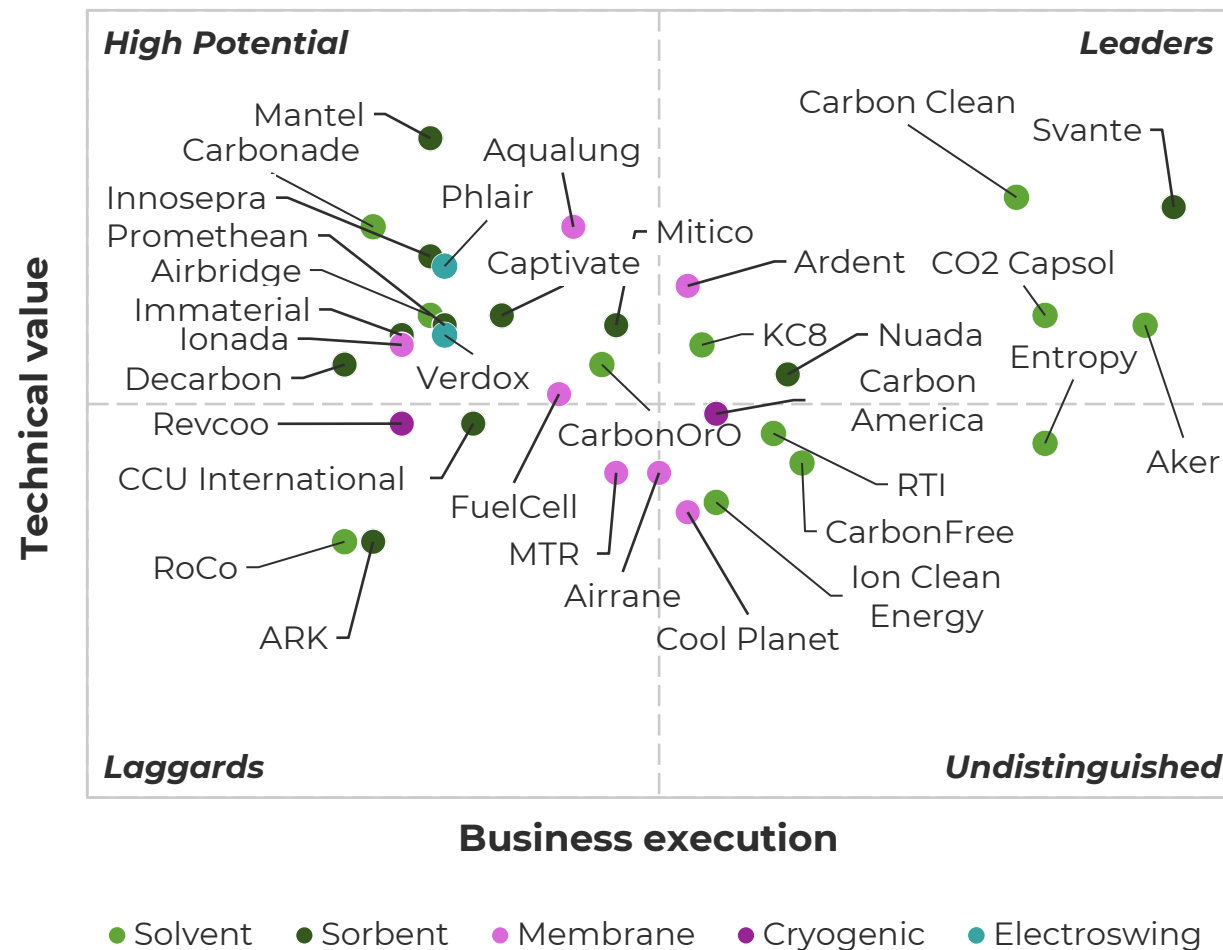
LUX INNOVATION GRID

Analyzing

30+

startups in carbon
capture






Lux Innovation Grid: Carbon Capture





CONCENTRATION APPLICABILITY

Target Flue Gas CO₂ Concentration of Carbon Capture Startups

Technology subcategory

-  Solvent
-  Membrane
-  Electroswing
-  Sorbent
-  Cryogenic

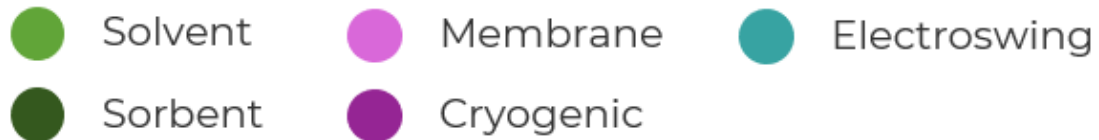
Deployment

-  Has deployments or has announced upcoming deployments
-  Claims capability but has not announced deployments

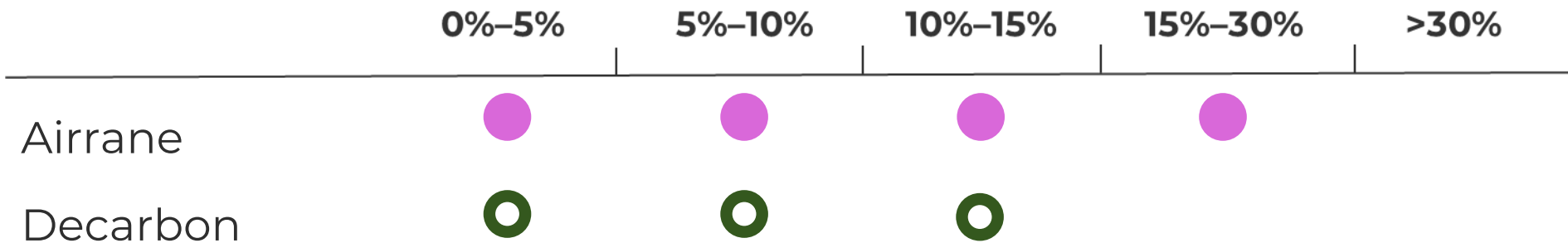
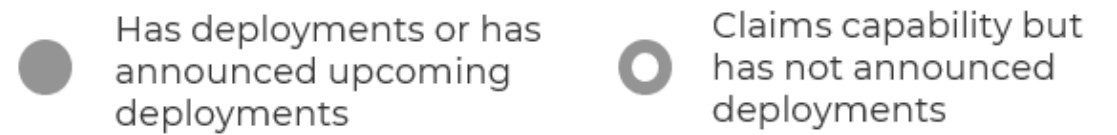
CONCENTRATION APPLICABILITY

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Deployment



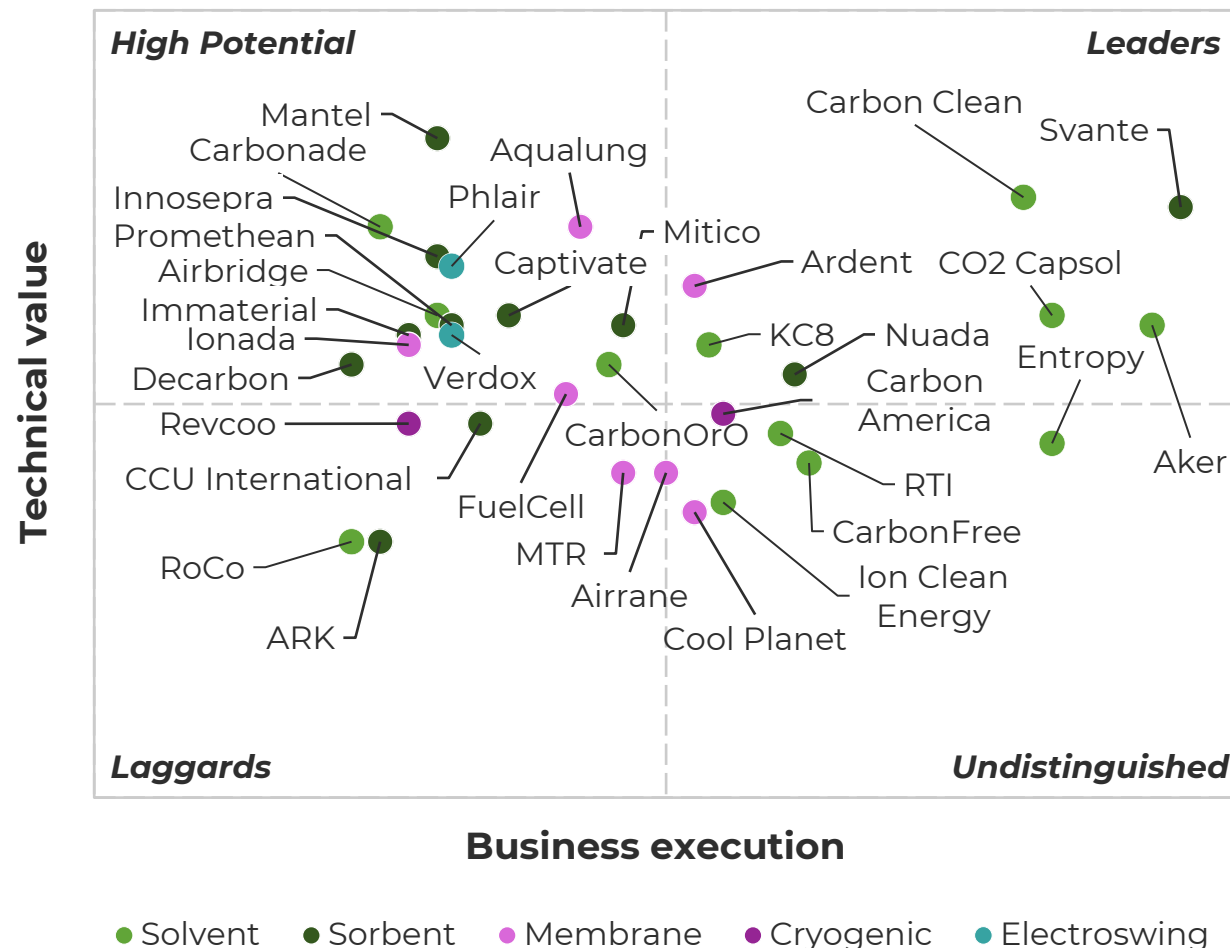
LUX INNOVATION GRID

Analyzing

30+

startups in carbon
capture

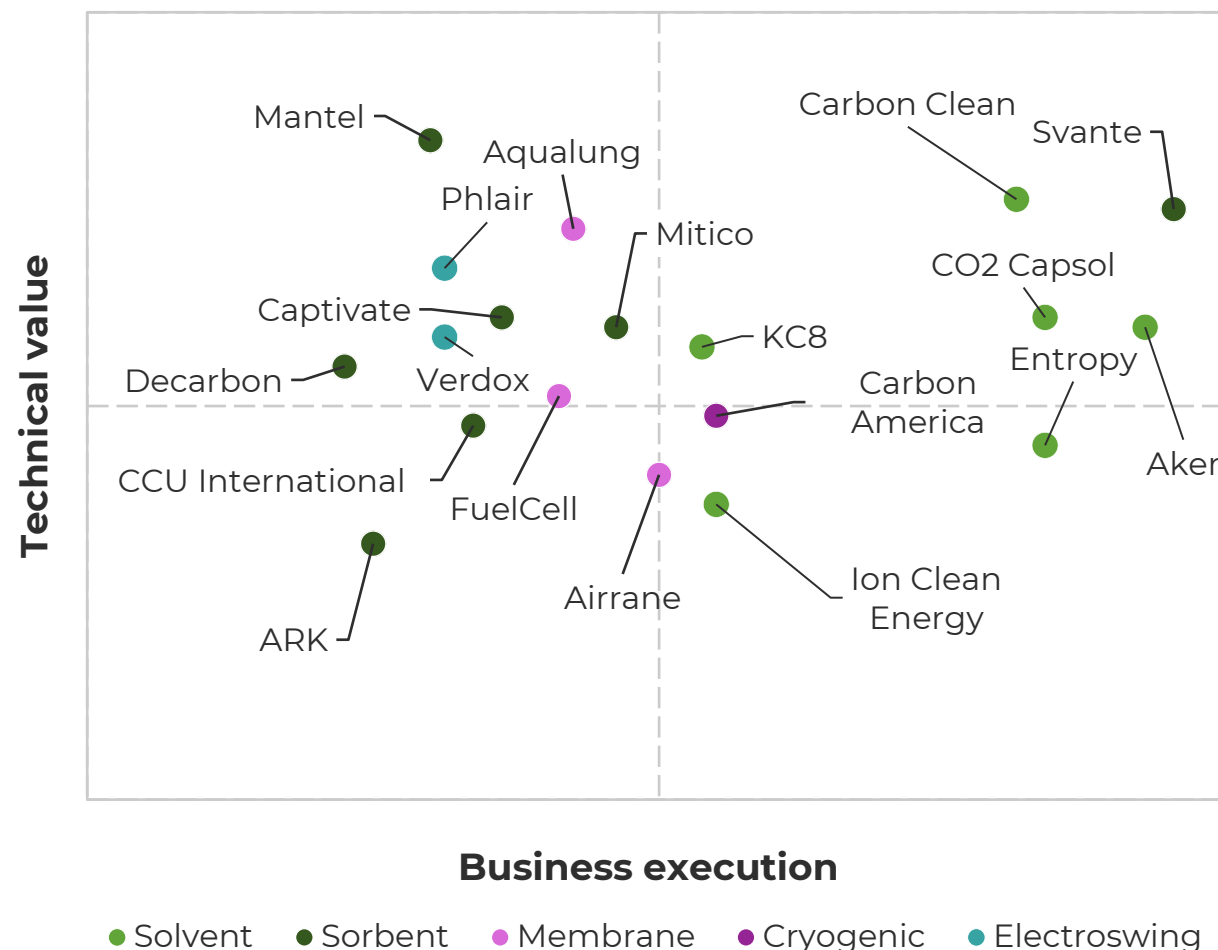
Lux Innovation Grid: Carbon Capture



STARTUPS FOR NATURAL GAS

Filtered to display
claimed and deployed
low-concentration
startups

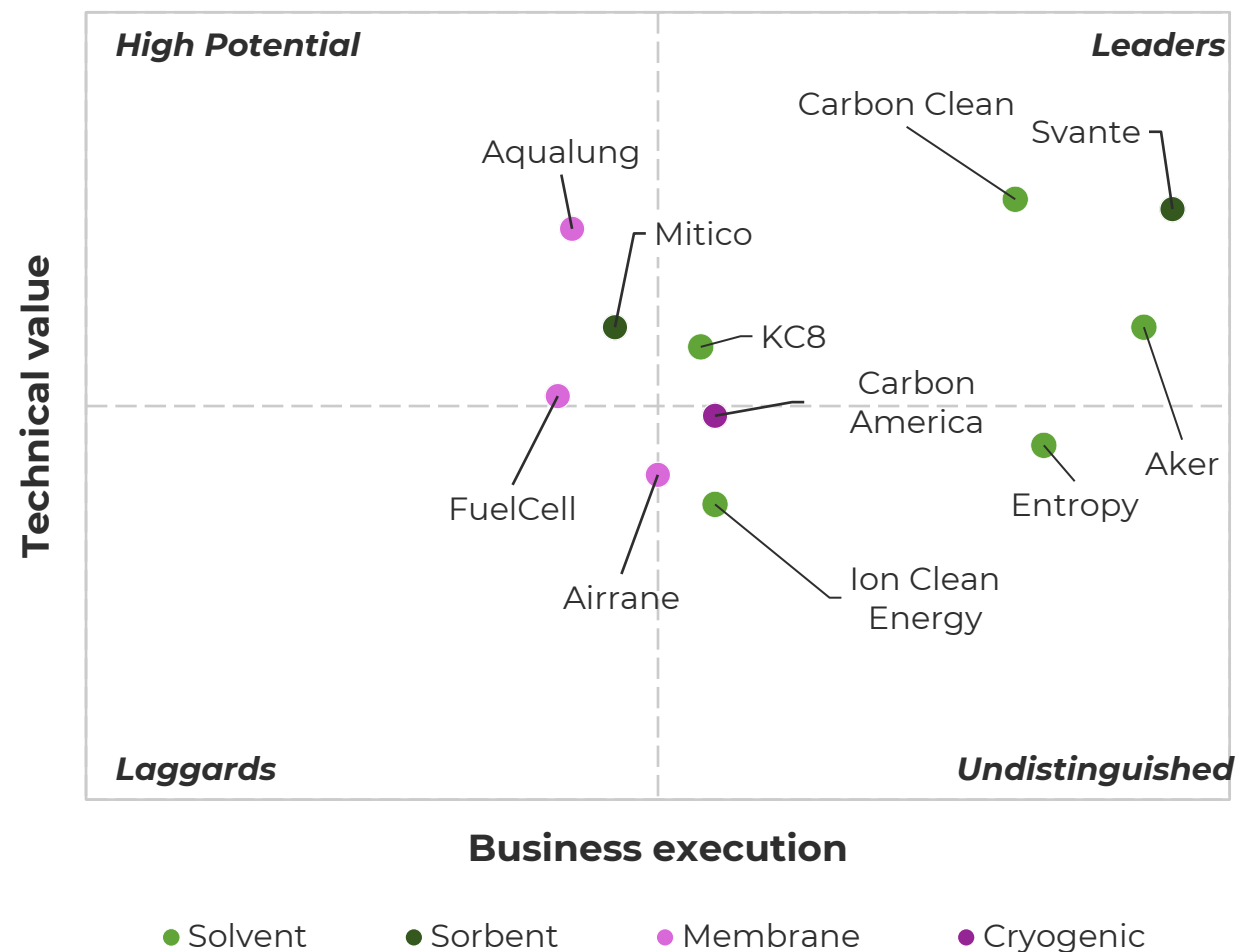
Lux Innovation Grid: Carbon Capture



STARTUPS FOR NATURAL GAS

Filtered to display deployed low-concentration startups

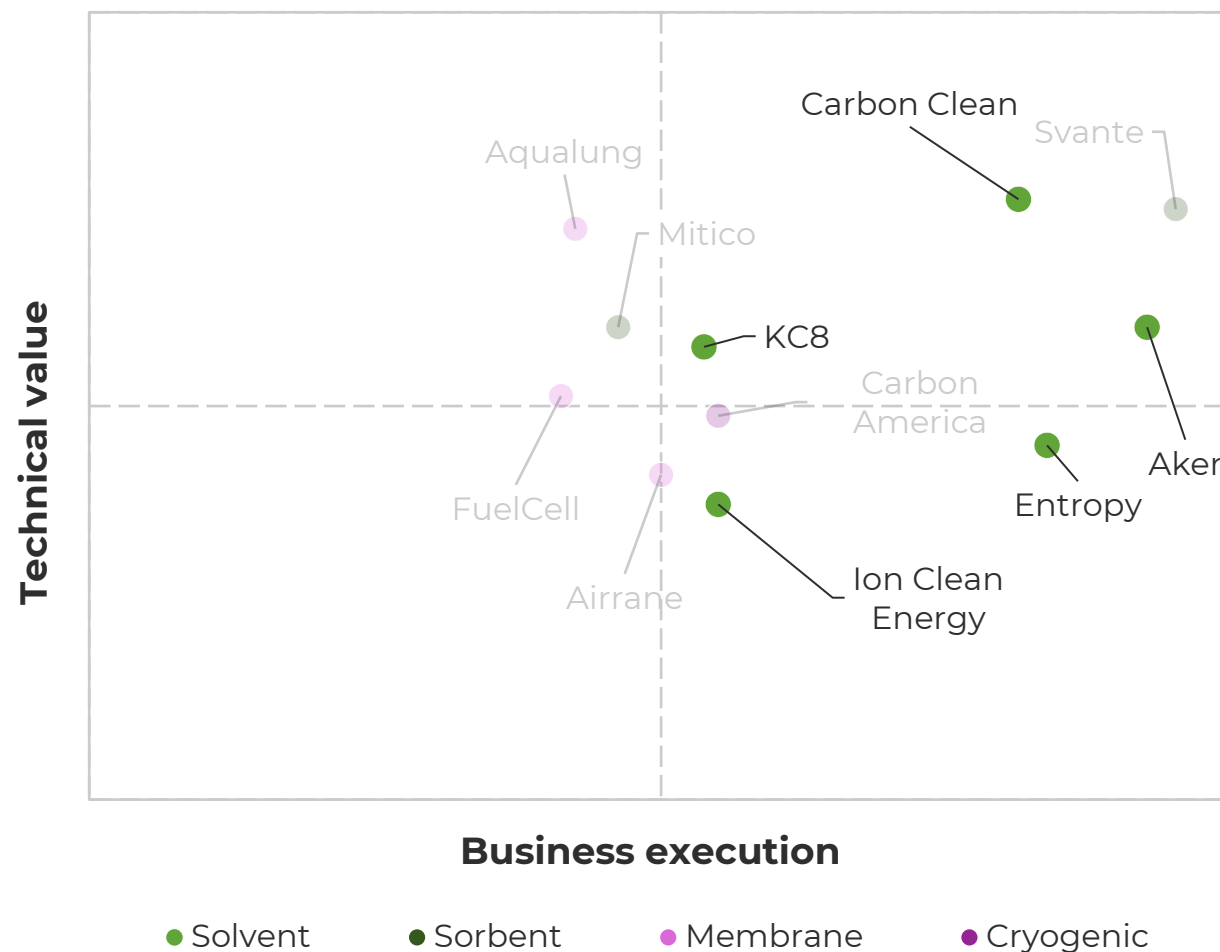
Lux Innovation Grid: Carbon Capture



STARTUPS FOR NATURAL GAS

Solvent providers make up the bulk of deployed startups

Lux Innovation Grid: Carbon Capture



NATURAL GAS CARBON CAPTURE

Incumbent

- High energy consumption
- Corrosiveness
- Stability

Next Generation

- Reduced energy consumption
- Lower impact
- Novel formulations

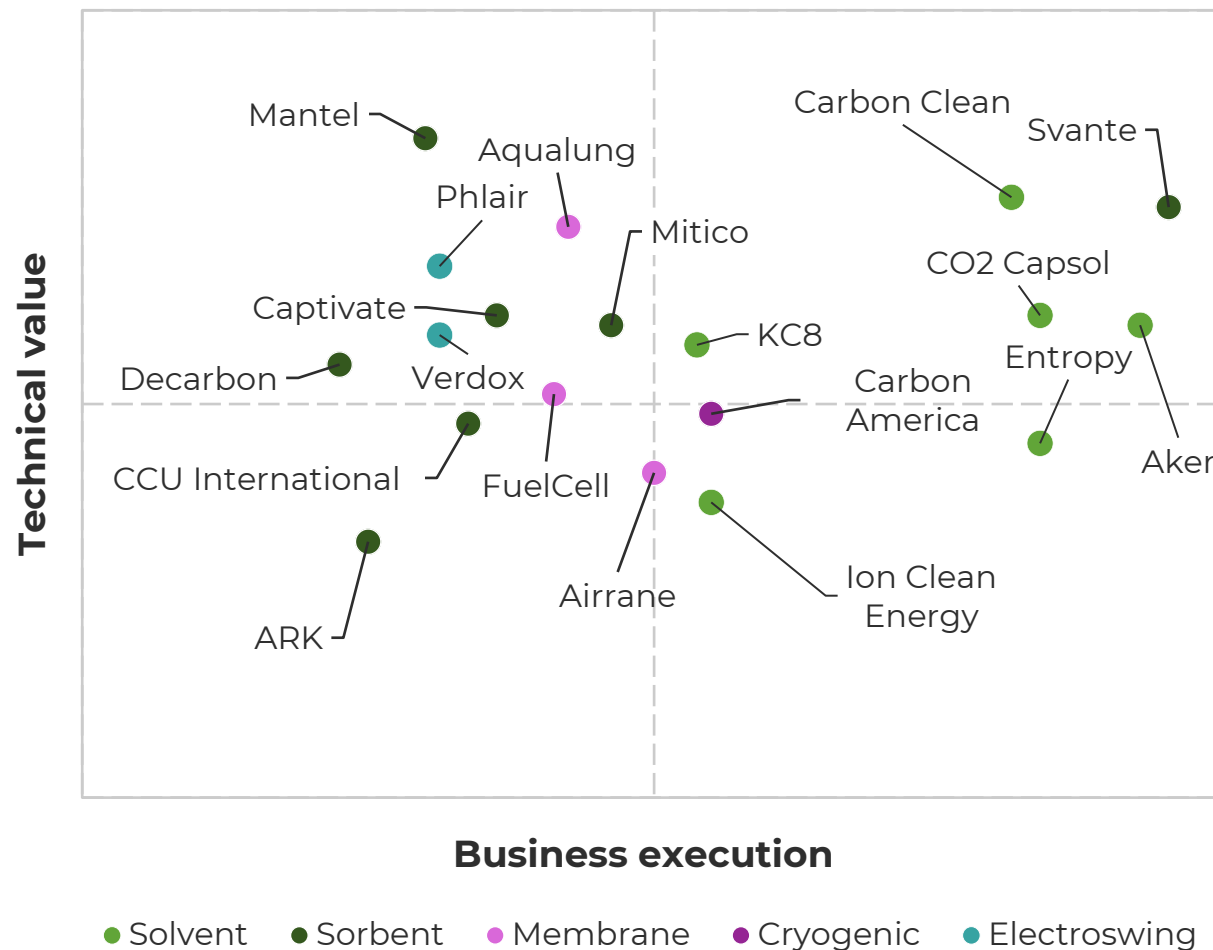
Future



LUX INNOVATION GRID

Filtered to display
claimed and deployed
low-concentration
startups

Lux Innovation Grid: Carbon Capture



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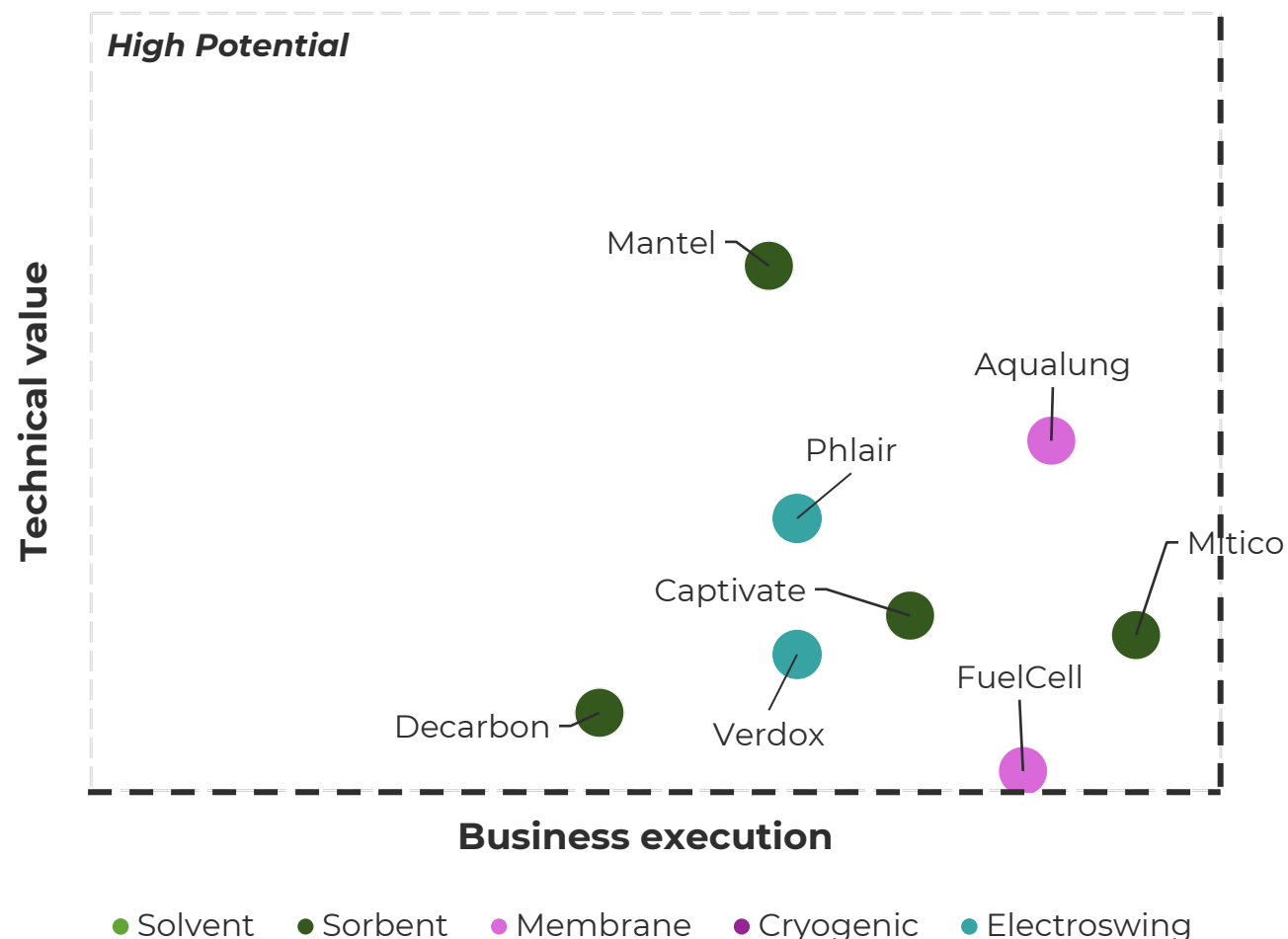
Future

- Fundamental process changes
- Dramatically reduced energy
- Application tailoring

HIGH- POTENTIAL NATURAL GAS

Novel technology
expands past
traditional solvents

Lux Innovation Grid: Carbon Capture



FUNDAMENTAL PROCESS CHANGE



APPLICATION TAILORING



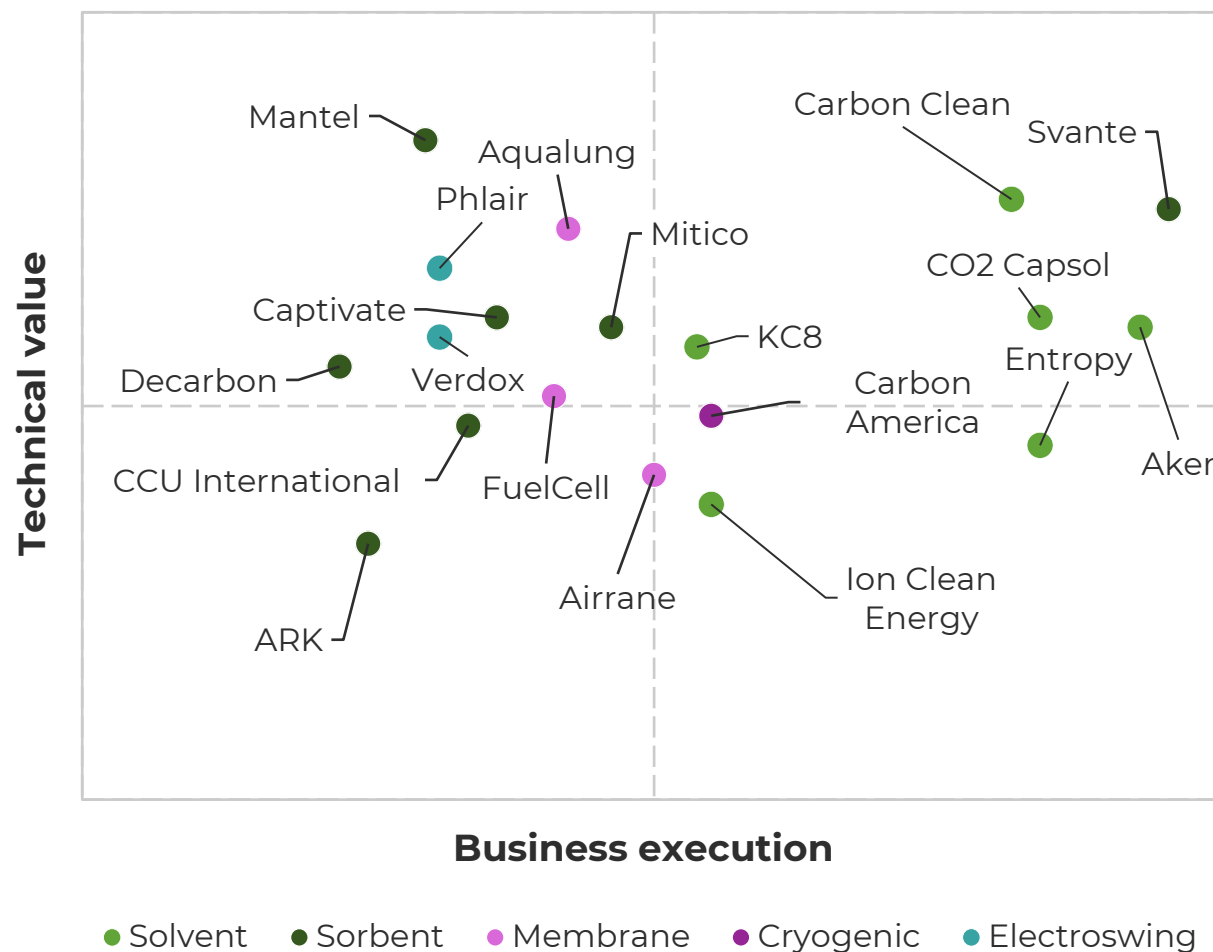
DRAMATICALLY REDUCED ENERGY USE



LUX INNOVATION GRID

Timeline influences
partner selection

Lux Innovation Grid: Carbon Capture



KEY TAKEAWAYS

1

A portfolio of carbon capture technologies addresses low-concentration power sources.

2

Natural gas carbon capture will have relevance outside just data centers.

3

Innovation is not static, and the grid is continually evolving.

LUX CLIENT ACTION ITEMS

1

Assess the entire CCUS value chain when considering NG + CC

Transportation and sequestration infrastructure play a key role in CCUS project success.

2

Enhance the importance of natural gas as a CCUS opportunity

Increase focus on natural gas power deployments, partnerships, and opportunities.

3

Utilize the Innovation Grid and assessments to narrow down partner selection

The grid, and additional research, provides insights to help narrow focus for specific applications, even outside of low concentrations.

4

Continually update your technology strategy

Novel developments bear monitoring, and new or existing companies can add low-concentration deployments expanding the range of potential partners.



THANK YOU



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ABOUT LUX

Our mission is to advise leaders about commercially viable science and technology to enable sustainable innovation. We deliver research and advisory services to inspire, illuminate, and ignite innovative thinking that reshapes and grows businesses. Using quality data derived from primary research, fact-based analysis, and opinions that challenge traditional thinking, our experts focus on finding truly disruptive innovations that are also realistic and make good business sense.

The “Lux Take” is trusted by innovation leaders around the world, many of whom seek our advice directly before placing a bet on a startup or partner — our clients rely on Lux insights to make decisions that generate fantastic business outcomes. We pride ourselves on taking a rigorous, scientific approach to avoid the hype and generate unique perspectives and insights that innovation leaders can’t live without.



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