

# MAXIMIZING HUMAN-CENTRIC INNOVATION:

#### From Insights to Action



Anthony Schiavo Senior Director & Principal Analyst

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### WHAT TO EXPECT

We'll discuss what it means to do Human-Centric Innovation and how it helps innovators overcome today's pressures.

We'll dig into the Lux Innovation Model and demonstrate where in
 the innovation process human-centric approaches have the most impact.

**03** We'll apply these approaches to a key question — data center energy supply — and see how they can lead to better outcomes.

# A NEW ERA OF INNOVATION

- Reduced budgets
- Pressure on profitability
- Cuts to head count
- Shorter timelines
- Changing government incentives
- Venture capital (VC) drying up



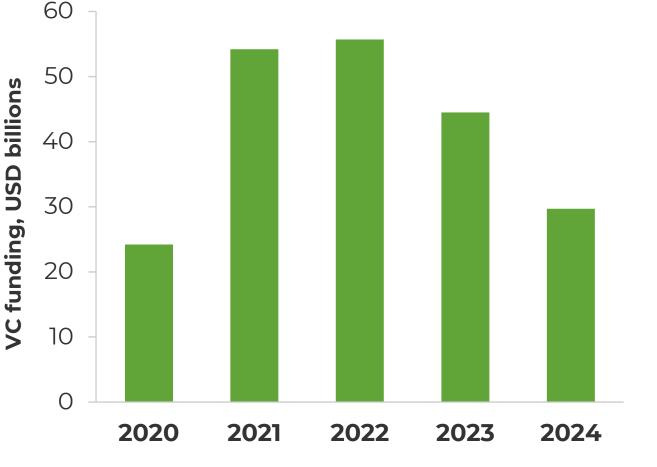
# INNOVATION TEAMS UNDER PRESSURE

#### 31 OCT, 2024

Layoffs surge in US white collar jobs as rates, AI alter office work

ARTIFICIAL INTELLIGENCE • CLEAN TECH AND ENERGY • VENTURE

Cleantech Funding Weakened In 2024 Cleantech VC Funding



# **U.S. RESEARCH FUNDING FACING CUTS**

#### "" "

The Texas Medical Center pumps billions of dollars into our economy ... [the] cuts put that money at risk along with thousands of jobs and critical research....

Christian Menefee, Harris County Attorney



# TRADE WAR THREATS CREATE AN ENVIRONMENT OF UNCERTAINTY



#### Trump's Trade Wars Tip World to Slower Growth, OECD Warns

US Consumer Sentiment Drops, Price Expectations Soar on Tariffs

Trump Loves AI But His Tariffs Ramp Up Costs for Data Centers

# CEOS SHIFT TO GROWTH, AWAY FROM TRANSFORMATION

#### **2024 CEO Priorities Survey:**





Business growth

+26%

Business transformation

8%

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Advanced technology

-8%



Climate and sustainability

-10%



# Innovation teams are under more pressure than ever!

### **3 CHALLENGES**

Innovation teams are being asked to demonstrate results in two years or less. 2

Priorities change quickly, making it difficult to build consensus for innovation.

#### 3

Social and political changes are disrupting existing innovation projects.

### WHAT TO EXPECT

01

We'll discuss what it means to do Human-Centric Innovation and how it helps innovators overcome today's pressures.

We'll dig into the Lux Innovation Model and demonstrate where
 in the innovation process human-centric approaches have the most impact.

**03** We'll apply these approaches to a key question — data center energy supply — and see how they can lead to better outcomes.



# HUMAN-CENTRIC INNOVATION

is a model that combines technical innovation processes with an analysis rooted in understanding human needs, behaviors, and aspirations

# HUMAN FACTORS CAN SINK TECHNICALLY SOUND PROJECTS



March 18, 2025:

#### By-Right Data Centers Eliminated in Loudoun, Existing Applications Grandfathered

#### "

**Community resistance** increased dramatically when in 2023, Dominion **Energy announced it** would need to construct four new overhead transmission lines....

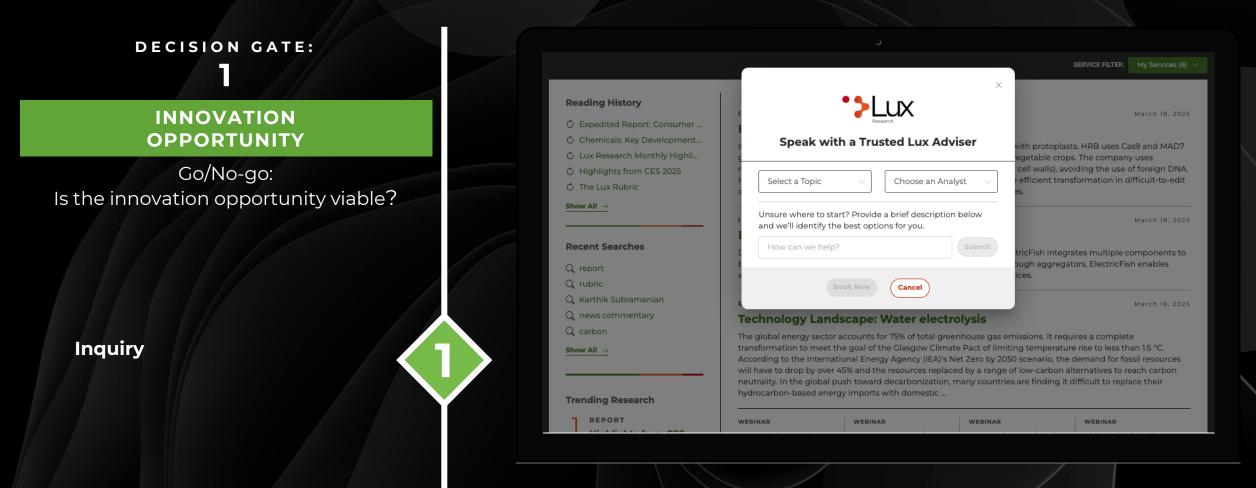
Ashburn Supervisor Mike Turner

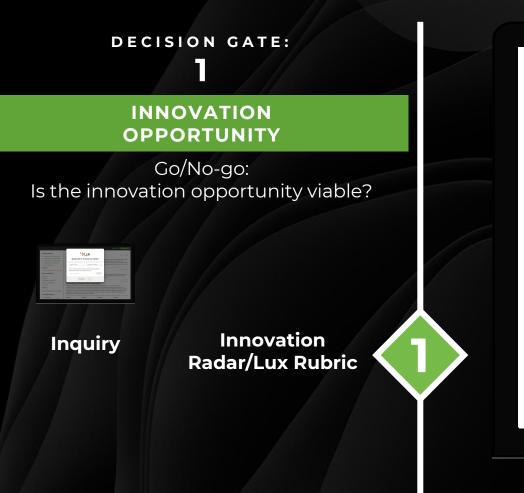




# Innovation challenge: Data center energy







Filter b	y Service    Filter by Priority  Filter by Urgency	u Lux Innovation Rada	ar List	
₹ank	Title	Innovation Prowess <b>()</b>	Market Momentum 🕄	Urgency 🖯
	Water Electrolysis ♡	5	5	-
	Decomposition of water into hydrogen and oxygen gases using electricity			_ 🖍
_	RECENT RESEARCH: Lux Research Monthly Highlights: March 2025			Engage
	Low-Carbon Cement ♡	4	5	
2	Materials and manufacturing innovations that reduce the CO2 emissions of producing			ເລັງ
24	conventional cement or a cement alternative with low CO2 emissions			Engage
24	RECENT RESEARCH: Color me curious: U.S. researchers develop rapid, color-based performance test for SC	Ms		
	Bioplastics ♡	4	5	
3	Plastics, both drop-in equivalents and novel plastics, derived from biobased feedstocks and/or those that are biodegradable			Assess
4	RECENT RESEARCH: Lactips introduces new sealant-grade barrier coating to expand market reach			A35635



Luxer

#### DECISION GATE:

#### INNOVATION OPPORTUNITY

Go/No-go: Is the innovation opportunity viable?

Inquiry	Innovation Radar/Lux Rubric
Luxer	Reports

#### **Research Report**

Fact-based and objective research and analysis engineered to inspire, illuminate, and ignite a client's innovation strategy

#### LAST UPDATED: OCTOBER 18, 2024

#### Expedited Report: Consumer Perceptions of Water Conservation (U.S., Germany, and Japan)

This report examines consumers' beliefs about water conservation in the US, Germany, and Japan, emphasizing the need to protect natural resources from commodification and ensure equitable access. They adopt water-saving habits, support sustainable industries, and adjust g...

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Overview

LEAD ANALYST

CONTRIBUTOR

Ph.D.

Fabian Bauwens,

Matthew Watton Senior Anthropologist

Anthropologist



### THE LUX RUBRIC PRIORITIZES TECH



#### **Lux Innovation Radar**

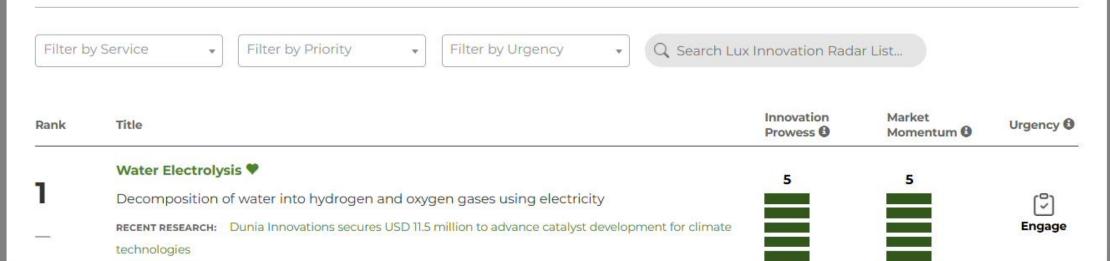
The technologies that will change the world, according to Lux Research's analysts and data scientists.

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#### **Overview**

With thousands of emerging technologies and countless startups, deciding which innovations to pay attention to can be a daunting task. At Lux, we select innovations, based on a proprietary methodology called the Lux Rubric, which we believe will not only have the greatest business value impact but will also help you achieve your corporate sustainability goals. This Lux Technology Innovation Radar provides a list of the top technologies that our analysts are actively tracking — and that innovation leaders should be following to stay ahead of the curve.

#### The Lux Innovation Radar

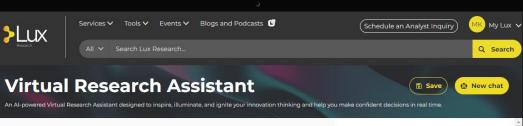


### LUXER

#### **IMMEDIATE ANSWERS**

With sources cited? Absolutely. Luxer points you directly to the Lux research behind every answer.

Never wait days for a written inquiry again!



What is Lux's take on the technology and market readiness of sugar reduction?

#### Technology and Market Readiness of Sugar Reduction

The technology and market readiness of sugar reduction solutions are advancing, driven by consumer demand and regulatory pressures. The landscape includes both first-generation and second-generation technologies. First-generation solutions, such as high-intensity artificial sweetners and sugar alcohols, are already commercially established. However, these often face consumer skepticism due to potential health concerns ±.

Second-generation technologies, including naturally derived alternatives, sweet proteins, physical modifications, and rare monosaccharides, are gaining traction. Sweet proteins, such as brazzein, thaumatin, and monellin, are particularly



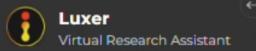
# Associate Research Director

#### **EXPERT GUIDANCE**

Luxer suggests the perfect Lux expert to take your understanding further.

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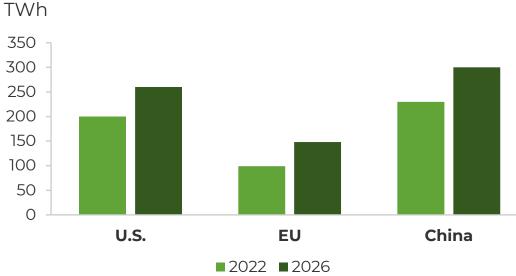
What's the opportunity to power data centers with renewable energy?



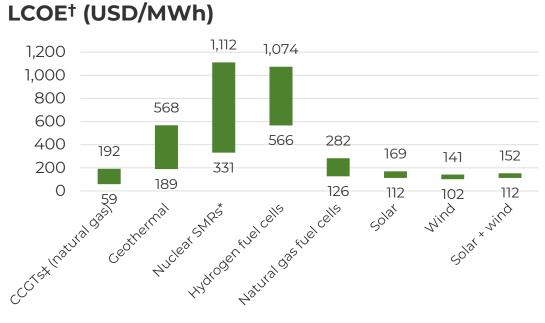
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### REPORTS

#### "The Economics of Low-Carbon Power for Data Centers"



Data center electricity consumption is expected to increase by over 30% in all major regions by 2026, a substantial rise in just a few years (IEA).

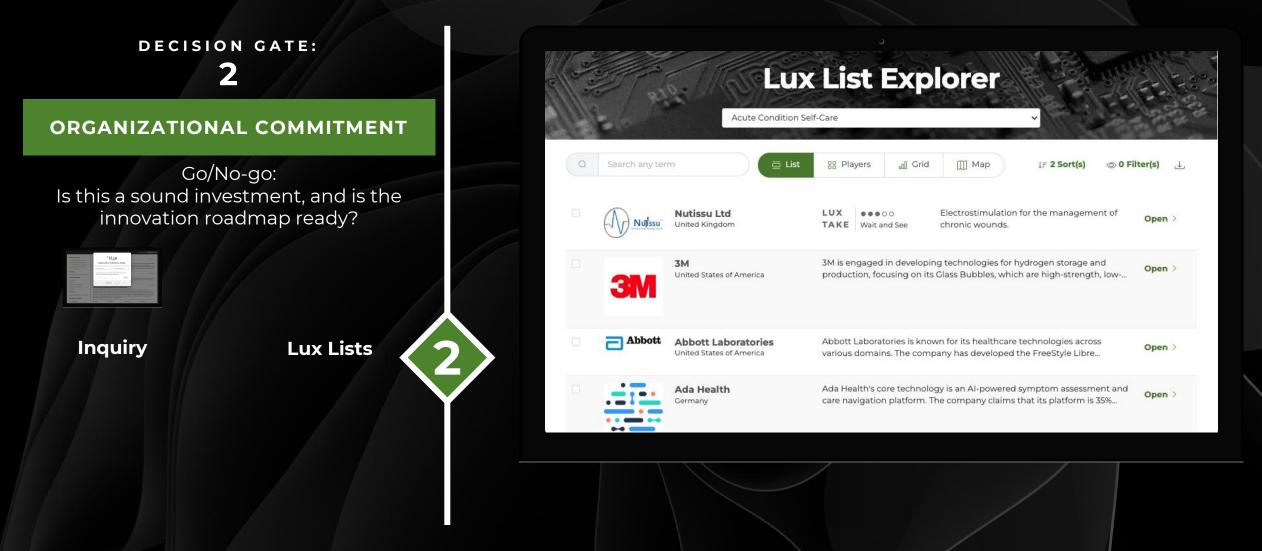


Note: Solar and wind have accompanying Li-ion storage and are reliant on the main grid to satisfy part of the demand.

#### **Data Center Electricity Consumption** TWh



DECISION GATE:	
2	SERVICE FILTER: My Services (6) ~
ORGANIZATIONAL COMMITMENT	Reading History       Image: Consumer and C
Go/No-go: Is this a sound investment, and is the	O       Lux Research Monthly Highli       c       egetable crops. The company uses         O       Highlights from CES 2025       r       cell walls), avoiding the use of foreign DNA.         O       The Lux Rubric       Select a Topic       Choose an Analyst       efficient transformation in difficult-to-edit         Show All →       Show All →       Select a Topic       Select a Topic       Select a Topic
innovation roadmap ready?	Recent Searches     Unsure where to start? Provide a brief description below and we'll identify the best options for you.     March 18, 2025       How can we help?     Submit     tricFish integrates multiple components to up harmenters.
	Q report Q rubric Q Karthik Subramanian Q news commentary Q news commentary Q news commentary
Inquiry	Q carbon       The global energy sector accounts for 75% of total greenhouse gas emissions. It requires a complete transformation to meet the goal of the Glasgow Climate Pact of limiting temperature rise to less than 1.5 °C.         According to the International Energy Agency (IEA)'s Net Zero by 2050 scenario, the demand for fossil resources will have to drop by over 45% and the resources replaced by a range of low-carbon alternatives to reach carbon neutrality. In the global push toward decarbonization, many countries are finding it difficult to replace their by drocarbon-based energy imports with domestic
	Trending Research



DECISIO1		Deep and balanced evaluation	ation of important technology innovators based on primary research, evaluative scorecard based on Lux's trusted methodologies	
ORGANIZATIONA	L COMMITMENT		nsift Innovations	INTERVIEWED BY
Go/No Is this a sound inves innovation road	tment, and is the	Advanced	membranes and membrane distillation systems for industrial zero harge and resource recovery. Image: Image: Imag	Research Associate
		At a Glance Details Score	card Innovation Grid Key Relationships Tech Signal Investment Trend	ds Patent Trends Related Research
Inquiry	Lux Lists		LUX TAKE	
		Lux Take: Positive ①	End-user clients seeking cost-effective water reuse, sludge reduction should partner with Memsift. Its MD technology offers low operation efficiency, with proven scalability. However, investors should proceed yet to establish a strong long-term market strategy.	onal costs and high-water recovery
Innovator Assessments				

	sumer Insights
ORGANIZATIONAL COMMITMENT	
	ions of consumer conversations online to predict the future of culture.
Go/No-go: Is this a sound investment, and is the innovation roadmap ready?	Apply Saved Searches Apply How do I ask a good question?
	onsumers view plastic packaging?" nt Calculate Profiles PDF   PPT   SAVE
to completely abandoning their use.	ver, the convenience and practicality of plastics in everyday life create a significant barrier ner attitudes towards plastic packaging is moderate to fast. This is evidenced by the
Innovator Virtual Assessments Anthropologist	

30

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# ANALYST ENGAGEMENT IS CRUCIAL



Approximately **90%** of Lux analysts have advanced degrees in science, engineering, or business.

Advisory members have unlimited access to analyst conversations.

### ANALYST DISCUSSIONS ARE 1 CLICK AWAY

What's the opportunity to power data centers with renewable energy?

#### Title: Renewable Energy Challenges for Data Centers

Answer: The opportunity to power data centers with renewable energy is fraught with challenges and complexities. Despite the growing demand for sustainable solutions, data centers continue to rely heavily on traditional power sources like natural gas due to their economic advantages and ease of deployment. The lack of emissions caps and the urgency to procure power have led to the continued use of coal and gas generators, which are cheaper and quicker to deploy than renewables such as geothermal or nuclear <u>±</u>.

Regulatory pressures are mounting, with the EU mandating emissions reporting for data centers, and similar regulations are anticipated in the U.S. However, the absence of standard software or reporting mechanisms complicates compliance  $\pm$ . Community opposition also poses a significant barrier, as data centers are often met with resistance due to environmental and resource concerns, including high electricity and water consumption, land use, and noise pollution  $\pm$ .

While hyperscalers like Microsoft, Google, Amazon, and Meta are making strides toward carbon-negative operations, the broader industry remains conservative, hesitant to invest heavily in new technologies like liquid and immersion cooling, which require significant capital and compatible hardware  $\pm$ . The high cost of green hydrogen further limits its potential as a renewable energy source for data centers, with prices needing to drop by 80% to 90% to compete with natural gas turbines  $\pm$ .

In summary, while there is a clear push towards renewable energy in data centers, economic, regulatory, and community challenges, along with technological conservatism, continue to impede rapid adoption.

sk a follow-up question...

Sources

Luxer answers questions based on tens of thousands of proprietary research reports written by Lux analysts, assembling responses using a proprietary generative AI application. It's been tested extensively, but we recommend speaking with a Lux Analyst to confirm key points.

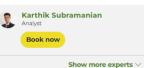
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#### Geothermal





#### Mukunda Kaushik

#### **Analyst Inquiry**

#### () 50 min

Web conferencing details provided upon confirmation.

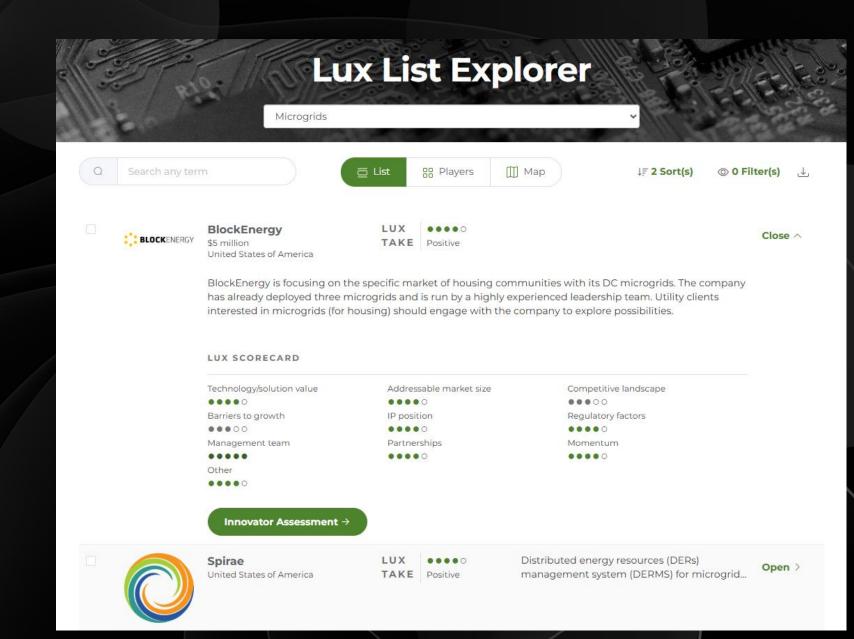
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#### Time zone

🛇 Eastern Time - US & Canada (10:36am) 🔻

# LUX LISTS STREAMLINE INNOVATOR MAPPING



# INNOVATOR ASSESSMENTS

Built from proprietary research

3–5 startup introductions every week

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unde elec tech valid requ	ities clients should note that VEIR's method for cooling s ock additional transmission capacity, a key for the deploy ctrification. However, the company is still in the early stag nology. Thus, interested clients should monitor VEIR's p dating the company's claimed transmission capacity and uires additional partnerships to develop safety and opera jaging with potential customers.	yment of renewables and transition i ges of developing and demonstration partnerships and pilot project demor d cooling system operation. The com

### VIRTUAL ANTHROPOLOGIST

Identifying needs

Validating solutions

**Revelation & evolution** 

#### **Consumer Insights**

Anthropology at scale, using millions of consumer converations online to predict the future of culture.

	How do I ask a good question?	
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Themes, Underlying Symbolism &		
Themes, Underlying Symbolism &		THEME:
	Key Insights ©	

# LUX'S VIRTUAL ANTHROPOLOGIST DIGS IN ON CONCERNS ABOUT DATA CENTERS

#### THEME:

Worries about energy efficiency

UNDERLYING SYMBOLISM:

Desire for sustainable energy solutions

#### KEY INSIGHT:

Consumers express concerns about the energy efficiency of data centers, reflecting a desire for sustainable energy solutions.

"I'm worried about the energy efficiency of these data centers. We need more sustainable energy solutions." THEME:

Worries about energy consumption

UNDERLYING SYMBOLISM:

#### **Environmental impact of data centers**

#### KEY INSIGHT:

Consumers are worried about the huge energy needs of computing and data storage centers, reflecting concerns about the environmental impact of data centers.

"I'm concerned about the huge energy needs of these data centers. It's not just about my data, it's about the environment too."

#### THEME:

#### Datacenter dominance: A cause for concern

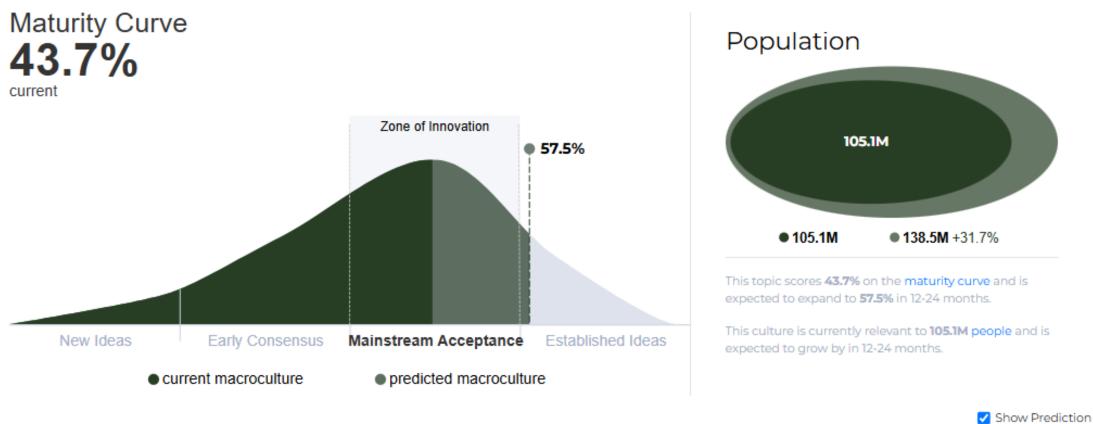
UNDERLYING SYMBOLISM:

Fear of AI monopolizing resources

#### **KEY INSIGHT:**

Consumers are concerned about the increasing dominance of AI in datacenters, fearing it may sideline more urgent priorities like clean energy.

"I'm worried that the focus on AI in datacenters will overshadow the need for clean energy solutions." macroculture: data centers



Our consumer insights platform answer questions based on 270M+ consumer data points, our proprietary library of thousands of manual ethnographies written by Lux anthropologists, and our proprietary anthropology at scale methodology for determining cultural maturity and future states, assembling responses using a proprietary generative AI application. It's been tested extensively, but we recommend speaking with a Lux analyst to confirm key points.



# HUMAN-CENTRIC INNOVATION IS THE ANSWER

Innovation teams are being asked to demonstrate results in two years or less.

Move quicker in the early stage of the innovation funnel. 2

Priorities change quickly, making it difficult to build consensus for innovation.

Quickly validate hypothesis and build cases for innovation.

#### 3

Social and political changes are disrupting existing innovation projects.

Dig deep into culture and meaning to understand risks.

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Ashburn Supervisor Mike Turner





# HUMAN-CENTRIC INNOVATION POINTS US TO NOVEL TECHNOLOGIES



#### Claims 5× transmission capacity

#### THEME:

Worries about energy consumption

UNDERLYING SYMBOLISM:

**Environmental impact of data centers** 

#### KEY INSIGHT:

Consumers are worried about the huge energy needs of computing and data storage centers, reflecting concerns about the environmental impact of data centers.

"I'm concerned about the huge energy needs of these data centers. It's not just about my data, it's about the environment too."

### **KEY TAKEAWAYS**

#### 2

#### Human-centric innovation is key for innovation teams, even in B2B industries.

Humans are behind all the key decisions customers and colleagues are making, and approaches that keep humans at the center are vital for successful innovation. Innovation teams are being challenged to adopt new skills and capabilities quickly.

Science and economics are no longer enough; convincing a skeptical public and navigating a fraught political environment require new skills.

#### 3

Innovation fails most often for human reasons, not technical ones.

Building consensus for innovation requires more than data — it needs a compelling narrative that makes it clear how innovation aligns with corporate priorities.



# THANK YOU

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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.

