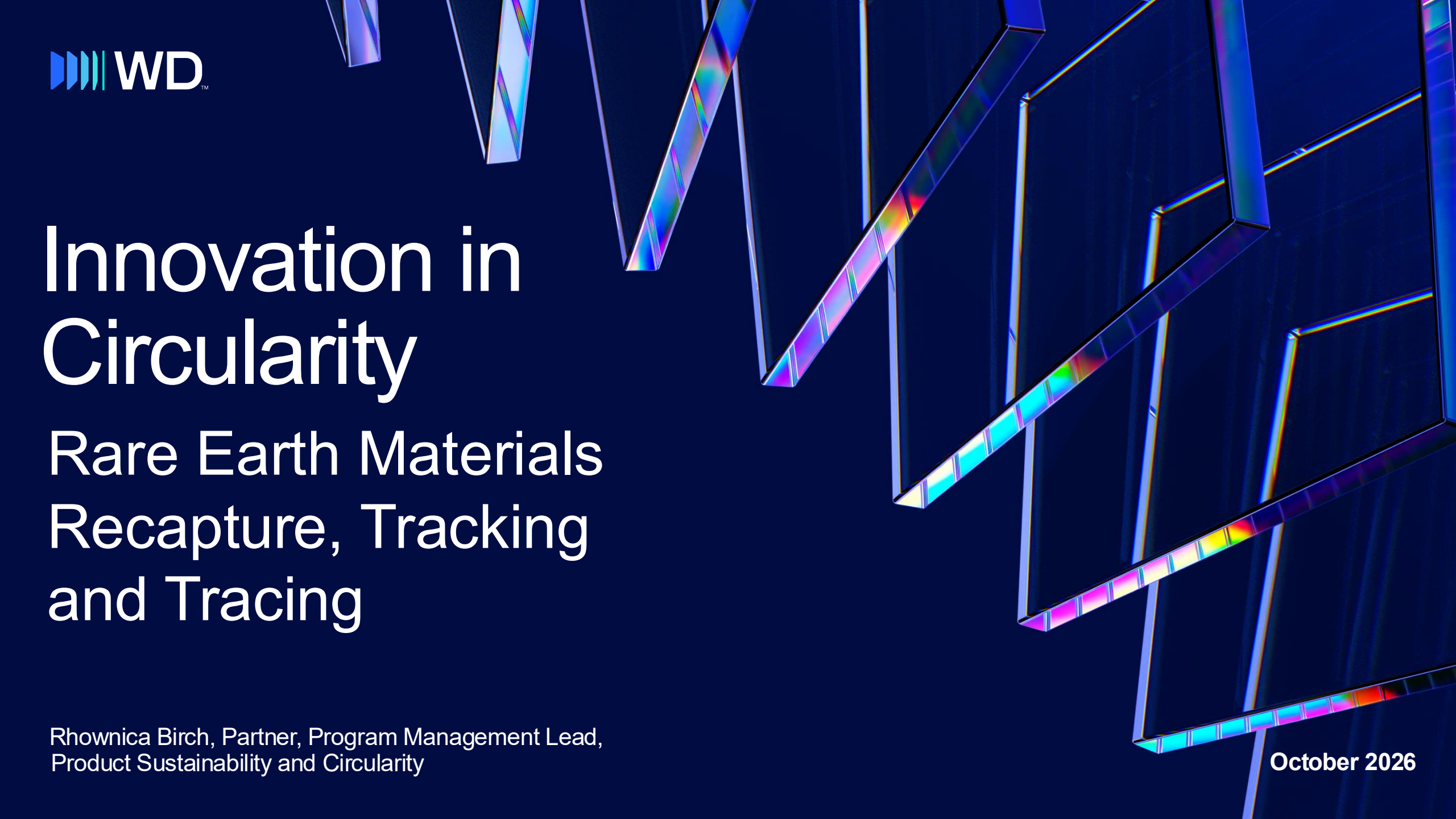

Innovation in Circularity

Rare Earth Materials Recapture, Tracking and Tracing

Rhownica Birch, Partner, Program Management Lead,
Product Sustainability and Circularity

October 2026

About Western Digital

Since our founding in 1970, WD has been dedicated to innovation. We have been and remain on the forefront of storage technology.

WD provides **scalable, sustainable technology** for the world's enterprises and cloud providers, and deliver **cutting-edge innovation** that is driving the next generation of AI-driven data workloads and storage.



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WD's Sustainability Vision for 2030

Lead in Sustainable Data Storage



Embrace & embed
sustainability in all decision-making



Minimize
our environmental footprint



Act sustainably & inclusively,
empower our stakeholders, influence our ecosystem

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Leadership Recognition 2025-2026

















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WD Recognized for Industry Innovation of Recovering Rare Earth Materials

Information Technology Industry Council (ITI)
Sustainability Steward Award



Inc. Magazine
Best Collaboration Award



Future of Memory & Storage
Most Innovative Sustainability Technology for Our Rare Earth Recapture Program



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Circularity drives Innovation



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Circularity Drives Innovation

WD actively engineers a future where the materials that power the HDD digital world can be recovered, reused, and reintroduced into WD's supply chain.

The most meaningful innovations are the ones that drive both performance and purpose:



Supply chain resilience



Less environmental impact



Resource conservation

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Circularity Is a Business Imperative

Humanity consumes around 70% more resources than the Earth can regenerate each year.

+75%

of surveyed companies believe **Circularity** is key to their business model **today**

+95%

expect **Circularity** will be key to their business model in **3 years**

Yet, only

20%

have successfully built circular supply chains at scale

[1] Earth Overshoot Day

[2] "Circular transformation of industries: The Art of Scaling Circular Supply Chains" World Economic Forum

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Why Rare Earths Matter

Impact across industries



Hard Disk Drives (HDDs) in Data Centers

~1K

metric tons per year based on ~80 million HDDs



Wind Power

42K+

metric tons per year



Automotive

>48K

metric tons per year



Robotics

10X

increase in rare earth demand projected by 2040

[3] Market Forecast: IDC Global DataSphere Forecast, 2026–2030

[4] Global Wind Energy Council Forecast 2027

[5] "Electric Vehicle Sales Headed for Record Year but Growth Slowdown Puts Climate Targets at Risk" Bloomberg NEF

[6] "Emerging magnetic materials for electric vehicle drive motors." MRS Bulletin

[7] "New report: Rare Earth Magnet Market Outlook to 2040." Adamas Intelligence

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Sustainability & Business Resiliency at Scale

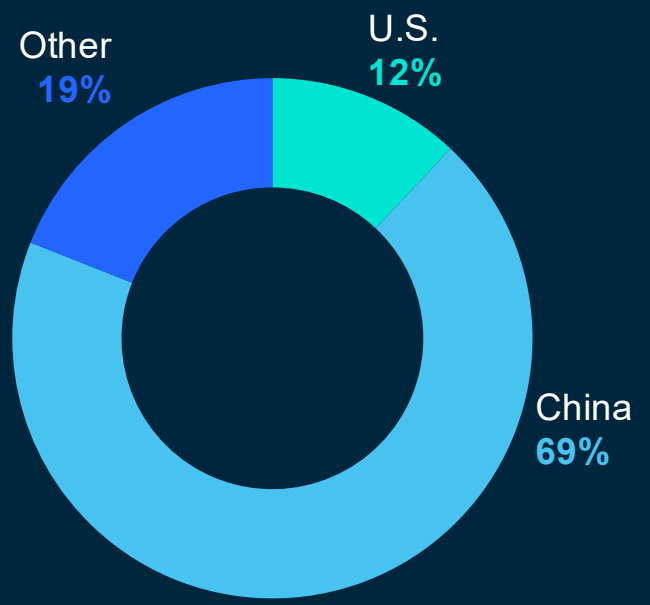
Sustainability

20-70M

pounds of HDDs are shredded per year in the U.S. with almost zero rare earths recovered

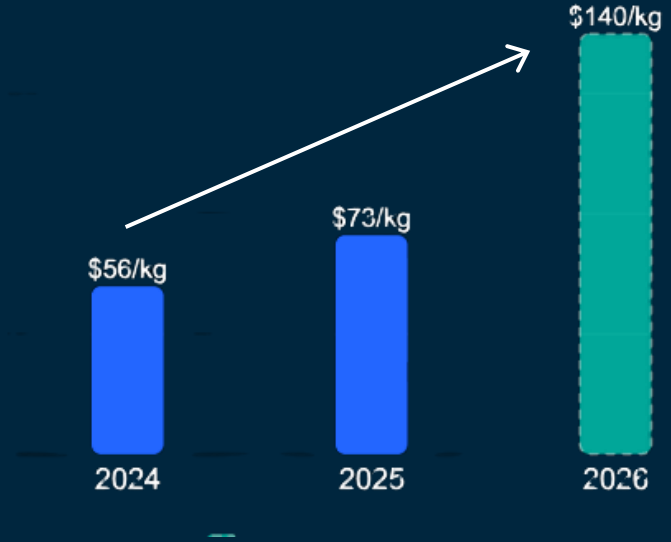
Resiliency

Global Virgin Mining Market



Profitability

Rare Earth (*Nd) Cost ($ per kg)



[8] "In a Circular Economy, Hard Drives Could Have Multiple Live in the Future" National Laboratory of the Roackies

[9] "Rare Earth Magnets 2027-2037: Technologies, Supply, Markets, Forecasts" IDTech

[10] "Mineral Commodity Summaries Price Table" USGS
[11] "Neodymium Oxide Prices, Trend, Chart, Demand, Market Analysis, News, Historical and Forecast Data Report 2026 Edition" imarc

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HDD Components to Shred

Rare Earth HDD Location



End-of-life shredded HDD



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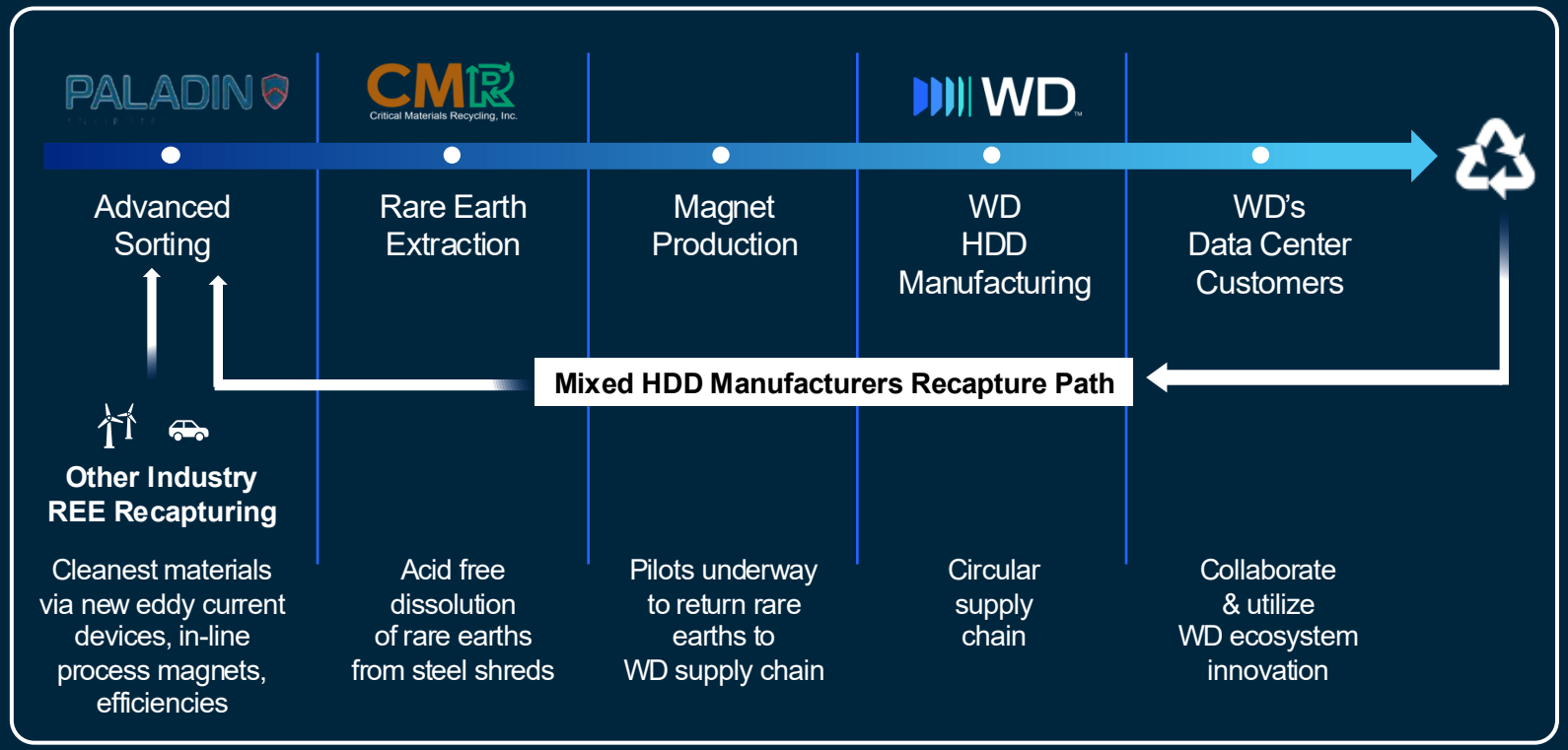
Circular Advanced Recovery Ecosystem

Leading Innovation

- Created end-of-life solutions for customers
- Connected partners
- Pioneered design of experiments, data validation, process optimization to mass production
- Increased economic and sustainability value



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Sustainability Innovation - Results

	As Usual Process	Western Digital-Led Innovation Process – Phase 2
Process	**Basic Recycling**	**Advanced Recapture**
Recycling capture rate	**60-70%**	**90%**
Rare earth element capture rate	**0%**	**91%**
Rare earth element destination	**Melted down with steel**	**Return to US Supply / WD Magnet Supplier**
Additional Benefit		**Carbon Footprint / Handprint, Global Visibility, Circularity**

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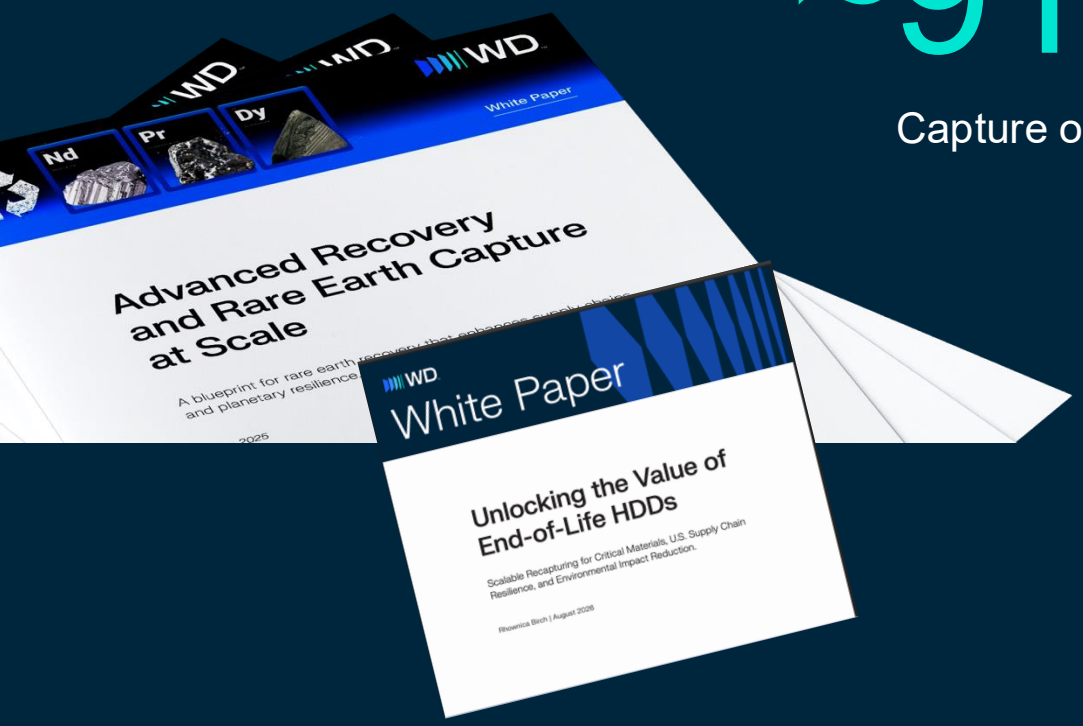
Powering a Sustainable Future with HDD Recovery

Rare earth capture at scale in the U.S.



~91%

Capture of rare materials

~90%

Feedstock recovered for reuse

~95%

Reduction in greenhouse gas emissions compared to mining

Third White Paper with Data Center Customer–
HDD Rare Earth Recapture: Circularity, Closing the Loop Coming Soon….

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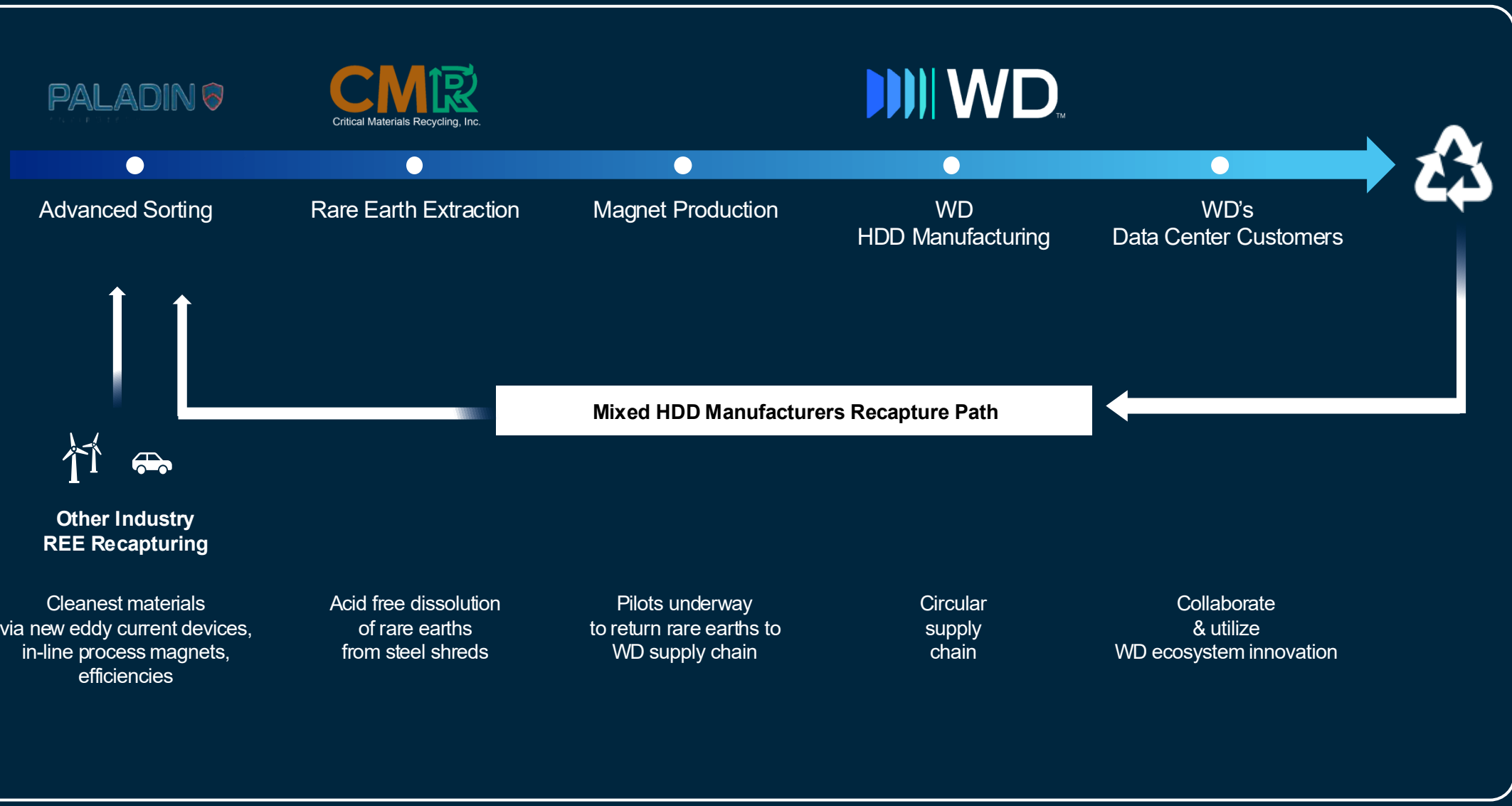
Circular Advanced Recovery Ecosystem



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Rare Earth Traceability Platform: Steps

Steps to developing first-of-kind tracing platform



1) Cambridge IfM Engage: Global Circularity Experts

Ideation, Development, Regulations, Policy, Competitive Analysis Define Methodology E2E Platform



2) UL Certification: Audit and Paper based Authentication

Assurance and Certification Experts

Authentication, Systems Classic pre-Assurance / Assurance & Sustainability/software Assurance/Automation, COO, Carbon Accounting



3) Sluicebox.AI Platform Developer: Carbon and Supplier Based Platform Experts

Digital Passport / Platform Database, Carbon / LCA and Supplier Interface with Anti- tamper traceability



4) Materialytics: Science Based Authentication Experts

Virgin and recaptured RE origin identification: Analytical Tool for Science based verification and data collection

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Rare Earth Traceability Platform: Timeline

Output: First-of-kind rare earth and carbon impact tracing digital passport



Sandbox Dec 2026 | **Soft Launch March 2027** | **Final Platform June 2027**

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WD Key Success Factors

Making sustainability transformation happen

- Commitment to Environmental Stewardship
- Continuously Innovate to Unlock New Solutions for Customers
- Lead the Charge & Unite Key Partners and Ecosystems



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Learn More

Discover more about WD's sustainability work

Check out our white papers:

1) *Advanced Recovery and Rare Earth Capture at Scale*
2) *Unlocking the Value of End-of-Life HDDs*
3) *White Paper 3: December 2026*

Peruse our **FY2025 Annual Sustainability Report**



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Links to Public Releases

2026 White Paper

https://documents.westerndigital.com/content/dam/doc-library/en_us/assets/public/western-digital/collateral/white-paper/white-paper-unlocking-the-value-of-end-of-life-hdds.pdf

2025 Press Release, Blog, and White Paper

https://www.westerndigital.com/company/newsroom/press-releases/2025/2025-04-17-at-scale-hard-disk-drive-rare-earth-material-capture-program-launched

https://blog.westerndigital.com/giving-hdd-rare-earth-elements-new-life/

https://documents.westerndigital.com/content/dam/doc-library/en_us/assets/public/western-digital/collateral/white-paper/white-paper-advanced-recycling-and-rare-earth-recovery-at-scale.pdf

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[2] Source: World Economic Forum. (2025). *Circular transformation of industries: The art of scaling circular supply chains*. World Economic Forum. (www3.weforum.org)

Why Rare Earth Matters

[3] Wright, A. "Market Forecast: IDC Global DataSphere Forecast, 2026–2030," IDC, June 2026. [Online].

[4] Source: Based on GWEC's (Global Wind Energy Council) forecast

[5] Source: BloombergNEF. "Electric Vehicle Sales Headed for Record Year but Growth Slowdown Puts Climate Targets at Risk, According to BloombergNEF Report." June 12, 2024.

[6] Rom, Christopher L., Rebecca W. Smaha, Shaun O'Donnell, Sita Dugu, and Sage R. Bauers. "Emerging magnetic materials for electric vehicle drive motors." *MRS Bulletin* (2024). (link.springer.com)

[7] Source: Adamas Intelligence. (2024). *New report: Rare Earth Magnet Market Outlook to 2040*. Adamas Intelligence. https://www.adamasintel.com/new-report-rare-earth-magnet-market-outlook-to-2040/ (adamasintel.com)

Sustainability & Business Resiliency at Scale

[8] Source: "Currently, 20 to 70 million HDDs reach the end of their lives every year in the United States. Most are collected from data centers and shredded, which limits the material recovery." https://www.nlr.gov/news/detail/program/2021/in-a-circular-economy-hard-drives-could-have-multiple-lives-in-the-future ; Dec. 13, 2021 National Laboratory of the Rockies

[9] Resiliency: China 69% US 12% and Others 19%

https://www.idtechex.com/en/research-report/rare-earth-magnets/1176

[10] USGS Mineral Commodity Summaries price table, quoted in USD/kg. In that series: 2024 = $56/kg and 2025 = $73/kg. (pubs.usgs.gov);

[11] Northeast Asia neodymium oxide at $145.05/kg in September 2026, (imarcgroup.com)

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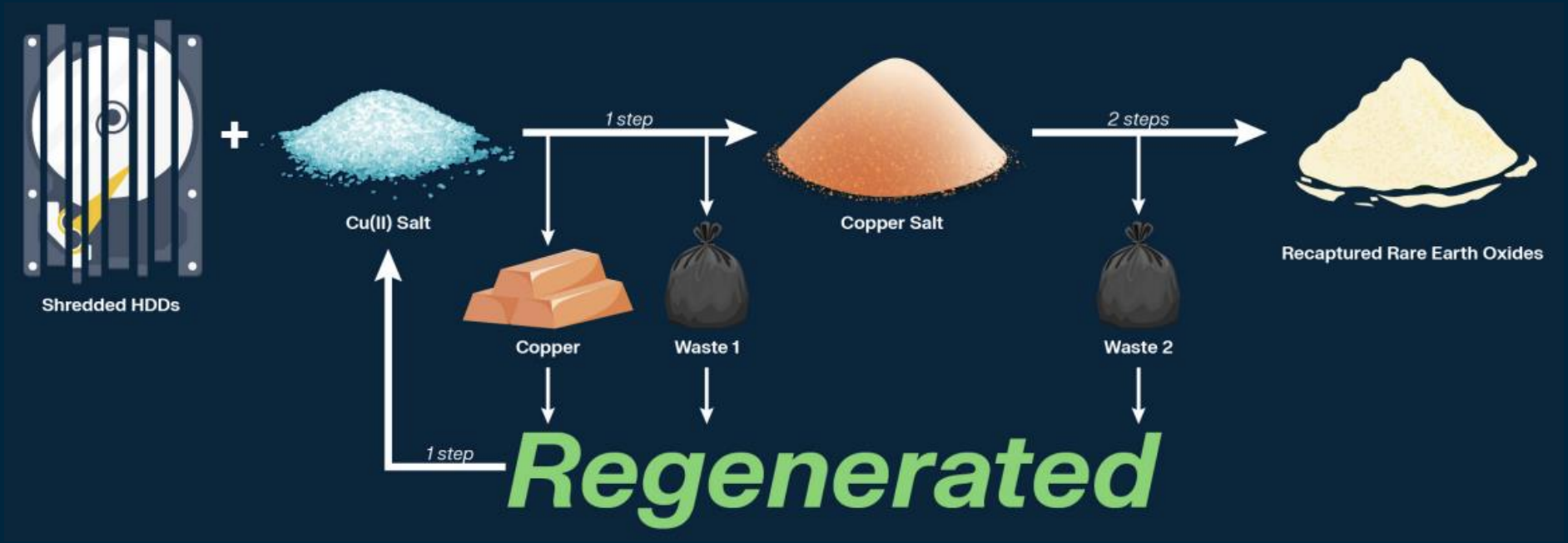
Low-Impact Rare Earth Capture Process

Acid-free dissolution recovery (ADR)



- ADR recovers >90% of REEs from an HDD shredded feedstock to produce a >99.5% pure REO
- Much lower potential human health impacts, benefit to workers and the broader community
- Benefits driven by selective leaching and avoidance of high concentration of strong acids and high-temperature / pressure techniques

Source: E. Sanchez Moran, D. Prodius, I. C. Nlebedim, and M. Mba Wright, "Rare-Earth Elements Recovery from Electronic Waste: Techno-Economic and Life Cycle Analysis," ACS Sustain. Chem. Eng., Sep. 2024, doi: 10.1021

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