HDD Storage in the Zettabyte Era

Paul Peck
Office of the HDD CTO, Western Digital

March 14, 2022
HDD Data Storage in the Zettabyte Era
Creating the Data-Driven Economy

Data Generation is Growing Exponentially

And Only ~4% is Stored
“Opportunity” if Value Can be Extracted

Storage Density Continues to Grow

ASRC Roadmap – WDC Proposal

- **PMR⁺**: Perpendicular Magnetic Recording with TDMR and with and without SMR
- **ePMR**: Energy-Assisted PMR MAMR or MAMR-related with TDMR and with and without SMR
- **HAMR**: Heat-Assisted Magnetic Recording with and without TDMR and SMR
- **HAMR⁺**: Ordered Granular Heat-Assisted Magnetic Recording with and without TDMR and SMR

Energy Assisted Recording is already here
Transition to Heat-Assisted recording is underway
Recognizing How the Dynamic Has Changed
Need to Match the Curve of Data Creation

How Data is Accessed Today

- Hot, fast, use-it-every-second
- Almost all other access
- Write once and hardly ever (or never) access

Each End Market is Different

- Client & Consumer
- Cloud
Technology Plan to Address the Evolution

Phase 1: Data Diversification
- Warm Tier emerges

Phase 2: Cold Tier Expansion
- TCO optimized storage

Phase 3: Accelerated ZB Growth
- 3X growth 2026 - 2030

HDD TAM (in ZB)
- 2020: 1.0
- 2021: 1.2
- 2022: 1.4
- 2023: 1.6
- 2024: 1.8
- 2025: *
- 2026: *
- 2027: *
- 2028: *
- 2029: *
- 2030: *

Source: IDC Market Analysis May 2020 (CY19-CY24), US46255120; *WDC View: 30% CAGR (CY25-CY30)
Thank You

Questions?