



# Tape Technology Update

*March 9<sup>th</sup>, 2026, Presented at Designing Storage Architecture Conference at The Library of Congress*

**Rich Gadomski, Director of Channel Sales, New Business Development**

[rgadomski@fujifilm.com](mailto:rgadomski@fujifilm.com), 862-268-0438

FUJIFILM North America Corp., Data Storage Solutions

# Agenda

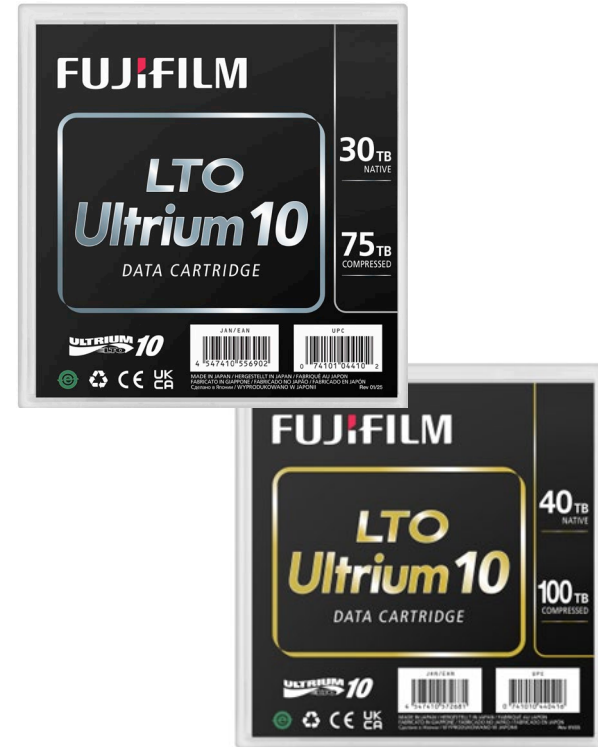
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1. LTO-10 Update
2. Tape Capacity Roadmap
3. TCO Advantage/Energy Advantage
4. Long Term Outlook



# LTO-10 Update

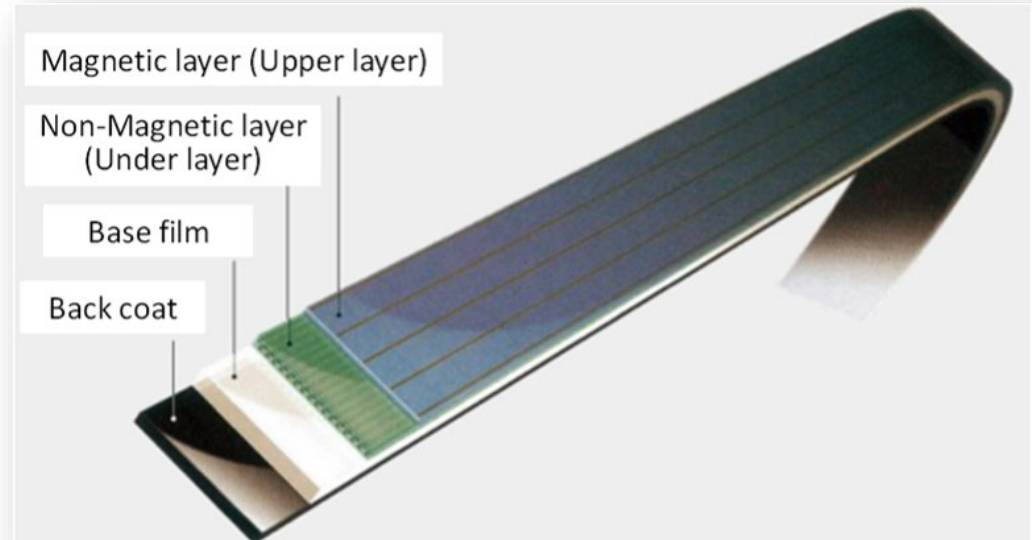
1. 30 TB native, 75 TB compressed (June, 2025)
2. 40 TB native, 100 TB compressed (Nov. 2025)
3. 400 MB/sec transfer rate for FH tape drives
4. Interfaces: 32 Gb/s Fibre Channel and 12Gb/s SAS
5. New advanced read/write head improves tape dimensional stability and eliminates the need for pre-formatting/initialization/optimization (as w/LTO-9).
6. Not backwards read/write compatible with previous generations
7. Media partitioning and self-describing tape
8. Hardware based encryption using quantum safe AES/GCM256
9. Open Recommended Access Order (oRAO)
10. WORM cartridge available in 30 TB



# Tape Technology - Base Film

## PET vs. Aramid Base Film

- **PET** base film has been used in LTO-9, LTO-10 30 TB
- **Aramid** base film will be used with LTO-10 40 TB and is more stable than PET base film against environmental factors (temperature and humidity)
- **Aramid** also thinner/stronger than PET, allowing 1,337 M tape length vs 1,035 in 30 TB.



# LTO-10 Hybrid Magnetic Particle

- Combines BaFe with SrFe
- Greater areal density
- Improved archival life



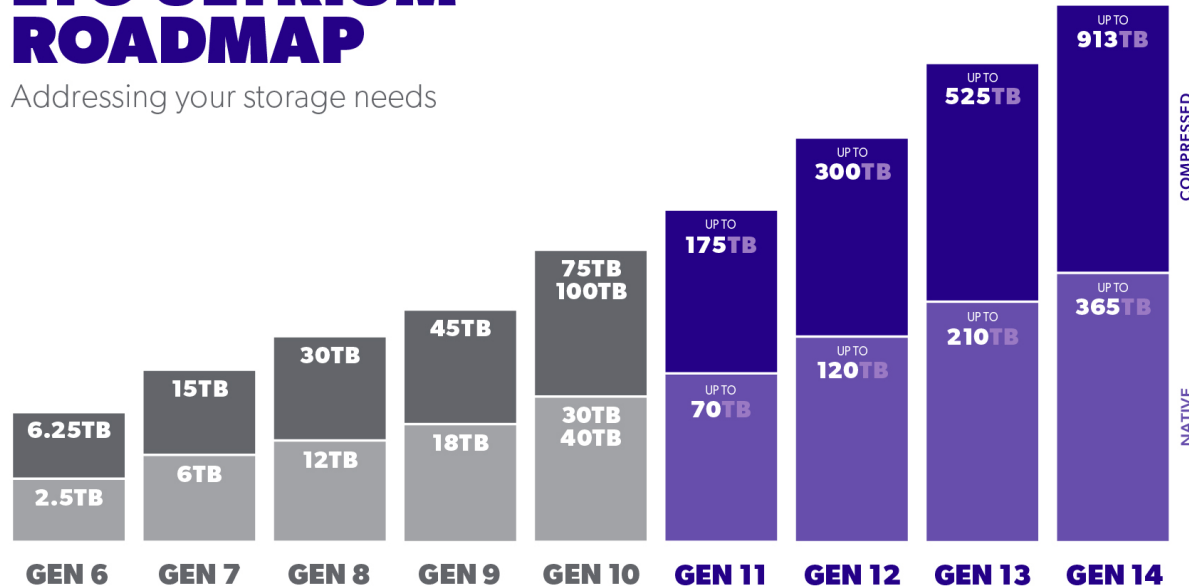
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# Updated LTO Roadmap – as of Oct. 2025

## LTO ULTRIUM ROADMAP

Addressing your storage needs



**NOTE:** Compressed capacities assume 2.5:1 compression (achieved with larger compression history buffer).

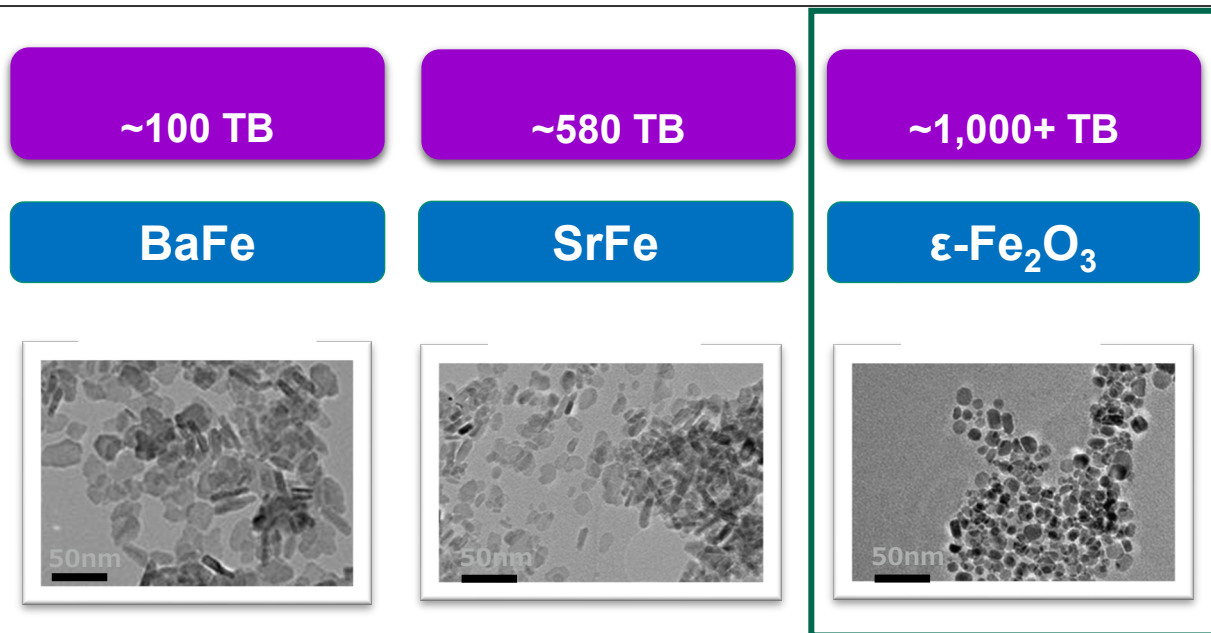
**SOURCE:** The LTO Program. The LTO Ultrium roadmap is subject to change without notice and represents goals and objectives only. Linear Tape-Open LTO, the LTO logo, Ultrium and the Ultrium logo are registered trademarks of HPE, International Business Machines Corporation and Quantum Corporation in the US and other countries. Please contact your supplier/manufacturer for more information.



HPE, International Business Machines Corporation and Quantum Corporation collaborate and support technology specifications, licensing, and promotions of LTO Ultrium products.

PARTITIONING ENABLED LTFS | ENCRYPTION | WORM

# Beyond BaFe and SrFe: Epsilon Ferrite



- **Epsilon Ferrite** enabled by Focused Millimeter Wave-Assisted Magnetic Recording (**F-MIMR**)\*

\* The present research was supported in part by the “Advanced Research Program for Energy and Environmental Technologies / Development of a millimeter wave assisted magnetic recording method for magnetic tapes” project (Ohkoshi Laboratory, **The University of Tokyo** / Nakajima Laboratory, **Osaka University** / Recording Media Research Laboratories, **FUJIFILM Corporation**) commissioned by NEDO of METI. <https://www.chem.s.u-tokyo.ac.jp/~ssphys/english/research.html>, Oct. 2020

# TCO Advantage for Tape

## Enterprise Data Storage TCO Analysis Tool

### Estimate the Savings of Using a Tape-Based System

This tool assesses the Total Cost of Ownership of Tape archive compared to disk and cloud-based archiving.

### Analysis of Results

This page displays 5-year and 10-year TCO estimates. It displays TCO by cost type and by year.

All Currencies are in US Dollars

### TCO Summary

TCO summary for both 5-year and 10-year scenarios. Tape savings is typically greater over 10 years because not all tape components need to be replaced within the 10 year period (tape library life-cycle is typically 10 or more years). Disks are typically replaced every 5 years. Cloud storage has annual on-going costs.

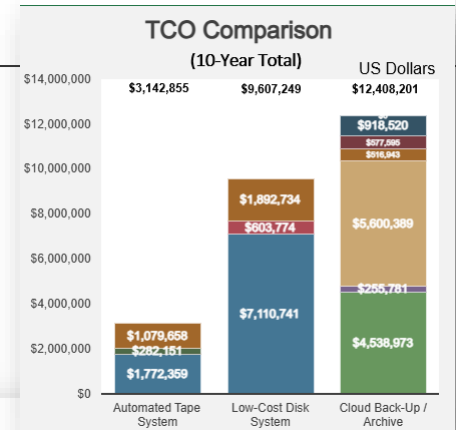
|                     | Tape                  | Disk                 | Cloud             |
|---------------------|-----------------------|----------------------|-------------------|
|                     | Automated Tape System | Low-Cost Disk System | Back-Up / Archive |
| 5 Year TCO          | \$1,604,311           | \$3,362,099          | \$3,606,905       |
| 10 Year TCO         | \$3,142,855           | \$9,607,249          | \$12,408,201      |
| 10 Year Tons of CO2 | 27                    | 1,844                |                   |

- 20 PB starting, 30% annual growth
- TCO 68% less than HDD, 75% less than Cloud
- 98.5% less CO2e
- 98.5% lower energy costs

### TCO Summary by Cost Component

Total costs by cost category.

| Cost Component                       | 5 Year TCO            |                      |                         | 10 Year TCO           |                      |                         |
|--------------------------------------|-----------------------|----------------------|-------------------------|-----------------------|----------------------|-------------------------|
|                                      | Automated Tape System | Low-Cost Disk System | Cloud Back-Up / Archive | Automated Tape System | Low-Cost Disk System | Cloud Back-Up / Archive |
| Acquisition, including warranty      | \$1,078,208           | \$2,509,294          |                         | \$1,772,359           | \$7,110,741          |                         |
| Energy Costs                         | \$4,767               | \$202,346            |                         | \$8,687               | \$603,774            |                         |
| Maintenance Costs                    | \$150,299             |                      |                         | \$282,151             |                      |                         |
| Offsite Vaulting Costs               | \$0                   |                      |                         | \$0                   |                      |                         |
| Provider Storage Service Fees        |                       |                      | \$1,562,795             |                       |                      | \$4,538,973             |
| Provider Data Retrieval Service Fees |                       |                      | \$54,272                |                       |                      | \$255,781               |
| Provider Data Transfer Service Fees  |                       |                      | \$1,319,969             |                       |                      | \$5,600,389             |
| Storage Management                   | \$371,037             | \$650,459            | \$177,653               | \$1,079,658           | \$1,892,734          | \$516,943               |
| Provider Support                     |                       |                      | \$223,593               |                       |                      | \$577,595               |
| Bandwidth                            |                       |                      | \$268,623               |                       |                      | \$918,520               |
| Initial Load                         |                       |                      | \$0                     |                       |                      | \$0                     |
| <b>Total</b>                         | <b>\$1,604,311</b>    | <b>\$3,362,099</b>   | <b>\$3,606,905</b>      | <b>\$3,142,855</b>    | <b>\$9,607,249</b>   | <b>\$12,408,201</b>     |



## Shipped LTO Capacity is Increasing

The tape market continues growing at a CAGR of 14% over the past 16 years

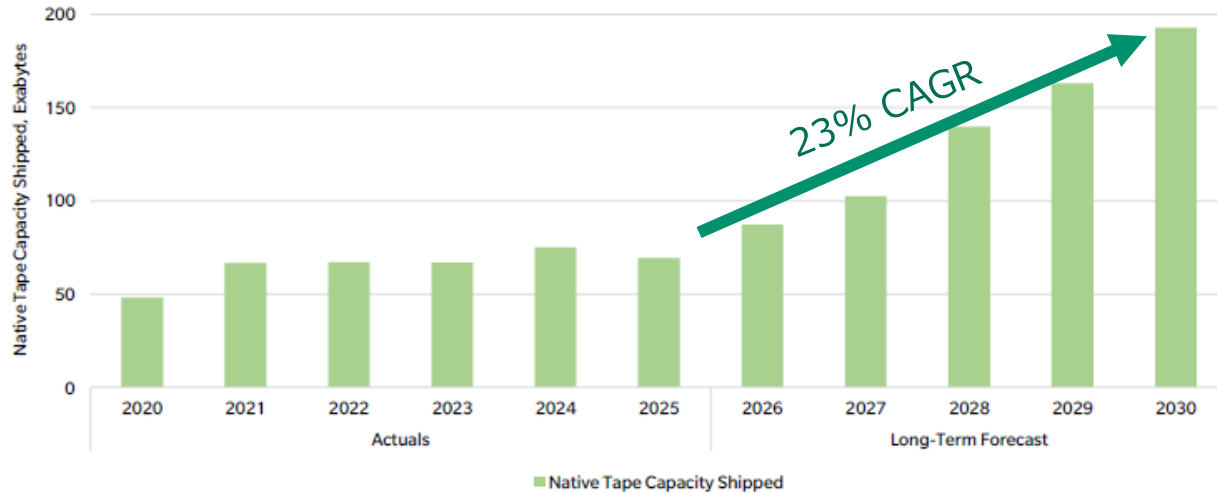
- HDD market has grown at a CAGR of approximately 10%.

LTO Capacity (EB) Shipped



<https://blocksandfiles.com/2025/07/23/lto-tape-exabytes-growth/>

# Tape Market Trend, Capacity Shipments, TRENDFOCUS, 12/18/25



- High Capacity
- Lowest cost and power
- Long archival life
- High reliability
- Cyber secure air-gap
- Active archive for massive AI data sets



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# Thank You!

**FUJIFILM**  
Value from Innovation

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