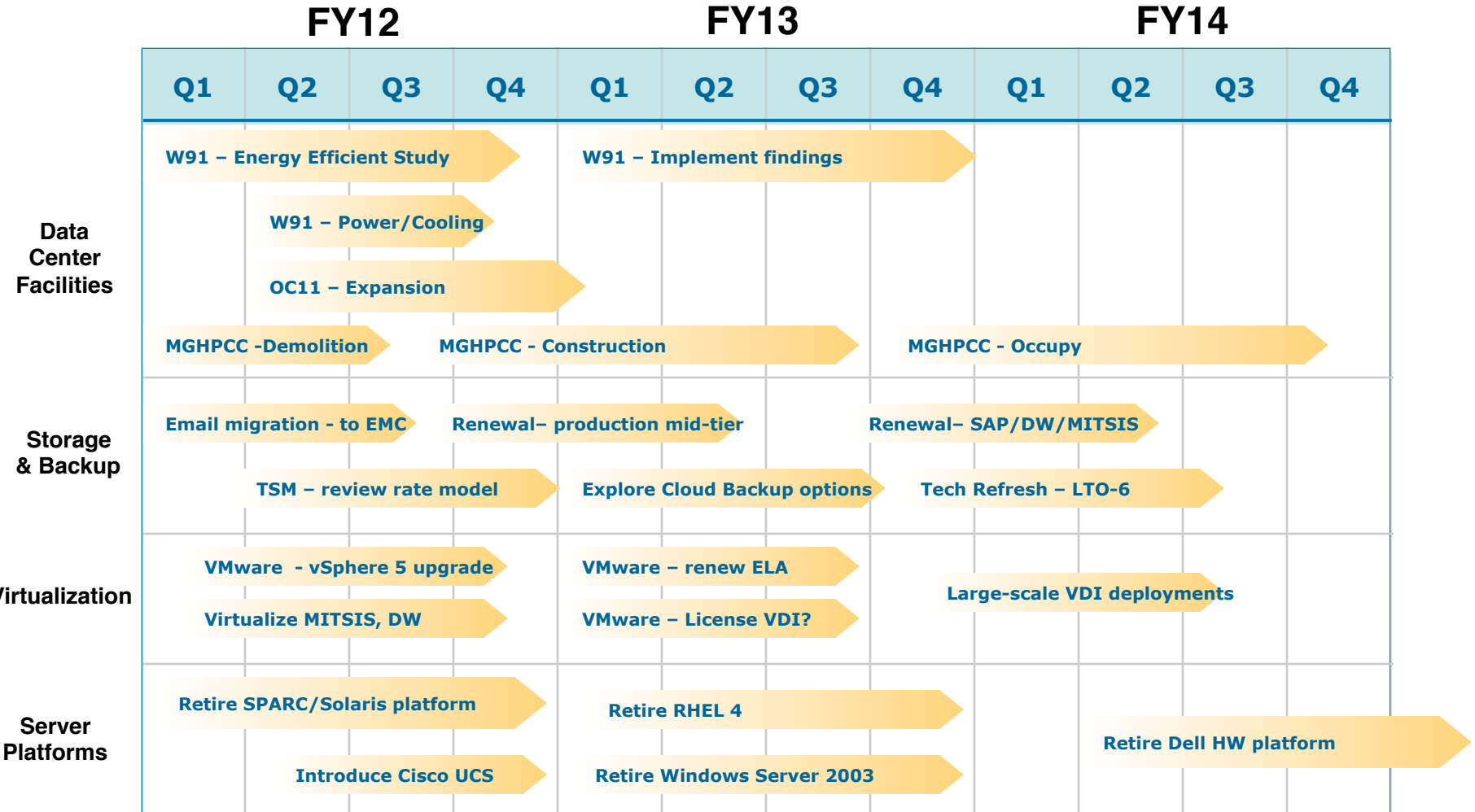


Data Centers Road Map

Garry Zacheiss & Mark Silis
Operations & Infrastructure, MIT IS&T

Data Centers – Executive Summary



Four Focus Areas

FY12 FTE

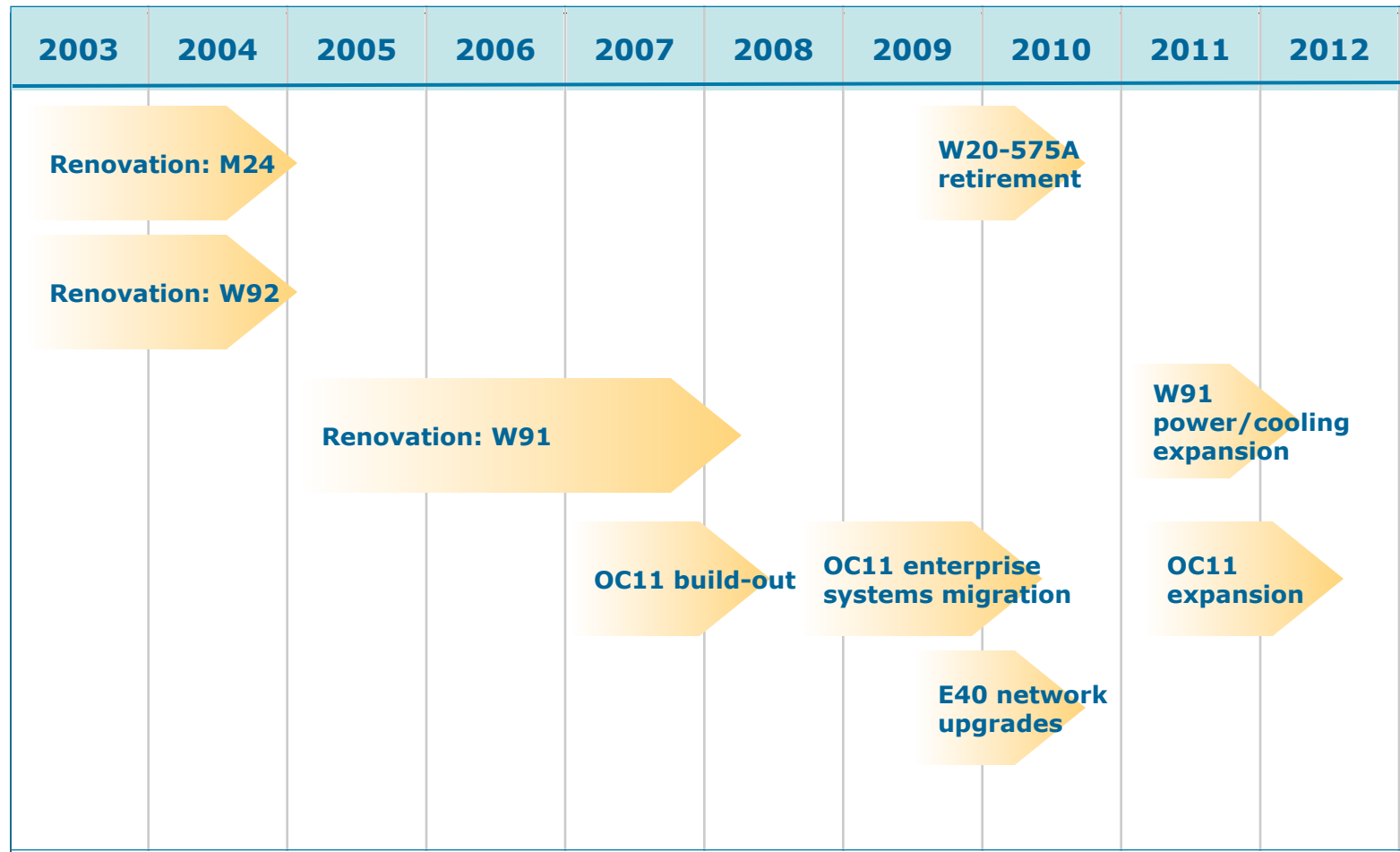
• Data Center Facilities	6.0
• Enterprise Storage	5.0
• Virtualization	3.5
• Server Platforms	8.5
	<hr/>
	23.0

Total FY12 Operational and Capital Budget = \$10.0M

IS&T Data Centers today

- IS&T operates 5 major data center facilities today:
 - OC11 – primary production site.
 - W91 – primary co-location site, legacy production.
 - E40 – test, development, and disaster recovery.
 - W92 – Network Operations & test/development SAN storage.
 - M24 – Network Operations.

Data Center Facilities – Work To Date



Data Center Facilities – Work To Date

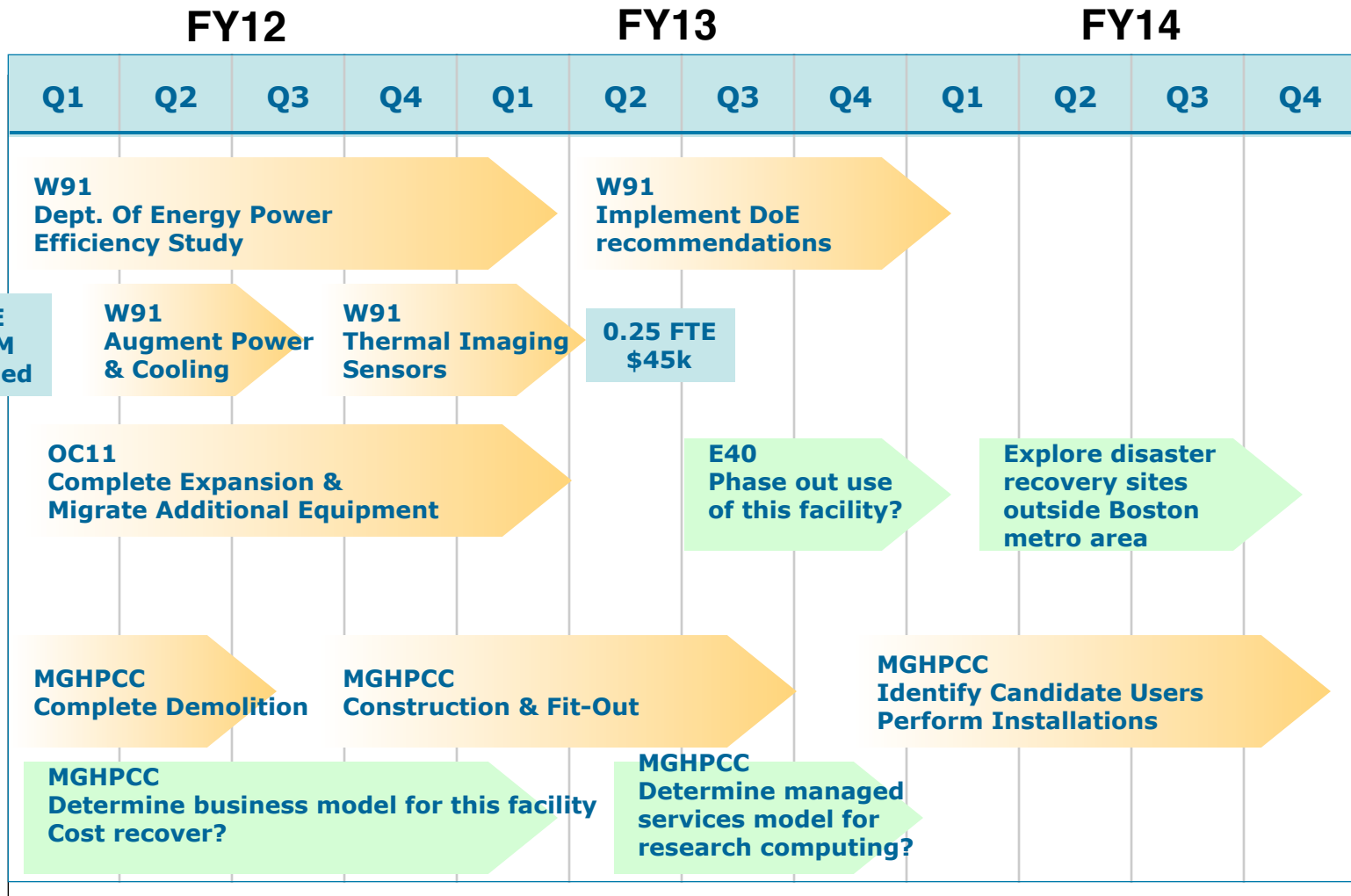
- Prior to 2003, IS&T data center facilities had significant deferred maintenance issues:
 - Insufficient power and cooling for expanding computing needs.
 - Out-dated, unreliable power and cooling.
 - Air flow issues due to under floor cable distribution.
- Activities since that time have concentrated investment in several core facilities:
 - M24/W92/W91 – Rack and cable distribution upgraded, significant power upgrades.
 - Introduction of OC11 as new production site for enterprise services: higher availability / redundancy than available with on-campus facilities.
 - De-emphasize use of W20 & E40 due to lack of generator, power expansion only available at high cost.

Data Center Facilities - Trends

- Increased demand for highly reliable, geographically diverse data center facilities to support robust enterprise computing services.
- Increasing need for centrally funded and administered data center facilities in support of high-performance research computing.
- Administrative need to track and account for enterprise and research computing costs separately.

Data Center Facilities – Timeline & Summary

6 IS&T FTE: 1.75 FTE project work, 4.25 FTE maintenance



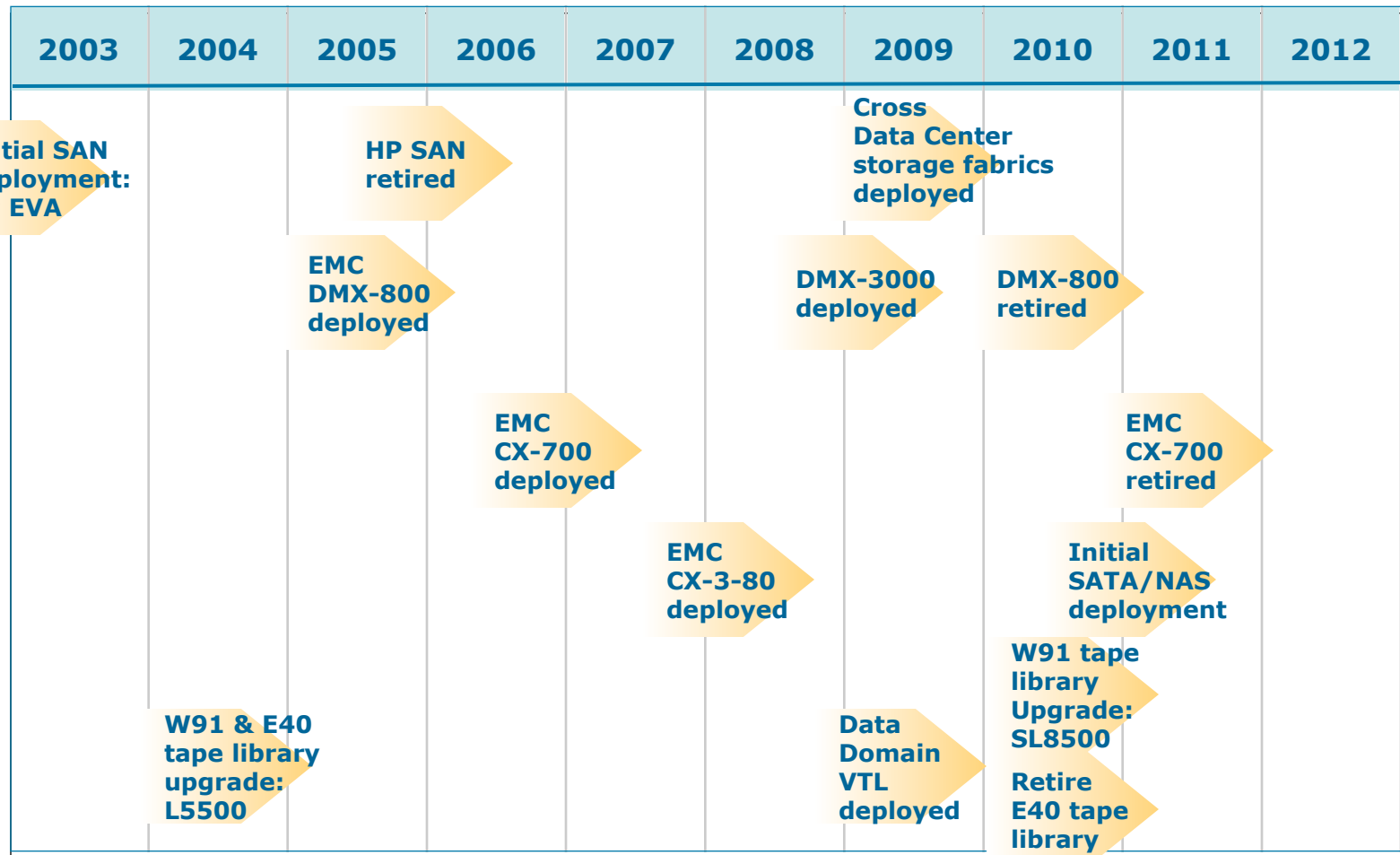
Data Center Facilities – Long Term Considerations

- Strategy for secondary / disaster recovery location for enterprise services.
 - Currently housed in **E40-008**, long term occupancy untenable.
 - Plan to consolidate DR equipment in **W92-130**; no firm timeline for migration.
- Explore options for managed services for research computing. Options include:
 - System administration services for PI-owned equipment.
 - Centralized storage management and allocation.
 - Managed (virtualized?) platform for HPC work.
 - Software development support.

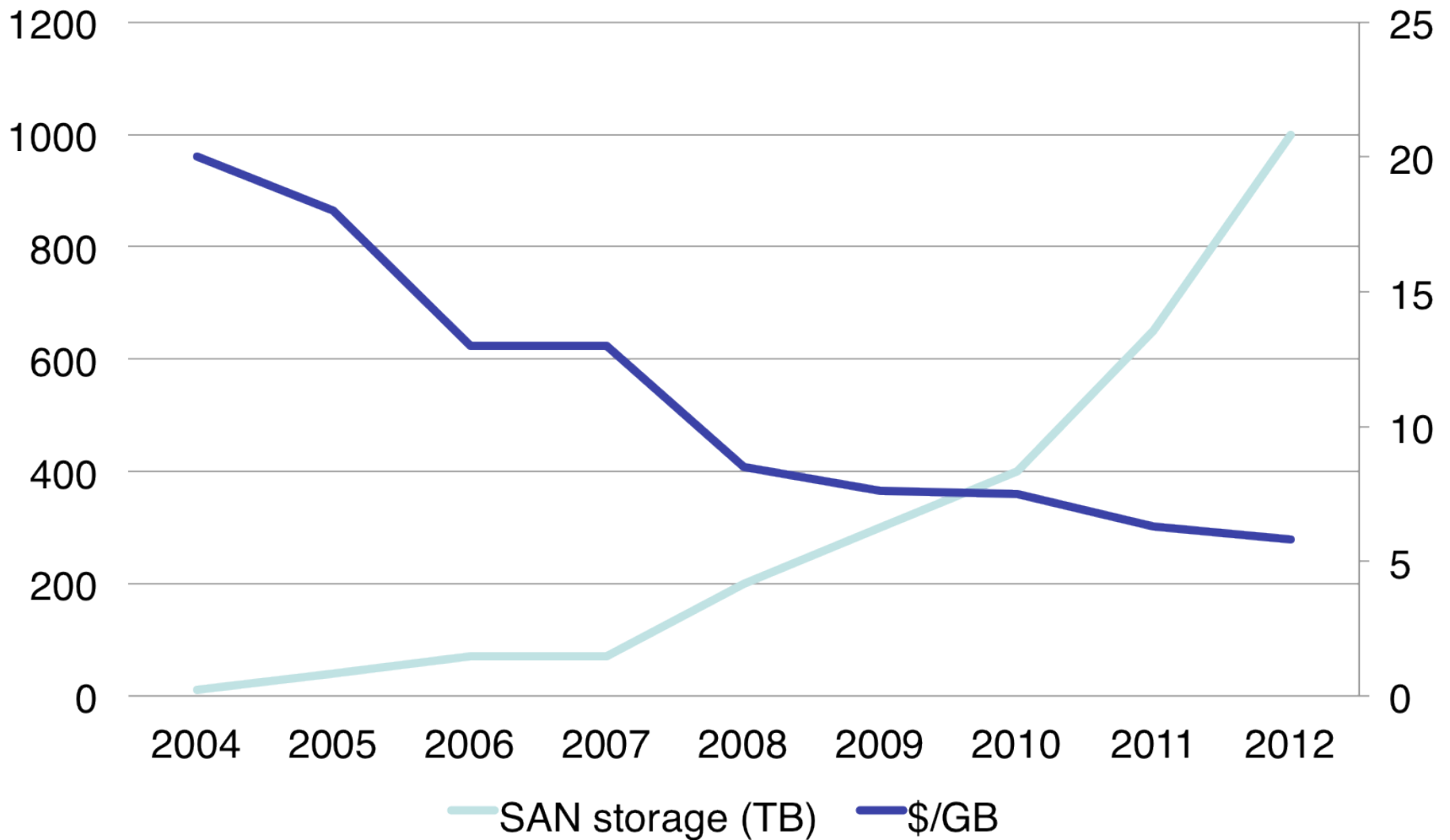
Data Center Facilities – Desired Outcomes

- Two modern, geographically diverse facilities to support MIT faculty performing computationally intensive research: W91 and MGHPCC.
- Robust, diverse infrastructure to support mission critical enterprise computing functions: OC11 and W92.
- Increased ability to accurately track and separate costs associated with both research and enterprise computing.

Enterprise Storage – Work To Date

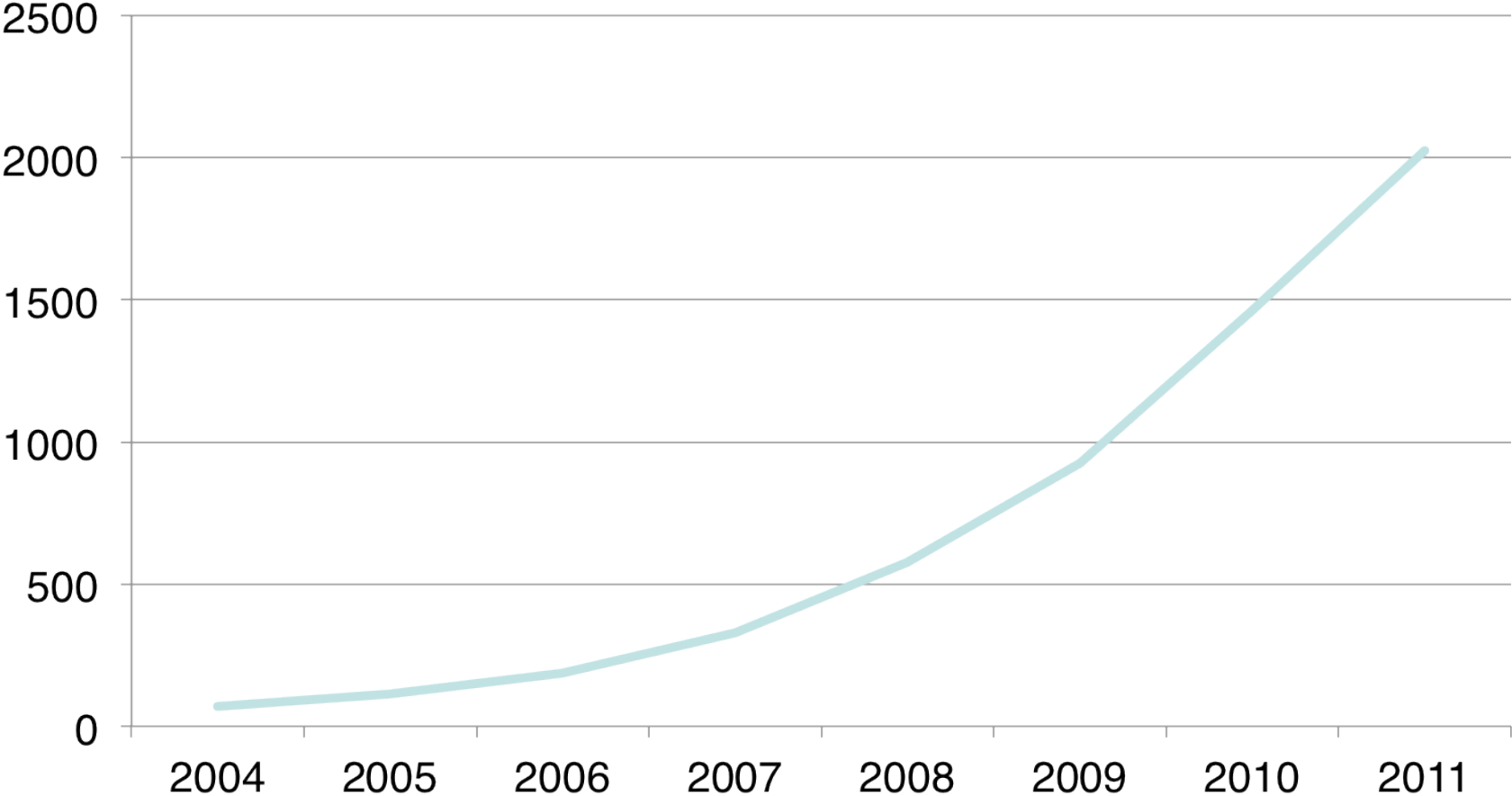


Enterprise Storage: Capacity vs. Cost per GB



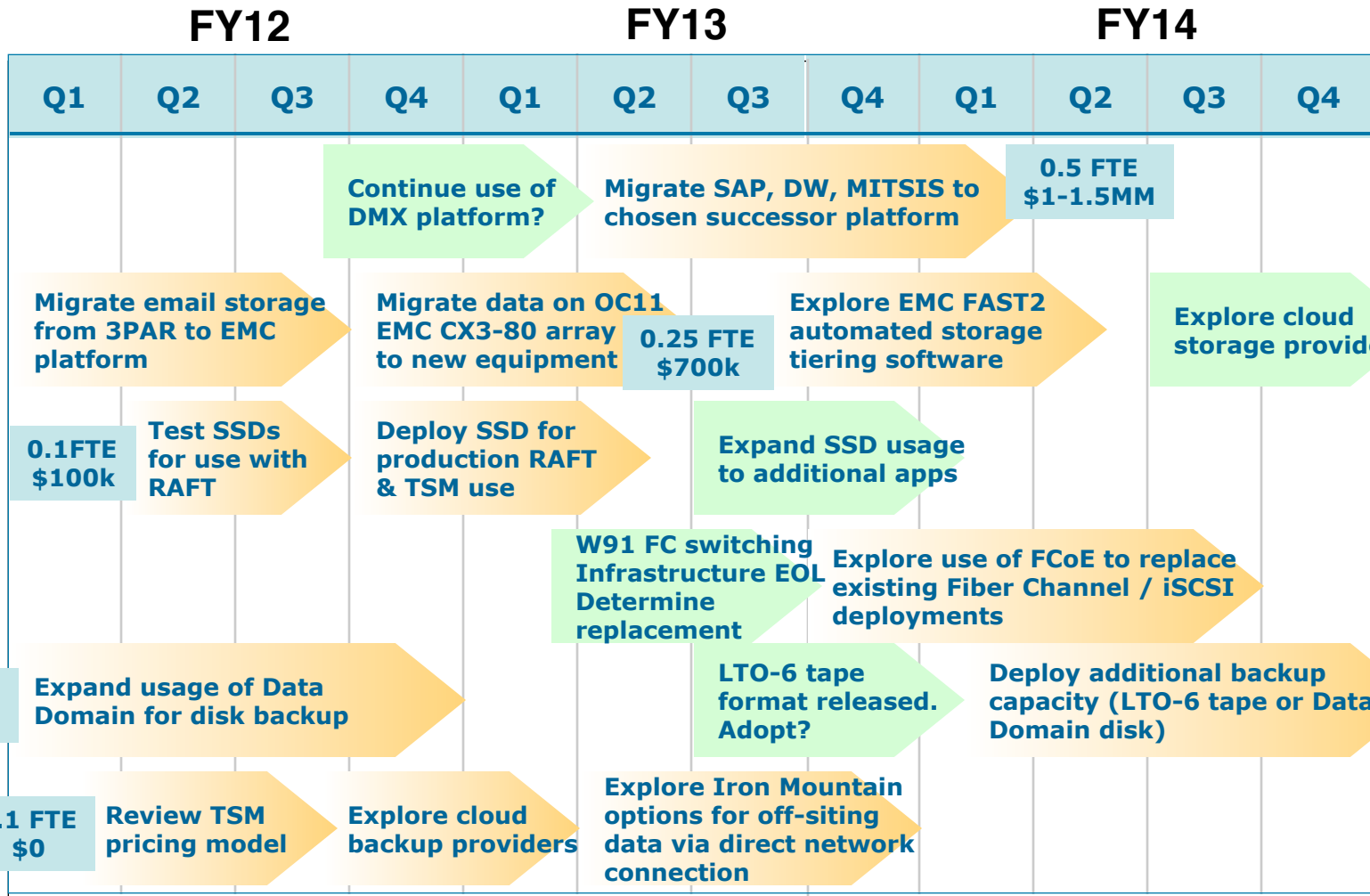
Enterprise Backup Data Stored

Backup Data (TB)



Enterprise Storage & Backup – Timeline & Summary

5 IS&T FTE: 1.5 FTE project work, 3.5 FTE maintenance



Enterprise Storage & Backup – Issues

- Community adoption of data protection (backup/archive) services is hindered by associated cost recovery practices.
 - **Recommendation:** Eliminate cost recovery scheme and offer backup services to all MIT community members free of charge.
- Extremely rapid growth of enterprise storage creates sustainability challenges given current budget resources.
 - Allocate additional funding for SOSC capital storage purchases?

Enterprise Storage & Backup – Desired Outcomes

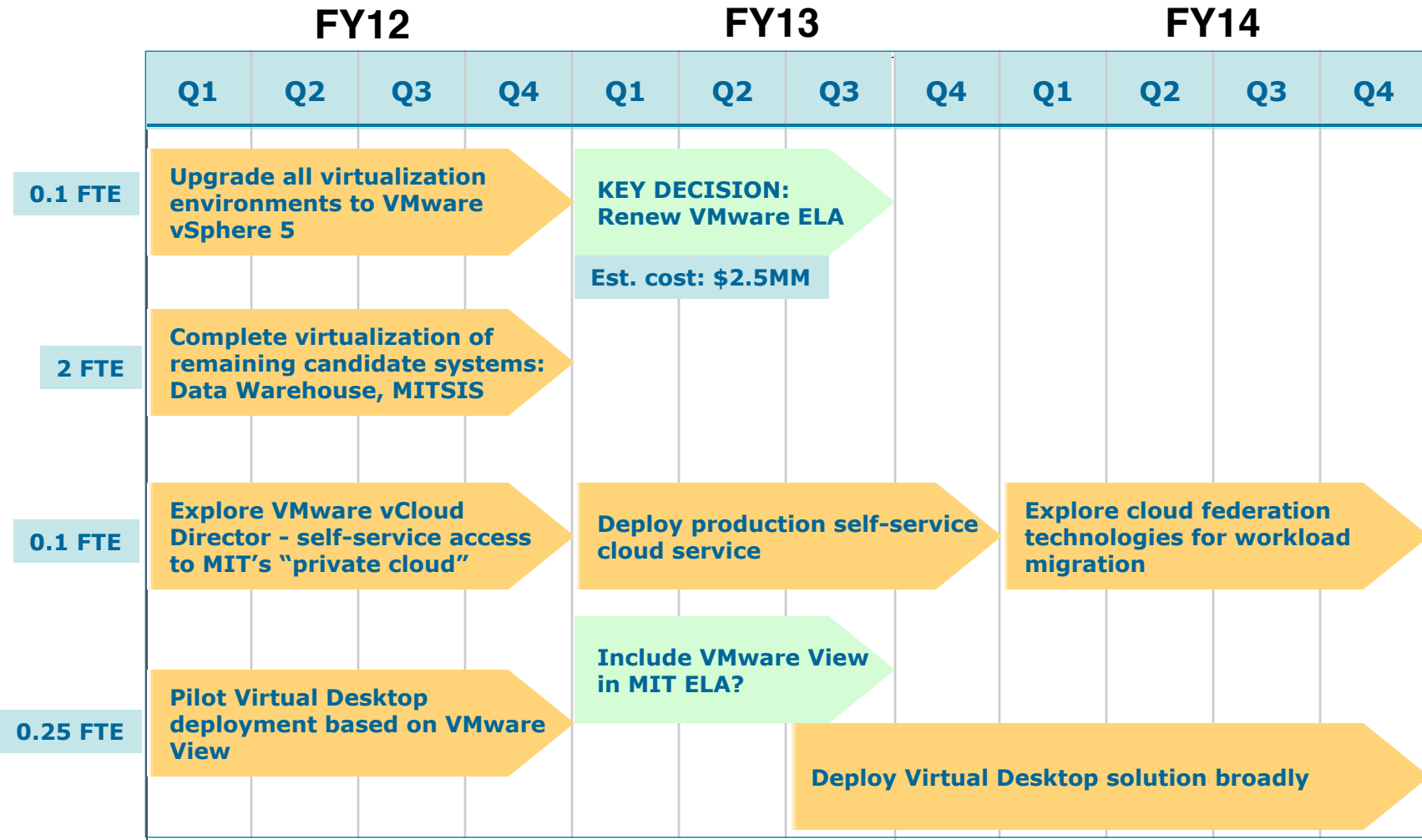
- Highly reliable, cost-effective, and high-performance storage backend for all enterprise servers.
- Consolidation of storage network fabrics onto a single, Ethernet-based backbone.
- Faster, more reliable backup service, while reducing physical data center footprint required to host backup service.
- Thorough understanding of “cloud” service options and implementation where strategic / appropriate.

Virtualization - Trends

- Increasing commoditization of hypervisor platforms creates more competitive marketplace and lowers cost to switching vendors.
- Increased interest in desktop virtualization (VDI) to consolidate desktop computing resources in data centers for ease of management, increased security, etc.
- Cloud-enabled enterprise technologies lower barrier to entry for migrating services/systems traditionally hosted on-premises to external providers.

Virtualization – Timeline & Summary

3.5 IS&T FTE: 2.5 FTE project work, 1 FTE maintenance



Virtualization – Upcoming work / issues

- Renewal of VMware Enterprise License Agreement:
 - Estimated cost: \$2.5MM
 - Negotiations will begin Q1 FY13, new agreement to be in place beginning of Q3 FY13.
- Hybrid “cloud” services will require a thorough analysis before implementation:
 - Data security
 - Data portability
 - Disaster recovery options
- MIT should develop and publish a consistent position on what categories of data we recommend be stored in a “cloud” environment.

Virtualization – Desired Outcomes

- Fully virtualized / virtualized-by-default data center environment.
- Virtualized desktop environment allowing user desktop access from anywhere, including mobile platforms.
- On-demand access to MIT's private cloud for any member of the MIT community.
- Transparent migration of systems between MIT's private cloud and external cloud providers.

Server Platforms – Timeline & Summary

8.5 IS&T FTE: 3 FTE project work, 5.5 FTE maintenance

