

# IMPLICATIONS OF TECHNOLOGY CHANGES FOR DATA CENTER ASSETS

Technology Futures Inc. Conference 1/29/2014

## Contact Information

2



**Kelli Badianis-DiPietro**  
Time Warner Cable  
[kelli.dipietro@twcable.com](mailto:kelli.dipietro@twcable.com)  
(704) 731-1788



**Pat Lynch**  
CBRE Data Center Solutions Group  
[pat.lynch@cbre.com](mailto:pat.lynch@cbre.com)  
(303) 628-1765



**Alan Schultz**  
Paradigm Tax Group  
[aschultz@paradigmatx.com](mailto:aschultz@paradigmatx.com)  
(408) 283-1040

Technology Futures Inc. Conference 1/29/2014

# Topics

3

- I. Recap - Where Have We Been
- II. Understanding What Now Drives Data Center Demand
- IV. Operating Considerations
- V. Industry Growth Forecast
- V. Assessment Issues



Technology Futures Inc. Conference 1/29/2014

# How Did Data Centers Evolve?

4

- Term originated in the 1970's era of water-cooled mainframe computers.
- Change began during the 1990's
  - Development of servers and client-server computing.
  - Networking equipment became affordable.
  - New standards for structured cabling.

Technology Futures Inc. Conference 1/29/2014

## What Defined a Data Center?

5

- Dedicated design and use
- Goal to ensure no down time
- Economies of scale
- Security

Technology Futures Inc. Conference 1/29/2014

## Boom Years

6

### Dot-Com Boom: 1998 - 2000

- Birth of a new information-based economy.
- Venture capital fueled the launch of an increasing number of start-up internet based companies.
- Rush to build out data centers to meet anticipated demand.

Technology Futures Inc. Conference 1/29/2014

## Bust Years

7

### Dot-Com Bust: 2001 - 2004

- Vacancy of data centers increases
- Excess capacity leads to multiple bankruptcies
  - NTT buys a failing Verio – August 2000
  - COLO.COM files for Bankruptcy May 2001
  - Exodus Communications files for Bankruptcy – Sept 2001
  - AboveNet files for Bankruptcy – May 2002
  - UUNET – (WorldCom) files for Bankruptcy – July 2002
  - XO Communications files for Bankruptcy – June 2002

Technology Futures Inc. Conference 1/29/2014

## A New Beginning - 2005 to Present

8

- Social Media (Facebook)
- Streaming video (YouTube)
- Photo sharing (many)
- IP based telephone (Skype)
- Apps
- Cloud computing (capacity without investment)

Technology Futures Inc. Conference 1/29/2014

## YouTube Traffic Rank

9

- 60 hours of videos are uploaded every minute, or one hour of video is uploaded to YouTube every second.
- Over 4 billion videos are viewed a day.
- Over 3 billion hours of video are watched each month on YouTube.
- Over 800 million unique users visit YouTube each month.
- More video is uploaded to YouTube in one month than the 3 major US networks created in 60 years.

Technology Futures Inc. Conference 1/29/2014

## Data Center Tier Structure

10

- Tier I: Basic Site Infrastructure
- Tier II: Redundant Site Infrastructure Capacity Components
- Tier III: Concurrently Maintainable Site Infrastructure
- Tier IV: Fault Tolerant Site Infrastructure

Technology Futures Inc. Conference 1/29/2014

## 2005 to Present – Seeking Efficiency

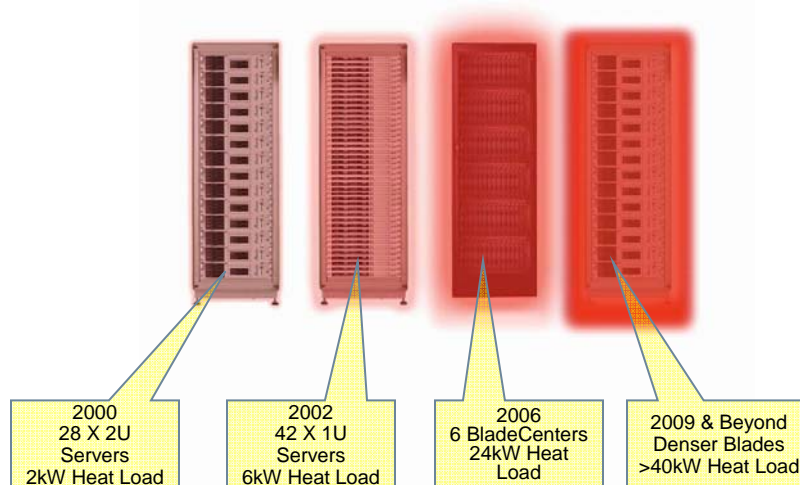
11

- Cost of Utility Power
- Operating Cost Reductions – Design/Build Solutions
  - Variable frequency driven (VFD) cooling units.
  - Air-Side economizers reduce load on cooling systems.
- Innovations in new designs will result in lower energy demands and significantly lower the cost per MW

Technology Futures Inc. Conference 1/29/2014

## Heat Is An Issue

12



Technology Futures Inc. Conference 1/29/2014

# Measuring Power Consumption

13

## PUE – Power Usage Effectiveness

$$\text{PUE} = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}}$$

Technology Futures Inc. Conference 1/29/2014

# Data Pods

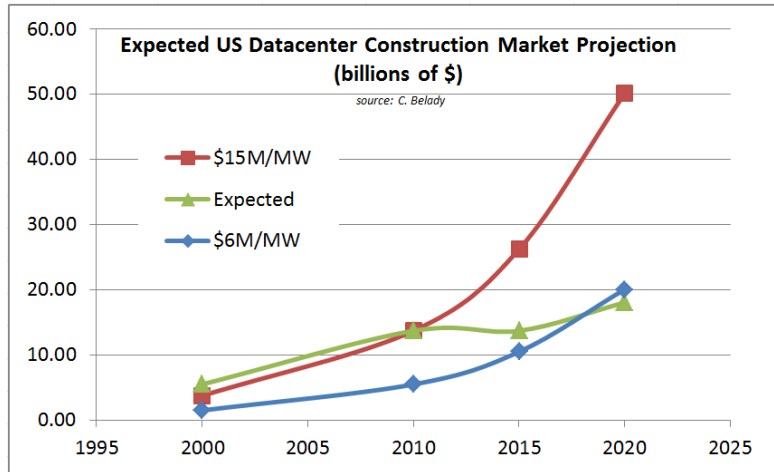
14

- Containerized module facilitates rapid deployment.
- Plug and Play fully functional data center often with pre-configured multivendor support.
- Temporary / remote data centers or stacked in warehouse.
- Cooling and electric power efficiencies.

Technology Futures Inc. Conference 1/29/2014

# Expected Data Center Construction

15



Technology Futures Inc. Conference 1/29/2014

## Assessment Issues Include:

16

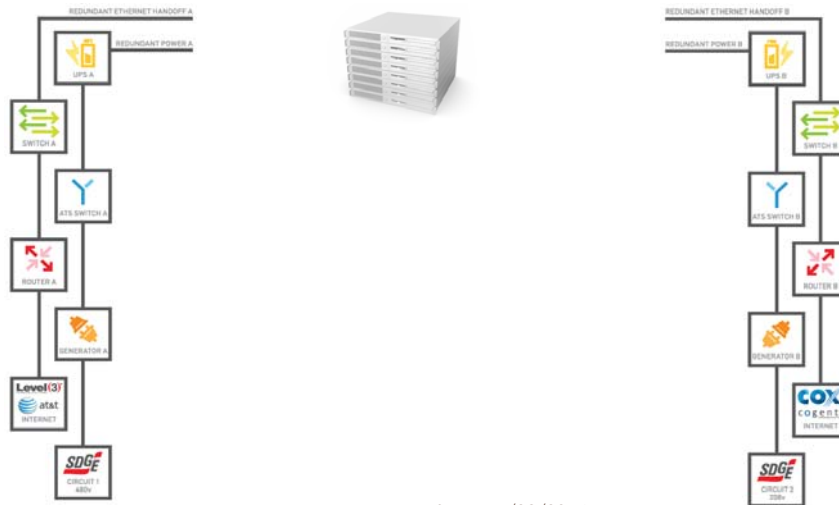
- Data centers rival traditional manufacturing plants in terms of capital investment
- Evolving Designs
- Industry Consolidation
- Owning vs. Outsourcing

Technology Futures Inc. Conference 1/29/2014



## Assessment Issue: Concept of Redundancy and Fixed Assets

17



Technology Futures Inc. Conference 1/29/2014

## Assessment Issue: Real vs. Business Personal Property

18

Component	Average % of Total
Land	3%
Building Improvements	27%
Power Distribution Units	3%
Uninterrupted Power Supply	22%
Switchgear & Transformers	19%
Fire Protection	2%
Security Systems	2%
Heating Ventilating & AC	6%
Chiller pumps / bldg automation	6%
Chilled water storage & pipes	11%
<b>TOTAL WEIGHTED AVERAGE</b>	<b>100%</b>

Technology Futures Inc. Conference 1/29/2014

## Assessment Issue: Unit of Appraisal

19

### Changing characteristics of a data center

- Multiple generations of data centers
  - 1<sup>st</sup> generation in late 1990's & early 2000's retrofit of R&D buildings.
  - 2<sup>nd</sup> generation of design/build projects.
  - 3<sup>rd</sup> generation incorporates energy efficient design elements.
  - Next ...

Technology Futures Inc. Conference 1/29/2014

## Assessment Issue: Change & Question of Value

20

### CONSIDERATION

- Useful Life of Component Equipment or Infrastructure
- Operating Costs

### ELEMENTS OF OBSOLESCENCE

- Physical
- Functional
- Economic



Technology Futures Inc. Conference 1/29/2014

## Assessment Issues: Recap

21

- Fixed Asset management and controls.
- Classification of assets between real and business personal property.
- Economic life of costs subject to depreciation.
- Data Center valuation from a total property perspective: are there elements of business value?

Technology Futures Inc. Conference 1/29/2014

## Assessment Issues: Industry

22

Dupont Fabros' EVP Scott Davis:

Data centers now have an average six to seven-year lifespan before their equipment and infrastructure needs updating as “bleeding-edge customers” want much denser facilities (more power for less pumping). That poses an issue with legacy data centers.

Source: [bisnow.com](http://bisnow.com)

Technology Futures Inc. Conference 1/29/2014