



*Data Center: The Impact of
Supply Chain Cost/Schedule
and the New 2023 Solution*

Presented By:
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Learning Objectives

- 1. The session identifies the most recent data center A/MEP equipment component supply chain schedule and cost impacts.*
- 2. The review will address impacts to new/renovation projects and also, the impacts to lifecycle equipment planning.*
- 3. The “alternate” solution model to reduce/minimize the supply chain cost and schedule impacts will be reviewed in detail. Critical is to identify and minimize risk.*
- 4. Elements of results.*

AGENDA

Section I: *The Data Center Supply Chain Impact Challenge - 2023*

Section II: *The Data Center 19 Elements Overview - 2023*

Section III: *The Ongoing and Current 2023 Data Center Supply Chain Activities*

Section IV: *The Results of the Data Center Supply Chain Cost and Schedule Impacts*

Section V: *The Current Conclusion of the Data Center Supply Chain Cost and Schedule Impacts*

Section VI: *Questions & Answers*

Section I:

The Data Center Supply Chain Impact Challenge - 2023



- 1) *The worldwide supply chain impact of extended schedule delivery and increased costs have impacted the cloud, colocation, and enterprise data center industry. The industry is demanding options and solutions.*
- 2) *Major data center facility infrastructure cost and schedule impacts especially felt on MEP (mechanical – electrical – plumbing) components:*
 - A) *Switchgear/generators/UPS – up to 90 weeks delivery from 18-36 weeks.*
 - B) *Costs upward of 85% increase from pre-pandemic.*
- 3) *Lifecycle equipment exposures for failure*



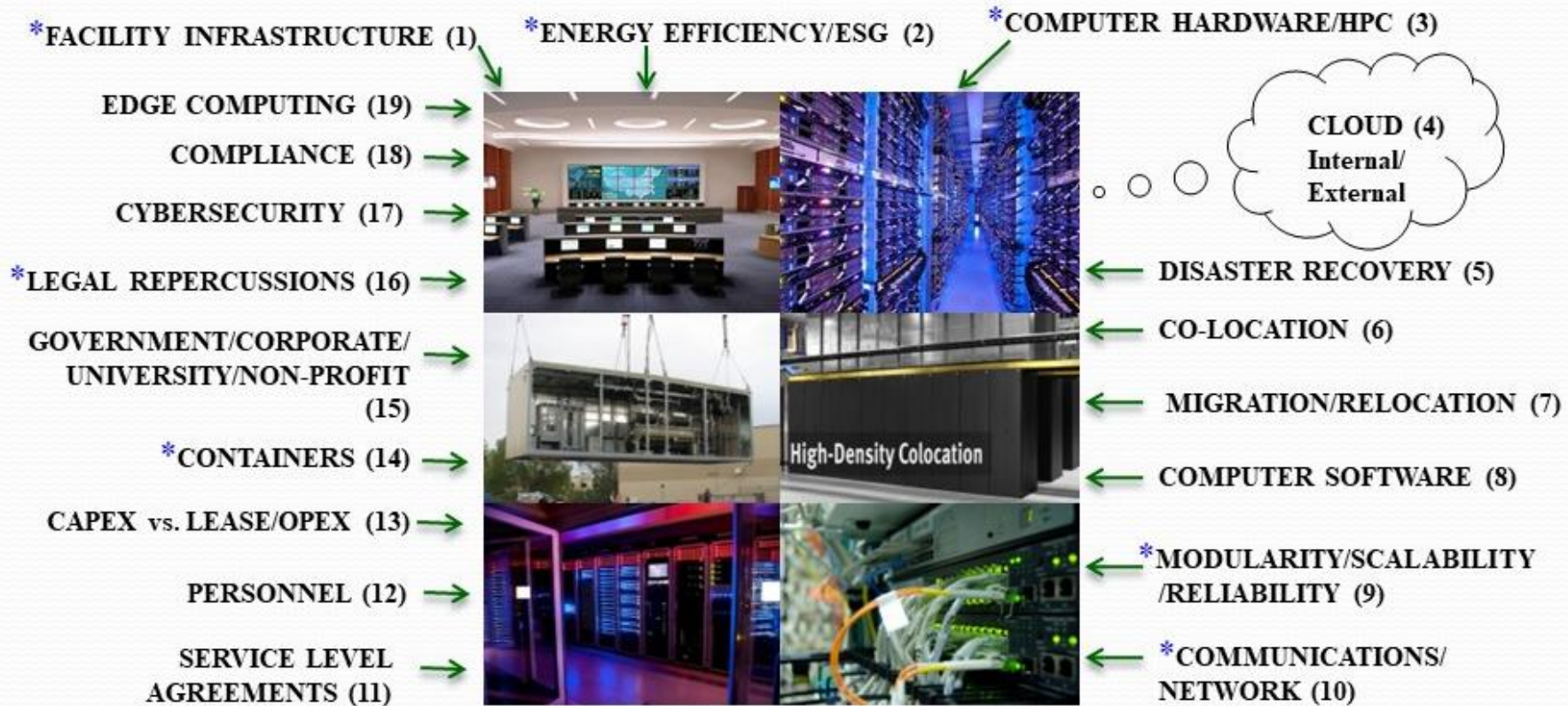
Section II:

The Data Center 19 Elements Overview - 2023



Elements of a Successful Data Center Project Data Center "Hybrid" Design/Build Solutions

The Hybrid "2023 Transformation" Efficient Data Center Elements



Critical Elements of the Hybrid Data Center Enterprise Solution 2023

#1 Facility Infrastructure

- A. Architectural**
- B. Civil**
- C. Electrical – Switchgear, UPS, Generators, Controls, PDU's**
- D. Fire Protection (EPO Code Change) – Update NEC/NFPA vs. Factory Mutual**
- E. Mechanical - CFD Models – CRAC Systems**
- F. Security - Physical**
- G. Site**
- H. Structural**
- I. Geographic Regional Considerations... i.e. southwest hurricanes, west earthquakes, etc.**



Critical Elements of the Hybrid Data Center Enterprise Solution 2023

#2 Energy Efficiency/Procedures/Standards

A. ASHRAE 9.9 – Higher Inlet Temperatures

- ✓ 80° F
- ✓ 90° F
- ✓ Δt of 20-25° F

B. Containment

- ✓ Hot Aisle
- ✓ Cold Aisle
- ✓ Impact to people
- ✓ HPC

C. DCIM

- ✓ Gartner “Magic Quadrant”
- ✓ Per data centre (UK)
 - a. Reduction in costs
 - b. Integration
 - c. Valuable insights
 - d. Increased productivity
 - e. Environmental benefits



Critical Elements of the Hybrid Data Center Enterprise Solution 2023

f. Management

g. Envelope

- ❖ Applications
- ❖ Computer Hardware
- ❖ Data Center Facility
- ❖ Network
- ❖ Data Center Operations

D. CFD Models

- ✓ Why
- ✓ Updates

E. Outside Air to Cool Data Centers

F. Virtualization of Servers

G. LEED – New Data Center Guidelines

- ✓ Written to save “dollars” and be more green
- ✓ Office of Management and Budget to create a strategy
- ✓ DOE and EPA to study server and data center efficiency trends
- ✓ New “data center energy practitioner program”



Critical Elements of the Hybrid Data Center Enterprise Solution 2023

- ✓ **New "metrics"**
- ✓ **Data center LEED guidelines – New – LEED v4
US Green Building Council (USGBC)**

H. Unity (close to) Power Factors on UPS Systems

I. Electrical Utility Costs

- ✓ **\$.03 per kWh vs. \$.18 kWh**

J. Procedures

- ✓ **Operating**
- ✓ **MEP**
- ✓ **Fire Protection**
- ✓ **Concurrent Maintenance**
- ✓ **MOP'S / SOP'S**

K. Standards

- ✓ **Data Center Operating**
- ✓ **Guidelines**



Section II: The Data Center 19 Elements Overview - 2023

Critical Elements of the Hybrid Data Center Enterprise Solution 2023



LEED v4 for BD+C: Data Centers Project Checklist

Y ? N

Y	?	N	Credit	Integrative Process	1
0 0 0 Location and Transportation 16					
Y	?	N	Credit	LEED for Neighborhood Development Location	16
Y	?	N	Credit	Sensitive Land Protection	1
Y	?	N	Credit	High Priority Site	2
Y	?	N	Credit	Surrounding Density and Diverse Uses	5
Y	?	N	Credit	Access to Quality Transit	5
Y	?	N	Credit	Bicycle Facilities	1
Y	?	N	Credit	Reduced Parking Footprint	1
Y	?	N	Credit	Green Vehicles	1
0 0 0 Sustainable Sites 10					
Y	?	N	Prereq	Construction Activity Pollution Prevention	Required
Y	?	N	Credit	Site Assessment	1
Y	?	N	Credit	Site Development - Protect or Restore Habitat	2
Y	?	N	Credit	Open Space	1
Y	?	N	Credit	Rainwater Management	3
Y	?	N	Credit	Heat Island Reduction	2
Y	?	N	Credit	Light Pollution Reduction	1
0 0 0 Water Efficiency 11					
Y	?	N	Prereq	Outdoor Water Use Reduction	Required
Y	?	N	Prereq	Indoor Water Use Reduction	Required
Y	?	N	Prereq	Building-Level Water Metering	Required
Y	?	N	Credit	Outdoor Water Use Reduction	2
Y	?	N	Credit	Indoor Water Use Reduction	6
Y	?	N	Credit	Cooling Tower Water Use	2
Y	?	N	Credit	Water Metering	1
0 0 0 Energy and Atmosphere 33					
Y	?	N	Prereq	Fundamental Commissioning and Verification	Required
Y	?	N	Prereq	Minimum Energy Performance	Required
Y	?	N	Prereq	Building-Level Energy Metering	Required
Y	?	N	Prereq	Fundamental Refrigerant Management	Required
Y	?	N	Credit	Enhanced Commissioning	6
Y	?	N	Credit	Optimize Energy Performance	18
Y	?	N	Credit	Advanced Energy Metering	1
Y	?	N	Credit	Demand Response	2
Y	?	N	Credit	Renewable Energy Production	3
Y	?	N	Credit	Enhanced Refrigerant Management	1
Y	?	N	Credit	Green Power and Carbon Offsets	2

Project Name:
Date:

0 0 0 Materials and Resources 13					
Y	?	N	Prereq	Storage and Collection of Recyclables	Required
Y	?	N	Prereq	Construction and Demolition Waste Management Planning	Required
Y	?	N	Credit	Building Life-Cycle Impact Reduction	5
Y	?	N	Credit	Building Product Disclosure and Optimization - Environmental Product Decl	2
Y	?	N	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
Y	?	N	Credit	Building Product Disclosure and Optimization - Material Ingredients	2
Y	?	N	Credit	Construction and Demolition Waste Management	2

0 0 0 Indoor Environmental Quality 16					
Y	?	N	Prereq	Minimum Indoor Air Quality Performance	Required
Y	?	N	Prereq	Environmental Tobacco Smoke Control	Required
Y	?	N	Credit	Enhanced Indoor Air Quality Strategies	2
Y	?	N	Credit	Low-Emitting Materials	3
Y	?	N	Credit	Construction Indoor Air Quality Management Plan	1
Y	?	N	Credit	Indoor Air Quality Assessment	2
Y	?	N	Credit	Thermal Comfort	1
Y	?	N	Credit	Interior Lighting	2
Y	?	N	Credit	Daylight	3
Y	?	N	Credit	Quality Views	1
Y	?	N	Credit	Acoustic Performance	1

0 0 0 Innovation 6					
Y	?	N	Credit	Innovation	5
Y	?	N	Credit	LEED Accredited Professional	1

0 0 0 Regional Priority 4					
Y	?	N	Credit	Regional Priority: Specific Credit	1
Y	?	N	Credit	Regional Priority: Specific Credit	1
Y	?	N	Credit	Regional Priority: Specific Credit	1
Y	?	N	Credit	Regional Priority: Specific Credit	1

0	0	0	TOTALS	Possible Points:	110
Certified: 40 to 49 points, Silver: 50 to 59 points, Gold: 60 to 79 points, Platinum: 80 to 110					

Critical Elements of the Hybrid Data Center Enterprise Solution 2023

#3 Computer Hardware

- A. Higher Efficiency*
- B. High Performance Computing (HPC) continues to dominate*
- C. New Flash Storage*
- D. Water cooled to the chip in 2023 and beyond*
- E. 52” Deep by 30” Rack!!!*
- F. Non-uniform cabinet distribution*
- G. “Submerged” systems in cooling*
- H. Scale within footprint*



Critical Elements of the Hybrid Data Center Enterprise Solution 2023

#9 Modularity / Scalability / Reliability

A. Optimize

- ✓ Computer hardware
- ✓ Applications
- ✓ Telecommunication (network)
- ✓ Facilities
- ✓ Service level agreements
- ✓ Disaster Recovery
- ✓ Cloud/Co-location/Modular Data Center

Scale with growth!

B. Defray CAPEX/OPEX dollars until needed across the board

C. Scale without interruption

D. Reliability past/present/future

E. In house vs. outsource



Critical Elements of the Hybrid Data Center Enterprise Solution 2023

#10 Communications / Network – Dominating 2023 and Beyond

- A. *Redundant / isolated paths?***
- B. *Multiple carriers***
- C. *Data breach? Who pays? Significant dominant focus 2023***
- D. *Data security? Who is responsible?***
- E. *Russian "Impact" to General Elections***
- F. *The power of the cloud – iPhone®***
- G. *Impact of network loss***
- H. *Who manages the network?***
- I. *Dominating the news media 2023***



Critical Elements of the Hybrid Data Center Enterprise Solution 2023

#14 Modular Data Centers

- A. *Speed to Market?*
- B. *Regulatory Agency Review – AHJ*
 - Temporary**
 - vs.**
 - Permanent**
- C. *Cost of Pre-Fabricated vs. “Stick Build”*
- D. *ADA Compliance*
- E. *High Performance Compute vs. Work Flow*
- F. *Conducive to Government/Emergency*



Critical Elements of the Hybrid Data Center Enterprise Solution 2023

#16 Legal Repercussions

- A.** *The most dominant theme of 2023 data center optimization impacting in house vs. outsource*
- B.** *The “Reaction” of 3rd Party Provider “Contracts” (i.e. Cloud/Co-location Companies) to the Liability Issue – Example: \$35 per sq. ft. per month to \$350 per sq. ft. per month – Trending!!*
- C.** *Government fines – No More “Life Lock” – Good Luck! / Class Action Lawsuits*
- D.** *Stockholder lawsuits*
- E.** *Individual lawsuits*
- F.** *Fiduciary responsibility*
- G.** *“Non-disclosed” trends*
- H.** *GDPR*
- I.** *California*



Section III:

The Ongoing and Current 2023 Data Center Supply Chain Activities



Section III: The Ongoing and Current 2023 Data Center Supply Chain Activities

- 1) Develop a comprehensive information technology/facilities short/long term strategic plan for the enterprise.**
- 2) Develop the data center strategic carbon footprint reduction/energy conservation measure strategic objectives.**
- 3) Maximize the data center mechanical cooling operating temperatures per ASHRAE 9.9.**
- 4) Provide a strategic facility infrastructure modular/scalable/reliable concept plan.**
- 5) Identify critical strategic information technology “go live” dates to assess facility solution options:**
 - *Cloud*
 - *Colocation*
 - *Enterprise*



Section III: *The Ongoing and Current 2023 Data Center Supply Chain Activities*

- 6) Review total cost of ownership vs. best practice vs. risk strategies to address supply chain “challenges”.
- 7) Evaluate supply chain new vs. reconditioned/warrantied vs. used equipment.
- 8) Define the risks associated with 3rd party/gray equipment.
- 9) Define the costs associated with 3rd party/grey equipment.



Section IV:

The Results of the Data Center Supply Chain Cost and Schedule Impacts



Section IV: The Results of the Data Center Supply Chain Cost And Schedule Impacts

- 1) Data Center strategic plan and deployment is now “normalized” to reflect supply chain schedule/cost impacts.**
- 2) Data center new vs. reconditioned/warrantied vs. used equipment is optimized.**
- 3) Facility infrastructure lifecycle analysis extended where applicable/cost effective.**
- 4) Client has evaluated and quantified “risk vs. reward” of third party new vs. reconditioned/warrantied vs. used (gray) equipment cost and schedule. Commissioning included with terms and conditions.**
- 5) Client has forecasted total cost of ownership vs. best practice vs. risk data center solution.**

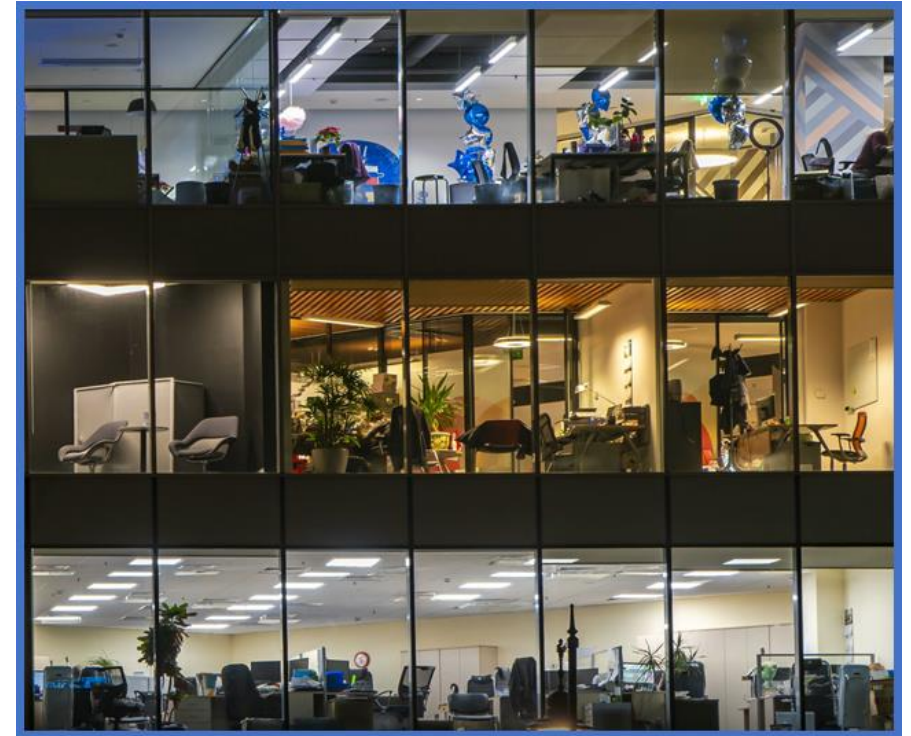


Section IV: *The Results of the Data Center Supply Chain Cost
And Schedule Impacts*

- 6) Client has prioritized list of:
 - *Tier I*
 - *Tier II*
 - *Tier III*
 - *Tier IV*applications.

- 7) Client has optimized his/her short/long term investment in comprehensive hybrid:
 - *Cloud*
 - *Colocation*
 - *Enterprise*short/long solution.

- 8) Lifecycle equipment extensions.



Section V:

The Current Conclusion of the Data Center Supply Chain Cost and Schedule Impacts



Section IV: The Current Conclusion of the Data Center
Supply Chain Cost and Schedule Impacts

The data center operator is reacting to both increased cost and schedule delays to his data center projects.

The "3rd party/gray market" once proven through commissioning, pricing, and manufacturing warranty are becoming a significant solution provider.
Warning/Danger.

End user data center clients are warehousing surplus supplies.

3rd party suppliers are ordering long lead time equipment, at a risk, to have factory warrantied equipment available.

Lifecycle equipment is being extended with additional maintenance.



Section VI:

Questions & Answers

THANK YOU!

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