

**BUILDINGS** PRESENTS

SMARTER  
BUILDINGS®  
WEBINARS

An event on

**BUILDINGSVIP**

## Shrink Your Data Center's Cooling and Power Demands



*Presented by*  
Daniel McGroary

*Moderated by*  
Janelle Penny



Thanks to our Sponsors!



[www.dataaire.com](http://www.dataaire.com)



[www.movincool.com](http://www.movincool.com)



## Please ask questions!

To ask a question, click on the green “Ask a Question” button at the bottom left hand side of your screen.

Although you may ask a question at any time, most questions will be answered at the end of the presentation during the Q&A session.

## Technical Support

If you are having technical difficulties, please click the Support link at the top right of your screen.

## Enlarging the Slides

You may enlarge the slides at any time by clicking the expansion icon at the bottom right of the media player.

# **BUILDINGS** PRESENTS

SMARTER  
BUILDINGS®  
WEBINARS

An event on **BUILDINGSVIP**



Daniel J. McGroary  
Senior Project Manager and Data Center Market Sector Leader  
Bala Consulting Engineers

# Learning Objectives

- Cooling Strategies.
- Hot aisle/cold aisle containment.
- Accurate and real-time measurement of power usage.
- Design of the physical infrastructure for cooling and power efficiency.



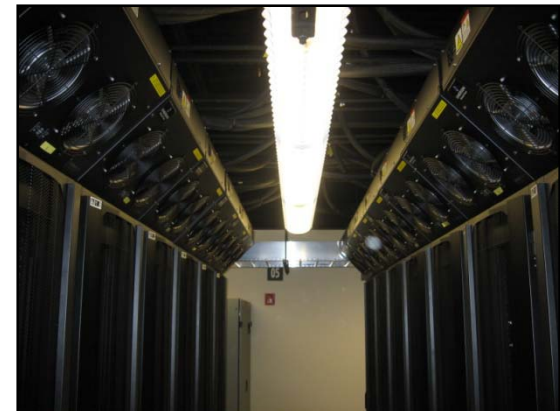
# Shrink Your Data Center's Cooling and Power Demands

Smarter Buildings Webinars,  
BuildingsVIP

Daniel J. McGroary  
Data Center Market Leader,  
Senior Project Manager  
Bala Consulting Engineers



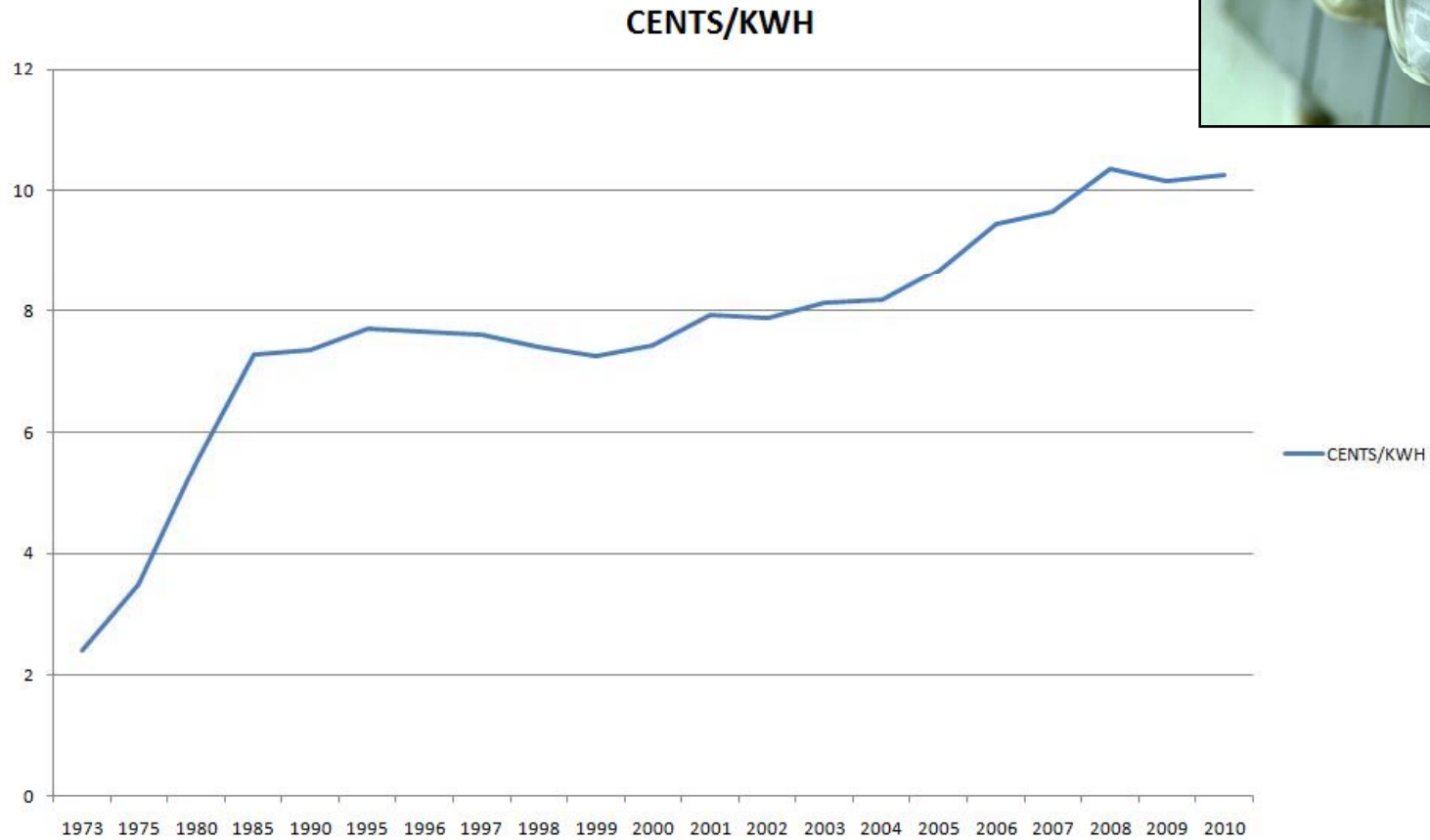
# Data Center Growth Exponential



SMARTER  
BUILDINGS<sup>SM</sup>  
WEBINARS

**BUILDINGSVIP**

# Data Center Energy Costs Skyrocketing?



# Data Center Cooling & Power Demands

- Power and Cooling Demands Continue to Grow



# How Do We Shrink Power & Cooling Demand?



# Strategies

- Reduce IT Demand
- Reduce Cooling Load
- Improve Cooling System Efficiency
- Right Size Power and Cooling Solutions
- Implement Energy Saving Strategies
- Meter / Monitor / Re-Evaluate / Re-Commission / Adapt

# Reduce IT Demand

- Equipment Refresh
- Energy Efficient Equipment
- Energy Saver Modes of Operation
- Virtualization
- Maximize Equipment Utilization
- Cloud Computing
- Demand Leveling at Server Level



# Cooling Challenges – Watts per What?

- Watts per Square Foot
  - 50 – 100 – 150 – 200 – 300 >>>>>> ???
- Kilowatts per Rack
  - 1 – 2 – 5 – 10 – 20 – 30 >>>>>>> ???



# Cooling Load Components

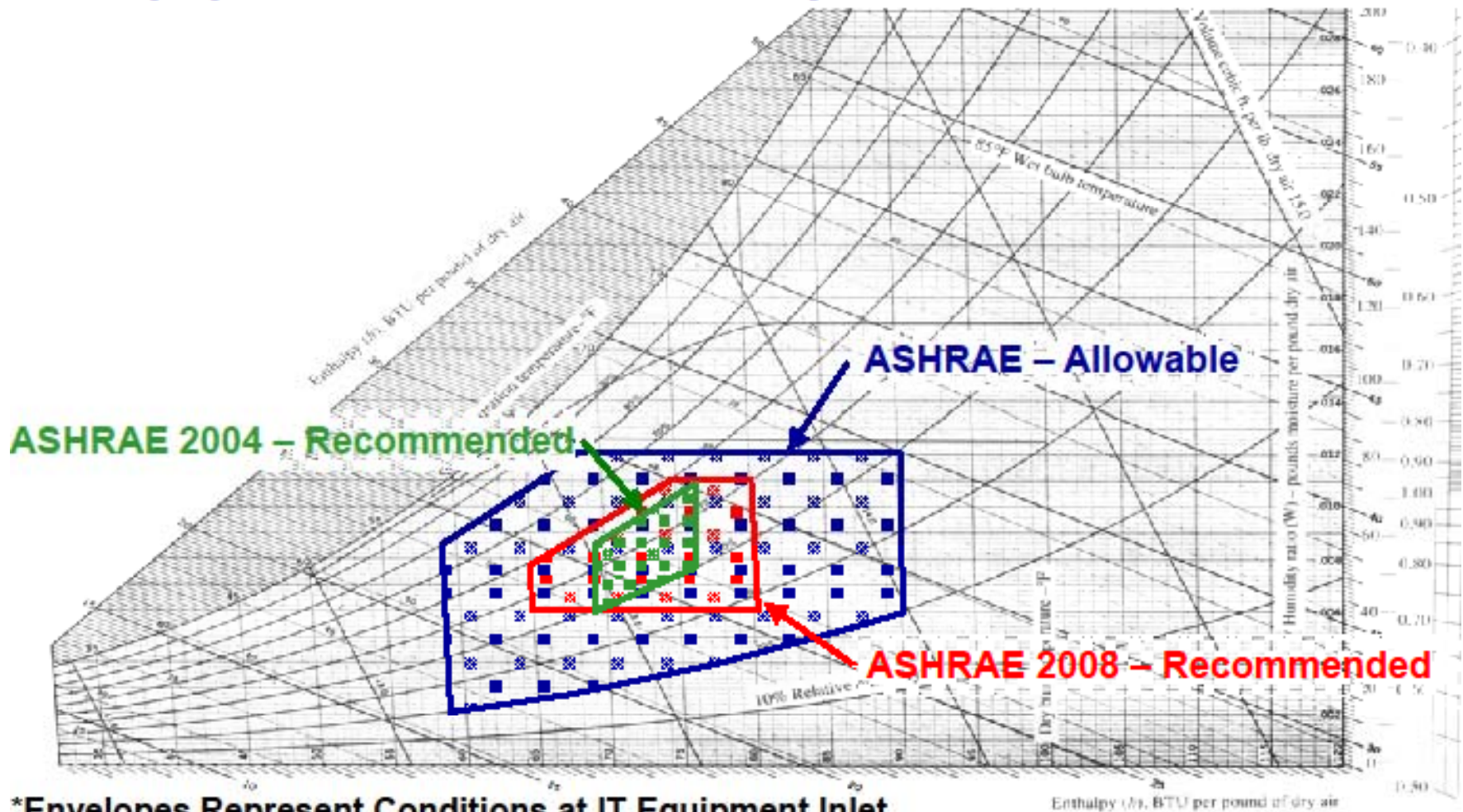
**IT Load      1kW = 3,410btuh = 0.3 sensible ton  
typically 85% of Data Center Cooling Load**

- Electrical Equipment Losses:
  - PDUs
  - UPS
  - XFMRs
- Building Envelope:
  - Walls
  - Glass
  - Roof
- People / Ventilation
- Lights

# Temperature and Humidity Criteria

- IT Equipment Room – Data Center Proper
  - **Temperature** and **Humidity** at the inlet to servers
- NOC – People Space
  - **Temperature** and **Humidity 72° Fdb / 50%rh**
- UPS Rooms
  - **Temperature 75° Fdb**
- Battery Rooms
  - **Temperature 77° Fdb, Hydrogen Exhaust**
- Switchgear Room
  - **Ventilation only 104° F** or **cooling?**

# IT Equipment Environment – Psychrometric Chart



\*Envelopes Represent Conditions at IT Equipment Inlet

# ASHRAE Guidelines Affect on Cooling Systems

## Higher Supply Air Temperatures

- More Economizer Hours
- Higher Chilled Water Supply Temperatures
  - Better Chiller Performance (more capacity and lower kW/ton)

## Higher Return Air Temperatures

- Increased Cooling Coil Capacity

# Cooling System Selection

- Cooling Load – Heat Rejection Type
- Load Density
- Air Distribution – Underfloor, Overhead, In-Row
- Redundancy
- Efficiency
- Modularity
- Phasing
- Future Growth
- Location of Data Center within the Building



# Cooling System Type – Heat Rejection

- Capacity
- Efficiency – First Cost vs. Operating Cost
- Space Constraints
- Redundancy Requirements
  
- **DX Air Cooled**
- **DX Water/Glycol Cooled**
- **Chilled Water – Air Cooled or Water Cooled Chillers**

# Air Distribution – Terminal Equipment

- IT Load Density – kW/Cabinet
- Access Floor or No Access Floor?
- Ceiling or No Ceiling?
- CRAC Units
- Central Air Handling Units – CV or VAV
- In-Row Cooling
- Overhead Terminals
- Integrated Cabinet Cooling

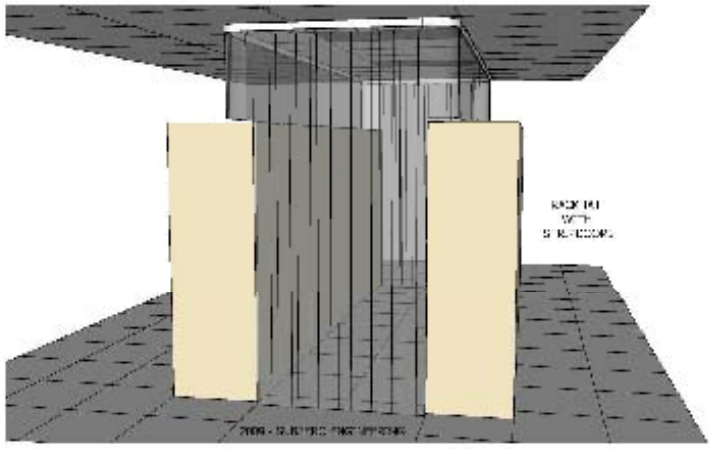
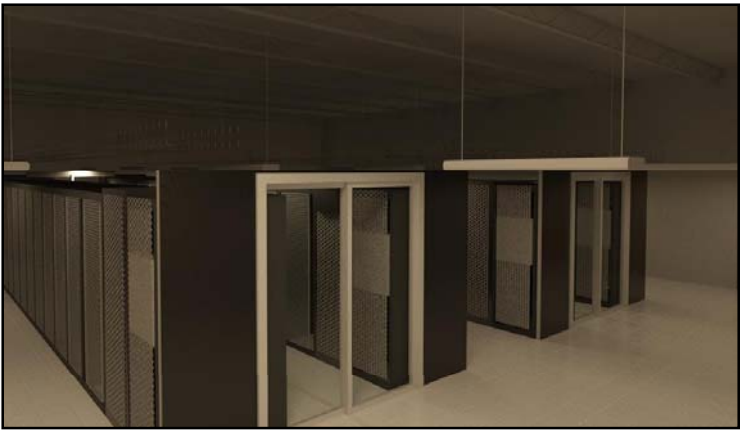
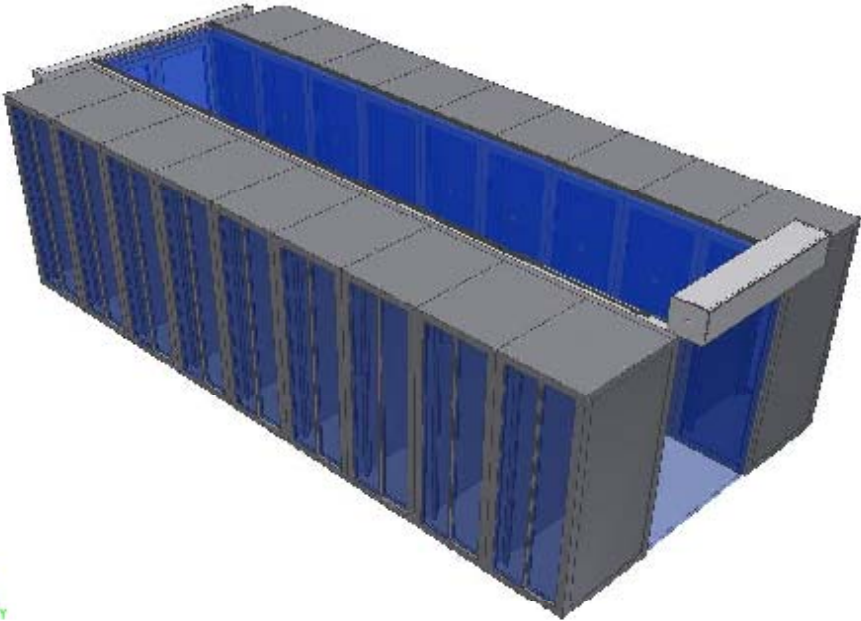


# Air Delivery to Servers

- Rule No. 1 – **Deliver All Cold Air to the Servers**
- Rule No. 2 – **Return Hot Air Back to A/C Unit without Mixing with Cold Air**

**Separation of Cold and Hot Airstreams**  
**AISLE CONTAINMENT**

# Aisle Containment



# Electrical Systems

- Scalability
- Modularity
- Efficiency – Reduce Losses
- AC / VS DC



# Real Time Metering / Monitoring

- DCIM Tools
- Power Monitoring
- Temperature / Humidity Monitoring
- Alarming Thresholds
- Automatic Feedback Loop Control of DC Efficiency

# Re-Commissioning / Retro-Commissioning

- Continuously Evaluate Needs
- Review and Evaluate Previously Established Benchmarks
- Stay on Top of Low Hanging Fruit
- Introduce Operational Energy Saving Strategies



[www.bala.com](http://www.bala.com)



# QUESTIONS



**Daniel J. McGroary**  
**Senior Project Manager and Data**  
**Center Market Sector Leader**  
**Bala Consulting Engineers**



**Janelle Penny**  
**Associate Editor**  
**Buildings**

**BUILDINGS** PRESENTS

SMARTER  
BUILDINGS®  
WEBINARS

An event on  BUILDINGSVIP®

Thank you for joining us.

Thanks again to our sponsors!

  
**DATA AIRE INC.**

MOVINCOOL®  
THE #1 SPOT COOLING SOLUTION