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National Grid

Your Partner in Energy Solutions

Data Center Presentation

February 27, 2013

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Beat the heat with cool cash from utilities

Grow your infrastructure with utility dough \$!

1. Two Part Presentation

- How National Grid efficiency programs benefit data centers beyond saving energy
- Spotlight on a new Thermal Analysis program National Grid provides

Webinar Objectives

- 
1. Energy efficiency may be just a leveraging point
 2. Opportunities for Data Center HVAC and Electric systems
 - Redundancy / Reliability
 - Increasing capacity
 3. How to determine if your facility has an opportunity
 4. How to get third party capital handed to you with no hitches

Over \$200 Million Available In 2013!



Towns with Municipal Electric Companies EXCLUDED

Why Bother If Energy Cost Is Not Your Issue?

IT DEPARTMENT CONCERNS with Facility Infrastructure

1. Reliability

- Uniform room temperature
- Adequate HVAC capacity
- Adequate redundancy of HVAC and UPS
- HVAC and UPS service outages

2. Capacity for growth (HVAC and UPS)

3. Capital budget constraints

Stretching Your Capital

1. Instead of increasing HVAC capacity by 20% go as high as 100% with 2 to 2.5 year payback
2. A new UPS rather than simply doing a battery replacement





SURPRISE!

We do that!

and we use energy savings as source of funding!

Capacity, Reliability and Redundancy

Our solutions may assist you with existing facilities:

1. Identify hot spots and help fund corrective measures
2. Squeezing an extra 25 to 30% capacity out of your CRAC units
3. Extend capacity out of your generator back up
4. Provide you a completely redundant cooling system
5. Provide you with an additional (back up)cooling tower
6. Provide free cooling which gives you redundancy for chillers 30 to 40% of the hours in the year

Situations Where We Could Help

1. Inability to maintain low enough room temperatures
2. One CRAC unit with service issue creates a high temperature condition
3. Lawn sprinklers running on your roof top HVAC condensers



Op-Ex Reduction

1. Cutting operating expenses for facilities by as much as \$500,000 annually

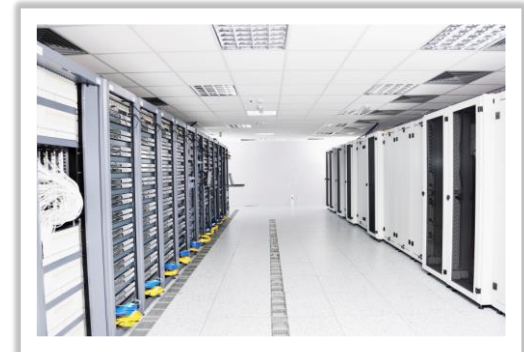
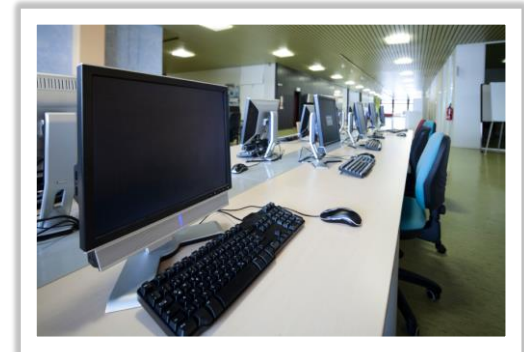


New Data Center Initiative

Targets: New, Existing, Expansions, Renovations

(Note: In NY ground up new construction are by NYSERDA)

- Data centers
- Computer Rooms
- Server farms
- Electronic equipment test rooms



*May or may not have; raised floor,
drop ceilings, UPS or generator*

National Grid Services

1. Free initial walk through or plan review
2. Extensive metering or thermal graphic analysis where applicable
3. Up to 50% share of detailed energy efficiency studies
 - Investment grade technical and economic analysis
4. Incentives \$\$\$\$\$\$ for installing efficient equipment and controls
 - Engineering, labor and materials
 - Incentives up to \$1 million / project

*You choose your own design
engineer and the installing contractor*

New Construction / Renovation

Top Opportunities

1. In row / close coupled cooling systems
2. VFD's on fans
3. Upgrading to include isle containment
4. More efficient UPS Systems
5. Free cooling



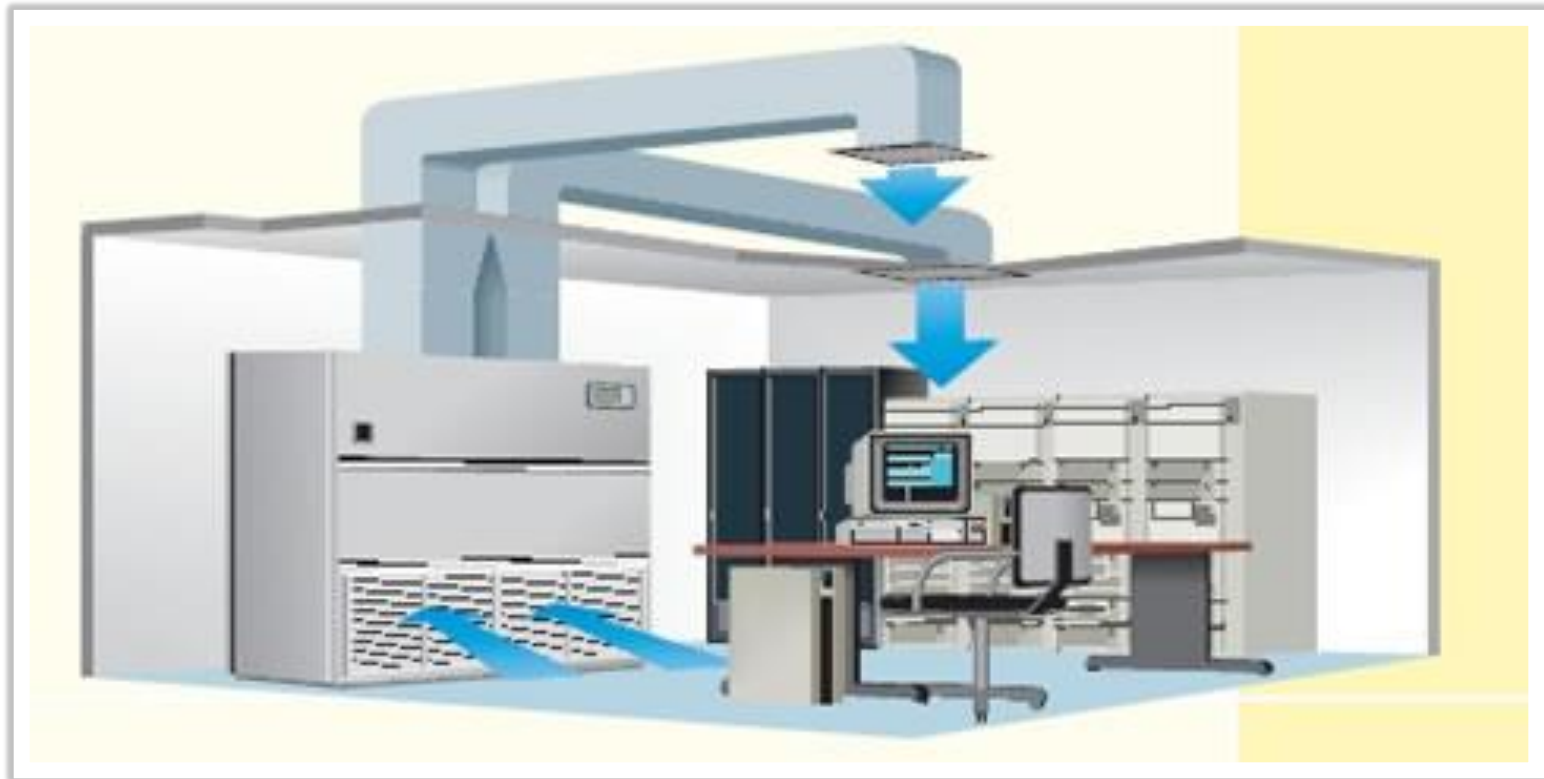
<http://www.coolingzone.com/index.php?read=58&magid=22&onmag=true>



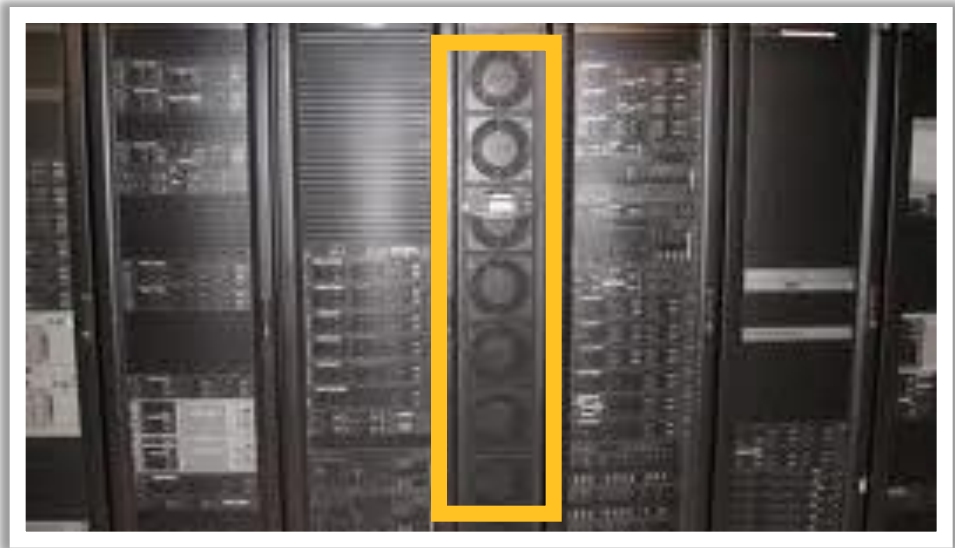
Upflow Not Ducted



Ducted Upflow CRAC System



In Row Cooling Units



Example: Staples Adaptive Cool

Size:	25,000 SF
HVAC:	16- 20 to 30 Ton CRAC units
Annual Savings	\$100,000
Cost:	\$271,000
<i>Incentive</i>	<i>\$148,000</i>
Payback	15 months

Case Study 2: Solution

1. Install hot isle containment
2. Shut off a several CRACs using automated controls
3. Adaptive Cool Panels
4. Install plenum return





Before



After

University Reheat and Humidification

Size:	approx. 2,000 SF
HVAC:	Multiple CRAH units
Annual Savings	\$7,500/ 67,000 kWh savings
Cost:	\$500
<i>Incentive</i>	<i>None</i>
Payback	1 month
Modification:	Adjust Controls

Higher Education: VSDs and Containment / Air Flow Mgmt.

Size:	approx. 2,000 SF
HVAC:	Multiple CRAH units
Annual Savings	\$16,000/ 153,000 kWh savings
Cost:	\$72,000
<i>Incentive</i>	\$36,000 (50%)
Payback	2.4 years after incentive
Modification:	VSDs on CRAH units and air flow management

Multi-Tenant Retrofit Free Cooling

Size:	approx. 20,000 to 30,000 SF
HVAC:	More than 12 CRAH units
Annual Savings	\$64,000/ 636,000 kWh savings
Cost:	\$305,000
<i>Incentive</i>	<i>\$150,000 (50%)</i>
Payback	2.5 years after incentive
Modification:	Adding dedicated tower to current under-utilized economizer.

Major Legacy DC Retrofit

Size:	100,000 SF
HVAC:	90- 30 Ton CRAC units
Annual Savings	\$470,000 / 420,000 kWh savings
Cost:	\$1.4 million
<i>Incentive</i>	<i>\$ 930,000 !!!!!</i>
Payback	1.0 years

VFD's on Fans, Containment, Blanking panels etc.

Most Common Opportunities and Solutions

TOP RETROFIT OPPORTUNITIES (Things to fix)

1. Existing water side economizers grossly underutilized
2. Overhead supply CRAC systems not meeting load supplementing CRAC units with Dx close coupled cooling units.

RETROFIT SOLUTIONS

1. Using ceiling plenums as return air path for downflow CRACs (reducing number of on line CRAC units)
2. Controls putting excess capacity on stand by (in excess of N+1)

90 % of jobs we've looked at have had opportunities to save energy

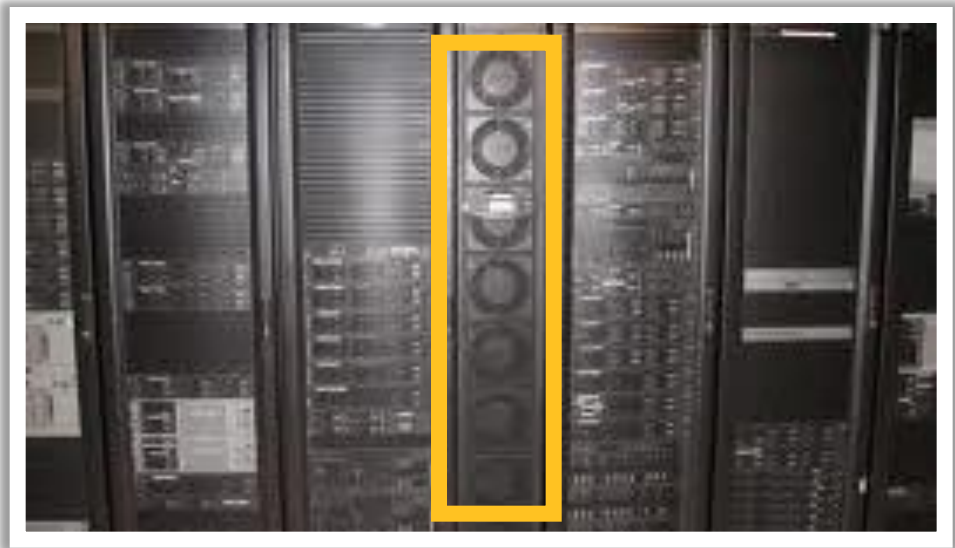


Before



After

In Row Cooling Units



Solution Adaptive Cool



- 2'x 2' Floor tile with a VSD fan that pushes extra air where needed.
- Eliminates hot spots, reduces need for general overcooling
- For under floor cooling systems

Underestimating the Range of Solutions

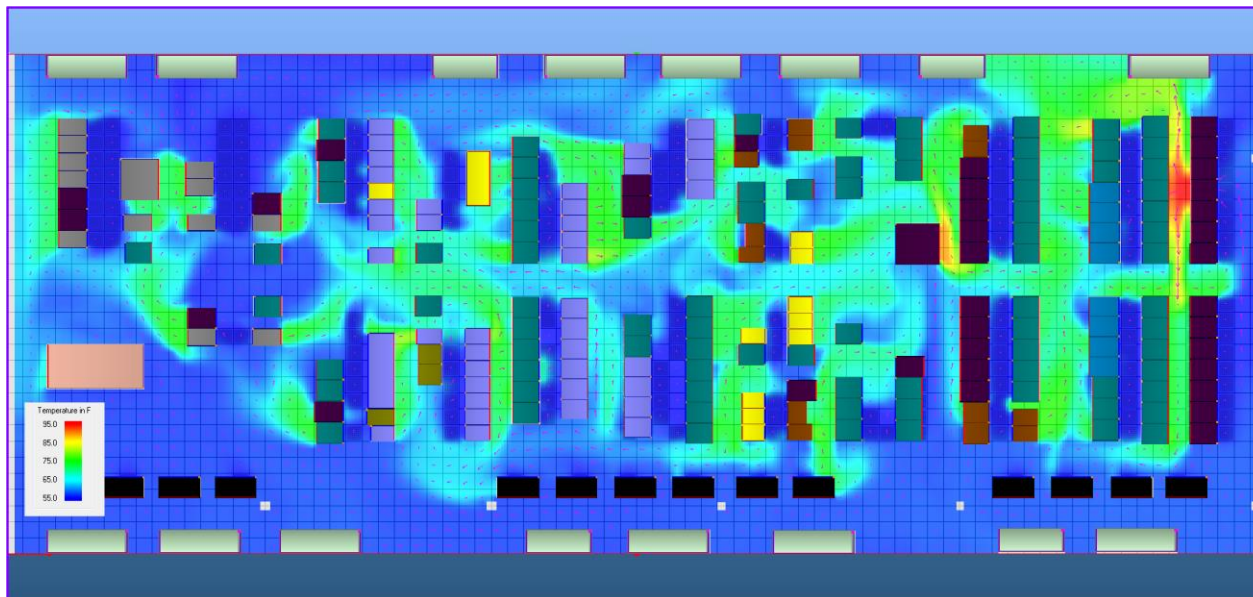
What's your reason for not acting?

1. No water in data center
2. Floor space constraints
3. Can't get Hot Isle / Cold Isle configuration
4. Fire department objection to containment curtains
5. Plastic containment curtains unsightly?
6. Mismatched server cabinet dimensions?
 - There are “countless” products and approaches.
 - Each constraint can be overcome.

New National Grid Metering Pilot

Free to first 10 customers (\$3,500 to \$6,500 value)

1. Wireless metering of CRAC unit electric use
2. Temporary wireless sensors produce a “thermal image”



**\$5,000 to
\$7,500 Value**

Requirements

1. Facility must have sufficient cooling load to justify study
2. Metering Offer
 - Smaller sites: CRAC power monitoring (30 days)
 - Larger Computer room or Telcom sites: Thermal Graphic (6 hr.)
3. Includes initial summary of opportunities and high level analysis
4. Prepares you for consideration of full detailed study

Wireless Metering Option

Wireless power monitoring for CRACs

Typically for smaller projects with 3 to 6 CRAC Units



Wireless Current Transformer



Measure reheat use, humidification power and compressors

What is the Potential?

**Our nine most recent surveys collectively identified
\$1.0 million in annual savings.**

Bonus Incentives For MA and RI

for many new projects completed in 2013!

Introducing

nationalgrid
HERE WITH YOU. HERE FOR YOU.

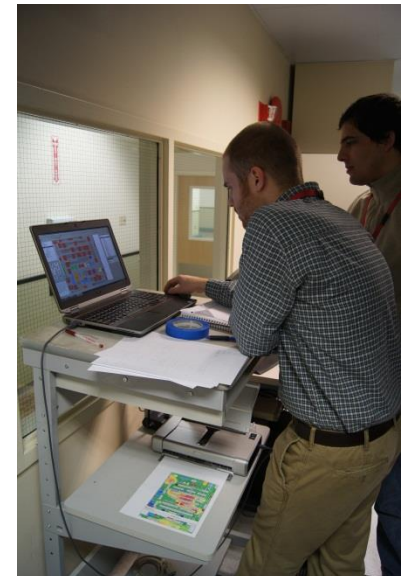
John Weale

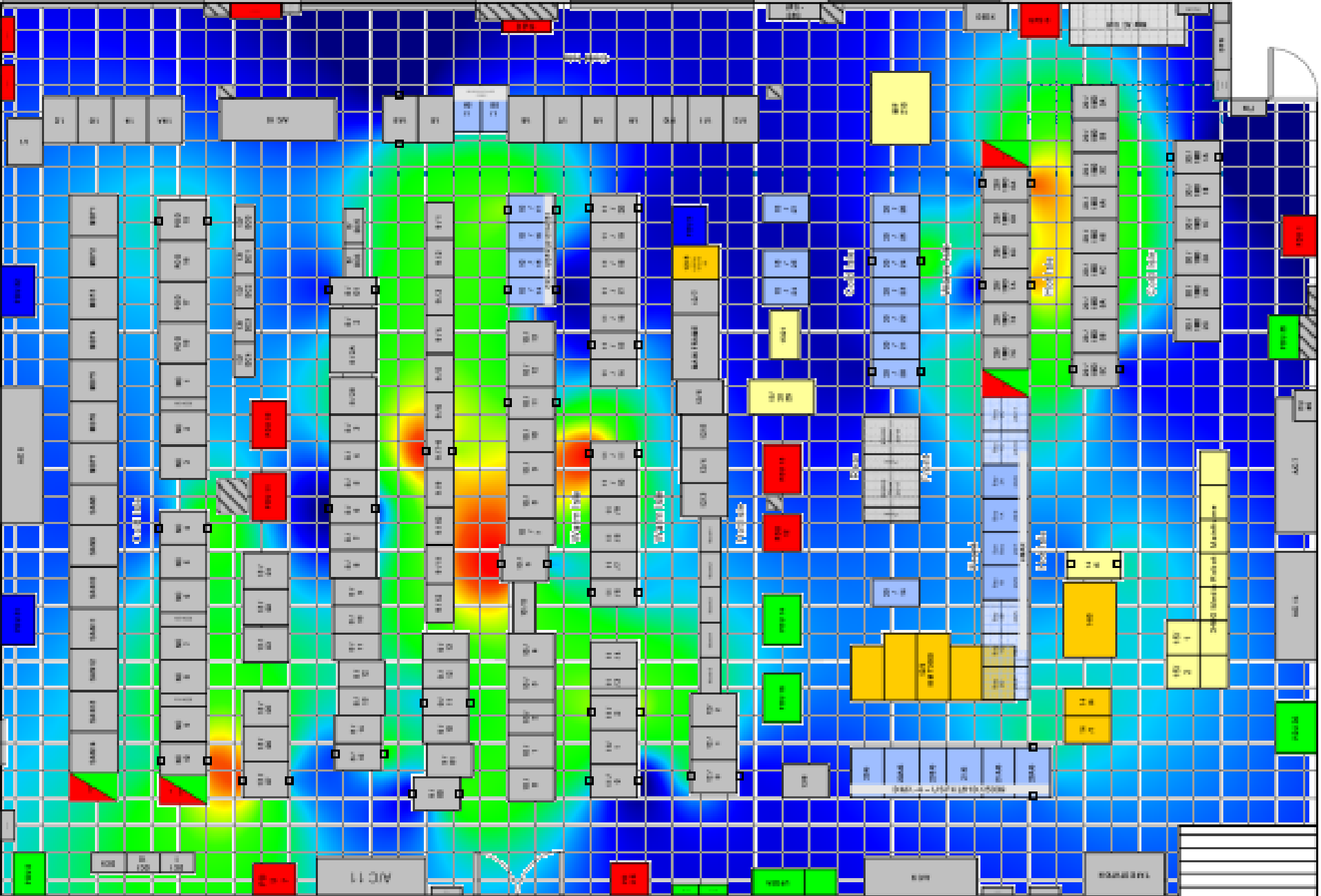
Integral Group



INTEGRAL GROUP

Thermal Mapping And Efficiency Opportunities

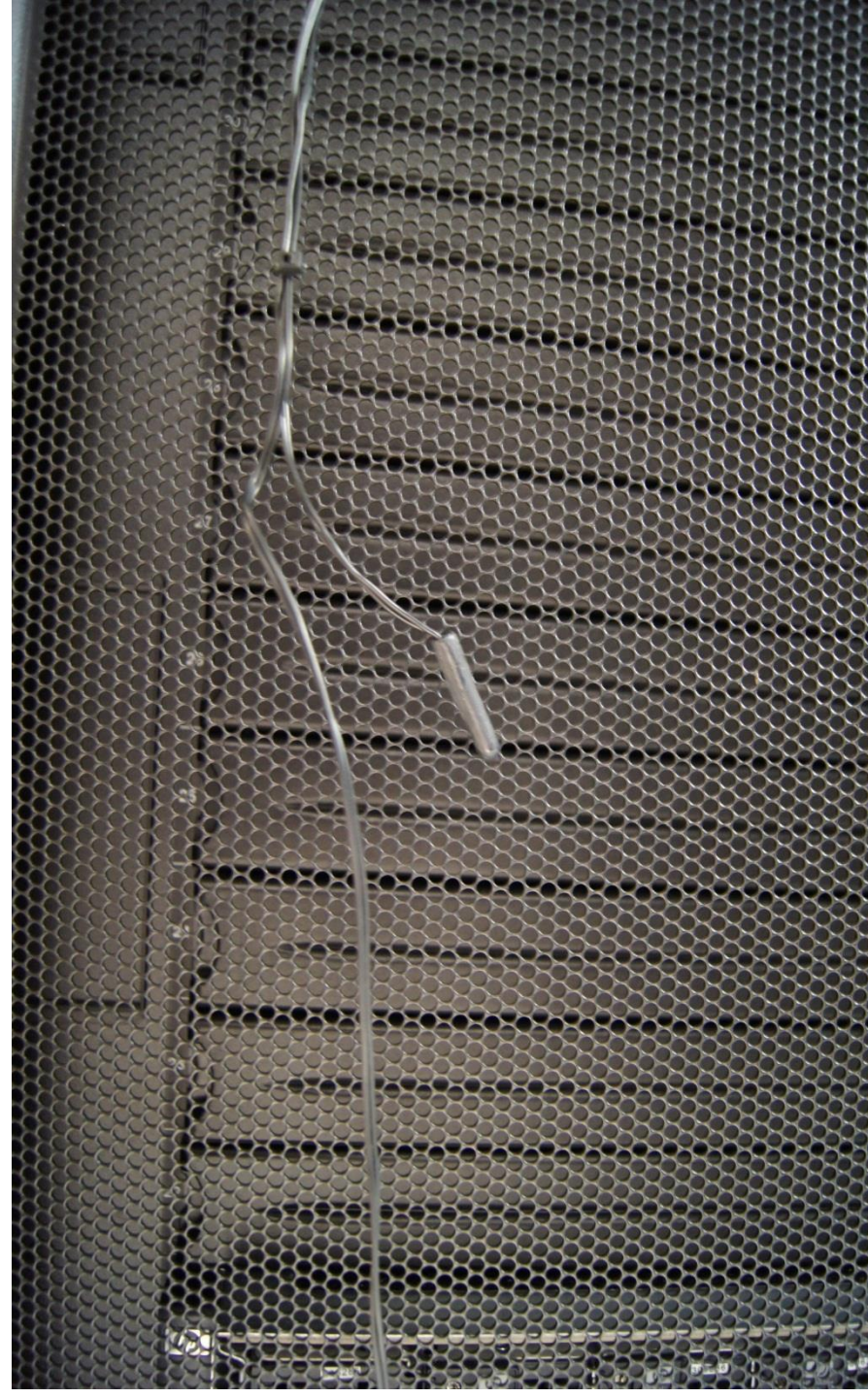
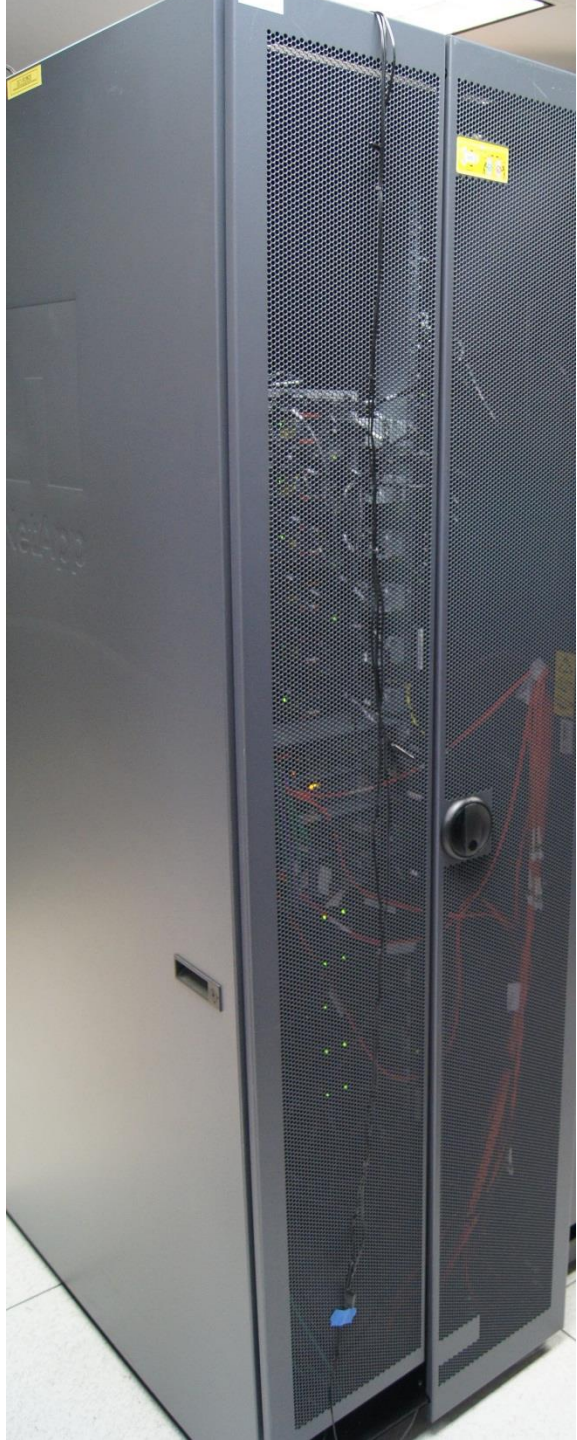


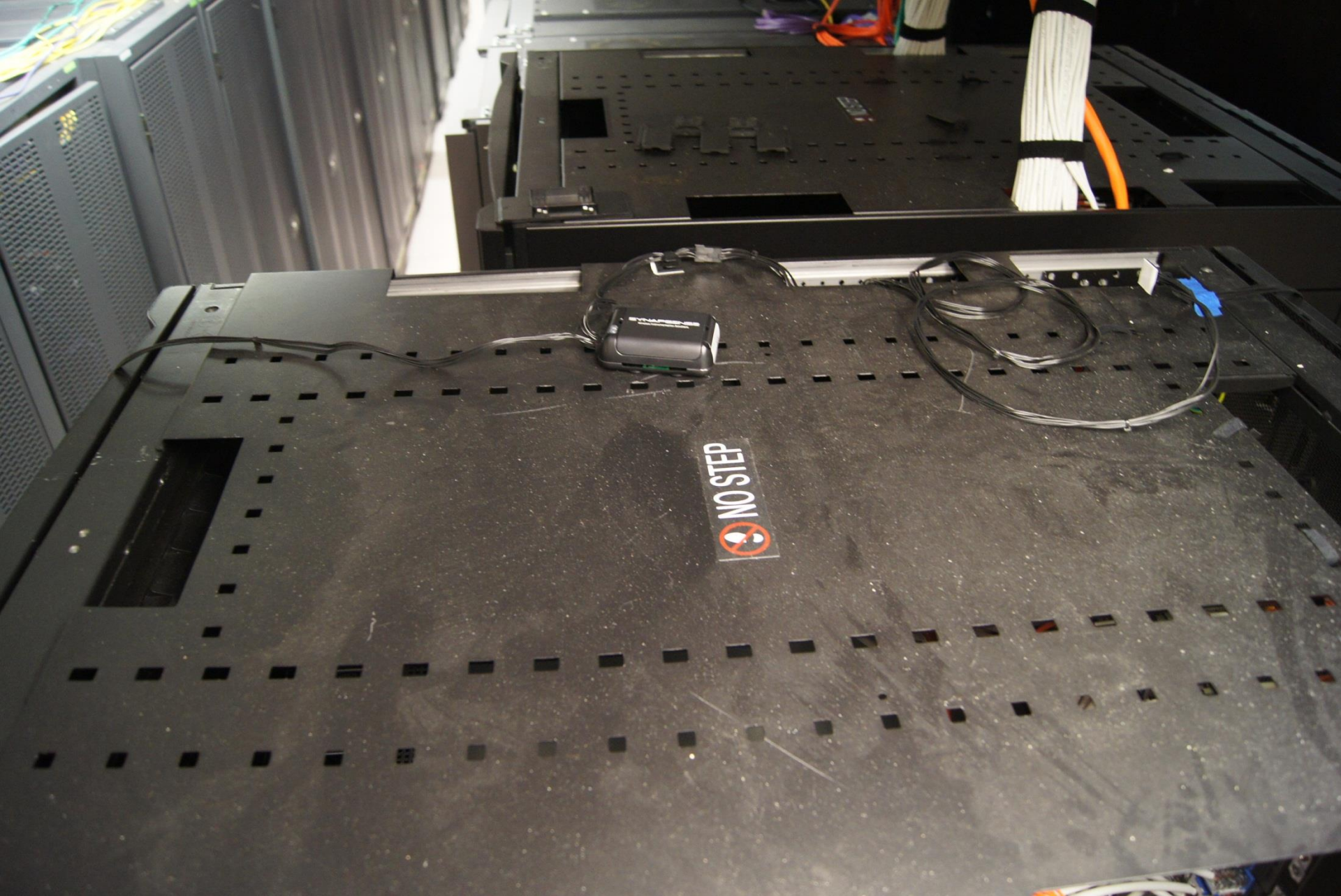


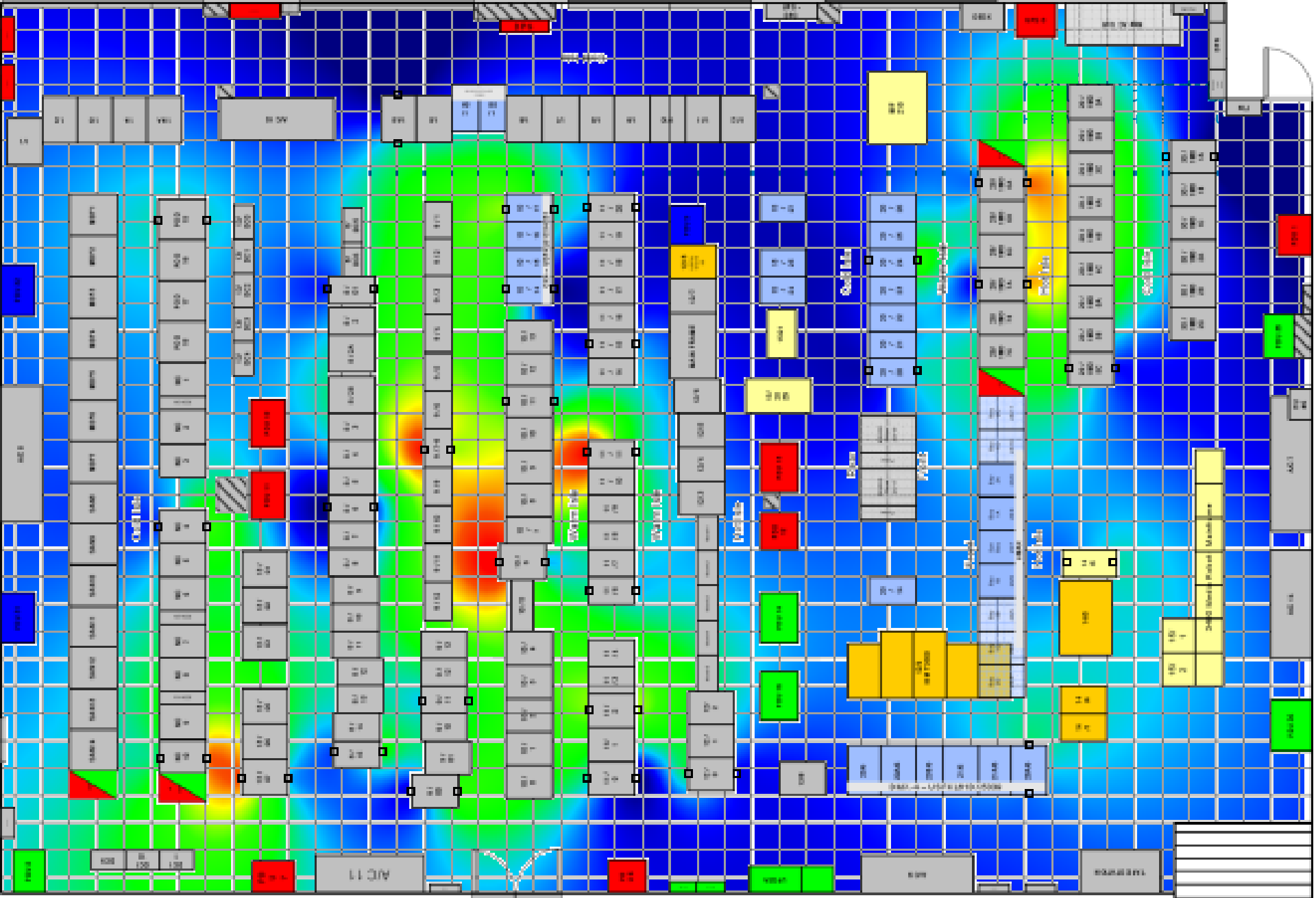
Details: What is Thermal Mapping?

- Identifies hot spots by measuring the temperature across the entire floor
- 200 – 300 wireless temperature sensors deployed to make map
- Provides hard data on effectiveness of datacenter conditioning
- Attractive product to datacenter operators, emphasizes respect for critical nature of temperature control



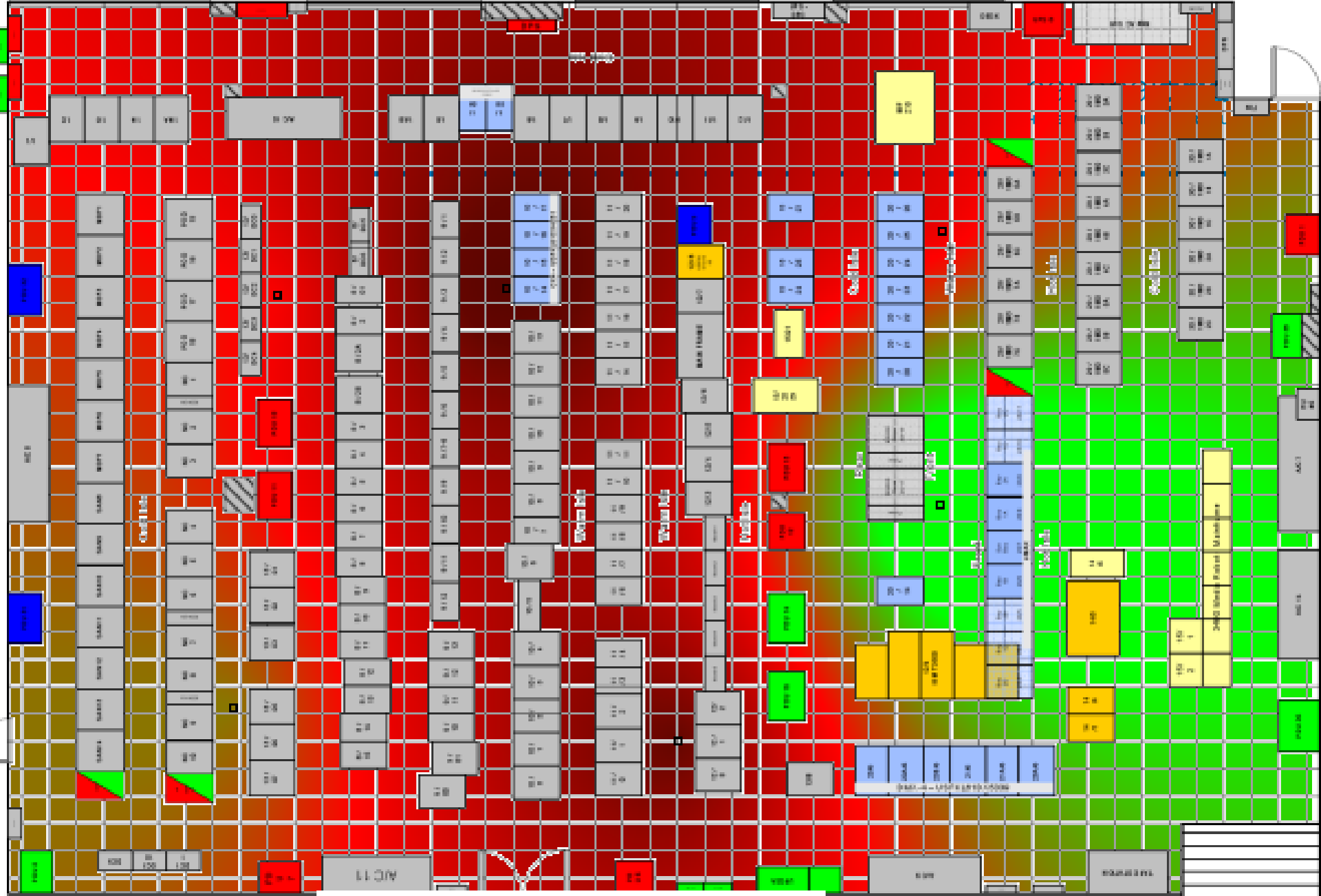








Can map underfloor pressure distribution



Underfloor Pressure (in WG)

Sign Up for Free Metering Offer

LIMITED TIME OFFER!

Contact:

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Or contact me via Linked in

Fan Optimization



6/25/2012

Controls: Reheat & Humidification



1. Reheat is unnecessary but often on (and energy intensive)
2. Overly tight humidity bounds can result in fighting, uncontrolled dehumidification
3. Incentive “Problem”: Payback is too low

6/25/2012

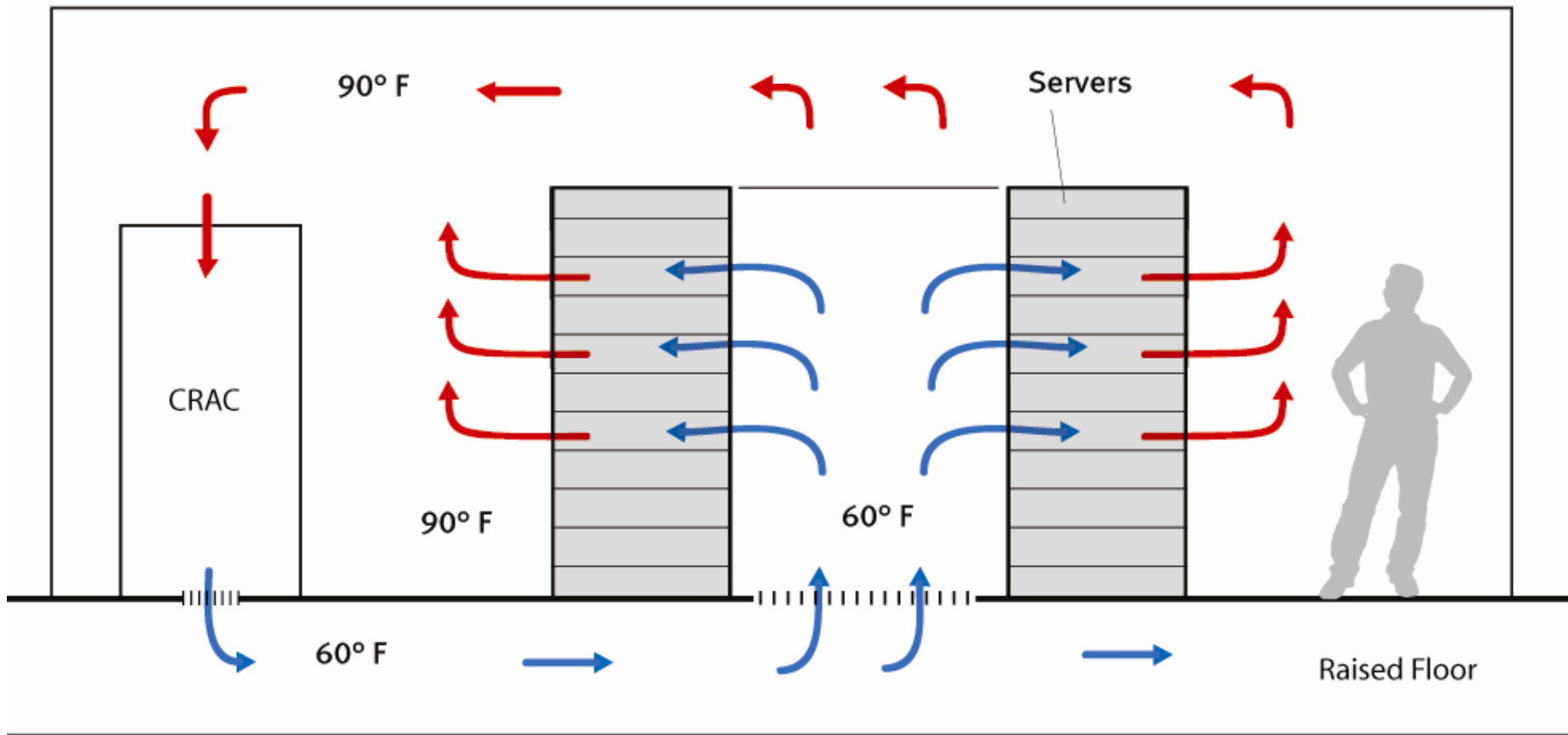
Case Study Results, *Combined Measure*

Site #	Measure	Cost Estimate	Annual Savings (kWh; \$)	Payback (before incentive)	Incentive
1	Disable reheat, add VFDs to CRAHs, airflow management	\$73,000	220,000; \$23,000	3.2	\$ 36,500
2	Disable reheat, airflow management, disable 1 CRAH	\$120,000	290,000; \$30,000	4	\$ 60,000

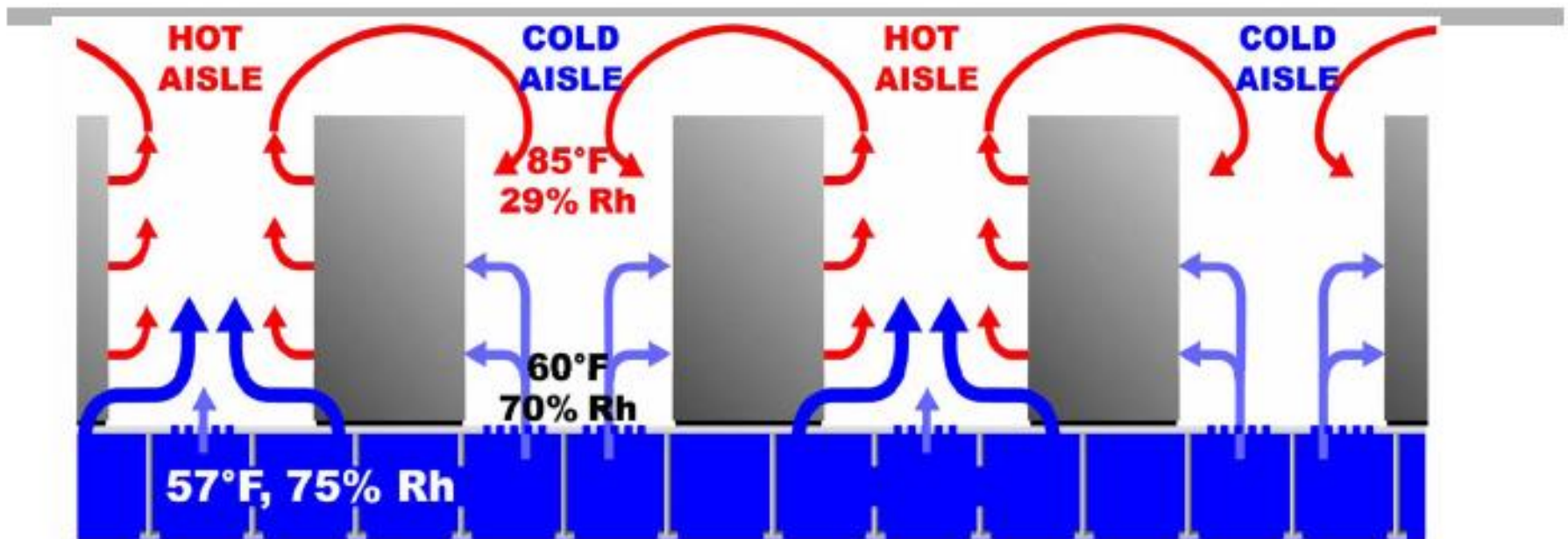
1. 2,000 SF Datacenter, CHW CRAHs and DX CRACS, Rhode Island
2. 7,000 SF Datacenter, 9 CRAHs, Andover MA

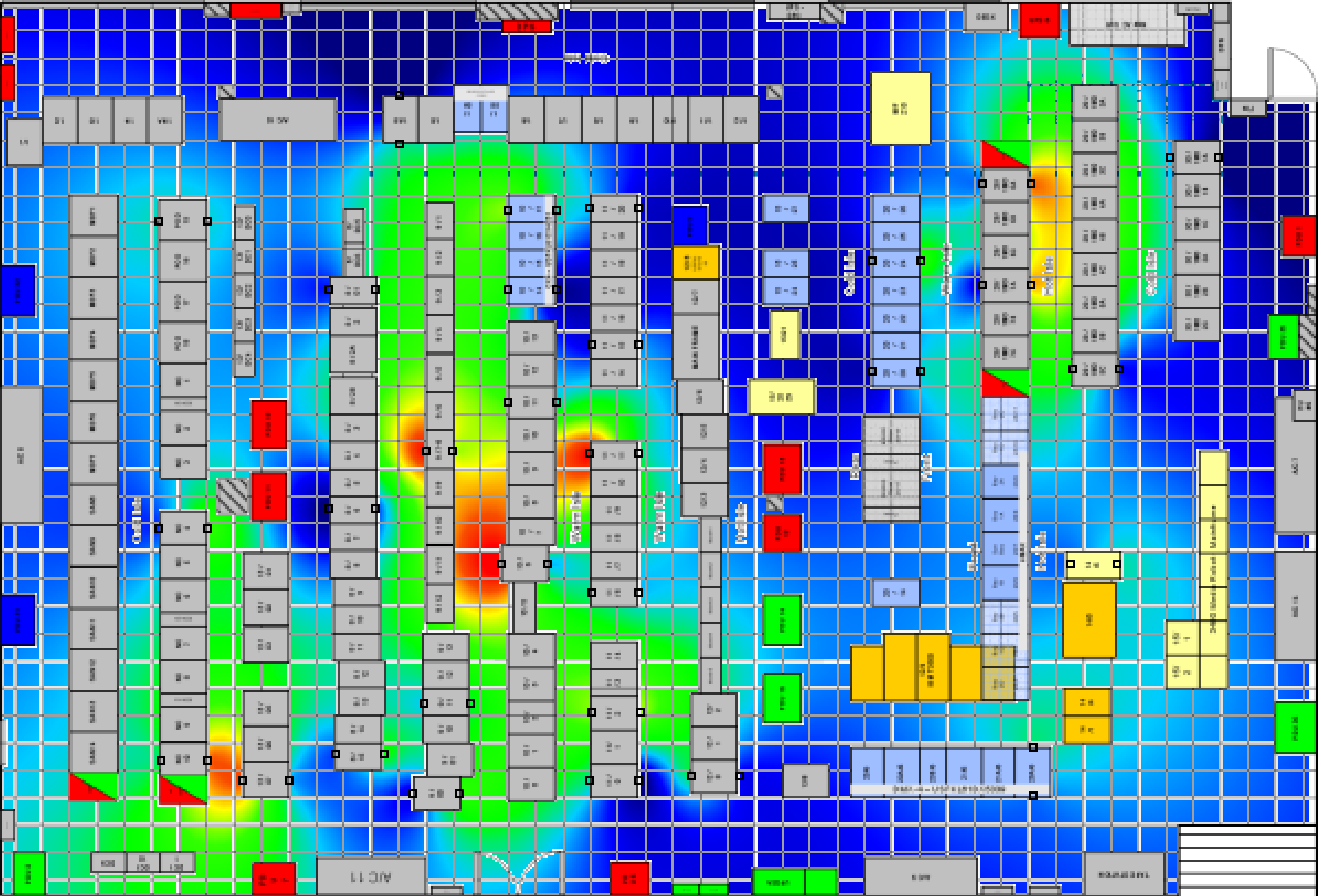
Air Management: Typical Data Center

Standard CRAC Unit Cooling Strategy



The Breakdown of the Hot Aisle/ Cold Aisle Configuration





“Retrofit” Chilled Water to Increase Capacity



Case Study, Drycooler Free Cooling

Site #	Measure	Cost Estimate	Annual Savings (kWh; \$)	Payback (before incentive)	Incentive
1	Install air cooled chiller with free cooling	\$290,000	600,000; \$63,000	4.6 years	\$ 145,000
1	Install in-row coolers to increase capacity	\$170,000	580,000; \$61,000	2.8 years	\$ 78,500
1	Combined	\$460,000	1,180,000; \$124,000	3.7 years	\$ 230,000

1. One MW Datacenter, DX CRACs & In-row CHW, Marlboro MA

Air Side Economizing Potential;

Supply Air Temp.	Full Economizing		Mechanical Cooling Only		Percent of Annual Load Covered by Chillers
	hours	% of year	hours	% of year	
55	5,200	59%	2,000	23%	30%
70	6,700	76%	50	0.5%	10%

Free Cooling



Case Study, Cooling Tower Free Cooling

Site #	Measure	Cost Estimate	Annual Savings (kWh; \$)	Payback (before incentive)	Incentive
1	Renovate abandoned free cooling system	\$45,000	330,000; \$35,000	1.3 years	\$ 0
2	Add new free cooling system	\$1,000,000	1,300,000; \$140,000	7 years	\$ 500,000

1. 50,000 SF Datacenter, AHUs and CRAHs

2. Two MW Datacenter, CHW CRAHs

UPS Opportunities: Case Study Results

Site #	Measure	Cost Estimate	Annual Savings (kWh; \$)	Payback (before incentive)	Incentive
1	Install high efficiency UPS	\$80,000	285,000; \$30,000	2.7 years	\$35,000
2	Install high efficiency <i>modular</i> UPS	\$29,000	320,000 \$34,000	.9 years	\$0

1. 1 MW Datacenter, DX CRACs & In-row CHW
2. 400kW UPS load increase, datacenter expansion

Sign Up for Free Metering Offer

LIMITED TIME OFFER!

Contact:

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Or contact me via Linked in

Thank you for participating today

Contact: Fran Boucher

Data Center Initiative Manger

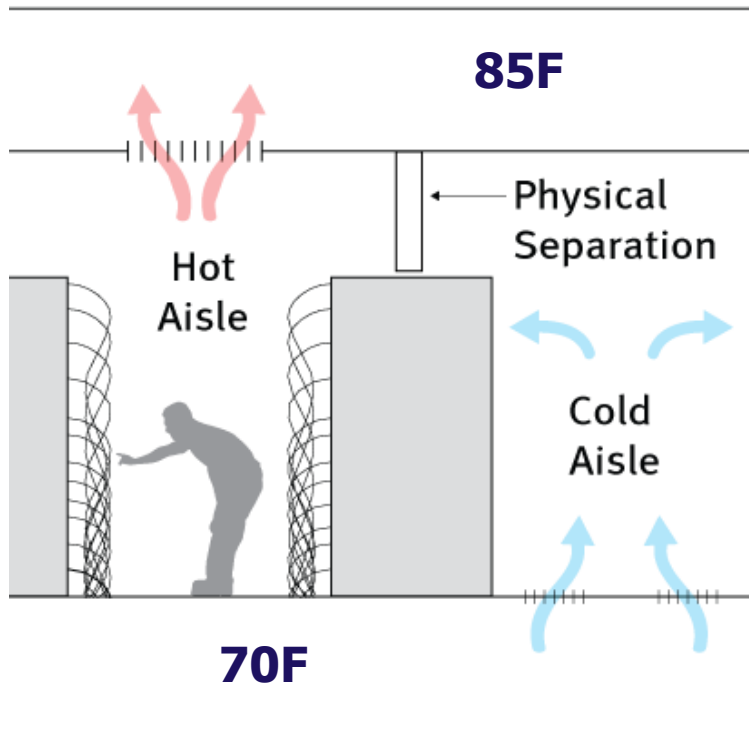
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Hot Aisle & Cold Aisle – Plenum Return or Overhead Supply

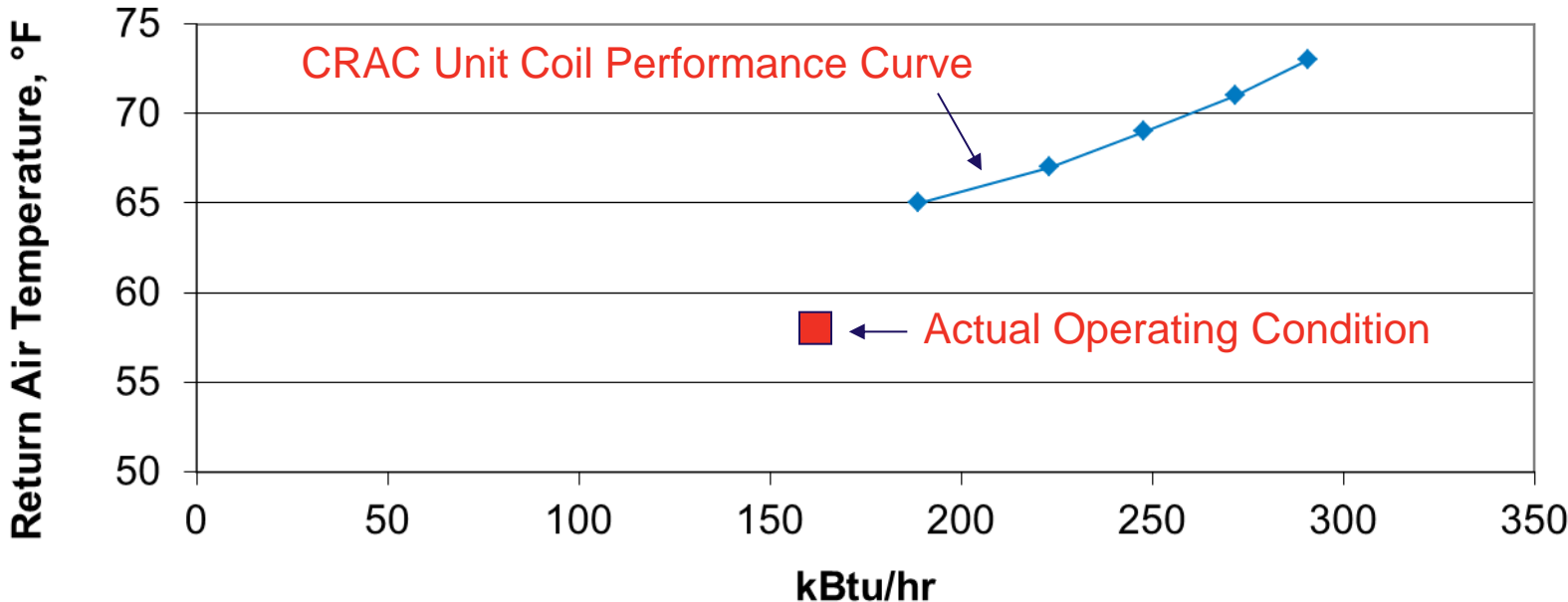


Cold Aisle Containment – Underfloor Supply, Space Return



Containment Can Increase Capacity

CRAC Unit Return Air Temperature vs. Design Capacity



Case Study Results, Combined Measure

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