2009 Utility Forum
Data Center Solution

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VSP's Sustainability Mission

VSP is committed to **sustainability**, and to be a **leader** for other business organizations and the community. Our goal is to improve environmental quality through operational excellence.

- conserve energy
- reduce waste
- reuse materials
- recycle

What's Our Motivation?

VSP's Commitment to Corporate Social Responsibility

**People
(Social)**

**Profits
(Economic)**

**Planet
(Environmental)**
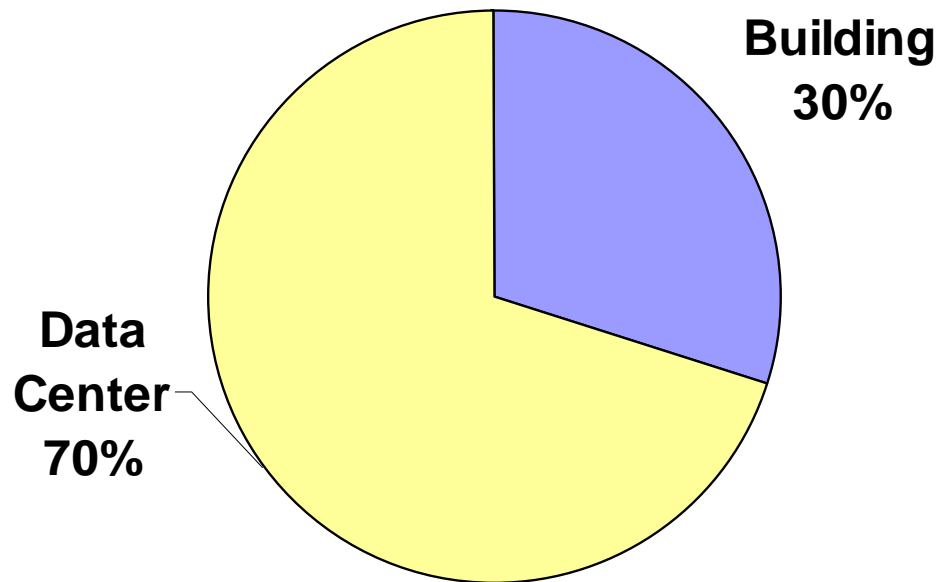
VSP Building HQ1

HQ1 at a glance:

- 152,000 SF
- 9,700 SF Data Center
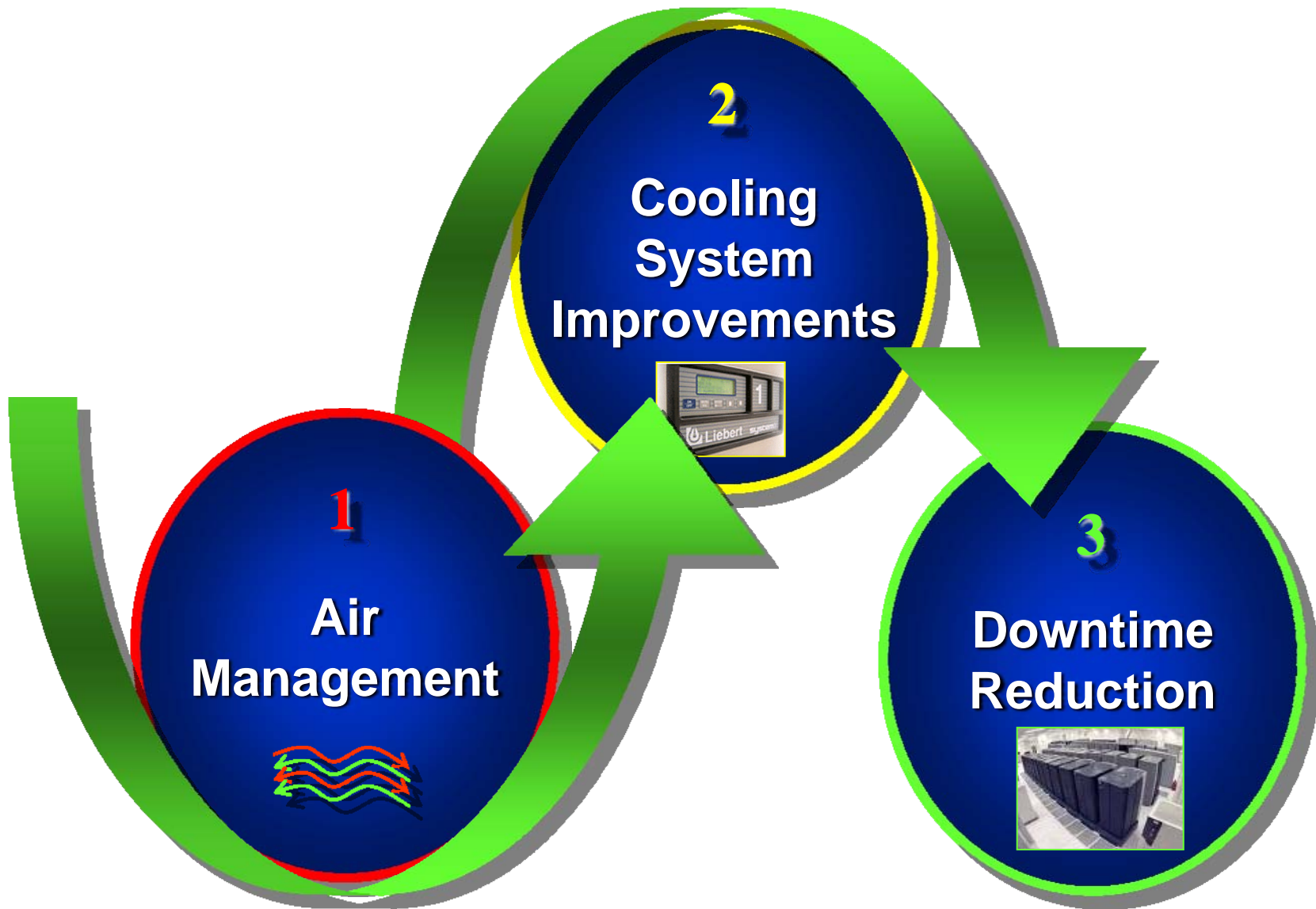- 17 years old
- Begin July 2007

Our First Hurdle: The Energy Star Score

Data Center Monitoring & Optimization

- Objectives

- Opportunities

- Options

- Return On Investment

The Path to the Green Data Center

VSP Return on Investment Summary

Monitoring & Containment

SynapSoft 4.0 Environmental Monitoring	$	22,184
Cold Aisle Containment	$	31,911
Blanking Plates/Koldloks	$	8,152
Total Cost	$	62,247

Adaptive Cooling - Control

VFDs, Liebert NICs & Network	$	16,103
Control Implementation & Commissioning	$	4,400
Total Cost	$	20,503

Total VSP Project Cost	$	82,750
SMUD Incentive (Capped at 35% of Project Cost)	$	28,962
VSP Out of Pocket Spend	$	53,787

Annual Energy Savings (Conservative Estimate)	$	23,000
Simple Payback - Months		28.1

One Solution – Three Vectors

Cooling

Balance Cooling Capacity

Optimization

Air Pressure & Flow

CRAC Utilization

Power

Improve Energy Management

UPS Capacity Planning

Balance

Energy Baseline

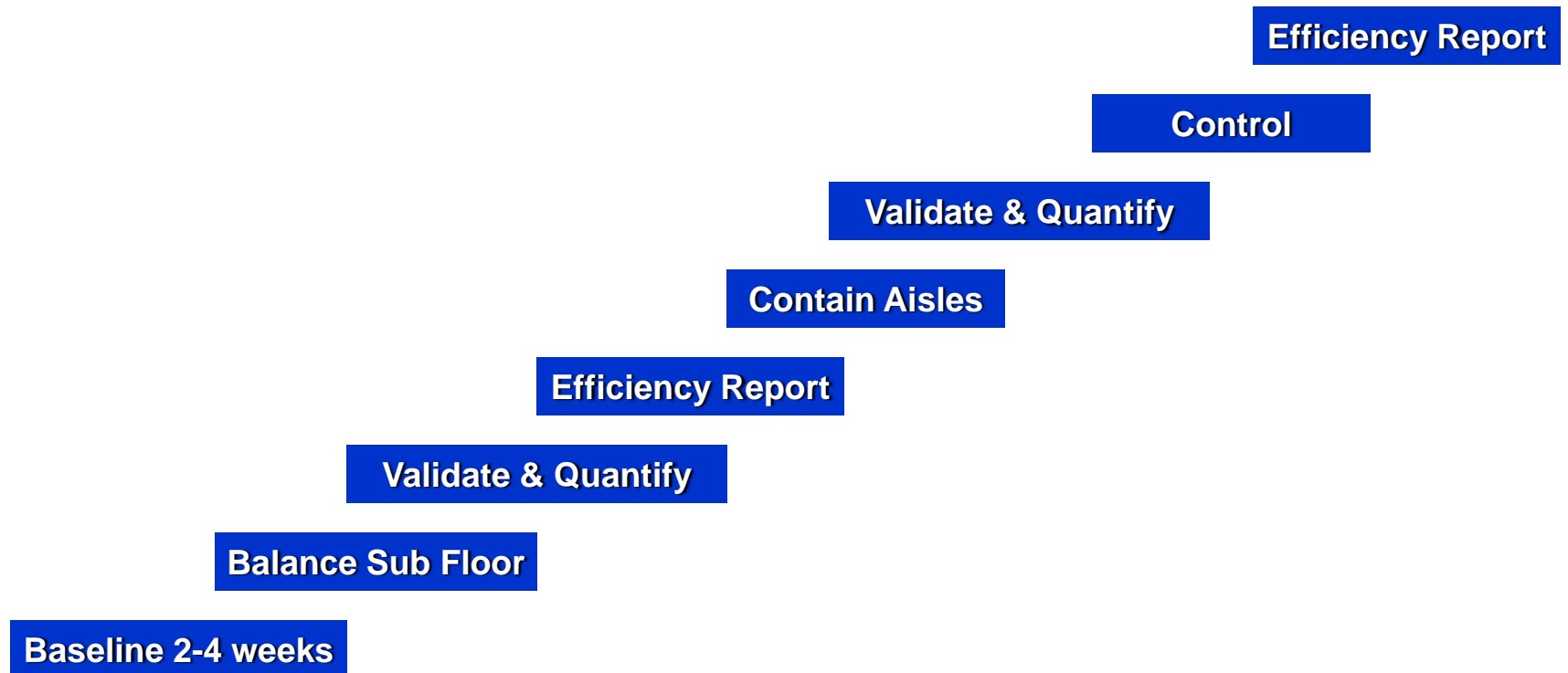Metrics – PUE / DCIE

Operations

Synergize IT & Facilities – *One Dashboard*

Efficiency

Integrated Tool Suite

Optimized Capacity Planning

Balanced IT & Infrastructure

Typical Optimization Timeline

Efficiency Report

Control

Validate & Quantify

Contain Aisles

Efficiency Report

Validate & Quantify

Balance Sub Floor

Baseline 2-4 weeks

SynapSoft™ 5.0 Visibility Solution
Complete Solutions

Infrastructure

- SynapSoft ™ 4.0 Resiliency Software

- Wireless Sensor Network

- Sensor Instrumentation
  - ~ 450 SP / 10K sf Temp / RH / Pressure Power Metering
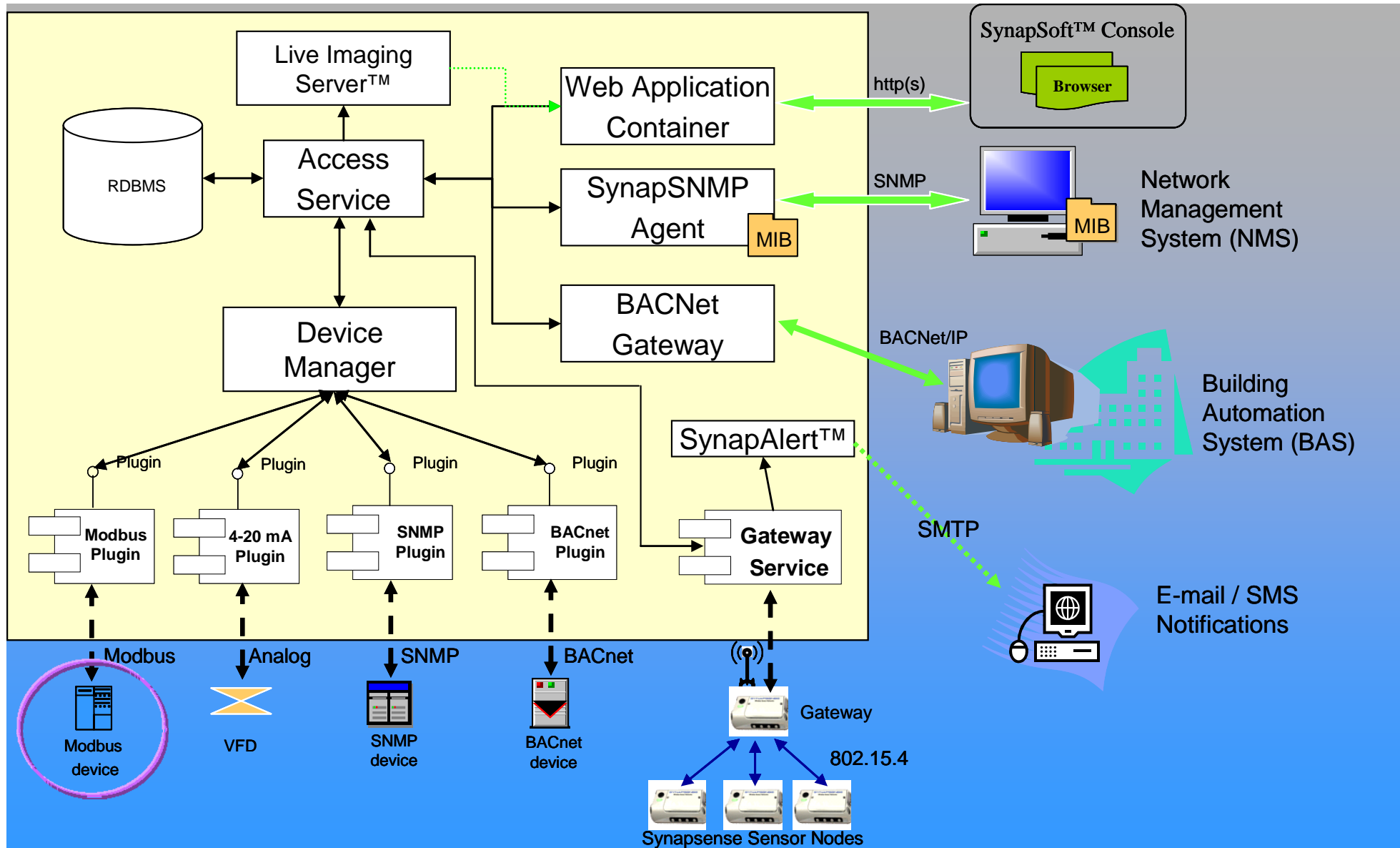
- Network Gateway

Operations

- 24/7 Visibility
  - Alerts
  - Alarms

- Data Trending

- Data Archiving

- Live Imaging™

- Global Visualizations

Service & Support

- Installation

- Technical Support & Online Account

- Maintenance

- Training – online & post-install onsite

- Green Data Center Assessment

SynapSense Solution Overview
Architectural Overview

Sensor Types

Chilled Water Flow

Branch Circuit Monitoring

Energy Metering

Leak Detection

Air Pressure

Rack Thermals

Room Relative Humidity

Door Status

Solution Overview
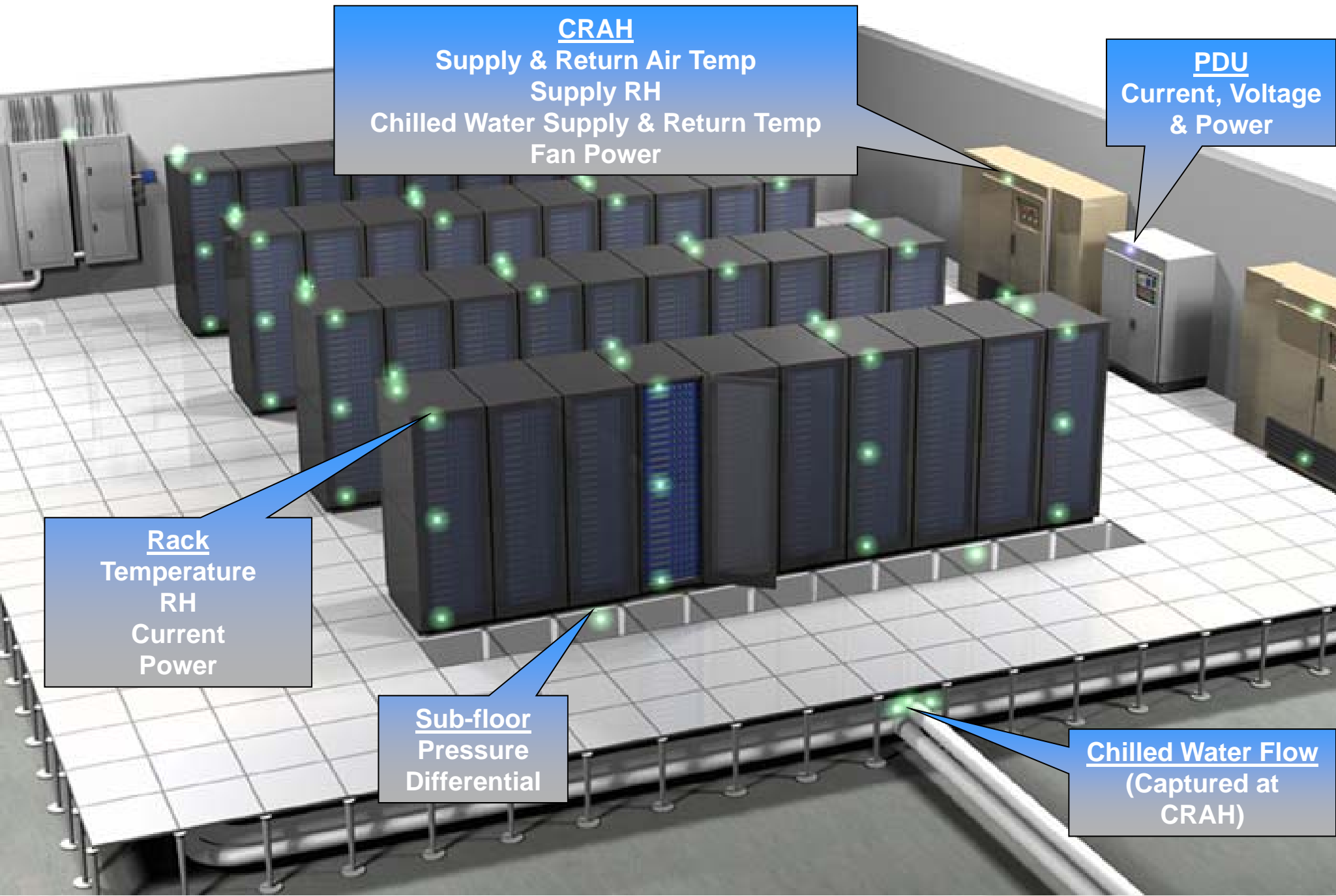
CRAH
Supply & Return Air Temp
Supply RH
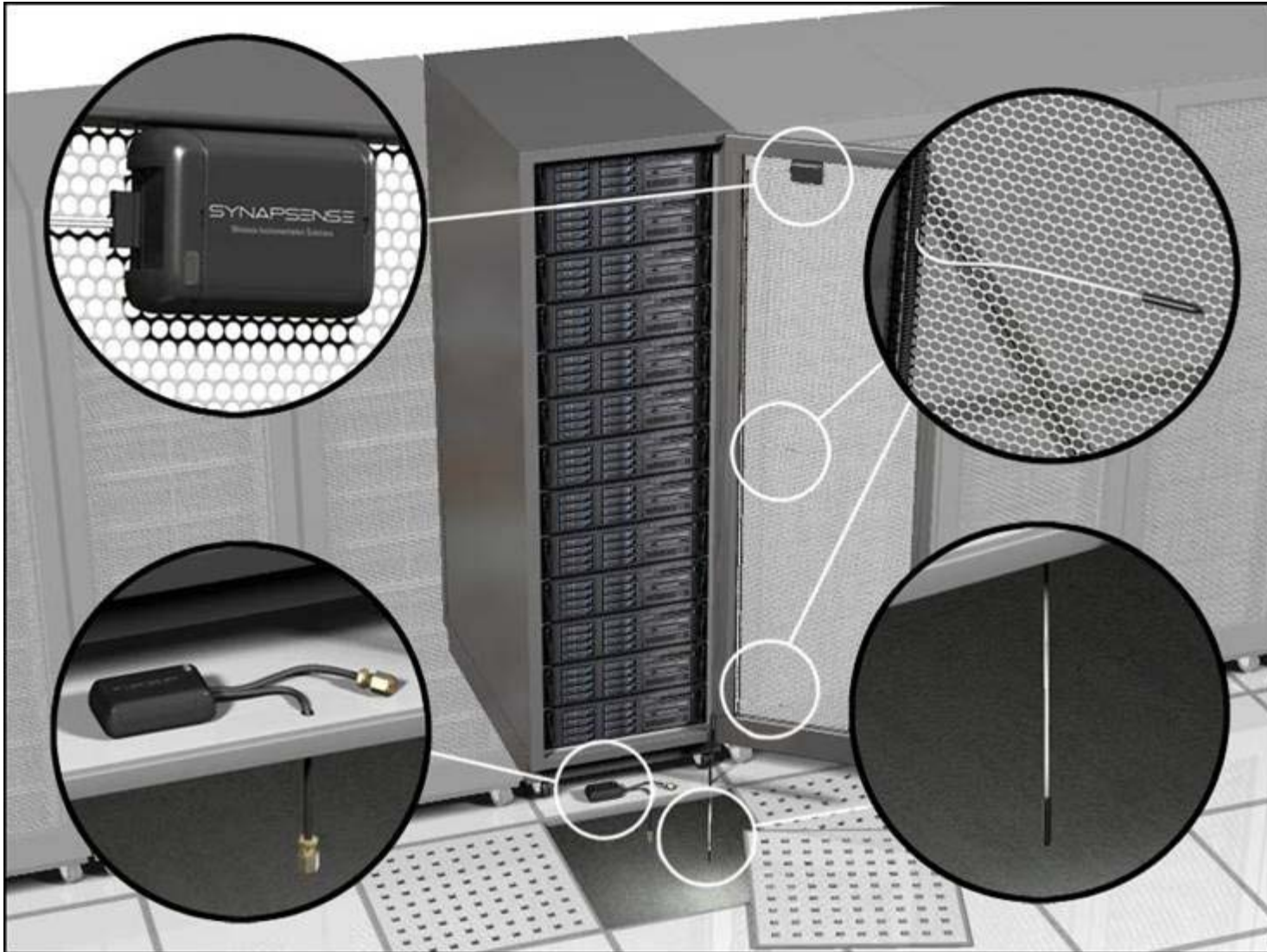Chilled Water Supply & Return Temp
Fan Power

PDU
Current, Voltage & Power

Rack
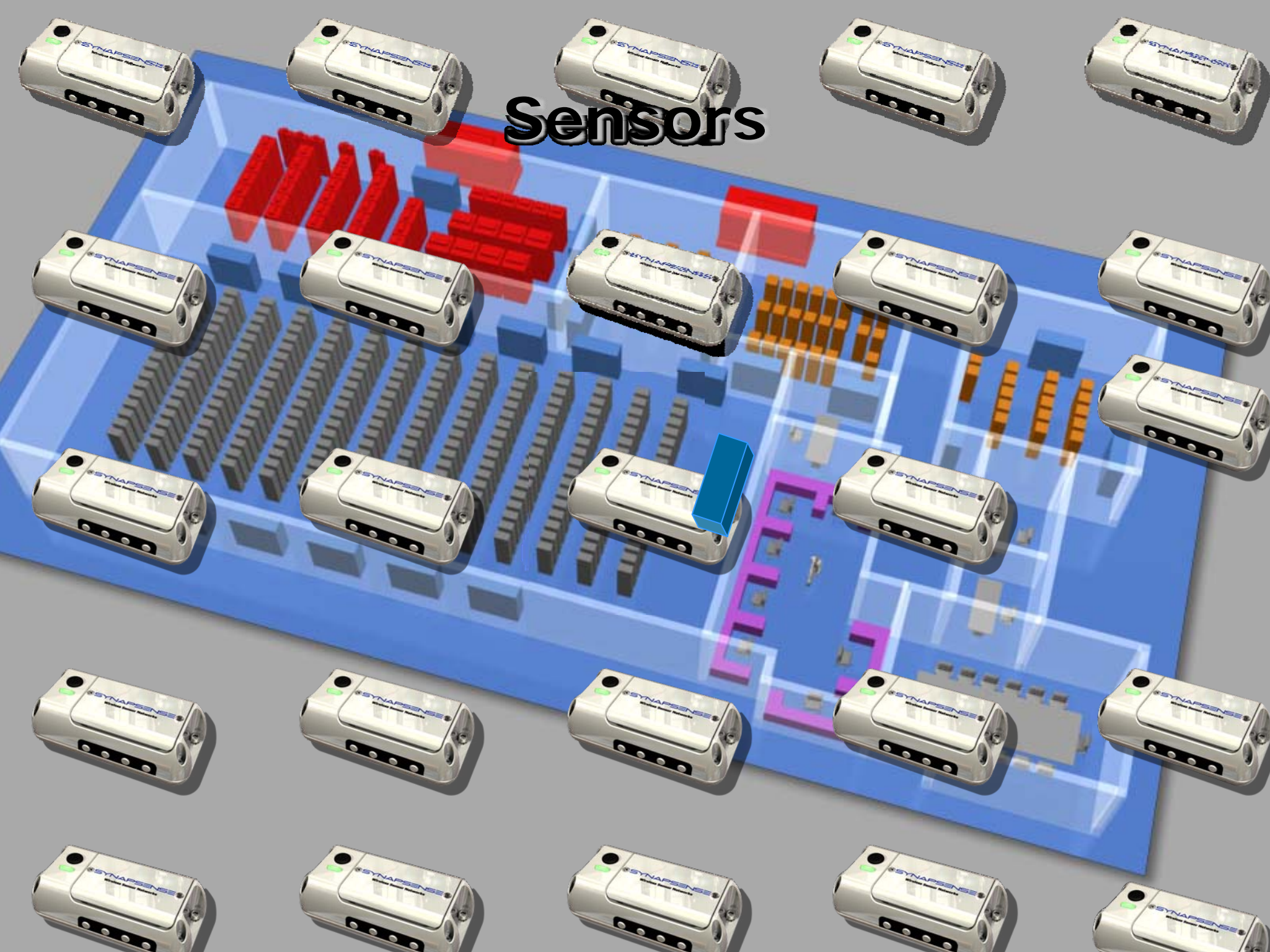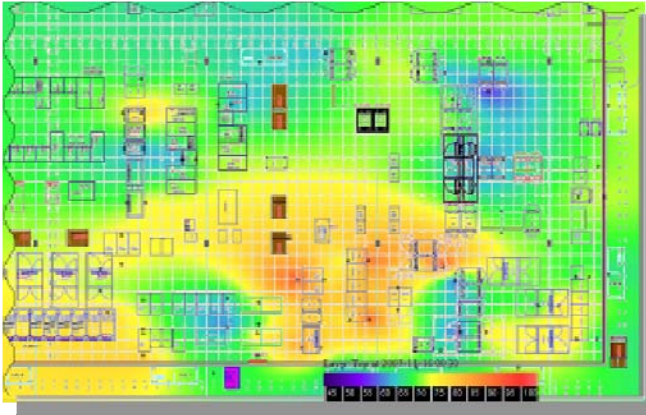Temperature
RH
Current
Power

Sub-floor
Pressure Differential

Chilled Water Flow
(Captured at CRAH)

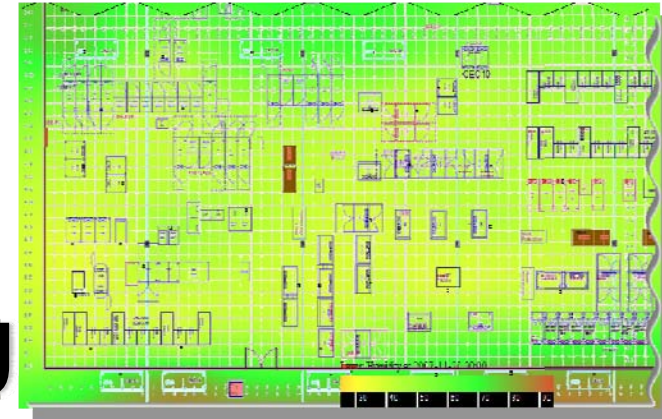# Location of Node, Thermisters and Pressure Sensors

Sensors

LiveImaging™   SynapSoft™ 4.0

2D Thermal Map   **2D Pressure Map**   **2D Humidity Map**
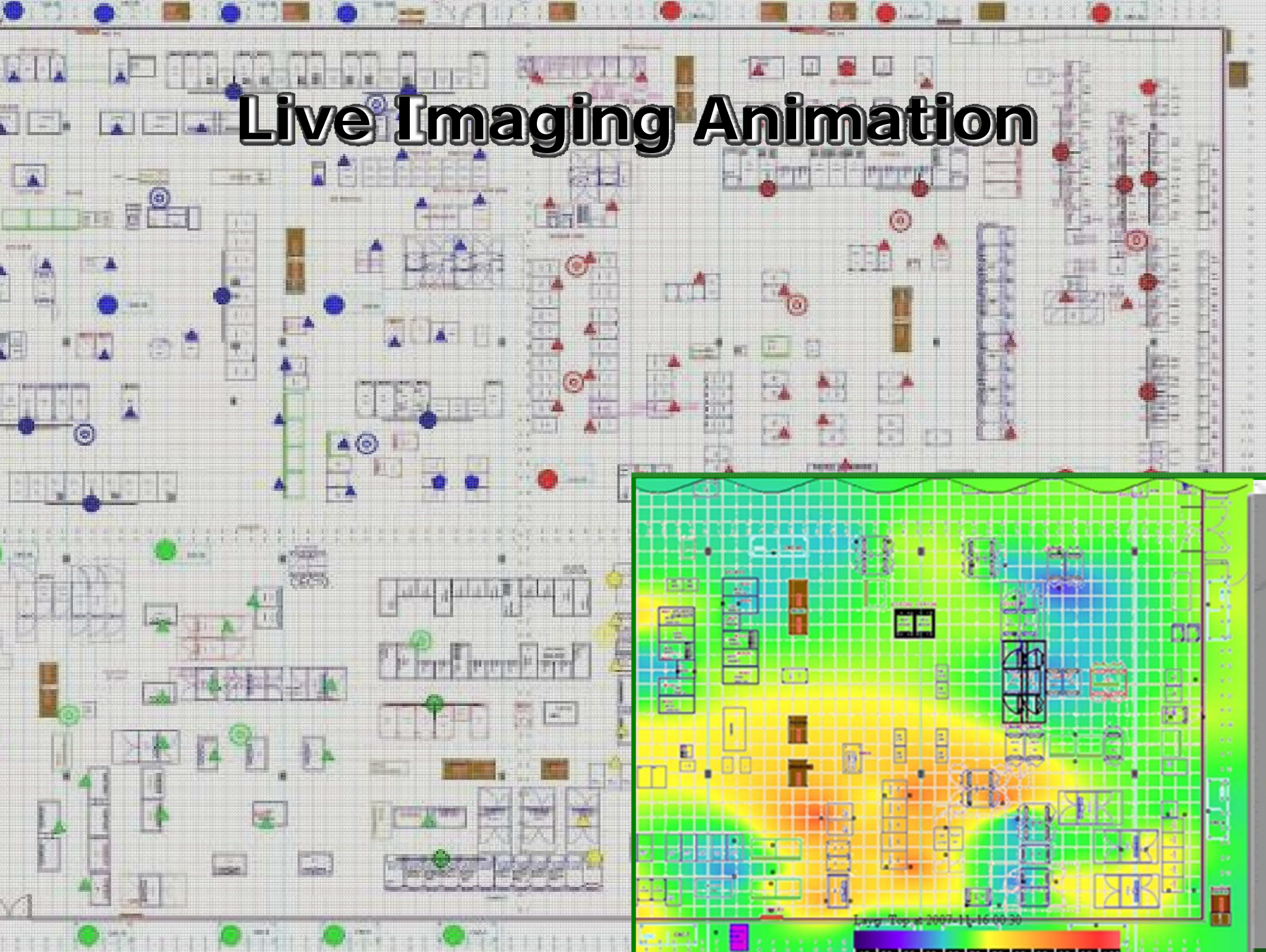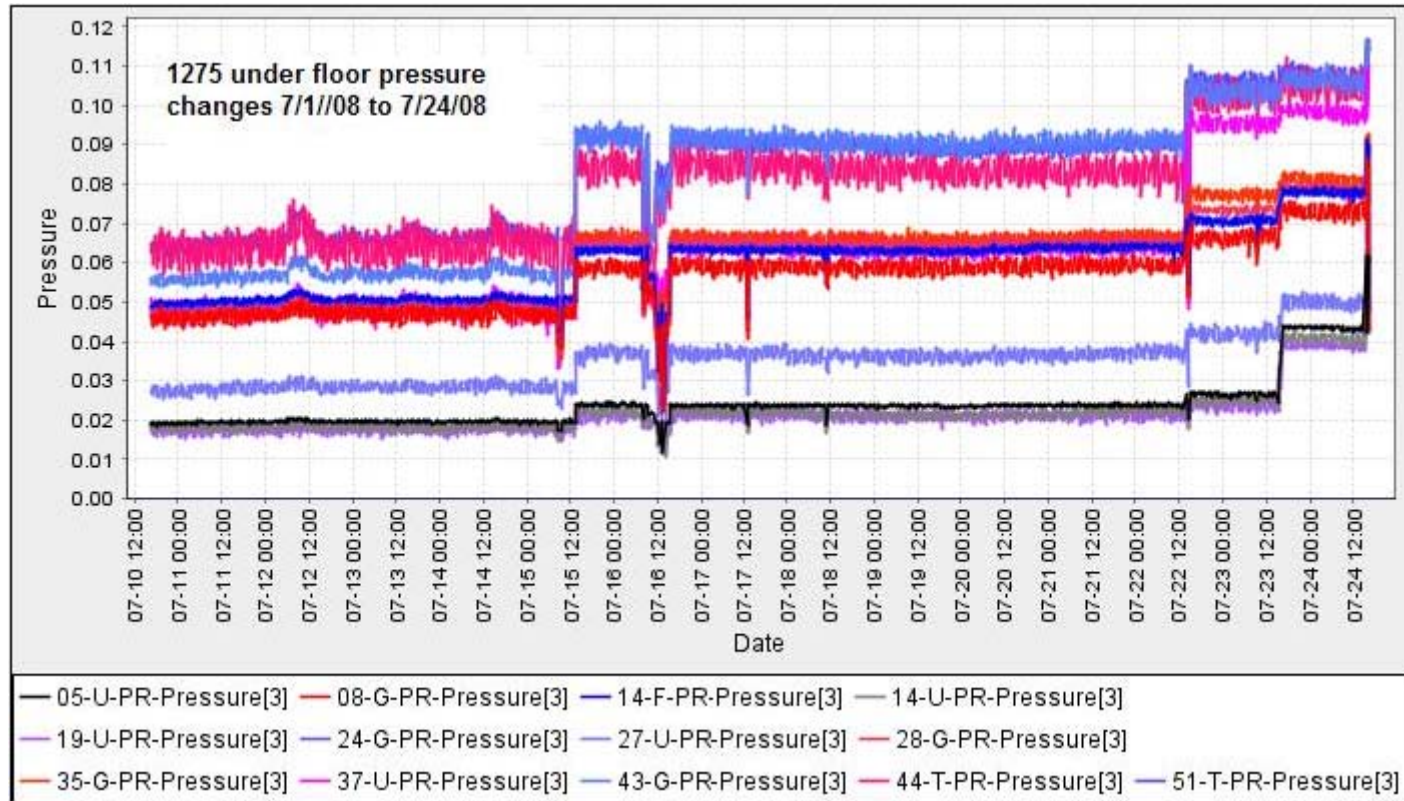
**Ground-breaking 2D maps use your real-time data center analytics
to create a visual description of your environment.**

Live Environmental Imaging™ is a special service for SynapSense customers.
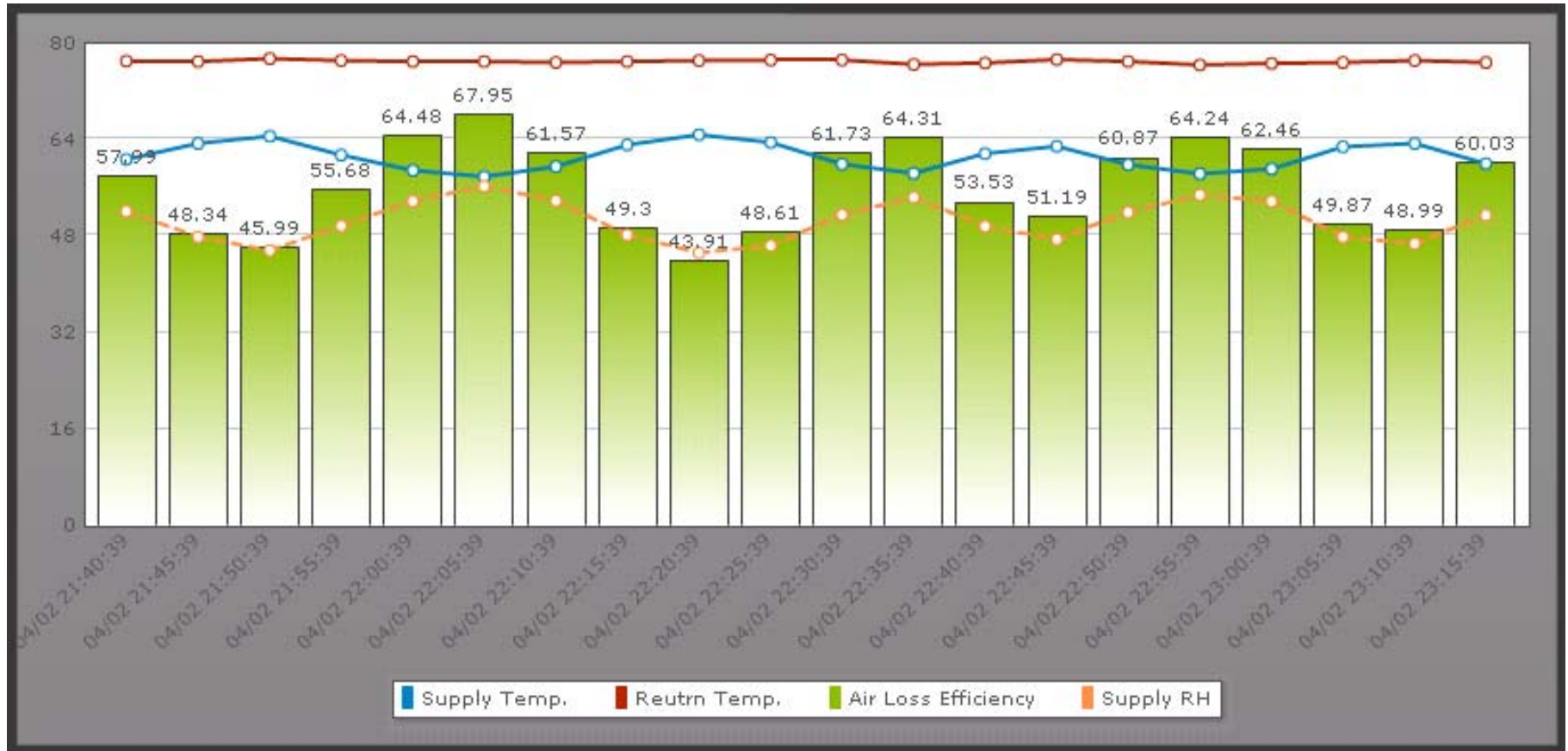
Live Imaging Animation

Charting

Make changes to improve plenum pressure, balance the floor and know the results!
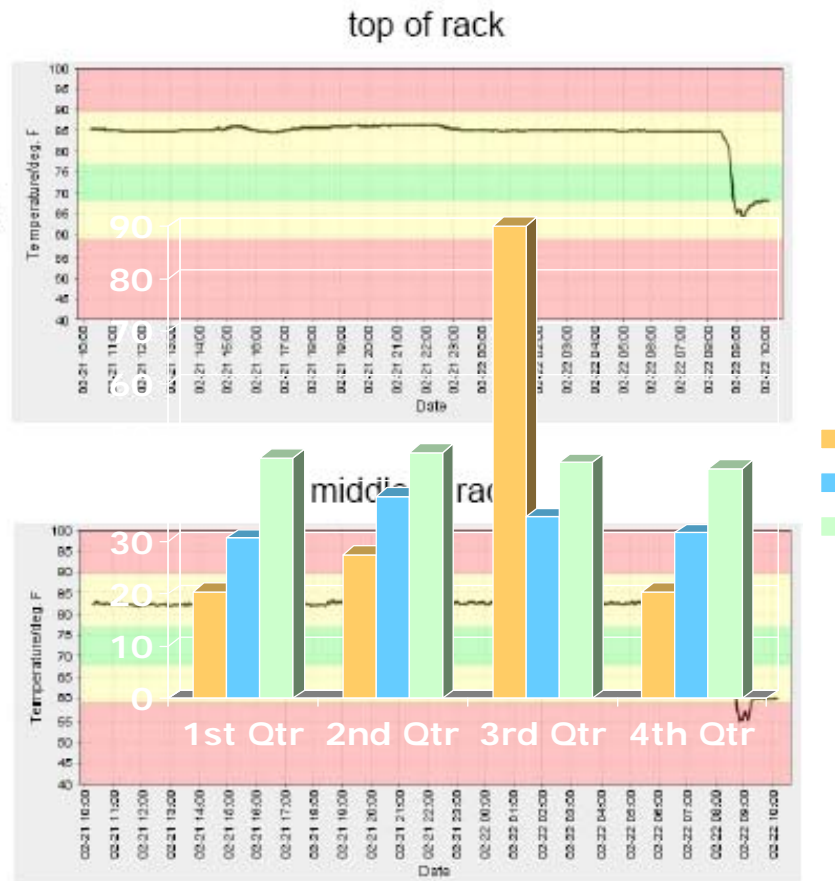
CRAC Efficiency Profile

Impact of Humidification Cycles

Remediation Results

Results: Blanking Panels

- One blanking panel added and temperature dropped ~20°

- impact of other best practices confirmed
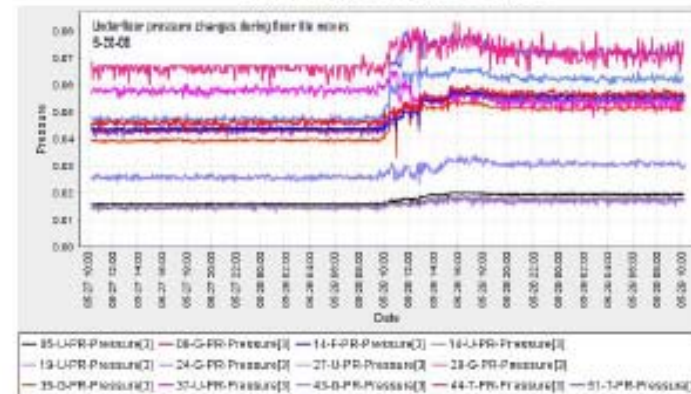 - eliminate leaks in floor
  - improve air management

Remediation Results

Results: Tune Floor Tiles

- Too many permeable floor tiles
- if airflow is optimized,
  - under-floor pressure ↑
  - rack-top temperatures ↓
  - data center capacity grows
- Measurement and visualization assisted tuning process

under-floor pressures

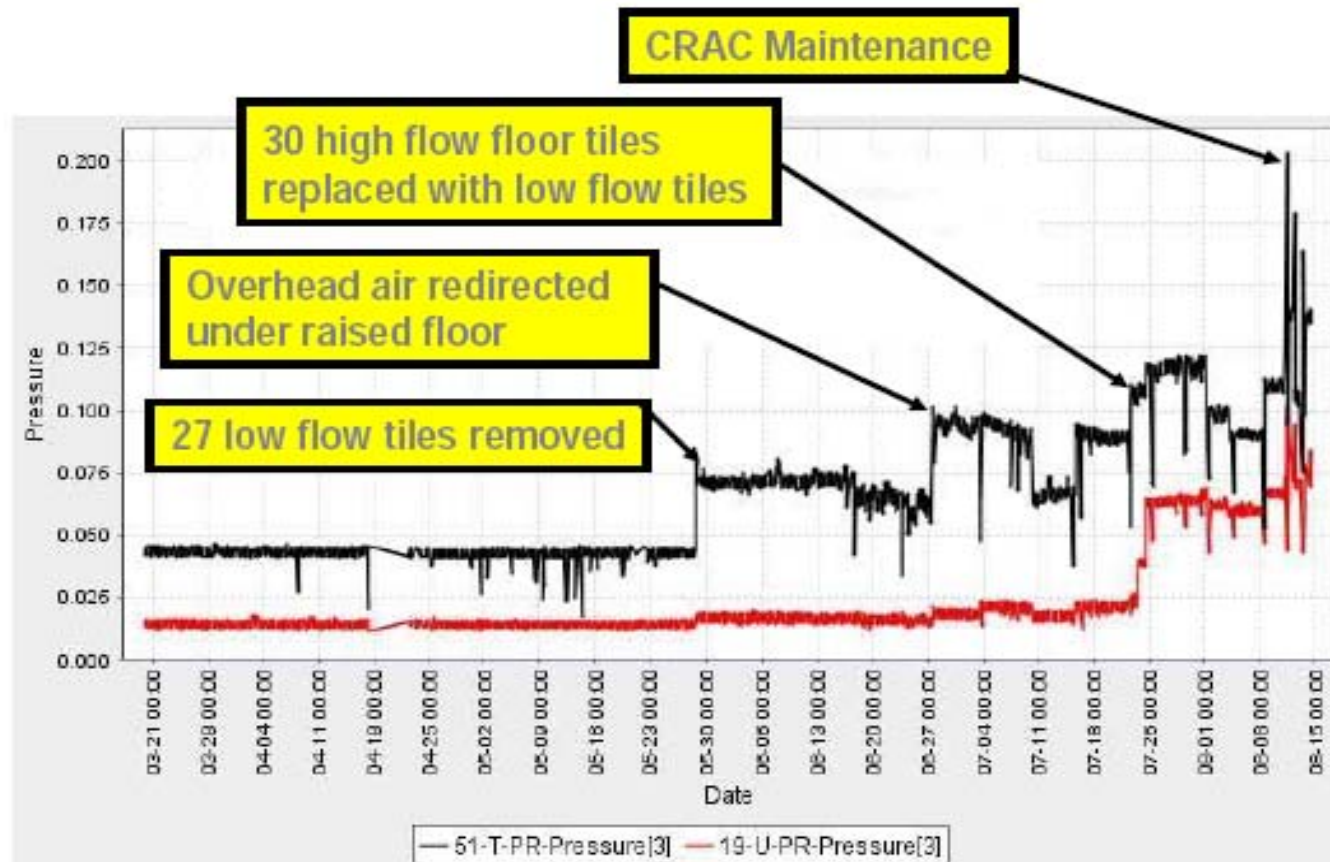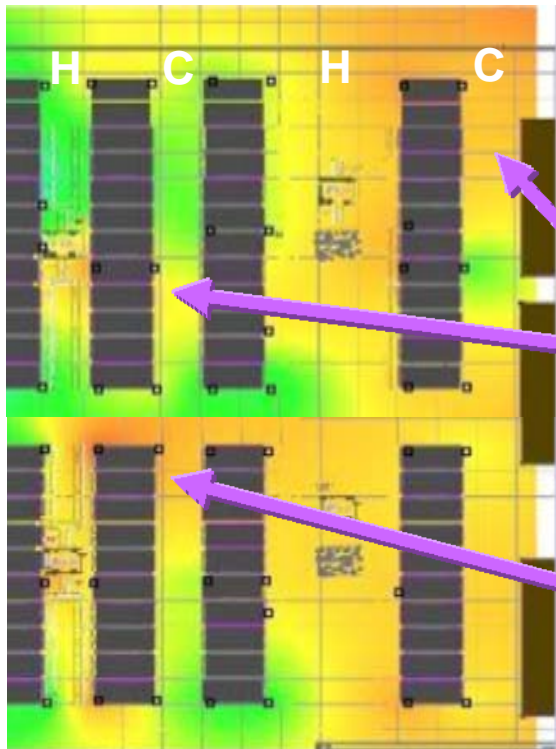rack-top temperatures

Remediation Results

Documenting Progress

CRAC Maintenance

30 high flow floor tiles replaced with low flow tiles

Overhead air redirected under raised floor

27 low flow tiles removed

— 51-T-PR-Pressure[3]   — 19-U-PR-Pressure[3]

5 months of floor pressure management

Environmental Baseline & Results
SynapSense Thermal LiveImaging™

Baseline

No Containment

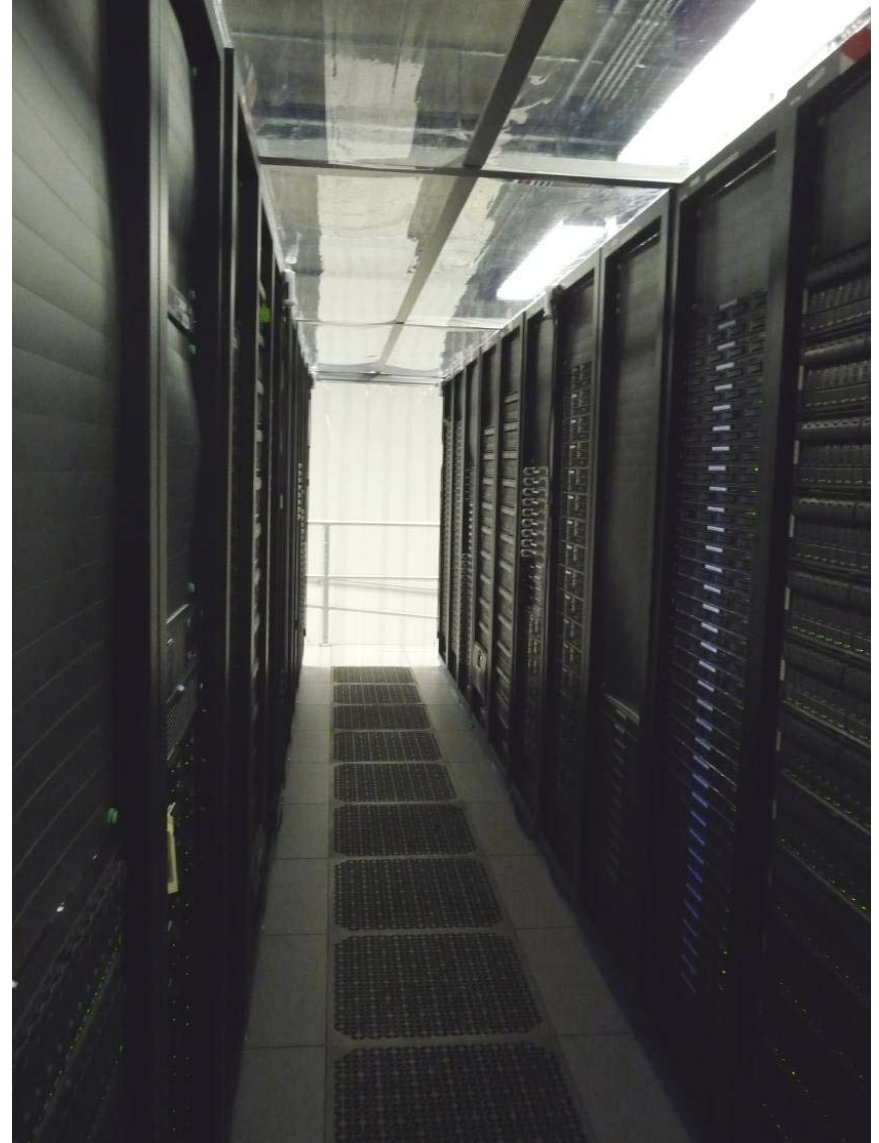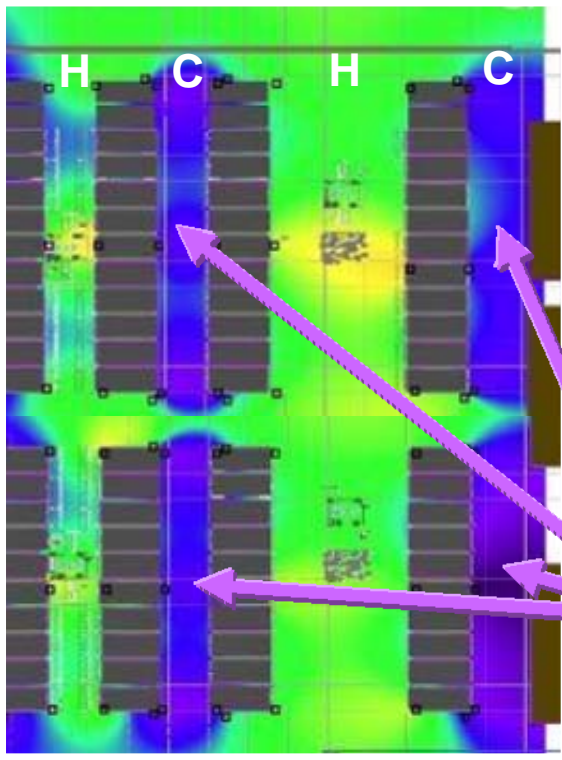High Degree of Air Mixing

High Inlet Temperatures

Map Legend: |30 |45 |60 |75 |90 |105

Cold Aisle Containment

Environmental Baseline & Results
SynapSense Thermal LiveImaging™

After Containment

H   C   H   C

Cold Aisles Contained

No Change to CRAHs

Overcooled

Map Legend: |30 |45 |60 |75 |90 |105
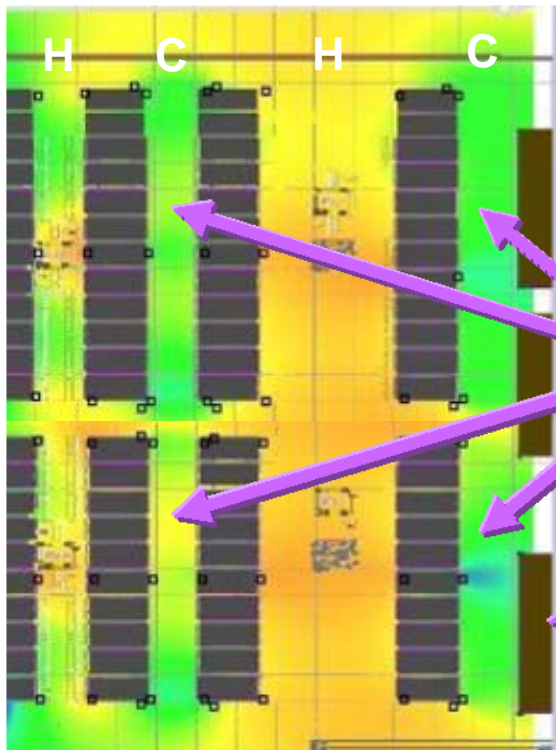
Environmental Baseline & Results SynapSense Thermal LiveImaging™

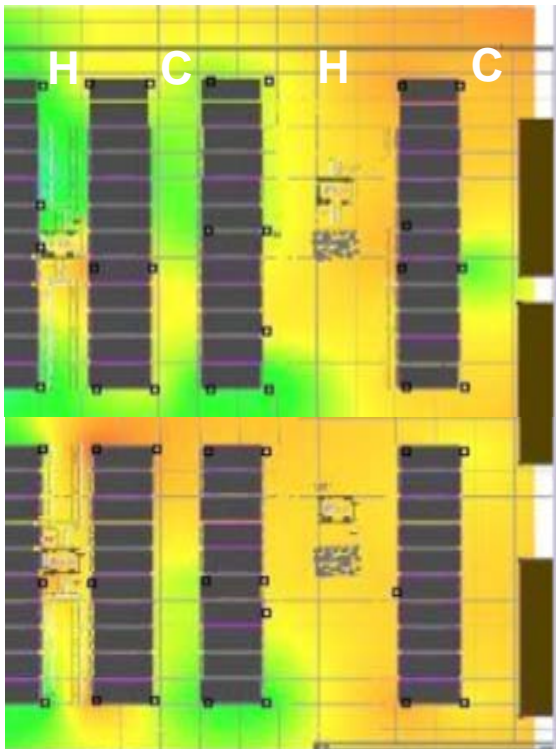**With Control**

Controlled CRAHs

ASHRAE Inlet Temperatures

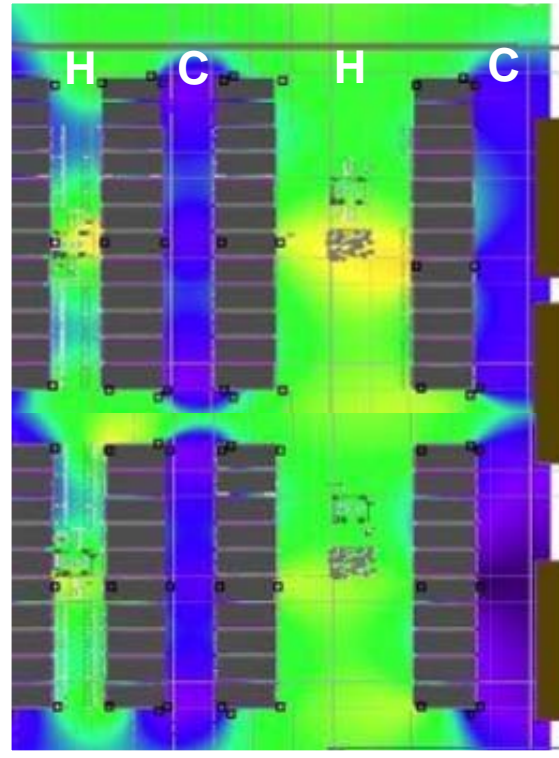Increased Return Temperatures

Map Legend: |30 |45 |60 |75 |90 |105

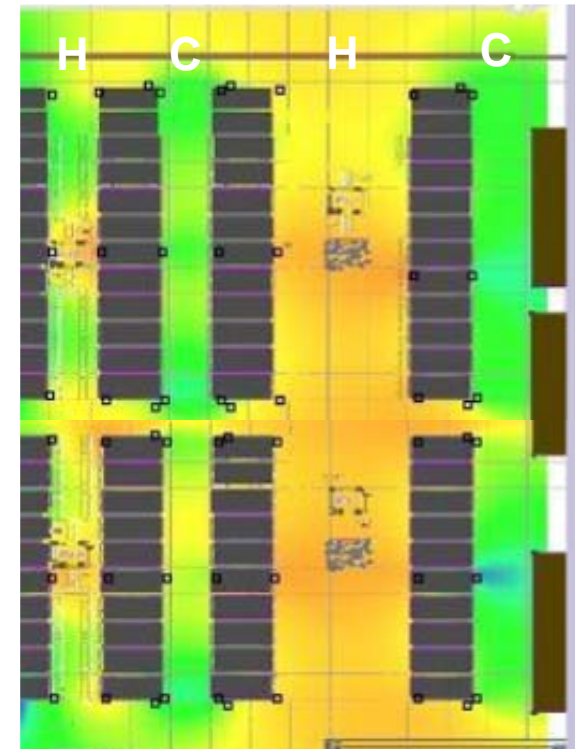# Environmental Baseline & Results
SynapSense Thermal LiveImaging™
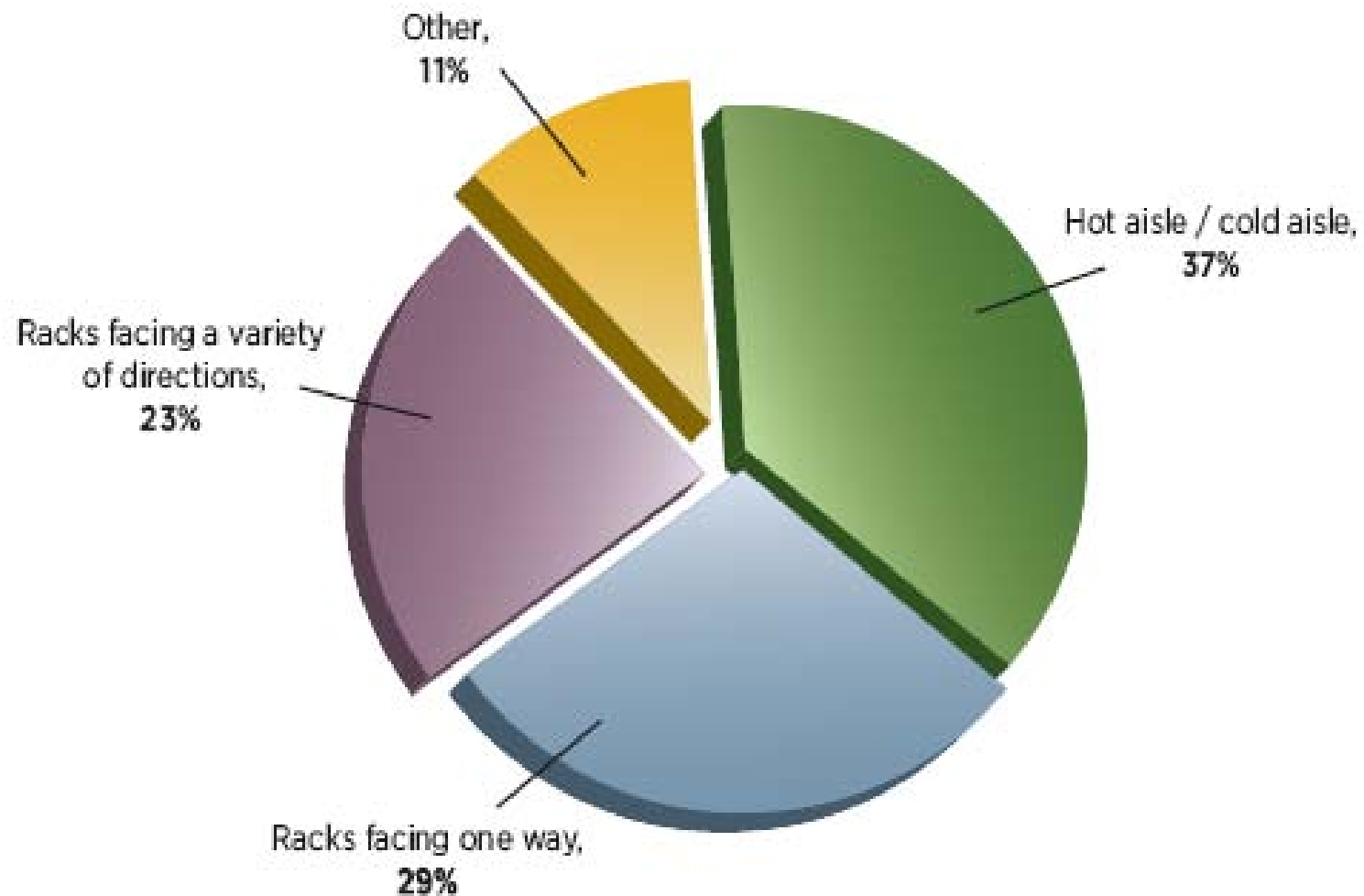
Baseline

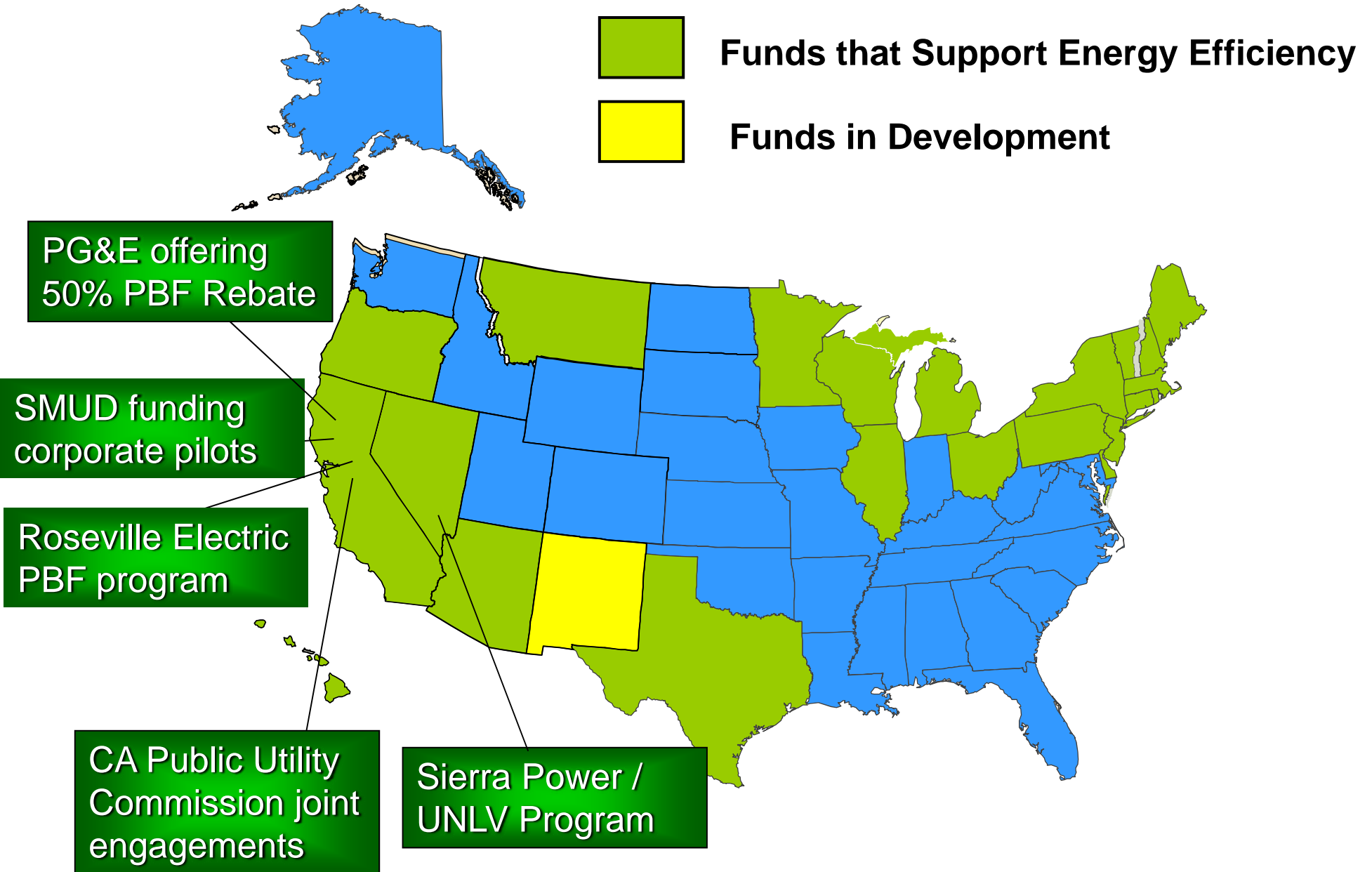**After Containment**

With Control

Map Legend: |30 |45 |60 |75 |90 |105

Environment – Layouts Used

Other, 11%

Hot aisle / cold aisle, 37%

Racks facing a variety of directions, 23%

Racks facing one way, 29%

SynapSense Engaged with Utilities
22 States have Public Benefit Funds

Funds that Support Energy Efficiency

Funds in Development

PG&E offering 50% PBF Rebate

SMUD funding corporate pilots

Roseville Electric PBF program

CA Public Utility Commission joint engagements

Sierra Power / UNLV Program

What Made This Goal Possible?

The Extended Team…

- **VSP Ancillary Members – HR, IT, C-Suite**
- **VSP Company-wide**
- **Vendors – Mechanical, Electrical, Synapsense**
- **Consultants – LEED, Retro-commissioning**
- **Other Partners – USGBC, SMUD**

Where is VSP Now?

VSP was awarded
Platinum Certification!

Questions?

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Thank You!