Federal Utility Partnership Working Group
Fall 2011
Philadelphia, PA

NASA Ames Saves Energy and Reduces Project Costs with Non-Invasive Retrofit Technologies

The Wireless Pneumatic Thermostat Enables Energy Efficiency Strategies, Ongoing Commissioning and Improved Operational Control

Harry Sim
CEO
Cypress Envirosystems
harry.sim@cypressenvirosystems.com
www.cypressenvirosystems.com

NASA Ames Reduced Project Cost by Over 80% with Non-Invasive Retrofit Technologies

- Legacy Pneumatic Thermostats
  - Waste energy
  - High maintenance costs
  - Uncomfortable occupants
  - No visibility

- Project Scope
  - 14 buildings
  - 1,370 pneumatic thermostats
  - Integration with campus BAS
  - Diagnostics for ongoing commissioning

OPTIONS

- Traditional DDC Retrofit
  - Cost over $4.1 million
  - Asbestos exposure/abatement
  - Occupants significantly disrupted
  - Project time: 12-18 months

- WPT Non-Invasive Retrofit
  - Cost under $850 thousand
  - No asbestos exposure/abatement
  - Occupants not disrupted
  - Project time: 3 months

Before

After

NASA PG&E AECOM CYPRESS ENVIROSYSTEMS™

70% of Buildings in North America Still Have Pneumatic Thermostats

- Waste energy, more maintenance, unhappy occupants…
  - No Night Setback, No Zone Control, No Optimal Start/Stop, No Occupancy Override, No Demand Response…
- High Cost to Retrofit
  - Market rate of $2,000 - $3,000 per zone for traditional DDC retrofit
- Disruptive to Occupants
  - Open walls and ceiling to run wires and change actuators
  - Exposure to Asbestos

Typical Legacy Pneumatic Thermostats

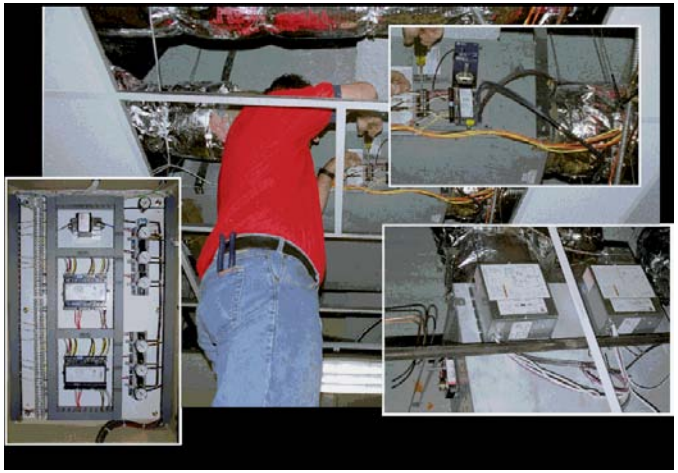
Retrofitting Existing Buildings is a PAIN IN THE NECK!!

The Wireless Pneumatic Thermostat Enables DDC Zone Control in 20 Minutes without Disrupting Occupants

- Invasive DDC retrofit
  - Opening walls and running wire drive up costs
  - Asbestos disturbance
  - Many hours or days per thermostat
  - Occupants impacted

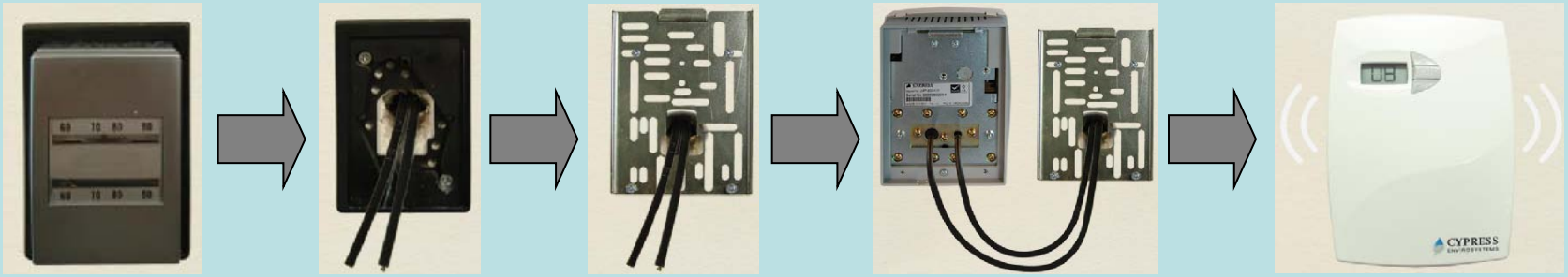
- Non-Invasive WPT retrofit
  - Leaving walls intact and not running wire keep costs low
  - No asbestos disturbance
  - 20 minutes per thermostat
  - Occupants not impacted

Traditional DDC Retrofit is Invasive

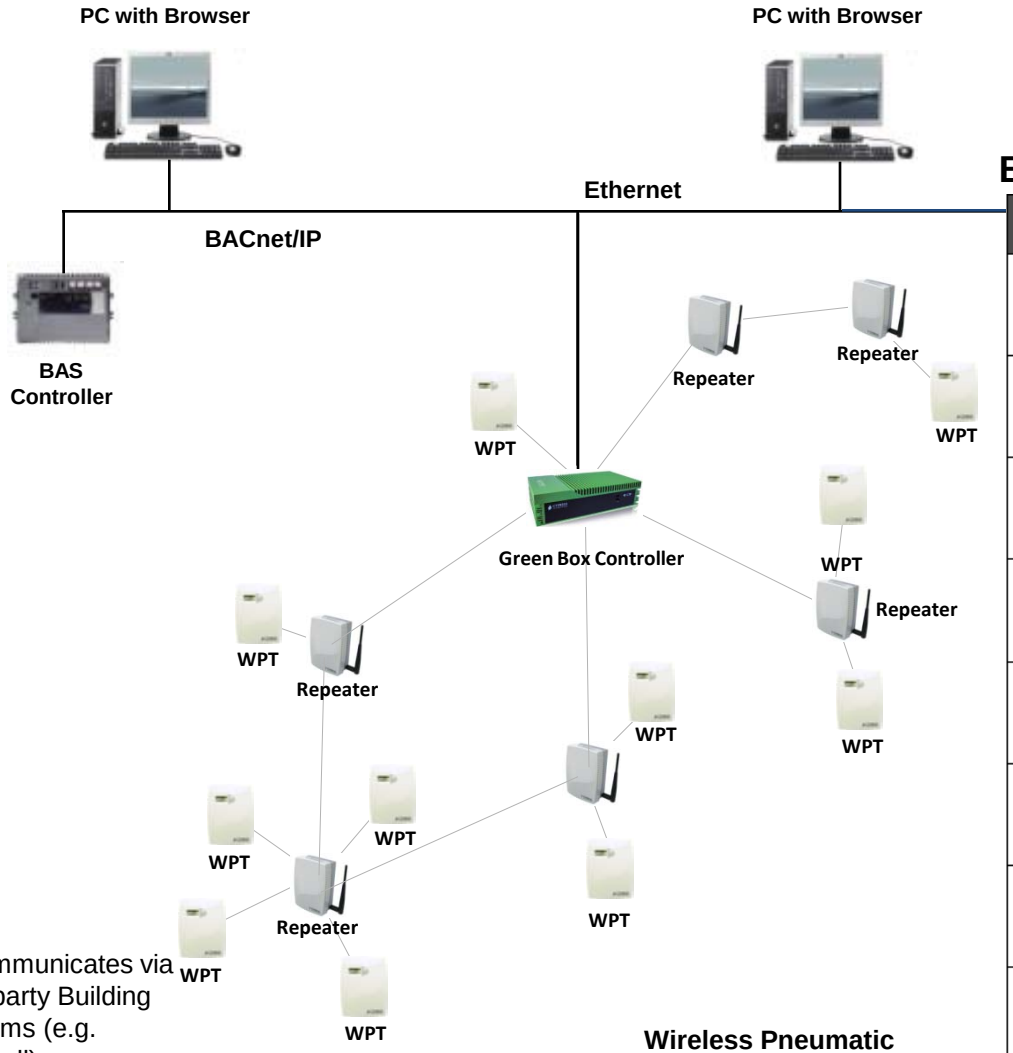


WPT Provides DDC Zone Control without Disruption

Step 1	Step 2	Step 3	Step 4	Step 5
Identify pneumatic thermostat type	Remove thermostat and backplate	Install WPT backplate to wall	Attach pneumatic pipes to WPT	Hang on wall and integrate with BAS



WPTs in 14 buildings at NASA Ames Integrated with Siemens Apogee Automation System



Wireless Pneumatic Thermostat (WPT) System

Notes:

WPT System Communicates via BACnet/IP to 3rd party Building Automation Systems (e.g. Johnson, Honeywell)

BACnet interface compatible with:

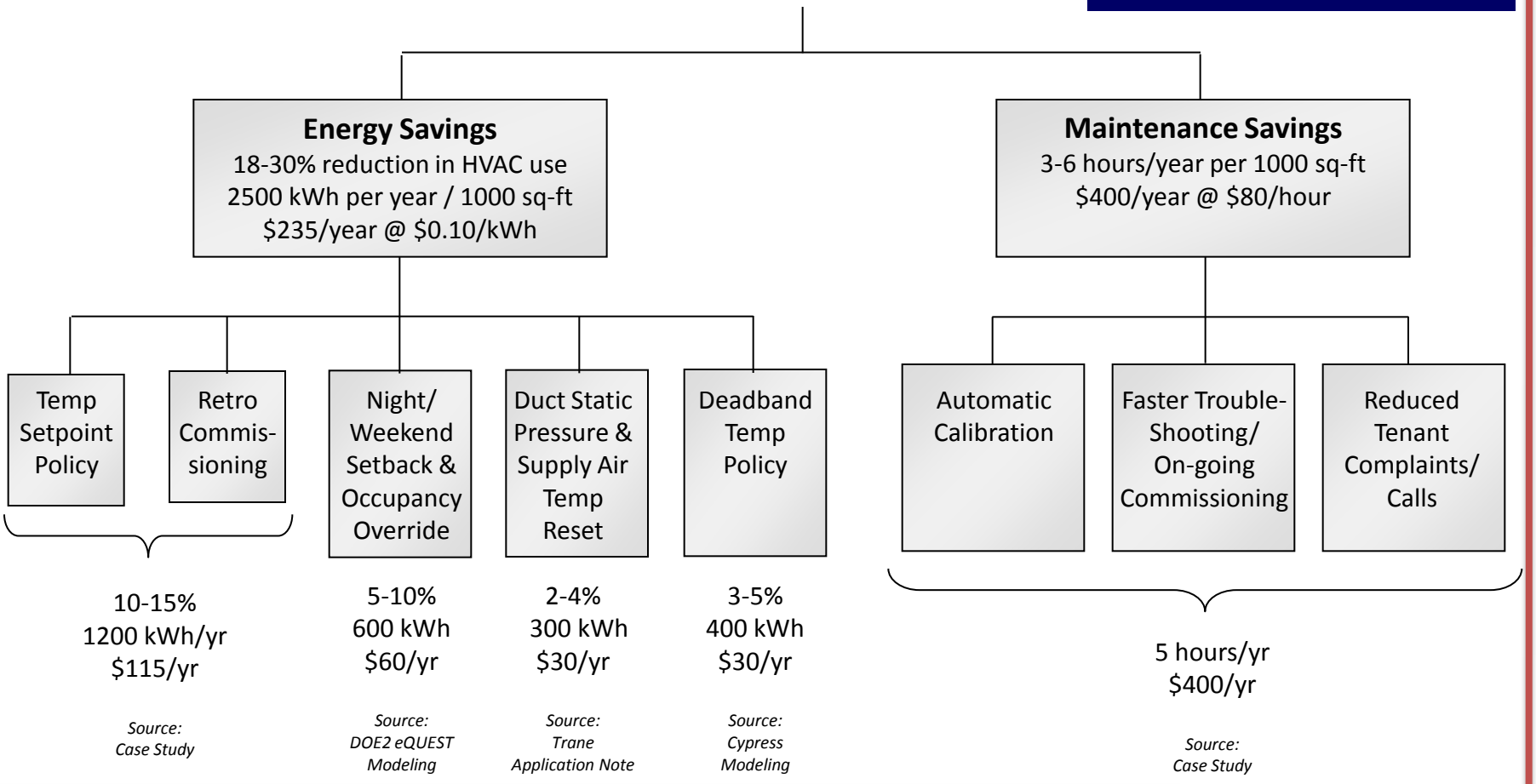
VENDOR	BAS
ALERTON	BACtalk
AUTOMATEDLOGIC CORPORATION	ALC
Honeywell	Excel, Tridium
Johnson Controls	Metasys
SIEMENS	Apogee
t.a.c by Schneider Electric	Andover Continuum
TRANE	Trane Tracer Summit BCU
Delta CONTROLS	ORCA

WPT Enables the Same Energy and Maintenance Benefits as Traditional DDC

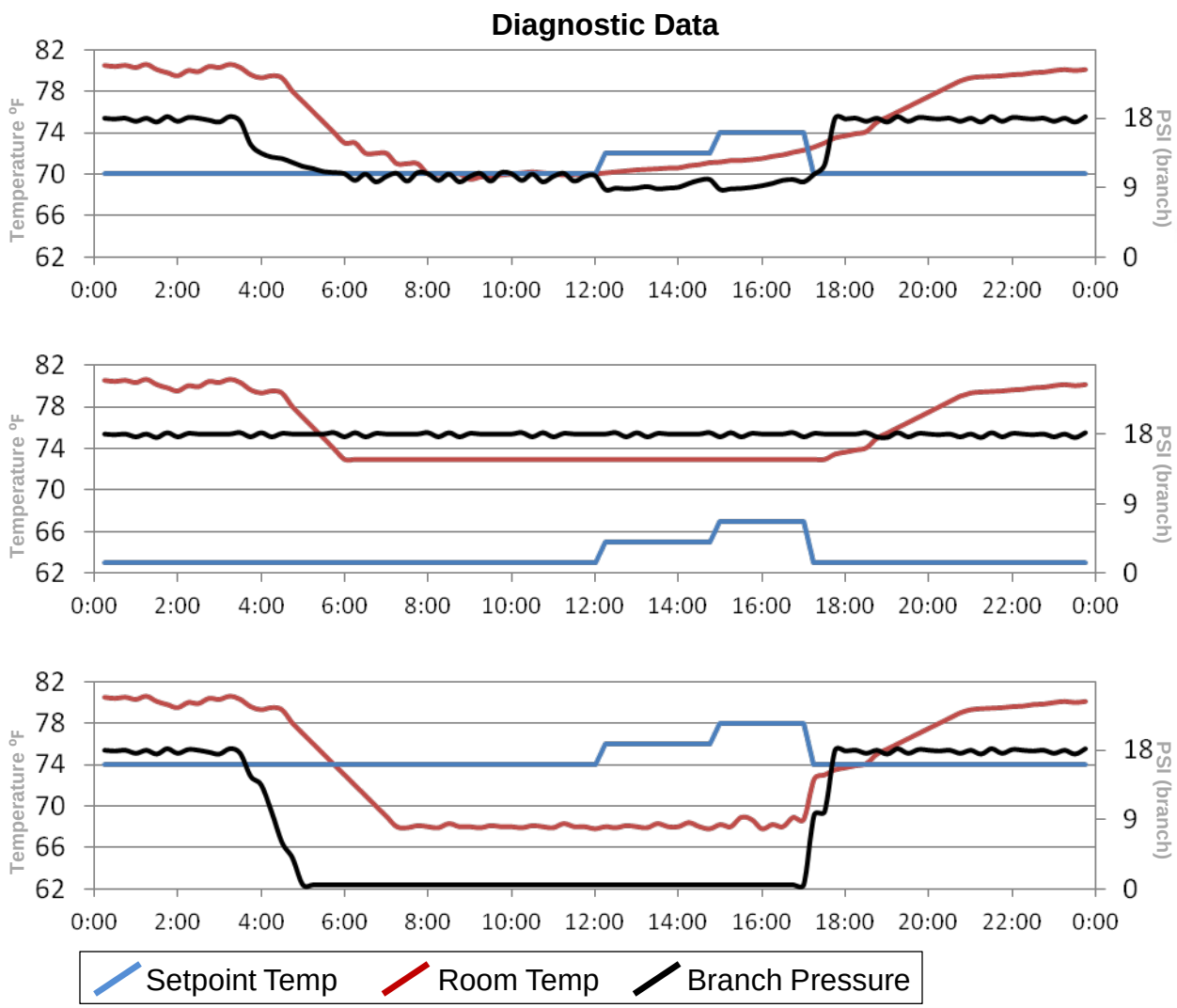
Estimated Savings Potential

$635/year (per 1000 sq-ft)
Upfront Retrofit Cost: $600 (per 1000 sq-ft)
Payback Period: 11 months

Note: All calculations based on 300,000 sq-ft retrofit project, $0.10 per kWh electricity rate, and $80 per hour maintenance labor rate.



The WPT's Diagnostic Data Enable Ongoing Commissioning to Improve Maintenance Costs and Save Energy



Alarm	Possible Faults
	• None
	• Faulty Reset Velocity Controller • Stuck damper • Broken spring • Undersized cooling capacity design
	• Faulty Reset Velocity Controller • Electric reheat and AC on • VAV Box Fault • Adjacent Zone Overcooling

Before and After Utility Data from the County of Santa Clara Quantify WPT Benefits

County Social Services Building

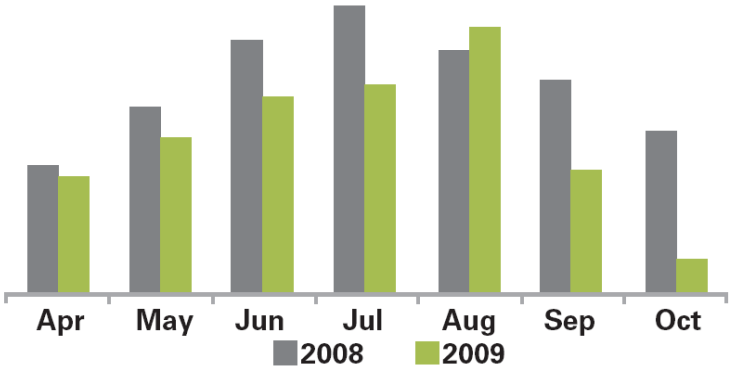
Best DDC Bid vs. WPT

	DDC Quote	WPT Actual
Installed price	$875,000	$175,000
Project time	6 months	8 days
Disruption	Significant	Minimal
Toxic exposure	If present	None
PG&E ADR incentive	31%	100%

Realized Benefits and Payback Period

- Payback period: 16 months
- Energy savings: $42,000/year
  - 350,000 kWh per year at $0.12/kWh
- Demand Response: $7,500/year
  - 10,700 kWh per year at $0.70/kWh
- Maintenance Cost Savings: $156,000/year
  - Reduced over 50% due to diagnostic data

Actual Year-Over-Year Utility Data



[1] Graph is based on actual PG&E billing data and reflects average kWh/day. The range shown is 15,000 to 20,897 kWh/day.

Full case study available at: http://www.cypressenvirosystems.com/files/pdf/CountyofSantaClara_EnergySavings_Final.pdf

Non-Invasive Retrofit Technologies Save Energy and Improve Operations in Many Applications in Various Types of Facilities

Typical Problems

Pneumatic Thermostats

Leaking Steam Traps

Dial Gauges

Non-Invasive Solutions

WIRELESS PNEUMATIC THERMOSTAT

"Go from Pneumatic to DDC in minutes"

WIRELESS STEAM TRAP MONTOR

"Avoid Expensive Steam Leaks"

WIRELESS GAUGE READER

"Remotely Read Gauges in minutes"

Sample of Installations

Government
- Architect of the Capitol
- GSA
- NASA
- Social Security Administration
- State of California
- VA Hospitals

Corporate
- Google
- Genentech
- InBev
- Texas Instruments
- Wells Fargo
- Fairmont Hotel

Healthcare
- VA Hospitals
- Catholic Healthcare West
- Kaiser Permanente
- General Hospital Toronto
- Quebec Hospital
- Presbyterian

Commercial Real Estate
- Cushman & Wakefield
- Vornado
- Equity Office
- Shorenstein

Education
- University of Notre Dame
- UC Berkeley
- UCLA
- Stanford University
- Dartmouth College
- Western Michigan University