

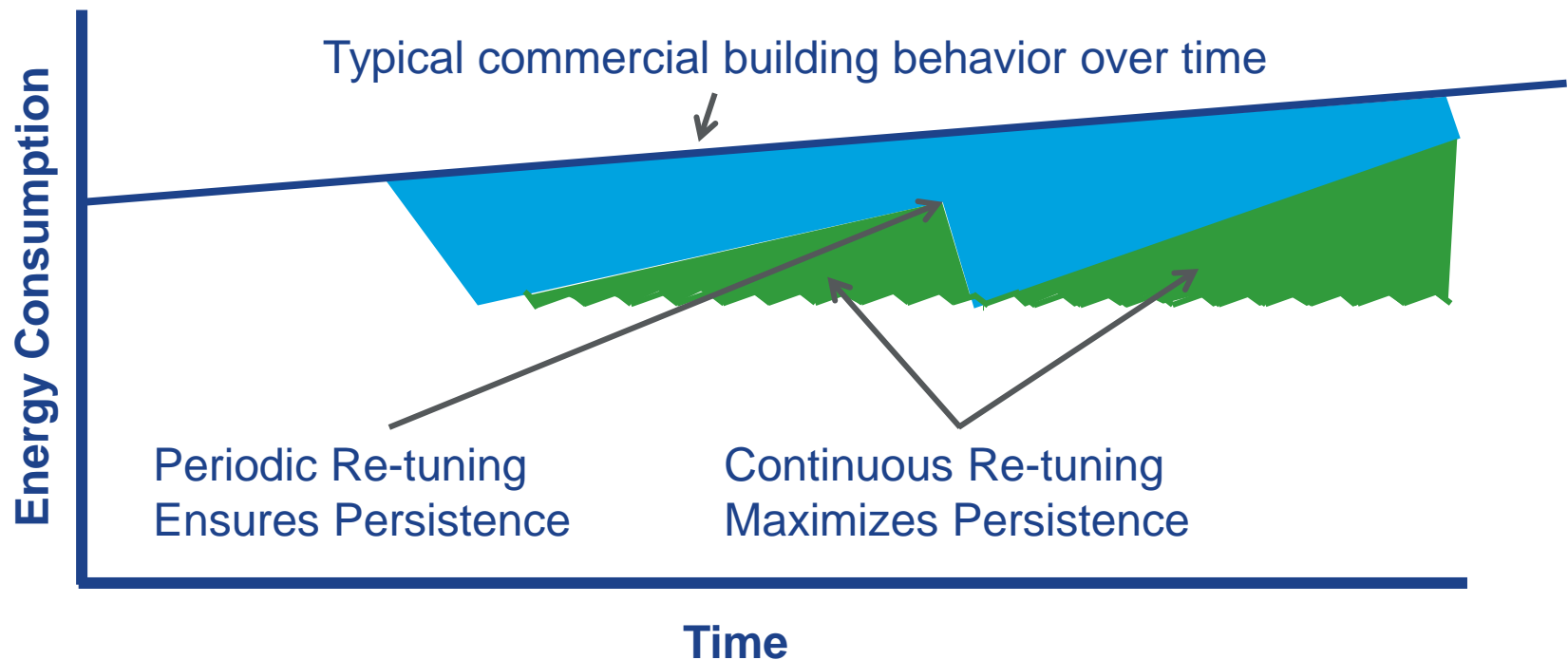


Commercial Building Re-Tuning: No/Low-Cost Operational Measures to Save Energy

Moderator: Marta Milan, Waypoint Building Group

Building Re-Tuning: No/Low-Cost Operational Measures to Save Energy

- Building Re-Tuning is a systematic process to identify and correct building operational problems that lead to energy waste
- Includes no/low-cost savings opportunities, such as replacing faulty sensors and adjusting set-points and BAS schedules



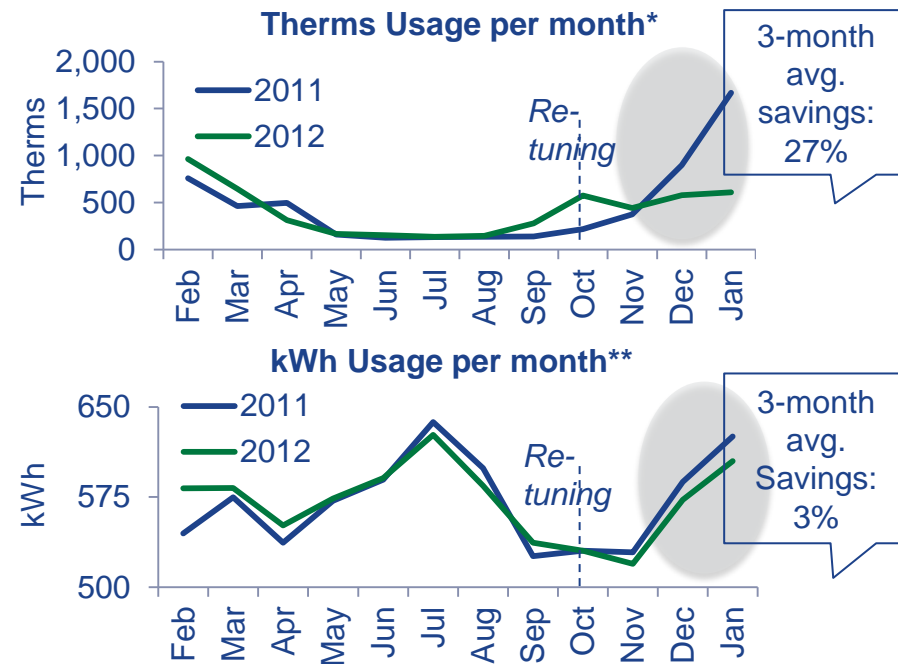
Vornado Office Building Saved a 3-mo Average of 27% on Heating After Re-Tuning

In October 2012, Vornado trained building operators to re-tune one of its buildings in Arlington VA

In the 3 months following re-tuning training, Vornado has saved an average of 27% on its heating bill and 3% on its electricity bill due to the following 5 measures that were identified:

- ▶ Lowering the boiler hot water supply temperature set point
- ▶ Lowering the static pressure on the main duct and branches
- ▶ Changing the set points on fan discharge temperature and chilled water supply temperature
- ▶ Lowering condenser water temperature supply
- ▶ Using motion sensors for the conference rooms to set VAV boxes to night mode

Vornado Energy Consumption Re-Tuning Data



*Both Therm and kWh usage were normalized by degree days

**Fan and cooling kWh savings are most significant during the Spring and Fall months

Re-Tuning Training Opportunities with NIST Manufacturing Extension Partnerships

Three NIST Manufacturing Extension Partnerships (MEP) are delivering re-tuning training across the nation, using the PNNL re-tuning materials.

If you are interested in a training for your organization's building operators and engineers, email MartaMilan@WaypointBuilding.com to get in touch with the trainers in your area.

NIST MEP	Region	Partners
Manex	San Francisco	The Corporation for Manufacturing Excellence in California, partnering with Laney College and the International Union of Operating Engineers Local 39
DVIRC	Philadelphia	Delaware Valley Industrial Resource Center in Pennsylvania, partnering with Pennsylvania State University and Pennsylvania College of Technology
NY DED	NYC & Albany	New York State Department of Economic Development in New York, partnering with City University of New York and Rochester Institute of Technology

Re-Tuning Resources Online and more in Development

Re-Tuning Resources on CBRD and PNNL websites

Interested parties can visit the Commercial Buildings Resource Database (CBRD) for free Re-Tuning Resources such as:

- Re-Tuning Training: Instructors Manual
- Large Building Re-Tuning Training
- Small Building Re-Tuning Training
- ECAM User's Guide
- Interval Data Analysis
- Building Re-Tuning Case Study: Vornado
- Coming soon: Additional case studies

Online Re-Tuning Training Available

PNNL offers two free interactive Re-Tuning e-learning courses to anyone interested in improving a building's energy performance and the comfort of the building's occupants (<http://retuningtraining.labworks.org/training/lms/>)

- Re-tuning for Building with Building Automation Systems (CEUs available from the Building Operator Certification Program)
- Re-tuning for Buildings without Building Automation Systems

Commercial Buildings Resource Database (CBRD)

CBRD: Resources to support the adoption of energy-saving building technologies

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

EERE Home | Programs & Offices | Consumer Information

Commercial Buildings Resource Database

EERE » Building Technologies Office » Commercial Buildings Resource Database

Printable Version Share

Refine your search

- clear all filters
- resource type
- topic
- building type
- audience type
- primary institution
- collection
- construction type
- phase of delivery
- publication date


Search

Your search resulted in 30 resources


retuning

Retain current search filters


sort by Title **Best Match**



Large Building Re-Tuning Training: Re-Tune Based on Findings
Re-tune the building based on specific findings. Building re-tuning maxims, assumptions, and conclusions.
[Download](#) [Read more](#)



Large Building Re-Tuning Training: Introduction
Understand the purpose of re-tuning, definition of building re-tuning, and what to expect from the training class
[Download](#) [Read more](#)



Large Building Re-Tuning Training: Air-Handling Units
Learn how to re-tune air-handling units (AHUs)
[Download](#) [Read more](#)

Panelists are here to share Re-Tuning Experiences

Our three panelists have implemented re-tuning in their own buildings after participating in the training

- Don Haas – Brandywine Realty Trust
- John Healy – Kennedy Wilson
- Susan Corry – University of Maryland

BOMA Philadelphia Re-Tuning Program

Don Haas, RPA, FMA, SMA, LEED Green Associate
Director of Operations - Three Logan Square
Brandywine Realty Trust



DOE Intensive Two Day “Hands On” Training Sessions

- ▶ Sept 23rd All Day Large Building Classroom Training – 1717 Arch
- ▶ Sept 24th All Day Tour Large Building with BAS:
 Central Plant – ARAMARK Tower
 Distributed System – BYN Mellon Bank
- ▶ Sept 25th AM Small Building with BAS Training and Tour
 610 Freedom Business Center, KOP
- ▶ Sept 26th AM Small Building without BAS Training and Tour
 200 Gibraltar Road – Horsham, PA



Large Building Classroom Training



Large Building with Building Automation System (BAS)

Three Logan Square
1717 Arch St. 2nd Floor



Large Building Facility Tour

ARAMARK Tower

- Central plant facility
- 634,000 RSF
- 1,800 ton chiller plant
- 6 - 100,000 CFM fans
- 2 – 250hp steam boilers
- VAV distribution
- Automated Logic BAS

Large Building with Building Automation System (BAS)



BNY Mellon Center

- Distributed HVAC systems facility
- 1,238,000 RSF
- 3500 ton Cooling Tower Capacity
- Water Cooled DX Package Units
- VAV distribution
- Delta Controls BAS



Small Building Training & Tours

AM Training / PM Tour

Small Buildings with Building Automation System (BAS)

Freedom Business Center

- With BAS
- 62,991 sf Three Story Class A Building
- 2 – 90 ton Packaged Units
- 75 VAV Boxes
- Perimeter Electric Heat
- Automated Logic BAS



Small Building Training & Tour

AM Training / PM Tour

*Small Buildings without Building Automation System
(BAS)*



200 Gibraltar Road

- No BAS
- 64,452 sf Three Story Class A Building
- 1 - 200 ton Evapco Cooling Tower
- 1 - Electric Boiler
- 84 Water source Heat Pumps
- Stand Alone Zone Programmable T-stats



Aramark Tower

32 Story High Rise Office Building
Philadelphia, PA

Re-Tuning Session

September 23rd and 24th 2013

Central Plant

John Healy

Operations Manager

Kennedy Wilson Pennsylvania
Management Inc.



Energy Star Certified since
2009

Reasons We Participated In The Re-Tuning Program

- **Ownership and Building Management are always looking for new ways to save energy.**
- **We wanted to learn about new control strategies to help run our HVAC systems more efficiently.**
- **We wanted the opportunity to share what we had learned as well as to learn from others about energy efficient measures that had successfully implemented.**
- **We saw an opportunity to validate the energy programs we had established.**
- **By having an advanced Building Automation System, we would be able to provide the long term trend data that the engineers at PNNL required.**

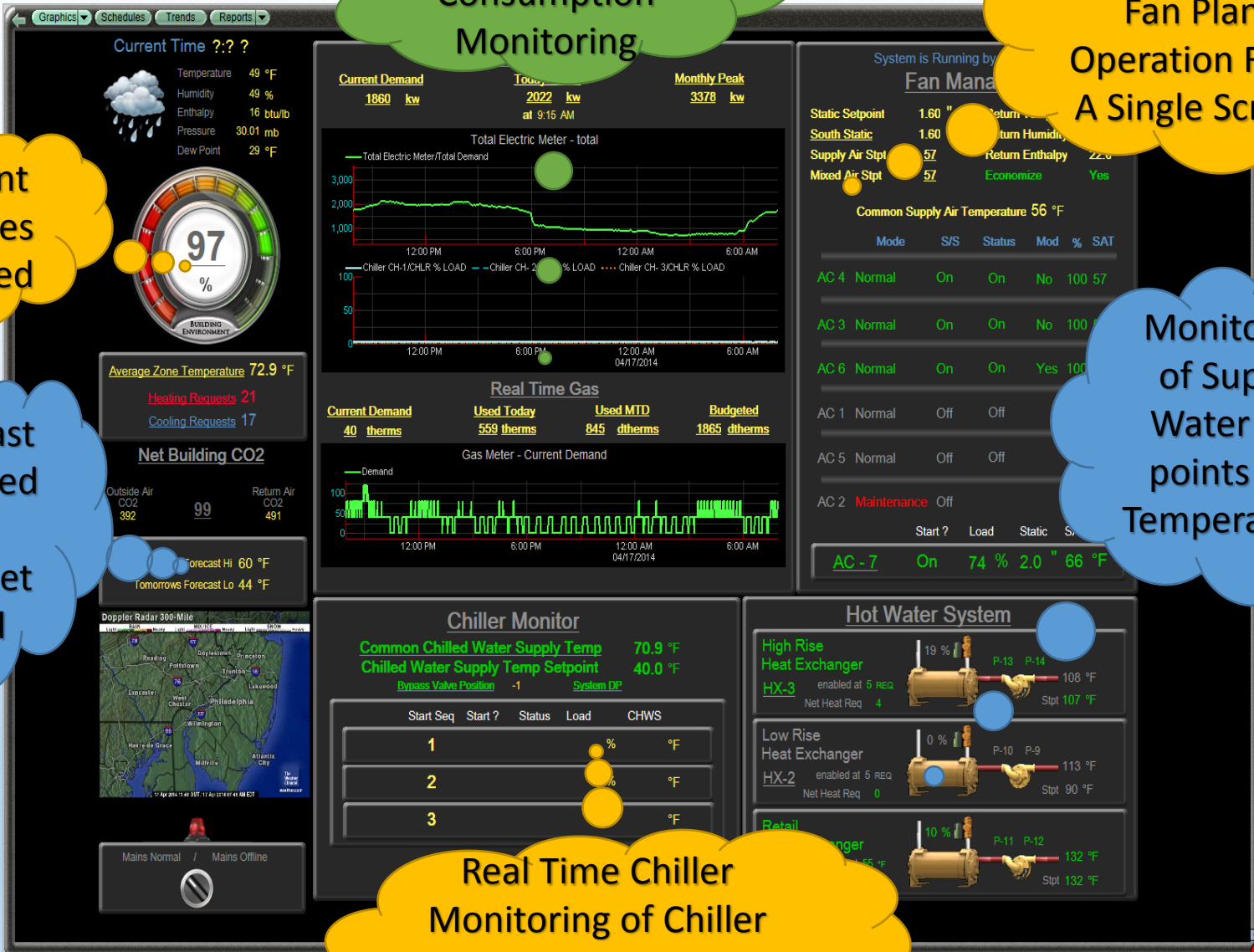
Things that we learned from the Re-Tuning Program

- It's all about collecting data, data, data.... We provided almost 10,000,000 points of data to be analyzed.
- Every building is unique and needs to be evaluated independently.
- Supply Air Temperature Reset – The data showed that the supply air temperature reset program currently in place in the automation system was not resetting correctly.
- Learned possible scenarios for making a supply static air reset possible with a central plant.
- Found some of the ideas presented were things we had already implemented or due to the building design or equipment age were cost prohibitive.

Real Time Electric and Gas Consumption Monitoring

Ability to Monitor Central Fan Plant Operation From A Single Screen

Percent of zones satisfied



Forecast Provided By Internet Feed

Monitoring of Supply Water Set points and Temperatures

Real Time Chiller Monitoring of Chiller Loads and Supply Water Temperatures

Static Press. Setpoint

44.7 °F
63.0 %rh
15.8 enthalpy

air flow 517 cfm
setpoint 522 cfm
damper 26 %open

VAV 28-1

16 turbs
30.01 mo
29 °F

Common Air System

Heating 70.00 C

OCCUPIED

Average Zone Temperature 72.9 °F

Heating Requests 14
Cooling Requests 7

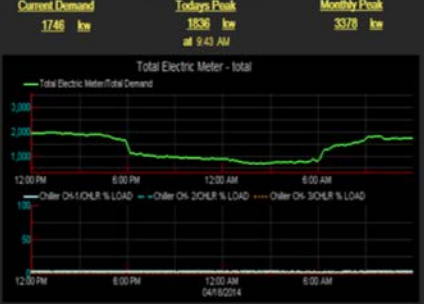
Net Building CO2

Outside Air CO2 406
Return Air CO2 454

Tomorrow Forecast Hi 60 °F
Tomorrow Forecast Lo 44 °F

Booster Heater 300 MW

Real Time Electric



Real Time Gas



Chiller Monitor

Common Chilled Water Supply Temp 72.1 °F
Chilled Water Supply Temp Setpoint 40.0 °F

Start Seq	Start ?	Status	Load	CHWS
1		%	%	°F
2		%	%	°F
3		%	%	°F

Hot Water System

High Rise Heat Exchanger HX-3
enabled at 5 req
Net Heat Req 2
115 °F
Spd 90 °F

Low Rise Heat Exchanger HX-2
enabled at 5 req
Net Heat Req 6
137 °F
Spd 136 °F

Retail Heat Exchanger HX-6
enabled at 66 °F
hydt 2

Fan Monitor

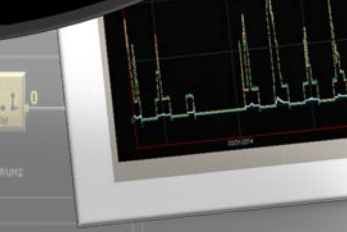
Static Setpoint 1.60 " Return Air Status On
South Static 1.63 " Return Humidity 81 %
Supply Air Spd 57 Return Enthalpy
Mixed Air Spd 57 Economizer Yes

Common Supply Air Temperature 57 °F

Mode	S/S	Status	Mod	%	SAT
AC 4	Normal	On	On	No	100 58
AC 3	Normal	On	On	No	100 58
AC 6	Normal	On	On	Yes	59 58
AC 1	Normal	Off	Off		57
AC 5	Normal	Off	Off		56
AC 2	Maintenance	Off			59
AC-7	On	84 %	2.0 "	62 °F	

Start ? Load Static SAT

Hot Water System



"You can't manage what you don't measure"



UNIVERSITY OF
MARYLAND

Re-Tuning Program

No to Low-Cost Measures

Susan Corry
Energy Manager, UMCP
May 8, 2014
Department of Energy
Better Buildings Summit



Goals of Pilot Program

- Provide “energy” training for Facility Managers and potentially O&M staff
- Re-tuning training in Atlanta, GA in July 2013
- Train the trainer – develop core group
- Identify and perform assessment of pilot facility
- Target goal of 20% reduction in EUI
- Develop priority list of no and low-cost measures for implementation
- Implementation of identified measures
- Develop process and procedure to replicate in other facilities on campus by Facility Managers or O&M staff

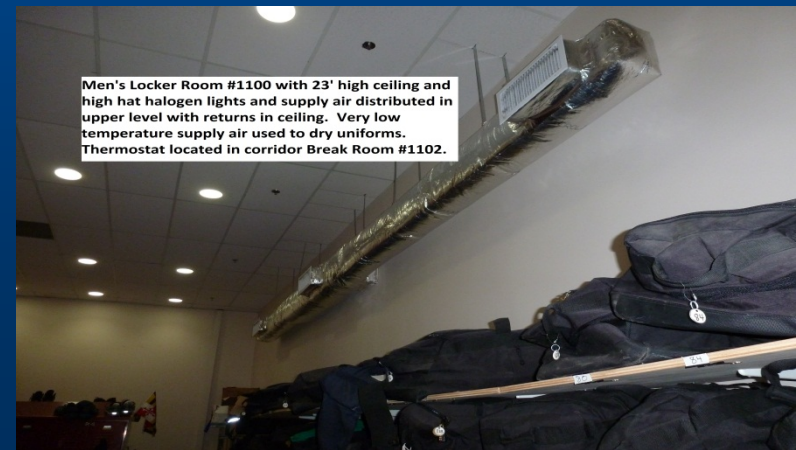
Police Training Academy

- All electric facility
- 9,873 GSF
- 3 joined pre-fabricated metal buildings
- Major interior renovation completed in June 2012
- Annual usage of 512 MWhs
- High EUI of 135 kBtu/GSF compared to CBECS average of 104 kBtu/GSF
- Limited building automation system



Findings

- No occupancy schedule in place
- Uncapped abandoned exhaust air duct
- Un-insulated roof/ceiling
- Low-temperature “clothes dryer” competing against halogen lights



Lessons Learned

- Gather all work orders for previous year
- Meet with building zone technicians for history
- Meet with key occupants for support and acceptance to program initiatives
- Implement no/low cost ECMs one at a time using work orders and FM personnel when possible
- Measure and verify results to make business case