Old Tools, New Tricks

Andy Padian – Data and Kids

Thomas Holmes – Fixing Ventilation

Barry Stephens – Ventilation, Heat Recovery

Mark Pando – Airsealing PTAC units

Tom Sahagian- Water + Leaks

Dan Rieber – Boilers & DHW

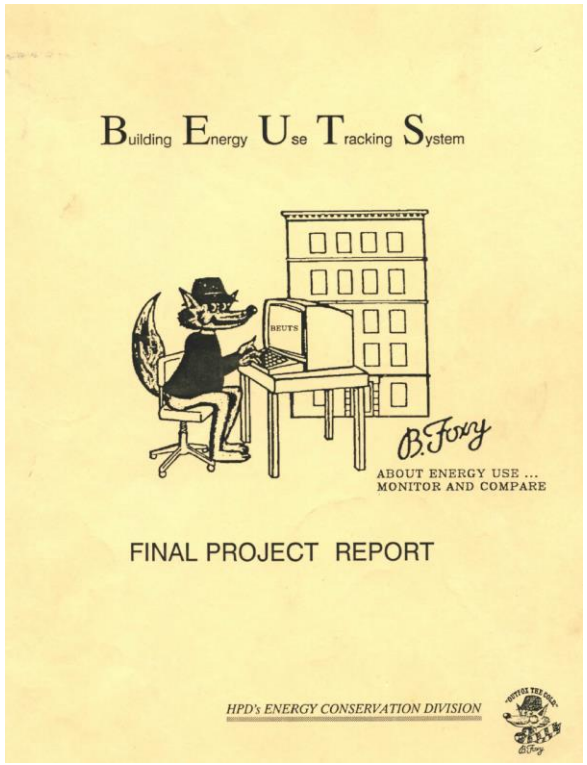
Henry Gifford – Elevators & Booster Pumps

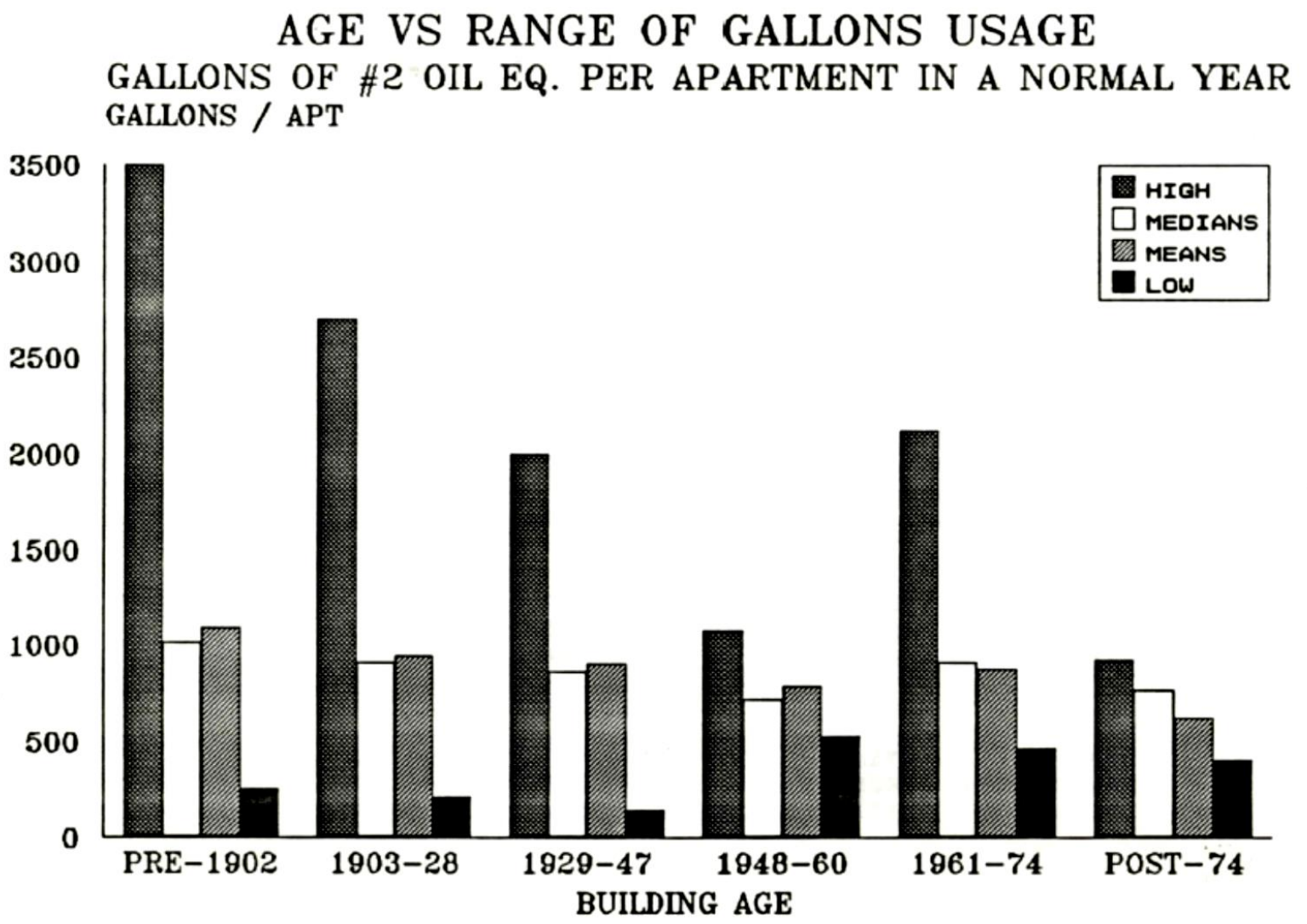
Andy Padian
Data and Kids

Data and Kids

Andy Padian
PadianNYC

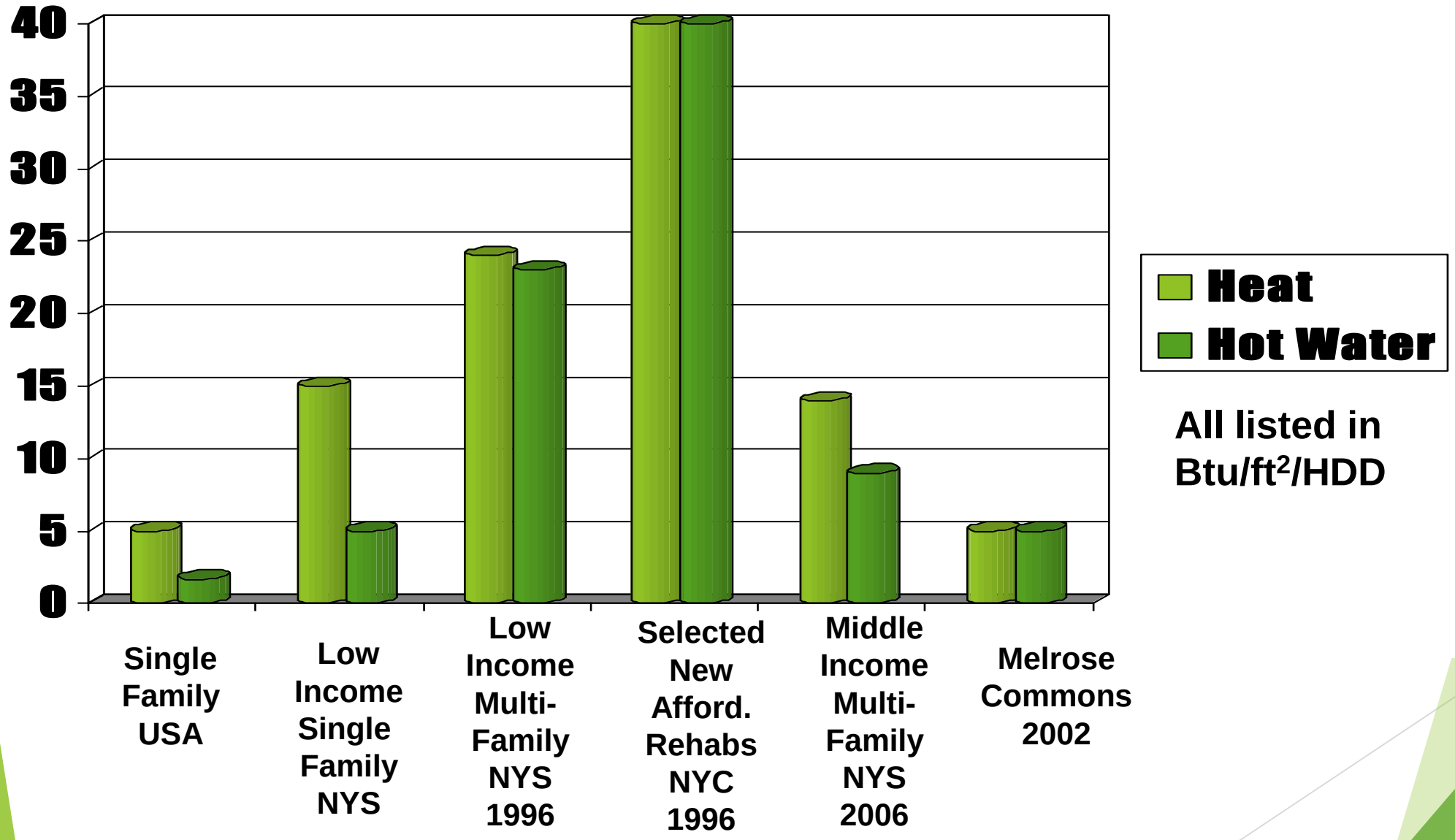
BENYC October 15, 2015



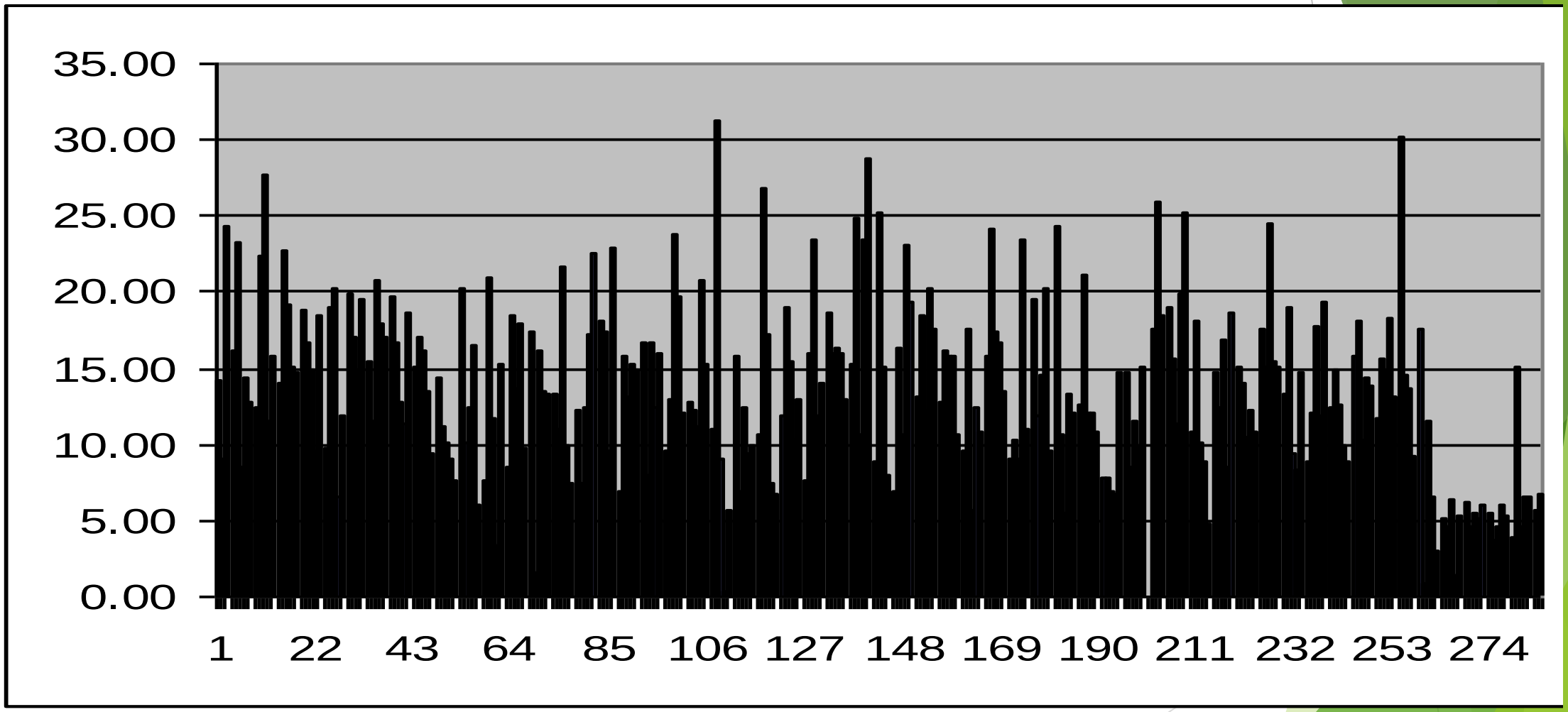


In 1989, a report written by Peter Judd noted that similar buildings ranged in energy usage by a factor of 7:1.

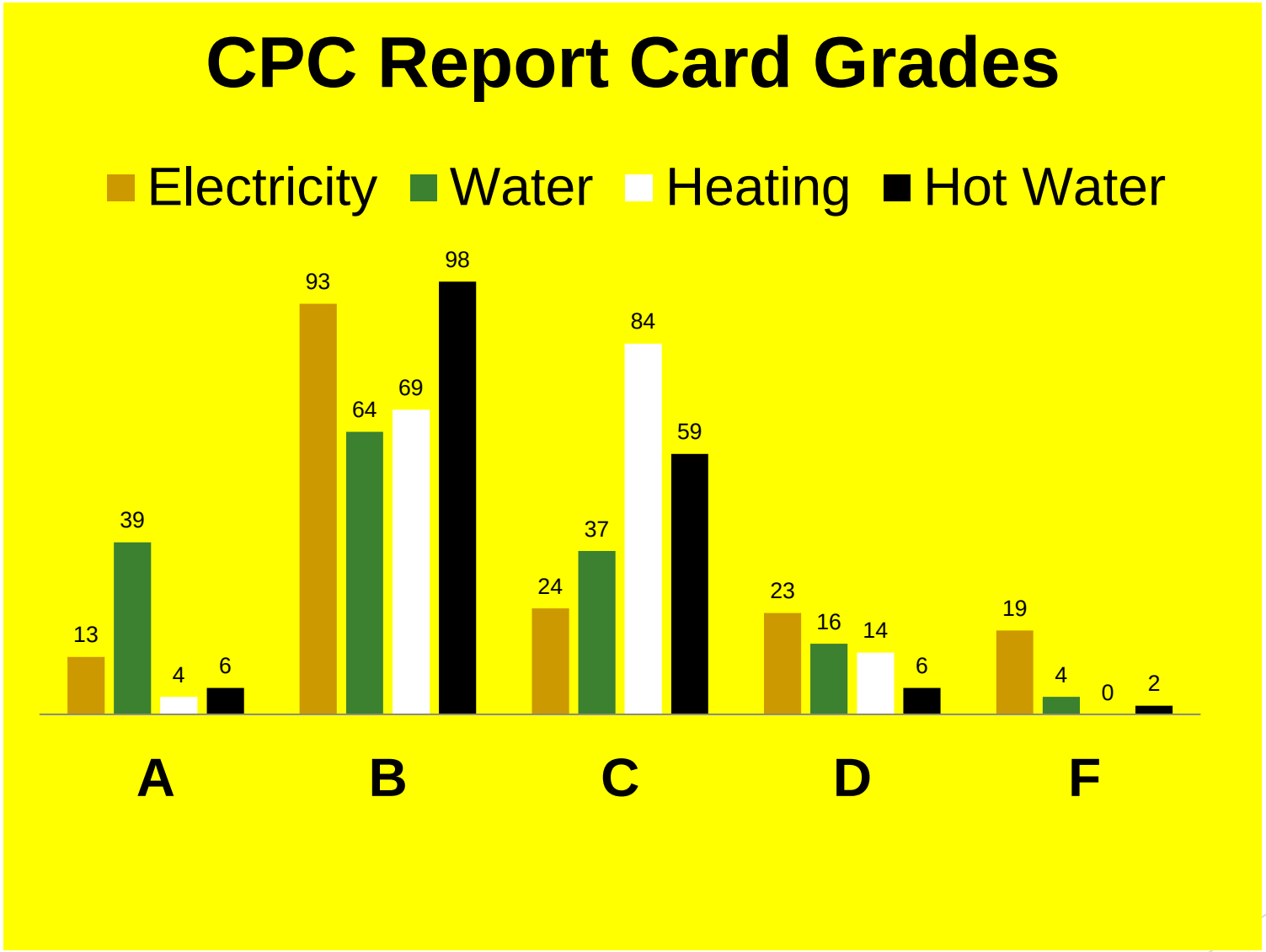
1996-2006 Range of Energy Usage in Buildings



Almost 300 NYS Buildings requesting NYSERDA Energy Audits 2001-2005 (BTU/ft2/HDD)



Data and understandable grades!



How can we miss WATER?

- In many MF buildings, largest resource cost
- More than gas, oil, electric
- In some buildings, larger than property taxes
- Owners don’t believe leaks, toilets, showers, the problem

Two Case Studies 21-40% Savings
6 to 8 Month Payback

←21%
Showerheads
& aerators

40% →
Toilets Only

WWII vs LEED Gold?

Financing Improvements During Refinacing Removes “Payback” Chatter

- When done as part of refinancing, no pain
- Cash flow increases, rates lower costs
- Some banks now loaning against savings
- Innovative programs and incentives
- 3rd Party financing initiatives

But banks and other financiers won't play unless:

- They have "comparables"
- Which means pre/post results
- DATA!
- Financing Session After Lunch

Auburn Housing Authority
188 Units, 24 Buildings
All furnaces, hot water makers replaced
Lighting and refrigerators replaced
50% gas savings.

Vacancy rate from 20% to 1%.

- 1873 Historic building
- Converted to senior housing
- Attic air sealing and insulation
- Heating and DHW replacement
- 20% savings
- No preservation alarms!

131 apartments, electric heated, individually metered

New Hot Water Makers, showerheads, aerators

Tightened apartments average 24%

Apartment electric savings 25%!

Gas use for hot water down 46%

Water use down 21%

North Street Apartments Canandaguia, NY

Rehab/Refi Huge Success

Old vs. New System

35 apts, 36,000 ft2

- Mod rehab + full weatherization package ($4000/apt)
- Boiler, airsealing, windows, insulation, better controls
- Oil usage declined (weather adjusted) 63.7%.
- Annual oil usage from $119,636 to $43,448
- Savings of $76,188 **($2177/apartment)** per year.

So we have the data, the buildings, and most of the solutions!

Now do we have the kids to do the work?

kid[1]

noun 1. (informal)
a child or young person.

You kids could be struggling with leaving HS, college, or grad school.

Some of you kids are 30-50 years old and are in career transition.

Some of you kids are older than I, and you are trying to give back.

THE FUTURE

- That should be all of you
- The “kids” in the audience
- How do you assume our jobs?
- Who trains you?
- Real world meets the ivory tower

FERTILIZE.
MENTORIZE.
GET A BOARD OF DIRECTORS.

Continue to Learn

Each year, you should learn as much at work as you have in your entire previous career

You learn more from working than sitting in a classroom

…because there's only two ways I'm leaving this business:

Thanks for listening!

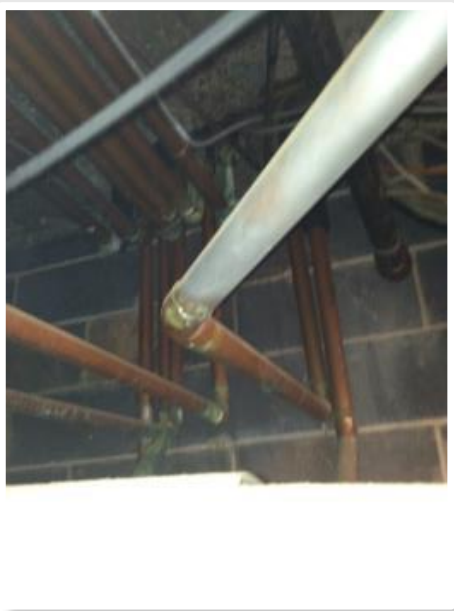
Thomas Holmes Fixing Multifamily Ventilation

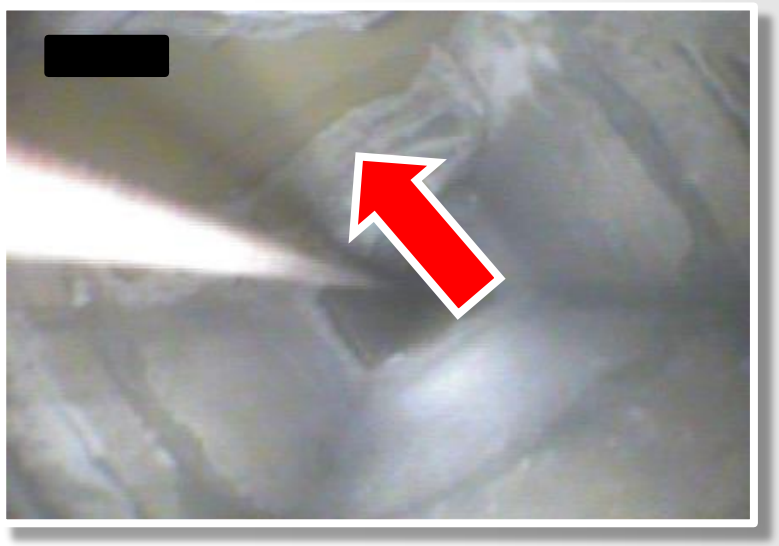
Multifamily Ventilation
A Balancing Act

Tom Holmes

Remediation Specialists, Inc.

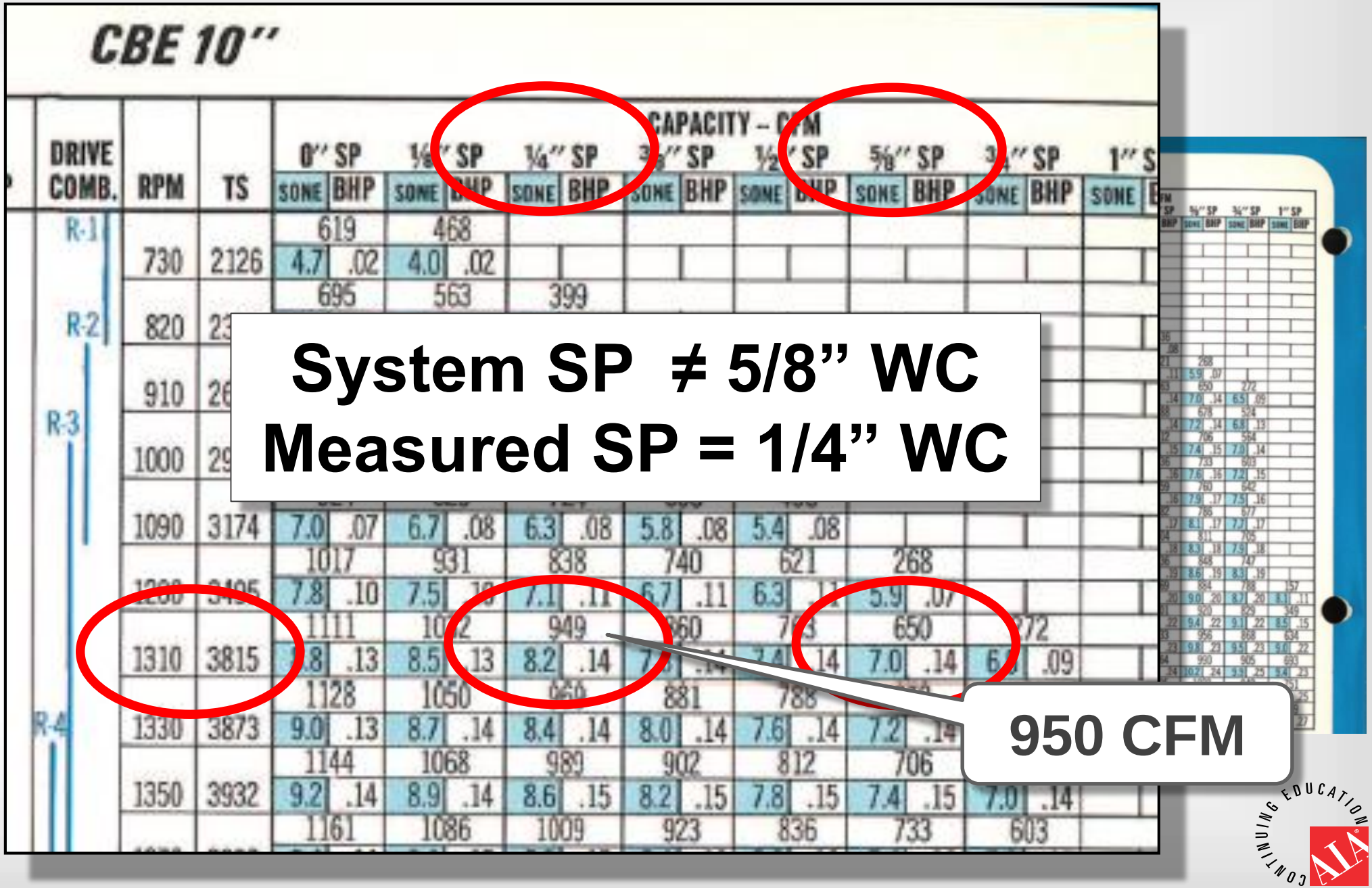
CONTINUING EDUCATION AIA



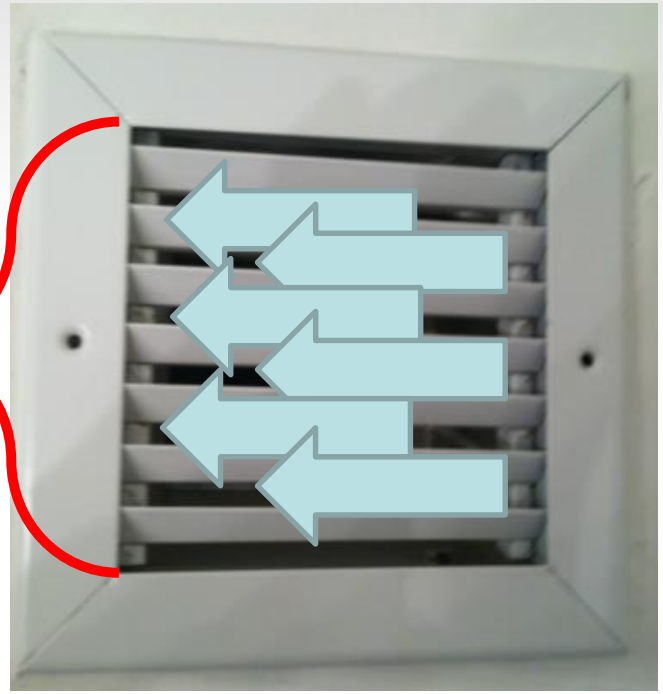


90

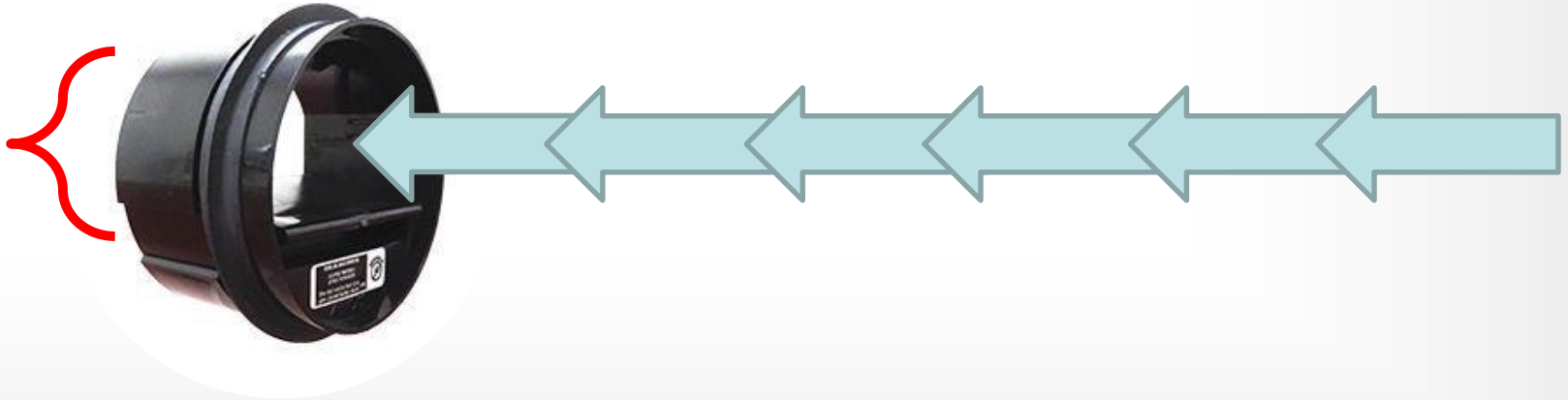
10


CBE 10"
DRIVE COMB.
RPM
TS
CAPACITY – CFM
0" SP
1/8" SP
1/4" SP
3/8" SP
1/2" SP
5/8" SP
3/4" SP
1" SP
SONE
BHP
R-1
R-2
R-3
R-4
730 2126 4.7 .02 4.0 .02
820
910
1000
1090 3174 7.0 .07 6.7 .08 6.3 .08 5.8 .08 5.4 .08
1310 3815 8.5 .13 8.2 .14
1330 3873 9.0 .13 8.7 .14 8.4 .14 8.0 .14 7.6 .14
1350 3932 9.2 .14 8.9 .14 8.6 .15 8.2 .15 7.8 .15 7.4 .15 7.0 .14
System SP ≠ 5/8" WC
Measured SP = 1/4" WC
950 CFM

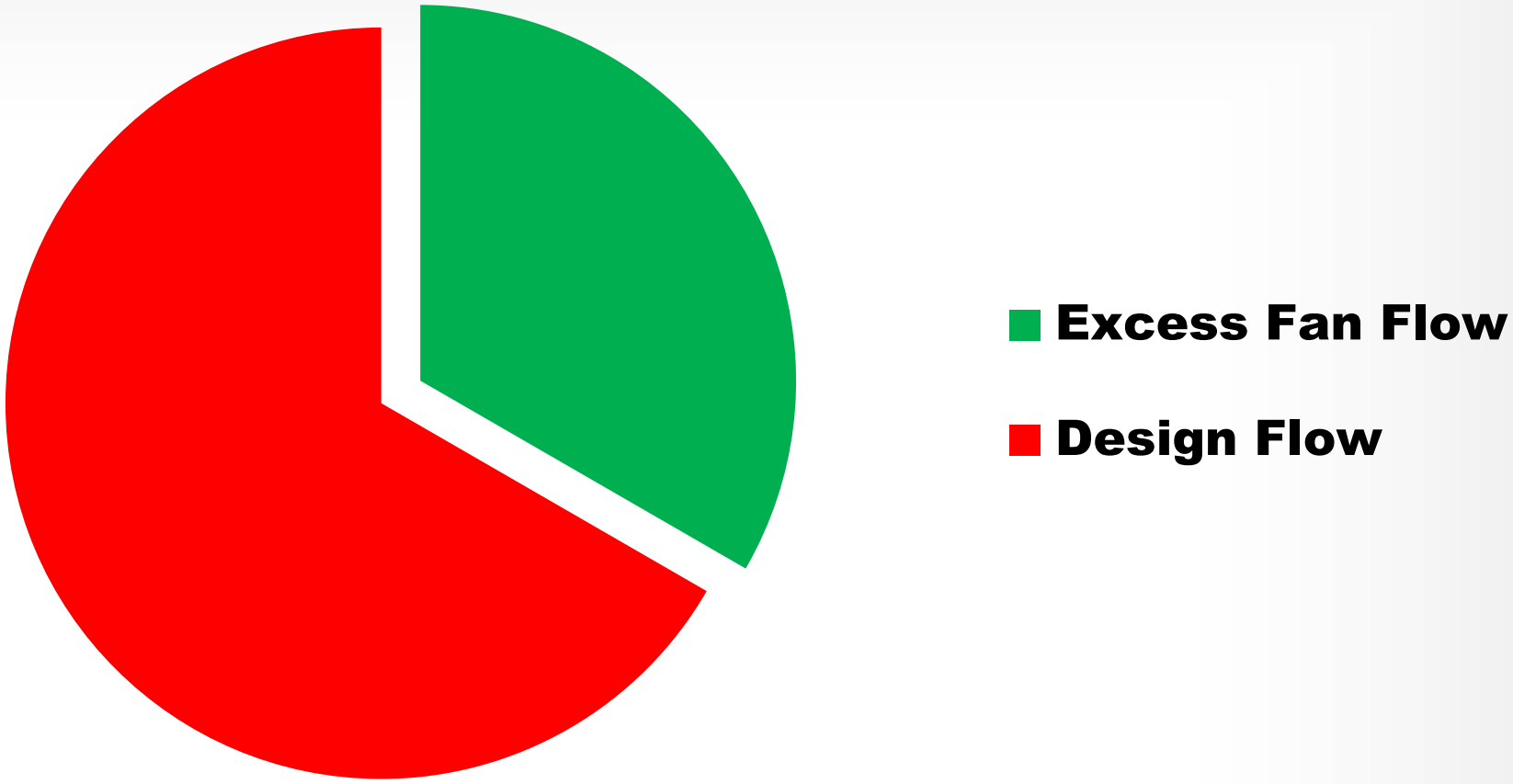
18 in^2



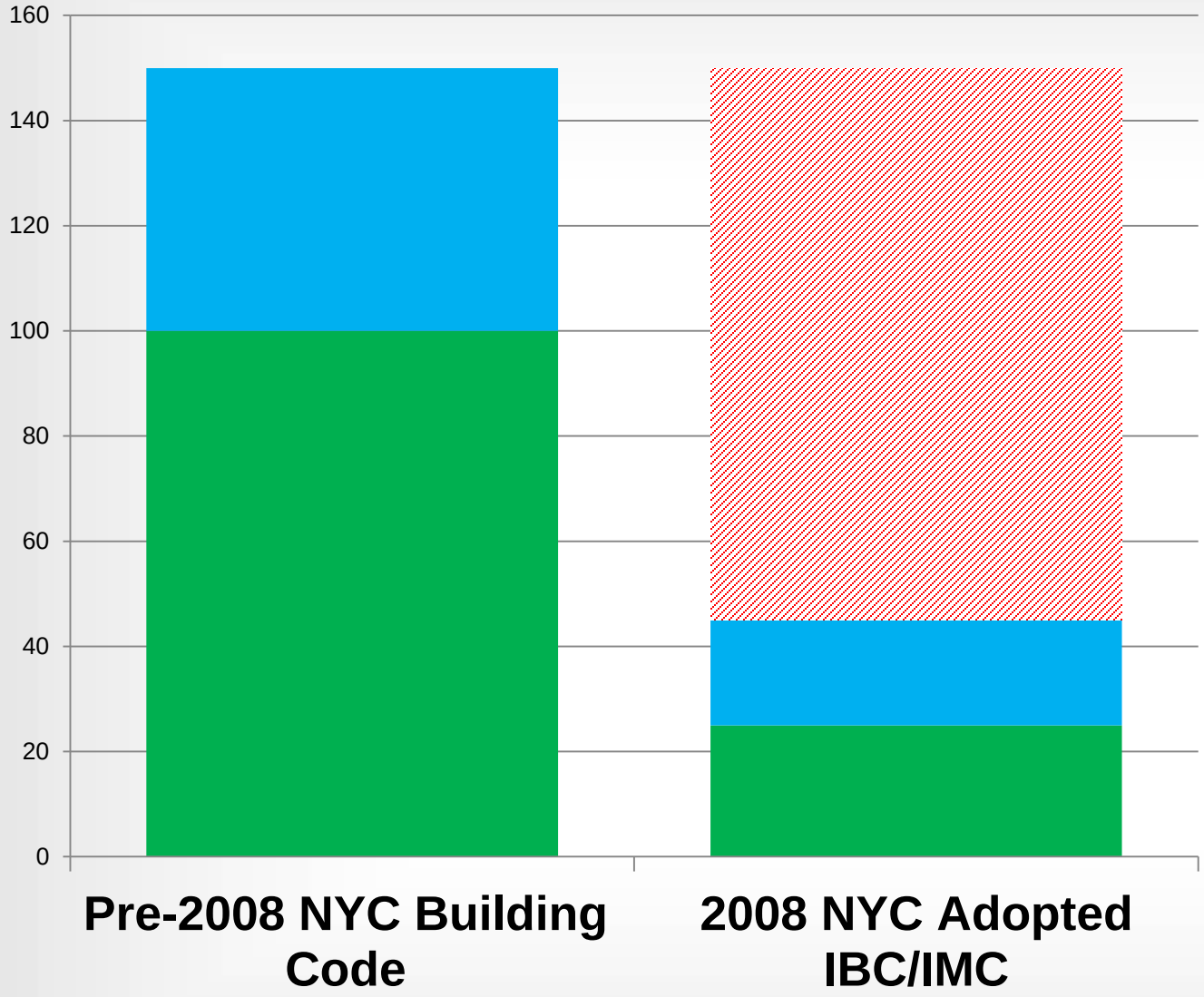
3 in^2



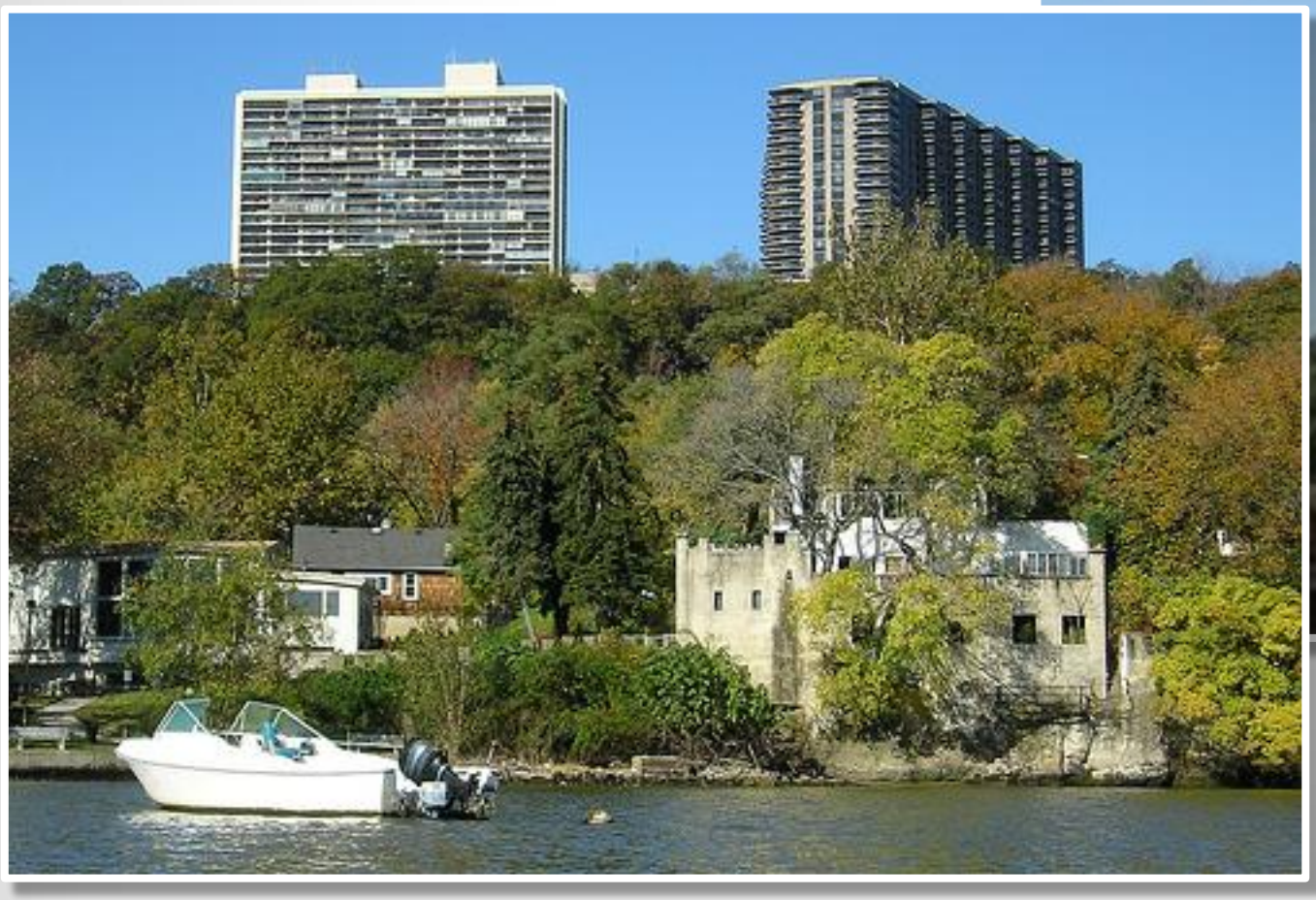
Balance


Excess Fan Flow
Design Flow

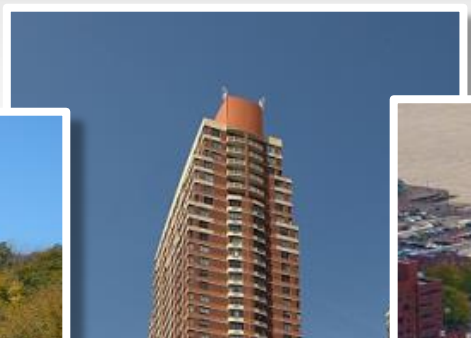
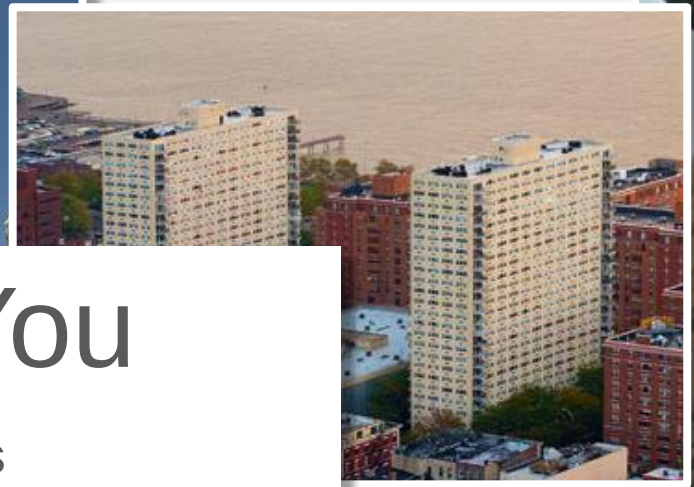
		Kitchens	Bathrooms
	**Natural Gas $0.49/ Therm**	$60	$24
	**#2 Heating Oil $2.99/ Gal.**	$244	$98
	**District Steam $38.50/ MLB**	$375	$150
	**Electricity $0.26/ kWh**	$863	$338


160
140
120
100
80
60
40
20
0
Pre-2008 NYC Building Code
2008 NYC Adopted IBC/IMC
Possible Energy Savings
Bathrooms
Kitchens

CONTINUING EDUCATION
AIA






Thank You

Tom Holmes

RSI Remediation Specialists, Inc.

(800) 395-8368

tholmes@rsinj.com





Barry Stephens Ventilation and Heat Recovery

Old Tools, New Tricks: Creative Solutions for Common Energy Problems

Ventilation and Heat Recovery

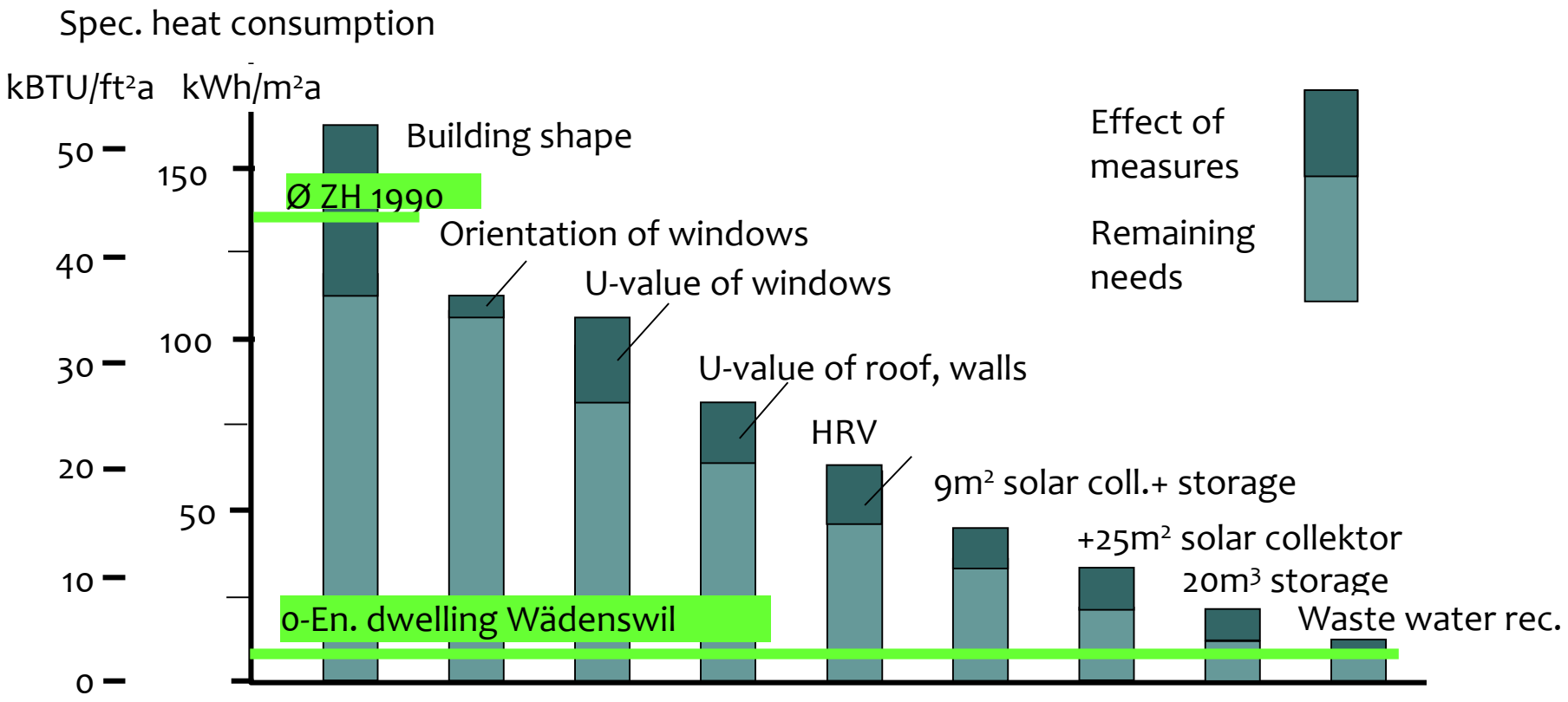
BENYC
15 October 2015
Presented by Barry Stephens

Experience with cutting edge energy efficiency with Zero-Heating-Energy-dwellings Wädenswil, 1990

Comprehensive measures to reduce consumption and to use solar heat

600 pounds of wood/year for space heating/DHW

Determining Factors for Energy Use in Zero Energy Homes

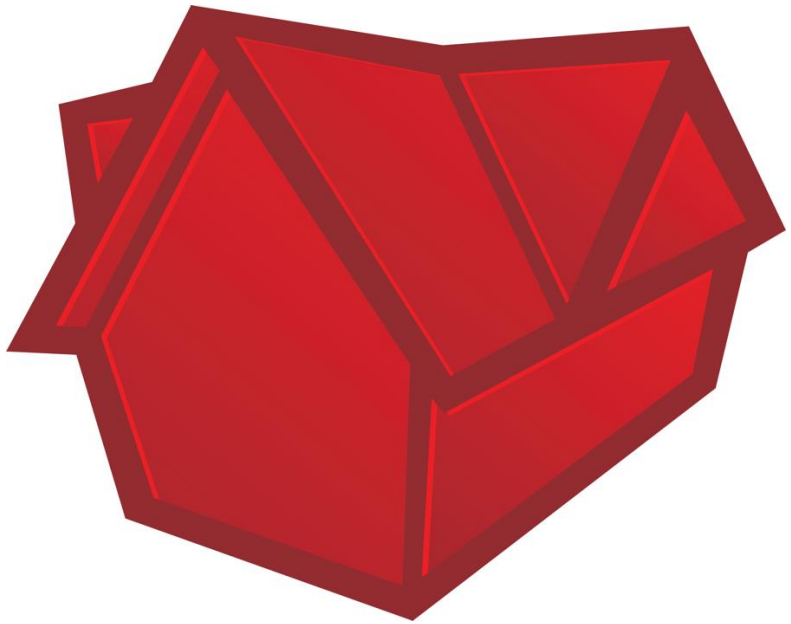


Bath Fan vs. HRV Energy Usage

Assumptions:

* 3 Bedroom/1 bath apartment
* 1500 SF – 8 FT ceilings
* Passive House Ventilation

  0.3 ACH = 60 CFM
* Outside Air Temp: 30°F
* Inside Air Temp: 70°F

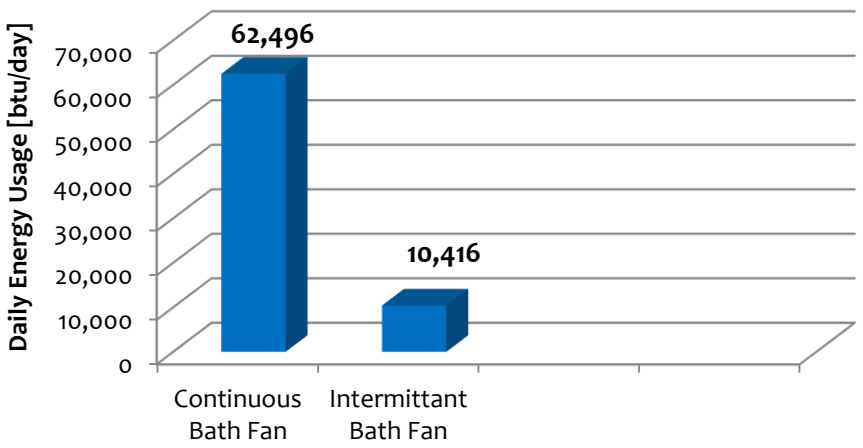


Bath Fan vs. HRV Energy Usage

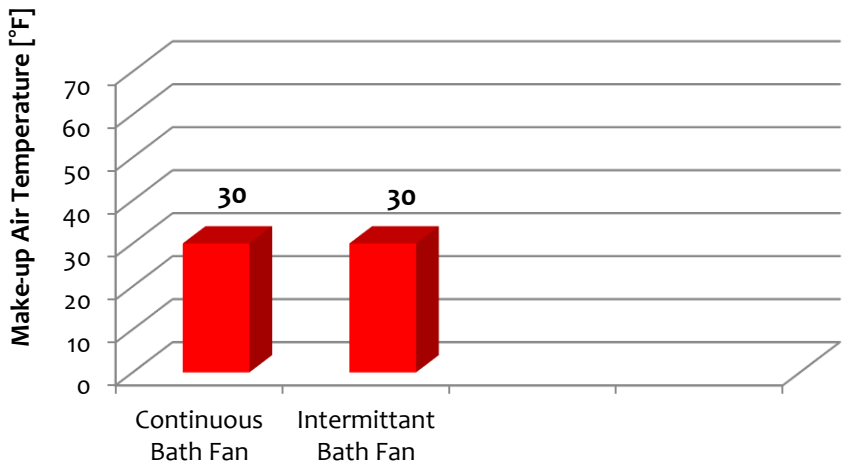
Bath Fan case, 60 CFM continuous:
Energy Usage = (1.085)(60 CFM)(70°F - 30°F)(24 hours) = **62,496 Btu/Day**

Bath Fan Case, 120 CFM intermittent (2 hours per day):
Energy Usage = (1.085)(120 CFM)(70°F - 30°F)(2 hours) = **10,416 Btu/Day**

Ventilation Thermal Energy Usage



Make-up Air Temperature



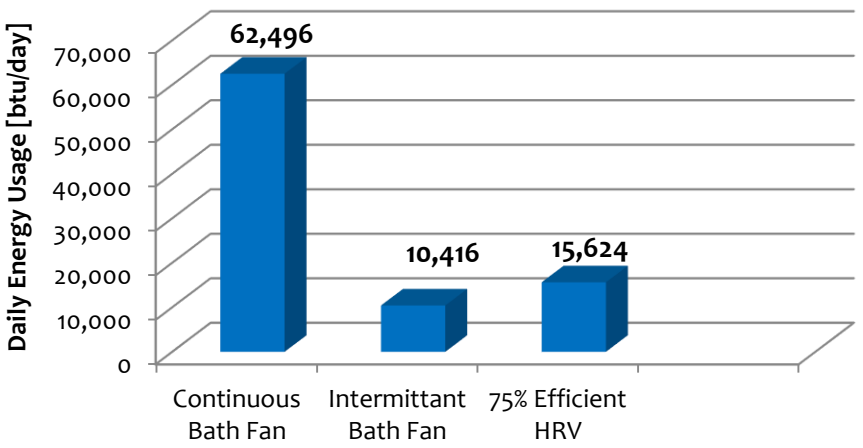
Bath Fan vs. HRV Energy Usage

75% Efficient HRV case, 60 CFM continuous:

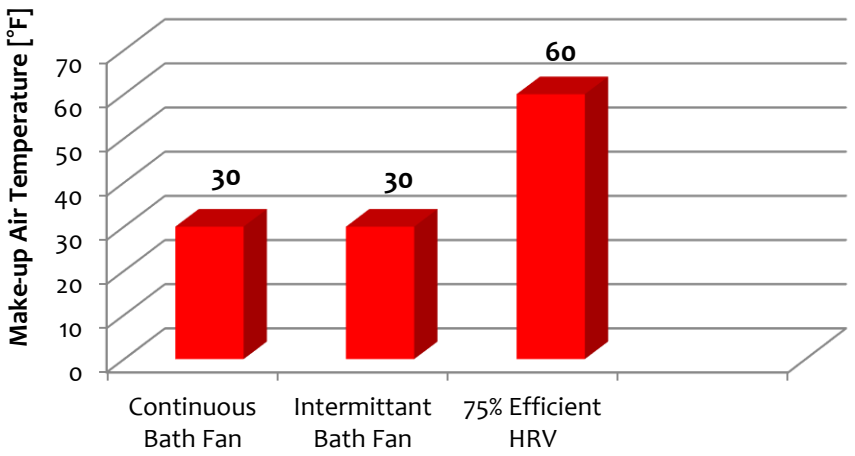
Energy Usage = (1.085)(60 CFM)(70°F - 30°F)(24 hours)(1 – 0.75) = **15,624 Btu/Day**

Make-up air temperature = 30°F + (70°F - 30°F)*(0.75) = **60°F**

Ventilation Thermal Energy Usage



Make-up Air Temperature



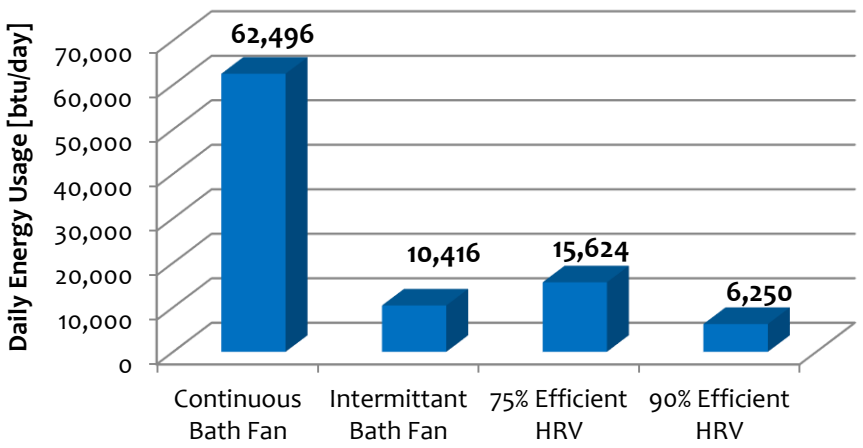
Bath Fan vs. HRV Energy Usage

90% Efficient HRV case, 60 CFM continuous:

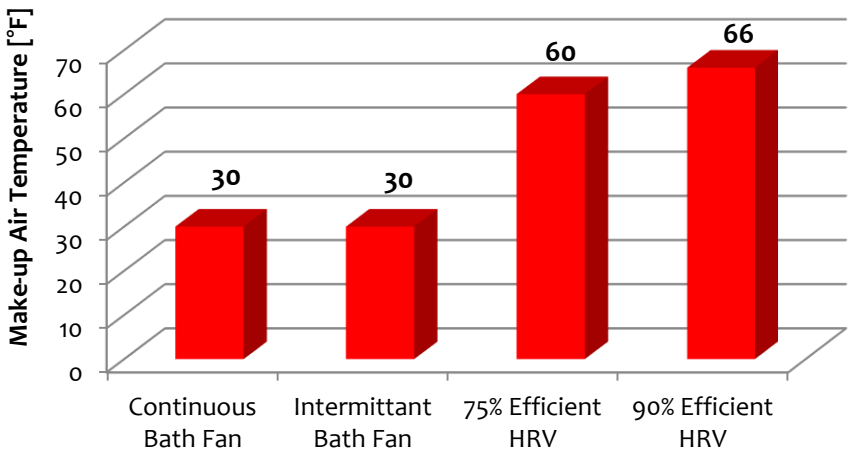
Energy Usage = (1.085)(60 CFM)(70°F - 30°F)(24 hours)(1 – 0.90) = **6,250 Btu/Day**

Make-up air temperature = 30°F + (70°F - 30°F)*(0.90) = **66°F**

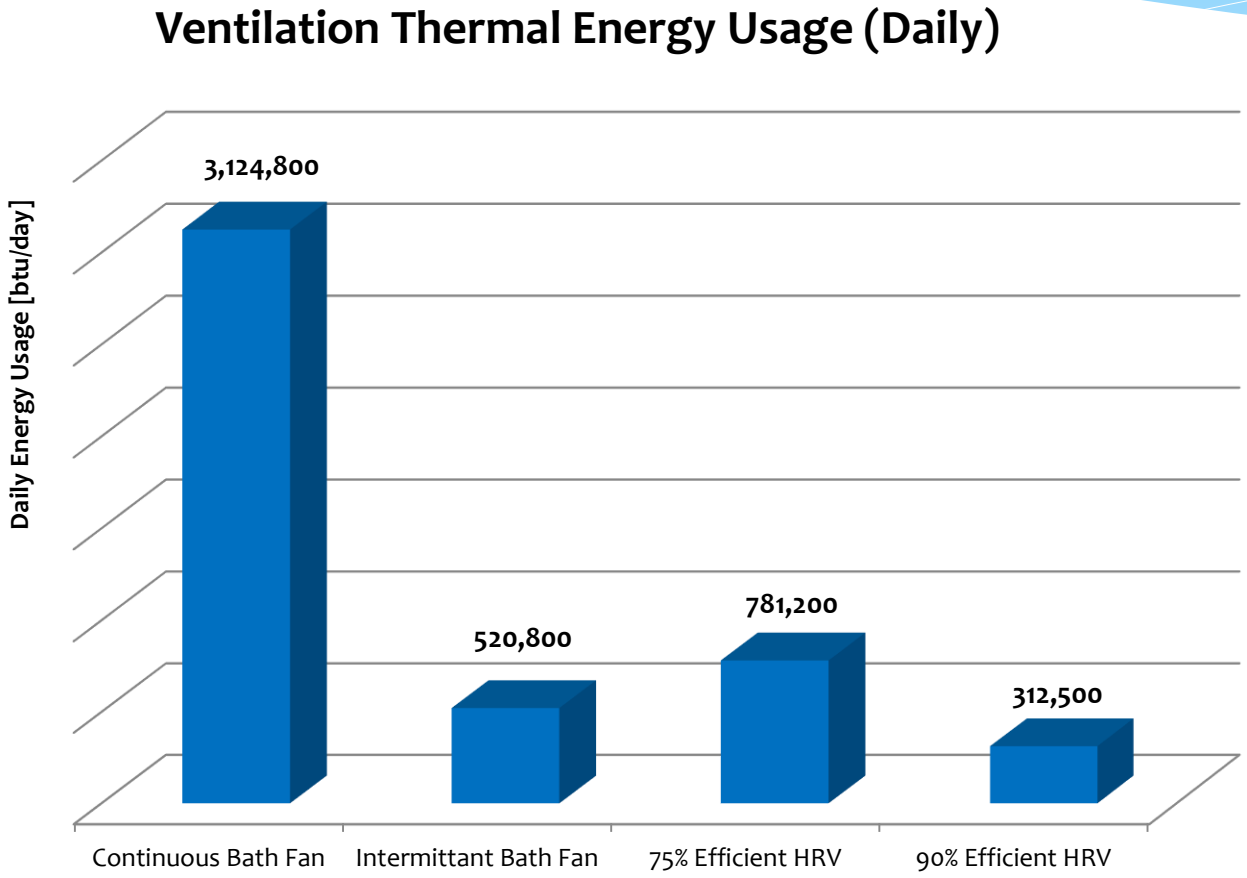
Ventilation Thermal Energy Usage



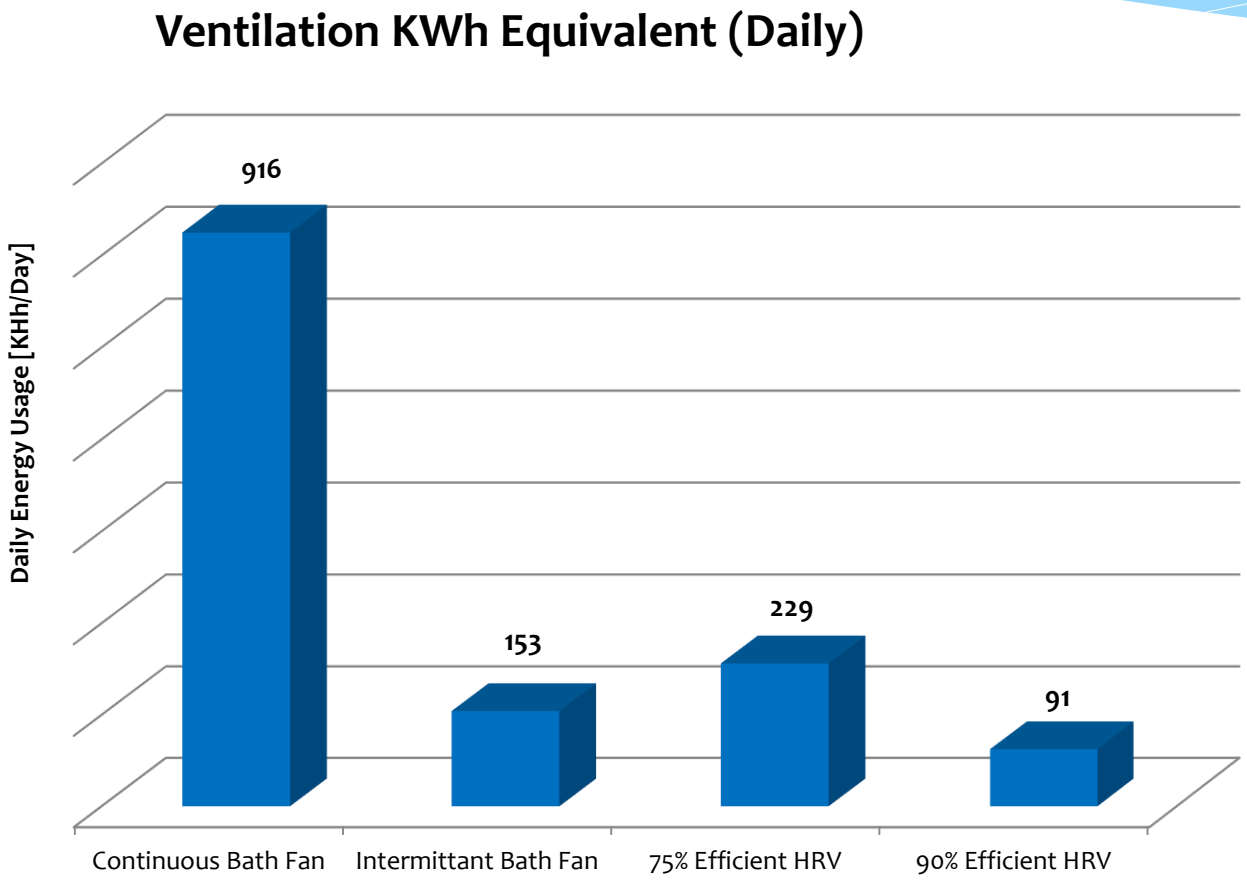
Make-up Air Temperature



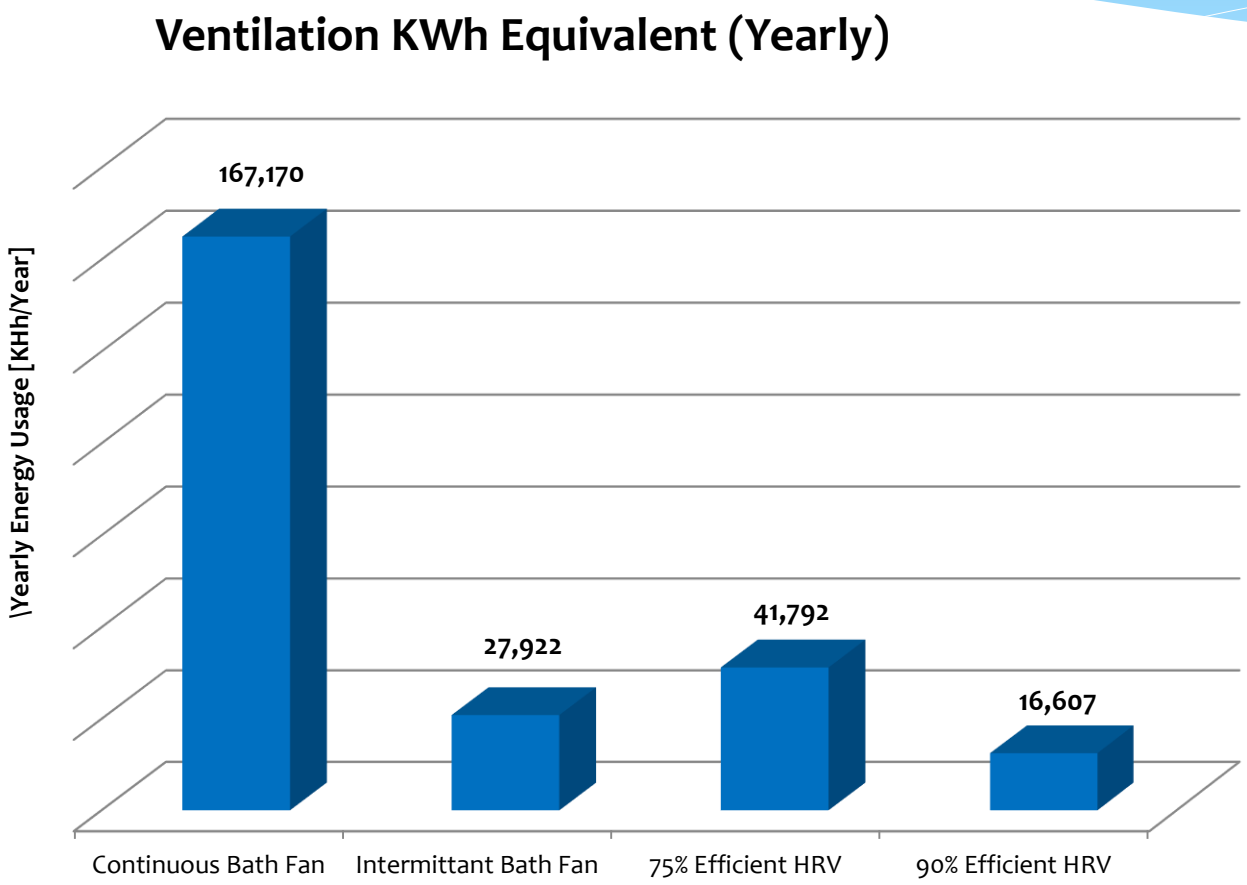
Apply formula to 50 unit multi-family



Apply formula to 50 unit multi-family



Apply formula to 50 unit multi-family



Calculated with average temperature gradient from outside to inside of 20F.

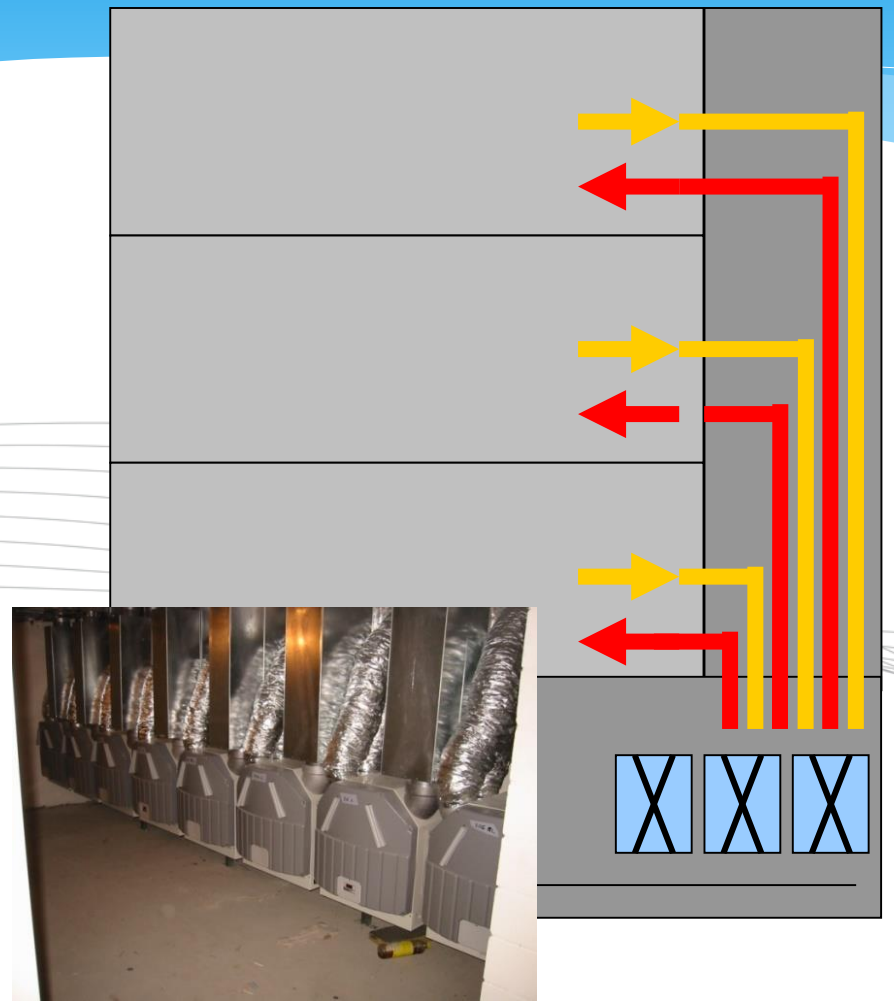
Ever seen one of these?

Rooftop AHU

Multi-Family Options

Install individual units in each Apartment.

Multi-Family Options



Individual Apartment Units
With Central Mechanical Room

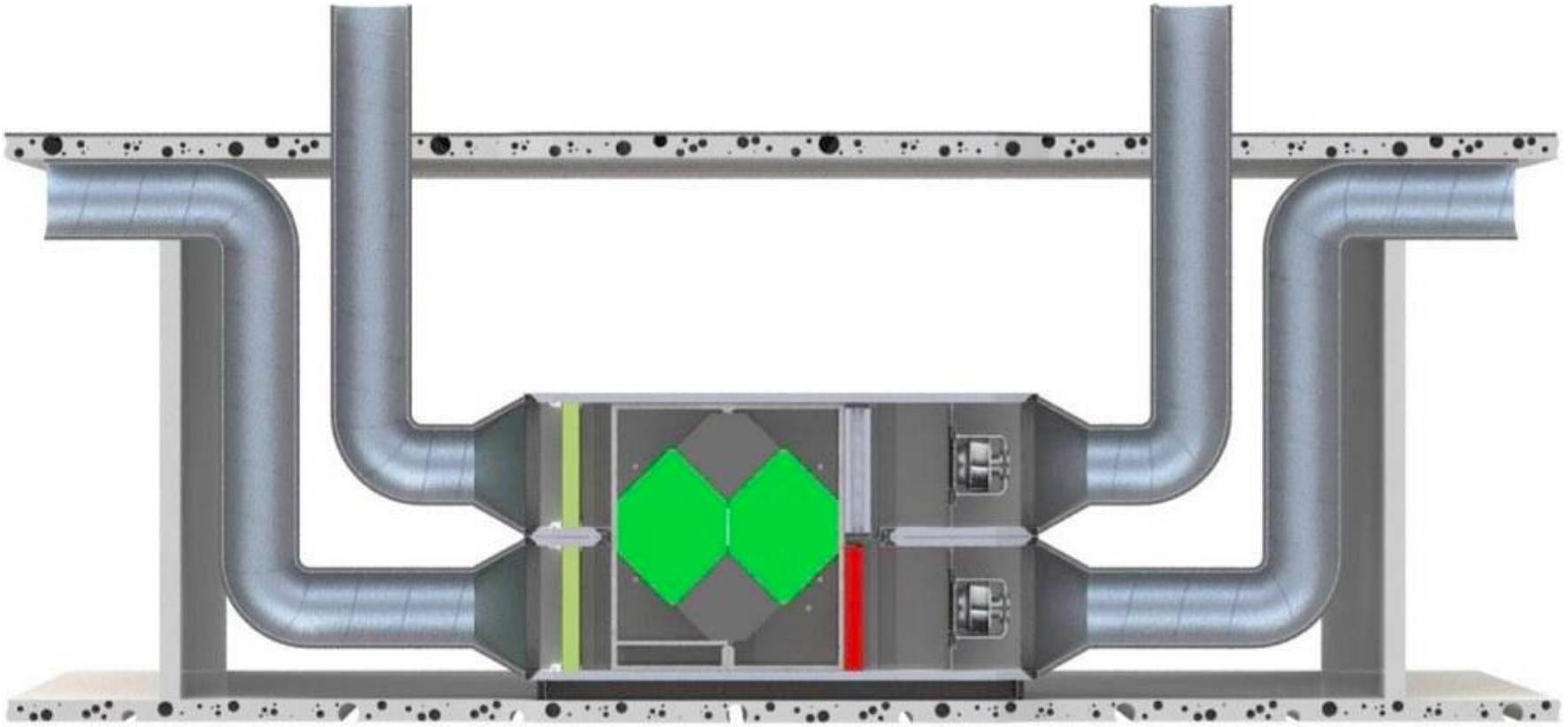
Pros

- Good Compartmentalization
- Individual Control
- Boost Capacity
- Minimize Penetrations
- Centralized Maintenance

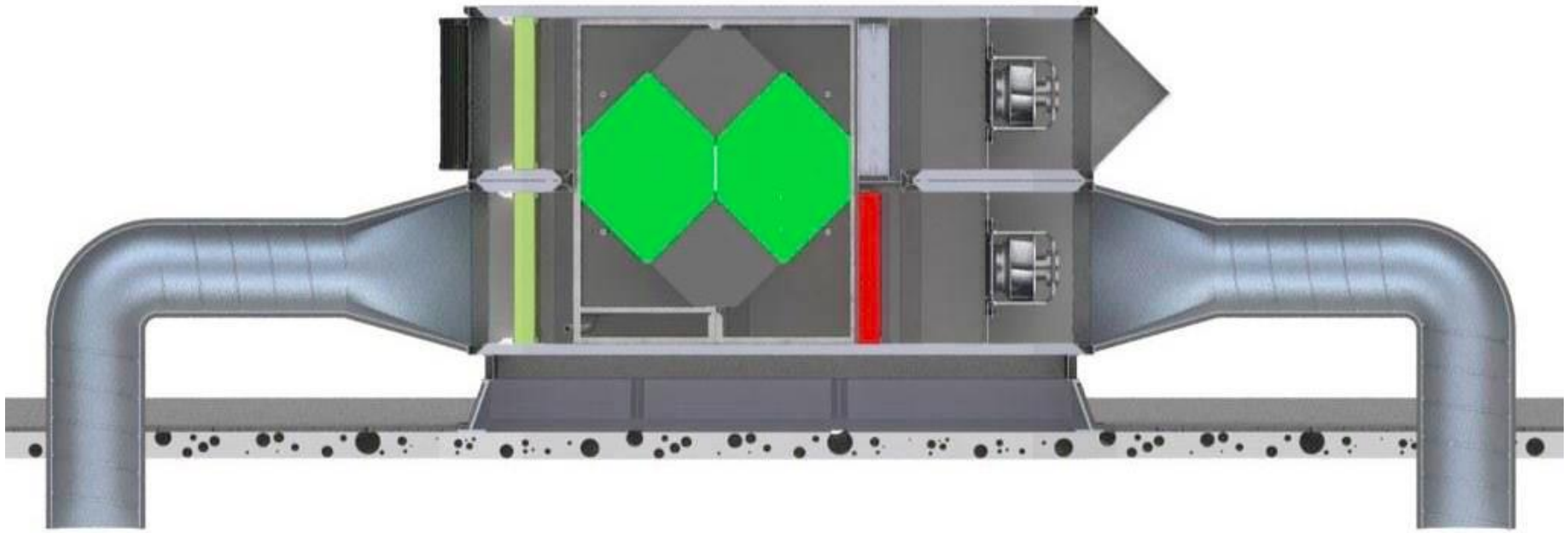
Cons

- Central Ductwork & Fire Dampers
- Loss of Floor Space for Shafts
- May be more expensive
- Energy paid by building owner

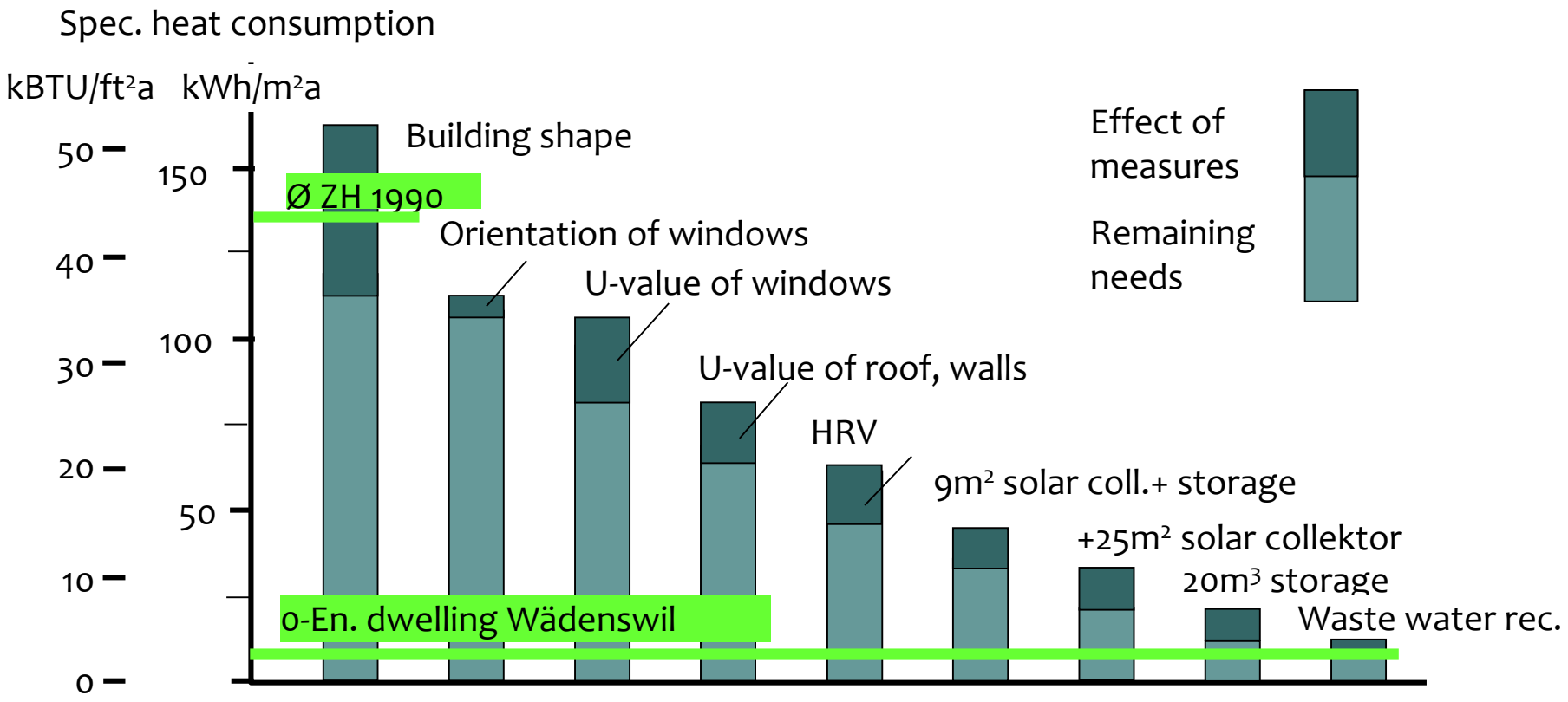
Mechanical Room Central Unit



Roof Top Unit



Determining Factors for Energy Use in Zero Energy Homes



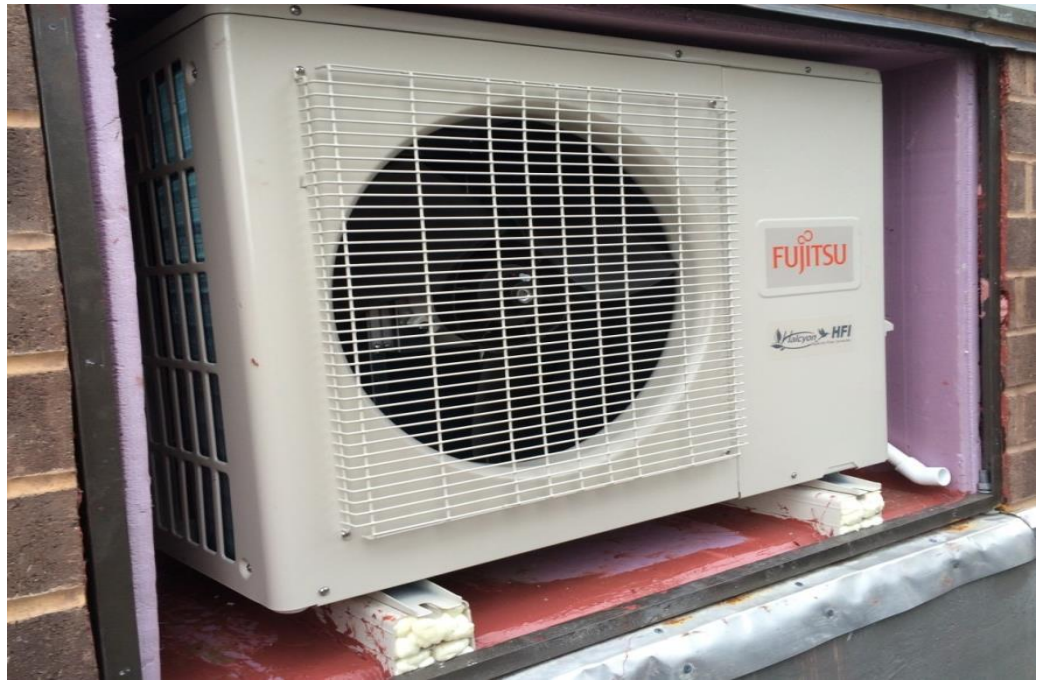
Mark Pando Retrofitting PTAC Units

Mark Pando
Bright Power, Inc.

Retrofitting PTACS: A New Solution

Proof of Concept

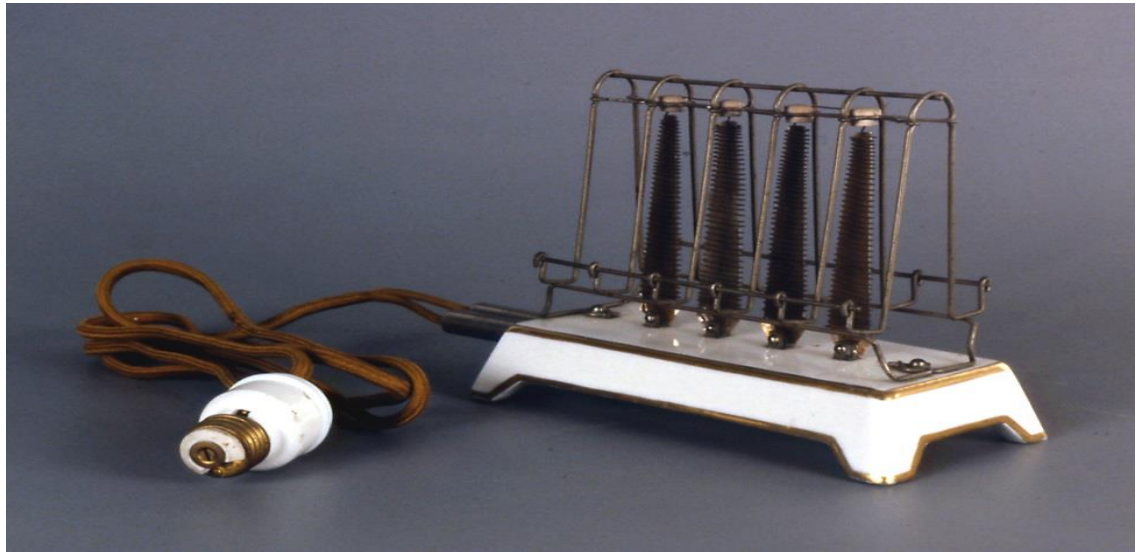
- Electric Heat PTAC with Mini-Split Heat Pump
- “Outdoor Unit” mounted in expanded PTAC cavity in masonry wall
- Completed December 2014



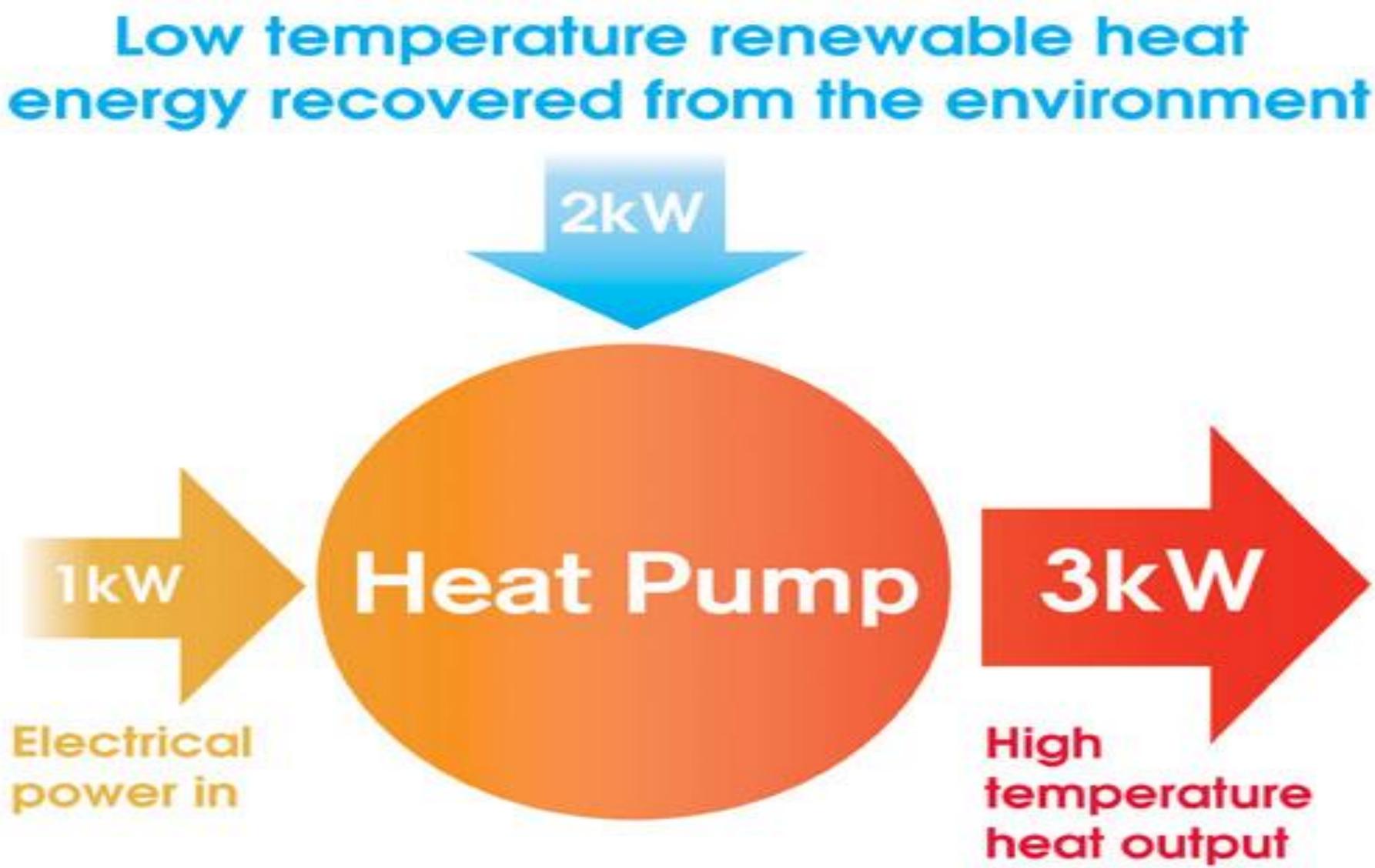
PTAC Sleeves – Leaky Envelope

Out-Dated Technology

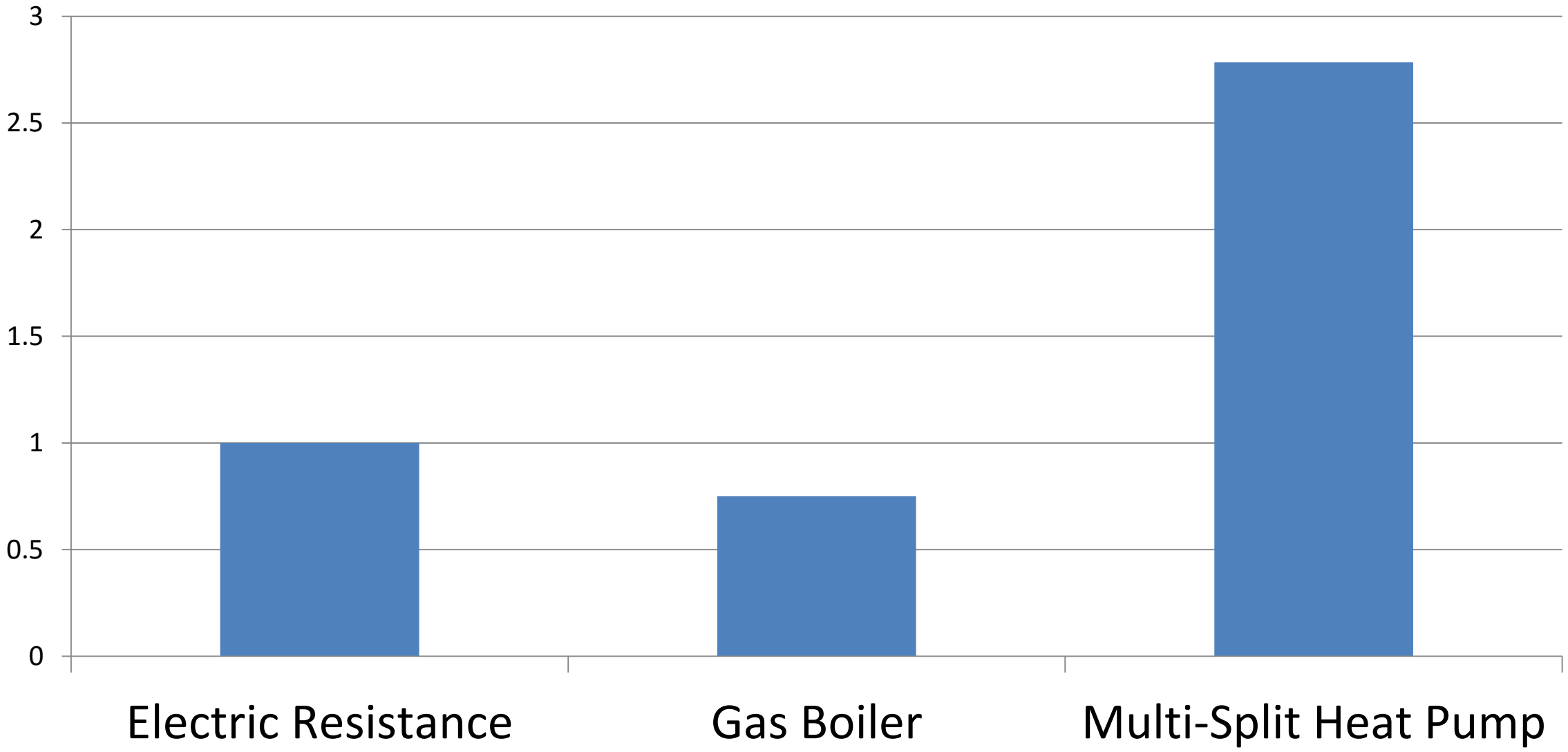
1909



2014


Low temperature renewable heat energy recovered from the environment
2kW
1kW
Heat Pump
3kW
Electrical power in
High temperature heat output

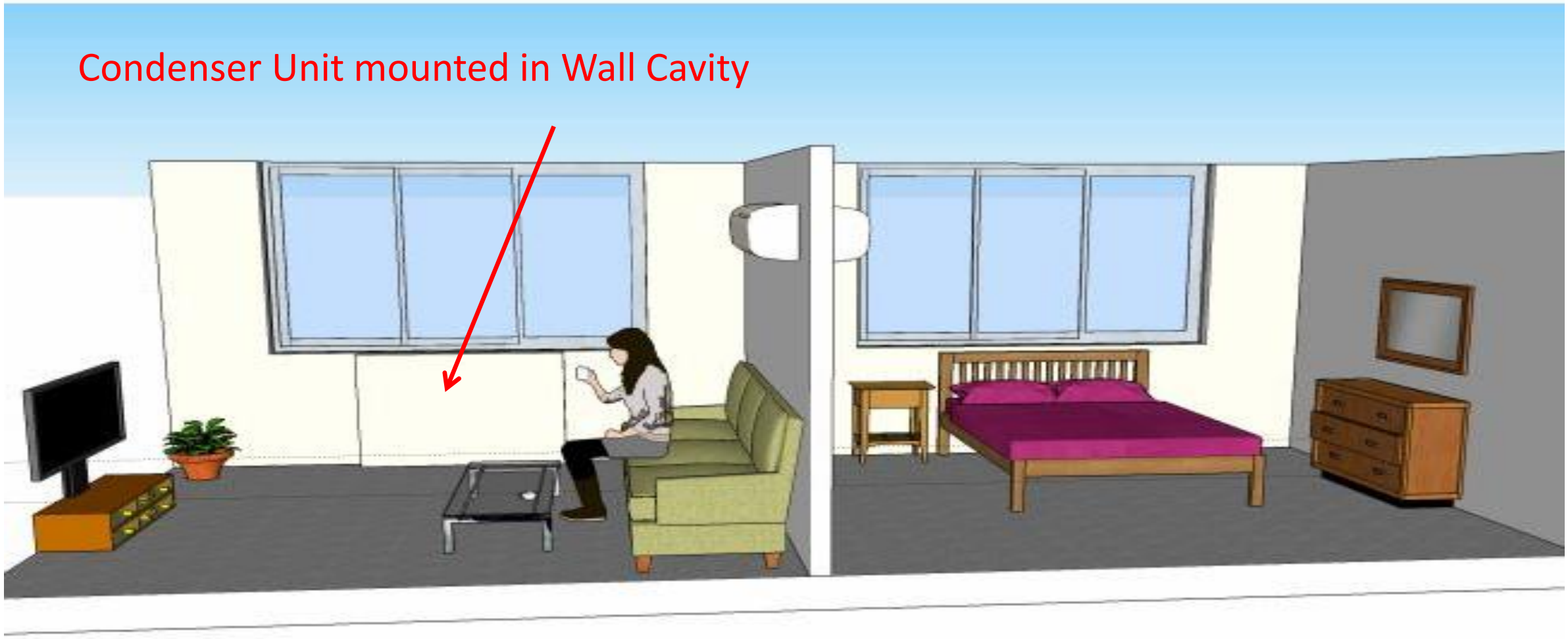
Heating System Efficiencies (COP/AFUE)



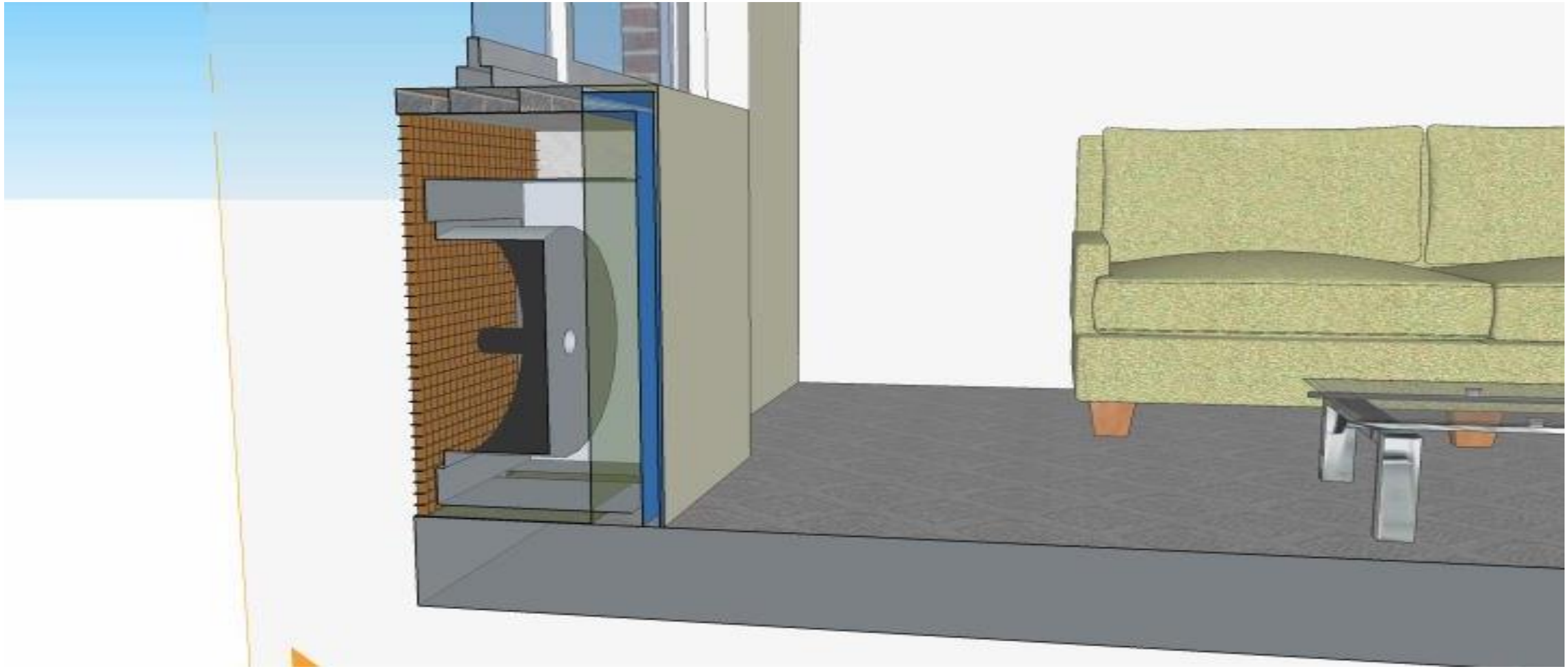
Retrofits: What were our options?

Hydronic Gas Plant	VRF	PTHP
New Piping Needed	Bldg Geometry Restrictions	Sleeve Size = Non Standard
No Space for new Plant	Refrigerant Piping Needed	Electric Ht. on Coldest Days
No Air Sealing	Metering Configuration	No Air Sealing

Solution: Mini Splits


Condenser Unit mounted in Wall Cavity

Condenser Unit Location




RAM BOARD

Enlarged grille

Air Seal Bedroom PTAC

BEFORE

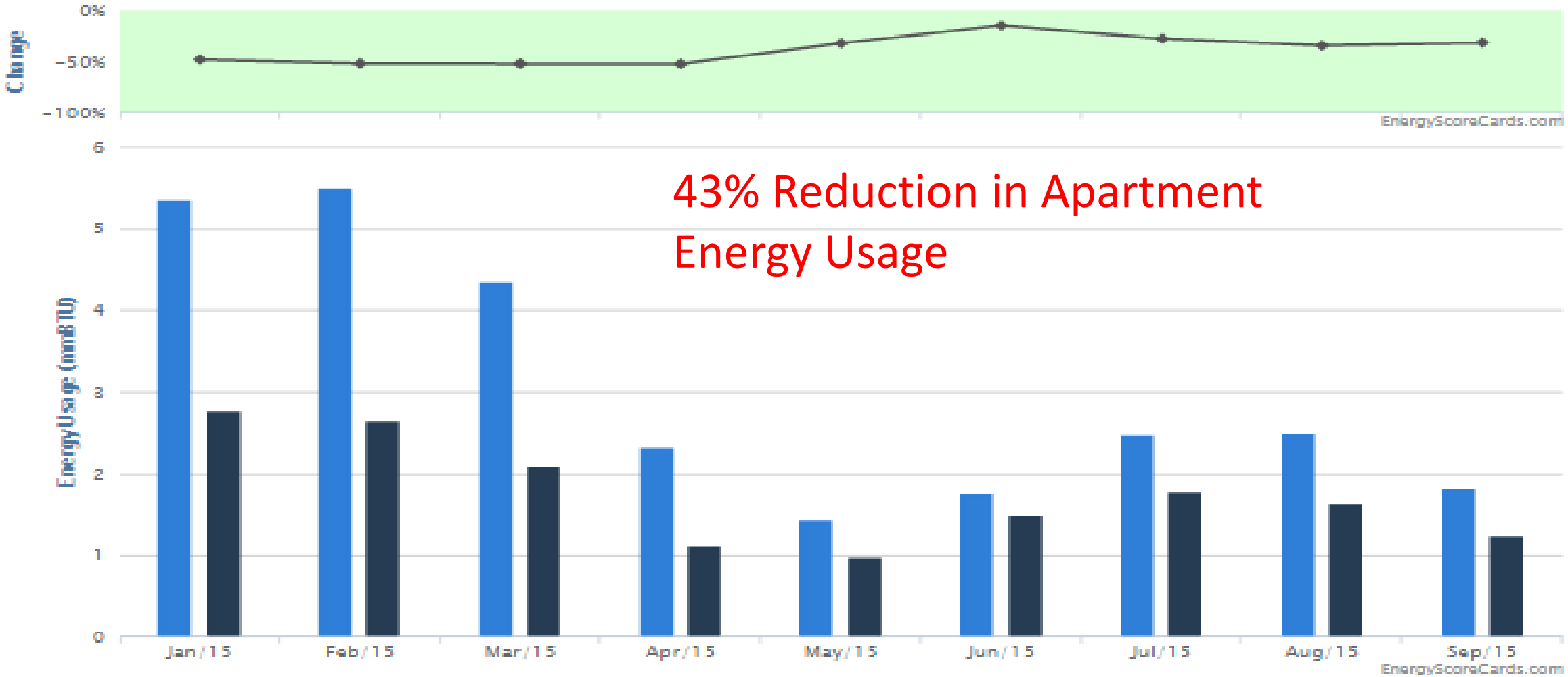
AFTER

Each PTAC occupied 8 sq. ft. of interior floor area

Package: **Heat Pump Install**

Status: **On Track**

Savings to Date: **$995** Energy Savings: **42.99%**



43% Reduction in Apartment Energy Usage

Baseline Period for Report

Pre-Retrofit - Owner

Dec 2013 - Dec 2014

All Energy

Display: Spending | Usage

Display Series: Baseline vs Actual

Accounts

Assumptions

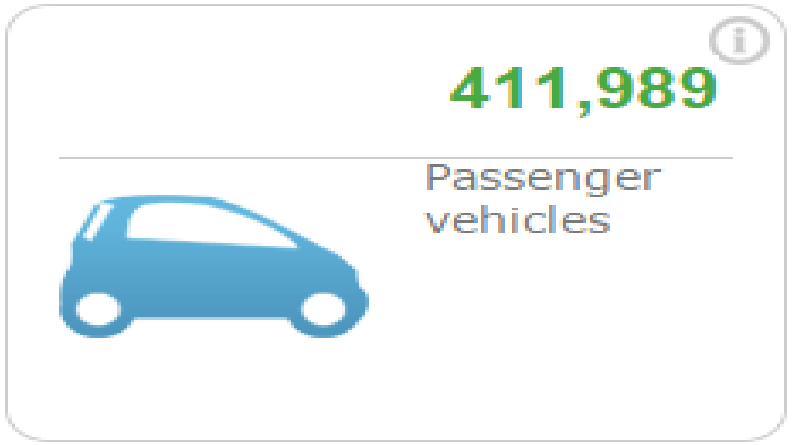
HVAC Savings

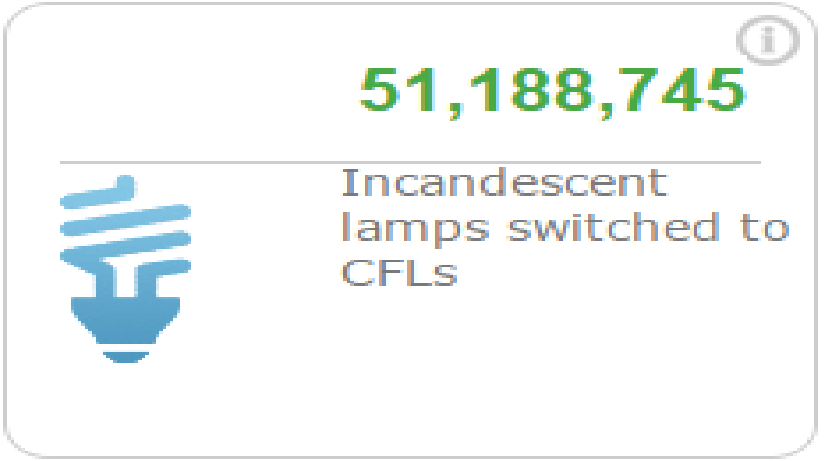
Indices_	Pre-Retrofit - Owner		Post-Retrofit - Owner		Difference		Units
Energy Index	43	N/A	27	N/A	-39%	-16.0	kBTU/ ft^2/yr
Cooling Index	5.4	D	3.1	C	-43%	-2.30	BTU/ ft^2/CDD
Heating Index	5.6	A	2.5	A	-56%	-3.10	BTU/ ft^2/HDD
Electric Baseload Index	2,555	A	2,574	A	~	19.0	kWh/unit/yr

Big Picture

Region	Electric Heating Usage MWh	Potential Savings MWh
NY State	2,102,000	1,346,000
New England	2,330,000	1,492,000
Total:	**4,432,000**	**2,838,000**

Source: RECS 2009 Data





Tom Sahagian Water Leak Warning System

Water Leak Early Warning System

Tom Sahagian

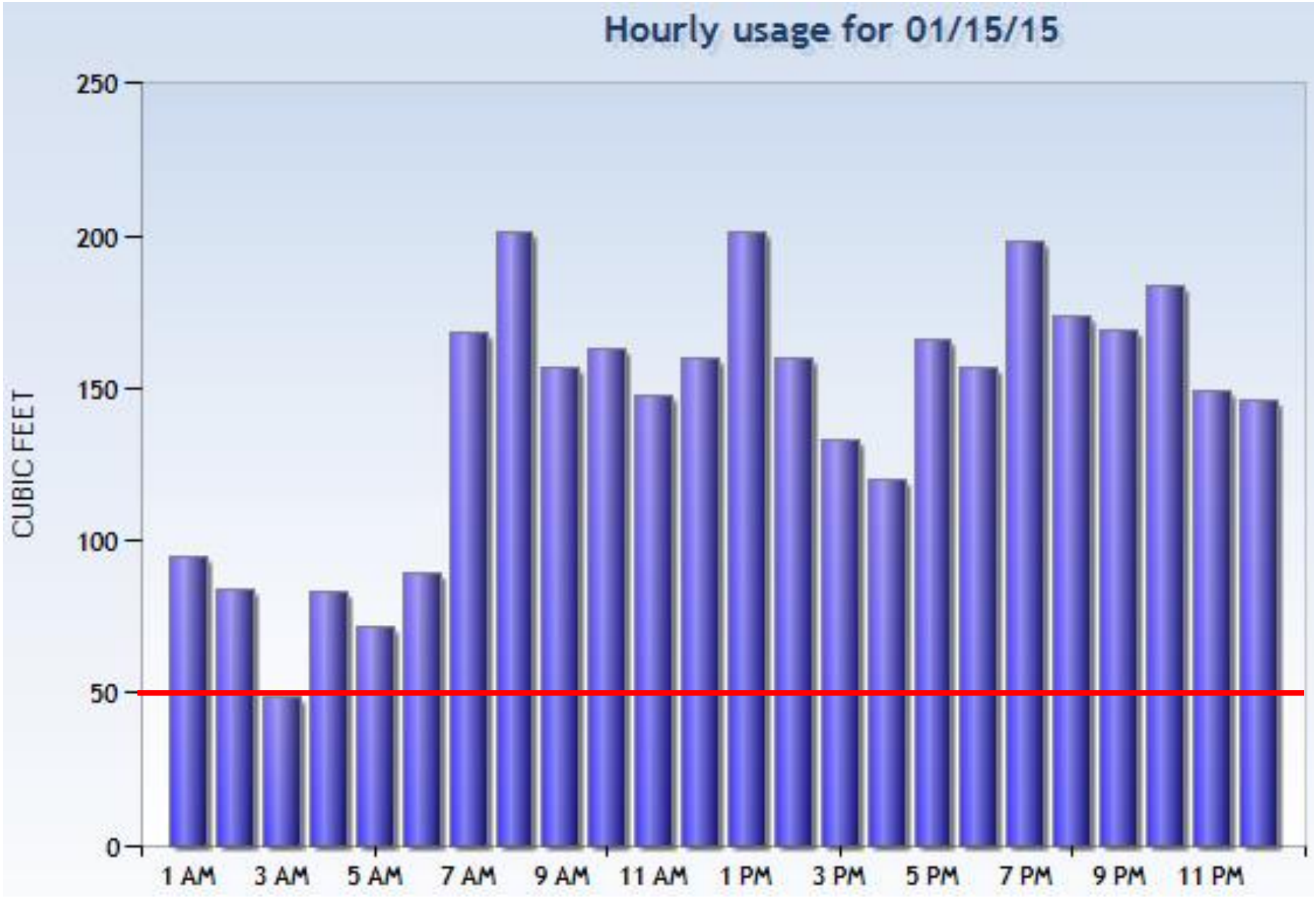
BE-NYC

October 15, 2015

Typical DEP Meter

DEP AMR Data-Gathering System

Typical DEP Graph



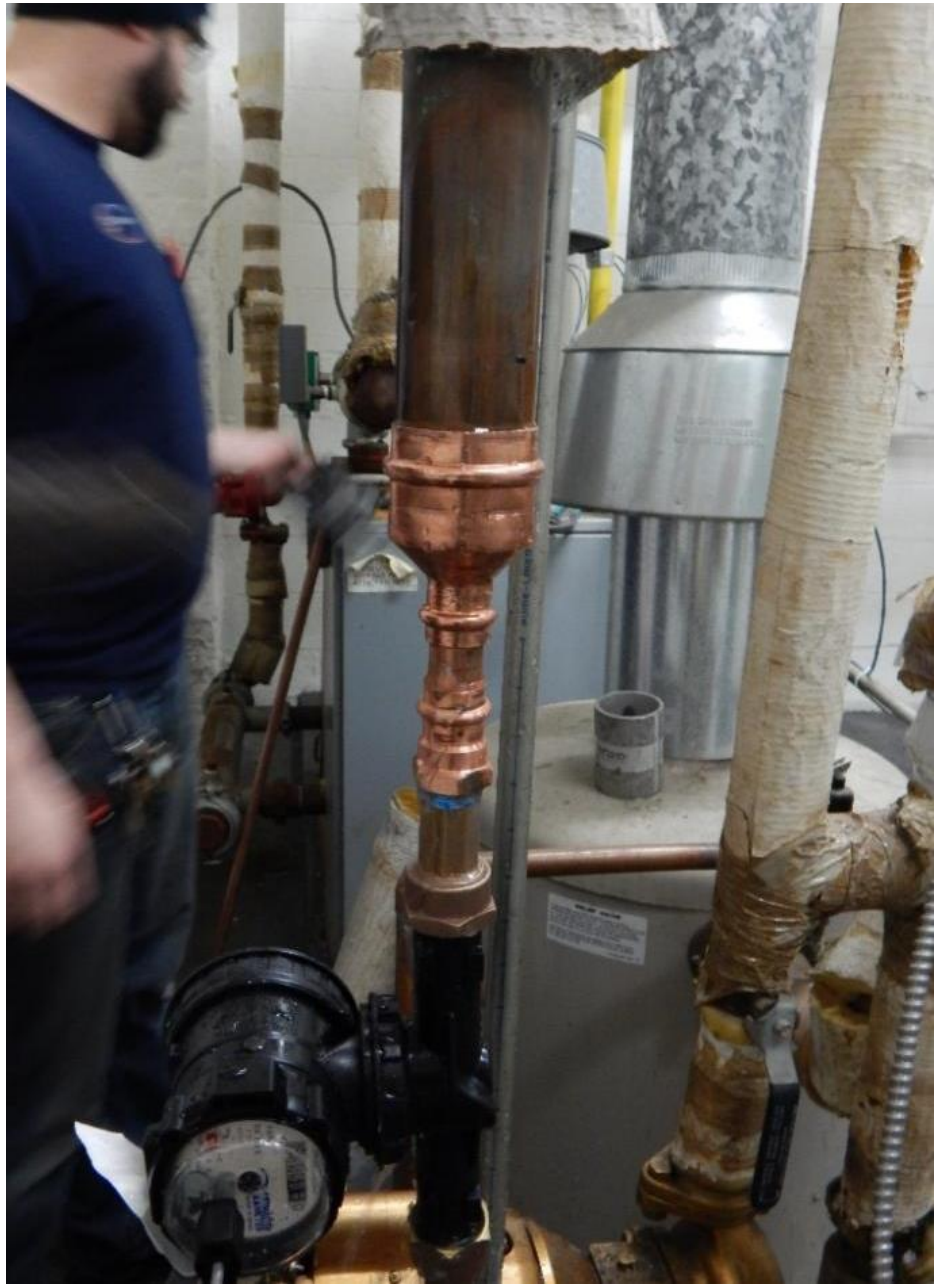
Water Submetering is Not New

What to do?

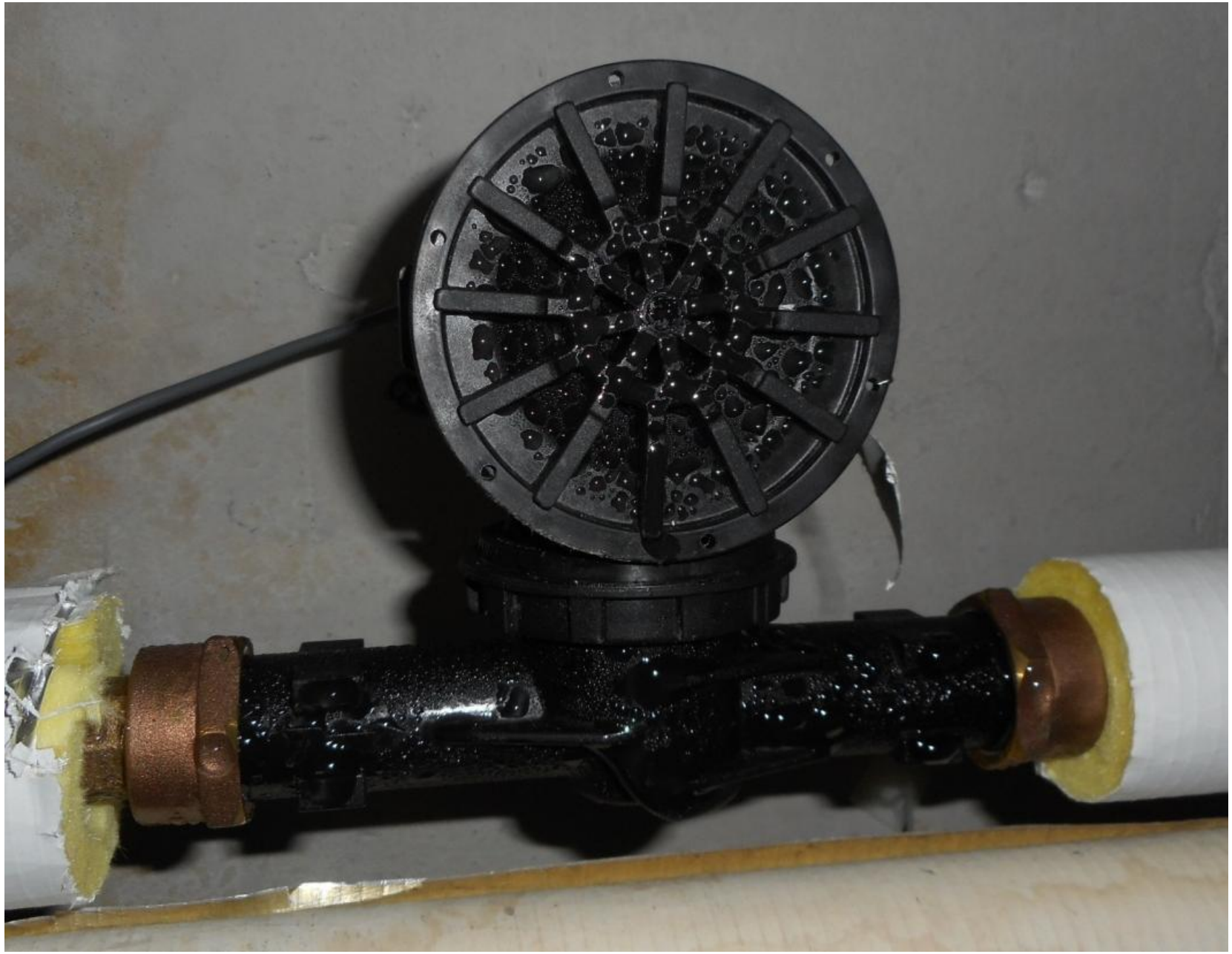
More Difficult Meter Installation

May Require a Shutdown

Meter Installation Technique



Note the Condensation

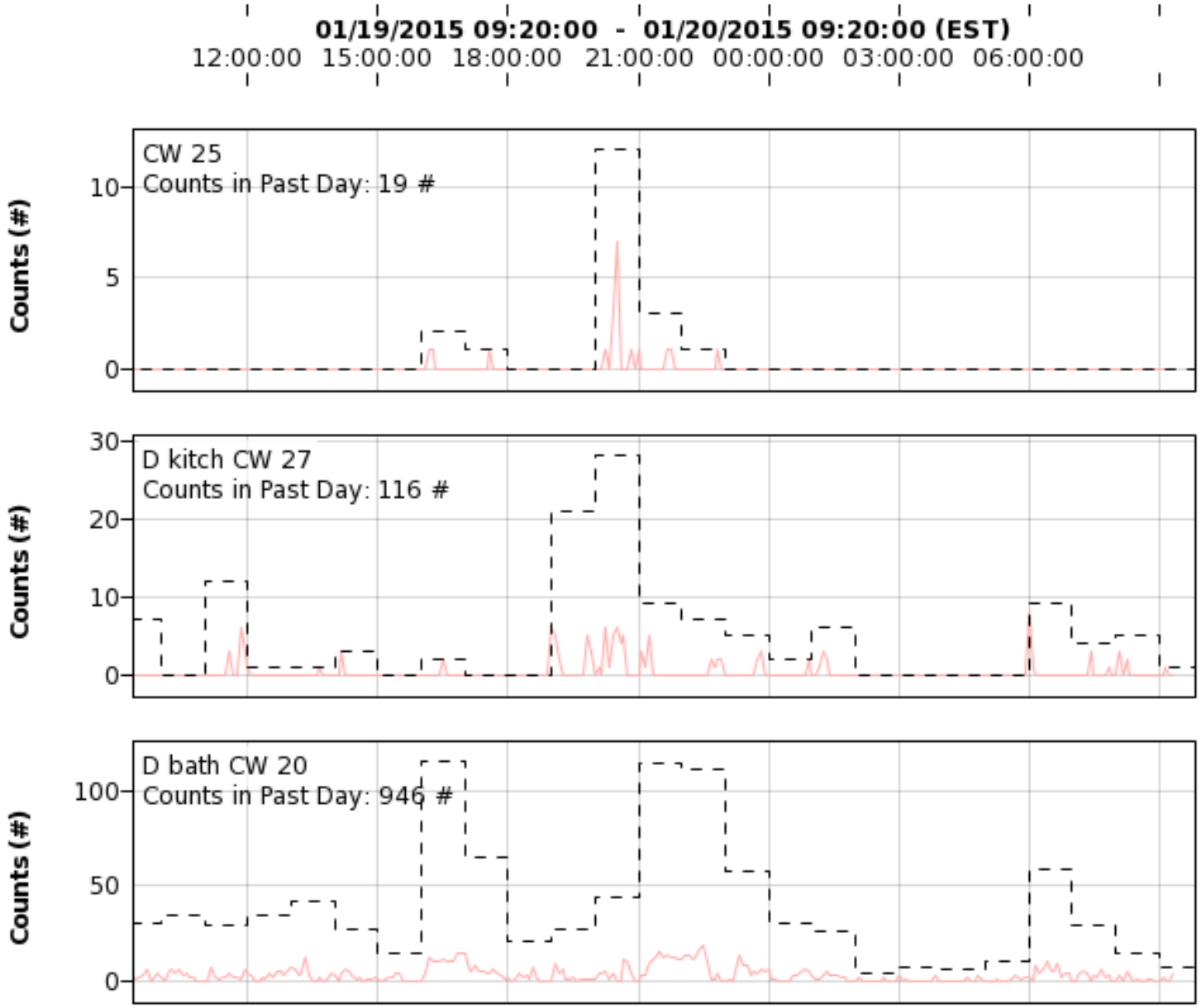


Note the Condensation

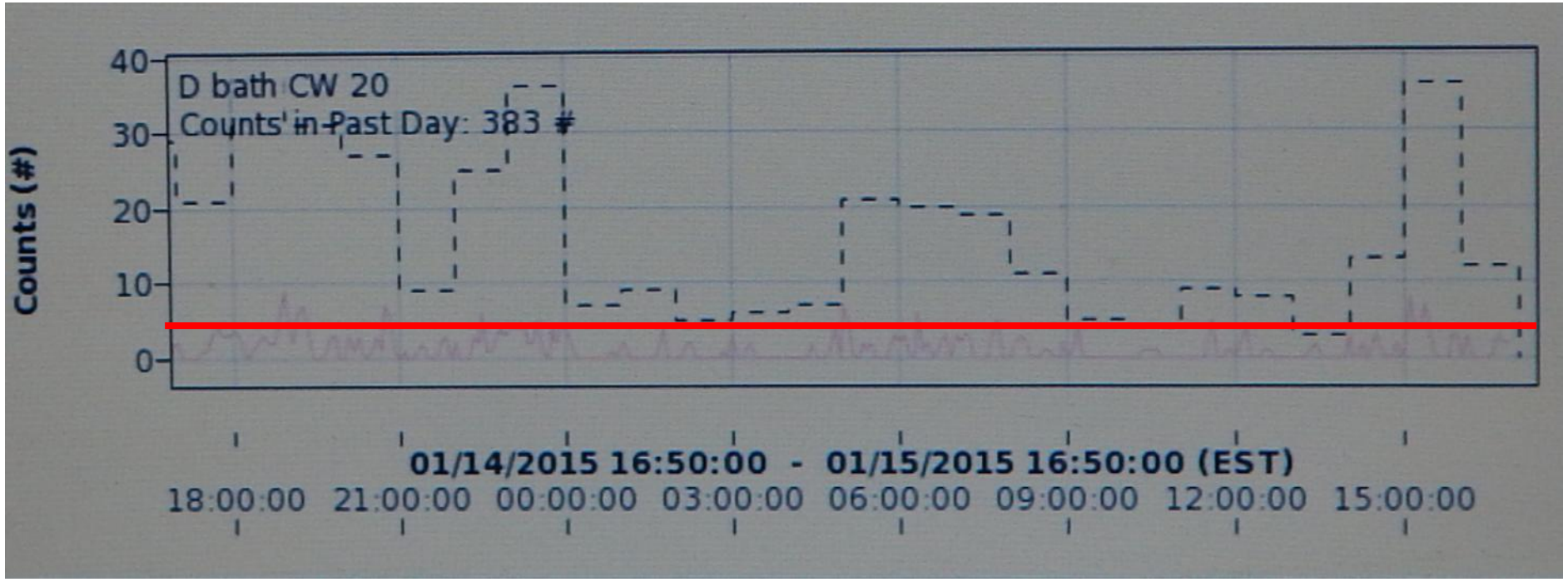
Logger and Pulsers

Internet Issues

Sample Datalogger Graph



Obvious Leak



Cost of a Leak

Leak (GPM)	Annual Cost
0.05	$ 337
0.1	$ 673
0.2	$ 1,347
0.5	$ 3,367
1	$ 6,734
2	$ 13,467

Wireless System -- Gateway

Wireless System -- Sensor

How Much Does it Cost?

Vendor Installed Cost Per Meter		
Meter Size	**Vendor 1**	**Vendor 2**
3/4-inch	$ 935	$ 625
1-inch	$ 1,230	$ 975
1-inch Hot	$ 1,350	$ 1,250
1.5-inch	$ 1,988	$ 1,725

Typical All-in Installed Cost Per Meter				
10-Meter System				
Meter*	**Logger****	**Wiring**	**Other Labor**	**Total**
$ 1,000	$ 200	$ 800	$ 524	**$ 2,524**
1,800	Hours			
204	Meters			
8.8	Hours per Meter			
$ 150	Hourly Labor Rate			
$ 1,324	Wiring Cost per Meter (includes Other Labor)			
*Includes pulse output capability				
**Logger costs about $2,000 or $200/meter for 10 meters				

Installed cost can easily be reduced

Thank you

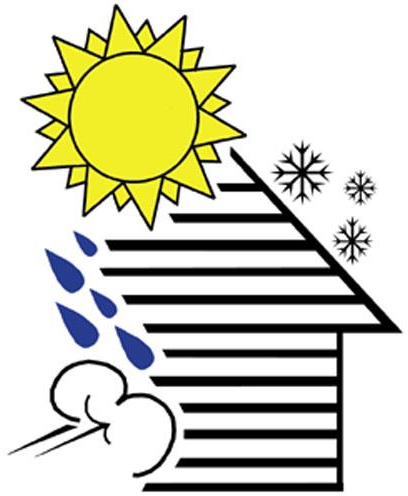
ts.conserve@gmail.com

Dan Rieber
Boilers and
Domestic Hot Water

NMIC
NORTHERN MANHATTAN IMPROVEMENT CORPORATION
www.nmic.org

BUILDINGENERGY NYC
OCTOBER 15, 2015 AT THE TKP NEW YORK CONFERENCE CENTER

- A common sense solution to replace a Steam boiler and add separate DHW.
- Converting to Hydronic heat, or insulating walls with cellulose and converting to Hydronic Heat.
- Either way it's a *home* run, because **Weatherization Works!**

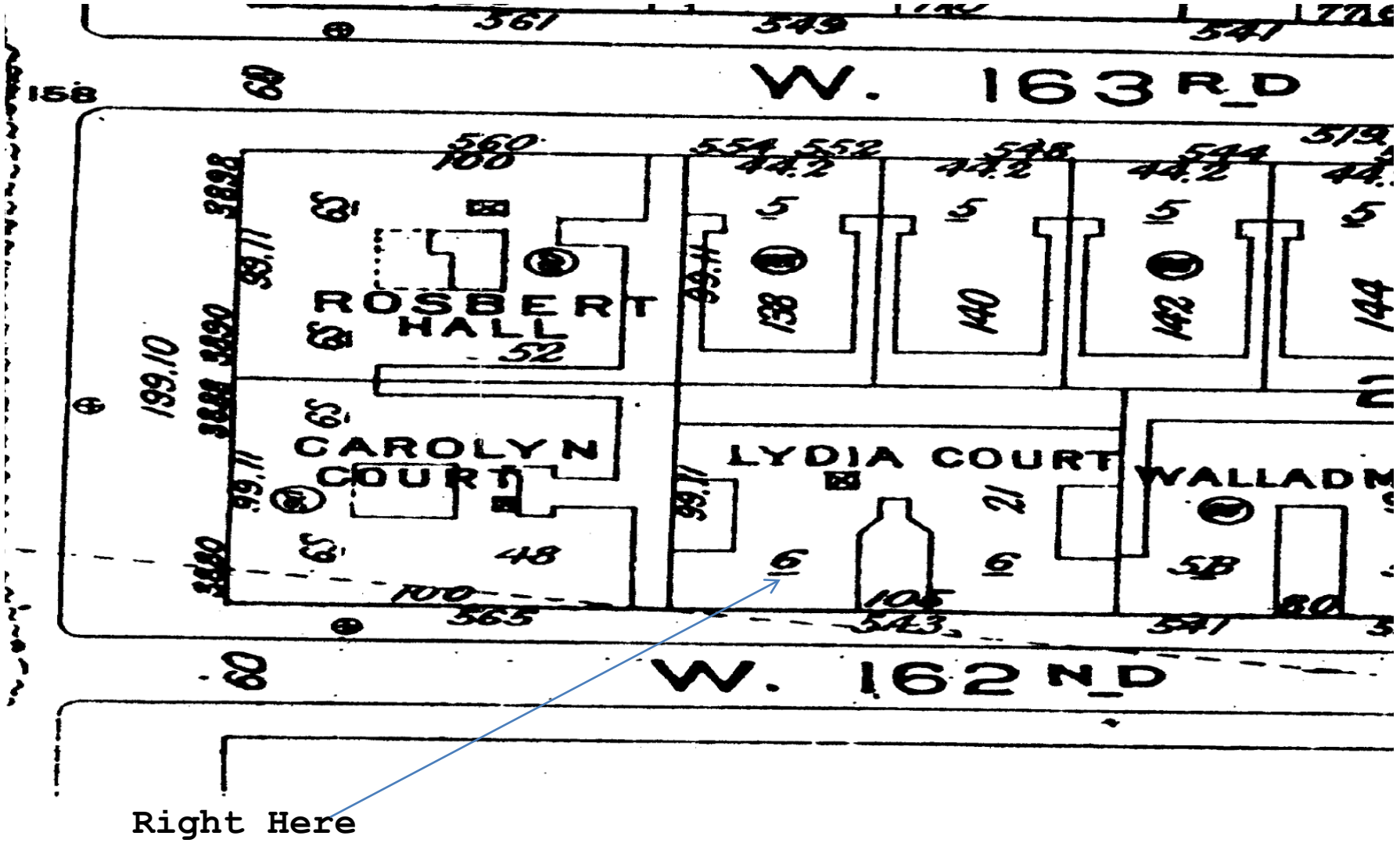


Dan Rieber
Weatherization Director, NMIC
danrieber@nmic.org

Steam boiler replacement with separate DHW

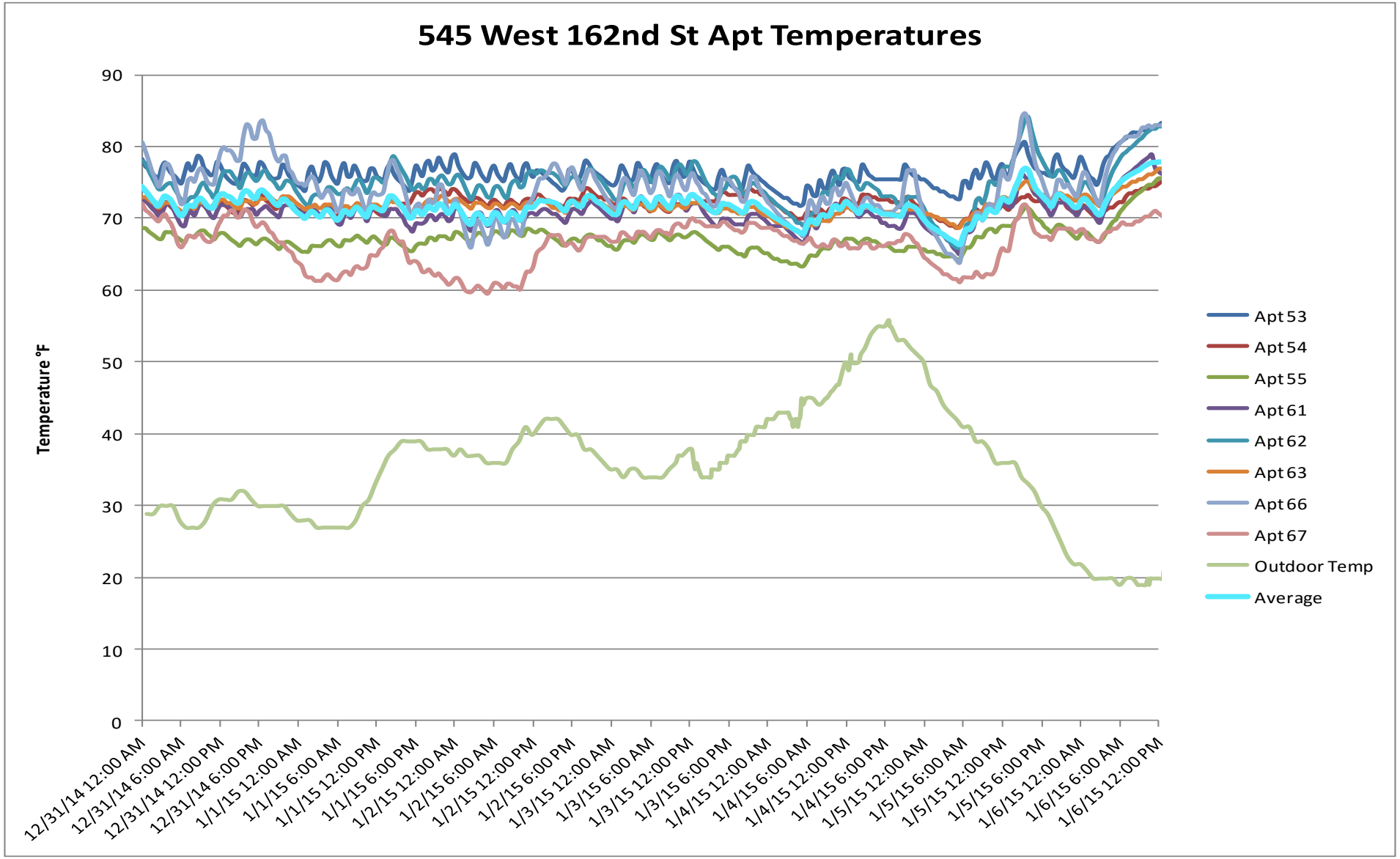
- 42 unit, 6 story elevator building built in 1910
- 1974 Gas fired Steam Boiler and unused oil tank.
- Old boiler is way oversized 100 HP or 4 million btu’s.
- Take advantage of space in boiler room to reduce boiler size and add a separate DHW maker.
- Pre WAP btu/sqft/hdd =20.37

Where is this building?



Typical Washington Heights pre-War building

We did a temperature study



545 West 162nd radiator survey*

Floor	Apt. Line 1	2	3	4	5	6	7	Supts
6	108.0	132.0	72.0	36.0	40.6	86.0	82.7	
5	61.5	68.0	60.0	38.0	64.0	78.0	66.0	
4	36.0	42.7	32.5	40.0	52.0	78.0	65.0	
3	53.3	65.3	32.0	40.0	45.0	96.0	104.0	
2	61.5	48.0	27.5	45.0	42.0	65.3	84.0	
0	48.7	36.0	56.0	40.0	0.0	66.0	80.3	
Total	**369.0**	**392.0**	**280.0**	**239.0**	**243.6**	**469.3**	**482.0**	**0.0**

NOTE: *Estimated values* in red

*Includes estimates for removed radiators

STEAM BOILER SIZING CALCULATION

RADIATIOR HEAT LOAD

Total Radiator EDR	Btu/hr Net	Btu/hr Gross	Boiler HP
2475.0	593,988	791,984	23.66

DOMESTIC HOT WATER LOAD

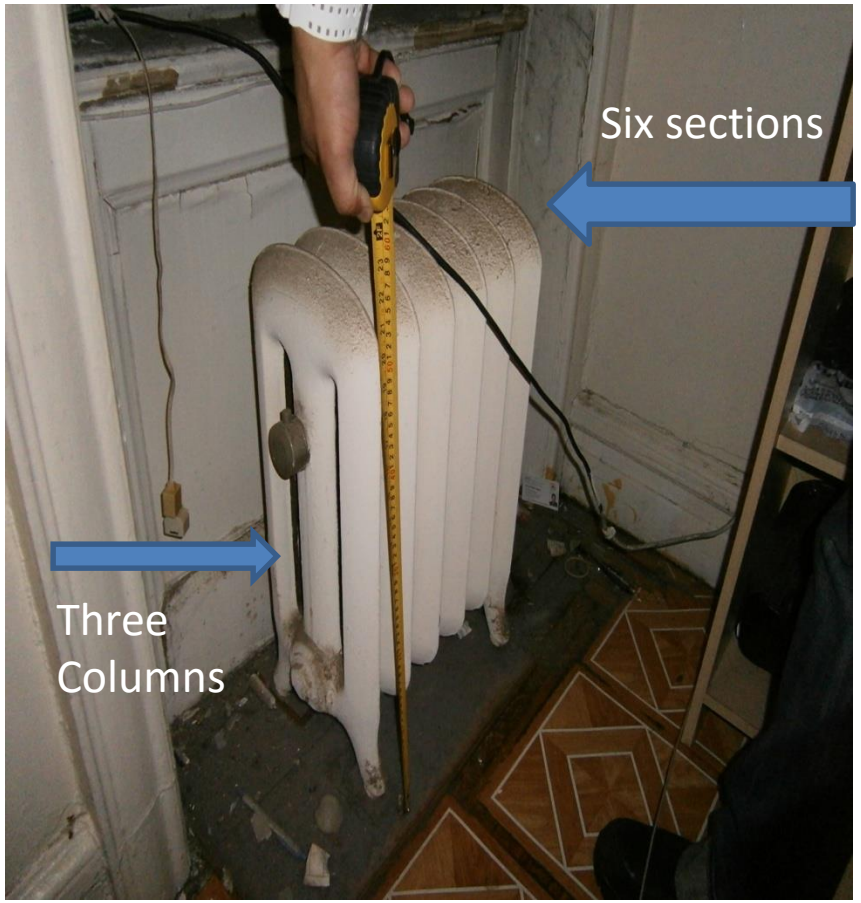
DHW Gallons Per Hour	Max Temp Rise [deg F]	Btu/hr Gross	Boiler HP
840.00	100	699,720	20.90

TOTAL BOILER CAPACITY = 44.56

1,491,704 btu/hr

1,492 MBH

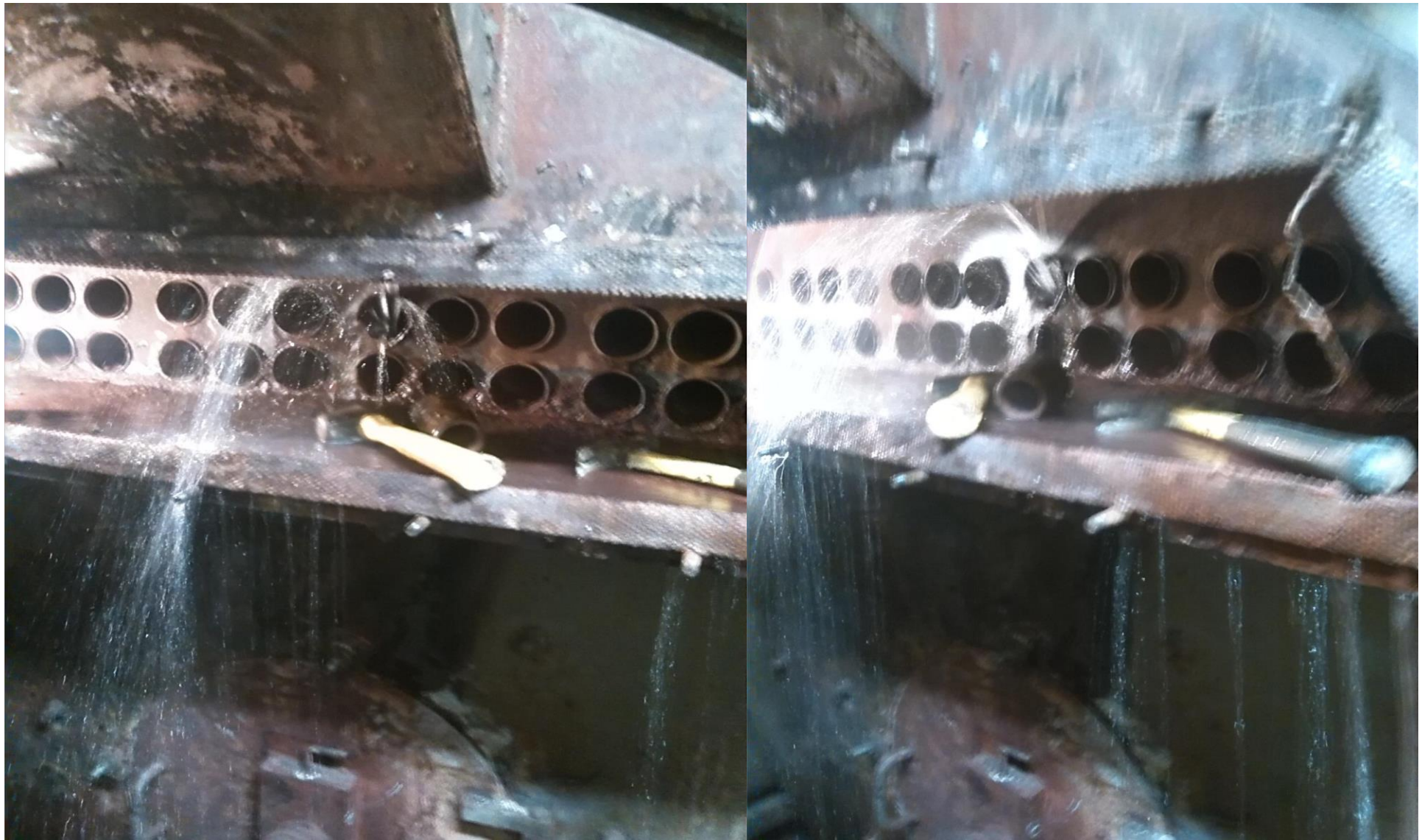
# of Sections	EDR
8	21.5
9	24
10	26.67
35 or 40 hp	29.33
12	32.00
13	34.67
14	37.33
15	40.00
16	42.67
17	45.33
18	48.00
19	50.67
20	53.33



The old boiler was a Rockmills MP100

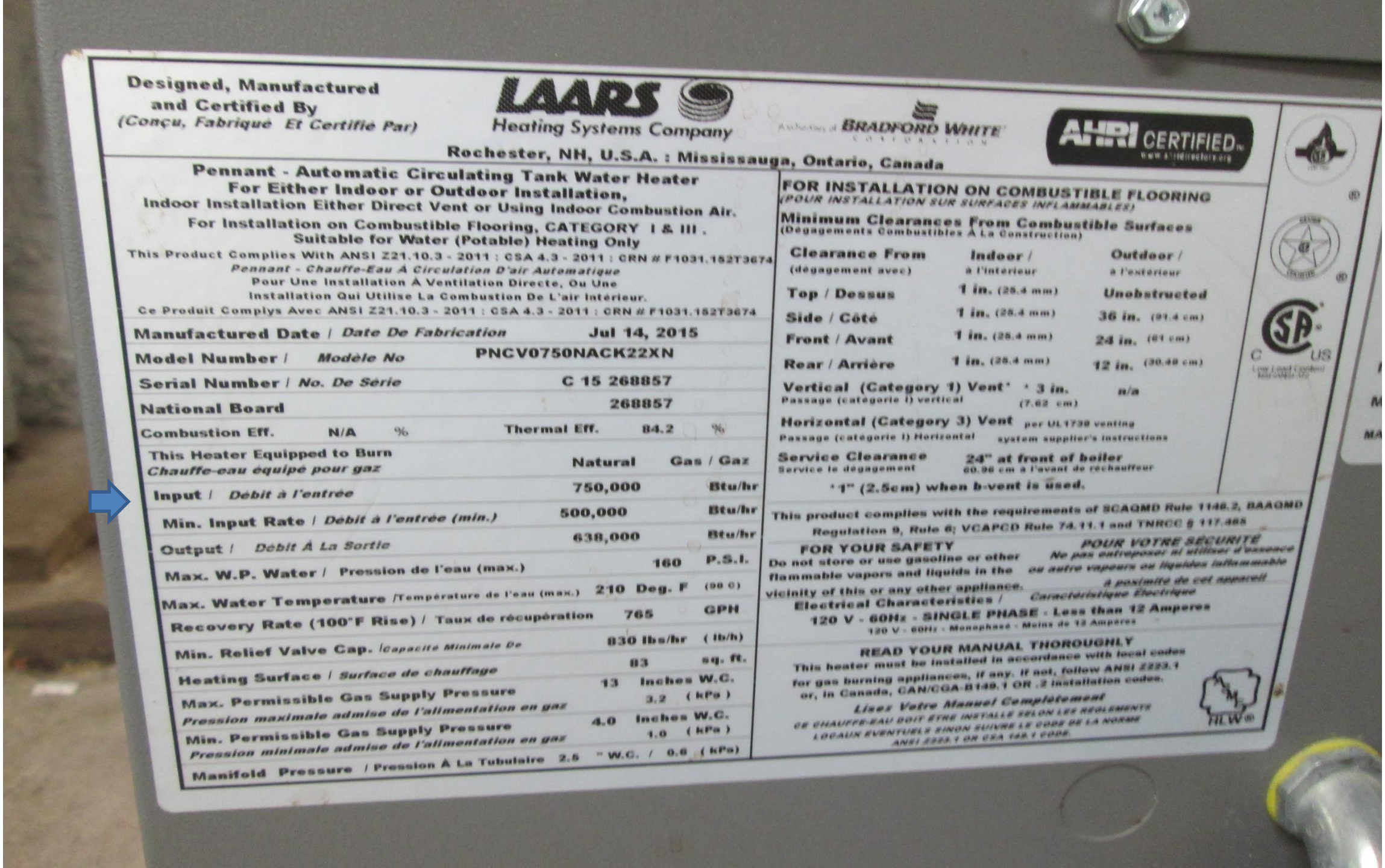
The Boiler is leaking

The leak revealed



Lets put in a 50HP boiler and a new 750,000 btu DHW maker

DHW boiler Laars Pennant 750,000 btus



Designed, Manufactured and Certified By
(Conçu, Fabriqué Et Certifié Par)

LAARS Heating Systems Company

A subsidiary of BRADFORD WHITE CORPORATION

AHRI CERTIFIED

Rochester, NH, U.S.A. : Mississauga, Ontario, Canada

Pennant - Automatic Circulating Tank Water Heater
For Either Indoor or Outdoor Installation,
Indoor Installation Either Direct Vent or Using Indoor Combustion Air.
For Installation on Combustible Flooring, CATEGORY I & III .
Suitable for Water (Potable) Heating Only

This Product Complies With ANSI Z21.10.3 - 2011 : CSA 4.3 - 2011 : CRN # F1031.152T3674

Pennant - Chauffe-Eau À Circulation D'air Automatique
Pour Une Installation À Ventilation Directe, Ou Une Installation Qui Utilise La Combustion De L'air Intérieur.
Ce Produit Complys Avec ANSI Z21.10.3 - 2011 : CSA 4.3 - 2011 : CRN # F1031.152T3674

Manufactured Date / *Date De Fabrication*	Jul 14, 2015		
Model Number / *Modèle No*	PNCV0750NACK22XN		
Serial Number / *No. De Série*	C 15 268857		
National Board	268857		
Combustion Eff. N/A %	**Thermal Eff.** 84.2 %		
This Heater Equipped to Burn *Chauffe-eau équipé pour gaz*	**Natural**	**Gas / Gaz**	
Input / *Débit à l'entrée*	750,000		Btu/hr
Min. Input Rate / *Débit à l'entrée (min.)*	500,000		Btu/hr
Output / *Débit À La Sortie*	638,000		Btu/hr
Max. W.P. Water / Pression de l'eau (max.)	160		P.S.I.
Max. Water Temperature /Température de l'eau (max.)	210 Deg. F	(99 C)	
Recovery Rate (100°F Rise) / Taux de récupération	765		GPH
Min. Relief Valve Cap. /capacité Minimale De	830 lbs/hr	(lb/h)	
Heating Surface / *Surface de chauffage*	83		sq. ft.
Max. Permissible Gas Supply Pressure	13 Inches W.C.		
Pression maximale admise de l'alimentation en gaz	3.2	(kPa)	
Min. Permissible Gas Supply Pressure	4.0 Inches W.C.		
Pression minimale admise de l'alimentation en gaz	1.0	(kPa)	
Manifold Pressure / Pression À La Tubulaire 2.5	" W.C. / 0.6	(kPa)	

FOR INSTALLATION ON COMBUSTIBLE FLOORING
(POUR INSTALLATION SUR SURFACES INFLAMMABLES)

Minimum Clearances From Combustible Surfaces
(Dégagements Combustibles À La Construction)

Clearance From (dégagement avec)	Indoor / à l'intérieur	Outdoor / à l'extérieur
Top / Dessus	1 in. (25.4 mm)	Unobstructed
Side / Côté	1 in. (25.4 mm)	36 in. (91.4 cm)
Front / Avant	1 in. (25.4 mm)	24 in. (61 cm)
Rear / Arrière	1 in. (25.4 mm)	12 in. (30.48 cm)
Vertical (Category 1) Vent* Passage (categorie I) vertical	* 3 in. (7.62 cm)	n/a
Horizontal (Category 3) Vent Passage (categorie I) Horizontal	per UL1738 venting system supplier's instructions	
Service Clearance Service le dégagement	24" at front of boiler 60.96 cm à l'avant de réchauffeur	

* 1" (2.5cm) when b-vent is used.

This product complies with the requirements of SCAQMD Rule 1146.2, BAAQMD Regulation 9, Rule 6; VCAPCD Rule 74.11.1 and TNRCC § 117.465

FOR YOUR SAFETY
Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

POUR VOTRE SÉCURITÉ
Ne pas entreposer ni utiliser d'essence ou autre vapeurs ou liquides inflammable à proximité de cet appareil

Electrical Characteristics / *Caractéristique Électrique*
120 V - 60Hz - SINGLE PHASE - Less than 12 Amperes
120 V - 60Hz - Monophasé - Moins de 12 Ampères

READ YOUR MANUAL THOROUGHLY
This heater must be installed in accordance with local codes for gas burning appliances, if any. If not, follow ANSI Z223.1 or, in Canada, CAN/CGA-B149.1 OR .2 installation codes.

Lisez Votre Manuel Complètement
CE CHAUFFE-EAU DOIT ÊTRE INSTALLÉ SELON LES RÈGLEMENTS LOCAUX EVENTUELS SINON SUIVRE LE CODE DE LA NORME ANSI Z223.1 OR CSA 149.1 CODE.

HLW

TURBOMAX®
Indirect water heater 119 us gal.

THERMO 2000

Richmond, Qc, Canada
J0B 2H0, 888-854-1111

OPTIMIZER®
Chauffe-eau indirect

MODEL NO.	TURBOMAX 109	NO. MODÈLE
SERIAL NO.	T0191506289	NO. SÉRIE
MAX. TANK PRESSURE	WATER 150 PSI EAU	PRESSION MAX. RÉSERVOIR
MAX. COIL PRESSURE	WATER 150 PSI EAU	PRESSION MAX. SERPENTINS
MAX. TEMPERATURE DOMESTIC HOT WATER	195° F	TEMPÉRATURE MAX. EAU CHAUDE DOMESTIQUE
MAXIMUM TANK TEMPERATURE	210° F	TEMPÉRATURE MAX. RÉSERVOIR

This tank is NOT designed to receive domestic water or open circuit water. The warranty s[illegible]ull and void if the fluid velocity in the coils is excessive (see warranty not[illegible]eat transfer medium liquid must be non-toxic and only additives rec[illegible] safe by the USFDA shall be used.

Ce Réservoir n'est PAS conçu [illegible] recevoir de l'eau domestique ou provenant d'un circuit ouvert. La garantie est nulle et inopérante si la vitesse du fluide dans les serpentins est excessive (voir la notice de garantie). Le liquide utilisé comme véhicule de transfert de chaleur ne doit pas être toxique. Uniquement des additifs reconnus comme sécuritaires par la USFDA doivent être utilisés.

Refer to installation manual for additional instructions
Se référer au manual d'installation pour des directives additionnelles

CANADIAN PATENT #	2,038.520	NO. BREVET CANADIEN
USA PATENT #	5,165.472	NO.BREVET USA

TURBOMAX1090

T0191506289R

Made in Canada / Fabriqué au Canada

www.thermo2000.com


PENNANT

Oh and Steam to Hydronic Conversion works. It just costs a lot!

New Gas Hydronic Heat & DHW

179 Henry St. New York, NY

Background:

- 12 floors
- 50 Units
- 60,400 Heated SqFt
- HUD regulated senior housing

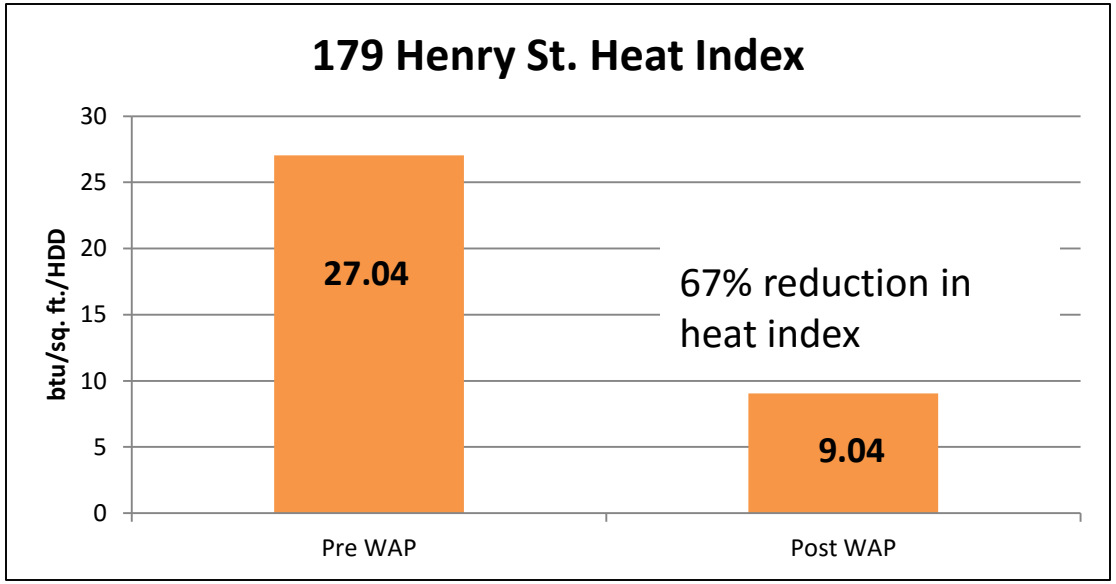
The cost for the new Heating/dhw/ & distribution system… $593,137.00 + Temp Service $16,087 = Grand Total of $609,224.00

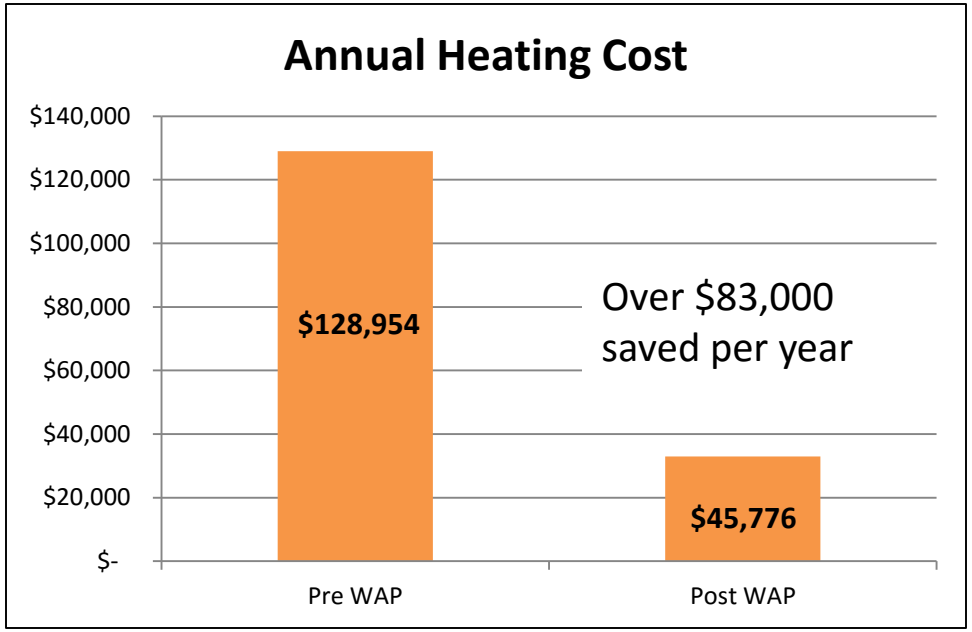
Workscope:

1. Conversion from steam to hydronic hot water system
2. Conversion from #6 oil to gas
3. Common area lighting upgrade
4. Apartment lighting upgrade

Savings:

- 47% Total Energy Reduction
- $83,000 First Year Savings





The Academy Street Project
NMIC and L&W

Gut Rehab of 5 buildings on Academy Street in the Inwood section of Northern Manhattan.

NMIC provided Roof insulation and Wall insulation

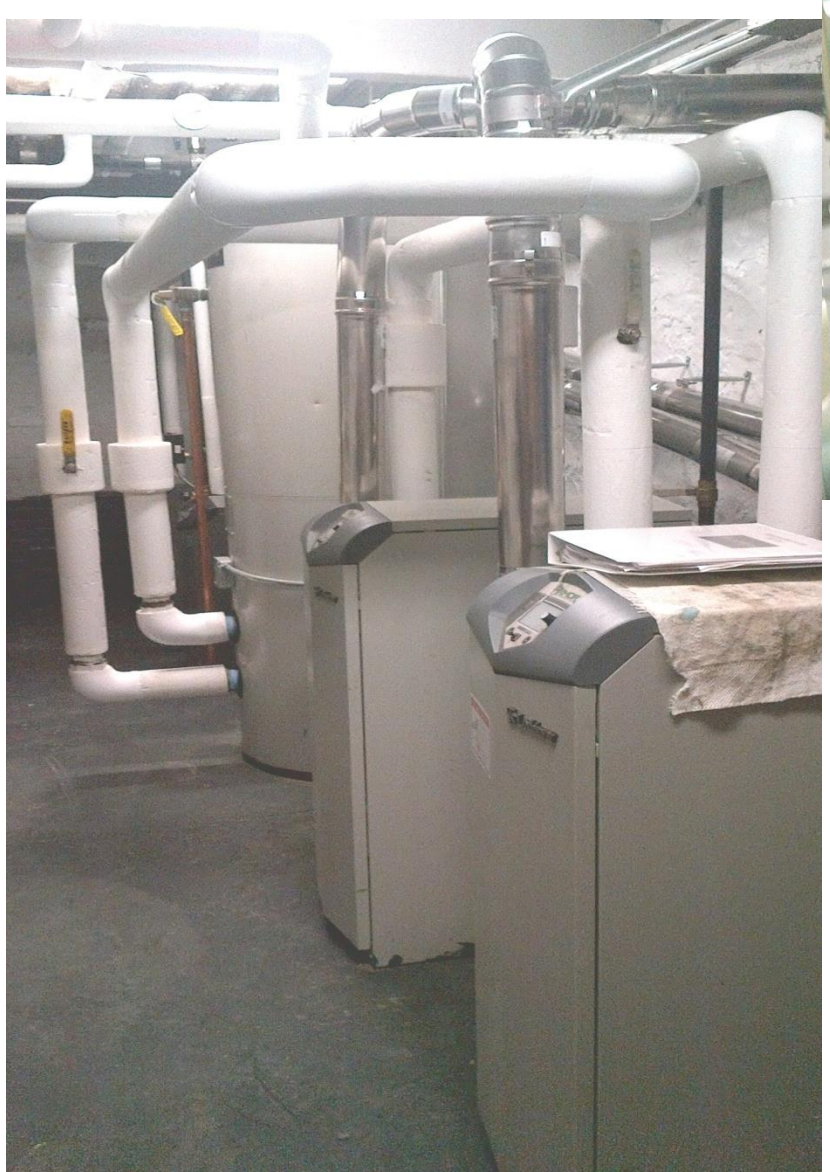
L&W as part of the rehab converted to Hydronic heating.

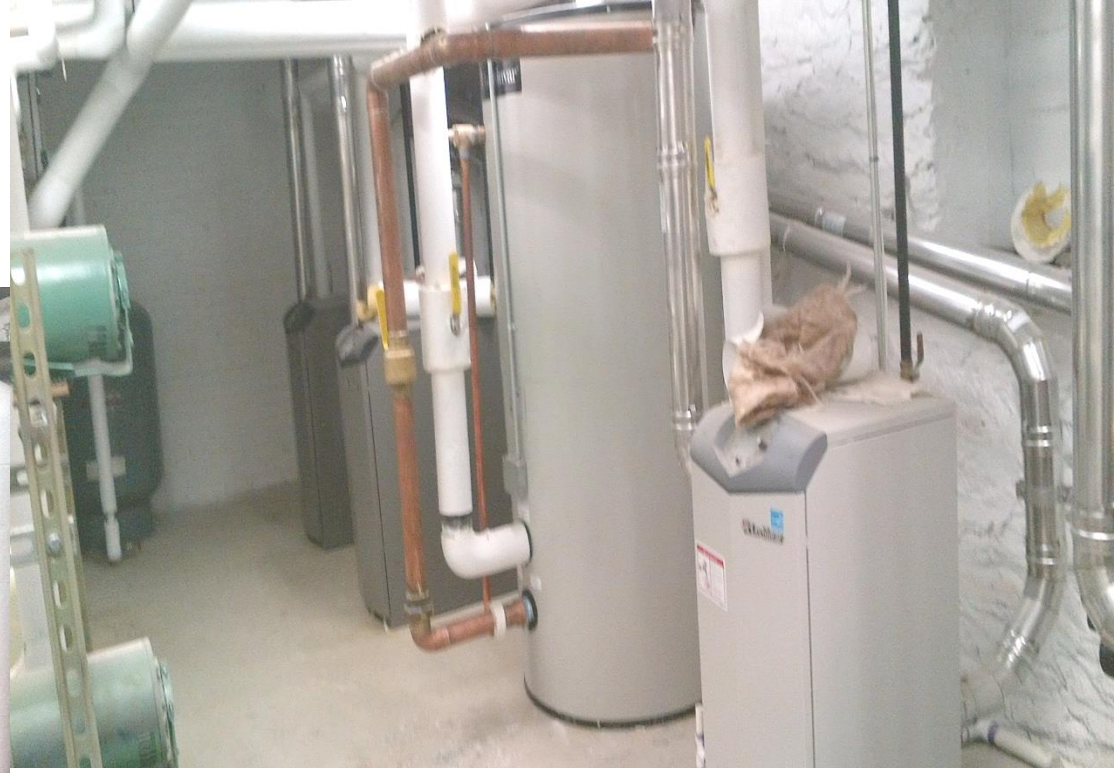
An uninsulated wall

An Insulated Wall

New baseboard hydronic radiators

High Eff Condensing boilers with DHW storage, by Lochinvar





Thank you and enjoy the rest of the Conference.