



SEBESTA  
BLOMBERG

***High Impact Hotel Projects***

Greater Boston Energy Efficient Hotels  
Conference

December 6, 2012

# Agenda

- High Energy Impact Projects
- Case Studies
  - Millennium Bostonian
  - Viking Hotel
- Available Resources
- Questions

# Lighting

## Two Common Types

- LED
  - MR16
  - PAR 30
  - A19
- Fluorescent
  - Compact fluorescent lamps (CFL)
  - 32W T8 conversion to 28W T8 or 25W T8
  - 32W U-tube conversion to 17W T8 linear



# Chilled Water Plant

- Optimization Software
  - Multiple vendors available
  - Multiple chiller operation
  - Operates chiller plant at most efficient operating point
- Magnetic Bearing Chillers
  - IPLV ~ 0.31 kW/ton
  - Exceeds ASHRAE 90.1-2007 energy code
  - Retrofit compressors or new installation



# Boiler Plant

- Condensing Heating Hot Water Boilers
  - Efficiency range 90% - 96%
  - Excellent application for hotels with heat pumps or pools
- Condensing Domestic Hot Water (DHW) Boilers
  - Thermal efficiencies up to 99%
  - Capacity from 125-1,200 gal
  - Long Life



# Heat Pump Alternatives

- 4-Pipe Fan Coil Units (FCUs)
  - Integrates wirelessly with network guest room controls
  - Requires chiller installation and HW boiler capacity verification
  - Excellent occupant comfort
- 2-Pipe Fan Coil Unit
  - Electric strip heat for shoulder months
  - Integrates wirelessly with network guest room controls



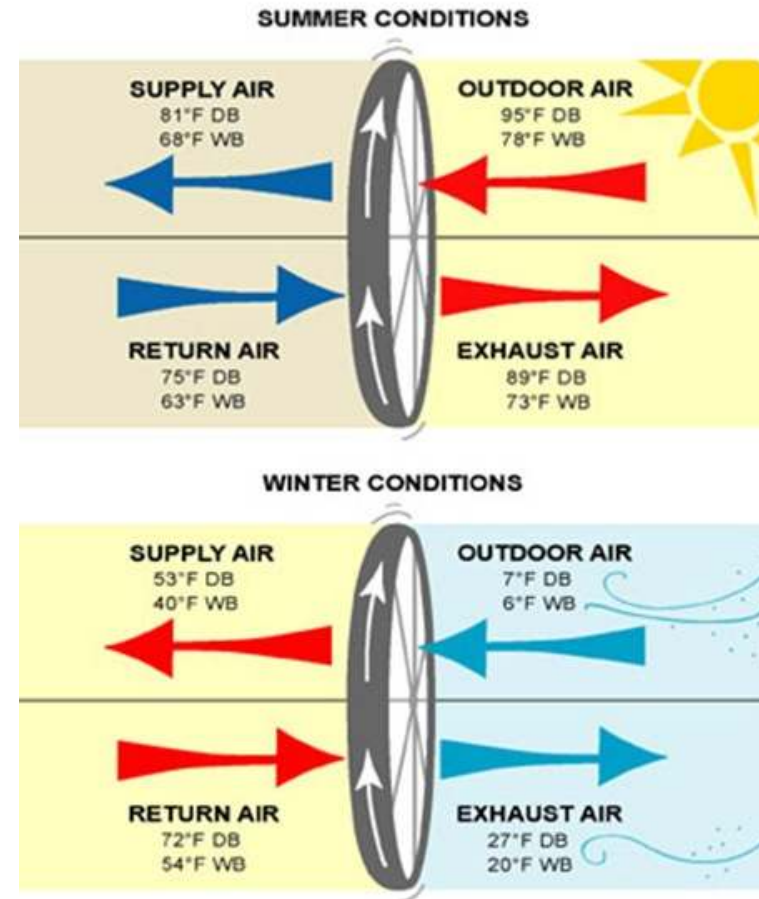
# Kitchens

- Kitchen Hood Controls
  - HVAC system modulates based on cooking range activities i.e heat and smoke
- Walk-In Cooler Refrigeration Controls
  - Cycles refrigeration compressors on/off based on walk-in cooler space temperature



# Heat Recovery

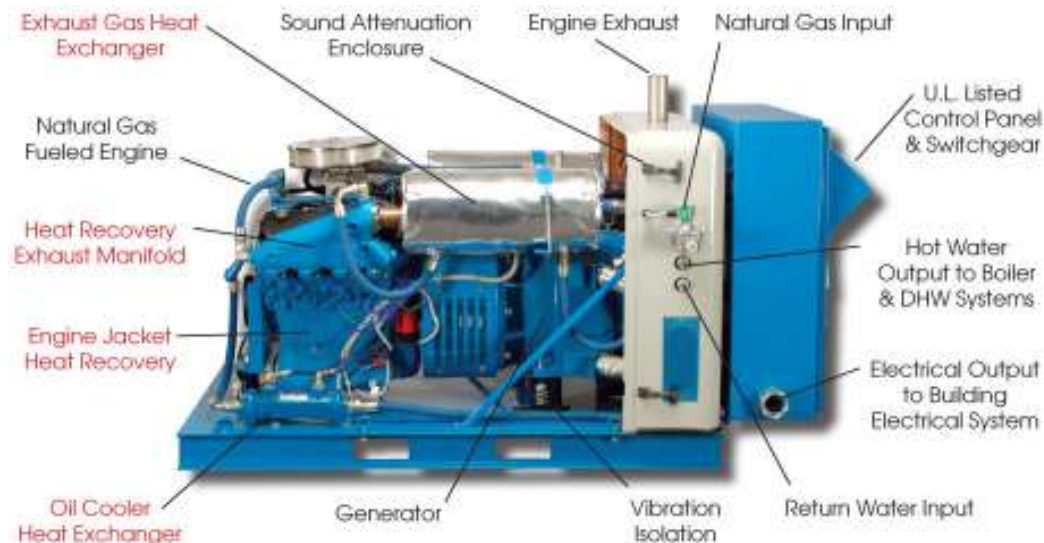
- Glycol Run Around Loop
  - Good for long distance pipe runs
  - Pumping penalty
- Heat Pipes
  - Passive system
  - Limiting factor is distance
  - Bypass option to reduce pressure drop
- Total Energy Recovery Wheel
  - Retrofit or new application
  - Bypass option to reduce pressure drop





# Cogeneration

- Cogeneration
  - Simultaneous generation of electricity and thermal energy (Steam or HW)
  - Thermal base load needed
  - \$750/kW utility incentive



# Sebesta Blomberg's Hotel Experience

Wide range:

- Nationwide
- Audits and retro-cx
- 250 – 1,400 rooms
- 190,000 – 1.1 mil. sqft.
- Range of systems, ages, condition

HYATT®



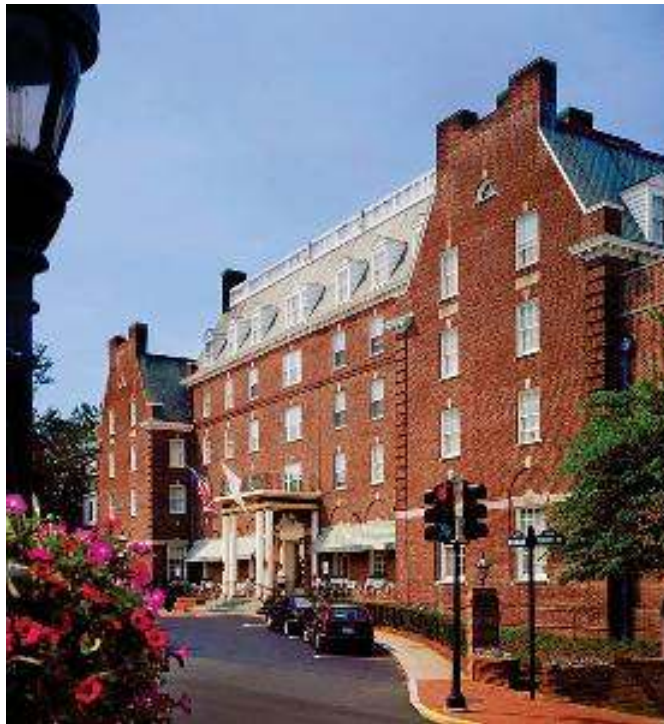
Marriott

MILLENNIUM  
HOTELS AND RESORTS

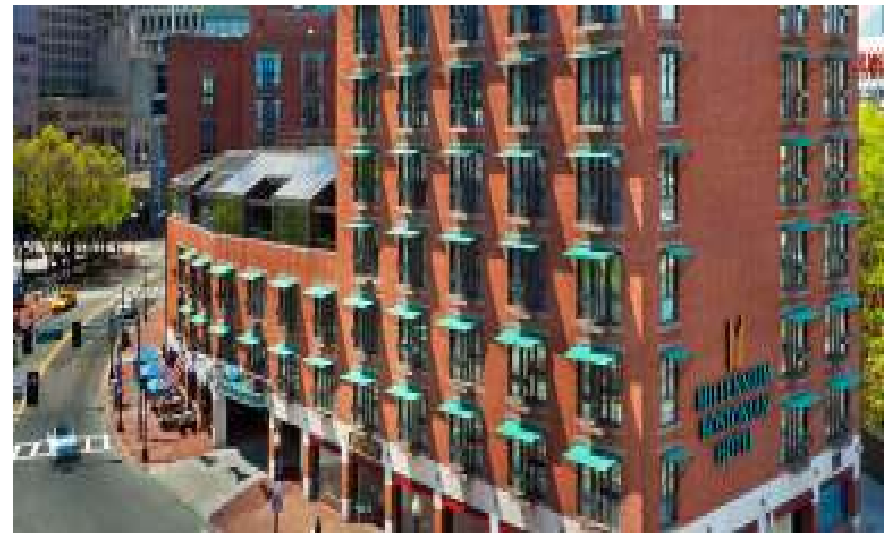
THE WESTIN  
MICHIGAN AVENUE  
Chicago

# Case Studies

**Viking Hotel, Newport, RI**



**Millennium Bostonian, Boston, MA**



# Millennium Bostonian Hotel

- 135,000 sqft, 201 guest rooms
- Built in 1982 plus 1998 addition
- Focused on rooftop units (RTUs), heat pumps, boilers, building envelope, controls, and lighting
- **14 ECMs identified**
  - Annual savings estimate = \$140,000 (19%)
  - Implementation costs = \$660,500

# Millennium Bostonian Hotel

Section	Energy Conservation Measures (ECMs)	Estimated Implementation Cost	Estimated Utility Incentive	Estimated Annual Utility Savings				Estimated Annual Cost Avoidance	GHG Offset (Metric Tonnes CO2)	Simple Payback (yrs)
				Demand (kW)	Electric (kWh)	Gas (Therms)	Water/Sewer (kGal)			
5.1	Retrofit 34W T12 Light Fixtures with 28W T8	\$7,200	\$975	0.8	6,800	0	0	\$952	3	3.7
5.2	Retrofit 32W T8 U-Tube Light Fixtures with 17W T8	\$1,100	\$400	0.2	1,200	0	0	\$168	1	1.9
5.3	Install Par 20 LED Lamps	\$6,400	\$637	10.0	88,000	0	0	\$12,320	0	0.5
5.4	Install Par 38 LED Lamps	\$1,400	\$840	1.3	6,500	0	0	\$910	3	0.8
5.5	Replace 200W Halogen with 49W LED	\$8,500	\$0	3.2	18,500	0	0	\$2,590	9	3.3
5.6	Replace Incandescent Exit Signs with LED	\$3,600	\$120	0.3	2,600	0	0	\$364	1	7.4
5.7	Install MR16 LED lamps	\$13,400	\$7,840	6.3	46,000	0	0	\$6,440	21	0.9
5.8	Add Integrated Enthalpy Economizer Strategy	\$7,800	\$900	0	43,000	0	0	\$6,020	20	1.1
5.9	Demand Controlled Ventilation	\$12,200	\$1,350	16	3,000	1,700	0	\$2,494	91	3.2
5.10	Install Sink Aerators	\$0	\$75	0	0	110	3.2	\$340	6	0.0
5.11	Modify Condenser Water Loop Heating Setpoint	\$0	\$0	21	102,000	(1,455)	0	\$12,537	(29)	0.0
<b>Subtotal</b>		<b>\$61,600</b>	<b>\$13,137</b>	<b>59.1</b>	<b>317,600</b>	<b>355.0</b>	<b>3.2</b>	<b>\$45,135</b>	<b>125</b>	<b>1.1</b>
Section	Capital Energy Conservation Measures (ECMs)	Estimated Implementation Cost	Estimated Utility Incentive	Estimated Annual Utility Savings				Estimated Annual Cost Avoidance	GHG Offset (Metric Tonnes CO2)	Simple Payback (yrs)
				Demand (kW)	Electric (kWh)	Gas (Therms)	Water/Sewer (kGal)			
6.1	Install Natural Gas Condensing Boilers	\$115,000	\$7,000	0	0	12,100	0	\$14,762	638	5.3
6.2	Install Energy Management System (EMS)	\$456,500	\$34,950	0	510,000	6,000	0	\$78,720	553	4.0
6.3	Replace Duplex City Water Booster Pumps	\$27,500	\$3,600	0	16,000	0	0	\$2,240	7	4.7
<b>Subtotal</b>		<b>\$599,000</b>	<b>\$45,550</b>	<b>0</b>	<b>526,000</b>	<b>18,100</b>	<b>0</b>	<b>\$95,722</b>	<b>1,199</b>	<b>4.2</b>
Combined CapEx and ECMs		Estimated Implementation Cost	Estimated Utility Incentive	Estimated Annual Utility Savings				Estimated Annual Cost Avoidance	GHG Offset (Metric Tonnes CO2)	Simple Payback (yrs)
<b>TOTAL</b>		<b>\$660,600</b>	<b>\$58,687</b>	<b>59.1</b>	<b>843,600</b>	<b>18,455</b>	<b>3.2</b>	<b>\$140,857</b>	<b>1,325</b>	<b>3.3</b>

## Estimated Blended Marginal Rates and Greenhouse Gas Values

0.14	\$/kWh Electricity
1.22	\$/Therm Gas
65	\$/kGal
0.00046	Metric Tonne CO2/kWh (Utility Power)
0.00528	Metric Tonne CO2/Therm Natural Gas

# Viking Hotel

- 142,000 sqft, 222 guest rooms
- Built 1920's
- Focused on roof top units (RTUs), heat pumps, boilers, controls, lighting, and envelope
- Heavily metered
- **14 ECMs identified**
  - Annual savings estimate = \$104,000 (18%)
  - Implementation costs = \$773,000

# Viking Hotel

	“Low-cost” ECM	Cost	Savings	SPB
1	Tune Bldg 3 RTU controls	\$16,800	\$12,500	1.3
2	Reduce Bldg 3 RTU run hours	\$600	\$6,500	0.1
3	Add economizer RTU-1 to -7	\$16,600	\$3,500	4.7
4	Demand control ventilation	\$6,800	\$3,500	1.9
5	Revise RTU sequence and controls	\$7,400	\$4,500	1.6
6	VFD kitchen MAU and EF	\$8,600	\$5,200	1.7
7	Water source heat pump loop temp.	\$14,200	\$8,500	1.7
8	Install pool cover	\$2,000	\$1,400	1.4
9	Lighting controls	\$15,000	\$8,700	1.7
10	Reduce DW heating short cycle	\$1,400	\$3,500	0.4
	<b>Sub-total</b>	<b>\$89,500</b>	<b>\$58,000</b>	<b>1.5</b>



# Viking Hotel

	“Capital” ECM	Cost	Savings	SPB
11	Lighting retrofit	\$15,000	\$8,700	1.7
12	Replace historic bldg boiler	\$35,000	\$3,700	9.5
13	Install networked guestroom controls	\$133,000	\$13,500	9.9
14	Replace single glazed with double glazed	\$393,800	\$19,800	19.8



# Available Resources

- Boston Green Tourism
- EPA EnergyStar guides
- ASHRAE *Procedures for Commercial Building Energy Audits*
- Illuminating Engineering Society of North America (IESNA)
- Flex Your Power: Hotels Best Practices Guide and Boosting Restaurant Profits with Energy Efficiency*
- Green Hotels Association
- LEED, Green Key, Green Globes, etc.



# Take Away

- ✓ There are always improvements
- ✓ Don't need large capital investments to save
- ✓ Pay attention to changing conditions
- ✓ SET GOALS
- ✓ Savings, comfort, extended equipment life
- ✓ Contact NSTAR or National Grid regarding available incentives for energy efficiency projects.

# Thank you!

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