

# Retuning or Recommissioning HVAC Systems

Jim Sura  
*JA Energy Services*  
[jsura@oz.net](mailto:jsura@oz.net)  
360-620-6465

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# Why Retune HVAC Systems

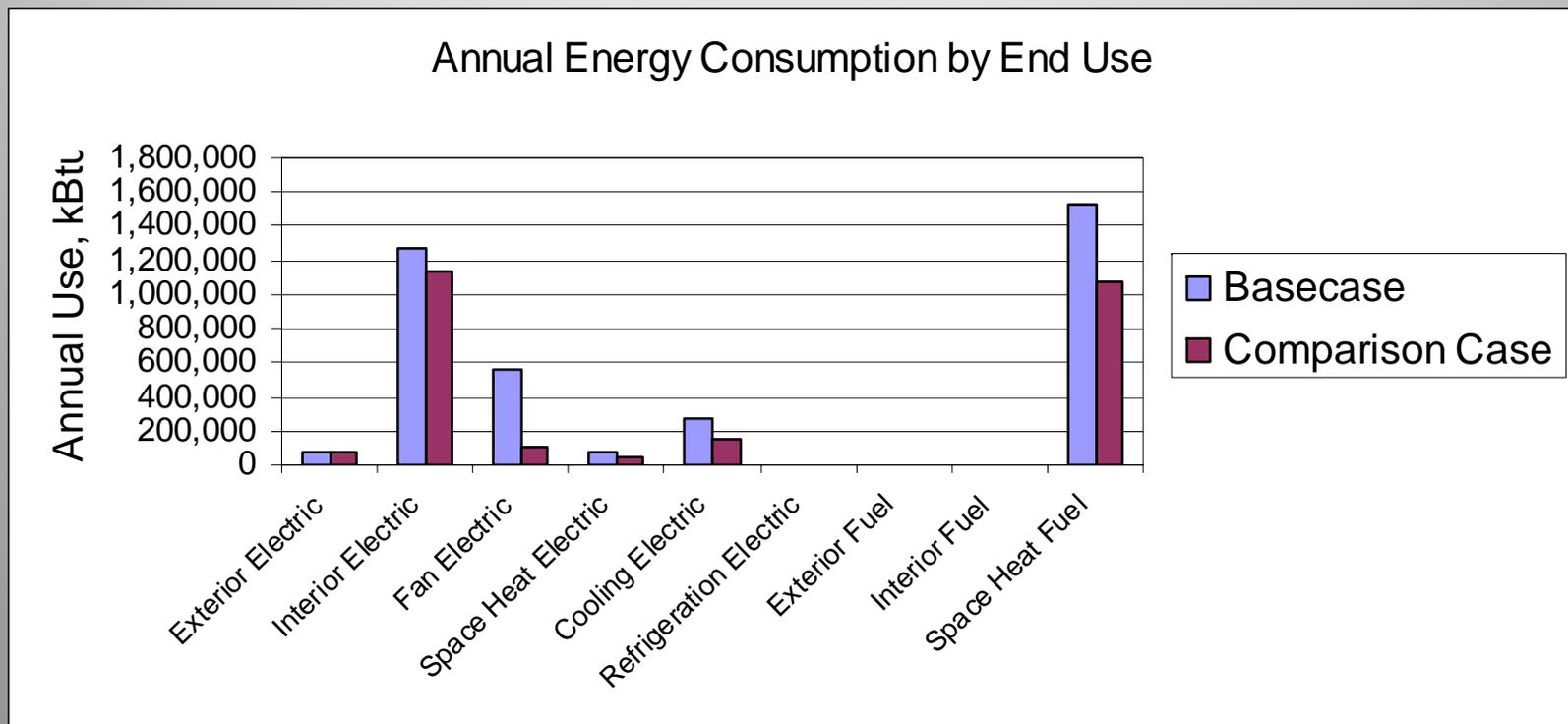
- Energy Cost Reduction
- Reduction In Maintenance Calls
- Reduction In User Complaints
- Meet IAQ Standards

# Some Retuning Issues

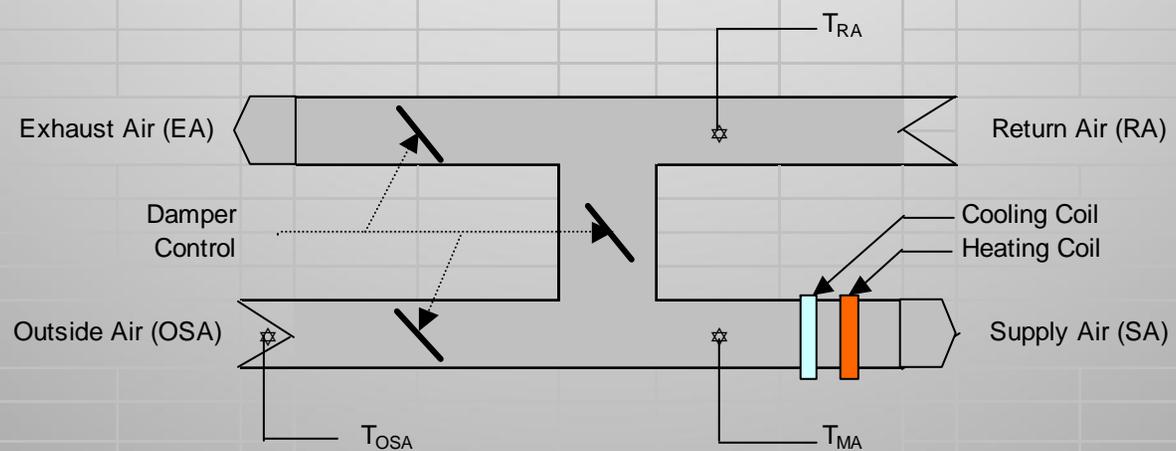
- [HVAC Rescheduling](#)
- [Economizing of the Damper Controls](#)
- Heating & Cooling Lockout - Based on Outside Air Temperature
- Resetting Temperatures in Over-Heated or Under-Cooled Rooms
- Addition of Demand Controlled Ventilation (CO<sub>2</sub> Control)
- Effective Ventilation Airflows
- Ensuring Proper Dead-Band Between Heating and Cooling, etc.

[Our focus today are on the first two items](#)

# Office Load Profile



# Typical HVAC System

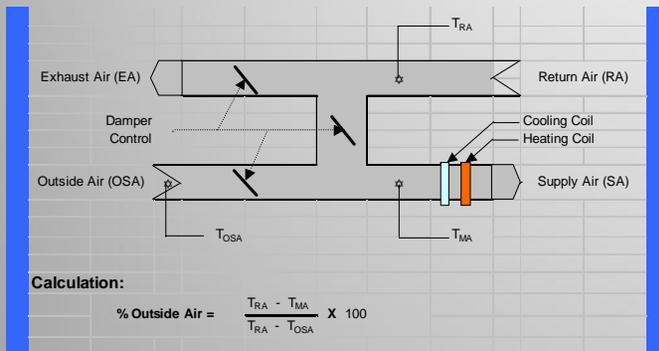


**Calculation:**

$$\% \text{ Outside Air} = \frac{T_{RA} - T_{MA}}{T_{RA} - T_{OSA}} \times 100$$

# Air Temperatures

## Calculating Percentage of Outside Air



Return Air Temp 72°

Outside Air Temp 52°

Mixed Air Temp 62°

- The HVAC vent system is a 1000cfm constant volume system.
- The building is 1000 SqFt.
- 7 people for 1000 SqFt.
- Where 7 people x 20 cfm/person = 140 cfm minimum, (140 cfm/1000 cfm = 14%)

What is the % of outside air?

(50% )

Is the OSA damper in an optimized position?

(No – It should be at 14%)

# Energy Usage Index (EUI)

Establishing and working the EUI requires:

- Utility bills (12 months summation of usage)
- Square footage
- Hours of operation

To Establish: Kbtu/Sqft-Yr or Btu/SqFt-Yr

# How to Determine your Retuning Potential

Compare your buildings' EUI to other  
buildings' EUIs

# Energy Use Index - School Facilities

## KBtu/Sqft-Yr

Schools in Western WA (All Electric)	Low	High	Median
Elementary Schools	26.5	71.5	43.5
High Schools	40.4	76.4	47.8
Middle Schools	39.1	61.3	47.1

WL	CV	<b>CH</b>	JP	GM	EH	BW	SD	<u>RT</u>
35.1	36.3	<b>37.5</b>	40.4	42.7	43.0	44.1	44.5	<u>48.1</u>

CW	SR	CC	EH	TY	SB	<b>OH</b>	<u>FV</u>	<u>CJ</u>
55.1	56.1	60.8	64.7	77.9	80.0	<b>80.8</b>	<u>84.3</u>	<u>90.1</u>

**Black** – Elementary

**Blue** – Middle School

**Red** – High School

### Collecting Data:

- *Utility Bills (minimum of 12 Months)*
- *Square Footage*
- *Operating Hours*

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# Benchmark Comparison Data

## Contact Your Utility

Energy Usage Index (Range)		Btu / SqFt - Year			Source
Building Type	EUI Data				
	Low	Medium	High		
1	All Electric Elementary Schools	26,522	43,521	71,523	PSE
2	All Electric High Schools	40,446	47,817	76,468	PSE
3	All Electric Middle Schools	39,139	47,149	61,376	PSE
4	Apartment - National	55,000	97,000	205,000	PSE
5	Assembly	24,000	75,854	125,000	PSE
6	Church - National	24,000	62,000	125,000	PSE
7	Community Center	178,000	280,000	475,000	PSE
8	Data Processing - National	100,000	125,000	375,000	PSE
9	Educational	52,000	60,957	145,000	PSE
10	Gas Heated Elementary Schools	25,448	52,527	108,942	PSE
11	Gas Heated High Schools	39,952	62,670	102,236	PSE
12	Gas Heated Middle Schools	29,005	57,087	128,206	PSE
13	Grocery	175,000	197,216	410,000	PSE
14	High Rise Apartment - National	24,000	85,000	150,000	PSE
15	High Rise Office - National	60,000	210,000	305,000	PSE
16	Hospital	175,000	206,195	400,000	PSE
17	Hotel	77,000	156,214	260,000	PSE
18	Libraries - Large Gas Heat	72,790	84,402	105,987	PSE
19	Nursing Home	100,000	134,199	200,000	PSE
20	Office	50,000	80,452	135,000	PSE
21	Other Schools (K-8, Alternative)	48,356	67,447	88,875	PSE
22	Portable Classrooms	17,305	36,730	82,444	PSE
23	Refrigerated Warehouse	25,000	43,911	70,000	PSE
24	Restaurant	100,000	355,062	400,000	PSE
25	Retail	62,000	74,554	105,000	PSE
26	Warehouse	20,000	45,755	60,000	PSE

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# Source for EUI Comparison Data

- Commercial Building Energy Consumption Survey (CBECS) conducted by the US DOE in 2003.
- Contain 5,215 records from the 50 States
- For all buildings, these files contain information such as the building size, year constructed, types of energy used, energy consumption and expenditures, etc.

<http://www.eia.doe.gov/emeu/cbecs>

# Case Study 1

## Department of the Navy Office Building

**Facility Description/Use:** Engineering Management Building built in 1971. Five story building with 211,376 square feet. Occupancy is typically 1200 personnel from 6 AM to 4 PM.

## Retuning & Rescheduling Results for the 211,376 SqFt Bldg

Retuning Damper Control Resulted in:

- Total Savings: 1015 MBtu/Yr, \$5938/Yr

Rescheduling (169 to 50 Hrs/Wk) resulted in:

- Motor Savings: 553,727KWH/Yr , \$22,823
- Heating Savings: 5418 MBtu/Yr, \$30,144

Total Heating Savings: 49%

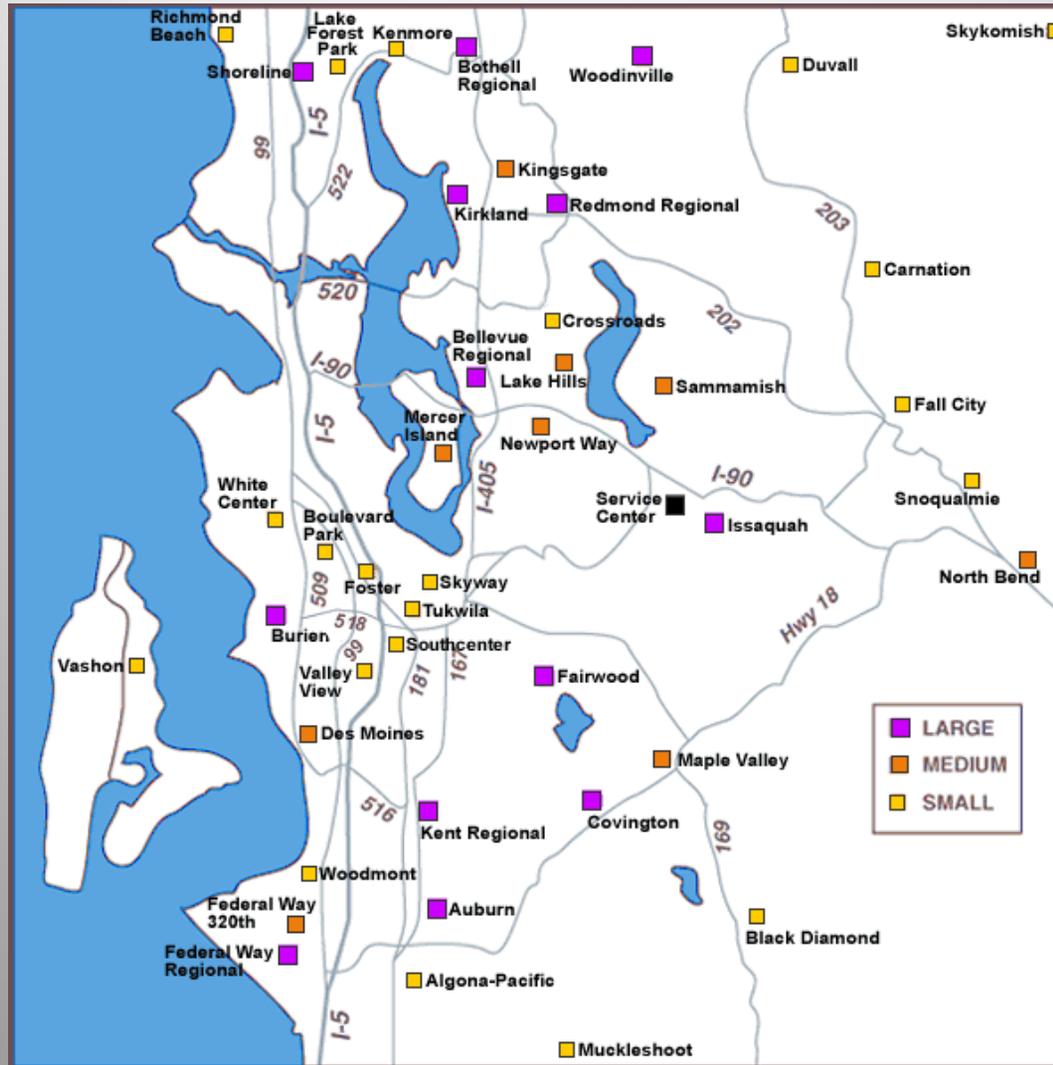
# Case Study 2

## King County Library System

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# Library Locations



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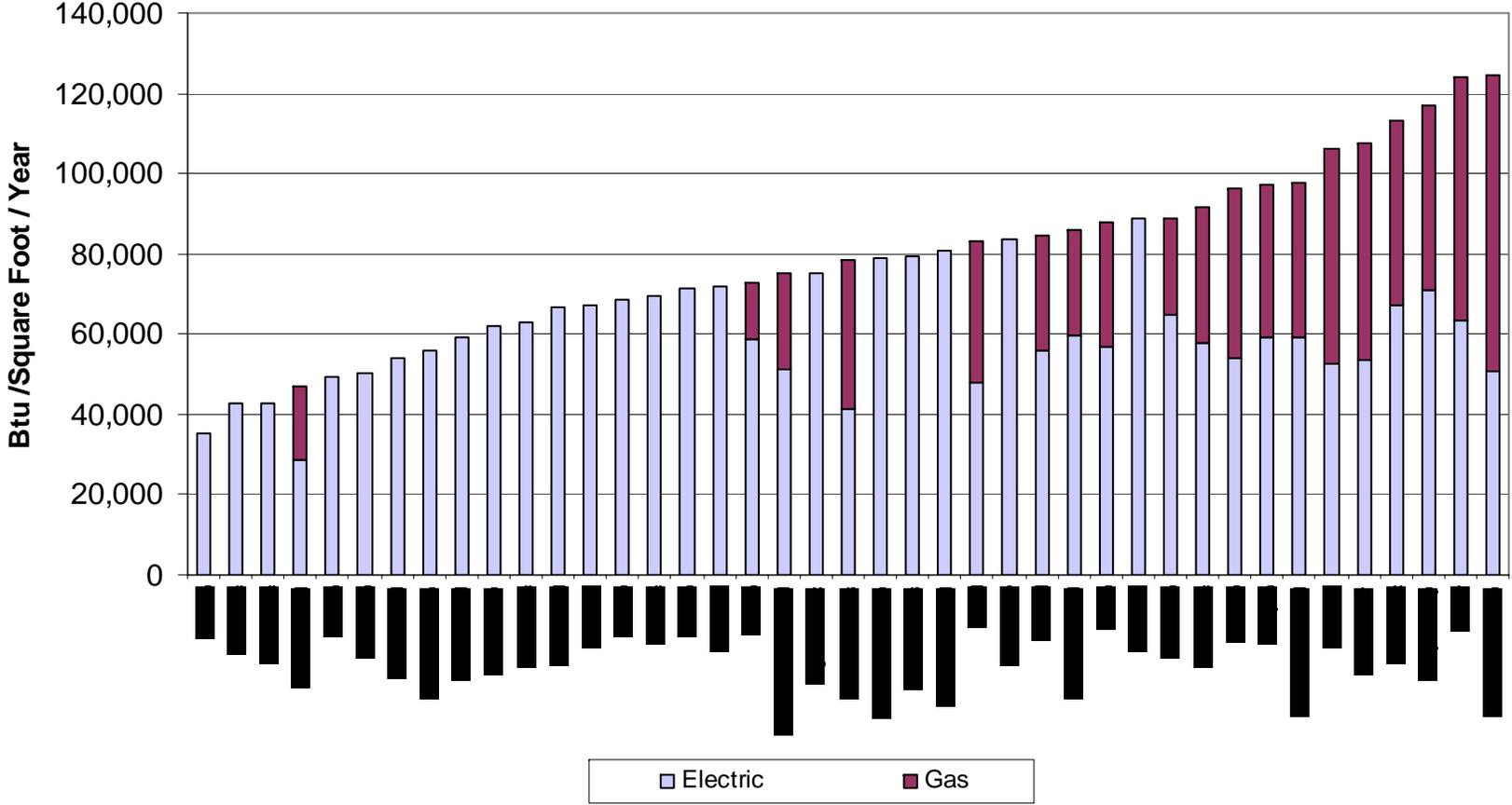
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# Buildings Evaluated

- 8 of 16 large Libraries (15,000 Sq Ft or larger)
- 2 of 8 Medium Libraries ( 8,000 to 11,000 Sq Ft)
- 2 of 20 Small Libraries (2,100 to 7,000 Sq Ft)

All 44 libraries were evaluated and recommendations made through an extrapolation process.

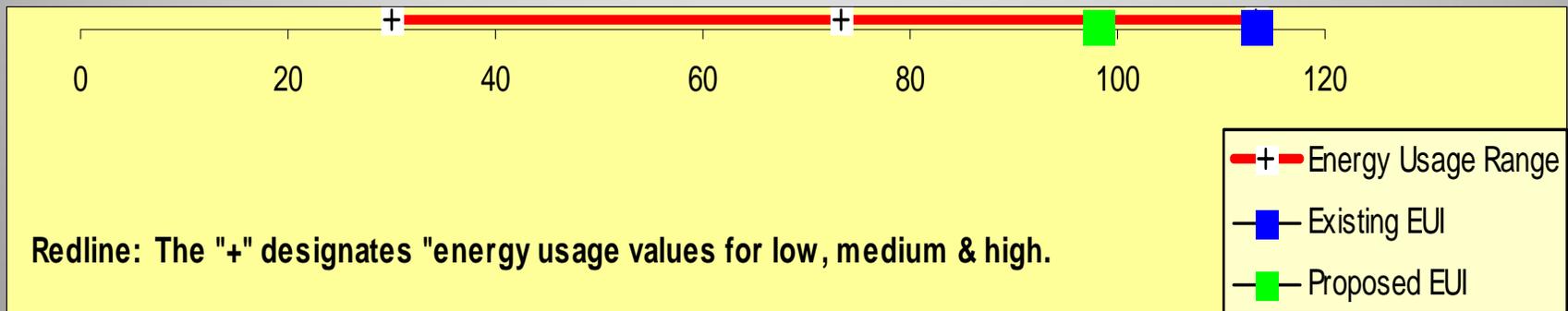
# King County Library System Energy Use Index - All Libraries



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# KCLS – Bellevue Regional



# Audit Findings with Focus on HVAC Retuning

- Estimated Energy Savings: 1191 MBtu/Yr
- Cost Savings: \$15,117

# Results for Bellevue Library



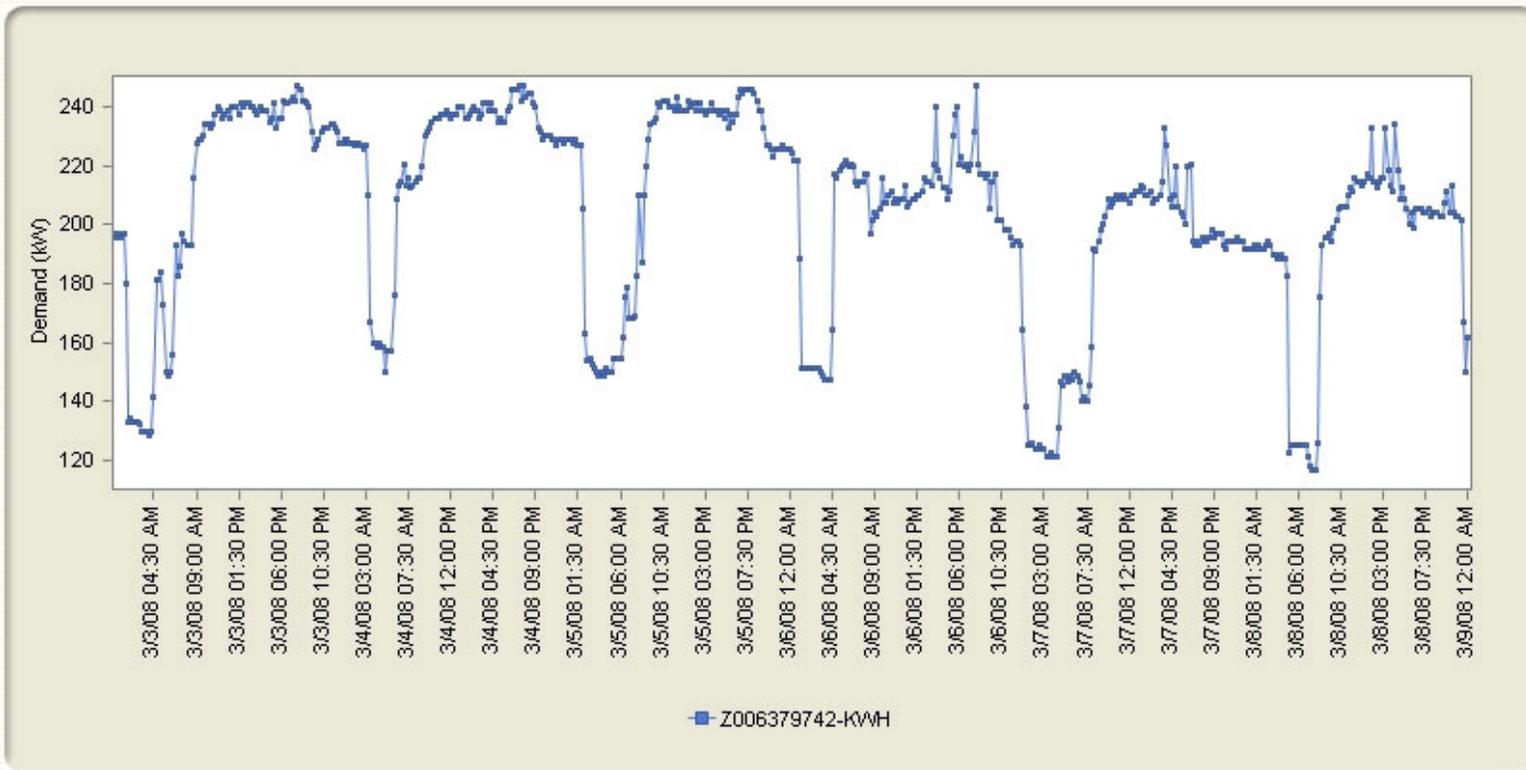
Trend Meter Usage

Report date: 4/1/2008 12:14:55 PM

Report span: 3/3/2008 - 3/8/2008

Total days: 6

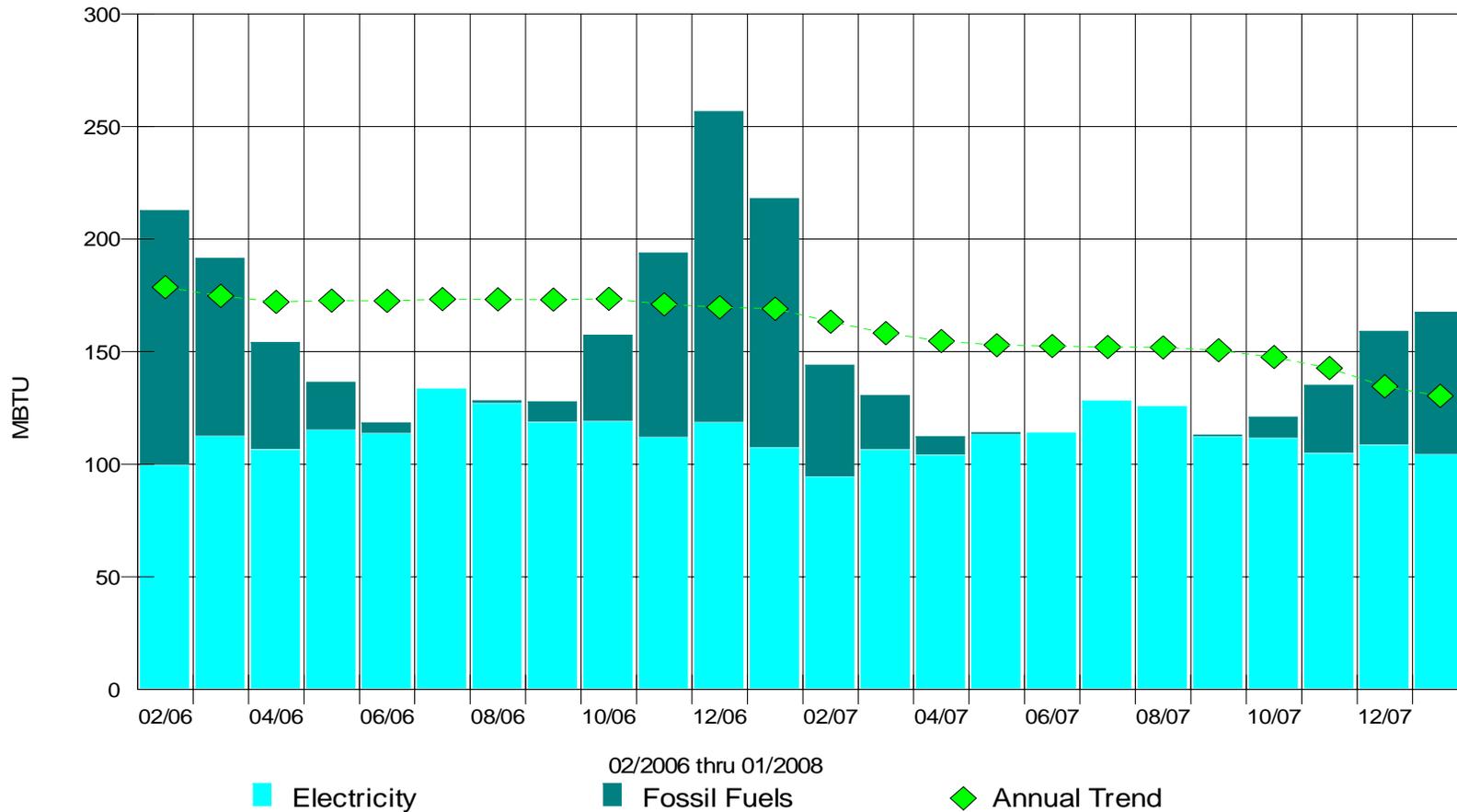
Meter description: Z006379742



Point ▲	Min Value	Min Timestamp	Max Value	Max Timestamp	Average Value	Units
Z006379742-KWH	116.40	3/8/2008 7:30 AM	247.20	3/3/2008 7:45 PM	205.04	kW

# UTILITY MANAGER PRO

## Energy Use Graph - Monthly and Annual Trend for Kent Regional Library



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# For More Information on the KCLS Progress & Energy Program Overview

Bob Johnson  
King County Library System

[bjjohnson@kcls.org](mailto:bjjohnson@kcls.org)

425-396-3290

# End of Presentation

## For Further Information Contact:

**Jim Sura, C.E.M.**

***JA Energy Services***

P.O. Box 698

Seabeck, WA 98380

(360) 620-6465

jsura@oz.net