

Marysville School District

Resource Conservation Program

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Resource Conservation Program

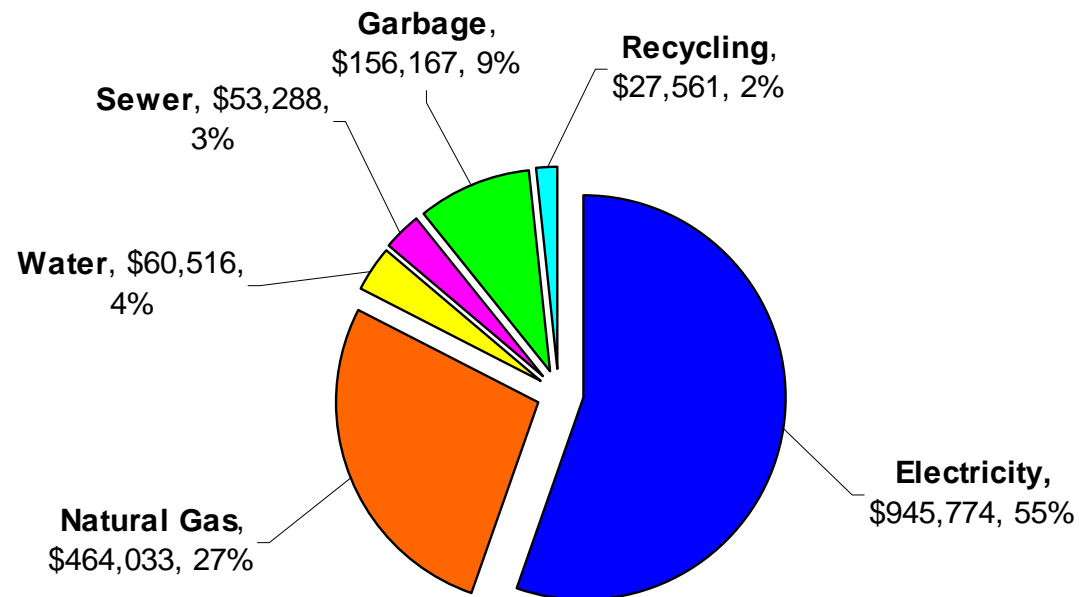
- ✓ Tools
 - ✓ Utility budget
 - ✓ Utility tracking
 - ✓ Benchmarking
 - ✓ Load profiles
- ✓ Program Support
 - ✓ Board policy
 - ✓ Building operating guidelines
- ✓ Implementation
 - ✓ Weekly meetings
 - ✓ Setting goals
 - ✓ Identifying projects and getting them installed
 - ✓ Involve staff
- ✓ New Construction
- ✓ Presenting Results



Tools

Utility Budget

Marysville S.D. - Utility Cost Breakdown
4/05 - 3/06



Total Utility Cost = \$1,707,339

Tools

2 Years History for Data Base

**Marysville School District, Marysville Pilchuck High School
Utility Usage History -- 09/2003 thru 08/2005**

Date	Electricity (kWh)	Demand (kW)	Natural Gas (Therms)	Oil (Gallons)	Diesel (Gallons)	Water (kGal)	Irrigation (kGal)	Sewer (kGal)	Refuse (Cu Yd)
09/03	171,647	554	4,266	N/A	N/A	0	N/A	N/A	0
10/03	172,936	456	8,107	N/A	N/A	293	1,309	0	581
11/03	287,140	750	N/A	N/A	N/A	0	N/A	N/A	2
12/03	284,431	759	33,338	N/A	N/A	349	190	349	203
01/04	274,266	798	39,579	N/A	N/A	0	N/A	N/A	17
02/04	309,199	799	24,666	N/A	N/A	N/A	N/A	N/A	16
03/04	306,599	792	24,893	N/A	N/A	590	85	0	11
04/04	281,811	766	17,219	N/A	N/A	486	200	0	21
05/04	276,223	758	12,727	N/A	N/A	N/A	N/A	N/A	21
06/04	293,229	744	10,992	N/A	N/A	0	N/A	N/A	29
07/04	246,826	716	5,055	N/A	N/A	427	1,279	0	21
08/04	162,135	608	2,733	N/A	N/A	0	N/A	N/A	17
Annual Total	3,066,442	799	183,575	0	0	2,145	3,063	349	939
09/04	237,802	707	3,506	N/A	N/A	511	1,169	17	0
10/04	295,757	768	9,105	N/A	N/A	0	N/A	N/A	0
11/04	323,162	798	N/A	N/A	N/A	835	140	26	176
12/04	350,324	905	36,551	N/A	N/A	0	N/A	N/A	19
01/05	281,296	812	21,751	N/A	N/A	664	33	9	9
02/05	330,502	812	22,682	N/A	N/A	0	N/A	N/A	15
03/05	340,032	812	24,973	N/A	N/A	466	62	466	16
04/05	314,155	799	22,614	N/A	N/A	0	N/A	N/A	21
05/05	281,242	752	16,763	N/A	N/A	481	57	481	17
06/05	275,302	775	10,075	N/A	N/A	0	N/A	N/A	0
07/05	176,127	637	5,337	N/A	N/A	438	236	438	0
08/05	171,643	299	2,426	N/A	N/A	0	N/A	N/A	1
Annual Total	3,377,344	905	175,781	0	0	3,395	1,697	1,437	274

- You Can't Manage What You Don't Measure

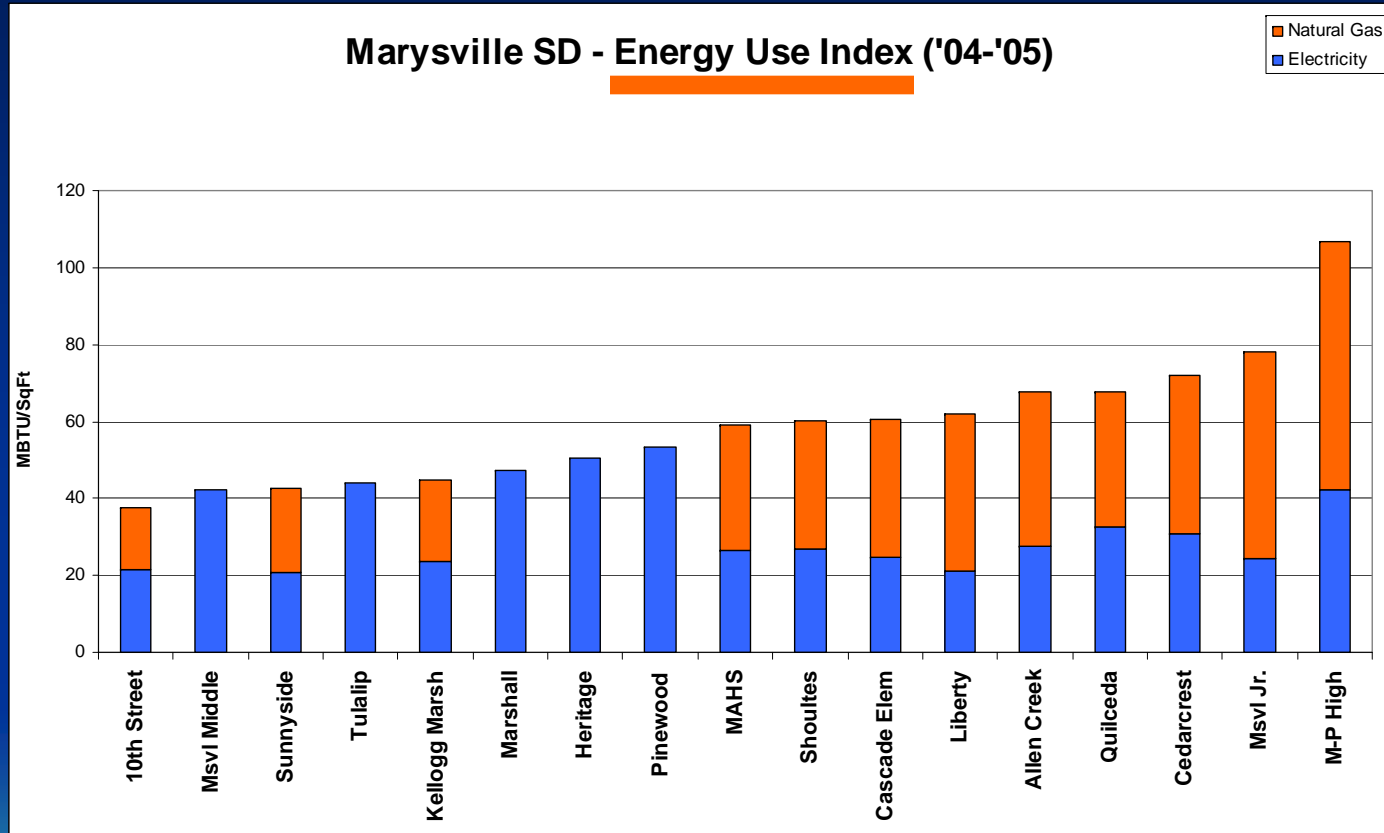
Benchmarking

- Where should you be?
 - Your schools compared to each other
 - Your schools compared to other local districts
- Use per square foot (EUI)
 - Track electric and gas separately
 - Can compare across other Puget Sound utilities
- Cost per square foot (ECI)
 - Use for comparison only if rates are similar
 - Can't compare PSE area school to PUD area school



Tools

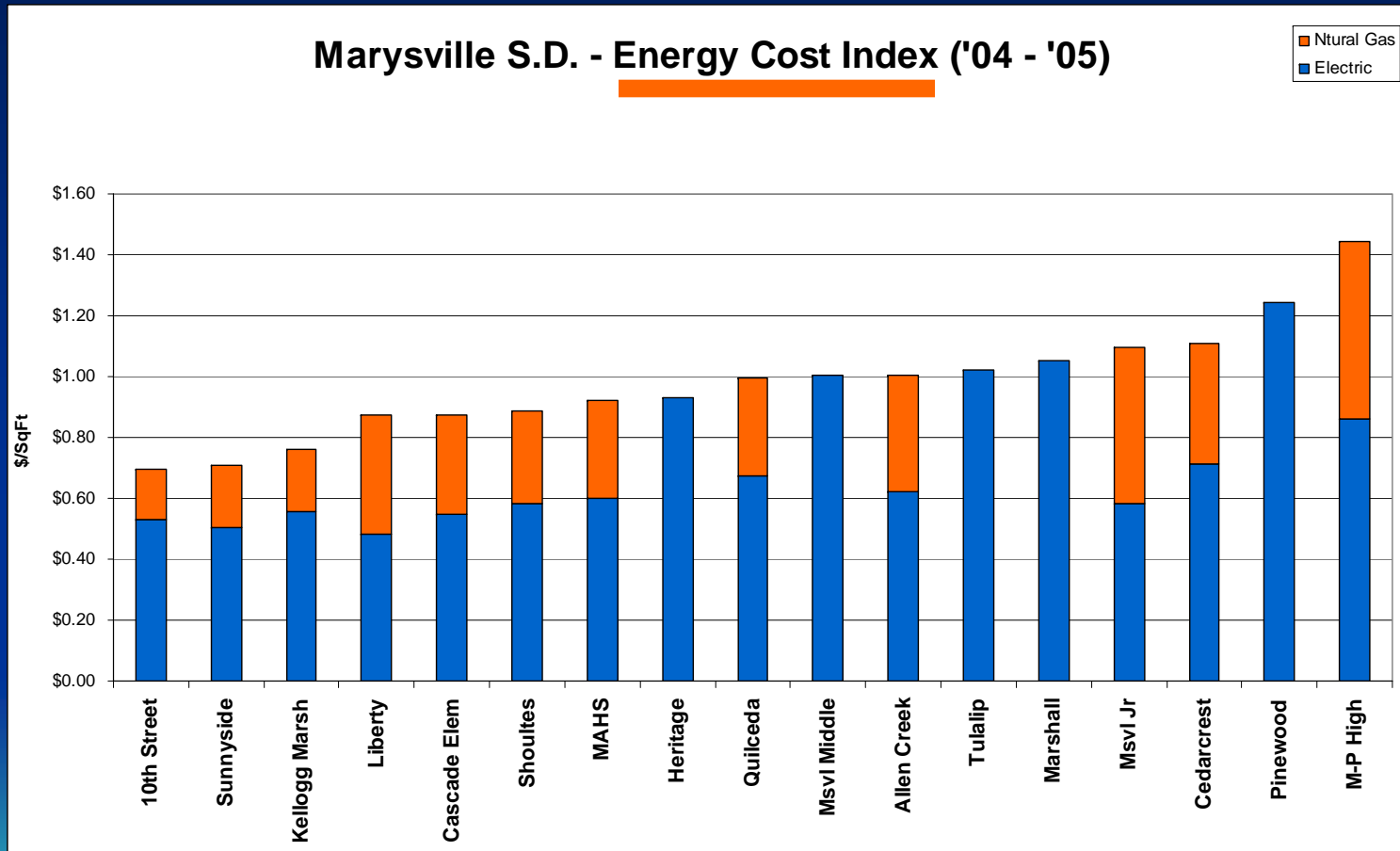
Benchmark – (EUI)



➤ You Can't Manage What You Don't Measure

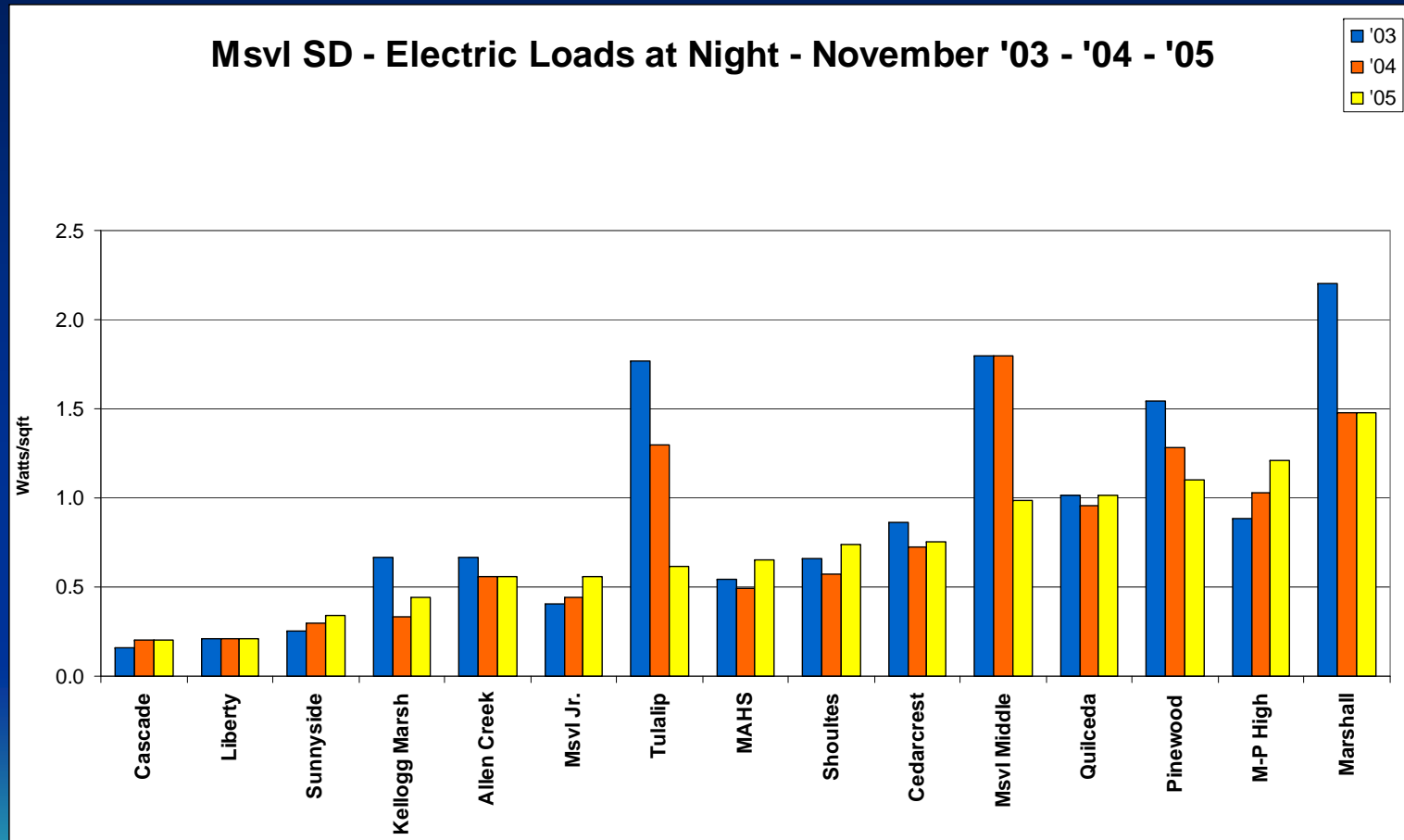
Tools

Benchmark – (ECI)



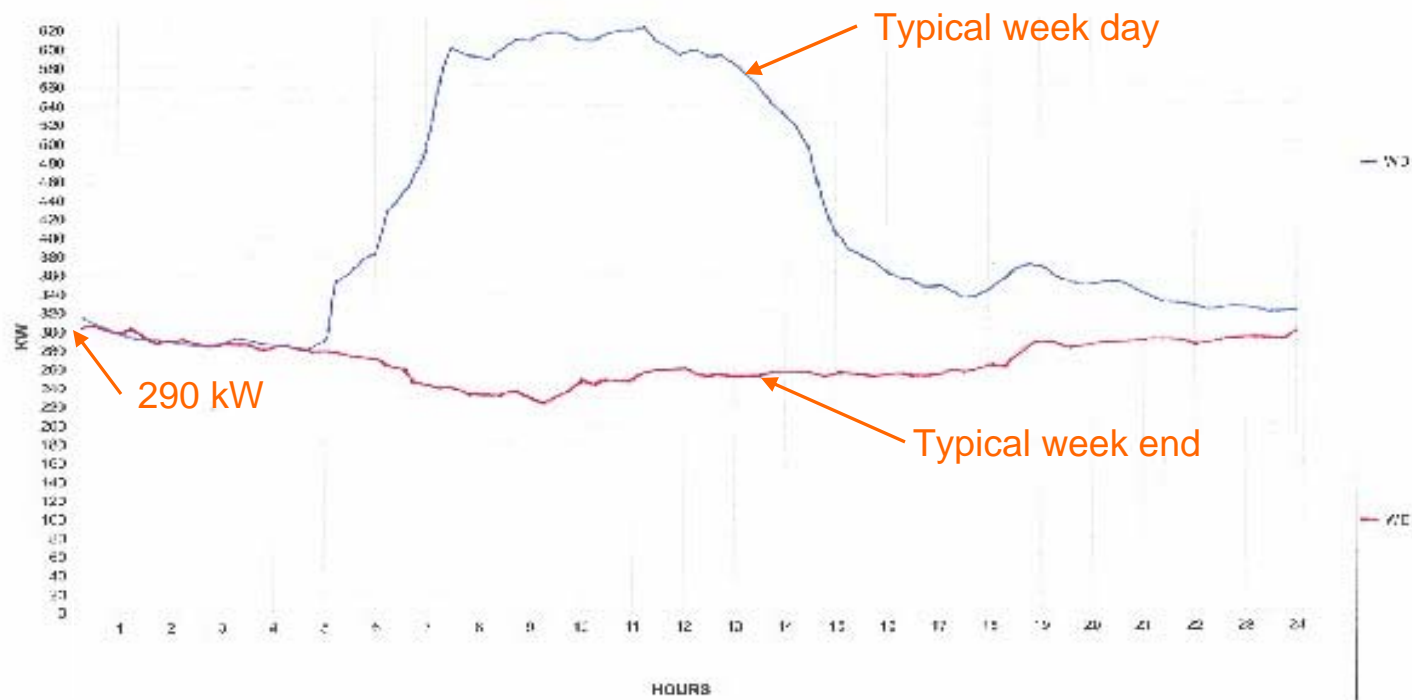
Tools

Benchmark - Electric Loads at Night



Tools

Electric Load Profile



Id: 8862

Name: MA MA-Pilchuck High

15 Min Clock Intervals

TYPICAL DAYS PLOT - WDWE

Chan: 1

Start: 03/06/06 14:16

Stop: 04/07/06 14:30

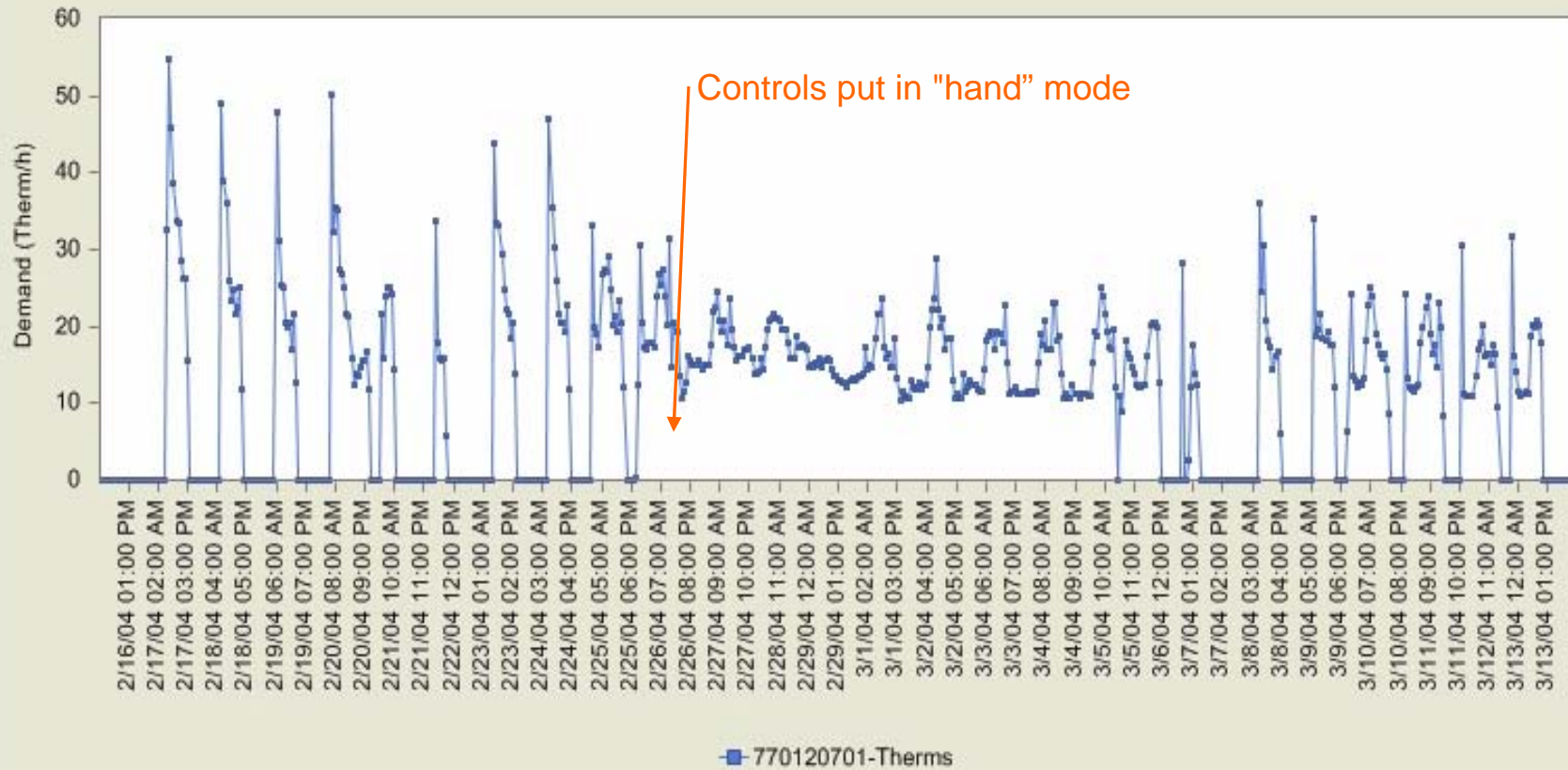
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Max: 622.3 K

Min: 223.9 K

Tools

Gas Load Profile



Program Support Board Policy

Policy No. 6810
Management Support

ENERGY MANAGEMENT/EDUCATION

The Board recognizes the responsibility to develop and maintain programs to support the conservation of energy and natural resources. In recognition of this leadership responsibility, the district shall strive to (a) institute effective energy management and (b) provide information and develop conservation attitudes and skills for the students it serves. To achieve the objectives of energy management, the Board shall appoint a team representing the Board, administration, staff, students, parents and utility representatives to develop and review plans for efficient energy management in the daily operation of the district's facilities. The committee shall have the responsibility to:

- A. Assess past and present energy consumption practices;
- B. Review current operational and maintenance practices;
- C. Study operation changes designed to reduce consumption and related costs;
- D. Examine the feasibility of retrofitting alternatives for existing facilities as a result of engineering studies and reports;
- E. Provide periodic reports and/or recommendations to the Superintendent and Board;
- F. Monitor the energy management measures which are implemented;
- G. Insure, through a monitoring process, that instruction in energy use and conservation is incorporated into the district's program.

The Board, as part of its educational mission, desires to foster the conservation ethic among the students. To achieve the objectives of the energy education program, instructional activities shall be designed to educate students on supply and costs of natural resources which, in turn, will stimulate skill building to effect responsible conservation behavior in students. As part of the educational process, students will be encouraged to assess the energy consumption policies of the school as a means of applying knowledge and skill.

The Superintendent is authorized to establish annual energy management goals, annual energy education goals, and extrinsic rewards to school buildings in recognition of conservation accomplishments. The Superintendent will make periodic and annual evaluation reports to the Board.

Cross References: Board Policy 2020 Curriculum development and Adoption of Instructional Materials
6923 Energy Conservation

Legal Reference: WAC180-030-406 Energy conservation program--Life cycle cost analysis

Adoption Date: 01/03/2000

Program Support

Building Operating Guidelines

Marysville School District Building Operating & Energy Conservation Guidelines

The following guidelines are set to establish standards to optimize the conditions of our learning and work environment while also conserving energy and natural resources and avoiding unnecessary and costly utility expenses. The implementation of this program is the joint responsibility of all school district staff, students and other users.

Lighting



- Individual classroom lighting should be turned on/off by teacher at beginning and end of each day.
- Teachers should ensure that lights are turned off when classrooms, shops, etc., are unoccupied for 15 minutes or longer.
- Lights in gymnasiums, multi-purpose rooms or commons should be turned off if room will be unoccupied for 30 minutes or longer.
- Whenever possible, natural lighting should be taken advantage of in lieu of indoor lights.
- Hallways and commons lighting shall be turned off at the end of the instructional day unless after-school activities require it.
- Outside lighting should remain off from midnight until 4:30 a.m.

Heating



- HVAC systems should always be operated in the most economical and efficient way possible.
- The heating system will be set to provide the following temperatures during time of student occupancy:

Classrooms/Libraries	68°-70°
Gyms/Multi-Purpose	68°
Offices	68°-70°
School Shops	68°
Hallways	65°
O&M and Trans. Shops	65°

Variations from the set schedule can be made by the Maintenance Dept. only for unique or special circumstances. The night setback temperature at all facilities shall be 55° to 60°, including all day during weekends and holidays.

- All exterior doors and windows shall remain closed during the heating season.
- Outside air setting shall be set for 15CFM per student in classrooms/libraries.
- Personal space heaters may not be used.

Electrical



- All electrical equipment such as computer monitors, printers, copiers, coffee pots, etc. must be turned off at the end of individual's workday. Do not turn off computer unit itself as system back-ups and software updates occur during night hours.
- High-energy use items such as kilns and self-cleaning ovens should be run between 2:00 p.m. and 5:00a.m. (non-peak times)
- All staff lounge refrigerators should be cleaned out and turned off during extended breaks.
- Pop machines need to be turned off during extended breaks.

Water

- Report any and all leaks.
 - Never leave faucets running unattended or between use except when cold weather procedures are warranted.



Solid Waste and Recycling

- Each school should develop and implement a recycling plan in order to reduce solid waste.
- Custodial staff will monitor the quantity and usage of the dumpsters. Dumpster size and frequency of pick-up will be adjusted if needed.



For more energy information, please contact
Maintenance at Ext. 20847.

Checklists for extended breaks

CONSERVATION CHECKLIST



Summer Shutdown for Custodians



HVAC Systems

- All heat/cooling off.
- All portable classroom heat/cooling to "OFF" position (not temporary override).
- If heat/cooling is necessary, only the smallest zone allowable is active.
- Exhaust fans off.
- Turbo fan use limited to carpet drying. Open doors and windows for natural ventilation.

Lighting

- All exterior lights off, except when needed for evening community activities.
- Interior lights on only in the immediate areas where work is being done, or use daylight.
- Hallway lights off when not working in halls.
- Display case lighting off.

Water

- Water heaters turned off. Cleaning tasks requiring hot water can be grouped so tanks can be off for extended period of time, and/or, designate one hot water tank to remain on.
Hot water circulation pumps off.

Implementation

Weekly Meetings

Who

- Maintenance Manager
- Building Operator
 - Lead HVAC Tech
 - Lead Custodian
- RCM

Topics

- Status of Existing Projects
- New ideas to save
- Load Profiles (Monthly)
- Who should be involved in projects

Follow-up "To Do" lists

- Each Member



Implementation

Establish Goals

- Based on existing utility costs
 - 1st Year = 10% (\$170,000 - estimate)
 - 2nd Year = 15% (\$250,000 - estimate)
 - 3rd Year = 20% (\$340,000 - estimate)

Marysville's results after 5 yrs = \$1,100,000
(20% maintained savings - actual)



Implementation

Ways to Identify Projects

➤ Night walk-thrus

➤ It's 3:00 a.m. – Do you know where your energy use is?

- Monitoring (sub-metering)
- Controls review
- Bill reviews (checking for errors)
- Employees suggestions
- Typical measures
 - Lighting
 - Mechanical
 - Other



Why non-school hours?

- After school, savings opportunities are abundant
 - No capital budget dollars needed
 - No impact to building systems
 - No impact to staff or studentsConsider “after hours” user groups

NO BRAINER!!!



Why should you care?

- \$

- **5 times more hours** “non-school” than during school

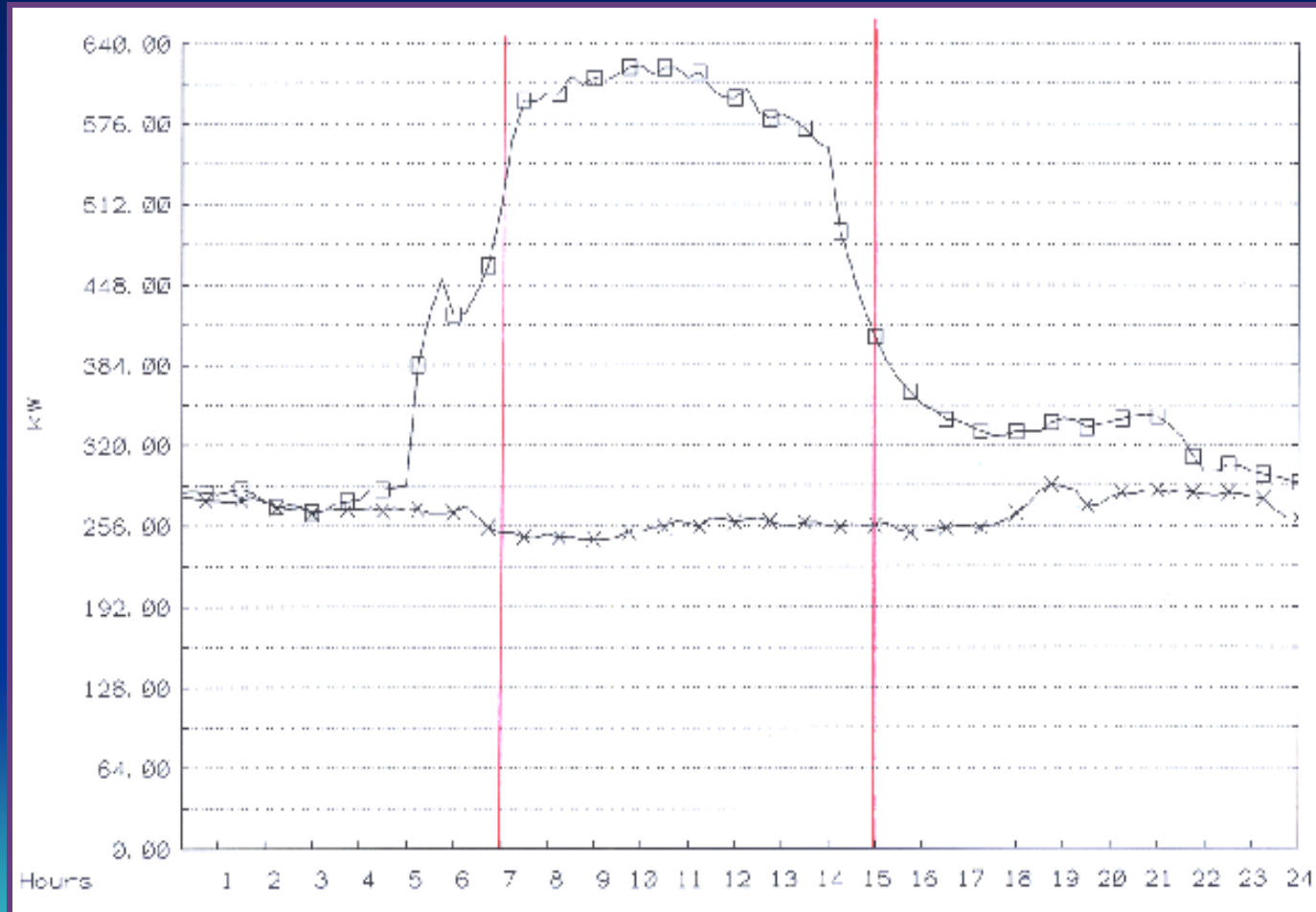
- From 7:00am – 3:00pm M-F = 1,440 hrs/yr

- Non-school = 7,320 hrs/yr

- Large % of energy use occurs during non-school hours



Worst Case Scenario



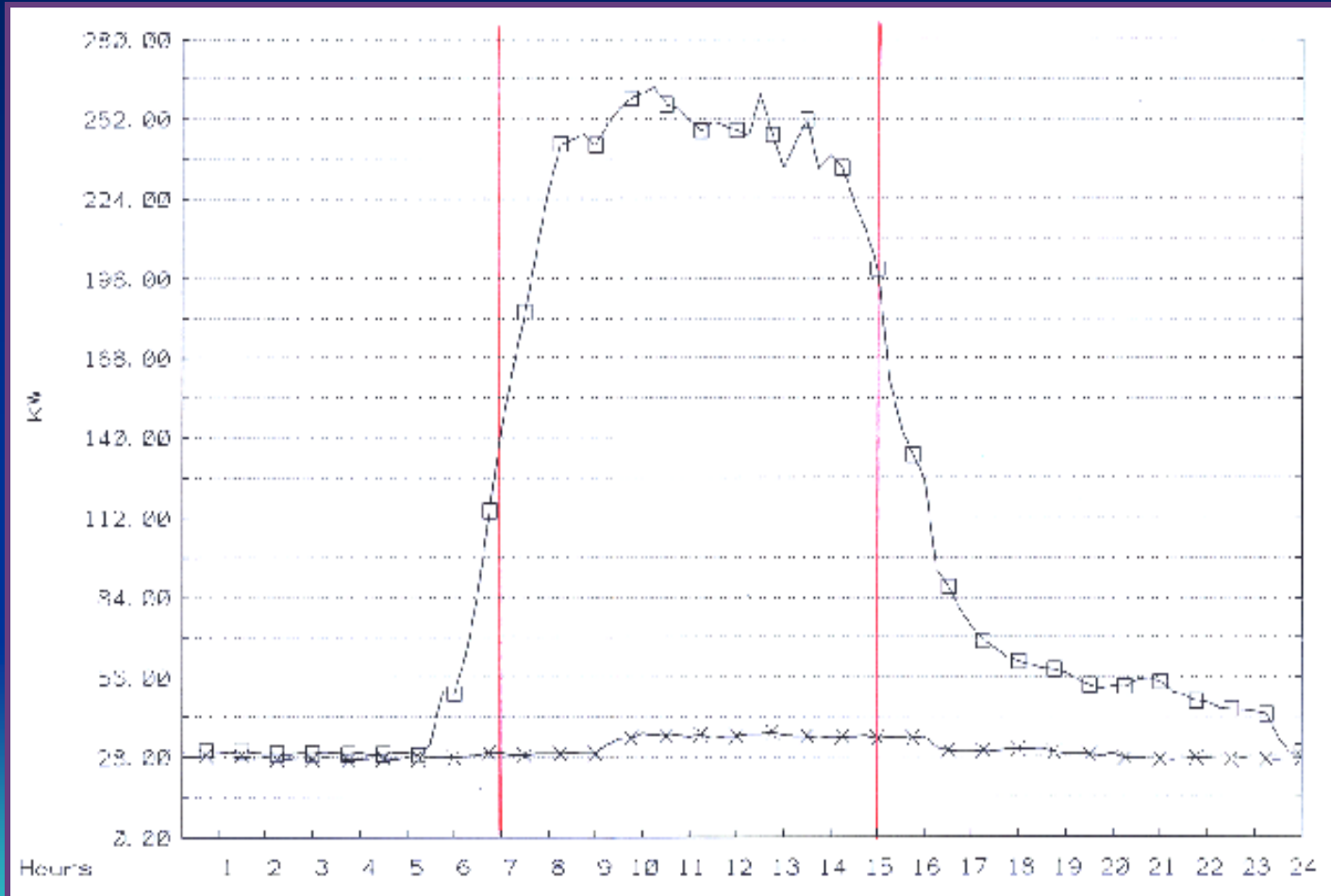
School hours
Energy use = 40%

Non-school hours
Energy use = 60%

Best Case Scenario

School hours
energy use = 60%

Non-school hours
energy use = 40%



Typical loads left on at night

➤ HVAC

- Heating to “occupied” temperatures
- Supply and exhaust fans running
- Outside air dampers open

➤ Lights

- All exterior
- Hallway
- Common areas

➤ Plug Loads

- Computers
- Pop machines
- Personal refrigerators



Implementation

Ways to Identify Projects

- Night walk-thrus
- **Monitoring (sub-metering)**
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Temporary Meters

- Digital Thermometers
- Lighting logger
- Motor Logger
- Occupancy Logger
- Temperature Logger
- Electrical
- Load profiles
- Air Flow



Implementation

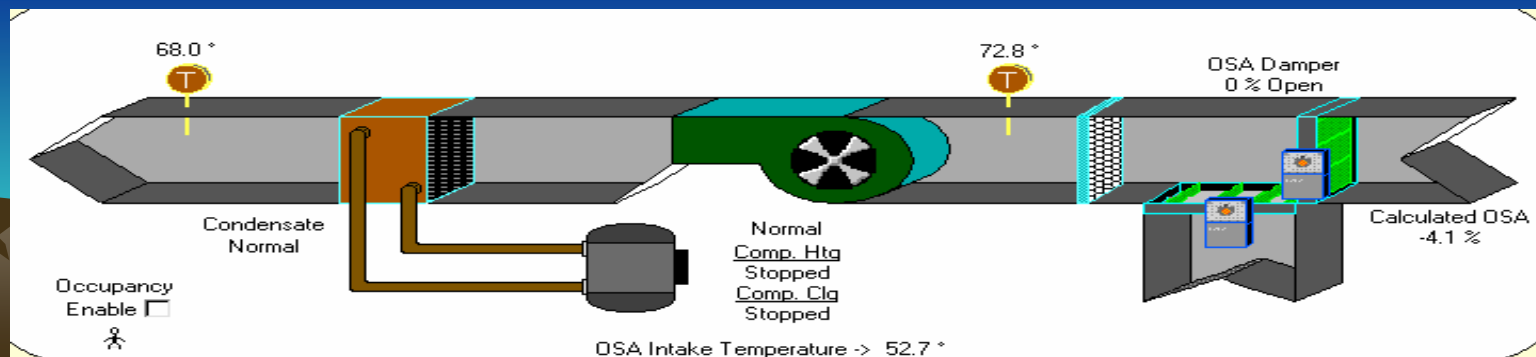
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Review controls annually

- Review EMS/time-clock settings
 - Occupied/unoccupied times
 - Start times versus occupied times (warm up period)
 - Temperature set points
 - Dead-bands
 - Economizer enabled
- Program holiday/non-school day schedules at beginning of year



Implementation

Ways to Identify Projects

- Night walk-thrus
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Understanding Your Utility Bill

DETAIL OF UTILITY CHARGES

801 E CASINO RD EVERETT

Service: Electric Metered General Service - Medium Load SCHED20C-C

<u>Meter Number</u>	<u>Current Reading</u>	<u>Previous Reading</u>	<u>Difference</u>	x	<u>Multiplier</u>	=	<u>Usage</u>
137097							
<u>KWH</u>	9438	8959	479		600		<u>287,400 KWH</u>
<u>KVARH</u>	4832	4622	210		600		<u>126,000 KVARH</u>
<u>KW</u>	1,646				600		<u>987,600 KW</u>

Connected Load: 884.00 KW
Load Factor: 39.1 %

Service Dates: Feb. 14, 2005 Mar. 17, 2005 Days in Billing Period 31

Customer Charge: 31 Days @ \$0.290000 Per Day	\$8.99
Energy Charge: 30,000 KWH @ \$0.075200 Per KWH	\$2,256.00
Energy Charge: 257,400 KWH @ \$0.060500 Per KWH	\$15,572.70
Power Factor: 0.92 (.97 Required)	
Billing Demand: 987.600 KW	
Adjusted Demand Due to Low Power Factor: 1,036.980000 KW <i>= \$179</i>	
Billing Demand Charge In Excess of 100 KW: 936.980000 KW @ \$3.620000 Per KW	\$3,391.87
Taxes: Everett Municipal (\$21,229.56 @ 4.5 %)	\$955.33

Service Charges * \$22,184.89

TOTAL UTILITY CHARGES \$22,184.89

* PUD electric rates include a state public utility tax at 3.873% - approximately \$822.22 on this bill.

Understanding Your Utility Bill

EVER SD-JACKSON HIGH PSE PUGET SOUND ENERGY

Page 2 of 2

Account No. XXXXXXXXXX

nt ID: XXXX 136TH ST SE, MILL CREEK

Meter Number	Pres Read	Prev Read	Pres Date	Prev Date	Turnup	Pressure Temp	FPV BTU Factor	CCF Therms	Code
389461	13336	10725	04/18	03/18	2611	45.08	1.006696	10635.00	ACTL
						60	1.028	10932.78	

Charge Description	Quantity	Price per Unit	Amount
Customer Charge			\$41.94
Delivery Demand Charge	125 Therms @ \$0.99 Per Therm		\$51.89
Gas Supply Demand Charge	125 Therms @ \$1.05 Per Therm		\$55.04
Delivery Charge	419.35 Therms @ \$0.2062 Per Therm		\$86.47
Delivery Charge	4,165.31 Therms @ \$0.15551 Per Therm		\$647.75
Procurement Charge	4,584.66 Therms @ \$0.00355 Per Therm		\$16.28
Cost of Gas	4,584.66 Therms @ \$0.66131 Per Therm		\$3,031.88
Gas Conservaton Program Charge	4,584.66 Therms @ \$0.00302 Per Therm		\$13.85
Milli Creek City Tax	\$3,945.10 @ \$0.00 Per Dollar		\$0.00
Charge Total			\$3,945.10
Customer Charge			\$58.07
Delivery Demand Charge	125 Therms @ \$0.99 Per Therm		\$71.86
Gas Supply Demand Charge	125 Therms @ \$1.05 Per Therm		\$76.21
Delivery Charge	580.65 Therms @ \$0.2062 Per Therm		\$119.73
Delivery Charge	5,767.47 Therms @ \$0.15551 Per Therm		\$896.90
Procurement Charge	6,348.12 Therms @ \$0.00355 Per Therm		\$22.54
Cost of Gas	6,348.12 Therms @ \$0.66131 Per Therm		\$4,198.07
Gas Conservaton Program Charge	6,348.12 Therms @ \$0.00406 Per Therm		\$25.77
Milli Creek City Tax	\$5,469.15 @ \$0.00 Per Dollar		\$0.00
Charge Total			\$5,469.15
Current Gas Charges			\$9,414.25

Implementation

Ways to Identify Projects

- Night walk-thrus
- Monitoring (sub-metering)
- Controls review
- Bill reviews (checking for errors)
- **Employees suggestions**
- Typical measures
 - Lighting
 - Mechanical
 - Other



Encourage staff to submit:

- Needed repairs
- Control problems
- Ideas for conservation!

THEY ARE YOUR BIGGEST ALLIES!!!



Implementation

Ways to Identify Projects

- Night walk-thrus
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Typical lighting measures



Typical mechanical measure

Programmable thermostats



Typical “other” measures

- Pool Cover
- CO₂ Control of Outside Air
- Motion Sensors for Lights
- Photocell Controls for Lights
- DDC System for HVAC
- Adjustable Speed Drives on Larger Motors



Implementation

Getting Projects Installed

- No cost/low cost O&M measures
(Use successes to promote longer pay-back measures)
- “Low fruit” first (most cost-effective)
- Identify funding sources
- **DON'T FORGET UTILITY FUNDING!**



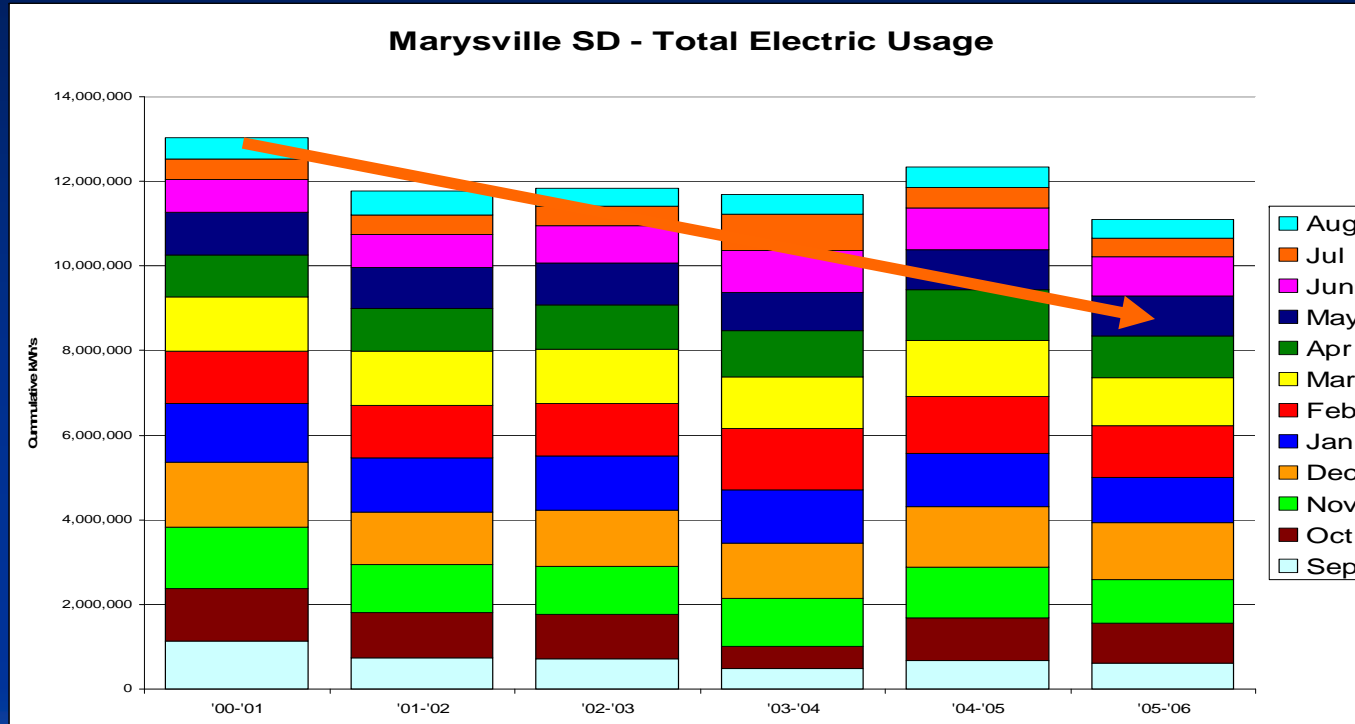
New Construction

- Have RCM involved from beginning
- Set energy performance goals
- Use utility incentive programs
- Start commissioning agent early
- Secured \$250,000 grant from State for Elementary #11 to construct to WSSP



Savings from RCM Program

Electric



Electrical Savings over 5 years = \$450,000

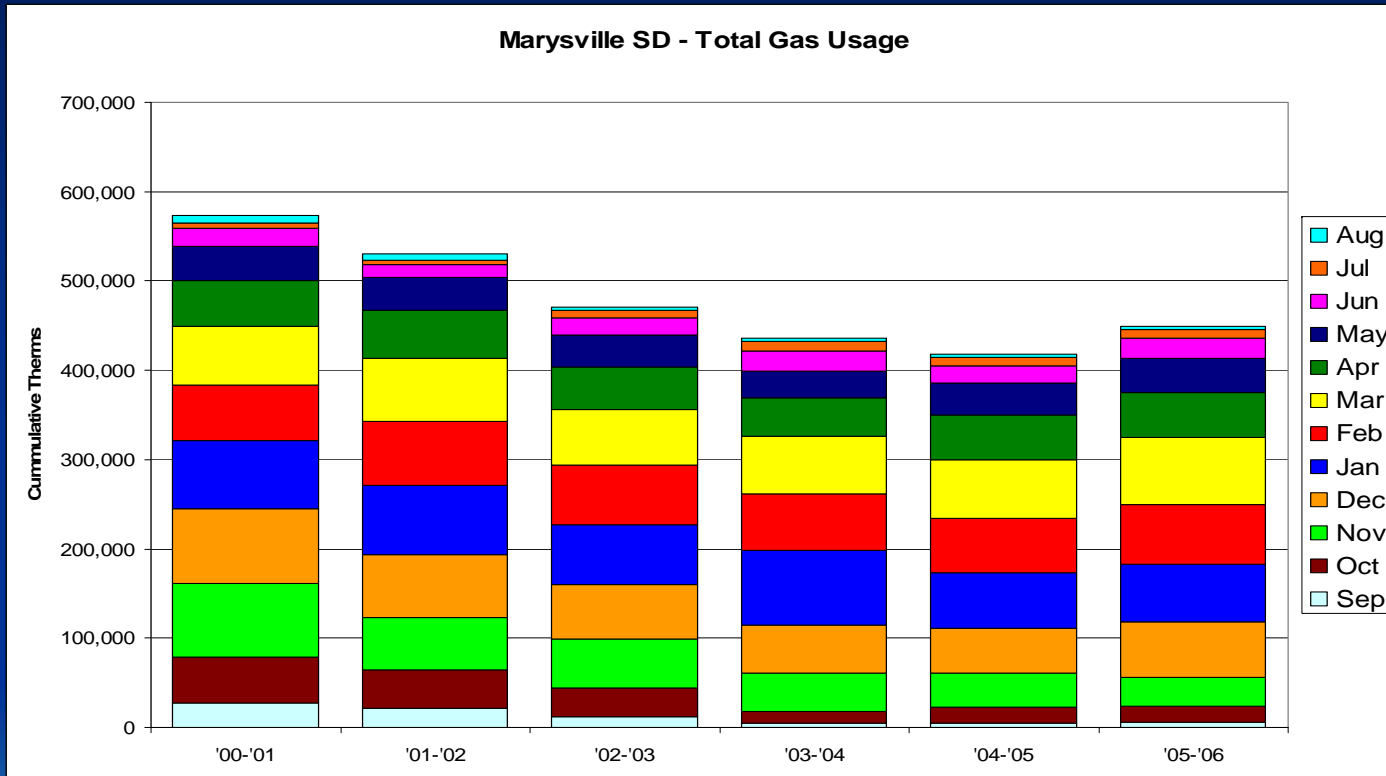
Additional Equipment Energy Usage = \$140,000*

Total Savings = \$590,000

* = 23,500 sq.ft. and 2,600 computers

Savings from RCM Program

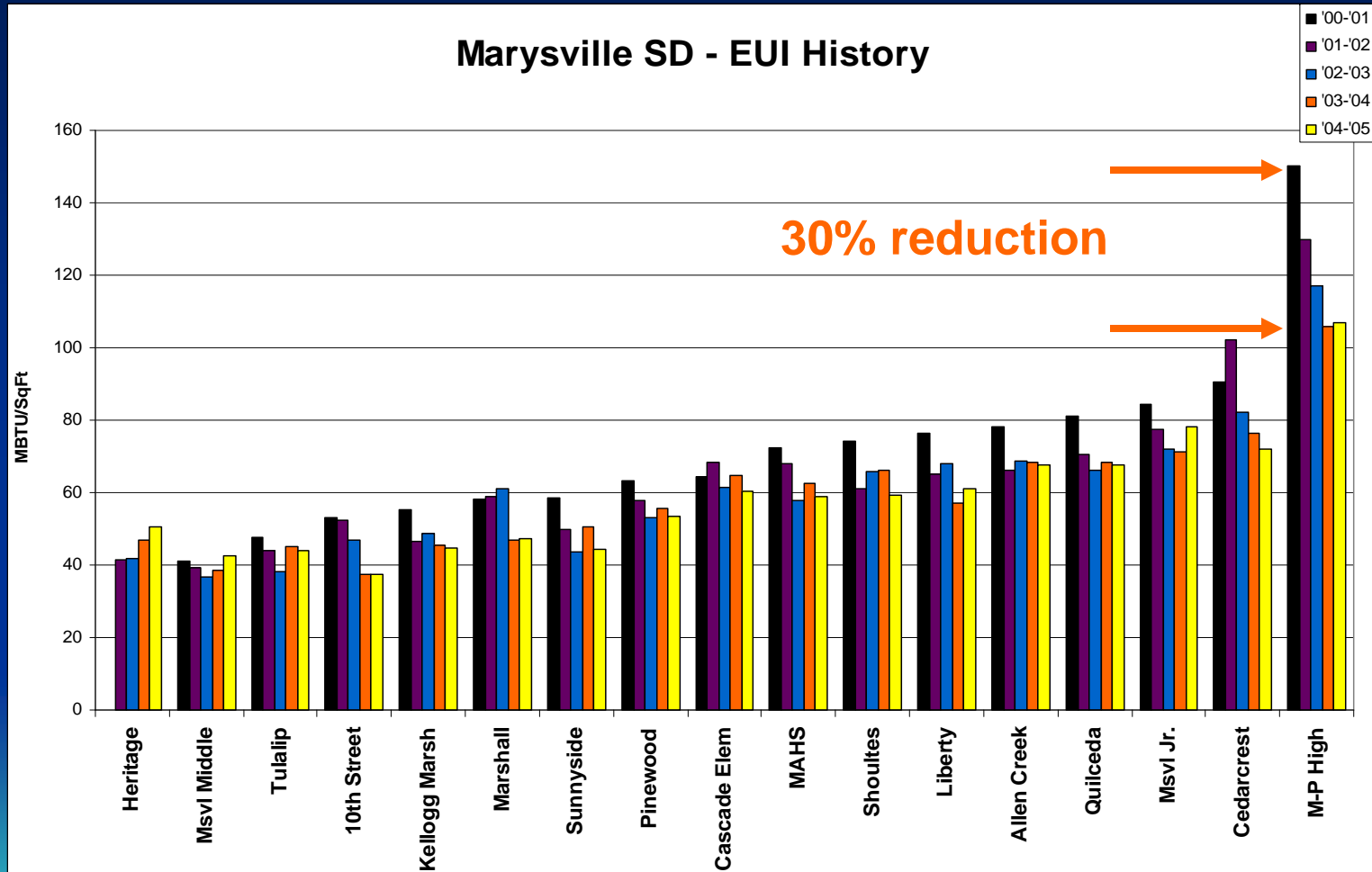
Natural Gas



Natural Gas Savings over 5 years = \$600,000

Present Results

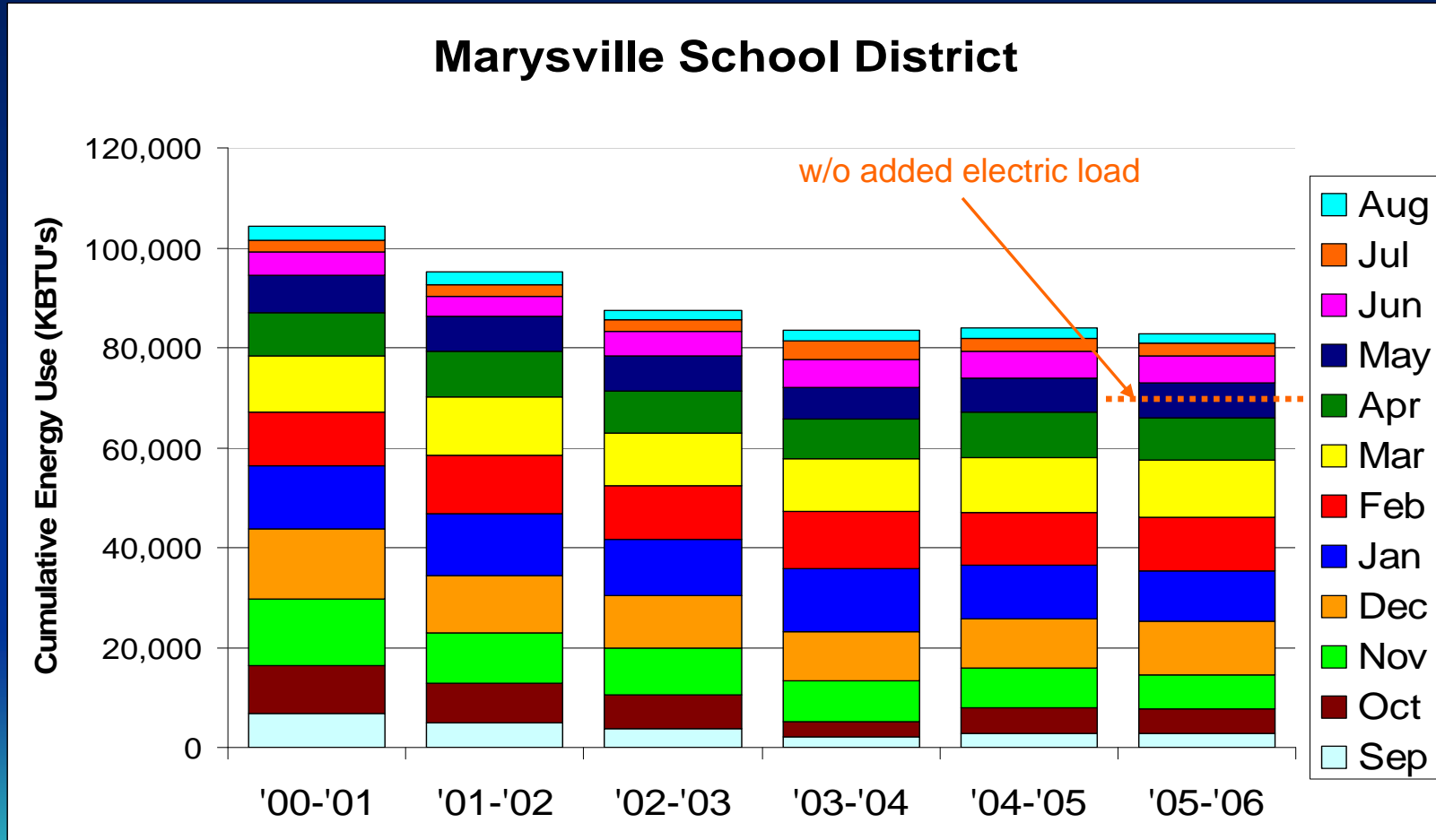
Individual Schools



30% Reduction at M-P High

Present Results

Entire School District



- 20% Sustained Total Energy Savings

10 Steps to a successful Resource Conservation Program

- 1 - Find a conservation champion (RCM)
- 2 - Track your utilities
- 3 - Understand your utility bills
- 4 - Call your local utilities
- 5 - Benchmark your facilities
- 6 - Review operating parameters
- 7 - Implement O&M saving measures
- 8 - Secure financing for capital projects
- 9 - Implement capital projects
- 10 - Present results



Marysville School District RCM Program

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