# Want to Cut Your Energy Cost by 30, 40 or even 50% ?

Ask Me How?

Bob Cowan

Director of Facilities Engineering

Fred Hutchinson Cancer Research Center

206 667 4473

# Fred Hutchinson
# 150+ Energy Conservation Projects - 10 years

- Electricity
  - 114 Projects
    - $1.4 million annual savings
    - 17.9 million kWhr
- Gas
  - 17 projects
    - $ 383,000 annual savings
    - 364,000 Therms
- Water
  - 15 projects
    - $268,000 annual savings
    - 20.1 million gallons

# Total Annual Savings $2 Million per year

- 09 Utility cost $4 Million
  - (6 without savings)
- And that's at 5 cents per kWhr

Photo by Donna Greene

# I'm not going to tell you about all 150!!

| NO. | MEASURE | TYPE | UTILITY SAVED | ANNUAL UTILITY SAVINGS | | | ANNUAL COST SAV ($) | COST OF MEASURE ($) | UTILITY INCENTIVE ($) | SIMPLE PAYBACK W/ INCEN | DATE COMPLT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ELECTRICITY (kwh) | GAS (therms) | WATER (ccf) | | | | | |
| 1 | Efficient exit signs - Phase I | ECM | elect | 58,400 | | | $3,504 | $21,000 | $8,200 | 4.0 yr | Jun-99 |
| 2 | Fresh water tank cooling | O&M | wtr/swr | | | 351 | $2,720 | $9,500 | $0 | 3.5 | Jan-99 |
| 3 | Kitchen exhaust shutdown *GE7* | O&M | gas/elect | 121,000 | 3,200 | | $9,340 | $800 | $0 | 1 month | Dec-99 |
| 4 | Low flow water closets- Minor | ECM | wtr/swr | | | 42 | $325 | $600 | $200 | 1.2 | May-00 |
| 5 | Aerco Water Heater | ECM | gas | | 49,300 | | $32,045 | $50,500 | $0 | 2.2 yr | Aug-99 |
| 6 | Reduce sterilizer water waste | O&M | wtr/swr | | | 8,070 | $62,540 | $700 | 0 | 1 week | Sep-99 |
| 7 | Sterilizer controls *W1* | ECM | wtr/swr | | | 2,660 | $20,615 | $38,300 | $19,000 | complete | Oct-00 |
| 8 | Reduce BE level A/C to 20 | O&M | gas/elect | 58,000 | 3,400 | | $5,690 | $240 | $0 | 1 month | Dec-99 |
| 9 | Reduce BE level A/C to 15 | O&M | gas/elect | 127,000 | 7,500 | | $12,500 | $900 | $0 | 1 month | Oct-00 |
| 10 | Phase II deduct meters | O&M | sewer | | | 2,890 | $15,900 | $250 | 0 | 1 week | Aug-99 |
| 11 | Freezer farm fan shutdown | O&M | elect | 26,300 | | | $1,450 | $100 | $0 | 1 month | Feb-00 |
| 12 | Reduce lab AC rate to 6 *GE1/2* | O&M | gas/elect | 737,000 | 66,000 | | $87,120 | $1,600 | $0 | 1 week | Aug-00 |
| 13 | VVVP for AH-A4 (Level 2) | ECM | elect | 136,000 | | | $8,160 | $1,200 | $0 | 2 months | Feb-98 |
| 14 | Repair control air leaks *E9* | O&M | elect | 6,900 | | | $410 | $1,600 | $0 | 4.2 yr | Jul-00 |
| 15 | Garage exh fans off at night *E8* | O&M | elect | 115,000 | | | $6,900 | $480 | $0 | 1 month | Jul-00 |
| 16 | Auto shutdown RR exh fans | O&M | gas/elect | 2,000 | 1,300 | | $1,000 | $500 | $0 | 6 months | Mar-03 |
| 17 | Phase I light retrofit-630 total | ECM | elect | 72,000 | | | $4,320 | $25,000 | $6,500 | 4.7 yr | Jul-01 |
| 18 | Fairview lighting retrofit | ECM | elect | 25,000 | | | $1,500 | $8,200 | $2,650 | 4.1 yr | Sep-01 |
| 19 | Opt. Ph II night setback *G1b* | O&M | gas/elect | 25,700 | 23,000 | | $16,492 | $320 | $0 | 1 week | Mar-03 |
| 20 | Static pressure reset-Arnold | ECM | elect | 163,500 | | | $9,810 | $19,025 | $14,120 | 6 mos | May-05 |
| 21 | Ph I VVVP for 7 air handlers | ECM | elect | 774,000 | | | $46,400 | $360,000 | $301,000 | 1.3 yr | Nov-01 |
| 22 | Ph II VVVP for 6 air handlers | ECM | elect | 963,000 | | | $57,780 | $170,000 | $143,000 | 6 months | Nov-01 |
| 23 | Heat recovery from washers *G4* | ECM | gas/water | | 13,000 | 4,088 | $40,100 | $110,000 | $30,000 | 2.1 yr | Mar-02 |
| 24 | Night setback for Ph I *G1a* | ECM | gas/elect | 57,700 | 83,000 | | $57,400 | $144,200 | $91,000 | 2.3 yr | Apr-02 |
| 25 | Heat recovery from PCW *G2* | ECM | gas/elect | 87,800 | 24,000 | | $20,900 | $76,000 | $43,100 | 2.0 yr | Nov-01 |
| 26 | Motion sensors-various loc | ECM | elect | | | | | | | | Jun-06 |
| 27 | SCCA discharge air reset | ECM | gas/elect | 209,000 | 12,000 | | $20,340 | $3,800 | $2,800 | 2 weeks | Jun-01 |
| 28 | Disc. Unnecessary lighting | O&M | elect | 28,000 | | | $1,600 | $480 | $0 | 4 months | Oct-03 |

# It’s a long list, and fairly boring…

- T 12’s to T 8’s
- T8’s to T5’s
- LED exit signs
- VFD’s
- Low flow Aerators
- 1000 motion detectors

# And You Guys Don't Want Boring…

- You Want Excitement, You Want Fun

  and You Want Something you can take home with you.

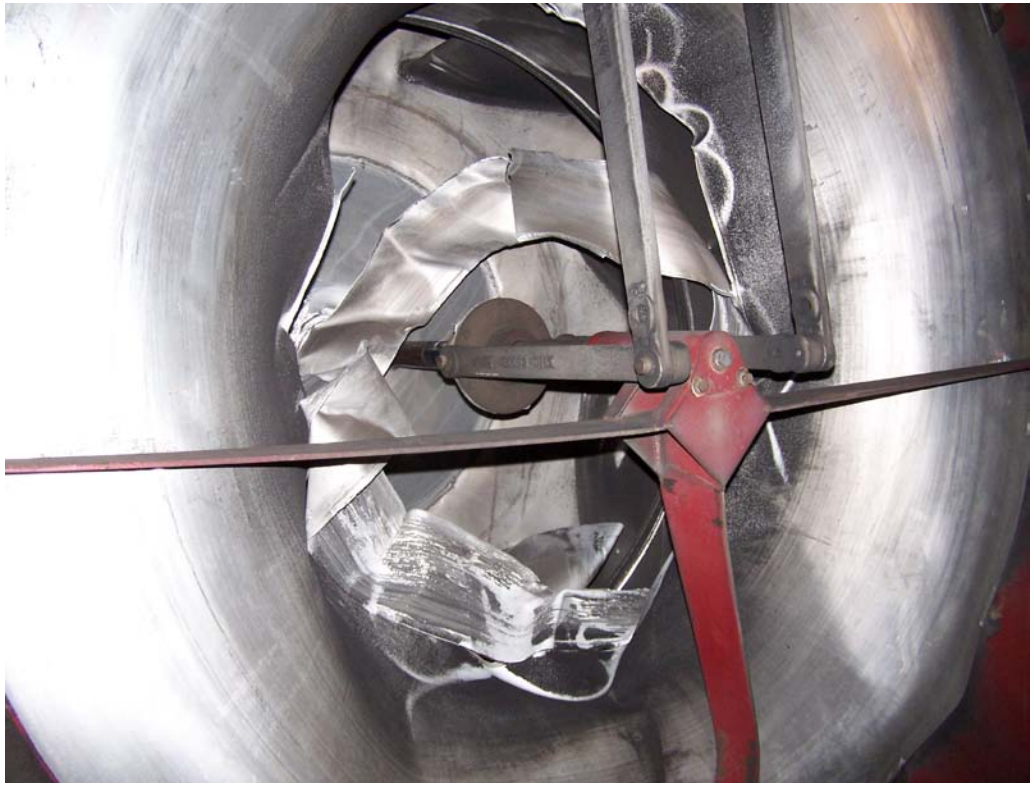
# So, I’m going to talk about the exciting ones today.

# Energy Conservation Project That Became a Disaster

- So you don’t make the same mistake!

# The Disaster that became an Energy Conservation Project

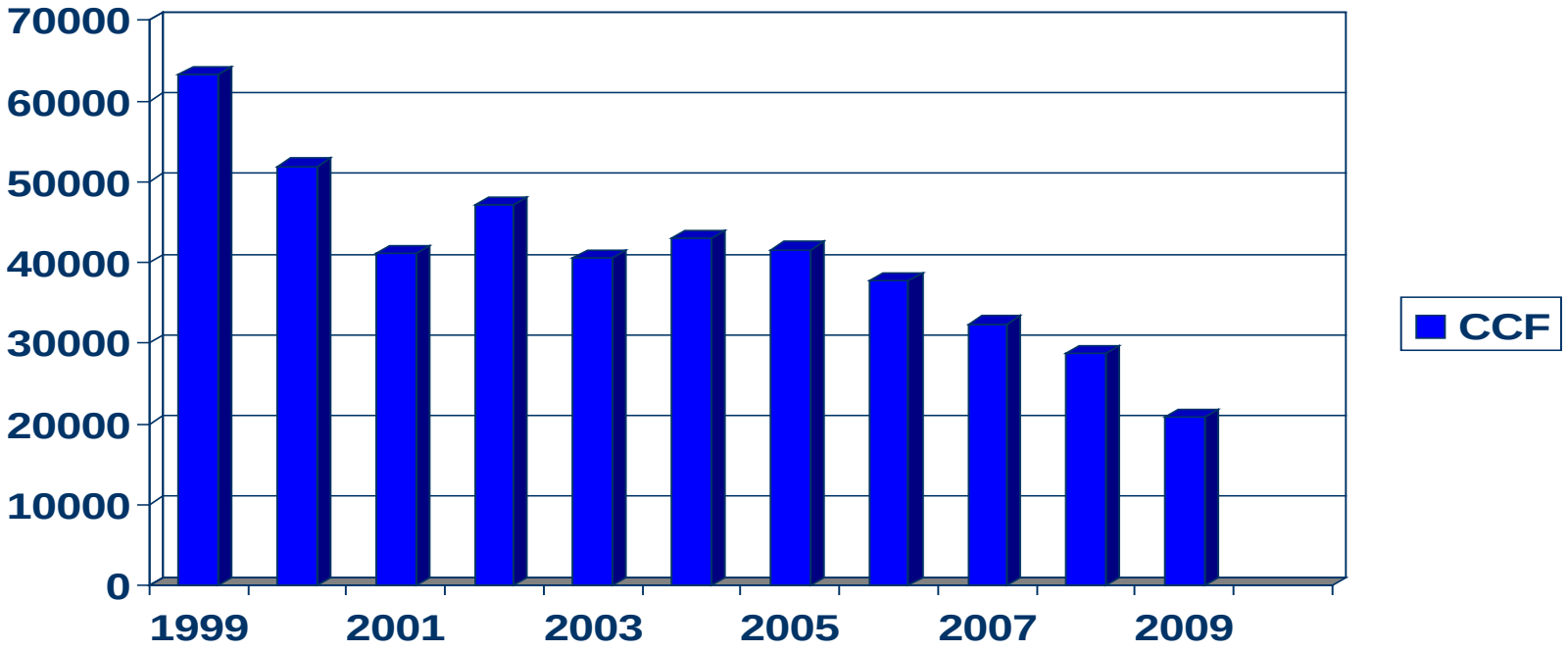
- So you are prepared…



# How We Used, Reused, Reduced the same Water Stream 9 times!

**Phase 1 & 2 Water use reduced 67%**

**32 million gallon annual savings**

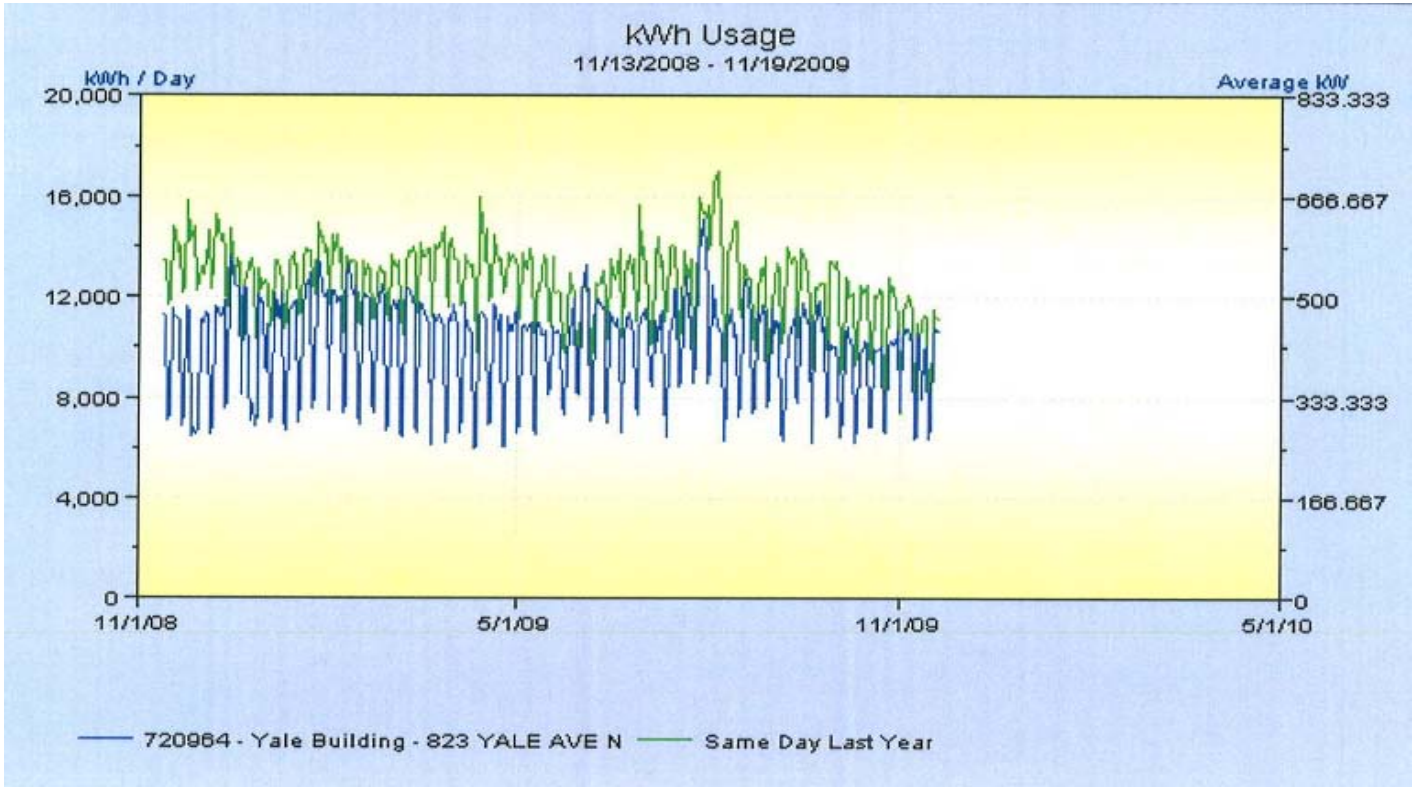


# Our Top Three Projects

- It’s all about Air; the savings are real and they are Stupendous!!!

# Operational Opportunities

- Smart meters, Smart systems, Smart people = Big Savings



# Our Energy Advantage

# But First…

- Let Me Tell you about
  - Fred Hutchinson Cancer Research Center
  - Our Energy Philosophy

# Fred Hutchinson Cancer Research Center

- World Famous Cancer Research Center
- 13 Buildings (1 LEED)
  - 1.4 Million Square feet
  - 3,000 employees
    - 3 Noble prize winners
- Sunny shores of South Lake Union

# Proponent of Interstitial Space…

# Energy Advantage with Interstitial

- Straight ducts (less static pressure drop)
- Straight piping (less turbulence)

# Flexibility, Reliability, Sustainability, Innovation, Savings

# Energy Philosophy

- Deliver the Right Amount of Energy
- Deliver the Energy Just in Time
- Deliver the Energy as Efficiently as Possible

# Energy Conservation Project That Became a Disaster

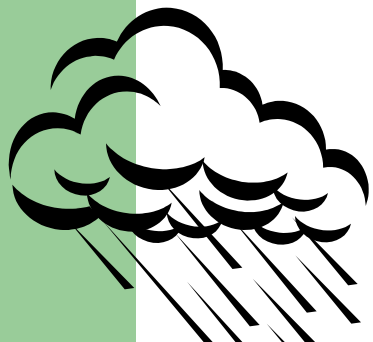
- It happened in our Vivarium
- And it may be happening in yours, right now

# Day the trans-genic mice stopped breeding…

- It was pretty scary
  - why do you think they call them trans-genic?

# It started on dark rainy day in Seattle…

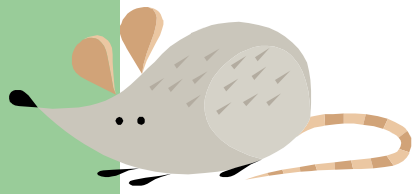
- But most days are dark and rainy in Seattle…
- What made this one different was one of our top researchers call me up and said;
  - "Bob, my mice aren't breeding as they should and I think your facility is causing the problem."
    - Then he mumbled something about ultra sonic noise…

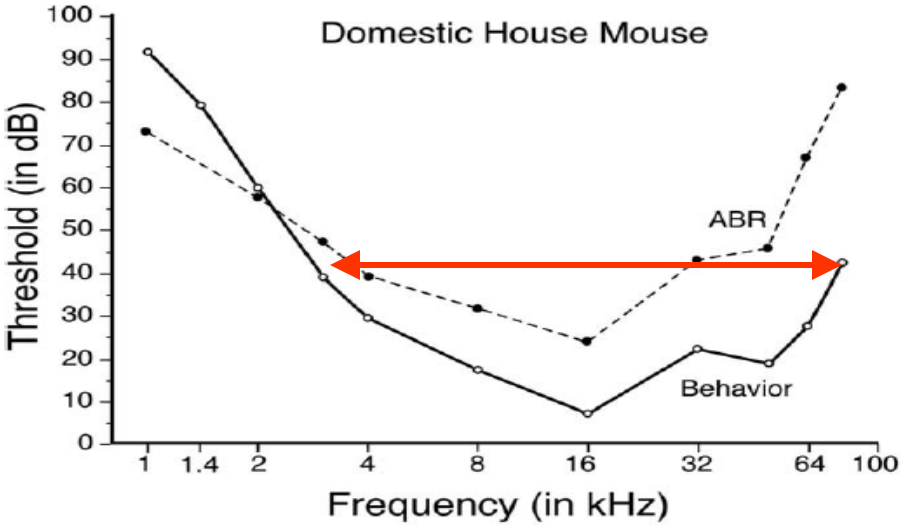


# Background

- Scientists love their transgenic mice more than their Facility Manager…

- Mice hear in a different range than we do
  - Humans up to 20kHz, mice 90kHz





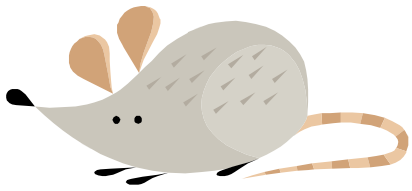
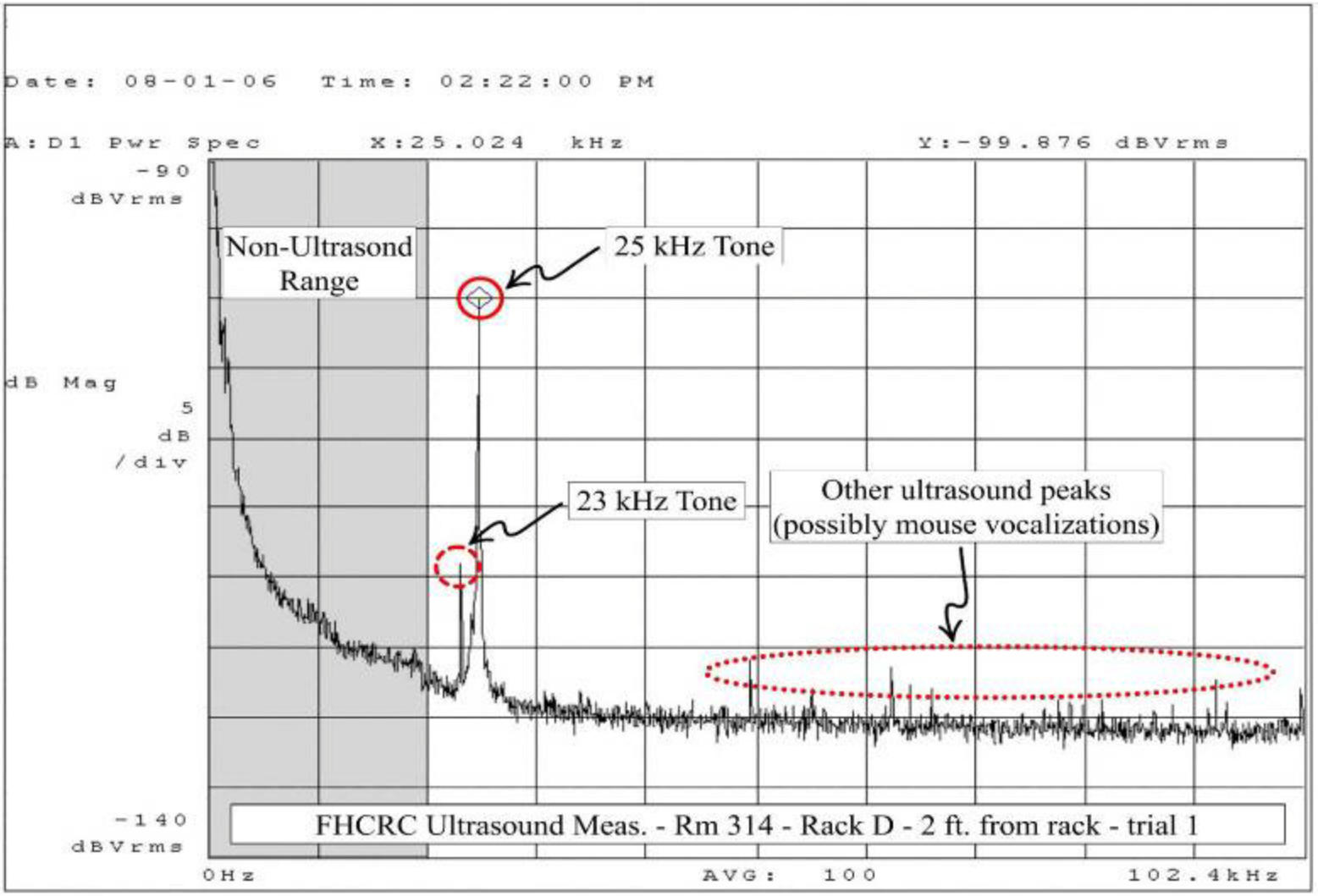



**Figure 19.5** Behavioral audiogram and auditory brainstem response (ABR) thresholds of C57BL/6J x C3HeB/FeJ mice. Note that the ABR overestimates low-frequency sensitivity and underestimates high-frequency sensitivity.

# We hired an Expert and found out we did in fact have ultra sonic noise …



# But What Was the Source?

- Electronic Ballast?, Transformers, Di Water System, UPS's, VFD's, Radio's, Fan motors?, piping, Controls, Motor Control Center? Motion Detectors? Lighting Controls? Smoke Detectors, Cage fan's, Humidifiers, VAV boxes?
- There were a lot of things on the list and we were prepared to spend a lot of time trying to find the source.

# Quickly Found the Culprit

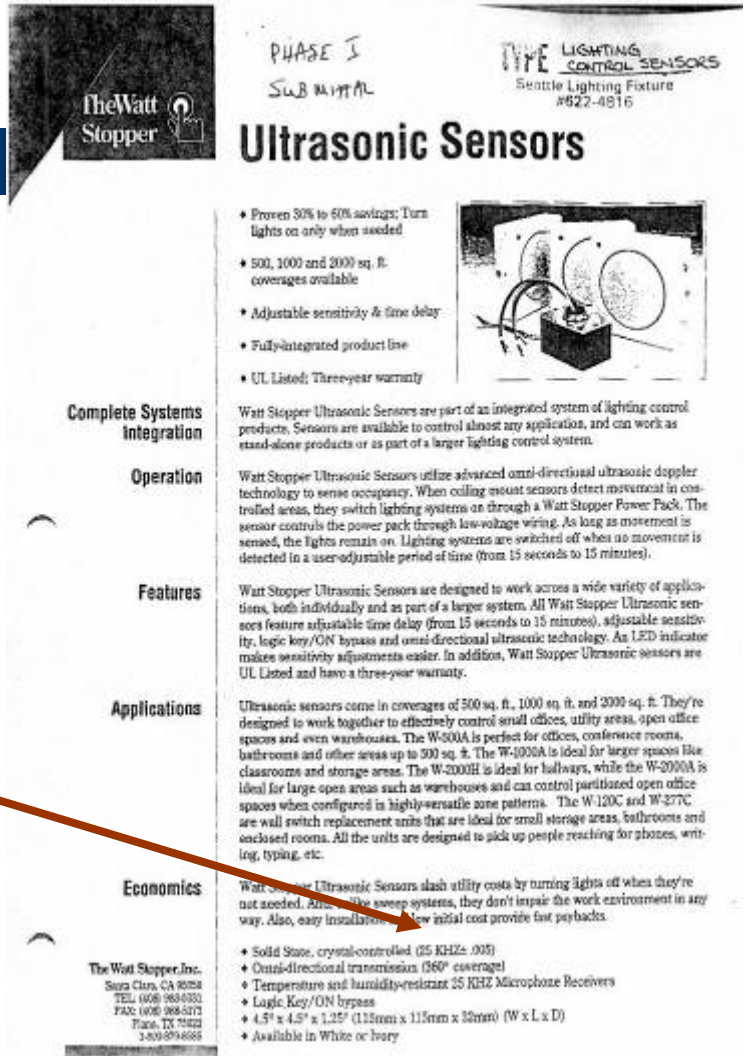
- Lighting Control System, motion sensors
  - Dominant ultrasound source from multiple motion sensors in corridors, even distant detectors.

# Funny thing is we should have known…

- It was right here

  on the submittal:

  Solid State, crystal controlled (25 KHZ)



PHASE I
SUBMITTAL

TYPE LIGHTING CONTROL SENSORS
Seattle Lighting Fixture #622-4816

The Watt Stopper

## Ultrasonic Sensors

- Proven 30% to 60% savings; Turn lights on only when needed
- 500, 1000 and 2000 sq. ft. coverages available
- Adjustable sensitivity & time delay
- Fully-integrated product line
- UL Listed; Three-year warranty

**Complete Systems Integration**

Watt Stopper Ultrasonic Sensors are part of an integrated system of lighting control products. Sensors are available to control almost any application, and can work as stand-alone products or as part of a larger lighting control system.

**Operation**

Watt Stopper Ultrasonic Sensors utilize advanced omni-directional ultrasonic doppler technology to sense occupancy. When ceiling mount sensors detect movement in controlled areas, they switch lighting systems on through a Watt Stopper Power Pack. The sensor controls the power pack through low-voltage wiring. As long as movement is sensed, the lights remain on. Lighting systems are switched off when no movement is detected in a user-adjustable period of time (from 15 seconds to 15 minutes).

**Features**

Watt Stopper Ultrasonic Sensors are designed to work across a wide variety of applications, both individually and as part of a larger system. All Watt Stopper Ultrasonic sensors feature adjustable time delay (from 15 seconds to 15 minutes), adjustable sensitivity, logic key/ON bypass and omni-directional ultrasonic technology. An LED indicator makes sensitivity adjustments easier. In addition, Watt Stopper Ultrasonic sensors are UL Listed and have a three-year warranty.

**Applications**

Ultrasonic sensors come in coverages of 500 sq. ft., 1000 sq. ft. and 2000 sq. ft. They're designed to work together to effectively control small offices, utility areas, open office spaces and even warehouses. The W-500A is perfect for offices, conference rooms, bathrooms and other areas up to 500 sq. ft. The W-1000A is ideal for larger spaces like classrooms and storage areas. The W-2000H is ideal for hallways, while the W-2000A is ideal for large open areas such as warehouses and can control partitioned open office spaces when configured in highly-versatile zone patterns. The W-120C and W-277C are wall switch replacement units that are ideal for small storage areas, bathrooms and enclosed rooms. All the units are designed to pick up people reaching for phones, writing, typing, etc.

**Economics**

Watt Stopper Ultrasonic Sensors slash utility costs by turning lights off when they're not needed. Unlike sweep systems, they don't impair the work environment in any way. Also, easy installation and low initial cost provide fast paybacks.

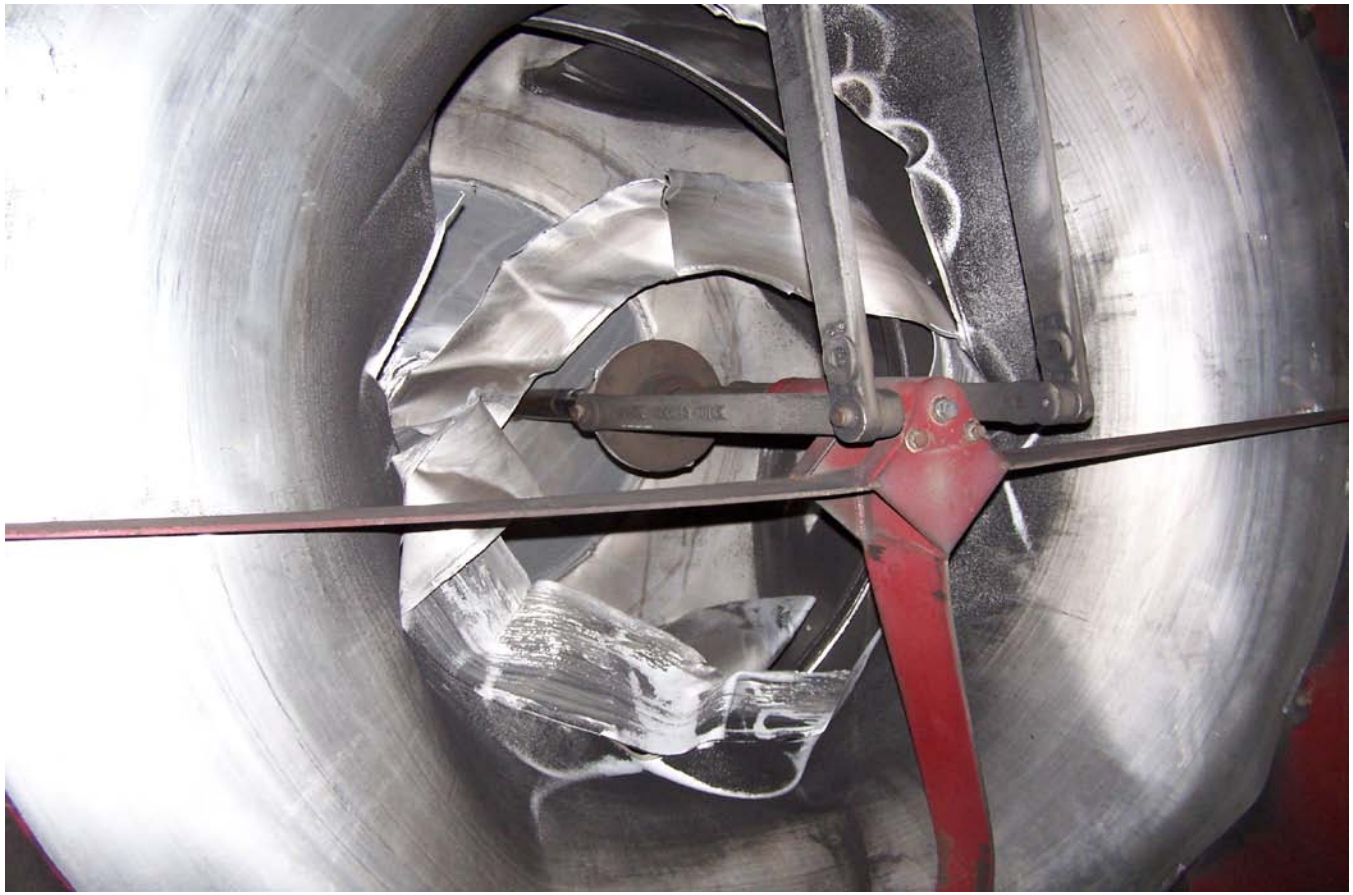
- Solid State, crystal-controlled (25 KHZ± .005)
- Omni-directional transmission (360° coverage)
- Temperature and humidity-resistant 25 KHZ Microphone Receivers
- Logic Key/ON bypass
- 4.5" x 4.5" x 1.25" (115mm x 115mm x 32mm) (W x L x D)
- Available in White or Ivory

The Watt Stopper, Inc.
Santa Clara, CA 95054
TEL: (408) 988-5331
FAX: (408) 988-5373
Plano, TX 75023
1-800-879-8585

# The Problem is that we were thinking in our spectrum…

- Failing to realize the mice operate in another.

# The Disaster that Became an Energy Conservation Project



# Again in the Vivarium…

- Main Air Handler (68,000 CFM) was a lemon
  - Installed in 1992
  - Two 150 HP plug fans (primary/standby)
- When you have a lemon, make lemonade
  - We developed a 50 year plan
    - Great Plan over 20 recommendations
- Didn’t have the guts to do it
  - Couldn’t find a big enough Temporary Air Handler
    - Biggest we could find 40,000 CFM

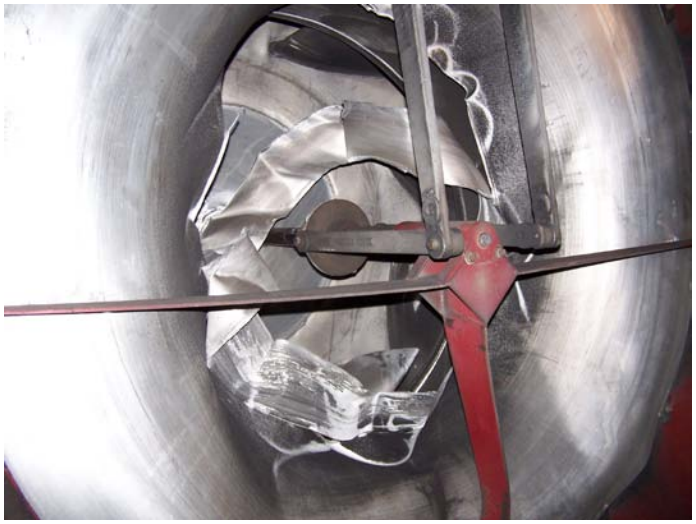
# But then Disaster Struck and we were Forced into Action

- Luckily we had a plan.
- And a redundant fan in the air handler.

Fan destroyed

150 HP Motor Broke off mounting blocks. Bad Day at Fred Hutch!

Econo Disk sucked into fan



# We implemented our Contingency Plan…

# Set the Wheels in motion!

# And 31 Days later the Damaged Fan was replaced.

# 3.5 Months Later

- We improved the system in 20 ways!
- We literally snatched victory from the jaws of defeat!

# Better Today, Than Yesterday

- No Econo Cone (known bad performer)
- No need to fix broken Actuator
- No Actuators (can't be repaired or replaced)
- No linkage nor shocks to maintain
- VSD on motor, easier starts
- VSD on motor, more energy efficient
- No capacitor bank to worry about (problematic in past)
- Able to by-pass MCC in an emergency and wire directly to VSD
- energy Efficient Fan
- Rebate from SCL for energy efficient fan and VSD on Motor
- more air capacity than old fan
- Filter bank in new location (another rebate from SCL)
- New Humidifier (another rebate from SCL)

- Replaced temperature, pressure and humidity Controls with new
- improved lighting
- New duct reduced static pressure ( another rebate from SCL)
- Drain pan under humidifier
- New Transducers
- Electrical outlets in the AH
- Emergency Interconnect

# Replace Inlet Volume Control with VSD's

- $4,880 per year electrical savings
- Eliminated old technology cone control
- Eliminated unsupported actuators
- Soft start for 150 HP motors
- Eliminated problematic capacitor bank

# High Efficiency Fan Wheels

- $9,010 per year electrical cost saving
- Replaced old Pace with current wheel manufacturer (Twin City)
- Efficient wheel design
- Increased future volume with new design

# Filter Bank Relocation

- Upstream of humidifier
- Allowed space for new humidifier
- Eliminated wet filters and mold issues
- $470 per year fan energy saving

# New *Ultra-Sorb* Humidifier

- 17 inches absorption vs. 15 feet
- 15 psig steam vs. 60 psig
- Flooding on floor eliminated
- Improved humidification control
- Steam traps & control valves now outside AHU

# New *Ultra-Sorb* Humidifier

- Vertical tubes improve condensate capture
- Tubes 3” OC vs. 18”
- Tubes hot only when humidifying
- 90% of booster humidifiers at rooms eliminated

# Improved Turbulent B2 Discharge

- Consultant report design saved 0.75” SP cost $60,000 (estimate), 3 week outage
- In house design saved 0.36” SP at $12,000 cost (actual), no additional outage
- With $2,100 cost saving and $8,000 utility incentive: 1.8 year payback

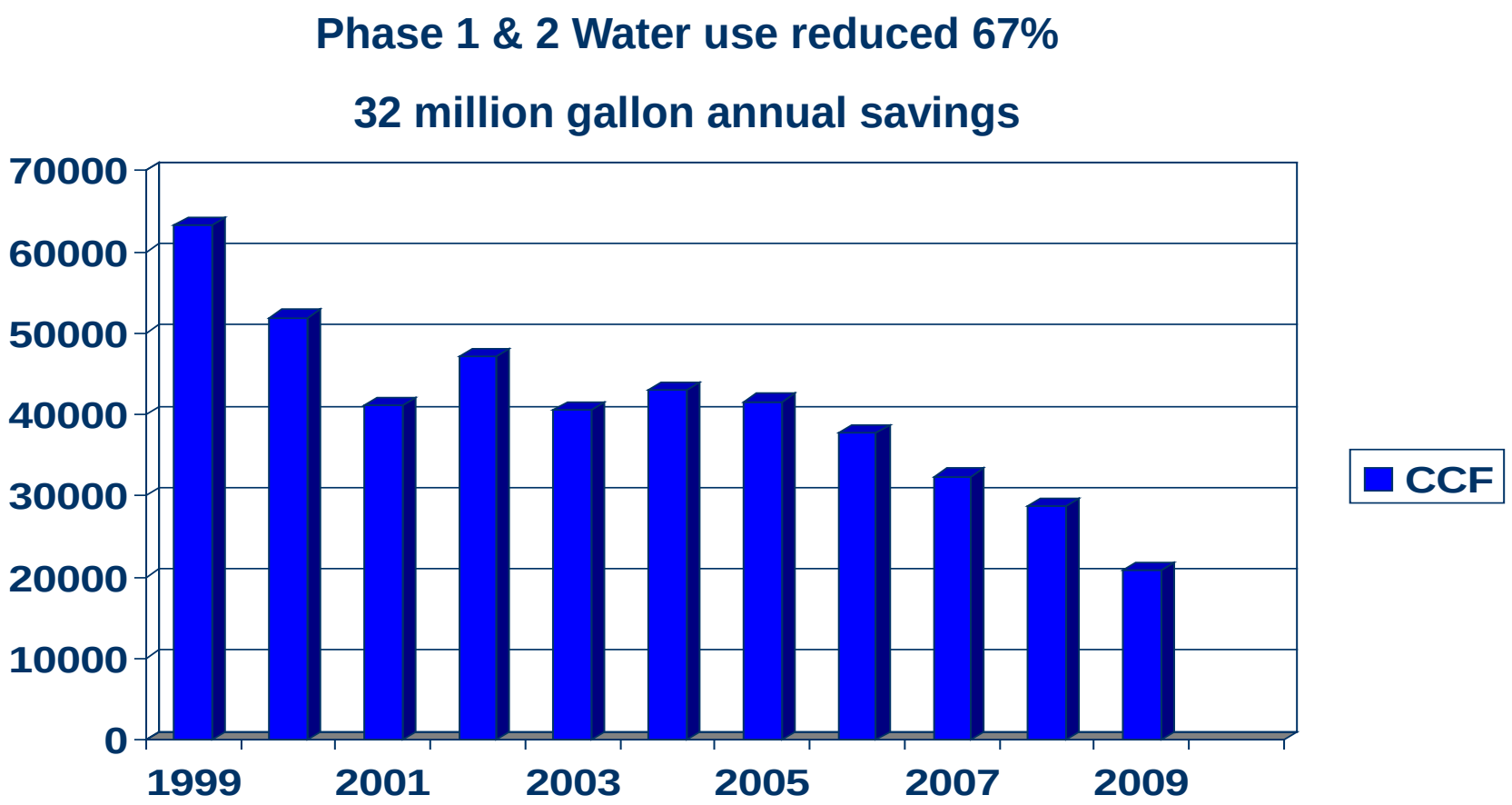
# Painful as it was initially, we made the best of a bad situation.

- Implemented 6 conservation initiatives
- Solved 8 reliability issues
- Eliminated 2 parts availability issues
- Incorporated 7 maintenance enhancements

# It wasn’t as expensive as you might think ($200,000)

- We got 75,000 dollars in rebates from local Utilities
  - Plus we’ll save 17,000 per year
- We got 77,000 dollars from the Insurance company
- That paid for 75% of the project
- In two years, with energy savings, we got ourselves a new improved AHU, For Free

# How We Used, Reused, Reduced the same Water Stream 9 times!!!



# This Time it’s not in the Vivarium!

- It’s the Water Stream Serving our Glass Wash facility (over 2 million pieces per year)
  - Use 1

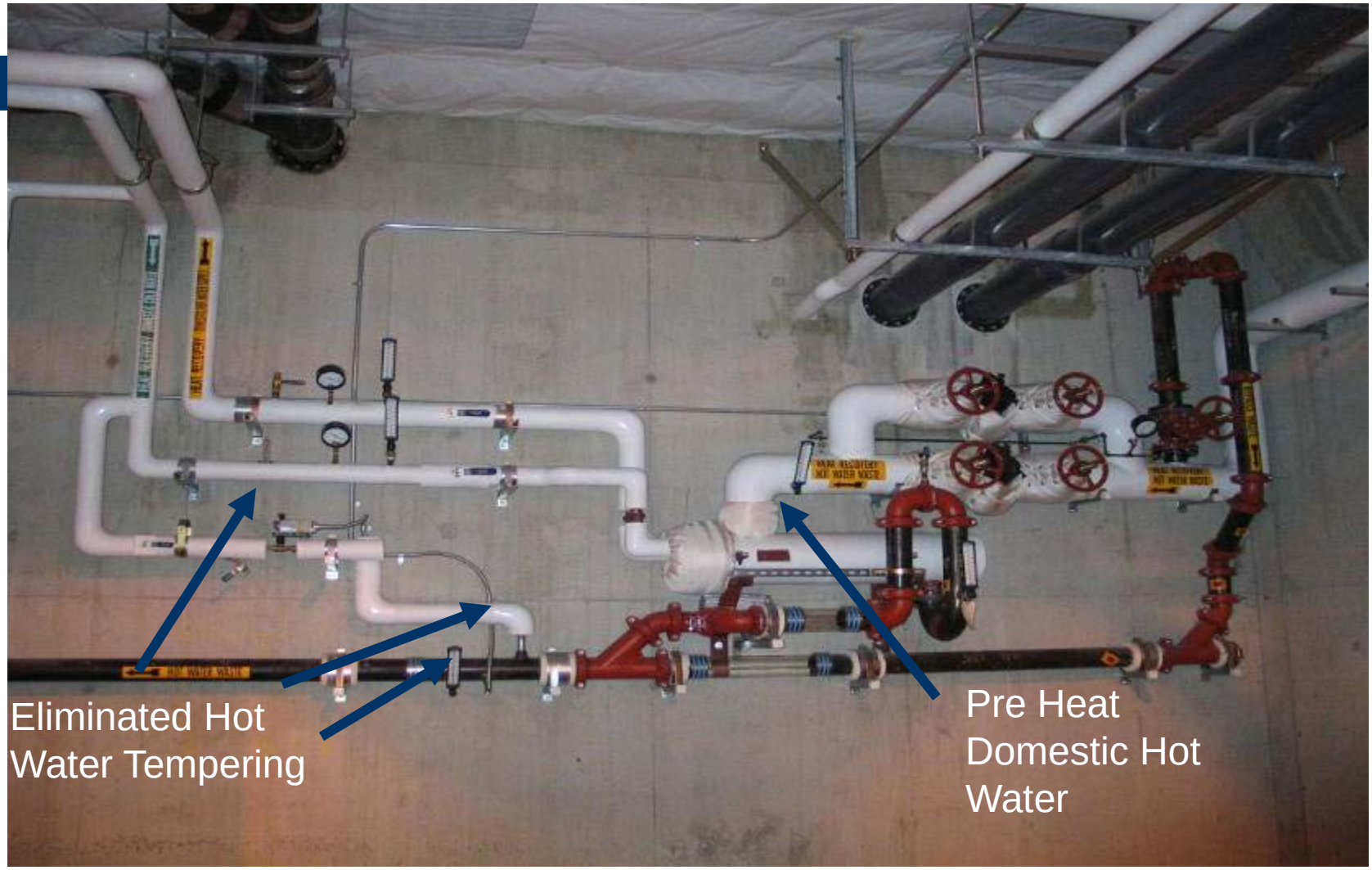
# 2. Water Efficient Glass Washers:


# 3. Conductivity Monitor- Reducing DI Rinse Cycles


4. Less Waste Water in the DI production

# Washer Heat Recovery, (5) Pre heat domestic hot water

# 6. Washer Heat Recovery, eliminated hot water tempering



# 7. Water Reuse For Cage Pre-Wash

# 8. Cage Pre Wash, Wasn't working right

Consuming an extra 1100 CCF per year

(twice as much as it should)

# 9. (future) Heat Pump

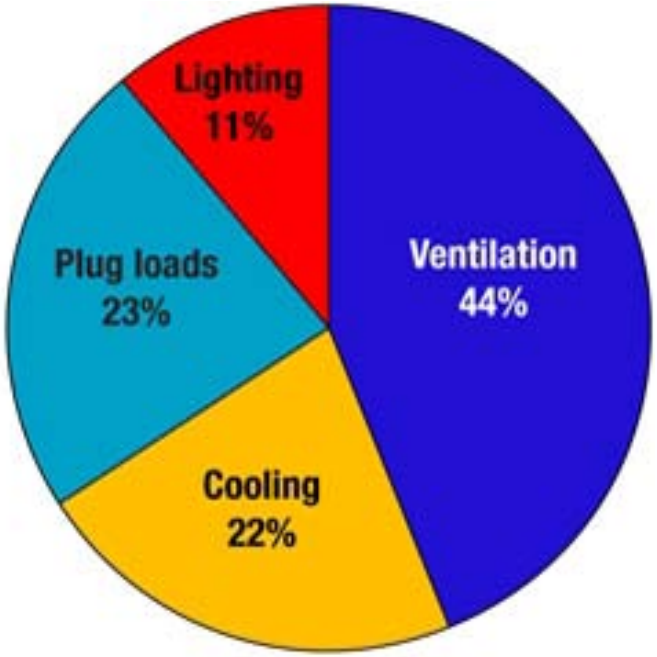
Take advantage of the 100 degree water

# Over 5,000,000 gallons per year saved($83,345)

- Efficient Glass Washers
  - 420 CCF water savings ($4090)
    - $243 K cost
- Glass Washer Conductivity
  - 241 CCF water savings ($2350)
    - $64 K cost
- Less DI Water Waste
  - 120 CCF water savings ($1175)
- Heat Recovery from Glass wash
  - 4088 CCF water savings ($40,880)
  - 13,000 Therms gas savings ($13,650)
    - $53 K cost ($30 K rebate)
- Water reuse at Garb-el
  - 1100 CCF ($11,000)
    - $47K cost ($26 K rebate)
- Excessive water flow at Garb-el
  - 1020 CCF ($10,200)
- Heat Pump (TBD)

# Our Top Three Projects

- **Its all about Air; The savings are real and They're Stupendous!!**



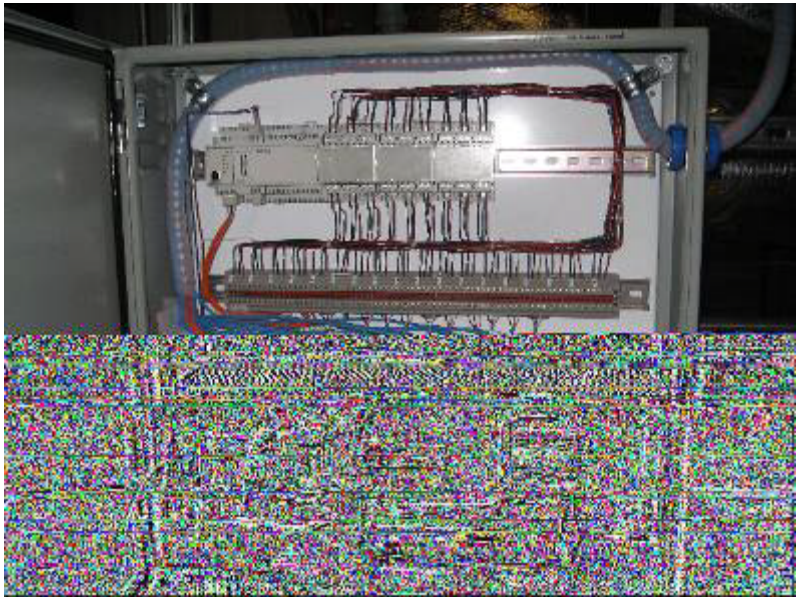

**•Fig. 1. Annual electricity use in Louis Stokes Laboratory, National Institutes of Health, Bethesda, Md.**

# Top 3- $493,340 Annual Savings

- Air
  - Reduce from 10 to 6 AC per hour In Phase 1 Labs
    - 25-15 in Vivarium
    - Savings 922,000 kWhr, 76,000 Therms,
    - $136,000 annually, Cost to Implement, $3,000
- Air
  - Reduce from 6 to 3 AC per hour after hours
    - Savings 961,200 kWhr, 178,300 Therms,
    - $245,000 annually, Cost to Implement ($538,120),
      - $291,400 rebate from Local Utilities
- Air
  - VVVP (Variable Volume Variable Pressure)
    - Savings 1,873,000 kWhr
    - $112,340 annually, Cost to Implement ($531,200)
      - $444,000 rebate from local Utilities

# Air Change Rate Setback (10-6)

# Night Setback (6 AC – 3 AC)

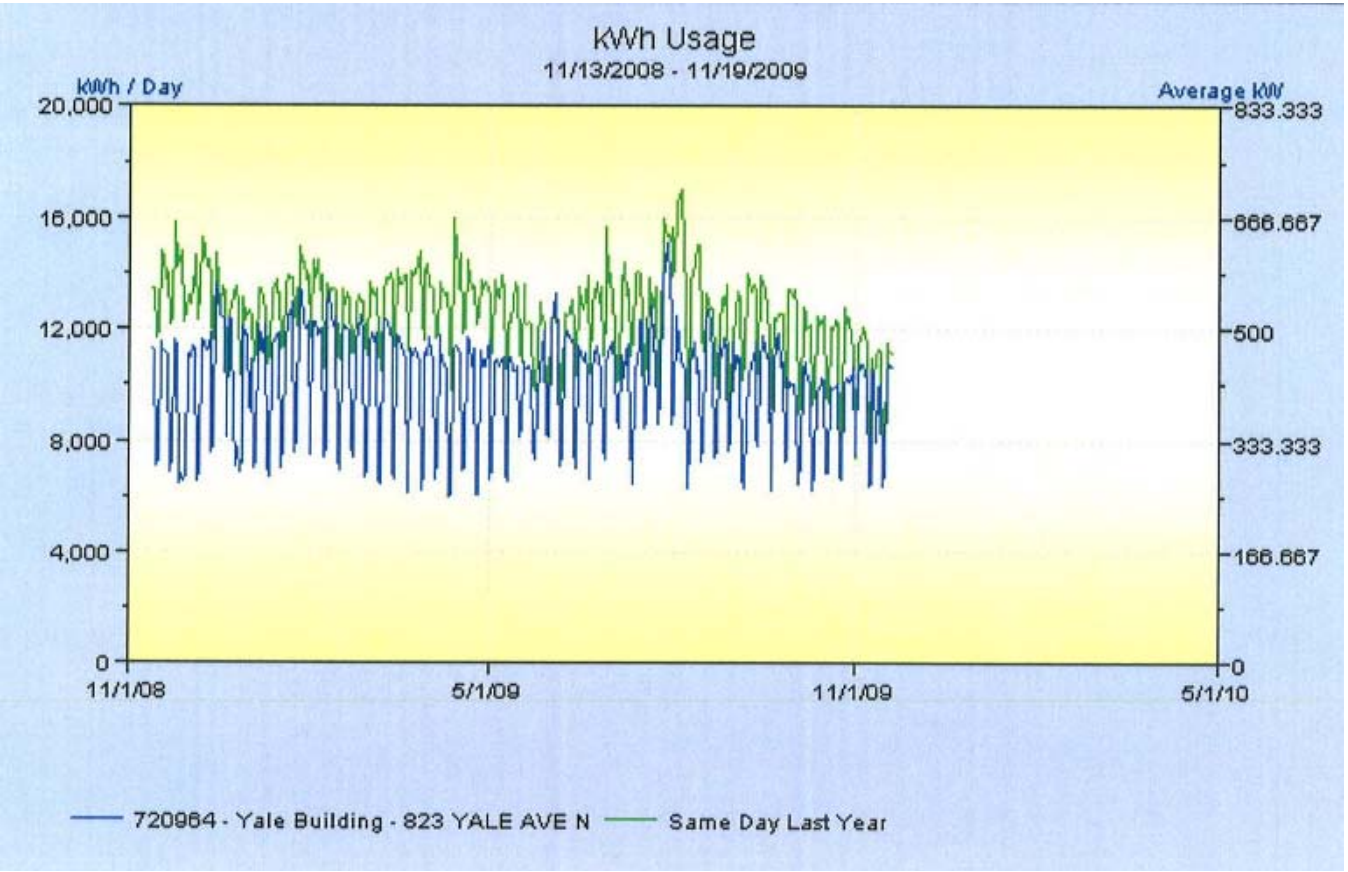


# Variable Volume, Variable Pressure

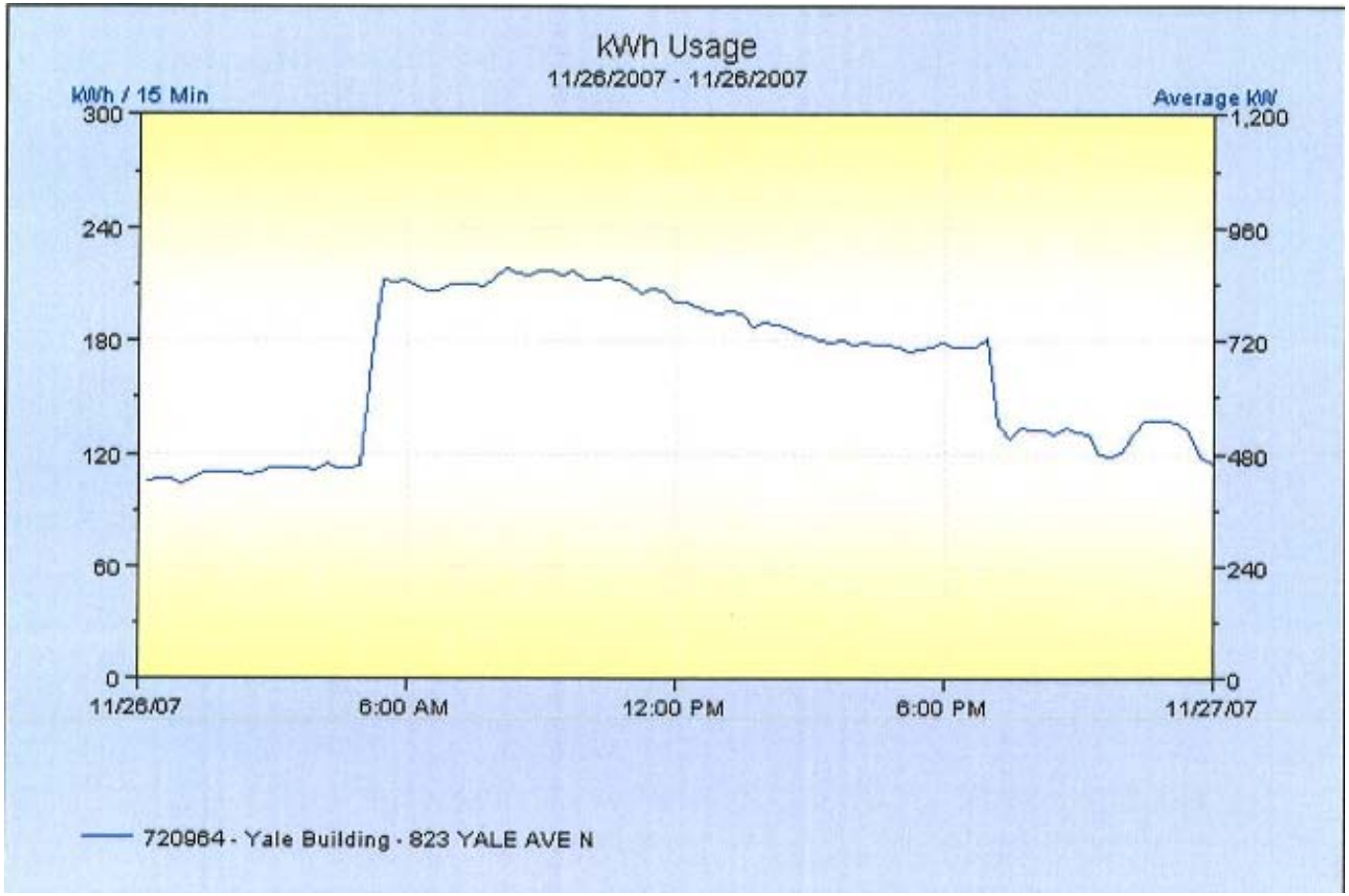
# Top 3- $493,340 Annual Savings

- Air
  - Reduce from 10 to 6 AC per hour In Phase 1 Labs
    - 25-15 in Vivarium
    - Savings 922,000 kWhr, 76,000 Therms,
    - $136,000 annually, Cost to Implement, $3,000
- Air
  - Reduce from 6 to 3 AC per hour after hours
    - Savings 961,200 kWhr, 178,300 Therms,
    - $245,000 annually, Cost to Implement ($538,120),
      - $291,400 rebate from Local Utilities
- Air
  - VVVP (Variable Volume Variable Pressure)
    - Savings 1,873,000 kWhr
    - $112,340 annually, Cost to Implement ($531,200)
      - $444,000 rebate from local Utilities

# Smart Meters, Smart Systems, Smart People = 20% reduction



# Seattle, Meter Watch



# Elevator traffic Survey

IMS Intelligent Management System — C bldg 6,7

October 30,2008 11:01:41PM

UP/DN CALL SUMMARY

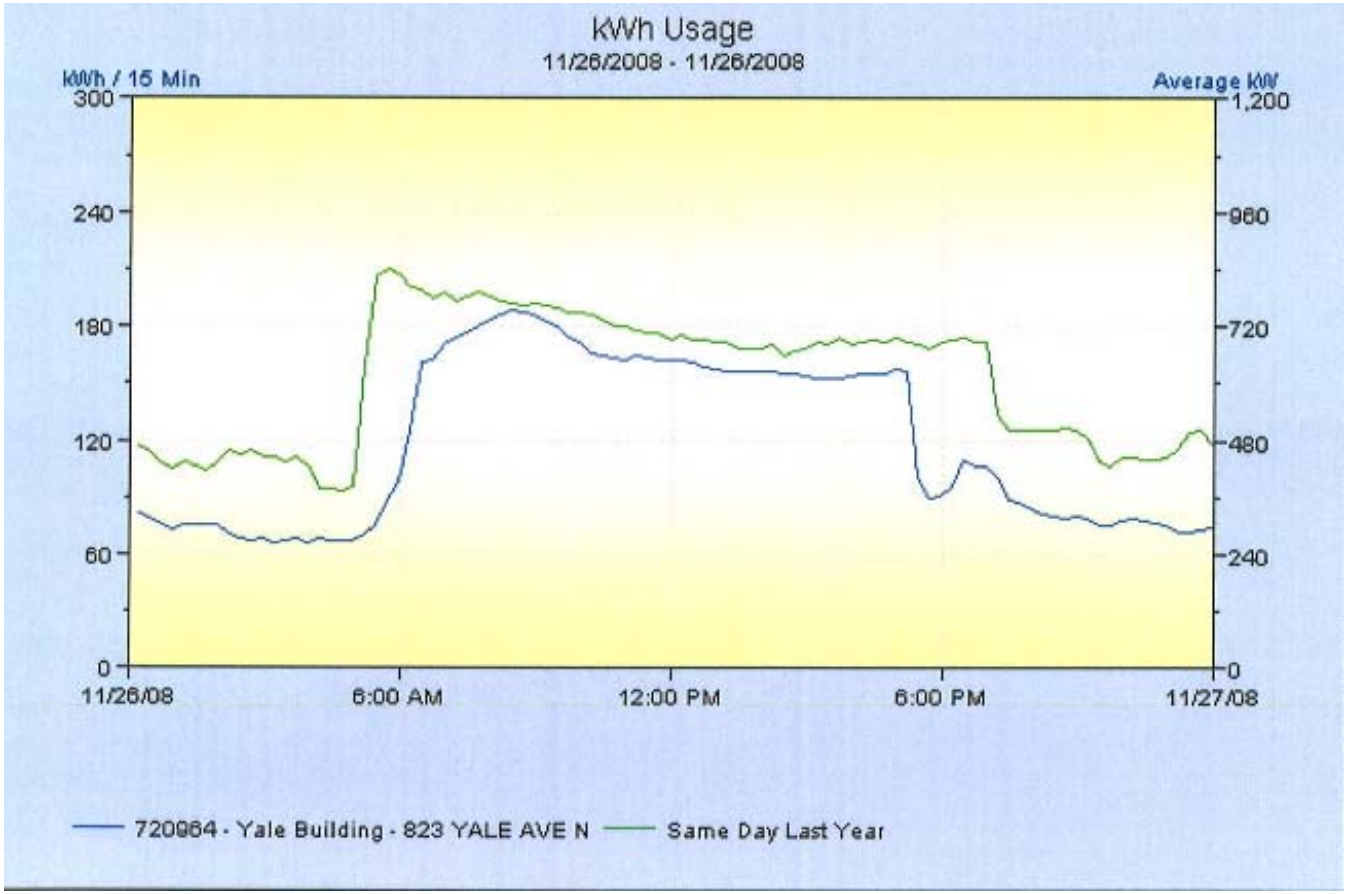
15 MINUTE INTERVALS

Start Time 10/30/2008 3:48:30PM

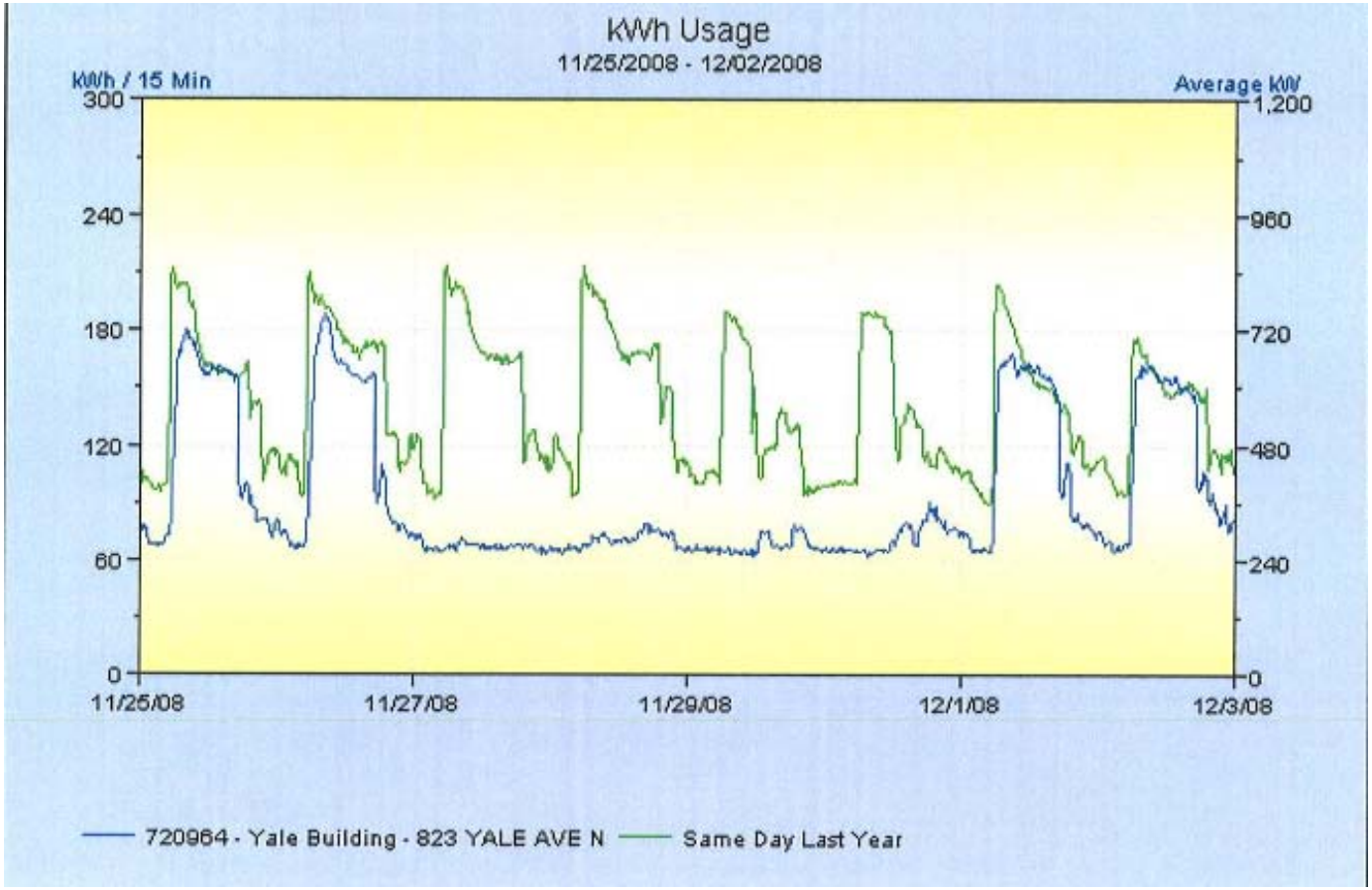
Stop Time 10/30/2008 9:03:30PM

| | | Time In Seconds | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Time Slot | < 15 | < 30 | < 45 | < 60 | < 120 | 120 + | Longest | Avg Wait | Total Calls |
| Dn | 10/30/2008 3:48:30PM | 4 | 0 | 0 | 0 | 0 | 0 | 10 | 6.8 | 4 |
| Up | 10/30/2008 3:48:30PM | 1 | 1 | 0 | 0 | 0 | 0 | 21 | 10.5 | 2 |
| Dn | 10/30/2008 4:03:30PM | 1 | 1 | 0 | 0 | 0 | 0 | 18 | 12.0 | 2 |
| Up | 10/30/2008 4:03:30PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 1 |
| Dn | 10/30/2008 4:18:30PM | 2 | 2 | 0 | 0 | 0 | 0 | 24 | 11.5 | 4 |
| Up | 10/30/2008 4:18:30PM | 3 | 0 | 0 | 0 | 0 | 0 | 5 | 1.7 | 3 |
| Dn | 10/30/2008 4:33:30PM | 3 | 1 | 1 | 0 | 0 | 0 | 34 | 15.6 | 5 |
| Up | 10/30/2008 4:33:30PM | 2 | 0 | 0 | 0 | 0 | 0 | 12 | 8.5 | 2 |
| Dn | 10/30/2008 4:48:30PM | 4 | 5 | 0 | 1 | 2 | 0 | 69 | 25.6 | 12 |
| Up | 10/30/2008 4:48:30PM | 2 | 1 | 0 | 0 | 2 | 0 | 105 | 43.6 | 5 |
| Dn | 10/30/2008 5:03:30PM | 5 | 3 | 1 | 0 | 0 | 0 | 33 | 15.4 | 9 |
| Up | 10/30/2008 5:03:30PM | 1 | 0 | 0 | 1 | 0 | 0 | 47 | 23.5 | 2 |
| Dn | 10/30/2008 5:18:30PM | 3 | 2 | 0 | 0 | 0 | 0 | 21 | 9.4 | 5 |
| Up | 10/30/2008 5:18:30PM | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 1 |
| Dn | 10/30/2008 5:33:30PM | 3 | 4 | 0 | 0 | 1 | 0 | 60 | 19.4 | 8 |
| Up | 10/30/2008 5:33:30PM | 3 | 0 | 0 | 0 | 0 | 0 | 13 | 6.7 | 3 |
| Dn | 10/30/2008 5:48:30PM | 0 | 2 | 0 | 0 | 0 | 0 | 16 | 16.0 | 2 |
| Up | 10/30/2008 5:48:30PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Dn | 10/30/2008 6:03:30PM | 2 | 1 | 1 | 0 | 0 | 0 | 39 | 18.0 | 4 |
| Up | 10/30/2008 6:03:30PM | 1 | 0 | 1 | 0 | 0 | 0 | 32 | 19.0 | 2 |
| Dn | 10/30/2008 6:18:30PM | 0 | 1 | 0 | 0 | 0 | 0 | 15 | 15.0 | 1 |
| Up | 10/30/2008 6:18:30PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Dn | 10/30/2008 6:33:30PM | 1 | 1 | 0 | 0 | 0 | 0 | 15 | 7.5 | 2 |
| Up | 10/30/2008 6:33:30PM | 2 | 0 | 0 | 0 | 0 | 0 | 8 | 7.5 | 2 |
| Dn | 10/30/2008 6:48:30PM | 1 | 0 | 0 | 0 | 0 | 0 | 10 | 10.0 | 1 |
| Up | 10/30/2008 6:48:30PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Dn | 10/30/2008 7:03:30PM | 3 | 1 | 0 | 0 | 0 | 0 | 21 | 10.0 | 4 |
| Up | 10/30/2008 7:03:30PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Dn | 10/30/2008 7:18:30PM | 0 | 1 | 0 | 0 | 0 | 0 | 16 | 16.0 | 1 |
| Up | 10/30/2008 7:18:30PM | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 6.0 | 1 |
| Dn | 10/30/2008 7:33:30PM | 2 | 1 | 0 | 0 | 0 | 0 | 16 | 10.7 | 3 |
| Up | 10/30/2008 7:33:30PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Dn | 10/30/2008 7:48:30PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Up | 10/30/2008 7:48:30PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Dn | 10/30/2008 8:03:30PM | 0 | 1 | 0 | 0 | 0 | 0 | 16 | 16.0 | 1 |
| Up | 10/30/2008 8:03:30PM | 0 | 0 | 0 | 1 | 0 | 0 | 54 | 54.0 | 1 |
| Dn | 10/30/2008 8:18:30PM | 3 | 0 | 0 | 0 | 0 | 0 | 11 | 5.7 | 3 |
| Up | 10/30/2008 8:18:30PM | 1 | 0 | 0 | 0 | 0 | 0 | 6 | 6.0 | 1 |
| Dn | 10/30/2008 8:33:30PM | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1.0 | 1 |
| Up | 10/30/2008 8:33:30PM | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 |
| Up | 10/30/2008 8:48:30PM | 2 | 0 | 0 | 0 | 0 | 0 | 6 | 5.5 | 2 |
| Dn | 10/30/2008 8:48:30PM | 3 | 1 | 0 | 0 | 0 | 0 | 21 | 9.3 | 4 |

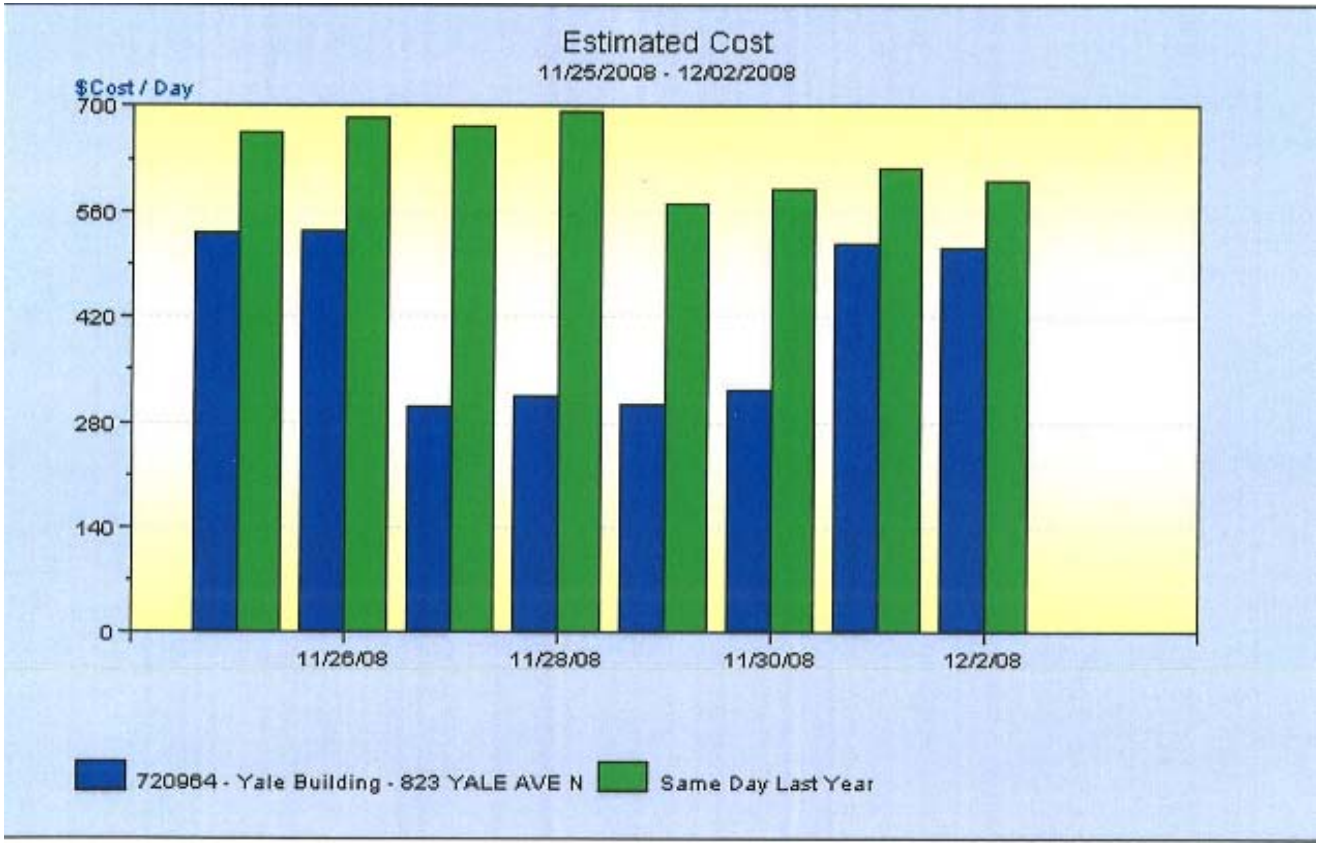
# We put them together…



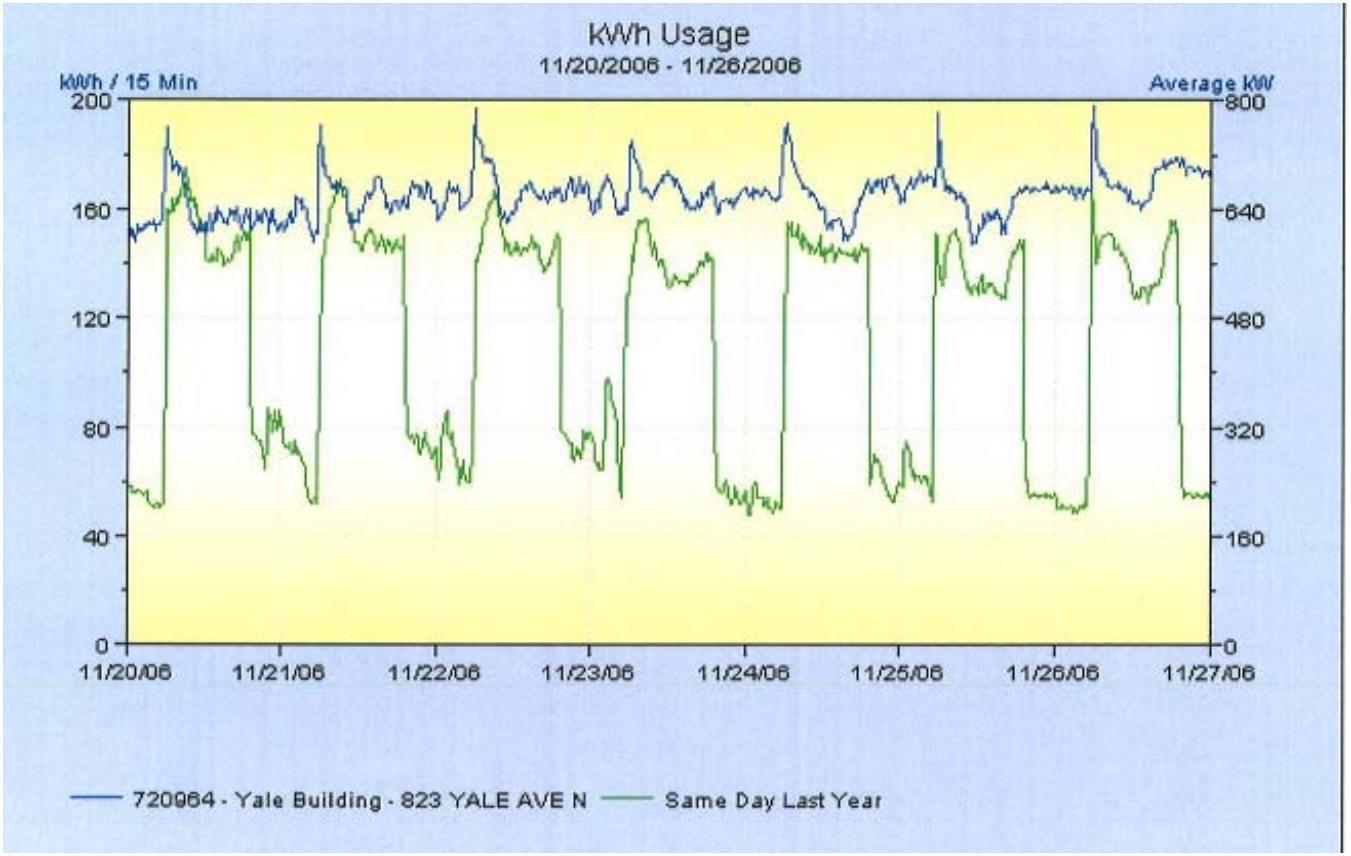
# We looked at Weekends & Holidays



# We Save a Lot of money 06-$268,000 to 09-$187,000



# Helps detects problems also…



# Our Energy Advantage

# We Live in Seattle (temperate climate)

# When you are using Large Volumes of outside air

## GMP Facilities…  54 AC/hr….100% outside air


# A Great Team!!!

# The Three Tradeline Takeaways

- Question your design parameters (especially on the air side)
  - The original designers weren't omnipotent
  - We are all a lot smarter than we were 10 years ago
- Don't let an Energy Conservation Project become a disaster
  - But do turn disasters or potential disasters into Energy Conservation Projects
- Water can be used, reused and reduced many times
  - And there is a lot of money to be made there

# Move to Seattle…

## The combination of climate and rates will cut your Energy Bills 75%