Why You Need to Meter Your Facility

by

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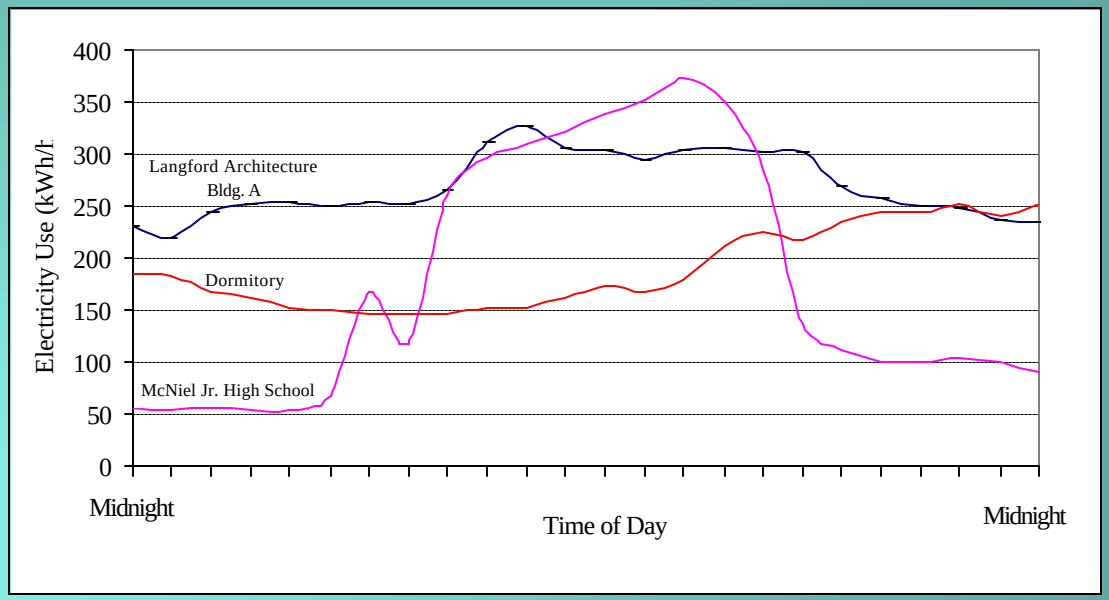
Energy Systems Laboratory

- Primary metering and monitoring subcontractor for Texas LoanSTAR Program
- Doing M&V work for more than 13 years
- Have metered over 500 buildings (individual and complexes)
- Performed Continuous Commissioning or over 150 buildings to date

Why Meter?

- Determine how the building is using energy
- Baseline energy modeling
- Allocate energy among energy-using departments
- Revenue billing
- Identify O&M measures
- Determine if retrofits are saving what they were predicted to save
- Provide data for a comprehensive commissioning program
- Electric utility deregulation

Why Meter?


400
350
300
250
200
150
100
50
0
Electricity Use (kWh/h
Langford Architecture
Bldg. A
Dormitory
McNiel Jr. High School
Midnight
Time of Day
Midnight

Baseline Energy Modeling

- Development of models of baseline energy consumption using utility bills or monitored data
- Development includes
  - normalizing for changes in weather
  - correcting for conditioned area changes
  - normalizing for load growth/creep

Allocate Energy Among Energy-Using Departments

Example: Reed Arena on Texas A&M campus

- **large 12,500 seat arena**
- **event driven (40-50 events/year)**
- **receives chilled water and hot water from central utility plant**
- **Initial university charge - $/sq ft basis**

Revenue Billing

Solution for Reed Arena

- Install own electrical meter
- Install revenue-grade hot water flow and Btu meter
- Install revenue-grade chilled water flow and Btu meter

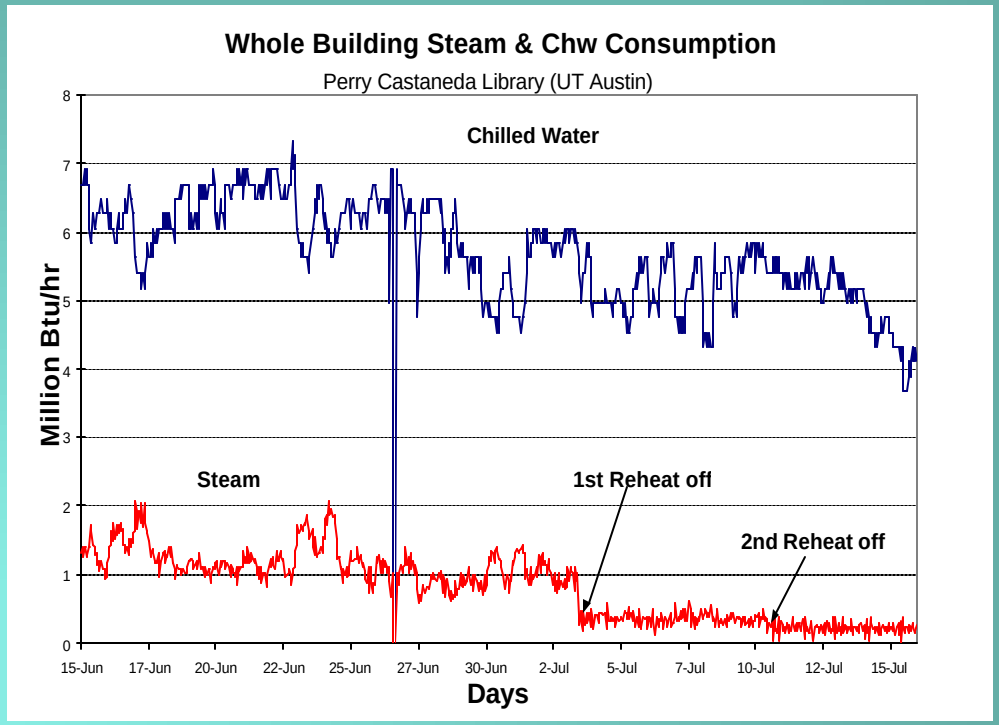
Result: Utilities charges were reduced significantly by charging for actual usage.

Identify O&M Measures

Case Study: Perry Castaneda Library (UT-Austin)

Metering and monitoring noted excessive steam consumption in summer

Added Benefits and Advantages of Metering & Monitoring



Determine If Retrofits Are Saving What They Were Predicted to Save

Case Study: Nursing Building (UT-Austin)

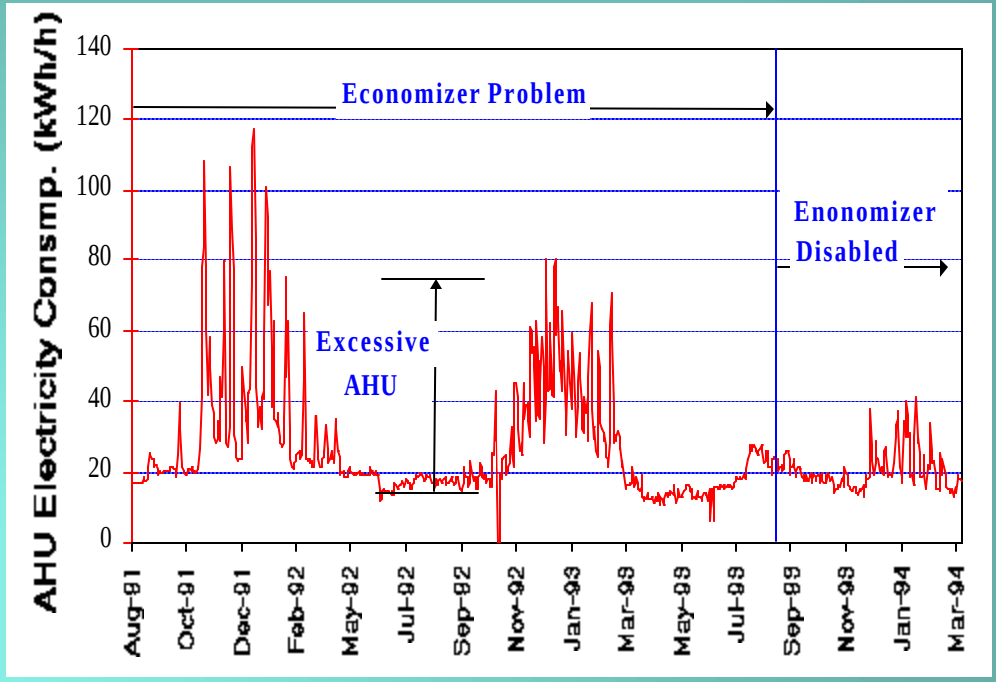
Retrofit: Install economizer cycle on two (2) double duct units

Added Benefits and Advantages of Metering & Monitoring

- Nursing Building (UT Austin)
- 94,000 Sq. Ft.
- 2 double duct units

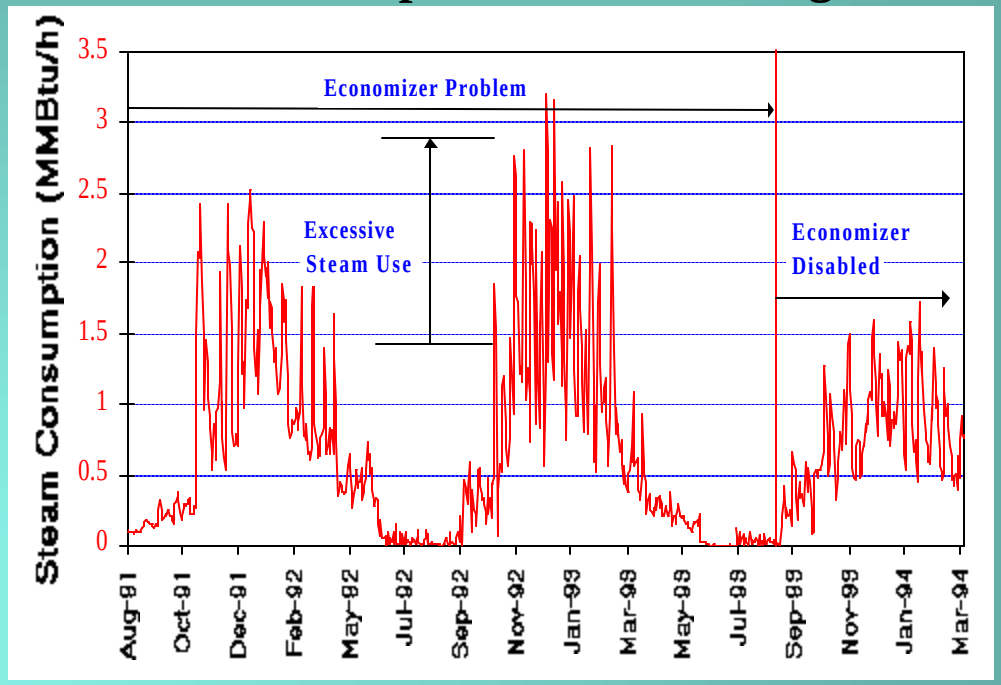
Added Benefits and Advantages of Metering & Monitoring

AHU Electricity Consumption at the Nursing Building



Added Benefits and Advantages of Metering & Monitoring

Steam Consumption at the Nursing Building



Summary of Savings

- Disable the economizer cycle
  - Savings from reduced consumption o steam and electricity
- Measured savings of $40,000 as of Dec 1998
- Savings would not have been possible without monitoring

Provide Data for a Comprehensive Commissioning Program

Case Study: Texas A&M University Campus

- University President authorized Continuous Commissioning℠ Program in 1995
- Initiated the program by installing CW, HW, electrical metering in all large campus buildings (> 50,000 sq. ft.), central utility plant, and all substations
- About 80 buildings, 4 substations, and central utility plant were metered
- Cost was roughly $1M

Continuous Commissioning℠

- Process whereby the energy-using systems in a central plant or building are analyzed and optimized for improved performance and reduced energy consumption
- Metering and monitoring of the facility before and after Continuous Commissioning℠
- Training of facility staff is essential
- Provides follow-up services to insure continued performance
  - Monthly feedback on status of savings and graphics of consumption
  - Additional visits to further fine tune

Case Study

Kleberg Building

Texas A&M University

Building & System Information
Kleberg Building

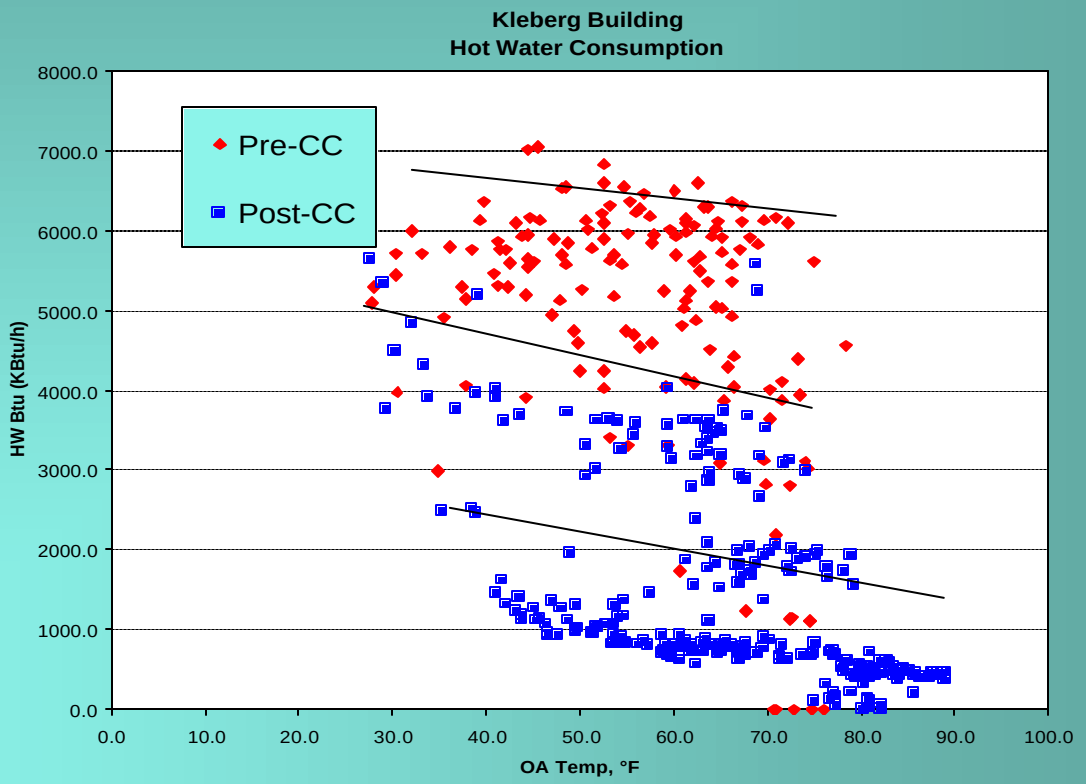
- Building: 165,031 ft^2, Basement plus 4-Story
- HVAC: 2 x 100hp SDVAV AHUs with Pre-Heat and Terminal Box Reheat

  2x 25hp Return Air Fans
- Building Type: Classrooms, Offices, Laboratories
- Central Plant Supply: CHW & HW

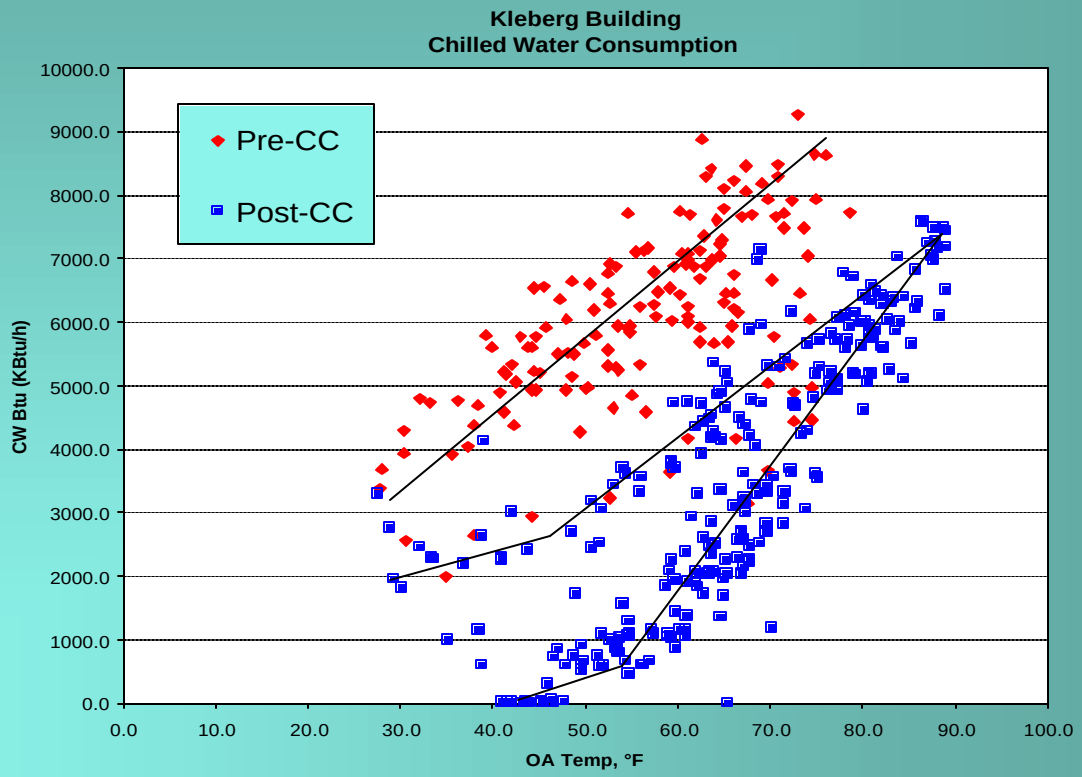
CC Measures
Kleberg Building

- Reset Cold Deck & Preheat Schedule
- Utilize Economizer Cycle
- Perform Lab Air Balance
- Reduce Building Pressure from 0.05” to 0.03” H20
- Reduce Exhaust Duct Pressure from 3.0” to 0.75” H2O
- Optimized CHW Pumping Control

Kleberg Building
Comparison of Heating Consumption



Kleberg Building
Comparison of Cooling Consumption

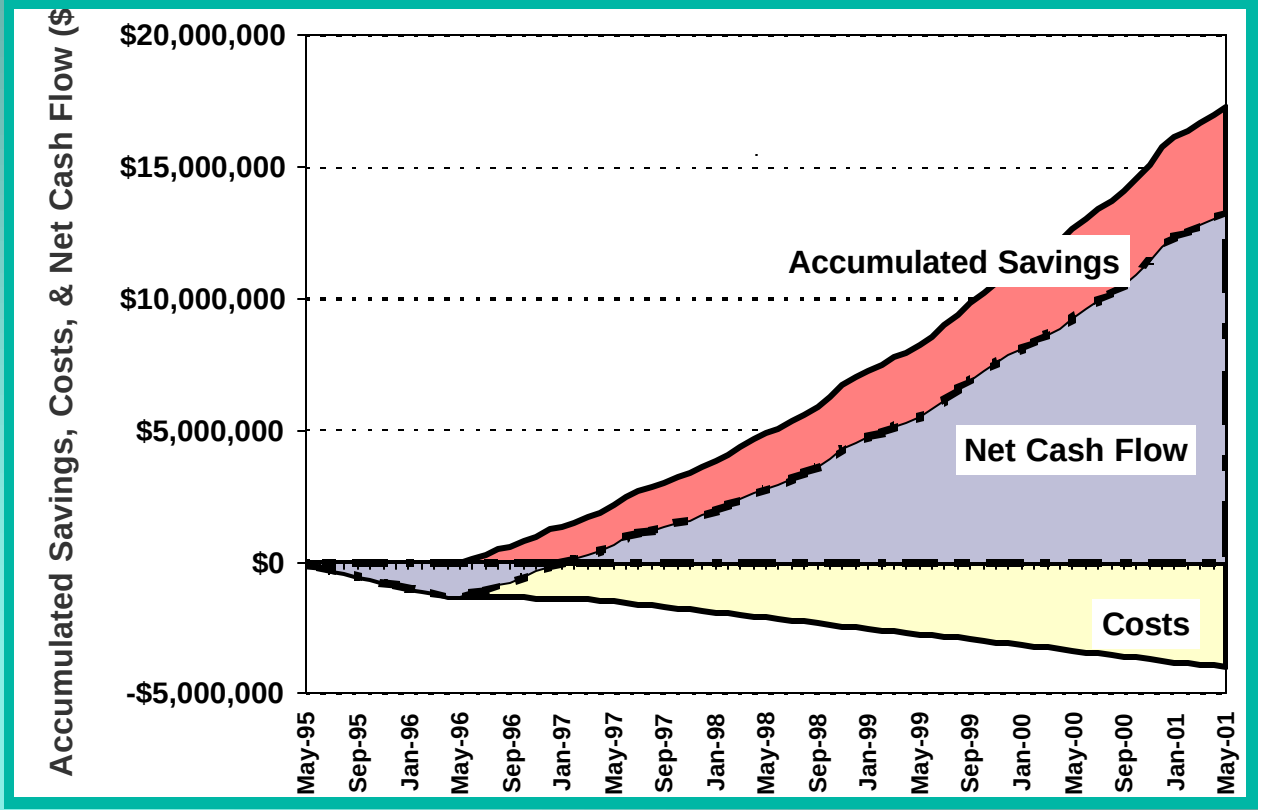


Measured CC Savings
Kleberg Building

Measured Savings
June 1996 to August 2001

HW	**=**	**$ 815,697**
CHW	**=**	**$ 888,724**
Total	**=**	**$1,704,421**

TAMU Project
Savings, Costs and Net Cash Flow



Electric Utility Deregulation

- New for State of Texas
- Retail Deregulation began January 1, 2002 for “Texas Grid”

Case Study

Six (6) Texas A&M University System Universities

Aggregated Loads and Purchased Power

- **Texas A&M-Kingsville**
- **Texas A&M - Corpus Christi**
- **Texas A&M International University-Laredo**
- **Texas A&M-Galveston**
- **Texas A&M-Commerce**
- **Tarleton State University**

Approach

- Began logging interval data (15-min load data) 18 months prior to January 1, 2002
- Obtained data from utilities, where available, and from ESL meters
- Aggregated loads for the RFP

Approach (cont'd)

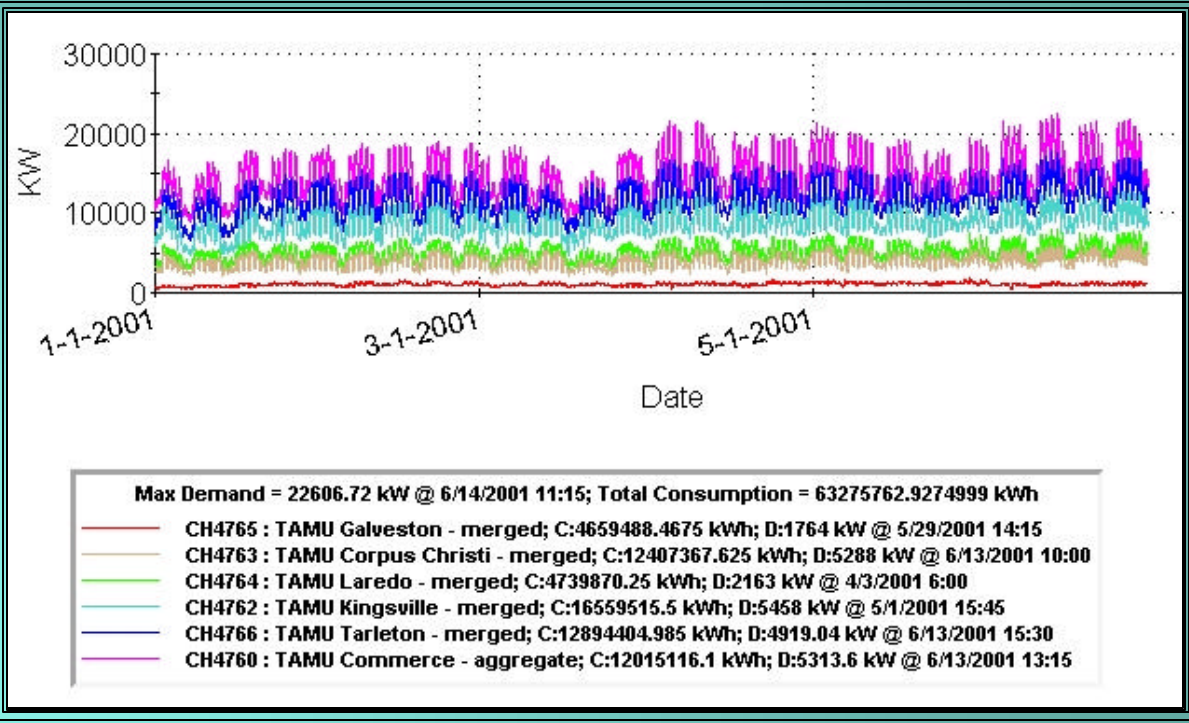
- Issued RFP in October 2001
- Received and reviewed 5 bids for power
- Requested energy charges only, on a ¢/kWh basis (i.e., no demand charges)
- Quote could be for all six universities or on five universities plus time of day rates for thermal storage system at TAMU-Corpus Christi

Results

- Signed one contract for 5 universities
- Signed a second contract (with same supplier) for time of use rates

  (This time of day pricing will save TAMU-Corpus Christi about $100,000 annually over flat rate pricing.)

TAMU System Aggregated Load for Period January 1, 2001 Through June 30, 2001



Final Recommendations

- Metering and monitoring is essential for performance contracts
- Metering is essential for proper building operation
- Interval metering is important in utility deregulation
- Metering, with engineering analysis, can save lots of utility dollars

Questions and Discussion