



EZ SIM BILLING ANALYSIS SOFTWARE

Performance Contracting for a Community College

MicroGrid, a Portland energy services company, and a community college wanted to forge a energy efficiency performance contract. But MicroGrid was swallowed up in so much monitoring data that it was difficult to explain to the client. So they turned to EZ Sim to aggregate and model the college's buildings and then present the information in an easy to understand graphical format that made sense to the college's management.

"This was the only economically viable method with sufficient precision to support our contract," said Terry Egnor, MicroGrid, a Portland energy services company (ESCO). "The method also supported a Quality Control review or savings verification of the retrofit."

"The ability of the program to forecast and backcast the baseline was essential in gaining the client's support of a shared savings agreement."

MicroGrid had installed short-term monitoring at the site with the intention of establishing a



baseline for a performance contract and then to oversee the energy saving retrofit measures.

However, the ESCO was literally overwhelmed with monitoring data, making it difficult to extrapolate the short-term measurements to an annual baseline.

In addition, both MicroGrid and the facilities manager wanted the baseline to be able to account for the college's seasonal scheduling changes and variations in local

weather, as well as forecast and backcast monthly energy usage.

The ESCO used EZ Sim to easily and successfully model before and after energy usage, and then MicroGrid made a visual presentation that enabled everyone to actually see how the buildings used energy, where the savings would come from and, given the seasonal variations of a college, when the expected energy savings would occur.



Performance Contracting for a Large Campus

This facility is a community college campus with 12 buildings totaling about 318,000 square feet. The entire campus is served by several gas meters and several electric meters, the meters having been added as the campus grew. Complicating the situation, five of the larger buildings are served by a hot water and chilled water loop. It is not possible to isolate the electric and fuel use of any one building. Instead the EZ Sim program is able

to sum energy billings and treat the campus as if it were one large facility.

The entire campus received a lighting retrofit and a tune-up of the chilled water loop. After the

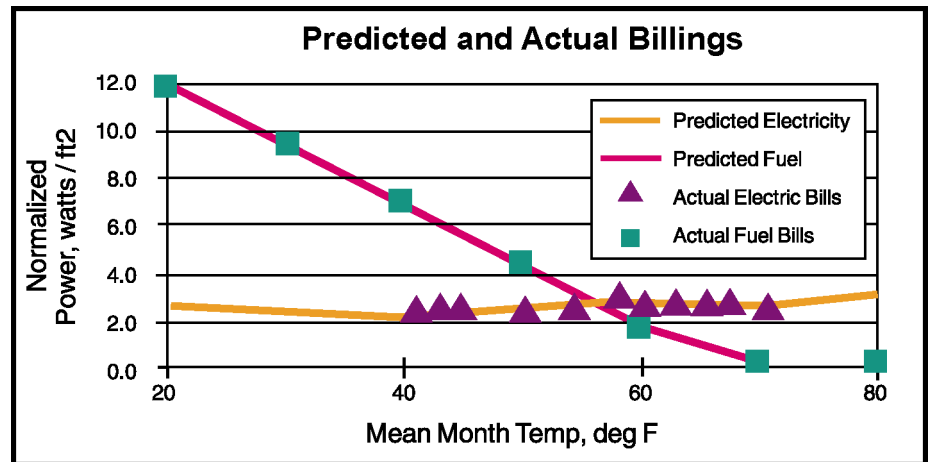
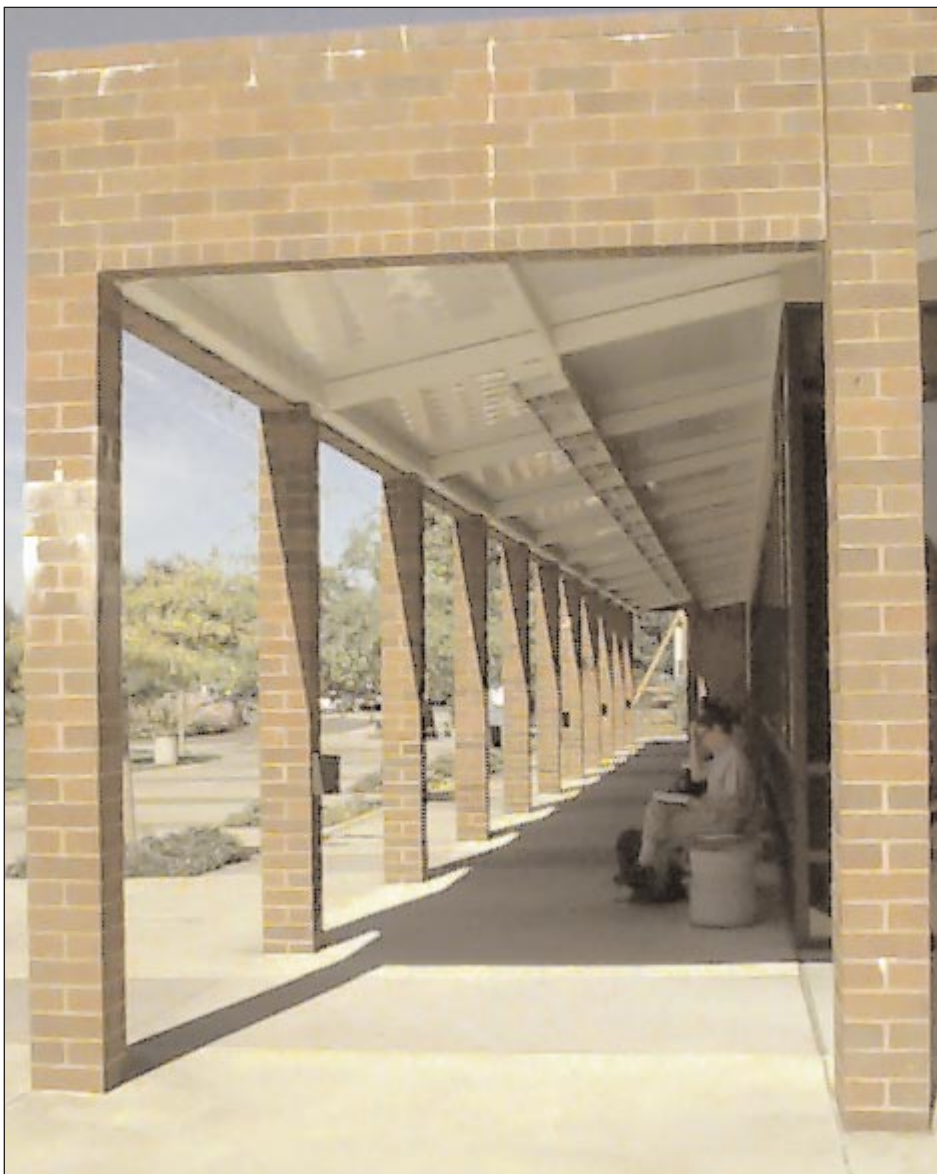


Figure 1. Pre-Retrofit Consumption



installation, MicroGrid, a Portland-based ESCO contractor, installed extensive short term monitoring to confirm equipment operating characteristics. The intent was to forge a baseline for a performance contract and to then provide further retrofit services. However, MicroGrid discovered that it was difficult to extrapolate the short-term measurements to an annual baseline. The contractor was literally overwhelmed with monitoring data and, besides, a performance contract based on these types of measurements could have imposed a high overhead cost.

The ESCO and facility manager wanted a performance contract readily understandable to both parties. To do this, the baseline definition had to be able to account for scheduling changes as well as local weather variation. Operations for the college are highly seasonal and will include scheduling changes from year-to-year.

The aggregated billing data

shows an orderly pattern for both the electric and gas data, as shown in Figure 1. As a check, this pattern was compared to both pre- and post-retrofit periods. The results were quite similar to an engineering estimate done at that time.

When modeling this and most other college campuses, it is necessary to estimate the mean occupancy for periods corresponding to holidays and vacations, summer school sessions, as well as registration and indoctrination weeks. These varying occupancy situations are readily identified from the academic calendar and from hourly electric data for one of the large buildings.

At first, we included a rigorous analysis for estimating occupancy down to the individual classroom. In retrospect, this exercise was unnecessary. An approximate estimate of the reduced occupancy derived from the academic calendar served quite well.

This close fit to prior engineering work and the ability of EZ Sim to predict both pre-and post-retrofit consumption convinced both the ESCO and the facilities manager at the college to use a model based on the aggregated billings as the baseline for a pending performance contract.

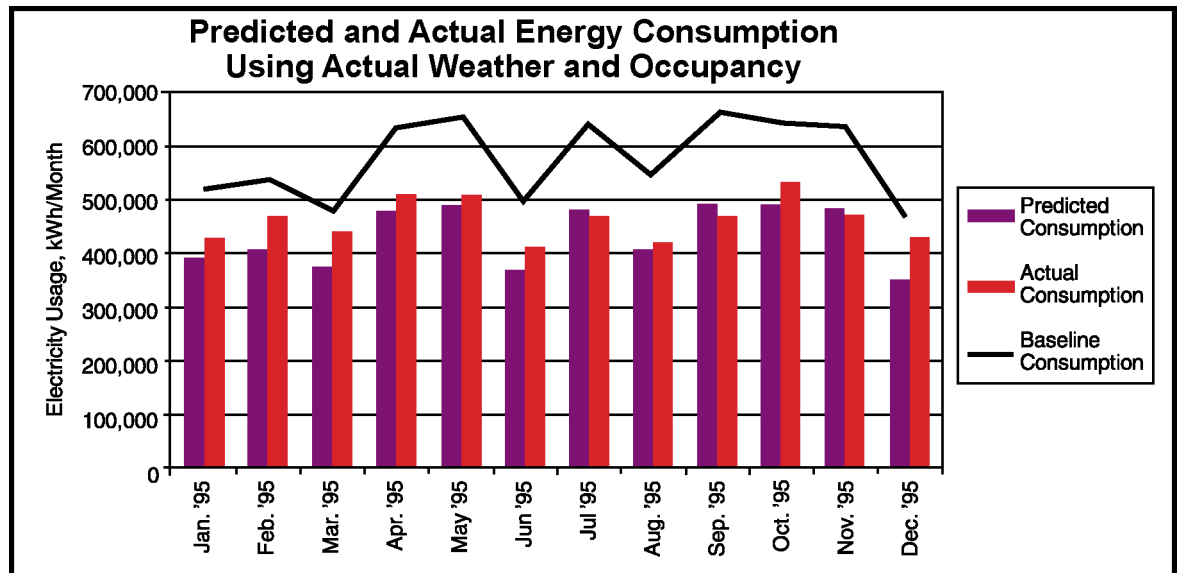


Figure 2 shows how post-retrofit consumption compared to predictions.

Modeling Parameters

Model Set-up

- Enter the sum of electric and gas metering for whole campus.
- Set floor area for the whole campus. Number of floors is approximate average.
- Set shape factor based on the exposed surface area of the multiple buildings. In this case, a shape factor of 3.0 is used. The twelve buildings have much more exposed wall area than would be the case for a single large building with the same floor area.
- Set wall U-values, window area, amount of connected plug loads based on averages from the energy audit report. Set lighting connected load at 1.96 W/sqft pre-retrofit based on audit.
- Increase daytime ventilation rate to 3 ACH as is typical for school facility.
- Set unoccupied usage factors for lighting and plug loads fairly high at 20%. Security lights and computer equipment are frequently left on overnight, based on site audit.
- Enter average operating hours by month as estimated by facility staff.
- Set HVAC type as “VAV with vanes.”

Model Tuning

- Adjust ventilation slightly based on calibration.

Conservation Measures

- Efficient lighting: use proposed connected load of 1.0 W/sqft from lighting audit.
- Upgrade chiller efficiency to 0.65 kW/ton.

Energy Analysis at your fingertips

EZ Sim billing analysis software

EZ Sim is the next step in energy accounting. Using actual utility bills, it reveals the patterns of use in commercial buildings.

EZ Sim:

- Diagnoses energy patterns and consumption
- Calibrates savings estimates to agree with actual energy usage
- Estimates energy end-uses within the facility
- Verifies vendor claims for energy products and services
- Generates performance targets and compares against actual energy bills

EZ Sim is a quick spreadsheet tool that is equivalent to a sophisticated engineering analysis, but you

don't have to be an engineer to use it. It's designed for resource conservation managers and facility operators.

EZ Sim uses actual energy bills and available information, so **the cost to operate EZ Sim is almost nothing.**

EZ Sim lets you use utility bills to calibrate a simulation of a commercial building in an interactive graphic window. **Once it matches the building's utility bills, the simulation model provides reliable and realistic estimates of potential conservation savings.**

With **EZ Sim**, the calibration process reveals how energy is used within the facility to **help diagnose the reasons for excessive consumption or poorly functioning components.**

Best of all, **EZ Sim** can be used to predict what future utility bills should be and can help you set performance targets to determine if installations are on track. **This is the simplest form of building commissioning — and at very little cost.**

STELLAR PROCESSES, INC.

Stellar Processes is a company of consulting engineers specializing in energy economics, measurement and verification. Experts in monitoring and commissioning large facilities as well as diagnostic evaluation of small buildings.

Support provided by:



October 1998



1033 SW Yamhill, Suite 405
Portland, OR 97205
(503) 827-8336
www.ezsim.com