

Application Note # 6

Cost allocation for campus and industrial facilities

Description of application: Cost allocation refers to the use of meters and data acquisition servers (DAS) to submeter and allocate energy usage by department or cost center within a campus or industrial facility. Allocating these costs provides accountability for energy use in campuses and allows businesses to accurately determine the cost of products and services.

Background: Many, if not most, campus facilities have primary metering for energy consumption (electricity, gas and water), but have little capacity for determining how energy is used “behind the meter”. For the energy manager responsible for operations, this typical structure poses several major problems:

- Internal users have little or no incentive to reduce energy costs
- Outside users (food services providers, community groups, etc.) are often subsidized by internal users
- Prioritizing and evaluating energy conservation efforts is virtually impossible
- Isolating and correcting operational problems can be difficult
- Determining the actual cost of manufacturing products is difficult and standard cost allocation methods (e.g., as % of revenue) may lead to poor decisions on product mix and pricing

Submetering to allocate costs alleviates these problems and provides the means to measure performance.

How does it work: For each building or department, the facility manager installs the necessary sensors and meters to isolate and measure the energy used by that department. On a monthly basis, the data from the DAS is analyzed to produce a cost for energy assignable to the department.

Benefits: For most energy and facility managers, there are benefits and payback to investing in the hardware and software to submeter campus facilities:

Energy savings from internal users: “If you can’t measure it, it won’t happen...” is a phrase often used in business texts to stress the importance of being able to measure the success at meeting objectives. The same applies to energy conservation and to modifying the behavior of building users to manage energy wisely. The governing board may set an overall objective to reduce energy costs, but if the responsibility and accountability for the reduction is not measured at the department or facility level, no one owns the goal and it is unlikely to be realized.

Recently, a large international hospitality company adopted a corporate wide goal of reducing energy usage by 5% in all its facilities. One of the largest facilities was served by a few primary meters and there was no way to assign responsibility for energy usage to individual operations, the energy manager chose to begin the energy saving process by sub-metering individual operations within various divisions of the campus. Data gathered from these sub-meters was used to benchmark current consumption and to provide information about operations within the campus. This benchmark data was used to compare the relative success of each group within the campus and was published monthly on the company's intranet site with rankings of the groups and their success at meeting the corporate energy savings goals.

With the exposure of the monthly reports, it is hardly surprising that managers began to be aware of energy usage and requested additional sub-metering to allow them to drill down into the usage within their organizations. The campus not only met, but exceeded the corporate goal for energy savings simply through making users accountable with cost allocation and monitoring of energy usage. The company was able to track with a high degree of accuracy such things as signage left on, motors left running and HVAC systems in operation during unoccupied periods.

There are also occasions where a department or other internal user group may have increased operating hours (e.g., final exams, special holiday events) for which charges may be assigned on a per square foot or per hour basis that may not reflect the actual cost of providing energy.

Cost recovery from external users: Many campus facilities offer space for rent by non-affiliated users (e.g., food service vendors, retail outlets, community groups). The usage by these non-affiliates is often on a different schedule than the normal operating hours and the energy cost is allocated to these users using either a fixed monthly cost or a formula for allocation based on square footage or per hour costs. In some cases, the external users may have a much higher energy density (energy usage per square foot) than the typical affiliated user and this higher usage is not allocated to the users appropriately in a fixed per square foot or per hour allocation.

Sub-metering of non-affiliated users is the fairest means of allocating the costs of energy as it provides an actual representation of the usage and costs for all users. The non-affiliates are charged fairly for their share and the affiliated users are not expected to subsidize the costs for these non-affiliates.

Drawbacks: The primary drawback to implementing a cost allocation program is the expense involved in installing the hardware and the ongoing cost of managing the data and producing useful reports.

Installation requirements: The hardware required to complete a cost allocation system will obviously vary depending on the layout of the campus and the method of operation for the physical plant (i.e., central plant vs. distributed systems), but the following general guidelines will apply to each building:

- AcquiSuite data acquisition server (DAS)– a standalone web server located on the building site that communicates with the sensor(s), stores interval information and communicates with the remote server
- Electrical submeters to monitor electricity usage (kWH) and demand (kW) for the building or department being monitored
- Gas meters if the natural gas is supplied directly to each building rather than supplied from a central plant
- Water meters
- Steam meters if the steam is supplied from a central plant
- Btu meters if chilled water is supplied from a central plant to the buildings
- Phone line or local area network (LAN) connection for communication with the remote server

Reports: The typical report for cost allocation will be prepared monthly and will provide a breakdown of the usage for each department by utility type. This report can then be provided to the accounting department for use in assigning costs to various groups on the campus. In the simplest scenario, each department is charged for its consumption based on a “blended” rate for the total facility from a primary meter. There can also be more sophisticated reports that allocate demand and time-of-use charges if appropriate. A sample report for a campus might look like the following:

The screenshot shows a web browser window displaying the following report:

Faber College Energy Allocation Report

February 2003

Department: ROTC

Utility	Usage	Cost
Electricity	10248 kWH	\$ 573.89
Gas	1200C Therms	\$ 1234.67
Water	4348 Gallons	\$ 118.48
Total		\$ 1927.04

Department: Delta House

Utility	Usage	Cost
Electricity	6135 kWH	\$ 343.56
Gas	9120 Therms	\$ 938.35
Water	6349 Gallons	\$ 173.00
Total		\$ 1454.91

Analysis/Actions: On a monthly basis, the accounting department would take the information from the report and assign the costs to the appropriate department. These costs can be used to develop budgets for succeeding years and to compare year-to-year changes in operations or energy usage.

Individual managers responsible for the departments being billed will likely be inspired to reduce the energy usage (see “Application Note #1: Accountability metering”) to minimize the budget impact and free resources for better use.

A side benefit to cost allocation is that the campus facility manager can use the data to determine if there are problems in the system (e.g., leaking steam traps). If the total cost allocated to all of the buildings is significantly less than the primary meter, it could indicate that system losses of steam or water due to leaks is much higher than expected and could provide a valuable tool in determining the priority for locating and repairing the leaks.

Costs: As with all the application notes in this series, it is very difficult to estimate costs due to a variety of factors (wiring distances, communications issues, scheduled shutdowns, etc.), but some general guidelines for costs (hardware and installation) are:

- AcquiSuite™ data acquisition server - \$1,800 to \$2,200
- Electrical sub-meter (3 phase) - \$600 to \$1,000
- Flow meter for gas or water - \$500 to several thousand
- Btu meter for chilled or hot water - \$300 to \$1,000
- Data storage and reports - \$20 per month per AcquiSuite™

Notes/miscellaneous: Cost allocation can be an important tool for the facility manager of a campus or industrial facility as it provides not only accountability for energy use, but also can be a valuable asset in determining priorities for energy retrofits. Identifying the major energy users is the first step in deciding where to allocate budgets for physical plant upgrades, lighting retrofits, control system upgrades, etc.

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