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Energy Management Information Systems:
A Selection Guide for Resource Conservation Managers

Managing a building's energy use by measuring and tracking energy consumption and trends is one of the main functions of a Resource Conservation Manager (RCM) – see sidebar. To carry out this work, RCMs need tools that give them the ability to measure and monitor consumption, facilitate identification and impact of improvements, communicate progress, troubleshoot problems, and help fulfill grant and program reporting obligations, as well as regulatory requirements – such as documenting greenhouse gas emissions.

Selecting the most appropriate energy management tool to measure and track energy performance, and communicate progress, can be a daunting task for an RCM. RCMs must sort through a large number of products with numerous features and a quickly shifting product landscape.

This article discusses different types of energy management tools, and how to determine the best fit for an agency, with an eye to the needs of public sector RCMs.[1] Their agencies generally have fewer funds and resources, and different missions and internal organization than private companies. Fewer tools are marketed to this audience than to facility staff, commissioning consultants, or private companies.

Existing RCMs exploring energy management tools may benefit from this article, as well as agencies hiring an energy manager and/or beginning an RCM program for the first time, as the energy management tool is foundational to such a program.
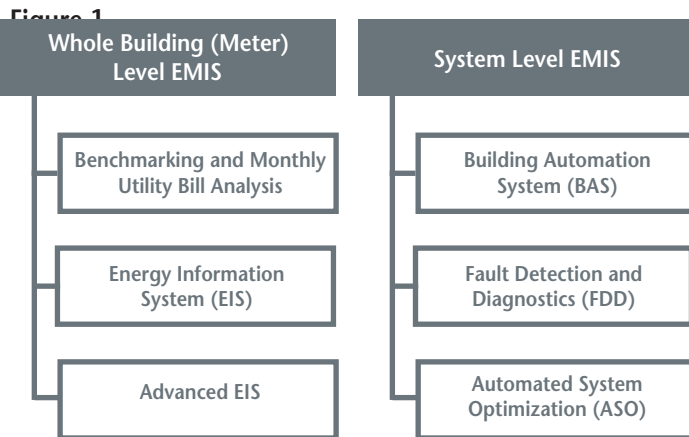
Resource Conservation Managers aim to reduce a building's resource use – which includes energy, water, waste and recycling. Performance improvements – how efficiently a building uses energy – are achieved through changes in operations and maintenance, occupant behavior, large and small capital improvements, and policy change. Measured at the whole building level, these changes can result in persistent savings over time. Energy managers, sustainability managers, and those with other job titles may do the same or similar work. The unifying principle is measuring and tracking resources to manage and reduce consumption.

Increased and persistent savings are more likely when RCMs are employees dedicated to their task. The reduction in resource use can often cover their salary. However, consultants who provide consistent RCM services to agencies can also be successful.

[1] Public sector RCMs manage resource use at municipal and state buildings, K-12 districts, higher education institutions, and other public facilities.

Energy Management Information Systems

Energy Management Information Systems (EMIS) is a term used for the broad category of tools that store, analyze, and display building energy data[2]. There are two main types of EMIS – whole building-level (meter-level) tools and system-level tools (see Figure 1). In general, RCMs work with whole-building metrics, while operations and commissioning staff monitor at the system level – such as HVAC and lighting.

Figure 1

Whole Building (Meter) Level EMIS	System Level EMIS
Benchmarking and Monthly Utility Bill Analysis	Building Automation System (BAS)
Energy Information System (EIS)	Fault Detection and Diagnostics (FDD)
Advanced EIS	Automated System Optimization (ASO)

Graphic modified from Lawrence Berkeley National Laboratory

Building Level EMIS

The three main categories of building level EMIS are 1) benchmarking and utility analysis tools; 2) energy information systems (EIS) – not to be confused with energy interval service; and 3) Advanced EIS. These measure energy performance of a building at the meter level. A utility-installed billing meter is usually read monthly, while utility interval meters or customer-installed meters may be read at the hour or 15 minute interval.

Building level EMIS can help identify the most energy-inefficient buildings for operations and maintenance (O&M) improvements, uses measure and verification (M&V) approaches to quantify savings from operations improvements, retrofits, and behavior-based programs, and can continually track energy use for persistent savings.

[2] *The term EMIS and the categories and definitions used here are generally accepted by a wide variety of experts, users, and EMIS vendors in order to be able to find common language.*

The simplest and most inexpensive EMIS tools, and the ones most often used by RCMs, are benchmarking and utility analysis tools. These track monthly energy use and cost through utility bills and compare a building's performance with its own historical performance, or with other similar buildings (see Figure 2). Tracking utility bills may also identify errors with billings. A downside of benchmarking is the inability to identify savings from a particular measure or change.

The reporting feature of these tools are essential as most RCMs are responsible for communicating progress to managers, staff, and others in a clear, understandable, and high-level way. Additional reporting features may include cost tracking and greenhouse gas emission reporting.

EIS and Advanced EIS display and analyze whole building data from utility interval or submeter data at a more granular level – generally at 15 minute or hour intervals – which provides greater energy savings potential than benchmarking tools. Having access to hourly building data – rather than waiting a month for the utility bill – allows for quicker trouble-shooting. EIS can be helpful in diagnosing problems by reviewing prior usage trends when the monthly utility bill identifies abnormal usage. A couple drawbacks of EIS for RCMs is its greater expense and learning curve.

Figure 2

Monthly Electricity Use (KWh), Sep–Aug. Report Period – Baseline year; Report Period – Year One.
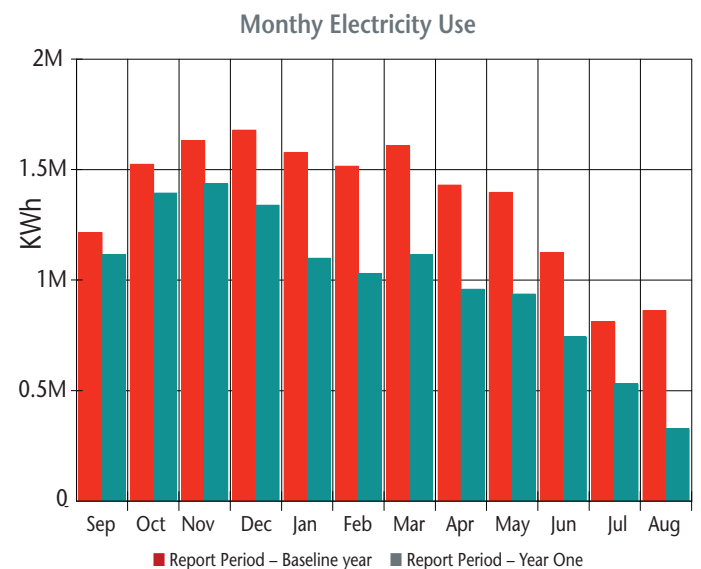
System Level EMIS

The more complex tools hardwired to building systems include building automation systems (BAS) – sometimes called building management systems – fault detection diagnostic tools (FDD), and automatic system optimization (ASO). Data is relayed every 15 minutes or less – which can create granular trending of data points from specific building systems such as heating, outside air ventilation, and lighting. Specific problems may be quickly detected, an FDD may signal an alarm due to a malfunction, and ASOs may be able to optimize systems automatically. Even if not viewed regularly, a BAS can help diagnose a problem that was roughly identified by abnormal use on a utility bill.

System level EMIS users tend to be technicians, commissioning agents, facility managers, and other technical staff. BAS tools make up a large portion of the current EMIS market, and vary in user-friendliness, features, and compatibility with other systems. Familiarity with these advanced tools may increase an RCM's effectiveness through greater collaboration with technical staff.

Tool Selection

All benchmarking and utility analysis tools measure and track at the meter level. All will generate some type of report. However, similarities may end there. While all the tools should track energy usage, not all will track energy cost, water, or other resource use. Report formatting can differ greatly, such as different metrics and different displays of graphs and tables. Some calculate weather normalization at the monthly level, while some may not calculate it at all. There are programs that store data in the cloud, others that keep it on a hard drive.

The most widely used benchmarking tool in the U.S. is ENERGY STAR Portfolio Manager®, from the U.S. Environmental Protection Agency. It is a

> It is important to recognize that EMIS tools alone do not manage energy. The value of EMIS is realized with appropriate staffing, organizational support, and a defined energy management process.

powerful, free tool and has been at least partially responsible for the increased widely accepted benchmarking practices and requirements by some local and state jurisdictions. Yet RCMs usually also employ a more advanced benchmarking system, due in part to limitations with Portfolio Manager®. For example, the weather normalization calculation in Portfolio Manager® is different and possibly incompatible with some other tools. Portfolio Manager® places utility bill information in discrete months, even if utility bills are not read in that timeframe. It is also unable to create reliable results if any data is missing.

Some of the larger utilities offer benchmarking programs to their business clients, usually at no cost. These are often required use to take part in utility energy conservation programs. These tools should also be reviewed for an agency's suitability. For example, they may not track water consumption, which the RCM will need to track elsewhere.

Considering agency needs, answering specific questions beforehand, talking with other users, and trying out the software before purchasing it can help lead to successful use. General considerations and questions are found below.

Considerations

A few internal factors to consider when selecting a benchmarking tool include:

- Funding and costs
  - What is the budget to purchase the software?
  - Where will savings from reduced consumption be used?

- Benefits and value
  - How will the tool benefit the agency?

- Staffing
  - Who will be using the tool – do they have the appropriate skills and time?
  - Will training be necessary?
  - Is staff time sufficient to use the tool well?
  - If utility bills cannot be automatically imported into your EMIS, or if utility does not export data in spreadsheets, does staff have time to manually enter the invoices?

- Management support
  - As with an RCM program, support from management is crucial to ensure success. What form of reporting will management want?

- Understand organizational conditions and trends such as expected growth and new buildings, as well as planned energy service contracts, and other changes.

Questions

The following questions will help narrow selection of the tool:

- What resources will you measure? Electricity, natural gas, steam, water, waste?

- Does computer capability meet the software's technology requirements?

- Does the utility provide automated bill entry, or bills in CVS format?

- Does the utility provide any benchmarking programs?

- Do you already use Portfolio Manager?
  – Does the benchmarking tool integrate with Portfolio Manager?

- Will it be a cloud-based system or desktop?

- What features are most useful? Examples:
  – Measure by annual EUI, monthly EUI, seasonal, weekly, and/or daily load profiles
  – Cost analysis or avoided cost
  – Weather normalized data

- Are each of your buildings metered separately, or is there one campus master meter?

- Do buildings have interval meters, or sub-meters? Some benchmarking tools can take advantage of these.

- How much control do you want? Some companies offer multiple options up to turnkey services, although these can be costly.

- How easy is the program to learn?

- What type of graphs and reporting features can the tool produce?

Benchmarking and Utility Analysis Sample Tools

An internet search for energy management benchmarking tools may offer many suitable results, yet does not often mean easy discovery of all available tools. To assist with a search, a sample of available benchmarking tools gathered from a variety of publications is listed below. They vary in functions, features, and cost, and some offer more EIS-like elements. It is in no way an exhaustive list, and the Washington State University (WSU) Energy Program does not endorse any of them. These products were available as of December 2018:

- Building Monitoring System, by Alaska Housing Finance Corporation. *https://www.ahfc.us/efficiency/ non-residential-buildings/building-monitoring-system*

- BuildingOS by Lucid EIS. *https://lucidconnects.com/*

- EnergyCAP by EnergyCAP. *https://www.energycap.com/*

- Energy Charting and Metrics Tool (ECAM) by Pacific Northwest National Laboratory, U.S. Department of Energy. *https://buildingretuning.pnnl.gov/webseries.stm*

- Energy Hippo by Energy Hippo. *https://energyhippo.com/*

- Energy Manager by Dude Solutions. *https://www.dudesolutions.com/solutions-energy*

- Energy Worksite by Building IQ. *https://buildingiq.com/products/visualization/ #energy-worksite*

- Metrix 4 Utility Accounting System, by Abraxas Energy Consulting, LLC. *https://www.abraxasenergy.com/software-products/ metrix/*

- Utility Manager by Utility Management Services. *http://www.utilityaccounting.com/category/tags/ utility-manager-software*

- WegoWise. *https://www.wegowise.com/home*

EMIS Tool Lists and Resources

A useful list of resources on general EMIS technologies, process, and commissioning can be found at the Smart Energy Analytics Campaign[3] at *https://smart-energy-analytics.org/top-resources*. Many resources on EIS are included as these are used for monitoring based commissioning (MBCx), which is the focus of the campaign. A barrier cited by some campaign participants in selecting software was their hesitancy to send out a lot of Requests for Proposal (RFP) to EMIS vendors. Reviewing proposals from the long list of vendors on the website would be very time consuming.

A May 2016 report by the Sustainable Endowments Institute summarized survey results from nearly 200 institutions about software platforms for energy efficiency projects. One finding was that while there are a lot of software solutions to save energy, many are expensive and created for larger portfolios in the corporate arena where funds are available to invest in building improvements.

Below are a few websites and publications that have lists of various EMIS tools, including benchmarking software.

- Inventory of Commercial Energy Management and Information Systems (EMIS) for M&V Applications. This is a very limited list, with mostly EIS software. *http://www.eeperformance.org/uploads/8/6/5/0/8650231/inventory_of_mv_applications.pdf*

- Capterra, Energy Management Software list. Features must be filtered. *https://www.capterra.com/energy-management-software/*

- Smart Energy Analytics Campaign, Find a Product or Service. There is not a separate benchmarking list. *https://smart-energy-analytics.org/product-service*.

- While not a tool list, *Better Buildings* from the U.S. Department of Energy offers templates for Request for Proposal, a Technology Specification and an Evaluation and Selection Criteria. *https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/emis_proc_spec_BBA_FINAL_021815_508.pdf*

Summary

Selecting the energy management benchmarking and utility analysis tool that enables the most success at reducing costs and consumption can be a time-consuming task. It is hoped that this factsheet can provide some assistance.

The WSU Energy Program RCM Program supports the creation and successful implementation of RCM programs in the public sector by providing program and technical support. Public sector RCMs and energy managers in the State of Washington may join the RCM listserv to receive informative monthly RCM Newsletters.

Contact Karen Janowitz at *janowitzk@energy.wsu.edu* or visit *http://www.energy.wsu.edu/PublicFacilitiesSupport/ResourceConservation.aspx*

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[3] *The Smart Energy Analytics Campaign was developed by Lawrence Berkeley National Laboratory and U.S. Department of Energy to promote and advance the use of ongoing monitoring practices to achieve the most effective energy-saving implementation and strategies. The campaign focuses on EIS, FDD, and ASO software, not benchmarking. As of September 2017, nearly 50 private and public organizations have taken part in the campaign.*