Energy Management and Information Systems (EMIS) Technology Classification Framework

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Task Completion Memo

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This short report documents the completion of Task 6, "Consensus-based EMIS technology classification framework" for the Project "Energy Information Systems – Deployment-based Cost-Effectiveness Evaluation, and Business Case for Adoption, LBNL-FY13-15." This documentation satisfies deliverable LBNL-FY-13-15-7 "EMIS Classification Framework."

This task entailed the following elements: 1) beginning with CEE's prior work, work to gain consensus on a classification framework to define the landscape of energy management and information systems (EMIS) tools; 2) establish consensus in concert with organizations such as CEE, Commercial Building Consortium, CBEA, EEB Hub, University CRE and Building programs.

In the first part of FY13, LBNL modified the CEE framework, incorporating feedback from domain experts such as the lead of the CEE Whole Buildings Committee, and researchers from PECI. The modified framework was then shared with 36 stakeholders. These stakeholders included representatives from utility programs, researchers and subject matter experts, EMIS vendors, BBA members and other EMIS users. Level of consensus was assessed through five questions:

1. Is there value in a framework such as this, for those new to the world of building control, automation, and energy analysis technologies?

2. Are there any logical breakdowns in this framing; are there any 'deal-breaking' flaws or logical breakdowns that would preclude its use for the intended purpose?

3. Is it useful and appropriate to list primary applications and principal design intent for each of the technologies listed; if no, why not?

4. What other continuous optimization systems, or equipment specific FDD tools are not listed, that you are ware of?

5. Are there other comments you would like to offer?

Respondents indicated nearly unanimously that there is value to a classification framework such as the one developed under this effort. While some offered suggested modifications, none of the respondents identified "deal-breaking" flaws, although one did perceive a potential logical breakdown. Respondents found the primary applications and principal design intent useful classification elements, and collectively identified a handful of FDD and continuous optimization systems that were not listed in initial version of the framework.

While there was consensus as to the value of the framework, respondents consistently noted the inherent challenge in distinguishing a collection of rapidly evolving commercial offerings with growing overlap and fuzzy boundaries. A common suggestion was to revisit this framework over time, to ensure that it reflects the current market and potential future convergence between technology types. In spite of this inherent challenge, we are satisfied that the framework delivered is suitable for it's intended purpose, aligns with prior and current PECI, and CEE work, and that general consensus has been documented.

Jessica Granderson, Principal Investigator

Background

Energy Management and Information Systems (EMIS) comprise a broad family of tools and services to manage commercial building energy use. These technologies include, for example, energy information systems (EIS), equipment-specific fault detection and diagnostic systems, benchmarking and utility tracking tools, and building automation systems.

There are a wide a wide variety of EMIS products available on the commercial market, and they are increasingly heavily marketed to the energy management community.

The lack of standard terminology for this family of technologies is currently a major barrier to meaningful dialogue and common understanding when stakeholders collaborate. In addition, those new to the domain are often confounded in determining key differences between commercial offerings.

Purpose of this Terminology Framework

The purpose of the framework presented in this document is to provide a common reference that can be used to understand key distinguishing factors and core attributes of different solutions within the family of EMIS technologies.

This framework can be used as a first step to orienting oneself; it intentionally stops short of a detailed accounting of specific technology features, instead providing a high level overview of primary applications within each category. Once oriented, users can take the next steps to explore details such as specific feature sets, data integration issues, matching tool capabilities to specific organizational energy management activities, and ultimately, specification and selection.

The purpose of this framework is not to dictate terminology - people can and should use terms that they are comfortable with, once they are familiar with EMIS offerings.

Expected Audiences for this Terminology Framework

This framework is targeted for use by: a) those newly gaining familiarity with EMIS technologies, who are trying to understand the diversity of commercial options; b) those working collaboratively, who want a common "language" in which to ground their communications.

Key Considerations

The dividing lines between some instances of these technologies can quickly become blurry - for example, some advanced energy information systems (EIS) may offer fault detection and diagnostic (FDD) analytical capability; however the historic *principal design intent* of advanced EIS is whole-building or portfolio energy tracking, and automated interval data analysis to identify efficiency opportunities. Furthermore some offerings may fit into multiple categories.

This framework does not attempt to fit 100% of the EMIS offering on the market, particularly those that are most newly emerging, and therefore still evolving in core applications and capabilities. Rather, the intent is to provide a framing that is well suited to over 80% of commercial technologies.

Finally, it is important to acknowledge that this is a rapidly evolving technology area, and what is true of today's market and today's technologies may be less applicable in the future.

Definitions of the technology attributes used in the Terminology Framework

May also be referred to as: other names that might be encountered; these are not necessarily recommended names, but are included to capture terms that may be used in less formal cases, or in marketing materials.

Typical data scope: the level and type of building data that the technology most commonly uses.

Typical data interval: the time resolution of the data that the technology most commonly uses.

Frequency of use: how often the technology is typically accessed by the user to gain performance insights.

Primary applications, principal design intent: core uses of the technology and user benefits.

Vendor examples: technology examples from the 2013 commercial market; these are representative examples, not intended to be a comprehensive inventory of market offerings.

Terminology Framework

The framework itself comprises a table that spans two 8.5x11 landscape oriented pages:

Technology attributes	Tools with a Whole-building Energy Focus			Tools with a System-level Focus		
	Benchmarking and Monthly Utility Bill Analysis	**Energy Information Systems**	**Advanced Energy Information Systems**	**Building Automation Systems**	**Fault Detection and Diagnostic Systems**	**Automated System Optimization**
Typical Data Scope	Whole-building	Whole building May include: submetering	Whole building May include: submetering and system-level monitoring	Systems, components, May include: system submetering	Systems, components, BAS trends May include: whole-building or system-level metering	
Typical Data Interval	Monthly	Hourly to 15-minute		15-minute and less		
Frequency of use	Monthly, annually	Daily, weekly, monthly			Weekly, monthly	
Primary Applications, Principal design intent	Utility bill reconciliation, energy use and cost tracking; peer-to-peer building comparisons of energy use.	Whole-building or portfolio energy tracking, and *data visualization* to identify opportunities to improve building operational efficiency.	Whole-building or portfolio energy tracking, and *automated interval data analysis* to identify opportunities to improve building operational efficiency.	Control of indoor temperature, light, and humidity setpoints based on building schedule; alarming of out-of-range operations.	Automated identification of faults, sometimes with associated causes, usually HVAC focused.	Automated modification of control parameters to optimize efficiency, energy use, and/or energy costs.

Technology attributes	Tools with a Whole-building Energy Focus			Tools with a System-level Focus		
	Benchmarking and Monthly Utility Bill Analysis	**Energy Information Systems**	**Advanced Energy Information Systems**	**Building Automation Systems**	**Fault Detection and Diagnostic Systems**	**Automated System Optimization**
***Vendor Examples**	EPA Portfolio manager, Metrix, EnergyCAP, Noesis, Energy Print, FirstView	Obvius building manager online, Lucid Building Dashboard, Noveda Energy Flow Monitor	NorthWrite Energy WorkSite, Pulse Energy, EnerNOC EfficiencySmart, Energy ICT EIServer, JCI Panoptix, EFT Energy Manager, Mach Energy Asset Manager, eSight Enterprise	Siemens Apogee, Johnson Metasys, Novar Opus EMS, Tridium Niagara, Automated Logic WebControl	Cimetrics InfoMetrics, EnerNOC EfficiencySmart, EZENICS, Sky Foundry Sky Spark	Optimum Loop, Optimum VAV, BuildingIQ, Enerliance LOBOS, QCoefficient
****May also be referred to as**	Utility tracking tools, monthly energy monitoring system, billing reconciliation	Whole-building monitoring system, energy performance tracking system, continuous energy monitoring system, meter visualization tool	Enterprise energy management system, energy analytics tool, continuous energy monitoring and analysis system	Energy management and control system, building management system, energy management system, building control system	System monitoring and analytics, Ongoing or Monitoring-based commissioning systems	Control optimization software, continuous optimization, automated energy optimization systems, energy management system

* Representative examples, not intended to be a comprehensive inventory of market offerings

** Other names that might be encountered; these are not necessarily recommended names, but are included to capture terms that may be used in less formal cases, or in marketing materials

Stakeholder Respondents

The table below contains the names and organizational affiliations of stakeholders who provided feedback on the classification framework. Feedback was provided by individuals, and should not be interpreted to indicate organizational endorsement or official organizational viewpoints.

Stakeholder Type/Perspective	Stakeholder Name	Organization
EMIS user	Michael Groppi	CBRE
	Russell Subjinske	Wendy's
	Mark Barich	Summa Health
	Bob Patten	Hyatt
	David Devos	Prudential
	Adam Jarboe	Yum! Brands
	Donna Trovalli	Verizon
	King Porst	GSA
	Will Teichman, Nate Mitten	Kimco
	Brent Avila	Pet Smart
	Sara Schoen	First Potomac Realty Trust
	Thomas Riley	Hospital Corporation of America
	Susan Vargas	Stanford
Researcher, Subject Matter Expert	Hannah Kramer	PECI
	Rich Shandross	NCI
	Dan Harris	NBI
	David Lehrer	UCB-CBE
	Peter Crabtree	Laney BEST
	John Messner	EEB Hub, Penn St. U
	Jim Braun	EEB Hub, Purdue
	John Goins	UCB-CBE
	Michael Bobker	CUNY
Vendor	Jason Freeman	McKinstry
	David Helliwell	Pulse Energy
	Steve Jones	Pulse Energy
	Patrick O'Neill	NorthWrite
	Chris Reid	Energent
	Peter Dickinson	BuildingIQ
	Jeremy Niederjohn, Jim Schwartz	JCI
	Eugene Gutkin	IBS
	Yan Lu	Siemens (Research)
	Cole Knappen	Obvius
	Zach Robins	EnerNOC
	Craig Ennis	EFT Energy
Utility	Kim Erickson	CEE
	Steve Rosenstock	Edison Electric Institute

Summary of Stakeholder Feedback

1. Is there value in a framework such as this, for those new to the world of building control, automation, and energy analysis technologies?

   Of 36 total respondents, 34 answered the question directly, and 33 affirmed that there is clear value to a framework such as this.

2. Are there any logical breakdowns in this framing; are there any 'deal-breaking' flaws or logical breakdowns that would preclude its use for the intended purpose?

   22 of the 36 respondents answered this question directly, with only 1 seeming to indicate that the framework did not stand up to their personal understanding of EMIS. This respondent's comments indicated a mental model in which EMIS are a subset of BAS. This is in significant contrast to the views of other stakeholders.

   In cases where the question was not directly answered, stakeholders provide suggestions for clarification, or modifications. There were not, however, common suggestions that were echoed across a significant number of respondents.

3. Is it useful and appropriate to list primary applications and principal design intent for each of the technologies listed; if no, why not?

   31 of the 36 respondents answered this question directly, and only 1 questioned the appropriateness of a category to characterize principal design intent and primary applications for each type of EMIS technology.

4. What other continuous optimization systems, or equipment specific FDD tools are not listed, that you are ware of?

   10 respondents offered additional vendor offerings that have since been incorporated into the vendor examples.

5. Are there other comments you would like to offer?

   The summary of responses to questions 1-4 capture the overall consensus across the group of respondents. The following quotes serve as highlights that illustrate the diversity of responses, as well as a few common themes.

   <u>Usefulness</u>
   The work you are proposing would be of great interest to GSA and we would greatly benefit from the results. We have done extensive work with EMIS across the portfolio.

   I did find value in this framework in helping me to understand the different offerings that are available and the uses/benefits of each type.

   You haven't quite cut through all of the confusion and made it to the heart of EMIS

Overlap in software functionality

This seems like a reasonable start, however there are so many overlaps between products this is difficult.

These categories are blurred by applications that blend function. For example, as interval data becomes more common, current monthly data EIS will add interval data capabilities.

Level of detail

I felt the breakdown was valuable and appropriate.

I think it might be more detail than all but the keenest of keeners would every even think about.

More on data needs would be nice.

Most property managers might not be able to tell the difference between some of these applications. It would be helpful to include some examples or visuals to more clearly show the difference between the applications for less sophisticated audiences. For example, for fault detection, what are typical faults that this system would detect?

Yes, it's general enough to guide a new user.

Scope, primary applications

As a reference yes this could be useful, but more in their spirit of providing some examples, not positioned as an exhaustive list.

It is very useful to list primary applications and design intent. In my opinion applications should be identified by the following functions: measure, report, alert, control, optimize, educate.

We believe that it is useful. This helps a user to better frame the scope of functionality for a given vendor's offering. This really gets to the features, benefits, and value provided by each solution.

This is ok as a snapshot of the current state of affairs. But products and their primary applications may change over time, making the listing potentially inaccurate and confusing in the future unless updated.