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U.S. DEPARTMENT OF ENERGY

Energy Management and Information Systems (EMIS) Specification and Procurement Support Materials

December 2020

U.S. DEPARTMENT OF ENERGY

Disclaimer

Acknowledgements

This work was supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231. It was authored by Guanjing Lin, Hannah Kramer, and Jessica Granderson of Lawrence Berkeley National Laboratory (LBNL). The authors would like to acknowledge Anuj Sanhhvi (National Renewable Energy Laboratory) for his contribution of content on cybersecurity. The authors also thank Amy Jiron and Cedar Blazek (U.S. Department of Energy) for their support and guidance.

How These Materials Were Developed

The contents of this package were developed using subject matter expertise combined with best-practice examples from leading-edge organizations that have issued RFPs and specifications for Energy Management and Information System (EMIS) technologies within their own portfolios. The material was reviewed by members of the U.S. Department of Energy's Better Buildings Alliance. The authors wish to acknowledge the contributions of the following reviewers:

EMIS Specification and Procurement Support Materials, version 1 (2015)

Aaron Daly, Whole Foods Market

Adrian Tylim, Los Angeles Unified School District

Ben Sullivan, Kauai County, Hawaii

Carmine Tucci, Ulta

Dan Seligman, Maryland Energy Administration

Donna Trovalli, National Energy Solutions

Kinga Porst, U.S. General Services Administration

Len Pettis and Lindsey Rowell, California State University

Pat Lydon, Legacy Health

Russell Subjinske, Wendy's Quality Supply Chain Co-op, Inc.

Sara Shirazi, University of California, Berkeley

EMIS Specification and Procurement Support Materials, version 2 (2020)

Edna Lorenz, Beaumont Health

Jared Parker, Michigan State University

Craig Wright, Aurora School District

Kelsey Ceccarelli and Austin Upton, Commonwealth Partners

Amy Albaugh, Oak Ridge National Laboratory

Jay Tulley, U.S. Department of Defense

James Dice, Jesse Dean, and Cory Mosiman, National Renewable Energy Laboratory

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Specification Template Instructions

Overview

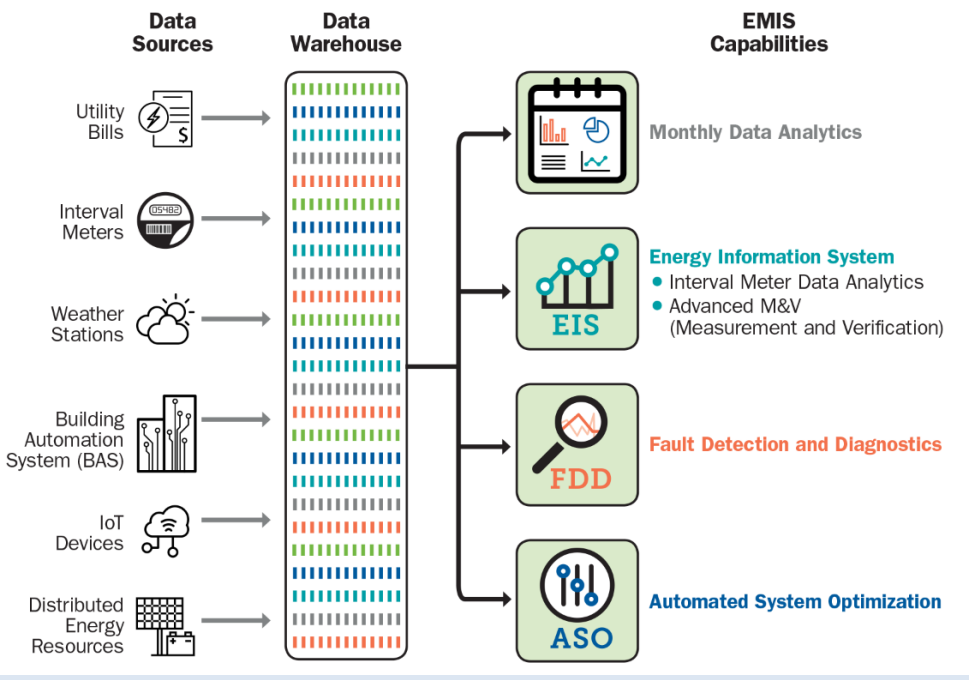
This package of materials is intended to guide you through the specification, procurement, and selection of an Energy Management and Information System (EMIS) or related building performance monitoring and diagnostic technology. It includes:

- A Request for Proposals (RFP) Template that can be filled out to create an organization- and project-specific RFP for vendors.
- An EMIS Technology Specification (Section 2) that can be tailored to generate owner-driven requirements for technology features and capabilities, data integration, and maintenance support.
- An Ongoing Services Specification (Section 3) that can be tailored to generate owner-driven requirements to support in-house staff beyond the EMIS installation period. If the EMIS will be utilized exclusively by in-house staff and ongoing service provider support, the services specification can be omitted.
- Additional sections to define the proposal format, eligibility, and evaluation approach. Appendices provide additional support for developing your RFP, including a table that can be used to summarize the owner's requirements and options with respect to the Technical Specification.

The scope of the RFP may include the purchase of software or software-as-a-service, data acquisition and integration, and ongoing services related to the use of the EMIS. This template contains sections to aid you with specifying those requirements.

Energy Management and Information Systems

Energy Management and Information Systems (EMIS) comprise a broad family of tools and services used to manage commercial building energy use. These technologies and associated functionality include monthly data analytics, energy information systems (EIS), fault detection and diagnostics (FDD), and automated system optimization (ASO). The technical specification template emphasizes EIS and FDD and includes basic specifications for monthly data analytics and ASO. To learn more about the characteristics of EMIS, see *A Primer on Organizational Use of Energy Management and Information Systems (EMIS)*.



How to Use These Materials

All EMIS installations are unique; this document is intended to be edited/adapted as needed for your unique circumstances.

- Content that can be directly transferred into your tailored document is shown in plain text.
- [*Instructions are in gray highlighted italic text and enclosed in brackets and may be deleted.]*
- [Specific areas for owners to fill in are highlighted in yellow and enclosed in brackets. Edit or delete per your organizational needs.]
- Any content that is not relevant to your organization or project may be deleted, and additional content may be added.
- Key concepts and pointers to the owner are provided in sidebars, which may be deleted from the final RFP.
- Definitions:
  - The word “owner” refers to the name of the organization soliciting proposals and procuring the technology. The owner may be a third-party manager.
  - The word “proposal” refers to the response of a person, company, or corporation proposing to provide the technology and/or services sought in the RFP.
  - The word “provider” means the person, company, or corporation that submits the RFP.
- These are not legally binding documents, and they do not serve as contracts. Legal and executive review is recommended to ensure that appropriate language is included in the documents you create.

Request for Proposals Template

This template will guide your creation of an RFP for an energy management and information system or related monitoring and diagnostic technology. If your organization has a standard RFP, use this template to supplement it with the suggested EMIS-specific content.

Project:	[Title of project in which the EMIS or related technology will be implemented**]**
To:	[Prospective technology and metering and integration providers]
From:	[Point of contact for the organization]
Date of Issue:	[Date]

1 Introduction

The introduction section of this RFP gives the proposer the necessary background on the owner's objectives for their EMIS. This section includes details on the owner's sites, systems, and existing monitoring infrastructure, as well as an overview of the project scope and team.

[The sidebars throughout this document include key concepts and definitions that may be deleted for the final RFP.]

1.1 Purpose

[Include a brief description of the purpose of this RFP. Edit to include monitoring-based commissioning (MBCx) services, and Energy Information System (EIS), fault detection and diagnostics (FDD), or Automated System Optimization (ASO) technologies as needed.]

[Name of organization] is soliciting proposals for qualified companies to provide an energy management and information system (EMIS), monitoring-based commissioning (MBCx) services, necessary metering and communications hardware and software, and system training. Technology and service providers are invited to submit a proposal in accordance with this Request for Proposals (RFP).

1.2 Background

[Include a description of the project with background information, including but not limited to the following elements:]

Organizational and facilities overview: *[Describe the organization's business services, building types, portfolio floor area, and geographical coverage.]*

Project scope: *[Describe the number of sites and floor area included in the technology implementation scope. Include whether this is a pilot and any potential plans to further scale the implementation in the future, and associated decision criteria.]*

Project technical objectives: *[Describe the goals of the project, motivation, and expected technology uses and ongoing service. The intention of this section is to give the proposer an overview of the project objectives. Add, edit, and delete from the following list as needed.]*

Monitoring-Based Commissioning (MBCx) and Energy Management and Information Systems

MBCx is an ongoing commissioning process with emphasis on analyzing large amounts of heating, ventilation, and air conditioning (HVAC), interval meter, and utility data on a continuous basis to improve building performance. EMIS tools are used in the MBCx process to organize, present, visualize, and automatically analyze the data. The EMIS may also include supervisory control functions to optimize system operations.

The analysis generated from EMIS tools enable building owners to operate their buildings more efficiently and with improved occupant comfort by providing visibility into and analysis of the energy consumed for space conditioning and ventilation, and other end uses.

For more information on EMIS features and capabilities, see *A Primer on the Organizational Use of EMIS* and the *EMIS Technical Resource Report*.

For more information on the MBCx process, see *What You Need to Know About MBCx* and *MBCx Plan Template*.

- Facilitate continuous energy management and increased operational efficiency
- Enable the organization to reduce portfolio energy use by [X] percent
- Automate energy performance analysis using an energy information system (EIS)
- Perform automated fault detection and diagnostics (FDD) for the HVAC system
- Achieve automated system optimization with the EMIS software performing supervisory control to supplement the building automation system (BAS)
- Track the impact of energy efficiency projects, and measure and verify savings
- Track and manage peak demand
- Produce reports for energy and utility management, operations, and maintenance
- Support implementation of ISO 50001 Ready
- Provide ongoing support to the owner's team for analysis, and follow up on EMIS results, as defined in the Ongoing Services Specification (Section 3 below)
- Manage utility rebate submissions and subsequent reporting

Project budget: *[May include a not-to-exceed budget, range, or no budget information, as applicable.]*

Implementation schedule: *[Include a desired time frame for implementation and ongoing MBCx services.]*

The Promise of ISO 50001 for Commercial Buildings

ISO 50001 is a voluntary global standard for energy management systems (EnMS) focused on continual improvement of energy performance as an everyday business practice. In contrast to EMIS, EnMS is not a software or hardware system. The focus of EnMS is on establishing an energy policy and objectives and the process and procedures to achieve those objectives. EnMS are a natural complement to EMIS in commercial buildings, with EMIS providing actionable information that energy managers can use to achieve EnMS objectives.

The U.S. Department of Energy (DOE) offers the 50001 Ready program to recognize organizations for establishing the foundational structure of ISO 50001. The program is a self-paced approach to building a culture of energy improvement that leads to deep and sustained energy savings. Organizations can use the 50001 Ready Navigator tool online for assistance in putting an EnMS in place. In the tool, the DOE has outlined 25 tasks with supporting guidance to help organizations implement a 50001 Ready system. The tasks are grouped by the seven ISO 50001:2018 sections:

1. Organization Context
2. Leadership
3. Planning
4. Support
5. Operation
6. Performance Evaluation
7. Improvement

Learn more at 50001 Ready.

1.3 Existing Site Characteristics, Systems, and Monitoring Infrastructure

[Describe the site characteristics and existing metering and monitoring infrastructure. Proposers will use this information in combination with the Scope of Work in Section 3 to understand key aspects of scope and data integration. Append spreadsheets if that is a more convenient format to present the information. This section is a critical component of the materials for potential respondents. Accurate price proposals depend on the amount of information shared about the existing systems. Include details where possible, given information availability and considerations of company privacy and confidentiality.]

1.3.1 Site Description

[Provide a description of the site(s) or campus included in the scope of work. Include the following:]

- Gross floor area by building, function and age of each building, and year of major renovations
- Relevant details of lighting and HVAC system design
- Critical loads and services

1.3.2 Meter and BAS Data

[Provide a description of the data available for integration with the EMIS.]

- **Provide a list of existing meters** that are desired for integration into the EMIS (e.g., electricity, natural gas, chilled water, heating hot water, steam, and/or water), and the level of measurement (e.g., whole-building, system). Note whether the meter data have already been integrated into the BAS or another monitoring system.
- **Provide monthly utility data** by building for at least one year (preferably two years or more). Include information on current software platforms used for utility bill processing and meter data management systems (MDMS). *[Required if the contract will have savings targets; otherwise it is optional]*
- **Provide BAS documentation**
    - Indicate the percent of building HVAC systems that are either pneumatic or not on the BAS.
    - Provide the make and model of the BAS, including year of installation, software version, and any existing bandwidth/speed issues. If available, documentation of the BAS point naming convention and metadata tagging model.
    - Describe centralization or remote access to the system.
    - Describe if there is an existing data gateway or protocol converter in place, and the communication protocol it supports (e.g., BACnet, Modbus).

1.3.3 Other Data and Integration

[If you will integrate data from other preexisting EMIS, lighting control systems, or Internet of Things (IoT) devices, describe the following.]

- The monitoring system, and whether it is currently in use. Note the make and model.
- Communication protocols (e.g. APIs), data storage, and data access for the existing system or device.

- If the EMIS will be integrated with a computerized maintenance management software (CMMS). Note the CMMS currently utilized, including the software version.

1.3.4 Diagrams and Sequences

- Provide a BAS architecture diagram.
- Indicate whether documentation of current control sequences of operation is available.

1.4 Scope of Work and Team Members

The Scope of Work includes a detailed specification of the technology requirements (Section 2) and the desired ongoing services (Section 3) to support the use of the EMIS over time.

The EMIS technology and services in this scope of work will be administered by the proposer in collaboration with the issuing organization's team members listed in Table 1. Team roles are also listed in Table 1 to provide an overview of the technology provider–owner interactions during the project. Detailed requirements for technology and services implementation are included in the EMIS Technology Specification (Section 2) and the Ongoing Services Specification (Section 3). The technology and services may be delivered by the same firm or by different firms.

Commissioning Before EMIS?

Most commonly, EMIS are implemented as tools to support an ongoing commissioning (or MBCx) process. In some cases, the owner may wish to implement a retrocommissioning (RCx) process prior to installing the EMIS. In this case, RCx can be added to the scope of work. RCx serves to find and address operational issues such as equipment malfunction, sensor calibration, and HVAC design issues identified from on-site inspection and functional testing of the BAS and associated systems and equipment connected to it.

The EMIS likely would identify these issues once installed, but where there are known issues, it can be beneficial to correct them first to streamline EMIS deployment. After RCx, the EMIS is used to continue to find new issues and opportunities not identified during RCx, determine the severity of issues, and ensure persistence of measures implemented during the RCx phase.

Table 1. Team Members

Title	Role
Energy Manager	Manages the EMIS project, oversees planning and implementation of the EMIS, and communicates progress and outcomes to management.
Building Engineer	Familiar with the building's control system and architecture. Assists with EMIS installation by answering questions from the EMIS provider around existing system configuration. Involved in the selection of analytics and FDD rules to apply to the systems.
IT Representative	Supports EMIS setup regarding IT networks, data transfer processes, and network cybersecurity.
Environmental Health & Safety Representative	If the equipment to be monitored includes specialty equipment that requires additional support, the EH&S representative will provide input.
EMIS Provider	The EMIS provider serves as the system integrator and is responsible for setting up data transfer and configuring and commissioning the EMIS according to this specification. The EMIS provider leads the training and hand-off to the energy manager, building engineer, and MBCx services provider.
(MBCx) Services Provider	The service provider may support the EMIS provider during EMIS installation, or they may be the same company as the EMIS provider. The service provider is responsible for the services in Section 3, and typically works with the building engineer to implement findings.

In the technology and services specification, the owner should indicate which capabilities are "required" or "preferred." *[The required and preferred capabilities may also be summarized through use of Appendix B: EMIS Technology and Ongoing Services Summary.]*

Note that if all or most capabilities are listed as required, this may exclude many EMIS vendors from proposing.

1.5 Schedule of Events

[Include the date for the RFP events.]

This RFP will be governed by the schedule in Table 2:

Table 2. RFP Schedule

Event	Date
Release of RFP	[Date]
Optional Proposer's conference	[Date]
Last day to submit written questions	[Date]
Last day for [Organization] to respond to questions	[Date]
Proposal due date (*Late proposals will not be accepted)	[Time and Date]
Optional interviews with Proposers	[Date]
Notice of intent to award	[Date]

2 EMIS Technology Specification

The following technology specification includes details on data integration requirements and the capabilities desired in the EMIS. This section also details IT requirements, including software hosting, data ownership, data communications architecture, and cybersecurity. The technology specification includes a framework for testing and commissioning the EMIS prior to the completion of installation and turnover. Proposers should look for designation of "required" or "preferred" technology capabilities, which are also summarized in Appendix B.

This section of the package contains the template to guide your creation of a specification for an EMIS or related monitoring and diagnostic technology. It provides a structure and content foundation to facilitate an owner-driven process to define technology capabilities and for successful installation of the technology.

By editing, adding to, and deleting from the template, you will produce a custom technology specification based on your organization's specific goals and energy management processes.

It is recommended that in each section of the specification you indicate when capabilities are preferred and not required.

EMIS Planning Phase

If support is needed to complete the EMIS Technology Specification for the RFP, you may complete a planning phase scope prior to preparing the RFP. An experienced consultant or MBCx service provider can help you define your EMIS needs and specify a system that meets those needs.

The Planning Phase may include the following scope:

1. Define goals and objectives for EMIS implementation.
2. Inventory existing systems and monitoring infrastructure
3. Design the EMIS solution and any recommendations for additional monitoring needed.
4. Define the diagnostic plan (align terminology).
5. Develop estimates for project costs and savings.
6. Develop the EMIS Technology Specification for the RFP.
7. Develop the Ongoing Services Specification for the RFP.

2.1 Data Integration

The EMIS provider will establish a secure data-transfer protocol between the owner's meters and control systems and the provider's infrastructure. The following sections provide technical specifications for the technology's capability to integrate various data sources into the EMIS. Data ownership is covered in Section 2.7.2. *[Delete any that do not apply (for example, utility data may be tracked in a separate accounting system that is not integrated with the EMIS), and add and edit as needed.]*

2.1.1 Utility data integration

- The technology will provide the capability to integrate utility meter data from existing owner systems (i.e., electricity, gas, steam, chilled water, water) by building (where applicable). [Specify the associated systems and data requirements.]

2.1.2 Interval meter data integration

- The technology will integrate with new and existing meters and monitoring systems from an interval meter and/or meters with pulse outputs. Where it is necessary to take advantage of existing metering data, the technology will integrate with the following systems for whole building meters and/or submeters: [note specific systems, e.g., Schneider ION, etc.]
- Indicate the desired data collection interval: hourly or sub-hourly (e.g., 15-minute data).
- Data should be available for analysis in real or near-real time through a continuous and automated data acquisition process.
- The technology will have the capability to consolidate meter readings to create virtual meter

points. In other words, it can add and subtract the readings from multiple meters at the same interval, to produce a calculated time series of energy use.

- The technology will be able to upload and store a minimum history of 5 years (if available) of energy use or other data from standard spreadsheet or text file formats.
- The technology will have the capacity to store at least 5 years of data, trended at intervals up to 15 minutes for analysis, reporting, and visualization.
- The technology will have the ability to parse out data cluster displays into coincident time intervals ranging from 10 minutes to 1 year.

2.1.3 Building automation system (BAS) data integration

The technology will extract data from the building control systems for FDD functions. *[Note specific building control systems existing at facilities. Indicate whether the EMIS will also provide supervisory control of building automation systems for automated system optimization purposes (See Section 2.5).]*

- The data collection interval will be selected to meet the needs of the FDD software and is compatible with BAS trending, with 15-minute interval data being the most implemented. Change of value and/or slower polling rates may be needed to reduce network burden on the control system, and the effect of data collection interval on network speed will be determined during FDD setup. Slower or faster polling rates may also be implemented based on the type of fault (e.g., hunting and cycling faults may need one- to five-minute interval data).
- Integration with non-legacy vintages of BAS providers will occur via common protocols such as BACnet and Modbus, or through the BAS vendor's gateway. If the BAS does not support BACnet, a data gateway or protocol converter will need to be installed by the EMIS vendor.
- *[Either all BAS data or a subset of available BAS data may be integrated into the EMIS. Owners that wish to limit the scope to specific systems should edit this section to indicate their preferences here.]* BAS data will be integrated as follows:
  - These data include: [chiller/boiler plant data, air handler data, and zone device data].
  - Integration will include but not be limited to [energy meter data already connected into the BAS, equipment status, setpoints, valve/damper control signals, fan speed, air flow rate, pump water flow rate, and air and water temperatures].
- Near-real time data polling or end of day batch uploads to the EMIS are acceptable.
- The data integration will not adversely affect the speed of the existing BAS control or visualization functions.

2.1.4 Additional monitoring required or preferred

If additional metering or monitoring is required or preferred by the technology provider (see Section 1.3 for details on existing monitoring infrastructure), the provider will call out any additional costs associated with adding monitoring to the scope of work. The provider must also indicate the potential impact on EMIS operation if additional metering or monitoring is not installed.

2.1.5 Metadata / data tagging

The use of standard naming conventions and a metadata schema (which may be referred to as 'data tags') improves the ability of the EMIS to consistently analyze, visualize, and derive value from

operational data. A metadata schema will be selected for the project, defining at a minimum:

- a data dictionary for all terms used in the schema;
- a data taxonomy, providing categories and subcategories for the defined terms;

The specific version of the metadata schema should be noted, as well as noting whether the schema is an adaptation or extension of another existing schema.

The technology provider will provide appropriate metadata for all data integrated with the EMIS, in alignment with the schema or tagging system selected for the project. *[If the owner has a desired metadata schema (e.g., Haystack, Brick, or the technology provider's standard metadata model), indicate the desired approach in this section. Alternatively, the metadata schema may be defined after the technology provider is selected. If strict adherence to Haystack or Brick are specified, the owner may be narrowing the field of eligible EMIS providers, since some providers have developed their own standard metadata schemas.]*

2.1.6 Other data sources and application programming interfaces (APIs)

The software platform may need to integrate with other software platforms used by the owner to operate and manage their facilities. *[Describe any desired requirements for what data the technology must integrate with and what would be helpful but not required. Consider the following potential capabilities; delete any that are not required and add and edit as needed.]*

- The software platform must have the ability to collect dynamic and static data from multiple sources (e.g., BACnet, Modbus, OPC, CSV, RDBMS, and SQL).
- The technology will integrate with multiple external data sources such as local or on-site weather stations or third-party weather providers. Degree-days will be calculated automatically and charted for inclusion in year-to-year or month-to-month energy comparisons.
- The technology will integrate with existing lighting control and plug control systems so these data sources are available for analysis and diagnostics. [List the lighting control and/or plug load control systems.]
- The technology will integrate with the owner's CMMS. [Indicate the CMMS vendor.] *[Work order management integration is detailed in Section 2.4.5.]*
- The technology will integrate with existing IoT-based sensing so these data sources are available for analysis and diagnostics. [List the sensing technologies and communication protocols.]
- Provision of an API to support integration of data and fault findings with the third-party applications such as business intelligence software or other accounting systems.

2.1.7 Data validation

The technology provider will work with the owner to ensure that all data brought into the system is as accurate as possible. *[Specify who is responsible for the data quality checks: in-house staff, the technology provider, and/or the service provider.]*

- The data connection to the EMIS will be validated by the technology provider. In case of a data connection interruption, the data should be stored locally for at least two weeks of hourly data, or one week of sub-hourly data (e.g., 15-minute or 5-minute data).
- The technology will detect meter and sensor data quality issues such as gaps, spikes, and flat-lines, and the technology provider will have an option or service to automatically fill and/or

correct data.

- The technology provider will help to identify inaccurate data. Any necessary configuration, calibration, additional sensors or points, or replacement costs for sensors critical to the analytics are not the EMIS provider's responsibility. Critical sensors include: [outdoor air temperature, supply air temperatures, chilled water supply temperatures, airflow stations, carbon dioxide (CO_2) sensors, and building pressure sensors.]
- The technology provider will address insufficient data collection intervals, false negative and false positive diagnostics, dropped communications, and erroneous metadata tagging.

2.2 Utility Bill Analytics

2.2.1 Utility bill management

The technology will provide the capability to pull data from the existing utility bill processing system. *[Describe any desired requirements for how the technology will incorporate and analyze utility billing information. Consider, for example, the following potential capabilities; delete any that are not required, and add and edit as needed.]*

- The technology will provide the capability to allocate utility costs to different tenants or occupant groups sharing a building, to enable recharges and tenant billing.
- The technology will provide capabilities for savings analysis and comparison across a building portfolio through benchmarking, deriving energy use intensity, aligning bills with a calendar month, and normalizing usage based on weather data using standard protocols such as IPMVP Option C.

2.2.2 Utility budgeting

[Describe any desired requirements for how the technology will forecast future utility costs and conduct a budget/cost comparison. Many of these functions may be included in the owners' utility accounting processes and would not need to be replicated by the EMIS. Delete any capabilities that are not required and add and edit as needed.]

- The technology will chart and report energy costs against budget, indicating surplus/deficit.
- The technology will include custom utility tariffs for energy cost and demand calculations. *[Requiring inclusion of utility tariffs may limit the vendors that can respond, as this is not a common feature in EMIS. Forecasting utility budgets using costs obtained from the bills rather than projected using the specific utility tariff may meet the owner's needs.]*

2.2.3 Greenhouse gas (GHG) tracking

[Describe any desired requirements for how the technology will compute and analyze GHG emissions based on collected energy usage. Consider, for example, the following potential capabilities; delete any that are not required, and add and edit as needed.]

- The technology will calculate, monitor, and report GHG emissions associated with facility energy use. The technology will supply recommended GHG conversion factors from a referenceable source, and the software will allow the users to enter their own conversion factors. *[Specify any reporting protocols that must be met and whether region-specific emissions factors are required, or if an assumed energy-to-CO_2 conversion factor is sufficient.]*
- Greenhouse gas calculations will account for on-site renewables, where relevant.

2.3 Interval Meter Data Analytics

The technology will allow the user to create customized charts and reports with the following meter data analytics.

2.3.1 Energy consumption tracking

[Describe the requirements for tracking energy consumption, including details such as the level of measurement (i.e., whole-building, end-use level, panel-level, or equipment-level submetering), time resolution of data, data input and storage, and data quality assurance. Delete any capabilities that are not required and add and edit as needed.]

- The technology will track and provide flexible charting capabilities for multiple meters on an hourly or sub-hourly (e.g., 15-minute) basis.
  - Whole-building level: electricity, gas, water, steam, etc.
  - End-use submetered level: HVAC, lighting, plug loads, etc.
  - Equipment submetered level: chiller, boiler, cooling towers, pumps, air handlers, etc.
  - Renewable energy sources: Solar photovoltaic, fuel cell, wind, etc.
- Energy cost tracking
  - The technology will calculate and provide visualizations of [near real-time/daily/monthly] (and historic) energy costs.
  - The technology will use [site-specific tariffs or estimated (blended) flat rates in $/energy unit]. *[Energy cost is most often calculated within EMIS using blended rates.]*
- Energy unit conversion *[Specify units and define any desired conversion standards.]*
  - The technology will have the ability to normalize the data according to factors that are known to affect energy consumption, such as floor area, number of occupants, heating degree days, and cooling degree days.
  - The technology will have the capability to convert, display, and report energy use in total kBtu and additional environmental metrics such as CO_2 equivalent.

Metering and Submetering

Energy consumption can be measured and tracked at a variety of levels. Whole-building metering can provide a high-level picture of how the building is performing and is a good starting place for organizations just beginning performance tracking. Metering beyond the whole-building level can provide more granular levels of information. It has the potential to offer deeper performance insights and enable greater savings over time.

Metering Best Practices: A Guide to Achieving Utility Resource Efficiency provides information on metering technologies, as well as guidance on how to implement metering.

2.3.2 Energy performance analysis

[Describe any desired requirements for how the technology will analyze interval energy data and provide actionable information. Consider, for example, the following potential capabilities; delete any that are not required, and add and edit as needed.

- Time series load profiling
  - The technology will provide plots of at least 24-hour periods of hourly (or more frequent) interval energy usage versus time [specify longer time periods, such as weeks or months, or unlimited, as desired].
  - The technology will provide options to select the time period and data points that are plotted.
  - The technology will allow multiple user-selected data points to be plotted on a single chart or graph.

Energy Performance Analysis

For more information and detailed examples of the energy analyses described in this section, refer to LBNL's *Energy Information Handbook: Applications for Energy Efficiency Building Operations* and *Using EMIS to Identify Top Opportunities for Commercial Building Efficiency*.

- Benchmarking

  Benchmarking using the following meter-level key performance indicators (KPIs) will be included in the EMIS for the following metrics. The technology will allow the user to add custom KPIs and custom normalization factors. The benchmarks will be configured to allow for comparison to the prior [day/week/month/year].

  [Consider the following KPIs in Table 3; delete any that are not required, and add and edit as needed.]

Table 3. Benchmarking KPIs

Meter-level KPIs	EMIS View	Analysis
Annual energy use with normalizing factors including gross floor area, heating degree days (HDD), cooling degree days (CDD), and % occupied	Whole building kBtu/sq ft or by fuel; ENERGY STAR portfolio manager benchmark score	Rank the portfolio and review outliers.
Monthly energy use with normalizing factors	Monthly energy use intensity (EUI) in whole building kBtu/sq ft and by fuel [add other normalizing factors as desired such as occupancy or production units]	Compare to the previous month or the same month of the previous year.
Daily electricity KPI: (Total building kilowatt-hours [kWh]/day)	Min/max/average/current daily reading	Establish facility benchmarks after commissioning.
Daily gas KPI: (Total therms/day)	Min/max/average/current daily reading	Establish facility benchmarks after commissioning.
Submetering (equipment or end uses)	kBtu or kWh	Establish facility benchmarks after commissioning.

The meter-level KPIs in Table 3 can be displayed in both cross-sectional benchmarking and longitudinal benchmarking formats.

- Cross-sectional benchmarking: The technology will allow the user to create "peer groups" and will rank buildings (and/or submeters, meters, and equipment) by a performance index. The technology will also interface with the ENERGY STAR Portfolio Manager to automatically produce ENERGY STAR scores for user-selected buildings. *[Specify critical indices or metrics for your buildings and equipment such as kBtu per sf, $ per year, and use of other normalizing factors.]*
- Longitudinal benchmarking: The technology will provide the ability to compare the KPI in a fixed period [day/week/month/year] for a building, system, or equipment component against past [and/or predicted] performance of the same period length.

- Heat map visualization
  - The technology will provide heat maps of energy consumption, color coding the magnitude of the metered energy usage for a user-selected time period of historic data.
- Baseline energy consumption modeling
  - The technology will characterize and predict the typical or expected energy usage based on key drivers such as weather (degree days or outside air temperature), occupancy, time of day/week, and other variables.
  - The baseline will be used for energy savings calculations, near-future load predictions, energy use comparisons, and energy anomaly detection.
  - The technology has the capability to set up multiple baselines, e.g., prior year and a corporate goal baseline.
- Energy anomaly detection
  - The technology will identify and flag unexpectedly high or low energy use at the [building, submeter, and equipment level] using [a baseline model / simple alarming threshold].
  - The technology will allow for energy anomaly detection thresholds to be user-defined.
  - The technology will provide the ability to track energy anomalies (duration and persistence) to facilitate response and resolution.
  - Assistance to set up the baseline model will be provided.

Managing Technology Costs

This template specification includes an extensive array of technology capabilities with the intention that users of the specification customize and eliminate capabilities that are not needed. Technology vendors may provide a standard offering with additional fees for custom options. Types of capabilities that may increase costs and complexity include:

- Import/upload of historical data
- Integration of the EMIS with older BAS or other end-use systems (e.g., lighting, plug loads)
- Options for user-defined customizable inputs
- Highly flexible visualization options
- Extensive integration of data streams from other databases
- A high degree of customization
- Integration with CMMS

To manage technology costs, take care that your specification does not result in a highly custom solution. For example, most interval data analysis technologies such as energy information systems will not provide extensive utility billing management capabilities or control capabilities. However, increasingly, EMIS provide both EIS and FDD functionality in a single software offering.

For descriptions of EMIS technology capabilities, see *A Primer on Organizational Use of Energy Management and Information Systems (EMIS)* and the *EMIS Technical Resource Report.*

- Building energy dashboards and reports
  - The technology provider will provide a public-facing configurable dashboard display for occupants and visitors to view owner-defined aspects of energy consumed in the building, including: [energy use intensity, cumulative savings over time].
  - The technology provider will provide an operator-facing or energy manager-facing configurable dashboard display to view building energy performance.
  - The technology provider will provide all necessary hardware, software, and connectivity for users to create their own shareable reports.

- Demand monitoring

  [Describe any desired requirements for how the technology will monitor and analyze building peak load. Consider, for example, the following potential capabilities; delete any that are not required, and add and edit as needed.]

  - The technology will provide [daily/monthly/annual] peak load monitoring.
  - The technology will provide notification through [e-mail, text message, or other means] to an individual and/or group of recipients when the demand for critical metered loads passes a threshold.

2.4 System Data Analytics

The owner desires equipment-level analytics and specific, automatic recommendations for improvements to occupant comfort, asset health/life, and energy use. This section covers the use of system data analytics to detect performance degradation and can be utilized in a conditions-based maintenance program. *[Describe any desired requirements for how the technology will provide fault detection and diagnostics with system data analytics. Consider, for example, the following potential capabilities; delete any that are not required, and add and edit as needed.]*

2.4.1 Fault and Optimization Opportunity Detection

Meter-level fault detection is covered in Section 2.3.2 under Energy Anomaly Detection. This section focuses on FDD using BAS data.

- The technology will utilize BAS trend data and system-level metering (where available and applicable).
- The technology will provide the capability to detect faults across the following systems: [chilled water plants, packaged rooftop units, air-handling units, terminal units/zone temperatures, and steam/hot water plants].
- The technology will provide the capability to detect faults across the following systems: [lighting, plug loads, domestic hot water heating, and manufacturing processes]. *[These systems are less common for inclusion in FDD and may add cost to integrate.]*
- The technology will be configured to continuously detect the following faults, opportunities, or performance degradation, as listed in Table 4. *[This list should be edited to meet the owner's needs for desired depth of diagnostics, HVAC system type, and available monitoring points. The list provided constitutes minimum requirements for most built-up HVAC systems that serve large*

buildings. Custom fault algorithms may be added where desired to meet specific owner needs. Technology providers typically have many more faults available for implementation than these minimum requirements.]

Table 4. Fault Detection Requirements

Fault Type	Fault List
General faults	• Sensor errors/faults including drift, bias flatline, or complete failure • Stuck/leaky valves and dampers in water- and air-side systems • Scheduling, i.e., HVAC use outside of intended hours of operation • Hunting or cycling, i.e., poorly tuned control loops, cooling tower fan cycling • Manual overrides in place
Chilled water plant	• Chilled water supply temperature reset • Chilled water plant lockout • Hydronic differential pressure reset • Cooling tower leaving water temperature reset • Chiller short cycling • Over-pumping and low delta T (for primary secondary chilled water pumping systems) • Monitoring optimum chiller plant performance
Air-handling unit / Packaged rooftop unit	• Under or over economizing due to sensor, damper, or control sequence issues • Excessive outdoor air intake • Unnecessary simultaneous heating and cooling due to sensor, valve, and control sequence issues • Air-handler unit (AHU) supply air temperature reset • AHU static pressure reset • Fouled or blocked coil and dirty filters • Compressor fault/failure (only for packaged rooftop unit) • AHU optimum start/stop
Terminal units	• Variable air volume (VAV) minimum supply airflow too high (causing reheat) • Zones are outside an acceptable space temperature range • Space heating and cooling setpoints: insufficient deadband or night setback • Rogue zones driving the AHU system to inefficient operation
Hot water plant	• Hot water plant lockout • Hot water supply temperature reset • Hydronic differential pressure reset • Boiler short cycling

- The technology provider will supply a list of the minimum set of measurement points and their thresholds/tolerance bands that are required to detect the faults listed in Table 4.
- The technology will include the ability to tune FDD rules based on required operational parameters for specific pieces of equipment and HVAC system types, and based on sequences of operation.
- The technology will provide an existing library of fault types and the ability to build custom fault detection algorithms if needed. Fault and opportunity detection routines created specifically for the owner's site will be documented sufficiently to allow the owner to implement the algorithms in the future if a different technology provider is selected.
- The faults will be prioritized according to a qualitative or quantitative estimate of the fault impacts in the following categories: [energy savings, comfort improvements, avoided O&M costs].

2.4.2 Fault and Opportunity Diagnosis

- The technology will provide root cause analysis of the fault to isolate potential causes of the fault.
- Additional capabilities may be specified within the FDD software, such as the ability to add notes to faults and assign a responsible party for follow up.

2.4.3 FDD Configuration

- The technology will be configured and commissioned to robustly support continuous energy and system analysis. System analytics thresholds will be modified to avoid high false positives or false negatives.
- The technology will be configured and commissioned to ensure that data are accurately and reliably gathered. *[Specify who is responsible for sensor calibration and data quality checks, either in-house staff or the technology vendor/service provider.]*

2.4.4 Fault management and FDD results presentation

- Each fault will be presented in a clear fashion that includes the fault identified, access to related fault logic used to detect the fault, access to trend data associated with the fault, and indication of possible fault causes.
- The technology will provide the ability to track faults (number of occurrences, duration, system, etc.) to facilitate response and resolution.
- The fault detection results can be displayed as daily, weekly, monthly, or cumulative. The technology includes links to time series data relevant to the fault, and the data can be viewed with multiple points on each axis.
- Summary reporting of faults is available by building or system type.
- The technology calculates the energy cost impact of the fault based on engineering calculations and inputs specific to the fault.
- The technology will track and record a history of identified faults, from identification through repair completion.
- The user will have the ability to "silence" a fault for a period of time.
- The technology will allow systems and equipment to be grouped and organized in a hierarchical structure (i.e, prioritize faults based on energy cost savings).

2.4.5 Work order management

It will be the responsibility of the technology provider to provide the technical resources necessary to integrate the EMIS with the work order management system. *[If work order integration between the technology and the owner's CMMS is desired, provide specifics around level of integration and desired workflow. Note that CMMS integration can add significant cost to an EMIS installation.]*

- The technology will have the ability to push faults to a work order system.
- The technology will have the ability to pull data from the work order system.
- The owner will have the ability to generate a work order within the CMMS directly from the faults generated by the FDD software.
- The fault shall be sufficiently characterized with problem description, priority, and asset number so the fault can be readily triaged and transferred to the CMMS for work assignment, upon prompting for work order generation by the user.
- Upon completion of work or fault resolution, data such as work order status, number, and resolution shall be transferred back to the FDD software for further analytics and tracking of information.

2.4.6 System-level diagnostic supports

- The technology will include visualization of time series operational data through customizable plotting, with the ability for the user to add multiple points to a single time-series plot, utilize and modify both y-axis scales, and modify date ranges.
- The technology will include the system-level KPIs shown in Table 5 *[edit as necessary]*.

Table 5. System-level KPIs

System-level KPIs	EMIS View	Action
Occupant Comfort Index (%)	% of operating hours spent within the zone target temperature	Measure for each zone or collection of zones. Track the average, minimum, and maximum values for each building.
Cooling Plant Efficiency (kW/ton)	Daily profile kW/ton Daily Average (kW/ton)/ton (kW of entire plant preferred)	Varies based on load. Review kW/ton vs. ton plots to identify performance drift.
Heating Plant Efficiency (%)	Btu per hour (out) / Btu per hour (in); Review daily profile	Varies based on load. Review efficiency vs. load plots to identify performance drift.
Fan System Efficiency (%)	kW of supply/return/exhaust fans per cubic foot per minute (cfm) of airflow	Varies based on load. Look for variance between air handlers or performance drift.
Chilled water delta T	Daily average difference in chilled water supply and return temperature	If there is an insufficient temperature difference, investigate over-pumping
Measured variable (e.g., supply air temperature, zone airflow rate, zone temperature)	Percentage of time that the measured variable is maintained within the desired deadband (setpoint ± threshold) during the period	Compare multiple components (e.g., VAV terminal units, AHUs) to find the best and worst performers; prioritize maintenance and repair.

- The technology will include diagnostic heat maps that are configured to include zone damper commands (% open) and zone deviation from deadband.
- The technology will include a system performance dashboard that summarizes faults detected, faults corrected, and estimated impact (avoided cost).

2.5 Automated System Optimization

The previous functionality has focused on one-way data transfer and analysis. Some EMIS products include two-way data transfer with supervisory control to implement advanced optimization algorithms in real time without user intervention. These optimization algorithms may implement model-predictive control, grid-response, or corrective action to address sensor faults or control improvement opportunities. *[Describe any desired requirements for how the technology will provide control. Consider, for example, the following potential capabilities; delete any that are not required, and add and edit as needed.]*

2.5.1 HVAC performance optimization

The technology will include the ability to minimize energy consumption, total utility costs, and/or carbon emissions through the following performance optimization capabilities:

- optimized control for the chilled water and air handling systems, including optimized reset schedules and control strategies
- automatic correction of sensor faults

2.5.2 Peak demand charge minimization

- The technology will include the ability to control building loads and stage equipment to minimum peak demand charges from the utility.
- The technology will optimize use of [thermal storage and/or battery storage] to minimize peak demand charges from the utility.

2.5.3 Provision of grid services

- The technology will provide the capability to initiate load shed, shift, or modulation for grid response in response to dispatch signals or price signals.
- The technology will interface with the utility via the [specify communication protocol, e.g., OpenADR, IEEE 2030.5] communication protocol.

2.5.4 Other supervisory control strategies

- Specify other types of supervisory control objectives such as setpoint enforcement across a portfolio of buildings.

For these control functions specified in sections 2.5.1 – 2.5.4, the following HVAC systems [chilled water plant, steam/hot water plant air-handling units], energy storage options [thermal storage and/or battery storage], and other distributed energy resources [solar photovoltaics, fuel cells, electric vehicle charging stations, and/or other generation sources] are available for system optimization. For these control functions, technology providers will need to detail:

- Failsafe and override operation.

- How operating parameters will be set and refined to maintain occupant comfort.
- Visualization and quantification of changes in demand
- Whether the optimization uses predictive algorithms
- Whether the technology uses specific utility tariffs, or a proxy

2.6 Project Management and Reporting

2.6.1 Project management and verification of savings

[Describe any desired requirements for how the technology will streamline the energy efficiency project process and evaluate project savings. Consider, for example, the following potential capabilities; delete any that are not required, and add and edit as needed.]

- The technology will provide the capability to log and track the status of energy efficiency projects (e.g., start, ongoing, finish) and personnel assigned. The technology will allow users to annotate charts and displays with key events and will store those annotations. *[These project tracking capabilities are less common in EMIS, and specification may limit responders.]*
- The technology will provide measurement and verification (M&V) capabilities in accordance with the International Protocol for Measurement and Verification Protocol (IPMVP) Option C or other industry standards, such as ASHRAE Guideline 14. The baseline model type should be described in the proposal, and preferably adhere to transparent/documented model specifications. Additional requirements include:
  - Provision of baseline model fitness metrics (e.g., NMBE, CV[RMSE], R2)
  - Ability to create multiple baseline models for a single meter
  - Ability to perform M&V using monthly and interval data
  - Ability to convert savings to common units (e.g., kBtu, $) and normalize (e.g., kBtu/sq ft/yr)
  - Ability to use ambient temperature data within the baseline models
  - Ability to acquire other independent variable data, such as number of occupants, number of beds occupied, number of meals served, etc. These data may be entered manually or acquired from an enterprise-level system
- The technology will provide the ability to express savings for each discrete project or in aggregate at the whole-building meter or submeter level, for a defined pre- and post- period or as a cumulative aggregated total. Output and charting requirements include: [time-series charts including actual and predicted energy use, cumulative sum of energy savings charts (CUSUM), energy savings report tables].
- The technology will provide capabilities to support savings analysis using IPMVP Option B.

2.6.2 Notification, reporting, and data export

[Describe any desired requirements for anomaly or fault detection, reports generated by the technology, and data that can be exported from the technology. Consider, for example, the following potential capabilities; delete any that are not required, and add and edit as needed.]

- The technology will provide customizable notification schemes including: [work order generation, e-mail, phone, text message, to individual and/or group recipients] for data quality alerting, anomaly detection, and fault detection.
- The technology will provide [year-over-year, month-over-month, week-over-week, or day-by-day] [energy, cost, and/or equipment health and performance reports] in a format specified by or acceptable to the owner.
- The technology will provide users the ability to create and save custom reports.
- The technology will export reports to the following file formats [specify which]:
  - .pdf
  - .doc/.docx
  - .jpg
  - .xlsx/.xls
  - .html
- The technology will allow users to export data (all, or selected points or totalizations) to the following file formats [specify which] for use in external tools such as MS Excel and MS Access:
  - .xlsx/.xls
  - .csv
  - .xml

Reporting Considerations

Take care to plan your reporting needs, based on your organization's operations and management. Consider, for example:

- Who will receive and access reports? Information content will differ based on roles and responsibilities (e.g., executives vs. operational personnel).
- How will the reports be used based on current business practices?
- What reports are currently used, and how frequently are they generated?
- What data are required to generate new energy or operational reports? Are those data included in your metering plan?
- What user-defined customizable options would you like supported?

Most EMIS can provide user-defined reports, so the exact format of the report does not always need to be known ahead of EMIS installation. However, it is essential to make sure the data desired for inclusion in the report are available through the EMIS.

2.7 IT Requirements

2.7.1 Data storage and backup

[Describe any desired requirements for data storage and backup services; delete any that are not required, and add and edit as needed.]

- Data archival will use a database and provide a periodic data backup option (e.g., monthly, quarterly, yearly).
- The technology will offer sufficient capacity to store all required data for a minimum period of [specify duration] (see listing of required data in Section 2.3.1).
- The owner will be given unfettered read-only access to the data and analytic results. The data will not be deleted and will be stored in such a way that historical data may be downloaded in the future [specify duration].
- At the conclusion of the contract, the technology provider must retain data for a minimum of [specify duration]. Upon request, the provider should return all data to the owner or if return is not feasible, destroy and not retain any copies (and furnish the owner with an appropriate Certificate of Destruction) of any and all owners' data that is in its possession.

SaaS vs. On-Premise Offerings

Many of today's energy analytics technologies are delivered as software-as-a-service (SaaS) offerings. Depending on the specific software solution or vendor, on-premise, self-hosted solutions may not be available.

On-premise solutions are not hosted "in the cloud" yet can still accommodate remote, off-site access. Server hardware and software, maintenance, and network connectivity are the responsibility of the site or owner. Data are stored and handled internally, behind any firewalls.

Instead of running on servers on-site with local data storage, off-site SaaS cloud-based applications are widely available. The data must travel over the Internet to the cloud provider, yet all storage, maintenance, and hosting is handled by the provider. Common security certifications and programs to validate the level of security provided by cloud-based service include the Federal Information Security Management Act (FISMA) and the ISO 27000 series.

2.7.2 Software hosting and data ownership

[Specify the preferred option for software hosting.]

- Software as a service (SaaS), operated and maintained by a technology provider
  - The owner retains ownership of all their data on the service provider's cloud-based server.
  - The owner's network security team will allow limited firewall rules to enable the cloud-based connection.
  - The service provider's server security settings must meet the owner's network security standards.
- On-premise [specify whether maintenance will be conducted by the technology provider or by the owner].
  - The owner will retain full ownership and control of the software platform and the data.
  - The software platform will be installed on owner-controlled virtual servers.
  - All data, reports, graphics, analytics, documentation, and other information associated with this system also will be stored on owner-controlled virtual servers.
  - Any algorithms and programming must be sufficiently documented to allow members of the owner team to operate and maintain the system without future support from the software provider.

2.7.3 Cybersecurity

The technology provider will describe the approach for complying with the owner's requirements for privacy and network and system protection identified in Table 6. *[Edit and add cybersecurity requirements as needed, including any specific requirements from the owner's IT representative and any specific frameworks and/or protocols that the technology provider will need to address. Table 6 identifies frameworks and protocols that are required by federal agencies as a reference for a robust cybersecurity process. Owner-specific requirements may differ. Delete any that are not required, and add and edit as needed.]*

[From Table 6, delete any cybersecurity areas, frameworks, or protocols that are not required, and add and edit as needed.]

Table 6. Owner's Cybersecurity Compliance Requirements

Cybersecurity Area	Related Framework / Protocol
Frameworks governing cybersecurity and risk management requirements	• Cybersecurity Framework (CSF) – Executive Order 13800 • NIST Special Publication 800-37R2 Risk Management Framework (RMF) – Federal Information Security Modernization Act (FISMA) & Office of Management and Budget (OMB) Circular A-130
Policy guidance for mapping information types and systems, and completing a cybersecurity review	• FIPS 199 "Standards for Security Categorization of Federal Information and Information Systems" (FIPS 199) • FIPS 200 "Minimum Security Requirements for Federal Information and Information Systems" (FIPS 200) • NIST Special Publication 800-60 Volume II: Appendices to Guide for Mapping Types of Information and Information Systems to Security Categories • Committee of National Security Systems Instruction (CNSSI) No. 1253 (mandated for Department of Defense facilities)
Policy guidance for developing a system security plan (SSP), identifying security boundaries, and selecting security controls	• NIST Special Publication 800-18: Guide for Developing Security Plans for Federal Information Systems • NIST Special Publication 800-53 "Security and Privacy Controls for Federal Information Systems and Organizations" • NIST Special Publication 800-171 "Protecting Controlled Unclassified Information in Nonfederal Systems and Organizations"

The technology provider must describe how the proposed EMIS solution addresses security requirements and how the technology provider will coordinate with the owner's IT representative during the project to ensure a comprehensive approach to security. *[Describe the desired requirements for the implementation process and coordination with owner's IT representative. Delete, add, and edit steps in the process as needed.]*

The work in each step would be completed after the contract is awarded:

- **Cybersecurity Review:** Work with owner's IT representative to conduct a security review of the EMIS system and to specify the approach for integrating the EMIS system with the existing IT infrastructure. *[In the federal sector, in addition to cybersecurity for the EMIS, all underlying systems connecting to the EMIS must go through a cybersecurity authorization process (BAS, meters, etc.) in order to be connected to the EMIS.]* The review should provide detail on:
  - Information types that are input, stored, processed, and/or output from the EMIS
  - Default interfaces and connections within the EMIS
  - List of assets and components that form the EMIS
  - List of applications within the EMIS
  - Architecture and data flow diagrams for the EMIS
- **Design Cybersecurity Approach:** Work with the owner's IT representatives to design a comprehensive security approach for EMIS implementation, and if applicable, provide input to update the owner's system security plan and/or other relevant security policies and protocols. Based on the cybersecurity review, identify security boundaries and select security controls. Controls must be tailored to organization-specific security requirements. Control measures must address best practices for maintaining information security, such as encryption, user access, and multifactor authentication. The owner's IT representative must review and confirm that the approach is consistent with the owner's requirements.
- **Implement Cybersecurity Frameworks & Protocols:** Implement the Cybersecurity controls as designed and agreed with the owner. Verify the effectiveness of the implemented security controls through the inspection, validation, and commissioning process.
- **Maintain System to Meet Cybersecurity Needs:** Describe how the technology provider's EMIS system will be monitored and maintained to address evolving cybersecurity requirements (e.g., intrusion detection, security patches, upgrade processes). Include a description of the technology provider's practices for managing information security incidents and improvements.

2.7.4 Permissions and access control

[Describe any desired requirements for end-user access to websites, servers, and mobile applications; delete, add, and edit as needed.]

- The technology provider will indicate any limits on the number of users and/or accounts that can be accessed via web browser or mobile web applications.
- The technology will implement role-based access, including a hierarchical set of permissions to be constrained to specific buildings, departments, people, etc.
- Login to the system will require a username and strong password. Default passwords are not acceptable.

- The technology provider will implement multifactor authentication.

2.7.5 Usability

[Describe any desired requirements for the technology user interface; delete, add, and edit as needed.]

- The technology will condense large amounts of real-time and historical energy usage data into a graphical format that is rich, intuitive, and user friendly.
- The technology will be accessible through multiple hardware platforms (i.e., smart phone, tablet, PCs, or Macs).
- The technology will support common Internet browsers, and the technology will be updated as needed for compatibility with browsers.
- The technology will allow creation and storage of custom views for different users or user types. [This capability might include, for example, color assignment, definition of type and location of charts on the page, inclusion of building photos, etc.; specify which are desired.]

2.7.6 Networking

[Describe bandwidth requirements and communication protocols; delete, add, and edit as needed.]

- The technology provider will indicate which protocols their technology is compatible with, including all relevant elements of the system, such as building metering and control communications, databases, web services, and Internet communications.
- The technology provider will indicate any web browser version dependencies.
- The technology provider will specify anticipated bandwidth requirements at interfaces within the building monitoring and control networks.
- The technology provider will address the approach to interfacing with legacy systems to avoid network overload and ensure cybersecurity best practices.
- The technology provider will implement cybersecurity hygiene with basic port security practices to restrict unauthorized activity.

2.8 Technical Warranty, Support, and Training and Commissioning

2.8.1 Warranty

[Describe any desired technical warranty and edit as needed. This section is optional since some technology providers cannot offer warranties due to insurance limitations.]

The technology provider will include a warranty that will begin after implementation, testing, and commissioning. The duration of the warranty will be at least [specify a period of time, e.g., two months]. During the warranty period, all software updates, hardware, and services listed will be provided to [name of owner] on a no-charge basis.

2.8.2 Technical support

[Describe any desired technical support services and edit as needed.]

- The technology will provide the following help system for end users:
    - An online help system that includes comprehensive system documentation

- Electronic versions of user manuals
- A service help desk with a guaranteed response time of no more than [define a period of time, e.g., one day, five hours].

- The technology provider will provide a detailed list of technical support and maintenance options, including how much support is included with the tool installation for diagnostic and reporting customization.
- The technology provider will include EMIS system tuning for [X months] after substantial completion of EMIS installation. This tuning process will include: identifying incorrectly mapped points, inaccurate sensor data, fault thresholds, and supervisory control policies. [An owner may request three months (to include various operating regimes) up to one year (optional).]
- The technology provider will provide estimates of the frequency of software updates during a year and any associated system downtime.
- Software license and firmware updates will be implemented proactively by the technology provider when available, and free of charge for the duration of the software-as-a-service contract.

2.8.3 Training

[This section covers training to occur during or immediately after the EMIS is installed. Ongoing training and technical support is covered in Ongoing Services Specification *(Section 3) . Describe any desired training, and edit as needed.]*

- The technology provider will offer user training in the following form. Training may include the following options:
  - Tools and instructional materials in video, electronic format, or hard copy
  - Initial [number of hours] hour on-site training programs at each site/campus
  - Ongoing group training sessions [frequency, e.g., twice a year] to update personnel and instruct new staff
- The technology provider will offer user training on the following topics *[edit as needed]*:
  - Login and navigation to access dashboards, screens, trend charts, tables, and other visualization
  - Access to key performance indicators and metrics
  - Access to alert log and reports
  - Detection of data integrity issues
  - Detection of communication and network interruptions
  - Access to online or in person support
  - Interpretation of analytic outputs
  - Interpretation of faults and method for changing thresholds or other FDD parameters
  - Programming additional faults as needed
  - Adding shortcuts, recommended workflow, and best practices in using the EMIS

2.8.4 Testing and Commissioning

Prior to hand-off, the technology provider will fully commission all data acquisition and communications systems and analytical functions supported by the technology. The provider will be responsible for providing a commissioning report to certify the following:

- The EMIS has been tested, verified, and all elements operate as proposed.
- Meters and sensors have been configured and are communicating accurately, and time-series data has been verified for timestamp alignment.
- The metadata model has been consistently implemented according to the selected metadata schema.
- Communication pathways within the EMIS are fully functional.
- Key performance indicators and metrics have been correctly calculated.
- Desired external data has been accurately integrated.
- Historical data has been imported and integrated.
- Dashboards, charts, and other visualization features have been configured.
- Alerts and alarms notifications have been configured.
- Reports have been configured and are available as designed.
- User credentials have been configured and made available.

3 Ongoing Services Specification

Once the EMIS has been installed and commissioned, the use of the EMIS moves to the MBCx Phase (or Ongoing Services Phase). In this phase, the technology will continuously monitor and automatically analyze the performance of building systems, and the service provider will support actions related to the findings. The service provider will support in-house staff beyond the EMIS installation according to the scope and length of contract in this section. Proposers should look for designation of "required" or "preferred" services capabilities, which are also summarized in Appendix B.

The EMIS technology and the MBCx services may be delivered by the same firm or by different firms.

The services defined in this section may be less extensive than a full MBCx scope for all systems. For instance, a service provider may provide troubleshooting support only as requested. In this section, "service provider" refers to the range of services outlined in this section, which may encompass a full MBCx process or supporting the owner in a more targeted way.

This template is intended to provide a structure and content foundation to facilitate an owner-driven process to define the ongoing use of the EMIS technology and the ongoing services an owner may obtain to support their use of the EMIS. The Ongoing Services Specification is not necessary to include in the RFP if the EMIS will be utilized exclusively by in-house staff, and service provider support is not needed.

By editing, adding to, and deleting from the template, you will produce a custom specification based on your organization's specific goals and energy management processes. It is recommended that in each section of the specification you indicate and distinguish between required services and preferred services.

With the inherent uncertainty in the time required to address diagnostic findings, the owner may wish to indicate a time commitment expected for this MBCx services scope (e.g., 50 percent time in the first year and 25 percent time each subsequent year in the contract period, or total hours per year or month).

3.1 Ongoing EMIS Review

Ongoing EMIS review includes support activities in which the EMIS results are reviewed and prioritized, and issues are investigated. *[Describe any desired ongoing EMIS review services, and edit as needed.]*

3.1.1 MBCx process management

- The MBCx service provider will organize and facilitate [weekly/biweekly/monthly] meetings with the owner's MBCx team to prioritize EMIS findings, scope projects/resolutions, update a findings and action items log, and close out corrected issues.
- [Quarterly/monthly/weekly] [summary reports or punch list] will be delivered through the EMIS or in a separate report outside of the EMIS.
- The MBCx service provider will communicate immediate alerts through email and phone call for equipment failures or other critical items.

3.1.2 Maintain benchmarks and an energy baseline

- The service provider will track whole building and system-level benchmarks as defined in the EMIS Technology Specification (Section 2) and flag significant benchmark changes.
- The service provider will update the baseline energy use period for the predictive energy models supplied in the EMIS, based on owner needs.

3.1.3 Review EMIS fault detection and diagnostic results and prioritize findings

- The service provider will monitor the fault detection and diagnostic results in the EMIS on a regular basis, identify faults and opportunities for improvement, quantify expected savings, recommend next steps, and note areas for potential future capital upgrades.
- The service provider will prioritize the issues and opportunities identified based on impact to asset health, comfort, and energy cost. The provider, through regular reporting and/or the EMIS interface, will provide low-cost energy conservation measures or system optimization recommendations.
- The service provider will monitor data quality and recommend corrective steps to handle data integrity issues.
- The service provider will review planned maintenance schedules and coordinate them with use of the EMIS capabilities to advise on conditions-based maintenance practices.
- The service provider will determine the root cause of the top priority issues identified in EMIS by reviewing the BAS trends, controls programming, and through field investigation *[determine whether site visits will be in scope for the service provider]*. The results will be tracked in an Issues Log or within the EMIS.
- The service provider will develop plans for correcting the issues.

3.2 Corrective Action and Verification

The corrective actions implemented during MBCx may be a maintenance/repair action, setpoint modification, control sequence modification, or recognition of needed capital improvements (although capital improvements may be outside of the MBCx process). *[Describe any desired action and verification services and edit as needed.]*

3.2.1 Implement corrective actions

- The service provider will closely coordinate with the building operation staff for the follow-up and corrective actions for the issues found through the EMIS and MBCx process.
- The service provider will scope and oversee the corrective actions when the building operation staff or control contractor or mechanical service contractor will be able to correct system issues or improve system operation.

3.2.2 Track issue close out

- Implementation and future recommendations will be tracked by the service provider in the [issues log / EMIS / work order management system], and changes will be updated in relevant building documentation.
- The service provider will verify that issues have been corrected using trend analysis.

3.2.3 Evaluation of MBCx benefits

- The service provider will track and report the value of the EMIS to justify and validate the business case, and to support ongoing investment through the following activities:
    - Utilize the EMIS metering and analysis capabilities to automatically quantify energy savings at the meter-level against a baseline period.

- Translate energy savings (and demand savings if applicable) to energy cost savings using the [utility rate schedule / levelized energy costs $/kWh)].
- Perform avoided cost calculations for measures implemented, either manually or automatically through the EMIS.
- Track qualitative benefits, including actions that extend equipment life, reduce maintenance labor, improve safety, and provide other benefits to the facility and maintenance organization.
- Track instances in which the EMIS helped the owner avoid degradation of prior energy-saving measures.

- The service provider will deliver energy and cost savings analysis on a [monthly/quarterly/annual] basis].

3.3 Additional EMIS Support

3.3.1 Ongoing analytics development

- The service provider will review the EMIS results (and applicable fault detection notifications) on a quarterly basis to ensure the MBCx approach is accurately monitoring the building performance without generation of false indicators or superfluous notifications.
- The service provider will identify new fault detection algorithms/reports/diagnostic plots or recommend changes to improve existing analytics as needed. The service provider will implement the changes as able or permitted, or else will work with the technology provider to implement the changes.

3.3.2 Ongoing training

The service provider will offer quarterly training to operations staff on the use of the EMIS, as needed based on desired functions and new staff training needs.

4 Proposal Format Guidelines

[Describe the required proposal format and contents, and what information the technology and service providers should include in their response, in what order, and by what date.]

Proposers are to provide the owner with a thorough proposal according to the following guidelines.

Proposals should use simple language with minimal jargon and avoid the use of elaborate marketing material beyond that necessary to provide a complete, accurate, and reliable offer. Each proposal will adhere to the order and content of sections defined below, and each section must be completed in full. Incomplete proposals will not be considered.

4.1 Cover Letter

Include a cover letter signed by a principal in the company, indicating full contact information (mailing address, telephone number, and e-mail address). The cover letter may also summarize key elements of the proposal and the uniqueness of the proposed technology or response. ([Number] pages, maximum)

4.2 Summary of Qualifications

Describe the qualifications of the proposing company and project leads, to demonstrate the capability to provide the technology and services required in this RFP. ([Number] pages, maximum)

Information shall include:

- Company information, including name (main point of contact), address, business type, and website.
- Description of the company, including:
  - The total number of employees.
  - An overview of all the products and services that the company provides.
  - The number of years that the company has provided the services requested in the RFP.
  - The number of current customers.
  - Primary building sectors (e.g., office, higher education, hospital, food service) that the company has worked with in the past.
  - Number of buildings, square feet and approximate BAS points currently connected to product, and BAS with which the EMIS has been integrated in prior projects.
  - Experience integrating with legacy BAS; provide a list of the legacy systems the technology has integrated with.
  - Experience with alternate funding opportunities such as utility rebate programs, government incentives and grants, and other options.
  - Any other relevant information about the company.
- Provide at least [number] references for customers that have received similar services as those detailed in the RFP. The Owner reserves the right to contact any of the organizations or individuals listed. Information provided shall include:
  - Customer name.
  - A brief description of the scope of products and services delivered, current status, project

start and end dates, total project square footage, number of facilities served, facility types, and product and services provided.

- The primary point of contact for the customer, including name, telephone number, and e-mail address.

4.3 Technology Features and Implementation Plan

Provide a description of the proposed approach and methodology to satisfy the Scope of Work defined in this RFP. ([Number] pages, maximum)

This section shall include:

- A network diagram of the basic system and data communications architecture of the proposed technology. Include data sources, interfaces (drivers and connectors), power requirements, network requirements, databases (timeseries database and metadata database), and applications in the network diagram. Indicate the metadata schema offered by the provider.
- A detailed description of how the proposed solution would fulfill the required and preferred requirements identified in the EMIS Technology Specification (Section 2), the Ongoing Services Specification (Section 3), and the EMIS Technology and Ongoing Services Summary (Appendix B).
- A description of any additional capabilities that may be of interest to the owner but are not specified as either “required” or “preferred” in the RFP.
- Where applicable, screenshots to clearly illustrate key reporting, visualization, or analysis capabilities.
- A description of how the proposed technology will satisfy the IT Requirements identified in Section 2.7.
- An overview of system compatibility with respect to sensing and control technology provided by others. (See also the integration requirements in the RFP.)
- For any wireless components, note the number of sensors or channels accommodated in the gateway and router hardware.
- A description of the commissioning process that will be used to ensure a successful deployment of the system.
- A description of the training and ongoing technical support and maintenance services that will be provided, including required work of subcontractors, such as BAS vendors (BACnet enabling, exposing points, and controls upgrades).
- Number of account licenses provided with this proposal (including whether there is a maximum number of points in the integration).
- A description of permission and access control configurations addressing such questions as: is the EMIS programmable to add additional features/faults, or does this require additional services from the EMIS provider?
- A thorough description of specific responsibilities required of the owner (e.g., site access, provision of electrical and network diagrams, network access) in conducting the project.
- A description of the value that can be expected from EMIS implementation. Provide savings estimates from similar projects.

4.4 Cost Proposal

The cost proposal shall explain the pricing structure for all software, hardware, integration, data commissioning, and other services required for the project. Include an itemized list of all direct and indirect costs (e.g., controls vendor support, personnel, travel, supplies, fringe benefits) associated with the implementation of the proposed EMIS. The proposal shall include the following:

- First costs
  - Sensing and metering hardware purchase, installation, integration, and commissioning fees
  - Communication hardware purchase and installation fees
  - Software setup fees (e.g., software configuration, programming, license, training)
- Recurring costs
  - Ongoing software fees (e.g., data storage and hosting, maintenance, access, technical support and maintenance, software updates, and security)
  - Service provider fees to support the ongoing use of EMIS (e.g., cost/frequency of EMIS and/or FDD reporting, cost for service provider troubleshooting)
- Additional costs and information
  - Any specified technology features or capabilities that add significantly to project costs
  - Any additional optional or bundled services or fees such as account licenses above the minimum stated in the proposal
  - Costs to add additional buildings, points, or systems beyond what is specified in this RFP

The Value Proposition for Energy Management and Information Systems

The Smart Energy Analytics Campaign, a partnership between the U.S. Department of Energy and building owners, resulted in the largest study to date on EMIS costs and benefits. Energy savings data was collected from 240 million sq ft of commercial buildings with EMIS in place, and cost data from over 550 million sq ft. Study participants with energy information systems (EIS) achieved a median energy savings of 3 percent ($0.03/sq ft), and participants with fault detection and diagnostic tools (FDD) achieved a median savings of 9 percent ($0.24/sq ft). A cost-effectiveness analysis showed a two-year simple payback period for both EIS and FDD implementations.

For the complete study findings, see the 2020 report, *Proving the Business Case for Building Analytics*.

4.5 Staffing

Describe the team that will be assigned to the project, with each member's areas of responsibility. Identify the lead personnel, and include a resume for each lead.

4.6 Protections and Assurances

Describe the specific measures and protections that the responding company can provide to the owner to ensure continuity of services in the event of bankruptcy, transfers of ownership, or other disruptions to business-as-usual operations.

5 Proposal Submission and Eligibility

[Describe the RFP procedures, including your organization's point of contact for the Proposer's inquiries, submission instructions, modification and withdrawal process, confidentiality, and other procedural details.]

5.1 Eligibility

[Include any eligibility requirements or preferences that may apply, considering, for example, foreign versus domestically owned companies, multiparty joint responses, small businesses, citizenship, and other criteria.]

5.2 Preparation

The proposal content and format must follow the guidelines provided in Section 4, Proposal Format Guidelines, in the RFP.

5.3 Submission and Due Date

[Provide a website, e-mail address, and/or mailing address for the proposal submission; identify whether electronic or paper submissions are preferred or required.]

Proposals are due by [insert the time and date from Table 2. RFP Schedule]. Late proposals will not be accepted.

5.4 Inquiries

Questions about this RFP must be directed in writing, via e-mail, no later than [insert the time and date from Table 2. RFP Schedule]. Send to:

[Provide the name and either e-mail address or telephone number for the desired organizational point of contact.]

5.5 Proposal Validity

Proposals are to be valid for a minimum of [number of days] days to allow sufficient time for evaluation and selection, and any unforeseen delays in the review process.

5.6 Modification and Withdrawal

Any proposal may be modified or withdrawn by written request of the Proposer, provided that the request is received prior to the submission deadline.

5.7 Right to Reject Proposals

This RFP does not commit the owner to award a contract, pay any costs incurred in the preparation of a response to this RFP, or procure or contract for services. The owner reserves the right to accept or reject any or all proposals received as a result of this RFP, to negotiate with any qualified Proposers, or to cancel this RFP in part or in its entirety.

5.8 Confidential Material

All the proposals will become the property of the owner. Proposers should not include proprietary or

confidential information in their response, unless required to clearly convey the proposed work or technology solution. Financial, commercial, or technical information that is considered confidential should be clearly indicated in the proposal.

5.9 Terms and Conditions

[In partnership with your organization's legal department or representatives, include specific terms and conditions that will govern the contracting and procurement of the technology and required services, as well as on-site work conducted to complete the project.]

6 Evaluation and Selection Criteria

[This section contains content to inform RFP respondents as to how their proposals will be evaluated. You may choose to use a qualitative description to share the evaluation and selection criteria in the RFP, including key criteria, or to include quantitative point and scoring information. You can use the framework to make a "first cut" and rule out some of the proposals, or you may base your final selection entirely on the scoring results. For a balanced review, it is recommended that more than one evaluator participate in the scoring activity.]

6.1 Evaluation Method

The proposal evaluation will be based on a weighted scoring process, according to the criteria listed in Table 7.

[Criteria may be removed or added, depending on the owner's objectives. To begin the process, each criterion is assigned a weight that indicates its relative importance; 5 would represent the most important criteria, and 1 would represent the least important. These weights will be set by the primary decision maker and should be kept fixed for each reviewer.

Each proposal is then scored by the reviewers. A score is assigned to each criterion in the table, with 10 representing the best response. A weighted score is calculated for each criterion (row) in the table. The weighted score is equal to the assigned score multiplied by the assigned weight. The total proposal score is the sum of the weighted scores for each criterion, i.e., the sum of values in the last column of the table.]

Table 7. Proposal Evaluation Criteria Weights

Proposal Evaluation Criteria	Weight (%)
Cost proposal	[assign %]
Compliance with the scope of work	[assign %]
Ability to deliver additional unspecified capabilities of value	[assign %]
Qualifications and experience	[assign %]
Overall quality of the proposal	[assign %]

6.2 Point-Scoring Method

[The following considerations may be used in the evaluation and scoring of each proposal. These considerations may be shared in the RFP as desired. Delete any that are not required, and add and edit as needed.]

6.2.1 Cost proposal

- How reasonable are the Proposer's pricing estimates?
- Was anything left out of the cost proposal, e.g., subcontracts for controls vendor or other work?
- How well does the Proposer meet the owner's financial requirements, considered over both the short term and the long term?
- How well did the Proposer communicate the pricing structure for the proposed technology and scope of work?

- How well did the Proposer communicate their value?
- Is the Proposer bonded for the amount of the installation?

6.2.2 Compliance with the scope of work

- How well does the Proposer demonstrate an understanding of the project objectives as listed in Section 1.2 Background?
- Do the proposed technology and services satisfy the required capabilities and functions defined in the specification?
- Do the proposed technology and services satisfy the preferred capabilities and functions defined in the specification?
- How well does the technology interoperate and communicate with other systems?
- How well does the proposed technology satisfy the IT and security requirements?
- How well do the proposed services and maintenance meet the needs defined in the specification?
- How well has the Proposer demonstrated that they understand the project scope and have a viable plan and schedule for successful implementation?
- How clear is the description of how required data will be acquired, given your specific site characteristics and existing monitoring and metering infrastructure?
- How scalable and expandable is the proposed technology?
- To what extent can EMIS and/or FDD data results and or reporting be leveraged by third-party service providers? (Does the provider provide an open, API accessible means of collecting data and adding faults for analysis?)

6.2.3 Ability to deliver additional unspecified features of value

- What additional value is being offered in the proposal from features that were not explicitly requested?

6.2.4 Qualifications and experience

- Do the proposing company and personnel possess the qualifications necessary to successfully complete the scope of work?
- Does the Proposer have a good history of experience with portfolios or sites similar to yours?
- Does the Proposer's software have enough flexibility and configurability to meet the owner's needs while not requiring a custom implementation to achieve this?
- Does the Proposer demonstrate strong experience with technology design, provisioning, installation, and commissioning?
- Has the Proposer demonstrated timely and successful completion of similar projects, within budget?
- Has the Proposer provided credible claims of savings from past projects using the technology as presented in the proposal?
- Has the proposed technology been demonstrated to integrate effectively with the owner's system types? In the absence of past demonstrations, what evidence is provided that integration will be

effective?

- How strong are the references that the Proposer has provided?

6.2.5 Overall quality of the proposal

- Have all the elements addressed in the Proposal Format Guidelines in Section 4 of the RFP been addressed?
- In the event of disruptions to the Proposer's normal operations, are the protections and assurances for continuity of services sufficiently addressed?
- Is the writing clear and concise?
- Is the proposal content well organized and easy to follow?
- Are the technical aspects of the proposal described clearly, with minimal jargon and with a sufficient level of detail?

Appendix A Glossary of Terms

Automated System Optimization (ASO): ASO tools are a subset of EMIS focused on continuous controls optimization. ASO tools dynamically modify building automation system control settings to optimize HVAC system energy usage or energy costs while maintaining occupant comfort. These tools read data from the BAS and write analytically based optimal setpoints back to the BAS.

Baseline: A representation of "standard" or typical energy performance, used for comparative purposes. Baseline may be expressed according to a variety of metrics and may account for weather or other independent variables that influence energy consumption.

Benchmarking: Comparing building energy performance to that of similar buildings (cross-sectional benchmarking) or its own historic performance (longitudinal benchmarking). Benchmarking may also be performed at the system or component level.

Building Automation System (BAS): A system that is designed to control building operations and indoor climate.

Communication Protocols: Standardized rules governing the transmission of information between devices. Common protocols for building data include, for example, BACnet, LonTalk, and Modbus.

Cumulative Energy Savings: Sum of the total accrued energy savings or increases over a certain time frame, relative to the baseline.

Data Tagging: The process of organizing data in which pieces of information are associated with tags, or keywords. For buildings, data tagging is used to aid the process of efficiently implementing FDD tools.

Degree Day: A measure of the heating or cooling load on a building relative to a "base" outside air temperature (e.g., 65°F). It is commonly calculated as the difference between the mean daily temperature and the "base" temperature.

Demand: The rate of energy use by a particular building or system, i.e., power. Common units of energy demand are kilowatts (kW) for electricity, tons for chilled and hot water, and therms per hour or cubic feet per minute for gas.

Demand Response: Changes in electric usage by customers in response to changes in the price of electricity over time or when system reliability is jeopardized.

Energy Information System (EIS): Software, data acquisition hardware, and communication systems used to store, analyze, and display building energy data.

Energy Management and Information System (EMIS): A broad family of tools and services to manage commercial building energy use. These technologies include, for example, energy information systems, equipment-specific fault detection and diagnostic systems, benchmarking and utility tracking tools, automated system optimization tools, and building automation systems.

Energy Savings: A reduction in energy use often quantified by accounting for key factors such as weather or hours of operation.

Fault: The system or equipment violates its intended operation of equipment (e.g., insufficient economizer utilization, chiller short cycling, sensor errors).

Fault Detection and Diagnostics (FDD): FDD automates the process of detecting faults or opportunities within physical systems and processes and diagnoses their potential causes. FDD systems for HVAC generally use algorithms to analyze BAS and meter data to determine fault conditions. FDD is a subset of EMIS, focused on system-level monitoring.

Greenhouse Gas (GHG) Emissions: The carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) gases released into the atmosphere as a result of energy consumption at the facility.

Measurement and Verification (M&V): The process of using measured data and other operational information to confirm the energy savings from energy efficiency projects. The International Protocol for Measurement and Verification defines four standard M&V approaches.

Metadata Schema: A metadata schema aids the process of implementing EMIS software. It is the class or typing hierarchy, characterizing the entities (things), properties, and relationships that are allowed or expected, as well as providing definitions for them. An example metadata schema might say that a Site entity can have one or more Buildings, Systems, or Equipment entities contained within its physical boundaries. Open-source examples include the Brick Schema, Project Haystack, and the Google Digital Buildings project.

Metadata Model: A metadata model represents entities, properties, and their relationships according to a specific schema definition. Metadata modeling is the process of characterizing the data for a particular project or building according to a metadata schema.

Opportunity: Potential to improve the current operation of the system or equipment (e.g., chilled water supply temperature reset, AHU supply air temperature reset, AHU static pressure reset).

Peak Load: The maximum rate of energy use (demand) during a specified period.

Appendix B EMIS Technology and Ongoing Services Summary

Table B-1 summarizes the technical requirements and preferred capabilities within Section 2 EMIS Technology Specification. By filling out Appendix B, the owner helps the technology provider understand the EMIS specification. The technology provider should indicate where there is significant cost added to fulfill a required or preferred capability, especially when the portion of the technical specification is indicated as "Negotiable". If a section of the technical specification is "not applicable (N/A)" then that section should be deleted from Section 2 and the column can be deleted from Table B-1.

Table B-1. EMIS Technical Specification Summary of Priorities

EMIS Technical Specifications	Required	Preferred – Now	Preferred – Future	N/A	Negotiable	Comments
2.1 Data Integration						
2.1.1 Utility data integration						
2.1.2 Interval meter data integration						
2.1.3 Building automation system (BAS) data integration						
2.1.4 Additional monitoring required or preferred						
2.1.5 Metadata / data tagging						
2.1.6 Other data sources and APIs						
2.1.7 Data validation						
2.2 Utility Bill Analytics						
2.2.1 Utility bill management						
2.2.2 Utility budgeting						
2.2.3 Greenhouse gas (GHG) tracking						
2.3 Interval Meter Data Analytics						
2.3.1 Energy consumption tracking						
2.3.2 Energy performance analysis						
2.4 System Data Analytics						
2.4.1 Fault and Optimization Opportunity Detection						
2.4.2 Fault and Opportunity Diagnosis						
2.4.3 FDD Configuration						

EMIS Technical Specifications	Required	Preferred – Now	Preferred – Future	N/A	Negotiable	Comments
2.4.4 Fault management and FDD results presentation						
2.4.5 Work order management						
2.4.6 System-level diagnostic supports						
2.5 Automated System Optimization						
2.5.1 HVAC performance optimization						
2.5.2 Peak demand charge minimization						
2.5.3 Provision of grid services						
2.5.4 Other supervisory control strategies						
2.6 Project Management and Reporting						
2.6.1 Project management and verification of savings						
2.6.2 Notification, reporting and data export						
2.7 IT Requirements						
2.7.1 Data storage and backup						
2.7.2 Software hosting and data ownership						
2.7.3 Cybersecurity						
2.7.4 Permissions and access control						
2.7.5 Usability						
2.7.6 Networking						
2.8 Technical Warranty, Support, and Training and Commissioning						
2.8.1 Warranty						
2.8.2 Technical support						
2.8.3 Training						
2.8.4 Testing and Commissioning						

Table B-2 summarizes the technical requirements and preferred capabilities within Section 3 Ongoing Services Specification. By filling out Appendix B, the owner helps the technology provider understand the services desired or preferred. The services provider should indicate where there is significant cost added to fulfill a required or preferred service, especially when the portion of the services specification is indicated as "Negotiable". If a section of the technical specification is "not applicable (N/A)" then that section should be deleted from Section 3 and the column can be deleted from Table B-2.

Table B-2. Ongoing Services Specification Summary of Priorities

Ongoing Services Specifications	Required	Preferred – Now	Preferred – Future	N/A	Negotiable	Comments
3.1 Ongoing EMIS Review						
3.1.1 MBCx process management						
3.1.2 Maintain benchmarks and energy baseline						
3.1.3 Review EMIS fault detection and diagnostic results and prioritize findings						
3.2 Corrective Action and Verification						
3.2.1 Implement corrective actions						
3.2.2 Track issue close out						
3.2.3 Evaluation of MBCx benefits						
3.3 Additional EMIS Support						
3.3.1 Ongoing analytics development						
3.3.2 Ongoing training						

Appendix C Resources

The following resources can be used to learn more about EMIS technologies and issues related to their use.

A Primer on Organizational Use of Energy Management and Information Systems (EMIS). Jessica Granderson et al. Prepared for the U.S. DOE Better Buildings Program. 2015.

Building Performance Tracking Handbook: Continuous Improvement for Every Building. California Commissioning Collaborative. 2011.

Characteristics and Survey of Automated Fault Detection and Diagnostic Tools. Jessica Granderson et al. Lawrence Berkeley National Laboratory. LBNL-2001075. 2017.

Energy Information Handbook: Applications for Energy Efficiency Building Operations. Jessica Granderson et al. Lawrence Berkeley National Laboratory. 2011.

EMIS Applications Showcase: Highlighting Applications of Energy Management and Information Systems. Eliot Crowe, Hannah Kramer, and Jessica Granderson. Lawrence Berkeley National Laboratory. 2020.

Energy Management Information System (EMIS) Technical Resource Report. Jesse Dean and James Dice, National Renewable Energy Laboratory, prepared for the Federal Energy Management Program. (in press, December 2020)

Metering Best Practices: A Guide to Achieving Utility Resource Efficiency. Federal Energy Management Program. U.S. Department of Energy. 2011.

Monitoring-Based Commissioning (MCBX) Plan Template. Hannah Kramer, Eliot Crowe, and Jessica Granderson. Lawrence Berkeley National Laboratory. 2017.

Proving the Business Case for Building Analytics. Hannah Kramer, Guanjing Lin, Claire Curtin, Eliot Crowe, and Jessica Granderson. Lawrence Berkeley National Laboratory. 2020.

The State of Advanced Measurement and Verification Technology and Industry Application. Samuel Fernandes et al. *The Electricity Journal* 30, 2017, 8–16.

Using EMIS to Identify Top Opportunities for Commercial Building Efficiency. Lawrence Berkeley National Laboratory. LBNL-1007250. 2017.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