Using an Energy Management Information System
Guide for an Industrial Customer

EXECUTIVE SUMMARY

An Energy Management Information System (EMIS) is a software tool that stores, analyzes, and displays energy consumption data. The challenge for organizations that are new users of EMIS is that the software is often deployed by people who are very skilled at energy management but have less experience in rolling out complicated software across an organization. Picking your way through the options is complex, especially when the software may need to be accompanied by hardware updates for data gathering. As a result, organizations may find themselves settling into a pattern of using the software that does not maximize the benefits to the staff members who make decisions that affect energy use.

This guide is designed to be used throughout the EMIS deployment cycle:

- Prior to launching the EMIS implementation, in order to establish realistic expectations and to consider the big picture of a fully realized EMIS
- During the EMIS rollout, as consistent reference
- After rolling out the EMIS, as an annual reference to prompt new usage considerations, expansions, training, etc.

The accompanying guide, "Selecting an Energy Management Information System," will help you select the right EMIS for your organization.

This guide is intended for the following users:

- Energy managers, champions and/or teams who are deploying EMIS in their organizations
- Executives, typically either operations executives or general managers, who set the vision for their organization's energy program and who will hold the organization accountable to use EMIS to get positive energy performance results
- Individuals designated by their organizations to be EMIS Power Users
- Managers who deploy EMIS-related programs or services on behalf of Energy Efficiency Program Administrators, such as utilities, agencies, or non-governmental organizations

This guide will help you understand:

- How to integrate the EMIS into your organization
- How to set accountabilities and responsibilities for utilizing EMIS
- How to communicate EMIS information across the organization
- How to understand if the EMIS is integrated into your organization's business processes

This guide does not cover the technical capabilities of EMIS or how to use the system you have selected. The EMIS vendor should provide this information.

The general flow of the guide is as follows:

There is also a final section that explains how your Energy Efficiency Program Administrator can help you with all of these steps.

CREATING THE PROPER EMIS GOALS FOR THE ORGANIZATION

EMIS can be an integrated and robust system that requires careful forethought planning. The first step in planning is to confirm what success looks like to the organization's executive team. If they do not have a clear vision for EMIS success, then they should be guided through a discussion that could include the following topics:

- Should EMIS success be measured in terms of outright savings (energy units and/or cost), problems diagnosed and solved, increased production efficiencies, or something else?
- As EMIS is an integrated system that should optimally be used by multiple teams/departments with accountability to management, what expectations does the executive team have for the system?

It may be helpful to compare EMIS to other enterprise software solutions that are accessed across multiple teams, either at a given site or across the organization. In gaining this understanding, the organization should ask:

What were the other systems?	**Common enterprise systems include:** • **Manufacturing Resource Planning (MRP)** • **Customer Relationship Management (CRM) software** • **Maintenance Management Systems (MMS)** • **Other enterprise software such as SAP**
What aspects of these deployments made them successful or less successful?	**Common examples of challenges include:** • Personnel used the systems for a time, but then when the users became busy, they stopped using the system • Management did not use the system for decision making, and therefore they did not hold any individuals or teams accountable to use the system or to use the results

Once success metrics have been agreed upon, the organization can then set goals to attain that success. The best practice is for goals to be SMART:

- **Specific** – the goal should not be general, but should be clear and specific
- **Measureable** – attainment of the goal should be clearly measurable
- **Action-oriented** – the goal should inspire action
- **Realistic** – the goal should be possible to attain, and be challenging but not frustrating
- **Time-bound** – the goal should have a clear timeframe in which to measure attainment

Based on the definition of success, the organization may decide upon different types of goals. They may be established in a top-down fashion, where a percentage improvement is applied to overall energy consumption or cost. These types of goals typically come from a regional or corporate headquarters that is looking to have common goals for multiple facilities. Alternatively, the goals may be set in a bottom-up fashion, based on the total of achievable energy projects for the coming year, or based on model analysis and targeting of best achieved performance in prior years.

An example of a top-down, SMART energy goal might be:

- **Specific** – 12% energy savings from expected energy consumption using a baseline model
- **Measureable** – the savings will be measured using the EMIS.
- **Action-oriented** – the goal should drive personnel to change what they are doing.
- **Realistic** – the 12% number was determined based on analysis of best achieved performance during a target analysis. 15% may have frustrated the team, while 10% would not have motivated the organization.
- **Time-bound** – the time in which the goal will be attained is the next three calendar years, so that the organization understands this and drives improved behaviors.

It is a best practice to establish milestones so you know if you are on track to attain the goal. For example, it is important to know if enough projects are being implemented or if the

organization is behind on energy consumption during an early month or quarter and will have to "make up" for suboptimal energy performance in a later period.

ENSURING SUCCESSFUL DEPLOYMENT

Initial Planning

EMIS is a sophisticated system with numerous stakeholders, , so it is vital to apply sufficient time and effort towards planning. You should ensure that a robust and complete project plan is in place to support both the technical implementation as well as the organizational integration. This project plan should include management reviews on at least a quarterly basis to ensure that the project is on track and to gain additional management support as required.

Your plan should also include the budget for the initial year and subsequent years. Bear in mind that your budget will likely increase over time due to:

- Increased scope of coverage
- Additional EMIS features from the vendor
- Pricing changes at the end of your initial contract

Personnel-related Planning

The impact of EMIS on personnel will vary over time, from the initial EMIS deployment through the full usage of the system by the organization. To ensure successful EMIS implementation, it is important to plan for how individuals and teams will interact with EMIS in those deployment phases.

Personnel Involved in Initial Deployment

Successful EMIS deployments require the involvement of several roles and teams. At the beginning, these should include the following roles:

- **Energy Champion** – this person represents the organization's energy program and should be able to speak to both high-level technical considerations as well as organizational realities and priorities that affect EMIS deployment
- **EMIS Project Manager** – this may be the same person as the Energy Champion; however, the workload and fixed term nature of EMIS deployment may make it more appropriate to use a project manager from another part of the organization

- **EMIS Executive Sponsor** – this person would authorize/approve the EMIS purchase/deployment decision, provide executive support for the program (including making key deployment decisions), and hold teams accountable to both use EMIS and to take appropriate action based on EMIS information

- **EMIS Team Members** – these people can support the project by facilitating discussions with other departments, investigating options from EMIS vendors, and supporting employee training on EMIS

- **Information Technology (IT) Representative** – this person would support an EMIS deployment by connecting network and database resources to EMIS as necessary

This group of people may be considered an extension of the organization's Energy Team; for the deployment, they may be referred to as the EMIS Team. As a group, they will be responsible for the successful rollout of EMIS to the entire organization. This group will likely have been involved in selecting the exact EMIS to deploy for the organization. This will increase familiarity of the group with the selected EMIS as well as ensure that the selected EMIS meets the needs of eventual users of the system.

As the deployment continues, the following roles may also be engaged:

- **Department Leads** – these people, often representing production and maintenance teams, could speak on behalf of their teams as well as plan for how accountability will flow into their staff to monitor and act upon EMIS information
- **Potential EMIS "Power Users"** – these people would represent teams that use EMIS, such as production and maintenance. A Power User would be an individual most versant in daily use of the system, seen by their team as the "local resource" to guide them on how to effectively use EMIS to make decisions within their team.
- **Human Resources (HR) Training** – this person would support integration of EMIS into the organization's training program or process.

Personnel Involved When EMIS is Fully Deployed

Next, you should plan for which teams or roles will use EMIS. By understanding which groups would use the fully-deployed EMIS, and then potentially configuring approaches to engage each of these groups, the EMIS team can be more effective. Some teams or roles that may use EMIS include:

Production Teams	• **This would typically be multiple teams, across different lines, shifts, or functions** • **The teams would monitor EMIS for additional key metrics used to efficiently manage their process** • **The teams may present their EMIS numbers at recurring management review meetings, typically ranging in frequency from daily to monthly**
Maintenance Team	• This team would monitor EMIS to support preventive maintenance priorities • This monitoring would be part of daily, weekly or monthly metrics that the maintenance team reviews
Executive Team	• This group may rarely monitor the EMIS itself, but would be consumers of information from EMIS reports

	Energy Champion	Production Team	Production Manager	Executive
	• Executives are also typically part of the escalation path established for when there are significant deviations from expected energy consumption			

Energy Team	• This team will use the EMIS to monitor overall organization performance, identify improvement opportunities, and potentially verify project results and impacts • The energy team may also communicate organization performance to executives as part of monthly, quarterly or annual reporting.
IT Team	• While the IT organization may not directly use EMIS, they are likely to get involved if any data exchange is required or if the deployment is wide enough to cover the whole company. • Engage your IT Team early in the deployment so they are not blind-sided later.

For each of these groups, you should establish clear expectations on accountability, responsibility and informed communications. To plan for these expectations, it can be helpful to use a "RACI Matrix", with RACI standing for Responsible-Approver-Consulted-Informed. Following is an example RACI Matrix:

Task	Energy Champion	Production Team	Production Manager	Executive
Monitor EMIS data	I	R		
Conduct EMIS trainings	R	I	I	A
Lead EMIS review at Energy Program Review	R	C		A

R = Responsible, A = Approver, C = Consulted, I = Informed

Training

You should also look at how you want to integrate EMIS into your organization's training program. Think of EMIS training in terms of intended audiences and desired knowledge:

- **Super-users.** This group should be training on maintaining and operating EMIS and on responding to questions from colleagues. There should be more than one super-user to allow for redundancy.
- **Production and maintenance.** These teams will need access to specific features for monitoring and targeting.

- **Executives.** Senior staff will be interested in particular reporting features.
- **General population.** Low-level training will be sufficient for their needs.

After determining what types of EMIS knowledge make sense for given audiences, consider how training is delivered within the organization. Training may be part of a formal program with automated curriculum delivery and tracking of training participation and compliance; or training may be less formal. In either case, the EMIS deployment team should look to integrate appropriate EMIS knowledge into the organization's training program. This integration could cover a number of areas:

- **New Hire Training** – Adding general EMIS awareness alongside general energy efficiency awareness to the organization's new hire training
- **Annual Training** – Adding general EMIS awareness to annual trainings, with recertification based on passing competency exams after completing the training
- **Team/Role Training** – Adding specific energy efficiency and EMIS knowledge to quarterly training for maintenance or production staff

Typically, the EMIS deployment team will conduct EMIS trainings. This team should lean on the EMIS vendor and potentially the Energy Efficiency Program Administrator (EEPM) for services that they provide, which may be via a consulting firm or a system integrator.

MANAGING DATA AND ENSURING DATA QUALITY

During the EMIS deployment, there is a general assumption that incoming data is of a sufficiently high quality to make appropriate decisions. EMIS vendors typically have data expectations for the meter data that they acquire. That said, **you should not take data quality for granted**. Meters and sensors may require calibration, which should be factored in for ongoing EMIS maintenance.

Some metering systems have the ability to communicate whether they have an error, letting the EMIS know if the data is potentially inaccurate. Without the communication ability, personnel will need to monitor the meters for error flags or to check the data compared to historical trends to identify potential data quality issues. Of course, data entered manually is also likely to have quality issues.

EMIS project managers typically have a consistent data quality process which they run on a regular (e.g. monthly) basis, regardless of whether data is entered manually or automatically:

- Confirm with vendor that no data errors have been observed
- Run trending reports to look for outliers (trending within the month and trending compared to prior periods)

- If there is a data quality issue

    o investigate source and look for preventive measures
    o correct the data if possible (if there are gaps, determine if interpolating is useful or misleading)
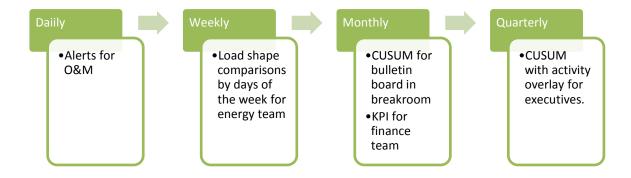   o notify users and explain the source of error and resolution

SETTING UP REPORTS

Reports can be extremely valuable to communicate with teams who do not use EMIS as part of their day-to-day jobs. Most EMIS have capabilities that enable users to either run existing reports or to create reports that address specific needs. For different individuals, the following reports may make sense:

- Executives or finance team members may gravitate towards reports showing dollars, budgets, and expenses in high-impact visuals with clear charts and graphs
- Production team members more often use reports showing energy performance, including positive results as well as negative excursions from expected consumption. These groups tend to be most familiar with Cumulative Sum of Differences (CUSUM) charts that display high level energy performance trends
- Maintenance teams may prefer reports that show time-based trends of energy consumption for individual systems, providing another data point to support their preventive and predictive maintenance efforts

An example of the flow of alerts and reports over time is shown below.

Daiily
- Alerts for O&M

Weekly
- Load shape comparisons by days of the week for energy team

Monthly
- CUSUM for bulletin board in breakroom
- KPI for finance team

Quarterly
- CUSUM with activity overlay for executives.

Some EMIS solutions have the ability to auto-generate and auto-deliver these reports on a regular basis. This can be extremely positive and worth the effort to set-up, as it will save end-users time, reducing the steps it takes them to regularly access the useful information coming out of EMIS. Automatically generated reports have the ability to greatly enhance the value the EMIS provides across an organization.

MEASURING PERFORMANCE WITH EMIS

First and foremost, organizations use EMIS to understand their energy performance. Energy performance can be very broad, depending on the audience. The following are two common perspectives:

- The organization's energy team may have an energy reduction goal of consuming less energy than historically used or than expected, based on KPIs or on models which take into account variables such as production or weather.
- An organization's finance department may only think in terms of dollars spent on energy in a fiscal year. If energy budgets are not based on production changes or weather, then the organization may go over budget; in addition, peak demand charges may play a significant factor in total energy costs. Total energy performance may thus be a combination of energy efficiency and energy demand.

Within the scope of this Guide, energy performance refers to energy efficiency, typically determined using models that factor in relevant variables, i.e. drivers of energy consumption such as production or weather. Some EMIS solutions provide the ability to have broader

energy performance understanding and metrics. For example, some EMIS solutions enable customers to encompass peak demand costs as part of their energy performance, with corresponding metrics expressed in kilowatts (kW) in addition to kilowatt hours (kWh).

For energy performance determination, baselines are extremely important to understand and plan for. The organization should understand what baseline time period is most appropriate. For EMIS deployments that have multiple energy models and/or performance indicators, different baseline time periods may be appropriate.

For more information on baselines, refer to NEEA's 2015 report on Energy Baseline Methodologies for Industrial Facilities.

In addition, you should anticipate when to potentially revise the baseline time period. Often, a period of energy use either grossly under or over the target prompts the organization to review the underlying energy model. If your current model is not reasonably predictive, the organization should consider updating the baseline time period to a more recent time period and revising the model's assumptions to reflect operating reality.

With the baselines established, you have the first element needed to estimate energy savings. Organizations typically then use a savings determination approach that compares actual energy consumption with the energy consumption predicted in the EMIS' model or models. Energy savings (or over-usage) are the result of subtracting actual energy consumption from expected energy consumption.

More sophisticated energy savings determination approaches may be necessary in some situations. Example scenarios include:

- **"Find and Fix"** – in a find and fix scenario, EMIS analysis triggers investigation and action to restore performance. In that case, the organization (and ideally the EMIS itself) will quantify the energy performance impact of the difference between fixing and not fixing the issues coming out of EMIS.

- **Combined kWh and kW** – when EMIS is used to improve energy performance in terms of consumption (kWh) and demand (kW), the organization and EMIS may determine results in terms of a combined metric that accounts for the values of reduction of either or both values.

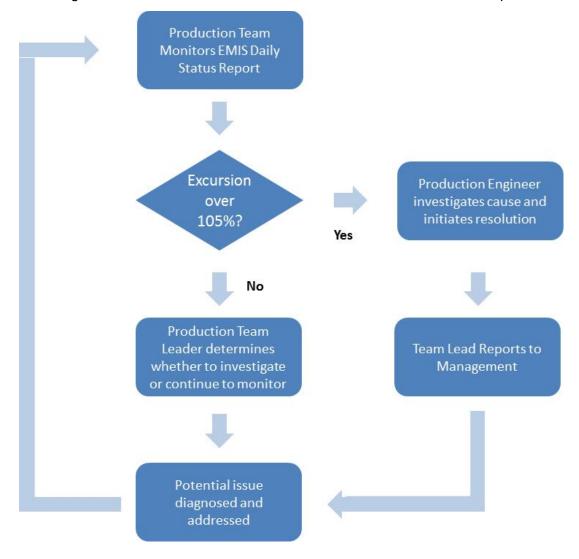## Using EMIS to Initiate Meaningful Action

With energy performance defined for the organization, it is then important to understand what good performance looks like. Often, energy performance is reported in terms of how actual energy consumption compares to expected energy consumption as predicted in an energy model within the EMIS. Based upon this, initially, the organization may start by stating that any actual energy consumption that is between 100 and 104% is a concern, perhaps designated with a yellow color in a management report. By that same thinking, actual consumption above 105% may be a major concern and might be designated with a red color in a report to management.

These thresholds and ranges will likely change over time, particularly as the organization gains familiarity with actual performance. Essentially, the organization should strike a balance in how often EMIS notifications occur, so that the audiences of EMIS information are not notified too frequently of negative performance. At the same time, the system should provide a sufficient amount of communication so that opportunities are not missed. With that, it is reasonable to plan for a ramp-up and learning process where the frequency of threshold attainment and organizational feedback guides how the thresholds are refined.

With thresholds in place, the organization should determine how to respond. For example, production teams may escalate to a team leader if energy performance is over a certain threshold (e.g. "yellow"), and then escalate to management or executives if they are considerably over that threshold (e.g. "red"). The rationale for escalation is that higher levels in the organization may be able to authorize or direct more aggressive solutions, such as temporary process shut-downs to investigate major energy cost impacts shown in EMIS.

It can be useful to use a process flow diagram to lay out the actions that include decisions and actions stemming from those decisions. On the following page is an example process flow diagram that addresses threshold and decisions within an EMIS implementation.

It can be extremely helpful to configure EMIS to trigger an alert when consumption crosses a threshold. This is more common for EMIS configurations that have data acquisition frequencies shorter than monthly intervals. The alerts can provide information to the organization so that they can investigate the root cause of the alert relatively quickly and ideally address the issue, rather than waiting for the next time that they use the EMIS dashboard functionality or review an EMIS report. Quick action can save energy that would otherwise have been wasted.

GETTING MORE PEOPLE TO USE EMIS

Like any large enterprise system deployment, EMIS is only valuable when people use it. Theoretically, the more people in your organization that use EMIS, the faster that issues will be dealt with leading to less energy waste and more ideas to improve performance.

The initial EMIS deployment should focus on the people who most directly impact energy consumption and who will provide the greatest impact as a result of their time spent with EMIS. After that initial EMIS deployment, the organization should consider expanding such that more people access the EMIS and/or its reports. As each group comes onboard with EMIS use, the organization should consider if it is worthwhile to engage each group in terms of their time spent using EMIS and/or reviewing its reports compared with the potential wastes that they may be impacting in their teams.

The EMIS team should look for opportunities to have EMIS users become "Power Users", where they become local resources for their teams regarding using EMIS to answer questions that they or their management have. This will expand the feeling of ownership across the organization, i.e. ownership of the EMIS as well as of energy management in general.

Evaluating EMIS Integration

In addition to measuring EMIS performance in terms of energy savings or energy performance improvement, it can be extremely valuable to measure the organization's level of engagement of the EMIS. At the core, the basic question for how employees are engaged would be to find out if EMIS helps them to do their job, and if not, to find out why.

To determine the level of engagement, the EMIS team can first get statistics from the system (different tools have different capabilities in this area). But these statistics cannot explain why people used the system, so it's important to query the EMIS users. During the first six months of deployment, it can be a good idea to get feedback on a more frequent basis, to diagnose and address any issues coming out of implementation. Afterwards, the ideal frequency may be every 3 to 6 months. To get this information, the EMIS team can do a range of activities, including:

- Informal, in-person interviews with different individuals
- Email- or document-based surveys
- Online survey tool
- Facilitated discussions with teams
- Count of newly identified energy saving opportunities identified

For the surveying, it can be helpful to use a common scale to measure the level of engagement for these individuals. A potential scale could consist of the following:

- **Level 1** – EMIS does not work for them (technically or other issues)

- **Level 2** – EMIS works, but it is not useful
- **Level 3** – EMIS is useful, but it is not used regularly
- **Level 4** – EMIS is used on a regular basis
- **Level 5** – EMIS is core to their job or role

Used as part of initial EMIS deployment and then over a year or more of EMIS use, this information may be extremely helpful in diagnosing EMIS shortcomings or understanding parts of the organization that are more difficult to successfully integrate EMIS into. The following image shows how the scale could be used over a period of 18 months:

EMIS Engagement

Organization Name Here
Date

	Engagement Level Definitions
1	EMIS does not work for them (technically or other issues)
2	EMIS works, but it is not useful
3	EMIS is useful, but it is not used regularly
4	EMIS is used on a regular basis
5	EMIS is core to their job or role

EMIS Engagement Over Time

	Monthly Check-ins						Quarterly Check-ins			
Team	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 9	Month 12	Month 15	Month 18
Executive Team	1	2	2	3	3	3	3	4	4	4
Production Team	1	1	2	2	3	3	4	5	5	5
Production Swing Shift	1	1	1	1	2	3	4	4	5	5
Maintenance Team	1	1	1	2	3	3	3	4	4	5

ENSURING EMIS PROVIDES OPTIMAL VALUE

Goals	Deployment	Data	Reports	Performance	Use	More value
1	2	3	4	5	6	7

For all EMIS deployments, there are a series of practices that the EMIS team should undertake to ensure success. These include:

- **Displaying Performance Charts** – EMIS teams should determine where information is typically communicated to the organization, and then look to display energy performance information in easily understood chart form in those places. Typical areas to display this information include Energy Team boards, centralized company metric boards, and break areas.
- **Regular Management Reporting** – EMIS teams should review how information is communicated in management reporting, and then look to integrate the appropriate

energy information into these reports. These reports may be distributed daily, weekly, or monthly. The EMIS team should review the energy performance numbers with the management team to gather their feedback as to whether the information is at the right level, and that it prompts investigation and action.

Different EMIS solutions have varying functionality which the EMIS team may choose to leverage to provide the greatest value to your organization. This functionality may include:

- **Event Tracking** – EMIS often include features related to event tracking, where-in the organization can log when energy impacting events occur within EMIS. This supports the use of EMIS as an analytical tool, such that the organization can designate when events occur that cause spikes or slope changes within EMIS.
- **Project Management** – Some EMIS have the ability to manage energy related projects. This can simplify the numbers of tools used the Energy Team for energy management related tasks.
- **Document Management** – Some EMIS can manage energy management related documents, such as policies, plans, and records. This enables EMIS to be a single source of energy management related documents that energy team members and other stakeholders can turn to for information.

Finally, it can be helpful for the EMIS team to set expectations with the organization regarding typical EMIS usage patterns. Common expectations may include:

- **Review of EMIS charts in management reports** – on a monthly basis by management
- **Monitoring of EMIS system** – on a daily to monthly basis by the energy team and maintenance team
- **Responding to EMIS alerts** – on an as-needed basis by production teams

Formal Review of EMIS

It is a best practice in energy management for organizations to conduct annual Energy Program Reviews in which they review their energy management processes. Within your review, you should also review EMIS. This EMIS review should use the results from ongoing survey questions. Specifically, the EMIS review topics include:

- **Sufficiency** – whether EMIS provides the right information to the organization to make the right kinds of decisions within an appropriate timeframe
- **Additional Data** – whether additional energy metering or other measurements from production sensors or other devices could make EMIS more valuable as an information source
- **Metrics** – whether current metrics provide useful information or they need to be changed, and/or if additional metrics coming from new models or other sources are appropriate
- **Features** – whether additional EMIS features, either available off the shelf from the EMIS vendor or as part of an upcoming product enhancement release, can make energy management efforts more effective
- **Staffing** – whether the right people are involved in using and maintaining EMIS, and whether they have received the proper training

Coming out of this review, the EMIS team may have a series of next steps to undertake, including engaging the EMIS vendor to request new functionality or features, creating capital budget requests for additional metering, or creating new reports within EMIS to address user needs.

THE ROLE OF YOUR PROGRAM ADMINISTRATOR

Your local Energy Efficiency Program Administrator (EEPM) may be able to provide numerous types of support for your organization to deploy EMIS. This support can include:

- **Deployment support** – Your EEPM may be able to support the EMIS deployment through services related to the EEPM's Strategic Energy Management (SEM) program. This would typically focus on supporting your organization in integrating EMIS into business processes.
- **Technical support** – Your EEPM may be able to provide technical support for EMIS deployment. This could include conducting EMIS feasibility audits, establishing energy models for use in the EMIS, and supporting other technical aspects of the deployment.
- **Continued funding** – Your EEPM may have available funding to support EMIS deployment and/or ongoing use. This would typically be via a multi-year program in which your organization participates.