U.S. DEPARTMENT OF ENERGY

Meter Connectivity, Energy Management Information System (EMIS), and Agency Metering Plan Overview

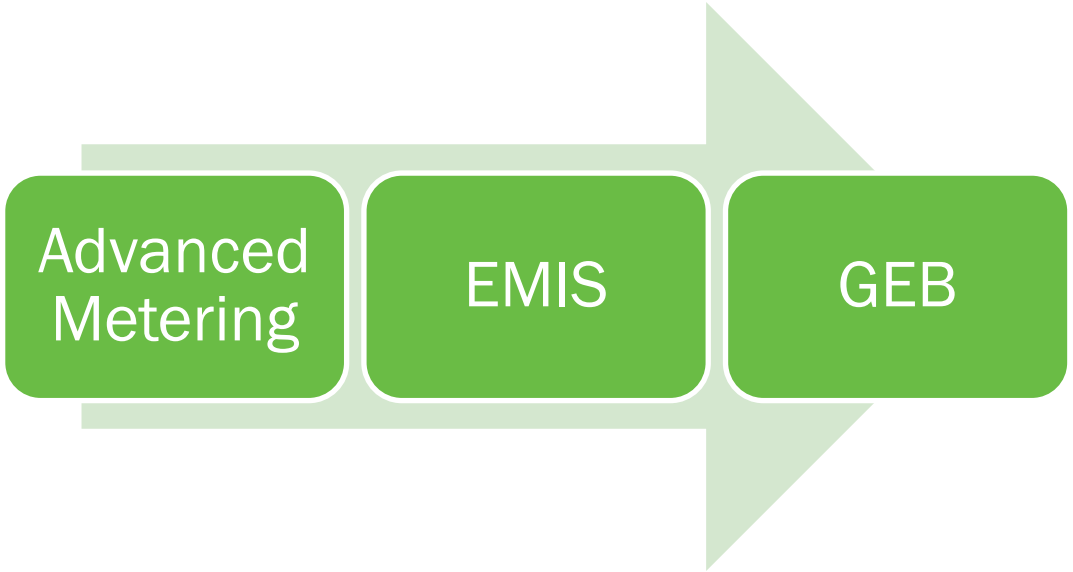
11 April 2024

SCEP
STATE & COMMUNITY ENERGY PROGRAMS

FEMP
Federal Energy Management Program

Presentation Outline

- Summary of the Agency Metering Implementation Plans
- Why Meter Data Management and Analysis?
- Prioritizing Buildings for Energy Management Information System (EMIS) and Grid-Interactive Efficient Buildings (GEB)
- What is General Services Administration (GSA) Advanced Metering Migration?



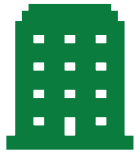
Why Meter?

- **You can't manage what you don't measure**
- **Advanced meters inform energy managers on performance of buildings and subsystems**
- **Insights can help meet energy and water goals, save money, and improve building operations**
- **Energy Act of 2020:**
  - Agencies must submit a multi-year agency metering implementation plan to DOE in 2023
  - Agencies shall install water meters
  - DOE will "check in" with agencies every two years regarding the statuses of metering implementation plans

Primary Meter Data Sources Cited in Agency Metering Plans

- Monthly utility data aka Green Button metering data
- Whole-facility energy and water meter interval data
- Sub-meter data
- Building control system or Energy Management Information System (EMIS) data
- Monitoring Building Commission (MBCx) data
- Grid-interactive Energy Building (GEB) data
- Centralized Agency Meter Connectivity Systems

Supporting Data Sources Cited in Agency Metering Plans



Real property data

Facility equipment inventories

Weather data

Utility bills and rate schedules

Operation and Maintenance (O&M) management records

Ten 15 Common Areas/Items of Concerns in Agency Metering Implementation Plans

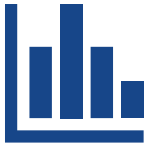
- Funding for more advanced energy meters
- Funding for advanced and standard water meters
- Funding for centralized agency meter connectivity system
- Cybersecurity requirements for metering systems
- Lack of trained field personnel
- HQ and field manpower bandwidth concerns
- Green Button metering data – how to obtain the data from utilities
- How to obtain Carbon Pollution-free Electricity data from utilities via advanced meters
- More best practices on how to integrate meter systems with Building control system or Energy Management Information System (EMIS)
- How are other agencies implementing their metering plans
- Best practices about Monitoring Building Commission (MBCx) and metering integration
- Best practices about Grid-interactive Energy Building (GEB) and metering integration
- Best practices about approved agency metering system and product lists
- Guidelines about electric vehicle system equipment (EVSE) and metering integration
- HOW IS FEMP HELPING FEDERAL AGENCIES TO IMPLEMENT THEIR METERING PLANS?

Ways that FEMP is helping Agencies with their Metering Plans

- Lack of trained field personnel – Revised metering training courses next FY
- HQ and field manpower bandwidth concerns – FEMP is working on an innovative agency bandwidth initiative
- Green Button metering data – how to obtain the data from utilities – FEMP will address issue in upcoming web-based metering best practices
- How to obtain Carbon Pollution-free Electricity data from utilities via advanced meters - FEMP will address issue in upcoming web-based metering best practices and new CFE/metering integration report/webinar. At EEx 2024, FEMP conducted a pre-event metering workshop
- More best practices on how to integrate meter systems with Building control system or Energy Management Information System (EMIS) – FEMP will address issue in upcoming web-based metering best practices
- How are other agencies implementing their metering plans – FEMP will initiate a quarterly Federal Agency Metering Community of Practice meeting in this FY
- Best practices about Monitoring Building Commission (MBCx) and metering integration – FEMP will address issue in upcoming web-based metering best practices
- Best practices about Grid-interactive Energy Building (GEB) and metering integration and cybersecurity requirements – FEMP will address issue in upcoming web-based metering best practices
- Best practices about approved agency metering system and product lists – FEMP will address issue in upcoming web-based metering best practices
- Guidelines about electric vehicle system equipment (EVSE) and metering integration – FEMP will address issue in upcoming web-based metering best practices and new EVSE/metering integration report. At EEx 2024, FEMP conducted a pre-event metering workshop

Advanced Meter Data Analysis Use Cases

- Benchmarking building energy and water use
- Identifying operational improvement and retrofit project opportunities
- Measurement and verification of energy and water project performance
- Advanced modeling for fault detection & diagnosis and building controls optimization



Why Meter Connectivity?

You can’t manage what you don’t measure.

You can collect and utilize metered data

Advanced Metering Data Management and Analysis

Data Management

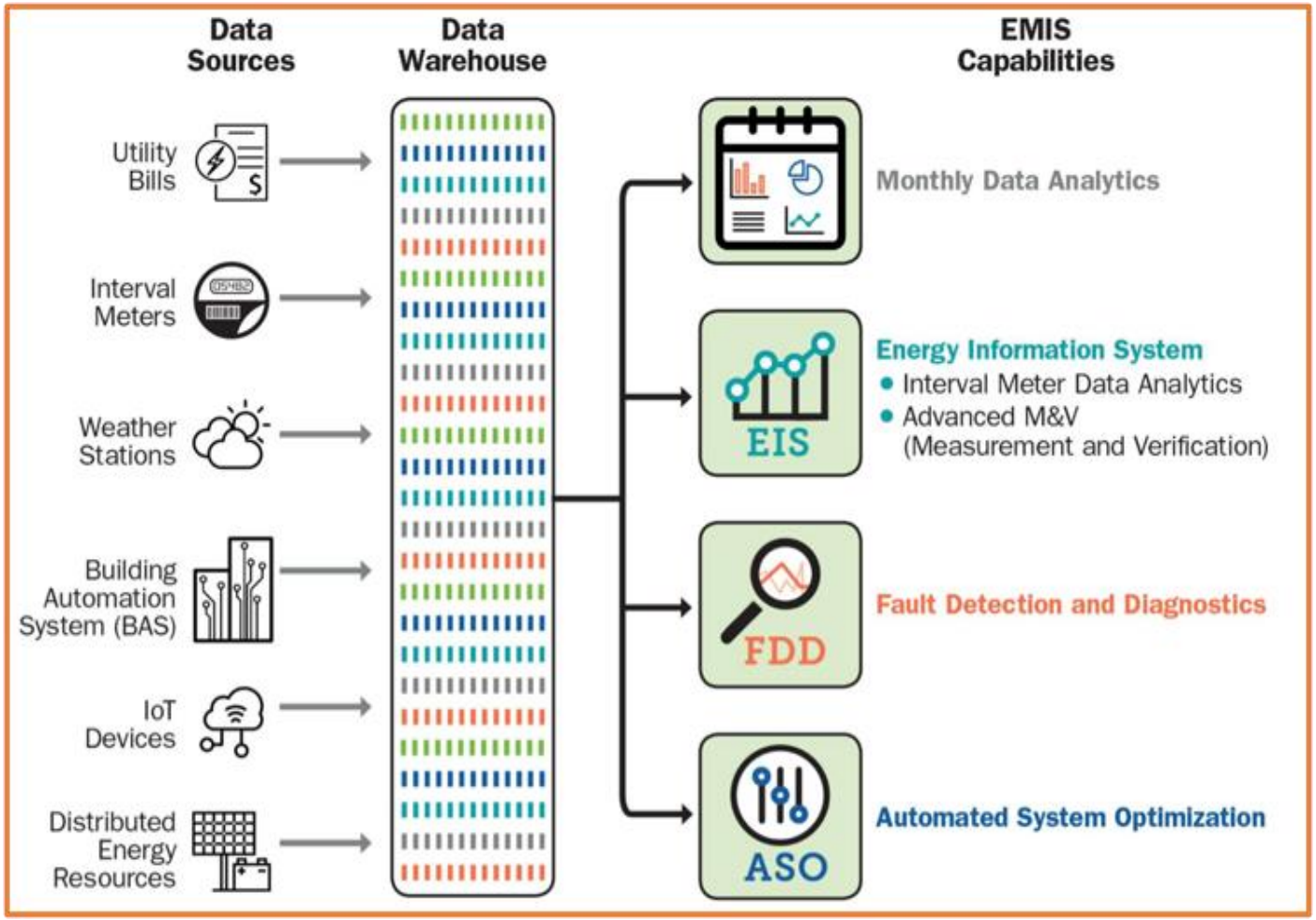
- Data management system
- Data storage and backup processes
- Data administration and user access
- Federal energy and water tracking and compliance systems

Data Analysis

- Analysis roles and responsibilities
- Data-driven decisions
- Functionality and desired analytical capabilities

Energy Management Information Systems

- **Meter data analytics** and many other capabilities are available from Energy Management Information Systems (EMIS)



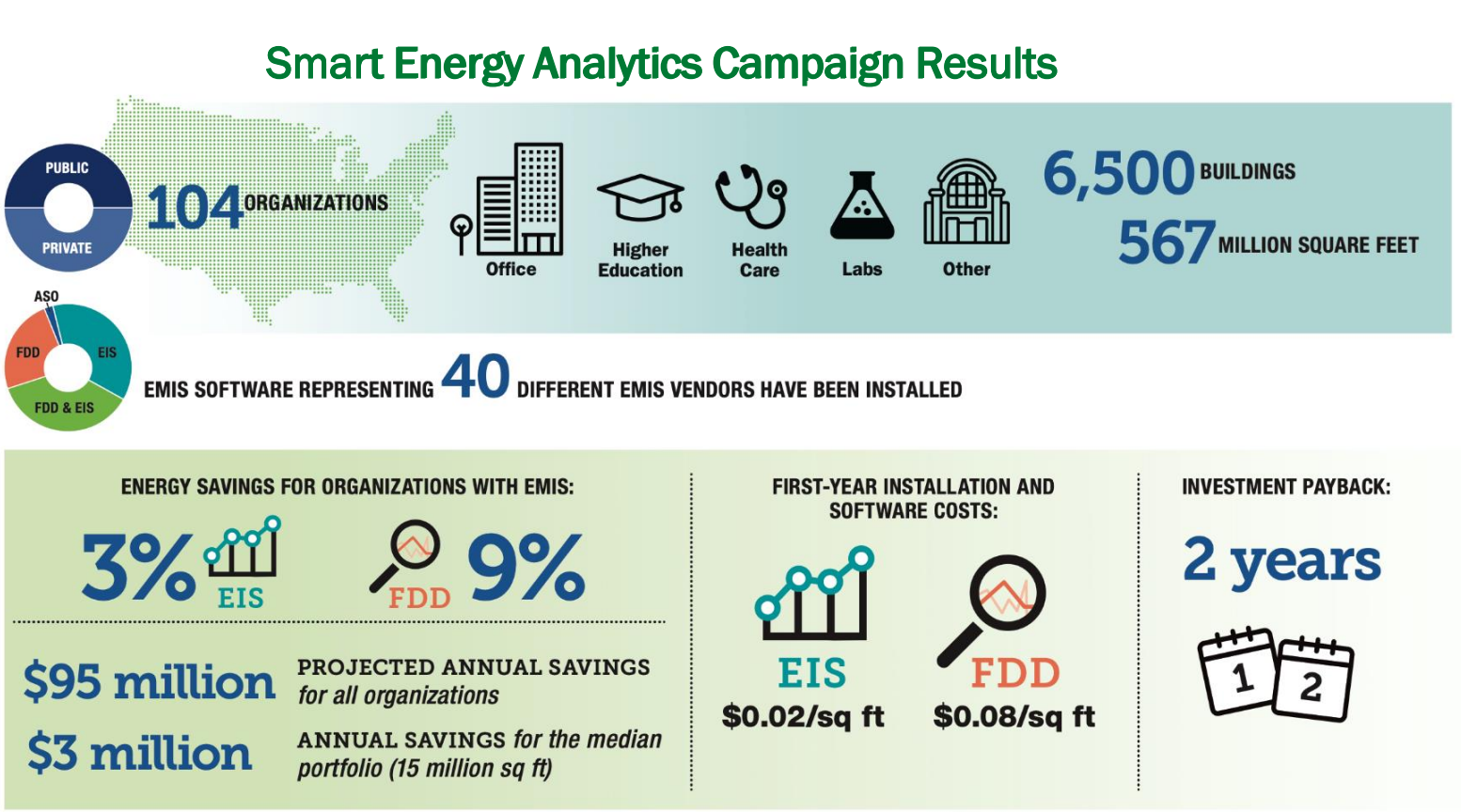
Why Energy Management Information Systems (EMIS)?

You can utilize metered data and interface with building and campus/installation-wide systems

Smart Energy Analytics Campaign (SEAC) Results

EMIS deployment is increasing nationwide

- U.S. Department of Energy (DOE) Building Technologies Office (BTO) and Lawrence Berkeley National Laboratories (LBNL) ran SEAC from 2016 to 2020
- EMIS installed on 567 million ft^2
- Campaign results: Fault Detection Devices (FDD) savings of 9% and Energy Information System (EIS) savings of 3%



Reference: https://smart-energy-analytics.org/assets/Building%20Analytics_2020sep16.pdf

Energy Act of 2020

EMIS Definition:

Energy Management Information Systems (EMIS) are a broad and rapidly evolving family of tools that monitor, analyze, and control building energy use and building/metering system performance

EMIS can support and improve site energy management by providing building owners and operators with well-organized building performance and energy consumption data, enabling a host of analytic capabilities. These capabilities include portfolio-wide energy benchmarking, data visualization, and key performance indicator tracking; automated fault detection and diagnostics; automated measurement and verification of energy conservation measures; and supervisory control enabling automated system optimization and demand management.

EMIS Capabilities that Support Federal Requirements and Mandates

EMIS Capabilities

Category From EPAct, EISA 2007, & EO	Centralize, Normalize, Visualize Data	Utility Bill Management	Interval Meter Analytics	Measurement & Verification (M&V)	Automated Fault Detection and Diagnostics (AFDD)	Supervisory Control	O&M Optimization
Energy Reduction	✔	✔	✔	✔	✔	✔	✔
Data Center Management	✔	✔	✔	✔	✔	✔	✔
Benchmarking of Federal Facilities	✔	✔	✔	✔			
Energy and Water Evaluations	✔	✔	✔	✔	✔		✔
Follow Up on Implemented Measures	✔		✔	✔	✔	✔	✔
Recommissioning and Retro-Commisioning	✔		✔	✔	✔	✔	✔
Web Based Certification	✔	✔	✔	✔			
Metering Requirements	✔	✔	✔	✔			
Annual Energy Report	✔	✔	✔	✔			
Renewable Energy Report	✔		✔				
Waste Management	✔	✔					✔
Water Management	✔	✔	✔				✔

Reference: https://www.energy.gov/eere/femp/energy-management-information-systems-federal-facilities

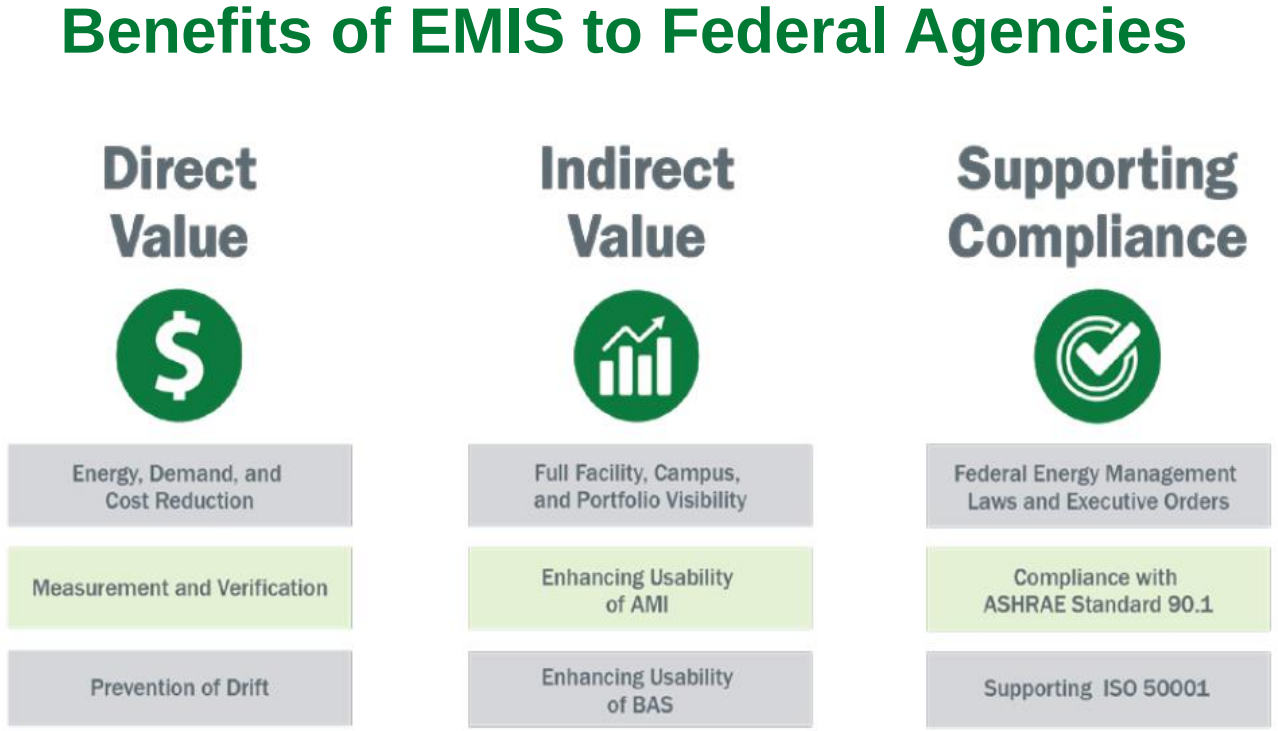
Benefits of EMIS to Federal Agencies

Direct Value

- Reduce energy and demand costs
- Commercially available EMIS tools worth the investment

Indirect Value

- Add value to agency's core mission
- Meter data systems
- Compliance with laws and regulations



Reference: https://www.energy.gov/eere/femp/energy-management-information-systems-federal-facilities

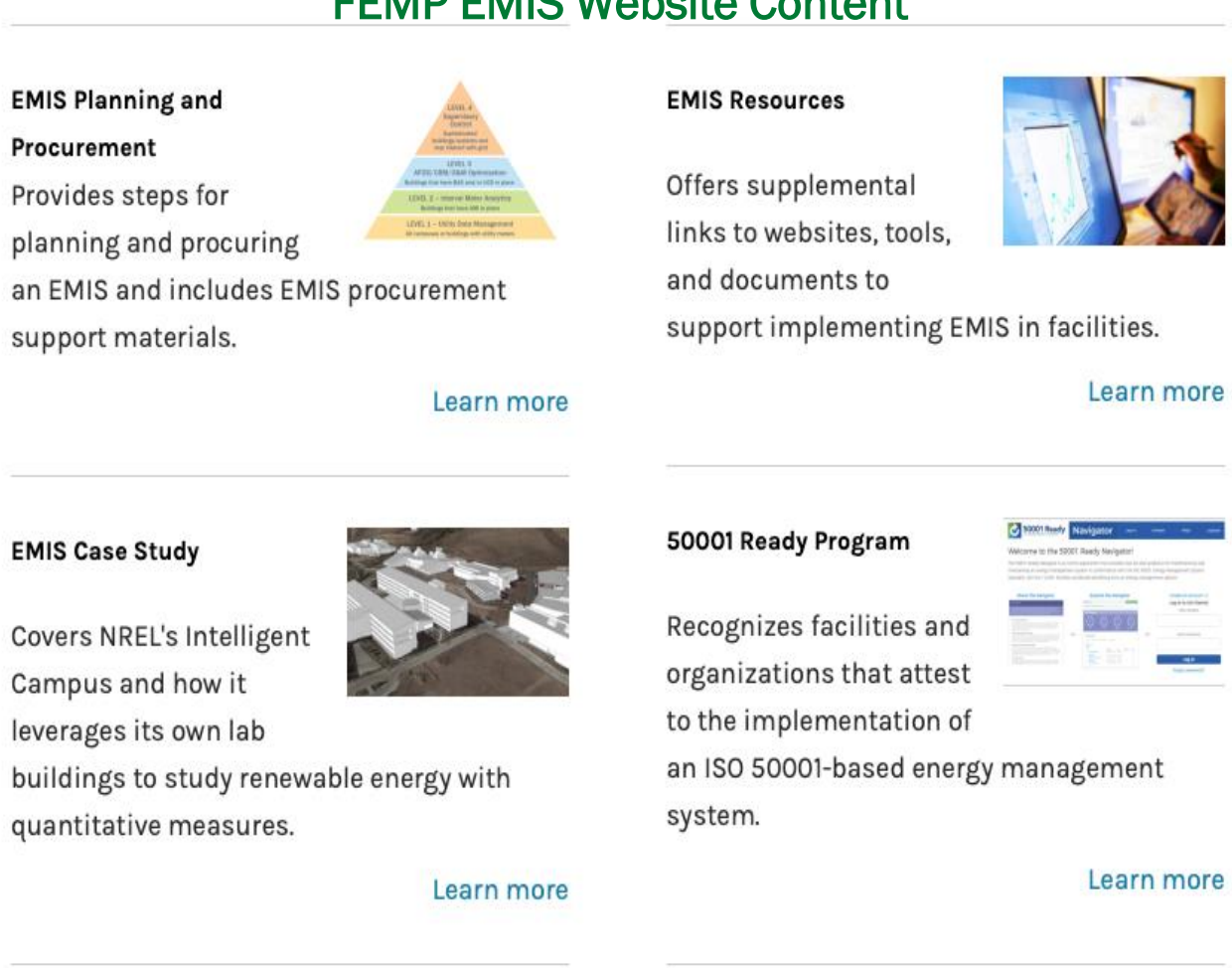
FEMP EMIS Webpage

FEMP EMIS Website Content:

- EMIS Technical Resources Report
- EMIS Technical Specification
- EMIS Planning and Procurement
- EMIS Resources
- EMIS Case Studies
- 50001 Ready Program

Completed Publications

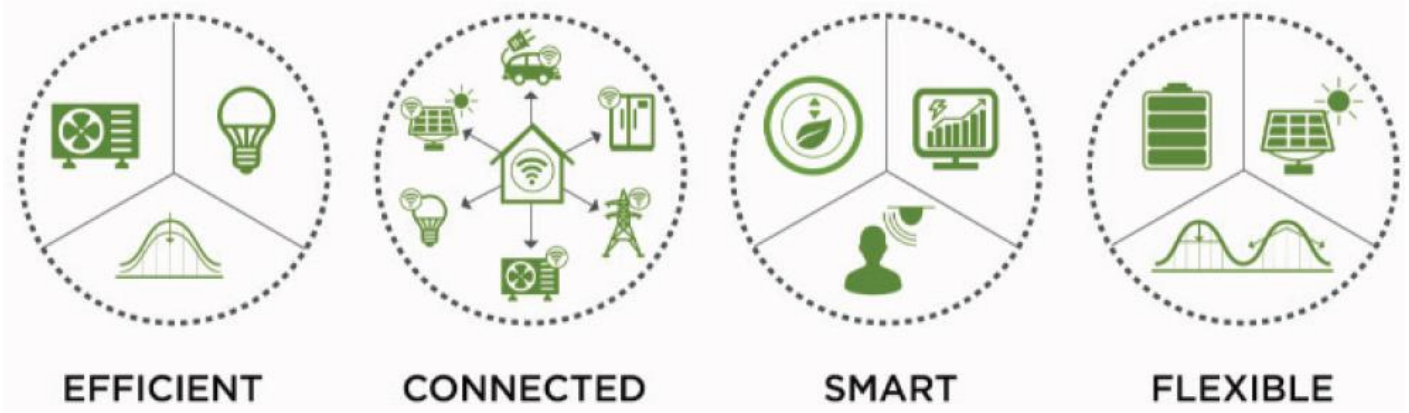
- Best Practices for EMIS Metadata Schemas
- EMIS Cybersecurity Best Practices
- Best Practices to Support EMIS Operation at Federal Facilities
- Best Practices for Enhancing Performance Contracts with Monitoring-Based Commissioning (MBCx)

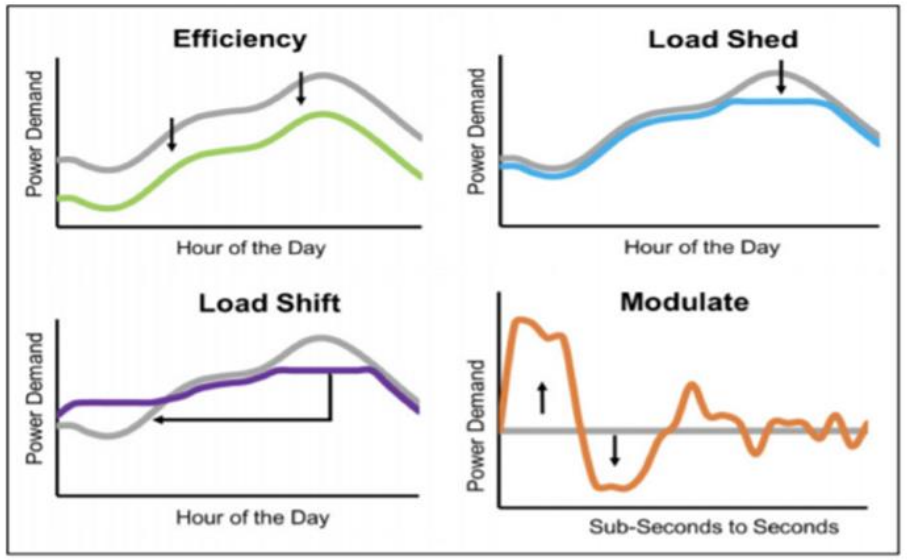


Reference: https://www.energy.gov/eere/femp/energy-management-information-systems-federal-facilities

FEMP's Grid-Interactive Efficient Buildings (GEBs)

Per the **Energy Act of 2020**, a GEB is an **energy efficient** building with **connected** and **smart** technologies characterized by use of **flexible** Distributed Energy Resources (DER).





- Energy-efficient design – high-quality walls and windows, high-performance appliances and equipment, and optimized whole building design.
- Connected – the ability to send and receive "signals" to respond to grid needs and/or other externalities.
- **Smart** — appropriate sensing and responsive controls that use data to benefit operations.
- **Flexible** — the building energy loads can be "shifted" in time to help mitigate solar generation, electric vehicle charging, and/or energy storage.

Adapted from Neukomm, M., Nubbe, V., & Fares, R. (2019). Grid-interactive Efficient Buildings: Overview. Office of Energy Efficiency and Renewable Energy, US DOE, Washington, DC, Tech. Rep.

FEMP's EMIS and GEB Resources

EMIS Website Link: Energy Management Information Systems for Federal Facilities | Department of Energy

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GEB Website Link: Grid-Interactive Efficient Buildings for Federal Agencies | Department of Energy

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What is the GSA Advanced Metering Migration?

One of many current agency-wide meter connectivity systems for other agencies to utilize

Innovation and Technology: Advanced Metering: Regional Update

Innovation and Technology | U.S. General Services Administration | 2024

AMI Network Call: March 2024

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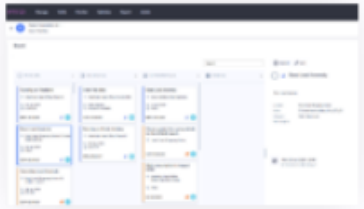
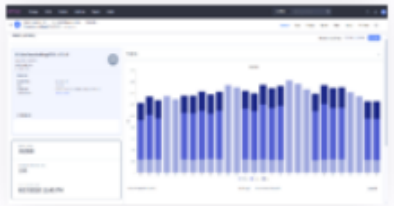
MUSE (Envizi) Advanced Metering Migration

Performance analytics (rules)

Issue management & workflow



Data visualization & analytical tools



Reporting & benchmarking

Extract & Export

Automated Data Capture

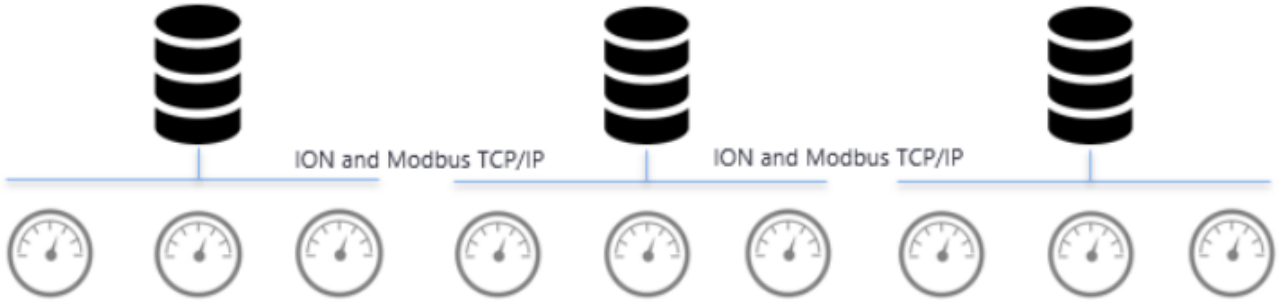
- AMS/EUAS/SOM/Utility Bill Pay
- Demand and Consumption
- Hourly updates
- Basic Trends and Modeling
- Performance Analytics Rules
- Incorporates weather, occupancy & utility data

Data to be polled/extracted from PME servers via XML formatted data dumps or ODBC calls to the PME server databases (15-minute or less intervals)

Weather data from IBM The Weather Company.

11 x Regional PME Servers

467 facilities, total 6,643 enabled sources including all metering sources, building square footages, weather sources and all other sources needed to evaluate performance of assets.
2,700 Meters with 40,000+ source measurement pairs



- Advanced Metering only
- Real-Time Data for all phases
- Power Quality Analytics Tools
- AMI Alarming

FY23 KPI

Measure Targets

Region		FY21		FY22		FY23 Target
		Target	Actual	Target	Actual	
NW	Level 3:	≤27% meters offline		≥70% meters ONLINE		≥70% meters ONLINE
	Level 4:	≤25% meters offline	~68-88.6% online	≥75% meters ONLINE		≥75% meters ONLINE
	Level 5	≤23% meters offline		≥80% meters ONLINE	~90.1% Online	≥80% meters ONLINE
	Level 3:					

Advanced Metering KPI: Current Status

Advanced Metering Offline Source Activity Report

11/22/2022

Submit an Advanced Metering Troubleshooting Ticket | Offline Meter KPI

National Summary

94.2%
Percent ONLINE* & Trend in Percent ONLINE

2,226 | 137
ONLINE | OFFLINE Meters

2,363
Total Meter Sources

>75% ▲19.2%
Target ONLINE Percent & Variance from Target

-839
Net Change in Offline Meters from Previous Week

-1,589
Change from Previous

-4,788
Change from Previous Year

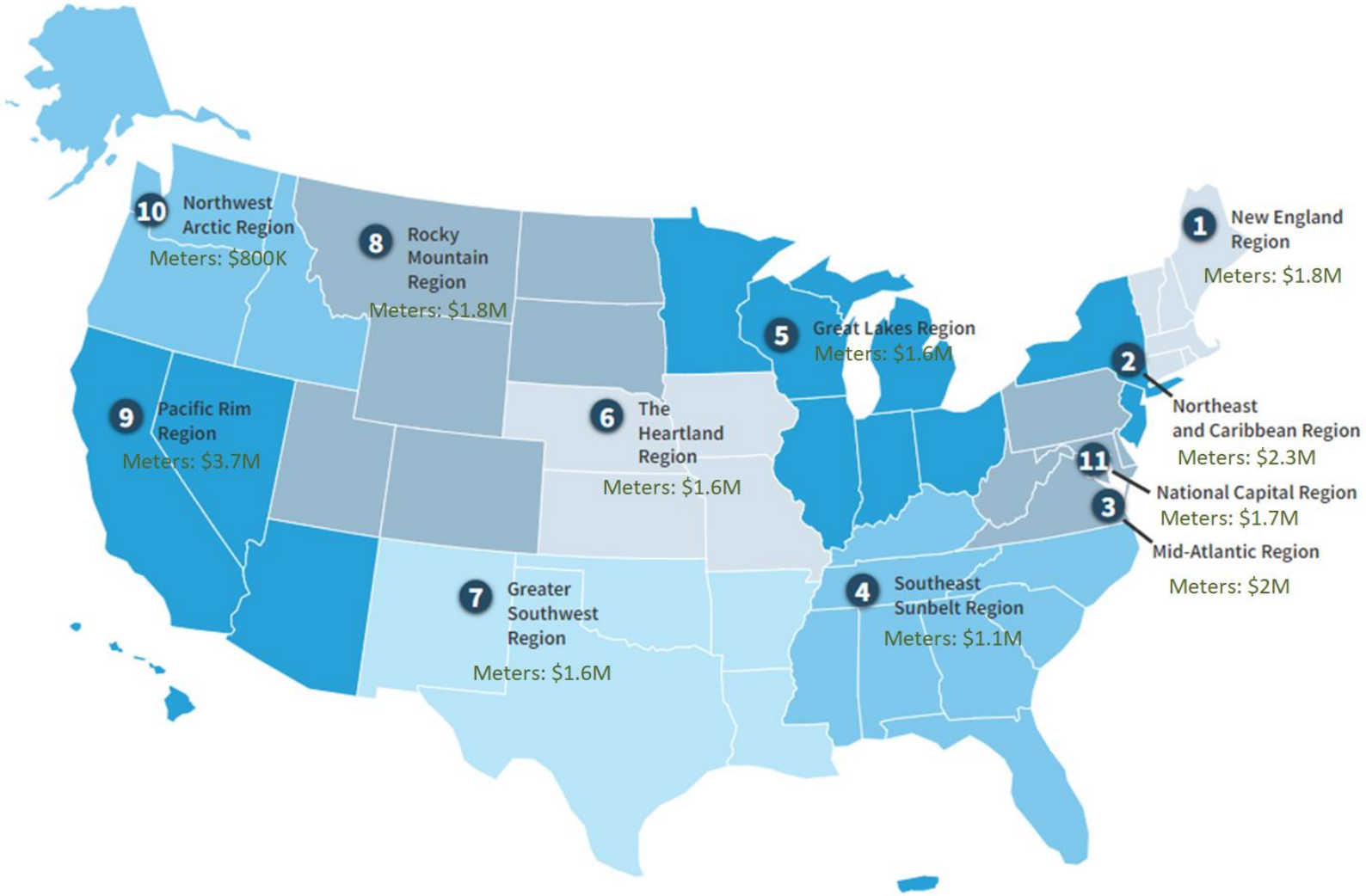
258
Average Days Offline

* measure includes meters that have been offline for 10 days or more

Regional Summary

Region	Total Physical Meter Sources	Offline Meters** Count	Percent Meters ONLINE	Change in Number of Offline Meters from Previous Week	Change in Number of Offline Meters from Previous Month	Change in Number of Offline Meters from Previous Year	Average Days Offline
R1	303	44	85%	-1	-2	-315	577
R2	244	18	93%	-74	-74	-354	228
R3	129	7	95%	+3	+4	-146	38
R4	130	0	100%	-81	-142	-426	2
R5	279	26	91%	-7	-3	-441	108
R6	166	18	89%	-14	-21	-222	160
R7	167	12	93%	-372	-1047	-1396	64
R8	509	7	99%	-81	-87	-514	189
R9	147	4	97%	-26	-24	-340	234
R10	184	23	88%	-27	-27	-286	192
R11	105	9	91%	-159	-166	-348	140

** regional totals include buildings that have been offline for 2 days or more



- ~~New Electric Meters in 128 Bldgs~~
- Replace End of Life meters in 104 Bldgs
- Water Meters for 134 Bldgs
- Gas Meters for 80 Bldgs
- PV Metering Integration for >17 Sites*
- EVSE Integration for >4 Sites*

* Additional sites under evaluation for inclusion

Advanced Metering IRA (draft) project requests

Installation of ~1,100 advanced meters, increase of 50%

Region	Funding Allocation
1	$1,800,000
2	$2,310,000
3	$2,010,000
4	$1,108,000
5	$1,581,000
6	$1,575,000
7	$1,591,000
8	$1,814,800
9	$3,699,000
10	$800,000
11	$1,711,200
TOTAL	$20,000,000