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Utility Metering Best Practices

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Module 1: Introduction and Overview

Learning Objectives

By the end of this section, you will be able to:

- **Identify** the core components of a successful utility metering program.
- **Evaluate** the cross-functional staffing requirements necessary for effective program implementation.
- **Navigate** the specialized technical resources and regulatory appendices provided in this guide.

Executive Summary: Effective utility management is predicated on the acquisition and analysis of technically sound data; this guide provides the framework for developing metering strategies, selecting technologies, and implementing a comprehensive program that spans from site-level technical staff to national headquarters.

Program Scope and Fundamentals

The primary goal of this guide is to facilitate the application of **energy and water metering strategies** through a structured approach to data collection and plan development. Rather than attempting to cover the entire universe of metering material, this resource focuses on four practical pillars:

- **Rationale:** Providing the technical background on why metering is critical for modern facility management.
- **Structure:** Establishing the framework for an **effective metering program**.
- **Technology:** Detailing current metering and communications hardware.
- **Application:** Highlighting how to translate metered data into actionable operational improvements.

Target Audience and Organizational Participation

While primarily designed for facility, energy, and water resource managers, the success of a metering program is highly dependent on **cross-functional cooperation**.

Key Participation Areas

A comprehensive program requires active involvement from the following functional areas:

- **Engineering and Technical Staff:** For system design and data integrity.
- **Operations and Maintenance:** To ensure hardware reliability and utilize data for real-time adjustments.
- **Procurement and Administration:** For funding, contracting, and resource allocation.



- **Training:** To ensure staff are capable of interpreting and acting upon technical data.

💡 **Design Tip:** Even if your site does not have these as separate departments, ensure the **functional responsibilities** of each area are assigned to specific team members to avoid gaps in program execution.

Organization and Maintenance of the Document

This guide (Release 3.0) streamlines complex technical information into accessible **summary tables** to assist in quick decision-making for Professional Engineers.

Guide Structure

- **Module 2: Rationale:** Technical drivers and the "why" behind metering.
- **Module 3: Planning and Economics:** Strategic development and financial considerations.
- **Module 4: Technologies:** Utility-specific hardware for electricity, natural gas, steam, and water systems.
- **Module 5: Data Analysis:** Methodologies for Energy Information Systems (EIS).
- **Appendices:** Technical glossary (A), Federal legislative mandates (B), and applicable **codes and standards** for installations (C).

⚠️ **Safety Constraint:** Engineering staff must consult **Appendix C** for select applicable codes and standards before finalizing any metering equipment specifications or installation plans.

Checkpoint Quiz

1. **Which functional area is responsible for ensuring that the data acquired remains "technically sound" throughout the program life cycle?**
 - a) Procurement
 - b) Training
 - c) Engineering and Technical Staff
 - d) Administration

Answer: (c). The guide emphasizes that technical staff are prime stakeholders in acquiring and maintaining sound data.

2. **According to the guide, what is a prerequisite for the success of a metering program?**
 - a) Using only the most expensive digital meters
 - b) Participation and understanding of principles at all organizational levels
 - c) Having every functional area as a separate department



- d) Replacing all summary tables with raw data logs

Answer: (b). Cooperation and dedication at all levels are stated as necessary for a program to succeed.

3. Where can a Professional Engineer find specific information regarding the Energy Policy Act of 2005 as it relates to metering?

- a) Chapter 4
- b) Appendix A
- c) Appendix B
- d) Chapter 6

Answer: (c). Appendix B specifically provides copies of Section 103 of the Energy Policy Act of 2005 and Section 434(b) of the Energy Independence and Security Act of 2007.



Module 2: Why Meter?

Learning Objectives

By the end of this section, you will be able to:

- **Evaluate** the business case for metering by identifying its impact on building operations and cost reduction.
- **Identify** the primary legislative and standard-based drivers for mandatory utility metering in federal and commercial sectors.
- **Apply** the ISO 50001 "Plan – Do – Check – Act" model to integrate metering into a continuous energy management improvement cycle.

Executive Summary: Metering is the fundamental tool for energy management; you cannot manage what you do not measure. Modern metering provides the real-time data necessary to comply with federal mandates, verify utility bills, and optimize equipment operations to realize significant cost savings.

Business Case for Metering

Applying meters to individual buildings and energy-intensive equipment provides real-time usage information. While meters are not an energy conservation technology in themselves, they provide the essential data resources needed to drive efficiency.

Core Objectives of a Metering Program

- **Reduce Consumption:** Lower overall energy and water use.
- **Cost Management:** Decrease energy and water expenses.
- **Operational Excellence:** Improve both general building and specific equipment operations.

Functional Applications of Metered Data

How data is utilized is the critical factor for program success. Effective data collection enables:

- **Financial Oversight:** Verification of utility bills, comparison of rates, and proper allocation of costs to tenants.
- **Load Management:** Implementing demand response or load shedding under time-based rates.
- **Performance Tracking:** Measuring and verifying project performance and benchmarking energy use.
- **Strategy:** Identifying retrofit opportunities and supporting annual energy reporting.



💡 Design Tip: When implementing a system, consider future expansion for new sensor technologies, but avoid overdesigning, which can lead to unnecessary costs.

Metering Drivers

The expansion of metering is driven by increased functionality, declining hardware costs, and a growing recognition of data value. Key technical drivers include the modernization of the electric infrastructure toward a **smart grid**, which utilizes two-way digital communication for real-time pricing and demand response.

Legislative Drivers

Federal facilities are subject to several legislative acts requiring energy and water metering to help agencies reduce costs.

Table 2-1. Federal Metering Legislative Drivers

	Establishing Authority		
	Energy Policy Act of 2005	Energy Independence and Security Act of 2007	Executive Order 13693: Planning for Federal Sustainability in the Next Decade March 19, 2015
Metering Requirements Section	Section 103: Energy Use Management and Accountability	Section 434 (b): Metering	Section 3: Sustainability Goals for Agencies
Applicability	All agencies	All agencies	All agencies
Key Requirements	<ul style="list-style-type: none"> - All buildings - Where practicable - By October 1, 2012 - Meter electricity - Hourly interval data (minimum) collected at least daily 	<ul style="list-style-type: none"> - Not later than October 1, 2016 - Each agency shall provide for equivalent (as to Section 103 EPA Act 2005) metering of natural gas and steam - Metering of water is encouraged to obtain data to support water intensity reduction goals 	<ul style="list-style-type: none"> - By fiscal year 2018, all data centers will have advanced energy meters installed and the data will be monitored (as to Section (a)(ii)(B)) - Install water meters and collect and use building and facility water balance data to improve water conservation and management (as to Section (f)(ii))

ANSI/ASHRAE/IES Standard 90.1-2013

This standard influences requirements for new construction and major replacements. It mandates sub-metering for all buildings or additions over **25,000 square feet**.

⚠️ Safety Constraint: You **shall** install measurement devices to monitor the following loads separately: total electrical energy, HVAC systems, interior lighting, exterior lighting, and receptacle circuits.

Recording Intervals:

- **Electrical Loads:** Minimum of every 15 minutes.
- **Other Fuel Sources:** Minimum of every 60 minutes.



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the technical materials.