



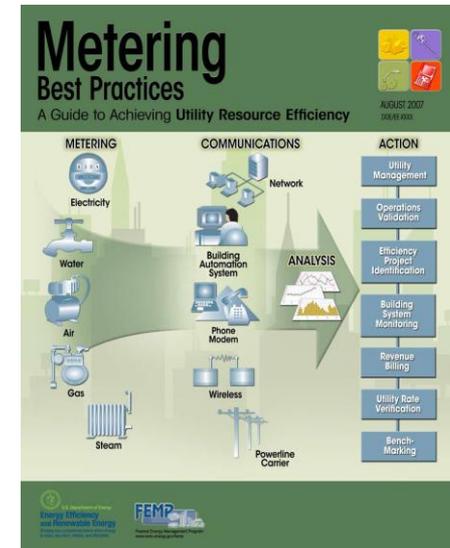
FIMS/RE Workshop
Advanced Metering

Greg Sullivan

Efficiency Solutions



- Legislative overview
- Definitions
- Metering planning
- Advanced meters
 - technologies and key components
- Data Analysis/Uses
- Economics
- Resources



***** IMPORTANT *****

Audience Participation Segment

- **EPAAct 2005:**
 - EPAAct 2005/Section 103: Energy Use Measurement and Accountability
- **EISA 2007:**
 - EISA Section 434B: Metering

EPAct 2005 Highlights:

- Meter electricity using “advanced meters”
 - Hourly interval capability
 - Daily download capability
- All Federal buildings deemed “practicable”
- Submit implementation plan
 - Key staff
 - Non practicable facilities
- By October 1, 2012

EISA 2007 Highlights:

- Expands EPO Act 2005 to include **Natural Gas and Steam**
 - All requirements of EPO Act for electricity – apply to natural gas and steam
- By October 1, 2016
 - Four additional years to complete

Advanced Meters

- Capability to measure and record interval data
- Communicate the data to a remote location/s
 - Advanced metering system

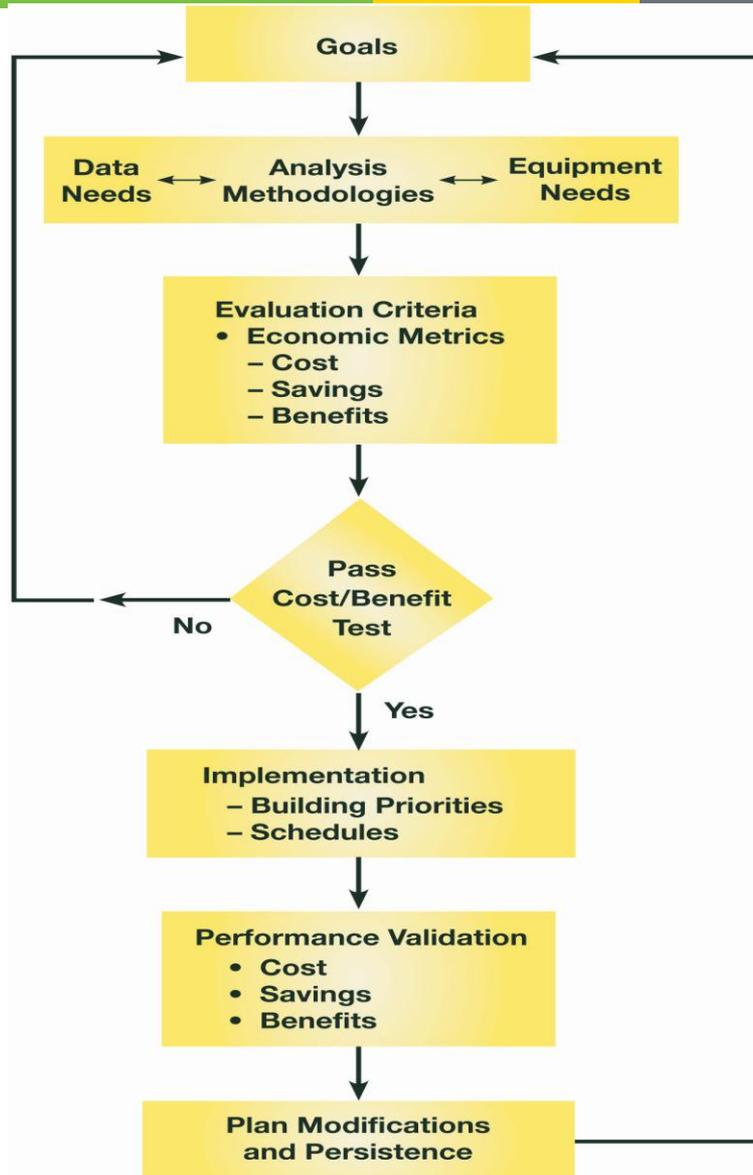
Advanced Metering System

- Collects time-differentiated energy usage data
 - Real time or defined schedule basis
- Data is processed to “information”
- Information supports: energy management, project identification, operational efficiency, and utility interaction

The Metering Plan

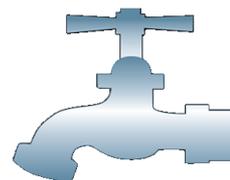
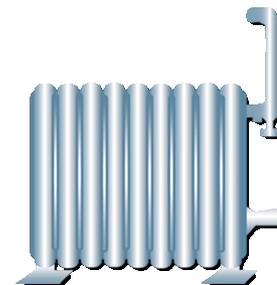
- Outline
 - Goals/objectives
 - Technical elements
 - Analysis needs
 - Data needs
 - Equipment needs
 - Implementation plan
 - O&M/Calibration and persistence

Planning Flow Chart



Metered Utilities

- Consider the predominant utilities
 - Electricity
 - Natural gas
 - Steam
 - Potable water
 - Chilled/HTHW



Technology Decisions

- Key metrics
 - Accuracy
 - Precision
 - Turndown ratio
 - Capital cost
 - Cost/ease of installation
 - Cost/ease of maintenance/recalibration



- **Electric Metering Technologies**

- Mechanical
- Electro-mechanical
- Solid State



• Solid State Meters

– *Advantages:*

- Accuracy
- Data storage and time-stamp capabilities
- Can accommodate other inputs
- Two-way communication
- Control/alarm features

– *Considerations/Challenges:*

- Expense as options and features increase
- Level of complexity
- Need ancillary systems for data transfer and use



- **Features/options**

- kWh/kW recording
- Average and peak demand
- Voltage recording
 - Phase and phase to phase
- Amperage recording
 - Phase and phase to phase
- Power factor
- Power quality
 - Harmonics
 - Total harmonic distortion
- Remote connect/disconnect
- Memory
- Communications



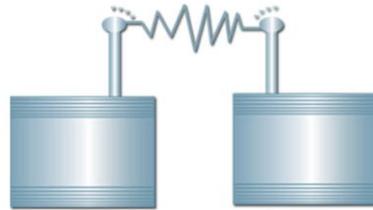
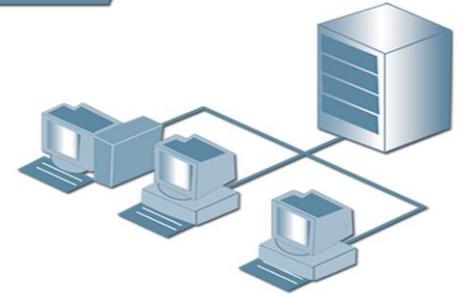
Electric Meter Selection Considerations:

- **Don't over-buy** – Plan well.
- **Consider flexibility** – Balance what you need now with that you see as having future benefits.
- **Communications** – Consider standardization on communication between meters and other data acquisition systems.
- **Data processing** – How will the collected data be processed? Does the metering equipment vendor offer this function/ service

Staff who install, maintain, and use the data should have a voice in meter selection.

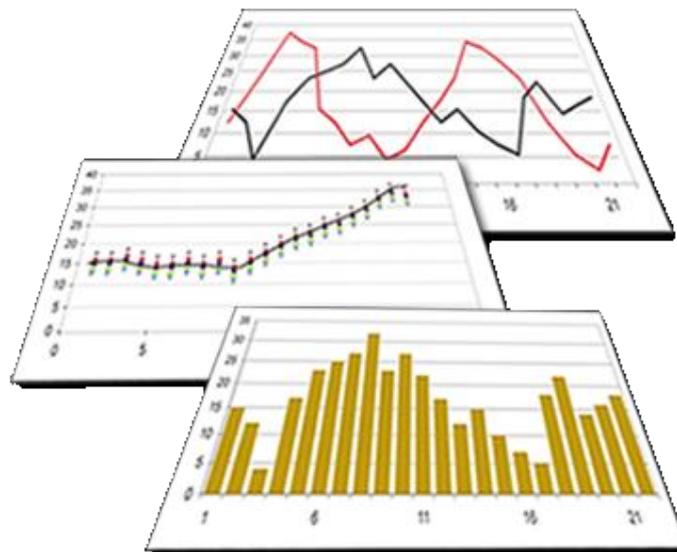
Metering Communications

- Most common options
 - Phone/modem
 - Local area network
 - Building automation system
 - Wireless



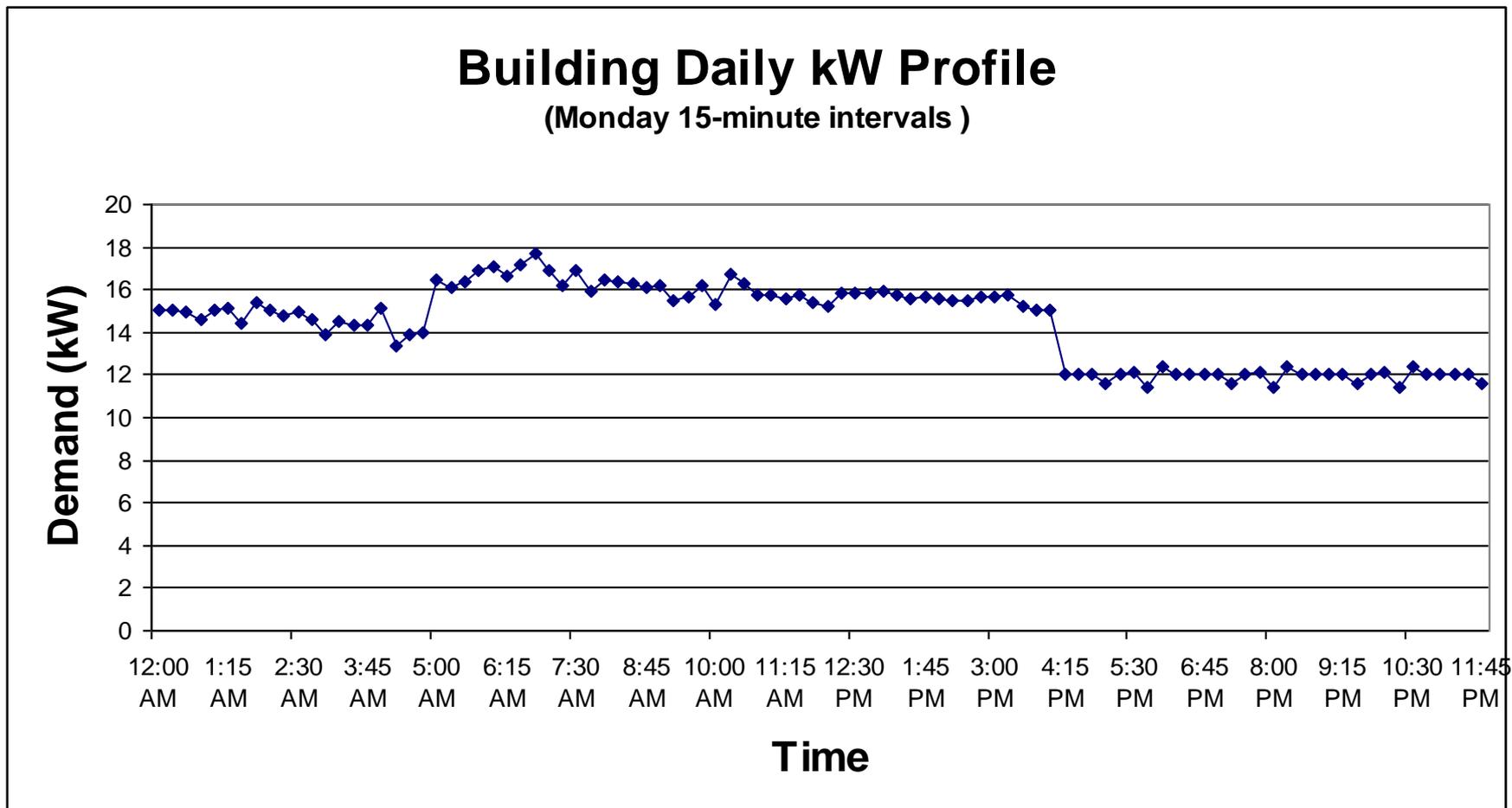
Data Uses

- Typical Advanced Meter Data Uses
 - Efficiency opportunity identification
 - Measurement and verification
 - Benchmarking
 - Reimbursable billing

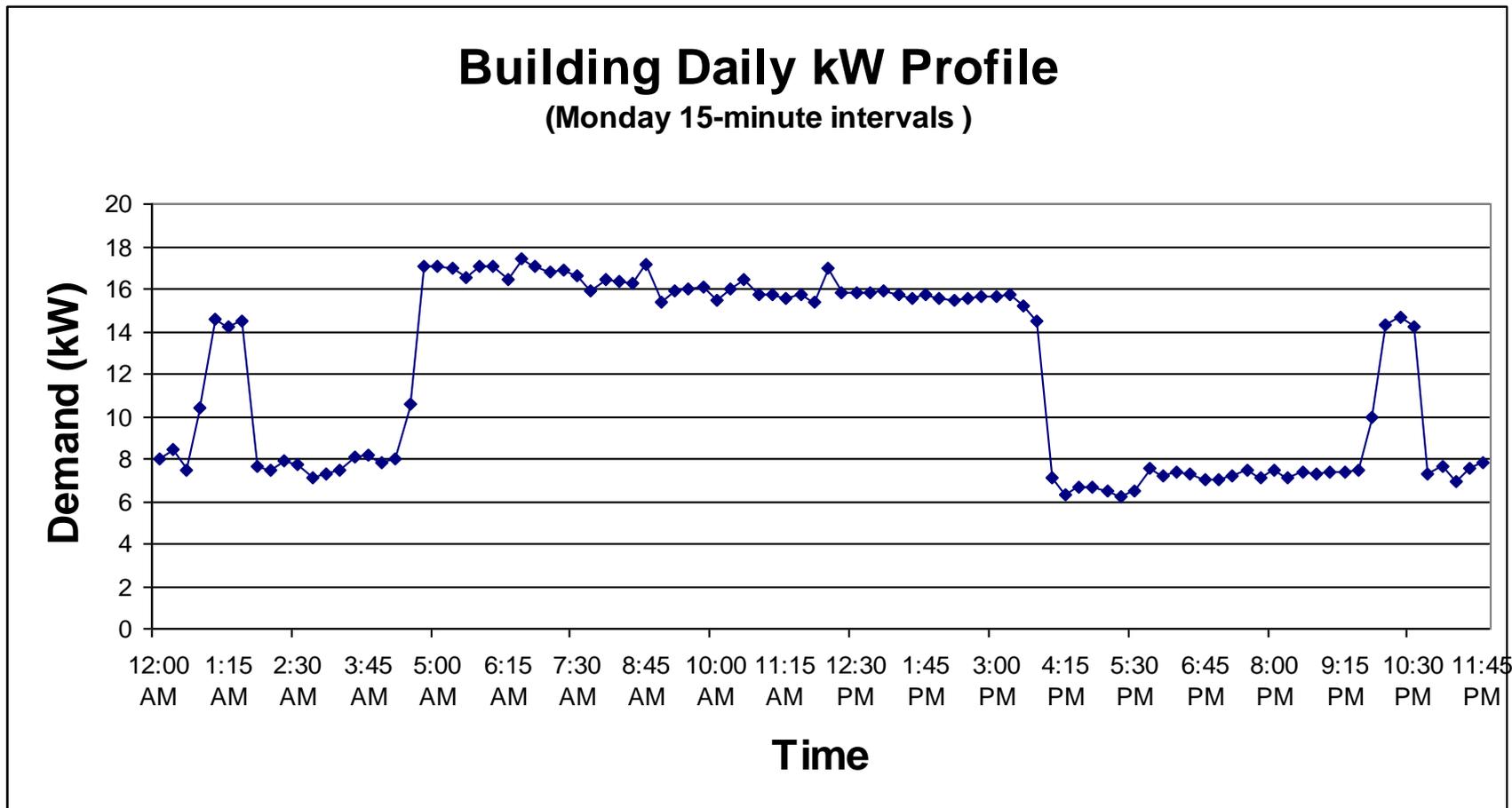


Sample Data Uses

Data Uses: Efficiency Identification

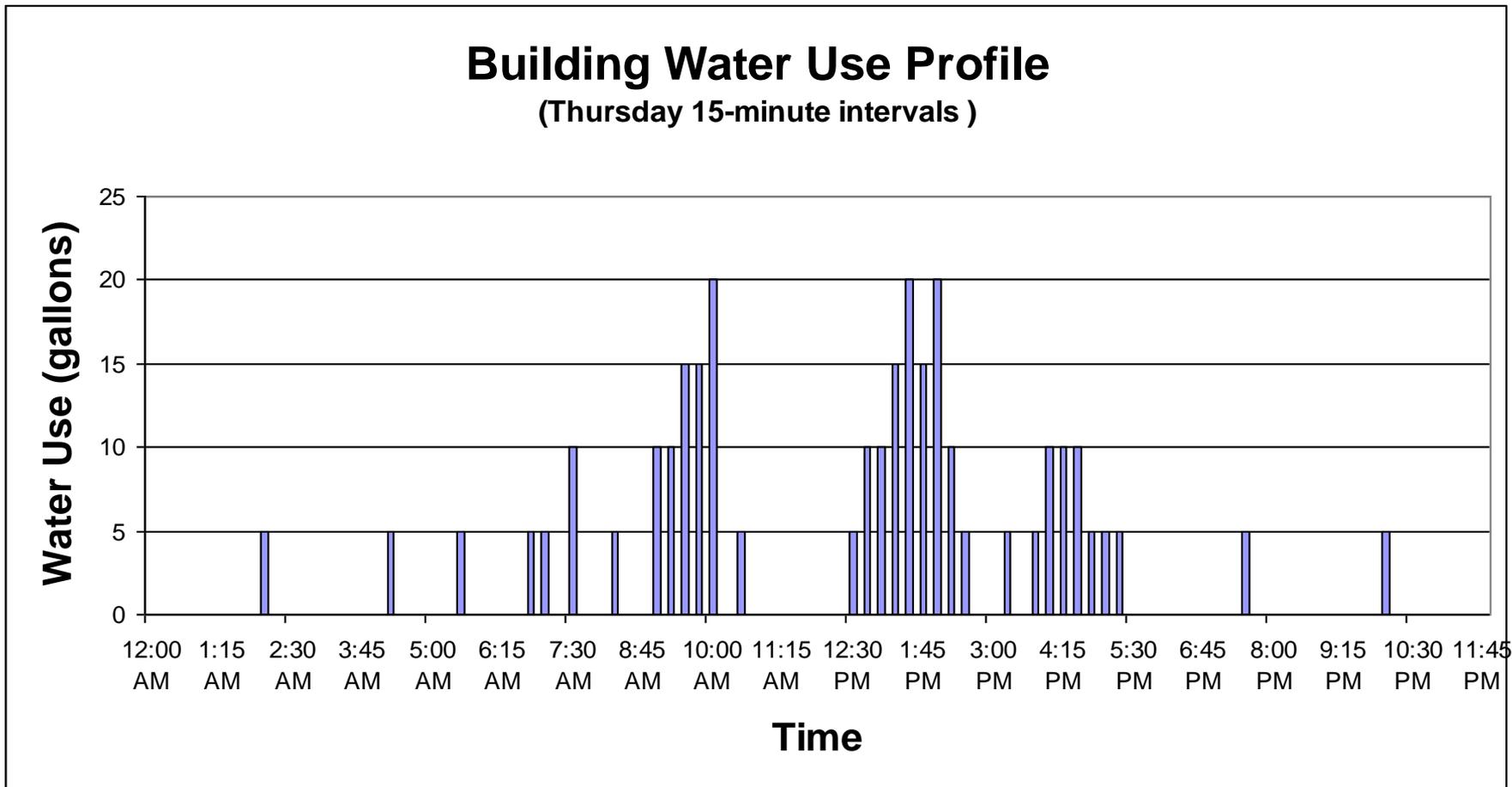


Data Uses: Efficiency Identification

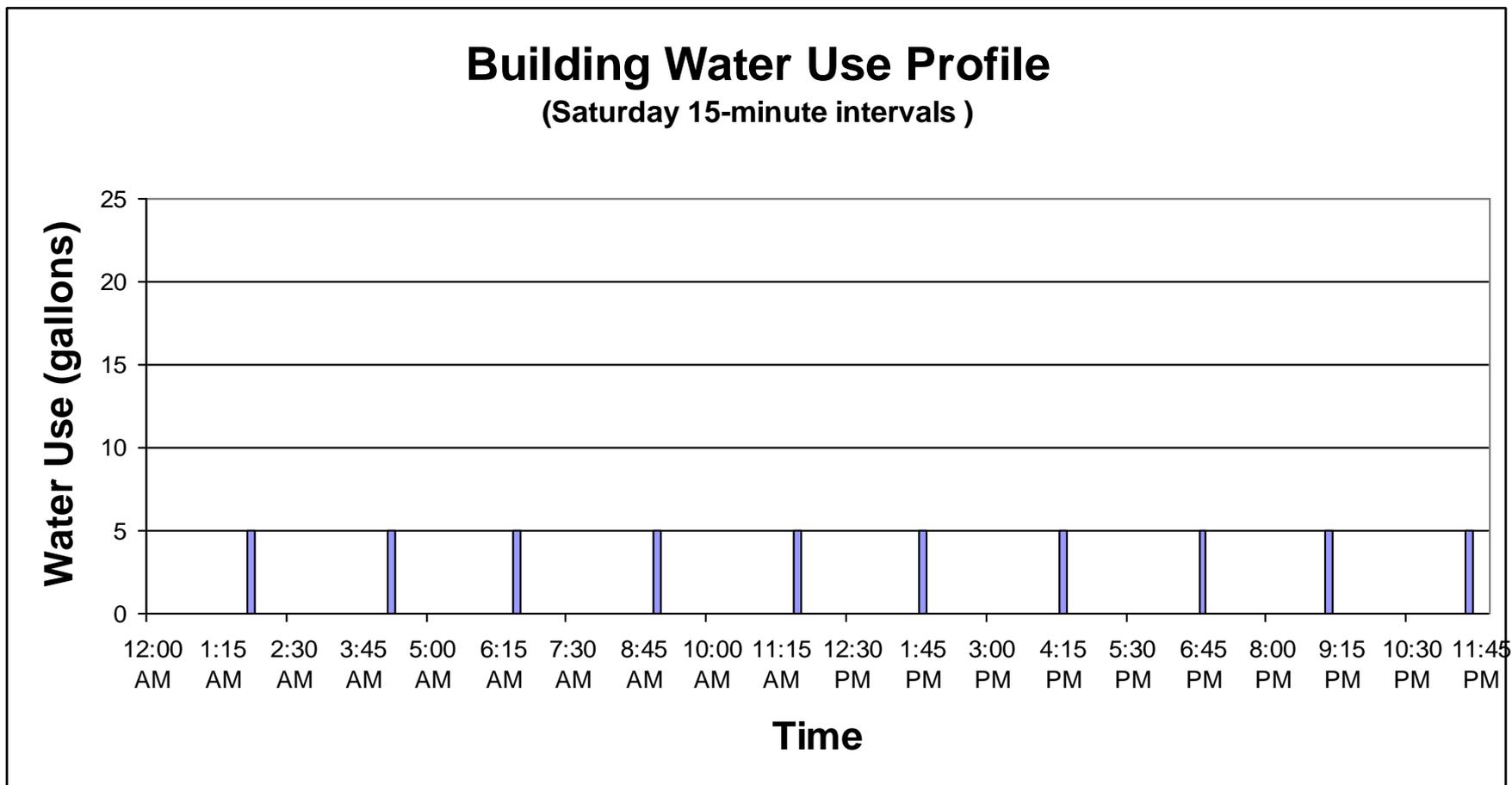


Data Uses: Efficiency Identification

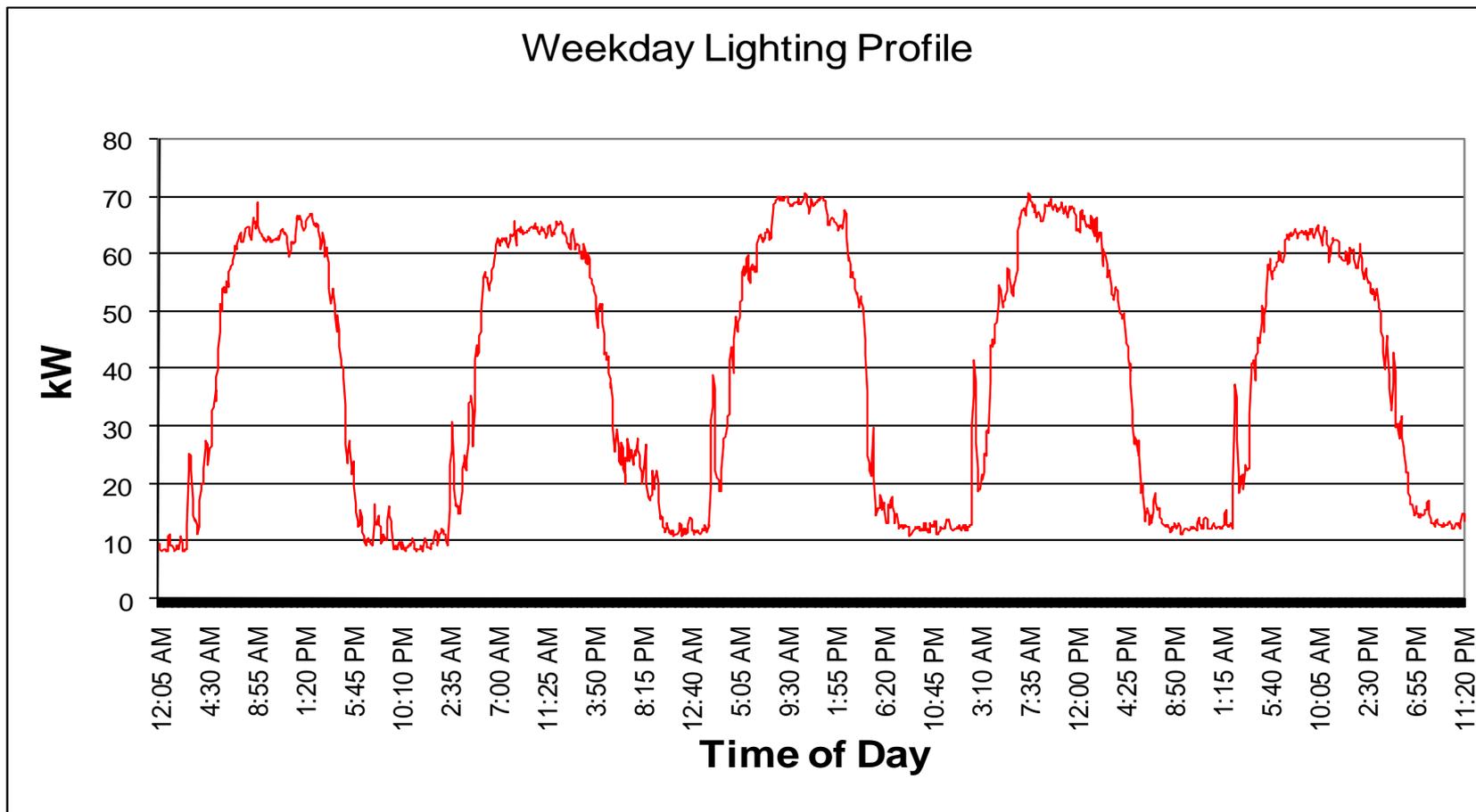
Building Water Use Profile
(Thursday 15-minute intervals)



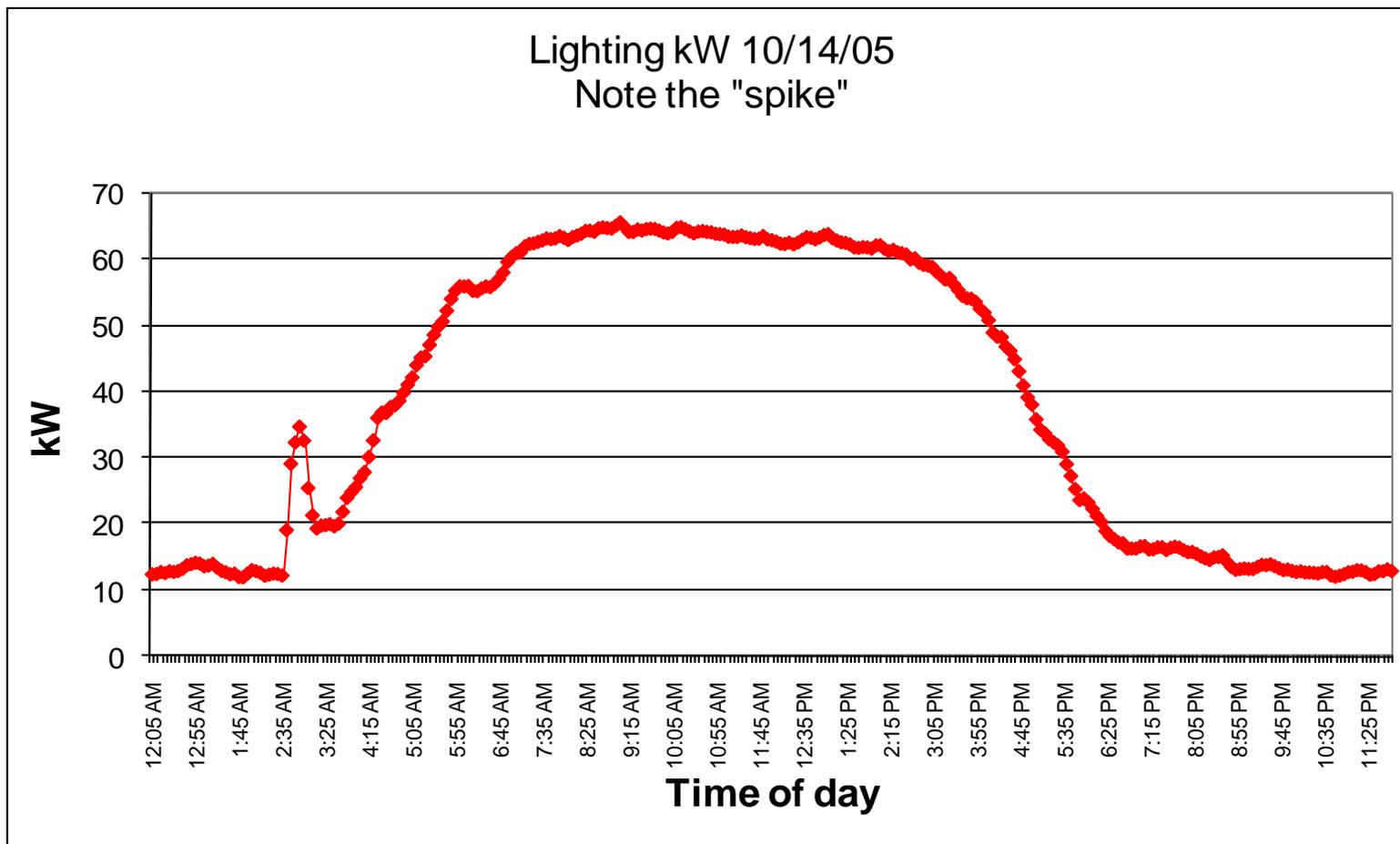
Data Uses: Efficiency Identification



Data Uses: Operational Opportunity

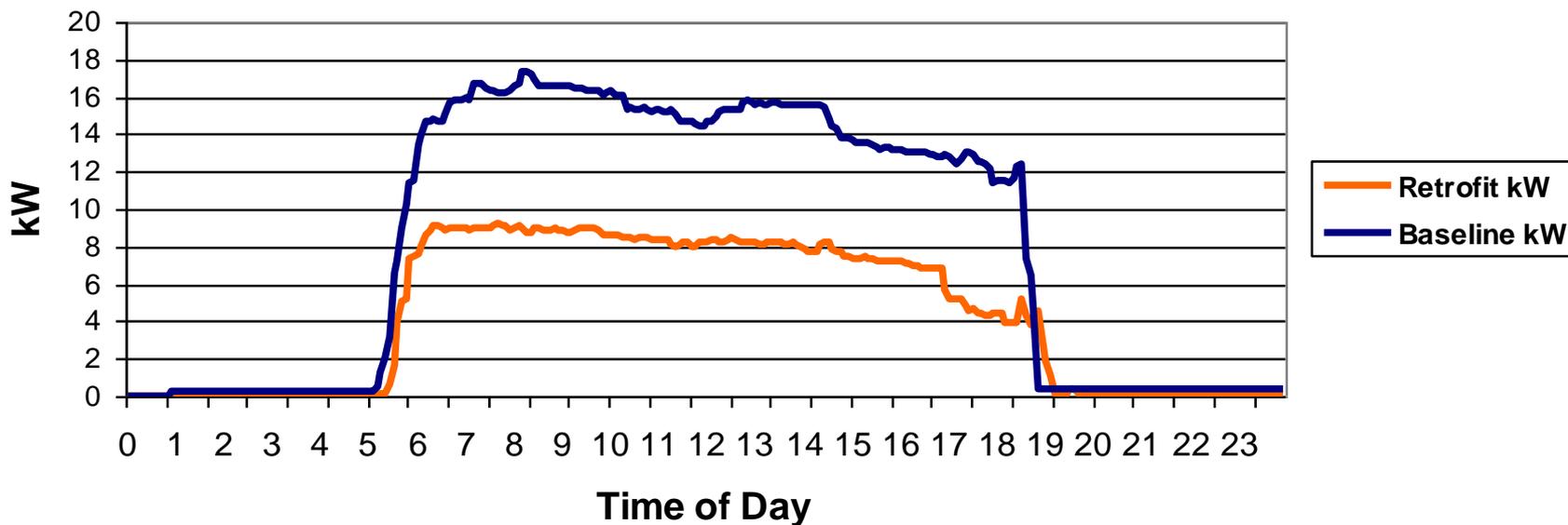


Data Uses: Operational Opportunity



Data Uses: Measurement and Verification

Spectrally-Enhanced Lighting Demonstration Aggregate Daily Lighting Profile



Metering Economics

- Metering costs variables:
 - Equipment
 - Configuration
 - Communications
 - **Typical Costs: \$1K - \$5K**
- Metering savings variables:
 - Available data
 - Analysis capabilities
 - Commitment/persistence
 - **Typical Savings: 2% - 10% annual use**



Metering Economics

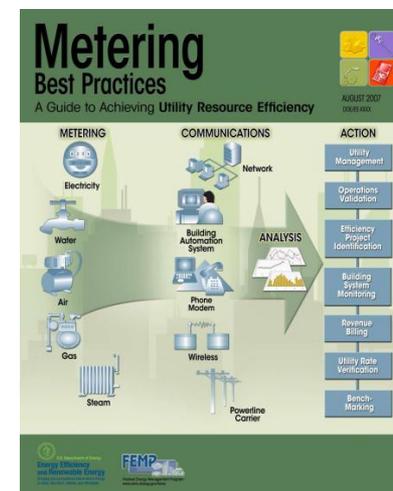
- Financing approaches:
 - Capital project specified
 - Appropriations/line item
 - Alternative financing
 - Utility – UESC
 - Private – ESPC
 - Retained savings



Resources:

FEMP Web site:

- Metering Best Practices Guide
- Guidance for Electric Metering in Federal Buildings
- Facility Metering for Improved Operations and Maintenance
- Advanced Utility Metering



www.eere.energy.gov/femp/program/om_metering.html

FEMP Metering Contact: Ab Ream ab.ream@ee.doe.gov

Audience Participation Segment

Could Metering Help?

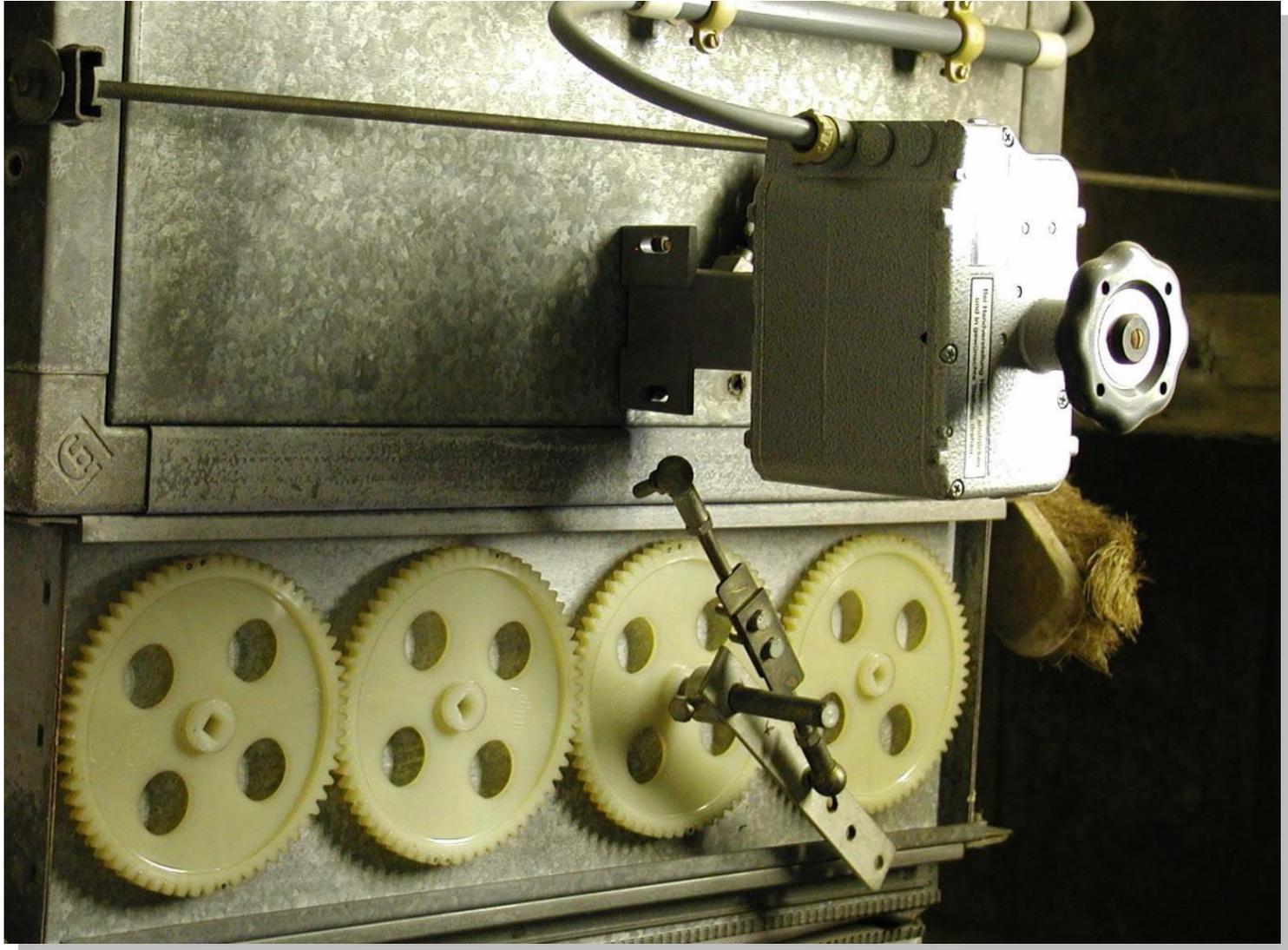
Could Metering Help?



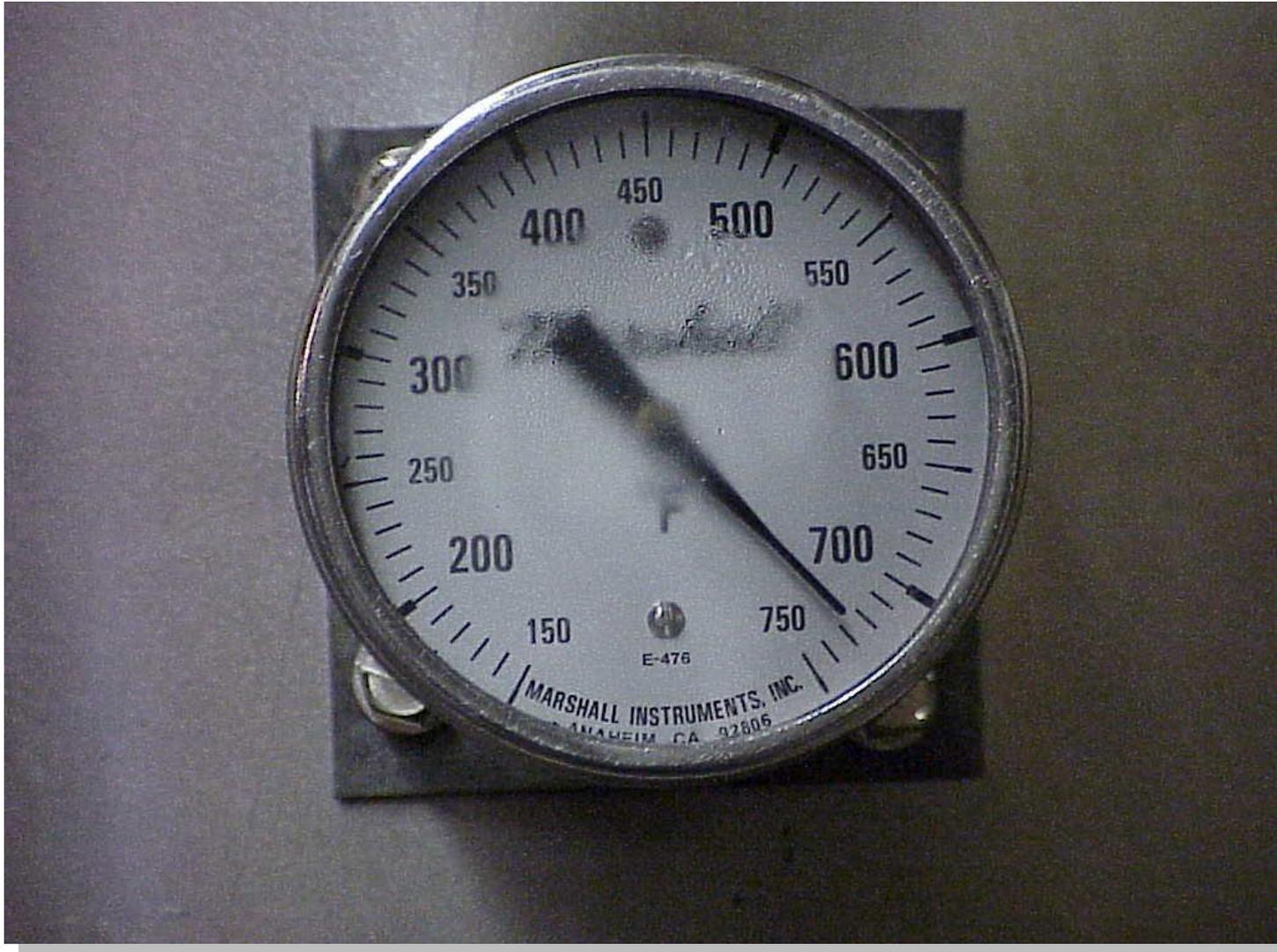
Could Metering Help?



Could Metering Help?



Could Metering Help?



Could Metering Help?



Could Metering Help?



Could Metering Help?



Questions?

