Program Management of Submetering Technologies

Patty Anderson | McKinstry June 8, 2011

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Discussion Topics

An overview of metering and software programs used for Active Energy Management, and a discussion on how organizations can utilize technology to achieve energy management goals.

1. Driving Factors
2. Defining Active Energy Management
3. Active Energy Management Programs
    1. Plan
    2. Analyze
    3. Act

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Efficiency alone does not save energy

Excerpt from a recent article in the Wall Street Journal

RE: California Utility's efficiency goals:

> *"For the 2006-2008 program, utilities said they achieved energy savings from all their energy efficiency programs that were 151% of the goal set by regulators. But the commission's staff, armed with exhaustive studies, said utilities saved only 62% of the goal amount, hurt by the bulbs."*

Active Energy Management requires both…smart technology and smart operators.

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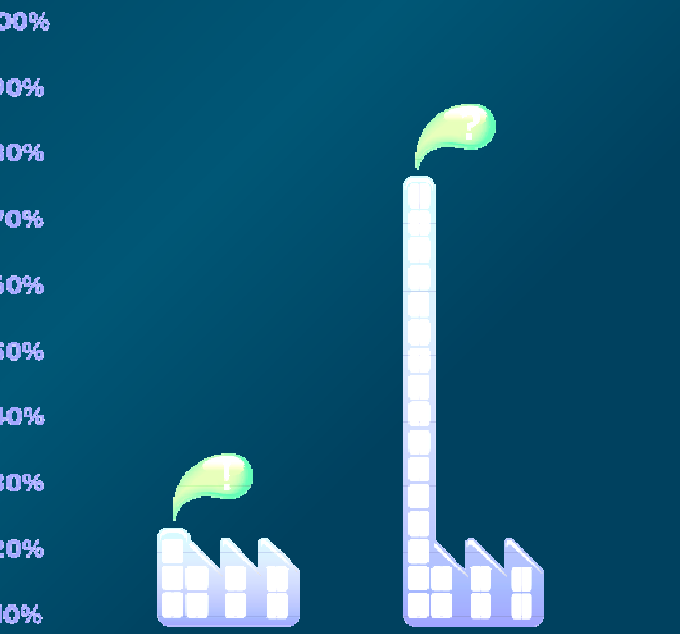
Do we know how are we doing?

Only 121 out of 552 LEED buildings know how they are performing.

78% DON'T know how they are performing.

22% Know how they are performing.



New Buildings Institute: Energy Performance of LEED for New Construction Buildings March 2008

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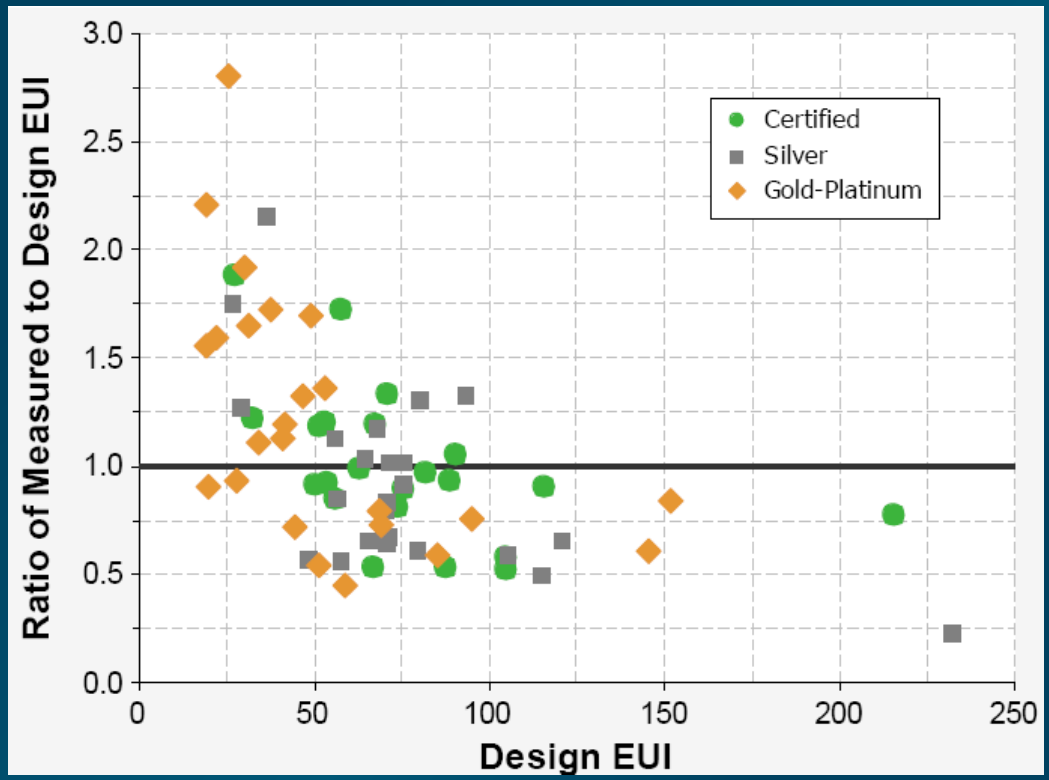
Does Green = Energy Efficient?

"Green" Buildings don't always perform as expected.



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Challenges to Building Efficiency

Why do well-designed, well-built facilities fail to meet performance expectations?

Design/Construction Challenges

- Opportunity for better Transition to Stable Operations
- Opportunity for better coordination between construction trades
- Lack of quality assurance in building system performance

Operational Challenges

- Increasing pressure to reduce budgets through staff reductions
- Lack of understanding of technology and performance measurement
- Poor maintenance practices
- Failure to incorporate facility best practices that leverage systems and data to measure performance and drive performance improvements

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Meeting the Challenge Head-on

Develop approach for measuring success

- Benchmark facility performance
- Define key performance indicators

Track Progress

- Monitor progress and status
- Implement performance alarms

Involve staff and occupants in efforts

- Promote involvement and awareness
- Communicate progress and results

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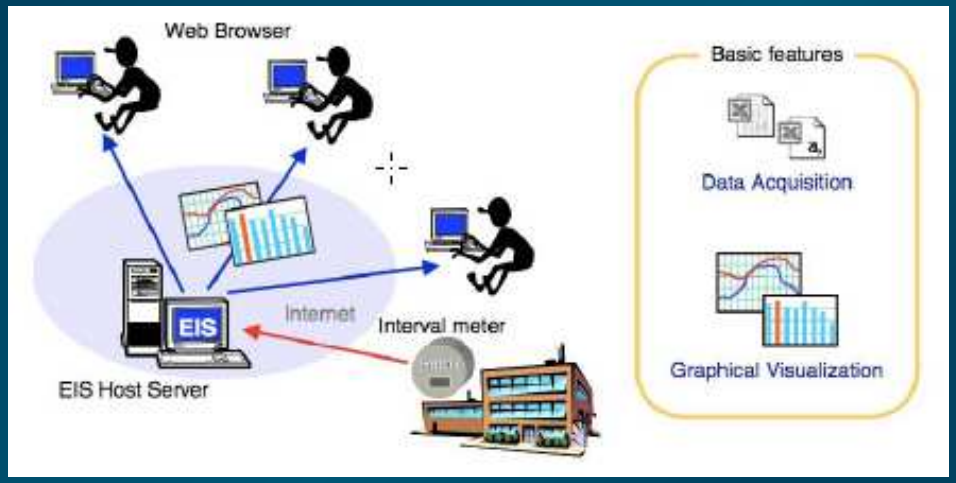
Advanced Energy Monitoring Solutions

- Performance monitoring software, data acquisition hardware and communication systems used to store, analyze and display building energy data.

- Provides hourly whole-building energy data that are web-accessible, with analytical and graphical capabilities.



Source: Lawrence Berkley National Laboratory – November 2009
'Building Energy Information Systems: State of the Technology and User Case Studies'

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Active Energy Management Program

Plan

- Energy Audits
- Operational Reviews
- Develop Guiding Principles
- Enterprise Energy Management Plan

Analyze

- Benchmark
- Performance Goals
- Identify Opportunities

Act

- Define Best Practices
- Establish Policy
- Implement Projects

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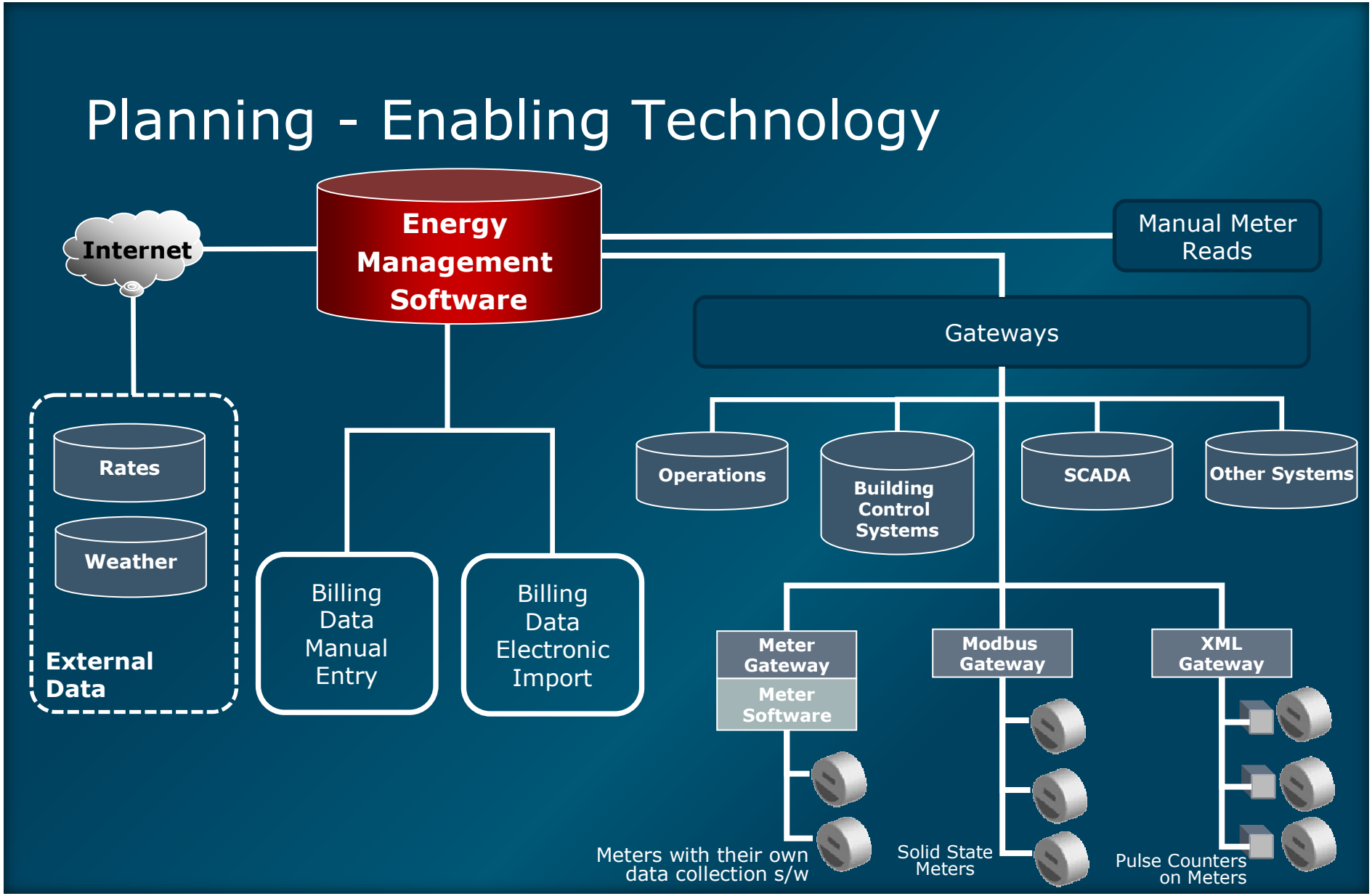
Planning - Enabling Technology



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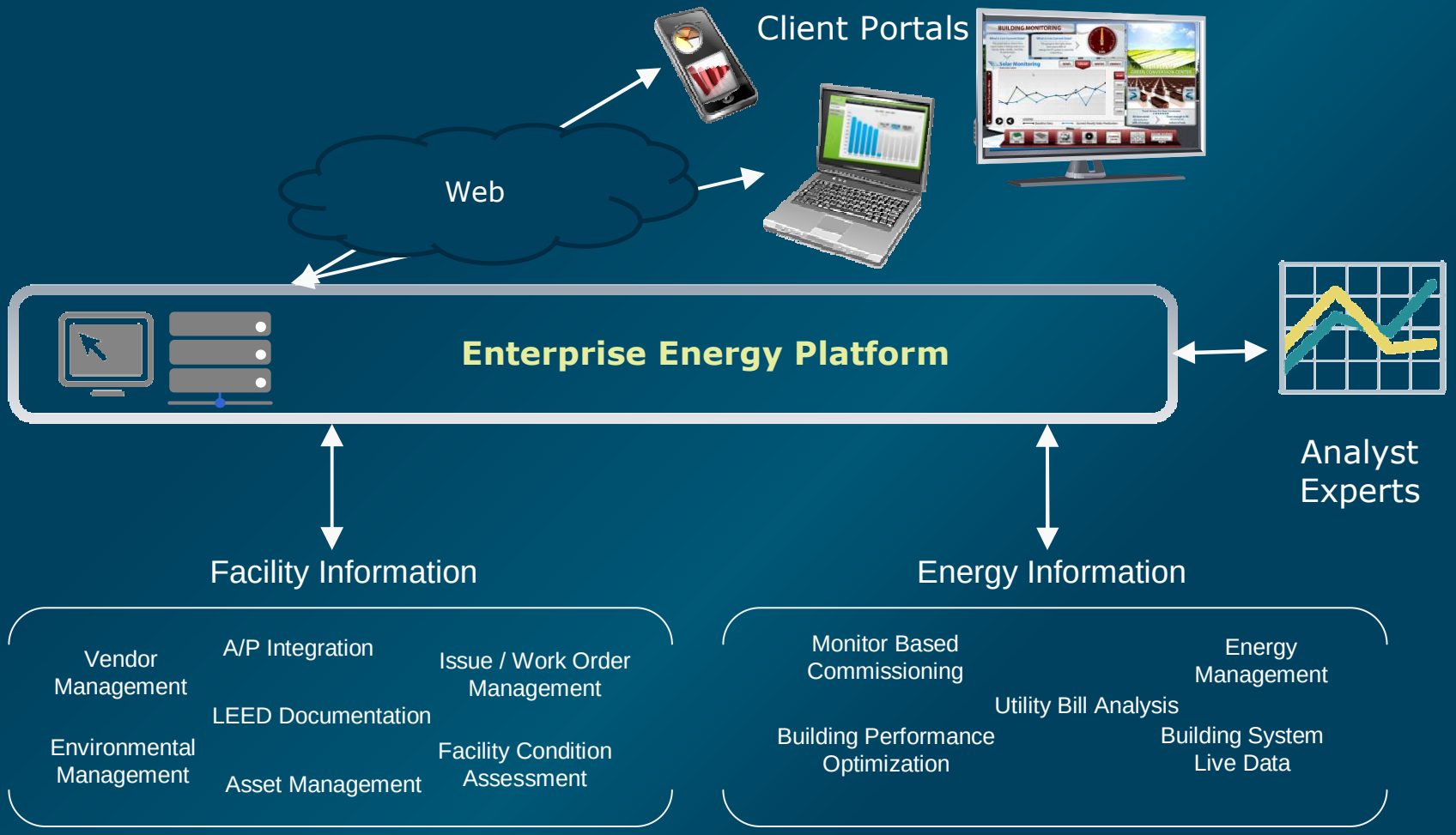
Making Information Accessible



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Planning – Guiding Principals

- Analyzing Technologies
  - Data Collection, Transmission, Storage & Security
  - Display and Visualization
  - Energy Analysis
  - Advanced Analytics
  - Financial Analysis
  - Demand response
  - Control and Management

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Planning - Guiding Principles

Category	Main Feature	Feature details	Feature Description	Building Automation System	Energy management Software	Power Metering Solutions
Data Collection, Tx, Storage, Security	Accepted energy inputs	electricity	does the EIS accept metered electricity data?	Y	Y	Y
		water	does the EIS accept metered water data?	Y	Y	Y
		hot water	does the EIS accept metered hot water data?	Y	Y	Y
		natural gas	does the EIS accept metered natural gas data	Y	Y	Y
		oil	does the EIS accept metered oil data?	Y	Y	Y
		steam	does the EIS accept metered steam data?	Y	Y	Y
		chilled water	does the EIS accept metered chilled water dat	Y	Y	Y
		LPG	does the EIS accept metered LPG data?	Y	Y	Y
		utility billing	does the EIS accept utility billing data?	N	Y	N
	Storage capacity	months, years, memory size, duration...	what are the storage limits?	N	unlimited	N
	Manual data entry		can the user manually input (externally) the collected data?	N	Y	N
	Minimum trend interval	daily, hourly, near real-time,real-time	what is the minmum resolution of interval data? - near real-time=15-min, real-time=1-2 min	1 min	1 min	15 min
	Upload frequency	daily, hourly, near real-time,real-time	how often does the EIS retrieve data?	daily, hourly, depends on ifo volume	RT	nightly
	Upload type/connectivity	phone (dial-up), Internet, etc	does the EIS use Internet or telecommunicatio	Internet	Internet	Internet
	Data sources	interval meter, submeter data	does the EIS provide component level energy use, or whole-building interval/submeter data?	All	all	interval meters
	Data Tx. stds/protocols, interop	BACnet, LonMark, MV 90, IP, OPC	what transmission protocols or standards does the EIS use/ineroperate with? LonMark=propr., BACnet=open, MV 90=meters ...	Modbus, Lon, BACnet, XML, Proprietary P2 Protocol	Lon, Bacnet, MV, modbus, ODBC, XML, EDI for bldg data	MV 90, CMEP, X MDEF, Lodestar d output
	Archived data	SQL, .net, XML, CSV, .xls ...	how is data archived? (ex. relational database, flat file, binary proprietary)	proprietary db	MS SQL server	relational databa
	Exported data	ASCII delimited (ex. CSV, TDL), XML ...	what export formats are supported for archived data?	BACNet	csv, xls, custom	CSV
	Security	https encryption, VPN, pgp, authentication ...	what security protocols/procedures does the EIS use to store, Tx, user access, etc? (Exclude physical security)	unknown	internal user authentication	NAT, secure w channel, passwor protection
Display/Visualization	Load profile	calendar	is it possible to display an entire month of consumption profiles (time series)?	Y	Y	Y
		daily	is it possible to display daily time series in hour-long intervals or less?	Y	Y	Y
		summary	is it possible to display aggregated usage? - daily, weekly, ...	Y	Y	Y
	Overlay	day	is it possible to overlay multiple days' trends on a single plot?	Y	Y	Y
		point	is it possible to overlay multiple time series data points on a single plot?	Y	Y	Y
	3D graphics		is it possible to generate three-dimensional surface plots?	N	Y	N
	x-y plots		can the user plot one trended data point vs. another?	N	Y	Y
	DR status		is it possible to display whether a DR event is occuring and event/communication details?	N	Y	Y
			...le to ga... ...ionality DR...	N		

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Analyze - Benchmarking Performance

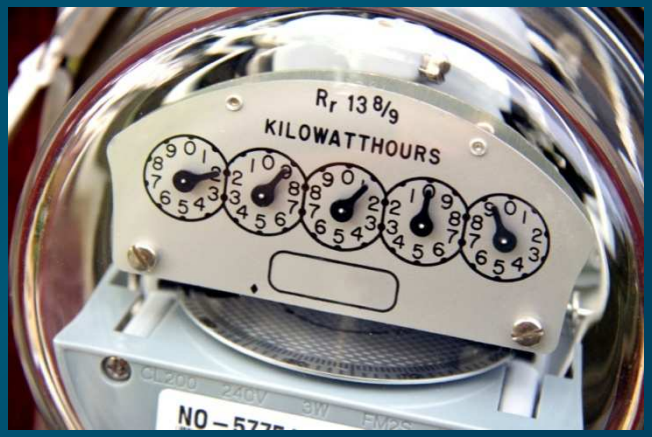
Considerations for establishing benchmarks

Data Normalization

- Weather
- Square footage
- Facility type
- Plug loads (i.e. computers)

Who to compare too?

- Facility specific
  - Historical comparison (baseline)
  - Model comparison
- Portfolio, region, national



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Analyze - Metrics for Benchmarking

Metrics for measuring ongoing and comparative performance

Energy Based Metrics

- Use per square foot (EUI)
- EUI for each utility (gas, electric, steam, etc.)
- Demand per square foot

Cost Based Metrics

- Cost per square foot (ECI)
- Cost per occupant

Other Metrics

- Non-energy based utilities
- After hours use
- Green House Gas/Sustainability

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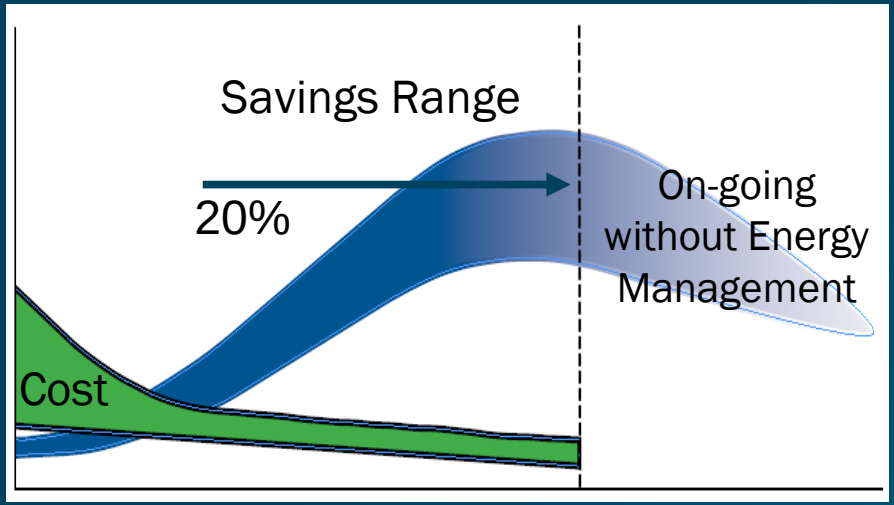
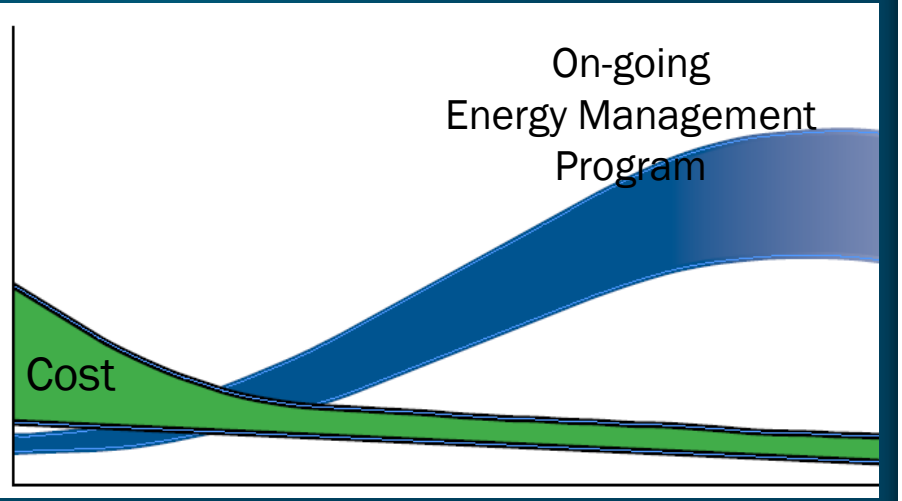
Act – Persisting Energy Savings



The typical facility will become 3-5% less efficient every year.

Persistence is key to on-going benefits



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Act - Optimized Process

Location

Facility Group: City of Longmont
Facility: Library (LIB)
Location Detail: Library

Issue

Issue Description: The Library is consuming power at a rate that will cause it to reach the monthly targeted kWh value before the end of the month.

Click here to access the site summary page:
http://172.16.2.95/Spara.html

Special Instructions:

Work Order Procedures

Service Procedure Detail: Alarm Monitoring - Performance Assurance
Issue Type: Alarm
Service Type: Alarm Monitoring
Vendor: McKinstry Company - Performance Assurance/AEM Team
Technician: AEM Energy Analyst

Performance alarms processed and sent to Maintenance Management Systems to includes location, detailed description of issue, and procedures followed

Analytical tools are used to identify performance issues – the system provides immediate indication to Maintenance Management Systems of high demand and consumption patterns

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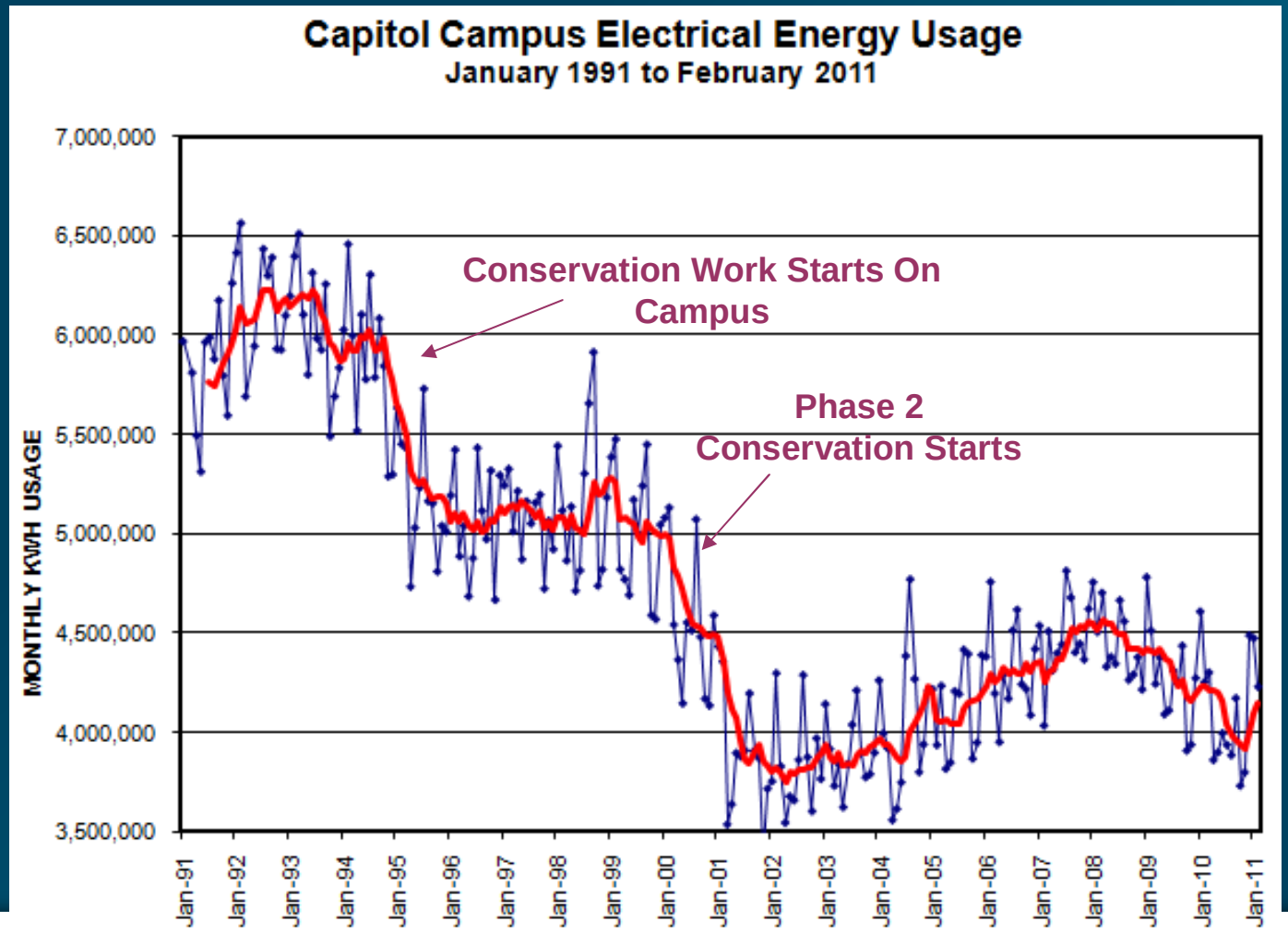
Act - Example of Program Fluctuation



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Act - Advantages & Benefits of Program

Performance Improvement

- Annual predicted energy savings (% reduction in energy use)
- CO2 emissions reduction

Education and Outreach

- Provides Facility and Energy Staff with technology necessary to enable action
- Enabling infrastructure for sharing of energy performance data to occupants and tenants

Scalable Foundation

- Smart Grid Ready = enabling infrastructure for Smart building deployment
- Flexible and scalable for future expansion

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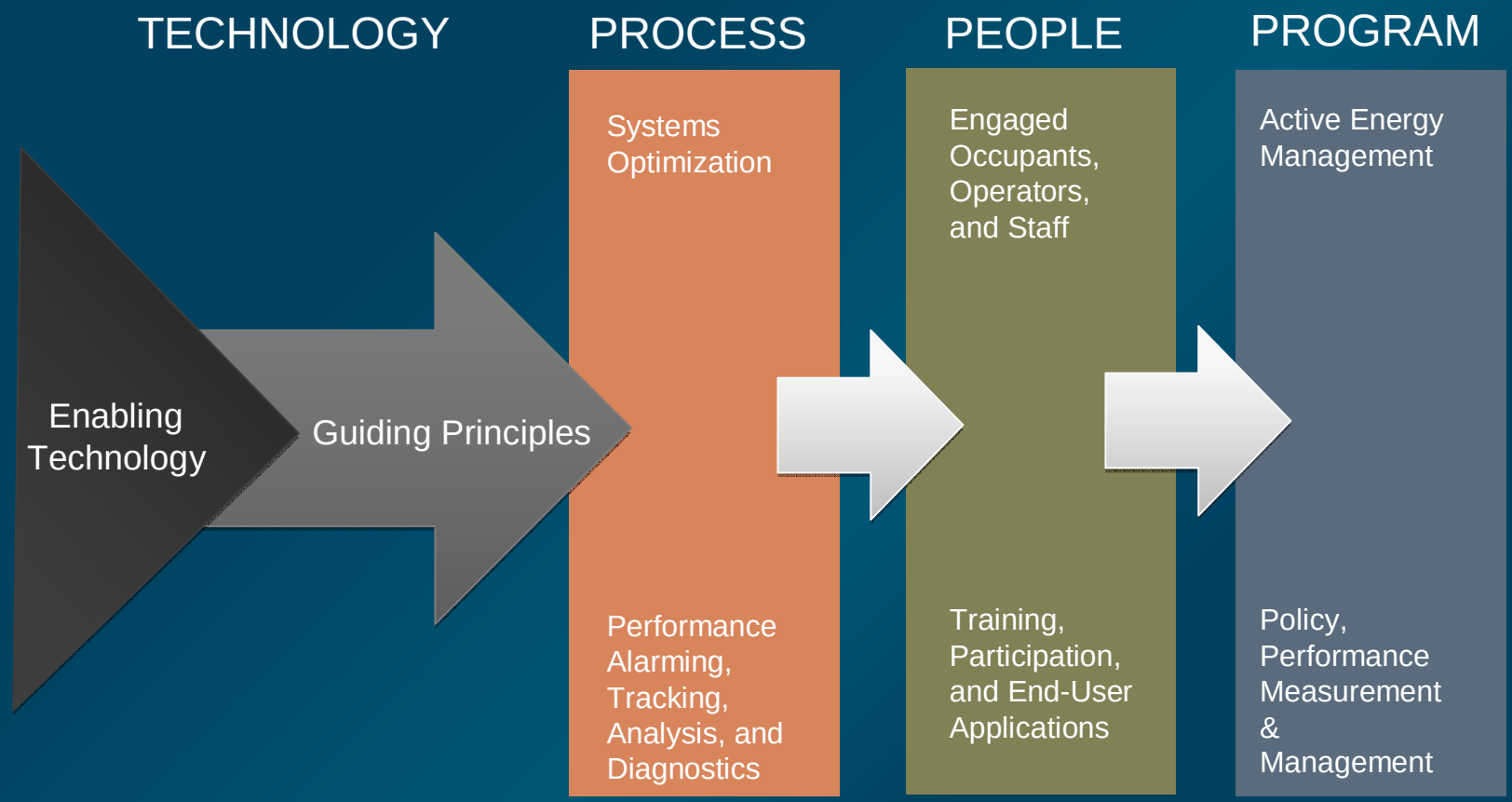
Achieving Active Energy Management Outcomes



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Questions?

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