Under the Hood: Operations and Maintenance

Why Wait for the Check-Engine Light?

Making the Business Case for Maintenance

James Jarvis
Altec Energy Systems, Inc.
Monday, 7, 2006
James@Alteces.com

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

A traditional view of Operations and Maintenance (O&M)

- Like energy costs, on the expense line
- Not considered an investment
- Outsourcing expense – drive costs out
- Respond to 'get ahead' or respond to problems
- A use it or lose it proposition

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Traditional miles per gallon

EPA mpg - City 19
EPA mpg - Hwy 25

15 gal/315 mi. = 21 mpg

=

Preventative and scheduled Building maintenance

- Repair/replacement of energy systems
- Lighting
- EMS (automation)

100 watts – 75 watts = 25 watts x 200 bulbs = 5,375 watts saved

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Question: Has this been successful in achieving expected energy savings?

How effective is this approach when considering energy crises?

- President Clinton, Executive Order 13123 – 35% reduction by 2010 – June 3, 1999
- Hurricane Katrina directive – Sept. 2005
- Energy Policy Act of 2005 – March 2005 10% savings each year (100% increase in natural gas - $6/MBtus - $12/MBtus

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Today, cars get instantaneous mileage.

2006 Chevrolet Impala LS

- **Cruise control**
- **Computer with:**
  - ✓ average speed,
  - ✓ average fuel consumption,
  - ✓ ***instantaneous fuel consumption*** and
  - ✓ range for remaining fuel

But we don't generally know this performance information about our buildings!

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Based on recently completed FEMP assessments, O&M is an untold Return On Investment (ROI) story.

- IAQ study of building operation.
  - Install monitoring devices
  - Identify/establish customer expectations
  - Assess energy waste from operations
    - Temperature (too hot in winter, too cool in summer)
    - Ventilation (compared ASHRAE design standard of 15 CFM to CO_2 operating performance – building over ventilated)

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

- **FEMP I findings:**
  - Potential of 21% savings to heat, cool, ventilate
  - = to 10% total energy usage
  - If building maintained to achieve a superior work environment

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

FEMP I Strategies

Winter Season Strategies

- **Strategy 1: Winter Temp Mgt.** ***Discovery of Consistently Higher Than Desired Room Temperatures During Winter Months.***
- **Strategy 2: Winter Ventilation.** ***Responsive Occupancy-Based Demand Controlled Heating Ventilation During Winter Months.***

Summer Season Strategy

- **Strategy 3: Summer Temp Mgt.** ***Discovery of Consistently Lower Than Desired Room Temperatures During Summer Months.***
- **Strategy 4: Summer Ventilation.** ***Responsive Occupancy-Based Demand Controlled Cooling Ventilation During Summer Months.***

O&M: Why Wait for the Check Engine Light?

BHW Potential Annual Savings for all Strate

Under the Hood: Operations and Maintenance

FEMP I Energy Savings Potential

Season	Strategy	MBtu Savings	Savings* if Strategies can be Implemented	Percent Savings of the estimated MBtu used to Heat, Cool and Ventilate
Winter	Temp Mgt	1,420	$9,110	5.3%
	Vent Mgt	2,365	$14,625	8.8%
Summer	Temp Mgt	937	$12,405	3.5%
	Vent Mgt	1,045	$13,850	3.9%
Total		5,648	$49,980	21.5%

*Note: the differenc

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

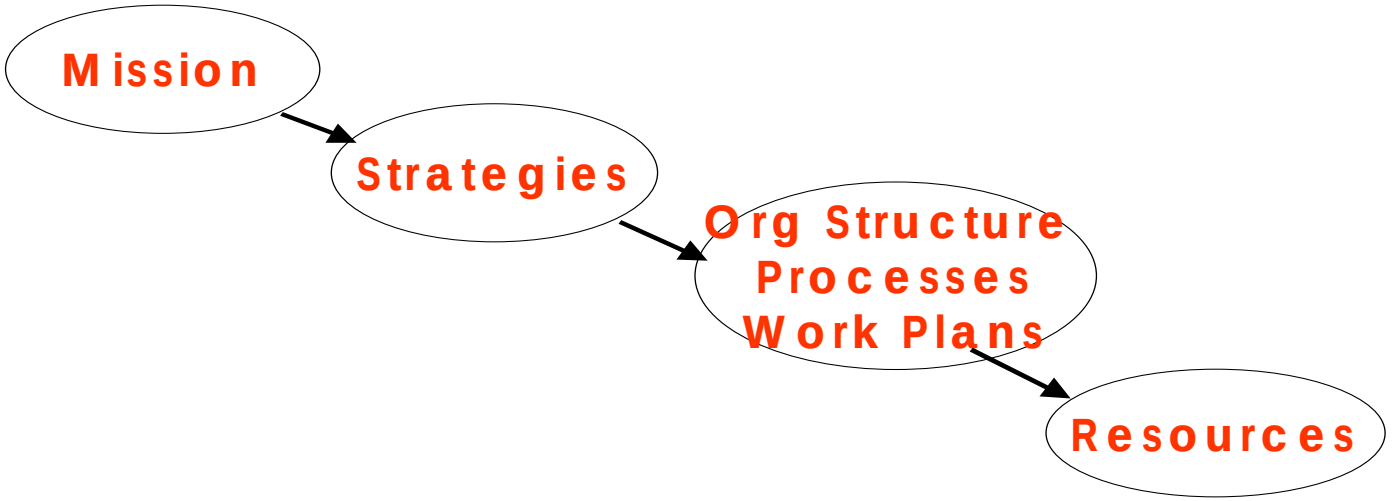
FEMP – Phase II (two components)

- *First component:* Building Audit/Recommissioning
  - Confirm savings potential of FEMP I
  - Answer question whether savings possible
- *Second component:* Management Audit to determine if mgt systems in place to achieve ROI.

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Organization Development Hierarchy



O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

FEMP II Mgt Assessment - Key Observations:

- **Energy Goals (mission)** not building specific (e.g., Btus/SF or Btus/Occupant).
- **PBS conservation strategies**, given "superior workplace mission" not universally understood, not accessible, operational vs. strategic.
- **Org structure & business processes** (highly supportive of capital, but not O&M, strategies.
- **Federal support resources** and budgets are "siloed" (FEMP, Center, Finance, Asset Management).

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

FEMP II Mgt Assessment - Key Observations (cont'd):

- **Resources or operations.** Unclear whether business processes misallocate resources or if resources insufficient (if both, where?).
- **Tenants**. As drivers, not fully utilized (lease agreements) and as customers, not advised of opportunities (CPUs, ventilation, identification of waste, incentives).
- **Communications feedback**. Insufficient data and communications feedback at the building specific level.

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

FEMP II Mgt Assessment Conclusion:

The current, mission, strategies, organizational structure and resource allocation will not achieve sustained energy savings without a good O&M program.

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Why should management be interested in O&M savings?

- Energy savings has become a social/cultural objective
- Interest at the highest levels
- Limited resources – organization will change if budget not available (downsizing)
- Affordability is changing – increasing costs of energy and reducing costs of continuous monitoring
- The right thing to do

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Making the case.

Premise: *if O&M maintains the building to customer specifications, it will save energy.*

Question: *If it could, does management want O&M to do so?*

- Use it or lose it. Can saved energy dollars be spent on O&M? If not, why even think about it?
- Management support. Is everyone on board? If not, then how will it happen?
- O&M Investment. What types of O&M investment are needed?

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Two chances to achieve an O&M ROI story

1. Replacement of equipment (traditional)
2. Energy savings

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

O&M energy savings - the application of traditional management tools:

A. **Goals:** Building-specific energy goals
B. **Performance criteria:** Tenant agreeable temperature and ventilation criteria.
C. **Strategies:** New approaches to ID low & no-cost savings opportunities *and* stakeholder collaboration.
D. **Organization structure:** Realignment and integration of management support functions.
E. **Verification & measurement:** Energy data to verify and measure persistent energy savings.
F. **Financial incentives:** (e.g., tenants, O&M, finance)
G. **Resource reallocation:** Training, budgets & funding to support the O&M function.
H. **Performance feedback.**

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

A. Energy Goals.

Do you have an energy performance goal for your building? What is it?

- ***Btus/GSF?***
- ***Energy budget $/year?***
- ***Btus/occupant?***
- ***x% reduction in usage?***
- ***Other?***

Under the Hood: Operations and Maintenance

B. Performance Criteria.

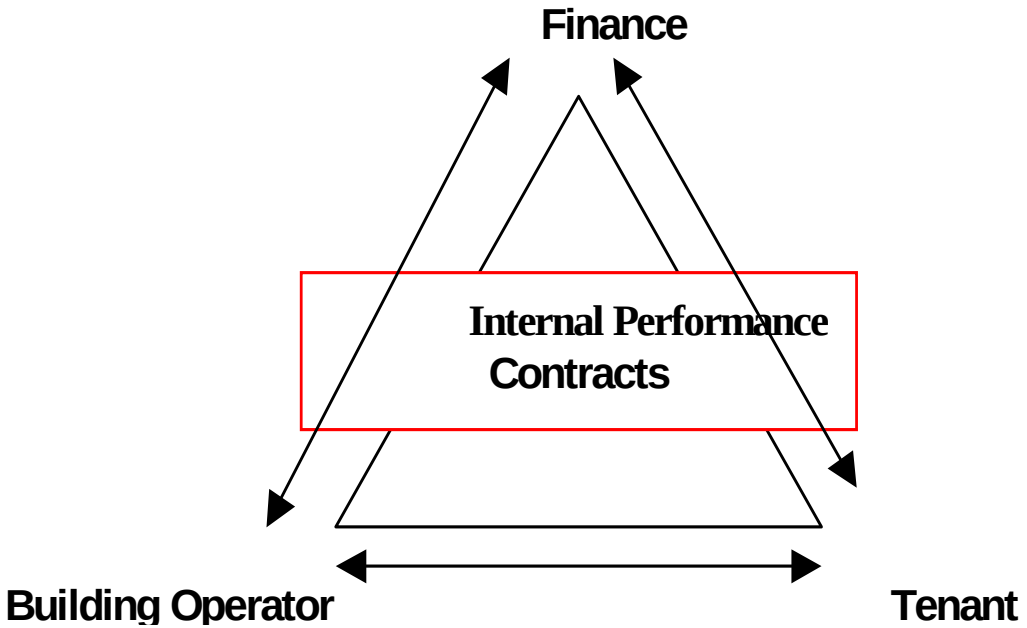
These typically exist and are consistent with PBS mission "to provide a superior workplace at good economies"

- **PBS building operation plans**
- **Tenant leases**
- **O&M contracts**

O&M: Why Wait for the Check Engine Light?

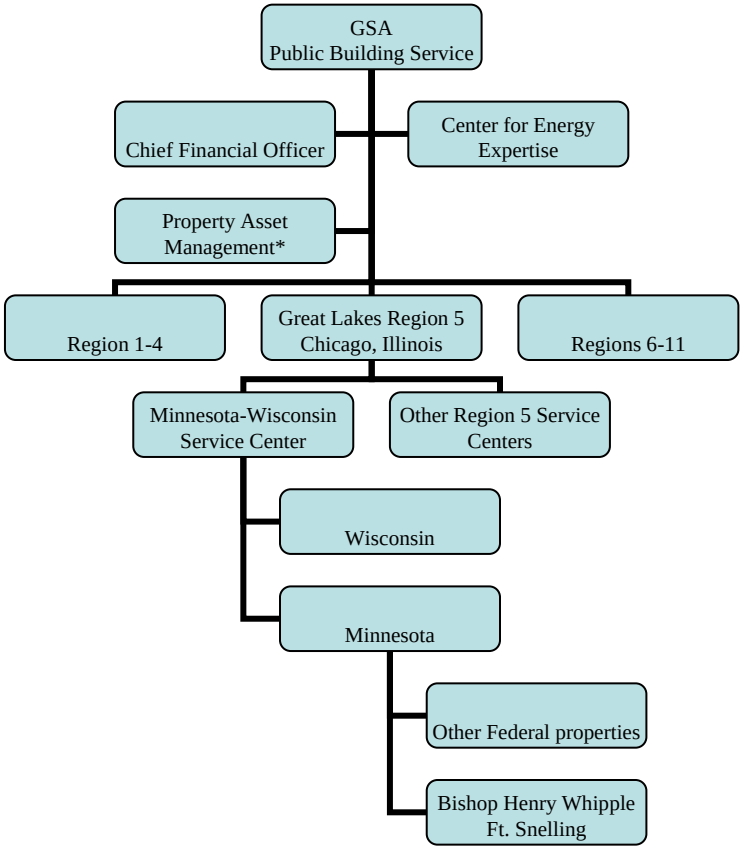
Under the Hood: Operations and Maintenance

C. Strategies (e.g., stakeholder Collaboration)



O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

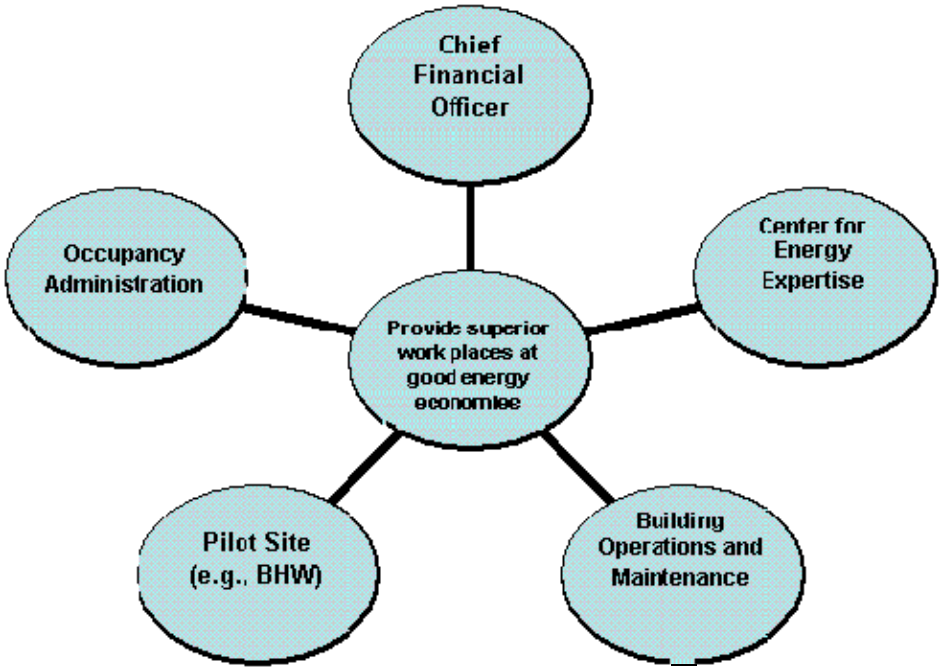


D. Existing organization structure.

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

D. An O&M Integration Scenario



O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

E. Verification & Measurement

Question: How will meeting energy goals be measured?

- Monthly bills
- Energy reports
- Energy budgets
- Square foot usage
- Occupancy usage
- Real-time tools – Section 103 Energy Policy Act 2005

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

F. Financial Incentives

- *Finance and property asset managers.* Continually seeking new sources of savings
- *Tenants.* Leases provide opportunity to provide incentive to tenants
- *O&M contractors.* O&M contracts have moved from prescriptive PM to cost-benefit assessment – could energy performance – consistent with tenant expectations – be added to the master contract?
- *PBS property management.* Property managers lack revolving funds for O&M investment.

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

G. Resource Reallocation.

- Reinvestment of energy savings.
- Reinvestment of fiscal energy budget savings.
- Recommended reinvestment purposes:
  - Training
  - Continuous performance monitoring
  - Acquisition of needed expense and low cost capital improvements

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Questions?

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Thank you.

James Jarvis, President
(612) 859-7732
James@Alteces@com

Altec Energy Systems, Inc.
3989 Central Avenue NE
Suite 530
Minneapolis, Minnesota 55421

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

- ALTEC Energy Management Audit
  - Managerial energy-related goals
  - Operational, financial and business performance indicators (tenant satisfaction)
  - Gap analysis in strategies for achieving these goals
  - Relevant authority and reporting lines
  - Organizational structures and business process (not building maintenance) design
  - Performance feedback

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

- **Range of Recommended Mgt Actions**
  - Current business practices
  - Methods for measuring real time energy usage
  - Retrofitting technologies or processes to achieve increased savings or optimization
  - Creation of energy optimization operating budgets and internal fiscal incentives
  - Training to achieve persistent savings
  - Improved feedback loops to communicate success
  - Operating and maintenance procedures
  - Accountabilities and motivation
  - Metering and verification of performance
  - Reporting feedback and controlling use

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

- Recommissioning Strategies
  - Reduce hours that equipment operates.
  - Reduce flow and system resistance to flow.
  - Reduce the level of heating provided to the building.
  - Reduce the amount of outside air brought into the building during low-occupancy hours, and just meet carbon dioxide (CO_2) requirements in critical rooms during occupied hours.

O&M: Why Wait for the Check Engine Light?

Under the Hood: Operations and Maintenance

Recommended Actions:

1. Complete *repair of heating and cooling control valves* (Currently in progress).
2. Continue *reduction in the scheduled hours* of HVAC operation.
3. Provide *control reports* to verify persistence of savings.
4. Modify controls to respond to *direct measurement of airflow demand.*
5. Lower the *reset schedules for hot deck temperatures*.
6. Couple *mixed air setpoints with supply air setpoints*.
7. *Test and balance maximum air flow* to meet actual demand.