



The Premier Energy Training Workshop
and Trade Show for Federal Agencies

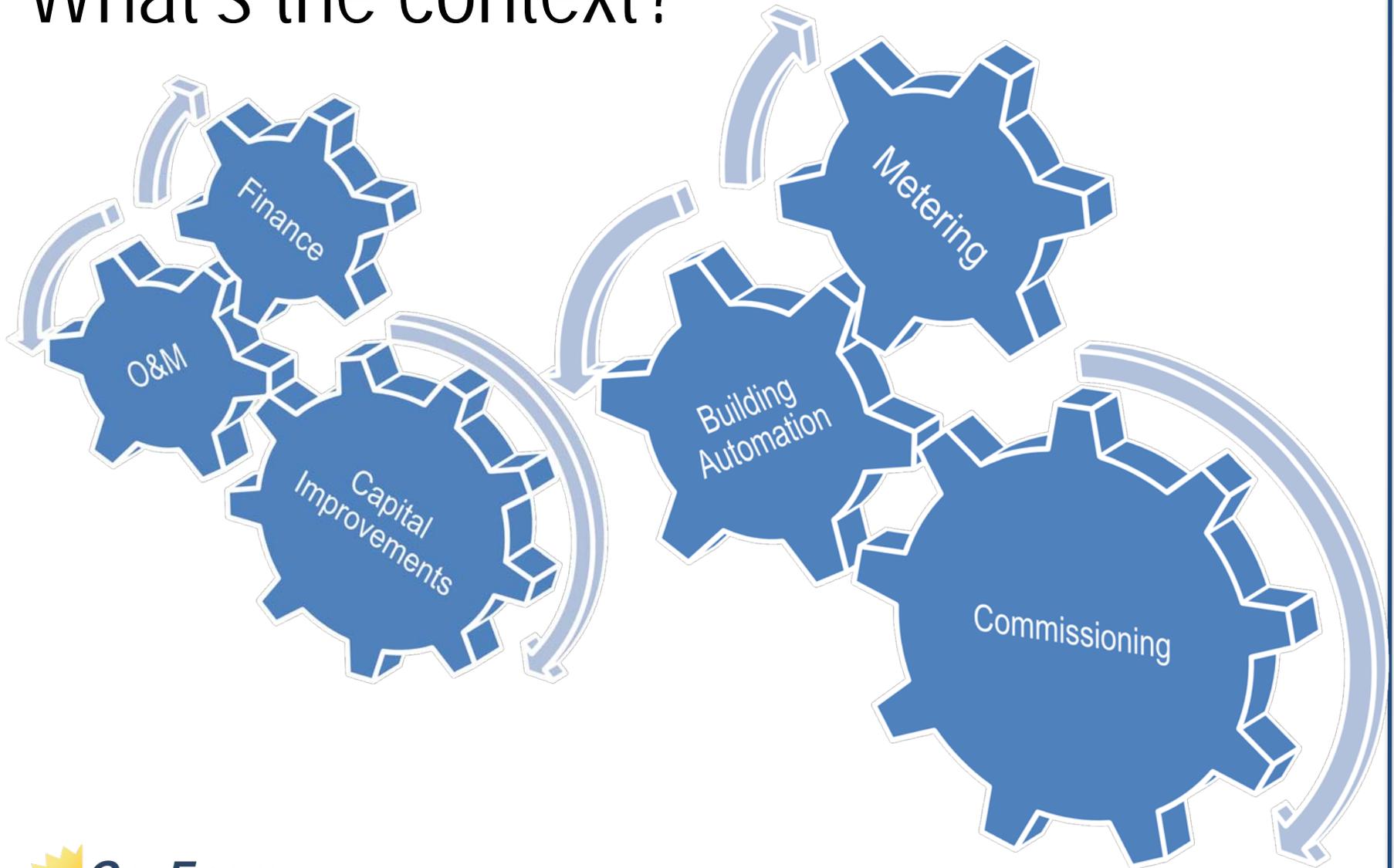
A River of Energy Solutions

Improving Energy Management

How to make the business case for your projects

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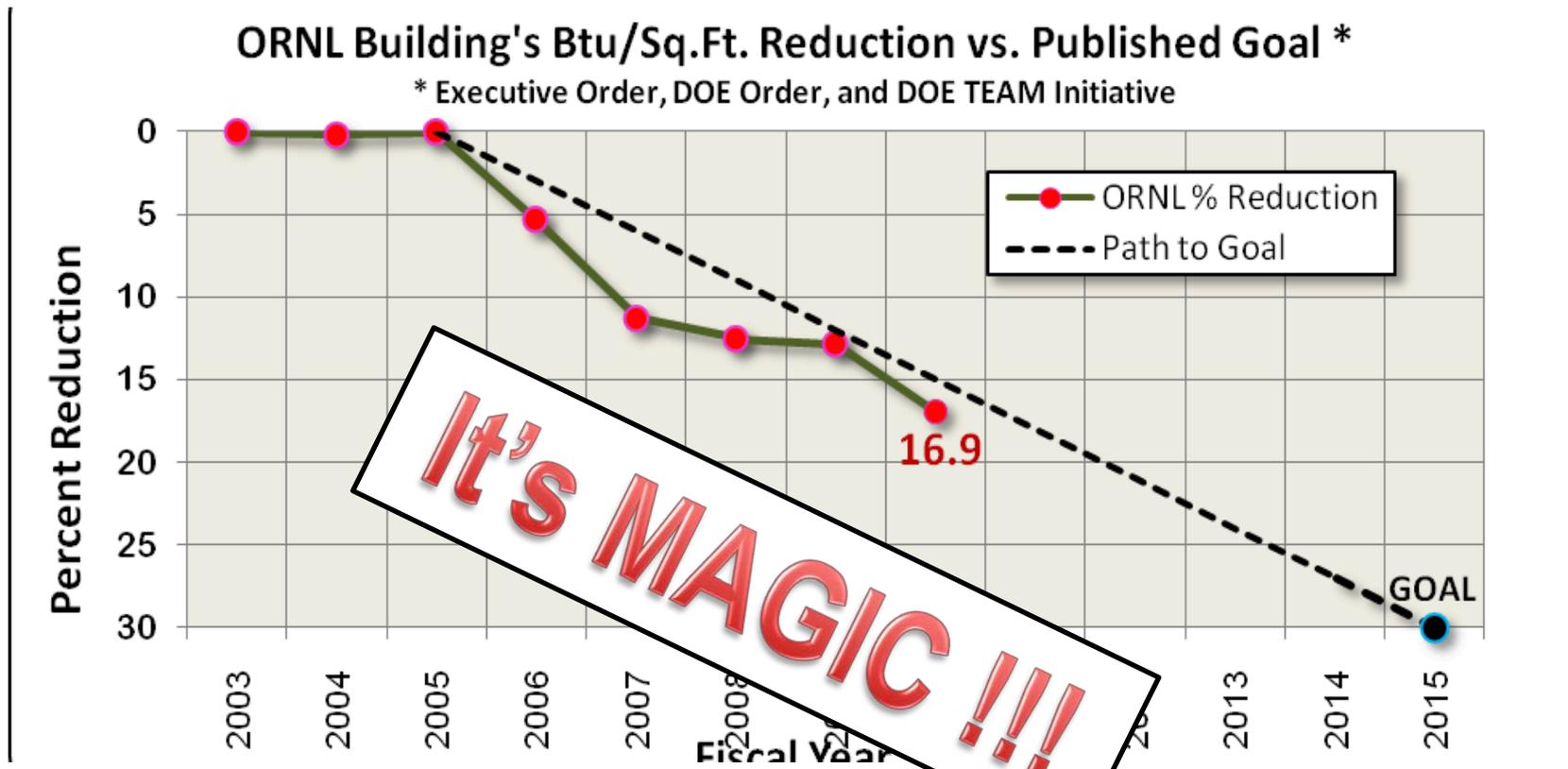
What's the context?



One tool of many

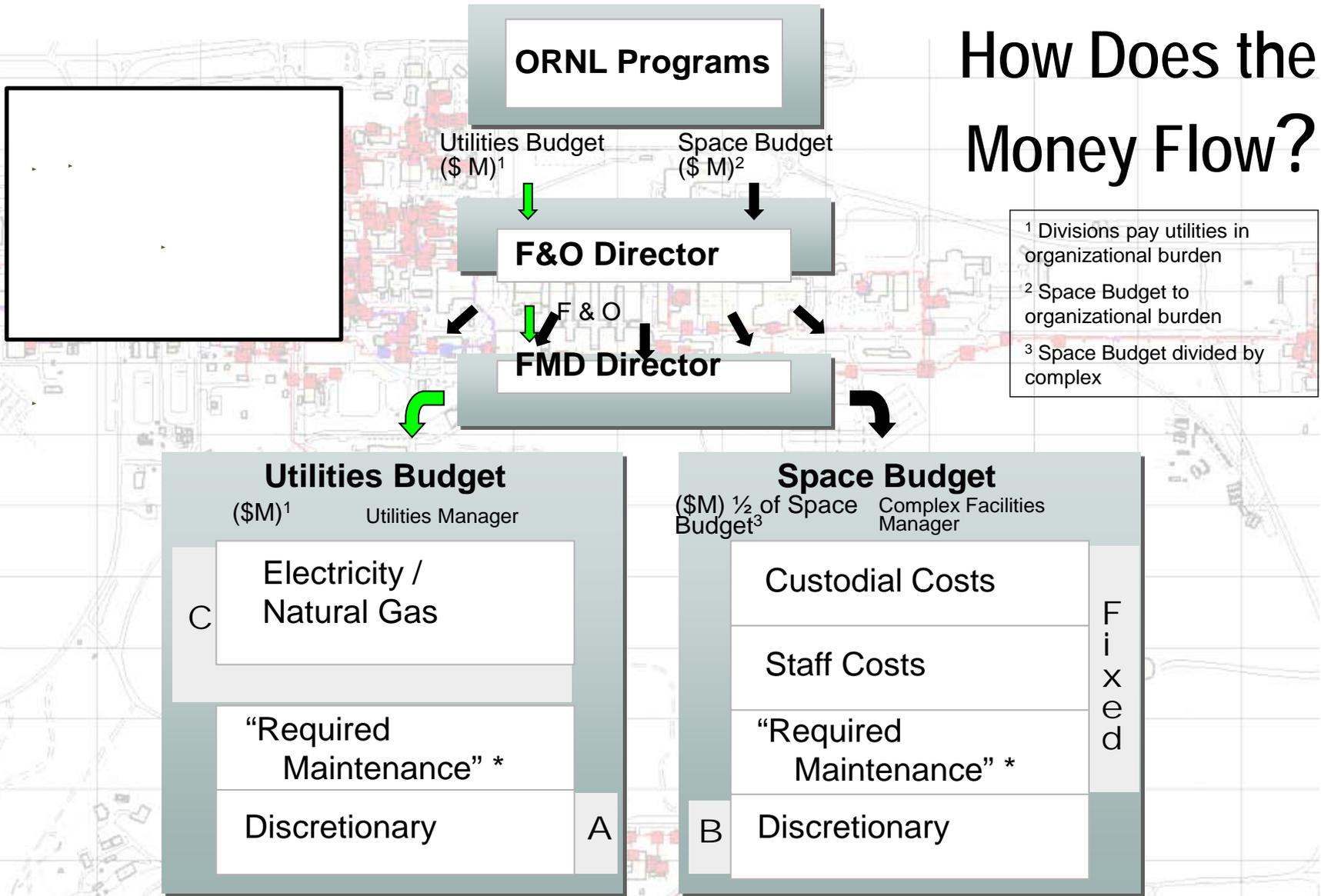
- *Requirements and business drivers say what results are desired, but not how to get there*
- Operations and Maintenance
- (O&M) and Capital budgets
- Metering systems
- Building automation systems
- Energy audits
- Federal reporting

Building Energy Efficiency



It's MAGIC !!!

How Does the Money Flow?



- ¹ Divisions pay utilities in organizational burden
- ² Space Budget to organizational burden
- ³ Space Budget divided by complex

How we spend A & B drives spending on C

Metering

Veris/JCI

Schneider
Electric

SATEC

Smart_Sync

Cutler
Hammer

Other /
Electricity

Pot. Water, Air,
Ch. Water, Steam,
Nat. Gas

Building Automation

Metasys

Honeywell

Pneumatics

None

Metered/Measured Data

Metasys

Powerlogic

Power
net

Reporting

Energy Mgr -
Aggregation

Energy Mgr -
Billing

Fleet

W.A.G.E.S.
Components

Occupancy

G.H.G.s

Work Management

DataStream-
Bethel Valley

DataStream-
SNS

HFIR
CMMS

PM

CM

SAP and other Systems

FIMS

FIC

ORNL One
View

LSS

Cyber
Security

Computing

Other Research

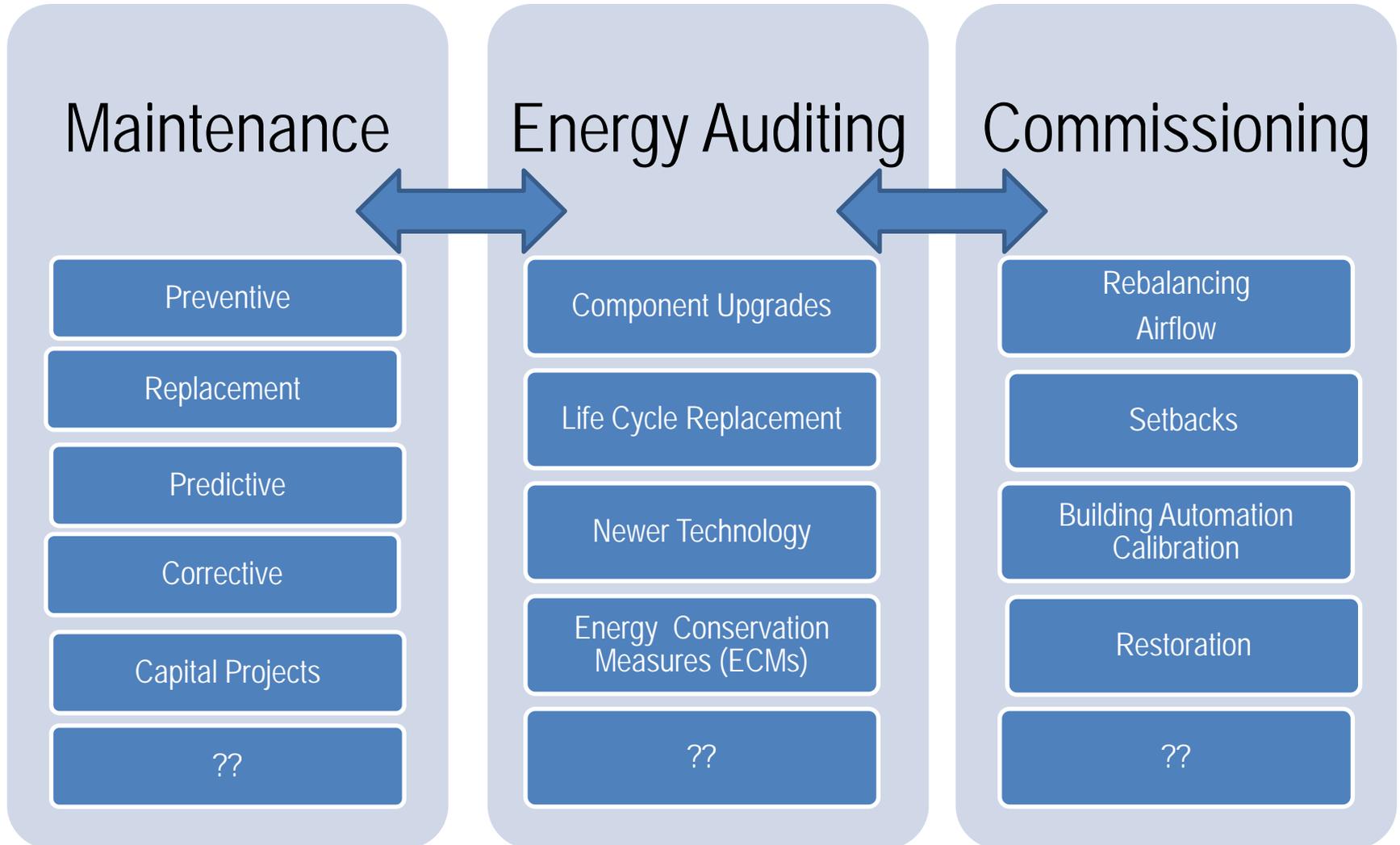
P
U
B
S
U
B

Vs

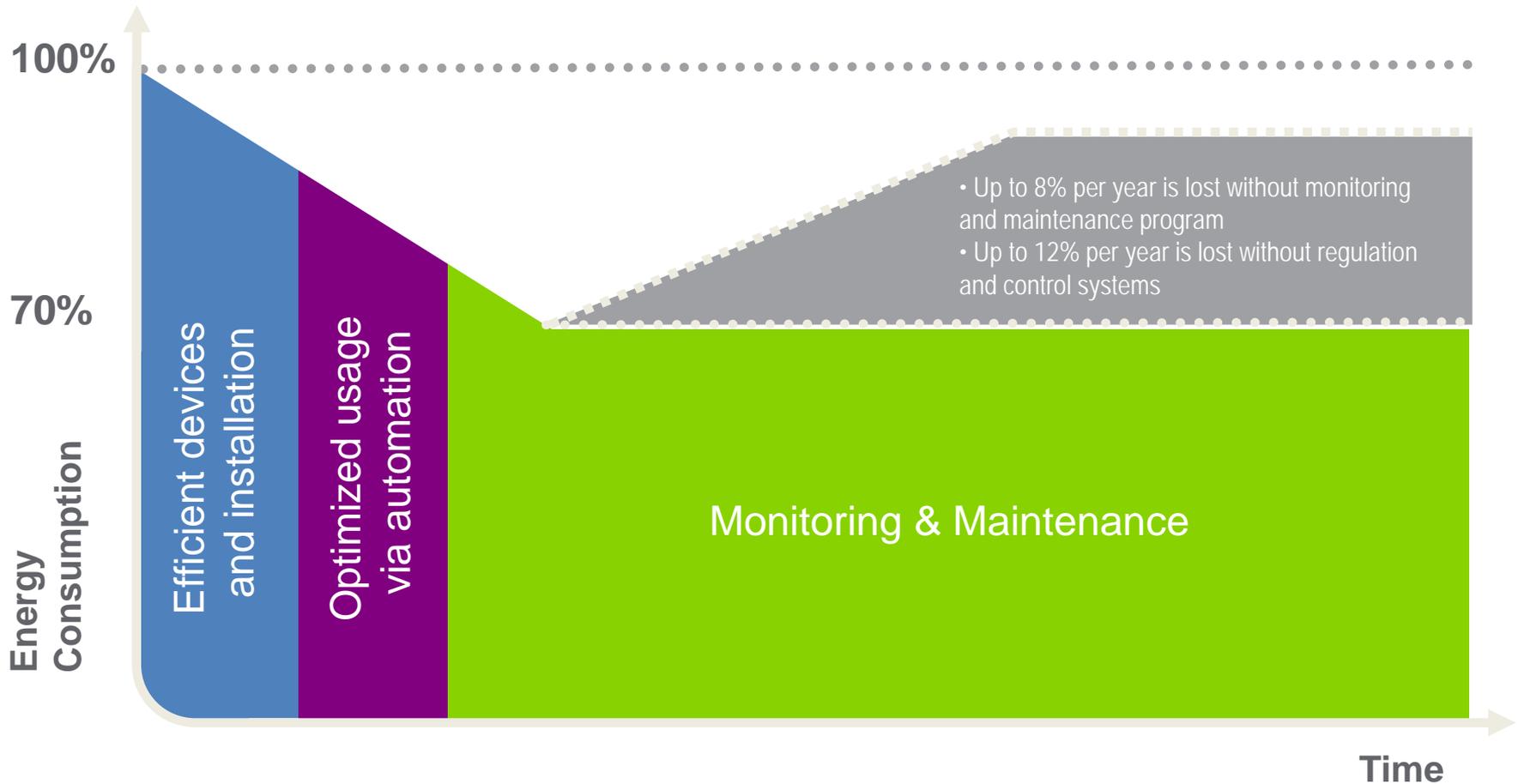
Client
Server?

Many
Systems
Involved

Which is which?



Control and monitoring technologies will sustain the savings -LBNL



Excerpt from the Energy Audit Protocol, Oak Ridge National Laboratory...

Executive Summary

The objective of this document is to outline the requirements for a single energy study at Oak Ridge National Laboratory (ORNL) that will identify cost-effective energy opportunities while ensuring full compliance with Executive Order 13423, DOE Order 430.2 B and 450.1 utilizing criteria outlined in:

Federal Energy Management Program (FEMP) Commissioning Guidance

High Performance Sustainable Buildings

LEED for Existing Buildings O&M

Energy Star Portfolio Manager...

Excerpt from the Energy Audit Protocol, Oak Ridge National Laboratory...

...The audit will follow the procedural order as laid out in the **FEMP Commissioning Guidelines**. This sequence is as follows:

Energy Star: Ensure the equipment in the facility is Energy Star rated and equipment is set to utilize Energy Star features.

Energy Star Portfolio Manager: Establish an EPA Energy Star rating for the building through the online assessment tool.

Commissioning: Check if different systems are operating as intended and build a retro-commissioning or a re-commissioning plan as applicable. Ensure that there is adequate metering at the system and sub-system level for measurement and verification purposes.

Energy Conservation Measures: Find energy saving opportunities for different energy intensive measures.

Renewable and Distributed Generation: Investigate opportunities for on-site and off-site renewable generation, and cogeneration etc.

Sustainable Stewardship Goal: Achieve targets set forth in the federal directives for areas such as green product acquisition, recycling, solid waste diversion, electronic plan, and use of material with recycled and bio-based content.

HVAC

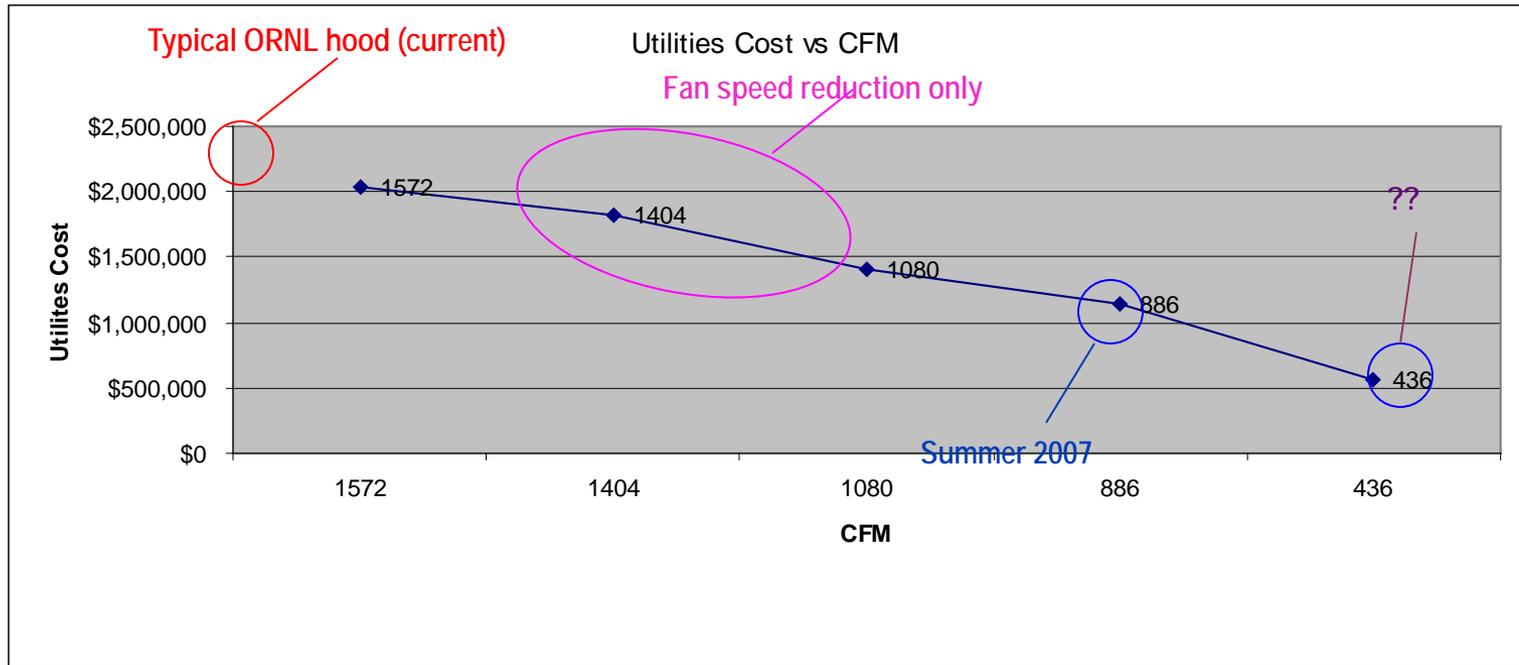
- Chiller Optimization
- Pump Speed
- Insulation
- Scheduling
- Adjust Outside Air
- Simultaneous Heating and Cooling
- Air Flow Speed
- Economizers

Exhaust Hood Ventilation

- Variable Frequency Drives on Hoods
- Significant Savings
 1. Electricity
 2. Chilled Water & Steam
- Electricity Metering
- Rebalance HVAC
- Improved in-lab hood performance



Utilities Savings



Steam Systems

- Steam Trap Maintenance – Trap survey
- Condensate Return
- Boiler Maintenance
- Insulation

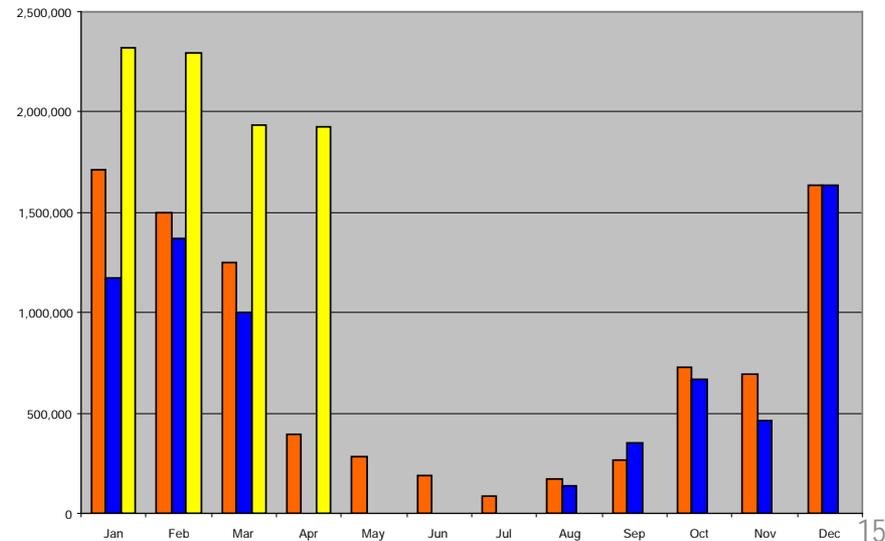
Condensate savings



- Condensate Return System Rebuilt
- 1 million gallons per month added
- \$200k per year savings

Condensate Returned

■ 2000-2006 average ■ 2006 ■ 2007

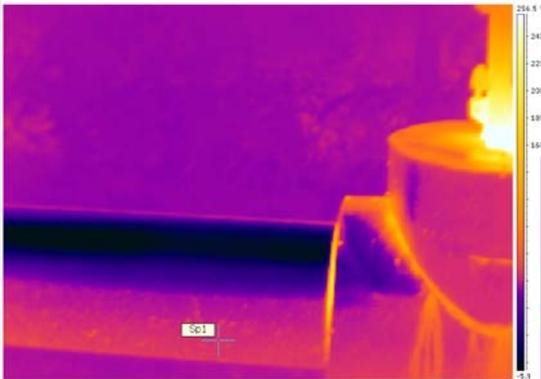


At \$5-10 a decatherm, Steam is EXPENSIVE!

- Pipe Insulation
 - Over 1800 feet of pipe
 - Seven steam pits
- Condensate Return System
- Regulators and Traps

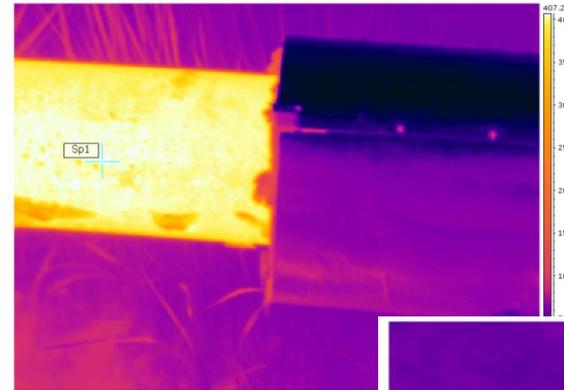
Steam Line (Before) 357.2 °F

After New Insulation 64.5 °F



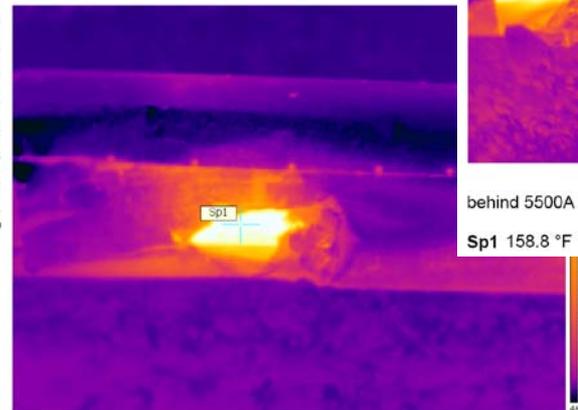
new insulation at steam pit #48

Sp1 64.5 °F



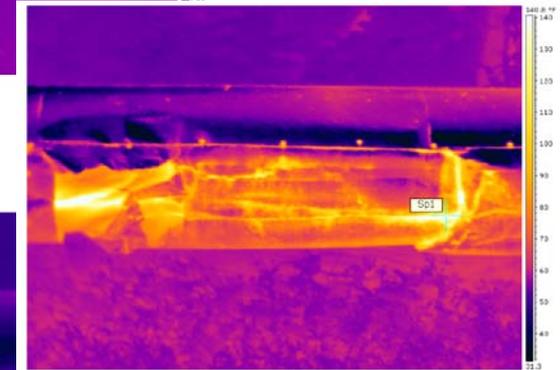
line behind 550A torn insulation

Sp1 408.8 °F



behind 5500 A torn insulation

Sp1 393.2 °F



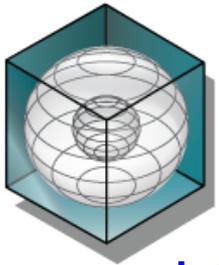
behind 5500A torn insulation

Sp1 158.8 °F

Impacting the Behavior Paradigm

- Use of Equipment
 - Turn off lights
 - Sash Height
 - Windows closed
 - Reduce dependency on space heaters
- Smart energy usage
 - The right amount of energy
 - When needed
 - Off when job complete
- Less Energy...More Jobs
- Rewards for *significant* reductions
- Incentive programs for directorates

- U.S. Department of Energy - Energy Efficiency and Renewable Energy
- Federal Energy Management Program Commissioning
- <http://www1.eere.energy.gov/femp/>



Energy Systems Laboratory

A Division of TEES: the Engineering Agency of the State of Texas

- <http://www-esl.tamu.edu/continuous-commissioning>
- ASHRAE Guideline 0 – 2005



Questions & Answers

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