

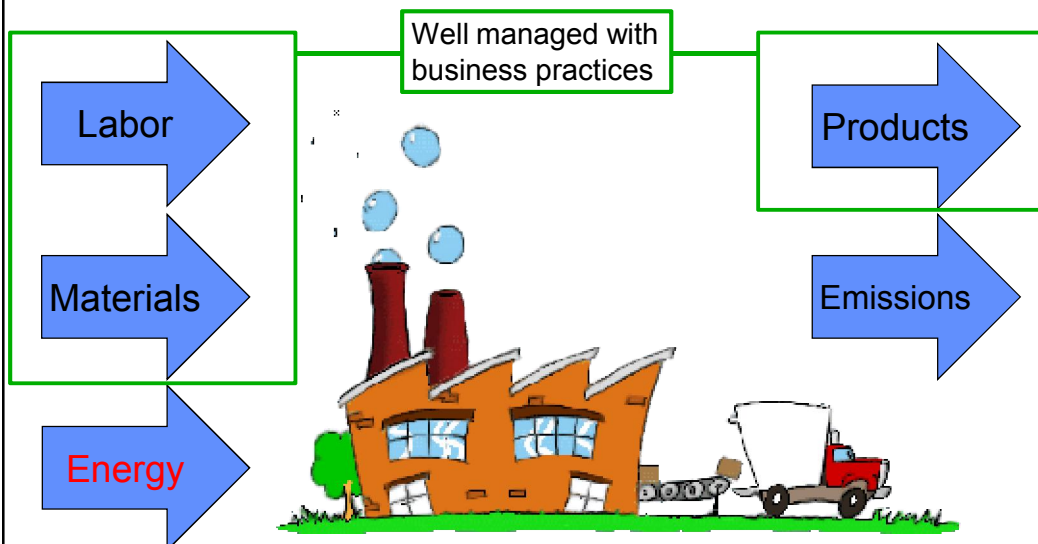
# Organizational Change in Industry Through Strategic Energy Management: Results and Barriers to Success

Dr. Peter Therkelsen and Dr. Prakash Rao – Lawrence Berkeley  
National Laboratory

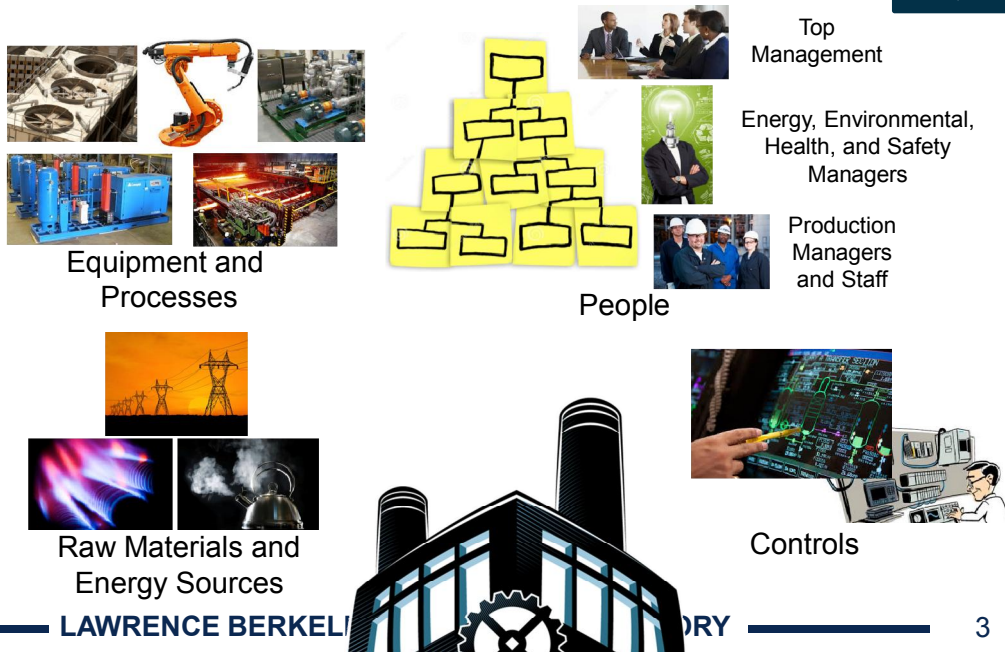
Behavior, Energy & Climate Change Conference

October 20, 2015  
Sacramento, CA

## Simplified Ins and Outs of a Manufacturing Facility



## Inside a Manufacturing Facility



## The Project Approach to Energy Efficiency in Manufacturing



### Energy assessment to identify projects:

- Estimates of energy savings for a piece of equipment, system, or process

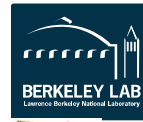
### Projects are then:

- Competed for capital funds with other higher priority items
- Reliant upon a champion to drive them forward

### Project savings:

- May not be quantified after implementation and communicated up or down the organization
- Are not well connected to overall facility energy
- Degrade

## Connections and Priorities for Energy Performance Improvement are Lacking



Top  
Management



Maximize  
Shareholder Value



Stay in  
Business



Energy = Sunk Cost



Energy,  
Environmental,  
Health, and  
Safety  
Managers



Meet Production  
Demands



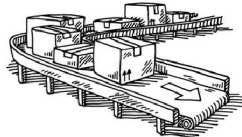
Avoid Violations



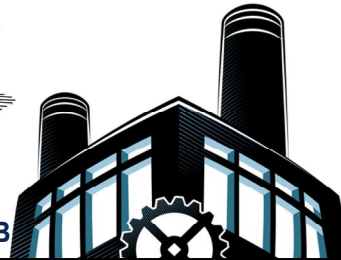
Lower  
Energy Prices



Production  
Managers  
and Staff



Produce Product



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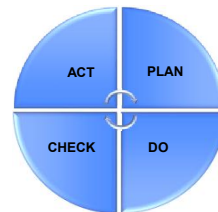
5

## Energy Needs a Foundation for Continual Improvement



EMS

(Energy Management System)  
Control Based System



EnMS

(Energy Management System)  
Continual Improvement  
Business Practice

- Continual improvement business practices (**EnMS**) connect people, equipment, controls, and energy through feedback loops utilizing data, analysis, actions, reviews, and decision making processes.

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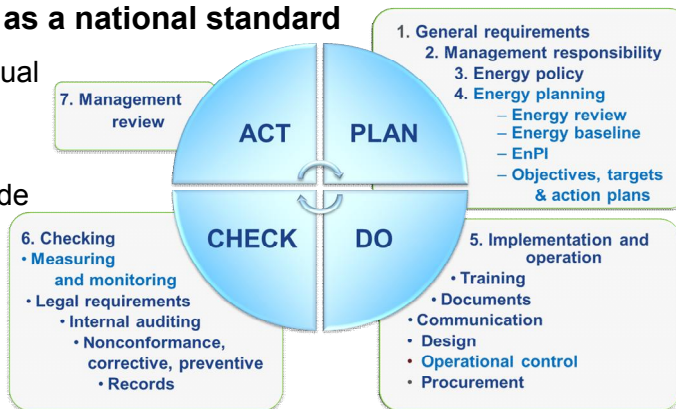
6

## ISO 50001 - Energy Management System Standard



- International developed standard
- Input from 56 countries
- Adopted by many as a national standard
- Foundation for continual energy performance improvement
- Connects people inside an organization
- Data driven decision making and review process

- Energy performance improvement targets set by the organization



Light blue text represents new data-driven sections in ISO 50001 that are not in ISO 9001 & ISO 14001

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7

## Superior Energy Performance® (SEP™)



$$= \text{ISO International Organization for Standardization} + \text{ISO 50001}$$

- Externally set energy performance improvement targets
- Third-party ANSI-ANAB accredited verification
- National (U.S. DOE) recognition

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## In Their Own Words: Value of Superior Energy Performance



“SEP adds rigor, analysis, and gives good guidance. It’s one thing to have a target and objective, but SEP gives tools that empower you to be more disciplined and prove the impact certain activities have.”

-Nissan North America Energy Team

“SEP is the mechanism responsible for driving continuous improvement in energy performance.”

- Stephen Cannizzaro, Sustainability Manager, General Dynamics

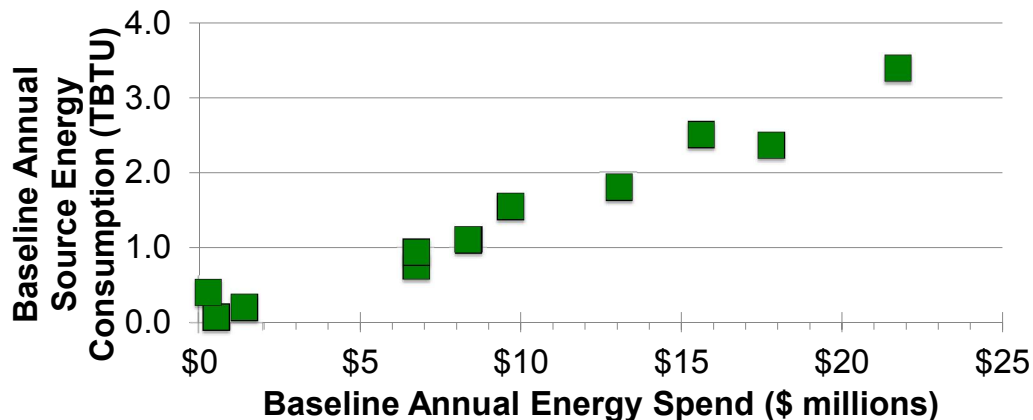
“SEP participation helped reveal new energy savings opportunities and helped us to develop a formal and continuous energy management training program – ultimately strengthening all energy awareness activities.”

- Amy Bechtold, Compliance, Manager and Energy Management, Representative, Harbec Inc.

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9

## Energy Consumption of Facilities Included in Current Study



Data availability:

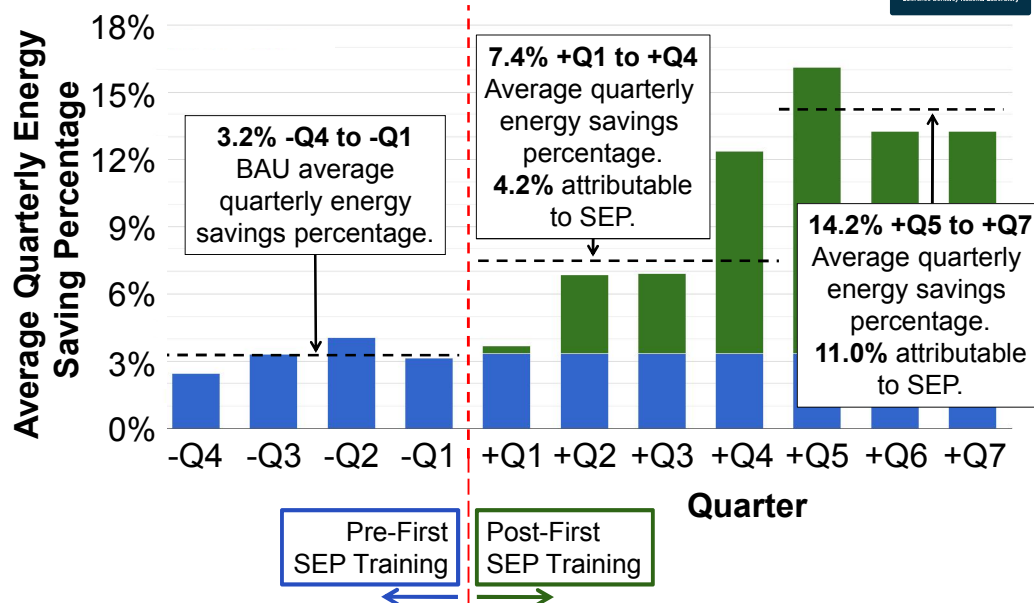
- Monthly energy consumption and savings
- Baseline + achievement period
- 4 quarters prior to first SEP training
- 7 quarters after first SEP training

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10



## Verified Facility Wide Energy Savings Attributable to SEP



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## Results – Energy Performance Improvement Actions

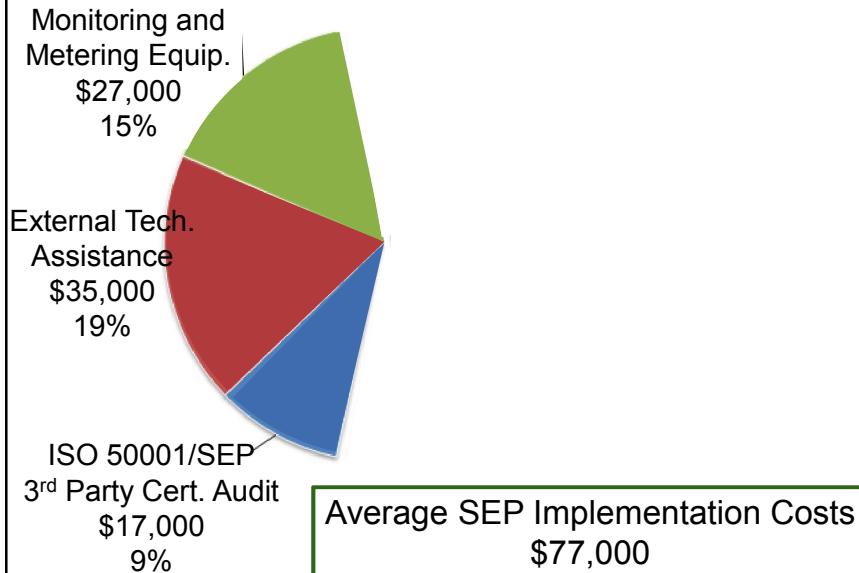


- ISO 50001 helped facilities identify previously unnoticed **operational** (low or no-cost) improvements opportunities.
- Impact of SEP - **operational** / capital energy savings split:
  - Pre-first SEP training: **64 / 36** (**operational** / capital)
  - Post-first SEP training: **74 / 26** (**operational** / capital)
- All facilities implemented **operational energy performance improvement actions**.
- 3 facilities only implemented **operational energy performance improvement actions**.

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12

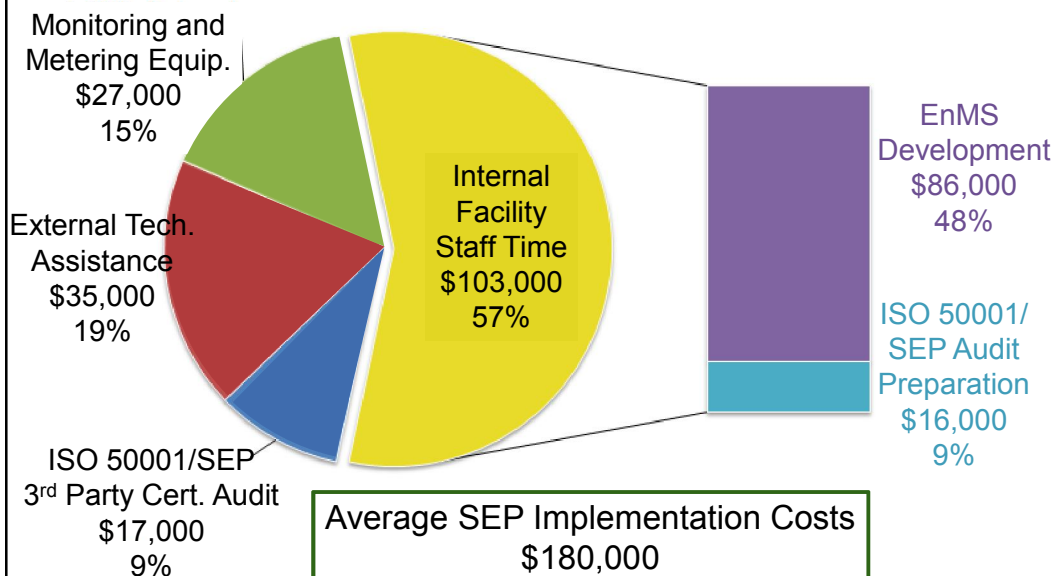
## Costs of Implementing and Certifying to Superior Energy Performance



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13

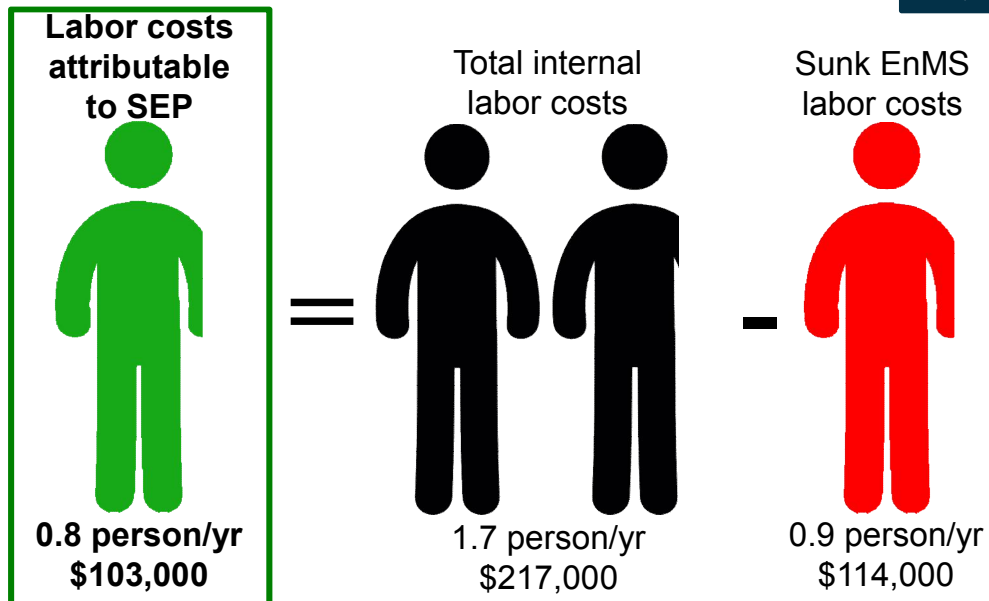
## Costs of Implementing and Certifying to Superior Energy Performance



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14

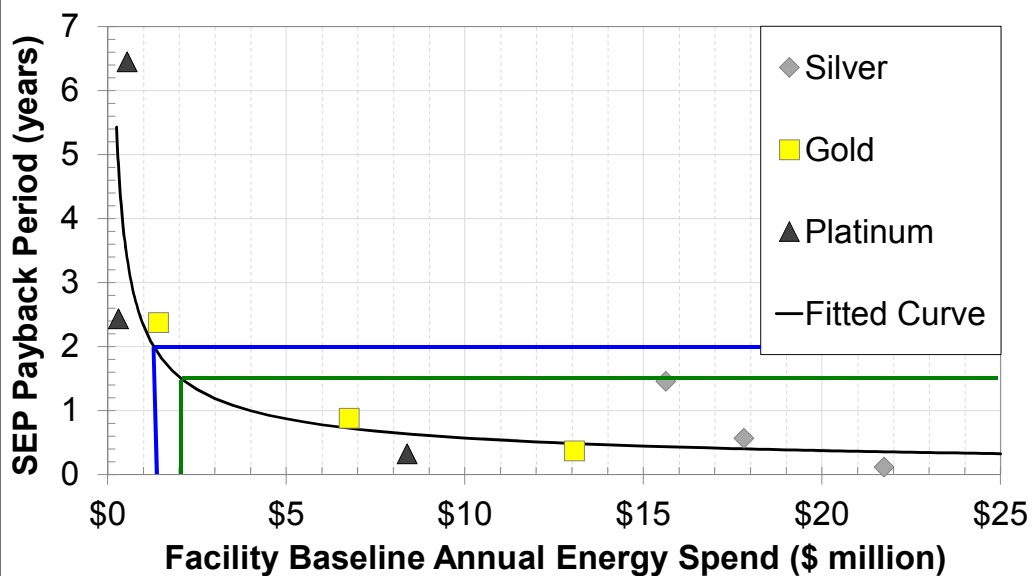
## An Improved Methodology to Determine Internal Staff Costs



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## A Representative Payback Function



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## Success (and Barrier) Predictors to ISO 50001 and SEP Certification



- Top management commitment and communication of investment
  - Change in management or ownership
  - Top management does not participate in review
  - No previous ISO management system experience
- Energy *team* engagement
  - Reliance on singular energy champion
- Acceptance of data driven framework
  - Refusal to let go of historic practices
- Recognition of need to continually improve EnMS and energy performance
  - Prioritization of business practice or engineering over the other
  - “Implement and forget” attitude – treating process like a project