



The Importance of Energy Efficiency in Lean Manufacturing: **Declaring Energy the Ninth Waste**

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Presentation Outline

- What is lean?
- Where does energy fit into lean?
- Lean and Energy in action
 - Northeast pilot project
 - Making L&E mainstream

Lean Principles

- More value, less resources
- A cultural transformation—focus on employee involvement
- Value stream mapping; systematic identification and elimination of waste
- One piece production flow
- Continuous improvement
 - Kaizen events: “to change for the good of all”

Lean in Practice

Not a government program—it's a business philosophy

- Lean's legacy: Toyota
- 70% of U.S. manufacturing plants are engaged in lean
- Lean has spread to numerous manufacturing & service sectors (appliances, construction, electronics, furniture, healthcare devices, metal fabrication, shipbuilding, healthcare services, even government)
- Large-scale lean practitioners

Manufacturing Extension Partnership

- 59 centers in all 50 states
- ~\$100 million from National Institute of Standards and Technology
- ~\$200 million from industry; state and local governments
- Provides industrial customers with services to improve productivity and competitiveness, including programs in Lean manufacturing.

Lean Wastes

1. Overproduction
2. Inventory
3. Transportation
4. Motion
5. Defects
6. Over-processing
7. Waiting
8. Under-utilized people
9. Energy

Lean and Energy: Making the Connection

Waste	Energy Use	Source: EPA
Overproduction	More energy consumed in operating equipment to make unnecessary products	
Inventory	More energy used to heat, cool, and light inventory storage and warehousing space	
Transportation	More energy used for transport	
Motion	More energy used for equipment, transport	
Defects	Energy consumed in making defective products. More space required for work in process (WIP) movement, increasing lighting, heating, and cooling demand and energy consumption	
Over-processing	More energy consumed in operating equipment related to unnecessary processing. Use of right-sized equipment often results in significant reductions in energy use per unit of production	
Waiting	Wasted energy from heating, cooling, and lighting during production downtime	

Benefits of the Lean and Energy Approach

Cost Savings: Reducing energy costs has a significant impact on business performance, though costs may be hidden in overhead or facility accounts.

Climate Change and Environmental Risk: Proactively addressing the environmental and climate impacts of energy use is increasingly important to industry and society. Failure to do so is a potential business risk.

Competitive Advantage: Lowering recurring operating costs, improving staff morale, and responding to customer expectations for environmental performance and energy efficiency increases your competitive advantage.

Lean's Energy "Coattails"

Toyota North America: Reduced energy use and greenhouse gas emissions from manufacturing by 30% per vehicle produced since 2000

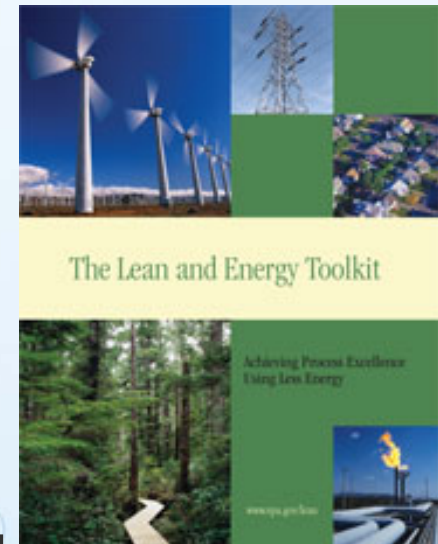
GE: Reduced CO₂ emissions by 250,000 metric tons and saved \$70 million in energy costs at facilities worldwide since 2005

Baxter Healthcare: One facility saved \$300,000 in energy costs in one year using Lean and Six Sigma

Lasco Bathware: WA pilot facility saved 12.6 million ft³ of natural gas and \$99,000 per year in energy costs

Lean and Energy Pilot Projects

- EPA Lean and Energy Toolkit
 - www.epa.gov/lean
- Partners:
 - EPA
 - Maine Department of Environmental Protection
 - MA Office of Technical Assistance and Technology
 - MA/NH/ME Manufacturing Extension Partnerships
- Implementation



Participating Companies

State	Company	Est. Start-Date of Program Delivery
MA	Algonquin Industries	Project in process
	Sullivan Paper	July 21
NH	High Liner Foods	TBD
	BAE Systems	July 14
ME	U.S. Felt	July 17
	TBD	TBD

Cost-Sharing Structure of Pilot Program

\$21,000 total per client

- **EPA**: \$10,500 per client
- **MA and NH**: Cost-share comprised of a mix of client funds and state funds for workforce development
- **ME**: Cost-share comprised of state funds set aside for MEP to apply to small, rural manufacturers.

Moving Forward, Leveraging \$

Goal: Get clients “to put skin in the game”

Challenges

- Current business climate
- Lack of awareness among smaller companies of lean, hidden energy costs
- Minimal seed money from state government

Advantages of the Partnership Model

- EPA can provide support and technical assistance on a macro-level. Can continue to provide seed money.
- In many states, manufacturers trust state-level MEP programs, which have expertise in lean implementation
- Client's contribution ties them to success of the project, increasing likelihood of greater energy and cost savings

Making Lean and Energy Mainstream

“Collaboration not Competition”

- Learn from similar partnership models such as the Green Suppliers Network
 - Partnership between EPA and MEPs
- Need to demonstrate cost-effectiveness
- Continue utilizing MEP’s strong EM&V
- Integrating federal and state agencies on an operational basis

Thank you. Questions? Comments?

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