

# Leveraging Lean Energy Principles in Petfood Manufacturing

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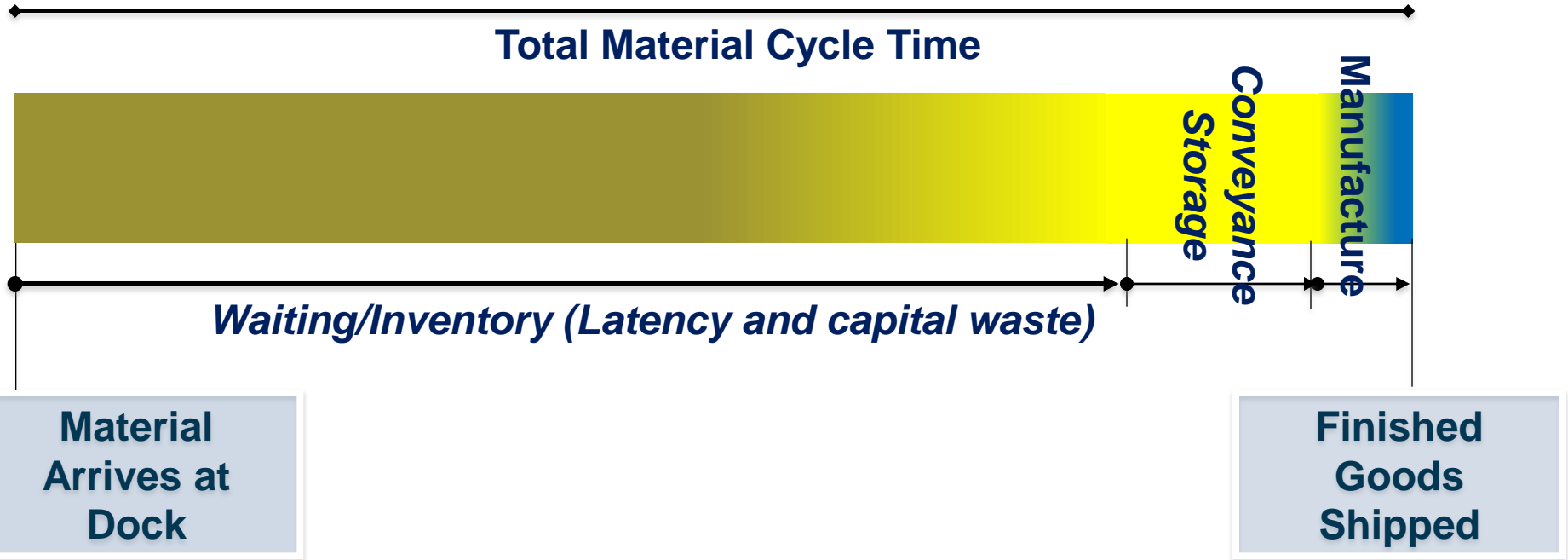
# Agenda

- Lean Manufacturing and Lean Energy
- Efficiency and Productivity
- Lean Energy Supply Chain
  - How to cut the COGS share of energy costs by 40%



# Lean Material Management

## *Goal: Reduce Latency*



Reduce Latency: Total Material Cycle Time → Value-Added Time

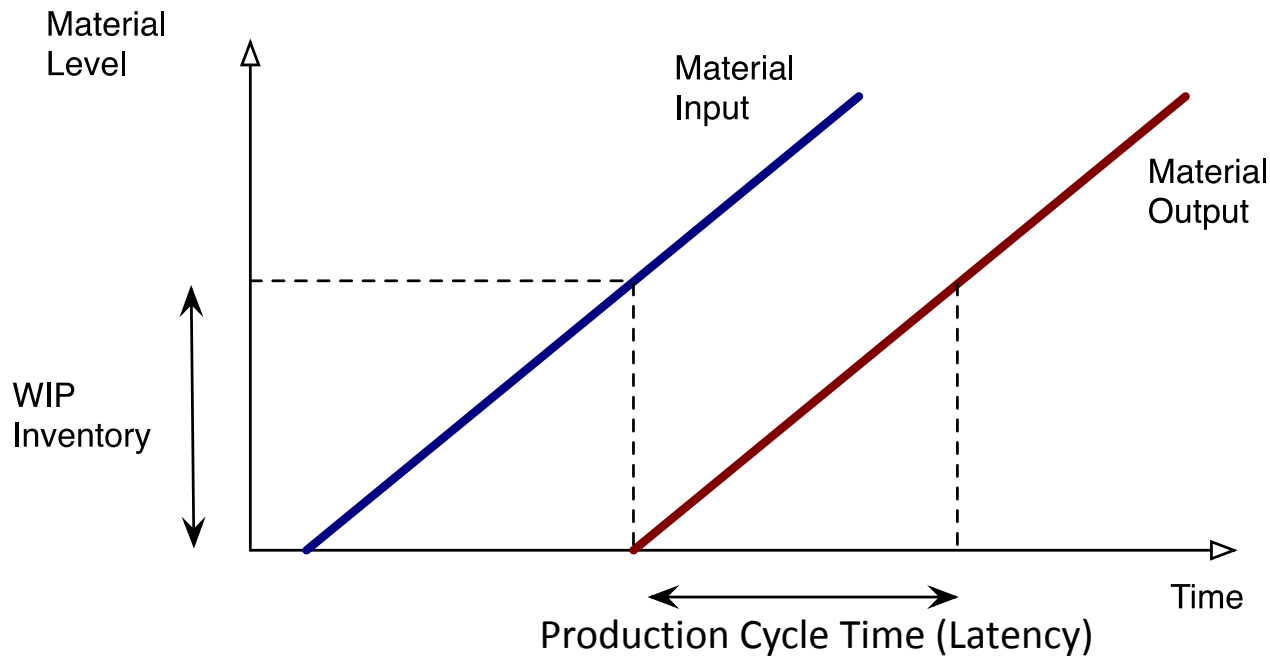
- By eliminating *waiting and conveyance*
- Manufacture is only value-added time



# LEAN MATERIAL MANAGEMENT

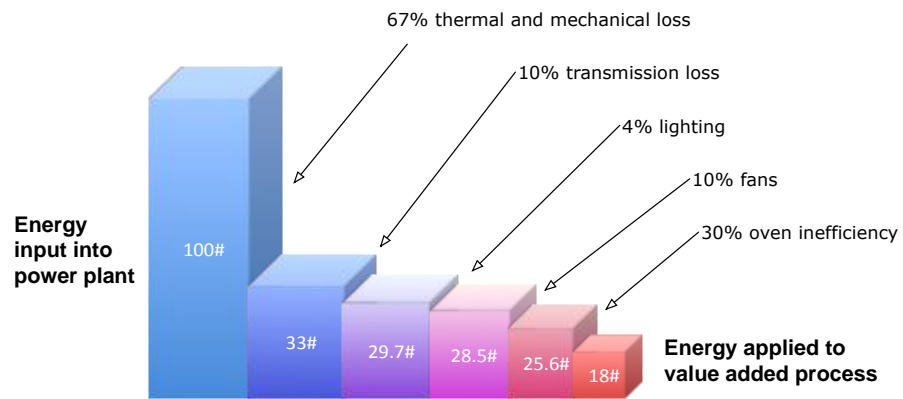
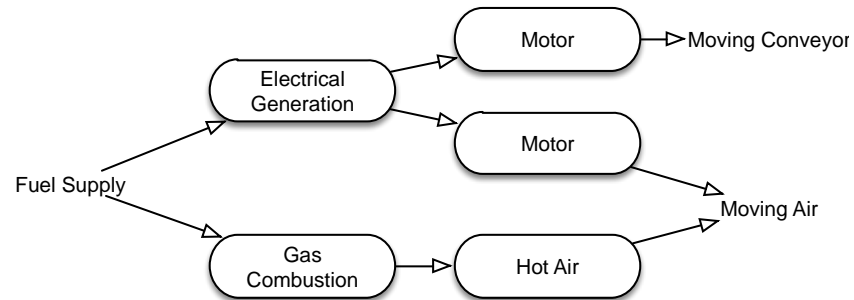
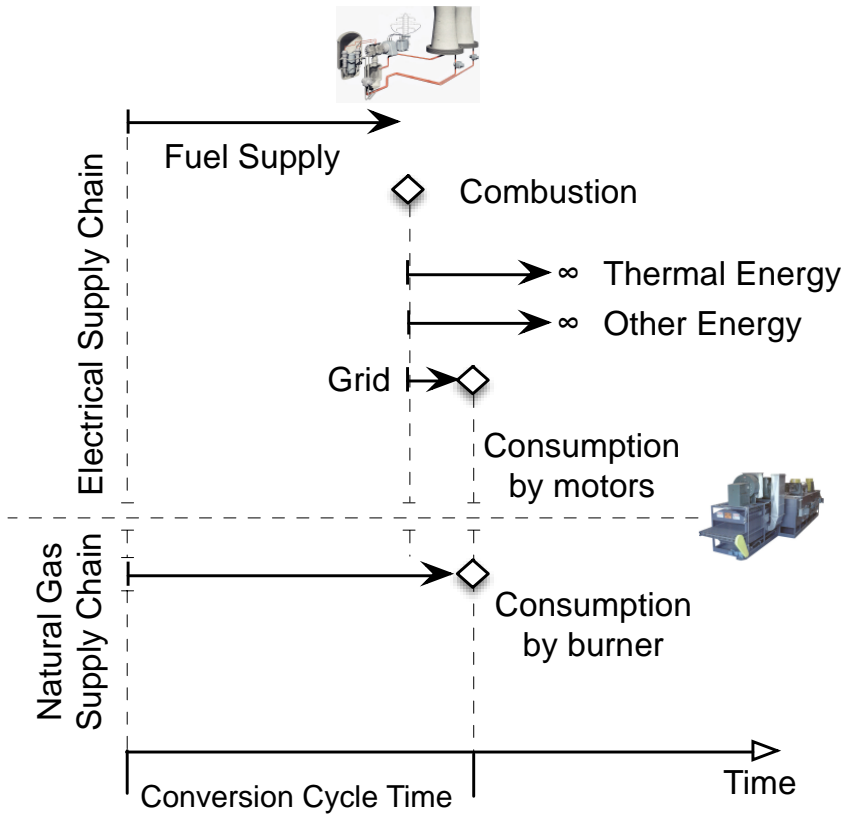
## Lean Material Management: Reduce Capital Costs

- **Material speed and inventory are inversely proportional to each other: *as speed increases, inventory decreases***
- **Squeeze cycle times toward zero, and costs and capital required for inventory management disappear.**



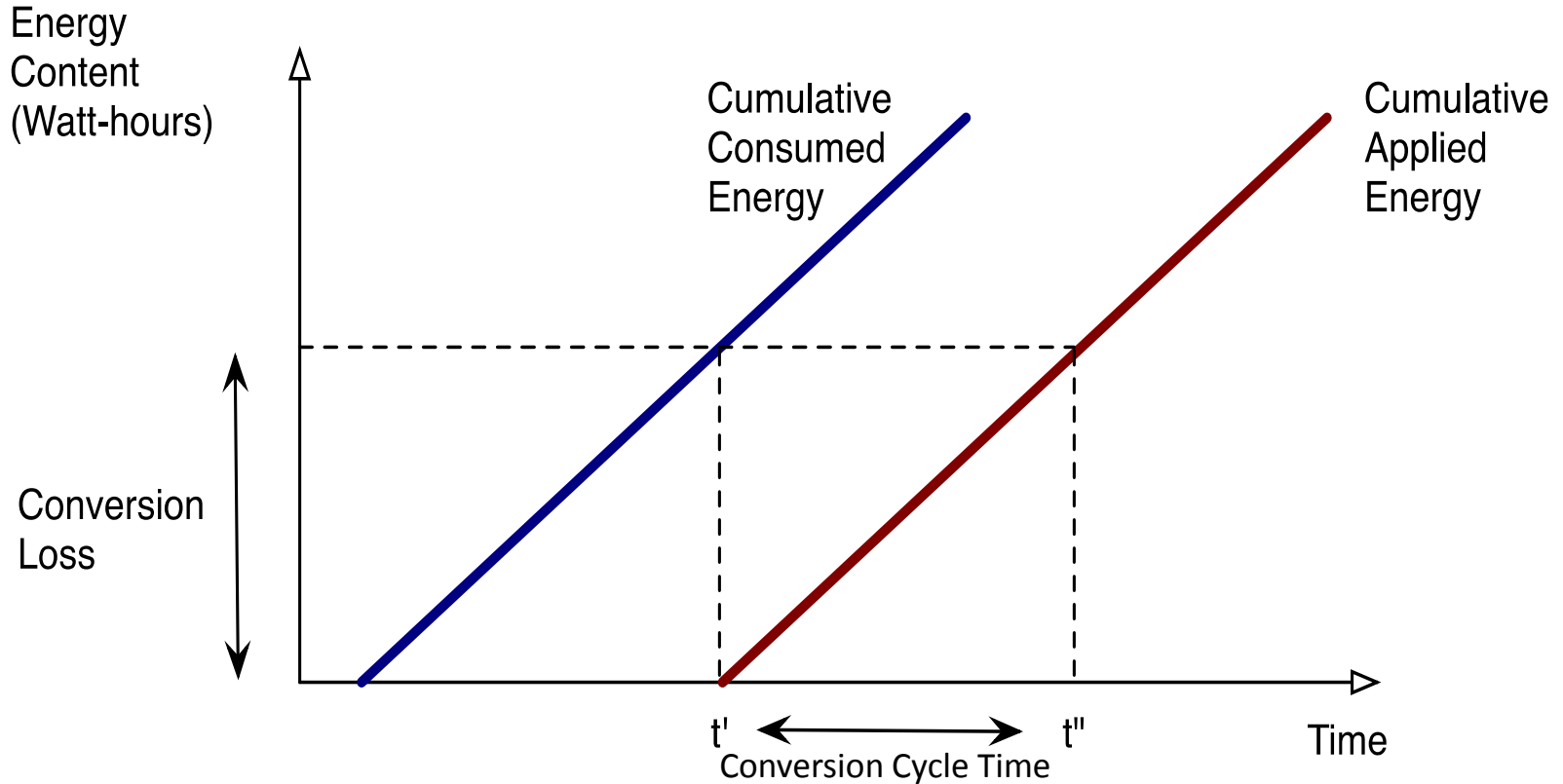


# CONSIDER A SIMPLE DRYER





# LEAN ENERGY

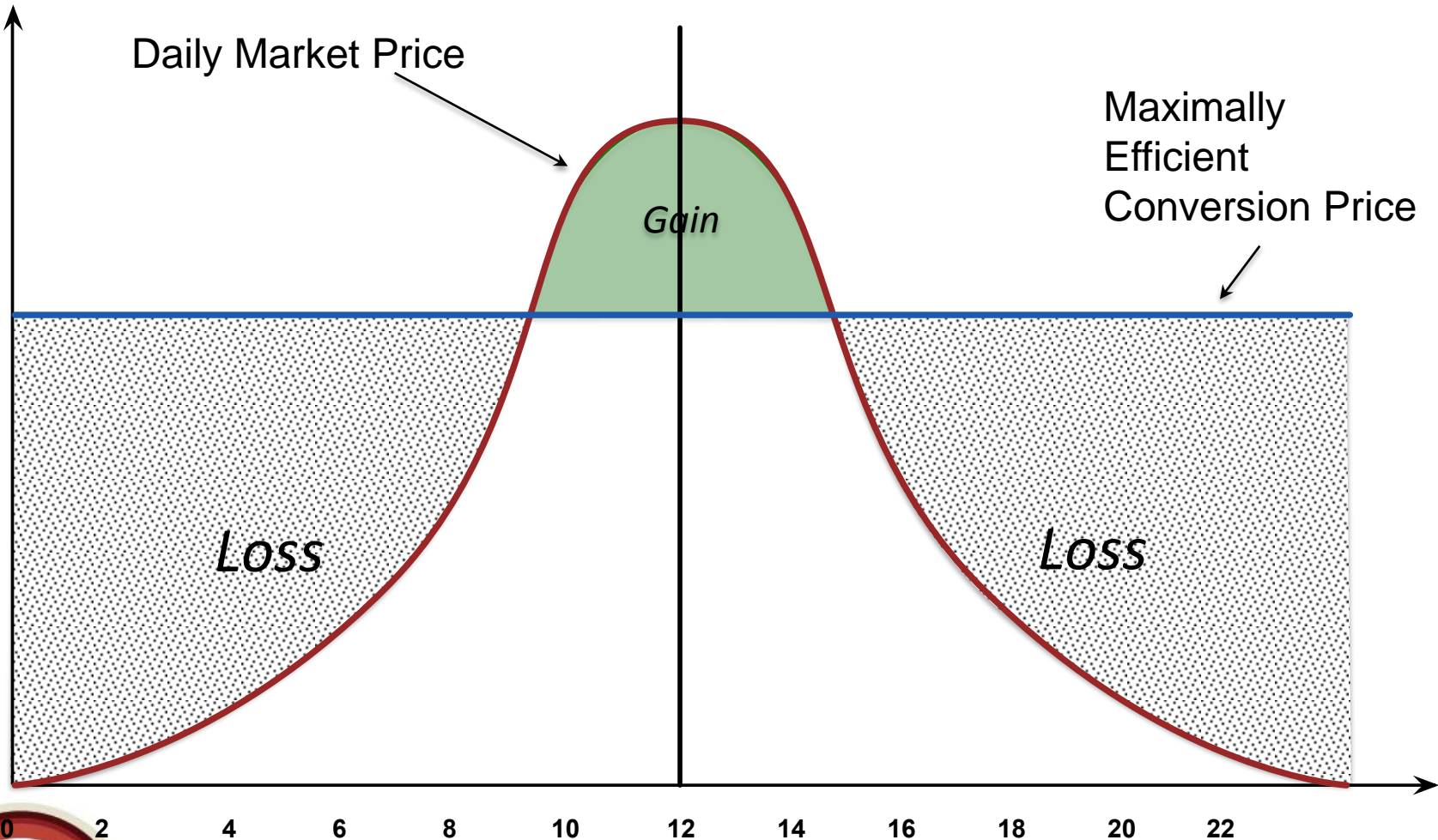


**ENERGY LOSSES → ZERO**

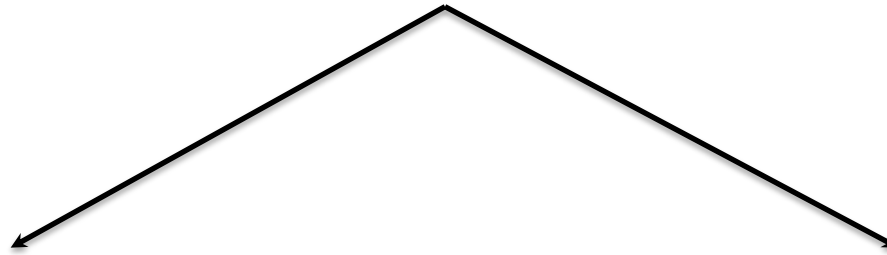
**Energy is converted**  
**(1) when needed**  
**(2) at its lowest available rate**



# Efficiency vs Productivity



# Lean Energy Goals



## Reduce Conversion Cycle Times

**Productivity =**  
Value Added / Energy Input

## Reduce Conversion Losses

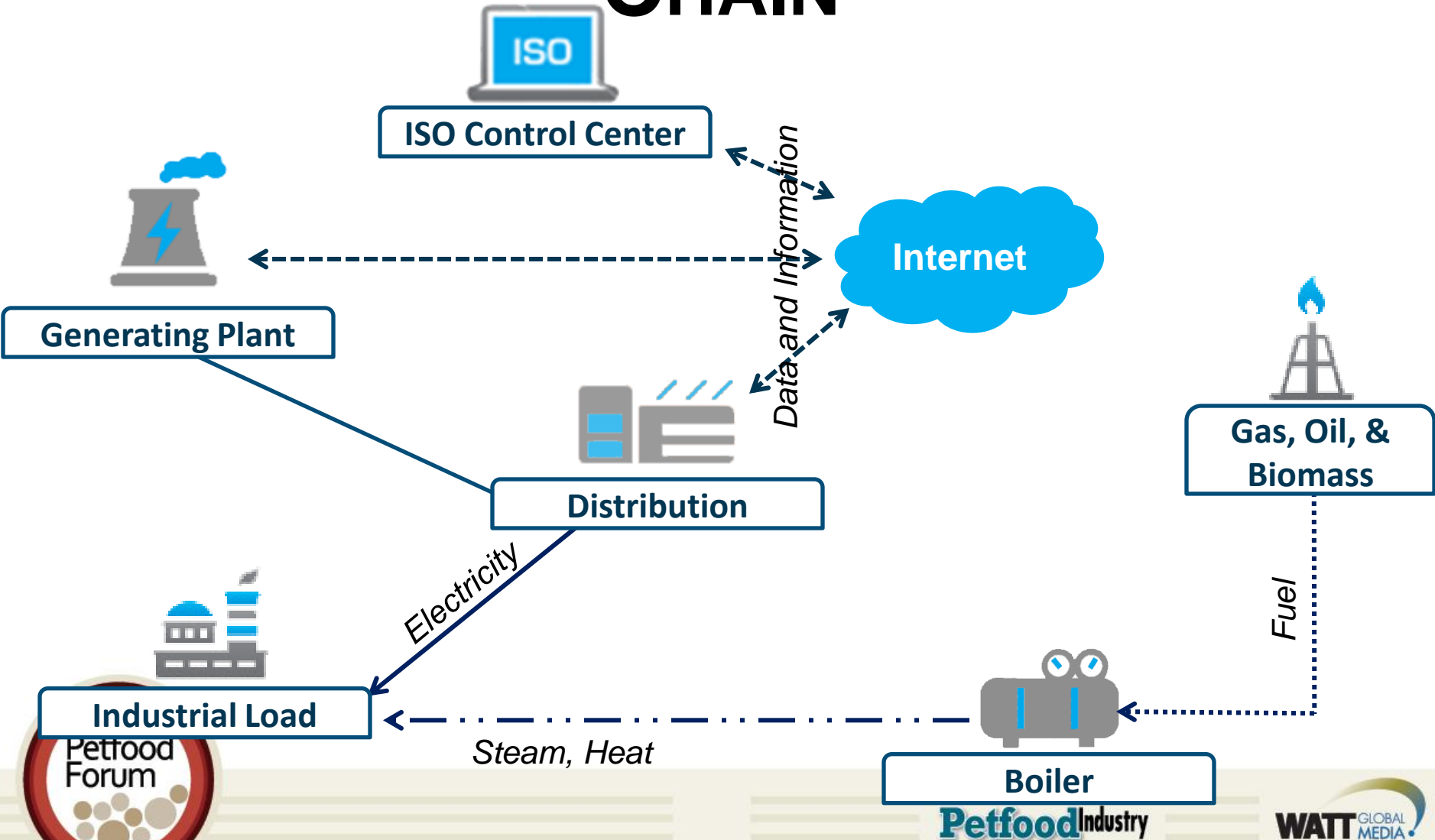
**Efficiency =**  
Energy Output / Energy Input

*Emphasis on this for this  
discussion today*





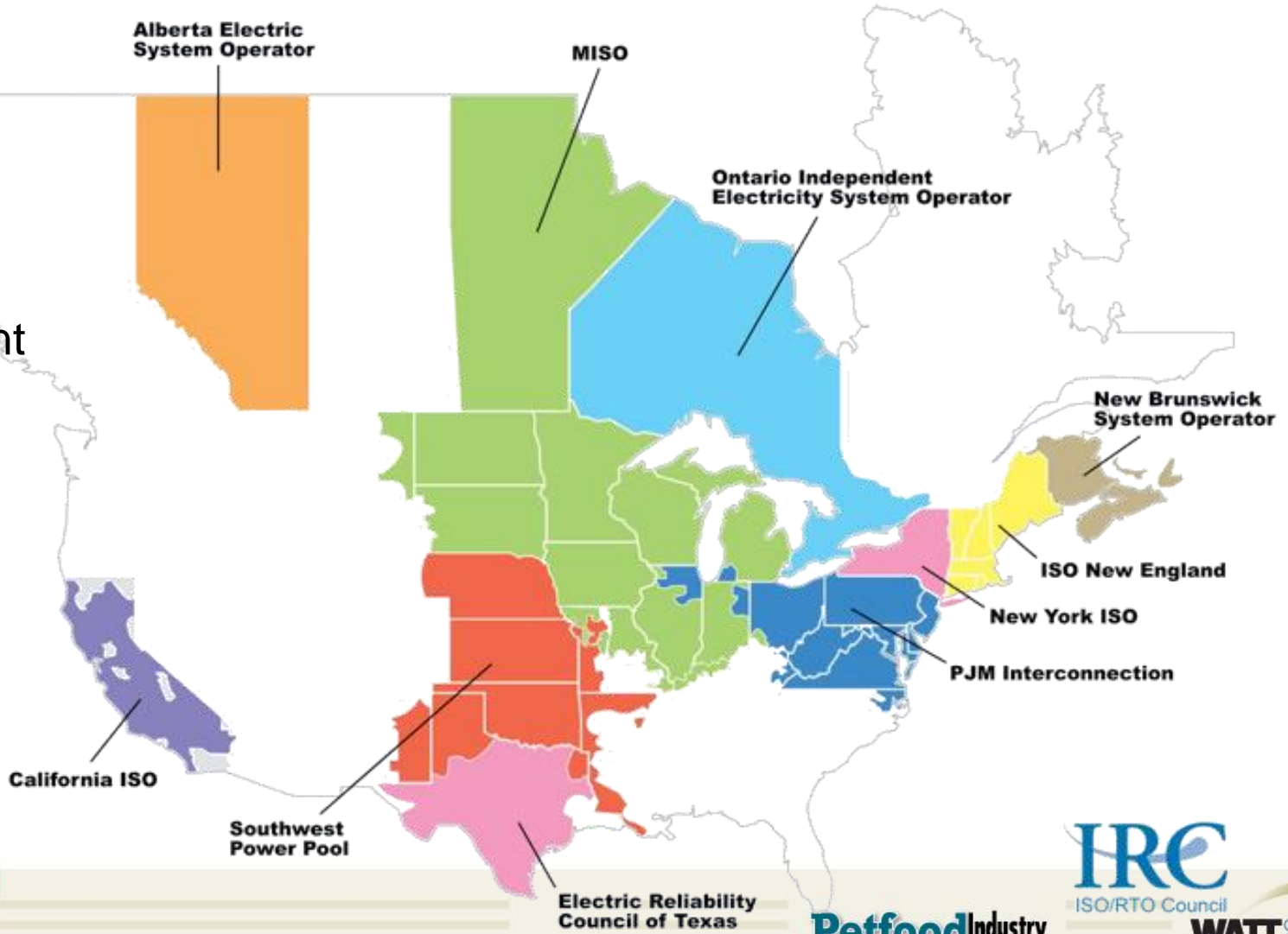
# CONVENTIONAL ENERGY SUPPLY CHAIN



# US ELECTRICITY MARKETS

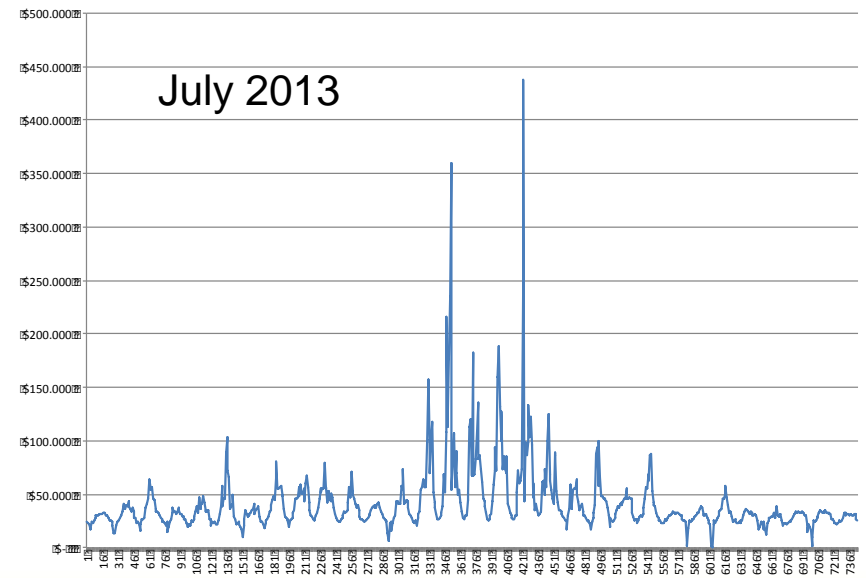
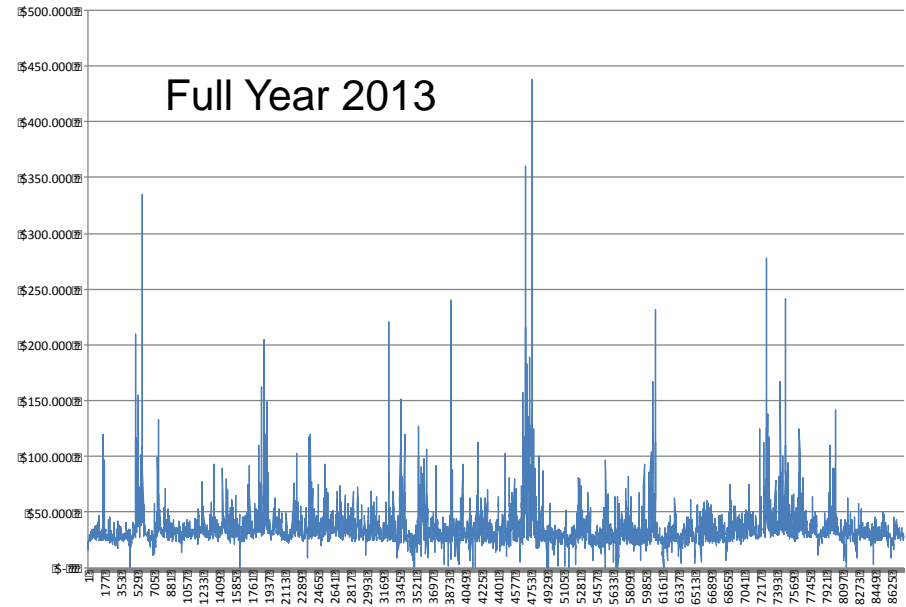
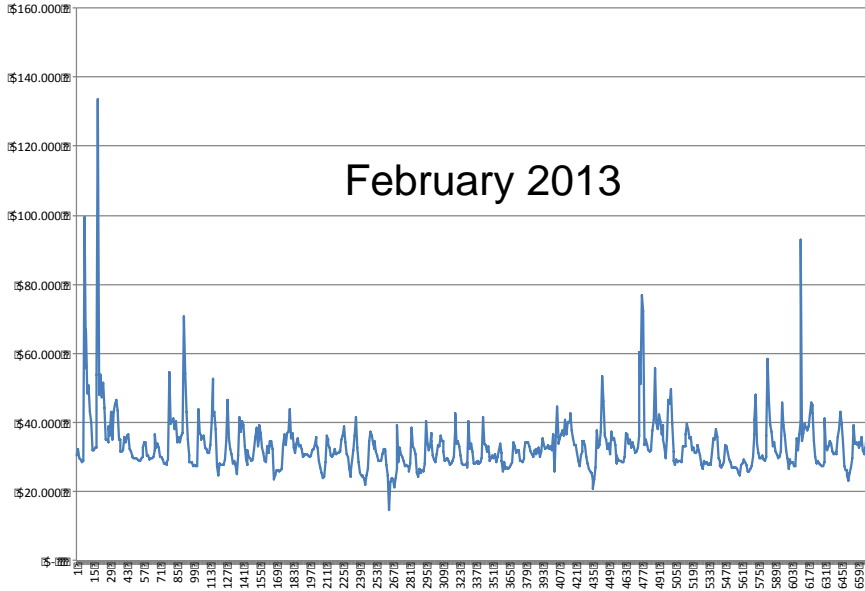
## REGIONAL MARKETS IN VARIOUS STAGES OF MATURITY

ISO –  
Independent  
System  
Operator



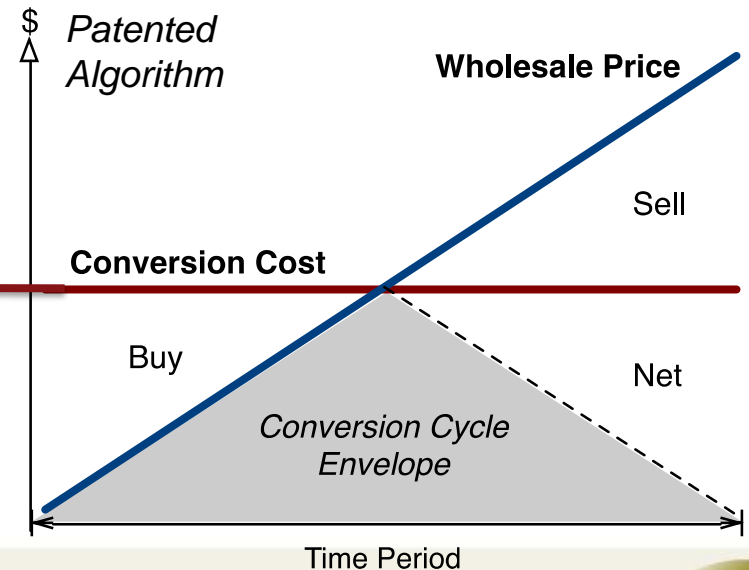
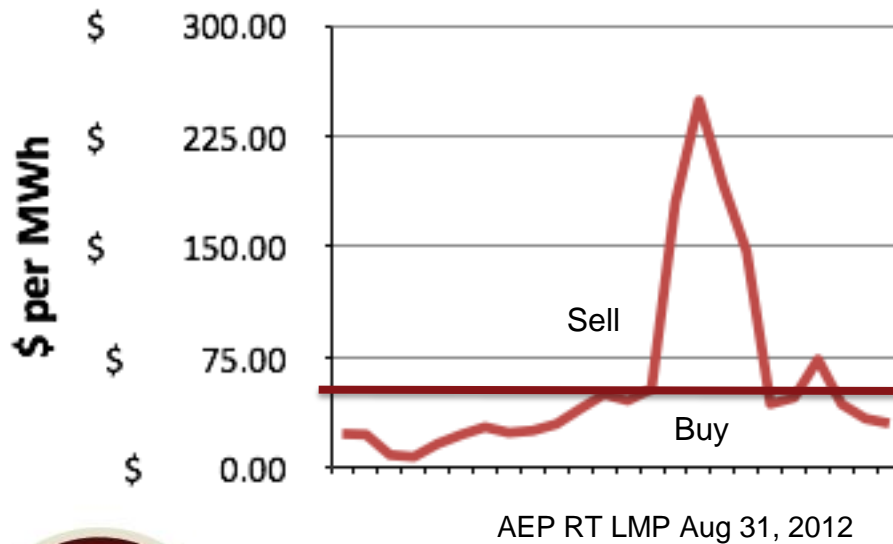
# AEP (Ohio) Market 2013

## Hourly Location Marginal Price (LMP)

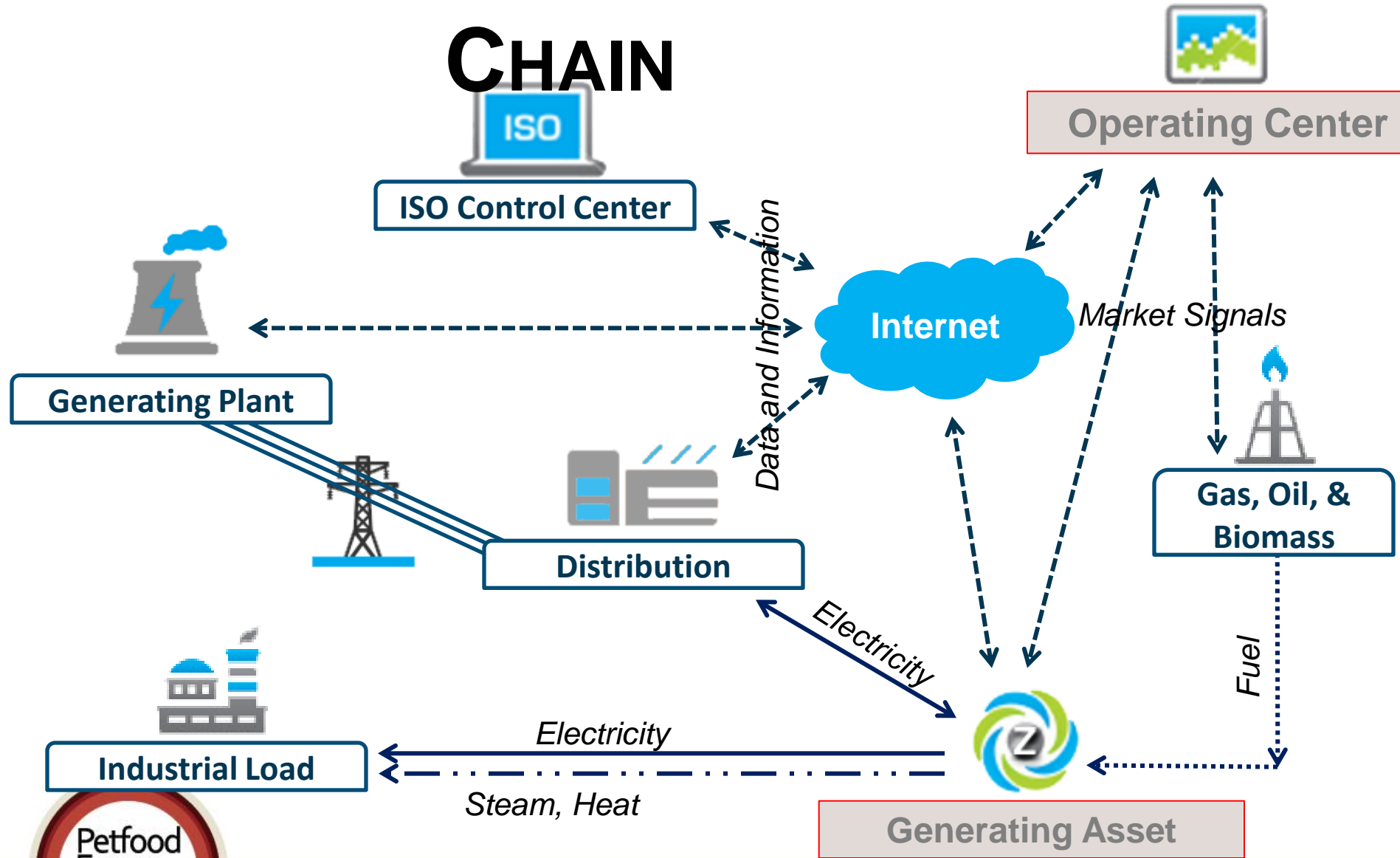


# ENERGY MARKET ARBITRAGE

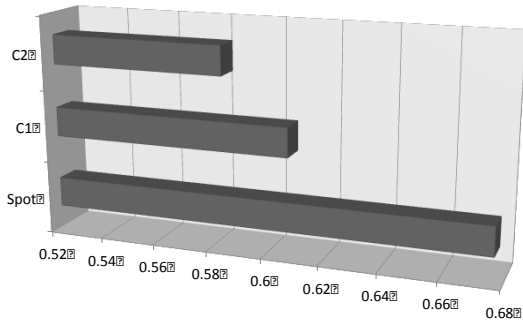
Electricity Market	Financial Disposition	Generation Asset
<i>Higher than Local</i>	<i>Sell</i>	<i>Run</i>
<i>Lower than Local</i>	<i>Buy</i>	<i>Stop</i>



# LEAN ENERGY SUPPLY CHAIN

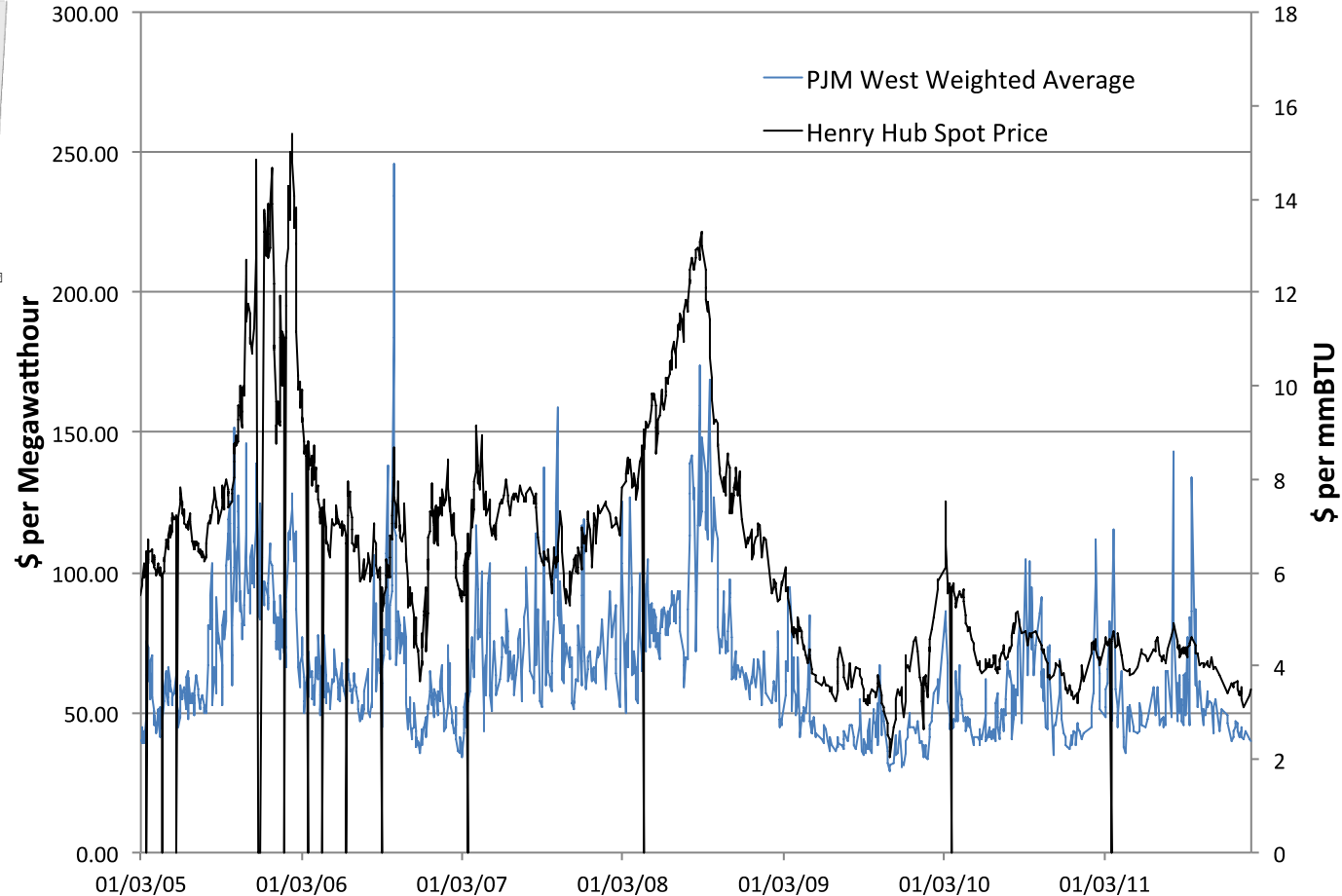


# Natural Gas and Electricity



**Correlation between PJM West Average and Henry Hub**

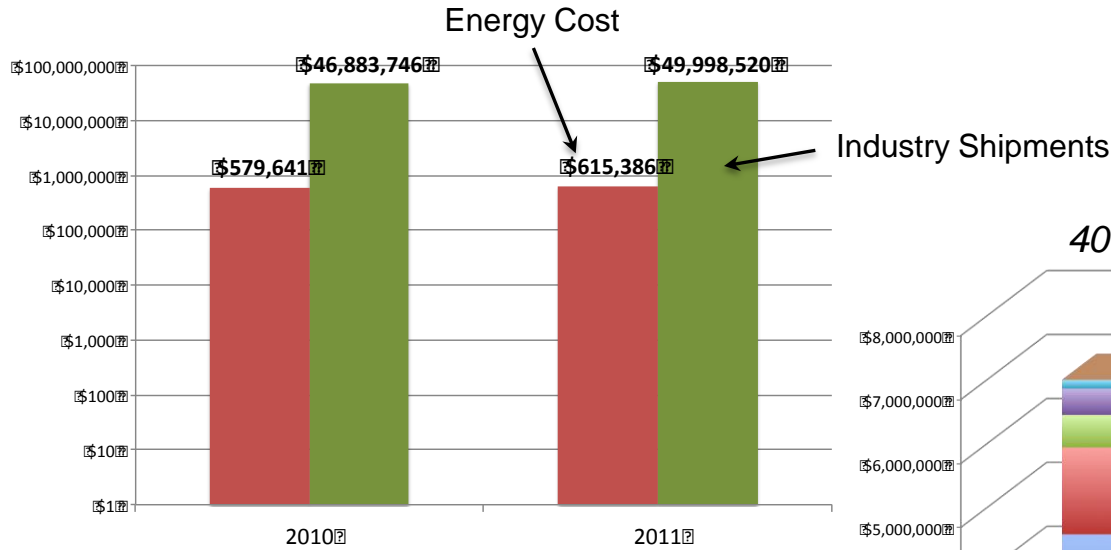
Contract Type	6 Year Hourly Price Correlation
Spot Price	0.67
C1 (1 Month)	0.61
C2 (2 Month)	0.58



# WHAT DOES THIS MEAN TO YOUR COMPANY?

## Petfood Manufacturing Sector (NACS 3111)

Figures in \$000's



Energy Cost is on average ...

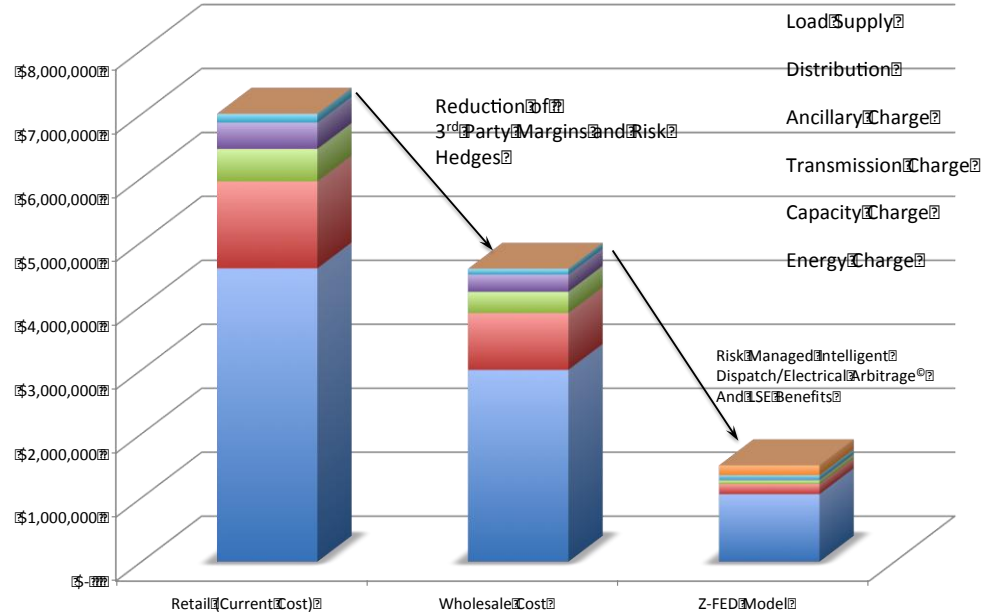
1.2% of Sales

1.6% of COGS

bring it down to....

**1% of COGS**

### 40-50% Reduction in Gross Energy Costs



# Summary

- Lean Energy means big energy cost reductions
- Use 21<sup>st</sup> century technology tools for both
  - Efficiency Increases
  - Productivity Increases
- Continue to push energy costs below 1% of COGS

