The Next Frontier to Realize Industrial Energy Efficiency

Keynote Address
World Renewable Energy Congress 2011

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Therm

Joule

BTU

Negajoule

GigaJoule

Kill-a-Watt

kWh

MegaJoule

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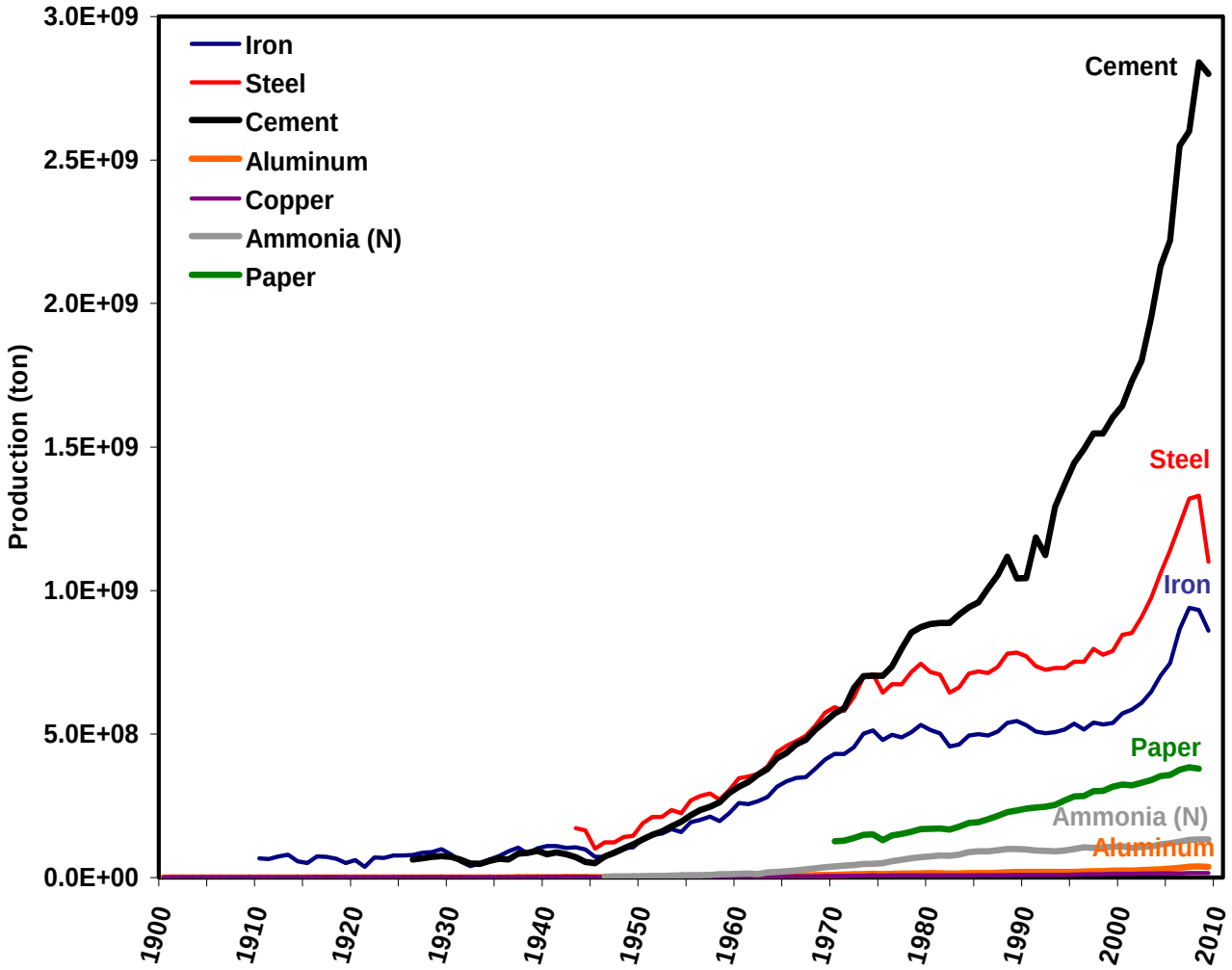
The Problem: Rapid Growth of Commodity Production



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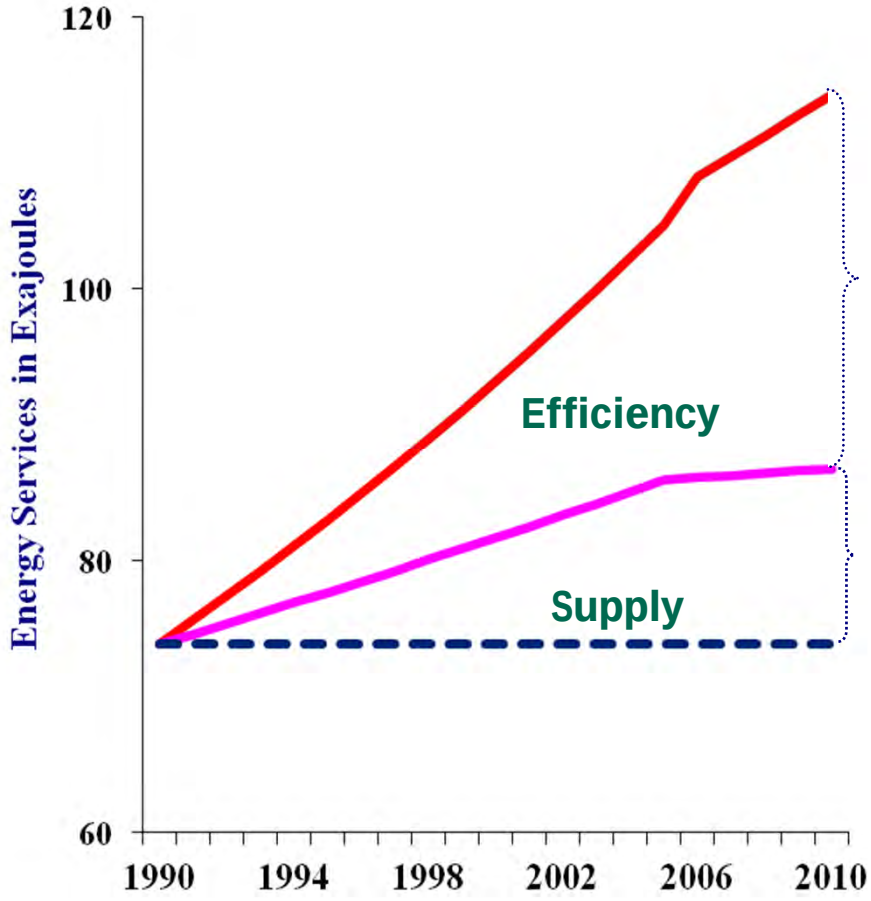
Energy Efficiency is the Most Important Supply Opportunity



Since 1990, energy efficiency will have met 67% of new energy service demands in OECD Europe while new energy supplies will have contributed 33% of new energy service demands

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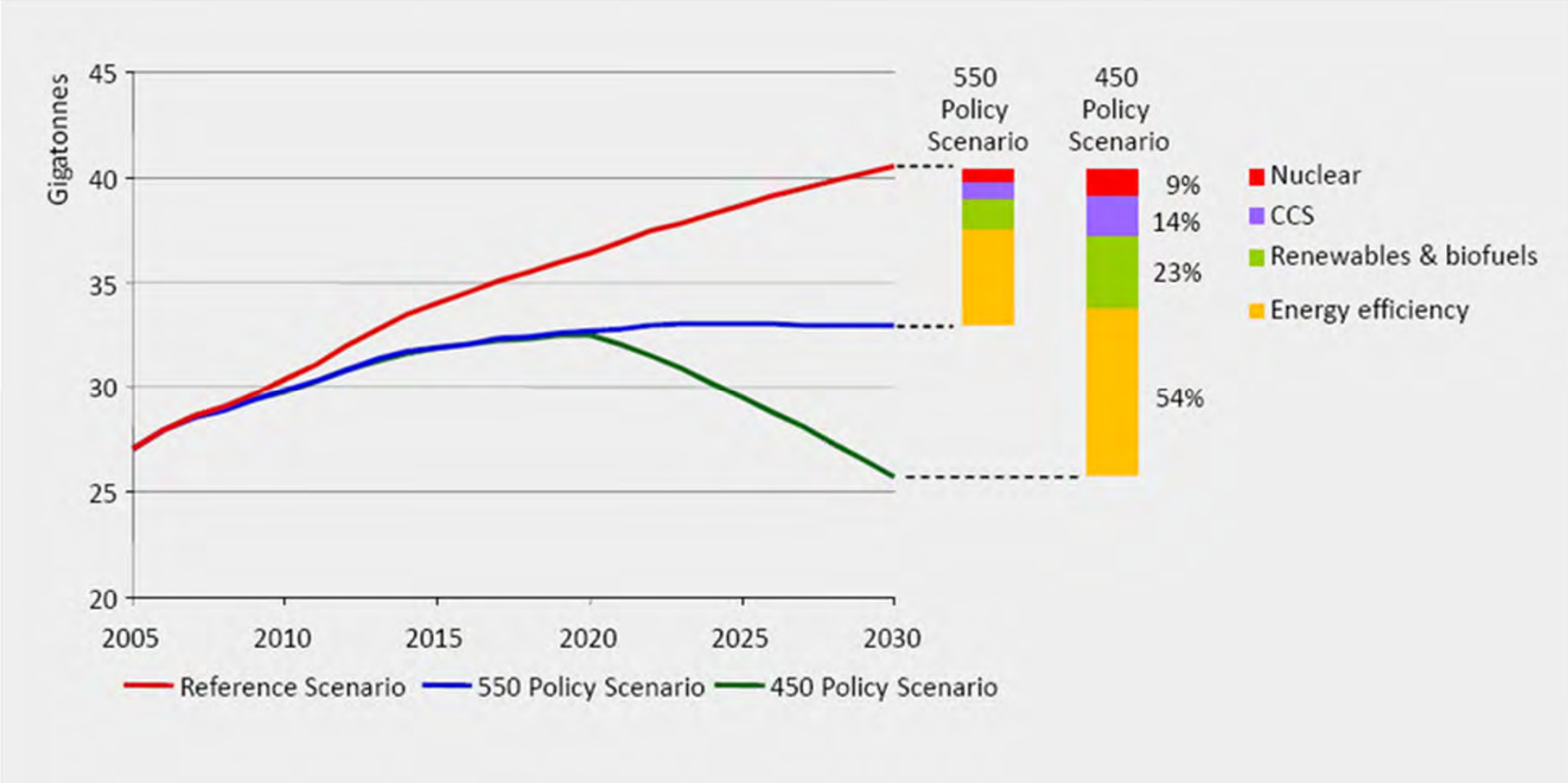
Source: UN Foundation (2007). Realizing the Potential of Energy Efficiency (updated by S. Laitner 2010).

Energy Efficiency is key to reduce GHG Emissions



IEA, World Energy Outlook 2008

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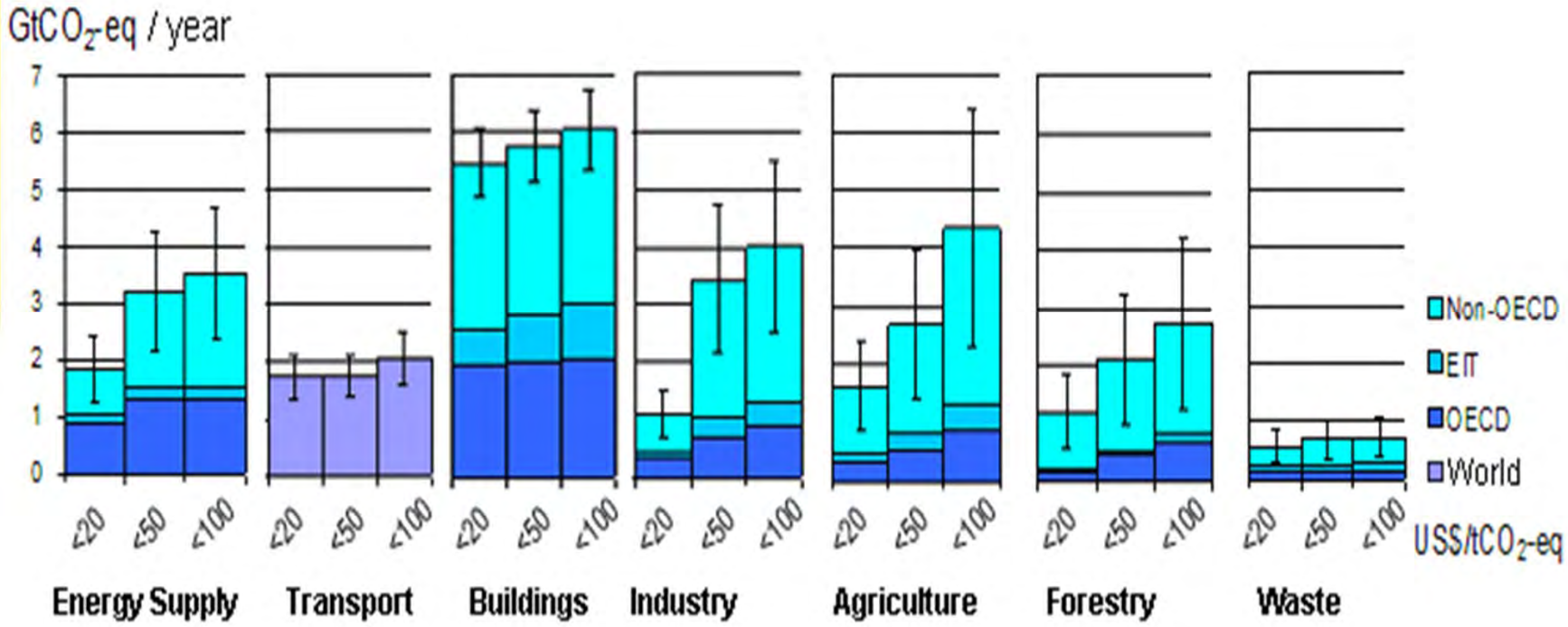
All Sectors Contribute to Energy Savings



IPCC, 4th Assessment Report – WG-III (2007)

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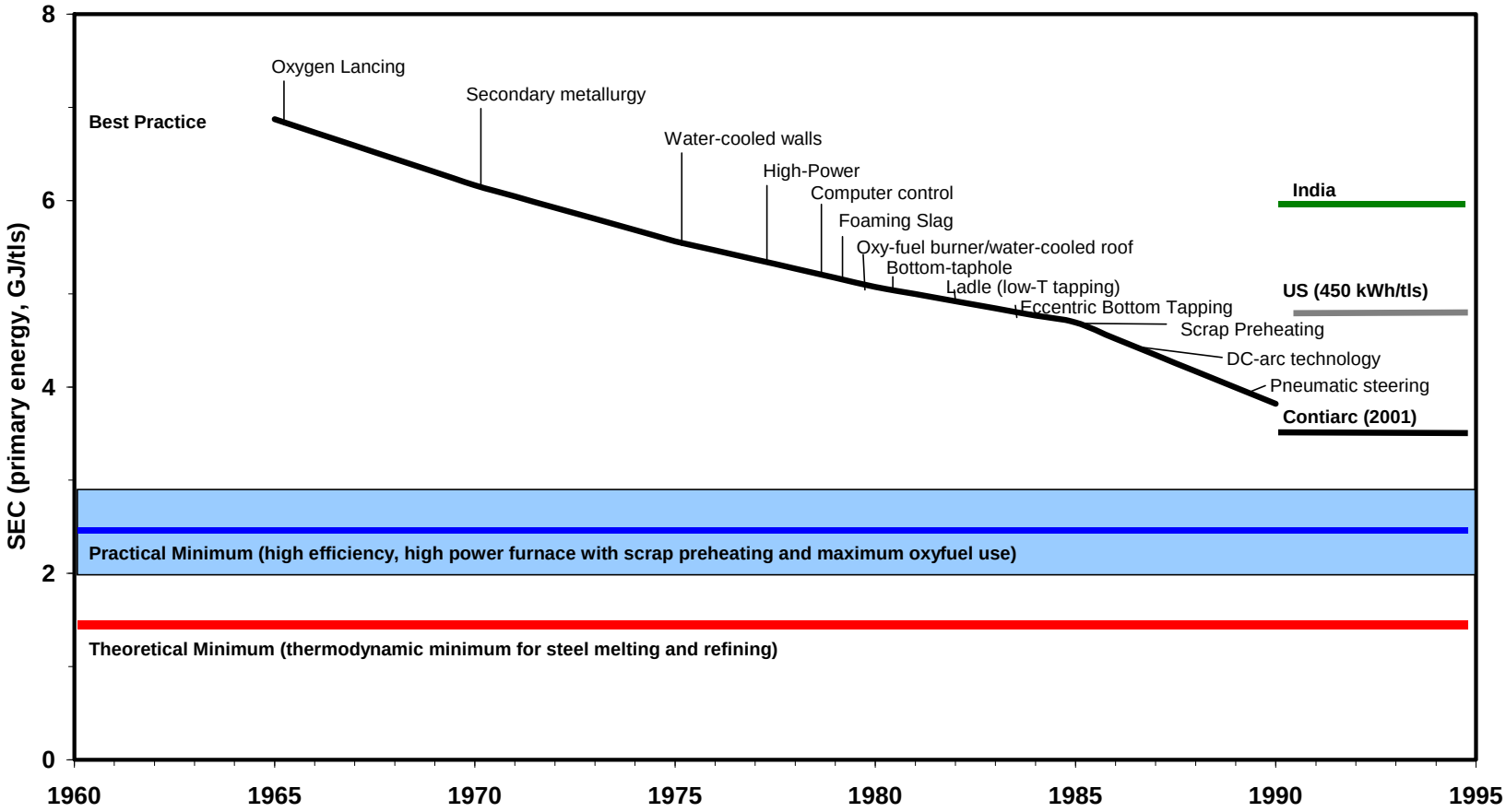
Process Level Energy Efficiency Improvement Example: EAF in the Steel Industry



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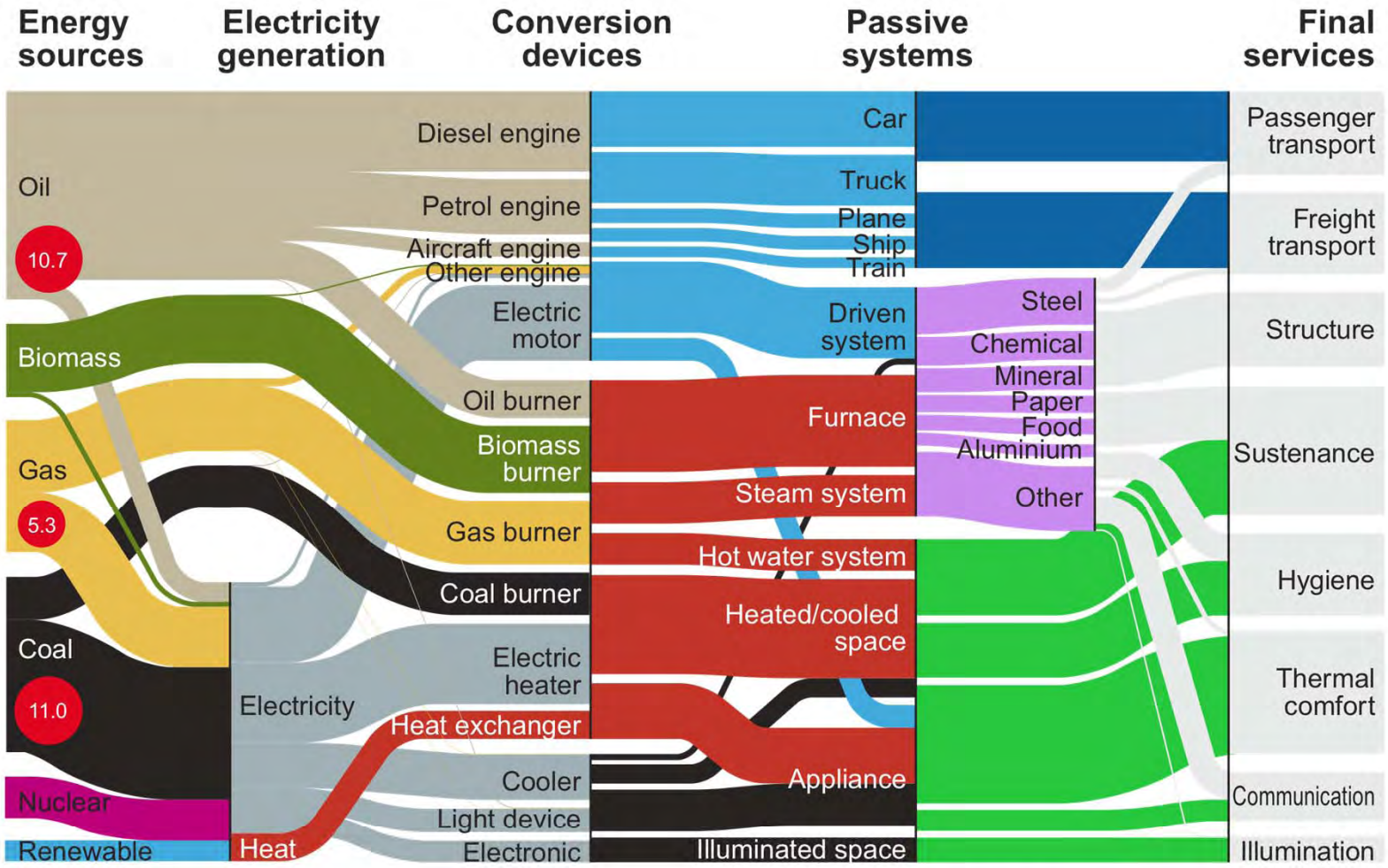

Global energy demand in 2005, total = 475 EJ

Global carbon emissions in 2005, total = 27 Gt CO_2

JM Cullen and JM Allwood
Energy Policy 38 (2010) 75–81

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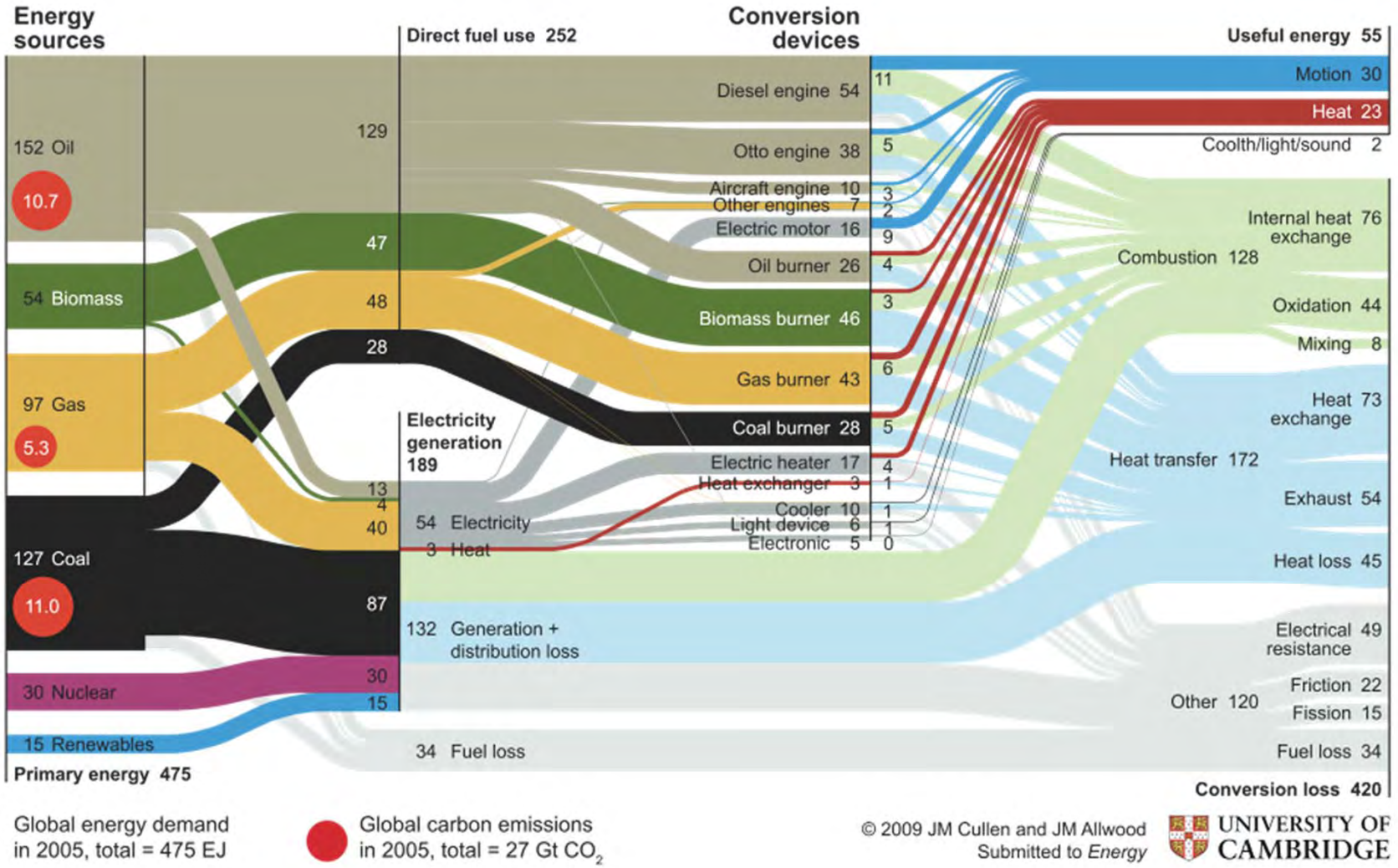
Theoretical efficiency limits in energy conversion devices (11%)



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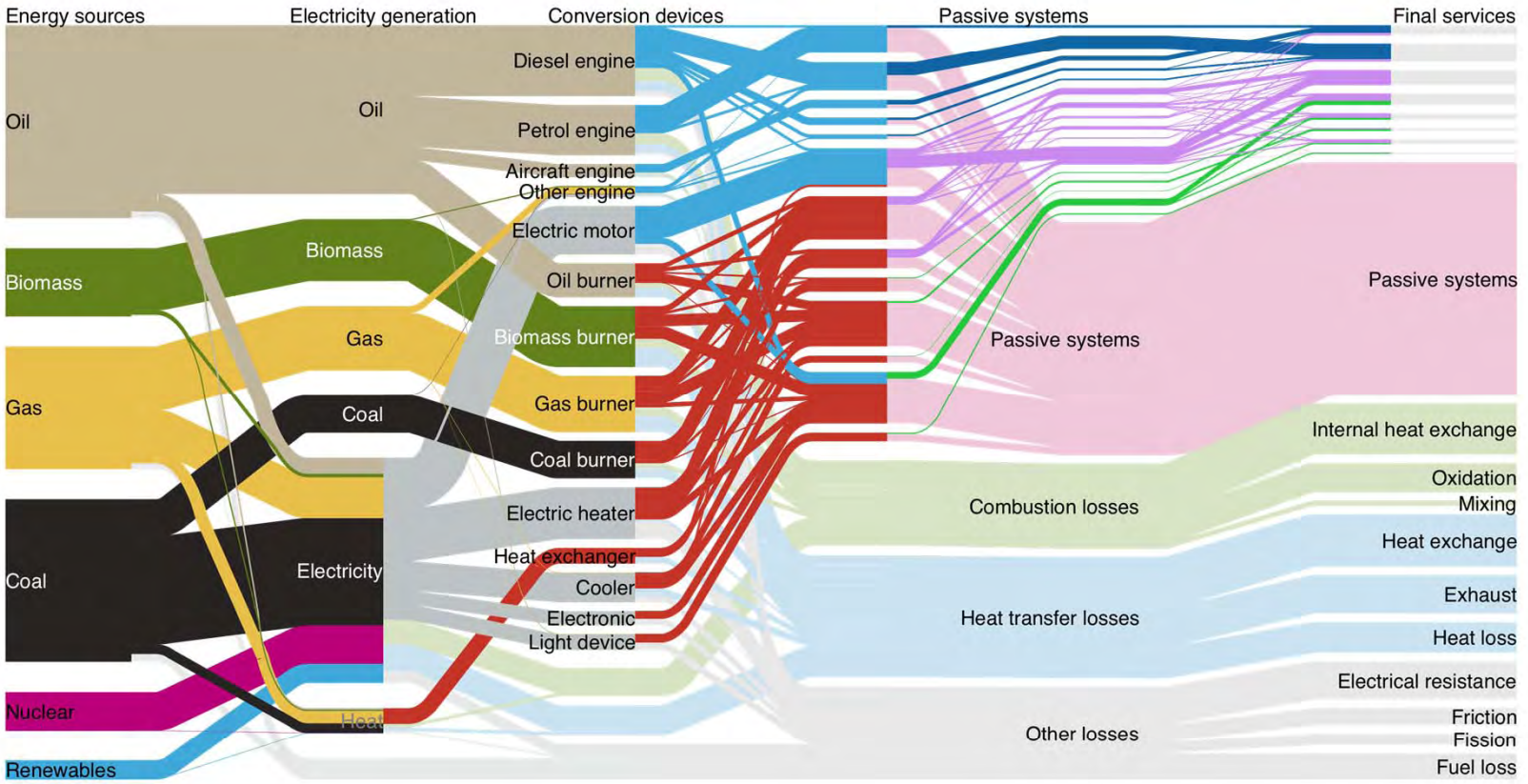
Practical losses in the global energy system (88%)



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Energy costs more than you think

Not only the energy bill, but also:

- Personnel for technical maintenance
- Investment in installations and appliances
- Different outsourced maintenance contracts
- Transaction and procurement costs
    - Management time, contract negotiation
- Environmental compliance costs (e.g. combustion installations, air pollution controls)
- Greenhouse gas emissions management (e.g. EU ETS)
- Loss of income due to power outages or other disruptions

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Energy cost reduction is achieved by:

- Understanding energy use
- Energy monitoring and benchmarking
- Developing an energy strategy
- Implementing an energy management system
- Implementing energy efficiency measures
- Energy purchase contract optimization

- Day-to-day decisions on the work floor and by management

"mindset" *{noun}*

a set of beliefs or a way of thinking that determines one's behavior, outlook and mental attitude.

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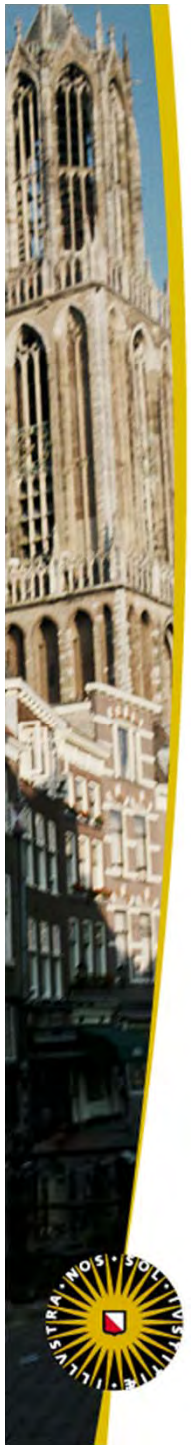

Why aren't all companies controlling their energy costs better?

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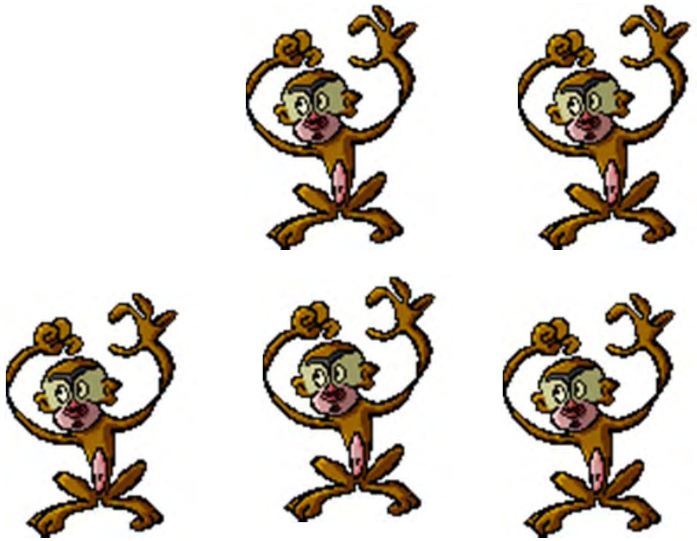
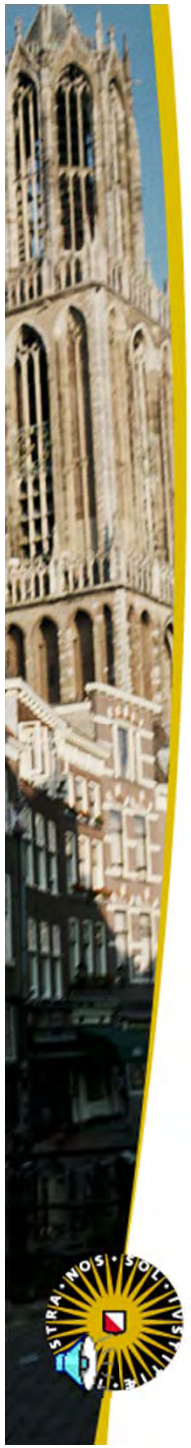
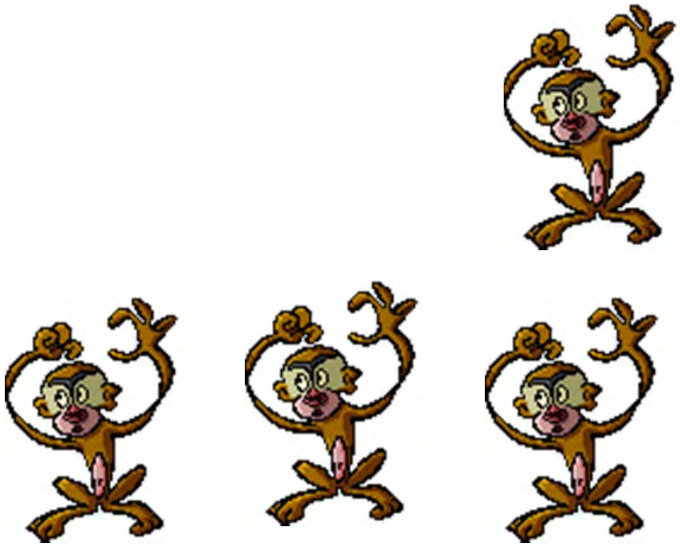
Monkey Theory



Source: Alan Ryan, SEI Ireland



Monkey Theory….



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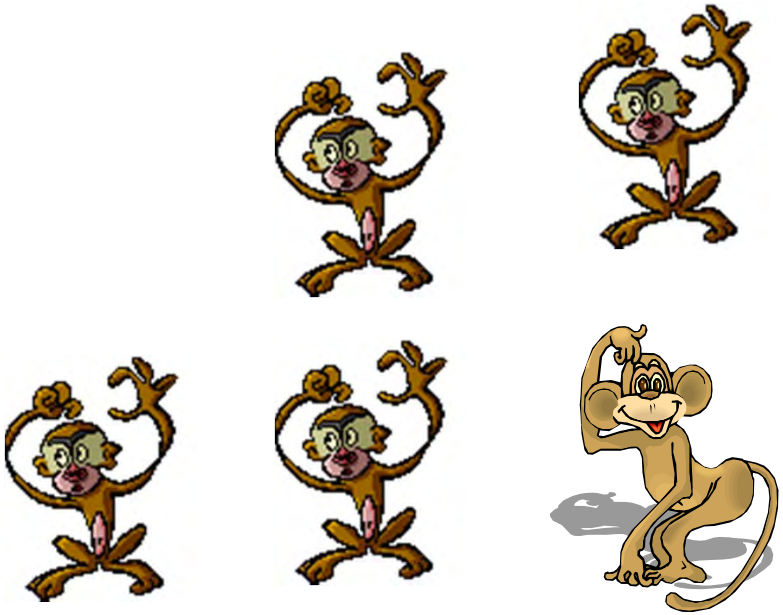
Monkey Theory.....



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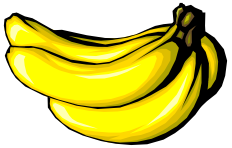
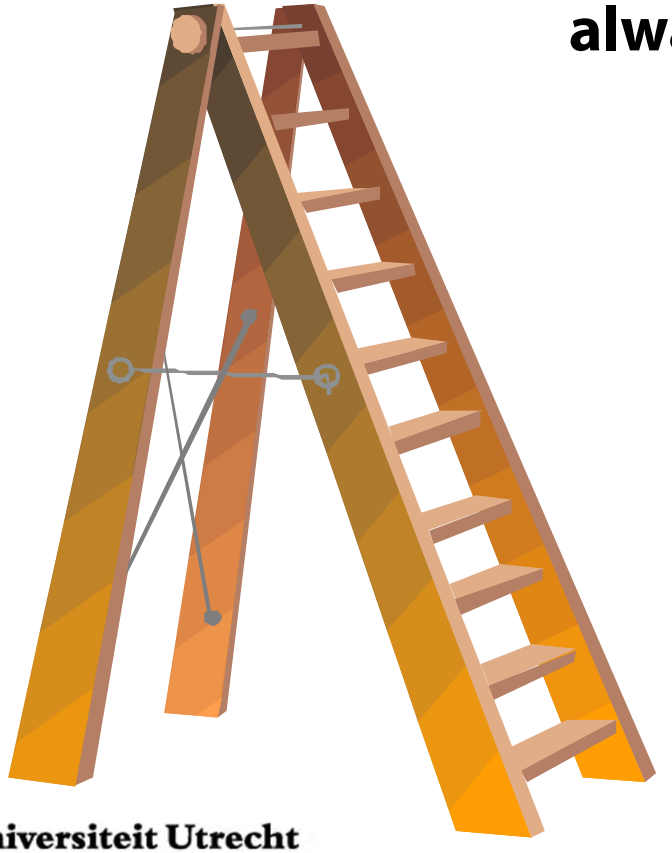
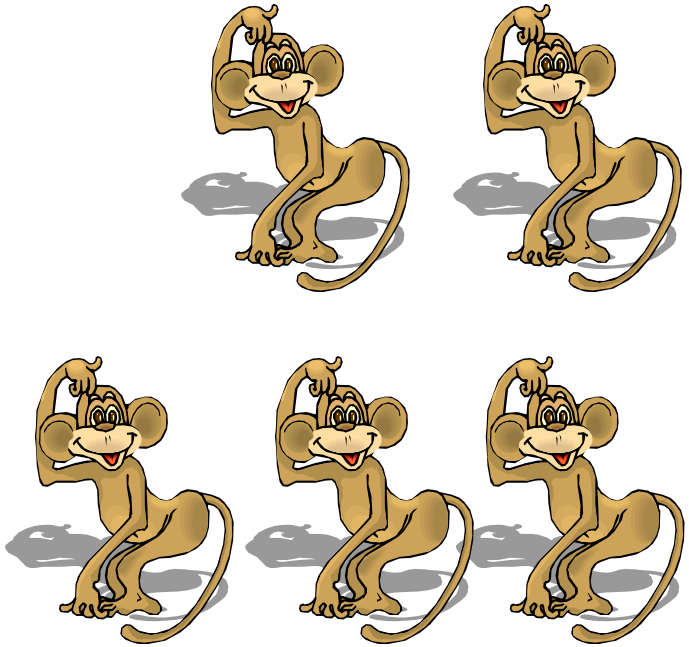
Monkey Theory.....





"Because that's the way it's always been done around here"



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Why don’t companies reach for the banana’s?

- Most programmes show that there are bananas available……but…
  - Lack of organisational support
  - Lack of information
  - Lack of personnel
  - Lack of funds
  - Lack of continuity
  - IN SHORT: NOT THE RIGHT MINDSET

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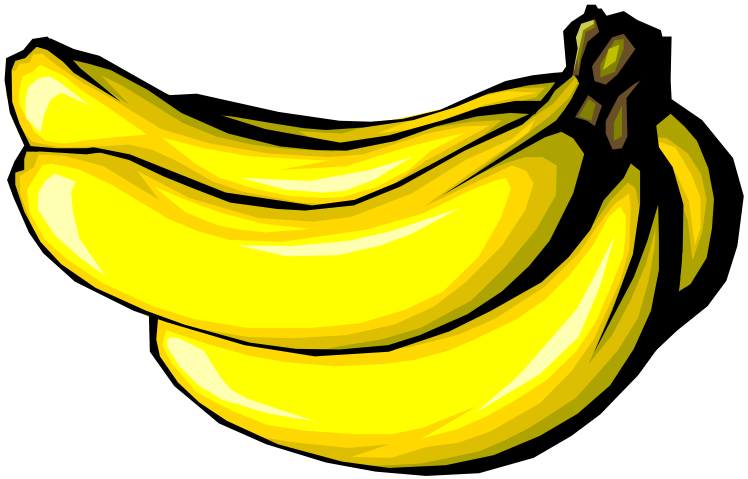
"We picked all the low-hanging fruit"



"75% of high-level decision makers view electricity costs as the least controllable category of business costs"

CFO Magazine, 1998

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Pitfalls in Energy Management

Typically considered a “technical issue”:

- Decentralized and not strongly organized
- Under-staffed or out-sourced
- Changes in management and organization
- Technology oriented
- Project and not program oriented
- Reactive
- Undervalued
- Considered capital intensive
- Lack of upper management support or involvement

Resulting in poor planning and decision making

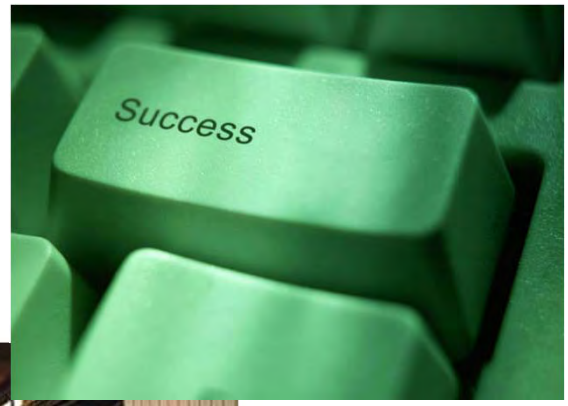
Energy Management

- **Successful management:**
  - Recognizes the “human factor”
  - Creates an organization-wide system and program for managing energy
  - Delivers sustained reductions over time and is designed for continual improvement
  - Relates itself to the core business of the organization

- **Businesses with formal energy management programs realize:**
  - energy savings
  - cost savings, and
  - greenhouse gas emission reductions

Success Factors for Energy Management

- Commitment of top management
- Clear and measurable targets
- Information and management systems in place
- Regularly assess and track performance
- Involvement of all levels in organization
- Stable organization
- Resources and time allocated
- Continuous program
- Excellent communication
- Networking
- External sparring partners
- Recognition



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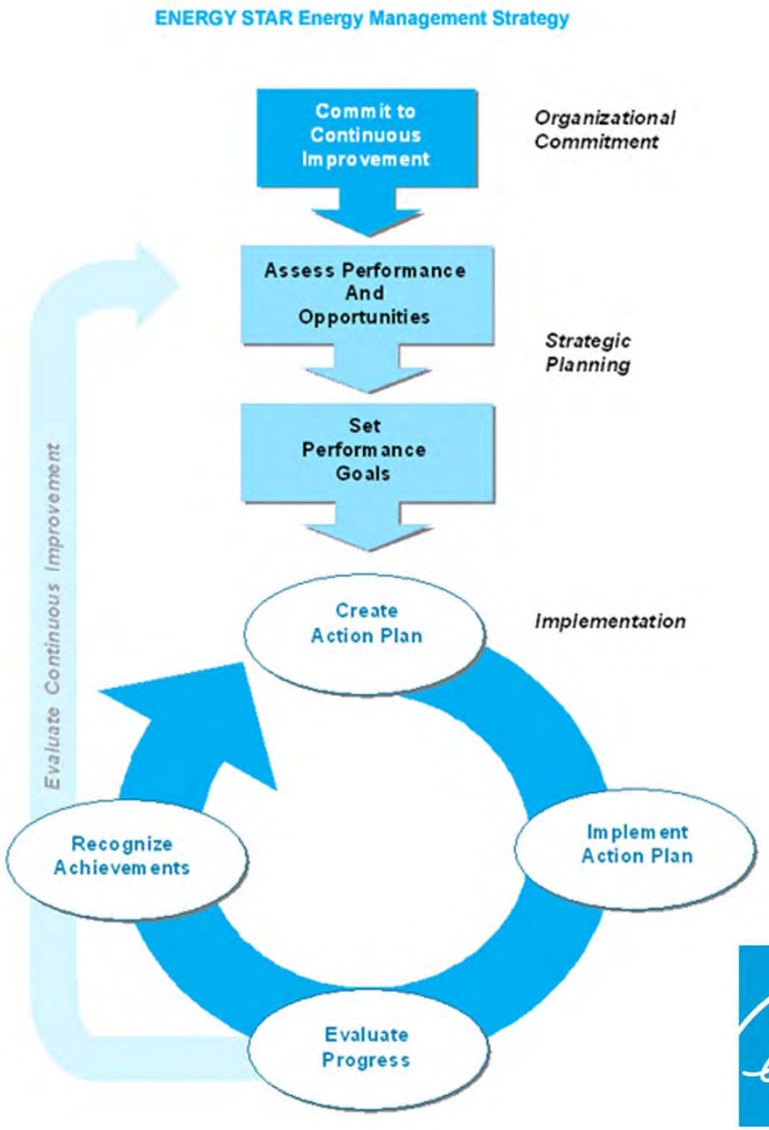
A Systematic Approach



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ENERGY STAR

Energy management: changing the mindset

1. Make commitment to continuous improvement
2. Assess performance
3. Set goals
4. Create action plan
5. Implement action plan
6. Evaluate progress
7. Recognize achievements

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1. Commitment

- **CEO involvement**
  - Clear message on importance of energy management
  - Communicate across company
- **Appoint an energy director**
  - Clearly assign responsibilities
- **Form a dedicated team**
  - Utilities and production (!)
- **Institute an energy policy**
  - Guidelines for corporate energy policy

3M's Energy Policy

3M Worldwide

Applicability
This Policy applies to all the 3M operations.

Introduction
The objectives of this policy are to improve energy consumption efficiency, reduce cost, optimize capital investment for energy efficiency, reduce environmental and greenhouse gas emissions, and conserve natural resources.

Policy Statement
3M will promote the efficient use of energy to produce and deliver products and services to its customers.

Policy Guidelines
- Improve energy efficiency continuously by establishing and implementing effective energy management programs worldwide that support manufacturing capabilities while providing a safe and comfortable work environment.
- Emphasize energy efficiency as a factor in product development and in process and facility design.
- Secure adequate and reliable energy supplies at the most advantageous rates and implement contingency plans to protect operations from energy supply interruptions.
- Encourage continuous energy conservation by employees in their work and personal activities.
- Drive further development of internal and external energy efficient and innovative technologies.
- Cooperate with governmental agencies and utility companies on energy programs.
- Support national energy efficiency policies.

Policy Approval
Corporate EHS Committee, revised Nov. 2004

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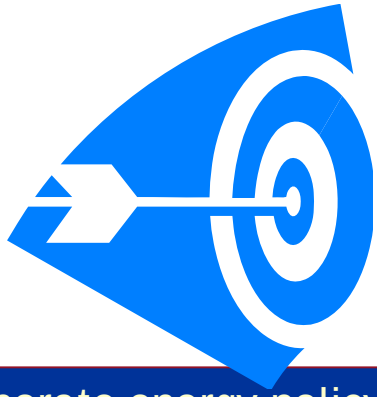
2. Assess Performance

- **Gather and track data**
  - "What you don't measure, you can't manage"
- **Establish baselines**
  - Baseline energy intensity/efficiency level for base year, using benchmarks
- **Benchmark**
  - Benchmarking provides insight in the efficiency relative to a reference (or *benchmark*) performance/technology
  - Benchmarking can help enterprises to identify inefficiencies and search for more efficient technology opportunities
- **Analyze energy use**
- **Technical assessments & audits**

3. Set Goals

- **Determine scope**
  - What will be included in energy policy?
  - Timeframe?
  - Stretch target?
- **Estimate potential for improvement**
  - Review performance data
  - Benchmarking
  - (Corporate) best practices
  - Audits (internal/external)
  - Comparison to peers
- **Establish goals**
  - Improve energy performance by 20% in 5 years (3M)
  - Reduce corporate energy use by 25% between 1995 and 2005 (GM)
- **Communicate goal across company**



Extend corporate energy policy to:
-Plants
-Offices
-National
-International
-Subsidiaries
-Suppliers
-Vendors
-Direct/Indirect energy use

Communicate!

- **Communication of action plan, targets and achievements is key to:**
  - Motivate employees
  - Increase customer loyalty
  - Demonstrate corporate responsibility
  - Build a broad base for energy efficiency
  - Make a lasting impact on the environment
- **Develop a communication plan**
  - Communicate to employees and senior-level management
  - Communicate to customers
  - Communicate to stakeholders

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4. Create Action Plan

- **Define technical steps and targets**
  - Determine a company-wide roadmap for energy management
  - Inventory of energy efficiency measures
  - Site-assessments
  - Select most effective and cost-effective measures
  - Develop energy plans (corporate/plant)
- **Determine roles and resources**
  - Establish corporate energy manager
  - Plant or site-energy managers
  - Determine responsibilities
  - Allocate time and funds for EMS
  - Determine procedures for resource allocation

Kaizen:
Kai = "change"
Zen = "better"

Corporate database for all Plant managers to access Good ideas for energy efficiency improvement (Toyota)

Kaizen event combines a quick technical assessment with brainstorming to develop a better solution (Kodak)

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5. Implement Action Plan

- **Create Communication Plan**
  - Company-wide campaigns
  - (Electronic) newsletter/posters
  - Intranet
  - Success stories
  - Weekly/Monthly Results (to management)
  - Use the right language!
- **Raise awareness**
- **Build capacity**
- **Motivate**
- **Track and monitor**

Examples:

Booklet for employees on saving energy at home (Toyota)

Stickers at light switches (Kodak)

Intranet with weekly highlights (3M)

Express savings in sales-Equivalents

6. Evaluate Progress

- **Measure results**
  - Determine key performance indicators
  - Develop and implement monitoring system
  - Benchmark performance (over time/across plants)
  - Communicate results
- **Review action plan**
  - Evaluate performance
  - Explain results/changes?
  - What worked? / What didn't work?
  - Adapt plan where necessary

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7. Recognize Achievements

- **Provide internal recognition**
  - Provide awards for operation and technical people
  - Visibility of program achievements (team/site)
- **Receive external recognition**
  - In many countries voluntary programs can recognize achievements
  - Positive PR for company
  - Share recognition between CEO and team members

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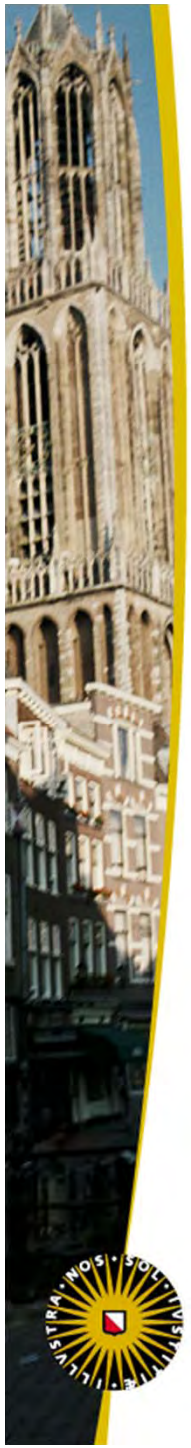

Thank you for your attention

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