



LAND OF THE CURIOUS



 FUTURE ENERGY SOLUTIONS

INDUSTRIAL ENERGY EFFICIENCY? WHERE ARE WE GOING

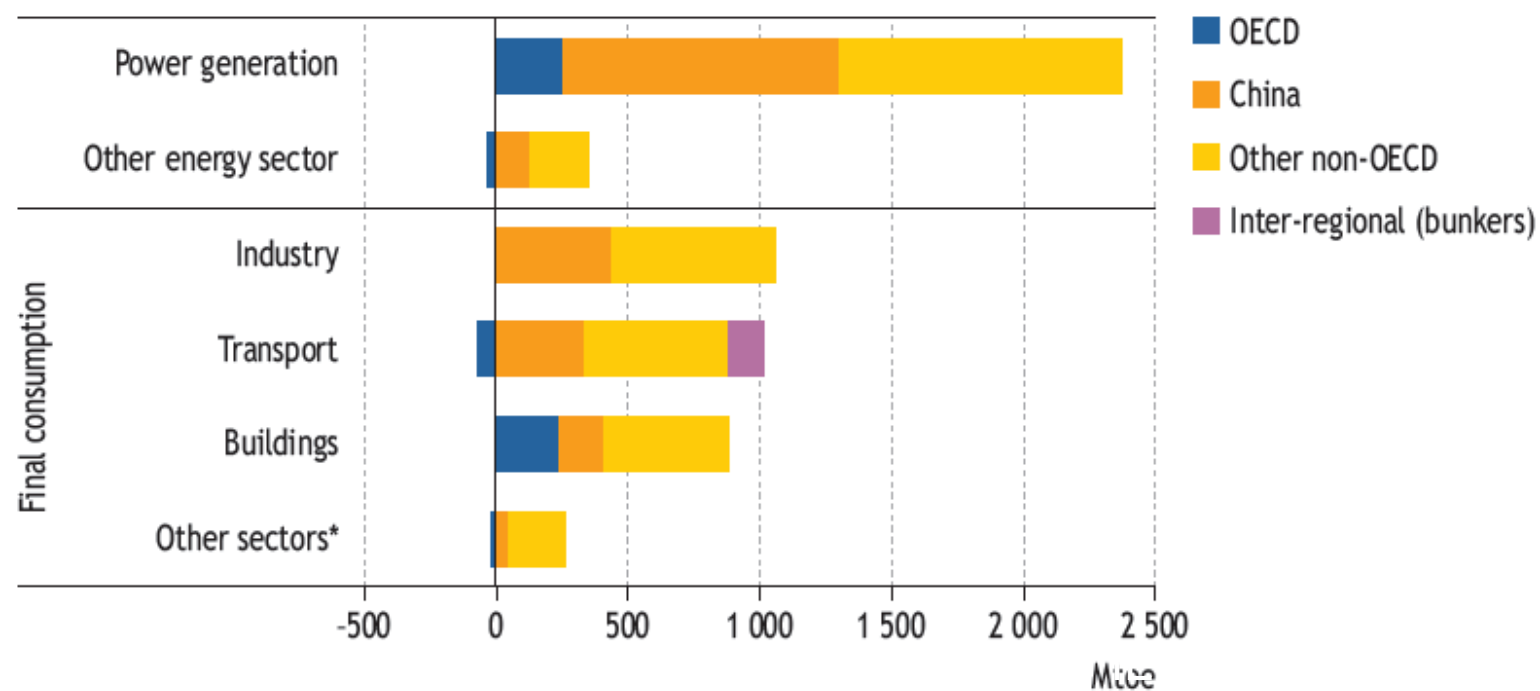
Esa Vakkilainen, LUT



INDUSTRY

- ▶▶ Industrial sector uses about 37% of the world's total delivered energy.
- ▶▶ Industrial energy demand is predicted to grow rapidly, at 1.4% per year
- ▶▶ Highest growth is in South-East Asia
- ▶▶ OECD focuses in CO₂ reduction not in energy efficiency

CHANGE IN INDUSTRY ENERGY USE 2008-2030





TOWARDS ENERGY EFFICIENCY

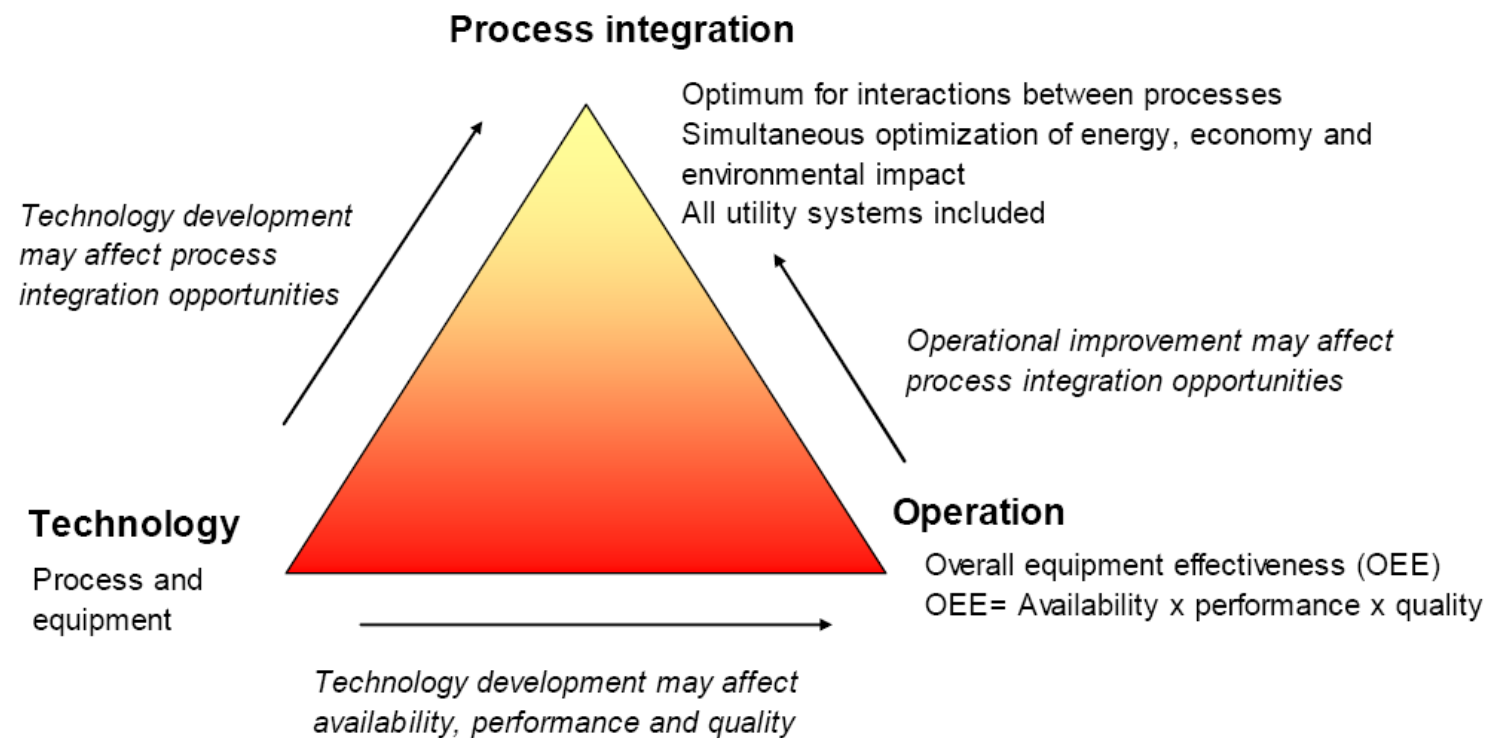


ENERGY MANAGEMENT

- » Energy management is the strategy of meeting energy demand when and where it is needed.
- » This can be achieved by adjusting and optimizing energy using systems and procedures so as to reduce energy requirements per unit of output while holding constant or reducing total costs of producing the output from these systems.
- » In any industry, the three top operating expenses are energy (both electrical and thermal), labor and materials.

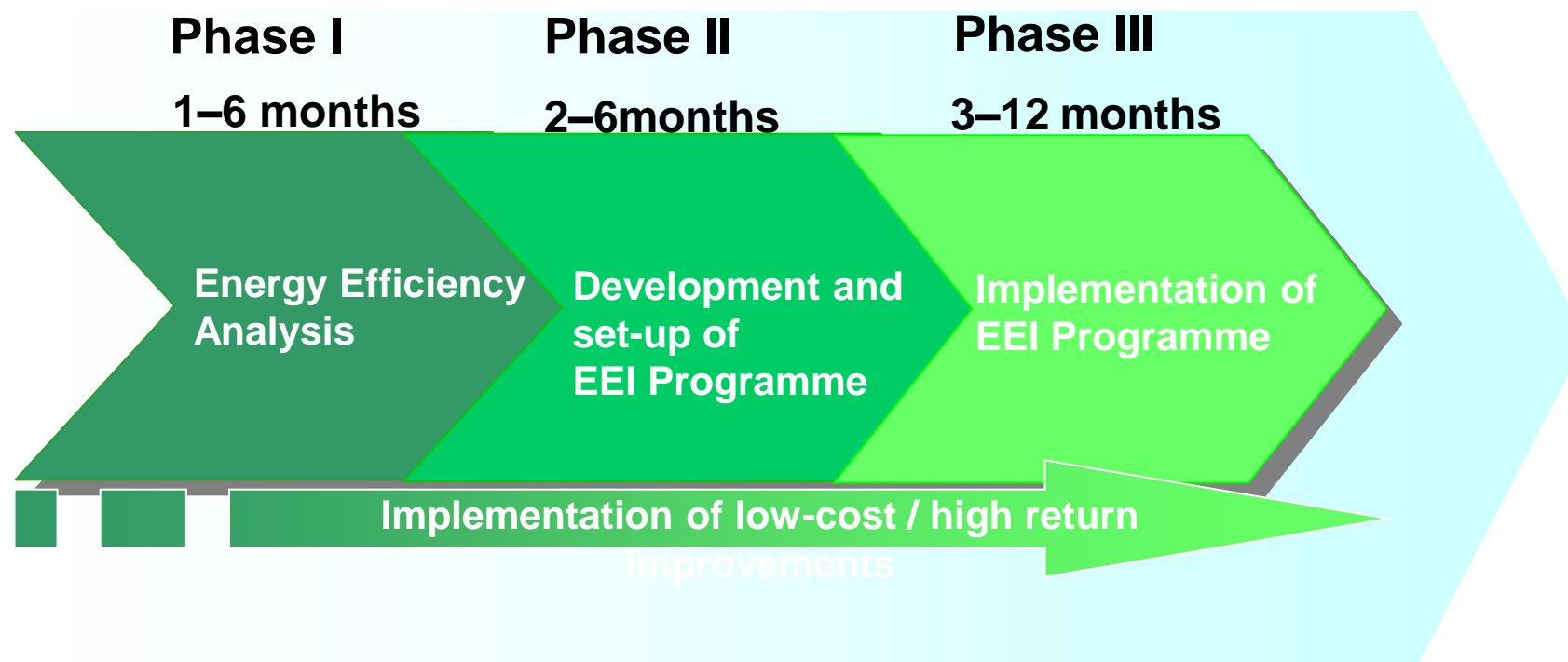
To minimize energy costs/waste without affecting production and quality and to minimize environmental effects

IMPROVEMENT OF ENERGY EFFICIENCY



Sivill, Manninen, Ahtila, 2009

ENERGY EFFICIENCY IMPROVEMENT (EEI) PROGRAMME FOR A POWER PLANT (MOTIVA)

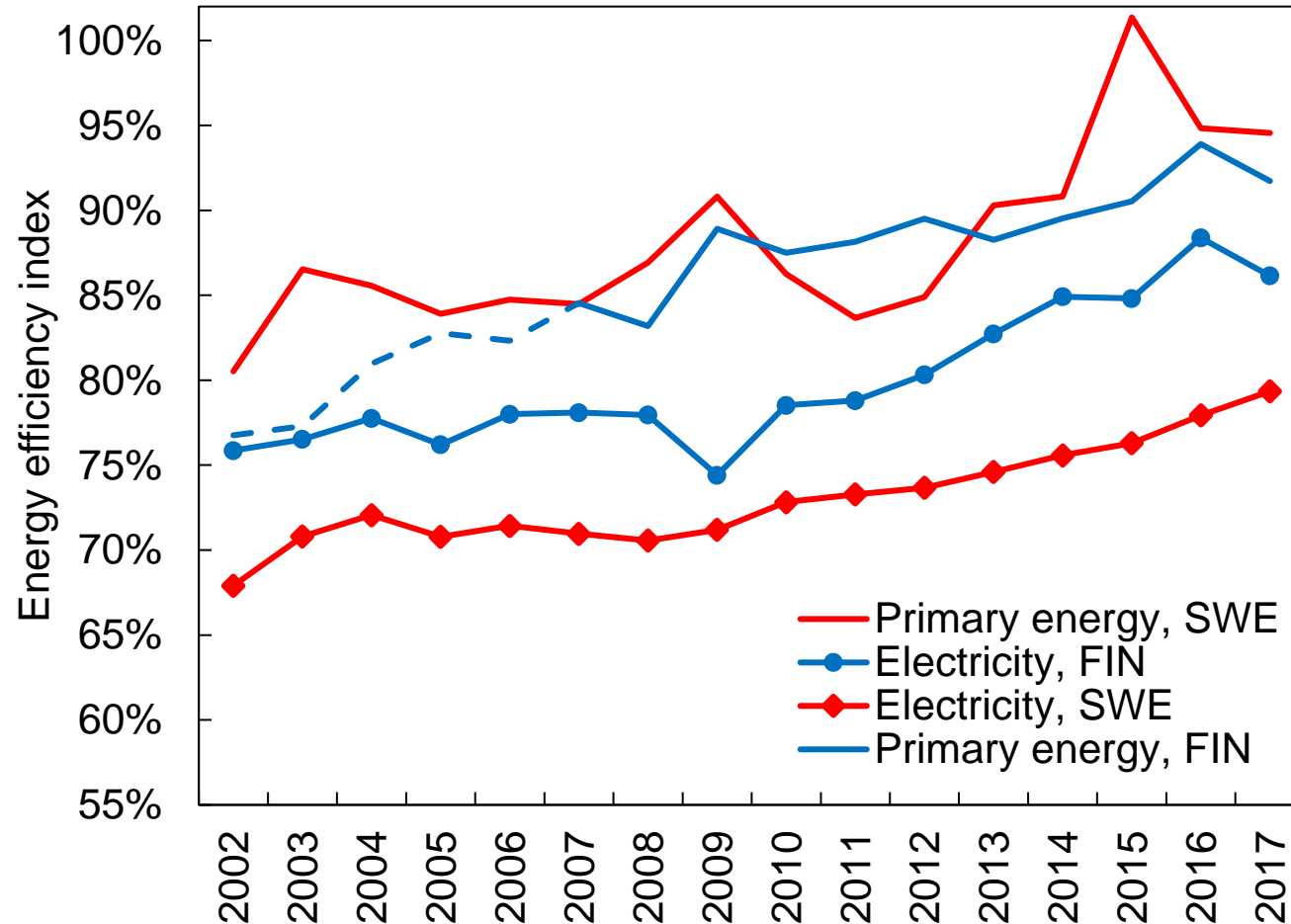


CASE STUDY - IMATRA MILL

- **Site:** Stora Enso, Integrated Pulp and Paper Mill, Imatra, Finland.
Total production approximately a million tonnes a year.
- **Project:** Power Plant Energy Efficiency Analysis as part of Finnish Energy Conservation Scheme.
- **Scope:** BFB boiler, gas boilers, NCG boilers, steam turbines, evaporation plant, recovery boilers, causticizing plant and lime kiln.
- **Findings:** Initially > 100 energy efficiency improvement ideas, 18 ideas selected for final saving calculations
- **Savings:** Identified annual energy cost savings potential > 1.0 MEUR



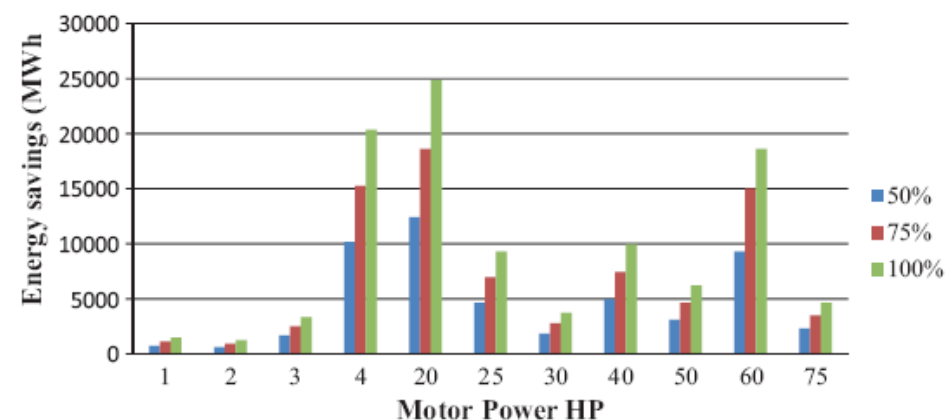
Development of energy efficiency in P&P



INNOVATIONS

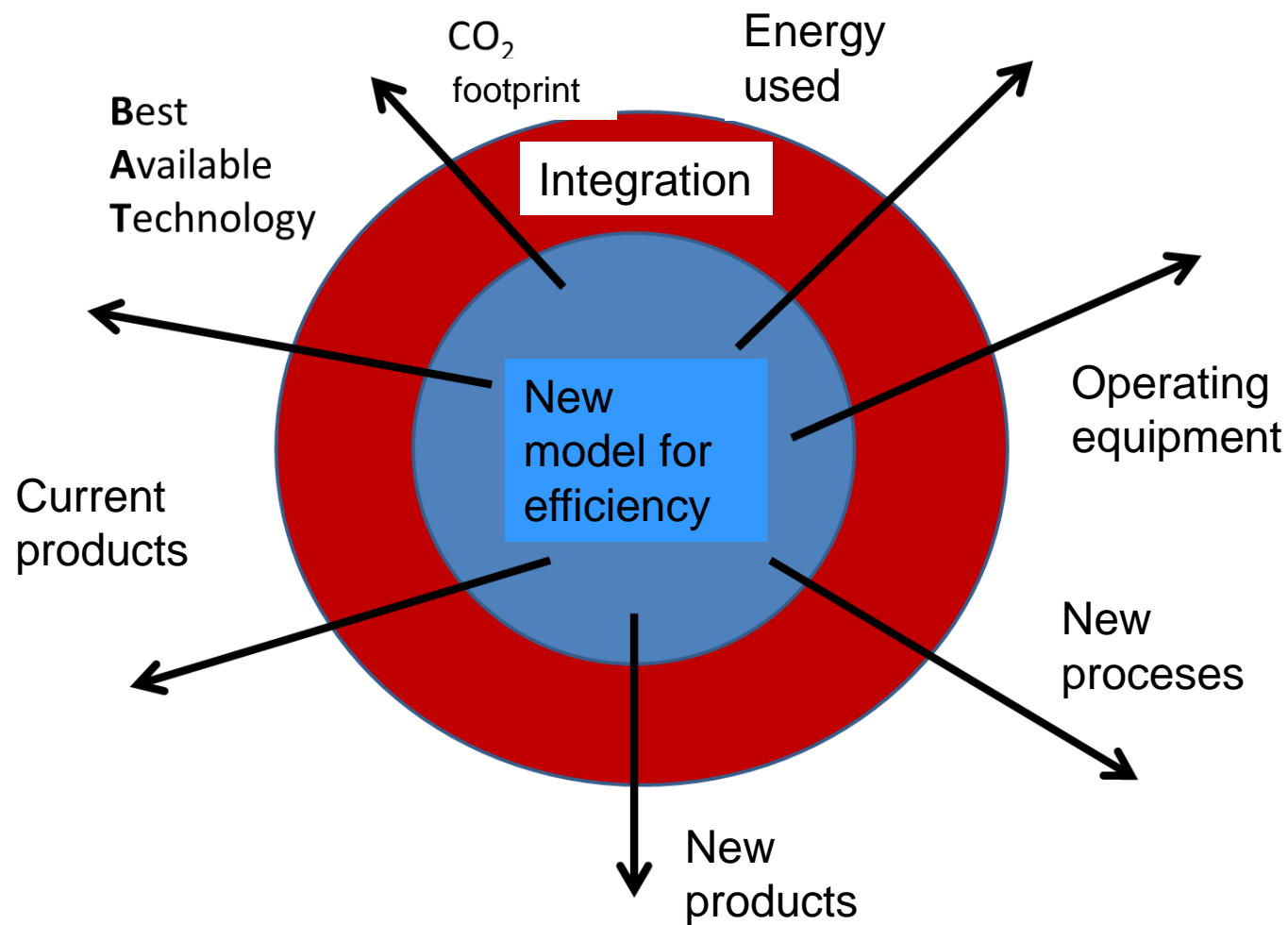
ENERGY SAVING – HIGH EFFICIENCY MOTORS

- » improved steel properties,
- » thinner laminations,
- » increase conductor volume,
- » modified slot design,
- » narrowing air gap,
- » improved rotor insulation,
- » more efficient fan design.



- » Now new EU MEPS standards out – ABB has very efficient model out thanks to LUT

TOTAL MODEL



Future development

➤➤ Fuel switching continues

- Banning of fossil fuels (e.g. coal in Finland)
- Increase in CO₂ prices? (Emission trading)
- The role of electrification?
- Companies' images

➤➤ Improvement of energy efficiency continues

- Still a high potential to reduce energy use
- Companies' competitiveness

➤➤ Industry as a source of negative emissions

- Capturing part of bio-based emissions could turn industry a negative emitter

➤➤ New energy technologies and higher integration rate

- E.g. BECCS, eFuels
- Efficient production of several products in the same site
- Average size and complexity probably continue to increase



»» Kiitos

