Energy Efficiency

The potential for selected investment opportunities

Industry Overview

Equity | Pan-Euro | Energy Efficiency
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Growing impetus to improve energy efficiency

The world is now facing unprecedented energy challenges resulting from high oil and gas prices, the increasing import dependency of major consuming nations and mounting evidence of climate change. The pressing need to reduce CO_2 emissions and the cost of energy consumed has given added impetus to the drive to improve energy efficiency. While there has been a clear shift of resources and investor attention towards renewable/ clean energy, energy efficiency has until now had a much lower profile as investors, we think, tend to view this as an important trend but believe that it is one that will only play out over time. We highlight in this report the sectors which are most directly impacted and which in our view represent the best investment opportunities.

Potential for both cost and CO_2 savings is material

The relatively low-cost energy savings and carbon emission reduction potential that could come from improving energy efficiency in buildings, transportation, industrial processes, etc, is still fairly under-explored. One of the reasons for this is the sheer breadth and complexity of the challenge, as it involves billions of small emitters. Governments also face the difficultly of trying to stimulate innovation in the supply chain to provide more energy-efficient products while at the same time trying to influence consumer purchasing patterns. The potential for costs savings is material however at €200bn per annum in Europe alone.

Focus of the report

The focus of this report is looking at the potential for greater energy efficiency, and investment opportunities, across several key areas: (1) building insulation; (2) fuel efficiency in autos; (3) more effective lighting systems; (4) reducing stand-by losses; and (5) greater energy efficiency in applications and industrial processes. In analysing the threat to the rollout of more energy-efficient measures globally we have focused to a large extent on China – as although it currently accounts for just 5% of global energy demand, its power sector alone is forecast to account for around 15% of global demand growth to 2020. Tighter energy efficiency standards here are thus crucial to the trajectory of global energy demand growth.

The potential for selected investment opportunities

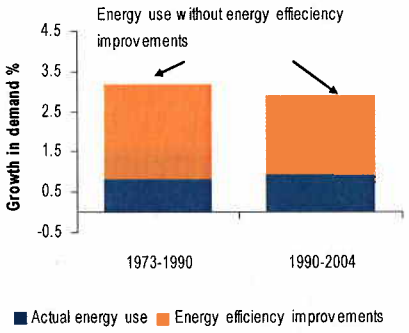
1. Introduction

The world is now facing unprecedented energy challenges resulting from high oil and gas prices, the increasing import dependency of major consuming nations and mounting evidence of climate change. The pressing need to reduce CO_2 emissions and the cost of energy consumed has given added impetus to the drive to improve energy efficiency. While there has been a clear shift of resources and investor attention towards renewable energy, energy efficiency remains an area that is relatively under explored. One of the reasons for this is investors, we think, tend to view this as an important trend but believe that it is one that will only play out over time.

The international energy agency (IEA) estimates that more than half the increased demand for energy between 1990 and 2004 was met through improvements in energy efficiency (see Chart 1). So energy efficiency has historically played a key role in reducing energy demand and CO_2 emissions but there is a need to increase the rate of improvement. The European Union estimates that Europe wastes at least 20% of its energy, the direct cost of which at an oil price of US$48/bl is more than €100bn annually. Fuel savings (net of tax) are significantly higher at current oil price levels, at c. €200bn annually in Europe alone (see Chart 3). The additional investment in more efficient and innovative technologies is very clearly much lower than anticipated fuel savings.

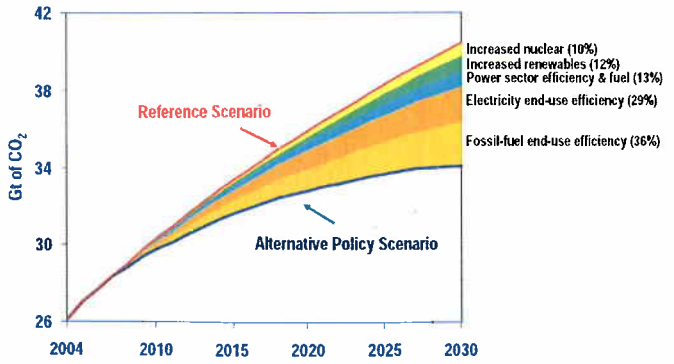
Improved end-use efficiency accounts for nearly two-thirds of total energy savings and avoided CO_2 emissions in the IEA's "alternative energy policy" scenario (see Chart 2). Fuel savings from more efficient vehicles, industrial processes and heating applications contribute 36% and lower electricity demand from more efficient appliances, industrial motors and buildings 29%.

Chart 1: Impact of energy efficiency improvements on final energy use (OECD)



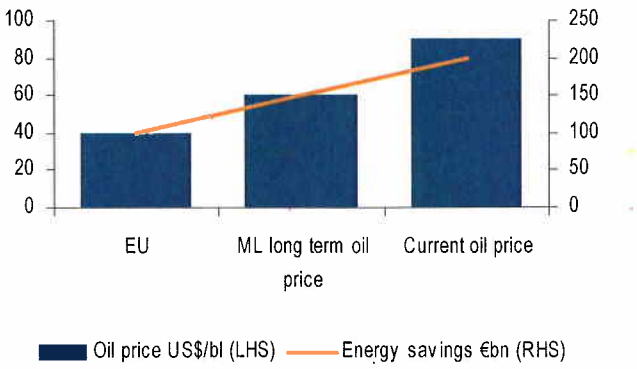
Source: IEA

Chart 2: The IEA expects 2/3rds of projected CO_2 emission savings to come from greater energy efficiency



Source: IEA

Chart 3: Over €200 bn per annum in energy savings at current oil prices



Source: European Union, Merrill Lynch

2. Scope of the report

The focus of this report is the potential for greater energy efficiency, and investment opportunities, across several key areas:

- building insulation;
- fuel efficiency;
- more effective lighting systems;
- reducing stand-by losses; and
- greater energy efficiency in applications and industrial processes.

Our view is that companies in these sectors are now faced with a significant market opportunity (as well as a threat for laggards) as policy changes look set to force a structural shift in demand patterns.

3. Key sectors

Capital Goods

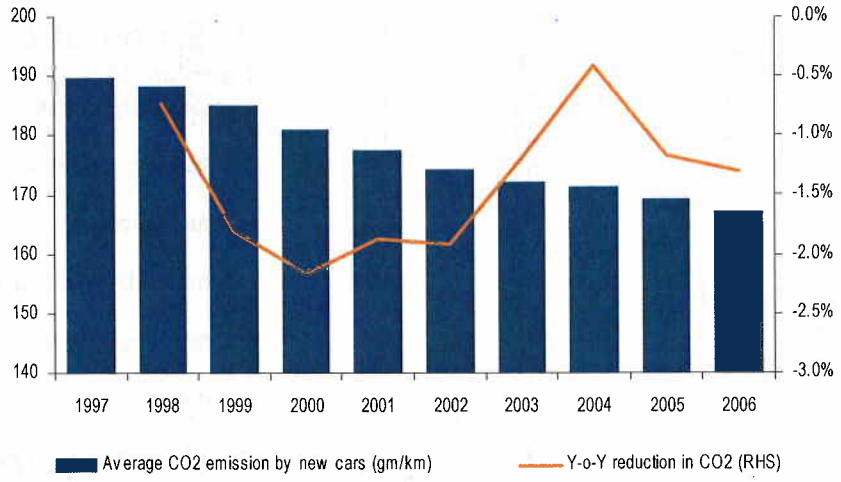
Although efficiency and productivity have been key demand drivers for capital goods for some time, the need to reduce emissions and energy scarcity has added impetus to the need to invest in reducing energy consumed. The IEA, based on the adoption of available best practices and technologies, estimates that the global manufacturing industry could improve its energy efficiency by between 18% and 26% overall (and at the same time reduce the sector's CO_2 emissions by 19-32%). While not all of these potential savings are likely to occur without a strong framework of regulation and/or incentives, the potential over time is considerable.

Autos

The automotive industry is increasingly facing constraints on oil consumption and emissions. Improvements in vehicle and engine technologies have been largely offset by consumer preferences for larger cars. Increased demand for passenger travel and limited reduction through energy efficiency means that energy use in the automotive industry has increased by around 25% since 1990 with a corresponding increase in CO_2 emissions.

The growth in passenger transport and the low rate of improvements in energy efficiency across the industry mean that this sector has been particularly vulnerable to negative legislative changes. We are now seeing that the confluence of energy security concerns and growing awareness of climate change has fuelled more stringent and widespread regulations on CO_2 emissions and energy efficiency. European companies have not come close to meeting the voluntary targets set in 1996, but nonetheless have all improved CO_2 performance since 1997, despite consumer demand for larger, faster, heavier vehicles and regulations prescribing increasingly stringent safety equipment levels.

Chart 4: CO_2 emissions per vehicle (g/km)



Source: SMMT

With the auto manufacturers now concentrating on improving CO_2 performance, and launching new smaller vehicles, overall CO_2 performance is starting to improve, albeit slowly, and less quickly than promised by the industry in its 1998 voluntary agreement with the EU Commission.

Building

Energy consumption within residential, commercial and public buildings accounts for about 40% of total estimated global energy use – the largest single component. IEA estimates suggest that the potential savings from improvements in the end-uses of heating, cooling, ventilation and hot water is at least 500 Mtoe per year (or 30% of projected energy use for the OECD by 2030). The UN IPCCC in their Mitigation of Climate Change report (*May 4th 2007)* likewise identified the buildings sector as the segment of the market with the largest potential for energy efficiency gains and importantly the sector where the most gains could be made for the lowest cost.

Legislation (predominantly at national level) has emerged in the past five years as an important factor behind more stringent building controls and, although standards vary across Europe, the underlying trend is very much towards an environment of more, and higher, insulation standards in all forms of new construction. This may not simply mean more insulation, but also the use of higher-value products, for example insulation panels and boards rather than glass or mineral fibres.

Energy-efficient products/solutions

The market for power semiconductors is expected to grow by around 9% per annum through 2010 driven by the need to improve energy efficiency throughout the electricity supply chain from generation, through distribution to end consumption. Focusing on consumption, there are a number of ways that chip companies can lower the amount of energy required including reducing standby power, lowering heat loss in power supplies and introducing variable speed drives in motors.

4. Factors driving energy efficiency

Policy: ability of governments to drive change

The relatively low-cost energy savings and carbon emission reduction potential that could come from improving energy efficiency in buildings, transportation, industrial processes, etc, is still fairly under-explored. One of the reasons for this is the sheer breadth and complexity of the challenge, as it involves billions of small emitters rather than, for instance, the limited number of big companies currently subject to heavy regulation under the European emissions trading scheme (ETS). Governments also face the difficultly of trying to stimulate innovation and competition in the supply chain to provide more energy-efficient products/solutions, while at the same time trying to influence consumer purchasing patterns.

In each of the key industries, policies and/or legislation have been introduced that are set to increase the market share of energy-efficient products/solutions. In Europe, a comprehensive framework of directives and regulations to improve energy efficiency in energy-using products, buildings and services is now in force in Community law.

It includes:

- the Eco-Design Directive;
- the Energy Star Regulation;
- the Labelling Directive;
- the Directive on Energy End-Use Efficiency and Energy Services; and
- the Energy Performance of Buildings Directive

The Commission will also this year begin the process of adopting minimum energy performance standards (eco-design requirements) for 14 priority product groups including boilers, water heaters, consumer electronics, copying machines, televisions, standby modes, chargers, lighting, electric motors and other products.

Changing consumer perceptions

Increased capital spending to improve energy efficiency is generally more than offset by savings in consumers' energy expenditure over the life of equipment. In addition there are the benefits of energy security and lower CO_2 emissions, but consumers generally are unwilling to assign a monetary value to these benefits.

Mandatory energy performance requirements and labels are viewed as highly cost-effective policy tools for reducing the average energy consumption of equipment without limiting consumer choice or triggering sustained increases in prices.

In addition, taxation is increasingly being used as a policy tool, for instance in the automotive sector, where taxes linked to CO_2 emissions are becoming the norm. New taxes have broadly come in three forms:

- higher new car purchase taxes for high CO_2 emission vehicles;
- higher road taxes for larger CO_2-emitting vehicles; and
- higher congestion charges for high CO_2 emission vehicles.

Eleven European countries already use CO_2 emissions (or fuel efficiency) as the basis for an annual vehicle tax, with sliding scales in many countries.

Table 1: UK road tax from 31 March 2007

g/km	12 mth tax	6 mth tax
<100	NIL	NIL
101-120	35	NIL
121-150	115.00	63.25
151-165	140.00	77.00
166-185	165.00	90.75
186-225	205.00	112.75
>225	300.00	165.00

Source: UK Government

UK company car taxes are also heavily skewed on CO_2, with vehicles under 140g/km taxed on just 15% of the car value to 35% of the car value for cars emitting over 240g/km.

5. Analysis of factors driving change and threats to implementation

Building insulation

Cost of CO_2 abatement

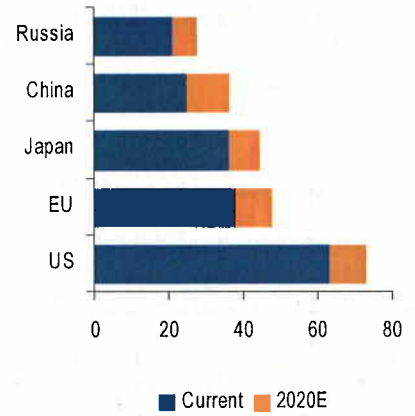
In the table below we show Merrill Lynch estimates for installation cost and CO_2 savings from various forms of insulation. In every case the savings over the lifetime of the equipment significantly outweigh installation costs, hence the negative cost per ton of CO_2 abated.

Table 2: Cost of abating CO_2 is negative in all scenarios as lifetime cost savings far exceed installation costs

Measure	Annual saving (£/yr)	Installed cost £	Installed payback	CO_2 saving per year (tons)	Lifetime (years)	CO_2 cost £/ ton
External wall insulation	300	1,800	6 years	2.5	40	-102
Loft insulation (0-270mm)	100	500	5 years	1.0	40	-88
Cavity wall insulation	75	500	7 years	0.8	40	-83
Hot water tank jacket	20	40	2 years	0.1	10	-90
Draught proofing	20	200	10 years	0.2	20	-50

Source: Merrill Lynch Estimates, The Energy Saving Trust (UK)

Chart 5: China's floor space per capita is growing fast (figures in m2 per capita growth)



Source: McKinsey Global Institute –Curbing global energy demand growth, May 2007

Specific factors driving change

Product substitution means that high insulation materials are taking market share from more 'traditional' materials, mainly driven by the higher insulation (both thermal, and increasingly acoustic) standards being demanded in new build specification. And while (to date) little has been attempted retrospectively, in terms of the stock of existing buildings, there is growing evidence that where repair, maintenance and/or improvement work is being undertaken, specifiers are taking the opportunity to raise insulation standards and, hence, the absolute value of materials specified. Thus current legislation is a key demand driver for the building insulation providers.

Whether legislators go further and seek to formally tackle the issue of insulation standards in existing buildings is more difficult to assess. We are inclined to believe that because of the cost implications of such a step, it is unlikely that any substantive progress will be made in this area in the short to medium term. That said, we do not entirely discount the possibility of a long-term move to tackle retrospectively insulation standards in existing buildings.

Threats to widespread implementation

The main driver of energy demand in buildings is floor space growth, due to the need for space heating and cooling. Floor space varies markedly across the globe, with the main drivers being GDP and population density. In developing countries, the demand for floor space is growing rapidly. A key threat is that the lax implementation of new, more stringent, building regulations, particularly in the developing world, means that buildings are being constructed without an improvement in energy efficiency and expensive retrofit economics will then represent a real barrier to improving energy efficiency going forward. China in particular is experiencing an unprecedented construction boom with 2 billion square meters of new commercial and residential floor space added every year, according to the IEA. Their estimates are for 800 million square meters of residential floor space to be built annually to 2030 to accommodate the growth in the urban population and a demand for larger dwellings. Energy efficiency in buildings in China is still low and varies widely by region with compliance rates with building standards in new buildings at only 8% in southern regions, compared to 60% in northern regions.

In addition, a key barrier to higher levels of energy efficiency in buildings is the very different incentives for landlords and tenants, as landlords have a limited incentive to invest in energy-efficient measures as the tenant typically pays the energy bills. Also, commercial buildings typically have a high turnover rate, which reduces the payback time required from energy-saving investments, creating an additional barrier.

Lighting systems

Cost of CO_2 abatement

To illustrate the potential cost savings from implementing energy-efficient lighting in the home, the table below compares the annual cost of a 100W incandescent light socket and the equivalent compact fluorescent solution.

Table 3: Shifting to energy-efficient lighting could reduce cost by over 60% per annum

GBP	Compact fluorescent	Incandescent
Cost/bulb	6.00	0.50
Life (years)	5	1
Electricity cost/yr	1.94	7.79
Total cost/yr	**3.14**	**8.29**
Saving	62%	

Source: Which? September 2006, Merrill Lynch estimates

Chart 6: Philips estimates that power consumption can be reduced by over 50% in most lighting applications

Area of lighting	Energy saving	CO2 savings per lamp per year
Road lighting	HPL → 57% → CosmoPolis	109 kg CO_2
Shop Lighting	Halo → 80% → CDM	115 kg CO_2
Office & Industrial Lighting	TL8 → 61% → TL5	77 kg CO_2
Home Lighting	GLS → 85% → CFLi	34 kg CO_2
LEDs	GLS → 82% → LED	34 kg CO_2

Source: Philips

Specific factors driving change

Several countries have announced regulatory measures that either will, or are likely to, result in the removal of inefficient incandescent lamps from the market. These include Australia, which has committed to phasing out low-efficacy incandescent lighting by 2010; the US, specifically California, which has legislation under development; and the UK, which has been supporting CCFL uptake in substantial volumes. The European Commission is also beginning a study to explore regulatory options.

In the longer term, we expect light-emitting diodes (LEDs) to enter mainstream lighting applications. The development of high-brightness LEDs emitting white light and with long operational lives is driving adoption in niche applications at present but we think that over time they will be used in domestic lighting. LED energy efficiency is currently in line with that of compact fluorescent solutions, but the higher manufacturing cost means that they have not yet started to be used as a substitute for mainstream incandescent and fluorescent lighting.

The key advantages of LED are: (1) low power consumption driven by the highly efficient conversion of energy into light, resulting in lower consumption of energy requiring lower voltage and no maintenance; (2) long life – on average LEDs can last 100,000 hours, or 11 years, even under extreme conditions; (3) variety of colours; (4) faster response time; and (5) environment friendly with lead- and mercury-free technology.

The disadvantages for LEDs include higher cost (partially due to the sorting

requirements of LEDs), problems with heat dissipation, and less standardisation.

Table 4: Advantages and disadvantages of LEDs

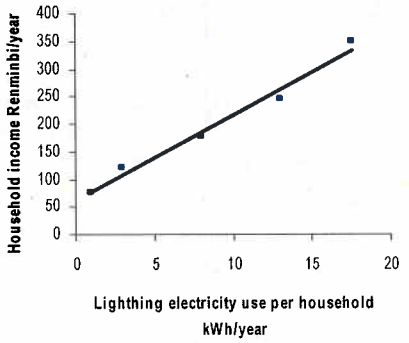
Advantages	Disadvantages
longer lifetime	higher costs
lower power consumption	heat dissipation
smaller form factor	less standardisation
thinner design	sorting requirement
no mercury content	

Source: Merrill Lynch

Threats to widespread implementation

As with appliance penetration rates per household, lighting intensity is projected to increase significantly with household income growth. Several countries have announced regulatory measures that either will, or are likely to, result in the removal of inefficient incandescent lamps from the market. Elsewhere there is little in the way of legislation, which may present a major barrier to market share gains.

Chart 7: Lighting intensity increases with household income growth



Source: McKinsey Global Institute –Curbing global energy demand growth, May 2007

Reduction of stand-by losses

Cost of CO_2 abatement

Standby power is responsible for 5-10% of total electricity use in most homes and roughly 1% of global carbon dioxide emissions, according to the IEA, however new technologies have become available that make it possible to reduce standby power by as much as 90% mainly through higher efficiency power supplies and improved design of circuitry. We show in the table below estimates of the cost of stand-by power consumption per annum for several household devices.

Table 5: Standby power consumption

Device	Standby power consumption (W)	Annual standby cost (GBP)
Integrated digital TV	0.25-2.89	0.18-2.03
DVD player	0.10-6.10	0.07-4.27
DVD recorder	3.20-20.30	2.24-14.23
Freeview box	5.50-22.60	3.85-15.84

Source: Which? October 2006

Table 6: Power savings potential using electronic power conversion and control

Application	Potential power savings
Stand by power (TV)	~90%
Power supply in a server	~12%
Lighting (electronic ballast)	~25%
Motor control	30-40%
Traction drives (energy recuperation)	20-30%
Climate control	30-40%

Source: Infineon

Specific factors driving change

Reductions in stand-by power can come about incidentally, as a result of improvements in technology, but only for certain appliances and will only happen overtime. Market forces alone therefore are not effective in reducing standby consumption. In 1999, the IEA proposed that all countries harmonise energy policies to reduce standby power use to no more than one watt per device in all products by 2010. Since then a number of countries have adopted regulations and several, Australia, Korea and Taiwan, have indicated that they intend to adopt new regulations for stand-by power in the near future. The EU eco-design directive is expected to introduce stand-by regulations for 14 priority product groups including boilers, water heaters, consumer electronics, copying machines, televisions, standby modes, chargers, lighting and electric motors. We show the timetable for this in Chart 8 below.