Improving energy efficiency in emerging economies

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Energy is everything. It powers human progress. From job generation to economic competitiveness, from strengthening security to empowering women, energy is the great integrator: it cuts across all sectors and lies at the heart of all countries' core interests. Now more than ever, the world needs to ensure that the benefits of modern energy are available to all and that energy is provided as cleanly and efficiently as possible. This is a matter of equity, first and foremost, but it is also an issue of urgent practical importance – this is the impetus for the UN Secretary-General's new Sustainable Energy for All (SE4All) Initiative.

This initiative is launched in a time of great economic uncertainty, growing inequity, rapid urbanisation, and high youth unemployment. It is also a time where there is emerging consensus on the need to act cohesively towards global issues such as climate change and sustainable development. How we capture these opportunities for wealth and job creation, for education and local manufacturing will be the key to unlock any real revolution. Three linked objectives underpin the goal of achieving Sustainable Energy for All by 2030:

- Ensuring universal access to modern energy services;
- Doubling the rate of improvement in energy efficiency;
- Doubling the share of renewable energy in the global energy mix.

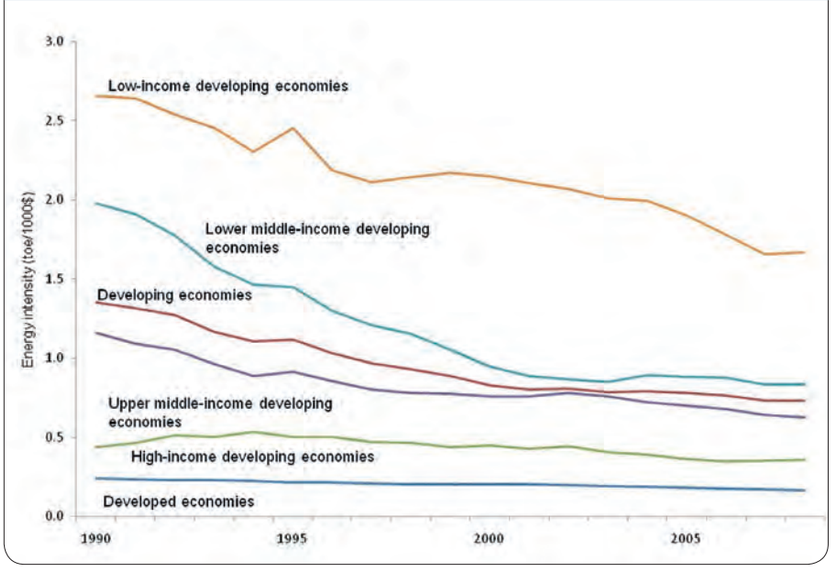
These three objectives are mutually reinforcing. As an example, increased efficiency in the production and use of electricity relieves strained power grids, allowing them to stretch further and reach more households and businesses. The alternative – unconstrained expansion of today's conventional fossil fuel-based energy systems – would lock in a long-term infrastructure commitment to an unsustainable emissions path for the world's climate.

Efficiency at the heart of energy policy

I want to focus on aspects of energy efficiency (EE) – and specifically on industrial EE in this short paper. To that end, I allude to the results of UNIDO's 2012 Industrial Development Report. Energy efficiency is a foundation of any good energy policy – and a pillar of the concepts of both "Green Economy" and "Green Industry". The economic, security, and environmental benefits of energy efficiency (EE) have been recognised for decades. Governments worldwide are designing and implementing policies and regulations to foster the development and use of energy saving technologies and systems. Firms too are changing approaches to manufacturing, considering new business models, and embracing the benefits of EE. Utilities are playing a leadership role in creating awareness, developing technologies and systems, and designing incentives to enhance energy efficient behaviour. While EE has gained growing momentum and the pace of progress has improved in the recent past, major work remains to be done and substantial environmental and economic benefits are still to be captured. This is particularly true for developing countries, which are lagging behind with regard to energy efficiency and productivity, as energy intensity profiles show (Figure 1).

Developing countries experienced an annual 2.3 per cent annual growth in total energy consumption over 1990-2008, which is more than 2.5 times the 0.9 per cent in developed countries. A key driver of the differences in growth of energy

Figure 1: Energy intensity over time between income levels



consumption between developed and developing countries is the disparity between developing countries' 0.6 per cent annual rise in industry's share of energy consumption and developed countries' 0.7 per cent annual decline. Manufacturing industry spends some US$1 trillion a year on energy, 55 per cent of it in developing countries. Manufacturing is the largest energy user sector globally, accounting for around 31 per cent of total global energy consumption since the early 1990s. In 2008, per capita industrial energy consumption in developing countries was 29 per cent of that in developed countries. Around 76 per cent of industrial energy was used to power manufacturing processes while the remainder was used as feedstock to those production processes.

Growth in industrial energy use would have been much higher over 1990-2008 but for reductions in industrial energy intensity. Global industrial energy intensity dropped some 26 per cent over 1990–2008, most of which was achieved during the 1990s. Since the year 2000 energy intensity has stabilised at around 0.35 tonnes of oil equivalent (toe) per US$1,000 of manufacturing value added (in 2000 US$). Since 1990, industrial energy intensity has fallen globally at an average annual rate of 1.7 per cent. Developed economies have the lowest level of industrial energy intensity, followed by high income and upper middle-income developing economies and – further behind – by lower middle income and low income developing economies. On average, over the period 1990–2008, energy intensity in developed countries was around 0.2 toe per US$1,000 of MVA while in low-income developing countries was 2.2 toe per US$1,000 of MVA. As an example of how the differences between economies manifest, in the Republic of Korea and the US, structural change accounts for more than two-thirds of the decline in industrial energy intensity. In China, India and Russia improvements in technology have been the main driver of reductions in energy intensity.

Table 1: Technical savings potential from industrial EE improvements (%)

Sector and product	Developed countries	Developing countries
Process sectors		
Petroleum refineries	10-15	70
Chemical and petrochemical		
Steam cracking (excluding feedstock)	20-25	25-30
Ammonia	11	25
Methanol	9	14
Non-ferrous minerals		
Alumina production	35	50
Aluminium smelters	5-10	5
Other aluminium	5-10	5
Copper smelters		45-50
Zinc	16	46
Iron and steel	10	30
Non-metallic minerals		
Cement	20	25
Lime		
Glass	30-35	40
Ceramics		
Combined sectors		
Pulp and paper	25	20
Textile		
Spinning	10	20
Weaving		
Food and beverages	25	40
Other sectors	10-15	25-30
Total	15	30-35
Excluding feedstock	15-20	30-35

Despite the significant achievements, large technical and economic potential for energy efficiency improvements persists in developing as well as developed countries. It has been estimated that industry globally could reduce its energy consumption by up to 26 per cent (IEA, 2008) through worldwide deployment of best available technologies and demonstrated best practices, including policies. Table 1 provides a snapshot of such untapped potential, highlighting the difference between Developed and Developing economies.

It is clear that while efforts must continue to promote and pursue new technological breakthroughs and solutions,

stronger support is provided for faster worldwide uptake of current best available technologies and practices, which would improve energy efficiency and productivity, ultimately reducing energy intensity. As an example, motor systems are a largely untapped, cost-effective source of industrial energy-efficiency savings that could be realised with existing technologies. Energy management systems (EnMS) and standards are another example of well proven best available technology and policy best practice. Energy efficiency in industry is achieved and sustained through changes in how energy is managed on a daily basis rather than through simple installation of new technologies. A systematic approach and top management engagement are required. National programmes hinged on the implementation of energy management system standards in EU countries showed that enterprises that implemented EnMS more than doubled their annual energy intensity reduction rate compared to enterprises without EnMS.

But major transitions in energy technologies can take decades and entail massive investments. Access to finance is bound to remain among the principal barriers to the full implementation of EE technologies and practices. This financing gap and the associated barriers are well documented. Today there are a suite of well understood, targeted and innovative financial policies and measures which policy makers can draw on. The data show a clear positive trend of new investment in EE, with an average growth rate of 28 per cent between 2004-2009. Still, the finance sectors in developing countries are often not familiar with the technical details of EE projects, and the scale is often too small to be handled directly by international financial institutions.

Despite the growing trend of EE investments, especially in developing countries and emerging markets, many financially profitable EE projects remain un-implemented. UNIDO conducted a survey of 357 manufacturing companies in 25 developing countries inquiring about their EE practices and investments. The survey found that the EE investment decision making process is driven by a traditional payback approach: more than 90 per cent of surveyed firms in developing economies used simple payback rules to assess the financial viability of EE projects, with an average payback period of 23 months. This reinforces the notion of large existing potential at low cost.

But while there has been growing recognition by industry that energy is a manageable production cost and a competitiveness/strategic factor, the majority of firms, especially in developing countries, remain largely unaware of and unable to seize these opportunities. The improvement in addressing the remaining barriers towards effective energy efficiency implementation requires sustained efforts to create enabling institutional, financial and industrial settings. Strong government and regulatory support is crucial to the success of some schemes. The international community has an important role to play in the endeavour. UNIDO's Industrial Development Report was developed to help underpin this action. ❑

Developing countries continue to lag behind with regard to energy efficiency

1. The incremental gain ranged from 1 per cent up to 5-6 per cent in certain cases, with an average of 1.5-2.0 per cent on annual basis (Gudbjerg et al, 2009). It had to be mentioned that such incremental reductions were achieved by large companies that already paid attention to energy consumption and had some energy efficiency programs in place. The experience of the USA confirms these results, showing also that in companies totally new to energy management average energy efficiency gains in the first 1-2 years can range between 10-20 per cent.

2. Bloomberg New Energy Finance