



Energy efficiency: Going beyond the slogan

By François Moisan
Director of Strategy and Research, ADEME

For many years, energy efficiency has been considered as an option only for developed and rich countries as a way, first in the 1970s and 1980s to reduce oil dependency and then, since the 1990s, to contain CO₂ emissions. It was up to governments to introduce policies, and for industry it was just a rational choice to adapt to energy prices, among other factors.

The increase in energy demand at world level with the strong economic growth of merging economies has changed the perspective. On the supply side, long-term prices of fossil energies remain on a rising trend, even if some exceptions could be expected in some countries with shale gas resources. The amount of investment required for energy accessibility to 9 billion people is huge and competing with other priorities. Climate change issues are more and more a worldwide preoccupation, even if, at this stage, an international regime is still far from agreed. Nuclear and renewable energy could be part of the solution but the acceptance of the first and the cost of the second one must be seriously improved.

ADEME and WEC, with the support of ENERDATA, have been conducting for several years a “panorama” study on energy efficiency throughout the world, aimed at identifying trends in energy efficiency and policy practices. The 2013 edition is rich in lessons about this:

Since 1990, primary energy intensity decreased at the world level at the pace of 1.3 per cent per year on average.

That means that if energy demand had grown at the same rhythm as economy we should have consumed 4.2 Gtoe more than we did in 2011 (one third higher). The decrease of final energy intensity was even more important, 1.6 per cent per year; the rapid increase in electricity consumption, still dominantly supplied by thermal power plants, explains the difference.

The increase of efficiency in energy use is observed in almost every region of the world, but at different paces. The overall result is strongly influenced by emerging economies, particularly China, whose energy intensity decreased by 7 per cent per year in the 1990s and by 3 per cent per year in the last decade. In the rest of the world, however, the decrease for the last two decades is around 1 per cent per year.

The energy intensity of world regions and main countries can be classified in three groups :

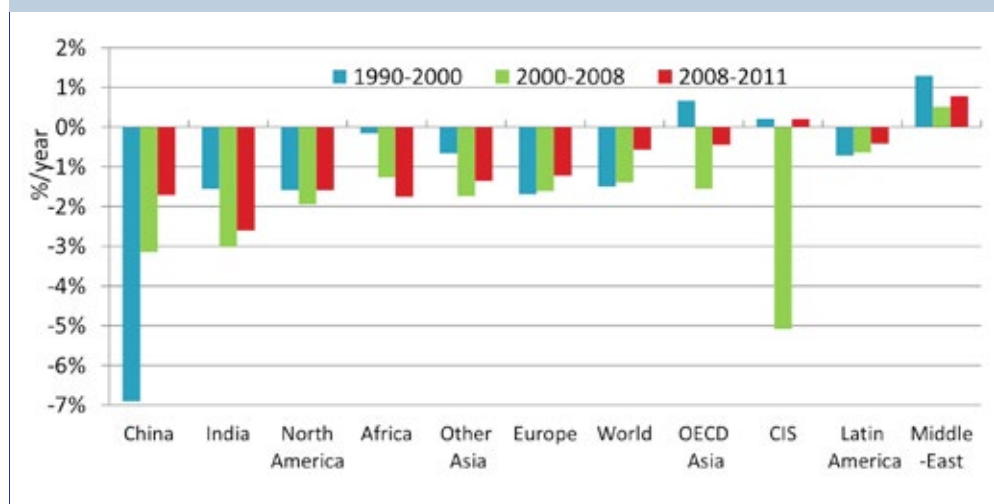
- Countries with the lowest energy intensity: Europe, Japan and Latin America
- Countries with an energy intensity 30 to 50 per cent higher than the previous group and around the world average: North America, India and other Asian countries (except China)
- Countries with a much higher energy intensity (double that of the first group: China, Africa and the Middle East) or even more higher (three times in the case of former Soviet or CIS states)

However, these discrepancies in primary energy intensity cannot be explained only by energy efficiency performance. The share of industry versus services in GDP and the energy

mix in the electricity conversion explain another part of the difference. Energy intensity of industry has declined in every region of the world, except in the Middle East, and a convergence between all regions can be observed. The industrial specialisation of some countries explains the difference (with China, CIS and the Middle East having more heavy industry than the average).

The energy intensity of the transport sector (energy consumption of per unit of GDP) has declined in all parts of the world, by 10 per cent on average between 1990 and

Figure 1: Primary energy intensity trends by region



2011, more strongly in China and India where the transport energy consumption per GDP is lower than in OECD. The progress in cars' energy efficiency all around the world, except where the main market is second hand, as in Africa, the cost of motor fuel and the share of railway transport for several countries (India, China which multiplied by three the degree of rail travel per inhabitant between 1990 and 2011) explain this trend and these differences.

The residential sector presents the most important discrepancies. While the energy consumption per household decreased by 0.8 per cent per year on average at the world level in the last two decades, in OECD countries this is mainly due to the increase of performance of heating and cooling equipment, while in developing countries it is mainly due to substitution of traditional biomass by more efficient fuels. The global consumption of electrical equipment per household is growing everywhere - slower in the OECD region, where there is some saturation of demand and better efficiency of high-consuming appliances is observed, much stronger in emerging economies where more and more households have access to these appliances. There is still a huge discrepancy among countries regarding the unit consumption of electricity per household, even excluding electricity used for space-heating: 750 kWh/household/year in India, 1,300 in China, 3,500 in Europe, 5,000 in Japan and 10,000 in North America.

The study done by ADEME within the WEC programme on energy efficiency is not only related to the assessment of energy efficiency trends. It also addresses the policies conducted by governments in each country, through a survey covering 85 countries representing more than 95 per cent of world energy consumption.

Energy efficiency is becoming a priority for all countries. Around 3-4 per cent of countries now have a dedicated institution (agency) to implement their national energy efficiency policies; while in 2006 only 40 per cent of countries had quantitative targets on energy efficiency; now, more than 80 per cent have such targets.

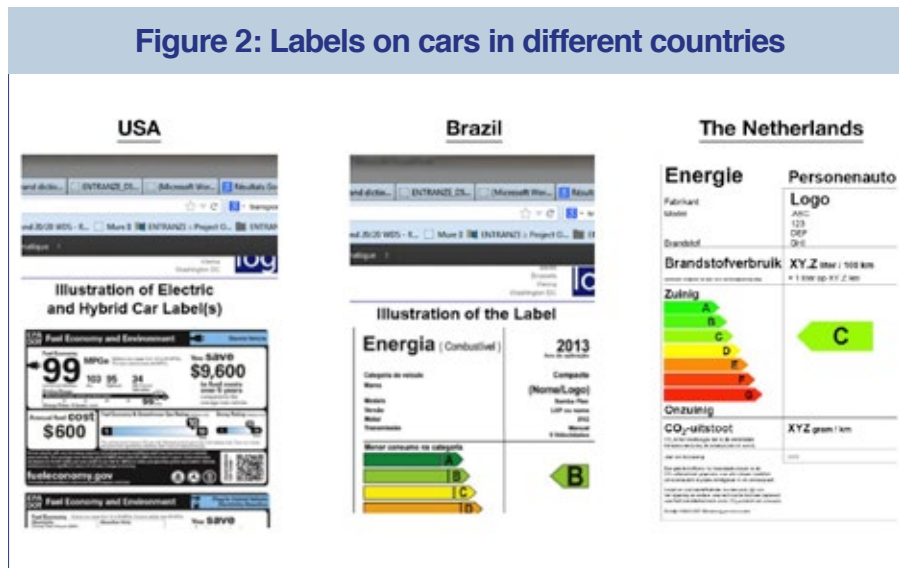
The main measures implemented by governments are far-reaching regulations but also financial mechanisms and

fiscal measures (mainly in the OECD for this last category). Seventy per cent of countries surveyed adopted the ban on incandescent lamps.

Regulations such as minimum efficiency standards (MEPS), labels or mandatory audits remain the most important measures deployed by governments. The residential sector is also the main sector concerned by energy efficiency measures (more than 50 per cent, and close to 30 per cent in the services sector). Labeling and minimum efficiency standards are spreading in all regions and not only in the OECD as it was in the past. Seventy-one of the countries surveyed have an energy efficiency label policy (100 per cent in the OECD, 90 per cent in Asia, 50 per cent in Africa), which is mandatory in 87 per cent of them. Ninety per cent of surveyed countries have implemented at least one MEPS. Minimum Energy Efficiency Standards on lamps, appliances (refrigerators, washing machines and AC) and new constructions are implemented in 80 per cent of the surveyed countries. MEPS on vehicles and solar water heaters are less common.

Seventy per cent of the countries surveyed have implemented fiscal or financial measures (mainly direct subsidies for investments but more and more replaced by low-interest loans in OECD countries). Financial measures target mainly the building sector (40 per cent) while fiscal measures apply often for cars. In industry measures implemented are energy audits (subsidised or mandatory), financial or fiscal measures and some labels or MEPS (electrical motors).

Figure 2: Labels on cars in different countries



More than half of countries have implemented measures on cars, mainly regulations such as standards and labels, but also fiscal incentives (tax based on CO₂ emissions).

In the residential sector, the most common measure are regulations such as building codes. Seventy per cent of countries implement building codes for new buildings, which are mandatory in 90 per cent of these countries. Labelling of buildings is a new approach that has been implemented recently in European Union countries and is spreading to other regions such as Chile. MEPS aim to remove the least energy-efficient lighting (incandescent lamps), heating, ventilation and air conditioning products from the market.

For appliances the most common measure is labelling, with an increasing number of appliances labelled (e.g. nine in EU countries, more than 10 in Canada, China and Brazil, and to up to 19 in the US). Dynamic labelling is expanding, in the EU with new efficiency classes A+, A++ and A+++ or in Japan with the top runner programme, to account for the fact that most of the sold appliances are already in the most efficient class). Labelling is also a way to introduce MEPS.

The frequency of regulatory measures implemented in the different countries increased by 30 per cent on average between 2009 and 2012.

Several issues should be raised in conclusion :

- Energy efficiency policies are spreading in all countries and several measures have proven to be relevant, such as regulation for equipment and buildings. Emerging countries took advantage of the experiences of OECD countries, which were the first movers in the 1970s. But the specificity of each country calls for new measures appropriate to the national context (such as second hand equipment).
- The pace of energy efficiency slowed down in the last decade, especially in developed countries, due to the fact that the easiest potential has been exploited and further innovative measures should be designed. This is the case in Europe for existing building refurbishment. Despite the proven cost-effective opportunity to reduce energy consumption in existing buildings, a significant proportion of the potential is not being realised. A key reason for this relates to the financing of energy efficiency. So far,

energy efficiency has not been able to attract significant amounts of private capital. Financial obstacles include the initial cost barrier, high transaction costs, long payback time, risk exposure, the lack of knowledge among finance providers and the absence of standardised measurement and verification practices. In OECD countries and mainly in Europe several mechanisms are implemented.

- While energy efficiency policies were for several decades a task for governments, more and more energy producers are now involved. Energy efficiency is becoming a resource for utilities by varying the price of electricity. Instead of building new capacity it becomes more rational to incentivise consumers to avoid consumption at certain periods through dynamic pricing which is a new field of expansion for business.
- Governments are trying out innovative measures in order to reduce the public transaction cost of policies. They include energy efficiency obligations imposed on energy suppliers, and white certificate markets to introduce more flexibility in the achievement of energy efficiency targets.

Energy efficiency is no longer a political slogan, but rather an effective priority. The debate is not any more whether there is or is not “low-hanging fruit”, but how to climb into the trees to reach it. □

WEC top 15 of 2012 energy efficiency measures (frequency of measures implemented)

