The long and winding road… that leads to energy efficiency: from mere engineering issue to first fuel

Maria Van der Hoeven

Maria Van der Hoeven
Executive Director of the International Energy Agency

Contact persons: Alessandro Federici, Ezilda Costanzo, Chiara Martini (ENEA)
alessandro.federici@enea.it

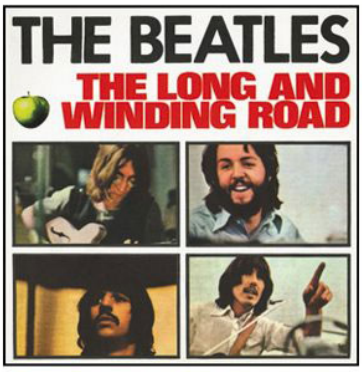
Introduction: the energy efficiency *Revolution*

The 1973 oil crisis acted as the Big Bang of *energy efficiency*; at that time, it emerged as a distinct field of interest, rather than a subsidiary engineering issue (Wulfinghoff, 2000).

With each passing decade, energy efficiency has scaled up its role in energy policy. From a market perspective, it is increasingly seen as a commodity – for all types of energy consumers and producers. In recent years, attention to energy efficiency has grown, from the lack of visibility inherent in its past identification as "the hidden fuel" (i.e. measured and valued only as the negative quantity of energy not used) to an increasing recognition as the **"***first fuel***"** (IEA, 2013).

Recent publications of the International Energy Agency (IEA) place energy efficiency on an equal footing with any other energy resource. Indeed, energy efficiency lies at the nexus of the three challenges that confront the world in terms of energy policy: energy security, sustainability and economic development. In the IEA 2DS scenario – consistent with limiting the long-term increase in global temperature to no more than two degrees Celsius – the biggest share of emissions

reductions, about 40%, comes from energy efficiency (IEA, 2014a). Energy efficiency also increases resilience against a variety of risks, such as energy price rises and volatility, stress on energy infrastructure, and disruptions to energy supply systems. And the benefits of energy efficiency go well beyond the reduction of energy demand and encompass sustainable development, health and productivity (IEA, 2014b).



Energy efficiency markets deliver goods and services that reduce the energy required to fuel our economies. In 2011, avoided energy use from energy efficiency improvements in 11 IEA member countries since the 1970s was larger than the total final consumption (TFC) of oil (1 202 million tonnes of oil-equivalent, Mtoe), electricity (552 Mtoe) or natural gas (509 Mtoe). [1]
Aggregate annual investments in energy efficiency were more than USD 310 billion in 2012, which was larger than supply-side investment in renewable electricity or in coal, oil and gas power generation (IEA, 2014c).

Such energy efficiency improvements are happening at a time when fast-developing economies are adding demand to the global energy system. Indeed, there is huge potential for energy efficiency in emerging economies beyond the OECD, playing an important role in countering volatile energy prices and limiting the share of income being spent on energy.

All you need is… energy efficiency: its market is spreading out *Across the Universe*

The IEA *Energy Efficiency Market Report 2014* (EEMR-2014) confirms energy efficiency's place as the "first fuel" for major IEA economies. The energy efficiency market is raising more and more interest from institutional lenders and investors.

Energy savings generated from investments over the 1971 to 2011 period in 11 IEA member countries were 1337 Mtoe, larger than the 2011 total final consumption (TFC) of the European Union. At country level, since 2001 energy efficiency has placed downward pressure on TFC in OECD countries. It is the prime mover of the absolute reductions in TFC in 12 countries, eight of which have experienced energy efficiency effects larger than activity effects. [2]

About 40% of energy efficiency investment worldwide is financed with debt and equity and the *finance* market is moving from being a niche to a

more established market segment. This is in part a result of the availability of a greater range of financial products, such as green bonds and Energy Performance Contracts involving a growing number of energy service companies (ESCOs).

ESCO markets in European countries are at diverse stages of development. Good market growth has occurred in Italy over the past ten years thanks to a more favourable legislative framework focused on refurbishment of public buildings, financial incentives for refurbishment and modernisation of private buildings, and stronger environmental awareness. Nevertheless, of some 150 Italian ESCOs identified, only half of them have the technical and financial capacity to provide long-term performance contracts.

Efficiency had a larger percentage improvement in the *residential* sector than any other, mainly driven by efficiency improvements of space heating, water heating, lighting and appliances. Energy efficiency reduced energy consumption during a time when energy prices increased between 11% and 52%, easing the adverse impact on households.

Among the best practices described in the 11 country case studies in EEMR-2014, the Italian 55/65% tax deduction scheme is mentioned for its role in spreading a culture of energy efficiency. Between 2007 and 2013, more than 1.8 million applications were approved and around EUR 23 billion of investments by households were leveraged, at a cost of about EUR 13 billion in undiscounted foregone tax revenue.

In the *transport* sector, by 2020 an estimated USD 80 billion annually is expected to be spent on energy efficiency in passenger LDVs, and over the next ten years investment in this area is expected to represent over 60% of all incremental investment in energy efficient technologies worldwide. Energy efficiency improvements could reduce fuel expenditure by between USD 40 billion and USD 189 billion annually by 2020.

In the *industry* sector, energy management systems and programmes are receiving increasing policy attention. European industry associations in iron and steel, chemicals, and pulp and paper have developed long-term

roadmaps for sustainable development of their sectors, serving as a basis for dialogue with policy makers in the EU.

Come together: the multiple benefits of energy efficiency

Energy efficiency engenders a wide range of associated benefits, although measuring them is still a challenge. The IEA (2014b) highlights energy efficiency's potential to deliver a host of other benefits beyond energy demand and greenhouse gas emissions reduction. The multiple benefits approach aims to capture the fact that investment in energy efficiency can provide a range of benefits to many different stakeholders. For example, the reduction of energy demand and associated costs can enable investment in other goods and services, and help to achieve other objectives – such as improving the indoor environment or boosting industrial productivity. Thus energy efficiency contributes to a series of strategic objectives, five of which were investigated in detail in the *Capturing the Multiple Benefits of Energy Efficiency* book: 1) macroeconomic development; 2) public budgets; 3) health and well-being; 4) industrial productivity; 5) energy delivery.

The impact of energy efficiency on macroeconomic variables can be measured through GDP, employment, trade balances and energy prices. Public budget impacts are closely linked to macroeconomic impacts such as reduced government expenditure on energy, increased tax revenues through greater economic activity, or reduced unemployment payments. Energy efficiency improvements in buildings contribute to occupants' health and well-being, particularly among vulnerable groups such as children or the elderly. Industrial energy efficiency measures, in addition to energy cost savings, enhance competitiveness and profitability, improve the working environment and reduce costs for operation and maintenance, and for environmental compliance.

Even utilities and other energy providers gain in a variety of ways from energy efficiency measures, both directly, from lower costs for energy generation, transmission and distribution, and improved system reliability, and indirectly, from improved affordability of energy services, which in turn can reduce arrears and associated administrative costs for utilities.

In spite of the key strategic role of energy efficiency, projections reveal that under existing policies the vast majority of economically viable investments will not be made. Many barriers contribute to this result, one of the main ones being the lack of attention paid to energy efficiency investment opportunities both by public and private stakeholders relative to supply-side opportunities, including new resources such as shale gas and oil. The multiple benefits approach seeks to address this barrier by identifying and valuing the diverse benefits for stakeholders across a variety of areas.

Help! How to measure energy efficiency

To date, the broader impacts of energy efficiency have not been fully assessed, due to a lack of data and the absence of mature methodologies to measure their scope and scale. As a result, the degree to which energy efficiency enhances economic and social development is not well understood, and is generally considered in national policy making only in a qualitative way, if at all.

To inform the policy-making process and meet domestic and international objectives, it is important to develop and maintain well-founded energy efficiency indicators and to make good-quality, timely, comparable and detailed data available. Such data should reflect the distinct characteristics of economic activity and resources available in each country, going well beyond energy balance data. Wide variations exist in the way data on energy efficiency are collected from country to country. The IEA is currently looking to improve its data collection and produce more robust indicators in order to help craft more effective policies and monitor their progress.

A first difficulty in evaluation is that the market does not resemble traditional energy commodity markets, where prices adjust to changes in the supply and demand for fuels. Market data on traditional commodities are dispersed through multiple information channels, facilitating changes in behaviour and corporate investment. There is no equivalent medium of exchange or unit of trade in joules of energy avoided through energy efficiency adoption. Nevertheless, firms and consumers routinely make investment decisions with minimising energy consumption as one consideration. Replacing old technology with new often brings with it an embedded energy efficiency improvement, but defining and evaluating such an investment is complicated.

For these reasons, the lack of proper data to build meaningful indicators is still a problem. In many countries data on consumption for specific energy services (e.g. energy used to heat office buildings) are simply not available, nor are the corresponding activity data (floor area).

For decades, countries have used the data contained in energy balances as a mean of tracking energy consumption and developing aggregate indicators (such as total energy per capita). These indicators, although readily available, are of limited worth and can even generate misleading results when used inappropriately. For example, energy performance should not be assessed based on TFC per unit of GDP or per capita, given the other factors, such as climate and economic structure, influencing this indicator.

A different set of explanatory data will be needed depending on the end-use sector, influenced by varying underlying factors. Such data are not reported in energy balances but recent efforts by several countries have helped to develop indicators that provide important information for understanding past trends, assessing potential for energy savings and enhancing energy efficiency policies. Finally, data quality is a constraint, in particular in emerging economies and in cross-cutting areas such as smart grids and integration of heat and electricity systems.

To this end, two recent IEA manuals provide guidelines and best practices on energy efficiency indicators, addressing the growing request for guidance on what data to collect for what indicators and how (IEA, 2014d and IEA, 2014e). The first manual addresses the information needed for the development of energy efficiency indicators and provides more than 160 surveying, metering and modelling practices used worldwide. The second aims to provide policy makers and energy analysts with the tools needed to prioritise the development of energy efficiency indicators and to select the data and indicators that will best support energy efficiency policy making.

The analysis of multiple benefits also needs to be supported by a robust evidence base, and enhanced ways to measure, quantify and ideally monetise them. For example, although most governments have developed methodologies to estimate the public costs and benefits of a policy, the full range of public budget benefits are rarely estimated. Furthermore, energy delivery benefits have proven difficult to properly integrate into cost-effectiveness evaluations, and therefore have not been accurately measured. Multiple benefits assessment remains limited for

two main reasons: 1) methods for assessing the costs and benefits of non-market impacts have not been fully developed; 2) such assessments require more resources than more traditional policy evaluation methods.

Tomorrow never knows: energy efficiency scenarios

The *Energy Technology Perspectives* (ETP) of the IEA (2014a) offers a comprehensive, long-term view of energy system trends and technologies essential to meet goals for affordable, secure and low-carbon energy. Although security and economic growth remain important drivers of energy policy, it remains to be demonstrated that the system can move to a cleaner path. ETP analysis aims to provide a call for action so that governments can take the necessary steps. [3]

ETP 2014 focuses on *Harnessing Electricity's Potential*, reflecting an opportunity arising from the convergence of two trends: rapidly growing electricity demand at world level and the clear need for increased system integration. Electricity production uses 40% of world primary energy and produces a similar share of energy-based carbon dioxide emissions today. However, cost-effective and practical solutions exist that can

increase efficiency and reduce electricity demand as well as carbon emissions between now and 2050. ETP 2014 also analyses technology penetration, market creation and technology developments using interim 2025 benchmarks.

The IEA Energy Technology Network (ETN) contributes high-level RD&D to IEA analysis, with the advantage of a worldwide engagement. Implementing Agreements (IAs) are the core of the ETN and are relevant co-operation initiatives among IEA member countries and key partner countries. So far, IAs have involved more than 6 000 scientists and experts, representing 500 different organisations of various types. Over 1 400 projects have been completed to date.

Several types of *technologies* are needed to transform the global energy system. From IEA analysis, the contribution of *technologies for energy efficiency* is clear and outweighs that of renewables technologies. As much as 44% of emission reductions to 2025 can be delivered by end-use energy efficiency, whose emissions reduction potential by 2015 is 17 $GtCO_2$ in buildings, 13 $GtCO_2$ in transport and 11 $GtCO_2$ in industry. Apart from RES however, most technologies are not on track for the ETP 2014 2DS scenario. Focusing on end-use technologies, we can examine the transport, industry, electricity and building sectors in turn.

In the *transport sector*, fuel economy solutions for internal combustion engines are in place in most OECD countries and can deliver the largest fuel savings in the short term. Sales for hybrid and electric vehicles (HEV and EV) set new records and market shares for hybrid, plug-in hybrid and battery electric vehicles all grew in 2013. China is supporting these technologies: about 150 million electric two-wheelers are already on the road and the Clean Air Action Plan for Beijing predicts nearly a one third share of battery electric, plug-in hybrid or fuel cell vehicles of the 600 000 new vehicles in the next four years. Still, the overall rate of growth of HEV and EV was below previous years and, as a single year, 2013 was below 2DS trajectories. Fuel cell vehicles are receiving renewed attention: although they have lower energy efficiency than EVs, the energy density of hydrogen allows them to provide equivalent performance (range, power) to those of conventional vehicles.

Nevertheless, improving technology in isolation will not provide for the most cost effective solutions, and options for the transport system as a whole need to be considered. Urban development strategies, and integrated transport system analysis (including public transport, logistics, modal shift, infrastructure, functionality, information technology for transport, efficient management, etc.) are needed to identify the optimal pathway towards a sustainable transport system.

Industry needs to cut energy use and direct CO_2 emissions by 14% by 2025 to meet 2DS targets: IEA analysis shows that widespread application of best available technologies (BAT) could technically slash energy use by 11% to 26% in iron and steel, chemicals, cement, pulp and paper, and aluminium. Energy intensity is falling but increased production has offset efficiency improvements. To meet long-term targets, new technologies and processes need to be developed. Supporting RD&D programmes in collaboration with the private sector is necessary to bring new low-carbon technologies to technical and commercial maturity and demonstrate them.

The *building* sector is of particular concern, as efforts for energy efficiency are presently off track. The 2DS target for 2025 limits energy demand growth to 0.7% per year from 2012; the trend since 2000 is more than double that at 1.5% per year.

Mandatory codes for energy performance of new buildings and infrastructure are a priority in emerging and developing economies, while strategies for increasing the rate of building renovation to at least 2% and new minimum energy performance standards (MEPS) to stimulate innovation in the sector are a priority for European countries.

Global *electricity* demand associated with network-enabled devices is growing at an alarming rate (IEA, 2014f). More than 14 billion network-enabled devices are already in homes and offices; by 2020, the number is expected to reach more than 50 billion. Without concerted global policy action to improve their efficiency, the electricity demand of these devices is expected to double by 2025.

Technologies are also needed to efficiently integrate energy supply and energy demand. A certain amount of delay is affecting smart-grid deployment. Since it involves multiple stakeholders, many aspects remain ill-defined, such as roles and responsibilities, cost- and benefit-sharing, and metrics. Regulatory instruments and policies to address barriers, new business models to engage end users, and infrastructure planning are all essential for improved technology deployment. Research into integrated solutions (extension to the urban district level, renewables integration facilitated by storage) can reduce the overall cost of the clean energy transition. New opportunities can also be offered by research into social and comfort limits of demand-response (DR).

Technology forward look: *Hello, Goodbye*

Policy remains vital to the competitiveness of clean energy technologies and to reducing risk. Developing business models to attract private finance and reduce risk is particularly challenging.

Emerging technologies can capture new niche markets through innovative business models. It is the case, for example, of EVs in numerous urban mobility programmes being launched around the world. They have the potential to attract private finance to car-sharing business models, where up-front costs and driving range are of less concern for users than in a decision to buy a vehicle.

Energy technology innovation is core to enabling the transition to an economically viable and secure low-carbon energy system. The 2015 edition of Energy Technology Perspectives seeks to increase confidence in the feasibility of achieving short- and long-term climate change mitigation targets, especially timely in the context of United Nations climate negotiations in 2015. It will help decision makers identify tools to spur innovation – encompassing Research, Development, Demonstration and Deployment (RDD&D) processes – and to evaluate their effectiveness. This will support the coordination of public and private efforts to ensure that policy drivers and targets are matched by investments and market instruments.

Quality remains a broad concern for much energy data, particularly for emerging economies. The IEA is presently seeking input into the development of metrics for tracking technological progress, assessing impacts of policies and opportunities for improvement, and establishing partnerships to expand and improve data quality.

In this context, the “3 Es” IEA approach to energy policy (Energy security, Economic growth, Environmental sustainability) is being enriched by a fourth “E”: Engagement worldwide. More than half of global energy consumption now takes place outside IEA member countries. The IEA ETN also contributes to the establishment of such partnerships, through a new approach based on system thinking and target integration.

Partnering and engagement also mean coordinating with various energy stakeholders. The IEA has already established a wealth of collaborative mechanisms with public and private actors, as well as with other international organizations. In order to recognize the role that local governments will play in the implementation of the needed clean energy revolution, the IEA has also set up partnerships with local government networks and the forthcoming ETP 2016 will focus on urban energy systems and smart integration of local and national policy frameworks.

References

International Energy Agency (IEA) (2013), *Energy Efficiency Market Report 2013*

IEA (2014a), *Energy Technology Perspectives*, www.iea.org/etp/

IEA (2014b), *Capturing the Multiple Benefits of Energy Efficiency*

IEA (2014c), *Energy Efficiency Market Report 2014*

IEA (2014d), *Energy Efficiency Indicators: Fundamentals on Statistics*

IEA (2014e), *Energy Efficiency Indicators: Essentials for Policy Making 2014*

IEA (2014f), *More Data, Less Energy*, www.iea.org/publications/freepublications/publication/MoreData_LessEnergy.pdf.

Wulfinghoff, Donald R. (2000), The Modern History of Energy Conservation: An Overview for Information Professionals, *Electronic Green Journal*, 1(13), https://escholarship.org/uc/item/22f883rr

---

[1] The 11 countries for which data were available are Australia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Sweden, the UK and the United States.
[2] The activity effect represents a change in final energy consumption due to a change in the demand for an energy service demand, while the structure effect points to technology switching. Finally, the fuel intensity effect explains energy changes caused by efficiency improvements. http://www.worldenergyoutlook.org/media/weowebsite/energymodel/documentation/Methodology_decomposition.pdf
[3] Maria van der Hoeven: “ETP 2014, Tracking clean energy progress” at Clean Energy Ministerial, Seoul, May 2014.

Interview with Maria Van der Hoeven, Executive Director of the International Energy Agency

Edited by Alessandro Federici, Ezilda Costanzo, Chiara Martini (ENEA)

- **The beginning was the oil crisis in 1973, a sort of big bang for energy efficiency...**

As you may know, the IEA was founded in response to the 1973-1974 oil crisis. Our initial role was to help countries co-ordinate a collective response to major disruptions in oil supply through the release of emergency oil stocks to the markets. Energy efficiency was a big part of that response.

Today, energy security remains a big concern for countries and energy efficiency continues to play an important part in country strategies to enhance security, whether it be in Europe, where concerns about gas emerge and re-emerge from time to time, or in Japan, for which energy efficiency has consistently played an important role in that country's efforts to manage its reliance on imported fuels.

And over the recent past, energy efficiency has emerged as a large and valuable contributor to sustainable development and emissions reduction efforts: the link there is clear. In IEA scenarios for limiting global temperature increase to 2 degrees Celsius, fully 40% of necessary

greenhouse gas emissions reduction will have to come from energy efficiency.

Of course the benefits from energy efficiency are not limited to IEA countries. Energy efficiency is also helping to dampen the growing energy consumption in emerging countries, strengthening their ability to generate sustainable economic growth. Without these improvements in efficiency the energy system would have been significantly more strained than it is today in providing energy, security and economic opportunities to the world.

Indeed, energy efficiency lies at the nexus of the three overlapping challenges that confront the world in terms of energy policy – energy security, sustainability and economic development. IEA analysis consistently identifies energy efficiency as the major contributor to potential cuts to carbon emissions, reductions in local pollution and cost-effective energy security. Simply put, the cleanest megawatt hour will be the one we never need, and the most secure barrel of oil the one we never burn. It is also often the cheapest, and the easiest to achieve in difficult conditions. But energy efficiency opportunities really make up an interlinked constellation – between transport, industry, buildings and the like. And understanding that constellation as a market is a relatively new undertaking. We now treat energy efficiency as we would any fuel such as oil, gas, coal or renewables. In fact, in 2013 we added energy efficiency to the suite of fuel market reports prepared by the IEA.

- **Nowadays, the IEA refers to energy efficiency as the First Fuel...**

This is because, in 2011, energy savings from continued improvements in the energy efficiency of 11 IEA member countries [1] exceeded the total final consumption from any single fuel source in these countries.

The contribution of efficiency to meeting rising world energy service demand is enormous. Energy efficiency markets deliver goods and services that reduce the energy required to fuel our economies, and the market for energy efficiency is as diffuse as consumption patterns themselves.

What is not always so clear is the valuable role that energy efficiency plays in the world economy. The market for energy efficiency investments is very large: the *Energy Efficiency Market Report 2014* estimates that it is larger than USD 310 billion and growing. Much of that investment needs financing, and we see that energy efficiency is moving from a niche interest to an established finance market segment, with increasing interest from institutional lenders and investors.

All of this investment is significantly shaping our energy system. The steady improvement in the energy efficiency of our cars, homes, appliances and other energy-consuming equipment over the last four decades has driven total final consumption 60% lower than what it hypothetically would have been in IEA countries – saving more energy than the total final consumption of any fuel.

Looking to the future, the potential savings from efficiency are huge. But we need to develop these markets now to better tap this huge potential. Seen in these terms, the data show efficiency not just to be a “hidden fuel”, but actually the “first fuel” now and going forward and I do hope that IEA work will help policy makers and other stakeholders, including the business and financial communities, to better realise how these markets are growing now and should grow even faster in the coming years.

Indeed, policy makers, standards development organisations, software and hardware developers, designers, service providers and manufacturers all have a key role to play. We already know that when all parts of the sector work together, massive savings can be realised on behalf of consumers. Energy efficiency policies play an important role in galvanising action across the value chain to reduce unnecessary energy demand.

- **Is this a mature market? Are the investments sufficient to sustain a market that can deliver the potential of energy efficiency?**

As the Energy Efficiency Market Report 2014 highlights, there is huge diversity in energy efficiency market maturity worldwide, with utility and ESCO markets in countries like the United States and China developing well. There are also gaps and sub-optimal investments: in different markets some products take off while others lag behind. Rarely do we take an integrated approach to energy efficiency investments – there are few one-stop shops for integrated solutions – gaps remain. There is a need for better policy design to ensure that markets are understood, enabled and encouraged.

The world doesn't fully understand the outcomes that energy efficiency delivers. For example, insulation installed in older homes results in health benefits that can be monetised. The market players that deliver these services don't reap the health benefits directly, but families and government health budgets are getting a far greater return than the value of their "saved" energy alone. The IEA has advanced this with its publication *Capturing the Multiple Benefits of Energy Efficiency*.

We clearly have much work to do but the energy efficiency market is growing in stature and maturity. In some ways it is developing more rapidly than the ability to properly evaluate and understand it. A particular priority is to improve our capability to measure the size, nature and impact of energy efficiency markets and the outcomes from investments made in them. We are addressing this through our *Energy Efficiency Market Report* series. Stakeholders must address the urgent need for better data to support stronger systems of measurement.

- **What are the reasons for the recent growth?**

The recent growth of this market has been driven by effective policy and high or volatile energy prices. Policies like energy standards, labelling, access to assessments and financing, and obligations on suppliers have proved crucial – but they need to be honed to maximise efficiency

benefits and minimise economic impact. Countries are taking energy efficiency seriously, judging from their stated policy goals.

In the transport sector, high oil prices and price volatility have in the past had a major impact on transport efficiency. Now that the oil price is much lower, policies such as fuel economy standards and minimum energy performance standards, that may at first have been introduced in response to high prices, have a lock-in effect in making sure we do not lose the gains we have made from energy efficiency. And while, in the short-term, lower energy prices might distract people from the need to continue to push for energy efficiency gains, it is important to maintain momentum moving forward, given the energy security and other multiple benefits that energy efficiency delivers. Meanwhile, the current low oil prices are a window of opportunity for policy makers to cut fossil fuel subsidies and support longer-term energy and climate goals.

- **Notwithstanding the new perspective and the encouraging figures stemming from the implementation of effective policies, a very big share of the potential for energy efficiency will remain untapped...**

The IEA has been advocating for energy efficiency for some time, and so I am pleased that energy efficiency has finally become a focal point of energy policies. And yet our analysis shows that by 2035, two-thirds of the economic potential for energy efficiency will remain untapped under current policies and practices. A key reason for this is the persistence of market barriers around information and salience. To change this, we need to start recognising the importance of energy efficiency for delivering benefits in real terms. We need to put a face on energy efficiency and change the narrative. This is why the IEA has been reaching out with the Energy Efficiency Market Report series and the Multiple Benefits book.

- **What about the financing of energy efficiency?**

The finance market is expanding and innovating in all different types of new products and the market is establishing itself as a real business opportunity. Both the number of products and the volume of finance

offered for energy efficiency loans are also greatly expanding. Green bonds, Energy Performance Contracts, carbon and climate finance, and development banks are all offering expanded flows of finance. As energy efficiency is essential to meeting our climate goals without hindering economic growth, the increasing use of finance is a welcome development. To fully expand this market, initiatives to continue to reduce barriers will need to strengthen. Investments in energy efficiency are still less than two-thirds of the level of fossil fuel subsidies – which encourage wasteful and inefficient consumption.

- **What is the importance of energy technology development and international collaboration on RD&D for the IEA?**

Since 1974 the IEA has established a structure for governments to carry out collaborative RD&D to conserve existing resources, develop alternative energy sources, and improve energy efficiency.

IEA multilateral technology initiatives (known as Implementing Agreements – IAs) are flexible mechanisms for collaborative RD&D. They provide: technical analysis, data, benchmarks, recommended practices, online tools, expert networks, project financing, personnel exchanges and even pilot plants.

The IEA Energy Technology R&D Network (ETN) enables specialists from institutions, industry, governments to advance hundreds of technologies worldwide. IAs' results provide practical means to fulfil national energy strategies and sound knowledge to support decision making. Moreover, they give input to high level mechanisms like UNFCCC and the Clean Energy Ministerial.

More than half of global energy consumption now takes place outside the IEA region and countries like Brazil, China, India, Russia, South Africa, Mexico, Kazakhstan and Singapore participate in the IEA collaborative RD&D network.

- **Turning now to the regional level, how is Europe progressing towards the 2020 climate and energy goals?**

There is no doubt that the EU has emerged as a global leader in the transition to a low-carbon economy and is on track towards its Kyoto and 20% GHG reduction target for 2020. Since 1990, GHG emissions have decreased by 19.2% and the carbon intensity of GDP in the EU has fallen by 40.9%. Today, the EU has a lower carbon intensity than non-European IEA members. Likewise, the energy intensity of GDP has fallen by 31.5% since 1990, and is now at the level of Japan, and lower than Canada, the United States and Australia.

It is fair to say that the economic crisis led to a strong reduction in energy consumption by industry – a 14% decrease in 2007-2012. But the EU has also made strong progress through the growing deployment of renewable energies and EU energy efficiency action on vehicle fuel standards, ecodesign and buildings. The EU leads efforts to reduce CO_2 emissions from passenger cars. Improvements are being made within the Energy Performance of Buildings, Ecodesign and Energy Efficiency Directives and the EU funds dedicated to energy efficiency.

Depending on the scale of economic recovery, achieving the 20% energy efficiency target by 2020 may be challenging. Progress will depend on: the further implementation of EU energy efficiency policies by Member States; the scaling up of energy efficiency investments to finance retrofits in existing buildings; and the encouragement of demand-side management by consumers through smart meters and grids.

- **What is your opinion about the EU 2030 targets?**

EU 2030 targets are ambitious and confirm the EU's leadership on climate and energy issues. However, they are only ambitions at this stage. The legal framework is yet to be defined, notably on energy efficiency the ambitions are indicative at best. Looking at the lessons learned from the 2020 targets, Europe has a long and costly transition ahead, if no measures are put in place to benefit from an EU wide approach. As Member States adopt different energy policy choices and decarbonisation pathways towards 2030, a strong "Energy Union" is needed to achieve the EU 2030 goals. The 2030 framework will need to embrace both a strong legal framework and new, stringent governance

with co-ordination between national and EU levels and across EU energy, climate, industry, trade and competition areas. [2] The Energy Union promises to take forward such a new approach.

The IEA has been supportive of the EU's 2030 ambition for energy efficiency, including the review in 2020 of whether to increase the target to 30%. For the review, it will be important for the EU to gather further evidence on the multiple social and economic benefits from energy efficiency, that have not yet been fully taken into account in their analysis.

- **And finally, what about Italy?**

Italy was a rich case study in the *Energy Efficiency Market Report 2014*. Italy's total final energy consumption dropped by 12% from a peak of 139 Mtoe in 2005 to 123 Mtoe in 2012, driven by combined ongoing impacts of the 2008 financial crisis and energy efficiency investments. Italy has thus managed to maintain its long-term trend towards lower energy intensity.

With comparatively high energy prices and significant exposure to energy imports, Italian energy efficiency programmes are working to save 13 million tonnes of oil equivalent per year. New Italian targets for energy efficiency are more ambitious, with plans to reduce 20 Mt per year by 2020 while saving EUR 9 billion in energy costs. Of the countries we reviewed, these actions place Italy as a leader in supporting growth for the energy efficiency market. Italy is also one of the 11 member countries I mentioned earlier that collects very good data on energy efficiency. Total Italian activity could mobilise more than EUR 50 billion of investment by 2020. Energy efficiency is a key goal in Italy, not just for improving its energy security, but also for increasing its competitiveness.

---

[1] The 11 countries evaluated are Australia, Denmark, Finland, France, Germany, Italy, Japan, the Netherlands, Sweden, the United Kingdom and the United States

[2] http://www.iea.org/newsroomandevents/speeches/141201_EU_IDR_Speech.pdf