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Review of the implementation of the OSCE commitments in the field of energy efficiency

Energy security and climate change mitigation requires more energy efficiency

19TH OSCE ECONOMIC AND ENVIRONMENTAL FORUM
"Promotion of common actions and co-operation in the OSCE area in the fields of development of sustainable energy and transport"

CONCLUDING MEETING
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Table of Contents

1. Introduction

The purpose of this report is to review the implementation of the OSCE[1] commitments in the field of energy efficiency, which in this paper is taken in the broader sense of energy saving, also encompassing energy conservation[2].

1.1 Background

The Permanent Council of the OSCE in its Decision Nº 959 of 2010 decided that the OSCE's Nineteenth Economic and Environmental Forum would take as its theme: [the] "*promotion of common actions and co-operation in the OSCE area in the fields of development of **sustainable energy** and transport*".

The Permanent Council further decided that the agenda of the Forum would include a "*Dialogue on the promotion of sustainable energy, including new and renewable as well as traditional energy sources; good governance and transparency in the energy field; **energy efficiency**; low-carbon energy technologies; and fostering of multi-stakeholder dialogue and co-operation between energy producers, consumers and transit countries"; as well as "Regional and subregional co-operation on sustainable energy and transport, and sharing of best practices and exchange of experiences in these fields*". (OSCE, 2010.)

The agenda also was to include a review of the implementation of OSCE commitments in the economic and environmental dimension, and relevant to the theme of the Nineteenth Economic and Environmental Forum.

The focus of the review this year is energy efficiency development in the OSCE area.

1.2 The OSCE commitments with regard to energy efficiency

In the **OSCE Strategy Document for the Economic and Environmental Dimension** adopted at its Maastricht Meeting in December 2003, the Ministerial Council recognized "*that a high level of energy security requires a predictable, reliable, economically acceptable, commercially sound and environmentally friendly energy supply, which can be achieved by means of long-term contracts in appropriate cases. We will encourage energy dialogue and efforts to diversify energy supply, ensure the safety of energy routes, and **make more efficient use of energy resources**. We will also support further development and use of new and renewable sources of energy*." (Paragraph 2.1.12) (OSCE, 2003.)

In 2009 at its Athens meetings the Ministerial Council (Decision Nº 6/09):

underlined "*that the interrelated challenges of climate change, energy security and*

[1] Abbreviations and acronyms are explained in **Appendix I**.

[2] "*Technically, 'energy efficiency' means using less energy inputs while maintaining an equivalent level of economic activity or service; 'energy saving' is a broader concept that also includes consumption reduction through behaviour change or decreased economic activity. In practice the two are difficult to disentangle and the terms are often used interchangeably*" (European Commission, 2011.) Energy conservation "*is typically defined as a reduction in the total amount of energy consumed. Thus, energy conservation may or may not be associated with an increase in energy efficiency, depending on how energy services change. That is, energy consumption may be reduced with or without an increase in energy efficiency, and energy consumption may increase alongside an increase in energy efficiency*" (Gillingham et al., 2009.)

efficient use of energy resources *are amongst the most important issues to be tackled in the strategic perspective of ensuring sustainable development";*

encouraged *"the participating States, with a view to addressing energy challenges in the OSCE region, to promote awareness of the G8 St. Petersburg principles and objectives on strengthening global energy security, namely:*
– Increasing transparency, predictability and stability of global energy markets;
– Improving the investment climate in the energy sector;
– Enhancing energy efficiency and energy saving;
– Diversifying energy mix;
– Ensuring physical security of critical energy infrastructure;
– Reducing energy poverty;
– Addressing climate change and sustainable development".

and tasked *"the Office of the Co-ordinator for Economic and Environmental Activities [OCEEA], in co-operation with other OSCE executive structures, within their mandates and available resources, to continue providing assistance to participating States, at their request, to support the exchange of best practices and build capacity in the areas related to energy security, inter alia* ***energy efficiency, energy savings*** *and the development of and investment in renewable sources of energy"*. (OSCE, 2009.)

In 2010 the OSCE Secretary General in a report "concerning the complementary role of the OSCE in the field of energy security" noted that:

*"The OSCE should promote sustainable energy solutions**,** inter alia, by facilitating the dissemination of information and best practices regarding* ***c****leaner energy,* ***energy efficiency****, renewable energy sources, technology solutions, etc., as well as through holding seminars and conferences on these issues". (p. 4)*

"A potential area for dialogue could also be the creation of the necessary conditions for the equal access of all countries to new and effective ***energy saving technologies*** *and the deepening of scientific, technical and investment co-operation in the energy sphere".*

"The OSCE could play a role in ensuring the access for the participating States to the new energy technologies and facilitating co-operation in the sphere of sustainable energy and ***energy efficiency****. Sharing progress on* ***energy efficiency*** *can help curb world energy demand growth". (p. 22)*

"[In] co-operation with partners, the OSCE could develop appropriate guidelines, including examples of best practices and the most effective solutions with regard to increasing ***energy efficiency and energy conservation****. It would also be useful to consider the possibility of holding seminars and conferences on this issues". (p. 23)*

"The OSCE can promote increased awareness regarding the linkages between energy security and climate change as well as ambitious and visionary energy policies that also support endeavours to combat climate change. As countries look for solutions that address energy, economy and climate change issues simultaneously, it seems that ***energy efficiency*** *provided an answer to all of these issues". (p. 23)* (OSCE, 2010b.)

1.3 Methodology

This review spans the 10-year period from 1999 to 2008. While there may exist data after 2008, it may be distorted by the impact of the economic and financial crisis, which generally depressed economic growth and energy consumption.

Because the OSCE spans three continents and includes a very composite set of countries in terms of economic development, energy consumption, as well as energy efficiency performance and policies, this report divides the 56 OSCE participating States in four clusters: North America, Western Europe, Central & Eastern Europe, and Eastern Europe, Caucasus and Central Asia (EECCA)(**Table 1**.)

The two main criteria behind this segmentation are (loosely defined) geographic contiguity and stage of economic development.

Table 1: Regional clusters within the OSCE area

Cluster	Number of countries	Countries	Rationale for cluster
North America	2	Canada, United States	History, size, economic weight, contiguity
Western Europe	23	Andorra, Austria, Belgium, Denmark, Finland, France, Holy See, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom	History, economic development, contiguity, common impact of EU policies
Central & Eastern Europe	19	Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, The former Yugoslav Republic of Macedonia, Malta, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, Turkey	History, economic development, contiguity, impact of EU "acquis communautaire"[3]
Eastern Europe, Caucasus and Central Asia (EECCA)	12	Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan, Ukraine	Highly energy-intensive consumption patterns during Soviet era

The primary sources of data are the US Energy Information Administration (EIA), which produces energy statistical series for most countries in the world, the International Energy Agency (IEA), BP, Enerdata, and the EU energy efficiency database, ODYSSEE. Because their energy consumption is relatively small, there are no data for some of the OSCE participating States such as Andorra, the Holy See, Liechtenstein, Monaco and San Marino. Data for Serbia and Montenegro are combined as distinct statistical series for these two countries only exist since 2006, year in which Montenegro became independent.

2. Energy intensity trends and developments in the OSCE area

[3] The full body of EU legislation as it must be incorporated ('transposed') over time in a candidate country's legislation.

2.1 The energy landscape of the OSCE area at a glance

The OSCE includes the three largest countries by area in the world (Russia, Canada and the United States), and eight countries that have borders stretching beyond the Arctic Circle (the three above plus Denmark, Finland, Iceland, Norway, and Sweden.)

28 countries were centrally planned economies until 1989-1991 (Central & Eastern Europe minus Cyprus, Malta and Turkey, and EECCA).

The OSCE participating States account for a little below 50% of world energy consumption (primary energy supply), 246 quadrillion BTUs in 2008, equivalent to 6.2btoe[4]. In 2008 the share of OSCE countries in global GDP was 64%.

In 2010 countries in the OSCE region consumed about 46% of world oil (with shares roughly equal between Canada-USA and the rest) against a share of 35% in total world production, with Russia, the world's largest oil producer, accounting for 13% of the world total (**Figure 1**). The OSCE region accounts for about 50% of global crude oil imports (~950 Mtoe in 2010), with the US accounting for a small half of that, and a small quarter (~440 Mtoe in 2010) of global crude oil exports, with Russia accounting for the bulk of these exports.

In 2010 OSCE countries consumed about 60% of world natural gas against a share of 57% in world production; it accounts for 70% of global imports and 62% of global exports (with Russia – the world's second largest producer behind the US – holding a 20% share, of which 93% flow to Europe via pipeline); 9 European countries represent 43% of world imports of natural gas[5]; and Europe as a whole 57%.

On the other hand in 2010 the OSCE region only consumed about 29% of world coal, marginally more than its share in world production (27%), and the USA – the world's second largest producer behind China - accounted for about half of both totals.

The OSCE region accounts for over 77% of the nuclear electricity, 43% of the hydro electricity and 71% of other renewable energy consumed worldwide in 2010 (for these, unlike for fossil fuels, the shares in production and consumption are normally equal).

Figure 1: Share of OSCE region in world consumption and production of energy (2010)

	Oil	Natural Gas	Coal	Total Fossils	PES
OSCE	Prod. 35%, Cons. 46%	Prod. 57%, Cons. 60%	Prod. 27%, Cons. 29%	Prod. [illegible], Cons. 44%	[illegible]

PES = Primary Energy Supply

Source: BP 2011

In other words, the OSCE region is close to being self-sufficient for natural gas and coal –its consumption of natural gas and coal only marginally exceeds production–, and is only

[4] Source: EIA. BP comes up with a slightly smaller number for 2008 at 5.7btoe.

[5] Belarus, Belgium, France, Germany, Italy, Spain, Turkey, UK and Ukraine.

significantly energy dependent for crude oil. However, there exist wide differences between regions within the OSCE[6].

North America (chiefly the USA) is self-sufficient in natural gas and coal. Former Soviet Union countries (chiefly Russia) are net exporters of coal, natural gas and (mostly) oil. Europe (broadly defined) is significantly dependent on imports for all three types of fossil fuels (**Figure 2**).

Figure 2: Dependency on fossil-fuel resources in various sub-regions of the OSCE area

Mtoe	**Oil**		**Natural Gas**		**Coal**		**Total Fossil**		**PES**	**% PES**	**Fossil balance/PES**
	Prod.	Cons.	Prod.	Cons.	Prod.	Cons.	Prod.	Cons.			
North America	502	952	701	705	587	548	1790	2206	2602	85%	
balance	**-450**		**-5**		**39**		**-416**				**-16%**
Europe	201	731	257	496	188	319	646	1546	1980	78%	
balance	**-529**		**-239**		**-131**		**-900**				**-45%**
EECCA	652	186	682	527	243	168	1577	881	992	89%	
balance	**466**		**155**		**75**		**696**				**70%**
Total OSCE	1355	1869	1639	1729	1018	1035	4012	4632	5574	83%	
	-513		**-90**		**-17**		**-620**				**-11%**

Source: BP 2011

2.2 Energy consumption

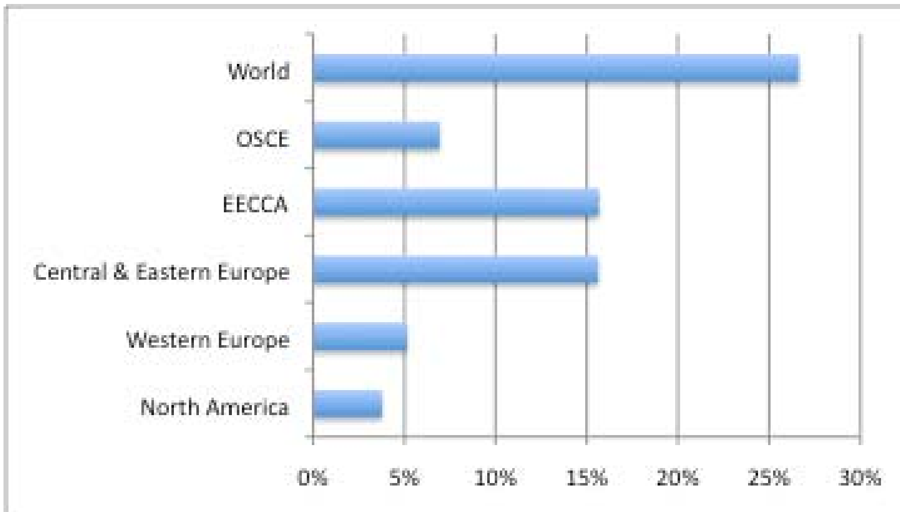
In the 10-year period between 1999 and 2008 the primary energy consumption[7] of the OSCE area rose by 7% against a worldwide increase of 27%.

Growth in primary energy consumption has been uneven across the four clusters: 4% in North America; 5% in Western Europe; 16% in Central & Eastern Europe and EECCA (**Figure 3.**)

[6] Western and Central & Eastern Europe are lumped together in this analysis as BP provides data only for 7 CEE countries.

[7] The IEA provides a useful definition of primary and secondary energy: "*Energy commodities are either extracted or captured directly from natural resources (and are termed primary) such as crude oil, hard coal, natural gas, or are produced from primary commodities. All energy commodities which are not primary but produced from primary commodities are termed secondary commodities. Secondary energy comes from the transformation of primary or secondary energy. The generation of electricity by burning fuel oil is an example. […] Both electricity and heat may be produced in a primary or secondary form.*" (IEA, 2005.)

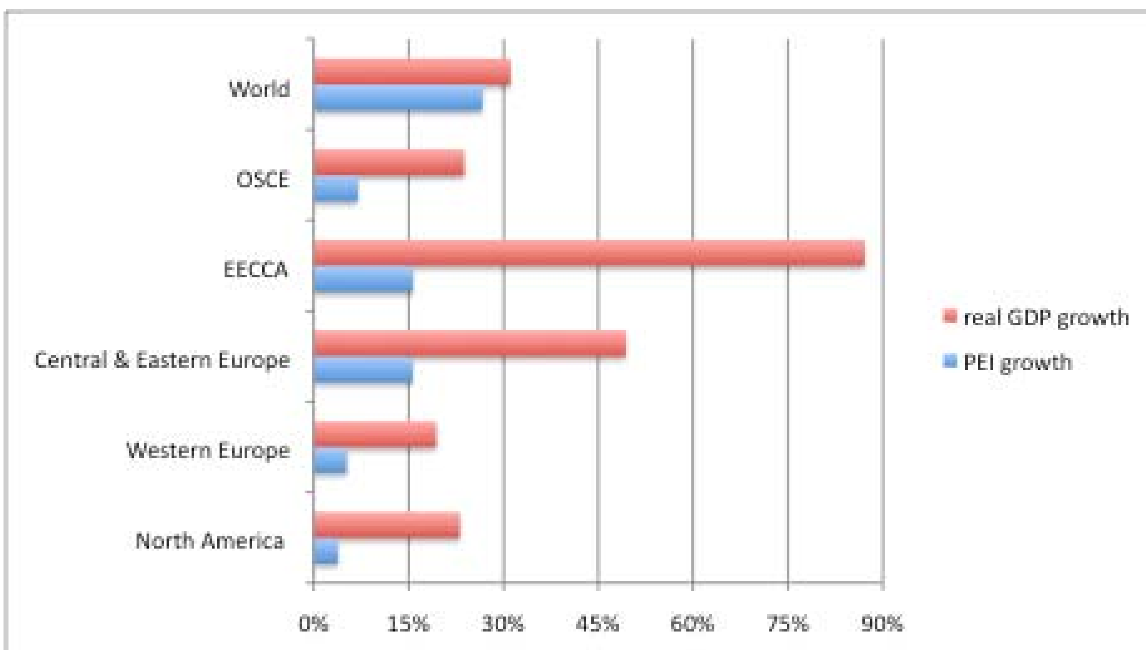
Figure 3: Growth in primary energy consumption (1999-2008)



Source: EIA

At the same time the aggregate GDP of OSCE participating States grew by 24% in real terms against 31% for the world as a whole. This suggests that the OSCE area has made a relatively more productive use of the energy it consumed. This is corroborated by data on primary energy intensity (PEI) (**Figure 4.**)

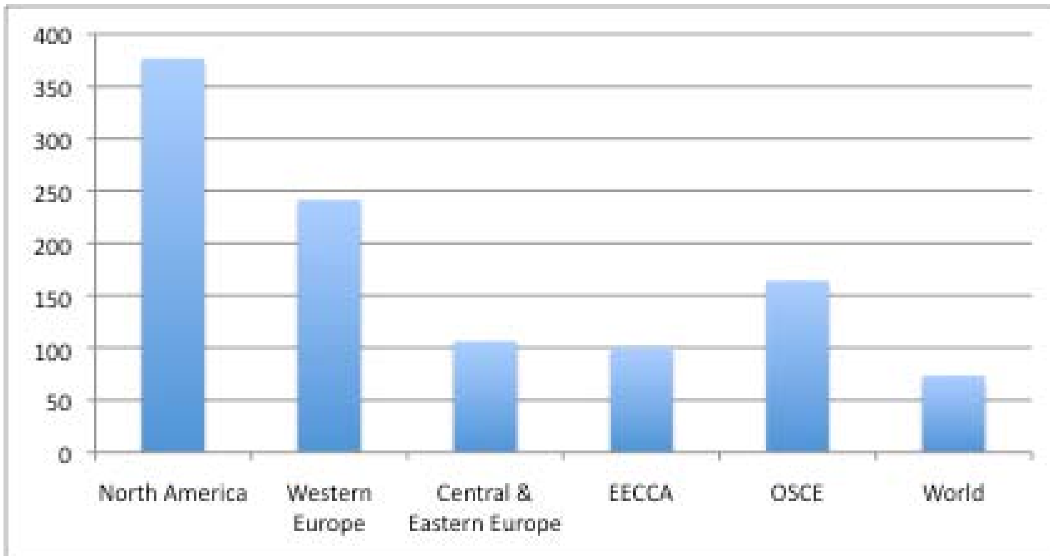
Figure 4: Growth in energy consumption vs. GDP growth (1999-2008)



Source: EIA (PEI) / USDA (GDP)

There are significant differences in primary energy consumption per capita, with North Americans consuming more than three times as much as inhabitants of Central & Eastern Europe and EECCA and more than twice as much as an average citizen of an OSCE participating State (**Figure 5**). These differences are narrowing over time, albeit slowly, and this is how it should be given the initial differences in GDP per capita. While the energy consumption of North Americans declined by 2% over the period that of EECCA inhabitants increased by 29%. At lower levels of development economic growth means increased consumption of energy per capita.

Figure 5: Primary energy consumption per capita (Mbtu per person, 2008 – arithmetic averages)



Source: EIA

2.3 Energy intensity and energy productivity

The most utilised indicator of energy efficiency at the level of an economy as a whole is the energy intensity of the gross domestic product (GDP), which is the ratio of primary energy consumption to economic output (GDP). The inverse of energy intensity (of GDP) is energy productivity (how much energy is needed to produce one unit of GDP), popularised by the McKinsey Global Institute. These are the two faces of the same coin.

GDP values are converted at purchasing power parity rates (PPP, in short) instead of nominal exchange rates to adjust for differences in price levels across countries. Using PPP increases the value of GDP in regions with a low cost of living, such as most developing and emerging countries, and therefore decreases their energy intensities. It also narrows the gap between more developed and less developed economies.

Energy intensity can be measured at the level of primary energy consumption or final energy demand. The main difference is that the former takes into account consumption and losses in the process of converting primary energy (in power plants, refineries) into, e.g., heat or electricity. The final energy intensity is a more appropriate indicator to assess energy efficiency at end-use level: it corresponds to the energy consumed per unit of GDP by final consumers for energy uses.

The interrelations between energy consumption, energy intensity and energy efficiency are described in **Box 1**.

BOX 1: Energy consumption, energy intensity, and energy efficiency

These three concepts are widely employed but sometimes their interrelations are not well understood.

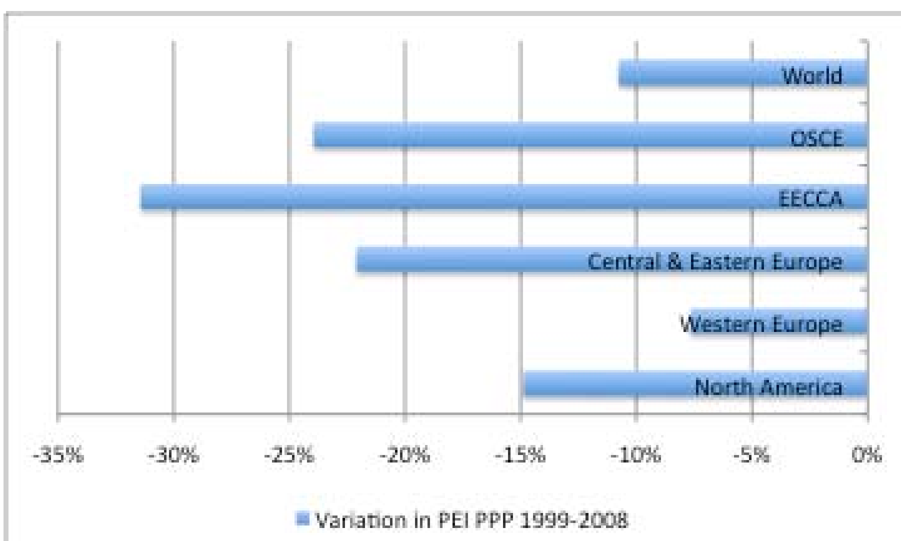
Energy consumption can decrease, while energy intensity decreases, and energy efficiency increases. That is the ideal scenario, but one that does not always occur. During the period 1999-2008 this has happened in 8 OSCE participating States as diverse in size, climate, geography, economic development as Denmark, the UK, The former Yugoslav Republic of Macedonia, Poland, and the Kyrgyz Republic. All of these countries have recorded real GDP growth, and unsurprisingly *also* the highest decrease in their energy intensities in their respective clusters. The exceptions are Poland and the Kyrgyz Republic; Slovakia records the fastest improvement in energy intensity in Central & Eastern Europe, and Azerbaijan in the EECCA; however because of their higher relative rates of GDP growth rates, primary energy consumption goes up.

The most frequent scenario in the OSCE area has been that energy consumption *increases*, while energy intensity decreases, and energy efficiency increases. The reason is that GDP has grown faster than energy intensity has decreased. The economy as a whole becomes more efficient at using energy, but energy consumption keeps rising.
The worst scenario is when energy consumption *increases*, and that energy intensity also increases, while energy efficiency does not necessarily decrease. This has happened in two OSCE participating States in the period 1999-2008: Iceland and Turkmenistan. The likely most pertinent explanation is that the economic structure has changed, towards more-intensive sectors, even though energy efficiency stays flat or even continues to improve, but not enough to offset the shift to highly intensive sectors (e.g. from services to industry, from low-intensity industrial sectors towards high-intensity sectors like steel and cement).

Other combinations are conceivable but less frequent.

Primary energy intensity of the OSCE area has decreased (improved) by 24% during the period 1999-2008, as against a decrease for the world of 11%. OSCE participating States have only needed 7% more energy to fuel a 27% real GDP growth. The equivalent numbers for the world are 27% and 31%. Improvement in primary energy intensity has been uneven across clusters (**Figure 6**[8]). The strongest improvement has been recorded by EECCA countries (-31%), admittedly starting from a low base (relatively higher energy intensity).

Figure 6: Change in primary energy intensity 1999-2008

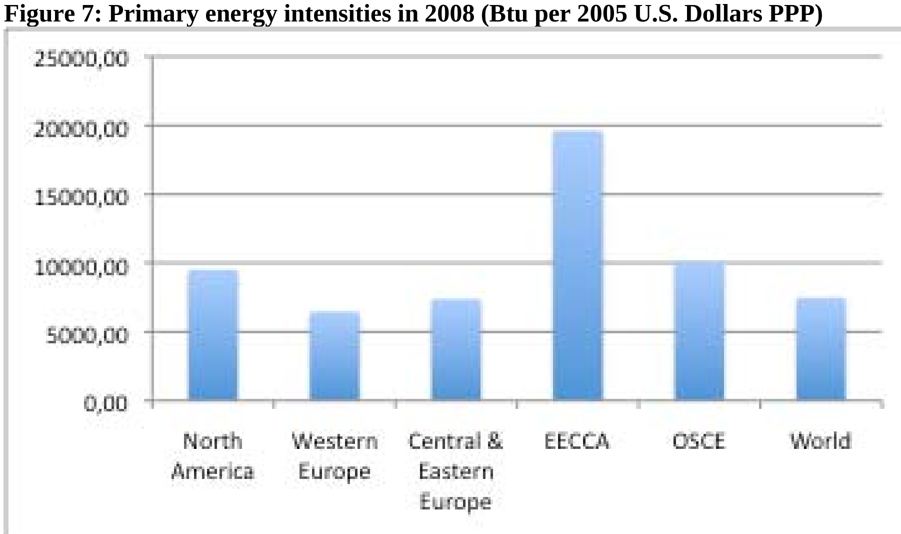


[8] The numbers for each cluster are *arithmetic* averages. This may distort the picture significantly, if countries exhibit very larges differences in terms of size of GDP or primary energy consumption, and the variation thereof over the period under review. For example, the reduction in primary energy intensity of the EECCA cluster would have been 43% without Turkmenistan (whose primary energy intensity increased by 69%.)

Source: EIA

Primary energy intensities vary significantly across clusters (**Figure 7**[9]). EECCA countries have an intensity about three times higher than that of Western European countries and twice as high as that of North America, which is about 50% higher than that of Western Europe[10]. The use of arithmetic (as opposed to weighted) averages flatters the OSCE average relative to the world in this figure as the two largest energy users in the OSCE area – USA and Russia – have higher energy intensities than the world average.

Figure 7: Primary energy intensities in 2008 (Btu per 2005 U.S. Dollars PPP)



Source: EIA

Why do countries differ so much in terms of energy intensity (of GDP) even after adjusting for differences in prices (with the use of PPP)? The following factors account for most of these differences:

- *Climate*; colder countries or countries that use a lot of air conditioning are more energy intensive than temperate countries (e.g. Western Europe.)
- *Economic structure*; all else being equal a higher share of services in GDP will induce a lower energy intensity. This in particular explains why Russia and Ukraine with their high share of energy intensive industries (steel, aluminum, etc.) have a relatively higher energy intensity.
- *The state of the capital stock*; modern, insulated buildings are more energy efficient; likewise there are a number of industrial processes that use less energy per unit of output (specific energy consumption).
- *The energy mix*, in particular the efficiency of thermal power generation. The efficiency of thermal power stations in the EU is about 40% against about 27% in the EECCA and 34% worldwide[11].
- *The level of energy prices;* low, subsidized, energy prices discourage rational use of energy, as well investment in energy saving equipment (capital stock). This certainly is a cause of the

[9] Numbers based on arithmetic averages. See previous footnote.

[10] The Enerdata numbers for 2010 (ENERDATA, 2011) using koe per 2005 dollar PPP show similar proportions for slightly different groupings of countries: North America (0.18), EU-27 (0.12), CIS (0.36).

[11] Source: WEC, 2010.

high energy intensity of EECCA countries, where during the Soviet era energy prices were highly subsidised and have remained so for some heat (district heat and hot water; domestic natural gas).

- *Organization and behavior*.
- *Income per capita;* high-income countries tend to exhibit a higher energy consumption per capita than developing and transition countries, due to the wider diffusion of some appliances, etc. This counterbalances the generally higher energy efficiency of these countries.

Energy efficiency policies can mitigate the impact of some of these factors, rarely of all.

Accordingly, change in energy intensity is a very imperfect indicator of progress in energy efficiency[12]. Variations in the energy intensity of a country can be caused by many different factors: apart from technical improvements in the use of energy these are climatic variations from year to year, structural changes in the composition of GDP by branches (e.g. the tertiarisation of the economies), changes in lifestyle (e. g. trend to more and bigger cars or larger dwellings) or other structural changes. The ODYSSEE indicators that are being developed under the aegis of the EU (Intelligent Energy for Europe programme), such as ODEX, aim to remedy those shortcomings (see **Appendix II** on ODEX indicators.)

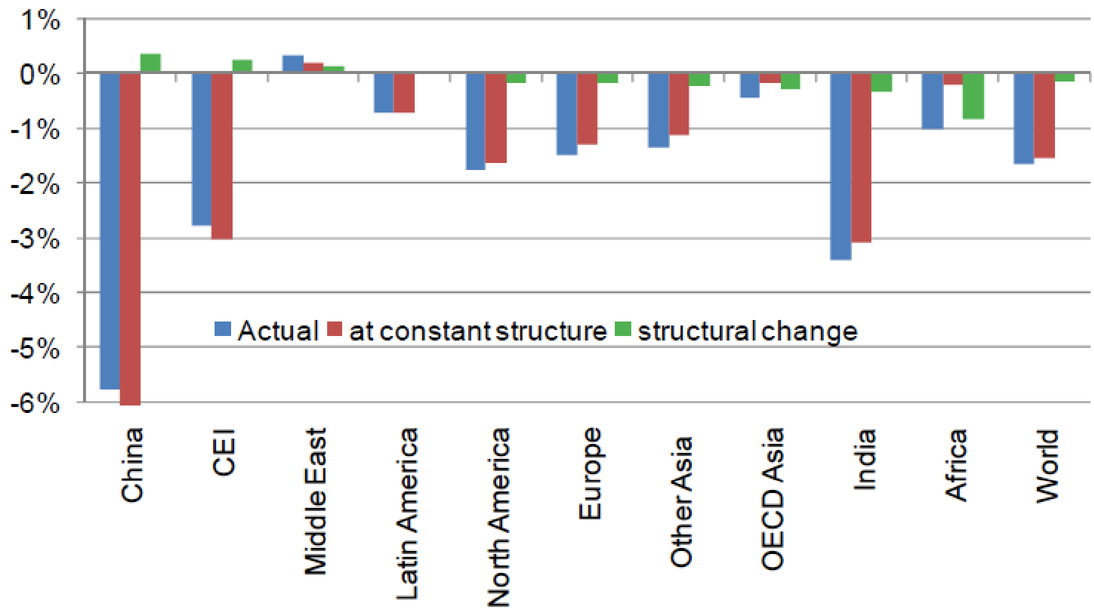
As noted by the WEC: "The effect of structural changes is especially important in countries with rapid economic growth. The share of industry in the GDP varies from 20% in North America, to 25% in Europe, India and Africa, around 30% for the world average, Latin America, OECD Asia and Pacific and around 60% in China" (WEC, 2010.)

It is therefore useful to calculate an energy intensity at constant GDP structure, i.e. assuming a constant share of agriculture, industry and services in the GDP as well as a constant share of the private consumption in the GDP (for households).

In essence, countries where the share of services in GDP has increased (tertiarisation) –most regions of the world and most of the OSCE area– registered a lower improvement in final energy intensity once this factor is taken into account –this factors overstates genuine improvements in energy productivity. The only countries and regions where the converse occurred were China and the EECCA, where an increasing share of energy-intensive industries has to an extent offset progress in energy productivity (**Figure 8**, from WEC 2010).

[12] According to the WEC: "*The energy intensity is more an indicator of "energy productivity" than a true indicator of efficiency from a technical viewpoint, as it reflects the effect of many factors that are not directly linked to energy efficiency. Indeed, the energy intensity level is influenced by the nature of the economic activities (the "economic structure", i.e. the contribution of various sectors in the GDP), the primary energy mix (i.e. the share between coal, oil, gas, biomass, other renewables and nuclear), the climate, the level of development and lifestyles, the organisation of transport sector (in particular the importance of public transport), and the technical energy efficiency. Trends in energy intensities are therefore influenced by changes in the economic and industrial activities of the country ("structural changes"), in the energy mix, in lifestyles, in transport infrastructures and in the end-use efficiency of equipment and buildings*" (WEC, 2010.)

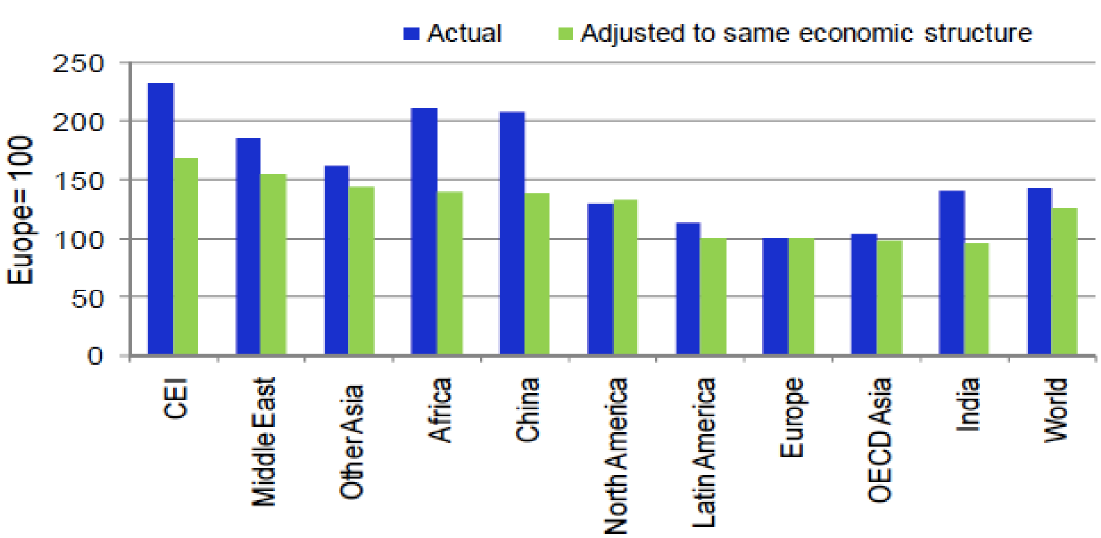
Figure 8: Impact of changes in economic structure on changes in final energy intensity (1990-2008)



Source: ENERDATA (WEC, 2010)

Accordingly, the ranking of countries in terms of energy intensity is altered if the comparison is based on the same economic structure, for example that of Europe. After this adjustment, final energy intensities (FEI) are much lower than their observed level. The impact is quite significant for CIS countries (CEI in Figure 9) with a high share of industry in the GDP (**Figure 9,** where Europe =100).

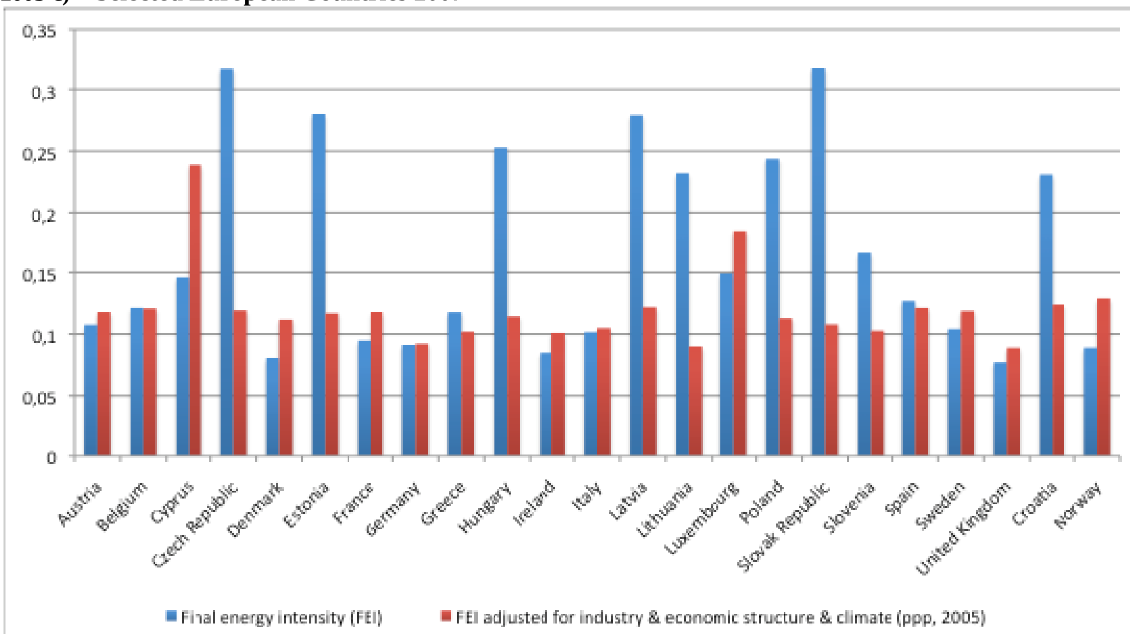
Figure 9: Final energy intensity adjusted at same economic structure (2008)



Source: ENERDATA (WEC, 2010)

ODYSSEE also calculates final energy intensities adjusted for climate, and for climate *and* economic structures. This results in further narrowing differences between countries – in this case among EU members and EU candidates (**Figure 10**), by reducing sometimes dramatically (half or more) the adjusted FEI of all Eastern European countries (9 in this sample). In particular, the often-cited argument of a lesser energy efficiency performance of Eastern European countries relative their Western European peers, appears to be if not altogether unfounded, at least much exaggerated.

Figure 10: Final energy intensity (FEI) vs. FEI adjusted for economic structure, climate & PPP (koe per one 2005 €) – Selected European Countries 2007



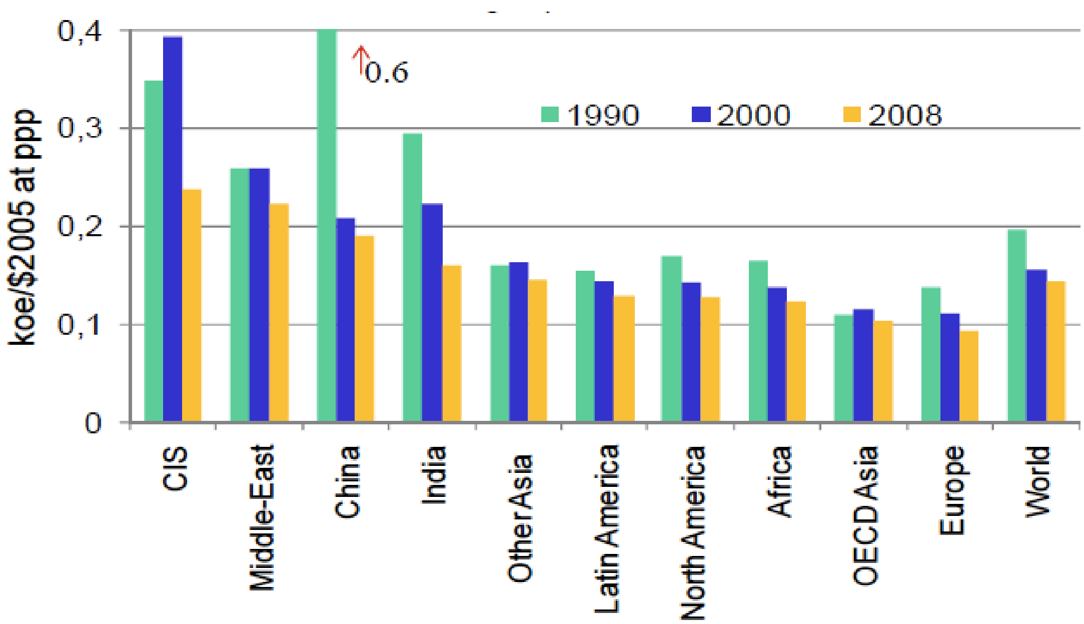
Source: ODYSSEE

The following paragraphs provide a cursory sector analysis of energy consumption and energy efficiency trends.

Industry

Energy intensity of industry has improved in all regions of the world between 2000 and 2008. While the energy intensities (PPP-adjusted) of industry of Europe (which includes the Western Europe and Eastern Europe clusters) and North America are below the world average, that of the CIS (which corresponds to the cluster EECCA) remains significantly above (**Figure 11**). Convergence between countries and regions is more pronounced than for the other sectors, as industry is more exposed to global competition and the imperative of cost-efficiency.

Figure 11: Energy intensity of industry in 1990, 2000 and 2008 in selected countries and regions (PPP)



Source: ENERDATA (WEC, 2010)

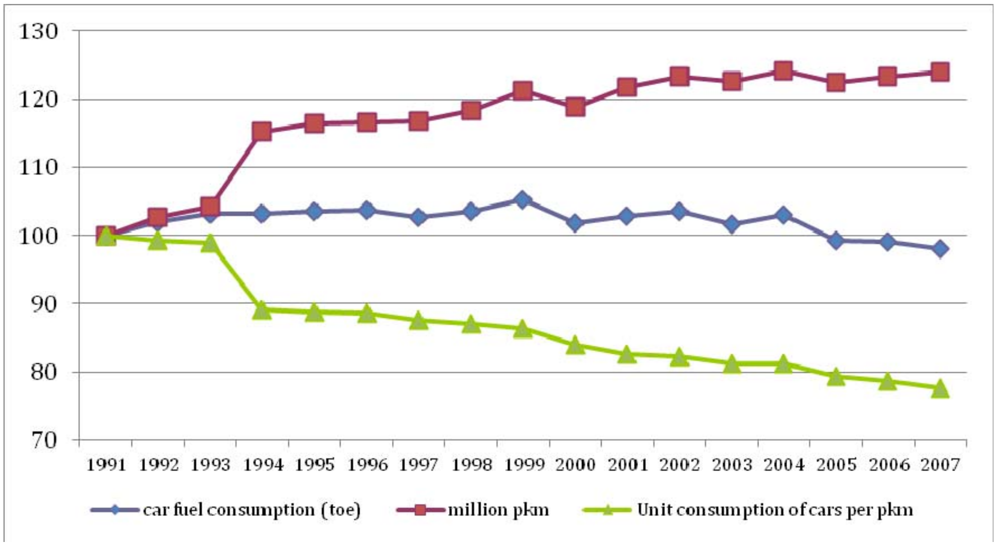
Transport

Energy efficiency in transport has improved, although in many countries it is the sector that has undergone the fastest growth in energy consumption. Key drivers are air transport, modal shifts (between water, road and rail), fuel efficiency of new cars, car ownership. According to the WEC (WEC, 2010): "The energy intensity of the transport sector appears to be quite similar in Europe, OECD Asia and Pacific and other Asia, while North America stands at a level 75% higher. The reduction in the energy intensity of transport in OECD countries is due to the combination of two main drivers: lower growth of car ownership and traffic, due to saturation, and improvement of the energy efficiency of new cars linked to the policy measures implemented. In the EU and Japan, the specific consumption of new cars has decreased regularly since 1995 (by about 20%)" due to voluntary agreements between manufacturers' associations and the government (European Commission in the EU.)

Road transport is the main component of total transport energy use in Western Europe, North America and increasingly in the other sub-regions. In Germany, for example, it accounts for almost 80% of the sector final energy consumption. Car-related energy consumption is the main component of road-related consumption (70%). Car-related fuel consumption was broadly flat during the period, the rise in traffic (millions of passengers-kilometer, +24%[13]) offsetting the lower fuel consumption per passenger-km (-22%) (**Figure 12.)**

13 The surge of car traffic in 1991 (+18%) could be a consequence of Germany's reunification, which created new opportunities for East Germans to buy cars and travel freely to West Germany and abroad. The highest level for new car registrations in Germany in the period was also un-coincidentally reached in 1991-1992, with 4.16 and 3.93 million cars respectively.

Figure 12: Drivers of car energy consumption in Germany (100=1991)



Source: ODYSSEE - OECD

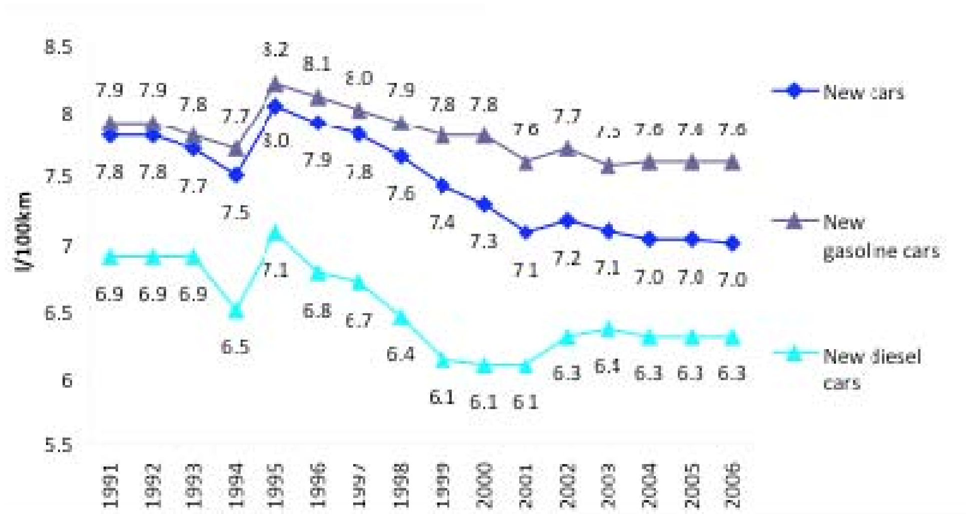
The lower unit consumption of cars is likely attributable to:

a) **Progress in fuel efficiency (in l/100km).** Two factors combined their effects: (i) improved fuel efficiency of new cars (from 9.2 l to 7.6 l/100 km for the stock of cars, an improvement of 17%), especially until 2001; (ii) the increasing share of diesel cars (whose fuel efficiency is better than for gasoline cars, albeit stagnant for new vehicles since 2003) in the stock of cars (**Figure 13**.)

b) **A switch from petrol to diesel cars.** Between 1990 and 2007, the share of diesel cars in new car registrations jumped by a factor of five, from 10% to 48%, with an acceleration between 1997 and 2003 (from 15% to 40%). Diesel consumption of cars increased by 122%; gasoline consumption of cars fell by 23%; and the share of diesel in total car-related energy consumption jumped from 15% to 33% over the period.

The reasons for this switch to diesel are as follows: (i) the excise duty on car diesel fuel in Germany (which accounts for more than 60% of the total price) is currently about 28% lower than for gasoline, and the same holds true for EU-15 (one exception is the UK where the excise rates are identical). The difference adds up to €0.184 per liter ($0.25 or $0.97 per gallon), which is very significant. This difference in the tax treatment of diesel and gasoline has existed in most EU countries for over 10 years. (ii) New diesel cars are about 20% more efficient (at constant power) than gasoline cars; and the purchase cost of the former has gradually come down as volumes were increasing.

Figure 13: Specific fuel consumption of cars (new vehicles)

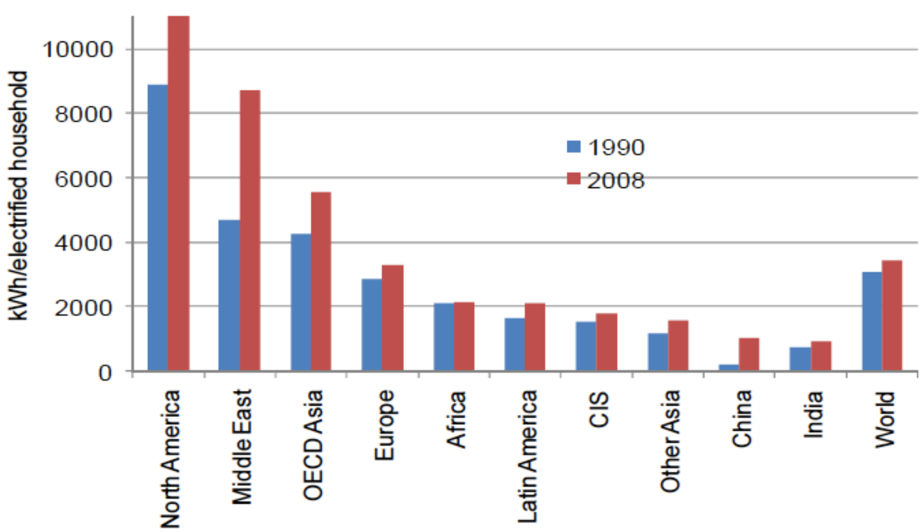


Source: Fraunhofer ISI, 2009

Households and services[14]

Household electricity consumption is rising in all regions of the world, and particularly in Asia. However levels of consumption per household remain very uneven, even after adjusting for degrees of electrification (vast swaths of African and other developing regions are under-electrified) and excluding thermal uses (mainly space heating which accounts for a significant proportion of household energy use in the Northern part of the OSCE region) (**Figure 14**).

Figure 14: Electricity consumption per electrified household excluding heating (2008 relative to 1990)



Source: ENERDATA (WEC, 2010)

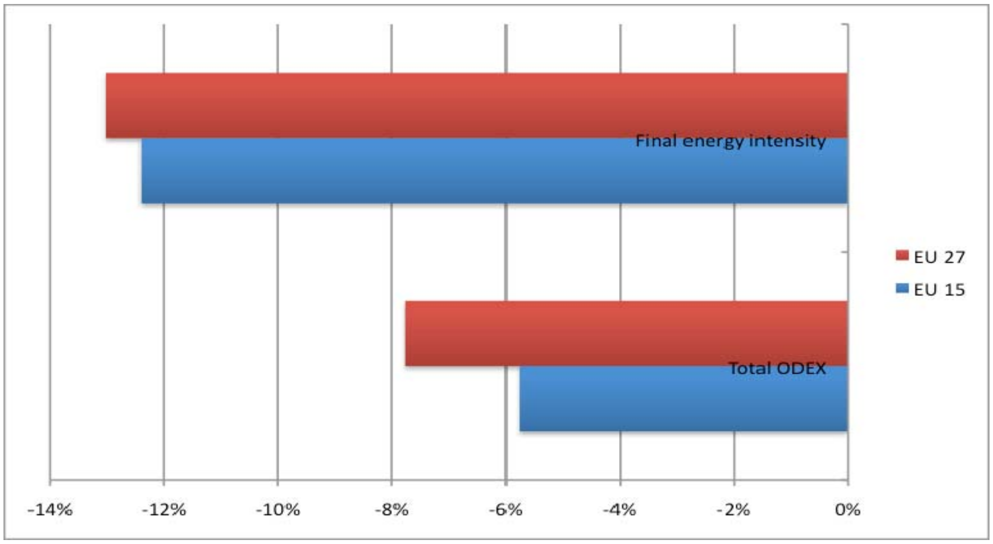
[14] In line with the WEC (WEC, 2010) ("*The diverse patterns among world regions of energy consumption for space heating and for the fuel mix for cooking make any comparison of the total energy consumption between regions fairly meaningless*"), the evaluation of energy trends in these sectors in this report therefore focuses on electricity.

Real progress in energy efficiency

As indicated earlier, energy intensity is only a crude proxy for energy efficiency. Other factors such as structural (e.g. tertiarisation, switch from heavy to light industries, etc.) and behavioral changes affect energy intensity but have nothing to do with energy efficiency. The ODYSSEE project's ODEX indicators aim to monitor and measure real progress in energy efficiency (see **Appendix II**). They mostly apply to the 27 EU members.

The decrease in final energy intensity in both EU15[15] and EU27[16] was much more pronounced than the progress in energy efficiency as measured by ODEX: the difference is considerable, about 5-6 percentage points over the period 1999-2006 (**Figure 15**). Progress in energy efficiency (ODEX) was most pronounced in industry

Figure 15: Evolution of ODEX vs. final energy intensity in EU 15 and EU 27 (1999-2006)



Source: ODYSSEE

2.4 Greenhouse gas emissions and carbon intensity

Total emissions of carbon dioxide (CO_2, responsible for about 80% of global greenhouse gas (GHG) emissions) from the consumption of energy[17] in the OSCE area amounted to 13.6 $GtCO_2$ in 2008, equivalent to 45% of world emissions. OSCE area CO_2 emissions from the consumption of energy have increased by 5% over the 1999-2008 against a worldwide increase of 30%.

Variations across regional clusters are of the same order of magnitude as for primary energy consumption (**Figure 16**): they range from 3% (North America and Western Europe) to 13% (Central & Eastern Europe) as against a range of 4-16% for primary energy consumption. For EECCA it is worth noting that the previous decade (1990-99) saw a sharp fall in carbon emissions, as a result of the contraction of the economy in the wake of the economic collapse that followed the breakup of the Soviet Union.

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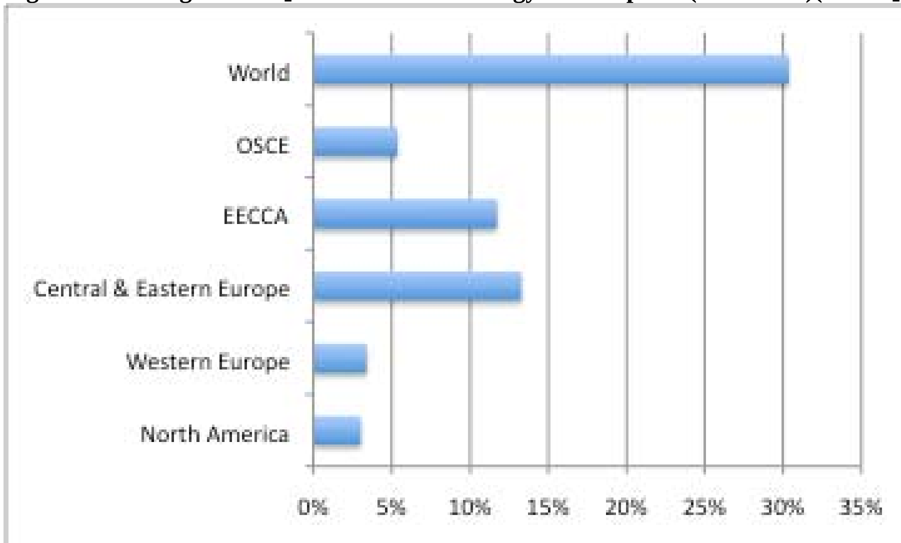
[15] The European Union before its enlargement to Central & Eastern European countries in the years 2004-2007.

[16] The current number of EU member states after the last wave enlargement (2004-2007).

[17] The other main anthropogenic cause of CO_2 emissions is deforestation and forest degradation (about 20% of world total emissions of GHG). This is negligible in the OSCE area.

Figure 16: Changes in CO_2 emissions from energy consumption (1999-2008)($MtCO_2$)

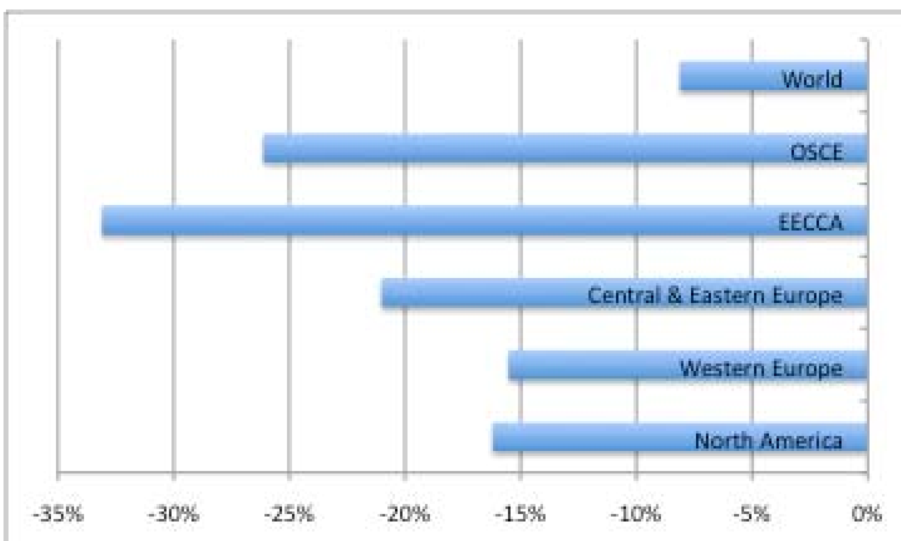


Source: EIA

As energy intensity for energy consumption, the carbon intensity of an economy measures the CO_2 emitted to generate one unit of GDP. Likewise it is useful to convert GDP values at PPP.

As for energy intensity, the carbon intensity of the OSCE region has decreased more rapidly than that of the world: -26% and -8% respectively. The OSCE region keeps releasing increasing quantities of carbon dioxide into the atmosphere, but GDP is growing faster than emissions, which is a positive thing but not sufficient to address the global challenge of climate change, which will necessitate absolute cuts in the amount of carbon emissions. Of the four regional clusters, the EECCA registered the largest decrease in carbon intensity (-33%) (**Figure 17**).

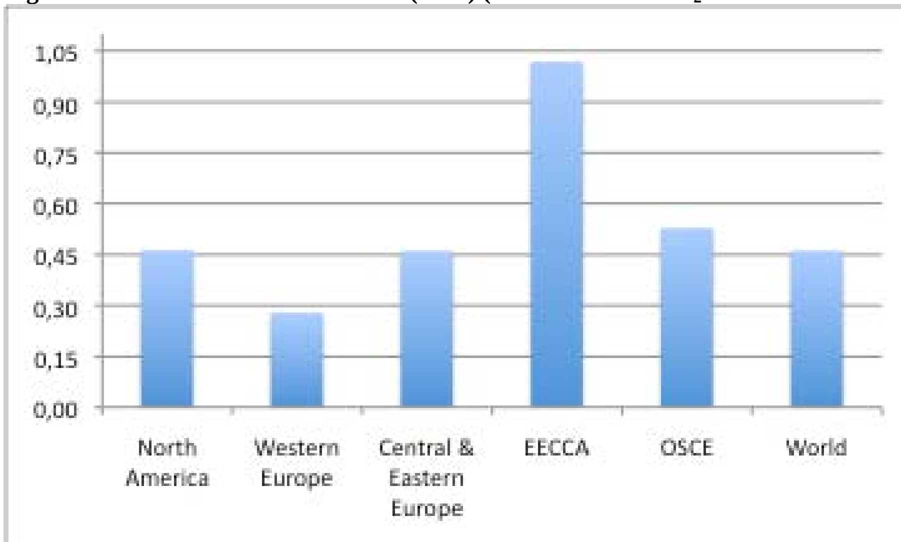
Figure 17: Changes in carbon intensity 1999-2008 (Metric Tons of CO_2 Thousand 2005 Dollars)



Source: EIA

The ranking of clusters in terms of relative carbon intensities is not much different from that observed for primary energy intensities, with the EECCA significantly above the other clusters and world. As for primary energy intensity, EECCA countries have an intensity about three times higher than that of Western European countries and twice as high as that of North America, which is about 50% higher than that of Western Europe (**Figure 18**).

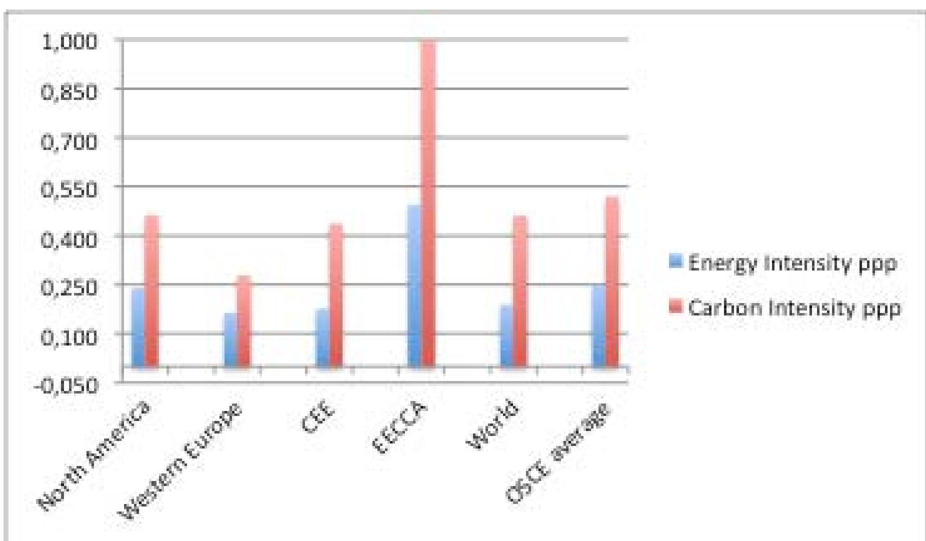
Figure 18: Carbon intensities of GDP (2008) (Metric Tons of CO_2 Thousand 2005 Dollars)



Source: EIA

The EECCA exhibits the highest energy and carbon intensities, Western Europe the lowest (**Figure 19**). Central & Eastern European levels are close to those of North America. However, as noted before adjustments for differences in climate and economic structure almost cancel out the differences in energy intensity.

Figure 19: Energy and carbon intensities (2008) (left axis: koe or kCO_2 per 2005 U.S. Dollar)



Source: EIA

There is a strong correlation between primary energy intensity and carbon intensity (of GDP). Energy intensity is a key determinant of carbon emissions and thus of carbon intensity. But it is not the only one. The second key factor is the *carbon intensity of the energy mix* (primary energy supply), which is a function of the share of each fossil fuel in total primary energy supply, and the carbon content of each fuel[18]. The higher the share of fossil fuels and coal in particular, the higher the carbon intensity of the energy mix. The higher the share of nuclear and renewable energies (hydropower, solar, wind, biomass), the lower the carbon intensity of the energy mix. The combination of these two factors explains the carbon intensity of GDP[19] (**Figure 20**).

Figure 20: Determinants of carbon intensity of GDP in selected OSCE participating States (2008)

Countries	Energy Intensity PPP	Carbon Intensity of energy supply	Carbon Intensity of economy PPP
USA	0.19	2.45	0.48
Canada	0.25	2.07	0.52
Germany	0.14	2.40	0.34
Switzerland	0.1	1.64	0.16
France	0.15	1.38	0.21
Sweden	0.17	0.92	0.15
UK	0.11	2.45	0.28
Bulgaria	0.26	2.47	0.64
Czech	0.21	2.62	0.54
Serbia	0.31	3.07	0.96
Turkey	0.12	2.68	0.32
Russia	0.42	2.32	0.97
Ukraine	0.4	2.27	0.91
Kazakhstan	0.54	2.94	1.58
Moldova	0.34	2.24	0.77
EU 27	0.14	2.2	0.31
FSU	0.4	2.34	0.95

Source: IEA

At one extreme is Sweden, with a combination of low energy intensity (although not the lowest of the Western Europe cluster, in part due to its cold climate) and low carbon intensity of its energy mix (due to the high share – almost two thirds – of non-fossil energies, chiefly nuclear and hydroelectricity, in its energy mix.) At the other lies Kazakhstan (or Turkmenistan), with a high energy intensity (due to climate, economic structure, subsidized energy prices, and slow introduction of EE policies) and a high carbon intensity of its energy mix (due to the high share of coal, 50%, of which Kazakhstan is the second largest producer in the Eurasian part of the OSCE region, and the relatively low efficiency of thermal power plants.) As a result Kazakhstan emits ten times more CO_2 per unit of GDP than Sweden.

In general, the high share of coal in the energy mix and particularly for power generation explains most of the high carbon intensity of the energy mix. Countries that had historically generous endowments in coal –the Czech Republic, Germany, Kazakhstan, Poland and the USA (as well as China, India, Indonesia, and South Africa beyond the OSCE), have a high carbon intensity of their energy mix. Coal was for long one of the hallmarks of the UK's industrialization and the engine of its ascent to economic primacy. But the UK was also one of the rare countries to strike oil (in

[18] Coal has the higher carbon content – it emits more CO_2 when combusted than gas or oil for a given calorific value. In addition there are various types of coal.

[19] Carbon intensity of GDP = Primary energy intensity x carbon intensity of the energy mix. It can be verified, e.g. for Germany that its carbon intensity of 0.34 (kCO_2 per euro of GDP PPP) = 0.14 (koe per euro of GDP PPP) x 2.40 (kCO_2 per koe).

the 1970s) after coal within its own borders, although that resource is also now in decline and peak production was reached more than 10 years ago (in 1999).

This means that countries should use two levers to reduce carbon emissions: First by improving energy intensity through a set of ambitious energy efficiency policies; second by decarbonising their energy mix through policies that promote greater use of non-fossil energy resources, cogeneration (the combined generation of electricity and heat or steam), and more efficient thermal generation of power and heat. At the intersection of the two lies the promotion of cogeneration plants using biomass –a renewable source of energy.

3. Policies and strategies on energy efficiency in the OSCE region

3.1 Is an energy efficiency policy necessary?

The case for energy efficiency policies – the existence of barriers

Governments design and implement energy efficiency policies to attain certain objectives in terms of energy savings[20] that society (the market), left to its own devices, is deemed unable to deliver. In an ideal (market) world governments, households and firms would use all information available and based on this information would take rational decisions as regards energy usage. This is not happening in reality, or the result falls short of socially desired outcomes. There is a gap between the opportunities for cost-effective energy efficiency investment and actual levels. This is usually called the “energy efficiency gap” or “energy paradox”.

The justification of policy intervention lies in the existence of barriers to the rational use of energy[21]. The literature on barriers is extensive and is becoming increasingly sophisticated along with progress in behavioral economics. Barriers are frequently divided in three broad categories: economic, behavioral and organizational (**Table 2**).

[20] Energy savings is a notion that is not best expressed as an absolute reduction in the amount of energy consumed. Energy savings may arise from a lower than expected growth in energy consumed compared to “business as usual” (the mere continuation of past trends) In most countries progress in energy intensity goes hand in hand with a growth in energy consumption in absolute terms. The same goes for carbon intensity and GHG emissions.

[21] A key distinction is between market barriers and market failures. “*Market barriers refer to any factor which explains why technologies which appear cost effective at current prices are not taken up. Market failures refer to those market barriers which (according to economists) justify a public policy intervention to improve economic efficiency. This distinction is important. Market barriers, which are not market failures, may prevent investment in energy efficiency but may nevertheless represent rational behavior. For example, energy efficient investments may be associated with hidden costs such as management time and disruption of production. These costs may be ignored in energy models but are nevertheless real. Investors may be making a rational decision not to invest in the light of these additional costs. Similarly, some energy efficiency investments may be high risk and may justify the use of high discount rates. Economists assert that intervention to encourage economic efficiency is only justified when resources are not being allocated efficiently through well functioning markets*”. (Sorrel et al., 2000)

Table 2: Taxonomy of barriers to energy efficiency

Perspective	Sub-division	Barrier	Claim
Economic	Market failure	Subsidized energy prices	Consumers will overuse energy if it is under-priced, e.g. from not factoring in the carbon externality.
		Imperfect information	Lack of information may lead to cost-effective energy efficiency measures opportunities being missed. Transaction costs for obtaining and processing information on energy efficiency are higher than for energy supply.
		Split incentives	If a person or department cannot gain benefits from energy efficiency investment implementation will likely be of less interest (e.g. landlords with tenants).
		Adverse selection	If suppliers know more about the energy performance of goods than purchasers, the purchasers may select goods on the basis of visible aspects such as price and be reluctant to pay the price premium for high efficiency products.
		Principal-Agent relationships	Principal-agent relationships occur when the interests of one party (the principal) depend on the actions of another (the agent). Strict monitoring and control by the principal, since he or she cannot see what the agent is doing, may result in energy efficiency measures being ignored.
	Non-market failure	Heterogeneity	A technology or measure may be cost-effective in general, but not in all cases.
		Hidden costs	Examples of hidden costs are overhead costs, cost of collecting and analyzing information, production disruptions, inconvenience etc.
		Access to capital/liquidity constraint	Limited access to capital may prevent energy efficiency measures from being implemented. Where internal funds are available, other priorities may take precedence.
		Risk	Risk aversion may be the reason why energy efficiency measures are constrained by short payback criteria.
Behavioural	Bounded rationality	Bounded rationality	Instead of being based on perfect information, decisions are made by rule of thumb.
	The human dimension	Form of information	Research has shown that the form of information is critical. Information should be specific.
		Credibility & trust	The information source should be credible and trustworthy in order to successfully deliver information regarding energy efficiency measures. If these factors are lacking this will result in inefficient choices.
		Inertia	Individuals who are opponents to change within an organization may result in overlooking energy efficiency measures that are cost effective.
		Values	Efficiency improvements are most likely to be successful if there are individuals with real ambition, preferably represented by a key individual within top management.
Organizational		Power	Low status of energy management may lead to lower priority of energy issues within organizations.
		Culture	Organizations may encourage energy efficiency investments by developing a culture characterized by environmental values.

Source: Adapted from Thollander et al., 2010, and Sorrell et al., 2000, who consider that the 15 barriers can be reduced to 12 by combining a) values with culture; b) bounded rationality with inertia; and c) form of information with credibility & trust.

A key barrier to energy efficiency is the subsidisation of energy prices, generally with the goal of alleviating energy poverty. In most OSCE participating States energy prices are set by governments (some retail prices), markets (wholesale generation, retail) or regulators (typically the distribution and transmission of energy through networks which constitute natural monopolies). The IEA estimates that direct subsidies that encourage wasteful consumption by artificially lowering end-user prices for fossil fuels amounted to $312 billion in 2009 (IEA, 2009a). These estimates do not include subsidies to fossil fuel producers, adding perhaps another $100 billion per year globally. While these subsidies have been phased out for the most part in OECD they are still pervasive in many transition and developing countries. In Russia, direct subsidies have been estimated by the IEA at almost $34 billion in 2009 (ibid.)

Russia‘s fossil fuel subsidies are mainly directed at natural gas and electricity (most of which is produced from gas) as consumer prices for oil products and coal have not been subsidised since the 1990s. Both gas and electricity are sold at average prices that are well below international market prices. This price gap between domestic and international prices was estimated to be approximately $19 billion for gas and $15 billion for electricity in 2009: equivalent to $238 per person and 2.7% of GDP, according to IEA estimates. Fossil-fuel consumption was subsidised at an average rate of 23%, meaning that consumers paid 77% of the full economic cost of energy prices.

High subsidies have several negative consequences: (1) they disproportionately benefit the higher-income groups because energy subsidies are not usually income tested but provided per unit of energy consumed; (2) they artificially reduce prices thus encouraging higher consumption and discouraging investment in new energy infrastructure and efficiency measures; (3) the inefficient use of energy hastens resource depletion and reduces the amount of energy available for export; (4) low prices have also meant that there has been little incentive for energy suppliers to invest in new production or distribution infrastructure, due to the prospect of low financial returns; (5) higher consumption results in greater greenhouse-gas emissions and local air pollution; and (6) they discourage investment in cleaner energy sources and technologies such as renewable energy by artificially reducing the consumer price for fossil-fuel products. (Laan, 2011.)

Beyond Russia, a recent UNECE report notes that “low-price policy in the energy sector has been identified to be one of the main economic and financial barriers in Belarus (electricity, heat), Bosnia and Herzegovina (electricity, heat), Romania (gas), the Russian Federation, Serbia, The former Yugoslav Republic of Macedonia, and Ukraine (all electricity, heat, gas). Prices and tariffs are considered too low to ensure an adequate return on investment for renewable energy and energy efficiency projects.” (UNECE, 2010.)

A classic barrier in industry is the lack of management attention especially for what looks like “seemingly small line-items”, a bias “biased toward investments that increase output or market share and away from those that cut operating costs”, and the use of very short payback times (which means implicit absurdly high discount or hurdle rates), while many companies “count lifecycle cost only for big items and make routine “small” purchases based on first cost alone”[22] (Lovins and Lovins, 1997.)

The rental building sector is characterised by “split incentives” between the landlords, responsible for investments related to heating and hot water equipment, and the tenants, who pay for energy costs separately from the rent. Typically landlords will purchase equipment with lowest “first cost” such as electric radiators, without paying attention to the associated energy cost, which is borne by tenants. Incentives are misaligned (“split”).

[22] Lifecycle costing is a way of costing equipment that takes into account not just capital outlay (purchase and installation) –“first cost”– but also recurrent running costs –including of energy– during the lifespan of the equipment.

In the transport sector, while motorists pay (in Western Europe) high fuel prices (currently around €1.30 or more for one liter of diesel), in most countries they do not pay for road use, with the exception of motorways in some countries (Croatia, France, Hungary, Italy, Spain, etc.). This gives an advantage to cars over more energy-efficient transport modes such as rail.

A study of 46 organisations drawn from the mechanical engineering, brewing and higher education sectors within the UK, Germany and Ireland, the authors found that "hidden costs and access to capital are identified as very important in all countries and sectors. *Problems associated with both appear to be the primary reason for not investing in energy efficiency in the case study sectors*. Also scoring highly are risk, imperfect information and split incentives. It is important to note that three of the four most important barriers *may* be interpreted as representing rational behaviour by organizations" (Sorrell et al., 2000).

Market failures and barriers to investment in energy efficiency are well-documented in the energy efficiency literature. Unfortunately, "quantitative evidence on the magnitude of many of these potential failures is limited" (Gillingham et al., 2009.). This is not specific to energy efficiency, but it is clear that it makes the task of policymakers much harder.

3.2 Policy responses

Energy efficiency policies aim to address these barriers in order to at least partially eliminate the "energy efficiency gap".

There is a broad international consensus on what energy efficiency policies should consist of. The list of 25 energy efficiency recommendations that IEA prepared initially for the members of the G8 (**Box 2**, and **Appendix V**) encapsulates the accepted wisdom in the field[23] (IEA, 2008a). The IEA estimated that if implemented globally without delay, the proposed actions could save around 8.2 $GtCO_2$/year by 2030 – equivalent to twice the EU's yearly emissions. This is an important document, as the IEA (24 of whose members are also OSCE participating States) regularly reports on countries' progress with implementing the 25 energy efficiency recommendations and equivalent measures. The latest such report was published in 2009 (IEA 2009b).

BOX 2: The G8/IEA 25 energy efficiency recommendations (summary)

1. *Cross-sectoral* policies:

#1 Measures for increasing investment in energy efficiency;
#2 National energy efficiency strategies and goals;
#3 Compliance, monitoring, enforcement and evaluation of energy efficiency measures;
#4 Energy efficiency indicators;
#5 Monitoring and reporting progress with the IEA energy efficiency recommendations themselves.

2. *Buildings* account for about 40% of energy used in most countries. Action is needed on:

#6 Building codes for new buildings;
#7 Passive Energy Houses and Zero Energy Buildings;
#8 Policy packages to promote energy efficiency in existing buildings;
#9 Building certification schemes;
#10 Energy efficiency improvements in glazed areas.

3. *Appliances and equipment* represent one of the fastest growing energy loads in most countries. Action is needed on:

[23] It does not however address public procurement, which features prominently in EU policy (EU, 2011.)

#11 Mandatory energy performance requirements or labels;
#12 Low-power modes, including standby power, for electronic and networked equipment;
#13 Televisions and "set-top" boxes;
#14 Energy performance test standards and measurement protocols.

4. Saving energy by adopting efficient *lighting* technology is very cost-effective. Action is needed on:
#15 Best practice lighting and the phase-out of incandescent bulbs;
#16 Ensuring least-cost lighting in non-residential buildings and the phase-out of inefficient fuel-based lighting.

5. About 60% of world oil is consumed in the *transport* sector. Action is needed:
#17 Fuel-efficient tyres;
#18 Mandatory fuel efficiency standards for light-duty vehicles;
#19 Fuel economy of heavy-duty vehicles;
#20 Eco-driving.

6. In order to improve energy efficiency in *industry*, action is needed on:
#21 Collection of high quality energy efficiency data for industry;
#22 Energy performance of electric motors;
#23 Assistance in developing energy management capability;
#24 Policy packages to promote energy efficiency in small and medium-sized enterprises.

7. *Energy utilities* can play an important role in promoting energy efficiency. Action is needed to promote:
#25 Utility end-use energy efficiency schemes

Source: Adapted from IEA 2008b - See **Appendix V** for an expanded version of the list.

3.3 Energy efficiency policy instruments

Energy efficiency policies at their most comprehensive consist of a strategy or action plan, targets, an implementing agency within the government apparatus endowed with powers and resources, and a cohesive suite or package of measures or instruments[24].

Increasingly OSCE participating States adopt **strategies or action plans** (for example, the National Energy Efficiency Action Plans (NEEAP) for the 27 EU member states & Switzerland[25]; National Energy Policy (NEP)(2001), and National Action Plan for Energy Efficiency (NAPEE) in the USA. These strategies or actions plans often include **targets**, which are non-binding. For example, the EU has set itself a target of reducing its primary energy consumption by 20% by 2020 relative to a baseline[26]. Indicative targets also exist at the level of EU Member States[27]; in

[24] There exist at least three databases of energy efficiency policy measures covering different if overlapping subsets of countries within the OSCE area: MURE (Mesures d'Utilisation Rationnelle de l'Energie) (http://www.isisrome.com/mure/) for EU Member States (for example, about 310 policy measures are present for the residential sector in EU-countries – see **Appendix III**), the IEA's Energy Efficiency Policies and Measures (http://www.iea.org/textbase/pm/?mode=pm) for IEA members –see **Appendix IV**, and the WEC's Energy Efficiency Policies and Measures (http://www.wec-policies.enerdata.eu/), which is global in scope.

[25] The existing energy efficiency *acquis communautaire* is extended to the EU's neighbours in South-Eastern and Eastern Europe via the Energy Community treaty (, ECT). The 9 Contracting Parties to the ECT (outside the EU itself) are Albania, Bosnia & Herzegovina, Croatia, The former Yugoslav Republic of Macedonia, Moldova (2010), Montenegro, Serbia and the United Nations Interim Administration Mission in Kosovo, and Ukraine (1 Feb 2011). EU policy on EE energy efficiency thus applies to 35 OSCE countries.

[26] Presidency Conclusions of the European Council of 8/9 March 2007.

[27] The 2006 EU Directive on Energy End-Use Efficiency and Energy Services (Energy Services Directive) requires Member States to submit NEEAP in 2007, 2011 and 2014. In the first NEEAP, each Member State should have adopted an overall national *indicative* savings target for end-use sectors of 9% or higher, to be achieved in 2016, and with an intermediate target for 2010. In 2013, the European Commission will assess the results and whether the

Russia (40% reduction in energy intensity by 2020); Canada (20% increase in energy efficiency by 2020); and Turkey (at least 15% reduction in energy intensity by 2020.)

A distinctive feature of energy efficiency policies is that they cut across sectors and government policies and thus no single government department can decide and implement policies without the contribution and collaboration of (most of) the others. This requires strong coordination between departments. In many countries the design and implementation of energy efficiency policies relies to a significant extent on a **dedicated public agency**, which also acts as a repository of expertise and a coordination mechanism. Examples of such agencies include EEA (Bulgaria), Go'Energi (Danish Energy Saving Trust), ADEME (France), DENA (Germany), Enova (Norway), SEEA (Serbia), and the Carbon Trust (UK). The highest concentration of dedicated agencies is in Western Europe.

OSCE participating States deploy a wide range of policy **instruments**. Instruments mostly fall under 4 categories: **regulations** (such as minimum energy performance standards (MEPS) for appliances and energy efficiency obligations of utilities; **economic instruments** such as energy taxes, tax rebates, soft loan schemes and subsidies; **information** such as labeling of energy-consuming products; and **voluntary agreements** such as for car fuel efficiency (**Table 3**).

programmes will deliver the EU 20% target, and will propose legally binding national targets if the review shows that the overall EU target is unlikely to be achieved. On current trends, savings would only reach 9%.

Table 3: Selected energy efficiency policy instruments with examples from OSCE countries

Types	**Selected instruments**	**Suitable circumstances in for this instrument***	**Examples in OSCE countries**
Economic instruments	Cost-reflective energy prices[28] Taxes and surcharges: - on car fuels - on fossil fuels - on motorway use Differentiated vehicle excise duties Premium prices for cogenerated electricity Financial incentives: Tax rebates on EE investments Lower VAT rate on EE equipment Soft loans Grants Vehicle scrapping schemes Carbon credits[29]	* When dealing with large target groups. * When aiming to internalize external costs. *When there is a financial barrier in place. * When an informative instrument (e.g., energy audit) needs financial incentives to attract the target group.	EU Germany (Ekosteuer), The Netherlands, Sweden Germany UK, France Germany France, Italy, The Netherlands, UK UK France (residential), UK (SMEs) Several countries France, Germany All OSCE countries (Kazakhstan and Turley on voluntary markets only)
Regulations	Standards (MEPS) - on new buildings - on boilers & appliances - on light bulbs (phasing out of incandescent lamps) - on motors in industry - on tyres EE obligations for utilities[30]	* When dealing with a target group which is: unwilling to act (e.g., voluntary agreement of producers not fulfilled) and difficult to address (e.g., landlord–tenant problem.) * When aiming at removing the worst products or services from the market with regard to energy consumption. * When aiming at large target	EU EU EU USA, Canada EU from 2012, USA

[28] Energy prices should be set at a level that reflects all costs (no subsidies) and environmental externalities (such as GHG emissions) through Pigovian taxes (such as in Denmark, Sweden, Germany) or a cap-and-trade system as exists in the EU since 2005 (EU ETS).

[29] Generic term for the tradable right to emit one tonne of CO_2-equivalent, the main greenhouse gas contributing to anthropogenic carbon emissions. In addition to the three trading mechanisms established by the Kyoto Protocol of 1997 (International Emission Trading, Joint Implementation, and the Clean Development Mechanism), 30 West European states (all EU member states plus Iceland, Liechtenstein, and Norway) participate in the EU Emission Trading Scheme (EU ETS), which has been in operation since 2005. The objective of the EU ETS is to contribute to meeting the EU GHG emission reduction (-20% by 2020.) EE is an instrument of choice for the approximately 11,000 installations subject to the scheme to keep their emissions within the cap or even generate a surplus of tradable allowances.

[30] An energy savings obligation is a "*measure in which energy companies (supplier/retailer or distributor) have a legal obligation to promote and stimulate investment, which will save energy in their customers' premises or households*" (WEC, 2010). The goal is to counter utilities' natural tendency to sell rather than save energy. If utilities

		groups being difficult to address by energy efficiency services. * When knowledge, financial, and institutional barriers play a role.	Belgium, France, Italy, UK
Information	Labelling of appliances, new cars, existing buildings, etc. Energy audits Eco-drive programmes	* When there is a knowledge/information barrier. * When dealing with large target groups. * When dealing with rather uniform technologies. * When there are large differences in energy performance between similar units. *When there is a knowledge barrier for buildings and production facilities.	EU, USA (EnergyStar) Turkey, Finland EcoENERGY (Canada), The Netherlands
Public procurement	Federal buildings All public buildings	* When there are sufficient possibilities to bundle large buyers of energy-efficiency technologies • When there is a limited number of market actors supplying energy-efficiency technologies • When potentials for further development and market transformation of new technologies are large enough	USA (FEMP[31]) EU
Smart grids & meters	Pilot programs		USA, Sweden
Energy performance contracting[32]	Federal buildings		EU (EE Action Plan 2011) US FEMP
Voluntary agreements	Car fuel efficiency Industry	*When dealing with a small number of actors with which you need to negotiate or a strongly organized sector. * When there is much relatively cheap saving potential (low hanging fruit)	EU (ACEA agreement) Netherlands
Dedicated financing mechanisms	Renovation of buildings EE in SMEs etc.	*When there is a financial barrier in place.	France (Fideme fund providing mezzanine debt) Germany (several

can earn credits by saving energy, use these credits for their own compliance or sell them to other parties who cannot meet their target, the system is called "white certificates", also referred to as Energy Savings Certificate, Energy Efficiency Credit, or white tag. In the OSCE area, some EU countries (such as Italy, France and the UK), and some US states (Connecticut, Pennsylvania, and Nevada) are implementing it.

[31] Federal Energy Management Program.

[32] The typical ESCO contract is called an energy performance contract (EPC), conveying the idea that the ESCO's remuneration is tied to its performance in saving energy at its customers' facilities or premises. There are two main EPC models. Under the "shared savings" model, the ESCO normally finances the project, and shares the savings with the client on a pre-determined basis. In the "guaranteed savings" model, a third party finances the project and the ESCO guarantees a certain level of energy savings to the customer: this model has the advantage that interest rates are usually lower (e.g. in the US municipalities can issue tax-exempt bonds). In contrast, in the shared savings model, the ESCO assumes both the performance and the credit risk

			KfW loan programmes) Portugal (Energy Efficiency Fund) Slovenia (Eko sklad j.s., Eco Fund) Spain (Institute for the Diversification and Energy Saving, IDEA) UK (zero-interest loans to SMEs from the Carbon Trust)

* This column is adapted from Harmelink et al., 2008

3.4 OSCE participating States' energy efficiency policies vs. best practice

North America and Western Europe

On the basis that the G8/IEA 25 recommendations represent international best practice, it is instructive to assess how countries perform relative to this benchmark. Since 2009 IEA tracks progress of G8 and its member countries in implementing the recommendations (IEA, 2009b)[33].

No G8 country (all of which bar Japan are OSCE participating States) has "fully or substantially" implemented more than 55% of relevant recommendations. This means that around 40% of the potential energy savings from the recommendations, or measures that achieve similar outcomes, remains to be captured. Policies for transport stand out as having the least substantial implementation, although many policies are "planned" in this sector. Russia is lagging in a number of areas, which can be explained by its history and more recent conversion to the merits of energy efficiency, but France and Germany are behind for standards for electric motors in industry (**Tables 4** and **5**.)

Table 4: Energy efficiency policy implementation in G8 countries …

4. Cross sectoral	All countries have some degree of national energy efficiency strategy or action plan. Innovative financial instruments (e.g. KfW loan programmes in Germany). High-quality indicator analysis exists in most countries (particularly Canada and UK).
Buildings	Strong building codes and promotion of passive energy houses are found in Germany. Policies for existing buildings exist in all countries. Building certification is currently in place in most countries whereas Russia is planning a building certification scheme.
Appliances	Most G8 countries have active minimum energy performance standards (MEPS) and associated labeling. Russia is planning MEPS and labelling schemes. Standby power requirements are either implemented or are planned in all G8 countries except Russia. Minimum energy standards exist for set-top boxes in most G8 countries.

[33] A second evaluation of progress by IEA members is due to be published in October 2011.

Lighting	Most G8 countries are currently implementing policies to phase out incandescent lamps.
Transport	Fuel efficiency standards are in place for heavy-duty vehicles in Japan. Policies aimed at rolling resistance of tyres are planned in all G8 countries except Russia. Stringent fuel efficiency standards for light-duty vehicles exist in EU member states, Japan and the USA. Measures that promote proper inflation of tyres are implemented in USA and Canada.
Industry	Coverage of industry energy statistics is improving in all countries, and is particularly well developed in Canada.
Utilities	Innovative policies to create incentives for utilities to promote energy efficiency exist in USA, UK, France, Italy (white certificates).

Source: EIA, 2009b

Table 5: Room for improvement in G8 countries

Cross sectoral	Further room for improving national energy efficiency strategies and action plans. Ensure greater effort in enforcement, compliance and evaluation. Expand efforts in financing, particularly with development of savings verification and measurement protocols, establishing public-private partnerships, and implementing findings of subsidy reviews.
Buildings	Establish stronger energy efficiency requirements for buildings. Strengthen support for passive energy houses and zero energy buildings. Increase efforts to promote energy-efficient windows and glazing.
Appliances	Establish policies to address the growing television-related energy demand. Develop measures to address home digital networks.
Lighting	Support for adoption of high-efficiency alternatives to fuel based lighting.
Transport	Ensure the implementation of planned policies. Create fuel efficiency standards for heavy-duty vehicles. Russia, in particular, requires additional effort to promote energy efficiency of its transport fleet.
Industry	Establish energy efficiency standards for electric motors (France and Germany need to increase efforts here). Pay more attention to energy management policies (the lack of formal energy management policy in Russia, France and Germany is of concern). Create policies to assist small and medium-sized enterprises.
Utilities	Devote more attention to providing incentives for utilities to promote energy efficiency in all G8 countries.

Source: EIA, 2009b

Looking at the IEA membership as a whole, only four OSCE participating States (out of the 24 that comprise the IEA membership) appear to have 'fully implemented' or 'substantially implemented' more than 40% of the recommendations: the United Kingdom, Canada, the United States and Denmark. Turkey, Greece, Poland, the Slovak Republic and Luxembourg have the highest proportion of "not implemented" recommendations (IEA 2009c) (**Table 6a**). There is a high proportion of recommendations in the 'implementation underway' and 'plan to implement' categories – this is particularly the case with EU countries. This indicates good to high potential to improve energy efficiency, but also points to implementation challenges. Furthermore, 12 IEA countries (all from the Central & Eastern Europe and Western Europe clusters) are currently implementing fewer than half of the recommendations. These are: the Czech Republic, France, Hungary, Italy, Luxembourg, Norway, the Slovak Republic, Spain, Turkey, Greece, Netherlands and Poland.

Table 6a: Status of implementation of IEA recommendations in IEA countries (OSCE participating States only)

	High proportion of recommendations implemented	Low proportion of recommendations implemented
Cross sectoral	Canada, Finland, Germany, Portugal, Sweden, Switzerland, the UK and the US	Greece, Norway, the Slovak Republic and Turkey
Buildings	Denmark, Germany, Portugal, Switzerland and the UK	Greece, Poland, the Slovak Republic, Spain and Turkey
Appliances	The IEA encourages all countries to extend, improve and implement the planned EE policies	
Lighting		
Transport		Turkey
Industry	Belgium, Canada, the Czech Republic, Ireland, Turkey, the UK and the USA	Greece, Luxembourg, the Netherlands, Poland and the Slovak Republic
Utilities	The IEA encourages all countries to consider how they can motivate utilities to promote energy efficiency.	

Source: EIA, 2009c

The IEA concludes that "IEA member countries must urgently ramp up their energy efficiency policy efforts" in particular in the areas listed in **Table 6b**. (IEA, 2009c.)

Table 6b: Areas for improvement – IEA countries

Summary of actions needed in IEA member countries

		IEA recommendation number*
Cross sectoral	All IEA countries need to:	
	▪ Further improve their national energy efficiency strategies and action plans.	1.2 a)
	▪ Give greater attention to enforcement, compliance and evaluation.	1.3
	▪ Expand efforts in financing, particularly with development of savings verification and measurement protocols, establishing public-private partnerships, and implementing findings of subsidy reviews.	1.1
	▪ Increase efforts to promote risk-mitigation instruments such as public-private partnerships.	1.1 a) v)
	▪ Complete reviews of impacts of fiscal policies on energy efficiency.	1.1 a) iii)
	▪ Improve quality and coverage of energy indicators.	1.4
Buildings	All IEA countries (with the possible exception of Germany, Denmark and Sweden) need to:	
	▪ Establish stronger energy efficiency requirements for buildings.	2.1a) and 2.1b)
	All IEA countries need to:	
	▪ Strengthen support for passive-energy houses and zero-energy buildings.	2.2
	▪ Increase efforts to promote energy-efficient windows and glazing.	2.5
Appliances	All IEA countries need to:	
	▪ Ensure adequate resources allocated to maintaining stringency of energy efficiency requirements for appliances.	3.1 b)
	▪ Ensure appropriate policies in place to encourage television service providers to deliver products that are as energy efficient as possible.	3.3c) iii)
Lighting	All IEA countries need to:	
	▪ Develop measures for promoting energy efficiency in non-residential lighting.	4.2
	▪ Support adoption of high-efficiency alternatives to fuel-based lighting.	4.2 b)
Transport	All IEA countries need to:	
	▪ Ensure the implementation of the transport energy efficiency policies that are planned.	5
	All IEA countries except Japan need to:	
	▪ Establish fuel-efficiency standards for heavy-duty vehicles.	5.3
Industry	All IEA countries need to:	
	▪ Develop or strengthen energy efficiency standards for electric motors.	6.2 a)
	▪ Establish measures to optimise energy efficiency in motor-driven systems.	6.2 b)
	▪ Develop further policies to assist small and medium-sized enterprises.	6.4
Utilities	All IEA countries need to continue to consider how to incentivise utilities to promote energy efficiency.	7

Source: IEA, 2009c

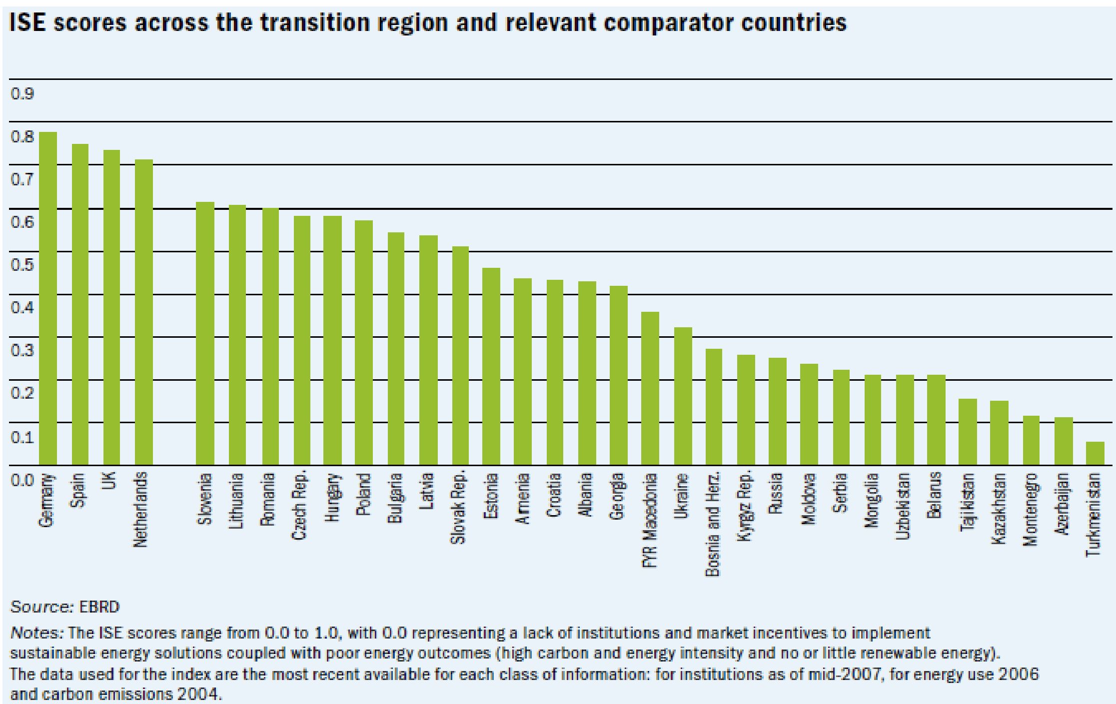
Central & Eastern Europe and EECCA

The foregoing data and discussion on IEA countries leaves aside all countries of the EECCA cluster (12), and the vast majority of Central & Eastern Europe countries (14 out of 19). Data on energy efficiency policies of these countries is scarcer, except for those that are members of the EU (12, all in Central & Eastern Europe), which are covered by the MURE database.

For these countries the EBRD has elaborated an index of sustainable energy (ISE), which attempts to combine in one measure quality of institutions and policy as well as outcomes. The ISE is thus a composite index of (i) institutions (including policies), (ii) market incentives (including energy pricing), and (iii) outcomes in three areas relevant to the use of energy and its effect on the climate: energy efficiency, renewable energy, and climate change. (EBRD, 2008.)

The index scores range from 0 to 1 (with 0 representing a lack of institutions and market incentives to implement sustainable energy solutions coupled with poor energy outcomes (high carbon and energy intensity and no or little renewable energy)). Results show a wide variation in scores across the region (**Figure 21**). Nine of the 10 new EU member states score close to each other and are all above 0.5 (except Estonia). This compares with substantially higher scores for the western European counterparts, which score close to 0.8. Some countries in south-eastern Europe, such as Croatia, score close to the group of new EU member states. The Western Balkans cluster together with most EECCA states, with a score of 0.4 or below. This is true for both energy-rich states (such as Azerbaijan, Kazakhstan, Russia and Turkmenistan) and the energy-importing Central Asian republics (such as the Kyrgyz Republic and Tajikistan).

Figure 21: EBRD's index of sustainable energy for countries in transition

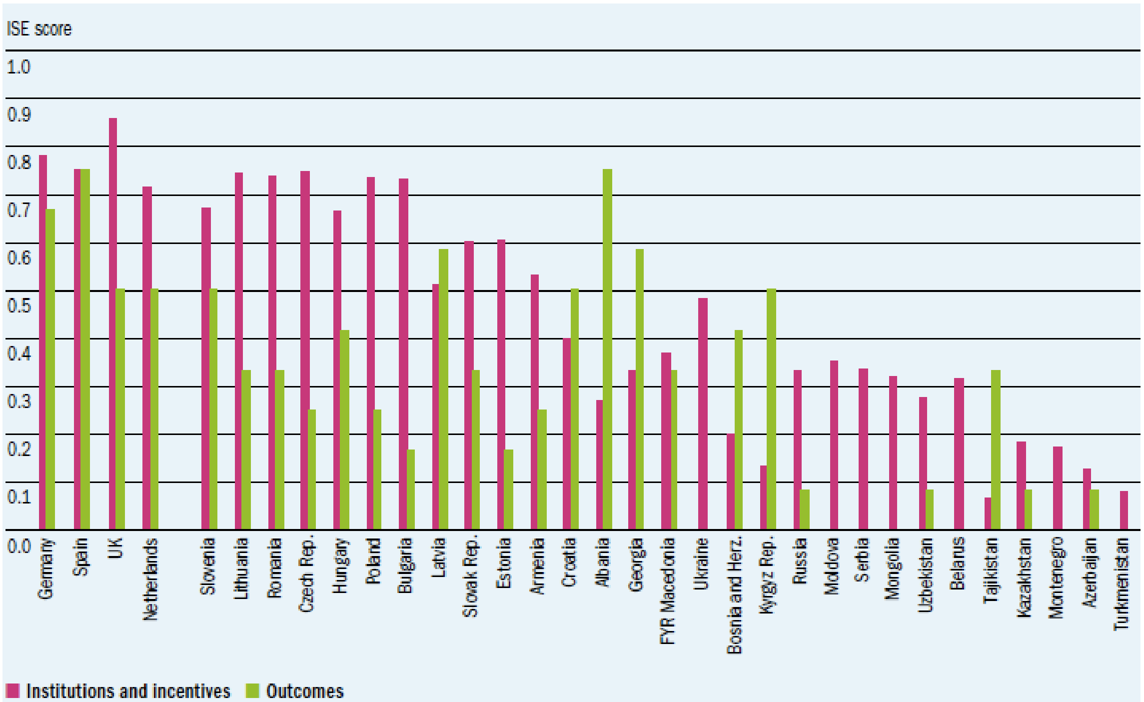


Source: EBRD, 2008

In energy efficiency, the regional leaders are the new EU member states (especially Hungary, Lithuania, Poland and Slovenia), reflecting a better institutional set-up, good market incentive mechanisms and favorable outcomes (relatively low energy intensity). At the other extreme, some countries have yet to implement basic institutions, continue to be very energy-intensive and lack basic incentives for energy savings (low energy tariffs).

The EBRD acknowledges that the indicator by aggregating institutions, incentives and outcomes may be confusing or misleading. Breaking the ISE down into institutional (institutions and market incentives) and outcome measures (**Figure 22**) yields two main conclusion: Firstly, some countries in the region, particularly the new EU member states and a few others (for example Armenia, and Ukraine), have made substantial strides in policy reforms to encourage sustainable energy outcomes, even though they still lag behind Western Europe for outcomes; secondly some countries such as Albania, Bosnia and Herzegovina, Georgia, the Kyrgyz Republic and Tajikistan, score relatively well in terms of outcomes despite their less advanced institutional structure (institutions and incentives). This is due to due to two factors: (i) their large endowment in renewable resources and the relative extensiveness of their use of large hydroelectric power plants; and (ii) an economic structure characterised by the low share of energy-intensive industry.

Figure 22: Policy reform vs. outcomes in transition countries



Source: EBRD

Notes: Some countries (such as Albania, Georgia and Tajikistan) have considerable renewable resources that are exploited in large hydroelectric power facilities, which reflects on outcome scores disproportionately. At this stage it is not possible to correct for this due to lack of disaggregated data availability. The data used for the index are the most recent available for each class of information: for institutions as of mid-2007, for energy use 2006 and carbon emissions 2004.

Source: EBRD, 2008

3.5 Policy instruments to tackle the financing barrier

The financing barrier

Financing is presented in the literature as a very important barrier to energy efficiency. “The essential issue blocking the realization of the potential energy savings is the underdeveloped state of energy efficiency investment delivery mechanisms, adapted to be able to work well in national and local economic environments.” (Taylor et al., 2008.) In short, the argument runs, there are good projects (technically, environmentally, economically), but they remain on the shelves for lack of financing.

This issue is real but is also probably over-stated by conventional statistics on financing flows for sustainable energy. For example, in “Global Trends in Sustainable Energy Investment 2011”, its annual review of investment trends in the sustainable energy sector co-produced with Bloomberg New Energy Finance, UNEP estimates overall global investment in sustainable energy at $211 billion in 2010. The financing of projects, large and small, represented slightly below 90% of that with $181 billion. An important limitation of this annual review is that the financing of energy efficiency projects hardly features at all, as these numbers exclude investment by governments and public financing institutions and those financed from companies' own cash flow. Probably because of this methodological hurdle the 2011 edition announces that it now "concentrates on renewable energy". The likely reason is that energy efficiency investment flows are not adequately tracked, in particular by banks.

A common perception is that banks in particular do not lend for energy efficiency, but this is not really true. Banks do lend for new boilers, motors, compressors, 'modernization', process line improvements, machine replacement, the renovation of buildings, etc. Banks do lend for energy efficiency; they just do not think of it in these terms. Banks are organized along geographic, sector, or product lines, and energy efficiency does not fall under either of them. In addition, energy efficiency upgrades are often embedded in capacity expansion or process modernization. Many banks finance energy efficiency improvements without knowing it, and without measuring it, because there is no methodology, nor an obligation, for banks to do so[34].

The following barriers are identified as main hindrances to the financing of energy efficiency investments:

1. High perceived risks, because of the lack of collateral value of energy efficiencyproject equipment, lack of understanding by financial institutions of how to evaluate energy efficiency investments, high perception of technical risks, and unfamiliar risk profiles of energy users, e.g. home-owner associations.
2. Lack of relevant expertise/capacity both within financial intermediaries and at the project sponsor level.
3. Unsuitable finance terms, in particular lack of long-term loans.
4. High transaction costs associated with developing and financing projects, due to the generally small size of projects.
5. Low returns vs. expectations of the project proponents (a synonym for quick pay back requirements or high discount rates), generally higher than for other capital expenditure project– although this is less a financing barrier than a financial barrier, which deters the project proponents from undertaking the project in the first place.

Mitigating the financing barrier

Governments and international financial institutions ((IFIs), using donor governments' funding to provide the grant element that enables IFIs to soften the terms of their financing and provide technical assistance[35]) have developed dedicated financing mechanisms and associated technical assistance (e.g. capacity building) in order to remedy these barriers. **Table 7** below provides an overview of how generic barriers are being addressed by these mechanisms and activities in OSCE countries (with special emphasis on countries in transition –our Central & Eastern Europe and EECCA clusters).

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[34] "*Funding for EE activities may be folded into more general borrowing activities - e.g. corporate, consumer, or municipal finance - or be described as "modernization" or "refurbishment", and may therefore not be visible as energy efficiency efforts by the lender*." (UNEP, 2009.)

[35] Technical assistance programs in connection with EE financing schemes typically include one or several of 5 components: (i) project preparation support (feasibility studies, energy audits, etc.); (ii) capacity building (training, etc.); (iii) marketing and communication; (iv) monitoring and evaluation; and (v) policy advice (more rarely.)

Table 7: How selected financing mechanism address barriers to EE Investments

Barrier / Issues	Solutions provided by financing mechanisms	Examples (mostly in the OSCE region)
(1) Low returns/Long payback	Investment subsidy Long-term lease coupled with tax credits Concessional funding (interest rate below market, long grace period and tenor)	EBRD (BEERECL, Bulgaria) TPPPA[36] for solar photovoltaic systems [USA] Clean Technology Fund (Turkey, WB)
(2) Lack of domestic sources of capital / inappropriate terms a. Long-term debt b. Equity c. Quasi-equity d. Excessive collateral requirements	 DFI-funded credit line to local banks Dedicated equity funds Dedicated quasi-equity funds New funding institution or new funding window	 EBRD (BEERECL), EIB EnerCap [Central Europe] FIDEME [France] Bulgaria Energy Efficiency Fund [BEEF, WB]. Carbon Trust [UK]
(3) High perceived risks by banks	Partial credit guarantees Lon payments through utility bills Loan payments through local property taxes New funding institution	IFC (CEEF) San Diego Gas and Electric Program (USA) Berkeley First (USA) BEEF
(4) Weak project development, appraisal and technical assessment capacity	TA for capacity building Dedicated banks	EBRD (BEERECL), IFC BEEF
(5) High transaction costs of small transactions	TA for project preparation Partial credit guarantees (on a portfolio basis)	EBRD (BEERECL), IFC IFC
(6) Lack of awareness, information	Campaigns, free energy audits, etc.	EBRD (BEERECL)[37], IFC
(7) Lack of EE project developers such as ESCOs	Help create new ESCOs or strengthen existing ESCOs	UkrEsco [Ukraine, EBRD]; HEP ESCO [Croatia, WB]
(8) Lack of relevant expertise, project appraisal capacity within FIs	TA for capacity building Specialized funding institution	IFC BEEF

Source: Adapted from UNECE, 2010, where these projects are described.

[36] Third Party Power Purchase Agreement (TPPPA), whereby a third party designs, builds, owns, operates, and maintains the solar systems and sells back solar-generated electricity to the end-user. US companies SunEdison and SunPower are two leading TPPPA proponents. Companies like Walmart, Whole Foods, Safeway, Staples, and Macy's use solar PPAs. SunRun has pioneered the model for residential customers

[37] The EBRD recently launched a €3.5 million stand-alone technical assistance facility –the Regional Energy Efficiency Programme for the Corporate Sector –to provide energy audit support for the manufacturing, agribusiness and natural resource sectors. The programme is funded by donors and EBRD’s Shareholder Special Fund.

The World Bank Group has mobilized finance for small scale energy efficiency projects in these region mainly through four approaches, which at times were combined within the same project: (i) partial credit guarantees to local banks; (ii) the creation of dedicated funds or de facto energy efficiency banks; (iii) dedicated lines of credit to local banks; and (iv) direct financing of ESCOs[38]. Three features are worth noting:

- Funded facilities (approaches (ii), (iii) and (iv)) have been the exception. Access to finance for EE investments was difficult but in the majority of cases for reasons other than lack of liquidity.
- Risk sharing through the provision of partial credit guarantees[39] was the predominant instrument it deployed, particularly through its private arm, the International Finance Corporation[40]. Banks perceived risks in relation to energy efficiency investments in part because they had no prior knowledge of EE technologies and benefits, also because they were weary of lending to some categories small clients, which might not provide enough collateral, e.g. home-owner associations[41].
- Financing is typically complemented by often very substantial technical assistance programs aimed at building capacity and addressing other knowledge and information barriers. The World Bank Group has mobilized very large amounts of funds from the Global Environmental Facility (GEF) for these purposes (under its climate change area of work).

The EBRD, which operates in the countries in transition and Turkey, relies primarily on dedicated lines of credit –Sustainable Energy Financing Facilities (SEFF)– to local banks, which then on lend funds for small- and medium-sized energy efficiency and renewable energy projects (EBRD, 2011)[42].

These credit lines have three main features: (i) local banks use the credit line to provide commercial loans, at their own risk; (ii) every credit line is supported by a comprehensive, donor-funded, technical assistance package that helps potential borrowers prepare loan applications and trains local bank loan officers to process sustainable energy investment opportunities. This assistance is provided free-of-charge by a project implementation team consisting of international and local experts; and (iii) often a performance-related incentive fee is paid to the participating banks and to the end-borrowers.

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[38] "*ESCOs are generally companies which offer energy demand reduction services, often financed through so-called 'performance contracting', where the energy savings generate cash flow which pays for the installation of the equipment and a margin*" (UNEP, 2009.)

[39] Partial credit guarantees (PCG) is a commitment by the guarantor to cover the losses suffered by a bank on a loan or portfolio of loans up to a certain percentage. The PCG can provide coverage of the "first loss" (the full loss up to e.g. 20% of the amount guaranteed) or "pari passu" (bank and guarantor share the same percentage of the loss, up for the guarantor to a ceiling.)

[40] Hungary Energy Efficiency Co-financing Program 1 and 2, Commercializing Energy Efficiency Finance (CEEF), OTP ESCO (Hungary), and Russia Sustainable Energy Finance Program.

[41] Home- owner associations are a recent creation in a number of countries in transition. Their creation is mandatory in Bulgaria since a law enacted in January 2009.

42 See for Bulgaria: www.beerecl.com and www.reecl.org. Ukraine: www.ukeep.org. Georgia: www.energocredit.ge. Slovak Republic: www.slovseff.eu. Romania: www.eeff.ro. Bulgaria: www.bulgaria-eueeff.com. Kazakhstan: www.kazseff.kz. Western Balkans: www.webseff.com .and www.websedff.com. Russia: www.ruseff.com. Ukraine: www.ukeep.org. Moldova: www.moseff.org. Armenia: www.ArmSEFF.org. Hungary: www.mffee.hu; Turkey: www.turseff.org.

The first such credit line was the Bulgarian Energy Efficiency and Renewable Energy Credit Line (BEERECL), which is the subject of a case study in **Appendix VI**. The incentive component lowers the actual cost of implementing sustainable energy projects and enhances the returns (IRR) to the project proponents. It also encourages banks to consider this type of projects. By tying payment of these incentives to performance (as attested by project completion), while asking banks to take the credit risk of the project interests are aligned.

The European Investment Bank (EIB), which can provide finance to 46 of the OSCE participating States has a similar approach, building on its long experience of "global" loans to banks.

The UNECE, through its "Financing Energy Efficiency Investments" project aims at launching a public-private investment fund, which will provide equity and mezzanine finance to RE and EE projects in 11 countries the region (Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Kazakhstan, The former Yugoslav Republic of Macedonia, Moldova, Russia, Serbia, Ukraine.)

3.6 The importance of evaluation for the design of good energy efficiency policies

Substantially improving energy efficiency in the OSCE region requires the introduction of good new energy efficiency policies as well as strengthening and enforcing existing policies. This begs the question: what characterizes good and effective energy efficiency policies and their implementation? Systematic ex post evaluation of energy efficiency policies can reveal factors determining not only what works and what does not but also explain why. (Harmelink et al., 2008.)

According to the WEC: "energy efficiency policies and measures are economically sound if the macroeconomic benefits of increased energy efficiency achieved by these policies and measures outweigh the overall cost to the taxpayer. The bigger the difference between the benefit and the cost, the more attractive and effective are the policies and measures." (WEC, 2010.)

A useful approach is to subject each policy instrument to five criteria (UNEP, 2006):

- Environmental effectiveness (note that benefits from free-riders should not be counted in the benefits from the policy);
- Economic efficiency (cost-effectiveness);
- Budgetary cost;
- Ability to implement and enforce;
- Support from stakeholders.

Policies should include monitoring and evaluation in the design phase. In this regard, "Theory-based policy evaluation" appears to have some advantages over other methods of ex-post policy evaluation[43].

[43] "*Theory-based policy evaluation establishes a plausible theory on how a policy instrument (or a package of instruments) is expected to result in energy efficiency improvements, and who is expected to take action at which point in time. The basic idea is to unravel the whole policy implementation process. Through this unraveling, insight is gained on 'where something went wrong in the process of policy design and implementation' and 'where the keys are for improving the impact and cost effectiveness.' A policy theory can be either explicit or implicit. In the ideal case, an explicit theory is available. This means that the policy makers have clearly described how they think the policy instrument is going to work before its implementation. That is, that they have clearly stated which actor needs to take action and that they have stated the expected outcome of each action. Often, the theory is largely implicit, and*

Using this tool, a study on “20 energy efficiency policy instruments applied across Europe, the USA, and Japan” found that:

- “Energy efficiency policies often lack quantitative targets and clear timeframes.
- Policy instruments often have multiple and/or unclear objectives.
- The need for monitoring information often does not have priority in the design phase.
- For most instruments, monitoring information is collected on a regular basis. However, this information is often insufficient to determine the impact on energy saving, cost effectiveness, and target achievement of an instrument.
- Monitoring and verification of actual energy savings have a relatively low priority for most of the analyzed instruments.
- There is no such thing as the ‘best’ policy instrument. However, typical circumstances in which to apply different types of instruments and generic characteristics that determine success or failure can be identified” (Harmelink et al., 2008).

4. Energy efficiency contribution to energy security and climate change mitigation in the region

Energy efficiency has three clear benefits for OSCE participating States, even for those that are significant exporters of fossil fuels, primarily oil and gas. For example, the World Bank Group has calculated that “Russia’s energy intensity has a cost of $84-112 billion per year in terms of foregone export revenues. This is roughly equivalent to 32-36 percent of the Russian government’s 2008 budget” (World Bank Group 2008). This is because so much oil and gas are wasted domestically.

First, energy efficiency enhances economic competitiveness by reducing production costs, and indirectly promoting better operational practices within firms. From this perspective energy efficiency is very often a profitable investment, even though company executives too often subject energy efficiency investment opportunities to excessively high discount rates (see section 3). Similarly, energy efficiency promotes resource efficiency. The World Bank Group study on Russia is worth a long quote: “On its current path, Russia will increasingly face the need to choose between serving Russian electric and gas customers, and gas export customers. The choice thus far has appeared to favor the more lucrative export markets. In the past several years, electric and gas customers have faced supply rationing of electricity and gas during winter months. Russia can overcome its supply constraints by investing in new production capacity, but energy efficiency investments are a much cheaper way of meeting supply needs. Russia can invest in energy efficiency at one-third the cost of building new energy supply capacity. For every kilowatt-hour of electricity, cubic meter of gas, or barrel of oil Russia saves, it delays the need to invest in new supply capacity. Russia would need to invest at least $1 trillion to supply as much energy as it could save by investing in energy efficiency.3 In order to reach its full potential for energy savings, Russia will need to invest only about $320 billion.” (World Bank Group, 2008.)

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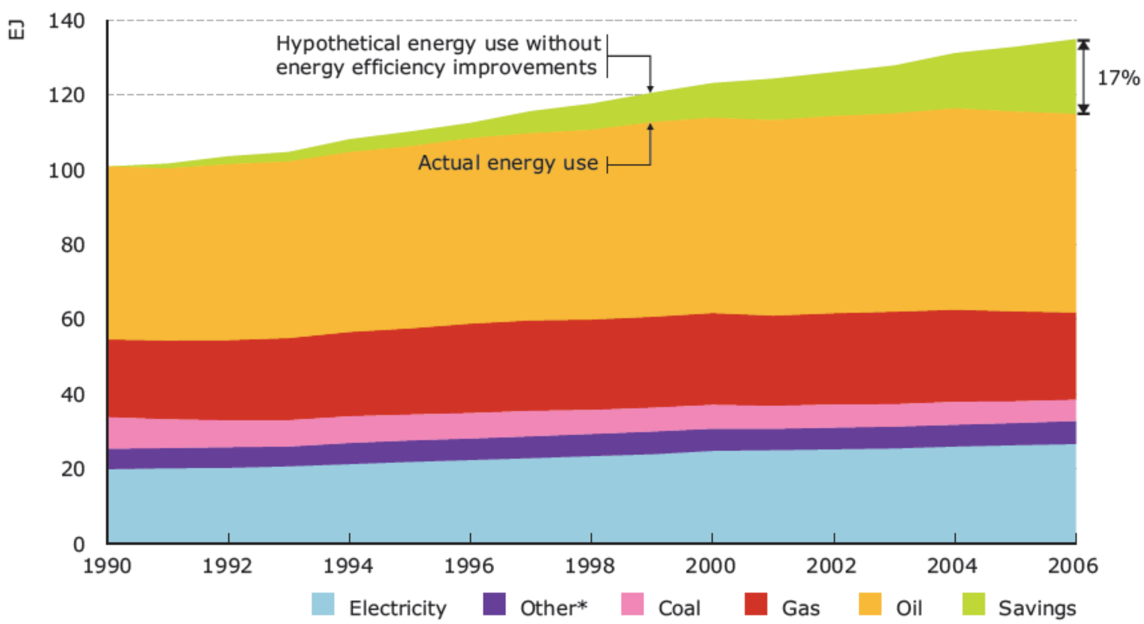
such a description is lacking. In this case, the evaluator has to try to reconstruct the policy theory”. (Harmelink et al., 2008.)

Second, energy efficiency strengthens energy security, by reducing the magnitude of energy imports. In this regard, without the energy savings resulting from reduced energy intensity, IEA member country energy use would have been significantly greater. IEA analysis shows that, for a group of IEA countries (IEA17[44]), total final energy consumption in that group would have been 17% higher in 2006 (**Figure 23**) than in a business as usual scenario. This represents an annual energy savings of 20 EJ in 2006, and 1.3 Gt of avoided CO_2 emissions

Figure 23: Energy savings from improvements in energy efficiency, IEA17



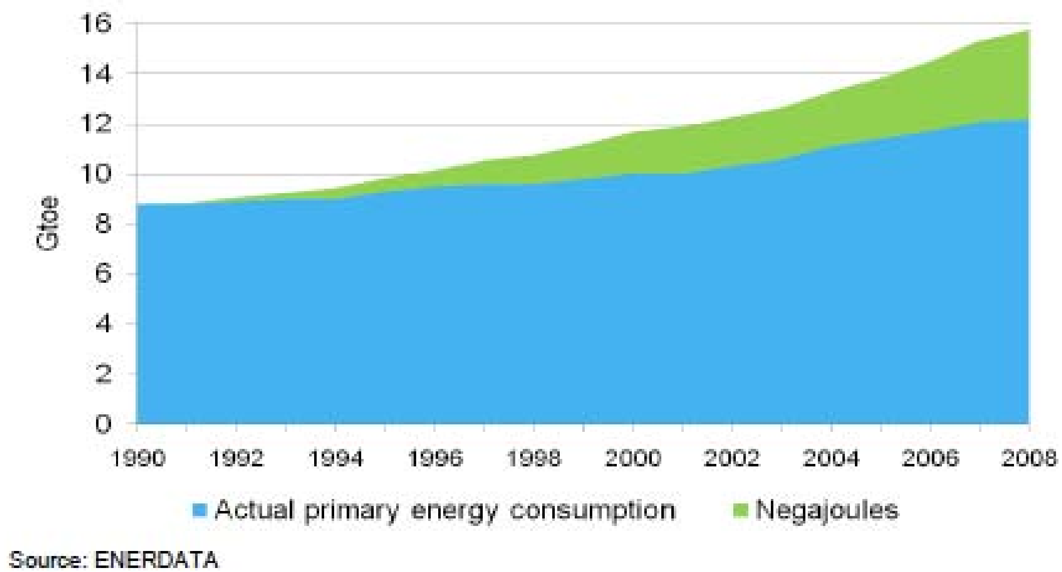
Note: "Other" includes renewable and district heat.
Source: IEA indicators database.

Source: IEA 2009

The World Energy Council confirms these results at the world level. At 1990 energy intensity by main region (i.e. at constant technologies and economic structure of 1990), world energy consumption would have been 3.6 Gtoe higher in 2008. In other words, "energy savings" from energy productivity improvements ("Negajoules)" reached 3.6 Gtoe in 2008 at world level, or almost 30% of the actual primary consumption observed in that year (**Figure 24**). This avoided 8 Gt of CO_2 emissions.

[44] 14 of which are OSCE countries: Austria, Canada, Denmark, Finland, France, Ireland, Italy, the Netherlands, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

Figure 24: Energy savings from improvements in energy efficiency, world



Source: WEC 2010

Third, energy efficiency, which is immediately available (as a low-carbon technology), represents the cheapest option to reduce greenhouse gas emissions. This should make energy efficiency the option of choice for climate mitigation.

In its 2008 Energy Technology Perspectives (IEA, 2008), the IEA presents a so-called 'BLUE' scenario, its most aggressive emission reduction scenario to the 2050 horizon. BLUE explores the least-cost solutions to achieve the IPCC's most ambitious scenario of keeping temperature increases below $2.4C^0$ (consistent with CO_2 concentrations in the atmosphere of 450 ppm). In BLUE, energy-related emissions[45] would need to be halved in 2050 compared to their 2005 levels (27 to $14GtCO_2$), implying staggering emissions cuts of $48GtCO_2$ compared to the baseline scenario ($62GtCO_2$ in 2050). End-use efficiency accounts for 36 to 44% of all reductions in BLUE and renewables for 21% (46% of the electricity mix in 2050). These are the largest shares before any other option.

IEA Executive Director Nobuo Tanaka estimated that EE and RE (including biofuels) could account for 54% and 23% respectively of the necessary abatement effort by 2030 in the 450ppm scenario[46].

McKinsey, the international management consultancy, confirm these conclusions as regards the potential role of EE, or "energy productivity", in achieving carbon saving targets[47].

McKinsey estimate that $170 billion a year could be invested from now until 2020 in energy productivity opportunities yielding an average internal rate of return (IRR) of 17 percent. These investments, equivalent to respectively 1.6% and 0.4% of global fixed investment and global GDP

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[45] Energy-related CO_2 comprise only around 55% of total GHG. But this percentage is set to rise in the future.

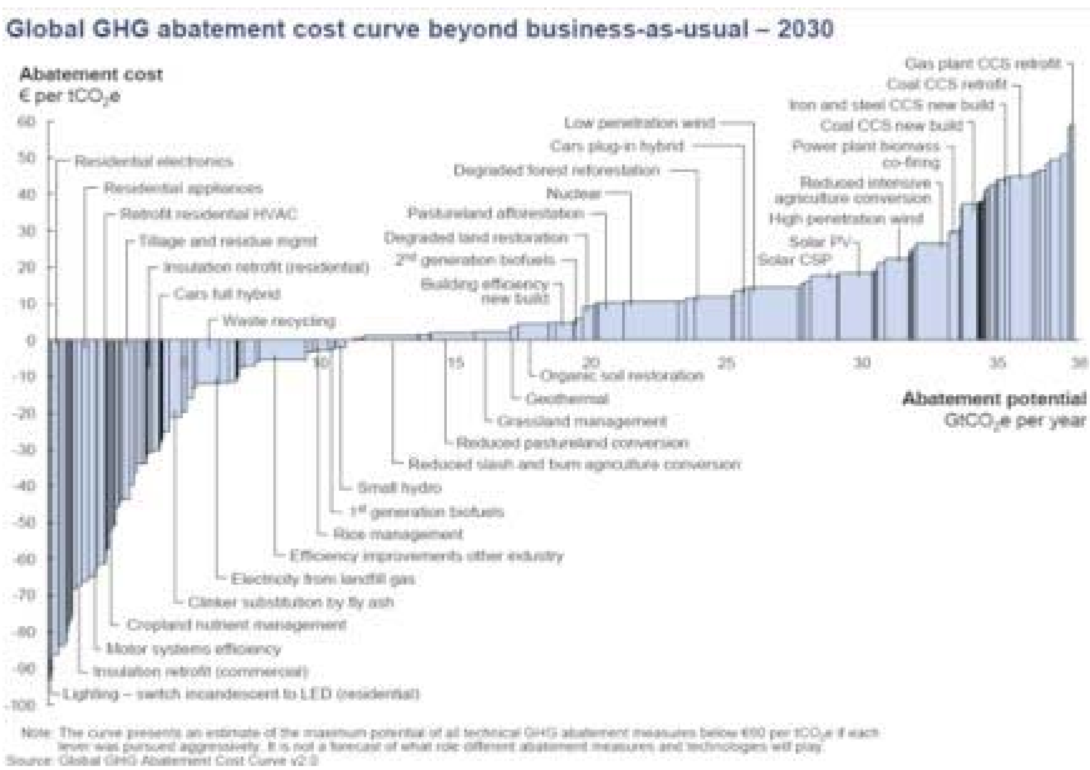
[46] http://www.iea.org/Textbase/speech/2009/Tanaka/EE_Global.pdf

[47]http://www.juccce.com/documents/Perspectives/Consultancies/Promoting%20Energy%20Efficiency%20in%20Developing%20Countries.pdf.

today, could cut the projected growth of energy demand from 2.2% p.a. to 0.7%, generate savings ramping up to $900 billion by 2020, and deliver up to half of the emission abatement required in 2020 to cap the long-term concentration of greenhouse gases in the atmosphere at 450ppm. Not least, this would avoid investment in energy infrastructure that would otherwise be needed to keep pace with accelerating demand (McKinsey Global Institute, 2008). The IEA estimates that on average an additional $1 spent on energy efficiency avoids more than $2 in investment in electricity supply.

Most energy efficiency opportunities yield GHG emission reductions at a negative cost, as shown in the abatement cost curve below (**Figure 25**). This is because so many energy efficiency measures also constitute a profitable investment opportunity.

Figure 25: Greenhouse gases abatement cost curve



Source: McKinsey, 2009.

5. Conclusions and Recommendations

Conclusions

OSCE participating States can make no better choice than energy efficiency to address their energy security, environmental and economic challenges.

Energy efficiency is the winning strategy to simultaneously address a variety of policy objectives, including security of supply (reduced energy dependency), climate change (lower GHG emissions), competitiveness (lower operating costs), balance of payments (lower imports, higher exports), reduced investment need (in energy generation and distribution) and environmental protection (reduced local pollution, deforestation.)

Energy efficiency is the largest, cheapest (most measures have a negative cost on life-cycle basis), and not least a domestic, energy resource.

Studies show that the potential for cost-effective (zero or negative on a life-cycle basis) energy savings in most OSCE participating States is vast, particularly in countries in transition, which only took interest in energy efficiency since 1989-1991.

The ‘canon’ and best practice in energy efficiency policies are well known and are widely debated in international conferences, and within international organizations’ fora and expert groups which involve experts from governments, such as the EU, the IEA, UNECE’s Committee on Sustainable Energy, and the Energy Charter Conference.

Yet, despite all these benefits, that potential remains largely untapped, and implementation (e.g. of the G8/IEA 25 recommendations) is lagging in many countries or sectors (e.g. transport). There is a paradox that the most obviously beneficial policy is not implemented, or only on a scale and with a scope that fall short of needs.

Policy-making is complex because energy efficiency cuts across sectors and traditional government departmental boundaries; enforcement is also an issue for energy efficiency if standards and other regulations are to be properly implemented (e.g. building codes)(WEC, 2010.) In addition monitoring and evaluation is still in its infancy, even in most advanced countries. The impact, cost and cost-effectiveness of policy instruments is not known as well as it should be, often because it is not monitored.

This complexity and the fact that energy efficiency “is part of the EU's wider resource efficiency goal encompassing efficient use of all natural resources and ensuring high standards of environmental protection” (European Commission, 2011) has led the EU to take a leading role in policy-making, through various action plans and a suite of directives encompassing buildings, standards, cogeneration, the emission trading scheme, etc.

The EU is now driving policy-making in 35 OSCE participating States through direct membership and the Energy Community Treaty, which requires adoption of the “acquis communautaire”, and by implication of the complete suite of EU energy efficiency policies. The EU is also influencing policy-making in the EECCA region through its technical assistance and the financing from both the EBRD and EIB, which apply EU environmental standards. In addition to the 27 EU members 5 OSCE participating States are members of the IEA: Canada, Norway, Switzerland, Turkey, and the USA. This means international support for energy efficiency policy-making is weakest in the EECCA cluster, with the exception of Russia (as member of the G8, and benefiting as such of dedicated policy support from the IEA as part of the ‘Gleaneagles process’[48].)

Recommendations

As was mentioned in the Introduction, the OSCE participating States have mandated that the Organization plays a role in energy security. As the world’s largest security organization, the OSCE is in a unique position to facilitate dialogue on energy security, given that it brings together many of the world’s leading energy producers, consumers and transit countries.

[48] The IEA G8 programme was initiated following the G8 leaders’ request at their 2005 Summit in Gleneagles, Scotland.

Given the OSCE's relevant position as a platform for dialogue, it is logical that the Organization contributes to the energy security dialogue, not only among its participating States, but also among leading experts, the private sector, elements of civil society, and international organization which specialise in energy-related issues. It is also worth noting that the OSCE has an extensive network of field offices, each with their own unique mandate. OSCE can collaborate with the UNECE secretariat to review implementation of OSCE commitments in the economic and environmental dimensions including in the field of energy. Projects by field operations on energy security topics could offer possibilities for cooperation between the OSCE, UNECE and other organisations, including opportunities for public-private partnerships.

For mainstreaming the benefits of energy efficiency, it is essential to raise awareness and skills by enhanced communication, information transfer and dissemination using multilingual platforms, interactive tools and exploiting the full potential of web-based technology. The organization of meetings and seminars to diffuse knowledge and relevant expertise among policymakers, practitioners in the energy and banking sectors and local communities is a key for success and instrumental in the usefulness of bottom-up initiatives.

By using their platforms for dialogue in bringing together experts – from specialized energy-related international organizations, the private sector, and academia – both the OSCE and UNECE would accomplish many challenges. First, they would be assisting the resolution of these issues in a complementary manner, and by making available the already existing expertise of other organizations without building up its own internal structures or bureaucracy. Second, by using such available expertise, the OSCE would be building up its own analytical capabilities. Finally, both organizations would be facilitating the resolution of these issues.

As regards facilitating dialogue and the exchange of best practices in the specific areas of energy efficiency, energy savings, and sustainable energy, there is a lot that the OSCE and UNECE can do.

The OSCE already brings together experts within the framework of its annual Economic and Environmental Forum and the UNECE facilitates the dialogue towards the sustainable energy development through the work of the Sustainable Energy Committee and its subsidiary bodies. The OSCE could complement the existing UNECE constituency and network of experts in the areas of energy efficiency and energy savings. These experts could use an OSCE online repository as well as a dedicated UNECE website, in order to exchange ideas and to continue discussions which were started during the Forum and other intergovernmental and expert meetings.

The OSCE participating States and UNECE member countries could use such discussions and expertise to generate ideas for specific project proposals which can be implemented by the extensive network of OSCE field offices. Practical examples of such projects could include the facilitation of data exchanges between OSCE participating States and international organizations which specialise in energy-related data collection. Workshops and training events could be held to facilitate the exchange of best practices in energy savings and energy efficiency. On a demand-driven basis, guidance could be offered to participating States who wish to improve their national legislation and standards in areas such as energy efficiency, energy savings, or the use of alternative sources of energy.

It should be noted that the OSCE participates in the Vienna Energy Club – a grouping of the eight

Vienna-based specialized international organizations which deal with energy issues – with the aim of improving our co-operation with these organizations. Through these interactions, each of the organizations comes to a better understanding of each other's programs, mandates, and perspectives. The OSCE could endeavor to make these relationships more formalized, and to expand the range of organizations with which it deals.

Concretely, the following recommendations are submitted for the OSCE participating States' consideration at the 19th Economic and Environmental Forum and will be also considered at the 20th session of the Committee on Sustainable Energy, which will take place in Geneva on 16-18 November 2011.

Recommendation #1

Establish a partnership with the UNECE, EU, and IEA in the field of energy efficiency, in particular to extend the benefit of their policy support (review of the G8/IEA 25 recommendations) and databases (ODYSSEE, MURE, etc.) to OSCE participating States that are not members of these organizations (mostly EECCA countries.) The ODYSSEE-MURE project, which is being developed under the aegis of the EU gathers representatives from energy agencies from the 27 EU Member States plus Norway and Croatia aims at monitoring energy efficiency trends and policy measures in Europe to a level of detail unmatched in the rest of the world. A concrete output was the elaboration of indicators of 'pure' energy efficiency improvements (technical improvements, as opposed to improvements due changes in economic structure, e.g. the switch to less energy-intensive industries) –the so-called ODEX (described in **Appendix II**.) The IEA reviews implementation by G8 and IEA members of its 25 recommendations (see **Appendix V.**) and the very existence of this review, and the benchmarking it allows (see section 3), creates emulation between countries. Both these instruments enhance the quality of policy-making in participating countries.

Recommendation #2

OSCE can complement UNECE's role as a platform for enhanced policy dialogue and assistance to policy-making. Examples of activities which could be facilitated within this framework include:

- Analysis of the cost-effective potential for energy efficiency measures and investments in some countries;
- Analysis of barriers to investment and financing;
- Feasibility studies;
- Analysis of how to reform fossil-fuel subsidies to promote economic efficiency, environmental effectiveness, and energy poverty alleviation.

Recommendation #3

Beyond Recommendation #2, and at the same time avoiding a duplication of work, create synergies with multilateral organizations active in the field of sustainable energy in the OSCE area (and beyond the scope of the technical activities mentioned under Recommendation #1); for example, joint events could be organized; and joint studies could be commissioned.

The potential for closer cooperation seems clearest with the UNECE and other major international instruments, one example of which could be the Energy Charter Conference (see **Appendix VII** for a list of areas of cooperation under the Energy Charter process) whose respective memberships present significant overlaps with that of the OSCE. Beyond those two organizations, greater dialogue could be established with the following international financing institutions, which are devoting increasing resources to energy efficiency in the Eurasian part of the OSCE area: the EIB; the EBRD; the World Bank Group; the Black Sea Trade and Development Bank; and the Council of Europe Development Bank.

Recommendation #4

In the area of energy efficiency investments, OSCE may strengthen the cooperation with UNECE in its work on market formation in the member states of UNECE and participating States of OSCE. UNECE is implementing a number of projects in the framework of the Energy Efficiency 21 Programme. In particular, the Financing Energy Efficiency and Renewable Energy Investments for Climate Change Mitigation (FEEI) Project promotes policy reforms, establishment of a network of energy efficiency managers, targeted assistance to project developers, and innovative financing mechanisms for energy efficiency and renewable energy, including preparatory work for the launch of an investment fund for such projects in 12 countries of South-Eastern Europe, Eastern Europe and Central Asia and the development of an energy efficiency programme within the context of the UNECE Global Energy Efficiency 21 project.

In the mid and long term, the self-sustainability and the cost-effectiveness of EE investments can be ensured only through sound reforms at the local, national and international level. In this direction, both OSCE and UNECE should continue to coordinate their activities with other international organizations and major stakeholders to ensure the efficient use of resources and avoid duplication.

Possible options under these four headings would be further developed, if requested by the intergovernmental machineries of both OSCE and UNECE, and a set of more detailed proposals may be submitted to interested countries and potential donors to further develop and identify possible means and resources for their concrete implementation.

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7. Appendices

I. Abbreviations, Acronyms and Units

II. ODEX Indicators

III. MURE database of energy efficiency policy measures

IV: IEA's Energy Efficiency Policies and Measures database

V. G8/IEA's 25 EE recommendations

VI. Case study: Dedicated loan facility to local banks supporting energy efficiency projects in Bulgaria

VII: List of possible areas of cooperation under the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA)

Appendix I. Abbreviations, Acronyms and Units

ACEA:	Association des constructeurs européens d’automobiles (European automobile manufacturers’ association)
BEEF:	Bulgarian Energy Efficiency Fund
BEERECL:	Bulgarian energy efficiency and renewable energy credit line
btoe:	billion tonnes of oil equivalent
BTU:	British thermal unit
CIS:	Community of Independent States
CEEF:	Commercializing Energy Efficiency Finance
CO_2:	Carbon dioxide
EBRD:	European Bank for Reconstruction and Development
EC:	European Commission
EIA:	Energy Information Administration
EE:	Energy efficiency
EECCA:	Eastern Europe, Caucasus and Central Asia
ESCO:	Energy service company
EU:	European Union
EU ETS:	EU emission trading scheme
FEC:	Final energy consumption
FEI:	Final energy intensity
GDP:	Gross domestic product
GHG:	Greenhouse gases
Gt:	Giga tonne
IEA:	International Energy Agency
IFC:	International Finance Corporation
IFI:	International financial institution
IPCC:	Intergovernmental panel on climate change
KIDSF:	Kozloduy International Decommissioning Support Fund
koe:	kilogramme of oil equivalent
KfW:	Kreditanstalt für Wiederaufbau
kWh:	kilowatt hour
MEPS:	Minimum energy performance standards
$MtCO_2$	Millions of tons of carbon dioxide
MURE:	Mesures d’utilisation rationnelle de l’énergie (Measures for the rational use of energy)
NEEAP:	National energy efficiency action plan
OECD:	Organization for Economic Cooperation and Development
PCG:	Partial credit guarantee
PEI:	Primary energy intensity
ppm:	parts per million
PPP:	Purchasing power parity
PEI:	Primary energy intensity
SEFF:	Sustainable energy financing facility
SMEs:	Small and medium-sized enterprises

TA: Technical assistance
toe: tonne of oil equivalent
TPPPA: Third Party Power Purchase Agreement
UK: United Kingdom
UNECE: United Nations Economic Commission for Europe
UNEP: United Nations Environmental Programme
USDA: United States Department of Agriculture
USA: United States of America
VAT: Value-added tax
WB: World Bank
WEC: World Energy Council

Conversion Equivalents between Units of Energy:

To: / From:	TJ (multiply by:)	Gcal	Mtoe	MBtu	GWh
Terajoule (TJ)	1	238.8	2.388×10^{-5}	947.8	0.2778
Gigacalorie	4.1868×10^{-3}	1	10^{-7}	3.968	1.163×10^{-3}
Mtoe*	4.1868×10^{4}	10^{7}	1	3.968×10^{7}	11630
Million Btu	1.0551×10^{-3}	0.252	2.52×10^{-8}	1	2.931×10^{-4}
Gigawatt-hour	3.6	860	8.6×10^{-5}	3412	1

*Million tonnes of oil equivalent.

Source: IEA, 2005

Appendix II: The ODEX indicators

ODEX is the index used in the ODYSSEE-MURE project to measure the energy efficiency progress by main sector (industry, transport, households) and for the whole economy (all final consumers).

For each sector, the index is calculated as a weighted average of sub-sectoral indices of energy efficiency progress; sub-sectors being industrial or service sector branches or end-uses for households or transport modes.

The sub-sectoral indices are calculated from variations of unit energy consumption indicators, measured in physical units and selected so as to provide the best “proxy” of energy efficiency progress, from a policy evaluation viewpoint. The fact that indices are used enables to combine different units for a given sector, for instance for households kWh/appliance, koe/m^2, toe/dwelling, etc.

The weight used to get the weighted aggregate is the share of each sub- sector in the total energy consumption of the sub –sectors considered in the calculation.

A value of ODEX equal to 90 means a 10% energy efficiency gain.

<u>Principle of calculation of ODEX</u>

Considering two sub-sectors with a share of the consumption of 60% and 40% respectively in the base year and a change in the unit consumption from 100 to 85 for the first sub-sector and 100 to 97.5 for the second, the weighted average index with a simple weighting system is:

$$0.6*(85/100)+0.4*(97.5/100) = 90$$

ODEX indicators represent a better proxy for assessing energy efficiency trends at an aggregate level (e.g. overall economy, industry, households, transport, services) than the traditional energy intensities, as they are cleaned from structural changes and from other factors not related to energy efficiency (more appliances, more cars…).

Source: http://www.odyssee-indicators.org/database/definition_odex.pdf

Appendix III: the MURE database of energy efficiency policies and measures

MURE (for Mesures d'Utilisation Rationnelle de l'Energie) has been designed and developed within the framework of the EU programmes 'SAVE' and 'Intelligent Energy for Europe' by a team of European experts, led and co-ordinated by ISIS (Institute of Studies for the Integration of Systems, Rome) and the Fraunhofer Institute for Systems and Innovation Research ISI (Germany). The development of the MURE database was also supported by national funding in each EU Member State.

The database is constructed in five, entirely separate, sections, which contain the energy efficiency measures, statistical data and a simulation tool relevant to the four main energy demand sectors: industry, households, services, and transport. A 5th database contains information on general energy efficiency programmes and on general cross-cutting measures.

As regards the types of measures, MURE uses the following classification:

- Normative measures (e.g. building regulation)
- Informative measures (e.g. mandatory labelling schemes)
- Financial measures (e.g. subsidy schemes)
- Fiscal/tariff measures (e.g. reduced VAT for energy efficient equipment)
- Information/Education/Training
- Co-operative Measures (mainly voluntary/negotiated agreements)
- Cross-cutting with sector-specific characteristics (e.g. eco-taxes which differ sector to sector.)

In addition, the database includes measure types specific to some sectors.

Transport:

- Infrastructure measures (e.g. urban traffic management and optimization)
- Social planning/organizational measures (e.g. car-sharing / increased occupancy of cars.)

Industry:

- New Market-based Instruments (e.g. the European Emission Trading Scheme EU ETS)

Cross-cutting:

- Incentives facilitating Third Party Financing / ESCOs
- "White certificates"
- Incentives for the producers of innovative technologies

Source: http://www.isisrome.com/mure/

Appendix IV: IEA's Energy Efficiency Policies and Measures database

The International Energy Agency classifies policy measures in the following categories.

Education and outreach: Policies and measures designed to increase knowledge, awareness, and training among relevant stakeholders or users. This can include general information campaigns, targeted training programmes, labelling schemes that provide the user information on a product's energy usage or emissions.

Financial incentives and subsidies: Policies and measures that encourage or stimulate certain activities, behaviours or investments using financial and fiscal instruments. These include rebates for the purchase of energy-efficient appliances, grants, and preferential loans and financing. They also include tax incentives, such as tax exemptions, reductions or credits on the purchase or installation of certain goods and services.

Policy processes: Refers to the processes undertaken to develop and implement policies. This generally covers strategic planning documents and strategies that guide policy development. It can also include the creation of specific bodies to further policy aims, making strategic modifications to existing policy, or developing specific programmes.

Public investment: Policies and measures guiding investment by public bodies. These include government procurement programmes (e.g. requirement to purchase energy efficient equipment and vehicles) and infrastructure investment (e.g. urban planning and transport infrastructure).

R&D: Policies and measures for the government to invest directly in or facilitate investment in technology research, development, demonstration and deployment activities.

Regulatory instruments: Covers a wide range of instruments by which a government will oblige actors to undertake specific measures and/or report on specific information. Examples include energy performance standards for appliances, equipment, and buildings; obligations on companies to reduce energy consumption; mandatory energy audits of industrial facilities; requirements to report on greenhouse gas emissions or energy use.

Tradable permits: Refers to white certificate systems stemming from energy efficiency or energy savings obligations. White certificate schemes create certificates for a certain quantity of energy saved, for example a MWh; regulated entities must submit enough certificates to show they have met energy saving obligations. Again, if they are short, this must be made-up through measures that reduce energy use, or through purchase of certificates.

Voluntary agreement: Refers to measures that are undertaking voluntarily by government agencies or industry bodies, based on a formalised agreement. There are incentives and benefits to undertaking the action, but generally few legal penalties in case of non-compliance. The scope of the action tends to be agreed upon in concert with the relevant actors. These are often agreed to between a government and an industry body, with the latter agreeing to certain measures; for example, reporting information on energy use to the government, being subject to audits, and undertaking measures to reduce energy use.

Source: http://www.iea.org/textbase/pm/?mode=pm

Appendix V: IEA's G8/25 EE recommendations

To support governments with their implementation of energy efficiency, the IEA recommended the adoption of specific energy efficiency policy measures to the G8 summits in 2006, 2007 and 2008. The consolidated set of recommendations to these summits covers 25 fields of action across seven priority areas: cross-sectoral activity, buildings, appliances, lighting, transport, industry and power utilities. The 25 recommendations are considered by the IEA Secretariat and member countries as a useful compilation of best-practice policies.

"All recommendations were subject to a rigorous set of criteria. That is, a proposal was justified if it: was likely to save a large amount of energy at low cost and with considerable economic advantages to consumers; addresses existing market imperfections or barriers by enabling consumers to make informed decisions and fully benefit from their investments; addresses a significant gap in existing policy; [and] is supported by a degree of agreement that internationally coordinated actions will lower costs to governments, manufacturers and consumers." (IEA, 2008a)

1. Cross-sectoral policies to support energy efficiency

1.1. Increased investment in energy efficiency

a) Governments should facilitate the private sector's involvement in energy efficiency investments by:

i) Adopting, and publicising to the private sector, a common energy efficiency savings verification and measurement protocol, to reduce existing uncertainties in quantifying the benefits of energy efficiency investments and stimulate increased private sector involvement;

ii) Encouraging financial institutions to train their staff and develop evaluation criteria and financial tools for energy efficiency projects;

iii) Reviewing their current subsidies and fiscal incentive programmes to create more favourable grounds for private energy efficiency investments;

iv) Collaborating with the private financial sector to establish public-private tools to facilitate energy efficiency financing;

v) Promoting risk mitigation instruments, such as securitisation or public-private partnerships; and

vi) Putting in place institutional frameworks to ensure regular co-operation and exchanges on energy efficiency issues between the public sector and financial institutions.

1.2. National energy efficiency strategies and energy efficiency goals

a) Governments should set goals and formulate action plans for improving energy efficiency in each sector of their domestic economies, utilising on-going IEA works for developing sectoral energy efficiency benchmarks and compiling best practices;

i) Best practice action plans should:

I. Assess energy consumption by end-use in all sectors;

II. Identify the economy's energy savings potentials; and

III. Establish objectives and adequate methods for evaluating the success of the plan.

b) Energy efficiency policy agencies should be adequately resourced.

1.3. Compliance monitoring, enforcement and evaluation

a) Governments should ensure that both voluntary and mandatory energy efficiency policies are adequately monitored, enforced and evaluated so as to ensure maximum compliance. At a minimum, this should include:

i) Considering and planning for optimal compliance, monitoring and evaluation procedures at the time new policies and measures are formulated;

ii) Establishing legal and institutional infrastructure for ensuring compliance with energy efficiency requirements;

iii) Ensuring transparent and fair procedures for assessing compliance; including specification of the methods, frequency and scope of monitoring activities;

iv) Ensuring regular and public reporting of monitoring activities, including instances of noncompliance;

v) Establishing and implementing a suite of enforcement actions commensurate with the scale of noncompliance and the value of lost energy savings; and

vi) Establishing and implementing a robust system for evaluating policy and programme success during and after implementation.

1.4. Indicators

a) Governments should ensure that their energy efficiency policies are supported by adequate end-use information by substantially increasing their efforts to collect energy end-use data across all sectors and relating to all energy-types.

i) This will require governments to increase the resources allocated to energy end-use data collection.

ii) At a minimum, governments should ensure that they are able to complete and submit the annual energy efficiency data template developed by the IEA in co-operation with other organisations.

1.5. Monitoring and reporting progress with IEA energy efficiency recommendations

a) Governments should agree to track progress in implementing each of the concrete recommendations and to provide the IEA with regular updates.

2. Energy-efficient buildings

2.1. Building codes for new buildings

a)

i) Governments that do not currently have mandatory energy efficiency standards for new buildings in building codes should urgently set, enforce and regularly update such standards.

ii) Those governments that currently have mandatory energy efficiency standards for new buildings should significantly strengthen those standards.

b) Energy efficiency standards for new buildings should be set by national or state governments and should aim to minimise total costs over a 30-year lifetime.

2.2. Passive-energy houses (PEH) and zero-energy buildings (ZEB)

a) Governments should support and encourage the construction of buildings with very low or no net energy consumption (passive — energy houses and zero — energy buildings) and ensure that these buildings are commonly available in the market.

b) Governments should set objectives for PEH and ZEB market share of all new construction by 2020.

c) Passive — energy houses or zero — energy buildings should be used as benchmark for energy efficiency standards in future updates of building regulations.

2.3. Existing buildings

a) Governments should systematically collect information on energy efficiency in existing buildings and on barriers to energy efficiency.

b) Standardised indicators should also be calculated for energy efficiency in buildings for international comparison, monitoring and selection of best practices.

c) Based on this information governments should construct a package of initiatives to address the most important barriers to energy efficiency in buildings.

i) This package should set standards to ensure that energy efficiency improvements are achieved during the refurbishment of all buildings; and

ii) Also, the package should increase awareness of efficiency in the building sector and raise the market profile of a building's energy performance.

2.4. Building certification

a) Governments should take actions to make building energy efficiency more visible and to provide information on major energy saving opportunities. This should include:

i) Mandatory energy certification schemes that ensure that buyers and renters of buildings get information on the energy efficiency of buildings and major opportunities for energy savings; and

ii) Structures that ensure that energy efficiency information is available to all actors in the building sector at all times.

2.5. Windows and other glazed areas

a) Governments should set up a policy package to improve energy efficiency in windows and other glazed areas. This policy package should include:

i) Minimum energy efficiency standards for windows and other glazing that are based on least lifetime costs;

ii) A requirement for window and glazed-product manufacturers to provide energy efficiency labeling for their products; and

iii) Governments establishing demonstration projects for efficient windows and implementing energy efficient window procurement policies.

3. Energy-efficient appliances

3.1. Mandatory energy performance requirements or labels

a) Governments should adopt mandatory energy performance requirements and, where appropriate, comparative energy labels across the spectrum of appliances and equipment at a level consistent with international best practices.

b) Adequate resources should be allocated to ensure that stringency is maintained and that the requirements are effectively enforced.

3.2. Low-power modes for electronic equipment

a) Governments should adopt the same "horizontal" 1-Watt limit and apply it to all products covered by an International Electrotechnical Commission definition of standby power with limited exceptions.

b) Governments should adopt policies which require electronic devices to enter low-power modes automatically after a reasonable period when not being used.

c) Governments should ensure that network-connected electronic devices minimise energy consumption, with a priority placed on the establishment of industry-wide protocols for power management.

i) In order to enhance energy efficiency across electronic networks, governments should:

I. Instruct relevant public and private standards authorities to ensure that industry-wide protocols are developed to support power management in appliances and equipment, including networked devices;

II. Ensure such protocols are developed and implemented.

3.3. Televisions, television "set-top" boxes and digital television adaptors (DTAs)

a) The IEA concludes that international best practice with respect to energy-efficient set-top boxes are policies that establish a minimum efficiency standard for Digital Television Adaptors. These regulations should:

i) Specify the maximum power levels while "on" and "off"; and

ii) Ensure that the consumer can easily switch the unit to the lower power level.

b) A second aspect of best-practice is to ensure that government-subsidised units meet higher efficiency requirements.

c) Governments should implement energy efficiency policy measures for TVs and set-top boxes designed to:

i) Promote the best performing current TV products and technologies;

ii) Stimulate the market entry of new television technologies which aim to halve TV energy consumption compared to current performance levels; and

iii) Minimise the energy used by TVSP customers in receiving TV services by ensuring that such requirements are included in relevant franchise or licensing agreements that allow TVSPs to operate.

3.4. Test standards and measurement protocols

a) Governments should:

i) Review energy measurement standards currently used, to determine whether they are consistent with national policy requirements; and

ii) Support the development and use of international measurement standards, where appropriate, in order to assist performance comparison and benchmarking for traded products while also reducing compliance costs.

4. Best practice in energy-efficient lighting

4.1. Best practice and incandescent phase-out

a) The IEA recommends that governments endorse the objective of across-the-board best practice in lighting.

b) Governments should move to phase out the most inefficient incandescent bulbs as soon as commercially and economically viable.

i) In aiming for this objective, there is a need both for appropriate time scales and performance targets to be established; and

ii) Also government and industry actions must be coordinated internationally to ensure a sufficient supply of good quality higher efficiency alternative lamps.

4.2. Non-residential buildings and phase-out of inefficient fuel-based lighting

a) Governments should put in place a portfolio of measures to ensure energy-efficient least-cost lighting is attained in non-residential buildings. The portfolio of measures should include the following:

i) The inclusion of energy performance requirements for lighting systems within building codes and ordinances applicable to the installation of lighting in the commercial, public, industrial, outdoor and residential sectors. These requirements should:

I. Include targeted measures to stimulate better control of lighting and the avoidance of illumination of unoccupied spaces;

II. Specify that general service lighting systems in new non-residential buildings, or substantial retrofits of existing non-residential buildings, should draw no more than 10W of power per square metre of internal floor area when averaged over the whole building;

III. Be based upon a review of recommended lighting levels, including a full peer review comparing local recommendations with those applied internationally to ensure that there are no excessive lighting levels recommended in national guidelines; and

IV. Hasten the phase-out of inefficient street lighting technologies such as mercury vapour lamps.

b) Governments should support international efforts to stimulate the adoption of higher efficiency alternatives to fuel-based lighting in off-grid communities e.g. via supporting the diffusion of solar powered solid state lighting devices.

5. Energy-efficient transport

5.1. Fuel-efficient tyres

a) Governments should:

i) Adopt new international test procedures for measuring the rolling resistance of tyres, with a view to establishing labelling, and possibly maximum rolling resistance limits where appropriate, for road vehicle tyres; and ii) Adopt measures to promote proper inflation levels of tyres.

I. This should include governments, acting in cooperation with international organisations including UNECE, making the fitting of tyre-pressure monitoring systems on new road vehicles mandatory.

5.2. Mandatory fuel efficiency standards for light-duty vehicles

a) Governments should:

i) Introduce new mandatory fuel efficiency standards for light-duty vehicles if they do not already exist, or, where they do exist, make those standards more stringent;

ii) Announce the more stringent content of the proposed standards as soon as possible; and

iii) Harmonise, where appropriate, as many aspects of the future standards as possible.

5.3. Mandatory fuel efficiency standards for heavy-duty vehicles

a) For heavy duty vehicles, governments should introduce:

i) Fuel efficiency standards; and ii) Related policies including labelling and financial incentives based on the vehicle's fuel efficiency.

5.4. Eco-driving

a) Governments should ensure that eco-driving is a central component of government initiatives to improve energy efficiency and reduce CO2 emissions.

i) Governments support for eco-driving should include promotion of driver training and deployment of in-car feedback instruments.

6. Energy efficient industry

6.1. High-quality energy efficiency data for industry

a) Governments should support the IEA energy efficiency indicator work that underpins critical policy analysis by ensuring that accurate energy intensity time series data for industrial sectors is reported regularly to the IEA.

6.2. Minimum energy performance standards for motors

a) Governments should consider adopting mandatory minimum energy performance standards for electric motors in line with international best practice.

b) Governments should examine barriers to the optimisation of energy efficiency in electric motor-driven systems and design and implement comprehensive policy portfolios aimed at overcoming such barriers.

6.3 Energy management

a) Governments should consider providing effective assistance in the development of energy management (EM) capability through the development and maintenance of EM tools, training, certification and quality assurance.

b) In addition, governments should encourage or require major industrial energy users to implement comprehensive energy management procedures and practices that could include:

i) The development and adoption of a formal energy management policy:

I. Progress with implementation of this policy should be reported to and overseen at company board level and reported in the company report.

II. Within this policy companies would need to demonstrate that effective organisational structures have been put in place to ensure that decisions regarding the procurement of energy-using equipment are taken with full knowledge of the equipment's expected life-cycle costs and that procurement managers have an effective incentive to minimise the life-cycle costs of their acquisitions.

ii) The appointment of full-time qualified energy managers at both the enterprise and plant-specific level as appropriate; and

iii) The establishment of a scheme to monitor, evaluate and report industrial energy consumption and efficiency at the individual company, sector and national level.

I. As a part of this effort, appropriate energy performance benchmarks should be developed, monitored and reported at levels deemed suitable in each sector.

6.4. Small and medium-sized enterprises

a) Governments should consider developing and implementing a package of policies and measures to promote energy efficiency in small and medium-sized enterprises (SMEs). This package should include:

i) A system for ensuring that energy audits, carried out by qualified engineers, are widely promoted and easily accessible for all SMEs;

ii) The provision of high quality and relevant information on energy efficiency best practice;

iii) The provision of energy performance benchmarking information which ideally would be structured to allow international and within economy comparisons; and

iv) Appropriate incentives to adopt least life-cycle cost capital acquisition and procurement procedures.

7. Energy utilities and energy efficiency

a) Governments and utility regulators should consider implementing mechanisms that strengthen the incentives for utilities to deliver cost-effective energy savings to end-users such as:

i) Establishing regulation which decouples utility revenue and profits from energy sales and allows energy savings delivery to compete on equal terms with energy sales; or

ii) Placing energy efficiency obligations on energy utilities, the stringency of which is periodically raised based on continuing cost effectiveness in delivering energy services, and where;

I. Such obligations may be tradable and structured such that utility costs are recoverable through the rates;

II. The obligations are designed to be consistent with any corresponding mandatory or voluntary CO_2 emission target imposed on utilities; or

iii) Allowing energy efficiency measures to be bid into energy pools, on an equal basis to energy supply options; or

iv) Other appropriate policy measures that encourage utilities to play an active part in funding and/or delivering end-use efficiency improvements among their customer base.

Source: IEA 2008a

Appendix VI: Dedicated loan facility to local banks supporting energy efficiency projects in Bulgaria (case study)[49]

General situation in Bulgaria

Currently, there is about 13 GW of installed capacity in Bulgaria including thermal, nuclear, and hydroelectric resources. 40 per cent of the current generation capacity was to be retired by 2010. Except for solar, Bulgaria has a significant but largely untapped potential for renewable energy resources. Bulgaria imports over 70 per cent of the fuel required for energy production and is interested in developing indigenous resources. As part of its obligation to the European Union, Bulgaria must have 11 per cent of its gross electricity consumption generated from renewable energy sources by 2010.

Furthermore, there is significant potential for improvement in energy efficiency in Bulgaria. The Bulgarian government has undertaken several key measures to combat energy wastage in the country. Nevertheless, its energy intensity remains well above the EU average. However, energy efficiency investments are still negligible and are hampered by market imperfections.

The project described in this case study has been established to support industrial energy efficiency and small renewable projects in the private sector and to overcome barriers still faced by sub-borrowers in developing/financing and implementing sustainable energy investments.

Description of the project

The Bulgarian Energy Efficiency and Renewable Energy Credit Line (BEERECL) was launched in 2004 as a joint initiative of the Bulgarian Government, the European Bank for Reconstruction and Development (EBRD) and the Kozloduy International Decommissioning Support Fund (KIDSF). It is the first of an innovative financing instrument –Sustainable energy financing facilities (SEFF)– initiated by the EBRD in the context of its Sustainable Energy Initiative.

Under BEERECL, EBRD provides dedicated loan facilities to local banks for on-lending to clients undertaking energy efficiency and renewable energy projects. The initial amount of €50 million was subsequently raised to over €100 million.

The role of KIDSF is to provide grant support to overcome barriers still faced by sub-borrowers in developing, financing and implementing sustainable energy investments. The KIDSF grants will be used to provide: (i) a completion fee to sub-borrowers ranging up to 15% (for EE, later reduced to 7.5%) and 20% (for RE) of the BEERECL loan amount – effectively reducing the cost of projects/enhancing returns, and (ii) completion fees to participating banks – encouraging them to consider this type of projects. The grant also finances free technical assistance to sub-borrowers on the basis that sub-loans meet the objectives of the KIDSF (see below).

Eligibility

- Sub-borrowers must be private enterprises, firms, businesses, sole proprietors or other private legal entities formed under the laws of the Republic of Bulgaria and operating in the Republic of Bulgaria. Sub-borrowers may not be majority-owned or controlled by the Republic of Bulgaria, or by any other political, governmental or administrative body, agency or sub-division thereof. Any sub-borrower will be eligible to

[49] This Appendix is adapted from UNECE b 2010b.

borrow up to a maximum amount of €2.5 million (or the equivalent thereof) in one or more sub-loans, unless otherwise agreed by EBRD.

- Eligible investments are investments carried out by private entities on both the energy demand and generation side contributing to the improvement of the energy performance of the industry sector. The loan can be used as a standalone project or a part of a larger general investment. The project must comply with the minimum energy savings and internal rate of return requirements.
- For energy efficiency projects, the energy savings, expressed as an industry sector indicator, which is calculated by the Project Consultant, will be greater than or equal to the national requirements of Bulgaria for this type of project.
- For energy efficiency or renewable energy projects, the minimum internal rate of return, as calculated by the Project Consultant, has to be at least 10% unless otherwise agreed by the EBRD.

Participating banks

7 banks were selected on the basis of their creditworthiness (financial strength, as EBRD's loans are made to the banks and on commercial terms), integrity and governance, and willingness to participate in the programme – project proponents decide which bank they wish to work with to finance their project:

- Allianz Bank Bulgaria (bank.allianz.bg)
- DSK Bank (dskbank.bg)
- Eurobank EFG Bulgaria (Postbank) (www.postbank.bg)
- Piraeus Bank Bulgaria (www.piraeusbank.bg)
- Raiffeisenbank (Bulgaria) (www.raiffeisen.bg)
- UniCredit Bulbank (www.bulbank.bg)
- United Bulgarian Bank (www.ubb.bg)

Project preparation support and verification

Establishment of required donor-funded contracts with consultants and energy experts to provide assistance to participating banks and sub-borrowers. The EBRD contracted DAI Europe which in co-operation with EnCon Services will provide consultancy services to project developers in preparing business plans (rational energy utilization plans), loan applications and implementation.

The EBRD furthermore contracted consulting firm KEMA as Independent Energy Expert, to verify the project after completion, on whether it meets the objectives of the facility and the KIDSF, which will be the basis for the decision to pay the project developer an incentive of up to 15 per cent for energy efficiency or 20 per cent for renewable energy of the loan given to the developer under the credit line facility.

Results of BEERECL implementation (as of August 2011)

- 215 sustainable energy projects have been developed out of which 150 have received financing under the BEERECL.
- Approximately €110 million worth of loans disbursed supporting projects worth €173 million.

- GHG emissions reduction of over 650 $MtCO_2$ p.a.
- Energy savings of close to 1 TWh p.a.
- Strong stimulus to market penetration of independent energy efficiency and renewable energy consultants, building companies, and equipment industry in Bulgaria.
- Other co-benefits of the project are lower production costs meaning enhanced competitiveness for firms and energy security for the country.

Credit Line for the residential sector

In 2005 a sister credit line targeting energy efficiency in the residential sector was launched – the Residential Energy Efficiency Credit Line. This too consisted of a €50 million EBRD credit line framework granted to Bulgarian banks for on-lending to individuals, and supported by a grant of €10 million from the KIDSF for: a) preparation, marketing, and verification purposes; and b) incentives to sub-borrowers and participating banks.

Critical success factors

- Strong assistance of EBRD experts and sub-contractors collaborating with banks;
- Incentive payments paid to participating banks and completion fees paid to sub-borrowers upon successful implementation of projects;
- Definition of reasonable (a compromise between simplicity and ambition) energy efficiency criteria for the financing of projects.

Risks

- Legal and regulatory framework regarding energy efficiency and renewable energy sources may offer only insufficient incentives for investments;
- Inefficient and long bureaucratic public administration procedures and complicated public tender regulations may lead to project delays;
- Subsidised (non cost-reflective) energy prices and poor cost allocation mechanisms obstruct willingness to invest and may lead to a lack of awareness of energy saving benefits and behavioral barriers for action;
- Credit-worthiness of stakeholders and difficulties with decision making may hamper the achievement of the Case Study’s goal;
- Low market penetration for high quality energy savings and renewable energy technologies may lead to bottleneck situations in procurement processes.

Conclusions

Launched in 2004 as a joint initiative of the Bulgarian Government, the EBRD and the KIDSF, the BEERECL facility aims to support investments in small-scale energy efficiency and renewable energy projects to mitigate the closure of the Kozloduy Nuclear Power Plant by either reducing energy demand or by replacing lost capacity with green energy supply.

Eligible projects are industrial energy efficiency and small-scale renewable energy investments. Not only does the programme provide financial assistance, it also helps with selecting projects and employing marketing strategies, as well as identifying specific energy efficiency measures and preparing technical studies to support applications.

The key objective of such project is to provide local and national financial institutions with necessary economic resources to achieve energy savings within industrial and residential sectors. It contributes to removing financial barriers in particular regarding the lack of grants from local banks to industrial and residential clients willing to undertake energy efficiency and small renewable energy projects.

Appendix VII: List of possible areas of cooperation under the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA)

The Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) entered into force at the same time (16 April 1998) as the Energy Charter Treaty. Building on the provisions of the Treaty (article 19), PEEREA requires its participating states to formulate clear policy aims for improving energy efficiency.

In contrast to other activities in the Charter process, the emphasis in the work on energy efficiency is not on legal obligations but rather on practical implementation of a political commitment to improve energy efficiency. This is promoted through policy discussions based on analysis and exchange of experience between the member countries, invited independent experts and other international organisations.

The PEEREA is designed to reinforce energy efficiency policies and programmes based on the following principles: the introduction of market mechanisms and price formation reflecting real energy and environmental costs, cost-effective energy policies, transparency of regulatory frameworks, dissemination and transfer of technologies, the establishment of domestic programmes for improving energy efficiency, and the promotion of investments.

The Protocol requires member governments to formulate policy aims and strategies for energy efficiency (Article 5), establish relevant policies (Article 3.2), develop, implement, and update energy efficiency programmes, and create the necessary legal (Article 3.2), regulatory (Article 3.2) and institutional (Article 8.3) environment for more efficiency energy use. (Adapted from the Energy Charter website, http://www.encharter.org/index.php?id=4)

44 Energy Charter Signatories that have ratified the PEEREA are also OSCE participating States. That includes all 27 EU Member States, 6 of the 9 Contracting Parties of the Energy Community Treaty, all the countries from Central Asia and the Caucasus.

The **Appendix** to the PEERA provides the below non-comprehensive list of possible areas of cooperation:

“Development of energy efficiency programmes, including identifying energy efficiency barriers and potentials, and the development of energy labelling and efficiency standards;

Assessment of the Environmental Impacts of the Energy Cycle;

Development of economic, legislative and regulatory measures;

Technology transfer, technical assistance and industrial joint ventures subject to international property rights regimes and other applicable international agreements;

Research and development;

Education, training, information and statistics;

Identification and assessment of measures such as fiscal or other market-based instruments, including tradeable permits to take account of external, notably environmental, costs and benefits.

Energy analysis and policy formulation:
• assessment of energy efficiency potentials;
• energy demand analysis and statistics;
• development of legislative and regulatory measures;
• integrated resource planning and demand side management;
• Environmental Impact assessment, including major energy projects.

Evaluation of economic instruments for Improving Energy Efficiency and environmental objectives.

Energy efficiency analysis in refining, conversion, transport and distribution of hydro-carbons.

Improving Energy Efficiency in power generation and transmission:
• cogeneration;
• plant component (boilers, turbines, generators, etc);
• network integration.

Improving Energy Efficiency in the building sector:
• thermal insulation standards, passive solar and ventilation;
• space heating and air conditioning systems;
• high efficiency low NOx burners;
• metering technologies and individual metering;
• domestic appliances and lighting.

Municipalities and local community services:
• district heating systems;
• efficient gas distribution systems;
• energy planning technologies;
• twinning of towns or of other relevant territorial entities;
• energy management in cities and in public buildings;
• waste management and energy recovery of waste.

Improving Energy Efficiency in the industrial sector:
• joint ventures;
• energy cascading, cogeneration and waste heat recovery;
• energy audits.

Improving Energy Efficiency in the transport sector:
• motor vehicle performance standards;
• development of efficient transport infrastructures.

Information:
• awareness creation;
• data bases: access, technical specifications, information systems;

• dissemination, collection and collation of technical information;
• behavioural studies.

Training and education:
• exchanges of energy managers, officials, engineers and students;
• organization of international training courses.

Financing:
• development of legal framework;
• Third Party Financing;
• joint ventures;
• co-financing".

Source: http://www.encharter.org/fileadmin/user_upload/document/EN.pdf#page=141