

Energy Efficiency Monitoring for Ukraine

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New Social & Economic Policy

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Motivation for indicators development

There can be economy only where there is efficiency

Benjamin Disraeli

The fifth fuel, as energy efficiency is sometimes called, is the cheapest of all

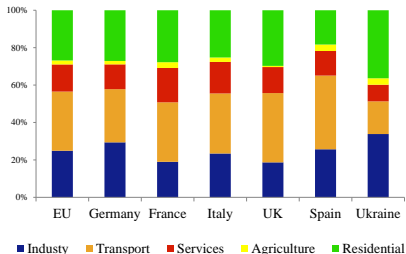
The Economist, "Invisible Fuel", 17th Jan 2015

Energy Efficiency Monitoring for Ukraine (EEMU)

- Initiated by the UNDP in Ukraine and NewSEP
- Instrument for an effective energy policy
 - 1 Estimate the potential energy saving after energy efficiency increase
 - 2 Set short and long-run energy efficiency targets
 - 3 Use for monitoring the progress towards determined targets
 - 4 Publication of the results should increase the responsibility and efforts of public authorities

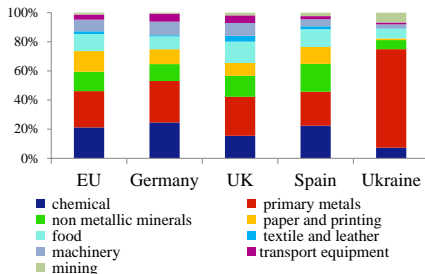
Structure of the Economy affects the final energy intensity

Figure 1: STRUCTURE OF ENERGY CONSUMPTION IN UKRAINE AND THE EU IN 2013



Source: ODYSSEE and Derzhstat

Figure 2: STRUCTURE OF MANUFACTURING ENERGY CONSUMPTION IN UKRAINE AND THE EU IN 2013



Source: ODYSSEE and Derzhstat

Use in the EU

The EU Directive on Energy Efficiency (2012/27/EU)

- Submission of country's annual reports on the progress achieved towards national energy efficiency targets (Article 24)
- Starting 2014 and 3 years thereafter, Member States should submit NEEAP containing achieved and expected energy efficiency saving
- The targets should be quantitative and expressed in primary and final energy consumption

Energiewende in Germany

Germany adopted additional monitoring process at national level. The implementation of policy measures and targets will be examined at regular intervals

Pan-European project on energy efficiency indicators ODYSSEE

- 28 EU countries and Norway
- Monitor and compare energy efficiency progress by sector
- Evaluate the energy efficiency policy measures in national programs

Methodology

- Methodology is based on IEA's method of energy consumption decomposition
- Accounts for changing the structure of the economy and business activity over time
- What would energy consumption in Ukraine would be if economy performed at the EU intensities?
- The data availability from SSSU constrained us to calculation of indicators for the following sectors:
 - agriculture
 - mining and 9 manufacturing industries
 - services
 - construction
 - residential sector
 - energy transformation at fossil-fuel power plants (FFPP)

Energy efficiency index

- The benchmark of the efficiency energy consumption is the correspondent energy intensity in the EU
- Hypothetically efficient consumption - intensity in each sector drops to the EU level
- Hypothetical energy saving i (HES_i) – difference between current (E_i) and hypothetically efficient consumption
- Energy efficiency indicator i (I_i) – percent of an effective energy use

$$I_i = \left(1 - \frac{HES_i}{E_i}\right) * 100\%$$



Major factors affecting energy consumption

- Business activity (*A*)– VA in the economy, tonnes of steel in steel industry, population in residential sector.
- Intensity (*I*) – energy use per unit of output
- Structure (*S*)– different activity by sub-sector

Decomposition of energy consumption over time

$\Delta E = E_{2014} - E_{2013} = \Delta A + \Delta S + \Delta I + \varepsilon$, where

ε residual term, the magnitude of which depends on decomposition method

Method of decomposition in EEMU 2016 – Log Mean Divisia I (recommended by IEA)

- Strong theoretical soundness
- Only LMDI allows to simultaneously get:
 - 1 ideal decomposition ($\varepsilon = 0$)
 - 2 time reversibility
 - 3 additivity by sub-sector

Table 1: ENERGY EFFICIENCY INDICATORS FOR UKRAINE IN 2014

	TFC and energy transformation at FFPP, ktoe	Energy intensity	Energy efficiency indicator, % of the EU
Ukraine	67,825		60.0
Agriculture	2,016	0.018	119.4
Industry	22,498		59.0
Mining	1,562	0.022	37.1
Manufacturing	20,936		60.6
Food&Tobacco	1,680	0.033	62.5
Textile&Leather	54	0.016	74.5
Wood	185	0.075	45.3
Paper&Printing	240	0.050	125.5
Chemical	1,159	0.103	51.5
Non-metallic minerals	1,250	0.143	59.0
Steel industry*	15,669	0.912	61.7
Machinery	508	0.023	22.5
Transport equipment	191	0.013	52.5
Construction	274	0.009	20.9
Services	4,663	0.008	35.2
Residential	20,384	0.021	56.0
Fossil Fuel Power Plants*	17,990	0.311	66.2

Source: State Statistical Service of Ukraine and EEMU 2016

Note: *Intensity in steel industry is weighted by steel production (Heinen (2012)) and intensity at FFPP is estimated according to Taylor et al. (2008)



Table 2: POTENTIAL ENERGY SAVING BY SECTOR IN 2014

Sector	Potential energy saving, mtoe	Share in total saving, %
Industry	9.2	33
Residential	9.0	33
FFPP	6.1	22
Services	3.0	11
Construction	0.2	1
Total	27.1	100%

Source: EEMU 2016

27.1 Mtoe \Rightarrow 29.9 bcm of natural gas¹ \Rightarrow is 1.5 times higher than total gas import in 2014

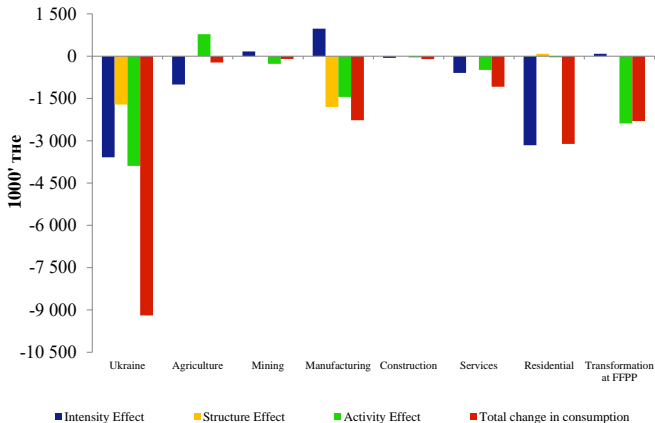


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at gross calorific value (GCV)



Figure 3: DECOMPOSITION OF ENERGY CONSUMPTION CHANGE BY SECTOR IN 2013-2014



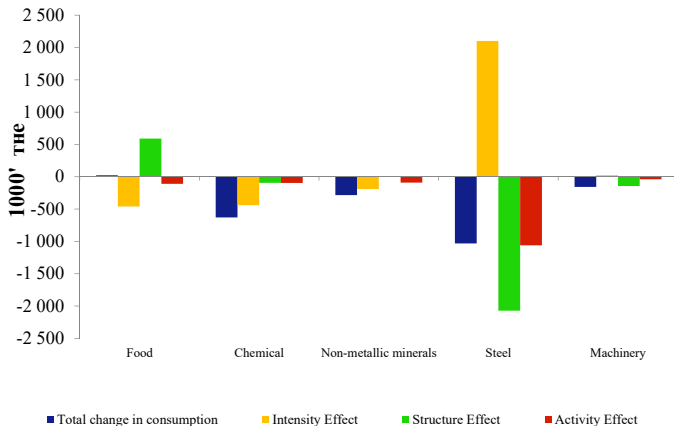
Source: EEMU 2016



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Figure 4: DECOMPOSITION OF ENERGY CONSUMPTION CHANGE IN INDUSTRY IN 2013-2014



Source: EEMU 2016



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Conclusion

- In 2014 structure adjusted energy efficiency estimate of Ukrainian economy increased by 1.8% to 60.0% from the EU level
- In 2014 energy efficiency increased in residential sector, services, agriculture and construction while in manufacturing was documented its decline
- The substantial energy efficiency increase in food, chemical and non-metallic minerals industries was offset by 8.5% decline in steel industry stemmed from lower utilization rates of production capacities after the escalation of the conflict in Donbass region
- Energy efficiency of FFPP stayed the same third year in a row
- Total final energy consumption and transformation at FFPP declined by 9.2 mtoe or 11.9% but only 3,6 mtoe or 39% of the decline is attributed to energy efficiency improvement
- Energy saving potential is estimated at 27.1 mtoe, which is equivalent to 29.9 bcm of natural gas exceeding 1.5 times its total import in 2014
- Industry and residential sector concentrated one third of energy saving potential each. Another third of potential is located in energy transformation and tertiary sectors – 22% and 11% respectively



Contacts

Thank you for attention!

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