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Energy Efficiency Initiatives on the EU Territory. Comparative Perspective

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Abstract: The worldwide population growth and the lower accessibility to the primary energy resources – that have fast diminishing reserves – are reflected in the EU records with the 54 million people affected by the "energy poverty". Therefore, the topic of energy efficiency is gaining a greater weight on the agenda of the governments, especially for countries that mostly depend on the energy resources of other countries. The Directive 2012/27/EU of the European Parliament and of the Council on Energy Efficiency include other requirements concerning the introduction of smart meters and networks to encourage a more efficient power consumption. The paper aims to highlight, from a comparative perspective, a number of provisions adopted by some EU Member States to achieve national targets for energy efficiency in 2020. Some countries have recorded progress, others worrying delays, thus stressing the need for full implementation of the European legislative framework for energy efficiency. The used methodology is mainly qualitative and is based on the analysis of documents and case studies, and the performed analysis aims at providing important information so to strengthen the accountability of the decision makers with regard to policies and measures development to increase energy efficiency, from a concerted perspective aimed at facilitating the Energy Union objectives fulfilment.

Keywords: Energy Union; energy poverty; public policy instruments; smart meter system

JEL Classification: K32; O13; Q4

1. Introduction

In the context of the natural concern for the energy evolution and global environment, marked by numerous constraints on world energy balance (currently, the oil and gas component is the biggest challenge), many countries have managed to quickly adopt strategies and action programs and alternative energy measures, such as shale gas or renewable energies[4], equally trying to ensure the sustainability maximization of these operations.

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[4] See for example the US emphasis on amplifying shale gas, Germany's wishes to reduce its dependence on nuclear power and switch to renewable energy sources by 2022, China's effort for a fleet of vehicles fully electric.

Currently, the energy efficiency is considered as a new "clean" energy resource of the sustainable energy policy[1] understood as that policy that *maximizes the long-term welfare of citizens, while maintaining a reasonable, dynamic balance between food security, competitiveness of energy services and environmental protection, energy system in response to the energy system challenges* (IER, 2003, p. 23).

The challenges facing Europe in the energy field are numerous, such as for example: *increasing dependence on imports, high energy prices and their volatility, globally increased demand for energy, slow progress in energy efficiency* etc.

In view of these uncertainties, the European energy policy benefits from a core of a variety of measures that aim at achieving an integrated energy market and ensuring security of energy supply and sustainable energy sector.

When rising the question on how prepared is the EU to face these new challenges, our attention should be turned first to the current list of priority objectives of the central or local administrations of the EU Member States and found that one of the stringent topics pertains to the *energy efficiency*, its implementing measures at national level being a means of boosting the economic growth and, at EU level, a *means of promoting the competitiveness of European economies*[2].

This bold paradigm shift from traditional policy, centralist and monopolist, *production oriented*, to that oriented towards *energy saving*, was strongly supported by the EU institutions and the concerted action of the EU Member States. The transition has allowed the EU energy market remodelling, and has put under scrutiny the environmental costs and social externalities.

The EU right and competence to act with regard to energy efficiency and energy savings is established in the Treaty on the Functioning of the European Union (TFEU) by art. 194, Para. (1). under this article, some aspects of the energy policy are subject to *shared responsibility*, thus strengthening the effort towards a common energy policy.

Being assessed as the largest energy resource in Europe, the energy efficiency is a central element of the EU's Europe 2020 Strategy for a Smart, Sustainable and Inclusive growth, disconnected from the energy consumption.

For the environmental protection, the current EU policy agenda has set wide-ranging objectives, grouped under the target "20-20-20" (a set of three key-objectives for 2020), for: 20% reduction of greenhouse gas emissions in the EU compared with 1999 levels; 20% increase in the share of energy produced from renewable sources in the EU; 20% improvement in energy efficiency in the EU.

Complementary, on a deeper perspective, the EU has established a set of long term goals within Roadmap 2050[3], the Energy Roadmap 2050 aiming at: reducing the greenhouse gas emissions (emissions GES) 80-95% by 2050 in comparison to the 1990 levels.

A common framework of measures to promote energy efficiency in the European Union is found established by the Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on Energy Efficiency (EED)[1].

[1] Energy efficiency needs to be considered as an energy source in its own right, representing the amount in Nw (negawatts) of the energy saved, as demonstrated beyond any doubt by recent world and European history. See more in *European Parliament Resolution* of *23 June 2016* on the *implementation report* on the *Energy Efficiency Directive* (2012/27/UE) (2015/2232(INI)).

[2] See Fact Sheets on the European Union–Energy efficiency.

[3] COM (2011) 112 final, A roadmap for moving to a competitive low carbon economy in 2050. This means the effective reduction of EU emissions internally, and not their compensation through carbon market.

In trying to remove the existing barriers on the energy market and overcome the market failures the EED rules set down for Member States the national indicative targets for energy efficiency for the 2020 horizon. Thus, art. 3 provides that each Member State shall establish a national indicative energy efficiency objective, based either on the primary energy consumption or on the final energy consumption, either on the primary or final energy savings, or on the energy intensity.

The mix of policy instruments that can be used by national states includes the *regulatory instruments* (e.g. energy taxes or CO2; regulations that allow the application of the energy efficient technology or techniques; standards and rules aimed at improving the energy efficiency of products and services, including buildings and vehicles), *stimulative instruments* (e.g. financing systems and instruments or fiscal incentives that lead to the implementation of the energy efficient technology or techniques), *persuasive instruments* (e.g. energy labelling systems), *instruments for providing administrative goods and services* (e.g. education and training, including programs on energy consultancy).

EED includes, among others, requirements on introducing smart networks and smart meters, as well as providing accurate information on the energy bills for empowering consumers and encouraging a more efficient energy use.

When there is no conditionality of technical, financial and proportionality compliance, the Member States should ensure that final consumers of electricity, gas, heating, cooling and domestic hot water the upgrade of these individual meters at competitive prices, which accurately reflect actual energy consumption and provide information on actual time of use.

If and to the extent that Member States implement smart metering systems and introduce smart meters for gas and/or electricity in accordance with Directives 2009/72/EC and 2009/73/EC they must meet a number of requirements on the reliability and security of smart meters, data protection and privacy, transparency, accuracy in communication with the end users, access to information on energy bills, imposing behavior of market participants to take into account the objectives of energy efficiency and final customer benefits etc.

To ensure transparency and fairness in measuring the individual consumption, should buildings with several apartments be fed either centralized or supersede common systems for heating or cooling such buildings, the Member States may introduce transparent rules for allocating costs for heat or hot water consumption in these buildings.

The conclusions of the European Parliament resolution of June 23, 2016 on the report on the implementation of the Energy Efficiency Directive (2012/27/EU) emphasize that until that time Member States have not properly implemented the EED nor the Directive on buildings of 2010 and recall that the deadline for EED transposition expired on June 5, 2014.

Following these conclusions, on 30 November 2016 the Commission proposed an update to the Energy Efficiency Directive including a new 30% energy efficiency target for 2030, and measures to update the Directive to make sure the new target is met[2].

2. Provisions Enforceable in a Number of Member States of the European Union

Judging by the resolution's conclusions and considering the fact that the deadline for the EED implementation was 2016 and that during its implementation a number of Member States have

[1] Amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC.
[2] See more https://ec.europa.eu/energy/en/topics/energy-efficiency.

encountered difficulties, of which we mention two relevant moments in 2014 when the European Commission has launched infringement procedures for failure to transpose the DEE against the 27 EU Member States (all except Malta) and 2016 when the European Commission has asked Denmark, through a reasoned opinion to ensure translation of the EED in the national legislation, we consider as appropriate for the proposed analysis of this paper to present through a comparative approach the applicable provisions in a number of EU Member States that adopted them so to implement the EED.

For the comparative analysis the paper takes into account 14 EU Member States that have adopted a number of provisions for reaching the national energy efficiency targets in 2020, some countries stood out as they registered a progress, others just worrying delays. The provisions are summarized in Table 1.

Table 1. Provisions enforceable for the energy efficiency improvement in a number of Member States

EU member state	Legal provisions
Czech Republic	2014 – start-up of a vast program of expending the heating network, for implementing new connections with clients in residential, commercial or industrial areas; technology upgrades to improve security of supply and the quality of the network, improving efficiency, and replacing pipes when necessary, with the purpose of updating the heating system to the newest technical standards[1]. The Czech Republic is one of the EU States that have fulfilled the minimum requirements specified by the Directive. Each operator has its own heating rate for its products, which is updated regularly and is currently subject to recent changes in the energy law of this country.
Croatia	It has achieved a partial regulation of the heating domain. Heat cost allocators are subject to individual agreements between service companies and customers (they are able to access their own Internet data, only for splitters), the district heating operators are not involved in this process.
Denmark	There is no special regulation for heat meters, for the district heating system was initiated a broad framework for action: large-scale investment; strong support from central and local authorities; efficient financing; diversification of simple technical solutions; citizens are shareholders of heating companies; detailed planning and monitoring. Heat metering has no impact on actual energy savings, but makes consumers more aware of the amount of their consumption. In Copenhagen, district heating benefit from high technology that allows remote reading, so every consumer is paying as much as he is consuming[2].
Estonia	District heating law adopted in 2003 and amended in 2014[3]provides that the metering process and the installation metering systems allow that quantities of heat entering or leaving a network are counted and data read from the user counters are collected and processed. Network operators have the right to collect justified connection fees, including a fee that may be justified for any changes in the technical conditions of heat consumption at the initiative of the customer. A company which sells heat to customers or to a network operator (which sells heat to customers) or produces heat in the process of generating combined heat and power, must obtain for each network area separately approval of the Competition Council on the maximum sale price of heat.
Finland	The thermal energy consumed in the housing is counted based on the flow sensor, temperature sensor and thermal energy, and the temperature sensor measures the water temperature in a constant way at the entry and exit of the building[4]. The measuring equipment is provided by the heat supplier that is required to provide customers a monitoring report on heat consumption at least

[1] http://ecoheat4.eu/en/Country-by-country-db/Czech-Republic/DHC-Benefits/.
[2] http://dbdh.dk/.
[3] https://www.riigiteataja.ee/en/eli/530102013083/consolide.
[4] http://energia.fi/en/home-and-heating/district-heating/price-district-heating.

	once a year, including adjustments for weather conditions for which are frequently used the S17 system, using an average difference of + 17 ° C between the inside and outside temperature[1]. The price depends on the heat of the thermal energy consumption for each customer, the cost of heating is shared between the inhabitants of buildings, usually on the living space. Charges include energy fee and power fee, in connection with the contractual capacity or the water flow contracted. Control heating regulating activities in Finland is based mainly on competition law and partly on the *Law on the electricity market*. The consumers' position is also protected by the Consumer Protection Act. According to the Competition Authority from Finland, a supplier of heat holds a dominant position on the market in terms of customers connected to the district heating network. Twice a year (on the 1st of January and the 1st of July), Finnish Energy Industries[2] collect information from district heating companies on the heating prices to three residential buildings of different sizes. Approximately 29% of the district heating price is made up of taxes and vary from one region to another. In big cities, district heating is produced in compliance with the energy efficiency in cogeneration with electricity, what is the solution to a favourable price.
France	In 2012 has been regulated by decree the allocation of costs for heating in apartment buildings for a primarily residential use, which has led to stopping the boom in energy prices and reducing the heating bills. The obligation of the cost individualization for heating is imposed after the assessment of the property and shall be made in accordance with the article R131-3 of the *Construction and Housing Code* [3].
Germany	Invoicing the consumption of the hot water and heating was regulated in 2009 by a normative act (ordinance)[4], establishing the distribution of costs for heating and hot water in buildings with at least two apartments, connected to a central network[5]. Buildings/living spaces consisting of only two apartments, one of which is occupied by the owner, are not subject to the provisions of the ordinance. The German federal government has appreciated that in compliance with the obligations of EED Directive implementation is not necessary to develop separate legislation to the ordinance on the costs of heating and has prepared a study on energy saving through the regular gathering of information, over the course of a year, consumption and bills on cooling, heating and the use of domestic hot water. In general, the provisions on cost efficiency are contained in the *Law on energy saving* (of transposition of the European directive provisions on the energy performance of the buildings[6]). In addition, the *National Action Plan* on energy[7] efficiency contains the variants of regulations improvement in the field of the thermal energy costs.
Latvia	The procedures by which the apartments' owners of the residential buildings pay for the services related to the use of real property are regulated by Regulation no.1013/2008. Thus, if an individual property has an autonomous heating system or the hot water from the central heating is not used in the individual property, the owner will pay for the thermal energy consumed for his personal needs, on the basis of the calculation carried out by an authorised specialist, in agreement with the administrator. To facilitate payments, the apartment owners may elect a representative who will monitor the thermal energy, will read the meters and will have other duties, according to the contract.
Lithuania	The implementation of the energy efficiency principles are faced with some key obstacles:

[1] http://energia.fi/sites/default/files/correct_use_of_districtheat_0.pdf.
[2] Order of 27 August 2012 on the apportionment of heating costs in multi-dwelling buildings for main occupancy.
[3] Order of 27 August 2012 on the apportionment of heating costs in multi-dwelling buildings for main occupancy.
[4] http://www.bbsr-energieeinsparung.de/EnEVPortal/DE/Regelungen/HeizkostenV/Download/HeizkostenV2009.pdf? __blob =publicationFile&v=1.
[5] http://www.bmwi.de/EN/Topics/Energy/Buildings/energy-saving-legislation.html.
[6] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:153:0013:0035:EN:PDF.
[7] http://www.bmwi.de/EN/Topics/Energy/Energy-Efficiency/nape.html.

	measuring the amount of heat used (maximum 10% of the buildings having individual heat meters or heat cost allocators heat installed in the apartments); in the system of heating of a block of apartments built during the soviet period, the radiators are connected in series (not in parallel), and a circuit serves several apartments, which makes it impossible to individual metering, without the consent of all owners of the apartments in a building; the problem of financing; the issue of the population income. For solving the problem of energy efficiency of buildings a standardized system of financing has been released, the period of the loan being determined provisionally between 10 and 20 years.
Holland	For the assurance of equitable conditions and equally comparative prices to consumers a *Law on district heating* was adopted, which entered into force in 2010. Supervision of compliance with legislation in the field is carried out by the Competition Council through its Office of Energy Regulation. The main heat sources for the national networks are cogeneration plants and conventional ones, only a small part deriving from the renewable sources of energy. The main cost factors are the size and age of the heating network of the heat scale.
Romania[1]	In the field of *liberalisation of energy markets*: The law of electricity and natural gas no.123/2012, as amended and supplemented by the Law no. 127/2014 and Law no. 160/2012 for the approval of GEO no. 33/2007 on the organization and functioning of ANRE, transposing the Directive 72/2009/EC concerning common rules for the common market in electricity and Directive 73/2009/EC concerning common rules for the common market of gas. In the field of *energy efficiency*: Law no. 121/2014 on energy efficiency transposes *Directive* 2012/27/EU on *energy efficiency*, amended and completed by Law no. 160/2016. In the field of *renewable sources of energy*: Law no. 220/2008 for establishing the promotion system of energy production from renewable energy sources), with subsequent amendments and additions (Law no. 122/2015). In the field of *high-efficiency cogeneration*: H.G. no. 494/2014 for the modification of H.G. no. 1215/2009 establishing the criteria and necessary conditions for the support scheme implementation for the promotion of high efficiency cogeneration based on useful-effective heat demand in 2011. In the field of *smart metering* [2] In accordance with the provisions of ANRE Order no. 145/2014, on the implementation of smart metering systems of the electrical energy, the concessionaire operators of the distribution have submitted to ANRE proposals for the realization of pilot projects, in 2015, whose results provide the information necessary to establish the conditions and the elements regarding the elaboration of the implementation national calendar of the smart measurement systems, as well as of the *National Plan for the implementation of smart metering systems.* ANRE has approved, in 2015, the 18 pilot projects in the amount of 69.639.770 lei (approx. 15475 euro), on the implementation of smart metering systems of the electrical energy. The support scheme for the promotion of high efficiency cogeneration has been introduced in Romania by HG nr. 219/2007 on the cogeneration promotion based on useful heat (the national transposition of the EC Directive no. 8/2004 on the promotion of cogeneration based on useful heat in the internal energy market that starting June 5th, 2014 has been replaced with the provisions of Directive 27/2012) and implemented by the HG no. 1215/2009 on establishing the criteria and necessary conditions for the support scheme implementation for the promotion of high efficiency cogeneration based on useful heat demand.

[1] ANRE Report, Department for Energy Efficiency, Energy Efficiency-Priority for Romania, presented at Romanian Energy Efficiency Forum 2016, Bucharest, 13 October 2016.
[2] ANRE Report on progress towards meeting national energy efficiency targets– 2016.

	In 2015 the European Commission has adopted a decision on the dismissal of infringement actions brought against Romania, of which the data subjects have been: the Cause 2014/2238 having as their object the infringement of the notification of the National Action Plan for energy efficiency (NEEAPS) according to article 24 paragraph 2 of Directive 2012/27/EU. Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repeal of Directives 2004/8/EC and 2006/32/EC, has been transposed *in full* into national law by *Law no. 121/2014 on energy efficiency*, with subsequent amendments and additions.
Slovakia	Currently, the district heating system have to cope with the competition between heating based on natural gas, electric heating and the one on coal[1]. District heating accounts for 40% of the market of thermal energy distribution. Over 90% of the apartments in the blocks are heated through the centralized public system. A number of approximately 500 heating companies are serving nearly two million inhabitants. In the pre-accession period to the EU, the Slovak government has transformed all state-owned companies into joint stock companies, in order to start the process of privatization (since 2005). Considering the energy sector as a strategic area, the government has limited the participation of foreign investors in the energy companies to 49% of the shares.
Sweden	Law on district heating (2008) requires that the district heating to ensure the transparency and accessibility of information to the general public on the prices applied for heating or for connection to the district heating network[2]. The government or the regulatory authority may issue decisions on compulsory information related to the prices and principles of working in the field.
Hungary	The development and operation of district heating systems is established by the *Law on district heating* (no. XVIII/2005). The operator shall cover the costs of development of the networks on which they operate, it is obliged to maintain, operate, develop and to bear the necessary costs. Municipalities may require the operator of the district heating extension of heating networks on the basis of local development plans and does not cover the charges made by the operators of district heating, or by their affiliates. The fees provided for the consumption of heat must be in accordance with the actual consumption of the subscriber, data on the amount of heat used being verified by a representative of the local body. Payment obligations and other expenses relating to the condominium shall not be borne jointly. There may be parts of the building for which they charge a user fee for individual taxpayers, as well as other fees for which no owners are responsible, but the local body.

4. Conclusions

The imbalances of the world energy scale, marked by the increasing number of the global population and lower accessibility to primary energy resources whose reserves are quickly diminishing, also affected the citizens of the EU, more than 54 million people affected by energy price increases, low-income and housing with reduced energy performance being identified, as shown by the study of the European Commission in 2015 on energy poverty at the European level. In this context, the issue of energy efficiency, a main pillar of the Energy Union, it becomes more acute, especially for states that are found in a situation of major addiction to the energy resources of other states. The comparative analysis presented by the paper reveals that the Member States, despite the progress made in achieving the objective of 20% increase in energy efficiency by the year 2020, as well as in the implementation of the Directive 2012/27/EU on Energy Efficiency, need to step up the efforts on energy efficiency, which requires the full implementation of the European legislative framework for energy efficiency.

[1] https://www.kpmg.com/SK/en/IssuesAndInsights/ArticlesPublications/Publicationseries/Documents/Central%20and%20 Eastern % 20European %20District%20Heating%20Outlook.pdf.
[2] http://ei.se/Documents/Publikationer/lagar_pa_engelska/District_Heating_Act.pdf.

Measures to increase energy efficiency become the red thread of the Energy Union Strategy, through which the EU wants to ensure European energy consumers, a sustainable, competitive and accessible energy, placing household and non-household consumers' energy in the centre of the Energy Union.

Even if all Member States have implemented a number of energy efficiency measures, in particular in terms of protecting vulnerable consumers or those affected by energy poverty, we consider it necessary to continue their concerted steps, especially in the direction of the development of markets for energy services and increased investment and programmes for energy efficiency.

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