FRAMEWORK CONDITIONS FOR USING RENEWABLE ENERGY SOURCES: QUO VADIS, UKRAINE?

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Abstract

Increasing the share of renewable energy sources in the consumption of primary energy has been the subject of national energy policies in many countries – for some time and for various reasons. This is also true for Ukraine, with its vast supply of renewable energy sources, which are, however, presently used only to the lowest degree. Based on these facts this paper analyzes the current situation in the field of renewable energy sources of Ukraine and proposes certain changes to the legal framework, which would lead to an "energy transition" in Ukraine.

Keywords: renewable energy, energy policy, green tariffs, energy dependency, security of supply
JEL Classification Codes: Q27; Q28

1. Introduction

In the last few years the use of renewable energy sources has gained (with increasing intensity) a momentum due to the importance of global warming and other civilization's disasters. Thus, for example, the share of renewables within total electricity consumption of Germany should respectively rise to 35% by 2020 and 80% by 2050. In addition, the primary energy consumption is expected to decline by 20% by 2020 and by 50% by 2050 compared to 2008. The CO2 emissions would thus reduce by 40% by 2020 and by 80% by 2050 compared to 1990. In the medium term, Germany will, in addition, entirely refrain from nuclear energy. The state policy thus intends to protect the climate, to reduce the dependence on imports of fossil energy sources, but also to build and establish a globally competitive industry in the field of

environmentally friendly technologies (for further details on the German «energy transition» (Energiewende) see Wiesmeth (2011a)).

Similarly, in its 7th Environment Action Programme adopted by the EU Commission in late November 2012, the European Union (EU) wants to fully implement the «climate and energy package» by 2020. According to the «20-20-20» aim, by 2020 the EU's greenhouse gas emissions should be reduced by 20% compared to 1990, the share of renewable energies in EU energy consumption should increase by 20%, and, in addition, the energy efficiency in the EU should rise by 20%. It is expected that these objectives will contribute to the mitigation of climate change and to the security of energy supply in the EU. The anticipated increasing international competitiveness of European enterprises in environmental technologies will thus stimulate «green growth» (see EU (2012)).

These are ambitious goals that will be accessible only by concrete measures and supportive framework conditions. In Germany there is for example the «Renewable Energy Sources Act» (Erneuerbaren- Energien-Gesetz – EEG) with its guaranteed feed-in-tariffs (see Deutschland (2004)). Figure 1 shows the proliferation, which demonstrates the experience of feed-in tariffs' implementation all over the world as an instrument for the promotion of alternative energy sources.

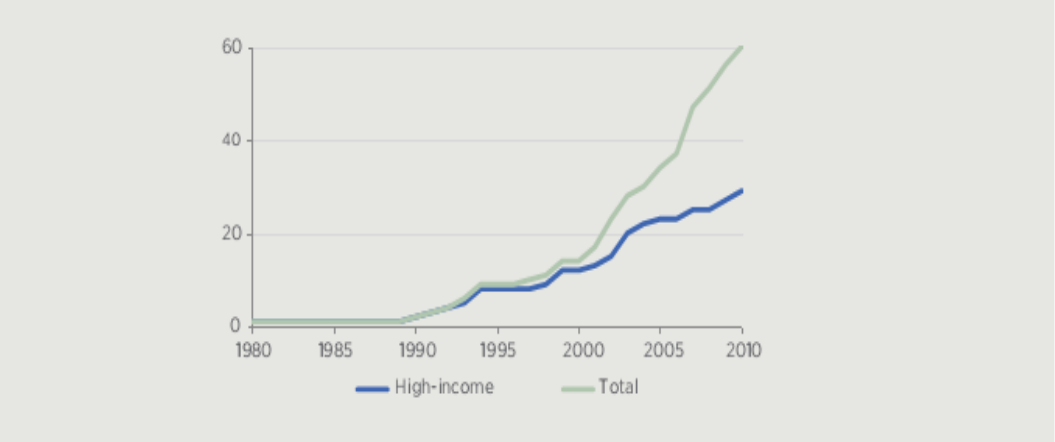

Figure 1: Number of developed and developing countries with feed-in tariffs for electricity from renewable energy sources (IRENA (2012))

The situation in Ukraine seems more complex and it will now be analyzed in more detail. In 2010, the share of alternative energy sources (solar, wind, biomass, geothermal) within total primary energy consumption of Ukraine was estimated at less than 1%. If the capacities of the large hydropower plants were added, the share of renewable energy would increase to approximately 3%. This share of the renewables is, however, too low in comparison to the potential of the country,

especially in view of the available biomass exploitable for energy purposes. Obviously, the current framework conditions do not encourage a more active use of alternative energy sources.

2. Energetics and Energy Policy in Ukraine

2.1. General Overview

Similarly to most other European countries, Ukraine is dependent on energy imports. Annual energy consumption (currently 190 to 200 MTCE (Mega Tonnes of Coal Equivalent)) is satisfied only at 43 to 45% using its own resources. In 2011, approximately 50% (about 182.6 MTCE) of the primary energy consumption was imported (see Figure 2). The share of renewable sources (solar, wind, biomass, geothermal) was, as already mentioned, less than 1% in 2010. Taking into account large hydroelectric power plants (they can also be considered conventional energy suppliers), the renewable energy sources increase to almost 3% of primary energy consumption. In contrast, the proportion of non-conventional energy sources is over 10% in Germany, approx. 8.4% in Denmark and approximately 7% in Italy.

A closer look at the energy import of Ukraine also shows that about 30% of its total gas imports come from Russia. In recent years due to increasing gas prices and severe restrictions during difficult price negotiations with Russia, the issue of energy saving and incentives to expand the use renewable energies has become extremely urgent. In particular, the issue of supply security is viewed with increased public interest. For most countries this is currently the main reason to focus on renewable energy sources more closely.

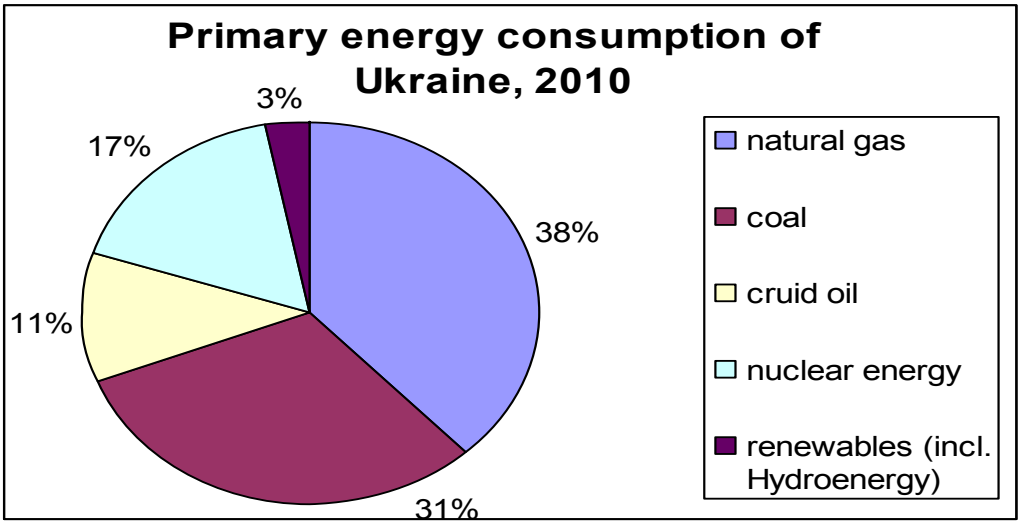

Figure 2: Primary energy consumption of Ukraine 2010 (see National Statistics Office of Ukraine (2010))

The energy industry of Ukraine is heavily subsidized. Currently this means that the conventional areas of energy production, including nuclear power plants, rely on financial grants from the government. Furthermore, the consumption of electricity and heat are also supported by the price policy of the public administration. 25% of electricity consumers in Ukraine are ordinary households.

Table 1 shows that the average price of natural gas for Ukraine has been increasing steadily in the recent years. This primarily reflects the general trend in the energy markets' development, but it is also a result of the political «price correction» of the Russian Federation towards Ukraine.

Table 1: Import price for natural gas for Ukraine since 2008

(Sources: http://economics.unian.net/ukr/detail/132044; http://ukrstat.gov.ua)

Average price level for natural gas, US-Dollars/1000 m^3	2008 %	2009 %	2010 %	2011 %	2012* %	**% on 2008**
	179 +33	238 +44.8	316 +21.5	328.4 +3.9	440 +33.9	**+145**

* Forecast calculation of national Joint-Stock company "Naftogas Ukraine"

In 2011 Ukraine paid nearly 14.5 bln. US-Dollars for its natural gas imports, which is 49.5% more than in 2010. The gas share within total imports of primary energy comprised 57.9% in 2010. Financially, this corresponds to nearly 17% of all imports of the country.

The issues of energy dependence are pressing not only for Ukraine but also for most European countries (Italy – 83%, Spain – 76%, Germany – almost 60%). These countries, however, restructure their energy policy through diversification of energy flows as well with various measures to save energy or to increase energy efficiency. Without a doubt, these objectives should also gain importance in Ukraine, particularly in order to reduce dependence on energy suppliers and, therefore, to improve the security of energy supply.

In many ways the current structure of the primary energy consumption in Ukraine (see Figure 2) as well as the import of primary energy in Ukraine (see Figure 3) is not «sustainable». It is neither politically nor economically viable and can bring the country to possibly precarious situations (as indicated by some distinct developments in recent years).

This statement is true even though the energy industry sector of Ukraine has been vastly reformed since the country's political independence. This reform process should continue for Ukraine, a country with its own high energy potential. From the point of view of «sustainability» of the energy supply, the structure of energy sources, as well as supply security, are considered to be the most important. Ukraine has already taken an important step in this direction by joining to

the Energy Community on February 1st, 2011. Thus the transformation process in Ukraine's energy sector and further in-depth adjustments to the standards of the Energy Community are continuing.

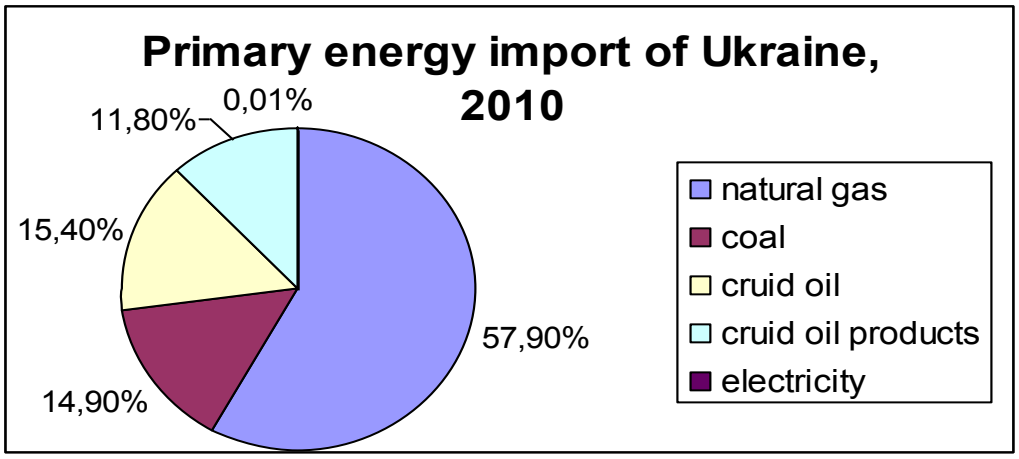

Figure 3: Primary energy import of Ukraine, 2010 (see National Statistics Office of Ukraine (2010))

2.2. Objectives of Energy Policy in Ukraine

The increased use of renewable energy sources – especially in the EU Member States – was originally driven by the threat of climate change and this reason now seems to have become less important in most countries. The security of energy supply and particularly the independence from increasingly expensive energy imports, however, has increasingly become more important. Energy savings will help this goal to come in time faster. In some countries such as Germany there are some extra economic aspects included: there is the influence of the German «energy transition» to build and to establish an internationally competitive industry under the guise of environmental protection, usually with almost direct financing by the consumer.

In Ukraine today the energy saving and energy efficiency were declared to play a major role in the strategic development plan of the country. It is the strategic objective of the government to reduce import dependence and to ensure the long-term security of energy supply. The «fresh» membership in the European Energy Community has definitely made its contribution. Thus many projects are currently being implemented in order to liberalize the electricity market in particular and to make it more competitive. This process aims to set the highest technical standards and regulations for the power distribution network, to enable the export of electricity in the near future and to promote the investment climate. Thus, the Ukrainian energy sector is becoming more intensively integrated into the EU energy sector compared to other sectors and this causes increased energy security. The membership in the

Energy Community makes access to international credit lines less difficult and allows Ukraine to receive technical assistance for the transformation of the distribution network. This is a very important aspect for Ukraine, since the entire network system dates back to USSR years.

Membership in the European Energy Community requires the takeover by Ukraine of the following guidelines in the realm of renewable energy:

1. 2009/28/EG requires the preparation of Ukraine's National Action Plan. This plan includes the strategic objectives for 2020 regarding the implementation of renewable energy sources with special attention to biomass, and measures to increase energy efficiency [Directive 2009/28/EC of the European Parliament and the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC: see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj: L:2009: 140:0016: 0062:en: PDF].

2. 2001/77/EG requires measures by the operators of electricity networks in Ukraine to secure the transmission and distribution of electricity from renewable energy sources. Ukraine should also offer priority access to the grid for electricity from renewable energy sources [Directive 2001/77/EC of the European Parliament and the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market: see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:283:0033:0040:EN:PDF].

3. 2003/30/EG requires that a minimum proportion of biofuels and other renewable energy sources in Ukraine should be placed on the markets [Directive 2003/30/EC of the European Parliament and the Council of 8 May 2003 on the promotion of the use of biofuels or other renewable fuels for transport: see http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:123:0042:0046:EN:PDF].

The abovementioned guidelines should have been transformed into national laws of Ukraine by August 31st, 2011. Obviously this process has not yet been completed. Public discussions were held regarding this topic, but at this point a roadmap with specific implementation instruments is required. It is therefore not surprising that the implementation process is evaluated by experts as unsatisfactory because there is a lack of harmonization of the legislation standards of Ukraine according to the guidelines of the Energy Community.

The following assessment of the legal framework for the electricity providers, particularly regarding the use of renewable energy sources shows that several serious inconsistencies still remain – with corresponding adverse effects for the intended fast transition to energy generation from renewable energy sources.

2.3. Legal Framework for Renewable Energy Sources in Ukraine

The essential conditions for the use of renewable energy sources in Ukraine are currently

regulated by the following laws:

1. Law of Ukraine «On electricity industry», 1991, last updated 5 July 2012 [Zakon Ukrainy „Pro elektroenergetyku": see http://zakon2.rada.gov.ua/laws/show/575/97-вр].

2. Law of Ukraine «On alternative energy sources» in 2003, last updated 25 September 2008 [Zakon Ukrainy „Pro alternatyvni dzherela energii": see http://zakon.nau.ua/doc/?code=555-15].

3. Law of Ukraine «On alternative fuels» 2009, last updated 19 June 2012 [Zakon Ukrainy „Pro alternatyvni vydy palyva": see http://zakon1.rada.gov.ua/laws/show/1391-14].

4. Law of Ukraine «On licensing certain types of economic activity» in 2000, last updated 2 October 2012 [Zakon Ukrainy „Pro lizenzuvannia pevnyh vydiv hospodarskoi diialnosti": see http://search. ligazakon.ua/l_doc2.nsf/link1/T001775.html].

5. Law of Ukraine «On natural monopolies», 2000, last updated 2 October 2012 [Zakon Ukrainy „Pro pryrodni monopolii": see http://zakon3.rada.gov.ua/laws/show/1682-14].

6. Tax Code of Ukraine, 2010, amendment 2012 [Podatkovyi kodeks Ukrainy: see http://zakon1.rada.gov.ua/laws/show/2755-17].

7. Energy Strategy of Ukraine to 2030, 2006 (reviewed in 2012) [Energetychna strategiia Ukrainy na period do 2030 roku: see http://search.ligazakon.ua/l_doc2.nsf/link1/FIN3853Z.html; Onovlennia Energetychnoi strategii Ukrainy na period do 2030 roku (07.06.2012): see http://mpe.kmu.gov.ua/fuel/doccatalog/document?id=222032].

8. Resolutions of the National Regulation Commission in the electricity sector [Postanovy Nazionalnoi Komisii, scho zdijsniue reguliuvannia u sferi energetyky (2011, 2012): see http://www.nerc.gov.ua/?id=199].

The Energy Strategy of Ukraine, which was adopted in 2006, establishes the guide lines for the energy branch until the year 2030. In 2007 it was followed by the National Energy Program with requirements that should have been met by 2010. However, as Ukraine could meet its energy needs in this period using relatively cheap imported energy, there was obviously no pressure for implementing these directives. Only since Ukraine has to purchase natural gas and crude oil at world market prices has the use of its own energy potential been discussed with particular urgency. In addition, the role of Ukraine in the global energy system has to be defined and clarified. Those are exactly the objectives of the amendment of the Energy Strategy.

In the amended Energy Strategy of Ukraine, its goals regarding energy policy for the near future are described in the following way:

1. Reducing the energy input of Ukrainian enterprises;

2. Reducing the energy consumption of the entire economy;

3. Overcoming the dependence of import energy sources;

4. Ensuring a secure energy supply for the country.

The share of renewable energy in gross energy consumption shall rise only to 4.1% by 2030. This is, however, little in comparison with the 20% (average) in the EU Member States.

The amendment to the Energy Strategy is currently being discussed and has therefore not yet been approved.

2.4. The Actual Situation in the Realm of Renewable Energy in Ukraine

Despite complex and partly contradictory legal framework on the political, legal, and socio-economic level the number of projects in the field of renewable energy in Ukraine is steadily increasing. However, under present conditions only big investors can participate in the further development of the energy supply from renewable energy sources (projects with a minimum installed capacity of 1 megawatt (MW)). These include the wind energy project Eco-Optima (Lviv Region) with 12.5 MW of installed capacity, which was built using funds of the European Bank of Reconstruction and Development; the solar power project Perovo (Crimea) with 105 MW installed capacity, an investment project of the Austrian company "Active Solar".

In addition, it takes approximately 1-1.5 years in order to receive government approval for such investment projects with the cost of the approval process amounting to approximately 65 thousand Euros.

The solar power plant Perovo (as well as the other solar power systems of the Active Solar Group) can feed electricity into the power grid and sell it for a fee of 5.05 UAH / kWh (approximately 0.46 eurocents / kWh). However, this tariff shall be reduced in three steps, namely in 2015 (by 10%), in 2020 (by 20%) and in 2025 (by 30%). According to the legal regulations, the feed-in tariff for installations completed in 2014 or later must also be reduced stepwise. Government and investors expect that the cost of financing and prices of installation components will decrease in a similar manner.

The total number of companies, doing business in the field of renewable energies, and producing electricity according to the «green tariff» has grown to 66. The number of systems installed in Ukraine is around 110 with 23 solar systems. The installed capacity of the plants generating electricity from renewable energy sources has increased over 2.5 times in 2011, mainly driven by the extraordinary growth of solar capacities.

When the law «On the electric power industry» was updated with «green feed-in-tariffs» in April 2009, the coefficients were calculated on the basis of the minimum level of feed-in tariffs.

The basic price of electricity was taken as the price on 1 January, 2009 and charged in Euros at the exchange rate on a given date.

The following table contains feed-in tariffs for electricity from renewable energy sources, as proposed in the updated, but not yet enforced amendment to the law «On the electric power industry»:

Table 2: Updated profiles for the feed-in-tariffs (see IER (2010), Law (2009), Ernst & Young (2012))

Type of the RE-Plant	Coefficient for Green Tariff (on the price basis 0,5846 UAH/kWh)		Peak load coefficient
	till 01/01/2013	after 01/01/2013	
Wind energy plants till 600 KW	1,2	1,2	-
Wind energy plants 600-2000 KW	1,4	1,4	-
Wind energy plants over 2000 KW	2,1	2.1	-
Biomass energy plants (electricity)	2,3	2,3	-
Biogas energy plants (electricity)	-	2,7	-
Municipal waste plants (electricity)	-	3,0	-
Solar energy plants (on land)	4,8	3,5	1,8
Solar energy plants (on roof or facade) over 100 kW	4,6	3,6	1,8
Solar energy plants (on roof or facade) till 100 kW	4,4	3,7	1,8
Solar energy plants (on roof or facade of private House) till 10 kW	-	3,7*	-
Small Hydro energy plants till 200 kW	1,2	2,0	1,8
Small Hydro energy plants 200-1000 kW	1,2	1,6	1,8
Small Hydro energy plants 1-10 MW	0,8	1,2	1,8

* Amended Law of Ukraine «On the electricity industry» from 1 July 2013 [Zakon Ukrainy "Pro elektroenergetyku": see http://zakon4.rada.gov.ua/laws/show/575/97-вр]

The amended law requires the state to buy electricity from renewable energy sources till 2030 according to the specified conditions, to provide adequate network connectivity, and to ensure the support of the relevant business sector. However, significant bureaucratic obstacles continue to exist and corruption complaints occur. Several international technical reports have testified to this effect [Rik v energetychnomu spivtovarystvi: dobre stoimo? Analytical research of GO„DiXi Group"; see http://ua-energy.org/upload/files/Ukraine_first%20year% 20in%20Energy% 20 Community.pdf; Zaluchennia investycij u sferu vidnovliuvanoi energii Ukrainy. Handbook on the development of the private sector (OECD- Initiative); see http:// www.oecd.org/daf/privatesectordevelopment/UkraineRenewableEnergyUKR.pdf;Energieeffizienz steigern:Eine gemeinsame Aufgabe für Staat und Markt. Newsletter der Deutsche Beratergruppe. Ausgabe 42. Februar 2012; see http://www. beratergruppe-ukraine.de/download/Newsletter/2012/ Newsletter_42_2012_Deutsche%20 Beratergruppe.pdf; Ukraina 2012: zahalna energetychna polityka. International Energy Agency. OECD/IEA, 2012; see http://www.iea.org/

publications/ freepublications/publication/UKR_Summaryplus.pdf].

The amended law «On the electric power industry» requires that local components are used for the production of electricity from wind and solar power plants. According to these requirements, the components must be Ukrainian-produced for not less than 30% (as of 1 January 2013) or 50% (as of 1 January 2014) of the total costs.

From January 1st, 2013 also private households may receive a feed-in tariff of about 0.39 to 0.40 Euros per kWh of electricity from solar power systems (up to 10 kW). But only, if they consumed less than was produced by this capacity. As a rule, one private household needs much more electricity than the solar batteries can produce in the best period. In this case the "green" electricity for the ordinary consumer is too expensive to be used.

Generally speaking, the analysis of the legal and regulatory framework in the field of renewable energy sources demonstrates that questions remain: in the future, will private households (such as it is provided in the amendment) be allowed to choose (produce and consume or produce and sell electricity from renewable sources under the "green" tariff)? Is there a state guarantee for the feed-in tariff in 2030 (in the law «On the electric power industry» there is a remark that the compensation depends on further legal changes)?

The next section will give recommendations for an integrated energy policy» for Ukraine, which should help to reach the ambitious targets in near future. The term «integrated energy policy» is thereby intended to refer to a comprehensive, holistic approach.

3. An «Integrated Energy Policy» for Ukraine

«Integrated policies» result from applied environmental economics (cf. Wiesmeth (2011b), Ch. 10). The basic idea is to integrate the relevant environmental commodities, which are typically characterized by external effects and public good properties, into the fundamental economic allocation problems. Equivalently, an integrated (environmental) policy is nothing but an allocation mechanism for these environmental commodities in consideration. Due to information problems and due to the externalities, the market mechanism has to be augmented, partially or completely replaced by some other tools with practical relevance. As energy "production" and energy "consumption" is closely associated with a variety of environmental issues, an «integrated energy policy» is required for taking into account all relevant aspects of "energy".

3.1. Fundamentals of an Integrated Energy Policy

An integrative, holistic approach to the energy policy should, in general, address the

following aspects:

1) **Goals:** The goals of a (revised) energy policy should be made clear from the outset. Examples for possible goals of a revised energy policy are: reducing the dependence on energy imports and the price risks associated with them; supporting environmental goals such as the protection of the global climate by means of a larger share of renewable energy sources in the consumption of the primary energy; liberalizing, protecting or strengthening the national energy sector; and, finally, stimulating the development of innovative products and processes for the global market.

Clearly, a typical policy with multiple goals requires priorities or weights, as the various goals need not be fully compatible. For example, increasing the share of renewable energies with the goal to protect the global climate without having a national industry to develop technologies and produce the relevant equipment might have a doubtful effect on the goal of stimulating the national economy.

2) **Financial Issues:** Policy changes of any kind are usually associated with economic costs implying a drain on a nation's resources. This is especially true for revisions of an energy policy to be based on a higher and further increasing share of renewable energy sources. The relevant question for which an answer is required refers to the distribution of the resulting economic costs, to "burden sharing".

In various countries, guaranteed feed-in prices for electricity from renewable sources are financed through higher consumer prices for electricity, marked-up through the reallocation charge for renewable energies – often with the exemption of certain industrial sectors [In Germany industries with high energy consumption are partially exempted from the resulting price markups. For example, industries, which consume between 10 and 100 GWh electrical energy per year pay only 1% of the regular reallocation charge]. Clearly, other models of such a «private-public partnership» with the public administration establishing the framework conditions and the private economic agents paying are feasible (see also Wiesmeth (2008)).

3) **Stakeholders:** The relevant stakeholders for such a policy have to be identified. This implies a thorough analysis regarding the economic agents, who will be affected by these goals, or who are needed to achieve these goals.

Thus, if for example renewable energy sources shall gain increasing importance in a revised energy policy, then all households and business companies should be integrated into the policy – not just because they should pay for it. Electricity from renewable sources can be efficiently produced in a decentralized way with small "energy plants". Photovoltaic modules on roofs of

private houses and biogas plants on agricultural farms in many countries are typical examples for successfully "integrating" households and small enterprises into the underlying policy.

3.2. Remarks on an Integrated Energy Policy for Ukraine

In this section the above remarks will be translated into some basic principles of an integrated energy policy for Ukraine.

1) **Goals:** From the above sections, in particular Section 2.2, the most important goal of Ukraine regarding energy seems to be gain a higher degree of independence from imports of oil and gas. Subgoals refer to increasing energy efficiency and reducing energy consumption in general. In addition, a certain share of the components for renewable energy plants must be Ukrainian-produced.

The crucial point is, of course, whether Ukraine can achieve these goals simultaneously in not too long a period of time. One of the questions is, whether the Ukrainian industry can provide the necessary equipment to satisfy the local-content requirement. Another question refers to the incentives for the industry, which is still controlled to a substantial extent by the government, for taking appropriate measures to increase the energy efficiency.

2) **Financial Issues:** Again from the above sections, it follows that renewable energies are and will continue to be promoted through guaranteed feed-in tariffs. The open question in this context is: who is going to pay for this «energy transition» in Ukraine?

This question is critical for at least two reasons. Firstly, electricity prices are currently heavily subsidized in Ukraine. So, what is going to happen with these "political" prices for electrical energy? Secondly, the subgoals of increasing energy efficiency and reducing consumption of energy are dependent, at least to some extent, on higher prices of electrical energy.

3) **Stakeholders:** A fast transition to renewable energy sources requires the support, the "integration", of a large number of households and business companies. In this sense, Ukraine plans to decentralize the market for producing and selling electrical energy form renewable sources. Without this step, the market will be dominated by foreign producers such as the Active Solar Group from Austria.

These remarks demonstrate that many relevant issues for a «sustainable energy supply» for Ukraine are still unclear and need further attention. The multiple goals of the Ukrainian policy can only be achieved with a holistic, integrated approach.

4. Summary

This paper first analyses the current structure of supply and consumption of energy in

Ukraine. Background is the well-known fact that Ukraine is to a large extent dependent on the import of oil and gas. This renders Ukraine economically vulnerable and leads to political efforts to reduce this dependency through a revised energy policy.

This revised energy policy puts more weight on renewable energy sources in combination with various subgoals such as increasing energy efficiency. However, the analysis shows that some crucial issues regarding an «integrated energy policy» are still open and should be clarified in near future.

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