



Study of 2020 energy targets achievability

Alina Zaharia

The Bucharest University of Economic Studies, Bucharest, Romania

alina.zaharia00@gmail.com

Received date: 23 January 2015; Accepted date: 21 July 2015; Published date: 16 Decembre 2015

Academic Editor: Radim Spicar

Copyright © 2015. Alina Zaharia. Distributed under Creative Commons CC-BY 4.0

Abstract

The Europe 2020 Strategy and the concepts through which green energy use is promoted represented starting points for evaluating the status of Member States economies in order to propose ways of achieving sustainable development. Thus, the European Union has established targets for diminishing the level of the negative effects of human development by 2020. These energy targets refer to improving energy efficiency, to diminishing the consumption of fossil fuels and to promoting the use of renewable energy. The paper tries to investigate the status of these targets achievability by comparing the 2012 levels of primary and final energy consumption with the 2020 targets and to assess the relevance of the assumed energy targets by all member states. Equally, this paper provides a comparison of 2012 levels of the share of renewable energy in gross final energy consumption with the 2020 targets. The results indicate low significance of the member states assumed targets for 2020 energy consumption, because their levels are similar to the one of 1990. European Union should consider all “green” existing concepts for integrating them into a more complete one to better substantiate the adopted targets in the energy sector. This could represent the pathway to energy sustainability achievement and, through it, the green society accomplishment.

JEL Classification: E21, O13, Q40.

Keywords: energy consumption, energy targets, sustainability, green society.

Introduction

Each economic sector uses energy in a greater or lesser degree. Therefore, worldwide, strategies have emerged for establishing ways of achieving energy sustainability which represent a significant part of sustainable development accomplishment. Sustainable energy use takes into consideration besides the economic impacts, the social and

environmental ones. Green economy, one of the ways for achieving sustainable development, aims to increase the renewable energy consumption at the expense of fossil fuel energy. Since the nineteenth century, many “green” concepts have emerged globally. These concepts support the diminution of energy use. In the past years, changes in the energy sector have emerged such as big investments and promotion schemes of renewable sources. These

changes have generated different effects in the country where they were implemented due to various limitative factors, like the existing legislative framework, the functioning of the regulatory institutions, the existing infrastructure. The 2020 targets established by the European Union in the energy sector refer to improving energy efficiency, to diminishing the consumption of fossil fuels and to promoting the use of renewable resources. The authorities and the specialists are trying to reach consensus on these issues, because without common actions the final result has a small impact or even non on a long term. The implications of using the energy with disregard generate local or regional crises, and have impacts from economic and political fields to socio-cultural and environmental ones. From this perspective, every country should apply several required measures for increasing energy efficiency and for diminishing the use of energy in all fields.

The main goal of this research is to establish the degree of achievability of energy consumption targets in the European Union. In order to accomplish this goal, initially, this research analyzes the “green” concepts which contribute or promote the reduction of energy consumption and the increase of energy efficiency. Furthermore, the EU 2020 energy targets achievability is discussed based on the comparison analysis between the expected 2020 targets of primary and final energy consumption set by the European Union for each member state and the 2012 levels. Finally, suggestions for achieving energy sustainability are proposed.

So, the energy field goes through many changes and requires a common plan for achieving energy sustainability, because the fossil fuels are limited while the energy needs are increasing. One of the limits of this paper consists in not substantiating new sustainable targets for the energy consumption which could represent a starting point for future research in this area of study. Also, it should be considered that currently the EU improves its measures in the energy field and the development in this area is permanent. Moreover, this study

limits at only 3 major energy indicators although in reality there are many other evolutions which could be analyzed. Future studies could also focus on extending this type of research at other non-EU countries for making a comparison at the international level.

Literature review

The Brundtland Report (WCED, 1987) emphasized the importance of how the energy resources are used, and the fact that action must be taken both for investing in renewable energies and for an efficient use of energy resources. As mentioned in a study by da Graça Carvalho (2012), the European Union has major objectives in the energy field: achieve 20% increase in energy efficiency by 2020, achieve 20% increase in the share of renewable energy in gross final energy consumption by 2020, increase the consumption of clear hydrocarbons, and strengthen the internal energy market. Also, da Graça Carvalho (2012) noted that energy infrastructure investments would be required for achieving the security of supply and the stabilization of consumer prices, that, further, it would contribute to maintaining a strong, diversified and competitive industrial base in Europe by increasing the access to clean, secure and affordable energy.

The study of Kitzing et al (2012) presents the increased trend of common approach of how and what kind of support instruments for renewable energy are applied at the EU level. In addition, this study show that policy makers take similar decisions and converge more and more, and it indicates the increase of adopting multiple support instruments at the same time. Moreover, Kitzing et al (2012) show a continuous implementation, change and improvement of their support for renewable energy sources in their country and an increase of their similarity.

Furthermore, Knopf (2015) conducted a study on assessing the energy 2030 target on sectorial impact by analyzing the implications for the electricity sector, and concluded that the share of renewable

energy in gross final energy consumption has been steadily rising from just above 8% in 2004 to 14% in 2012 and that there are large differences in RES deployment and costs between Member States.

According to Zaharia and Rătezanu (2013), compared to the USA and China, the EU is leading the path to lower fossil fuels burned for obtaining energy by strongly promoting the use of renewables. According to the European Environment Agency (2013), the main issue of achieving energy efficiency is represented by the presence or not of the binding measures. Even though some steps were made by adopting binding measures in the sub-sectors of economy such as buildings, these are not overall recognized. As da Graça Carvalho (2012) noted, the energy targets that Europe has set in order to combat climate change are conditional on international agreements.

Methodology

This research used international databases from the European Commission, the World Bank and the International Environmental Agency. Also, it is based on previous studies regarding the energy targets. This research is split into two analyses: a conceptual analysis

of “green” concepts relevant for energy field and a target analysis based on the comparison between the assumed 2020 energy consumption targets at the European Union level and the reached ones in 2012. Additionally, the achievements and targets of the share of renewable energy in gross final energy consumption are considered and analyzed. Based on the conducted analyses, measures to use sustainable the energy along with suggestions for establishing higher energy consumption targets’ levels in the European Union are proposed.

Results and discussion

“Green” concepts analysis and discussion

The “green” concepts analyzed in this paper, which aim sustainability, are from particular to general: hydrogen economy, low carbon economy, circular economy, green economy, blue economy, sustainable development and green society. Figure 1 illustrates the relation between “green” concepts and sustainable energy with all its dimensions for diminishing energy consumption: energy efficiency, energy savings, renewable use, green technologies implementation.

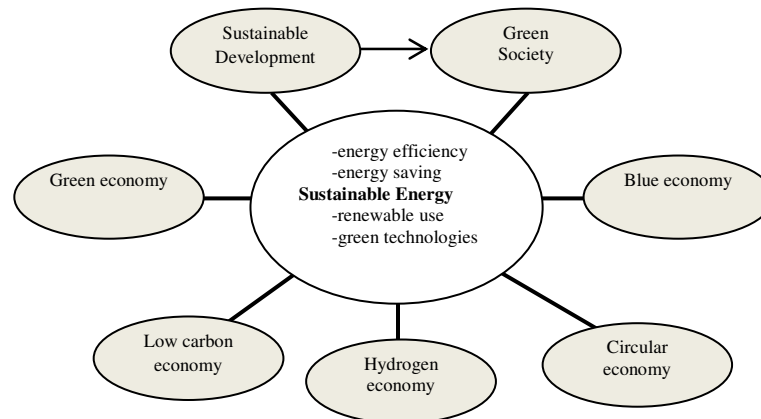


Figure 1: Relation between “green” concepts and sustainable energy

It is important to acknowledge that governments became aware of the importance of environment and social dimensions and that there are taken actions for a sustainable use of energy resources.

Hydrogen economy has its roots since the '70s (Bockris, 1977) and sustains the reduction of fossil fuels used for energy production. It is also a controversial subject among scientists in what concerns its

environmental protection because it still uses preponderantly fossil fuels (Züttel et al., 2011). Low-carbon economy is a relatively new concept, with its first appearance in 2003 (UK Department of Trade and Industry, 2003), but the actions to achieve it started from the '70s, when it emphasized the need of promoting the use of energy renewable sources and the diminution of fossil fuel use in order to mitigate with climate change by reducing the greenhouse gas emissions (Runnalls, 2011). Circular economy refers to reusing all the waste, materials, components of a product, by creating the products with renewable resources and by making agreements between the producers and the users (Ellen MacArthur Foundation, 2012). In fact, circular economy is targeting more the life cycle of a product. Green economy is the well-known and promoted way of achieving sustainable development. Even though this concept makes us think about environmental protection due to the word "green", the main interest is on the social dimension, because, besides the promotion of efficient use of energy resources, the goal is to create new industries, new technologies, new ways of life, which could lead to new jobs (UNEP, 2011). The author considers that green economy contains and promotes some principles of low-carbon economy and of hydrogen economy.

Three new concepts take into consideration a lot more than the environmental dimension, and exceed the limits of green economy. Blue economy sustains that mankind could develop its activities by using the renewable resources in such a way that allows human society to function like an ecosystem and, through that, at the same time, to preserve and even restore the natural ecosystems (Gunter, 2010). Sustainable development represents the human society development which considers the social, environmental and economic dimension of all activities during time. Green society is promoted by Simone Cesaretti Foundation in order to achieve a sustainability of the welfare; an important role in this model is "equity"

which should complement the three pillars of sustainable development (Cesaretti et al., 2011).

All these "green" concepts represent different ways and views of reaching green society, which, conceptually, represents more than sustainable development, because it integrates equity among the economic, social and environmental pillars of development.

In conclusion, these concepts have sustainability as a basic principle and they have the purpose to promote the use of renewable energy and to reach a consensus between human development and nature for not depending anymore on the fossil fuel limitative and pollutant stocks. So, in order to achieve sustainable development with tangible results, the author considers that all these concepts should be integrated into only one and applied in common strategic measures which should be promoted, equable understood at global scale and applied uniformly and with responsibility.

Energy consumption targets analysis and discussion

In order to achieve the 2020 energy targets, each Member State should fulfill at least a certain percentage for each indicator according to the Directive 2009/28/EC calculations which do not take into account the gross final consumption of energy in aviation. Also, by establishing certain targets, the EU can better monitor the evolution of energy sector.

In 2012, the EU had the share of renewable energy in gross final energy consumption of 14.1%, with 5.9% distance of target achievement. In 2012 only three member states achieved their targets, Sweden, Estonia and Bulgaria, and already surpassed it with 2%, 0.8% and 0.3%. Figure 2 illustrated the targets assumed by each Member State for 2020 along with the 2012 achievement of each share of renewable energy in gross final energy consumption.

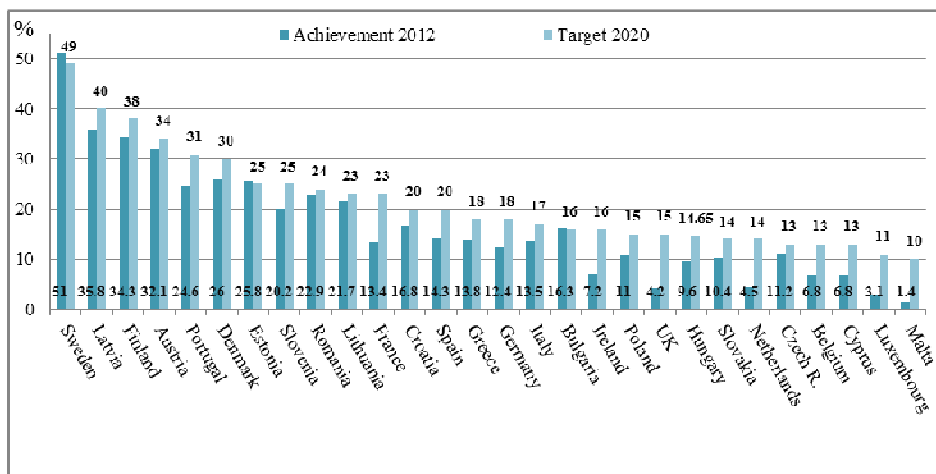


Figure 2: Achievements and targets of the share of renewable energy in gross final energy consumption

Source: own representation based on the EU's data

As it can be seen in figure 2, the highest 2020 targets are in the case of Sweden (49%) and Latvia (40%), while the lowest targets are for Malta (10%) and Luxembourg (11%). Of course, from now on, the targets should consider, among other variables, also the available resources and the consumption of the population. Also, considering that the remaining rate represents the difference between the target and the 2012 achievement, the highest remaining rate in 2012 was in the case of the UK, of 10.8%, while the future target is having 15% share of renewable energy in gross final energy consumption. France is positioned after the UK with 9.6% and the Netherlands with 9.5%. The case of the Netherlands is worth mentioning, considering that it is a country which assumed a target of only 14% and which is known for its investments in green energy. The lowest remaining rate is in the case of Romania with 1.1%, Lithuania with 1.3%, the Czech Republic with 1.8%, and Austria with 1.9%. Among these countries, Austria has the highest target for 2020 - must achieve 34% share of renewable energy in gross final energy consumption. In this analysis, the initial difference between the target from 2020 and the achievement of 2005 should be also considered. In this case, it could be explained why the remaining rate in 2012 is so high in the UK, France, Ireland and the Netherlands, and why it is surpassed,

respectively almost achieved, in Sweden, Estonia, Bulgaria, respectively in Romania and the Czech Republic.

Another objective of the European Commission by 2020 is to achieve higher energy efficiency (European Commission, 2010). To assess the status of energy efficiency, the following indicators were measured: primary energy consumption or savings, final energy consumption or savings and energy intensity (Directive 2012/27/EU). The 2020 EU target for primary energy consumption is 1483 Million tonne of oil equivalent (Mtoe), and the primary energy savings in 2012 were of 10.5%, which represented more than half of the 20% target of 2020. The 2020 EU target for final energy consumption is 1086 Mtoe, and the final energy savings in 2012 were of 12.1% which represented more than half of the 2020 target of 20% (Eurostat, 2014). Comparing the data of primary energy consumption from 1990 with the 2020 target can be noticed in that the last mentioned will be smaller if it would be achieved. Comparing the final energy consumption from 1990 with the 2020 target can be observed in that the 2020 value would be higher than the one from 1990. This phenomenon raises a question mark on the achievement of the second proposed objective regarding energy efficiency. Table 1 presents the difference

between 2020 targets of primary and final energy consumption and those for 2012, in Mtoe. The analysis was conducted for 28 Member States, even though Croatia did not

register until 2014 the 2020 target for primary energy consumption on Eurostat, so it was not taken into consideration in analyzing this indicator.

Table 1: The difference between 2020 and 2012 targets for primary and final energy consumption

No. Crt.	European Union	D* - Primary energy consumption (Mtoe)	D** - Final energy consumption (Mtoe)
1	Austria	-0.3	-1
2	Belgium	-5	-4.1
3	Bulgaria	-2	-0.04
4	Croatia	-	3.34
5	Cyprus	0.3	0.4
6	Czech Republic	-0.5	1.215
7	Denmark	-0.1	0.7
8	Estonia	0.5	-0.1
9	Finland	3.1	1.4
10	France	-10.1	-19.4
11	Germany	-21	-18.8
12	Greece	1.2	4.2
13	Hungary	5.1	3.5
14	Ireland	0.3	1
15	Italy	2.8	7
16	Latvia	0.97	0.47
17	Lithuania	0.585	-0.522
18	Luxembourg	0.082	0.039
19	Malta	-0.075	0.093
20	Netherlands	-6.7	1.1
21	Poland	3.1	6.8
22	Portugal	1.6	1.2
23	Romania	9.39	7.62
24	Slovakia	0.5	0.1
25	Slovenia	0.413	0.188
26	Spain	0.3	-0.3
27	Sweden	-4.6	-2.1
28	United Kingdom	-17.8	24
	European Union (28)	- 37.93	18.003

D*= 2020 targets – 2012 for primary energy consumption

D**= 2020 targets – 2012 for final energy consumption

Source: own calculation based on the EU's data

The countries with positive values at D* and D** have achieved and even diminished the values under their 2020 targets in what concerns the primary and final energy consumption, while the ones with negative values of D* and D** have not achieved the 2020 targets until 2012. Among the EU countries with D* positive, which compares primary energy consumption from 2012 and 2020, are Romania, Hungary, Finland and Poland, but only Romania had the biggest reduction of primary energy consumption related to 2020 target and it had, also, a big reduction of this indicator since 1990, as can be observed in table 2. The countries with the highest negative D*, that did not achieved in 2012 the 2020 targets are, in this order, Germany, UK, France, Netherlands, countries which did not account well in the share of renewable energy in the final consumption.

Oppositely, the UK, Romania, Italy, Poland and Greece register the highest D** positive, which indicates an accomplishment of the 2020 final energy consumption target, compared to France, Germany, Belgium, Sweden and Austria, which have the highest D** negative.

In table 2, the increases or decreases of the primary and final energy consumption related to 1990 and 2005 were calculated, because, on the one hand, 1990 is relevant for assessing longer evolution of these indicators and, on the other hand, 1990 represents a peek year for these analyzed indicators in the last 24 years, which means that this year should be considered when establishing the future energy targets. Also, 2005 is relevant in the context of expanding the model of sustainable development.

Table 2: 2020 and 2012 targets for primary and final energy consumption compared to 1990 and 2005

European Union	Primary energy consumption - indices				Final energy consumption - indices			
	2020/1990 - 100	2012/1990 - 100	2020/2005 - 100	2012/2005 - 100	2020/1990 - 100	2012/1990 - 100	2020/2005 - 100	2012/2005 - 100
Austria	34.62	35.90	-3.37	-2.45	36.27	41.45	-6.74	-3.19
Belgium	-4.17	6.80	-14.65	-4.88	2.85	15.82	-11.68	-0.54
Bulgaria	-39.69	-32.06	-16.40	-5.82	-44.15	-43.90	-9.31	-8.91
Croatia	-	-8.43	-	-7.32	56.61	0.00	46.67	-6.35
Cyprus	75.00	56.25	12.00	0.00	100.00	63.64	22.22	0.00
Czech Republic	-17.67	-16.63	-6.16	-4.98	-22.11	-25.85	-2.63	-7.31
Denmark	1.14	1.70	-7.77	-7.25	9.63	4.44	-4.52	-9.03
Estonia	-33.67	-38.78	20.37	11.11	-51.72	-50.00	-3.45	0.00
Finland	31.02	19.71	7.81	-1.50	24.19	17.67	5.53	0.00
France	10.21	14.93	-9.71	-5.85	-3.45	10.80	-19.29	-7.37
Germany	-17.01	-10.71	-12.80	-6.18	-15.12	-6.90	-11.08	-2.47
Greece	25.46	19.91	-11.44	-15.36	39.46	10.88	-2.38	-22.38

Table 2: 2020 and 2012 targets for primary and final energy consumption compared to 1990 and 2005

Hungary	-1.85	-20.66	4.72	-15.35	-8.54	-26.13	0.00	-19.23
Ireland	43.30	40.21	-5.44	-7.48	60.27	46.58	-7.14	-15.08
Italy	10.49	8.53	-11.68	-13.25	16.99	10.49	-6.32	-11.52
Latvia	-32.03	-44.30	19.33	-2.22	-30.16	-37.50	11.75	0.00
Lithuania	-57.05	-60.93	-17.91	-25.32	-55.90	-50.52	-7.00	4.35
Luxembourg	28.06	25.71	-6.62	-8.33	28.45	27.27	-5.80	-6.67
Malta	37.50	50.00	-17.50	-10.00	64.33	33.33	23.25	0.00
Netherlands	6.30	18.04	-12.41	-2.74	26.09	23.43	-0.38	-2.48
Poland	-2.72	-5.85	9.55	6.02	17.53	6.18	20.75	9.09
Portugal	39.75	29.81	-10.00	-16.40	46.22	36.13	-8.90	-15.18
Romania	-24.97	-41.36	17.14	-8.45	-25.69	-44.36	22.75	-8.10
Slovakia	-19.80	-22.28	-8.99	-11.80	-31.58	-32.24	-10.34	-11.21
Slovenia	28.30	21.05	4.47	-1.43	37.51	32.43	3.84	0.00
Spain	44.42	44.06	-10.52	-10.74	45.18	45.71	-15.24	-14.93
Sweden	-4.62	5.49	-10.88	-1.44	-2.88	3.85	-10.09	-3.86
United Kingdom	-11.38	-2.50	-20.36	-12.38	15.27	-2.26	3.27	-12.43
EU (28 countries)	-2.02	0.88	-10.14	-7.48	3.81	2.15	-5.71	-7.22

Source: own calculations based on the EU's data

The positive values from table 2 show an increase of primary or final energy consumption for those EU countries that have a negative situation, because one of the EU's objectives in the energy sector is to reduce energy consumption. Also, the negative values from table 2 show a decrease of primary or final energy consumption which indicates a positive situation. By making a comparison of the 2020 targets with the values of primary and final energy consumption from 1990, respectively 2005, it could be noticed that the targets set for 2020 could be easily achieved. In these

conditions, we consider appropriate to set higher targets, in order to obtain results with a significant impact on the energy sustainability at the EU level. As it can be observed in table 2, the 2020 targets for primary energy consumption, respectively final energy consumption, are higher than the ones from 1990 for 14 EU countries, respectively 17, of 28. Also, the 2020 targets are higher than the ones from 2005 for 8 EU countries in the case of primary energy consumption and for 10 in the case of final energy consumption. The situation is negative, because the EU should have

considered the 2020 targets for consumption on a lower level than the ones from 1990 and 2005. Normally the EU took 2005 as base year in its consumption analysis, but we think that it would be more correct and necessary that the chosen base year to be 1990, as explained previously.

For those countries which achieved their 2020 targets, they should be proposed higher targets. The only question that remains is if this action would be fair considering that the countries which did not achieved their 2020 targets until 2012 would not accomplish them not even in 2020. In these conditions, the most suitable solution remains implementing more active programmes on diminishing faster the energy consumption for those countries which yet did not achieved their targets. When the 2020 targets are fulfilled by all EU countries, the EU policy makers should propose more ambitious energy targets than the previous period of time. Likewise, the EU member states should assume further better substantiated targets than those of 2020 and higher-aimed ones considering the status of the energy sector in 1990. While these new energy targets' projections could be made for 2030, mandatory rectification should be proposed in 2025, but only to higher targets, in order to green the energy sector and make it more sustainable for the future.

From analyzing these indicators, it could be concluded that the governments should consider in their analysis regarding the degree of achievement of the energy targets, among the remaining rate of achievability the target, also the starting point (the year 1990). Overall, the level of these targets has been set too high (negative situation), in the sense that the reduction of the energy consumption will be low if the comparison is made with 1990 and if we think about the current problems in the energy sector which requires fast solutions. So, the European Union should make integrated efforts for its member states to surpass the assumed target and to sign new agreements in order to achieve the sustainable energy development and a sustainable welfare.

Limitative factors of energy sustainability achievement and suggestions

- The main limitative factors of “green” concepts’ implementation in terms of energy sustainability are:
- The population’s information and education concerning the necessity of reducing energy consumption (considering both producers and consumers) is reduced;
- The significant diversity of “green concepts”, that it could confuse the population and the companies of the objectives necessary to be followed.
- The lack of a common understood and responsibly applied goal in terms of energy efficiency and renewable energy use, because the specialists in the field did not agree at only one “green” concept of being the best in protecting the interests of both mankind and planet, especially in the past years when, even though the green economy is promoted by EU (which is not complete), the other “green concepts” have emerged;
- The concept of green economy is not properly and similarly understood by all states and it is losing credibility because of the appearance and mixture with other “green concepts”, like those previously analyzed (Allen and Clouth, 2012);
- EU has adopted green economy as the current economic model, but this study concluded that in some countries this is not the right choice after all when analyzing the energy sector, because the chosen targets for reducing energy consumption and improving energy efficiency were set at low levels considering their ability of achieving them;
- The promotion schemes for renewable energy are supported by final consumers in some countries, like Romania. In these

cases the author rises the problem of inequity and maybe the one of continuously encouraging a careless behavior of energy producers with reference to environmental protection and civic spirit, that in practice it should be an environmentally conscious behavior generated from a voluntary and intrinsic motivation and not seen as a liability or as something from which one can gain monetary or non-monetary wins.

- The Directive 2009/28/EC on the promotion of the use of energy from renewable sources does not take into consideration the aviation transportation when analyzing the energy consumption, a part of transportation that has various negative impact on environment and human health.

- The current EU targets on energy efficiency (which is evaluated through energy consumption according to the European Commission) have no actual positive impact if their level is compared to the level of a lower base year from a longer period of time, like 1990.

For adopting higher energy consumption and renewable use targets, decision makers could:

- Adopt binding measures for energy efficiency targets at member states' levels;
- Integrate all the "green" concepts into one for a better understanding by each member state and person;
- Adopt punitive measures if energy targets have not been achieved due to the deadline, but with the specification that these could be applied only if the EU provides the support required by every member state considering their own characteristics;

- Application of ethical economic and non-economic instruments, measures, strategies by respecting the human rights and the environmental protection principles;

- Create, calculate and assess new energy indicators and targets, like the change of technologies into green ones at commercial societies level, local investors in green energy etc.;

- Establish new targets and agreements for the energy use at international level by taking into consideration the highest energy targets until the present. For the moment, we suggest at least an increase to 26% of primary and final energy consumption until 2020 in order to slightly surpass the 1990 levels.

Worldwide, the governments should decide on an economic model which could achieve the sustainable welfare by taking into consideration their unethical interests in order to be able to prevent this kind of behavior. By analyzing the current "green" concepts, the European Union should identify the best principles and elements of each concept and integrate them into one for the good of the planet: human society, biodiversity and natural capital. The author considers that a starting point for designing this new sustainable green concept in the energy sector should be the integration of all "green concepts" into a newer or even older concept like green economy. Afterwards, the promotion of this concept would be the key, first in understanding it and afterwards in applying it correctly. For achieving this, the European Union could create a EU marketing and PR division, that it should collaborate with each member state in designing presentations, reports etc. on green economy.

From this research it can be concluded that there are several "green concepts" which confuse both decision factors and population. Although there are better "green" economic ways of supporting the sustainable use of

energy resources than green economy, like blue economy and green society, the EU is not promoting them and not even integrating them into the green economy model. The aim of the European Union should be to target the achievement of a green society which represents conceptually more than sustainable development, because it integrates equity among the pillars of development.

The results of the analysis of the renewable energy share in the final energy consumption indicate a good promotion of renewable energy use in the European Union. However, EU member states did not assume and achieve a good level of energy efficiency, which was analyzed by primary and final energy consumption, maybe because these targets are not mandatory overall the economy as in the case of the renewable energy objective. So, the first step, it should be applying binding targets for energy efficiency for all member states, because the sub-sectorial binding measures are not sufficient.

Maybe after 2020, the EU considers to adopt a new pathway to increase energy efficiency and savings and to grow the use of renewable energy by taking into consideration all the main issues pointed out in this study and by integrating all the economic, social, environmental and technological principles which could harmonize better human cohabitation with nature, because the natural capital is the support of life on Earth and of human activities. In this new concept, which integrates all green pathways, the EU could assume higher energy targets and should create a marketing and PR division, which it should collaborate with each member state in better understanding green economy, in integrating the missing issues from the presented "green" concepts, for promoting more renewable energy and the necessity of reducing energy consumption in order to reach sustainability in the energy field.

In brief, the European Union should better support its member states to surpass the assumed targets, to diminish the discrepancies between the member states in

what concerns the energy sector and to establish higher targets in order to achieve the sustainable energy development and to reach to a green society.

References

1. Bockris, J.O'M (1977), *Environmental Chemistry*, Springer US, 549-582.
2. Cesaretti, G.P., Scarpato, D., Misso, R.A., Annunziata, A. Borelli, IP, Viola, I., Olleia, A. (2011), 'Sustainability and equity in a competitive economy: the "green society" strategy', *Supplement of Quality-Access to Success*, ISSN 1582-2559, November 2011, Bucharest, Romania, 22-28.
3. da Graça Carvalho, M. (2012) 'EU energy and climate change strategy,' *Energy*, 40(1), 19-22
4. Department of Trade and Industry (2003), *Our Energy Future-Creating a Low Carbon Economy*. Energy White Paper, [Online], TSO (The Stationery Office), Norwich, UK, [August 2014]. Available: <http://webarchive.nationalarchives.gov.uk/+http://www.berr.gov.uk/energy/whitepaper/2003/page21223.html>.
5. 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 repealing Directives 2004/8/EC and 2006/32/EC, Article 3, Energy efficiency targets, Official Journal of the European Union, L 315/1, [August 2014]. Available: [http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0027].
6. Directive 2009/28/EC of the European Parliament and of 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, Annex I, A, Official Journal of the European Union, L 140/16, [August 2014]. Available: [http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32009L0028].

-
7. Ellen MacArthur Foundation and McKinsey & Company (2012), Towards the circular economy: Economic and business rationale for an accelerated transition, 6-8.
8. European Commission (2014), Energy Efficiency Directive, Reporting targets, [August 2014]. Available: [http://ec.europa.eu/energy/efficiency/eed/reporting_en.htm].
9. European Environment Agency (2013) Towards a green economy in Europe - EU environmental policy targets and objectives 2010-2050. EEA Report No 8/2013, Copenhagen.
- 10.Kitzing, L., Mitchell, C., and Morthorst, P. E. (2012) 'Renewable energy policies in Europe: Converging or diverging?,' *Energy Policy*, 51, 192-201
- 11.Knopf, B., Nahmmacher, P., and Schmid, E. (2015) 'The European renewable energy target for 2030–An impact assessment of the electricity sector,' *Energy Policy*, 85, 50-60.
- 12.Pauli, G.A. (2010) The blue economy: 10 years, 100 innovations, 100 million jobs. Paradigm Publications.
- 13.Runnalls, D. (2011) 'Environment and economy: joined at the hip or just strange bed-fellows?', *S.A.P.I.E.N.S.* 4 (1), [August 2014]. Available: [<http://sapiens.revues.org/1150>].
- 14.Allen, C., Clouth, S. (2012) A Guidebook to the Green Economy. Issue 1: Green economy, Green growth, and Low-carbon development–history, definitions, and a guide to recent publications. Division for Sustainable Development, Department of Economic and Social Affairs, United Nations, New York, August.
- 15.United Nations Environment Programme (2011) Towards a green economy: Pathways to Sustainable Development and Poverty Eradication. UNEP.
- 16.Zaharia, A., Rătezanu, I. (2014), 'Analysis of the degree of achievement of "Europe 2020" targets', *Quality-Access to Success*, 15 (139), 91-94.
- 17.Züttel, A., Borgschulte, A., & Schlapbach, L. (Eds.) (2011) Hydrogen as a future energy carrier. John Wiley & Sons.