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Legal Framework of Renewable Energy Sources in the European Union

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Introduction

Alternative energy is based on different natural resources – ocean, wind, solar, geothermal, etc., therefore, it is unlimited. All renewable energy sources provide 3078 times the current global energy needs[1]. Possessing such a long – term potential for satisfying energy needs, renewable energy gives a strong impulse for future development and its active exploitation especially in the regions highly dependent on energy import.

"About 55% of Europe's primary energy is imported. With reduced oil and gas output in the North Sea, this is expected to increase to 57% by 2030 and 58% by 2050, despite increasing contributions from renewables (achievement of 20% target by 2020). For oil and gas this is even higher, with import dependency of over 60% for gas and 80% for oil today already, increasing to over 80% and 90% in 2030 and to over 90% (gas) and close to 100% (oil) in 2050 in the worst case if no action is taken"[2].

The renewable energy strategy of the European Union has been dynamically developing. Renewable energy has been playing more and more important role not only for providing energy security and independence but as well for creating low carbon future.

The European Union is moving towards the creation of a competitive low – carbon economy. The main ways for this transition are clean energy and reduction of greenhouse gas emissions. Nowadays the energy sector in Europe produces the biggest amount of greenhouse gas emission and because of this fact the decarbonisation of economy requires an increased share of clean renewable energy. For a long period of time renewable energy has been regarded as alternative to conventional energy, but in recent times its role has changed dramatically: from alternative to conventional energy to its dominant source in low – carbon economy. These changes in energy paradigm and sustainable development of renewable energy require new policy solutions and intelligent regulation.

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[1] Re – thinking 2050. A 100% Renewable Energy Vision for the European Union [http://www.erec.org/fileadmin/erec_docs/Documents/Publications/ReThinking2050_full%20version_final.pdf.: Access: 08.04.2015].

[2] Commission Staff Working Document Impact Assessment. Accompanying document to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A Roadmap for moving to a competitive low carbon economy in 2050" SEC (2011) 288 final.

New concept of low – carbon economy requires elaboration of a systematical approach because the energy security is not the only driver to carbon economy. Among other factor are the following.

The first is climate change and other environmental change. Energy security is the other driver. The third factor is the enormous increase in demand for energy. The investments are required for the maintenance of existing energy supply facilities in all sectors and to meet new demand. The market, political and institutional restrictions on conventional energy investment must be counted as the fourth reason why it is important to explore a transition beyond the hydrocarbon economy. The fifth factor is the energy needs of the one – third of the World's population who lack access to modern energy services. These five factors indicated that the present economy, heavily dependent on fossil fuels, is not sustainable over the medium to long term[3].

Sustainability is a matter of global concern. The Paris Agreement on climate change that entered into force in November 2016 provides an international pledge to hold global warming to no more than 2°C degrees above the pre – industrial level. Keeping in mind the international commitments to combat climate change the thesis investigates the European Union contribution to achievement of sustainability by means of development of environmentally friendly renewable energy.

It is the European Union renewable energy policy and legal framework that fall under the scope of investigation of the thesis.

The European Union is working on elaboration of relevant energy and climate policy and legal framework able to create a favourable platform for development of eco-innovation in particular friendly renewable energy technologies.

In parallel, the European Union is striving to make its policy more innovative and to create innovation mechanisms in regulation.

The thesis combines together the analysis of 2020 and 2030 forward – looking renewable energy framework of the European Union with its incentives to adopt smart regulation providing certainty and predictability, and common trends of creation an "Innovation Union" and "Energy Union". The thesis reveals the fragile points of the transition towards low carbon economy (obstacles for market integration of renewable energy, development of smart grids, and gaps in legal regulation of renewable energy).

[3] p.6-9, Beyond the Carbon Economy. Energy Law in Transition. Edited by Donald N.Zillman, Catherine Redgwell, Yinka O.Omorogbe and Lila K. Barrera – Hernández. Oxford University Press, 2008 – 562 p.

The evaluations formulated in the thesis are made on the analysis of the evaluation of the renewable energy legal and policy framework starting since the middle of 1970s. Legal framework is presented mainly by soft law provisions of quite technical character. In general, more than 15 500 acts relating to renewable energy sources were analyzed when writing the thesis.

The reasons that gave impetus to the development of renewable energy sources are investigated in the first chapter of the thesis. The first chapter describes the peculiarities of the original energy and renewable energy policy and its objectives. Specific emphasis is made on the analysis of the energy crisis of 1974 – 1975 and the measures for overcoming its consequences on the level of the European states, the level of the European Economic Community, and on the international level.

Conventional energy issues are described in the thesis only in the extent directly related to promotion of renewable energy sources.

The second chapter of the thesis investigates the major peculiarity of renewable energy framework namely its technical and innovative character and provides the chronology of adoption of energy and renewable energy research and development programmes. Over time the technology development policy has been transformed into the innovation policy. And nowadays innovation has become an umbrella concept embracing not only technology, but social, economic, legal and policy fields. As far as technological and innovative aspect of renewable energy is not the only one determining its policy and framework the second chapter investigates the trajectory of renewable energy policy and regulation in order to make a general picture of renewable energy framework.

Originally, renewable energy development was accompanied by significant amount of innovations and novelties. Progressive development of renewable energy sources requires new changes such as grid extensions, flexible usage of energy, and development of grids that are able to integrate intermittent flows of renewable energy. The third chapter of the thesis describes the smart grids development and the consequences for failing to modernize the existing energy networks and infrastructure for promotion of renewable energy sources, completion of common energy market, and achievement of renewable energy targets of the European Union.

Renewable energy sources targets, their legally binding and non – binding nature and effectiveness for the development of renewable energy sources are evaluated in the fourth chapter of the thesis. In the fourth chapter is provided analysis of future 2030 renewable energy framework, the general capacities of the internal energy market to integrate renewable energy, the support mechanisms established by the Renewable Energy Directive.

In the conclusion the main outcomes of the thesis are analyzed and some suggestions on possible future developments of renewable energy sources in the European Union are proposed.

1. Analysis of historical development of energy and renewable energy sources legislation in the European Economic Community

Introduction to the first chapter

"Law is a historical product which came into being and developed in a given age"[4].

This philosophical statement can be totally applied to the topic at issue because the creation of alternative energy legislation is the product of time and it was the rapid development of alternative energy technologies and demand in them that axiomatically pushed the *initus* of alternative energy legal regulation.

There are two theories ("Technology Push" and "Demand Pull") explaining the reasons giving the impetus to emergence of new technology and innovation.

The first one attributes innovation with a scientific motivation or sees it as being pushed by the technological opportunities that appear; it derives that the new products and processes are generated by progress in scientific knowledge ("Technology Push" theory). The second theory regards innovation as a consequence of demand (the "Demand Pull" theory)[5].

"Demand Pull" theory is applicable to the emergence and development of alternative energy and its legal regulation.

The first chapter of the thesis describes the factors influenced the emergence and development of alternative energy and its legal framework.

The objective of the first chapter of the thesis is without any depreciation of such epoch – making events as two World Wars, information, scientific and technical revolution of the second half of the twentieth century and their far - reaching results for energy development is to investigate and to analyze those events that are of great importance to development of alternative energy legal regulation and its policy in the European Economic Community and the cooperation of the Community with third states in the field of energy.

Conventional energy issues are regarded in the first chapter of the thesis in extend that make it possible to reveal the factors that influence alternative energy regulation and peculiarities of international cooperation in alternative energy field.

In the first chapter are regarded the following issues:

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[4] p. 234, Law and Philosophy. Selected Papers in Legal Theory. Csaba Varga. Budapest, AKAPRINT Nyomdaipari Kft., 1994 - 530 p.

[5] p. 47, The Dynamics of Technology. A Methodological Framework for Techno-Economic Analyses. Giancarlo Barbiroli. The Netherlands, Kluwer Academics Publishers, 1997 – 337 p.

the energy crisis of 1973 – 1974, its role and consequences for energy sector, the ways of overcoming energy problems in the level of different states, the European Community and international levels;

the activity of international energy organizations dealing with energy;

the cooperation of the European Economic Community and third countries and conclusion of international agreements dealing with energy and alternative energy;

the development of alternative energy legal regulation in the European Economic Community.

The interim described in the first chapter of thesis starts from the first quarter of 1970s till the mid of 1990s and the beginning of 2000s. These dates have not been chosen occasionally – the energy crisis of 1973 – 1974 for the first time gave a strong rise to alternative energy development and mainly to its technical development and research and since the mid of 1990s started the transition from development and research alternative energy policy to alternative energy policy and legal regulation.

In the middle of 1990s and in 2000 were adopted several acts aimed at development of the common energy strategy and the role of renewable energy sources in it.

In 1995 the White Paper "An Energy Policy for the European Union" that defined the energy objectives was adopted.

The Green Paper "Energy for the Future: Renewable Sources of Energy" (1996) proposed a policy strategy aimed at increasing the share of renewable energy in total energy consumption.

In 2000 the Commission adopted a Green Paper "Towards a European Strategy for Security of Energy Supply" in which various security issues were discussed. It acknowledged that the European Union's energy production is insufficient to cover its energy demand[6] and highlighted that the increased use of new and renewable energies could significantly reinforce sustainable and secure energy supply. The basic point about energy situation is the impossibility of energy self – sufficiency. The security of supply is not aimed at providing energy self – sufficiency but is aimed at reducing risks caused by energy dependence. Renewable energy is the key to rebalance the supply in favour of demand policy.

Though there was some progress the Green Paper (2000) concluded that renewable energy was still in its infancy. Wind energy was widely recognized as a viable option.

[6] If no measures are taken, in the next 20 to 30 years 70% of the European Union's energy requirements, as opposed to the current 50%, will be covered by imported products. In economic terms, the consequences of this dependence are heavy. It cost the Union some EUR 240 billion in 1999, or 6% of total imports. In geopolitical terms, 45% of oil imports come from the Middle East and 40% of natural gas from Russia [Commission of the European Communities Green Paper "Towards a European strategy for the security of energy supply" COM(2000) 769 final].

Photovoltaic energy, though promising, was far from economically competitive. Development of renewable energy depends on substantial political and economic efforts combined with stabilization of energy consumption. The potential of renewable energy was significant from environmental and geopolitical perspectives but not from economic competitiveness.

Legal regulation of alternative energy and the approaches to their role in energy mix in the period from the mid - 1990s and present time are regarded in the following chapters of the thesis.

1.1. The role of energy crisis of 1973 – 1974 in development of renewable energy legislation.

After overcoming the circumstances of the Second World War the European states could reach the new frontiers of economic development and energy supply. But the stable economic and energy progress was put in jeopardy when the energy crisis of 1973 – 1974 struck down becoming the crucial moment altering the energy situation in the European states for further decades.

In the middle of 1973 the European countries and the United States suffered a grave energy shock, one of the main reasons of which was the decision of OPEC (the Organization of Petroleum Exporting Countries founded in 1960) to increase "in a 70 per cent the price of crude oil, as well as a 10 per cent cut in oil exports (later briefly raised to 25 per cent). During the winter of 1973 – 1974 oil prices soared"[7].

The energy crisis and its influence to domestic economy varied in different states and was more significant in countries highly depended on importing oil. The purpose of this paragraph of the thesis is not to examine the circumstances of the energy crisis of 1973 – 1974 in every European state, but to reveal common and typical of them in order to analyze the appropriateness of measures taken for overcoming the crisis and the extend it influenced on alternative energy legal regulation and international cooperation between states in energy sphere.

The major energy crisis circumstances in the European states are the following:

a) Energy crisis lead to the period of economic stagnation.

In Great Britain, for example, "the huge rise in price of oil fuelled inflation on a scale unknown since 1919"[8].

b) The energy crisis revealed problems in energy supply management.

c) In spite of the fact that oil demand in the industrial countries increased dramatically due to economic growth energy conservation measures were inadequate[9].

d) After the energy crisis of 1973 – 1974 the European industrial countries first became painfully aware of their dependence on oil producer countries.

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[7] p. 351, A History of Contemporary Italy. Society and Politics. 1943 – 1988. Paul Ginsborg. London, the Penguin Group Penguin Books Ltd., 1990 – 586 p.

[8] p.130, The Oxford History of Britain. Volume V. The Modern Age. H.C.G. Matthew and Kenneth O. Morgan. New York, Oxford University Press, 1992 – 175 p.

[9] p.27, The History of the International Energy Agency the First Twenty Years. Volume 1. Origins and Structures of the IEA. Richard Scott. OECD/IEA, 1994 – 428p. http://www.iea.org/media/1ieahistory.pdf. Access: 26.04.2014].

The amount of imported oil could be very high, for instance, in Italy oil had come to provide 75 per cent of energy needs by 1973, compared to only 33.6 per cent in 1955[10].

The measures for overcoming these energy crisis circumstances are regarded in three levels – on the level of a single European state, on the level of the European Community, and on the international level though they appeared to be quite similar.

In order to overcome energy crisis the European states took new oil - conservation measures including an increase of the duration of oil stocks, explored and produced indigenous fossil minerals, developed nuclear energy, promoted the alternative energy sources.

For proving these statements two examples are provided - the Great Britain that appeared to be immune enough to crisis and Spain that experienced grave crisis effect.

Great Britain was in many aspects better prepared to confront the energy crisis because of possessing its own nuclear power stations and hydro-electric schemes, as well as abundant supplies of coal. The energy crisis stimulated the exploitation of the oil reserves and natural gas in the North Sea. The undertaken measures lead in the middle of 1980s to Britain's self-sufficiency in the North Sea oil, and strengthening its energy base [11].

A contrary situation was in Spain that appeared to be one of the countries where the oil crises of 1973 – 1974 lead to the most destructive circumstances. The National Energy Plan of 1979 (Plan energético nacional) described the situation in Spanish energy in the terms of dependence and insecurity. According to the National Energy Plan the ways to decrease energy dependence were the following. The first one was to implement measures of energy saving and its rational use. The second one was to use preferably the local natural recourses such as national carbon, to give support to hydroelectric power centers, nuclear stations construction. The third way was seen in substitution of petroleum by other energy sources mainly by carbon and nuclear energy[12].

Probably the major consequence of the energy crisis for the European Community was the recognition of necessity to reduce dependence on oil – producer countries and first came the vital necessity of searching alternative to conventional energy and diversification of supply in order to provide energy security and independence.

Further are regarded the measures taken by the European Community.

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[10] p. 352, ibid

[11] p.130 - 139, The Oxford History of Britain. Volume V. The Modern Age. H.C.G. Matthew and Kenneth O. Morgan, New York, Oxford University Press, 1992 – 175 p.

[12] p. 20 – 22, Sector energético: Polìtica y Derecho. José Manuel Diaz Lema. Palma de Mallorca, Serie Ensayos-6, 1984 – 207 p.

The energy crisis caused the necessity to elaborate the energy security and independence concept.

Thought it was not the first time when importance of energy security arose, its significance was realized at the beginning of the twentieth century.

Energy security became a decisive factor in international relations in the years preceding the First World War when "the convert of the Britain Royal Navy from coal to oil created a daunting problem of supply. It was Churchill who announced the diversification of supply to become a fundamental touchstone of energy security"[13].

Since that time the concept of energy security has not modified significantly.

Such component of energy security as diversification of energy supply remains unchanged since the beginning of the twentieth century[14] but the twenty-first century elaborated a new concern of energy security taking into account new components such as the instability in some oil-exporting nations, terrorism, the rebirth of resource nationalism, fears of a scramble for supplies, the costs of imported energy, and geopolitical turbulence[15].

At that time of energy crisis of 1973 – 1974 energy security was divided into importing and exporting country security. "While an importing country was concerned primarily with access to resources and supply security, an energy exporter was preoccupied with access to markets and security of demand"[16].

Since first articulated by President Richard Nixon in his November 1973 "Project Independence" energy policy speech the issue of energy security often gets framed in terms of energy independence.

Realizing great importance of energy security and independence the European Community adopted a set of measures for overcoming the circumstances of the 1973 – 1974 energy crises and for ensuring energy independence.

Not denying the essential role of imported oil Vice – President of the Commission of the European Communities at the end of 1974 in his speech "Europe in Search of an Energy Policy" underlined the equality of new sources of energy and the rapid development of indigenous

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[13] p.264 - 265, The Quest: energy, security, and the remaking of the modern world. Yergin Daniel. New York, the Penguin Press, 2011 – 804p.

[14]Helga Steeg, former Executive Director of the International Energy Agency, regards energy security as diversification of energy supplies at affordable prices to help economies to grow [p.157, Energy Law in Europe. National, EU and International Law and Institutions. Edited by Martha M. Roggenkamp, Anita Rønne, Catherine Redgwell, Iñigo Del Guayo, Oxford University Press, 2001 – 1097p.].

[15] p. 264 - 265, The Quest: energy, security, and the remaking of the modern world. Yergin Daniel. New York, the Penguin Press, 2011 – 804p.

[16] p.94, Energy and World Politics. Mason Willrich. New York, the Free Press, 1975 – 234 p.

sources of supply. One of the ways of solving energy crisis problems was seen in development of alternative sources of energy. He also announced that tension imposed on the world energy market endangered the future prosperity of the European Community because the insecurity of supply conditions, risks caused by privileged bilateral trading relationships contrary to the letter and spirit of G.A.T.T. agreements[17].

To resume the measures for overcoming the circumstances of the energy crisis in the European Community are united into internal and external measures:

internal (reducing dependence on non – member countries for energy supplies in the medium term (1985) by considerable energy savings, development of nuclear energy and gas – production, maintenance of coal – production; the Member States were obliged to maintain oil stocks to meet requirements for 65 days and to increase those stocks to meet requirements for ninety days from 1 January 1975; reducing energy consumption; implementing policy for hydrocarbons and electricity sector; stimulating energy research; adoption of programs for developing alternative energy recourses)[18].

For instance, according to energy balance sheets of the European Community oil stocks at the end the first quarter of 1974 in the European Community itself in terms of consumption were equivalent to 72 days (not of 65 as required). In France the duration of oil stocks at the end of the first quarter of 1974 in terms of consumption is equivalent to about 85 days, in Italy to about 76 days, in Netherlands to about 110 days, in the United Kingdom to between 60 and 65 days[19].

The energy consumption should be reduced by 1985 to a level of 15% in comparison with 10% of June 1974. The share of nuclear energy was expected to reach 35% of total energy consumption in 1985 (25% in 1973)[20].

external measures (negotiations with oil – producing countries particularly with the Community's oil suppliers and with other oil – consuming countries within the framework of the

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[17] p.9 - 10, Europe in search of an energy policy. Address by Mr. H. Simonet, Vice – President of the Commission of the European Communities, to the Foreign Affairs Club, Oxford University. Oxford, 5 December 1974 (EU Speech) [http://aei.pitt.edu/13085/1/13085.pdf. access: 22.05.2014].

[18] Community energy policy 1973 – 1974 (Information Memo P-69/74, December 1974). EU Commission Press Notice. [http://aei.pitt.edu/30292/1/P_69_74.pdf. Access: 19.05.2014].

[19] Energy balances of the Community. SEC (74) 280 final, 14 January 1974 (EU Commission – SEC document) [http://aei.pitt.edu/9214/1/9214.pdf. Access: 22.05.2014].

[20] Community energy policy – objectives for 1985 (Information Memo P – 66/74, November 1974) [http://aei.pitt.edu/31836/1/P_66_74.pdf. Access: 19.05.2014].

Organization for Economic Co-operation and Development (OECD); establishing foreign relations with oil – exporting countries - European – Arab and OPEC relations)[21].

The conducted activities of the European Community energy policy allowed determining the objectives in energy sphere until 1985. The Community's further energy supplies were expected to expand by the use of nuclear energy, the maintenance of the level of coal production, an increase in coal imports, and increase use of natural gas. These objectives were regarded as policy guidelines for Member States.

Joint actions were also seen in the creation of a common market, monitoring and harmonization of prices, and a joint research program[22].

The measures for overcoming the energy crisis circumstances on the international level are regarded in the next paragraph of the first chapter of the thesis. The next paragraph as well examines the international cooperation of the European Economic Community, its Member States and third countries, activity of energy international organizations in the fields of energy.

[21] Community energy policy 1973 – 1974 (Information Memo P-69/74, December 1974). EU Commission Press Notice [http://aei.pitt.edu/30292/1/P_69_74.pdf. Access: 19.05.2014].

[22] p.14, European Community, April 1974, No 175. [http://aei.pitt.edu/43960/1/A7561.pdf. Access: 28.04.2014].

1.2. Membership of the European Economic Community, Member States and third countries in international energy organizations.

In the previous paragraph were regarded measures for overcoming the consequences of energy crisis of 1973 – 1974 on the level of European states and the European Economic Community. In this paragraph are regarded measures for solving energy crisis problems on the international level, mainly those of them that caused significant influence on the development of alternative energy sources.

As stated, the energy crisis of 1973 – 1974 revealed that energy policy of different European states resembled to each other and that the countries elaborated quite similar approaches to solve energy problems. The problems facing the European Community after the crisis were in a certain degree close to those ones of a single state. In spite of positive steps in energy sector for dealing with the crisis issues it became understandable that energy measures taken on the level of a single state and the European Economic Community were not enough to go through the crisis circumstances and to guarantee energy security and independence. The European countries realized the necessity of international coordinated measures.

That is why one of the ways of overcoming the consequences of energy crisis of 1973 - 1974 was seen in expansion of international cooperation between oil – producer and oil – consumer countries, closer collaboration of oil – import countries and creation of a contractual basis for further cooperation, common market creation, and speeding up the production of nuclear energy.

Energy problems with the highest priority required coordinated actions of European Economic Community. The position that energy problems were better to solve together was announced at the Copenhagen European Summit of 14 – 15 December 1973 when the Nine Member States of the European Community affirmed the Declaration on European Identity. It was stated that though in the past the European countries were individually able to play a major role on the international scene, current international problems were difficult for any of the Nine to solve alone (art.6)[23].

The basic position of the European Community on overcoming the World energy crisis of 1973 - 1974 was announced in the Declaration of the President of the Commission of European Communities in his speech in the opening of the Washington Conference on 11 February 1974. According to the document the major directions of Community energy police were the creation

[23]Declaration on European Identity (Copenhagen, 14 December 1973) [http://www.cvce.eu/content/publication/1999/1/1/02798dc9-9c69-4b7d-b2c9-f03a8db7da32/publishable_en.pdf. Access: 28.04.2014].

of orderly functioning common energy market; an effective use of energy and reduction of wastage; developing alternative sources of energy and indigenous sources of oil and gas, coal, nuclear energy and unconventional fuels and developing international cooperation in this sphere; the pursuit of extensive cooperation with the producer countries; the study with other oil – consuming countries – under the auspices of the OECD – of means of dealing with common long – term energy problems[24].

The February 11 – 13 of 1974 Washington Energy Conference was held in order to overcome the circumstances of energy crisis. Representatives from 13 major oil – consuming countries – the EEC "Nine", the United States, Canada, Japan, and Norway participated in it[25].

The main results of Washington Conference held on 11 – 13 February 1974 were the establishment of energy saving programs, development of alternative energy sources, support of the developing countries in confronting the crisis, carrying on dialog with the oil – producer countries and cooperation with oil companies[26]. It was resumed that the energy crisis revealed the energy problems to be resolved within the establishment of cooperation framework between different states both oil – importer and oil – exporter countries.

The most significant result of international collaboration objected to meet the needs of energy consuming countries and to provide regular oil supply was found in the establishment of the International Energy Agency which came into being in 1974. As reported, "the origins of the Agency may be found in the fundamental changes in economics and politics associated with the international oil market during the period leading up to the Middle East War crisis of 1973-1974 and the industrial countries' responses to those changes"[27].

The International Energy Agency was established by Decision of the Council adopted on 15th November 1974 as an autonomous body within the framework of the Organization for Economic Co-operation and Development under the art.1 of this Decision[28].

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[24] Declaration on world energy crisis by the President of the Commission of European Communities at the opening of Washington Conference. Washington DC, 11 February 1974 [http://aei.pitt.edu/12920/1/12920.pdf. access: 19.05.2014].

[25] p.8, European Community, April 1974, No 175 [http://aei.pitt.edu/43960/1/A7561.pdf. Access: 28.04.2014].

[26] Community energy policy 1973 – 1974 (Information Memo P-69/74, December 1974). EU Commission Press Notice [http://aei.pitt.edu/30292/1/P_69_74.pdf. Access: 19.05.2014].

[27] p.27, The History of the International Energy Agency the First Twenty Years. Volume 1. Origins and Structures of the IEA. Richard Scott. OECD/IEA, 1994 – 428p. [http://www.iea.org/media/1ieahistory.pdf. Access: 26.04.2014].

[28] Decision of the Council establishing an International Energy Agency of the Organization (adopted by the Council at its 373rd Meeting on 15th November 1974) [http://www.iea.org/media/aboutus/history/decesionofthecouncil.pdf. Access: 01.05.2014].

The IEA was also seeking to present the common interests of oil – consuming countries and to confront OPEC after the energy crisis.

The Agreement on an International Energy Program was signed on 18 November 1974. The International Energy Program created the obligations of Member States that are international ones, requiring separate national actions[29].

The main activities of the IEA provided in the Agreement on an International Energy Program can be divided into two groups according to their character:

emergency measures (establishment of emergency self-sufficiency in oil supplies; activation and deactivation of emergence measures to be taken in case of oil support reduction; creation of emergency reserves oil stocks);

cooperation measures (promotion of programs for long term energy cooperation; development of relations with oil producer countries, consumer countries, non-participating countries, international organizations, and with entities and individuals; establishment an Informational System on the international oil market and a permanent framework for consultation with oil companies)[30].

After the energy crisis of 1973 – 1974 countries facing the necessity to reduce their dependence on oil intended to do it by means of development of new sources of energy. But a wide range of problems emerged, first of all, financial and economic, technical and scientific. It became understandable that development of alternative sources of energy also required close cooperation of different states. These circumstances forced European countries to establish and develop bilateral and multilateral relations in order to solve the abovementioned problems all together. It was difficult to create common grounds for mutual cooperation because of the differences in energy demands, level of technological development, and economic situation of the countries.

Although energy cooperation in energy was not unknown at that time, there was little more than information exchange rather than effective international coordination of projects. In Members' research and development decision process, there was a need for broader energy policies and realistic prospects of the technological research to be given due weight[31].

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[29] p.157, Energy Law in Europe. National, EU and International Law and Institutions. Edited by Martha M. Roggenkamp, Anita Rønne, Catherine Redgwell, Iñigo Del Guayo, Oxford University Press, 2001 – 1097p.

[30]Agreement on an International Energy Program (as amended 25 September 2008) [http://www.iea.org/media/aboutus/history/agreementIEA.pdf. Access: 30.04.2014].

[31] p. 228 - 229, The History of the International Energy Agency. The First Twenty Years. Volume 2. Major Policies and Actions. Richard Scott. OECD/IEA, 1994 – 396p. [http://www.iea.org/media/2ieahistory.pdf. Access: 29.09.2014].

This kind of the IEA's activity continues nowadays as well, but attitude of the IEA to the energy development and research and its policies and activities in this sphere have been progressively changed since the moment of its foundation. The energy crisis changed significantly the cost of energy. High cost on oil created opportunities for research and development to be carried out on a more productive basis and searching out new cost – benefit solutions[32].

Before the energy crisis of 1973 – 1974 European states did not attach significant importance to the development of new alternative energy technologies because enjoying the affordable prices on oil and other natural resources the necessity in investment in alternative energy research was not very high. After the energy crisis first came recognition of necessity to reduce dependence on oil by creation of new energy technologies and then the necessity to provide financial and technical background for alternative energy.

The International Energy Agency recognized the need for flexible mechanism to respond to energy technology challenges through joint research, development and demonstration activities. In 1975 the IEA Governing Board approved the establishment of the IEA Technology Collaboration Programmes as the principal tool for multilateral technology collaboration. During the period 1975 – 1980, oil supply disruptions and soaring oil prices spurred research into alternative sources of energy and technologies to improve energy efficiency. But the search for alternative energy sources extended far beyond conventional fuels as pioneering research on renewable energy was also a feature of the early Technology Collaboration Programmes (such as the Bioenergy, the Hydrogen, the Hydropower Technology Collaboration Programmes, Technology Collaboration Programmes on Solar Heating and Cooling, and on Wind Energy). In 1977 the Wind Technology Collaboration Programme was adopted. Seven participating IEA countries agreed to each design, build and operate a 1 megawatt or greater wind turbine and to share their respective knowledge and experiences. By 1985, 13 large – scale wind turbines had been built in the seven countries. Following the initial construction period, applied research began on each of the pilot turbines, associated systems and performance under respective weather conditions. This Technology Collaboration Programme continues to operate today, though the focus of activities has changed to analysis of wind energy technologies and policies[33].

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[32] p. 227 – 228, The History of the International Energy Agency. The First Twenty Years. Volume 2. Major Policies and Actions. Richard Scott. OECD/IEA, 1994 – 396p. [http://www.iea.org/media/2ieahistory.pdf. Access: 29.09.2014].

[33] Technology Collaboration Programmes. Highlights and outcomes. The International Energy Agency, 2016 [http://www.iea.org/publications/freepublications/publication/TechnologyCollaborationProgrammes.pdf. Access: 17.01.2017].

Creating a base for international energy research and development caused the necessity of a legal mechanism for it. The International Energy Agency was among the first international organization to create a legal framework for international cooperation in alternative energy research and development - the International Framework for International Energy Technology Collaboration. The IEA provided a range of Implementing Agreements by means of which it stimulates cooperation in alternative energy sources research among members and non – member states, other international organizations, non – governmental organizations, private entities in order to guarantee development of energy and alternative energy, diversifying energy supply, environmental security, economic growth.

Cooperation in the field of nuclear energy

The energy crisis caused the promotion of nuclear energy. Nuclear legal regulation was presented by a great number of legal acts the scope of which was changing starting from the necessity of development of nuclear energy to assessment of risks and jeopardy caused by it. High risks of nuclear energy stipulated the development of alternative energy sources.

The international cooperation in the sphere of atomic energy received a systematic organization with the foundation of the International Atomic Energy Agency (IAEA) in 1957 in Vienna. The IAEA Statute was approved on 23 October 1956 by the Conference on the Statute of the IAEA and came into force on 29 July 1957, its objective is to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity, and to ensure the assistance provided by it or at its request or under its supervision or control is not used for military purposes[34].

The IAEA concluded bilateral agreements with a large number of states with the target of ensuring nuclear safety and promoting nuclear research. For example, Verification Agreement between the IAEA and the European Atomic Energy Community (EURATOM) of 14 September 1973 was concluded, the objective of it was to develop research, production and the use of nuclear energy for peaceful purposes without discrimination[35].

Another stream of international activity in nuclear sphere besides nuclear research dealt with liability and compensation for nuclear damage[36]. The main objective of this activity was to

[34] The Statute of the IAEA [http://www.iaea.org/About/statute.html. Access: 02.04.2014].

[35] Verification Agreement between the IAEA and the European Atomic Energy Community [http://www.iaea.org/Publications/Documents/Infcircs/Others/inf193.shtml. Access: 14.05.2014].

[36] The first international treaty in this field was concluded under auspices of the OECD: the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy (enforced on 1 April 1968) in conjunction with the

create a balanced mechanism for the promotion and use of nuclear energy granting high level of protection for persons suffered from its use.

After one of four high-power channel-type reactors at Chernobyl in the Ukraine suffered a steam explosion on 26 April 1986 nuclear cooperation moved towards the guaranteeing nuclear safety including notifications of nuclear accidents[37] and preventing nuclear arms proliferation that became more rigorous in 1990s. The IAEA was responsible for about 221 safeguards agreements in the member states[38].

In spite of intensive international activity in the nuclear sphere the usage of nuclear energy revealed another tendency. Nuclear development and its risks to the environment caused environmental disputes and protests in the European states and as the alternative were proposed the use of alternative energy sources (solar, wind, hydropower).

In 1977 mass protests against proposals to develop nuclear power installations at Grohnde, Kalkar, and Brokdorf in the Federal Republic of Germany and at Creys-Malville in France were held[39].

In 1976 the Royal Commission in Environmental Pollution's in the Great Britain published report on Nuclear Power and the Environment. It was the first official study of its kind to be produced anywhere in the world[40]. But in spite of the environmental risks caused by the use of nuclear energy in the Great Britain it continued to be seen as the possibility to provide independence from coal and imported oil. Mrs Thatcher's government stated that nuclear energy could be produced much more cheaply than alternative sources of energy. However, during the 1980s it emerged that the economic case for nuclear power had been based on faulty evidence; the massive costs of nuclear waste made the enterprises uneconomic after all. For many years the

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supplementary 1963 Brussels Convention (enforced on 4 December 1974). These Conventions prepared by the OECD's Nuclear Agency were regional in scope, with participation limited to Western Europe. In 1963 Vienna Convention on Civil Liability for Nuclear Damage was adopted [p. 97, Energy Law in Europe. National, EU, and International Regulation. Second Edition. Edited by Martha M. Roggenkamp, Catherine Redgwell, Iñigo del Guayo, and Anita Rønne. Oxford University Press, 2007 – 1488 p.].

[37] See, for example, Convention on Early Notification of a Nuclear Accident on 18 November 1986 INFCIRC/335 [https://www.iaea.org/sites/default/files/infcirc335.pdf. Access: 10.10.2014].

[38] p.308, The Major International Treaties of the Twentieth Century. A History Guide with Texts. Volume one. Edited by J.A.S. Grenville and Bernard Wasserstein. Great Britain, Padstow, TJ International Ltd, 2001 – 464p.

[39] p. XV, Historical Dictionary of the Green Movement. Historical Dictionaries of Religions, Philosophies, and Movements, No 20. Elim Papadakis. Maryland & London, the Scarecrow Press, Inc. Lanham, 1998 – 223 p.

[40] p.180, Environmental Discourses in Public and International Law. Edited by Brad Jessup and Kim Rubenstein, Cambridge University Press, 2012 – 536 p.

subsidies for nuclear industry withheld investment for less damaging wind - and wave - power projects and research[41].

The Great Britain's example reveals that it was extremely difficult to achieve energy independence without development of alternative energy and that in spite of its expensiveness they could not lead to such destructive damages to humans and environments as after nuclear explosion or other nuclear accident.

After the analysis conducted in this paragraph two conclusions can be made.

The first one connects with the events that gave an impetus for development of alternative sources of energy. They are the following:

the energy crisis of 1973 – 1974 and as its consequence the necessity to reduce state's dependence on natural resources such as oil and gas and in such a way to decrease dependence on energy – export countries;

depletion of natural resources;

negative effects of nuclear energy usage;

damage to environment and health caused by use of traditional energy resources;

development of new alternative energy sources technologies.

The second consequence of the energy crisis is the increased activity aimed at development of energy and alternative energy at the levels of a single state, the European Economic Community and the international level. Summing up the international activity in alternative energy sphere based on participation in international organizations it can be stated that it was aimed at:

promotion of research and development of alternative sources of energy;

utilization and deployment of alternative sources of energy;

mobilization of financial resources for research and development of alternative sources of energy;

information exchange;

long – term cooperation between various participants such as governmental and non – governmental organizations, public and private entities, research institutions, etc.

environmental protection.

[41] p.320, State and Society. British Political and Social History 1870 – 1992. Pugh Martin. Great Britain, Edward Arnold, 1994 – 352p.

1.3. International cooperation in the field of energy and renewable energy between European Economic Community and third countries

In the previous paragraphs were regarded the issues of the energy crisis of 1973 - 1974 and ways for overcoming it on the levels of European states, the European Economic Community and international level, particularly the activity of international organizations dealing with energy. In this paragraph we will tackle the cooperation between the European Economic Community and third countries, mainly the agreements concluded between the EEC and third countries.

This analysis of international agreements is necessary for revealing the peculiarities of the first legal provisions concerning alternative energy sources.

The Treaty of Rome granted the European Economic Community two express treaty – making powers, one in the field of trade (the common commercial policy), and the other establishing the power to conclude association agreements with third States or groups of States[42]. Having international legal personality, the Community is a subject of public international law[43].

Possessing legal personality and treaty – making powers the European Economic Community created a wide cooperation framework with the United States, European and third countries, including former colonies in the form of various agreements providing energy and alternative energy collaboration.

The communication of the Commission of the European Economic Community "Collaboration with the United States in the Field of Energy" on 9 January 1974 underlined the necessity of a broad – based cooperation between the energy – producing and energy – consuming countries. In the result of the US – European Community dialog the cooperation was elaborated with oil – producer countries as well as with consuming countries among the developing nations[44].

The European Economic Community suffering from lack of natural energy resources was interested in developing relations not only with oil – consuming countries but also with oil – producing countries and in the middle of 1970s intended to establish and expand energy and alternative energy cooperation worldwide.

In the period from 1970s to 1991 in the majority of agreements energy and alternative energy issues were included in economic and environmental cooperation framework.

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[42] p. 97, The Oxford Guide to Treaties. Duncan B. Hollis. Oxford University Press, 2012 – 804 p.

[43] p. 421, EEC Law. Second Edition. Anthony Parry, James Dinnage. London, Sweet & Maxwell, 1981 – 531 p.

[44] Communication from the Commission to the Council "Collaboration with the United States in the Field of Energy" on 09 January 1974 [http://aei.pitt.edu/12606/1/12606.pdf. Access: 19.05.2014].

The criterion for dividing international agreements described in this paragraph is the scale of energy and alternative regulation and the character of the alternative energy regulation whether it was provided within conventional energy provisions or independently and separately of it.

Three groups of energy provisions were classified when analyzing the agreements concluded by the European Economic Community:

I. General norms concerning promotion of conventional energy cooperation, including nuclear energy field;

II. General norms concerning promotion of alternative energy;

III. Specific and more detailed provisions concerning energy and alternative energy cooperation.

Further is provided the list of agreements in accordance with this classification in chronological order.

I. The first group includes very general norms of energy collaboration that just mention the necessity of energy cooperation, for example, art. 3 of Framework Agreement for cooperation between the European Economic Community and the Federative Republic of Brazil on 18 September 1980[45]. The peculiarity of these norms is that they just mention the necessity of cooperation in the field of energy without providing any concrete steps for it[46].

[45] Framework Agreement for cooperation between the European Economic Community and the Federative Republic of Brazil on 18 September 1980 [http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1412539810296&uri=CELEX:21980A0918(01). Access: 05.09.2014].

[46] The same provision contain, for example, art.3 of Cooperation Agreement between the European Economic Community and Indonesia, Malaysia, the Philippines, Singapore, and Thailand member countries of the Association of South – East Asian Nations on 7 March 1980 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21980A0307(01)&qid=1412539810296&from=EN. Access: 05.09.2014];

art.1 of Cooperation Agreement between the European Economic Community and the Cartagena Agreement and the member countries thereof – Bolivia, Colombia, Ecuador, Peru and Venezuela on 17 December 1983 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21984A0608(01)&qid=1412438402902&from=EN. Access: 05.09.2014];

art. 3 of Cooperation Agreement between the European Economic Community and the Yemen Arab Republic on 29 January 1985 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21985A0131(01)&qid=1412438402902&from=EN. Access: 05.09.2014];

art. 10 of Agreement on Trade and Economic Cooperation between the European Economic Community and the People's Republic of China on 21 May 1985 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21985A0919(01)&qid=1412438402902&from=EN. Access: 05.09.2014];

The agreements providing cooperation in nuclear energy field are: the Agreement between the European Economic Community and the European Atomic Energy Community and the Union of Soviet Socialistic Republics on trade and commercial and economic cooperation of 18.12.1989 according it the Contracting Parties encourage economic co – operation in areas of mutual interest, in particular energy, including nuclear energy and nuclear safety (physical safety and radiation protection); science and technology in areas in which they consider to be of mutual interest, including nuclear research (art. 20)[47]. The cooperation in nuclear field was developing with Czech and Slovak Republic[48] and Romania[49].

II. The second group of agreements contains general norms about promotion of alternative energy sources. They are not numerous, for example, Agreement for commercial, economic and development cooperation between the European Economic Community and the Islamic Republic of Pakistan 23 July 1985 according to it Contracting Parties promote economic cooperation in energy including the development of new sources of energy (art. 3)[50]; Agreement between the European Economic Community and the Hungarian People's Republic on trade and

art. 18 of Agreement between the European Economic Community and the Polish People's Republic on trade and commercial end economic cooperation on 19 September 1989 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21989A1122(01)&qid=1412438402902&from=EN. Access:04.09.2014];

art. 4 Framework Agreement for trade and economic cooperation between the European Economic Community and the Argentine Republic on 2 April 1990 [http://eur-lex.europa.eu/resource.html?uri=cellar:861836c2-b5b3-4eb7-8af6-5207f8a7cd9e.0008.02/DOC_1&format=PDF. Access: 04.09.2014];

art. 3 Framework Agreement for Cooperation between the European Economic Community and the Eastern Republic of Uruguay on 4 November 1991 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21992A0408(01)&qid=1412539810296&from=EN. Access: 05.09.2014].

[47] Agreement between the European Economic Community and the European Atomic Energy Community and the Union of Soviet Socialistic Republics on trade and commercial and economic cooperation of 18.12.1989 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21990A0315(01)&rid=1. Access: 04.09.2014].

[48] Art. 17 of Agreement between the European Economic Community and the European Atomic Energy Community and the Czech and Slovak Federal Republic on trade and commercial and economic cooperation of 07.05.1990 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21990A1023(04)&rid=3. Access: 04.09.2014].

[49] Art. 20 of Agreement between the European Economic Community and the European Atomic Energy Community and Romania on trade and commercial and economic cooperation of 22.10.1990 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21991A0326(03)&rid=2]. Access: 04.09.2014].

[50] Agreement for commercial, economic and development cooperation between the European Economic Community and the Islamic Republic of Pakistan 23 July 1985 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21986A0425(01)&qid=1412438402902&from=EN. Access: 05.09.2014].

commercial and economic cooperation on 26 September 1988 (art.11)[51]; the Agreement between the European Economic Community and the People's Republic of Bulgaria on trade and commercial and economic cooperation on 8 May 1990 (art. 21) [52].

III. The third group of agreements contains specific and more detailed provisions concerning energy and alternative energy cooperation in comparison with the two previous groups and provides not only the promotion of energy and alternative energy collaboration but some specific measures in this field that is why these agreements are regarded separately.

Art.4 of Cooperation Agreement between the European Economic Community and the Republic of Tunisia on 25 April 1976 provides the participation of Community operators in programs for the exploration, production and processing of Tunisia's energy resources and any activities developing these resources, and the proper performance of long – term contracts for delivery of oil, gas or petroleum products[53].

Another example is of Cooperation Agreement between the European Economic Community and the People's Democratic Republic of Algeria on 26 April 1976 (art. 4)[54].

Art. 5 of Cooperation Agreement between the European Economic Community and the Socialist Federal Republic of Yugoslavia on 2 April 1980 provides that the aim of cooperation in the energy field between the Community and Yugoslavia should be to encourage the participation of the Contracting Parties' economic agents in research, production and processing programs in connection with Yugoslavia's energy resources[55].

Art. 5 of Agreement for commercial and economic cooperation between the European Economic Community and India on 23 June 1981 provides encouragement of technological and

[51]Agreement between the European Economic Community and the Hungarian People's Republic on trade and commercial and economic cooperation on 26 September 1988 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21988A1130(01)&from=EN. Access: 05.09.2014].

[52] Agreement between the European Economic Community and the People's Republic of Bulgaria on trade and commercial and economic cooperation on 8 May 1990 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21990A1023(02)&from=EN. Access: 04.09.2014].

[53] Cooperation Agreement between the European Economic Community and the Republic of Tunisia on 25 April 1976 [http://eur-lex.europa.eu/resource.html?uri=cellar:a1b136d1-02c2-492f-9ae4-415f1670414f.0008.02/DOC_1&format=PDF. Access: 05.09.2014].

[54] Cooperation Agreement between the European Economic Community and the People's Democratic Republic of Algeria on 26 April 1976 [http://eur-lex.europa.eu/resource.html?uri=cellar:8e765bfe-c3ad-4780-b982-029421692d60.0008.02/DOC_1&format=PDF. Access: 05.09.2014].

[55] Cooperation Agreement between the European Economic Community and the Socialist Federal Republic of Yugoslavia on 2 April 1980 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21983A0214(01)&qid=1412539810296&from=EN. Access: 05.09.2014].

scientific cooperation including joint programs of research and development in the fields of energy sources, energy conservation, energy technology, protection and improvement of the environment[56].

According to art.3 of the Cooperation Agreement between the European Economic Community and the countries parties to the General Treaty on Central American Economic Integration and Panama on 12 November 1985 provides development of new energy sources, and taking measures to reduce dependence on energy products derived from oil[57].

According to the art. 30 of the Framework Agreement for Cooperation between the European Economic Community and the United Mexican States on 27 April 1991 the Contracting Parties recognize the importance of energy sector to economic and social development and prepare to step up cooperation relating to saving and efficient use energy. Such cooperation includes the assessment of energy potential of alternative sources and the application of technology for the saving of energy to industrial process[58].

The indicated agreements reveal that the main activity in alternative energy field at the end of 1970s and the beginning of 1990s was focused on their technical development and research.

The evaluation of alternative energy legal norms from general to more detailed ones and dealing with promotion of alternative energy can be given also on the example of ACP – EEC Conventions signed at Lomé.

Chapter 2 "Development of the mining and energy potential of the ACP States" of the Second ACP – EEC Convention provides that the Community should give its technical and financial assistance to help with the exploitation of the ACP States' energy potential in accordance with the procedures peculiar to each of the instruments at its disposal[59].

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[56]Agreement for commercial and economic cooperation between the European Economic Community and India on 23 June 1981 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21981A0623(01)&qid=1412539810296&from=EN. Access: 05.09.2014].

[57]Cooperation Agreement between the European Economic Community and the countries parties to the General Treaty on Central American Economic Integration and Panama on 12 November 1985 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21986A0630(01)&from=EN. Access: 05.09.2014].

[58] Framework Agreement for Cooperation between the European Economic Community and the United Mexican States on 27 April 1991 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21991A1211(01)&from=EN. Access: 04.09.2014].

[59]The Second ACP – EEC Convention signed at Lomé on 31 October 1979 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21979A1031(01)&from=EN. Access: 04.09.2014].

Art. 75 of the Third ACP – EEC Convention provides that the ACP States and the Community agree to cooperate in energy area with a view to finding solutions to their energy problems. In ACP – EEC cooperation particular emphasis made on energy programming, operations for saving and efficient use of energy, reconnaissance of energy potential and the economically and technically appropriate promotion of new and renewable sources of energy[60].

The Forth ACP – EEC Convention states that particular emphasis should be placed on reconnaissance of energy potential and the economically and technically appropriate promotion of new and renewable sources of energy (art. 105); encourage increased use of alternative, new and renewable sources of energy (art.106)[61].

The investigation of legal aspects of alternative energy would not be complete without mentioning the United Nations Conference on New and Renewable Sources of Energy held in 1981 implementing the Nairobi Programme of Action for the Development and Utilization of New and Renewable Sources of Energy. In the conference was underlined the necessity of promotion the development of new and renewable sources of energy. Special attention was paid to international cooperation between developed and developing countries in this sphere. The Conference underlined the importance of new and renewable sources of energy and their contribution to economic and social development, particularly in the developing countries, and the transition from the international economy based primarily on hydrocarbons to economy based mainly on new and renewable sources of energy[62].

After the scrutinized legal analysis of international agreements adopted from 1970s till 1991 it can be concluded that in the majority of agreements energy and alternative energy issues were not regulated separately but as a part of economic or environmental protection cooperation framework. The international cooperation in energy and alternative energy was focused on:

encouraging energy and alternative energy cooperation taking into account differences in the level of development of countries;

promoting energy and alternative energy research and development by means of information exchange, technical expertise;

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[60] Third ACP – EEC Convention signed at Lomé on 8 December 1984 [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:21986A0331(01)&rid=7. Access: 04.09.2014].

[61]Forth ACP – EEC Convention signed at Lomé on 15 December 1989 [http://eur-lex.europa.eu/resource.html?uri=cellar:ffc89d43-73eb-4f51-9670-20b493a85516.0008.02/DOC_1&format=PDF. Access: 07.09.2014].

[62] United Nations Conference on New and Renewable Sources of Energy on 17 December 1981. A/RES/36/193 [http://www.un.org/documents/ga/res/36/a36r193.htm. Access: 30.09.2014].

creating a favorable climate for investment;

disseminating new energy technologies;

energy planning and energy saving measures;

deployment and installation of new energy resources friendly to the environment;

training and studies in energy sector, mainly in new and renewable sources of energy.

1.4. The European Economic Community renewable energy framework

Above in the chapter is regarded legal framework of international cooperation of the European Economic Community and third countries in the field of energy and alternative energy sources. The accent is made on the investigation of energy and alternative energy international cooperation of the European Economic Community and third countries after the energy crisis because it was the period when the benefit of mutual collaboration was recognized and it was the international regulation that gave a strong impulse to the development of the own European Economic Community legal regulation in the related area.

The international cooperation of the European Economic Community with third countries without taking the appropriate internal measures was not enough to solve the energy problems and actions at the Community level were required. Further in this paragraph is described the energy and renewable energy policy and regulation within the European Economic Community.

The necessity to adopt an integrative strategic approach to energy policy appeared after the energy crisis.

First come recognition that not only current but also future energy supply can become less secure and can be affected by external political factors. And the time for managing the energy transition was limited and required urgent measures[63].

In order to minimize the future risks of disruptions on energy supplies the European Economic Community set as priority the reduction of energy import and energy consumption and development of indigenous and renewable energy production.

The European Economic Community set in 1974 the energy policy objectives for 1985 and in 1979 the energy policy objectives for 1990. The objectives both for 1985[64] and for 1990[65] had mainly quantitative indicators. According to the Communication "Community energy policy

[63] Communication from the Commission to the Council "Energy Situation in the Community and in the World" COM(79)142 final.

[64] The long - term growth rate of internal consumption to 3.5% per annum instead of 5% as originally planned; 35% of electricity consumption (25% in 1973); reduce of imported energy to approximately 40% (63% in 1973); the increase of the contribution of hydroelectric and geothermic power to the overall energy supply to 43 mtoe (30 mtoe in 1973) [Communication from the Commission to the Council "Community energy policy objectives for 1985" COM(1974) 1960 final].

[65] Gradually reduce below 0.7 the ratio between the growth of energy consumption and economic growth; limit to 50% dependence on energy import and more particularly to restrict to 470 million tonnes the level of net imports of oil (the level of 1978); increase in the use of solid fuels and nuclear energy which, together, should cover 70 to 75% of the production of electricity [Communication from the Commission to the Council "Energy Objectives of the Community for 1990 and Convergence of Policies of Member States" COM(79)316 final].

objectives for 1985" (1974) the energy policy related mainly to the security of supply and was closely related with environment, scientific and technical research, transport, industrial and social policies.

The adoption of long – term energy objectives did not lead to the implementation of the common energy strategy for achieving them though the necessity of common actions taken by the Community and Member States was realized. According to the "Energy Strategy for the Community" (1981) in the absence of common approach to energy policy the Community would not meet the energy challenge[66]. The objectives of security and stability of supply to all forms of energy were declared to be the key feature of the Community energy strategy.

Inasmuch as the Treaties dealt respectively with coal and nuclear power the absence of any clear direction to an integrated energy policy was the major problem in energy regulation[67].

Besides the absence of integrated approaches to energy regulation energy policy of the European Community has been considered as one of the weakest due to the intention of the Member States to keep tight control over a sector they consider of strategic economic importance[68].

The energy policy was based on the necessity to provide security of supply due to reduce of energy import, decrease of internal energy consumption, and increase of production of indigenous energy sources.

Prior to 1988 there was no clear Community policy regarding the energy field. In 1988 Working Document the Commission of the European Economic Community highlighted the creation of an Internal Energy Market as one of the specific goals in the establishment of the larger common market[69].

The single energy market should contribute to the achievement of the Community's energy policy objectives[70].

Since the adoption of the Coal and Steel Treaty in 1952 and the Euratom Treaty in 1957 the Member States tried to establish a long - term common approach to energy. Energy issues in the European states after the Second World War held one of the key positions. "Because of

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[66] Communication from the Commission to the Council "The Development of an Energy Strategy for the Community" COM(81)540 final.

[67] p. 412, EEC Law. Second Edition. Anthony Parry, James Dinnage. London, Sweet & Maxwell, 1981 – 531 p.

[68] p. 63, Legal aspects of EU Energy Regulation. Implementing the New Directives on Electricity and Gas Across Europe. Edited by Peter Cameron. Oxford, Oxford University Press, 2005 – 578 p.

[69] p. 1 – 2, European Community Energy Law. Selected Topics. David S. Mac Dougall, Thomas W. Wälde. London/Dordrecht/Boston, Graham&Trotman/Martinus Nijhoff, 1994 – p. 318.

[70] Commission Working Document "The Internal Energy Market" COM(88) 238 final.

Europe's great need for energy in the post - War reconstruction, European policy – makers focused in the energy sector as an area for urgent development of common policies and coordinated action. This is reflected in the fact that two of the three treaties dating from the 1950s are specifically directed at the energy sector (the Treaty establishing the European Coal and Steel Community in 1951 and the Treaty establishing a European Atomic Energy Community (EURATOM) in 1957)"[71].

In the middle of 1980s was elaborated the energy policy aimed at achieving the objectives that are similar and coincide with the modern ones:

secure conditions of supply and geographical diversification of supply;

reduction of oil consumption.

diversification between different sources of energy and development of indigenous energy sources;

reducing risks of sudden fluctuations in energy prices;

development of energy sources under satisfactory economic conditions and greater market integration free from barriers to trade;

improving economic competitiveness;

development of networks;

energy - efficiency;

a vigorous policy for the implementation of energy policy measures;

balanced solutions between energy and environment;

development of less-favored regions;

promotion of innovations through research, development and demonstration and rapid and appropriate dissemination of results[72].

A significant potential of renewable energy for achieving energy policy objectives was realized after the World energy crisis.

First was determined that renewable energy could provide the security of energy supply[73].

In 1980s was specified that renewable energy could contribute to limiting climate change and increasing the share of clean energy[74]. It became necessary to establish the correlation between environmental and renewable and energy policies.

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[71] p. 214, Energy Law in Europe. National, EU and International Law and Institutions. Edited by Martha M. Roggenkamp, Anita Rønne, Catherine Redgwell, Iñigo Del Guayo, Oxford University Press, 2001 – 1097p.

[72] Council Resolution of 16 September 1986 concerning new Community energy policy objectives for 1995 and convergence of the policies of the Member States (86/C 241/01).

[73] Council Resolution of 9 June 1980 concerning Community energy policy objectives for 1990 and convergence of the policies of the Member States. Official Journal of the European Communities No C 149/1.

According to the European Economic Community's Position for the first United Nations renewable energy conference on New and Renewable Sources of Energy held in Nairobi in 1981 it was not expected that renewable energy would solve all energy problems. Nevertheless, the expectations were high. According to the Commission renewable energy was bound to a higher proportion of the Community's supplies and could cover from 6 to 10% of the gross energy consumption in 2000. The development of new and renewable sources of energy was a necessary condition for the transition towards a less oil-dependent economy[75].

The Council Resolution of 16 September 1986 concerning new energy policy objectives for 1995 and convergence of the policies of the Member States placed promotion of renewables among the sectoral objectives that were regarded as the guidelines for examining the convergence and cohesion of the Member States' policies between 1986 and 1995. This central objective was confirmed in the Council's Recommendation 9 June 1988 on developing the exploitation of renewable sources of energy.

According to the Council Resolution of 26 November 1986 a Community orientation to develop new and renewable energy sources must seek to optimize the exploitation of renewable energy sources taking into account resources available in the Member States; ensure cooperation at the Community level with a view to the coherence of national legislative, financial and information measures; prepare measures at Community level; promote industrial cooperation; the extension of markets; make its efforts as profitable as possible[76].

Since that time the role of renewable energy has been constantly increasing: from being one of the means to provide security of supply to becoming a key element of a less carbon-intensive energy and sustainable development[77].

The United Nations Framework Convention on Climate Change declaring as the objective long-term reductions of greenhouse gas emissions and the United Nations Conference on Sustainable Development ("Rio+20") declaring transition towards a green economy in the context of sustainable development put renewable energy technologies are at the heart of sustainable development and green economy.

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[74] 56% of Community citizens consider renewables as the least polluting energy sources [Communication from the Commission to the Council on "Energy and the Environment" COM(89) 369 final].

[75] Community Position for the United Nations Conference on New and Renewable Sources of Energy (Nairobi. August 1981) COM(81) 381 final.

[76] Council Resolution of 26 November 1986 on a Community orientation to develop new and renewable energy sources (86/C 316/01).

[77] European Community programme of policy and action in relation to the environment and sustainable development. 17.05.1993. Official Journal of the European Communities No C138/5.

The role of renewable energy is constantly increasing. It is necessary for the achievement of economic growth; the development of a strong European industrial renewable energy base which can compete successfully in the global market; increasing employment; regional development and strengthening the economic structure of the outermost and isolated regions; and for economic and social cohesion.

Nowadays one more possibility of usage of renewable energy is being discussed and it is the use of renewables in defence sector[78].

None of the abovementioned objectives can be achieved without technological development of renewable energy sources and maturity of renewable energy technology itself. A more detailed analysis of renewable energy technology policy is provided in the second chapter of the thesis.

[78] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Towards a more competitive and efficient defence and security sector" COM(2013) 542 final.

Conclusions to the first chapter

In spite of grave consequences of the energy crisis of 1973 – 1974 it played a significant role in energy sphere and gave a strong impetus to the following phenomena:

international energy cooperation became worldwide and involved oil – importer and oil – exporter countries;

establishment of new energy international organization – the International Energy Agency;

research and development of the alternative energy sources.

Among factors that influenced the development of renewable energy sources besides the energy crisis were risks caused by nuclear energy and damage to environment by conventional energy.

Renewable energy sources regulation after the energy crises was first provided at international level. But in fact provisions related to alternative energy development were adopted practically simultaneously by the Decision of the Council establishing an International Energy Agency (adopted on 15 November 1974) and the Energy Research and Development Programme (approved by the Council Decision on 22 August 1975). Because of this fact it is more reasonable to state without making sharp division between the European Economic Community and the international level that alternative energy sources received legal regulation at the supranational level.

The energy crisis for the first time revealed the vital necessity of searching the alternative to conventional energy and conventional energy supply in order to provide energy security and independence of the European states and the European Economic Community and their future sustainable development. The energy crisis revealed the necessity to conduct coordinated energy policy within the European Economic Community in spite of the Member States' strong intention to control energy sector that they considered to be of national importance.

It is important to mention that core objectives of energy and renewable energy sources were elaborated at the end of 1970s and the 1980s: security of supply, competitiveness, environmental protection, diversification of indigenous and renewable energy sources. It has been concluded that the achievement of energy and renewable energy objectives would be possible due to high level of technology development and creation of common energy market. At the end of 1980, the beginning of 1990s the energy policy and legal framework has been developing taking into account the necessity to complete the internal energy market.

The present objectives of energy policy have not been changed since the time they first have been set (security of supply, competitiveness, the objective of environmental protection was replaced by the objective of sustainability). Their achievement is possible due to the maturity of energy technology and completion of the internal energy market and its effective functioning.

Though the major objectives of the energy policy remained the unchangeable since the time they first were proclaimed the strategy towards the energy policy itself has become more integrated and systematic.

The significance of renewable energy sources for the achievement of the common energy objectives and their contribution to energy independence and security was realized after the World energy crises and they continue to play the dominant role in the current energy policy especially now when the European Union is moving towards the creation of low – carbon economy. In order to increase the share of renewable energy sources in total energy consumption the European Union has adopted a wide range of measures and norms.

The basic instruments for the achievement of major energy and renewable energy sources remained the same: the elaboration of energy and renewable energy policy strategy, renewable energy technology maturity, completion of the internal energy market, strong legal base. These issues are analyzed in the second chapter of the thesis and are regarded together in order to provide a complete picture of renewable energy policy and legal framework.

As far as since the middle of 1970s until the middle of 1990s the development of renewable energy was mainly of technical character and was aimed at technology research and development and dissemination of successful results the second chapter starts with the description of renewable energy technology framework. The multiannual research and development programmes promoted technology progress of renewable energy sources in order to increase the market share of renewable energy sources and improve their contribution to the overall energy production.

2. The European Union renewable energy policy and legal framework

Introduction to the second chapter

The first chapter of the thesis is focused on the energy crisis of 1973-1974 and measures taken for overcoming the consequences of the crisis and the changes in the international and European energy policy caused by it. This paragraph is focused on the research and development of renewable energy technology because it preceded the establishment of the legal framework.

The major outcomes of the first chapter are the following. Energy held one the key positions in the European states after the Second World War and the European policy-makers focused in this sector as an area for urgent development of common policies and coordinated actions. The economic and energy development was put in jeopardy after the World energy crisis of 1973 – 1974. One of the consequences of energy crisis was the necessity of searching alternative to conventional energy and diversification of supply for providing energy security and independence. First come recognition of necessity to reduce dependence on oil-producer countries by means of development of renewable energy sources.

One of the ways for solving the consequences of the energy crisis and economic depression was seen in technological development. High dependence on energy and damage caused by conventional energy promoted a range of innovations in different fields and stimulated technology development.

According to the "Demand Pull" theory[79] necessity is the mother of invention: the impetus to development of new renewable energy technology was given by the necessity to solve the consequences of the energy crisis. Another factor promoting the development of renewable energy was the necessity of environmental protection because together with expectations that new technologies could lead to economic recovery appeared recognition that they can lead to depletion of natural resources and can cause damage to environment. The concept of planet with unlimited nature resources was replaced by the concept of sustainable development and encouraged the development of innovations able to increase energy efficiency and to make energy technologies more secure to the environment.

Energy security and environmental protection are still one of the factors promoting innovations. The innovations in these areas are required also because the potential of global

[79] There are different theories explaining the reasons giving rise to innovations. See the first chapter of the thesis.

warming and climate change to stimulate conflict disasters has been realized. Climate change has become an important element of human and environmental security[80].

Coming back to the technology policy development it should be stated that the role of the research and technological development policy changed in 1980 when the evolutionary and institutional economic theory revaluated the understanding of the importance of technological innovation for economic development[81].

1990s was a very dynamic period of the European integration not just because of opening markets by also because of creating conditions for increasing competitiveness, stimulating growth and decreasing unemployment rates. The scope of the European integration has expanded considerably and encompassed directly or indirectly all spheres of policy-making including research and innovation policy[82].

By the mid-1990s the transition from a technology policy towards an innovation policy was regarded as a new innovation paradigm. This transition relies on a new theoretical conception of the innovation process. This conception presumes that innovation is not a linear process starting with a scientific discovery and ending in its industrial application, but is a more complex process involving social learning and organizational change. This new approach to the nature of the innovation process makes an emphasis not on the knowledge itself but the "success" that a new knowledge had in a social and organizational context. Innovations are so because they are socially relevant[83].

Innovation is a complex phenomenon regarded as a source of social and economic prosperity and embracing not only technology and research aspects but governance challenges; legal issues including intellectual property rights, education and training, standards; the issues of human values and social trust in respect to science.

Innovation policy became one of the central elements of Lisbon Process and nowadays continues to play an important role in the European Union. The "Innovation Union" is one of the flagships provided by Europe 2020 Strategy for smart, sustainable and inclusive growth. It advocates a strategic and integrated approach to research and innovation that would lead to

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[80] Global Biosecurity. Threats and responses. P. Katona, John, P. Sullivan, Michael, D. Intriligator. USA, Routledge – 2010, 116 – 117.

[81] p. 1-2, Innovation Policies in Europe and the US. The new agenda. Peter S. Biegelbauer, Susan Borrás. Great Britain, ASHGATE, 2003 – 325p.

[82] p. 3, Dynamics and Obstacles of European Governance. Dirk De Bièvre, Christopher Reynolds. UK, Edward Elgar Publishing, 2007 – 204 p.

[83] p.15, 183 – 184, The Innovation Policy of the European Union. From government to Governance. Susana Borrás. UK, Edward Elgar, 2003 – 231 p.

economic recovery and reduce unemployment and development of the European approach to innovation able to face major economic, energy and societal challenges and to increase competitiveness. It is aimed at improving framework and access to finance and attract investment for research and innovation.

A multifaceted character of the innovation policy causes certain difficulties in its development. The development of innovation policy is obstructed by absence of a system approach to policy and regulation, complexity and overflows of models and mechanisms of innovations, lack of transparency and clarity, bureaucratic burden, unfavorable framework in promotion of ideas to the market because of low financing; costly patenting; market fragmentation; outdated regulations and procedures[84].

As stated, the major challenges the European Union is facing today are climate changes and energy security and they require development of renewable energy technologies. But nowadays the renewable energy technologies have become so mature that their future prospective development requires innovations in their financial and regulatory spheres more than in technologies themselves.

Innovations are required in order to ensure flexibility and security of the European energy system; to decrease costs of the energy infrastructure and prepare it for much larger amounts of renewable energy; to provide the continuity of electricity supply; to rationalize demand for infrastructures through cost-effective balancing of renewable electricity, enable balance between multiple renewable energy source locations, for example, for linking offshore wind farms; to create favourable market environment for consumers; to develop and promote ocean energy[85].

Future development of renewable energy technology requires creation of favorable market environment and revealing gaps between technologies and the market. The difficulties when introducing renewable energy to the market and its commercialization are explained mainly by high cost of renewables. Innovations in financial and economic mechanisms are expected to provide competitiveness of renewable energy with conventional one in the market.

The following description of innovation phenomena and innovation paradigm is provided because though their influence on the development of renewable energy sources was indirect it was quite significant. Creation of renewable energy technology *per se* was a kind of innovation.

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[84] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Europe 2020 Flagship initiative: Innovation Union' COM(2010) 546 final.

[85] European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Energy Technologies and Innovation' COM (2013) 253 final.

The idea that the development of renewable energy sources at the beginning had a technical character is described in the second chapter of the thesis. The other issue discussed in the second chapter is the transition from renewable energy technology to renewable energy policy and legal regulation.

The second chapter describes the following issues:

first, research and development programmes adopted at the level of the European Union, actions and measures taken in technology area, though some programmes and actions are of general character all of them have an influence on renewable energy technology development;

second, integration of renewable energy technology with innovation policy and the concept of the “Innovation Union”;

third, integration of renewable energy technologies with the common market;

forth, the European Union renewable energy policy framework that is closely connected with the common energy policy.

These issues are regarded together because progressive development of renewable energy technologies requires their commercialization and development of favorable market conditions; and development of common energy market able to integrate renewable energy sources is impossible without an adequate policy strategy and legal regulation.

2.1. Technological aspects of renewable energy legal framework

This paragraph provides analysis of technology renewable energy framework starting from the end of 1970s till present times. Many research and development programmes touch on the issues of common energy market, energy and renewable energy policy, and energy networks. The objective of development and promotion of renewable energy technologies and their maturity are directly interrelated with the European energy and renewable energy policy and strategy. All these issues are regarded in the following paragraphs of the second chapter of the thesis.

During the period between the 1970s and the end of 1980s the legal regulation of alternative energy regulation was not significant mainly because of the absence or the adequate level of alternative energy development; renewable energy technologies were not widespread if not to say some of them were not existing, that is why the majority of international agreements[86] and policy actions were aimed at the development and research of alternative energy.

The first step taken by the European Economic Communities was the financing of demonstration projects of renewable energy sources in order to disseminate results about benefits of usage of renewable energy and its capacities to solve energy and climate problems.

The energy crisis of 1973 – 1974 caused the adoption of two Energy Research and Development Programmes. The First Programme was adopted in 1975 for four years. The Second Energy Research and Development Programme was adopted in 1979. Both of them were aimed at stimulating contract research in the renewable energy and energy conservation areas, including in the production and use of hydrogen, solar, geothermal energy, and energy systems analysis and strategy. The Commission paid up to 50% of the total research cost[87].

The Member States recognized the significance of joint and cooperated actions in technology development and that actions at the Community's level could bring more effective results than isolated and dispersed national actions. One of the examples of such joint actions was cooperation in the field of solar energy between industrial companies and between European laboratories[88].

The Council Resolution of 1983 on framework programmes for Community research, development and demonstration activities and a first framework programme for 1984 to 1987

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[86] See paragraph 1.3. of the first chapter of the thesis.

[87] p. 5, Achievements of the European Community First Energy R & D Programme. J.T. McMullan, A.S. Strub. The Hague/Boston/London, Martinus Nijhoff Publishers, 1981 – 48 p.

[88] Communication from the Commission to the Council "Scientific and Technological Research and the European Community Proposals for the 1980s" COM(81)574 final.

provided that the common science and technology strategy should be defined in framework programmes setting out the scientific and technical objectives that should be pursued at the Community level[89]. The integration of renewable energy objectives within the common framework for research and development at the Community level and later strengthening the Member States' cooperation increased the effectiveness of development of renewable energy.

The Single Economic Act formally authorized legislative action in the areas of research and technological development and regional development[90]. The Single Economic Act established framework for cooperation in the related field the objectives of which is implementation of research, technological development and demonstration programs (art. 130g)[91]. This provision enhanced the development of alternative energy and cooperation within the Community that were mainly focused on technical development based on national peculiarities in energy field and increased exploitation of local resources. This cooperation was aimed at diversification of different forms of energy; energy – saving and rational use of energy; promotion of technological innovations through research, development and demonstration and by rapid dissemination of the results within the Community; information and experience exchange; environmental safety; coordination and harmonization of national policies.

At the end of 1970s and 1980s the assent in technology development of renewable energy was made on research and demonstration programs, promotion of cooperation among industries producing renewable energy equipment, exchange of information about the development of renewable energy, in particular by agreements for access to national data bases, providing information in the field of technical standards and technical rules for the exploitation of renewable energy sources. The European Economic Community technology policy was aimed at disseminating results and reproducing successful projects.

In the middle of 1980s the contribution of new and renewable energy was less than 2% of inland energy demand. It was underlined that long – term progress depends on advances in technology and the evolution of energy prices[92].

The Community's research and development programmes were aimed at gradual exploitation of the potential of new and renewable energy sources. There were different

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[89] Council Resolution of 25 July 1983 on framework programmes for Community research, development and demonstration activities and a first framework programme 1984 to 1987.

[90] p. 15, Cases and Materials on European Community Law. George A.Berman, Roger J. Goebel, William J. Davey, Eleanor M. Fox. St. Paul, Minn, West Publishing Co, 1993 – 1218 p.

[91]Single European Act, enforced 1 July 1987.

[92] Communication from the Commission to the Council "Progress in Structural Change – the Main Findings of the Commission's Review of Member States' Energy Policies" COM (84) 87 final.

programmes and subprogrammes aimed at the technological development of renewable energy sources. The majority of energy multiannual programmes included subprogrammes dealing with renewable energy sources, for example a non-nuclear energy research and development program for a four-year period started on 1 January 1985[93]; non - nuclear programme JOULE adopted for a period of three years and three months from 1 January 1989 (1989 - 1992)[94] and Thermie programme[95].

Such programmes contained measures for the implementation of energy – efficient technologies friendly to the environment.

Further in the paragraph the information about technology energy and renewable energy programmes is provided in chronological order and is summarized according to the context of the programmes (technology demonstration programmes, programmes aimed at development of less - favoured regions, renewable energy specific programmes, European Union research and development framework programmes, strategic energy technology plan). The majority of these programmes contain information related to other sources of energy (nuclear, conventional energy sources), describe measures for increasing energy efficiency, development of eco – innovation technologies compatible with environmental protection, framework programmes provide development of different social or economic fields. In the thesis are analyzed only aspects related to development of renewable energy sources.

Technology demonstration programmes

The development of renewable energy sources could be delayed because financial risks in the development of new technologies were very high. In order to diminish such risks the Community assisted financing and promotion of demonstration programmes. So, the first actions for technology development of renewable energy sources were elaboration of technology demonstration programmes and financing of such programmes by the Community.

In 1978 the Council adopted the Regulation on granting financial support for projects to exploit alternative energy sources. This support was aimed at encouraging demonstration

[93] Commission Communication concerning the non-nuclear energy research and development program. Call for proposals (85/C 69/04).

[94] Council Decision of 14 March 1989 on a specific research and technological development programme in the field of energy — non-nuclear energies and rational use of energy — 1989 to 1992 (Joule) (89/236/EEC).

[95] Commission Communication on the provision of financial support to projects for the promotion of energy technology — Thermie programme — Promotion, implementation and dissemination of innovative energy technologies (91/C 180/16).

projects for using among other alternative sources, geothermal fluids to heat, living, industrial or other premises, to generate electricity, or to provide heat for industrial or agricultural purposes[96].

One of the ways for promotion of demonstration measures was seen in establishment of "demonstration centres for new and renewable energy sources" in different regions of the Community with the functions to collect results of projects and evaluate them, collect results of projects, provide data and technical, commercial, and administrative assistance for private users and for small and medium-sized firms, prepare reports to the Commission about financing and results of regional programmes[97].

Energy played a dominant role in the Community's research and development programmes. In 1979 energy research and development field accounted more than 70% of total funds in the research and development budget[98]. The Community's energy research programme had three main objectives: improved knowledge of nuclear technology and standards for safe operations in the nuclear field; improvements in energy saving techniques and improved knowledge of new energy sources, in particular solar, geothermal and nuclear fusion.

Renewable energy sources are facing the problem typical for many emerging technologies. It is lack of trust and confidence on the part of investors, consumers, regulators because of lack of knowledge and information about new technologies. The demonstration and dissemination projects are supposed to solve this problem. The Community adopted the demonstration programmes and support programmes for demonstration projects aimed at dissemination of successful results of the renewable energy development[99].

The development of renewable energy sources became one of the common research, development and demonstration objectives.

At the beginning of 1990s the environmental, renewable energy and energy efficiency policies remained quite technological in their content. After 1990s the progress achieved in the

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[96] Commission of the European Communities "Demonstration Projects in the Field of Energy – Saving and Exploitation of New Energy Sources" COM(78) 672 final.

[97] Opinion on the proposal for a Council Recommendation to the Member States on developing the exploitation of renewable energy sources in the Community (88/C 80/03).

[98] Communication from the Commission to the Council "Energy Policy in the European Community: Perspectives and achievements" COM (80) 397 final.

[99] Council Regulation (EEC) No 1972/83 of 11 July 183 on the granting of financial support for demonstration projects relating to the exploitation of alternative energy sources and to energy saving and the substitution of hydrocarbons. Official Journal of the European Communities No L 195/6.

development of new and renewable energy sources was maintained by emphasizing the disseminating and reproducing successful energy projects and programmes[100].

Programmes aimed at technology development of less – favored regions

The importance for developing of renewable energy sources in less - favored regions especially those dependent on energy import and lacking conventional energy, such as peripheral and remote areas, islands, rural areas, industrial areas under reconversion was underlined at the Community level. That is why research and development programmes were aimed including at the promotion of energy development of less - favored regions taking into account a specific regional development interests[101].

In those areas renewable energy sources have a high potential for job creation, the development of indigenous resources and industrial development and implementation of new technology projects.

The energy objectives such as providing security of supply, development of renewable energy, energy efficiency, and reduction of CO_2 emissions have to be connected with regional policy because the development of indigenous energy sources contributes towards the achievement of common energy goals. The exploitation of regional energy sources promotes the economic and industrial growth in the regions.

Research and development programmes such as Thermie provides a better link between the Community's regional and common energy policy objectives. A Community programme is established to contribute to the development of certain less-favored regions by exploiting endogenous energy potential. The programme provides for the implementation in the regions and in the light of socio-economic needs and regional potential of a series of consistent, multiannual measures aimed at the exploitation of local energy resources and the efficient use of energy together with promotional measures in both cases, including the dissemination of new technologies[102].

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[100] Council Resolution of 16 September 1986 concerning new Community energy policy objectives for 1995 and convergence of the policies of the Member States (86/C 241/01).

[101] Common Policy for Science and Technology. Impact of Community R&D on Horizontal Policies (Report by the Commission to the Council) COM(81)66 final.

[102] Council Regulation (EEC) No 3301/86 of 27 October 1986 instituting a Community programme for the development of certain less-favored regions of the Community by exploiting endogenous energy potential (Valoren programme). Official Journal of the European Communities No L 305/6.

One of the major obstacles in renewable energy development in less-favored regions is the necessity to implement technologies that are not always readily available or mature. The Thermie programme or the earlier demonstration programmes were designed including for overcoming such problems. Although their overall impact is positive they are not very effective in the less - favored regions because the programmes that include considerable element of innovation imported from the more developed regions are not always suitable in less – favored regions because of the higher capital costs and absence of technical abilities to inform energy users about new technologies[103].

In the long-term renewable energy is regarded as the main source of sustainable development. The regions play an important role in exchanging experience, technology transfer of renewable energy know-how.

Altener Programme

In 1993 was adopted the Altener programme aimed directly at the development of renewable energy. It is the first programme containing non-technology measures for the promotion of renewable energies.

The Altener programme for the first time provided financial instruments for the promotion of renewable energy.

In May 2000 the Altener II programme was extended until 2002 under the new Energy Framework Programme[104].

The objectives of the Altener programme are creation of legal, social, financial and administrative conditions and new market instruments for development of renewable energy sources and attraction of public and private investments.

The objectives of the Altener programme contributed to the achievement of energy objectives (security of energy supply, reduction of energy import, limitation of CO_2 emissions, promotion of economic development and employment, local and regional development and strengthening the economic potential of remote areas).

The Altener II programme became the basic instrument for the Community Strategy and Action Plan (1997) and for monitoring its implementation.

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[103] Communication from the Commission to the Council, the European Parliament and the Economic and the Economic and Social Committee "Energy and Social Cohesion" C0M(93) 645 final.

[104] Decision No 646/2000/EC of the European Parliament and of the Council of 28 February 2000 adopting a multiannual programme for the promotion of renewable energy sources in the Community (Altener) (1998 to 2002).

In comparison with the first Altener programme (1993) the Altener II does not contain measures to support Member States' initiatives for creating infrastructure concerned with renewable energy sources[105]. The pilot projects on the creation and extension of an infrastructure in the Member States received the majority of funding (about 68%)[106].

The Altener programme provides the following actions and measures:

studies and other actions, intended to implement and complement other measures taken to develop renewable energy sources (such as development of sectoral and market strategies, norms and certification; studying the long-term cost and benefit trends resulting from the use of traditional forms of energy and the use of renewable energy sources and their environmental impact; the analysis of legal, socio – economic and administrative conditions, tax incentives favourable to the market penetration of renewable energy; preparation of legislation favourable to investment);

pilot actions for the development of renewable energy sources in local and regional planning, the tools for planning, design and evaluation;

measures to develop information, education and training structures; to encourage exchange of experience and know-how; establishment of a centralized system for collecting and circulating information on renewable energy sources;

actions facilitating the market penetration of renewable energy sources and transition from demonstration to marketing;

monitoring and evaluation actions taking into account the environmental and social aspects and the effects on employment[107].

According to the special report providing the examination of execution of the Altener programme the proper scientific and financial management, monitoring and control of Altener was not provided and the large number of parallel information networks and points disseminating information negatively affected the effectiveness of the information policy[108]. But in general, the report gave a positive conclusion of the efficiency of the Altener programme and

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[105] Council Decision of 13 September 1993 concerning the promotion of renewable energy sources in the Community (Altener programme) (93/500/EEC).

[106] The Altener Programme: results and achievements [http://cordis.europa.eu/news/rcn/8150_en.html. Access: 05.10.2016].

[107] Council Decision of 18 May 1998 concerning a multiannual programme for the promotion of renewable energy sources in the Community (Altener II) (98/352/EC).

[108] Special Report No 17/98 on support for renewable energy sources in the shared-cost actions of the JOULE-THERMIE Programme and the pilot actions of the Altener Programme together with the Commission's replies (98/C 356/03) [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31998Y1120(03)&qid=1473701991829&from=EN. Access:14.05.2015].

provides that it has played an important role in raising awareness about the role of renewable sources of energy in the European Union.

European Research and Development Programmes

The first European framework programme for research was adopted in 1984. Since that time framework programmes have become the major instrument for promotion of research and technology development. They were progressively developed and becoming more ambitious and integrative by their context.

The framework programme defines the common strategy in the field of science and technology, adopts the objectives and actions and measures for their achievement.

The activities and measures provided by the framework programmes embrace all the European research and development incentives. The framework programmes encourage technological breakthroughs that enable benefits of scientific and research progress to solve problems having the European dimension. They are aimed at improving competitiveness of industry and economy, environmental protection and sustainable development and meeting the society needs.

This paragraph analyses the framework and specific programmes in the extent they are related to renewable energy.

Every framework programme starting with the first one provides objectives for development of renewable energy sources. One of the scientific and technological objectives of the first framework programme for research 1984 – 1987 was the improvement of management of energy resources such as development of renewable energy sources and rational use of energy[109].

According to the Council Resolution of 25 July 1983 on framework programmes[110] the common strategy in the field of science and technology is defined in framework programmes setting out the scientific and technical objectives to be pursued at Community level, and actions necessary for their achievement and financing. The Council approves the principle of a framework programme according to which it is adopted for four years periods and is reviewed at least every two years and revised if necessary. In accordance with conditions of framework programmes the Council adopts specific decision on research and development.

[109] Commission of the European Communities "Framework Programme for Research 1984-1987" COM (83) 260 final.

[110] Council Resolution of 25 July 1983 on framework programmes for Community research, development and demonstration activities and a first framework programme 1984 to 1987.

Specific programmes as well as the framework programmes are progressively developing becoming more detailed from the points of technology and research prospects. Specific programmes are reflecting the objectives and approaches of framework programmes.

As an example below are provided some framework programmes and specific research and development programmes supplementing them. The choice was made to describe the programmes since the middle of 1990s because they contained more multidisciplinary approaches to renewable energy sources including actions for their commercialization in comparison with the programmes preceding them[111].

Framework programmes provide technology research, development and demonstration actions. The common features that have the aforementioned programmes are the implementation of integrated approaches to research, development and demonstration of renewable energy sources, better integration of energy systems with environment, security of supply, large scale usage of renewable energy, the efficient use of energy, the establishment of technology framework favorable to a significant increase of renewable energy, and market deployment. The actions should be aimed at facilitating the integration of renewable energy from technological, financial and social points of view.

The forth framework programme (1994 – 1998) provides the aim to develop and demonstrate effective, cleaner and more reliable technologies guaranteeing compatibility between energy usage, the equilibrium of the biosphere and economic development[112].

The specific programme for research and technological development, including demonstration, in the field of non-nuclear energy (1994 – 1998) investigates technical and non-technical barriers for decentralized energy production, non-technological instruments for

[111] See for example: research and development programme in the field of non-nuclear energy (1985 - 1988) one of the objectives of which is development of renewable energy (solar, wind, biomass, geothermal) [Council Decision of 12 March 1985 adopting a research and development programme in the field of non-nuclear energy (1985 to 1988) (85/198 /EEC)];

specific research and technological development programme in the field of non-nuclear energy (1990 - 1994) set as the objective development of renewable energy for future large-scale application in electric utility systems, such as the development of grid-connected solar power plants, wind generators, wave power systems, tidal power schemes, small hydro-electric power systems, etc. [Council Decision of 9 September 1991 adopting a specific research and technological development programme in the field of non-nuclear energy (1990 to 1994) (91 /484/EEC)].

[112] Decision of the European Parliament and of the Council of 26 April 1994 concerning the fourth framework programme of the European Community activities in the field of research and technological development and demonstration (1994 to 1998) No 1110/94/EC.

reducing legal and administrative obstacles, policy instruments for introduction of renewable energy such as socio – economic research, planning and training[113].

The peculiarity of the fifth framework programme (1998 – 2002) is that it is aimed at solving socio – economic challenges[114].

One of the reasons for public backlash against emerging technologies is the failure to provide the adequate stakeholder involvement and public communication. Public trust in an emerging technology and its governance is critical to the success of the technology[115]. Low level of public awareness about emerging technologies can slow down their development and widespread installation.

One of the obstacles renewable energy technology is facing is typical for all emerging technologies; it is lack of confidence from the part of governments, investors, and users because of lack of knowledge and information about their technological and economic potential and uncertainties about technology risks and benefits.

Thus, inclusion of investigation of social issues in the research and development programmes was extremely important for the promotion of renewable energy sources because one of the obstacles renewable energy is facing is social resistance to deployment of renewable energy techniques (for example, to wind farms installations, grids and infrastructure). It was necessary to reinforce the research in social fields because not enough attention has been paid to the investigation of consumer behavior when facing with energy choices, in particular the reaction of the public as energy consumers to the establishment of new renewable energy installations[116].

Step by step social aspects of renewable energy development have been integrating into renewable energy policy. After the adoption of the "Innovation Union" flagship initiative the role of citizens in innovative society and their engagement in business models including in the field of renewable energy (demand side management) has been reinforced.

The programmes provide measures for dissemination of information about new renewable energy technologies and networks, as well as about benefits of usage of renewable

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[113] Council Decision of 23 November 1994 adopting a specific programme for research and technological development, including demonstration, in the field of non-nuclear energy (1994 to 1998) 94/806/EC.

[114]The fifth framework programme of the European Community for research, technological development and demonstration activities (1998 - 2002) [https://ec.europa.eu/research/fp5/fp5-intro_en.html. Access: 19.09.2016].

[115] p.61, Innovative Governance Models for Emerging Technologies. Gary E.Marchant, Kenneth W.Abbott, Braden Allenby. USA, UK, Edvard Elgar Publishing, 2013 – 266 p.

[116]Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions "The Energy Dimension of Climate Change" COM(97) 196 final, some other examples are given in the paragraph 2.3.

energy including cost saving potential. Consumers throughout the European Union could save up to € 13 billion per year if they all switched to the cheapest electricity tariff available[117].

The strategic goal of the specific programme for research, technological development and demonstration on energy, environment and sustainable development (1998 – 2002) is to contribute to sustainable development. The programme provides an innovative approach for solving social issues, namely involving the stakeholders, end-users from business, industry and policy-making sectors, private-public partnership; and supporting only proposals of regional, European and global significance. Research actions in renewable energy field include investigation of energy impact of society and employment[118].

The fourth and fifth framework programme for research, technological development and demonstration projects are complemented by the Altener II programme.

The sixth framework programme for research, technological development and demonstration activities was adopted for the 2002 – 2006 period. The basic objective of it was the contribution towards the creation of the European Research Area by facilitating integration and coordination of research activities in the European Union[119]. The sixth framework programme in general contributed to the Union's efforts to promote sustainable development and knowledge-based economy. Priority of the current programme included sustainable energy development including cost – effective supply of renewable energy and large-scale integration of renewable energy.

The specific programme "Integrating and strengthening the European Research Area" (2002 – 2006) made an emphasis on promoting the strategy of sustainable development. The programme continued a tendency to develop measures changing consumer energy behavior especially in urban areas. One of the targets was to bring to the market renewable energy technologies and to integrate renewable energy into networks, for example by supporting stakeholders who were committed to establishing 'Sustainable Communities' integrating a high percent of renewable energy[120].

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[117] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee of the Regions "Single Market Act II: Together for new growth" COM(2012) 573 final.

[118] Council Decision of 25 January 1999 adopting a specific programme for research, technological development and demonstration on energy, environment and sustainable development (1998 to 2002) (1999/170/EC).

[119] The sixth framework programme of the European Community for research, technological development and demonstration activities (2002 - 2006) [https://ec.europa.eu/research/fp6/pdf/fp6-in-brief_en.pdf. Access: 19.09.2016].

[120] Council Decision of 30 September 2002 adopting a specific programme for research, technological development and demonstration "Integrating and strengthening the European Research Area (2002-2006)".

The seventh framework programme (2007 – 2013) set more ambitious objective to contribute to the European Union becomes the World's leading research area[121].

The Competitiveness and Innovation framework programme (2007 - 2013) is complementary to seventh framework programme for research, technological development and demonstration activities. The Competitiveness and Innovation framework programme promotes eco – innovation and set as one of the objectives development of sustainable, competitive, innovative and inclusive information society, and promote development of new and renewable energy sources[122].

The most ambitious is the eighth framework programme for research and innovation Horizon 2020 (2014 - 2020)[123]. One of its specific objectives is the transition to a reliable, affordable, publicly accepted, sustainable and competitive energy system. The activities in energy sphere under the program are: reducing energy consumption and carbon footprint by smart and sustainable use; low-cost, low-carbon electricity supply; a single, smart European electricity grid; building Intelligent Energy Europe, funding framework for energy research and innovation. Horizon 2020 is the financial instrument of the European Union flagship initiative "Innovation Union".

The description of research and development framework programmes and specific energy programmes starting since 1984 (the adoption of the first framework programme) make it possible to reveal that there is a certain balance between continuity and novelty in their development. The programmes include technology research, development and demonstration component and then add it with economic, social, environmental aspects and later with the "innovation" component. Research programmes reveal a high degree of continuity in renewable energy technology development. More and more factors have been analyzed and taken into

[121]Decision of the European Parliament and of the Council of 18 December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013) No 1982/2006/EC.

[122] Eco-innovation is any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy [Decision of the European Parliament and of the Council of 24 October 2006 establishing a Competitiveness and Innovation Framework Programme (2007 to 2013) No 1639/2006/EC].

[123] European Parliament and the Council, Regulation (EU) No 1291/2013 of the European Parliament and the Council of 11 December 2013 establishing Horizon 2020 – the Framework Program for Research and Innovation (2014 - 2020) and repealing Decision No 1982/2006/EC.

account necessary for successful promotion of renewable energy: technological, financial, environment, social, and their abilities to move towards low – carbon economy.

Intelligent Energy – Europe Programme

European research and development programmes and their attempt to remove market barriers when implementing demonstration projects were complemented by Intellegent Energy – Europe programme.

The multiannual programme Intelligent Energy – Europe[124] (launched in 2003) is designed as the main European instrument for non-technological support in the field of energy. It provides continuity for the actions under the Altener programme, SAVE programme (concerns the improvement of energy efficiency), STEER programme (relates to all energy aspects of transport), COOPENER programme (promotes the development of renewable energy and energy efficiency in developing coutries)[125].

The Intelligent Energy – Europe programme combines all activities in energy sectors contributing to the achievement of 12% of the share of the renewable energy in gross energy consumption in 2010, promotion of sustainable development and security of supply.

As its predecessors the Intelligent Energy programme supports the implementation of the European Union legislation by enhancing national, regional and local efforts across the Union. The programme strengthens support for action at local and regional level. It focuses on the removal of non-technical barriers to green energy, the creation of market opportunities including by means of designing standards, increasing training activities, elaboration of planning and monitoring tools; effective mechanisms for the exchange of know-how and best practice.

Some actions are aimed at development of information, education and training structures; the utilization of results, promotion and dissemination of know – how and best practices involving consumers.

Imperfect dissemination of information appeared to be one of the weakest points of the Intelligent Energy programme (similar problems were revealed after the examination of Altener programme in 1998) and it caused barriers to promotion of the use of renewable energy. Another

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[124] Intelligent Energy-Europe. Global Work Programm for the years 2003 – 2006 [https://ec.europa.eu/energy/intelligent/files/call_for_proposals/doc/eie_work_programme_2003-06_en.pdf. Access: 19.09.2016].

[125] Decision of the European Parliament and of the Council of 26 June 2003 adopting a multiannual programme for action in the field of energy "Intelligent Energy — Europe" (2003 — 2006) No 1230/2003/EC.

remark had a more general character and concerned the planning of the programme: the policy model of the program should be more explicit with time limit objectives[126].

Strategic Energy Technology Plan

The role of eco – innovation has been reinforced within the Europe Strategy for competitive, sustainable and secure energy (2010) and the "Innovation Union" flagship initiative. The first attempt in creation of a systematic approach to eco – innovation was the adoption of the Environmental Technologies Action Plan (2004)[127] providing a range of activities for development ecological technologies protecting the environment and contributing to competitiveness and economic growth in the European Union.

Since the beginning of the technology development of renewable energy sources it has been clear that the most significant results can be achieved due to joint actions of the Member States because it would be extremely difficult to provide the appropriate level of technology development if measures are taken just at the national level[128].

Strategic Energy Technology Plan (SET - Plan) is the first attempt to embrace all aspects of energy technology development and innovation, including the policy framework required to attract investments in the field of low - carbon technologies taking into account socio-economic issues. Since 2007 Strategic Energy Technology Plan has been at the core of the European energy technology policy.

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[126] Intelligent Energy 2003 - 2006 Special Report No 7//2008 European Court of Auditors [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52008SA0007&qid=1473701991829&from=EN. Access: 23.04.2016].

[127] Communication from the Commission to the Council and the European Parliament "Stimulating Technologies for Sustainable Development: An Environmental Technologies Action Plan for the European Union" COM(2004) 38 final.

[128] The investment needed in Europe for development of wind energy over the next 10 years is estimated as €6 bn. The return would be fully competitive wind power generation capable of contributing up to 20% of EU electricity by 2020 and about 33% by 2030. The investment needed in solar energy in Europe over the next 10 years is estimated as €16 bn. Up to 15% of EU electricity could be generated by solar power in 2020 [Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Investing in the Development of Low Carbon Technologies (SET-Plan)" COM(2009) 519 final].

In 2007 the European Commission presented its Strategic Energy Technology Plan[129] aimed at strengthening research and development and accelerating innovation in green economy field. This Plan contains the new European approach to promote the development and deployment of cost – effective low – carbon technologies which are crucial to achieve the 2020 goals. It provides delivering the results concerning a new joint strategic planning; a more effective implementation; an increase in resources; and a new and reinforced approach to international cooperation.

Research and innovation pillar of the European energy policy is based on the implementation of the Strategic Energy Technology Plan that provides a long-term agenda to address the key innovation bottlenecks that energy technologies are facing. The application of SET - Plan promotes the application of new technologies capable to help in realization of 2020 energy objectives first of all by providing the installation and modernization of energy infrastructure, including smart grids due to the increase amount of investments in innovation and technology projects.

The SET - Plan enforces the activity of the European Technology Platforms established in 2003.

The European Technology Platforms are industry-led stakeholder fora that develop short to long-term research and innovation agendas and roadmaps for action at the European Union and national levels to be supported by both private and public funding[130]. The European technology platforms established in the energy field do not overcome the problem of fragmentation but they cause and effect on the European and national programmes uniting large-scale integrated energy technology initiatives. The platforms are calling for action at the European level and a framework for the elaboration of needs to be developed for this to happen.

The SET-Plan emphasizes the role of the European Research Area. It is a unified research area that is put at the heart of the Innovation Union flagship initiative[131].

The adoption of Energy Union package (the issue is discussed in the last chapter) led to the establishment of Strategic Energy Technology Plan in 2015. It has been adopted in order to

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[129] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee of the Regions "A European Strategic Energy Technology Plan (SET-PLAN) "Towards a low carbon future" COM(2007) 723 final.

[130] Commission Staff Working Document "Strategy for European Technology Platforms: ETP 2020" SWD(2013) 272 final [ftp://ftp.cordis.europa.eu/pub/etp/docs/swd-2013-strategy-etp-2020_en.pdf. Access:12.08.2016].

[131] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A Reinforced European Research Area Partnership for Excellence and Growth" COM(2012) 392 final.

reach the Energy Union's priorities first of all research and innovation, and decarbonising the economy; and is a core part of the governance structure of the Energy Union. Among the core priorities of the Strategic Energy Technology Plan are renewable energy and consumers.

The SET Plan (2015) provides a more integrated approach moving from a vertical and technology-specific focus to embrace a more horizontally integrated approach, identifying new opportunities made possible by research and innovation. The SET Plan plays an important role in development of innovative low – carbon technologies necessary for decarbonization of the European Union energy system.

Achievement of the SET Plan objectives requires its integration into the Energy Union initiative and 2030 climate and energy framework, strengthening coordination of research and innovation activities and more joint actions. The European research and innovation activities have to join together all relevant stakeholders and initiatives, including public – private partnerships and Joint Technology Initiatives. The European Strategic Forum for Research Infrastructure[132] can be used as a base for a new type of public – public partnership in order to create large scale demonstration facilities for estimating regulatory frameworks and identifying bottlenecks to the deployment of new innovative energy technologies.

[132] The European Strategy Forum on Research Infrastructures was established in 2002 for supporting a coherent and strategy-led approach to policy-making on research infrastructures in Europe, and to facilitate multilateral initiatives leading to the better use and development of research infrastructures at the European Union and international level. [Strategy Report on Research Infrastructures. Roadmap 2016 [https://ec.europa.eu/research/infrastructures/pdf/esfri/esfri_roadmap/esfri_roadmap_2016_full.pdf#view=fit&page mode=none. Access: 21.01.2017].

2.2. Transition from renewable energy technological to innovative legal framework

The description of every renewable energy programme or project is beyond the remit of the thesis because their amount is enormous[133]. On the contrary the objective is to single out the results that are planned to be achieved through their adoption and implementation and to reveal the landmark in technical regulation. They are the following: research and development programmes; research and development framework programmes; strategic energy plans. This division is quite relative and it is not grounded on technology progress as such but mainly by the changes in energy and climate policies, establishing the goals increasing the amount of renewable energy, reducing of greenhouse gas emission, changes in technology and innovation policy (including creation of the Innovation Union).

In spite of these "external" changes the objectives of renewable energy technology development remained the same: reducing greenhouse gas emissions, increasing the share of renewable energy in the total energy balance, ensuring the security of energy supply, and encouraging industry development, economic and social cohesion and regional development; and as a consequence providing energy import independence.

The European Union technology programmes and plans described above are aimed at overcoming technology difficulties. When the first technology programmes were adopted in the middle of 1970s and the beginning of 1980s their major objective was to reduce the overall energy consumption, diversify the sources of supply and decrease dependence on imported oil but later new technologies were regarded as the way to encourage the development of industry and increasing its competitiveness including in less – favored regions. Another objective of the programmes was environmental protection and reduction of CO_2. Additionally, energy and renewable energy research and development programmes and actions were aimed at solving the economic and social problems as unemployment, rural problems.

But achievement of all these objectives was not possible just by means of technology development of the renewable energy. Research and development and demonstration programmes were not enough to promote the development of renewable energy because in spite of certain maturity of renewable energy technologies there were many obstacles for their further

[133] The number of programmes is notable. For example, around 200 projects providing direct support for the Action Plan (1997) including the Campaign for Take-Off were selected and approved under the 1998 - 1999 period [Communication from the Commission to the European Parliament, the Economic and Social Committee and the Committee of the Regions on the implementation of the Community Strategy and Action Plan on Renewable Energy Sources (1998 – 2000) COM(2001) 69 final].

exploitation. The technology success itself is not guaranteeing further successful application and usage of technology because the process of integrating the technology into the market is facing with multiple obstacles. And many programmes being technological by their very nature concern the ways to ease the market commercialization of renewable energy technologies (in particular the Altener, Intelligent Energy - Europe programmes). Large - scale strategic energy and further renewable energy actions and programmes will be required for creating a new green energy environment.

In spite of the measures provided by the Altener programmes the technology progress of renewable energy was slowed down because of difficulties in market integration of new technologies into the market. Difficulties of renewable energy market integration are limited first of all by high costs of renewable energy in comparison with conventional energy, lack of information about renewable energy and their benefits, education and training programmes.

Besides the abovementioned research framework programmes, specific research and development programmes, the European Technology Platforms and SET – Plans there is range of instruments available at the European and national levels that help to accelerate technology development (technology push). The following is a non-exhaustive list of such instruments: Risk Sharing Finance Facility of the European Investment Bank, Infrastructures for research, Joint Technology Initiatives, European Coal and Steel Research Fund, national research and innovation programmes, innovative financing mechanisms, European Investment Bank, Structural Funds for innovation, etc.[134]

International, European, national policies are moving towards the revision of the existing policy models and implementation of new policy mechanisms and approaches corresponding to global economic and energy changes and technical achievements. In the light of these changes it is necessary to regard the renewable energy regulation applying integral methods and approaches uniting producers and customers of renewable energy, developing coherence between various fields such as information and communication technology, building and construction, standards, and energy.

Experts estimate that the future of renewable energy depends on financial risk – return profiles, business models, investment lifetimes, infrastructure integration, social and environmental factors, a fundamental rethinking of how energy systems are designed and operated; cost comparisons and environmental costs, future fuel prices, technology choices, total energy demand, levels of energy efficiency achievable, social acceptance, and the overall shape

[134] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions "Towards a European Strategic Energy Technology Plan" COM(2006) 847 final.

and characteristics of future energy systems. Experts suggest extending the application of the "whole-system thinking" applying it not only on technical levels, but also on institutional, policy, business, and social levels[135]. Thus, the future development of renewable energy sources is not determined any longer by technology progress but other actions not dealing with technology research are required.

These factors caused the necessity to elaborate a common European strategy to renewable energy sources regulating not only technology issues but as well a long – term stable framework for political, legislative, administrative, economic aspects based on new effective solutions.

Innovation has become an essential part of renewable energy policy helping to reduce energy dependence, providing energy mix and energy efficiency, decreasing greenhouse gas emissions. Future low – carbon development is impossible without innovations and new methods taken in different levels.

Technology innovation is a sophisticated process, sometimes very lengthy; it includes research and development, generating up–to–date data about technologies and their assessment, commercialization, dissemination of results, and widespread application of new technologies. Quite often new technologies are suffering lack of certainty about their risk and benefits.

Usually technologies are not emerging totally mature; on the one hand, it complicates the assessment of risks and benefits[136], on the other hand, the time of their "immaturity" gives the

[135]Renewables Global Futures Report 2013 [http://www.ren21.net/Portals/0/documents/activities/gfr/REN21_GFR_2013.pdf. Access: 02.10.2015].

[136] The following description is the example of investigation of electricity risks. When electricity was first introduced in the 1880s the public was apprehensive. By the 1930s transmission lines became symbols of industrialization and modernization. By the late 1960s and early 1970s individuals, governments, scientific and public health communities, the electric utility industry began to express increasing concern about the effects of electric and magnetic fields. In the mid - 1960s scientists conducted laboratory experiments dealing with the effects of electricity on humans and animals. Until the late 1970s researches focused on the effects of electric fields around transmission lines. By the early 1980s an increasing number of epidemiological studies reported about connection between cancer and residential and occupational environment. By 1979 concern among the public, regulatory and technical representatives about possible health effects from electric and magnetic fields increased, precipitating additional research efforts and regulatory activity in the 1980s. Mounting fear and public activism caused delays in licensing and construction of major transmission facilities and as a result by December 1988 several states set limits on power line electric field intensity. New York was the first state to consider restricting distribution line [p. 88-99 Risk and Responsibility W. Leiss, C. Chociolko. Canada, McGill-Queen's University Press, 1994]. Even taken into account not the period of introducing the electricity in 1880s but the period when its transmission capacity increased in 1930s this brief historical review shows that it took around sixty years to realize and to estimate possible risks of electricity.

law the possibility to discover new technology and to adapt to its needs if necessary. Thus, the technology assessment should be prepared as early as possible.

Nowadays together with creating sophisticated technologies it is necessary to create techniques and tools to calculate their risks using the achievements of modern sciences more quickly. As far as one of the major problems of new technologies is uncertainty concerning their risks another way to increase the effectiveness of regulation of new technology is to create a mechanism able to prevent and minimize risks of technologies, for example by means of technology assessment[137]. Regulation can increase its effectiveness by means of anticipatory technology assessment on the earliest stages of technology development, dismissing information about it that can help the stakeholders to understand risks and benefits and to prepare the market to the introduction of new products if necessary.

At the beginning of the second chapter of the thesis is described the transition from a technology policy towards an innovation policy and emergence of new innovation paradigm. Significant transformations and changes in technological development, necessity of economic recovery, creation of knowledge – based economies, changes in relationship between law and governance lead to the increased attention to the phenomenon of innovation, innovative regulation and innovation policy.

The biggest challenge for the European Union and its Member States is to adopt a much more strategic approach to innovation whereby innovation is the overarching policy objective in longer-term perspective, and all policy instruments, measures and funding are designed to contribute to innovation, mutually reinforcing European and national policies.

[137] Technology assessment was developed as an element of legislative policy making in the United States in the early 1970s with the creation of the Office of Technology Assessment. Technology assessment refers to the systematic assessment and evaluation of the positive and negative impacts of technology and is defined as an applied process that considers the societal implications of technological change in order to influence policy to improve technology governance. This admittedly broad definition captures the essence of the process, while leaving room for its forms and numerous methodologies. There are three types of technology assessment. Traditional technology assessment serves as an early warning function regarding the potential impacts of technologies for policy makers and relies primarily on analysis performed by technical experts. Initially focused upon economic and technological impacts, over time it expanded in some applications to include environmental, social and cultural impacts. Participatory technology assessment emphasizes the social nature of technology and involves citizens into the process, providing opportunities for them to learn and to share their opinions about technologies. Constructive technology assessment focuses on the earliest stages of technological change, involving scientists, regulators, workers, users and the broader public in the development and design of technology. Its variants are interactive and real-time technology assessment [p. 61, Law and the Technologies of the Twenty – First Century: Text and Materials. Roger Brownsword, Morag Goodwin. UK, Cambridge University Press, 2012 – 469 p.].

As previously stated the development of innovation policy is obstructed by unfavorable framework conditions (difficulties in promotion of ideas to the market because of low financing, market fragmentation, outdated regulations and procedures; slow standard-setting process, etc.). One of the major difficulties is the absence of a system approach to innovation policy and regulation, complexity and overflows of models and mechanisms of innovations, lack of transparency and clarity, bureaucratic burden and procedures.

The European Union innovation policy suggested a wide definition of innovation. The content of innovation has become wider in scope embracing innovation in every form – not only technological innovation (affecting products and processes) but also administrative, organizational, social and work-related innovation, including innovative new business models and services[138].

In 2016 the Council stressed the application of innovation principle, whereby policy and regulatory measures are evaluated in terms of their impact on research and innovation[139].

One of the latest attempts to elaborate a common approach to innovation policy at the European Union level is the adoption of the "Innovation Union" and "Resource - efficient Europe" flagships initiatives. They are parts of seven flagship initiatives that are included in the Europe 2020 strategy aimed to deliver smart, sustainable and inclusive growth.

The Europe Strategy for smart, sustainable and inclusive growth 2020[140] was adopted in 2010 and set three mutually integrated priorities: smart growth (developing an economy based on knowledge and innovation); sustainable growth (promoting a more resource efficient, greener and competitive economy); inclusive growth (fostering a high-employment economy delivering social and territorial cohesion).

The "Innovation Union" flagship initiative is adopted in order to improve framework conditions and access to finance for research and innovation in order to ensure that innovative ideas are turned into products and services that create growth and jobs[141].

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[138] European Parliament resolution of 15 June 2010 on Community innovation policy in a changing world (2009/2227(INI)) (2011/C 236 E/06).

[139] Competitiveness Council Conclusions, 27 May 2016

[140] Communication from the Commission "EUROPE 2020: A strategy for smart, sustainable and inclusive growth" COM(2010) 2020.

[141] The Commission launched innovation partnerships initiatives in areas addressing major social challenges. Examples of possible partnerships are tackling the climate change and energy challenge coming from cities by creating a representative platform of key stakeholders and boost the use of existing and future ICT to accelerate the deployment of smart grids, new systems for using renewable energy [Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Europe 2020 Flagship Initiative Innovation Union" COM(2010) 546 final].

The European Union 2020 climate and energy targets were incorporated into the Europe Strategy for smart, sustainable and inclusive growth 2020 and into its flagship initiative "Resource efficient Europe" [142] in order to increase economic growth by smart use of natural resources, support of the transition towards a low carbon economy. Transformation to a resource – efficient Europe highlights the significance of research, development and innovations.

The challenges the energy field is facing, the new targets increasing the share of renewable energy in total energy consumption in 2020, 2027 and beyond modified research and development framework of renewable energy technologies. It has become more diversified and sophisticated. The European Union approach to renewable energy development converted into strategic one, promoting strategic planning to technology and renewable energy fields providing a common approach to cross-border issues (grids and energy infrastructure first of all) and to transition towards the low – carbon energy of the future. Energy and renewable energy technology and innovations still remain a fundamental pillar of the European Union energy and climate change policy and is vital to achieve decarbonisation targets.

Sustainable development requires huge research and development efforts in order to guarantee economic attractiveness of new energy technologies and to overcome potential barriers to deployment of renewable energy technologies. The future renewable energy technologies and innovations that are required for their promotion are dealing with the decrease in their cost and improving their competitiveness with conventional energy sources.

In the European Union's energy system, innovation concerns not only new energy technologies, but also new business models and services, social innovation and new policy and financial mechanisms[143].

Effective functioning of the internal energy market encourages the development of new renewable energy technologies and innovations. As far as renewable energy policy was constantly reinforcing the role of the consumers in the usage and development of renewable energy (in particular small – scale installation, smart metering devices) there is a necessity for innovations addressing consumers' demand.

The framework research and development programmes (for example, the fifth framework programme (1998 – 2002) and the following framework and specific programmes) are

[142] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy" COM(2011) 21 final.

[143] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, and the European Investment Bank "Accelerating Clean Energy Innovation" COM(2016) 763 final.

encouraging the public involvement in promotion of renewable energy and grids and promoting innovations among consumers.

One of the examples of promotion of innovations among consumers is the implementation of smart meters and smart grids[144] for encouraging active participation of consumers in the electricity market. The implementation of smart meters and smart grids is subject to an economic assessment of the benefits the individual consumers can gain using them. Demand response is an important component of smart grids; its advantages and characteristic are thoroughly investigated in order to give consumers the relevant information.

At the core of the development of smart grids is a demand response and efficient management of networks they can bring, its objective is to induce modulation (increase or reduction) and optimize electricity usage and balance of networks, electricity production and consumption, for example by facilitating the integration of renewable energy sources to the grid. Demand response can be defined as "changes in electricity usage by end – use consumers from their normal or current consumption patterns in response to market signals, such as time – variable electricity prices or incentive payments, or in response to acceptance of the consumer's bid, alone or through aggregation, to sell demand reduction at a price in organized electricity markets"[145].

Smart grid itself is a kind of innovation. Further development of renewable energy requires innovative approaches in order to guarantee efficient and sustainable use of natural energy resources and to install intelligent and secure energy infrastructure and networks for transmission and distribution of energy that are able to realize the potential of renewable energy and their connection to the network making possible energy saving and efficiency. An integrated innovation and research approach will stimulate the development of new technologies and mechanisms necessary for effective functioning of smart grids and taking into account renewable energy peculiarities when generating and transmitting energy. The innovation methods and techniques will provide security of smart grids, the possibilities to monitor, manage and control renewable energy flows and give the possibility to react effectively in normal and emergency situations.

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[144] The description of smart meters and smart grids is provided in the chapter three of the thesis.

[145] Commission Staff Working Document. Guidance note on Directive 2012/27/EU on energy efficiency, amending Directives 2009/125/EC and 2010/30/EC, and repealing Directives 2004/8/EC and 2006/32/EC. Article 15: Energy transformation, transmission and distribution. Accompanying the document Communication from the Commission to the European Parliament and the Council "Implementing the Energy Efficiency Directive – Commission Guidance" SWD(2013) 450 final.

In order to give Europe a competitive lead to a new industrial revolution the Commission proposes a partnership between the European Union, Member States and industry and proposes to focus jointly on investment and innovation including in smart grids. Legislative proposals on smart grids should facilitate the roll out of recharging infrastructures, particularly in the cities[146].

In the first chapter was mentioned that recently appeared one more area where renewable energy sources can be used. It is defence sector. The Commission launched a specific consultation mechanism with Member States' experts investigating the possibilities of using renewable energy and alternative fuel, energy infrastructure and smart grids technologies in defence sector; and developing recommendations for a guidebook on renewable energy and energy efficiency in defence sector[147].

Another example of renewable energy innovations is application of renewable energy technologies (among others) in such large – scale projects as "Smart Cities".

"Smart Cities" technology is a combination of multiple technologies such as information and communication technologies, energy and transport. "Smart Cities" are defined as an evolution of the present cities, where the increased inclusion of technology, in particular information and communication technologies, drives towards more sustainable growth and better quality of life of citizens. Estimations of the benefits achievable through the deployment of "Smart Cities" in the coming decade anticipate up to 50% reduction in energy consumption, 20% decrease in traffic and 80% improvement in water usage[148].

The examples provided above in this paragraph reveal that the scale of application of renewable energy sources. Due to technology achievements renewable energy sources can be potentially used in different sectors not only in energy one. These changes lead to the point that one of the key approaches to energy innovation policy is the concept of "the whole energy system when setting priorities. A system approach means going beyond the existing divisions

[146]Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A Stronger European Industry for Growth and Economic Recovery. Industrial Policy Communication Update" COM(2012) 582 final.

[147]Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Towards a more competitive and efficient defence and security sector" COM(2013) 542 final.

[148] 68% of population lives in urban areas consuming 70% of energy and accounting for 75% of the EU's total greenhouse gas emissions [Commission Staff Working Document "Technology Assessment. Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Energy Technologies and Innovation" SWD(2013) 158 final].

between energy sources and end users, and exploit synergies between sectors (energy, information and communication technologies, transport, agriculture, etc.), taking advantage of cross – sectoral complementarities and spill overs, as well as looking for life – cycle based solutions that reduce the overall need for energy by reducing waste and re – using and recycling materials"[149].

All these significant challenges in renewable energy technology cannot provide its effective development without a common renewable energy strategy and its regulation. Technology development is accompanied by legal and policy development. They are analyzed in the next paragraph of the thesis.

[149] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Energy Technologies and Innovation" COM(2013) 253 final.

2.3. Renewable energy policy strategy and legal regulation

The paragraph 2.1. describes the technology development of renewable energy sources by means of adoption and implementation of framework research and development programmes, specific energy programmes. This paragraph analyses policy and legal framework of renewable energy sources since the middle of 1990s (the adoption of the Green Paper "Energy for the future: renewable sources of energy") without focusing on some concrete acts but consistently describing them together in order to create an overall picture of renewable energy legal regulation and policy.

In the first chapter of the thesis are described the energy and renewable energy policy objectives. They are security of supply and diversification of supply, competitiveness, reduction of consumption, development of energy sources under satisfactory economic conditions and greater market integration, protection of environment, development and promotion of clean renewable energy, promotion of innovations, and transition towards a less oil – dependent economy. The establishment of policy goals itself does not lead to the achievement of results they set. Though the energy and renewable energy objectives were adopted there were no clear strategy for achieving them and no adequate policy and legal framework to development of renewable energy sources.

Though significant technology progress has been achieved and the share of renewable energy has been increased the technology progress by itself could not provide an efficient development of renewable energy sources able to contribute to the achievement of the core energy policy objectives of the European Union (sustainability, security of supply, and competitiveness) and remove some non – technical barriers.

Renewable energy is facing many obstacles besides the maturity of low – carbon technologies.

One of the first obstacles the renewable energy development faced besides the maturity of technologies was that the data about the exploitation of renewable energy were not very reliable because of the methods applied for its quantification[150].

For solving the problems of lack of energy data and methods to analyze and forecast their development the Commission since the end of 1982 has taken some measures aimed at improving energy demand management and increasing use of local energy resources by means of organizing exchange of experience between regional or local authorities, organizations, institutes

[150] Opinion on a Community orientation to develop new and renewable energy sources (86/C 207/05) [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:51986AC0504&qid=1473701991829&from=EN. Access: 09.09.2016].

and experts, and promoting studies about energy planning. But these measures were isolated and did not lead to wider information exchange[151].

It was already mentioned that the large number of parallel information networks reduced effectiveness of the information policy provided under the Altener programme.

With the evolution of technology renewable energy regulation in particular the adoption of the SET – Plan and the establishment of the Energy Union promoting research and innovation the necessity to improve the transparency and exchange of information in order to measure the achieved results in a quantifiable way has increased. The Commission would strengthen the current SET – Plan Information System (SETIS)[152] for guaranteeing a more diligent and intelligent use of available information and data by stakeholders and the Member States[153].

Another obstacle renewable energy development faced with was the necessity to create a policy framework favorable for their promotion and development that would include not only technological aspects but also connect the technological progress with the achievement of energy and climate objectives, create financial and economic background for competitiveness of renewable energy with conventional one, and adopt legislation keeping pace with these challenges.

It should be underlined that the first framework research and development programmes provided the necessity of creating a common energy strategy and conducting research in energy field within the common existing research and development framework, and the necessity to integrate renewable energy within the common market.

The first framework programme for research (1984 – 1987) provides the necessity to integrate and adapt research and development activities taken in energy field into the overall research and development strategy of the Community.

The second framework programme for research and technological development (1987 – 1991) stressed that the objective of developing energy technology derives directly from the

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[151] For example, energy planning studies were promoted by regional energy agencies in France, by German government as part of the regional programmes, by municipal authorities in Denmark, by regional authorities in Belgium and in the Netherlands [Communication from the Commission "Energy Planning in the European Community (at regional level)" C0M(91) 53 final].

[152] For example, SETIS publishes annual reviews of the progress achieved every year concerning the implementation of the Integrated SET-Plan.

[153] Communication from the Commission "Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European Energy System Transformation" C(2015) 6317 final.

Community energy strategy, the overall goal of which is to increase, in the long term, security of supply and to decrease energy import taking into account environmental conditions[154].

In spite of general concern to establish the common Community – wide energy strategy at the end of 1980s was observed the general lack of political commitment to the promotion of rational, ecological energy use and to the exploitation of renewable energy sources[155].

It was the second framework programme for research and technological development (1987 – 1991) that provided the necessity to integrate strategy for technologies with the completion of the internal market including through the definition of common standards.

The overall objectives of the European Union energy policy can be described as existing in "two layers". Objective of the first layer is the economic integration of national energy markets and removal of restrictions on the free movement of energy products. The second layer consists of the sector – specific policy objectives of the internal energy market, concerning the creation of a competitive, secure and environmentally sustainable energy market[156].

In 1988 was described the state of the energy market.[157] It was presented as a non - homogeneous sector due to considerable amount of energy operators having different status, political traditions of the states, and different nature of energy products. This fragmentation caused barriers to free movement of energy products. The major barriers were infrastructure, technical barriers and energy prices. Technical barriers could be removed by harmonization of technical norms and setting a minimum standard of requirements for renewable energy technologies for increasing confidence in new technologies.

The objective of the development of environmentally – friendly energy technologies at reasonable cost within the market was confirmed in the framework programme[158] in the field of research and technological development (1990 to 1994) and in the following framework programmes.

In 1995 the White Paper "An Energy Policy for the European Union" defined the energy objectives: competitiveness, security of supply, environmental protection and provided that

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[154] Council Decision of 28 September 1987 concerning the framework programme for Community activities in the field of research and technological development (1987 to 1991).

[155] Opinion on the proposal for a Council Decision adopting a specific research and technological development programme in the field of energy—non-nuclear energies and rational use of energy—1989-1992 'JOULE' (Joint opportunities for unconventional or long-term energy supply) (89/C 23/09).

[156] p. 62, Investing in EU Energy Security. Exploring the Regulatory Approach to Tomorrow's Electricity Production. Henrik Bjørnebye. The Netherlands, Wolters Kluwer, Law & Business, 2010 – 456 p.

[157] Commission Working Document "The Internal Energy Market" COM(88) 238 final.

[158] Council Decision of 23 April 1990 concerning the framework programme of Community activities in the field of research and technological development (1990 to 1994) (90 /221 /Euratom, EEC).

market integration is a central factor of energy policy[159]. The White Paper identified that renewable energy in the long – term would become the main sustainable energy source and should make a contribution to the achievement of security of supply and environmental protection. Market integration has become the central and determining factor in the common energy policy.

It should be stressed that the first White Paper on energy policy and the following acts dealing with energy and renewable energy have been adopted in parallel with the adoption and implementation of research and development programmes (for example, in 1990s were adopted Altener and Altener II programmes).

In 1991 renewable energy sales presented less than 2% of primary energy demand, renewable energy's share rose to nearly 4%[160].

In 1996 according to the Green Paper "Energy for the Future: Renewable Sources of Energy" renewable sources of energy contributed less than 6% to the Union's overall gross inland energy consumption[161].

The reasons that ground the necessity to increase the share of renewable energy sources in total energy consumption described in the Green Paper (1996) do not differ from that that have already been described. The development of renewable energy contributes to the achievement of objective of protection of environment and reduction of CO_2 emissions from the energy sector; to reduce of energy import; to achieving greater social and economic cohesion between the regions and regional development; promotion of employment.

The Green Paper (1996) proposed a policy strategy according to which:

the objectives for increasing the share of renewable energy should be clear ambitious and yet realistic and should be adopted at the European Union level;

Member State should strengthen co-operation on renewable energy and to implement renewable energy policy at national level;

the European Union should reinforce its policies dealing with development of renewable sources of energy;

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[159] White Paper "An Energy Policy for the European Union" COM(95) 682 final.

[160] Opinion on the proposal for a Council Decision concerning the promotion of renewable energy sources in the Community (93/C 19/03) [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:51992AC1314&qid=1473701991829&from=EN].

[161] Communication from the Commission "Energy for the Future: Renewable Sources of Energy. Green Paper for a Community Strategy" COM(96) 576 final.

it is necessary to assess and monitor the progress towards the achievement of the renewable energy objectives.

The obstacles for renewable energy development described in the Green Paper (1996) are grid connection (mainly for wind and solar energy, supply variability between day and night and between the seasons), and interconnection requirements to safety and equipment.

The White Paper for a Community Strategy and Action Plan (1997) provides the strategic objective of promoting renewable energy sources as an integral part of energy policy and set the indicative objective of doubling the contribution of renewable energy sources to the European Union's energy balance by 2010 (achieving a contribution by renewable energy to the gross inland energy consumption to 12%)[162].

The White Paper (1997) moved towards a direction of elaboration of a comprehensive strategy for renewable energy necessary for increasing the penetration of renewable sources in energy balance and an action plan for achievement of renewable energy target.

A policy for the promotion of renewable energy should not be developed in isolation and requires the integration with other policies such as energy, environment, employment, taxation, competition, research and technology development, agriculture, regional and external relations. A basic aim of a strategy for renewable energy should be the promotion of renewable energy in new policy initiatives and implementation in existing policies.

Creation of the internal energy market is the way to provide security of supply, reduce energy cost and improve energy efficiency of the energy industry in order to increase competitiveness.

Besides the policy measures the White Paper (1997) provides that renewable energy development requires a stable framework embracing also legislative, administrative, and economic and market measures.

In order to provide coordination of all policies and measures required for the promotion of the renewable energy sources and to overcome the obstacles for their development the White Paper (1997) provided an action plan. The priority measures in order to reach the indicative target of 12% share of renewable energy sources are fair access to the electricity market; fiscal and finance measures; new bioenergy initiative for transport, heating and electricity; improving building regulations.

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[162] Communication from the Commission "Energy for the Future: Renewable Sources of Energy. White Paper for a Community Strategy and Action Plan" COM(97)599 final (26/11/1997).

The first year after the adoption of the White Paper for a Community Strategy and Action Plan (1997) showed that the increase of renewable energy contribution to overall renewable energy production was not significant[163].

As it has been mentioned development of renewable energy lead to decrease of greenhouse gas emissions. The international obligations of reduction of greenhouse gas emissions were impelling the more active use of renewable energy. After the Kyoto Conference of the Parties to the United Nations framework on Climate Change in 1997 the Commission stated that the major potential area for action that would enable the European Union to meet its commitment is accelerating the penetration of renewable energy in the production of electricity[164].

In 2001 the Commission adopted a European Union long – term strategy for sustainable development[165]. According to this strategy economic growth, social cohesion and environmental protection should be interrelated. Sustainable development has become a global objective and in order to reach it more support to research, development of clean and renewable energy sources was required. The creation of common energy market has to be in line with the sustainable development objectives[166]. Sustainability objective was transmitted to energy policy objectives in 2006 (the Green Paper "A European Strategy for Sustainable, Competitive and Secure Energy").

In order to meet the target of 12% of share of renewable energy sources in 2010 it was considered necessary for the electricity sector to make a contribution by raising the share of renewable energy sources in total electricity consumption to 22.1%[167].

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[163] In general, period 1989-1998 show an increase of 32% on the total renewable energy sources primary energy production (increases of 2154% in wind and of 138% in solar) and an increase of 29% on the total renewable energy electricity generation [Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions on the implementation of the Community Strategy and Action Plan on Renewable Energy Sources (1998 – 2000) COM(2001) 69 final].

[164] The European Union agreed to a commitment of an 8% reduction of greenhouse gas emissions for the period 2008 to 2012 compared to 1990 [Report to the Council and the European Parliament on Harmonization Requirements Directive 96/92/EC Concerning Common Rules for the Internal Market in Electricity COM(1998) 167 final].

[165] Communication from the Commission "A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development" COM(2001)264 final.

[166] Report from the Commission "Annual Report on the Implementation of the Gas and Electricity Internal Market" COM(2004) 863 final.

[167] The electricity industry is one of the biggest economy sectors in Europe, with production of some 2500 terawatt-hours per year and annual turnover totalling around EUR 150 billion [Communication from the Commission to the

The 12% target by 2010 required the necessity for Member States to encourage the development of renewable energy sources in accordance with their own potential.

In addition to actions provided for achievement of the 12% target of penetration of renewable energy by 2010 new more efficient actions were necessary. In order to increase the electricity produced from renewable energy sources elaboration of policy strategy was not enough it was necessary to create a legal framework.

The first progressive action in the creation of legal framework was the adoption of the Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market[168]. It was the first legal act aimed directly at the development of electricity produced from renewable energy sources.

The Directive 2001/77/EC provided requirements for national indicative targets and requirements for Member States for achieving them (implementation of attractive support schemes; removal of administrative barriers; guarantee of fair grid access; issuing of a guarantee of origin). In accordance with the Directive 2001/77/EC the Member States adopted national targets for the share of electricity production from renewable energy sources.

If the Member States adopt the measures necessary for the achievement of their national targets, the share of renewable energy electricity should reach the share of 22.1% provided by the Directive 2001/77/EC.

The Member States were required to guarantee open access for electricity produced from renewable energy sources, to ensure that calculation of cost of connecting new producers of renewable energy electricity and transmitting renewable energy electricity were transparent and non - discriminating. The Directive 2001/77/EC did not provide a harmonized approach to support schemes for electricity produced from renewable energy sources.

By October 2002 the Member States should have adopted and published a report setting national indicative targets for future consumption of electricity produced from renewable energy sources in terms of a percentage of electricity consumption for the next 10 years. October 2003 was the deadline for the Member States to bring into force the laws, regulations and administrative provisions necessary to comply with the Directive 2001/77/EC.

In 2004 the Commission evaluated the effect of legislative and other policies on the development of renewable energy sources. It was concluded that in accordance with measures and actions taken by the Member States the European Union would achieve a share of 18 – 19%

Council and the European Parliament "Recent progress with building the internal electricity market" COM(2000) 297 final].

[168] Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the promotion of electricity produced from renewable energy sources in the internal electricity market

of renewable energy in 2010 compared to 14% in 2000. The main reason for failure of achieving the target was lack of active policies in some Member States and imbalance between the Member States' levels of commitment to the development of renewable energy[169].

The actions taken at the level of the European Union for the promotion of development of renewable energy sources besides the Directive 2001/77/EC were the adoption of research and development technology framework programmes and specific energy programmes (for example, Intelligent Energy – Europe adopted for 2003 – 2006).

The adoption of the Directive 2001/77/EC made the legal framework more clear and determined but it has not lead to the elimination of imbalances between the Member States commitment to develop renewable energy sources.

In 2005 renewable energy electricity contributed 15% to overall electricity consumption in the European Union and the Union could achieve as maximum 19% by 2010[170]. The reasons for a slow progress in production of electricity from renewable energy sources was dealing including with the result of delays in planning, administrative barriers, restricted grid access and financing obstacles.

The progress reports on renewable energy sources confirmed lack of progress in the achievement the 2010 target and that the European Union as a whole would fail to reach the 2010 renewable energy target. The contribution of the Member States to the achievement of 2010 renewable energy target was different[171].

Another reason for failure to achieve the targets was the indicative nature of the national targets and the uncertain investment environment provided by the existing legal framework[172].

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[169] Communication from the Commission to the Council and the European Parliament "The share of renewable energy in the EU Commission Report in accordance with Article 3 of Directive 2001/77/EC, evaluation of the effect of legislative instruments and other Community policies on the development of the contribution of renewable energy sources in the EU and proposals for concrete actions" COM(2004) 366 final.

[170] Due to the efforts of Denmark, Germany, Spain, Ireland, Hungary, Netherlands and Luxembourg the European Union could at best achieve a share of 19% of renewable electricity in 2010. In a number of Member States the share of renewable electricity was even declining [Communication from the Commission to the Council and the European Parliament "Green Paper follow - up action Report on progress in renewable electricity" COM(2006) 849 final].

[171] Only Denmark, Germany, Hungary, Ireland, Lithuania, Poland and Portugal achieve their 2010 targets for renewable energy in electricity generation; only Austria, Finland, Germany, Malta, Netherlands, Poland, Romania, Spain and Sweden achieve their targets for renewable energy in transport [Communication from the Commission to the European Parliament and the Council "Renewable Energy: Progressing towards the 2020 target" COM(2011) 31 final].

[172] Communication from the Commission to the Council and the European Parliament "The Renewable Energy Progress Report: Commission Report in accordance with Article 3 of Directive 2001/77/EC, Article 4(2) of

Other reasons that prevent achievement of 10% target by 2010 were the high cost of renewable energy compared to conventional energy and the lack of a coherent and an effective long – term European Union policy framework.

The Commission took steps for development of a new more effective policy framework for the development of renewable energy sources and further, the adoption of legally binding targets for renewable energy for 2020.

Among the general deficiencies in the completion of the internal energy market that were taken into account when adopting the third energy package there were the following: regulated prices; insufficient unbundling of transmission and distribution system operators that cannot guarantee their independence; insufficient competence of regulators; discriminatory third party access to the network, in particular as regards preferential access granted to incumbents for historical long – term contracts; insufficient indication of origin of electricity, which is essential for promotion of renewable energy; and absence of efficient regulation of cross border issues relating to network access[173].

In April 2004 the European Parliament adopted a resolution on the International Conference for Renewable Energies in Bonn (June 2004) and called upon the Commission and the Council to make the necessary efforts to reach a target of 20% for the contribution by renewable energy to domestic energy consumption in the European Union by 2020[174].

The Green Paper "A European Strategy for Sustainable, Competitive and Secure Energy" (2006) provides that the common energy policy objectives should be sustainability, competitiveness, and security of supply[175]. The Green Paper (2006) identified the scope of activities in energy field: competitiveness and the internal energy market; diversification of energy mix; solidarity; sustainable development; innovation and technology; external policy. Measures necessary for creation a common market included development of the European grid, a priority interconnection plan, investment in generation capacity. Security of supply actions included reducing demand, diversifying energy mix with the use of competitive renewable energy sources.

Directive 2003/30/EC and on the implementation of the EU Biomass Action Plan COM(2005)628" COM(2009) 192 final.

[173] Communication from the Commission to the Council and the European Parliament "Prospects for the internal gas and electricity market" COM(2006) 841 final.

[174] European Parliament resolution on the International Conference for Renewable Energies (Bonn, June 2004) P5_TA(2004)0276.

[175] Green Paper "A European Strategy for Sustainable, Competitive and Secure Energy" COM(2006) 105 final.

One of the ways encouraging innovations was found in the elaboration of a strategic European energy technology plan and in more general terms in the adoption of the seventh framework research and development programme.

In 2007 the Commission proposed that the energy policy should be based on the following objectives:

the European Union objective in international negotiations of 30% reduction in greenhouse gas emissions by developed countries by 2020 compared to 1990. In addition, 2050 global greenhouse gas emissions must be reduced by up to 50% compared to 1990, implying reductions in industrialized countries of 60-80% by 2050;

the European Union commitment to achieve, in any event, at least a 20% reduction of greenhouse gases by 2020 compared to 1990[176].

In March 2007 the European Council established a new forward – looking policy agenda for achieving core energy objectives of the European Union (sustainability, competitiveness and security of supply). It endorsed a new "20 – 20 – 20" initiative: reducing greenhouse gas emissions by 20%, increasing the share of renewable energy sources in energy consumption to 20% and improving energy efficiency by 20% by 2020.

The European Council endorsed a binding target of a 20 % share of renewable energy sources in the overall European Union energy consumption by 2020[177]. All types of renewable energy sources used in a cost-efficient way contribute to security of supply, competitiveness and sustainability. The European Council provided that the most efficient way to reach 20% target was making it legally binding. It was expected that the legally binding targets would enforce the government incentives and would provide guaranties to the investors. As far as the Member States have different possibilities for development and deployment of renewable energy the national targets should differ and be fair and accounting national peculiarities.

In 2008 the Commission adopted the Communication "20 20 by 20: Europe's climate change opportunity" and according to it the Member States should have freedom to determine their own energy mix and to promote renewable energy in different ways[178].

In 2008 the share of renewable energy in the overall energy consumption was 8.5%[179].

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[176] Communication from the Commission to the European Council and the European Council and the European Parliament "An Energy Policy for Europe" COM(2007) 1 final.

[177] Presidency conclusions, European Council, March 2007.

[178] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "20 20 by 2020 Europe's climate change opportunity" COM(2008) 30 final.

The Commission adopted the second Strategic Energy Review "The European Union Energy Security and Solidarity Action Plan" (2008). The prerogative areas identified in this Plan are infrastructure and diversification of energy supplies; external energy relations; oil and gas stocks and crisis response mechanisms: energy efficiency; development of indigenous energy sources[180]. It was stated that energy security is the matter of common European Union concern and within the internal energy market national isolated solutions are often insufficient.

In order to achieve 2020 energy and environmental targets was elaborated the Third internal energy market package (adopted in 2009) aimed at ensuring more effective competition and creating favourable conditions for investment, diversity and security of supply.

Among the reasons for changing renewable energy policy and the adoption of the Renewable Energy Directive 2009/28/EC of 23 April 2009 on the promotion of the use of energy from renewable sources[181] was the inadequate rate of progress to achieving 2010 target, and the need to foster renewable energy development in all Member States and not only in a few of them.

The Renewable Energy Directive 2009/28/EC forms part of the Third energy package and provides a strong and stable regulatory framework for the development of the renewable energy in Europe. It sets differentiated and legally binding targets for each Member State to reach an overall European Union target of a 20 % share of renewable energy in total gross final energy consumption (including electricity, heating and cooling and transport) by 2020.

The Member States should bring into force the laws, regulations and administrative provisions necessary to comply with the Directive 2009/28/EC by 5 December 2010.

The Directive 2009/28/EC provides a legal requirement for elaboration of National Renewable Energy Action Plans, calculation of renewable energy shares, reforming planning regimes, and developing electricity grids. It includes cooperation mechanisms to facilitate the Member States working together to achieve the 2020 target in a cost-effective way.

Member States should notify their National Renewable Energy Action Plans to the Commission by 30 June 2010.

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[179]Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "20 20 by 2020 Europe's climate change opportunity" COM(2008) 30 final.

[180] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Second Strategic Energy Review. An EU Energy Security and Solidarity Action Plan" COM(2008) 781 final.

[181] 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.

The Directive 2009/28/EC provides that Member States shall guarantee the origin of electricity produced from renewable energy sources, evaluate their administrative authorization procedures pertaining to such production plants, and guarantee networks access for electricity produced from renewable energy sources, and possible priority access.

The Renewable Energy Directive 2009/28/EC is wider in scope in comparison with the Directive 2001/77/EC on the on the promotion of electricity produced from renewable energy sources in the internal electricity market. The Directive 2009/28/EC regulates energy consumption as whole, including for heating and cooling and it is not limited just to electricity production and consumption.

The Renewable Energy Directive 2009/28/EC does not establish a harmonized framework for support schemes and the Member States are free to set their own support schemes. This approach is in line with that one provided by the Directive on the promotion of electricity produced from renewable energy sources. Harmonization of support schemes was found to be ineffective (this issue is discovered in the fourth chapter of the thesis that analyzes the effectiveness of the Renewable Energy Directive 2009/28/EC).

Though it is expected that in the future due to the measures and actions provided in the Roadmaps 2050 and the Third energy package renewable energy cost will be decreased it remains one of the major obstacles for promotion of renewable energy.

The cost of renewable energy is not determined solely by wind, solar, biomass or water resources; project costs are also driven by administrative and capital costs. Complicated authorization procedures, the lack of one-stop-shops (one single agency for all authorization, certification and licensing procedures), the registration procedures, and planning processes may take months or years and increase project risk[182].

Beyond the cost and economic barriers in the development of renewable energy, complex and lengthy administrative procedures create significant problems (for example, for projects of European interest)[183].

The Renewable Energy Directive 2009/28/EC provides that the Member States shall ensure that the procedures for authorization, certification and licensing procedures for renewables are necessary and proportionate; promote coordination between different administrative levels and agencies and set concrete time limits for decisions. Administrative

[182] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Renewable Energy: a major player in the European energy market" COM(2012) 271 final.

[183] See chapter three of the thesis.

procedures shall be streamlined at the adequate administrative levels and administrative requirements shall be objective, transparent and proportionate.

The renewable energy progress report (2013) revealed that administrative procedures are often subject to local and regional decisions and are not always national in their scope. Significant differences appear in the way the local authorities work, even within the same country (for example, Sweden and Spain). The concreteness and completeness of measures taken for administrative simplification is very low in all Member State reports: the quantity of required permits and the number of authorities involved in procedures often are not mentioned[184].

The Green Paper "Towards a secure, sustainable and competitive European energy network" provides that planning and administrative authorization procedures are a common source of delays to energy projects.

Another obstacle to development of energy infrastructure and network is the "not in my backyard" (NIMBY) reaction, where the European interest is not shared at the local level. One of the ways to lessen the social perception is placing cables underground but this leads to significant increase in cost[185].

The analysis conducted by the International Renewable Energy Agency (IRENA) in 2016 identified key social barriers to deployment of mini – grids as conflict with local authorities (local industry, communities, churches), resistance to cultural changes (loss of indigenous cultures), unwillingness to visit or work in the remote areas, insufficiently concentrated population, opposition to local energy generation (Not In My Backyard)[186].

In 2010 was adopted a Strategy for competitive, sustainable and secure energy 2020 that empowered consumers[187]. In parallel the framework research and development programmes underlined the necessity to strengthen the social dimension of energy (for example, the fifth research and development programme).

As far as the European Union 2020 climate and energy targets were incorporated into the Europe Strategy for smart, sustainable and inclusive growth 2020 and into its flagship initiative

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[184] Commission Staff Working Document. Accompanying the document Report from the Commission to the European Parliament and the Council "Renewable energy progress report" SWD(2013) 102 final.

[185] Commission of the European Communities "Green Paper: Towards a Secure, Sustainable and Competitive European Energy Network" COM(2008) 782 final.

[186] Mini – grids are integrated energy infrastructure with loads and energy resources "Innovation Outlook: renewable mini – grids", IRENA, 2016 [http://www.irena.org/DocumentDownloads/Publications/IRENA_Innovation_Outlook_Minigrids_2016.pdf].

[187] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Energy 2020 A strategy for competitive, sustainable and secure energy" COM(2010) 639 final.

"Resource efficient Europe" the Strategy for competitive, sustainable and secure energy 2020 established priorities in which energy strategy should be focused. They are the following: the creation of energy – efficient Europe; a truly pan-European integration of the energy market; empowering consumers and achieving the highest level of safety and security; Europe's leadership in energy technology and innovation; strengthening the external dimension of the energy market.

The time limit of the 2020 energy and climate package raised questions about future development of renewable energy after 2020.

The majority of investments in the energy system are long – term assets and having life times of 30 – 60 years[188].

In order to promote certain guarantees to investors and to foster cost reduction for post – 2020 period some Member States adopted renewable energy targets[189].

The European approach to climate change and achievement of objectives of energy policy required post – 2020 predictable strategy and policy framework based on common European approach.

In 2011 was adopted a Roadmap for moving to a competitive low carbon economy in 2050 that underlined the central role of electricity in the low carbon economy[190]. The European Union is committed to reducing greenhouse gas emissions to 80 - 95% below 1990 levels by 2050 in the context of necessary reductions by developed countries as a group. The creation of a competitive low – carbon economy by 2050 should be achieved by elaboration of innovation solutions for attracting investments in energy and energy efficiency, transport, industry and information and communication technologies.

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[188] Commission Staff Working Paper. Impact Assessment accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Energy Roadmap 2050" SEC(2011) 1565 final Part 1/2.

[189] For example, in 2011 Germany adopted the goal to increase renewable power share to 50% by 2030, rising to 60% by 2040 and 80% by 2050; in 2012 Denmark committed to achieve 100% of its national energy supply with renewable by 2050 [Commission Staff Working Paper. Impact Assessment accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Renewable energy: a major player in the European energy market" SWD(2012) 149 final].

[190] The share of low carbon technologies in the electricity mix is estimated to increase from around 45% in 2011 to around 60% in 2020, including through meeting the renewable energy target, to 75 to 80% in 2030, and nearly 100% in 2050 [Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A Roadmap for moving to a competitive low carbon economy in 2050" COM(2011) 112 final].

As far as the energy sector in Europe produces the biggest amount of greenhouse gas emissions the decarbonisation of economy requires an increased share of clean renewable energy. The general target of reducing greenhouse gas emissions in 2050 should be compatible with the core energy objectives (sustainability, security of supply and competitiveness).

In 2011 was adopted an Energy Roadmap 2050. All decarbonisation scenarios show that in 2050 the biggest share of energy supply technologies are renewable energy technologies and the share of renewable energy increase substantially in all scenarios achieving at least 55% in gross final energy consumption in 2050[191].

For achieving the decarbonisation targets the Energy Roadmap 2050 proposed the following objectives for giving more certainty to investors and stakeholders for the period after 2020: elaboration of different decarbonisation pathways for 2050 and their economic, social and environmental impacts and creation of future policy strategies at the European Union level; setting milestones after 2020 to mobilize stakeholders.

The integrative approach for a transition towards the low – carbon energy and economy provides more stability in comparison with fragmented national actions. The increased share of renewable energy and energy efficiency require modern, reliable and smart infrastructure and networks.

It is important to pay attention that discussions about new renewable energy targets started soon after the Renewable Energy Directive 2009/28/EC came into being. Similar discussions took place after the adoption of the Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. In April 2004 the European Parliament called upon the Commission and the Council to make the necessary efforts to reach a target of 20% for the contribution by renewable energy to domestic energy consumption in the European Union by 2020.

These facts highlight the necessity to adopt a long – term renewable energy strategy otherwise absence of adequate legal and policy framework can slow down the development of renewable energy even in the medium term.

There is a certain analogy between the indications of necessity to elaborate renewable energy strategy compatible with climate protection objectives in the first technology research

[191] High Renewable Energy Sources scenario: strong support measures for renewable energy leading to a very high share of renewable energy in gross final energy consumption (75% in 2050) and about 97% in electricity consumption. The share of renewable energy in electricity consumption is about 64% in a High Energy Efficiency scenario [Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Energy Roadmap 2050" COM(2011) 885 final].

and development programmes and the necessity to set new renewable energy targets provided in the Roadmaps 2050. All these acts are quite technological by their character.

Prospective of the renewable energy targets for the post – 2020 period are investigated in the fourth chapter of the thesis. Before continuing the analysis of future renewable energy legal and police framework and the ways to remove some obstacles for renewable energy promotion (inadequate infrastructure and networks) it is necessary to make a conclusion to the second chapter and create an overall picture of technology, policy and legal regulation of renewable energy.

Conclusion to the second chapter

The second chapter of the thesis describes the technological and innovative aspects of renewable energy legal framework, policy and legal regulation of renewable energy.

One of the basic points of the thesis is that renewable energy technology development gave an impetus to development of legal and policy framework. Research and technology development of renewable energy is the first step to provide energy security and independence. Financial and legal steps should then be taken.

One of the difficulties in the technology development in the 1970 – 1990s was that the level of industry in general was dominantly based on energy – intensive and power – consuming technologies. They were not compatible with the environment and further sustainable international and European strategy. Development of renewable energy was impossible without changing the paradigm in energy consumption from conventional energy – intensive sources to low – carbon friendly to the environment renewable energy sources. This paradigm change in this or that extent embraced not only energy policy but also industry, agriculture and rural development, regional policy, environment, research and development, financial, labor, and external relations. That is why renewable energy development is closely connected with these policies.

One of the first renewable energy acts were research and development programmes and acts on granting financing support to projects for exploiting renewable energy sources. Since the moment of adoption of the first research and development programme in 1984 development of renewable energy has been established as one of the goals of common technology research and development; this underlines the significance of research and development of renewable energy for technology development of the European Union.

In order to place energy system of the European Union into the framework of the sustainable development and to achieve ambitious climate and energy objectives is necessary to reorient the technology policy from basic research activities to market integration. The weak point of technology and research development of renewable energy is that the technology process itself is represented by a considerable amount of technology incentives and actions that should be taken simultaneously in many different areas.

The analysis conducted in the second chapter made it possible to conclude that basic characteristics of the current European Union renewable energy policy were elaborated in 1980s and since that time remained practically unchangeable.

In 1981 innovation was declared to be a necessary part of the energy strategy. Since that time development of renewable energy and energy networks has been inseparable from innovation process.

There are different factors that complicate the progress of renewable energy sources. The technical obstacles that renewable energy is facing are: nature and weather conditions (wind, sun light, ocean, etc.) are sometimes intermittent and unpredictable and influence the energy flows; difficulties in integration of renewable energy into the grid and networks and when transmitting it.

The major obstacles for development of renewable energy sources such as their high cost and difficulties for integration with energy networks were first realized in 1980s. Until nowadays these two problems are not solved efficiently.

At the beginning of 1980s was provided that energy development required a common approach taking into account different possibilities of Member States for deployment of renewable energy. The key feature of Community energy strategy became security and stability of supply. The current energy and renewable energy strategy is based on common – wide European approaches and energy and renewable energy objectives.

The initial framework research and development programmes underlined the necessity to bring renewable energy technologies to the common market. And nowadays the commercialization of renewable energy technologies is one the priority actions for integrating renewable energy to the common energy market.

In the middle of 1980s the contribution of new and renewable energy sources was less than 2% of inland energy demand. According to Eurostat in 2014 renewable energy sources accounted for a 12.5% share of the gross inland energy consumption. This progress was not achieved just due to the technological and innovative achievement in renewable energy field. Although the basic characteristics of renewable energy policy were elaborated in 1980s there was no common strategy able to provide effective development of renewable energy sources. It was elaborated later by means of adopting indicative and legally binding targets for renewable energy sources, energy action plans, strategic energy technology plans, Directive 2001/77/EC and Renewable Energy Directive 2009/28/EC aimed at development of renewable energy in the medium and long – term perspective.

The renewable energy policy and its innovative aspect have become more predictable and detailed. The quantitative expectations concerning renewable energy has considerable increased and it plays the central role in decarbonization of industry and economy including in long – term prospective.

Even effective legal regulation and policy framework would not be able to guarantee creation of low – carbon energy and economy without relevant level of technological development. The third chapter of the thesis describes the major technological challenges renewable energy is facing today such as difficulties of its connection to the energy networks, necessity to develop smart grids that are able to integrate increasing amounts of renewable energy and its unified flows, and legal and administrative barriers hindering their development.

3. The European Union smart grid legal framework

Introduction to the third chapter

In the second paragraph is made a conclusion that energy technology and innovation strategy is an integral part of the European Union energy policy. Innovations are vital to achieve the 2020 energy and climate objectives and to ensure transition towards low – carbon economy. One of the most remarkable examples of innovation in renewable energy field is the smart grid.

Infrastructure is at the heart of the European energy policy, and its development and modernization is a prerequisite for achieving competitiveness, security of supply and sustainability[192].

The energy networks require significant changes because the architecture and management of energy distribution and transmission relies on a technology that is currently 120 years old[193].

At the beginning of the third chapter is provided the general overview of the changes that energy networks do require, further is described the energy network legal framework in the extent related to smart grid (intelligent network) because it is that kind of technology that allows future development of renewable energy.

The third chapter describes the definitions of smart grids given in renewable energy legal acts and legal means for their development and obstacles preventing successful updating of energy network.

A key point is whether it is possible to connect renewable energy sources with existing energy networks and what are the conditions for such connection. Renewable energy depends on weather conditions and geographical peculiarities and energy generated from renewable sources is not stable and there is a need to create networks that will pay into account the specificities of renewable energy.

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[192] Commission Staff Working Document. Implementation of TEN – E, EEPR and PCI Projects. Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions "Progress towards completing the Internal Energy Market" SWD(2014) 314 final.

[193] Commission Staff Working Document. Accompanying document to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions on mobilizing Information and Communication Technologies to facilitate the transition to an energy efficient, low carbon economy. Impact Assessment SEC(2009) 269.

Renewable energy sources are connected to energy grids that are not constructed for integration of such energy. The development of renewable energy sources is in many cases limited by inadequate development of transmission grids and lack of interconnections between Member States, between mainland and island regions and between islands. Removing these restrictions requires a twin – track approach: the development of the existing grid and its modernization, and modern management of the grid, consumers and producers of electric power connected to the grid. In addition, different storage technologies should be integrated when developing the grid, because they reduce the need for further grid capacity and can also make reserve power available. Generation of energy from renewable sources depends on external factors, such as wind or solar radiation levels. This limits the growth of the capacity of renewable energy installations. Improved renewable energy sources operation can be achieved by establishing renewable energy sources clusters using different technologies, such as: wind turbines, photovoltaic solar energy, biomass and biogas, geothermal energy and power storage technology through the use of intelligent grids[194].

The future electricity infrastructure will have to face three major challenges: the integration of national systems into a proper managed single European system; the massive integration of intermittent and non – dispatchable sources, like wind and combined heat and power; security of the system and its robustness to large scale cascading system problems (for instance to avoid or limit blackout)[195]. Solving these problems requires technological and economic challenges.

The networks need to become flexible, to integrate a variety of renewable energy sources, to ensure more decentralized power generation, and to incorporate smart energy demand technologies[196].

The task to modernize the power grid for integrating more distributed generation units and smart technologies for better demand management and absorbing large amounts of renewable energy generation, going beyond 2020, must become a top priority for the EU[197].

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[194] Opinion of the Committee of the Regions on "Renewable energy: a major player in the European energy market" (2013/C 62/11) [http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012AR2182&rid=499. Access: 25.05.2015].

[195] Commission Staff Working Document accompanying the legislative package on the internal market for electricity and gas. Impact assessment SEC(2007) 1179.

[196] Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the implementation of the trans – European energy networks in the period 2007 – 2009 pursuant to Article 17 of Regulation (EC) 680/2007 and Articles 9(2) and 15 of Decision 1364/2006/EC COM(2010)203 final.

[197] Green Paper "Towards a secure, sustainable and competitive European energy network" COM(2008)782 final.

Activities for the development of smart networks should be aimed at increasing the efficiency, safety and reliability of the European electricity systems and networks including by transforming the current electricity grids into an interactive (customers/operators) service network and removing obstacles to the large – scale deployment and effective integration of distributed and renewable energy sources[198].

Future development of internal energy market and energy security are impossible without an adequate energy network and infrastructure because energy transmission and distribution requires development of new energy networks and cross – border interconnections.

Today's grid was constructed to transmit electricity from large power plants to national retail distribution networks. Tomorrow's grid will take into account the climate change challenges and to serve as an integrated European market for multiple small suppliers of renewable energy (like wind farms or domestic electricity generation) and for larger power plants. Significant changes to the European electricity grid are required to accommodate decentralized generation. Concepts such as an offshore super – grid ring around Europe to connect southern solar, western wave and northern wind or hydro energy with the main consumption centers needs to be explored further[199].

"Traditionally, most European electricity markets and electricity grids have been constructed to ensure sufficient supplies of electricity to national end – users, although the idea of building cross – border transmission lines has existed for over fifty years. The internal market at its present stage of evolution is therefore characterized by a lack of interconnectors, that is, transmission lines linking electricity systems"[200].

The European Union 2020 and 2030 energy and climate targets cannot be achieved without a fully interconnected European energy network with more cross – border interconnections, storage potential and smart grids to manage consumer demand and ensure a secure energy supply in a network with higher shares of energy generated from renewable energy sources. A well – interconnected grid is crucial for sustainable development and decarbonizing the energy mix as it enables the grid to accommodate different renewable energy

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[198] Proposal for a decision of European Parliament and of the Council concerning the seventh framework program of the European Community for research, technological development and demonstration activities (2007 to 2013) COM (2005) 119 final.

[199] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Second Strategic Energy Review. An EU energy security and solidarity action plan" COM(2008) 781 final.

[200] p. 25, Investing in EU Energy Security. Exploring the Regulatory Approach to Tomorrow's Electricity Production. Henrik Bjørnebye. The Netherlands, Law & Business, Wolters Kluwer, 2010 – 456p.

sources in a more secure and cost – efficient way and allows more competitive prices in the internal marker. Electricity interconnections will improve the reliability of the electricity system, increase the quality of service and reduce power interruptions and productivity losses in the commercial and industrial sectors[201].

[201] European Union Package. Communication from the Commission to the European Parliament and the Council. "Achieving the 10% electricity interconnection target. Making Europe's electricity grid fit for 2020" COM(2015) 82 final.

3.1. Current legal regulation of smart grids

The original Trans – European Networks for Energy (TEN – E) were developed when the European Union was considerably smaller, and there was no need in creation of a large – scale network able to provide connection of increased amount of new sources of energy. The first TEN – E guidelines were adopted in 1996.

The European Council approved a new energy policy in 2007 the objectives of which are sustainability, competitiveness and security of supply. For achieving these objectives were adopted the 2020 strategy and the Third internal energy market legislative package and the Energy Security and Solidarity Action Plan.

The Energy Security and Solidarity Action Plan highlighted the importance of energy infrastructure for security of supply. The Plan proposed several priority infrastructure actions such as connection of isolated energy markets; Mediterranean energy ring linking Europe with Southern Mediterranean through electricity and gas interconnections; Blueprint for a North Sea offshore grid in order to interconnect national electricity girds in North – West Europe together and launch the numerous planned offshore wind projects.

In 2008 the Commission adopted a Green Paper "Towards a secure, sustainable and competitive European energy network" that provided that TEN – E challenges should be conducted in accordance with the 2020 energy and climate targets and should be incorporated into national infrastructure plans; ensure that the development of grid allows connecting of renewable energy; guarantee security of energy supply through assistance for key infrastructure projects.

The 2020 Strategy for Comprehensive, Sustainable and Secure Energy reinforced the necessity to change the way energy networks are constructed and operated, one of the initiatives is to launch new Europe – wide projects concerning smart grids linking the whole electricity grid system and electricity storage.

The Resource – efficient flagship initiative puts forward a new methodology of strategic planning to map out necessary infrastructure, to identify which one is of European interest on the basis of a clear and transparent methodology, to provide measures to speed up authorization procedures, and to improve cost efficiency.

Other European Union measures such as European Strategic Energy Technology Plan and Horizon 2020 research program promote development of innovative technologies including smart grids. Research, development and demonstration projects are developing through

European Industrial Initiatives on Electricity Grids, the European Innovation Partnership on Smart Cities and Communities, other projects.

The European industrial initiative on electricity grids is a priority of the Strategic Energy Technology Plan. Large – scale research and development projects proving the feasibility of smart grid technologies give the impetus to rapid deployment of flexible and secure energy systems. The European Strategic Energy Technology Plan promotes a technological platform for development and demonstration projects for new and innovative technologies, including for smart grids. The SET – Plan proposed the establishment of new joint strategic planning; more effective implementation; new and reinforced approach to international cooperation.

The European research and development framework and specific programmes describe measures and actions that should be taken for technical development of grids and infrastructure.

For example, the specific programme Intelligent Energy - Europe promoted development of energy grids and market implementation of new technologies and removal of non – technological barriers (financial, regulatory, and administrative).

Horizon 2020 framework programme suggests that activities for establishing a single, smart European electricity grid shall focus on research, development and full scale demonstration of new smart energy grid technologies, back – up and balancing technologies enabling higher flexibility and efficiency, including conventional power plants, flexible energy storage, systems and market designs to plan, monitor, control and safety operate interoperable networks, including standardization, in an open, decarbonized environmentally sustainable, climate – resilient and competitive market under normal and emergency conditions.

According to Horizon 2020 electricity networks have to respond to three interrelated challenges to enable a consumer – friendly and increasingly decarbonized electricity system: creating a pan – European market; integrating a massive increase of renewable energy sources; and managing interactions between millions of suppliers and customers (where increasingly households will be both), including owners of electrical vehicles. Future electricity networks will pay a key role for the transition to a decarbonized energy system, while providing additional flexibility and cost benefits to consumers. The goal by 2020 is to transmit and distribute about 35% of electricity from dispersed and concentrated renewable energy sources.

The Third energy package set out requirements for the installation of intelligent metering systems in at least 80% of householders by 2020. The Smart Grid Communication provides the overall policy framework to driver forward their deployment.

The Third internal energy market package requires that transmission operators strengthen their cooperation; establishes the European Network of Transmission System Operators for Electricity (ENTSO – E) that is empowered to elaborate network development plans.

Implementation of smart meters is a first step on the path to smart electricity grids. The introduction of advanced metering with two - way communication would allow major improvement of the grid management and reduction of transmission and distribution losses when transmitting or distributing the electricity[202].

Flexible coordinated electricity networks designed to new architectural schemes and embedding innovative technological solutions are important to address major energy challenges: mounting network congestions, increasing deployment of renewables and more efficient electricity generation units and diffusion of dispersed generation installations. In order to make the transmission and distribution grids work together efficiently and safety they need to be further developed in terms of carrying capacity and of advanced information and communication technologies and control platforms. Since building or upgrading conventional overhead lines to increase the transmission capacity is progressively more difficult, alternative technologies are either being deployed or are under development, for example HVDC (High Voltage Direct Current) systems, already mature for long distance and oversea transmission (also suitable for connecting offshore wind farms) that may contribute to regulation of the current flows through network[203].

Positive results of the technical and innovation process in intelligent networks and renewable energy field will not guarantee the achievements of 2020 energy goals and beyond without an adequate transparent legal regulation.

The most sensitive legal issue related to smart grids is whether the existing legal regulation is enough to provide their efficient development and functioning. The Third energy package provides general norms of the necessity to modernize the existing energy networks and does not fully consider the peculiarities of smart grids; does not establish a clear transparent cooperation mechanism between producers, consumers, transmission and distribution system operators, Member States and the European Union; the existing standards for installations, equipment, interoperability, cyber – security, energy – efficiency are insufficient for smart grid development.

[202] Commission Staff Working Paper. Annex to the Impact Assessment. Accompanying the document Directive on the European Parliament and of the Council on energy efficiency and amending and subsequently repealing Directives 2004/8/EC and 2006/32/EC SEC(2011) 779 final.

[203] Commission Staff Working Document. Accompanying document to the Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions. A European Strategic Energy Technology Plan (Set - Plan) – Technology Map SEC(2007)1510.

The Directive 2009/72/EC concerning common rules for the internal market in electricity[204] obliges the Member States to assess the roll – out of intelligent metering systems and provides general measures for better coordination of infrastructure planning, development, operation and roll – out of intelligent meters. The Member States should encourage the modernization of distribution networks, such as through the introduction of smart grids in such a way that facilitate decentralized energy generation and energy efficiency.

Directive 2009/28/EC on the promotion of the use of energy from renewable sources provides that the Member States shall take the appropriate steps to develop transmission and distribution grid infrastructure, intelligent networks in order to allow the secure operation of the electricity system as it accommodates the further development of renewable energy electricity, including interconnection between Member States and between Member States and third countries (Art. 16).

Both Directives do not contain a precise requirement but encouragement for the Member States for development of smart grids.

Regulation (EC) No 714/2009 on conditions for access to the networks for cross – border exchanges in electricity[205] does not contain provisions concerning smart grids and access to the network of renewable energy.

An Agency for the Cooperation of Energy Regulators was established in order to fill the regulatory gap at the European Union level and to contribute to guaranteeing the effective functioning of the internal market in electricity and gas[206]. Before the establishment of the Agency an independent advisory group on electricity and gas – the European Regulators Group for Electricity and Gas established by the Commission in 2003 was functioning. It was dissolved in 2011; it was aimed to facilitate consultation, coordination and cooperation between the regulatory bodies in the Member States, and between these bodies and the Commission with a view to consolidating the internal market and ensuring the application by all Member States the related legislation concerning common rules for the internal market in electricity and gas[207].

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[204] Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC.

[205] Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the networks for cross – border exchanges in electricity and repealing Regulation (EC) No 1228/2003.

[206] Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009 establishing an Agency for the Cooperation of Energy Regulators.

[207] Commission Decision of 16 May 2011 on repealing Decision 2003/796/EC on establishing the European Regulators Groups for Electricity and Gas.

The Agency for the Cooperation of Energy Regulators in close cooperation with the Commission, the Member States and relevant national authorities monitors the state of the internal electricity market, in particular access to network including access of renewable energy electricity.

The Regulation (EC) No 714/2009 and the Regulation (EC) No 713/2009 did not contain measures for smart grid development. But the Agency for the Cooperation of Energy Regulators participates in the elaboration of technical codes and, thus, in some extend participate in regulation of smart grids; and together with the European Networks of Transmission System Operators ensures collaboration and transparency in network planning, operation, research and innovation.

The Regulation (EC) No 714/2009 and the Regulation (EC) No 713/2009 were repealed by the Regulation No 347/ 2013 on guidelines for Trans – European energy infrastructure.[208] The Regulation No 347/ 2013 defines a 'smart grid' as an electricity network that can integrate in a cost efficient manner the behavior and actions of all users connected to it, including generators, consumers and those that both generate and consume, in order to ensure an economically efficient and sustainable power system with low losses and high levels of quality, security of supply and safety.

Further, the paragraph 3.2. gives more detailed definitions of smart grids that are suggested in renewable energy legal framework, describes smart grids participants and benefits of smart grids.

[208] Regulation (EU) No 347/2013 of the European Parliament and of the Council of 13.04.2013 on guidelines for trans – European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009.

3.2. Legal genesis of smart grids

There were several smart grids European Union initiatives starting since 2005.

In 2005 the Commission launched the European Technology Platform for Smart Grids aimed at creation of a joint European Union vision and research agenda for smart grids. The European Electricity Grids Initiative was established under the Strategic Energy Technology Plan to accelerate the deployment of smart grids technologies in the view of the 2020 targets[209].

The concept of smart grids was developed in 2006 by the European Technology Platform for Smart Grids. It concerns an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both - in order to efficiently deliver sustainable, economic and secure electricity supplies.

European electricity grid initiative launched in 2008 was focused on the development of intelligent electricity grid, including energy storage, and on the creation of a European Centre for implementing research program for the European transmission network.

Task Force for the implementation of smart grids was launched in November 2009; its role is to advise on policy and regulatory directions at the European level and to coordinate the first steps towards the implementation of smart grids under the provisions of the Third energy package[210].

The definition of smart grids was constantly developed within the energy and renewable energy legal framework (mainly in soft law provisions). Below are provided the definitions.

Smart grids should provide integration of renewable energy sources on a far greater scale than is possible today with positive impacts for energy security and environment, guarantee management of the consumption[211].

Smart grid is an upgraded electricity network to which two – way digital communication between supplier and consumer, intelligent metering and monitoring systems have been added. Intelligent metering is usually an inherent part of smart grids[212].

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[209] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Smart Grids: form innovation to deployment" COM(2011) 202 final.

[210] Communication from the Commission to the Council and the European Parliament "Report on progress in creating the internal gas and electricity market" COM(2010) 84 final.

[211] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "On mobilizing Information and Communication Technologies to facilitate the transition to an energy – efficient low – carbon economy" COM(2009)111 final.

smart grid is an electricity network that can cost efficiently integrate the behavior and actions of all users connected to it – generators, consumers and those that do both – in order to ensure economically efficient, sustainable power system with low losses and high levels of quality and security of supply and safety. Smart grid employs innovative products and services together with intelligent monitoring, control, communication, and self – healing technologies[213].

Smart grids support the development of electricity markets, enabling the unbundling of the operators, providing more capable cross – border links, and supporting the involvement of all the stakeholders, down to the consumer/prosumer level[214].

Smart grid is a set of electronic meters, software and other tools which, once connected through the internet or into a network allows power to be provided and shared more efficiently, reducing the need for peak capacity, and allowing two – way real communication with the customers[215].

A smart grid service is "the outcome a user needs or will need from the electricity grid in a fully developed liberalized market; it is associated to one provider and to a number of primary beneficiaries, recognizing that the benefits will ultimately be reflected in consumer societal and environmental terms. The achievement of service outcomes is possible only through smart grid functionalities, which represent elementary bricks through which services can be implemented and delivered to beneficiaries"[216].

Smart Grids participants are:

network operators (transmission and distribution system and network operators);

grid users (generators, consumers including mobile consumers, storage owners);

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[212]Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Smart Grids: form innovation to deployment" COM(2011) 202 final.

[213]Commission Staff Working Document "Definition, expected services, functionalities and benefits of smart grids" SEC(2011) 463 final.

[214] Commission Staff Working Document. Technology Assessment Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Energy Technologies and Innovations" SWD(2013) 158 final.

[215] Commission Staff Working Document. Accompanying document to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions on mobilizing Information and Communication Technologies to facilitate the transition to an energy efficient, low carbon economy. Impact Assessment SEC(2009) 269 final.

[216]Commission Staff Working Document "Definition, expected services, functionalities and benefits of smart grids" SEC(2011) 463 final.

other actors (suppliers, metering operators, applications and services providers, power exchange platform operators, etc.).

In the most Member States, distribution system operators combine several roles, including network and metering operators (data collection), application and services providers (data clearing). Network operators (distribution and transmission system operators) are prime movers for the deployment of smart grids and they should implement the network infrastructure that has a central role which allows the flows of both energy and information between consumers, generators, suppliers and all the other smart grid participants, some of them provide services, based on a combination of functionalities to other smart grid participants[217].

One of the functions of transmission and distributions system operators is that they shall provide "any new producer of electricity produced from high – efficiency cogeneration wishing to be connected to the system with the comprehensive and necessary information required, including: a reasonable and precise timetable for receiving and processing the request for grid connection; a reasonable indicative timetable for any proposed grid connection"[218].

The benefits of smart grids are the following, they:

enable the integration of vast amounts of onshore and offshore renewable energy and electric vehicles while maintaining availability for conventional power generation system;

reduce the annual primary energy consumption of the energy sector;

can manage direct interaction and communication among consumers, other grid users and energy suppliers and provide possibilities for consumers to direct control of their individual consumption patterns;

promote economic growth and create new jobs;

will be the backbone of the future decarbonized power system and reducing CO_2 – emissions;

give an opportunity to increase future competitiveness and guarantee leadership of the European technology;

[217] Commission Staff Working Document "Definition, expected services, functionalities and benefits of smart grids" SEC(2011) 463 final.

[218]Commission's proposal for a Directive of the European Parliament and the Council on energy efficiency and repealing Directives 2004/8/EC and 2006/32/EC COM (2011) 370 final.

provide a platform for traditional energy companies or new market entrants such as information and communication technologies companies to develop new, innovative energy services while taking due account of data protection and cyber – security challenges[219];

allow consumers to save energy [220].

Technological progress creates opportunities for intensive development of renewable energy sources and smart grids and lead to more effective interconnection of the European energy networks making inter – regional and cross – border electricity interconnection suitable for renewable energy connection. Intelligent energy infrastructure and grids compatible with environment requirements will help to achieve energy and climate policy goals of the European Union and will be an essential component of energy market.

Development of smart grids is closely connected with a range of other policies and fields such as environmental protection, industrial policy, transport, strategy for micro- and nanoelectronic systems, energy efficiency technologies, standardization, etc. Below are provided some examples but more detailed focus would be made on standardization and energy efficiency.

In accordance with Art.17 of the Regulation establishing the Connecting Europe Facility the Commission shall adopt multiannual and annual work programs for the transport, telecommunications and energy sectors. Work programs shall be coordinated in such a way as to exploit the synergies between transport, energy and telecommunications in particular in such areas as smart grids[221].

Smart grids offer wide opportunities for development of present and future energy infrastructure and require development of various technologies; being an essential part of integral process of industrial policy it is especially important to set cooperation with highly technological fields such as micro- and nanoelectronics that are used in smart meters and grids to lower energy consumption. Smart grids as a part of energy policy should be connected with

[219] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Smart Grids: form innovation to deployment" COM(2011) 202 final.

[220] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Energy Efficiency Plan 2011" COM(2011) 109 final.

[221] Regulation (EU) No 1316/2013 of the European Parliament and the Council of 11 December 2013 establishing the Connecting Europe Facility, amending Regulation (EU) No 913/2010 and repealing Regulations (EC) No 680/2007 and (EC) No 67/2010.

industrial policy including with the strategy for micro- and nanoelctronic components and systems[222].

Development of renewable energy sources and future energy infrastructure and smart grids is impossible without taking into account climate challenges[223]. The difficulties of creating modern networks are to adapt them to the global climate changes and at the same time create techniques and installments able to reduce greenhouse gas emissions; more cross - border electricity interconnections can alleviate environmental impact and increase the shares of alternative energy in the networks, and thus to give incentive to development of research and innovation and growth of renewable energy industry.

The 2020 climate and energy targets are interdependent. Active usage of renewable energy sources and energy efficiency by means of smart grid is an essential element for low - carbon electricity system and can contribute to decarbonisation of supply. Smart grid activities are focus on research, development and demonstration of new environmentally friendly technologies, flexible energy storage, technologies and mechanisms to plan, monitor, control and safety manage smart grids under normal and emergency conditions providing environmental protection and increasing energy efficiency.

Effective application of information and communication technologies allow to increase the share of renewable energy in the grid, reduce energy consumption, and improve the management and control of electricity grids.

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[222]Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A European Strategy for Micro- and Nanoelectronic Components and Systems" COM(2013) 298 final.

[223]Impacts on climate change, such as increased frequency of extreme weather events or changing water and air temperatures have effects on energy transmission, distribution, generation and demand. Recent studies suggest important impacts of climate change on the energy sector and underpin the need for adaptation, notably in electricity sector. The transmission and distribution grids are increasingly challenged by new seasonal and regional demand patterns as well as direct physical effect of extreme weather events (storms or floods). They are also subject to new balancing requirements arising from the integration of significant volumes of renewable energy electricity (typically sparsely distributed) [Commission Staff Working Document. Adapting infrastructure to climate change. Accompanying the document Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions "An EU Strategy on adaptation to climate change" SWD(2013) 137 final].

Smart grid standardization

Standardization plays an important role in supporting Europe 2020 Strategy for smart, sustainable and inclusive growth, in creation of resource – efficient decarbonized economy and resistance to global climate change by means of innovation and industrial policies.

Creation of the common European grid is possible if its construction and exploitation is based on common rules and standards. There are certain prerequisites of adoption of a European Grid Code that will provide harmonized conditions for grid access, legal regulation for cross – border energy transmission. The European Union and Member states together with the European and international standardization bodies should elaborate technical and safety standards for smart meters and smart grids; the standards should correspond to international standards in order to guarantee their interoperability and improve cross – border interconnection and their cost – effectiveness.

It is essential to set up the right framework conditions for industry to develop the technologies and production capacities. In parallel, the European Union must deliver the standards for ensuring the interoperability of smart grids across borders, a common minimum set of standards for meters and advanced metering infrastructures.

In 2011 the Commission issued a mandate M/490 to European standardization bodies to develop a first set of Smart Grid standards by the end of 2012 to develop standards facilitating the implementation of high – level smart grid services and functionalities. Under mandate M/490 (for 2013 - 2014) work focuses on development of a second set of standards. The Smart Grids Task Force established by the Commission in 2009, approved mandate M/490 to support European Smart Grid deployment for 2013 – 2014 to address two main topics: system interoperability testing methods and a conformance testing map. The European Electricity Grid Initiative which was set up under the Strategic Energy Technology Plan in 2009, compiled in 2010 an innovation roadmap describing smart grids innovation needs, including smart metering aspects, to achieve the 2020 energy targets. This roadmap was updated in 2013. Under smart grid mandate M/490 further standards are developed in the course of 2013 – 2014 on key issues such as demand response, conformance testing and interoperability[224].

Smart grid standardization and interoperability should be a priority: “open standards and data interoperability are priorities in various Commission policies. To help create a climate of

[224] Commission Staff Working Document. Cost – benefit analysis & state of play of smart metering deployment in the EU – 27. Accompanying the document Report from the Commission “Benchmarking smart metering deployment in the EU – 27 with a focus on electricity” SWD(2014) 189 final.

open data exchange, the Commission supports the mapping of existing relevant standards for a number of big data areas including smart grids"[225].

Besides the European standardization bodies transmission and distributions system operators, some of smart grids participants shall be empowered to adopt public standard rules relating to bearing and sharing costs of technical adaptations, such as grid connections, improved operation of the grid and rules on the non – discriminatory implementation of grid codes; and provide standardized and simplified procedures for the connection of distributed high efficiency cogeneration producers to facilitate their connection to the grid. The standard rules shall be based on objective, transparent and non – discriminatory criteria taking particular account of all the costs and benefits associated with the connection of those producers to the grid[226].

Smart grid should be developed and constructed in accordance with the European Union safety and health – related requirements and standards that would enhance interoperability between the Member States and regions, provide stability of smart grid, and promote smart grids research and innovation.

Energy efficiency and smart grids

Technology development of intelligent networks and infrastructure should take into consideration energy efficiency elements. The European Union has set the 20% energy efficiency target to be achieved by 2020.

The internal energy market package provides the tasks of distribution and transmission system operators to carry out their responsibilities with due regard to energy efficiency requirements. The Member States as well must ensure that national regulatory authorities pay due regard to energy efficiency in their decisions on the operation of electricity infrastructure (Art. 15 of the Directive on energy efficiency)[227]. The Member States, national regulatory authorities and network operators should fulfill the requirements of network codes that are

[225] Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions "Towards a thriving data – driven economy" COM (2014) 442 final.

[226] Commission's proposal for a Directive of the European Parliament and the Council on energy efficiency and repealing Directives 2004/8/EC and 2006/32/EC COM (2011) 370 final.

[227] 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.

developed to implement the internal energy market legislation and those on system operation, demand connection and balancing[228].

According to the Directive concerning common rules for the internal market in electricity undertakings are strongly recommended to optimize the use of electricity, for example by providing energy management services, introducing intelligent metering systems or smart grids, where appropriate. Such encouragement of modernization of distribution networks, including through the introduction of smart grids, is reinforced by the general objectives and the duties of national regulatory authorities which are responsible to promote internal electricity market.

The description of standardization of smart grids and energy efficiency legal provisions are provided in order to reflect the idea that smart grid is an integrative legal concept embracing legal norms from different areas not directly related to renewable energy regulation. In spite of this complexity of legal regulation of smart grids there are some legal gaps in their development. The next paragraph describes the obstacles for smart grids regulation.

[228] Commission Staff Working Document. Guidance note on Directive 2012/27/EU on energy efficiency, amending Directives 2009/125/EC and 2010/30/EC, and repealing Directives 2004/8/EC and 2006/32/EC. Article 15: Energy transformation, transmission and distribution. Accompanying the document Communication from the Commission to the European Parliament and the Council "Implementing the Energy Efficiency Directive – Commission Guidance" SWD(2013) 450 final.

3.3. Obstacles in smart grid development and legal regulation

There are certain risks complicating development and exploitation of smart grids and influencing security of energy supply and security of the grid itself. The most significant risks are natural risks (earthquakes and floods), environmental risks (pollution and habitat and biodiversity loss); operational risks (congestion and discontinuity of supply) and anthropogenic or political risks (safety risks and terrorism). In order to prevent all possible risks Member States are suggested to draw up a risk map as a tool for decision making and monitoring the results of smart grid implementation. The Commission estimates the possibility of including in the energy infrastructure priorities projects the provisions concerning safety and security of major energy infrastructures and grids against accidents and natural or human – induced disasters[229].

The obstacles for smart grids development are typical for renewable energy technologies. They are technical, financial, regulatory and administrative obstacles.

One of the problems is a low level of technical coordination. There is no clarity enough on how to integrate the smart grid systems and to enrich them with cost and energy effective technologies.

The other barrier preventing the development of smart grids is insufficiency of legal regulation. Regulation and standardization concerning smart grids is not harmonized, some national technical standards are incompatible with each other. It is necessary to adopt standard rules, guidelines and security standards that would facilitate the evolution from present numerous isolated national energy networks to a common European intelligent network.

When several countries are involved in infrastructure and network development projects lack of the harmonized planning and authorization cause additional difficulties. Improvement of management regulation can facilitate cross – border trade. Even if legal procedures are generally comparable in the most Member States, the main phases (overall planning application process) are implemented through different procedures especially when different networks need to be integrated, and various authorities are involved, or consultation periods and authorization procedures are very lengthy.

Non – discriminatory network access and equally effective level of regulatory supervision in each Member State do not yet exist[230].

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[229] European Parliament resolution of 5 July 2011 on energy infrastructure priorities for 2020 and beyond (2011/2034 (INI)) (2013/C 33 E/06).

[230] Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC.

Other obstacles that should be removed are of administrative character. They are the following:

time – consuming legal and licensing procedures that constitute significant difficulties for energy transmission projects, fragmentation of procedures, strong opposition from local and regional communities, unjustified use of veto powers, and large number of entities responsible for granting permits;

planning and administrative authorization procedures are common source of delays of energy projects due to differences in local and national planning ruling[231]. One example is the authorization procedures for installation of undersea cables dealing with maritime legal regimes[232];

some transmission system operators are slow to increase their cross – border capacity.

The common approaches should include common rules on cross – board transmission of energy, access to smart grids, grid connection rules, data protection.

The ways to remove technical, administrative and regulatory obstacles can be found in the creation of similar conditions for development and exploitation of smart grids in the Member States because significant differences between national energy networks can prevent the connection of renewable energy to the grid, the achievement of balance of production and consumption of renewable energy and management and control over this process due to innovative cost and time effective mechanisms.

The European Union's ten – years network development plans to integrate electricity (and gas) networks and Regional Initiatives play an important role to streamline and optimize permitting and granting procedures and to remove regional regulatory barriers. The network development plans serve as a technological platform for energy network development for the achievement of the 2020 climate and energy targets and for removing energy islands. The Commission encourages and promotes coordinated actions for development of smart grids at the European and regional level by means of the Regional Initiatives and its involvement in ENTSO–E.

Increasing cooperation between regions on national and European levels will promote implementation of energy infrastructure projects especially dealing with elaboration of smart energy efficient interconnectors of conventional and renewable energy and facilitate grid planning and management, elimination of energy islands, and well - functioning energy market.

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[231] Green Paper "Towards a secure, sustainable and competitive European energy network" COM(2008)782 final.

[232] For example, Fennoscan undersea cable linking Finland and Sweden, where authorization procedures deal with water rights [Communication from the Commission to the Council and the European Parliament "Priority Interconnection Plan" COM(2006) 846 final].

The Member States shall cooperate with each other for achieving 2020 energy targets, integrate their national markets at one or more regional levels. In order to complete the creation of a fully liberalized internal energy market the Member States shall promote and facilitate the cooperation of transmission system operators at a regional level including on cross-border issues and taking into account regional differences; stimulate the consistency of their legal, regulatory and technical framework and facilitate integration of the isolated energy systems (electricity islands).

Projects of European Interest can contribute to the removal of smart grids obstacles especially in the fields of development of offshore wind energy and ocean renewable energy and in remote areas of the European Union. Projects of European interest can also contribute to achievement of the energy and climate targets if integrating renewable energy to the smart grid and promoting the creation of a pan - European grid with joint mechanisms to plan, manage, operate and control it at all levels. It will optimize energy demand and supply.

The Commission may designate Coordinators for projects of Community interest in order to promote the European dimension of a project and initiate a dialog between public and private sector, regional and national authorities and local population. The Coordinator helps to coordinate the national procedures including environmental ones[233].

The Regulation on guidelines for Trans – European energy infrastructure establishes general conditions for energy infrastructure projects necessary for creating the internal energy market, providing the conditions for every Member State to be a part of the European grid and regulating competence of European Coordinators and their term of duty (for a twice renewable period of up to one year) (Art. 6)[234].

Below are given some examples of participation of European Coordinators in the networks projects:

project for electricity interconnection between France and Spain. In September 2007 a special coordinator was appointed to help to mediate between the interested parties. This project was a priority interconnection for France and Spain and the European Union as a whole. The coordinator succeeded in negotiating a compromise solution taking into account local

[233] Communication from the Commission to the Council and the European Parliament "Priority Interconnection Plan" COM(2006) 846 final.

[234] Regulation (EU) No 347/2013 of the European Parliament and of the Council of 13.04.2013 on guidelines for trans – European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009.

population's requests, fulfilling the requirements of security of supply and environmental protection[235];

priority project for development of the offshore wind network. The European coordinator was appointed to control the progress on the development of grid connections between wind turbines in the North and Baltic Seas and the onshore grid. The experience of the Coordinator revealed that the development of the offshore grid to connect the wind farms with the onshore gird will increase energy trade and provide energy balance. It can only be done if involving all the Member States concerned, transmission system operators, regulatory authorities and other stakeholders including NGO's. In July 2008 the coordinator launched a working group uniting all of them in order to steer the multinational process[236].

Development of offshore renewable energy and its connection with the grid is one of the priority projects. Offshore wind and ocean renewable energy are examples of renewable energy sources the exploitation of which can significantly contribute to the achievement of energy and climate objectives but the absence of an intelligent grid stops their development. The offshore renewable energy will help in development of an effective island electricity market through a network connected throughout the European Union, and will guarantee stable energy supply. It is important to connect different types of renewable energy generated from different sources – wind, ocean to the grid.

The obstacles and difficulties of energy development and generation on the islands are caused by their geographical isolation, the distance remoteness of energy market, low possibilities for diversification of energy supply, dependence on import energy, and obstacles in transportation and transmission of energy from the continent.

All these reasons give an impulse to the development of island alternative energy sources especially solar, ocean and wind and ways for its transmitting in particular smart grids. It would be possible to combine different renewable technologies in the regions with new methods of managing power generation and transmission capacity through the application of smart grid technologies[237]. For this, islands should be granted special benefits in order to reduce their energy dependency either by developing their potential in alternative energy or by promoting energy efficiency and flexible energy saving.

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[235] Green Paper "Towards a secure, sustainable and competitive European energy network" COM(2008)782 final.

[236] ibid

[237] Opinion of the Committee of the Regions on "Renewable energy: a major player in the European energy market" (2013/C 62/11).

Besides the geographical and technical barriers for connecting offshore and ocean energy with the grid there are financial and administrative barriers. Many of the projects are uncertain because of high cost of grid connection. Power stations generating ocean or offshore wind energy are often located in low population and remote regions where network connection is limited. Because of geographical constraints grid connections may not be planned in the areas where they are likely to be needed.

The development of offshore renewable energy will not be complete without creation of the offshore grid infrastructure. The authorization procedures of infrastructure projects are frequently fragmented even in the same country. When a project crosses the territory of different Member States, this can complicate the overall process and increase the realization of the project. The insufficient integration of electricity markets and connection regimes and national support schemes to offshore renewable energy generation and the absence of market rules adapted to electricity systems based on variable renewable energy sources can impede the development of offshore projects and of European offshore grid[238].

Another infrastructural challenge relates to the availability of suitable port services and specialized vessels that are required for transportation, installation and repair of devices, installation of underwater cables and connectors, and operational and maintenance services. Europe has a number of ports that are already being used for offshore marine energy installations in the Irish Sea and North Sea, while some others are being remodeled to service the offshore marine energy industry.

Ocean renewable energy is one of the five pillars of the Blue Growth Strategy. The active exploitation of ocean renewable energy grants not only the possibilities to strengthen smart grid interconnection but also plays a significant role in promotion of innovation and research, and development of smart technologies. The offshore wind and ocean renewable energy will help in development of an effective competitive energy market through a grid connected throughout the European Union, and will guarantee stability and security of energy supply.

Planning offshore wind and ocean energy development and necessary grid infrastructure requires close coordination between Member States, national regulatory authorities, transmission system operators and the European Commission. Maritime spatial planning and definition of offshore wind and ocean energy development zones can enhance development and facilitate investments in this sector.

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[238] Communication from the Commission "Energy infrastructures priorities for 2020 and beyond – A Blueprint for an integrated European energy network" COM(2010) 677/4.

Countries participating in offshore wind energy development and exploitation face the necessity to elaborate a cooperation mechanism, whether it would be a regional cooperation based on national, regional or European rules. The countries concerned will have to remove certain barriers and differences in national regulation of new offshore wind energy sources and grids and found out common approaches to offshore wind energy generation and transmission.

New grid infrastructure installations require significant amount of space, including in cross – border areas. There are significant benefits to be expected from the common approach to, and enhanced cross – border coordination on, maritime spatial planning[239].

New energy infrastructure and interconnectors should be installed and exploited in accordance with the European Union standards and should guarantee the high level of security including physical security of offshore wind energy infrastructure and grids. It is necessary to provide an increase in grid capacity in order to allow the incorporation of new generated offshore wind and ocean renewable energy.

Future development of ocean and offshore wind renewable energy will be stopped without their connection to the grid including onshore grid and decrease amount of investment to the field highly dependent on them. Smart grids on the islands and remote areas are also necessary for territorial and social cohesion. The future development of smart grids requires a definite legal framework. Work programs and actions plans should be implemented in order to provide connection between renewable energy, information and communication technologies, and transport that will lead to a stable development of smart grids in remote territories with physical constraints.

The Communication on Energy infrastructure priorities for 2020 and beyond – a blueprint for an integrated European energy network and Regulation on Guidelines for Trans – European energy infrastructures identify strategic geographic infrastructure priority corridors in electricity field and the European Union infrastructure priority areas including for smart grids, the implementation of which is the common priority. The first set of Projects of Common Interest is an important step towards the better integration of Member States' networks and

[239] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Maritime Spatial Planning in the EU – achievements and future development" COM (2010) 771 final.

guaranteeing that no energy islands remain and offering alternatives to Member States dependent on a single source of energy supply[240].

One of the Infrastructure Priority corridors and areas in the field of energy is Northern Seas offshore grid that is aimed at development of an integrated offshore electricity grid in the North Sea, the Baltic Sea and neighboring waters to transport electricity from renewable offshore energy sources to centers of consumption and storage and to increase cross – border electricity exchange; Member States concerned are Belgium, Denmark, France, Germany, Ireland, Luxemburg, the Netherlands, Sweden, and the United Kingdom.

One of the Priority areas with all Member States concerned is smart grid development with the objective to accelerate the adoption of smart grid technologies across the European Union[241].

One of the major European initiatives on smart grids is to link the whole electricity grid system from the offshore wind farms in the North Sea, solar plants in the South and existing hydro – electric dams to individual householders, while making power networks more intelligent, efficient and reliable[242].

The European Union can prompt energy projects by granting them a status of "project of European interest" and financing some of them. The selection of projects of European interests should be conducted on the basis of objective and transparent criteria and with the involvement of all stakeholders. In order to decide whether the project should have "priority", the following criteria are taken into account. The project must have a European dimension (clear public interest); its necessity must be technically grounded; it must be compatible with climate and energy efficiency objectives; be consistent with long – term energy policy (allowing flexible and multifunctional application and avoiding lock – in effects); it must offer a good cost-benefit ratio and cost efficiency[243].

Projects of Common Interest are part of the European Union law. Their monitoring will ensure that the projects are implemented in due time and that no delays will occur that

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[240] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions "Long term infrastructure vision for Europe and beyond" COM(2013) 711 final.

[241] Proposal for a Regulation of the European Parliament and of the Council establishing the Connecting Europe Facility COM(2011) 665 final/2 2011/0302 (COD).

[242] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Energy 2020: A Strategy for competitive, sustainable and secure energy" COM(2010)639 final.

[243] European Parliament resolution of 5 July 2011 on energy infrastructure priorities for 2020 and beyond (2011/2034 (INI)) (2013/C 33 E/06).

undermine the achievement of the common energy objectives. The European Commission and ACER (Agency for the Cooperation of Energy Regulators) closely monitor the process[244].

The role of the Commission in coordination of projects of common interest is very high especially for controlling whether the projects are terminated in due time. This coordination should take into account territorial and physical peculiarities of Member States concerned and promote the necessary information exchange and joint mechanisms for solving problems.

The European priority projects can be included into national strategic plans and to future priorities of regulators and transmission system operators. Member States should act within the agreed time schedule. Uniform procedures and criteria will assist the completion of strategic cross – border projects. In the absence of a specific European Union competence, a reflection is needed on how the European Union can help to simplify planning procedures in the case of major cross – border energy projects. The solution can be found in exchange of information and best practice among Member States[245].

[244] Commission Staff Working Document. Implementation of TEN – E, EEPR and PCI Projects. Accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of Regions "Progress towards completing the Internal Energy Market" SWD(2014) 314 final.

[245] Green Paper "Towards a secure, sustainable and competitive European energy network" COM(2008)782 final.

Conclusion to the third chapter

The description of smart grids provided in the third chapter is a good example of how the renewable energy legal framework looks like. It is very technical and fragmented.

Energy field is changing due to the increasing energy demands and technological progress. In spite of the appeal to energy efficiency and reduction of energy consumption it is expected to growth. The increasing amount of generated energy will require new means for its transportation, transmission and distribution including on long distances especially when the energy is generated in remote and isolated areas. Adequate modern energy networks should be compatible with the future long – term European Union's challenges dealing with the removal of energy islands and development of electricity interconnectors.

The European Union has already set target of at least 27% for the share of renewable energy consumed in 2030.

In May 2014 the Commission proposed to extend the current 10% electricity interconnection target by 2020 to 15% by 2030 while taking into account the cost aspects and the potential of commercial exchanges in the relevant regions. For achieving this target the Commission will use regional cooperation structures paying attention to regional differences and geographic peculiarities especially of energy islands[246].

In 2015 the Commission adopted the Energy Union package that proposes mechanisms for an effective smart grids regulatory framework. The Energy Union package provides the adoption of network codes in order to facilitate harmonization of flow of electricity across different transmission systems as provided by the Third energy package in order to ensure a better functioning of cross – border energy markets. There is a need to expand the possibilities for distributed generation and demand – side management, to develop new high – voltage long – distance connections (super grids) and new storage technologies for development of synergies between the Energy Union and Digital Single Market agenda and to take measures to ensure privacy protection and cyber – security.

The Roadmap for moving to a competitive low carbon economy in 2050 proposes that low carbon technologies should meet nearly 100% of electricity supply by 2050 and identifies the smart grids as a key enabler for a future low – carbon electricity system.

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[246] European Union Package. Communication from the Commission to the European Parliament and the Council "Achieving the 10% electricity interconnection target. Making Europe's electricity grid fit for 2020" COM(2015) 82 final.

These far reaching goals mean that a strategy for research and innovation will remain at the very heart of the European Union especially if the Union holds the leadership position in renewable energy.

Without adequate modern grid development of renewable energy sources will be cut down.

It is urgent to upgrade the European energy network and to deploy smart energy grids in order to improve the efficiency and flexibility of the grids that should correspond to following energy challenges: creation of common energy market; development of a decarbonized energy efficiency electricity system capable to integrate a great share of renewable energy sources the amount of which will increase by 2020 and beyond including consumer own – generated power; granting cost benefits to energy producers and consumers and allowing them to benefit from new technologies and to control their energy consumption through smart metering and monitoring systems in real time; increasing energy storage potential for improving the balance of energy supply and demand that would lead to a positive economic effect.

The obstacles for creation of smart grids and future power grid technologies have technical, financial, regulation and administrative character.

Fragmented regional cooperation based on local or national norms appeared to be rather ineffective when removing administrative barriers and besides national administrative and authorization procedures are time – consuming. Without relevant and appropriated measures taken by the European Union in order to simplify administrative procedures and to reduce planning and construction time especially for the priority European projects it would be impossible to solve this problem. The Commission can submit practical proposals to simplify and speed up administration procedures for priority infrastructure projects and to promote cooperation between the European Union and energy grid operators in order to improve cross – border grid connections in so far as development of smart grids is impossible without close collaboration between transmission and distribution system operators, promotion of data exchange between them, and transparency of smart grid planning.

It is necessary to promote technical harmonization of the European networks but in parallel with technological and innovation development should run legal one.

An effective legal mechanism and long – term and harmonized regulatory environment for smart grid development should be created at the European Union level. Any harmonization should be properly prepared in order to avoid disruption of existing national markets[247].

[247] European Parliament resolution of 25 November 2010 " Towards a new Energy Strategy for Europe 2011 – 2020" (2010/2108 (INI)) (2012/C 99 E/14).

The Commission will promote smart grid and smart meters development and incentives including by setting common standards and monitor the Member States' progress in development of smart grids and meters. Member States should apply common minimum standards, in particular grid connection standards in order to fulfill the necessary requirements within the energy market taking into account consumer and data protection, requirements on privacy, security of supply, environmental protection, and safety requirements.

The development of an internal energy market requires full implementation of the legislative framework by all Member States and integrated energy networks that will promote competition and reduce energy costs for European companies[248].

The European Union is making its policy more innovative in order to meet the 2020 energy and climate targets. The implementation of grid codes should become part of this innovative regulation. Smart grids and infrastructure development will allow producers, new micro – producers, consumers and grid operators to communicate in real time and to ensure optimal matching of demand and supply. Future promotion of smart grids development requires technical standards; data protection for consumers; regulatory framework to provide incentives for smart grid deployment; and support to innovation and technology research.

Legal regulation will create a favourable investment environment that is necessary to modernize energy grids and infrastructure, connect energy islands, and create conditions to renewable – based decarbonized economy.

Smart grids development can best be achieved when planned from the European perspective; any energy strategy should be aimed at completion of common energy market and guaranteeing security of supply.

New electricity grids should become smart systems with flexible and controlled energy flows based on modern information technologies. Smart interconnected electricity grid using information and communication technologies is an essential element for achieving 2020 energy targets and they should play an essential role in promotion of innovation and research. It is necessary to advance research activities in order to establish a sustainable energy system based on innovative information and communication technologies, and, thus, improve the quality of supply, integrate electricity generated from renewable energy into the grid, provide transparency in the calculation of the grid transmission capacity.

[248] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "For a European Industrial Renaissance" COM(2014) 14 final.

4. Future development of renewable energy sources in the European Union

Introduction to the fourth chapter

The fourth chapter of the thesis presents the analysis of the current renewable energy regulation, mainly the mechanisms provided by the Renewable Energy Directive 2009/28/EC for achievement of 2020 renewable energy targets. As far as nowadays the Renewable Energy Directive is the main legal instrument for renewable energy development in the European Union the main issue discussed in the paragraph is whether the mechanisms provided by the Directive 2009/28/EC are sufficient for achieving 2020 and future energy targets or whether for their achievement is necessary to revise the existing renewable energy legal regulation. The chapter describes only instruments ensuring the future development of renewable energy sources that were defined on the basis of the positive results achieved by the implementation of the Renewable Energy Directive and the instruments that are obligatory for renewable energy development.

The Renewable Energy Directive endorsed a mandatory target of a 20% share of energy from renewable energy sources in overall European energy consumption by 2020 and mandatory national targets consistent with a 20% share of energy from renewable sources in the European Union energy consumption by 2020.

2020 is only an intermediate step towards a competitive low carbon economy and security of energy supply and there are some expectation about future development of renewable energy and reduction of greenhouse gas emissions in 2030 and 2050 in the European Union.

In October 2014 the European Council agreed on the 2030 climate and energy policy framework and endorsed a binding target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990; the target of an at least 27% renewable energy share in the European Union consumption; and at least 27% improvement in energy efficiency. The renewable energy target will be binding at the European Union level and will be fulfilled through Member States contributions to achieve it collectively. The target will not be translated into nationally binding targets[249].

Setting such kind of targets inevitably raises questions about their interplay, binding or non – binding nature, level of implementation, and economic sectors to which the targets could

[249] European Council Conclusions on 2030 Climate and Energy Policy Framework SN 79/14.

be addressed. Taking into account the maturity of renewable energy technologies the targets can be technologically neutral or specified.

As far as the 2030 renewable energy target has been set it raise several questions about how to find a balance between concrete European measures and Member States' autonomy to meet the target in a way which is most appropriate to national conditions at the same time not leading to fragmentation of the energy market.

Besides these quantitative renewable energy targets at the core of the European energy policy are objectives to provide sustainability, security of energy supply and competitiveness.

The Energy Roadmap 2050 does not set any binding targets but discovers the possible scenarios for reduction of greenhouse gas emissions by 85 – 90% in 2050 compared to 1990 and for increase of renewable energy share in gross final energy consumption (at least 55%).

While setting more ambitious climate and energy goals starting from 20% reduction of greenhouse gases by 2020 compared to 1990 to achievement of 85 – 90 % reduction in 2050; goals of increase share of energy from renewable sources from 20% to 55% the European Union should change the legal regulation of renewable energy sources in order to create the necessary environment for achieving the targets.

The concept of the Energy Roadmap 2050 is based on the common market, the necessity to implement the existing climate, energy and infrastructure legislation. The constant growth of renewable energy sources, energy efficiency, flexible and smart grids and infrastructure is a “no regrets” option. According to the Energy Roadmap 2050 the growth of renewable energy would be delayed without further development of legislative and policy framework because their cost is still not competitive with conventional energy. The adoption of the regulation covering post – 2020 period would create the certainty and clarity necessary for facilitating investments in development of renewable energy sources and grids.

In this regard the reasonable question is what changes the European Union needs in order to guarantee the stable progress of renewable energy development and not to “bury” its development after 2020. Answering this question requires investigation of:

the factors that are ensuring the development of renewable energy nowadays (the European Union and national mandatory renewable energy targets for 2020 and national support schemes and cooperation mechanisms for achievement of these targets);

the factors that are strongly required for renewable energy development (energy networks and smart grids capable to integrate the increasing amount of renewable energy; fully integrated energy market);

economic and financial factors (reducing renewable energy cost, funding of renewable energy research and development, attraction of investments in this field).

The structure of the paragraph is the following:

2030 renewable energy legal framework;

evaluation of Renewable Energy Directive 2009/28/EC;

analysis of renewable energy targets and their effectiveness;

description of national support schemes and cooperation mechanisms, their possible harmonization and relevance with the internal energy market;

design and sensitive points of the energy market.

conclusion about possibilities to achieve the 2030 renewable energy target and future development of renewable energy sources.

The main difficulty of the analysis of the abovementioned issues is the insufficiency of available data of support mechanisms application in the Member States and data concerning the level of development of renewable energy technologies. The data is essential for revealing the impact of support mechanisms on the completion of the energy market and renewable energy integration into the market.

4.1. 2030 renewable energy legal framework

Legal targets, energy grids, and energy market able to integrate the necessary amount of energy generated from renewable sources are paramount factors in the future development of renewable energy sources.

There is no need to criticize strictly the uncertainty of legal renewable energy regulation in respect of these phenomena. At the time of adoption of the Renewable Energy Directive the necessity to create market and legal environment able to integrate increasing amounts of renewable energy and impossibility to provide it by the adopting legal provisions was not fully realized.

One of the most fragile points of regulation of emerging technologies and innovations is: how is it possible to connect law and new technologies that are arising and developing much rapidly than the hard law is able to do and when the enormous amount of soft law acts is not able to provide transition from quantity to quality especially in the field that has been historically identified with state security and independence. Regarding renewable energy from the position of new and emerging technologies it is necessary to pay attention that this is probably the only one from the emerging technologies that, on the one hand, is able to ensure energy security and as a consequence to ensure state security and, on the other hand, can affect public health and environment (though the possible risks are not clearly estimated yet).

Future development of renewable energy is supposed to be accompanied by modern energy grids, reduced costs, maturity of technologies and innovation support.

For establishing future perspective on climate, energy and transport the Commission presented several initiatives in 2011 – the Roadmap for moving to a competitive low carbon economy in 2050, the Energy Roadmap 2050, that consider several aspects of the transition towards a low carbon economy, reduction of greenhouse gas emissions, and cost – effective development of renewable energy. In 2013 the Commission presented a Green Paper on a 2030 framework for climate and energy policies that provided the positive results in development of renewable energy policy, analyzed experience gained from 2020 climate and energy regulation, and set five key issues that the 2030 framework had to address. They are targets; coherence of instruments, competitiveness of the European Union economy; security of supply; and acknowledgment of the varying capacity of Member States to act.

The Energy Roadmap 2050 provides different scenarios of the transition towards secure low carbon economy and scenarios of possible increase of renewable share not setting any targets and because of this reason the present paragraph regards only the 2030 renewable energy framework.

In 2014 the European Council agreed on the 2030 climate and energy policy framework and set the target of an at least 27% renewable energy share in the European Union consumption that will be binding only at the European Union level and will be fulfilled through Member States contributions to achieve it collectively while fully respecting the Member States' freedom to determine energy mix.

The adoption of binding targets only for the European Union, and not binding the Member States, will require the elaboration of guidance on the adoption of renewable energy national action plans for 2021 – 2030 period. To avoid distortions of the internal energy market it will be important to improve the consistency of different national support measures and to enhance the use of the cooperation mechanisms between Member States.

In 2015 was adopted a Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy[250].

The goal of a resilient Energy Union with an ambitious climate policy at its core is to give European consumers both households and businesses secure, sustainable, competitive and affordable energy. Achieving this goal requires a fundamental transformation of Europe's energy system: transition from centralized supply – side approach that relies on old technologies and outdated business models towards low – carbon sustainable economy. The transition should be made from the supply towards demand side. The Energy Union empowers the consumers through providing them with information, choice and creating flexibility to manage demand and supply.

In order to bring together energy security, sustainability and competitiveness the Energy Union strategy suggests five interconnected elements: energy security, solidarity and trust; a fully integrated European energy market; energy efficiency contributing to moderation of demand; decarbonization of the economy, research, innovation and competitiveness.

The European Union has energy rules set at the European level, but in practice it has 28 national regulatory frameworks. It is necessary to move away from a fragmented system characterized by uncoordinated national policies, market barriers and energy – isolated areas. Fully integrated energy market is necessary for increasing competitiveness, producing affordable prices for consumers, improving the usage of energy generation facilities. The current market design and national policies do not set the right incentives and provide insufficient predictability for investors.

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[250] Energy Union Package. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank "A Framework Strategy for a Resilient Energy Union with a Forward – Looking Climate Change Policy" COM(2015) 80 final.

Energy infrastructure is ageing and is not adjusted to the increased amounts of renewable energy. Energy islands continue to exist because many markets are not properly connected to their neighbours and this increases costs for consumers and creates vulnerability in terms of energy security.

The Energy Union reinforces the European Union's committed to become the world leader in renewable energy, the global hub for developing the next generation of technically advanced and competitive renewable energy. To integrate renewable energy production progressively and efficiently into the market that promotes competitive renewable energy and drives innovation, energy markets and grids have to be fit for renewables. The current legislation and new market rules need to be fully implemented, enabling the roll – out of new technologies, smart grids and demand response for an efficient energy transition.

With this in mind, the next paragraph analyses the efficiency of the Renewable Energy Directive 2009/28/EC and mechanisms provided by it for development of renewable energy and its relevance with the ambitious renewable energy objectives of the European Union.

4.2. Evaluation of the Renewable Energy Directive 2009/28/EC and its relevance with the new renewable energy objectives of the European Union

The creation of future legal framework of renewable energy sources requires the evaluation of the Renewable Energy Directive 2009/28/EC and instruments provided therein in order to achieve 2020 renewable energy targets, searching out the ways to eliminate market and non – cost barriers, effectiveness of 2030 renewable energy target.

This paragraph is structured in the following way:

first, renewable energy targets are evaluated;

second, renewable energy support mechanism is analyzed.

Renewable energy targets

Below is provided the analysis of renewable energy sources targets. The analysis is based on the IRENA (International Renewable Energy Agency) reports describing the possible forms of renewable energy targets and global tendencies in target setting and on the European Union policy and legal approaches to set renewable energy targets.

In 1981 was elaborated the Community energy strategy; it was recognized that without a common approach based on coordinated actions of the Member States the Community would not meet the energy challenges[251].

The Community energy objectives for 1985 were based on three principles. The first one was that the Community energy objectives should consist of a set of quantifiable scenarios that would be a ground for long-term actions for the Member States' governments, businesses and individual citizens. The second principle was that these objectives should not be binding and should serve as the guidelines. Without legally binding objectives the Community energy policy would be the sum of separate energy policies of the Member States that had to act voluntarily towards the achievement of the Community's energy objectives. The third principle was international cooperation to solve energy problems, both with energy - producing and - consuming countries within the International Energy Agency. The initial energy objectives were updated for 1990 and 1995 and highlighted the necessity to guarantee Community's energy supplies at acceptable price[252].

[251] For more detailed information see paragraph 1.4.of the thesis.

[252] Opinion on Community Energy Policy (94/C 393/20).

The White Paper for a Community Strategy and Action Plan (1997) provides the strategic objective of promoting renewable energy sources as an integral part of energy policy and set the indicative objective of doubling the contribution of renewable energy sources to the European Union's energy balance by 2010 (achieving a contribution by renewable energy to the gross inland energy consumption to 12%).

The indicative targets should serve as the guidelines to increase the share of renewable energy from the medium (2010) to long term (2020) and to measure progress in this field[253].

The first legal act aimed directly at development of renewable energy electricity was the Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market that established the overall target of 22.1% of renewable energy electricity by 2010 and requirements for national indicative targets. The national indicative targets should be consistent with the overall indicative target of 12 % of gross national energy consumption by 2010 and in particular with the 22.1% indicative share of electricity produced from renewable energy sources in total Community electricity consumption.

2010 indicative renewable energy targets for electricity produced from renewable energy revealed that without binding targets substantial development of renewable energy would be very low and limited by development just in some Member States.

The 12% target by 2010 was not achieved; one of the reasons for failure was that it was political and not legally binding tool.

The transition of the overall targets into specific targets for each Member State was governed by the need to secure a political consensus to drive energy and climate change and to carry public opinion[254].

The Renewable Energy Directive 2009/28/EC sets differentiated and legally binding targets for each Member State to reach an overall European Union target of a 20 % share of renewable energy in total gross final energy consumption (including electricity, heating and cooling and transport) by 2020.

The elaboration of the post 2020 climate and energy strategy required the adoption of renewable energy targets for the period after 2020.

In 2014 the European Council agreed on the 2030 climate and energy policy framework and endorsed the target of an at least 27% renewable energy share in the European Union consumption. The renewable energy target will be binding at the European Union level and will

[253] Council Resolution of 27 June 1997 on renewable sources of energy (97/C210/01).

[254] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "20 20 by 2020 Europe's climate change opportunity" COM(2008) 30 final.

not be translated into national binding targets and will be fulfilled throughout Member States contributions to achieve it collectively.

As part of 2030 energy and climate framework, the Commission proposed a governance scheme based on national plans for competitive, secure and sustainable energy in order to enhance regional coordination and coherence between European and national energy policies. It also proposed three energy security indicators: diversification of energy imports and the share of indigenous energy sources in energy consumption; deployment of smart grids and interconnections between Member States; and technological innovation[255].

The European Union 2030 climate and energy targets were reinforced in the Paris COP21 Agreement which recognized the need for an effective and progressive response to the urgent threat of climate change and required that all parties shall formulate long – long low greenhouse gas emission development strategies and foster sustainable development.

Though some Member States have already achieved 2020 renewable energy targets it is precipitating to make conclusions about the achievement of the overall Energy Union target.

The results of achieving national renewable energy targets vary from state to state[256]. The success has been achieved due to binding national targets, national renewable energy action plans and biennial monitoring. These legal provisions have contributed to the overall achievement of energy and climate targets, security of energy supply, employment, and regional development[257].

According to the studies of the mid – term evaluation of the Renewable Energy Directive (2015)[258] and the REFIT evaluation of the Renewable Energy Directive (2016) the national

[255]Commission Staff Working Document. In – depth study of European Energy Security. Accompanying the document Communication from the Commission to the Council and the European Parliament "European Energy Security Strategy" SWD (2014) 330 final.

[256] All Member States except Luxembourg, the Netherlands and the United Kingdom met their 2013 – 2014 interim renewable energy targets. France, Luxembourg, Malta, the Netherlands and the United Kingdom and to a lesser extent Belgium and Spain, need to assess whether their policies and tools are sufficient and effective in meeting their energy targets. Achievement of the 2020 renewable energy targets is also not certain in the case of Hungary and Poland [Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank "State of the Energy Union 2015" COM(2015) 572 final].

[257] Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Renewable energy progress report" COM(2015) 293 final.

[258] Mid-term evaluation of the Renewable Energy Directive. A study in the context of the REFIT programme, April 2015

[https://ec.europa.eu/energy/sites/ener/files/documents/CE_Delft_3D59_Mid_term_evaluation_of_The_RED_DEF.PDF. Access: 21.11.2016].

legally binding targets were the most important driver for renewable energy policy and investments in many Member States. The legally binding renewable energy targets at the European Union level for all Member States have strengthened national actions, even if experience in some Member States reveals that target may be used to limit renewable energy deployment up to the national target only. Binding national targets are an effective means for renewable energy development, particularly in Member States with low renewable energy ambitions. Legally binding renewable energy target provides certainty to investors and confirm the importance of meeting the climate and energy targets of the European Union, security of energy supply, employment and regional development. As far as one of the major obstacles for promotion of renewable energy remains its cost, binding targets force Member States to develop renewable energy instead of simply lowering their renewable energy ambitions.

Besides the legally binding national targets the National Renewable Energy Action Plans and biennial monitoring provided in accordance with the Renewable Energy Directive have been effective for promoting transparency for investors and other economic operators, and have ensured high quality information on national renewable energy markets and policies. This is illustrated by the rapid increase of renewable energy after the adoption of the Renewable Energy Directive (from 10.4% share of renewable energy in 2007 to 17% in 2015)[259].

In 2015 the International Renewable Energy Agency has provided report on renewable energy target setting describing variety, policy spectrum and characteristics of renewable energy targets.

In the first band of the spectrum, renewable energy targets can take form of political announcements, vision statements or regional – level energy declarations or plans that are usually supported by further elaboration of the targets. The second category of the spectrum includes electricity expansion plans and integrated resource plans. Such renewable energy targets can be embedded within energy planning tools or underpin alternative scenarios and strategies, but remain at the planning stage and are aspirational or indicative in nature. In the third category of the spectrum, renewable energy targets have become more specific and are geared towards implementation. They grow more sophisticated both in terms of alignment with broader economic and energy objectives and in terms of transition into specific actions plans, policy,

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[259] In 2015 twelve Member States have already achieved their 2020 targets (Austria, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Finland, Greece, Italy, Lithuania, Romania and Sweden) [Commission Staff Working Document "REFIT evaluation of the Directive 2009/28/EC of the European Parliament and of the Council Accompanying the document Proposal for a Directive of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast)" SWD(2016) 416 final].

regulatory, fiscal and financial instruments. This category includes roadmaps, renewable energy programs, etc. The last tier of the spectrum corresponds to renewable energy targets that are clearly measurable and translated into specific policies and measures containing clear compliance mechanisms for their implementation[260].

According to IRENA report "REthinking Energy" (2017) at the end of 2015 173 countries established renewable energy targets at the national or provincial level. After the Paris COP21 Agreement around 74 countries have included specific renewable energy targets in their NDCs (Nationally Determined Contribution). Recent target adjustments indicate a trend towards higher level of ambition, especially in the power sector. A growing number of countries, provinces and cities are aiming for 100% targets by 2030.

Renewable energy support mechanism

As it has been stated the Renewable Energy Directive 2009/28/EC provides the European and national renewable energy targets and various support schemes and cooperation mechanism that are the main legal instruments for development of renewable energy sources.

Effective functioning of national support mechanisms is one of the means to achieve renewable energy target but it is conditional to market changes. The implementation of this or that support scheme depends on the maturity and peculiarities of renewable energy technology, period of time, geographical location, natural resources, technological innovation, coherence with different policies and other factors.

The most commonly used renewable energy schemes are feed-in tariffs, feed-in premiums, quota obligations, tax exemptions, tenders, and investment aid (can be partially financed from structural and cohesion funds). Cooperation mechanism is practically not applied; the exception is Sweden cooperating with Norway. Their joint scheme has the potential to be expanded further to include more countries[261].

The Renewable Energy Directive 2009/28/EC provides the following cooperation mechanisms that could be implemented in two or more Member States: statistical transfers, joint projects and joint support schemes.

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[260]IRENA (2015) "Renewable Energy Target Setting" [http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Target_Setting_2015.pdf. Access: 09.09.2015].

[261] Commission Staff Working Document "European Commission guidance for the design of renewables support schemes" SWD (2013) 439 final.

The studies of the Commission highlight the opportunities for surpluses from wind energy in the North of Europe (Sweden, Denmark, Finland, Germany) and from solar energy in the South-West of Europe (concentrated solar power in Spain and photovoltaics in France) to be traded applying the cooperation mechanisms[262].

Member States are free to apply several support schemes and to control over their costs and effects for providing successful application of support scheme.

One of the weakest points of the national support schemes is their cost efficiency affected by the choice of some Member States to support a wide range of technologies (although such an approach could reduce costs in the longer term as in case of solar PV) and by national support schemes which in many Member States have not been flexible enough to adjust to changing circumstances (such as technology costs and level of development)[263].

In fact, one of the major obstacles for renewable energy development – is its high cost that is determined by diverse natural and geographical resources, different levels of renewable energy support and other conditions. The high cost makes it difficult for renewable energy to compete with conventional energy sources and to integrate them into the energy market. The question of reducing the cost of renewable energy requires new economic solutions and is not falling under the scope of the thesis.

What can be analyzed from the legal position is the possibility to apply common methods for providing cost efficiency of support schemes and necessity to harmonize support schemes. There are different opinions on these points. On the one hand, it is argued that Member States have to ensure the convergence of support schemes and to integrate more efficiently renewable energy to the market because numerous support schemes with the focus on national energy generation exclude benefits of energy market integration. On the other hand, it is stated that changes to established support schemes could increase investor uncertainty.

Implementation of renewable energy support mechanisms in the most cost – effective way applying common methodology means convergence of cost and technologies, methodology of determining costs, time limits for support, and adapting support mechanisms to market conditions; accepting energy supply from other Member States in national support schemes through creation of cross – border support schemes at regional or European level through cooperation mechanism; phasing out support for renewable energy technologies as technologies

[262] Commission Staff Working Document accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Renewable energy: a major player in the European energy market" SWD(2012) 164 final.

[263] Staff Working Document. Impact Assessment "A policy framework for climate and energy in the period from 2020 up to 2030" SWD(2014) 15 final.

become mature. Integration of renewable energy to the properly functioning market (grid codes, more interconnections, real competition, flexibility of the energy system, etc.) is the only way to reach cost – effectiveness of renewable energy[264].

Before revealing the possibilities and necessities of support schemes harmonization some opinions about the role of the European Union and the Member States in maintenance of renewable energy support schemes and there regulation are provided.

Some Member States consider that renewable energy subsidies should be more coherent and include better cooperation between Member States, and welcome the support mechanism guidance from the Commission. Energy intensive companies, utilities, the power sector, and general business organizations consider that policy for the transition to the low carbon economy should be technology neutral, support should be limited, harmonized at the European level and temporary. Several utilities state that additional support is distorting the market as far as high renewable energy subsidies might lead to technology penetration beyond the infrastructure adaptation rate; they call for progressive phase – out of subsidies and removal of non – economic support. Non – energy intensive companies, renewable energy companies and non – governmental organizations consider that subsidies for fossil fuels and nuclear energy should be removed; support schemes should be adapted to the technology maturity and flexibility and should be introduced in the support schemes in order to reflect it; better coordination across the European Union on support mechanisms is required[265].

So there are no straightforward opinions among market participants that possible harmonization of support schemes would reduce support mechanisms cost. The bibliographic research neither has clarified the situation. There are positions for and against support schemes harmonization.

For example, Dörte Fouquet states that renewable energy sources targets cannot be achieved by a harmonized, technology – neutral support system, because such a system fails to trigger immediate deployment, development and cost reduction of technologies which are still more expensive. But renewable energy sources targets can be achieved either by improved (strengthened) national support systems or by a harmonized European Union – wide support system, as long as support is offered that its technology - specific[266].

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[264] Commission Staff Working Document "European Commission guidance for the design of renewables support schemes" SWD(2013) 439 final.

[265] Staff Working Document. Impact Assessment "A policy framework for climate and energy in the period from 2020 up to 2030" SWD(2014) 15 final .

[266] p. 217 - 218, EU Energy Law. Volume III. The European Renewable Energy Yearbook. Belgium, CLAEYS&CASTEELS, 2010 – 276 p.

Tom Howes indicates that on the one hand a reduction in the number of different support schemes – through harmonization at the European level – could generate substantial economies of scale, simplify the regulatory environment and increase transparency for investors, and hence allow a more cost – effective achievement of the renewable energy targets. On the other hand, forcing the pace of harmonization could have a significant destabilizing effect on the sector, disrupt investment and jeopardize the targets' achievement[267].

A similar position is taken by Angus Johnston and Guy Block who suggest that the harmonization of support schemes could simplify the regulatory environment, allow industrial growth and boost economies of scale, and provide a clearer framework for the efficient exploitation of renewable energy across the European Union[268].

The Commission investigated the issue of co – existence and harmonization of support schemes from the medium to longer term development. Harmonization in the medium term might potentially disrupt certain markets and complicate the achievement of the Member States' energy targets. Among the potential advantages of harmonization were the arguments that harmonization of green certificate or feed – in systems would decrease the overall cost of complying with 2010 targets rather than applying of the different national policies; the integration of renewable energy in the internal market with a common set of rules could increase competitiveness of renewable energy industry. Among the potential disadvantages were the arguments that a harmonized green certificate scheme could work only if it based on the correct certificate prices and penalties across the European Union; relevant information on technologies and costs was required to optimize the tariffs because without proper management of these issues the harmonized tariff system would become expensive and inflexible; the Member States importing electricity produced from renewable energy might be unwilling to pay the bill without gaining profit from the local beneficial effects (employment and rural development, reduced local pollution) that would be achieved if the renewable energy sources were produced in their territory[269].

In 2008 the Commission underlined the inappropriateness to harmonize European support schemes because quantity – based and price – based instruments could be designed in accordance with electricity market rules; the introduction of a harmonized system could create uncertainty and disruption in the marker for renewable energy; since it would abolish national

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[267]p.82, EU Energy Law. Volume III. Book One. Renewable Energy Law and Policy in the European Union. Paul Hodson, Christopher Jones, Hans van Steen. Belgium, CLAEYS&CASTEELS, 2010 – 372p.

[268] p. 338, Angus Johnston, Guy Block. EU Energy Law. Oxford University Press, 2012 – 425 p.

[269] Communication from the Commission "The support of electricity from renewable energy sources" COM(2005) 627 final.

support schemes; it could be difficult to differentiate between different costs for different technologies in different states and additional support measures would be required for technologies that were far from producing renewable energy electricity at market price; national support schemes were often designed so to promote regional development and harmonization might oblige Member States to find other ways for its promotion[270].

From the legal perspective the question about the support scheme harmonization should not be: "Is it possible to ensure cost efficiency of support schemes by means of harmonizing them?", but perhaps "Is it possible to harmonize support schemes in accordance with the current legal regulation?".

The answer is not connected with possible uncertainties or disruptions of energy market if applying a harmonized support scheme but with the answer whether it is relevant with the Renewable Energy Directive.

The Renewable Energy Directive setting binding renewable energy targets for the Member States provides that one important means to achieve renewable energy target is to guarantee the proper functioning of national support schemes and to allow Member States to design effective national measures for target compliance. The Article 23 of the Renewable Energy Directive provides the Commission shall submit proposals based on the evaluation of the implementation of the Directive and that the proposals shall neither affect the 20% target nor Member States' control over national support schemes and cooperation measures. There is the legally binding approach towards renewable energy targets and at the same time autonomy of the Member States to achieve this target applying market based mechanisms. The Directive 2009/28/EC does not create a harmonized European regulation for renewable energy support mechanism. Besides the European Union's measures shall not affect a Member State's right to determine the conditions of exploiting its energy resources, its choice between different sources and the general structure of its energy supply (Article 194(2) of TFEU) and Member States can decide upon energy mix.

Nevertheless, conclusions that support scheme harmonization is not possible gives no answer about relevance of support mechanisms with the energy market especially in the view of future redesign of energy market and their real economic outcomes. The interim results of national support schemes implementation and their relevance with the energy market are very uncertain insofar as they do not provide enough data to make a final conclusion about the future "destiny" of support schemes. It is clear, that the development of support schemes and

[270] Commission Staff Working Document "The support of electricity from renewable energy sources" SEC/2008/0057 final.

cooperation mechanism should be in line with future climate and renewable energy policies. A variety of support mechanisms able to adapt to market changes has to become an integral part of the future renewable energy legal framework in order to reduce cost of renewable energy sources and technologies.

Due to different national approaches for renewable energy support schemes Member States have a large room for manoeuvre for implementation of the European Union renewable energy legislation. Therefore the 2030 policy framework should strike a balance between concrete implementing measures at the European level and Member States' flexibility to meet targets in ways that are most appropriate to national circumstances and not disrupting the internal market[271]. Increased flexibility for Member States must be combined with an increased emphasis on the need to complete the internal energy market. Different national support schemes need to be rationalized to become more coherent with the internal market, more cost – effective and provide greater legal certainty for investors. Attainment of the European target for renewables would be ensured by a new governance framework based on national plans for competitive, secure and sustainable energy prepared by the Member States[272].

In accessing the relevance of renewable energy support mechanisms within the internal energy market, another pivotal question should be asked what support mechanisms does the energy market require in light of its current level of development.

Energy security is impossible without the completion of the internal energy market able to integrate an increasing amount of renewable energy. Besides the expensiveness of renewable energy another obstacle for their development is how to integrate big amounts of different kinds of unfixed renewable energy to the market if the energy networks and infrastructure and energy storage capacity systems are outdated and are not able to receive the necessary amounts of renewable energy, and cross – border interconnections are insufficient to remove the existing energy islands integrating them with the energy network. More detailed the issues of energy networks, infrastructure, and smart grids were regarded in the second chapter of the thesis.

Another issue necessary for integration of renewable energy is provided in 2015 Energy Union strategy according to which flexible markets both on the supply and demand side within and beyond a Member State's borders are required[273].

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[271] Green Paper "A 2030 framework for climate and energy policies" COM(2013) 169 final.

[272] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A policy framework for climate and energy in the period from 2020 to 2030" COM(2014) 15 final.

[273] Energy Union Package. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank "A

With regard to demand side energy market development, it should be underlined that one of the peculiarities of energy market design is active consumers' participation in it and expectations concerning their participation in completion of energy market and achievement of climate and energy goals are very high. Consumers should take more ownership and benefits from new renewable energy technologies. Among the steps for putting consumers at the center of energy market are providing them with real – time information about energy consumption and costs; giving them access to competitive and transparent market – based offers; giving them the possibility to participate in the market including through reliable intermediaries; etc.[274]

This is not an exhaustive description of energy market design. But these issues are amongst the main that fall within the scope of new electricity market design together with short-term markets, notably intraday and balancing markets. In relation to national support schemes the following challenge is ahead: a more coordinated regional approach to support schemes. This could promote cost – efficient development of renewable generation in optimal geographic locations and enlarge the market for renewable energies, facilitate their integration and promote their efficient use. The need for secure and cost – efficient development and management of the electricity system calls for increased coordination and cooperation between all actors in the energy market. In some cases, this will involve moving from national to regional or European-wide approaches. A fully – functioning internal energy market requires that Member States coordinate and cooperate with their neighbors when developing their energy policies. When fragmented national systems exist, regional cooperation should become an essential part of effective governance for the Energy Union and a first step towards the European Union – wide harmonization where required. Regional cooperation between Member States will also be necessary to achieve the agreed European Union targets more cost – effectively (e.g. making better use of cooperation mechanisms to meet the renewables target)[275].

The new electricity market design is aimed at creation a market fit for renewable energy sources that would reduce the need for specific support schemes. This would allow to

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Framework Strategy for a Resilient Energy Union with a Forward – Looking Climate Change Policy" COM(2015) 80 final.

[274] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Delivering a New Deal for Energy Consumers" COM(2015) 339 final.

[275] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "Launching the public consultation process on a new energy market design" COM(2015) 340 final.

progressively focus public support on less mature renewable energy electricity technologies and complement research and innovation efforts by market pull instruments for those technologies[276].

In spite of the positive REFIT (Regulatory Fitness and Performance program) evaluation of the Renewable Energy Directive the current legal regulation does not fully reflect the following needs:

to update the energy transmission and distribution infrastructure and networks in order to integrate the increasing amount of renewable energy and supply different kinds of renewable energy that can have changeable and unfixed flows;

to modify the energy storage capacities able to integrate renewable energy;

to stimulate the participation of new renewable energy producers and consumers in the market first of all by means of demand response and making energy prices more affordable.

These very needs together with some market disruptions and non – cost barriers present one of the major problems for legal renewable energy framework for 2030 and 2050. Since an ambitious climate policy is an integral part of the Energy Union secure, sustainable and competitive energy policy posits an integrated approach that will effectively tackle environmental and economic challenges. On the one hand, it is necessary to reduce the increase of greenhouse gas emissions; on the other hand, to provide energy security that often depends on political instable regions and diversification of energy supply.

It will take years to balance climate change challenges and to reduce energy import dependence by means of increasing energy security based on renewable energy sources that is why the lack of clear objectives and transparent legal framework would irremediably slow down these processes.

The description of energy market needs would not be complete without mentioning the necessity to attract investments in smart energy grids, energy generation, research and innovations but the energy market design and legal framework do not create conditions that would be transparent and stable enough for potential investors especially when long cycle investment projects require several decades for their implementation. The absence of such mechanism creates additional renewable energy costs.

Financing is another instrument to modernize infrastructure and to bring innovation to the market. Innovation and infrastructure projects have been among the first projects approved for the European Fund for Strategic Investments (approved financing €5.7billion).[277]

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[276] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, and the European Investment Bank "Accelerating Clean Energy Innovation" COM(2016) 763 final.

The information about financial support of renewable energy and related to it areas is considered in the thesis in order to present as much detailed renewable energy framework as possible but sufficiency of such financial incentives and means for their improvement are not falling under the scope of the research.

This new design of energy market brings some light on the future development of renewable energy sources but its practical implementation is far from clear.

It can be concluded that until now there are more or less sufficient ways for development of renewable energy. The first one, is the adoption of legally binding national renewable energy targets; the second one, is the national renewable energy support mechanism; and the third one provided beyond the regulatory instruments, is financial support linked to climate change and sustainable energy. Mandatory targets backed by indicative interim targets seem to be effective especially in Member States with low renewable energy sources shares and investments. National support schemes and cooperation mechanism providing a large room for maneuver for the Member States in direct connection with binding renewable energy targets as well has brought some positive results for 2020 renewable energy development.

[277] The Investment Plan for Europe State of Play [http://ec.europa.eu/priorities/sites/beta-political/files/ip-eu-state-of-play-jan-2016_en.pdf. Access: 25.01.2016].

Conclusion to the fourth chapter

The present chapter analyzed support schemes and cooperation mechanisms usually applied in the Member States in order to reach their 2020 renewable energy targets, their applicability with the internal energy market, and possible variants of their improvement; the most sensitive issues of energy market; nature and levels of renewable energy targets.

The European Union has the ability to generate energy from renewable energy due to the favorable natural and geographical conditions and many renewable energy technologies have become more mature and some of them in the future will be able to compete with energy generated from conventional sources.

But this is not the condition that predetermines the future development of renewable energy. The outdated energy grids are not able to transmit and to distribute unfixed flows of energy generated from renewable sources. As far as there is no Member States binding renewable energy target for 2030 (and until now it was probably the most effective way for renewable energy development) the energy market should as minimum provide the possibility to integrate the renewable energy in the cost – competitive way.

According to 2016 REFIT evaluation of Renewable Energy Directive 2009/28/EC many stakeholders believe that national binding target is the best method to ensure compliance with the European Union target. In the absence of national binding targets for 2030, the achievement of this target will ultimately rely on Member States contributions to the European Union level target. Even if the European Union and all but one Member States are currently on track towards its overall renewable energy 20% target for 2020, target achievement by 2020 will only be secured if the Member States continue to meet their increasingly steep trajectories.

In this respect it is interesting to refer to 2004 evaluation of the effect of legislative instruments and other Community policies on the development of renewable energy according to which "at Community level, the necessary legal and policy framework has been put in place, but responsibility for progress lies clearly with the Member States"[278].

This idea (rarely met in renewable energy acts) in reality reveal that the main "actors" for achieving the post 2020 renewable energy target will be not the European Union but the Member States. It is surprising that the European Union setting such ambitious target of becoming World number one in renewable energy makes such a modest legal contribution for its achievement.

[278] Communication from the Commission to the Council and the European Parliament "The share of renewable energy in the EU Commission Report in accordance with Article 3 of Directive 2001/77/EC, evaluation of the effect of legislative instruments and other Community policies on the development of the contribution of renewable energy sources in the EU and proposals for concrete actions" COM(2004) 366 final.

The 2016 REFIT evaluation of Renewable Energy Directive 2009/28/EC assumes that in the absence of legally binding national renewable energy targets for 2030 cooperation mechanisms would be more relevant after 2020 and their role would increase. Cooperation mechanisms will provide the needed flexibility for the Member States while reaching overall European Union's climate and energy goals. To note nowadays cooperation mechanisms are practically not applied but in the next few years their application should recompense the absence of legally binding targets for the Member States.

But today’s energy market design and very high cost of renewable energy together with the absence of adequate energy network lead to a rather pessimistic conclusion about renewable energy future and great difficulty to achieve the renewable energy targets for post 2020 period.

Conclusion

Since the time of the World energy crisis of 1973 – 1974 when first come recognition of the role that renewable energy can play in providing energy security till nowadays it has experienced fundamental transformation: from alternative to conventional energy to a dominant source of energy in a low – carbon economy. This transformation in renewable energy field required accumulation of efforts in different fields: technological, policy – making, legal, and economic.

The energy sector has been changed due to the geographical spread of renewable energy sources. The challenges the global energy market is facing are increase in energy consumption, the integration of renewable energy sources, energy access, energy prices, climate change and environmental pollution, and public reaction on new energy installations and deployment.

In spite of the global tendency to sustainable development and environmental protection to combat climate change the global energy demand and consumption is constantly increasing.

According to the 2016 World Energy Outlook of the International Energy Agency a 30% rise in global energy demand to 2040 means an increase in consumption for all modern fuels. Natural gas fares best among the fossil fuels, with consumption rising by 50%. Oil demand will reach 103 million barrels per day by 2040. Coal use is hit hard by environmental concerns and, after the rapid expansion of recent years growth essentially grinds to a halt. Nearly 60% of the power generated in 2040 is projected to come from renewable energy, almost half of this comes from wind and solar photovoltaics. In the four largest power markets (China, the United States, the European Union and India), variable renewables become the largest source of generation, around 2030 in Europe and around 2035 in the other three countries[279].

When making conclusions about the state and future of the European Union renewable energy policy and legal framework these global trends in energy sector should be kept in mind. Though the share of renewable energy in the overall energy consumption in the European Union is increasing in the future renewable energy sources will be developing against the backdrop of

[279] The increase in nuclear output is spurred mainly by deployment in China. With total demand in OECD countries on a declining path, the geography of global energy consumption continues to shift towards industrializing, urbanizing India, Southeast Asia and China, parts of Africa, Latin America and the Middle East. China and India see the largest expansion of solar photovoltaics; while by the mid - 2030s developing countries in Asia consume more oil than the entire OECD. Yet, despite intensified efforts in many countries, large swathes of the global population are set to remain without modern energy [International Energy Agency. World Energy Outlook 2016 [https://www.iea.org/publications/freepublications/publication/WorldEnergyOutlook2016ExecutiveSummaryEnglish.pdf. Access: 17.02.2017].

rapidly developing renewable energy in different regions worldwide. This tendency will "heat" the issue of competitiveness and the European Union ambitions to be World number one in renewable energy.

Renewable energy sources have become an integral part of energy policy of the European Union.

In the middle of 1980s the contribution of new and renewable energy was less than 2% of inland energy demand. In 2014 renewable energy sources accounted for a 12.5% share of the gross inland energy consumption.

According to decarbonisation scenarios investigated in the "Energy Roadmap 2050" (adopted in 2011) the share of renewable energy will increase substantially achieving at least 55% in gross final energy consumption in 2050 and the biggest share of energy supply technologies will be renewable energy technologies.

The White Paper for a Community Strategy and Action Plan (1997) established the strategic objective of promoting renewable energy sources as an integral part of energy policy and set the indicative objective of doubling the contribution of renewable energy sources to the European Union's energy balance by 2010 (achieving a contribution by renewable energy to the gross inland energy consumption to 12%).

In March 2007 the European Council established a "20 – 20 – 20" policy agenda for achieving core energy objectives of the European Union (sustainability, competitiveness and security of supply). The European Council endorsed a binding target of a 20 % share of renewable energy sources in the overall European Union energy consumption by 2020.

In 2014 the European Council agreed on the 2030 climate and energy policy framework and set the target of an at least 27% renewable energy share in the European Union consumption that will be binding only at the European Union level and will be fulfilled through Member States contributions to achieve it collectively.

In 2015 a Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy was adopted. The Energy Union reinforces the European Union's committed to become the World leader in renewable energy, the global hub for developing next generation of technically advanced and competitive renewable energy.

Achievement of renewable energy targets requires significant technology development. The role of technology and innovations in development of renewable energy is significant. One of the first renewable energy acts adopted at the end of 1970s and the beginning of 1980s were research and development programmes and acts on financial support to projects for development of renewable energy sources. According to the Communication (1981) innovation is a necessary part of the "Energy strategy for the Community".

Innovations are required for modernization of energy networks and development of smart grid including offshore grid that are able to integrate a big amount of generated renewable energy. Smart grids guarantee the possibility of full exploitation of renewable energy potential, better interconnection between Member States and removal of energy islands. Nowadays the intelligent grids and infrastructure are the main instruments to establish pan – European energy grid without internal borders that will complete the internal energy market. Smart grids are one of the energy network and infrastructure priorities for achieving 2020 and further energy targets.

The analysis conducted in the thesis makes it possible to summarize the main ways to develop renewable energy sources and to unite them into three groups.

I. development of common renewable energy policy.

II. integration of renewable energy into the internal energy market.

III. adoption of legal regulation of renewable energy sources.

The order of summarizing the actions for development of renewable energy sources in such groups is arranged in the way the European Union provided the development of renewable energy sources. Firstly, the affirmation of the necessity to conduct common renewable energy sources policy, the initial steps of which were aimed at technology research and development of renewable energy. Secondly, the necessity to commercialize renewable energy technologies and innovations and to push them into the internal energy market. The initial research and development programmes adopted in the middle of 1980s and the beginning of 1990s underlined the necessity to bring renewable energy technologies to the internal market. Thirdly, the adoption in 2001 of Directive 2001/77/EC on the promotion of electricity produced from renewable energy sources in the internal electricity market. It was the first legal act aimed directly at the development of electricity produced from renewable energy sources that established requirements for national indicative renewable energy targets and requirements for Member States for achieving them.

The major outcomes both positive and negative of development of renewable energy sources in accordance with the groups in which they were arranged can be summarized as follows.

The main outcomes of the European Union renewable energy policy are the establishment of precise renewable energy targets, strengthening the role of renewable energy in energy and industry sectors, and transforming clean renewable energy into the dominant source of energy in the future decarbonization of the economy.

The European Union common renewable energy policy has played a significant role in the promotion of renewable energy. According to the Green Paper “A European Strategy for Sustainable, Competitive and Secure Energy” (2006) the European Union’s energy market had

an annual turnover of €15 billion (half of the World market), employed about 300 000 people, and was the major renewable energy exporter.

The outcomes of the second group (integration of renewable energy into the internal energy market) are not so optimistic. Because of its high cost renewable energy is not fully competitive with conventional energy.

Serious obstacles to market integration of renewable energy sources are energy islands and lack of cross – border interconnections between the Member States. The energy networks are outdated and are not flexible for integration of renewable energy, for ensuring more decentralized power generation, and for incorporation of smart energy demand technologies. Security of supply is impossible without modern intelligent energy networks and infrastructure. Without serious modernization of existing energy grids and metering systems renewable energy generation will be hindered, there will be little opportunities for energy saving and energy efficiency and the internal energy market will develop at a much slower pace.

According to the Communication of the Commission "Long term infrastructure vision for Europe and beyond" (2013) it is estimated that up to 2020 about 200bn euro investments are required to upgrade and expand the European energy networks.

Besides the necessity to attract huge financial resources to develop renewable energy and to guarantee its transmitting another obstacle to development of energy infrastructure and network is the "not in my backyard" (NIMBY) reaction, where the European interest is not shared at the local level. The analysis conducted by the International Renewable Energy Agency (IRENA) in 2016 identified key social barriers to deployment of mini – grids as conflict with local authorities (local industry, communities, churches), unwillingness to visit or work in the remote areas, insufficiently concentrated population, and opposition to local energy generation[280].

Other obstacles are time – consuming legal and licensing procedures that constitute significant difficulties for energy transmission projects, fragmentation of procedures. Planning and administrative authorization procedures are common source of delays of energy projects[281].

New electricity market design foreseen in the Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy is aimed at creation of the market fit for renewable energy sources favourable for attracting investments that would allow to focus public support on less mature renewable energy electricity technologies and complement research and

[280] For more detailed information see paragraph 2.3. of the thesis.

[281] For more detailed information see paragraph 3.3. of the thesis.

innovation efforts by market pull instruments for those technologies. But it is still early to estimate how this new market mechanism will work.

The major outcomes of the third group (legal regulation of renewable energy sources) are the adoption of legally binding targets for renewable energy sources.

The Renewable Energy Directive 2009/28/EC provides a strong and stable regulatory framework for the development of the renewable energy. It sets differentiated and legally binding targets for each Member State to reach the overall European Union target of a 20 % share of renewable energy in total gross final energy consumption (including electricity, heating and cooling and transport) by 2020.

According to the studies of the mid – term evaluation of the Renewable Energy Directive (2015) and the REFIT evaluation of the Renewable Energy Directive (2016) the national legally binding targets were the most important driver for renewable energy policy and investments in many Member States. The legally binding renewable energy targets at the European Union level for all Member States have strengthened national actions and are an effective means for renewable energy development, particularly in Member States with low renewable energy ambitions. Legally binding renewable energy target provides certainty to investors and confirm the importance of meeting the climate and energy targets of the European Union, security of energy supply, employment and regional development. Insofar as one of the major obstacles for promotion of renewable energy remains its cost, binding targets force Member States to develop renewable energy instead of lowering their renewable energy ambitions.

Development of renewable energy and its future progress requires interconnection of actions described in all three groups: development of common renewable energy policy strategy, integration of renewable energy into the internal energy market, and adoption of legal regulation of renewable energy sources. Furthermore, development of renewable energy is always accompanied by development of relevant technologies and research and development policy.

The achievement of 20% renewable energy sources target by 2020 relies on the interplay of actions from all three groups and if actions from one group (like, for example, promotion of renewable in the internal market) are insufficient they can be compensated by actions in other fields (for example, binding targets gave an impetus to development of renewable energy even in the Member States with low renewable energy incentives).

The question by what means the development of renewable energy sources would be provided after 2020 remains open. Even effective forward – looking renewable energy policy in isolation from integrated energy market would not be able to guarantee the renewable energy growth. There would be no binding targets that could enforce the development of renewable energy sources as it is doing now. Probably, it can be assumed that if the 2020 renewable energy

target is met and that the Renewable Energy Directive creates a good background for future development of renewable energy (by its specific mechanisms like national renewable energy action plans, grid access, different support schemes) Member States may continue the successful development of renewable energy in a collective way if there are real possibilities to do it in a cost – effective manner.

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