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The Importance of Renewable Energy in the Contemporary Global Economy through the Innovation Model in Germany

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***Abstract*—In the last decade the Chinese Economic miracle became a stimulus to accelerate the global competition in recent technology. The implemented term of "Chinese player" resulted in years of less than 700% (7times) of the cost of the clean energy production and consequently a decline of over 60% (from 112 to 45 US $) per barrel) oil prices ,hence in a similar order of magnitude of natural gas and coal. For the largest and most innovative player of the European economy, the Federal Republic of Germany, the export Leader of innovative products has created opportunities and threats made by Japanese competition in 60 years of the last century. In this paper we rarely touched the problems of the biggest technology corporations, energy and financial USA and the Federal Republic of Germany with leaders of major political parties and NGOs with constitutionally guaranteed status of lobbying organizations.**

Based on over 200 years of tradition and a solid foundation of the cooperation is one of the most important elements in global competitive edge, wealth of world leaders, the implementation of scientific research and development .Above all, the implementation of their results, which are the largest representatives of the US, the Federal Republic of Germany, Japan, China and South Korea. The most famous "Think Tanks" are preparing the strategies to exploit the opportunities as well as to avoid the risks of competing the parts of development in the history on the Asian Economic Tigers: China, South Korea., India, Indonesia and Malaysia; the examples are listed below: E-on, General Electric, Vattenfall, EnBW and Siemens, Microsoft, Google, Oracle, from the technological and Berkshire Hathaway Inc. Munic Re (Warren Buffett and his successors), Deutsche Bank, Allianz from the analysis and economics.

More completed list of over 300 transatlantic corporates involved in the process competitiveness of energy can be found in positions [Desertec; Warren Buffett]. The potential of renewable energy sources has risen (RES) to 80 % - according to the Government's Energy Reform introduced by Angela Merkel, reform will bring the challenges as well as the national and global problems by 2050. The analysis undertaken in the article is called as ' German Energiewende Goal - The Development of the Clean Energy'. This article shows the importance of renewable energy in the modern global economy through the innovation model in Germany.

Keywords—energy; renewable energy; economy; Germany; production

I. INTRODUCTION

This paper presents the latest results of the research conducted by the authors since 2012. It focuses on legal, technological and economic aspects of the research, process management, and innovative technologies for sustainable energy development. Since 2007, the research is conducted under two projects: Polish -German- Swiss Research programs: “Renewable & Sustainable Energy revolution (RSER)" and Global Electronic Education System (GEES) ".

The initiator , coordinator and strategic sponsor of this research is the European Business Club e.V. with headquarters in the castle Oedheim in the center of the Great Switzerland's largest European Technological lower as shown in the figure below.

The first results of analyzes related to the aspects of innovation of technology and economy named "Green Energy Revolution" were presented in scientific papers [1, 2] at international conferences [3, 4], the two presentations, the thesis German-Swiss European postgraduate studies Academy of Technology & Management [5] and thesis [6]. The research was funded by the three scholarships: two German (2012, 2013) of the Scientific Council of the European Business Club e.V. [7], [8] and the Polish (2014) scholarship from the Ministry of Higher Education and Science.

This study is devoted to aspects of traditional process management research and implementation of innovative technologies in the Federal Republic of Germany - the precursor and one of the undisputed leaders of the global Green Revolution Energy between the years 2010-2015. It should be emphasized that this revolution is a confirmation of the results of research by teams of experts of the

European Business Club e.V. The results of these studies conducted in 2007-2010 [9-11] are presented as below:

1. achievement of the price competitiveness (break even point) of the following production technologies for renewable electricity and thermal energy: photovoltaic's , wind farms on land (onshore) , micro (< 25kW) , low- < 1MW and medium (> 10 MW) hydropower , solar heating of buildings and water, shallow (< 300m heat pumps) and deep (> 2000m), geothermal and concentrated solar power (concentrated Solar Power CSP) model DESERTEC - Mojave)

2. Competitiveness , with the price of crude oil > US $ 50 per barrel, bio-ethanol produced within the framework of second-generation technology from sugar cane in the stabilization of energy production and to drive motors

3. Competitiveness, even at an oil price of> 50 US $ per barrel of shale gas.

It should be emphasized that similar to the results of experts of the European Business Club e.V., but sheltered from competition and public opinion results obtained analysts and specialists:

1. the largest energy companies in Europe and the world: E-on, RWE, General Electric, Vattenfall, EnBW

2. leading technology companies, examples are General Electric, Siemens and Bosch.

3. largest investment fund in the world Warren Buffett (Berkishire) and tycoons information, all of which are examples of Microsoft and Oracle

4. Renewable Energy Agency, USA (2010) and the Fraunhofer Institute (2014) [12].

II. Overcoming the reistance of structural oligopoly of energy companies in Germany

Energy focuses on the areas of politics, economy and technology. Finiteness of resources hitherto dominant energy forces us to search for other solutions to ensure rapidly growing economy energy security. Numerous theoretical studies and analyzes as well as the specifics in the form of distributed systems not in need of fuel supply appears RES advantage over traditional power plants. Currently ongoing and accelerating the process of implementation of the results of these studies can be described as the biggest energy revolution in the history of mankind. As a result of this revolution mentioned energy companies in a very short time completely give up not only with energy but also breakable nuclei of the nineteenth-century technologies generating energy from fossil hydrocarbons, including considered to be the cheapest energy production of heat and electricity from mined by opencast coal lignite and hard coal. The leader of this revolution and the most promising strategies to replace 100% ecologically disruptive and increasingly economically inefficient technologies is: E-on, General Electric, Vattenfall, EnBW and Siemens. Awareness need to change also signals the EDF Suez French monopolist only a few percentage shares also in the German market.

Thus, in an article which forms the first part of the analysis of opportunities and threats green energy revolution for Europe and the world, and thus Polish will present the conclusions of the transformation of the German energy policy as well as the company's restructuring program E-on, which also confirms the effectiveness increase shareholders' confidence, as illustrated by the following chart [13]:

Fig. 1. Comparison of effectiveness increase of the shareholders' confidence [13, 14]

It is emphasized that the lowest rate E - on'u of: 16.10.2014 is the assumption that it is actually the lowest rate until the next global crisis of the stock exchange. In contrast, at least for the last 6 months for RWE share price of 15.01.2015 took place under conditions of rapid growth in the value of shares (DAX index on the Frankfurt Stock Exchange and is the only local minimum consequence, this means that in the coming months, even in the boom can be expected depreciation of the REV. The decrease in the profits of large energy companies, which is a powerful expression decline in the value of their shares on the stock market, it is mainly due to an increase in the importance of local generating installations.

In the case of E -one increase in confidence of analysts, shareholders and stock market players due to the consistent restructuring decisions leading to the separation of income currently, mainly in perspective of the group dealing with:

1. Operations on the stock exchange purchase of energy

2. Construction of transmission routes the north - south to stabilize the power grid energy associated with overproduction of wind farms in forfeiture of wind speeds above 90km / h (25m / s). Extreme fluctuations in energy production from wind farms are associated with increasing the power of the wind speed 3 the amount of energy supplied. Scales illustrates the problem of electricity production wind farms located mainly in northern areas (and partly the middle) areas

of the Länder of Germany during the hurricane 'Niklas' [15] 'In Germany, the installed capacity is 38.5 GW, equivalent to 23 nuclear power plants. On 30 March 2015 during the hurricane Niclas wind farms reached 30 GW of power at the same time energy photovoltaic power corresponding to 13 GW. According to data from the DCI (International Agency for Renewable Energy Economic) produced energy equivalent to the energy produced by 40 conventional coal-fired or nuclear power plants. This means that 'on 31 March 2015. It was again unbeaten record production of energy from wind farms and solar farms, whose production of electricity exceeded by 16% the previous record of April 2014 [16].

The increase in prices of energy sold for 1 kWh of 0.15 € to 0.29 €, an increase of over 80 % in the last 10 year period resulted in acceleration of decentralized, individual production of clean energy for their own needs: Small and Medium Enterprises manufacturing and service companies, cities, municipalities and non-governmental organizations and 35 million households.

This trend is not curbed further amendments to the law to reduce the wages of RES electricity produced and supplied to the network by communal and individual producers. In the most cost-effective photovoltaic's RES guaranteed by law (EEG) the price paid by big companies communal and individual producers fell between 2009 and 2015 from 0,32 € to 0,09 € per 1 kWh. For small < 50kW wind turbines to take the energy price of 0.08 € / kWh.

Price reduction reception and at the same time increase the price of energy sold by itself it is the result of lobbying by the 4 largest energy companies: E-on, RWE (Rheinwestfälische Elektrizitätswerke), Vattenfall, EnBW (Energie Baden - Württenberg). The increase in the price of energy sold yielded measures to reduce the price and take the energy of competing communal and individual producers little to slow growth in clean energy production in the years 2007-2012. In this way, E -on, Vattenfall and EnBW acquired the resources and time needed for restructuring.

In contrast, RWE still has structural problems, some of which is related to the start of decentralized production of clean energy through Hamburg and many other centers in the past clients group. Germans changed the course of action chosen as evidenced by public announcements stop building nuclear power plants abroad by E-on and RWE, Siemens and transmission tycoon resigns from atom to support wind energy and hydropower. Worth addition is that Energiewende changes are beneficial for Small and Medium Enterprises manufacturing and service companies, cities, municipalities and non-governmental organizations and pond 30 million households and stimulate the restructuring of the above-mentioned energy companies, breaking their monopoly position despite extremely strong lobbying in the federal parliament (Bundestag) and parliament (Landtag) of all federal states, big capital whose activities are independent from the federal government [9, 12, 17].

The new strategy of E - on bases its work on three pillars: the production of energy from renewable sources, consulting services for clients and managing electricity systems. And leading the direction of development is to be wind and solar energy. Areas: the "liquidation" of conventional power (nuclear, coal and gas), trade in energy resources, and exploration and production of oil and gas will be routed to a separate, independent company [18]. The decisions are confirming that also this powerful energy company forecasts that the conventional energy sector in Europe will be very profitable and will have worse prospects for development. Therefore, changing the strategy will make E.ON [19] will not be as active in investments in Russia and will therefore not interested in further lobbying and influence on the shaping of the German eastern policy.

III. RENEWABLE ENERGY SOURCES ATTRIBUTE THE GERMAN ENERGY BALANCE

The European Community is one of the largest energy consumers in the world. Its resources are limited, resulting in imports of energy carriers from other countries in order. Against the background of, among others, the situation in Ukraine, the Council of Europe more and more emphasis on the growth of energy security, which will undoubtedly help to meet the EU's objectives regarding the fight against climate change [20]. Such an energy policy seeks to ensure not only the security of supply or maintain affordable prices but also actually to reduce greenhouse gas emissions and develop renewable energy sources. Analysing the pre-mentioned case the leader of the Green Revolution Energy which is Germany, case, have not noticed any of the willingness and commitment to action aimed at the country's sustainable development. Already in 1990 and 2001, primary energy consumption in Germany fell by an average of 0.3% per year, and emissions of greenhouse gases by 2.1%. It is worth noting that the first steps to phase out nuclear power plants have already been taken in 2000 [21]. In subsequent years (1998-2000), Germany invested over one billion Euros in various sectors of the development of renewable energy sources. In 2002, Germany exceeded the stage of 10000MW of installed wind power, and it was one third of the world potential. Also in 2000 officially by the Federal Government was adopted renewable energy expansion program at the expense of extinction by 2022 all nuclear reactors (one of which was extracted until 23% of energy), which certainly is an event without precedent.

Sustainable management and implementation of eco - innovative solutions in the field of renewable energy sources in Germany implies emission reductions of their greenhouse gas emissions by 21% (as in 2008-2012 aim is achieved over the planned level of 23.6% and set a new level of 40% by 2020) [22] and by 2050 to achieve energy balance to 80% of the electricity from renewable sources [13, 15, 23]. Remarkable is the fact that between 2000 and 2013

year, production of electric power from nuclear power plants decreased by 43% (simultaneous reduction of coal and lignite at 2%), and clean energy increased by 300% (multiplied by 4.00) and total production grew by 9.9% [24].

Table 1: Production of electricity in RFN in the years 2000-2013 in billion kWh [25]

	2000	2005	2010	2012	2013	Różnica
Nuclear energy	169,6	163,0	140,6	99,5	97,3	–72,3
Lignite and coal	291,4	288,2	262,9	277,1	286,0	–5,4
Oil and gas	55,1	84,7	98,0	84,0	73,2	18,1
Other	22,6	24,1	26,7	25,7	25,4	2,8
RES	37,9	62,5	104,8	143,5	151,7	113,8
Production	576,6	622,6	633,0	629,8	633,6	57,0
Wear	579,6	614,1	615,3	606,7	599,8	20,0

Moving on to more complete analysis can be derived that in 2013 the share of energy production from coal and lignite stood at 45% in the total energy balance of Germany in comparison with the year two thousand years where amounted at 50% of total consumption for the country. And the energy derived from alternative sources has systematically dynamics of growth which is reflected in the gradual loss of importance of dirty energy (coal and lignite). However, the overall decline in production was also relatively mild weather conditions during the winter at the turn of 2013/2014. As a result, there was a decrease in energy consumption, and thus it was reflected in the reduction plant efficiency coal and gas [26, 27].

To sum up in Germany much clean energy, mainly produced from the wind, sun and biomass over the last decade has tripled up. The figure below shows the considered demands:

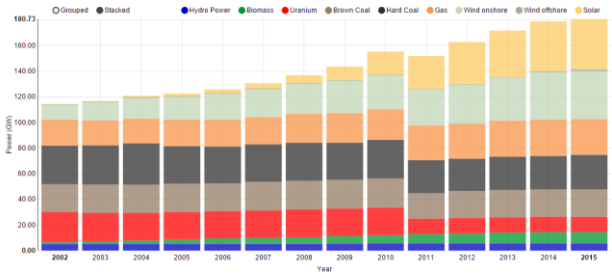

Fig. 2. Power installed electrical energy in Germany between 2002 to 2015 [28]

German citizens' awareness about the rights under the pro - social and -ekology Act of 2000. On renewable energy sources, which ensure the safety of investments alone, home-producing and consuming power for their own needs electricity allows individual investors to compete with the giants. Manufacturers of clean energy from renewable sources have the opportunity to sell it to the network after the predefined rate. This means that the cost of renewable energy sources is transparent and single, and the rate digressive, which is progressively reduced over time to ensure lower prices in the future. Thus, the statutory merger market instruments and regulation ensures electricity from renewable sources of priority connection to the grid and allows it to reap the profits. The result of these assurances is that more than half of the investments in renewable energy sources have been made by private investors who are confident the legal and organizational stability.

Economic analyzes clearly show the benefits of the transformation of Germany, which in turn is reflected in the strengthening of the economy of this country. Undoubted is that high-performance renewable energy still requires many investments and activities at the level of 200 billion euros to achieve the goals of energy policy. RES are becoming cheaper and energy from conventional carriers more expensive. The reason for this is mainly Earth's natural resources. Other reasons for this situation is the high subsidies of fossil fuels by the state (it should be noted that the price does not include the impact on the environment), and substituting imports with renewable energy sources will not only increase the trade balance of the country, but primarily affects the growth of energy security. Such a treatment strategy for environmental protection and energy policy, and finally independence from global energy companies are a worthy model to follow for other countries, particularly in combating economic and financial crisis.

The fall in wholesale prices in the market solar and wind power by more than 10 percent in 2014 compared to 2012 (for comparison: in 2014 compared to 2010, this decline amounted to 32 percentage points) has meant that cheaper electricity means lower costs operating. In this way, the German state has become an attractive place, especially for energy-intensive industries. Economic viability was expressed by strengthening and the desire to create modern technology "Made in Germany" focused on clean energy mainly by Chinese manufacturers, who also took over the production plants (at 40%) in Germany. The scale of the reduction of investment costs illustrated in the following Fig. 3.

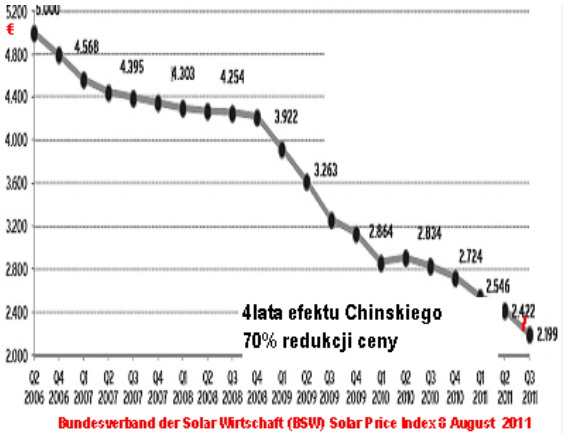

Fig. 3. The scale of the reduction of investment costs

Recognizing this figure it can be expected that the next countries that will be modeled on the success of the energy transition in Germany, you will have advanced technologies, know-how and range of services constituting an arsenal of high-quality export (ranging from solar panels, solutions like "passive

houses "until the electric mobility solutions and more innovative, or hybrid) [2]. Therefore, there aimlessly German climate and energy policy relies on strong manufacturing presence harmonized with green future. It should be noted, however, that ultimately it is the decision-maker level market of the investment in the field of renewable energy sources and forms of electricity prices. As pioneers and leaders of sustainability at the same time Germany have achieved economic success Intrastate creating the largest photovoltaic market as evidenced by a decline of 66 per cent of the total cost of installing a photovoltaic system between 2006 and 2012 a year ago [4, 8]. This situation undoubtedly contributes to a situation that in other countries to invest in renewable energy sources will be much cheaper, especially in countries with a much better solar potential than Germany.

IV. CONCLUSSION

Germany's energy transformation despite the clear skeptic and many environmentalists ought not to question the pursuit of the green energy revolution has found its permanent place in the mainstream of German politics for 70years of the twentieth century to the present day. Cancellation of nuclear and conventional in favor of clean energy from renewable sources has its justification, among others, the consequences of the Fukushima disaster. With all conviction German citizens as well as political parties agree on transforming the energy sector, which will be more efficient, effective, and environmentally friendly and based on alternative energy sources. The implementation of the energy policy aimed at environmental protection is undoubtedly a lengthy and complicated process and therefore confidence in the effective implementation of this project as a new industrial policy by decentralizing power system has its foundations in the country many years of experience. Such eco-innovative activities will not only provide energy security of Germany, but also the EU. Green policy also gained the support of the scientific establishment. On the whole area German federal country observe a widespread innovation - also in terms of environmental - energy strategy. So significant increase clean energy generation would not be possible if not for the rapid development of distributed energy sector of individual producers (prosumers).

Especially in rural areas, we see that local communities benefit from the creation and implementation of projects green revolution through investments (mainly cities and municipalities in Germany), which started to produce energy in a 100 % consumed by their residents or neighboring municipalities. Decentralized energy supply residents (voters) and the creation of jobs in municipalities / cities [29] is currently the basis for electoral success because residents receive less expensive energy, and supporters of the ruling parties interesting jobs in municipalities and communes with decentralized local supply. For reference, economical use of renewable energy solutions are also the largest urban agglomerations, an example of which is Hamburg (resigned from the services RWE), as well as more institutions, Christian churches.

Worth added at the end is the fact that the German Government works and planning your future on various studies and surveys ("tooltips") [30] Top-Managers: Deutsche Bank, Allianz, Munic Re, 4 Banks Land (Bavaria, Baden Wirttembergii, North Rhine Westphalia and Hesse), major technological companies (Siemens, Bosch, SAP, IBM Europe, Hewlett Packard Europe) and energy (E-on, RWE, EnBW, Vattenfall, BASF) and automotive BMW, Daimler, Audi-Porsche-Volkswagen). So practicing politics also has its support in the world's leaders and dictators political and business, as confirmed by himself, Vladimir Vladimirovich Putin, President of Russian Federation in support of its decisions and plans of much indisputable analysis of the German specialists such as Schröder. Such treatments are undoubtedly a recipe for success as evidenced by the German state and an even greater extent Switzerland, USA, Japan and South Korea [16], [19]. The above-mentioned countries have their rational and effective policy, as well as a know-how and technological having their economic rationale stand out from the rest of the world, which are purely theoretical Marxists of all time. Moreover, a hallmark of success and wealth of the country is the use of it if other citizens wealth. However, to reach such a state should be benchmarked against best practices, which, among others, appropriate legal and organizational procedures (to sit on the supervisory boards and other bodies prosperous corporations and companies dependent on them). In the State of successful lobbying organizations, like the European Union have official legal status of a non-profit, public benefit (eg. A foundation), where no external company dare not ignore.

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