

# POLISH ENERGY SECTOR IN ORDER TO REACHING THE STANDINGS OF EUROPEAN UNION CLIMATE AND ENERGY POLICY

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The economic development of European Union countries is getting faster. Therefore the demand for energy is rising as well, and such a situation is connected with necessity of investing in energy sector and research for a new solutions to guarantee an energy security of EU. However, despite the many benefits and strategic position in the European Union policies, this sector is one that cause the greatest pressure on the environment. Emitted pollutants can lead to irreversible changes in climate and environment. Such situation may for example result in raising level of water, climate warming and the changing conditions of agricultural crops. Despite of restrictive EU ecological law, it turn out to be insufficient. Many of forecasts appeared that if the EU fails to make changes in the structure of energy production and the infrastructure quality will not change, it will cause further growth in CO<sub>2</sub> emissions and other pollutants. As a result of forecasts presented at the European Council on 11-12 December 2008, EU countries adopted the "Climate and Energy Package", otherwise known as "Package 3x20". Therefore, the European Union countries will have to face many new challenges in the coming years, caused by the adoption of the package. This will mean the necessity of change the structure of investment in member countries and transfer of funds for investment in renewable sources of energy and modernization of already existing plants to reduce emissions by 2020. Because of the Polish membership in the European Union since 2004, it is required to fulfill the provisions of the climate-energy package, which assume<sup>1</sup>:

1. 20% reduction in greenhouse gas emissions, including CO<sub>2</sub> by 2020 and aspiration to achieve reductions of 50% in 2050 compared to 1990.
2. Share of energy from renewable sources in total consumption is expected to be 15% by 2020 (for the rest of the EU 20%), due to lower efficiency and the amount of renewable energy resources.
3. Energy efficiency growth by 20% by reducing the final energy use by 2020.
4. The increase of biofuels to 10% of total consumption of transport fuels by 2020.

The provisions of the package for the Polish energy sector raises a lot of controversy. Optimists says that those provisions are achievable and will give an impulse to growth of polish economy and also diversification of energy sources. In addition, the goals of the package are complementary, which means that they have mutual influence on each other. However, among the approaches is pessimistic forecast that these requirements are unrealistic, because of an excessive burden for the country's economy in short term.

From among all the goals that Poland is obliged to meet, the most reliable to fulfill seems to be the order 4 – increase the share of biofuels to 10% of the total consumption of transport fuels by 2020. According to projections conducted for the "Energy Policy", by the Ministry of Economy in 2020 Poland will reach 10% biofuels share of transport, while in 2030 it is estimated that this figure will reach 10.4%<sup>2</sup>. In 2020, a significant share of the biofuels will be biodiesel from rapeseed (48.2%) and biodiesel sugar-starch (29.4%). Compared to 2010 it would constitute a double and a triple increase in biofuels from this source. In 2010 the consumption of transport biofuels have a value of 549 ktoe, while by 2020, according to forecasts made by the Ministry of Economy should be at 1444.1 ktoe<sup>3</sup>.

Another objective to be analyzed is a 20% reduction in greenhouse gas emissions, including CO<sub>2</sub> by the year 2020 according to the year 1990 and increase renewable energy to 15% of its total consumption by 2020. Polish energy sector is based mainly on power generated from conventional fuels, mainly coal and brown coal. Indeed, the primary energy production from these sources in 2009 accounted for almost 92% of the total energy produced<sup>4</sup>. It should also be noted that coal-fired plants are a strategic resource to ensure the energy security of Poland, because it is dependent on energy imports only 25.5%, while the average EU-27 is 53.1%<sup>5</sup>. However, if Poland still wants to use coal technology it is needed to thorough modernization in order to reduce and prevent emissions of harmful pollutants and dust emissions, including CO<sub>2</sub>.

Unfortunately, the Polish energy sector is operated by the infrastructure with long term life cycle. Because of it over the years, a national "energy mix" transformation is very slowly<sup>6</sup>. As mentioned above, coal energy has strategic importance in the national economy, and therefore it seems obvious that in the next few years it will play a leading role, in spite of its total share will be reduced at the expense of renewable energy sources. The process of ensuring energy security and concern about climate change will force the continued development of large-scale coal-fired plants, it is also necessary to invest in their modernization, and construction of modern buildings using the latest carbon-free or low-carbon technologies.

Over the nearly 20 years the Polish power plant construction industry was in recession<sup>7</sup>. Last major investment was in 1997 when it was completed in block No. 4 Opole Power Plant with a capacity of 360 MW. Only in 2008 was

<sup>1</sup> Op. Cit. „Potencjał efektywności energetycznej...”, 9-13

<sup>2</sup> *Prognoza zapotrzebowania na paliwa i energię do 2030 roku*, Ministerstwo Gospodarki, Warszawa 2009, s. 11-13

<sup>3</sup> Tamże, s. 11-13

<sup>4</sup> <http://www.cire.pl>

<sup>5</sup> <http://epp.eurostat.ec.europa.eu>

<sup>6</sup> Pawlik M. „Krajowy sektor elektroenergetyczny wobec wyzwań pakietu klimatyczno-energetycznego UE”, XXXII Międzynarodowa Konferencja ekologiczna „Wytwarzanie energii elektrycznej i ciepła w aspekcie pakietu Klimatycznego UE- stosowane technologie i zagrożenia”, Łódź 24- 25 Czerwiec 2010, s. 7-14

<sup>7</sup> Tamże, s. 7-14

put to use supercritical unit with a capacity of 464 MW in Pątnów<sup>8</sup>. In 2009 construction of another block having a supercritical CFB boiler burning bituminous coal (the biggest in the world) has been finished at Łagisza Power Plant<sup>9</sup>. Work is still in progress on construction of the country's largest supercritical unit with a capacity of 858 MW lignite-fired power station in Bełchatów<sup>10</sup>. It can be concluded that the Polish coal-fired power, although with considerable delay, implement new technologies based on supercritical steam parameters. However, long periods of the above investments, including new generating capacity meant that they are not as modern as they were when the investment begun.

According to the decisions of the package, carbon dioxide emissions should be reduced by 20%, which means up to 120 million tonnes. This means that achieving the targets of the package will require an establishment of gross energy production from renewable sources in 2020 to almost 31 TWh (30.1 TWh net), which equates to 18.4% (19.3% net) of the total production gross electricity in the country this year - 168.5 TWh (156.1 TWh).

It is forecasted that in the perspective of 2020, demand for electricity will increase to the level of 170 TWh. This analysis shows the possibility of production of energy without CO<sub>2</sub> emissions to achieve emission levels equivalent to 120 million tonnes. As indicated by the forecast, there are several options for achieving such a state (Table 1). Under the scheme, for example for a 10% share of energy without CO<sub>2</sub> emissions is the production of close to an optional 144 TWh of electricity from new high-efficiency coal blocks with supercritical parameters.

This means We need to achieve a 16.23 GW of installed capacity from this source. The dominant role in diversification of the national "energymix" have classified as sources Without missionary (RES and nuclear energy), their share increases with the transition to cleaner energy sources. In the case of to achieving the 20% energy without emissions, will require modernization of existing facilities, and production of energy from this source of nearly 80 TWh. In this case, as compared to the previously described scheme decreases almost by half (to 47.68 TWh), the share of new high-efficiency coal-fired plant. This means you need to install 6.81 GW of new power

Table 1 – Structure of the Polish Energy in 2020, according to the share without emission energy sources.

Production of electricity by. sources (TWh)	The share of energy without CO <sub>2</sub> emissions			
	10%	15%	20%	25%
existing installations	30,86	55,34	79,82	104,3
new installations	113,64	80,66	47,68	14,7
Power plants without emissions	17	25,5	34	42,5
gas power plants	8,5	8,5	8,5	8,5
<b>TOTAL</b>	<b>170</b>	<b>170</b>	<b>170</b>	<b>170</b>

Achieving the 20% carbon-free energy production is realistic, if Poland will have access to nuclear energy. One option is to build the first nuclear power plant in our country by 2020. In case of failure to execute the planned construction of such a facility, it is possible to purchase energy from this source in Lithuania (Ignalina NPP), or from the planned and approved to build a nuclear power plant in Kaliningrad.<sup>11</sup> As regards the installation of 6.81 GW in high and new coal power plants, it is achievable.<sup>12</sup> Determinant of this state is able to obtain the objects of free emission allowances after 2013.

Experts estimate that by 2020 will be installed from 7 thousand. to 11 thousand. MW of power which is generated by wind turbines.<sup>13</sup> However, according to the Polish Wind Energy Association, an installed capacity of wind in 2020 is estimated to be up to nearly 13 thousand. MW.<sup>14</sup> This means that the increase in electricity production from this source of 12.5 - 17.5 TWh per year, depending on the degree of implementation of plans.

However, one of the most promising technologies for capturing the "green" energy in Poland is biomass, defined as wood waste from forestry production, and waste from industrial production and forestry and energy crops.<sup>15</sup> More and more interest in Poland has a technology that is co-firing biomass with coal in existing power boilers.<sup>16</sup> This technology is implemented in nearly 20 domestic power plants and power plants. It is estimated that the use of about 1 million hectares of wasteland for agricultural domestic production of energy crops, which would be used for biogas production will reach a level close to 60 TWh of energy in the primary fuel.<sup>17</sup> In addition, in 2009, the Ministry of Economy has adopted the program "Innovative Energy-Energy Agriculture." It envisages construction of a biogas plant on average in each municipality in the Republic until 2020.<sup>18</sup> This means you can acquire an additional 10 TWh of

<sup>8</sup> Tamże, s. 7-14

<sup>9</sup> Tamże, s. 7-14

<sup>10</sup> Pawlik M. „Nowe moce wytwórcze w Polsce w świetle unijnych regulacji”, artykuł opublikowany w czasopiśmie :*Energetyka*”, nr 9/2010

<sup>11</sup> Op. Cit. Pawlik M. „Nowe moce wytwórcze...”

<sup>12</sup> Op. Cit. Pawlik M. „Krajowy sektor elektroenergetyczny...”, s. 7-14

<sup>13</sup> Tamże, s. 7-14

<sup>14</sup> „Ocena możliwości rozwoju i potencjału energetyki wiatrowej w Polsce do roku 2020”, Polskie Stowarzyszenie Energii Wiatrowej, raport zamieszczony na stronie www.psew.pl, s. 6

<sup>15</sup> „National Renewable Energy Action Plan”, Minister of Economy, Warsaw 2010, s. 114-124

<sup>16</sup> Op. Cit. Pawlik M. „Nowe moce wytwórcze...”

<sup>17</sup> Tamże

<sup>18</sup> Op. Cit. Pawlik M. „Krajowy sektor elektroenergetyczny...”, s. 7-14

electricity from renewable sources. It is therefore important to intensify the cooperation between producers of biomass and electricity sector.

Poland is on its way to complete foundation package of both CO<sub>2</sub> emissions and the share of renewables in the national "energy mix".

The last of the requirements of climate and energy package is to increase energy efficiency by 20% by reducing the final energy use by 2020.

During the last 10 years in Poland can be seen significant progress in the field of energy efficiency. Energy intensity of GDP has fallen since about 30% (Fig. 19). It is the merit of the projects in the field of thermal performed under the Act on supporting thermal modernization, as well as through the upgrading of street lighting and optimization of industrial processes. Despite this efficiency of the Polish economy is still almost three times lower than most developed European countries and 2 times lower than the average of the EU<sup>19</sup> countries. In addition, primary energy consumption in Poland, related to the size of the population is almost 40% lower than in EU-15th This demonstrates the high potential in terms of saving energy in Poland, which is characteristic of fast growing economy.

To sum up The Polish economy is on track to meet the requirements of climate and energy package. Any predictions made by the Government show that these targets will be met. It also shows an increase of investments in the energy sector aimed at increasing the share of renewables in total energy production and reduce carbon emissions. Analyses indicate that in subsequent years the Polish "energy mix" will continue to dominate the energy from conventional sources, however, be helped by coal power plants with supercritical parameters, and to a large extent by renewable energy sources (mainly wind and biomass). Although the trend in energy consumption is growing for several years, Poland from one year to reduce energy consumption in the economy. If the assumptions set out projections are met, Poland will be ready to meet the provision of energy and climate package on energy efficiency.

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<sup>19</sup> <http://www.mg.gov.pl>