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Clusters: an example of a state strategy for creating energy security in Poland

Introduction

The notion of a cluster has been around for some time now. It is commonly acknowledged that the reciprocal links between businesses, suppliers, providers and other units of the market offer a vast array of possibilities for competitiveness and innovation. This explains why various entities decide to join this kind of cooperation. In the case of energy clusters, the notion first appeared in the Polish Renewable Energy Sources Act of 2016. A definition of energy clusters was put forward, and their role was defined. As part of creating a strategy of energy security, a decision was made to combine the aspect related to local energy resources and the experience of different entities with the potential and support offered by the state. More emphasis began to be put on the role of safety and security understood on different levels – even on the lowest ones, which started to be seriously regarded as an inherent part of the entire system.

The goal of this paper is to determine to what extent the growth of clusters may have a major impact on improving energy security. The paper can be broken down into three parts. The first part looks at the role and direction of the state policy geared towards the development of clusters. The second part discusses the current situation concerning investments in the field, i.e. what investments have already been implemented, and to what extent they have an influence on improving the general level of energy security. The third part looks at the impact of public governance on the future of energy clusters in Poland. It explains to what extent the decisions taken by the bodies of public administration can shape the path and direction of the development of local entities. For the purposes of this analysis,

a hypothesis has been formulated, which assumes that the creation of a cluster policy as part of public governance has an impact on the growing level of energy security in Poland. In short, the paper will be of a mixed nature: on the one hand, it will consider the management aspect; on the other hand, it will take the political decision-making tier into account too. Throughout the paper, a method has been applied that hinges upon scrutinising the content of a variety of government documents and international press releases, including websites. It also takes advantage of several empirical methods, i.e. observation – learning about a given phenomenon by means of different government publications and press releases; description – being the outcome of the observation; and a selection of general research methods, including analysis, synthesis, induction – a form of reasoning used in pursuit of understanding and knowledge, establishing a relationship between observations and theory; and deduction – an approach whereby a series of general premises leads to a set of specific conclusions. The paper is based on a selection of primary sources and monographs, edited works, articles, as well as various publications found on the websites of government departments, ministries, organisations, and other relevant entities.

Direction and role of the state policy aimed at developing clusters in Poland

Admittedly, there is no single definition of a cluster. In the literature on the subject, references can be found to a variety of terms, including e.g. the industrial cluster (M. Porter), and the concentration of industries (A. Marshall). Cooperation of various entities launched with a view to meeting a variety of ends and needs makes any attempt to provide a detailed description of a cluster even more problematic. Yet one needs to emphasise the fact that its core lies in the idea of cooperation on both local and global markets. Additionally, clusters do not focus on an individual sector. Their multi-dimensional and multifaceted nature makes them far more attractive, opening up an array of possibilities for further collaboration. This explains the rationale for adopting a strategy labelled 'cluster-based policy,' a policy that rests on the development of clusters, or a growth policy that is based on clusters.[1] This initiative is discernible in the decisions made by the ruling party in Poland as well. Emphasis needs to be placed on the fact that support is granted not only on the international and national level, but also on a regional and local level. A major role at the EU level is played by the Communication from the Commission, which stresses the importance of the support offered to cluster initiatives across Europe.[2] The document highlights a variety of noteworthy elements, including the importance of local business enterprises (bottom-up approach), and it paves the way for the so-called European cluster label for excellent cluster organisations. The idea of

[1] Ministerstwo Gospodarki. Departament Rozwoju Gospodarki, *Kierunki i polityka rozwoju klastrów w Polsce*, Warszawa 2009, pp. 6–8.

[2] Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions, *Towards world-class clusters in the European Union. Implementing the broad-based innovation strategy*, COM(2008) 652 final.

promoting the best has given rise to some doubts and reservations, which is why a decision has been made to entrust the European Cluster Observatory with the task to supervise the actions taken in this area.[3] The following forms of support offered to clusters in Poland have been identified so far:

- increased competitiveness of businesses for the years 2004–2006, including support for the activities and/or relations between the spheres of research, development and the economy as part of clusters;[4]
- within the development of human resources for the years 2004–2006 (SPO RZL), Action 2.3: *The Development of the Modern Economy Staff* by holding a series of training programmes aimed at so-called 'clustering';[5]
- *The programme of economic innovation in the years 2007–2013 (PO IG)* – as part of the innovation of businesses – no direct mention of financing clusters, or at the level of the support provided; however, emphasis has been put on the cooperation between businesses and research and scientific units. Assistance subdivided into regional (so-called regional operational programmes), and supra-regional;[6]
- *Operational Programme 'Human Capital',* which, within Action 2.1, offers support for staff as part of staff development schemes;[7]
- *PARP Cluster Development Support Programme* – using the resources obtained from structural funds, i.e. *the National Cohesion Strategy*. The programme was a pilot project;[8]
- *'Smart Growth' Operational Programme (PO IR) for the years 2014–2020* – support given to key regional clusters;[9]
- *'Eastern Poland' Operational Programme (PO PW)* – targeted at the following Polish provinces: Lubelskie, Podkarpackie, Podlaskie, Świętokrzyskie, and Warmińsko-Mazurskie – aimed at stimulating the growth of innovative entrepreneurship;[10]
- *'Smart Growth' Operational Programme launched as part of the European Regional Development Fund in the years 2014–2020* – aimed at supporting regional initiatives.[11]

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3 For more information, see: Cluster Observatory, http://www.clusterobservatory.eu [accessed: 9.05.2020].

4 PARP, *Sektorowy Program Operacyjny Wzrost Konkurencyjności Przedsiębiorstw, lata 2004–2006*, Warszawa 2008.

5 Sektorowy Program Operacyjny Rozwój Zasobów Ludzkich 2004–2006, Journal of Laws of the Republic of Poland – Dziennik Ustaw Rzeczypospolitej Polskiej (Dz.U.) No. 166, item 1743.

6 Ministerstwo Rozwoju, *Program Operacyjny Innowacyjna Gospodarka, 2007–2013*, Warszawa 2007.

7 For more information, see: *Program Operacyjny Kapitał Ludzki, Ministerstwo Rodziny, Pracy i Polityki Społecznej*, http://www.kapitalludzki.gov.pl [accessed: 9.05.2020].

8 PARP, *Regulamin programu Wsparcie na rozwój klastra. Regulamin, Zespół Wdrażania Instrumentów Finansowych*, Warszawa 2007.

9 For more information, see: *Portal Funduszy Europejskich*, https://www.funduszeeuropejskie.gov.pl [accessed: 9.05.2020].

10 For more information, see: *Polska Wschodnia. Program*, https://www.polskawschodnia.gov.pl [accessed: 9.05.2020].

11 For more information, see: *Inteligentny Rozwój. Program*, https://www.poir.gov.pl [accessed: 9.05.2020].

Clusters are regarded as entities that have so-called spillover effects, i.e. ones that help to incentivise the sector of small and medium-sized businesses, and facilitate getting access to specialised factors of production and reducing the costs of production, thus allowing for the transfer of knowledge and technologies – such as e.g. strategic partnerships, purchasing licences, or joint ventures. Here, an element that plays a major role is the so-called relational capital, which includes the relations between businesses and institutions.[12]

Interestingly, the very establishment of a cluster is rather ambiguous. According to government reports, so far no unequivocal cause has been identified that underlies the origins of clusters, such as e.g. "the relevant historical setting, the availability of natural resources, the proximity of a potential customers market, or the availability of scholars and academics. The origins of clusters could be found in the setting up of the first companies with a related scope of commercial activity in a given area."[13] The formation of clusters can be subdivided into three stages. The first stage includes the birth of a cluster, the second stage concerns its growth and maturation, and the third stage – its decline, and the termination of its activity. The most important aspect to consider is the cluster's maturation, a stage that consists in attracting external businesses and potential workers, which can consequently lead to boosting the growth of a variety of entities. Emphasis needs to be placed on the fact that this process is cooperative by its nature, and sometimes in the subject literature it is set against the metaphor of a chain. Therefore, it needs the raising of public awareness a lot. In short, one of the possible examples of the cooperation of a cluster could be the following: research and development centres, industry-related associations, government schemes, cooperation with the local and/or regional authorities, and cooperation with the institutions that function in the external environment of a business, such as e.g. business incubators, Regional Development Agencies, and many others.[14]

Currently, in Poland, the competitiveness of the economy is based to a much larger extent than before on research, development and innovation (R+D+I), and this is clearly the outcome of the functioning of clusters. This explains the rationale behind creating the so-called List of Key National Clusters, available on the official website of the Republic of Poland, evaluated on the basis of the following elements: "human and organizational resources, infrastructural and financial resources, economic potential of clusters, creation and transfer of knowledge, acting to the benefit of public policies, level of customer orientation."[15] Getting on the list occurs on the basis of a contest announced on the website. The educational form

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12 *Kierunki i polityka rozwoju klastrów w Polsce*, *op. cit.*, p. 10.

13 *Ibidem*, p. 13.

14 M. Baran, 'Klasyfikacje klastrów i inicjatyw klastrowych. Wnioski dla systemu wspierania struktur klastrowych w Polsce', *Szkoła Główna Gospodarstwa Wiejskiego, Katedra Polityki Agrarnej i Marketingu. Prace Naukowe*, 2008, No. 47; Metody ewaluacji polityk wspierania klastrów ze środków strukturalnych, https://depot.ceon.pl/bitstream/handle/123456789/4911/Klasyfikacje_klastrow_i_inicjatyw_klastrowych_Wnioski_dla_systemu_wspierania_struktur_klastrowych_w_Polsce.pdf?sequence=1&isAllowed=y [accessed: 15.05.2020].

15 Ministry of Economic Development, Labour and Technology, *List of Key National Clusters*, 15.04.2019, https://www.gov.pl/web/rozwoj/lista-kkk [accessed: 9.05.2020].

relies on traditional training programmes and business meetings, but one should not forget about informal channels of communication, which nowadays, in the time of a high risk, constitute the major sources of information and gaining knowledge. Competition puts a lot of pressure, forcing everyone to change and adapt quickly to the trends that are dominant in the market at a given time, which raises the bar in major way as part of acquiring the so-called business skills.

The government policy highlights the significant role of clusters in regional cooperation. In 2015, it was noted that between 2004 and 2015, there were approximately 140 clusters, of which 65% were reasonably young structures. They received most of the support and grew rapidly in the years 2014–2015. Clusters could benefit not only from the support of the state, but also from EU financial resources.[16] It is also important to mention the intensity at which clusters kept growing across the different industries, e.g. in the energy sector. Here the entities that play a significant role include:

- energy clusters: a term launched in 2016 with a view to improving the level of local energy security; it also pertains to individuals, scientific units and research institutes, as well as to the diverse units of the local and/or regional authorities as part of the renewable energy generation and distribution scheme;[17]
- energy cooperatives: their activity rests on the creation of electrical energy of biogas, or heat;
- prosumers: they are the end-users, i.e. the entities that generate energy in micro-installations, obtaining it from renewable sources, which implies purchasing electrical energy on the basis of a so-called master agreement.[18]

In 2010, 2012, 2014 and 2018, the Polish Agency for Enterprise Development (Polish: PARP) conducted a study entitled "Benchmarking of Clusters in Poland." Benchmarking has been defined as "an attempt to identify, analyse, adapt and implement solutions applied by organisations that are most effective in a given domain."[19] The report scrutinises the support provided for forty clusters across Poland. It also points to the international dimension and cooperation as part of the European Clusters Alliance PRO INNO:

- BSR InnoNET (Baltic Sea Region Innovation Network) – operating within the Baltic Sea Region Innovation Network;
- INNET, cooperation with the Polish Agency for Enterprise Development and the Office of the Marshall of the Masovian Province;
- CEE-ClusterNetwork, in which Poland is represented by the Industrial Development Agency (Polish: Agencja Rozwoju Przemysłu, ARP).[20]

In order to analyse the role of clusters, it may also be useful to apply a variety of analytical methods and techniques. They all consider the causes and effects, the

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[16] For more information, see the website of the Ministry of Agriculture, https://www.gov.pl [accessed: 9.05.2020].

[17] For more information, see the website of the Ministry of State Assets, https://www.gov.pl/web/aktywa-panstwowe [accessed: 9.05.2020].

[18] The Amended Renewable Energy Sources Act of 19 July 2019, Journal of Laws of the Republic of Poland – Dz.U. of 2019, item 1524.

[19] PARP, *Benchmarking klastrów w Polsce – edycja 2018*. *Raport ogólny*, Warszawa 2018, p. 5.

[20] *Ibidem*, p. 30.

cost analysis, the multi-criteria analysis, or the application of the SWOT method. Reference is also made to the views of experts and analysts, stakeholders, and the society at large.[21]

The role of clusters in creating energy security

The definition of an energy cluster presented on the government website suggests that it could be described as "an agreement of locally functioning entities that manufacture, consume, store and sell electrical energy, heat, cooling, electrical energy in transport, and fuel."[22] The concept was incorporated into the Polish legal order in June 2016.[23] From a formal standpoint, an energy cluster is a civil-law agreement made in the form of a contract by its parties – individuals, legal entities, research units, institutes, or units of the local and/or regional authorities.

In November 2016, the Ministry of Energy commissioned an independent expert opinion concerning the "Functioning of Energy Clusters in Poland." The report was developed by a consortium of companies: the Polish National Energy Conservation Agency (Polish: Krajowa Agencja Poszanowania Energii, KAPE) – acting as the leader of the consortium, WiseEuropa – the Warsaw Institute of Economic and European Studies Foundation and ATMOTERM S.A., with the participation of the National Distributed Power Engineering Institute. Emphasis was put on the fact that clusters have a major impact on the development of local power industry, and thus enhance the energy security of the state. The report also highlighted the fact that renewable energy sources are placed in close proximity to their local recipients, i.e. those who need them the most. It is of primary importance to make sure that in the long run small investments become fully independent and autonomous.[24]

The government has opted for the promotion of the idea of energy clusters, a case in point being the outcome of the first contest of 2018, in which of the 115 applications received, 33 entities were awarded a pilot energy cluster certificate. The updated list of clusters is available on the official website of the Ministry of State Assets – around June 2020, there were 66 clusters on this list. Yet one has to stress the fact that there is no legal obligation to report a cluster, which means that their actual number can be higher. The basic scope of a cluster is the area of a county or five communes. The above awarded entities operate on the level of local and/or regional authorities. A cluster has its coordinator (DSO), appointed

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21 A. Chodyński, 'Proekologiczne, regionalne powiązania przedsiębiorstwa', in P. Raźniak (ed.) *Przekształcenia struktur regionalnych*, Krakowskie Towarzystwo Edukacyjne – Oficyna Wydawnicza AFM, Kraków 2012, p. 48.

22 For more information, see the website of the Ministry of State Assets, *op. cit.*

23 The Amended Renewable Energy Sources Act of 22 June 2016, cf. Journal of Laws of the Republic of Poland – Dz.U. item 925; the Renewable Energy Sources Act of 20 February 2015, Journal of Laws of the Republic of Poland – Dz.U. of 2015, item 478, as amended.

24 Ministerstwo Aktywów Państwowych, *Koncepcja funkcjonowania klastrów energii w Polsce. Ekspertyza,* 20.06.2018, https://www.gov.pl/web/aktywa-panstwowe/koncepcja-funkcjonowania-klastrow-energii-ekspertyza [accessed: 15.05.2020].

by the President of the Energy Regulatory Authority (Polish: Urząd Regulacji Energetyki, URE), and further governed by the provisions of Section 9d of the Energy Act. The above mentioned report has also provided additional details regarding the issue of distribution system operators (DSO):

- it is not the owner of a distribution infrastructure, but only uses it as part of a signed agreement with its owner, i.e. a given cluster;
- the cluster makes use of the assets of a given DSO, paying all the necessary and relevant fees.

In addition, an energy cluster coordinator is in charge of trade balancing, i.e. supervising all the financial settlements as part of the energy provided and collected for every single settlement period.[25] Therefore, it seems legitimate to assume that the underlying idea behind the creation of energy clusters was also that of using the energy resources that were either (or could be) locally unavailable, which makes it possible to identify a direct link with Poland's energy security strategy. This has also been confirmed by the official statement made by the Energy Regulatory Office: "the goal of clusters is to make sure that energy is provided on an ongoing basis at the local level, and at the same time maintain a positive impact on the natural environment. One of their expected effects is also the growing competitive advantage of a given region."[26] Having said this, an effective cluster also has to cooperate with the National Energy System.

According to the Department of Energy, in 2019, the power capacity of the Certified Energy Clusters stood at approximately 1,790 MW, of which over 730 MW was the various types of power retrieved from stable and dispatchable generation sources. Despite the dynamic growth of energy clusters, there are still several issues that to a large extent hinder their further development: the legal context, the lack of one's own distribution network, issues related to getting financial resources for investments, issues connected to the transfer of technology to a cluster, or poor cooperation with research units. A major response to all these difficulties has been the project launched by the Ministry of Energy entitled "The Growth of Distributed Energy Generation in Energy Clusters (KlastER)", implemented as part of the MENAG Science Consortium, whose overriding goal has been to scrutinize the hardships and work out a reliable growth strategy for energy clusters in Poland.[27]

In 2018, Krzysztof Tchórzewski, the then Minister of Energy, stressed the significance of distributed energy generation, claiming that "it would be optimal if such energy kept growing and replaced in part the large energy industry. We would also like to replace it with the power industry of business enterprises and our nationals wherever possible."[28] This is why it came as a big surprise when in

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[25] 'Klastry energii – mechanizmy funkcjonowania', Energetyka24, 28.05.2018, https://www.energetyka24.com/klastry-energii-mechanizmy-funkcjonowania [accessed: 15.05.2020].

[26] For more information, see the official website of the Energy Regulatory Office, https://www.ure.gov.pl [accessed: 9.05.2020].

[27] 'Energia z klastrów', Dziennik.pl, 25.06.2019, https://gospodarka.dziennik.pl/artykuly/600975,energia-z-klastrow.html [accessed: 15.05.2020].

[28] '33 pomysły na klastry energii z certyfikatem resortu energii', wnp.pl, 9.05.2018, https://www.wnp.pl/energetyka/33-pomysly-na-klastry-energii-z-certyfikatem-resortu-energii,322855.html [accessed: 15.05.2020].

2018 it was the energy cooperatives that received a major support rather than the clusters. Another amendment of the Act on renewable energy sources has been meant to support farmers and their individual production of energy. According to Jadwiga Emilewicz, "this project is aimed at implementing the next step, which we set ourselves in the 'Energia Plus' programme, announced in January. Under the new regulations, small and mid-sized entrepreneurs will gain the status of prosumers. The same goes for energy cooperatives."[29]

At this point, a question arises: do energy clusters really have a future, and if so, what sort of future lies ahead of them? Apparently, entering an initiative on the so-called priority activities list is not enough. Support and incentives ought to be visible in all kinds of actions and decisions, and so far in the energy sector, beyond energy cooperatives, other concepts have begun to appear, such as e.g. singling out the so-called prosumer, or the "My electricity" initiative. Such dispersion could be an opportunity for several entities, but it can also lead to disintegration and a lack of cooperation. One of the examples could be the already announced changes proposed by Michał Kurtyka, Minister of Climate, in one of his statements made in March 2020. The changes are expected to occur within the Energy policy strategy to be launched by 2040, the investments in wind turbines on the Baltic Sea, and the issues related to the functioning of energy clusters – given the transformation and growing interest in this sector on the part of various entities.

Energy clusters in Poland have focused their activity on investments in photovoltaics, a case in point being ZKlaster, the Zgorzelec Renewable Energy Sources Development and Energy Efficiency Cluster. The individually owned distribution network will ensure supplies from photovoltaic farms to the local network handled by Tauron Dystrybucja, a major Polish energy provider. The project has also envisaged energy supplies to other members of the cluster. However, one of the major problems remains the collection of the generated energy and the payment for it.

The impact of public governance on the future of energy clusters in Poland

Apart from energy clusters, there has recently been a major shift in the importance attached to the prosumer, and the support offered as part of the "My electricity" initiative. The amended Renewable Energy Sources Act, adopted at the end of June 2019, features the definition of a prosumer, i.e. a person who not only generates electrical energy based on renewable energy sources for his/her individual needs using a micro-installation, but who is also able to store the surpluses and transfer it to the energy network.[30] In addition, a so-called prosumer

[29] 'Żegnajcie klastry, witajcie spółdzielnie energetyczne', 26.06.2019, gramwzielone.pl, https://www.gramwzielone.pl/trendy/100982/zegnajcie-klastry-witajcie-spoldzielnie-energetyczne [accessed: 15.05.2020].

[30] The original notion was related to the Entrepreneurs Act of 6 March 2018, Journal of Laws of the Republic of Poland – Dz.U. of 2018, items 646, 1479, 1629, 1633, and 2212.

package has been singled out, which concerned small and mid-sized businesses, as well as energy cooperatives, which not only take advantage of the prosumer rules/principles but also benefit from additional discounts.

Another form of support could be the government scheme by the name of "My electricity", launched in July 2019. It allows individuals to make use of the assistance of an expert and get a subsidy of PLN 5,000 as reimbursement of the costs incurred for a micro-installation. The goal of the programme is to increase the amount of electrical energy generated from photovoltaic micro-installations. The funding covers PV installations with a general power capacity of 2–10 kW, and ones that have not been completed before 23 July 2019. The project is targeted at individuals who generate electricity for their own needs, and who have handled all the relevant procedures related to introducing such energy into the network.[31] Experts believe that Poles install solar panels with an overall power of 4–6 kW, paying from PLN 20–30 thousand. Therefore, the estimated government funding should cover only about 15–25% of the overall value of the investment in question.[32]

The July amendment of the Renewable Energy Sources Act gave priority to yet another form of cooperation – energy cooperatives (cf. Figure 1). Hence, it is currently possible not only to generate energy, but also to store it, and to collect it. The legislator has specified the scope of activity of such a cooperative and has obliged it to join a distribution system operator (DSO), or a thermal network. In a way, an energy cooperative will operate on the same terms as a prosumer: it can generate energy in the form of electricity, heat, or biogas. In order to commence its activity, a cooperative has to provide all the necessary data on the so-called general list kept by the Director General of the National Support Centre for Agriculture (Polish: Krajowy Osrodek Wsparcia Rolnictwa, KOWR). At this point, a question arises: what does the discounts system mean? How could a cooperative benefit from it? Experts claim that "for each kilowatt-hour of energy introduced by a prosumer into the network, his/her next bill for a kilowatt-hour obtained from the network can be reduced at a 1:08 rate in the case of a micro-installation with a power capacity of up to 10kW, or at a 1:07 rate in the case of larger micro-installations, yet ones that do not exceed 50kW."[33] A discount has to be claimed within one year, on condition that an adequately high level of consumption has been generated.

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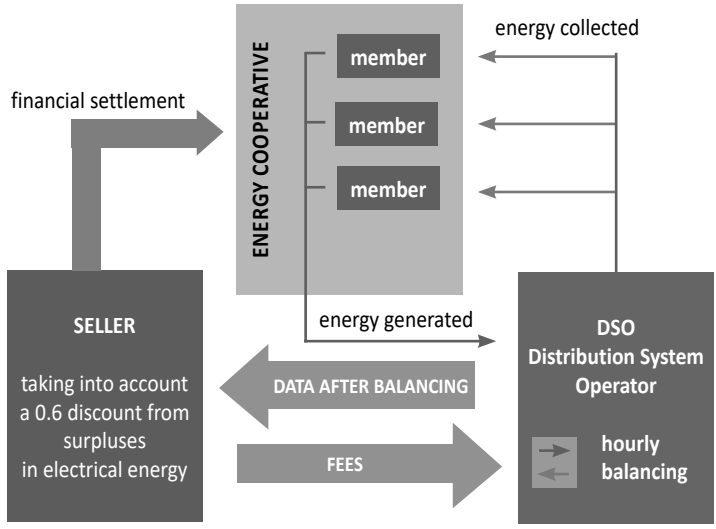
[31] For more information, see the official website of the "My electricity" project. The financing scheme for photovoltaic micro-installations can be found at https://mojprad.gov.pl/ [accessed: 9.05.2020].

[32] 'Co zmieni „Mój prąd", czyli 5 tys. zł dopłaty do paneli słonecznych? Policzyliśmy', money.pl, 28.007.2019, https://www.money.pl/gospodarka/co-zmieni-moj-prad-czyli-5-tys-zl-doplaty-do-paneli-slonecznych-policzylismy-6406657642985601a.html [accessed: 15.05.2020].

[33] 'Spółdzielnie energetyczne prosumentami?', Leonardo Energy. Portal na rzecz czystej energii i klimatu, 28.06.2019, https://leonardo-energy.pl/spoldzielnie-energetyczne-prosumentami/ [accessed: 15.05.2020].

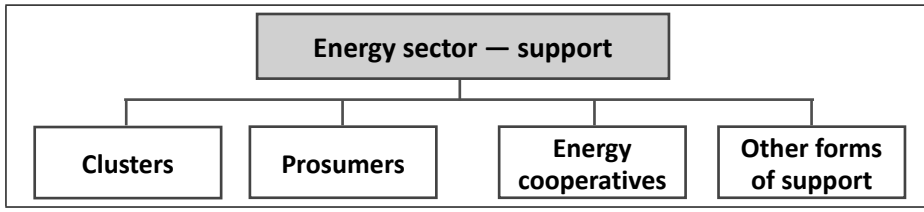
Figure 1. The flow chart of energy cooperatives



Source: 'Spółdzielnia energetyczna co to takiego?', https://www.prosument.org/home/baza-wiedzy/jak-zostac-prosumentem/spoldzielnie-energetyczne/ [accessed: 15.05.2020].

According to Michał Kurtyka, the then Minister of Climate, the success of the "My electricity" programme and Poles' growing interest in photovoltaics has made it necessary to extend the scope of the support to include housing cooperatives and housing associations. This is why, as part of the "Sunny roofs" project, about PLN 100 million have been assigned to various types of investments, e.g. in PV photovoltaic installations of up to 50kW power. In 2019, a pilot scheme was launched in Wielkopolskie province. It was aimed at granting low interest loans, with a partial remission or extinction option. The project was positively assessed by entities in other Polish provinces, and in March 2020, Ślesin, a town near Poznań, confirmed its participation in the venture. The project is financed from the financial resources of the National Environment Protection and Water Management Fund and the Regional Environment Protection and Water Management Fund in Poznań.[34]

Figure 2. The energy sector in Poland, and distributed power engineering



Source: own individual elaboration.

[34] For more information, see the official website of the Regional Environment Protection and Water Management Fund in Poznań, https://www.wfosgw.poznan.pl [accessed: 9.05.2020].

The above solutions suggested by the government (cf. Figure 2) aim to offer Poland some energy stability. Here, a new aspect comes to the fore: taking into consideration the local investments and the locally available resources and their collaboration for the state's energy security. The European Union highlights the autonomy of its member states in terms of the energy mix. This said, one must not forget the EU's guidelines and its emphasis on the protection of the natural environment. In November 2018, the EU put forward the so-called climate neutrality strategy, which implies that the CO_2 emissions level ought to be at the same level as the level of CO_2 absorption. Furthermore, in 2030, CO_2 emission should be cut down by 45%.[35] It is important to mention that in 2019 Poland failed to abide by the required EU 15% of the share of renewable energy sources in the general energy balance, and the forecasts for 2020 are similar. 80% of energy in Poland is still derived from hard coal and brown coal, which Poland has been importing on a large scale recently, given the price of the resource offered on foreign markets. In spite of the large potential of the renewable Energy sources sector in Poland, the number of investments is still not impressive. Experts use the notion of 'hidden potential', which, despite a variety of ideas, keeps being unfulfilled in light of the problems caused by the unstable legal context, a shortage of financial resources, or the lack of experience and know-how. As of January 2020, the body assigned with the task to supervise the actions taken in the energy sector – especially the effectiveness of the efforts taken as part of the promoted local solutions enhancing the level of security on the state level – is the Government's Plenipotentiary for Renewable Energy Sources. The government's keen interest is expected to incentivise potential investors.[36]

The solutions outlined above give the state a certain alternative choice: they prove that not only international investments, global relations or keeping up with rivals and current trends are evidence of a certain level of energy stability. It is also worth looking at the smaller elements, i.e. on private investors, small businesses, clusters, or energy cooperatives. Yet in the face of the crisis, which we are facing up to now, and the general lockdown of the economy in introduced to fight against coronavirus, a question of major relevance needs to be asked: what impact will the risk have on the entre energy sector? How will prosumers cope with the situation, and how will energy cooperatives and clusters get past it all? Can the market of renewable energy sources in Poland be an alternative for the non-renewable resources? According to Piotr Rudyszyn, expert of the Jagiellonian University, "the traditional methods of extracting coal and generating energy are becoming risky for the workers and their health."[37] To corroborate the words of the expert, suffice it to consider the situation that concerns the temporary closures of coal mines due to the numerous cases of coronavirus infections revealed among the staff.

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[35] For more information, see the EU's official website, https://ec.europa.eu [accessed: 9.05.2020].

[36] For more information, see the website of the Ministry of State Assets, *op. cit.*

[37] 'Wpływ koronawirusa na produkcję energii. Rynek OZE w Polsce może mieć poważne kłopoty', Salon24, 6.04.2020, https://www.salon24.pl/u/zielonaenergia/1033790,wplyw-koronawirusa-na-produkcje-energii-rynek-oze-w-polsce-moze-miec-powazne-klopoty [accessed: 15.05.2020].

Conclusions

To sum up the above reflections on the role of clusters in the shaping of Poland's energy security, it is possible to draw the following conclusions. First, energy clusters may constitute a stable pillar of the entire energy sector given the use of local resources and the cooperation with individual stakeholders. Horizontal and vertical integration makes it possible to work out reliable solutions, which are so very needed in the sector of renewable energy sources, which explains the need to devise and implement a cluster policy as part of public governance as a strategy aimed at improving the energy security of the state as a whole. Second, despite their dynamic growth and interest, energy clusters are currently unable to guarantee Poland a reasonable level of energy security. Several factors play a pivotal role in this respect: an unstable legal context, support for other projects – such as energy cooperatives, prosumers , or "My electricity" project – which means that investors can on the one hand choose where they will allocate their resources, and, on the other hand, they will think twice about the relevance and/or appropriateness of such investments. Third, in Poland, energy clusters require a long-term support, alongside a reliable growth scenario, indicating the potential threats and opportunities, working out a support scheme in case of crisis situations. At present, no-one can be sure about their future, and, clearly, a situation like this does not attract prospective investors. Fourth, there is still no stable strategy of Poland's Energy security. Maybe it should be necessary to consider fine-tuning some issues related to local investors in these documents, which would have a major impact on the importance and priority of the individual undertakings. There is also a looming fear of the continuity of such investments in the event of a major political reshuffle that leads to a new government. What happens once other solutions are laid on the table? A similar situation has already taken place in the case of wind energy in Poland. What is more, energy clusters, energy cooperatives and the question of prosumers seem to be a good step forward to building a stable market of renewable energy sources in Poland, which would, in turn, be a clear response to the EU requirements. Therefore, it is important to provide necessary support and assistance to the energy sector in order to facilitate the growth of Energy clusters. This ought to be done not just in a short-term perspective, but rather in the long run, and with particular emphasis put on the situation of competitive markets and the trends that can be discerned on the global market.

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Klastry jako przykład strategii państwa na rzecz poprawy bezpieczeństwa energetycznego w Polsce

Streszczenie

„Klaster" nie jest pojęciem nowym. Wiadomo również, że wzajemne powiązanie przedsiębiorstw, dostawców, jednostek itp. daje szereg możliwości pod względem konkurencyjności i innowacyjności. Stąd też podmioty decydują się na tego rodzaju współpracę. Koncepcja klastrów energii pojawiła się wraz z ustawą o odnawialnych źródłach energii w 2016 r. W ustawie zdefiniowano, czym są klastry energetyczne i jaka jest ich rola. W ramach kreowania strategii bezpieczeństwa energetycznego postanowiono połączyć aspekt lokalnych zasobów energetycznych i doświadczenia podmiotów wraz z potencjałem i wsparciem ze strony państwa. Zaczęto podkreślać rolę bezpieczeństwa na różnych płaszczyznach, nawet tych najmniejszych, będących cząstką całego systemu. Celem artykułu jest ustalenie, w jakim stopniu rozwój klastrów może wpłynąć na poprawę bezpieczeństwa energetycznego. Artykuł został podzielony na trzy części. Pierwsza przedstawia rolę i kierunek polityki państwa na rzecz rozwoju klastrów. Druga analizuje stan faktyczny inwestycji, tj. jakie inwestycje zostały zrealizowane i w jakim stopniu wpływają one na poprawę bezpieczeństwa energetycznego. Trzecia część omawia wpływ zarządzania publicznego na przyszłość klastrów energetycznych w Polsce oraz pokazuje, w jakim stopniu decyzje administracji publicznej mogą kreować kierunek rozwoju lokalnych podmiotów. Na potrzeby analizy sformułowano hipotezę, że kreowanie polityki klastrowej w ramach zarządzania publicznego wpływa na poprawę bezpieczeństwa energetycznego w Polsce. Artykuł ma charakter mieszany: został uwzględniony

zarówno aspekt zarządzania, jak i aspekt decyzji politycznych. Omawia problem istotny dla bezpieczeństwa energetycznego Polski, koncertując się na najnowszych informacjach i wydarzeniach.
Słowa kluczowe: klastry, zarządzanie publiczne, bezpieczeństwo energetyczne, Polska, państwo, strategia

Clusters: an example of a state strategy for creating energy security in Poland
Abstract

The notion of a cluster is not new. Linking companies, suppliers, units and other bodies gives one a range of opportunities in terms of competitiveness and innovation. This is why various entities go in for this kind of cooperation. The concept of energy clusters first appeared in the Polish Renewable Energy Sources Act of 2016, which defines what energy clusters are, and what their role is. As part of creating an energy security strategy, it was decided to combine the aspect of local energy resources and the experience of entities along with the potential and support of the state. Emphasis was placed on the role of security at various levels, even those being a part of the whole system. The goal of this paper is to determine to what extent the development of clusters can improve energy security. The paper has been divided into three parts. The first part looks at the role and direction of state policy for the development of clusters. The second part scrutinises the current state of investments, i.e. what investments have been made and to what extent they improve energy security. The third part discusses the impact of public governance on the future of energy clusters in Poland. It shows to what extent decisions of public administration bodies can devise the path of development of local entities. For the purposes of this analysis, a hypothesis has been formulated that puts forward the idea that creating cluster policy as part of public management improves energy security in Poland. On the whole, the paper is of a mixed nature, as it includes management as an aspect of political decisions, and the issue relevant to Poland's energy security by focusing on the latest news and events.
Key words: clusters, public governance, energy security, Poland, state, strategy

Cluster als Beispiel der Strategie des Staats für die Verbesserung der Energieversorgungssicherheit in Polen
Zusammenfassung

Der Begrifff Cluster ist nicht neu. Es ist auch bekannt, dass die Partnerschaft von Unternehmen, Lieferanten, einzelnen Einheiten usw. eine Riehe von Möglichkeiten in Hinsicht der Wettbewerbs- und Innovationsfähigkeit bietet. Daher entscheiden sich die Marktbeteiligten auf so eine Zusammenarbeit. Im Falle der Energie-Cluster kam das Konzept zusammen mit dem Gesetz über die erneuerbaren Energiequellen am Jahre 2016 auf. In Gesetz definierte man, was die Energie-Cluster sind und welche Rolle sie haben. Im Rahmen der Gestaltung der Strategie für Energieversorgungssicherheit beschloß man den Aspekt der lokalen Energieressourcen und der Erfahrung der Unternehmen mit dem Potenzial und der Unterstützung seitens des Staates zu verbinden. Man begann, die Rolle der Sicherheit auf verschiedenen Ebenen zu betonen, sogar auf den kleinsten, die ein Teil des ganzen Systems sind. Das Ziel des Artikels ist zu bestimmen, in welchem Umfang die Entwicklung der Cluster die Verbesserung der

Energieversorgungssicherheit beeinflussen kann. Der Artikel wurde in drei Teile gegliedert. Der erste stellt die Rolle und die Richtung der Politik des Staatses für die Entwicklung der Cluster dar. Der zweite Teil analysiert den Sachverhalt der Investition, d.h. welche Investitionen umgesetzt wurden und in welchem Umfang sie die Verbesserung der Energieversorgungssicherheit beeinflussen. Der dritte Teil handelt von dem Einfluss des öffentlichen Managements auf die Zukunft der Energie-Cluster in Polen und zeigt, inwiefern die von der öffentlichen Verwaltung getroffenen Entscheidungen die Entwicklungsrichtung der lokalen Unternehmen schaffen können. Für die Analyse formulierte man die Hypothese, die voraussetzt, dass die Schaffung der Clusterpolitik im Rahmen des öffentlichen Managements sich auf die Verbesserung der Energieversorgungssicherheit auswirkt. Der Artikel hat einen gemischten Charakter, in dem sowohl der Managementsaspekt, als auch der Aspekt der politischen Entscheidungen berücksichtigt wird. Zusätzlich wird ein für die Energiversorgungssicherheit wichtiges Problem mit dem Schwerpunkt auf die neuesten Informationen und Ereignisse behandelt.
Schlüsselwörter: Cluster, **öffentliches** Management, Energiversorgungssicherheit, Polen, Staat, Strategie

Кластеры как пример стратегии государства по повышению энергетической безопасности в Польше
Резюме

Понятие «кластер» не является новым. Также известно, что взаимосвязь предприятий, поставщиков, подразделений и т.д. – предоставляет ряд возможностей в сфере конкурентоспособности и инноваций, что является стимулом развития сотрудничества. В случае энергетических кластеров, концепция такого сотрудничества в Польше появилась после принятия закона «о возобновляемых источниках энергии» в 2016 г. Закон дает определение, что такое энергетические кластеры и какова их роль. При разработке стратегии энергетической безопасности было принято решение объединить местные энергетические ресурсы и имеющийся опыт субъектов с потенциалом и поддержкой со стороны государства. В статье предпринято попытку дать ответ на вопрос, в какой степени развитие кластеров может повлиять на повышение энергетической безопасности. Исследование состоит из трех частей. В первой – представлена роль и направление государственной политики по развитию кластеров. Во второй – анализируется фактическое состояние инвестиций, т.е. указано, какие инвестиции были реализованы и в какой степени они способствуют повышению энергетической безопасности. В третьей части обсуждено влияние государственного управления на будущее энергетических кластеров в Польше и показано, в какой степени решения государственного управления могут определять направление развития местных субъектов. Для анализа была сформулирована гипотеза, которая предполагает, что создание кластерной политики в рамках государственного управления влияет на улучшение энергетической безопасности Польши. В статье рассмотрены аспекты управления и принятия политических решений, обсуждены актуальные проблемы и события, связанные с энергетической безопасности Польши.
Ключевые слова: кластеры, государственное управление, энергетическая безопасность, Польша, государство, стратегия