

AGNIESZKA CHRISIDU-BUDNIK

ORCID: 0000-0001-7775-241X

University of Wrocław

Networking of legal and organizational solutions in energy transition

Abstract: The article focuses on the question of networking of legal and organizational solutions in the energy transition process, which accepts energy collectives. Energy collectives take on two fundamental forms in the Polish legal order: energy clusters and energy cooperatives. The article presents a description of these two basic legal and organizational mechanisms of energy transition and identifies the main indicators making it possible to compare them to each other. The paper uses the method of content analysis of legal regulations (EU and national) and specialised literature on the subject.

Keywords: energy transition, energy collectives, energy clusters, energy cooperatives.

Introduction

Energy transition, which is essentially a complex and multidimensional process of moving from a conventional energy-based economy to a sustainable economy based on renewable energy sources (RES), gives rise to questions about the significance of networking mechanisms of cooperation in the pursuit of the objectives of this transformation and the function of the legal regulations in shaping these mechanisms.¹ The trajectory of the processes determining the pace of

¹ The significance of creating various types of inter-organizational networks to pursue the climate policy goals at all levels, namely global, EU and national levels, is noticed in the area of public governance. See: D.J. Gordon, "Between local innovation and global impact: Cities, networks, and the governance of climate change," *Canadian Foreign Policy Journal* 19, 2013, no. 3, pp. 288–307; C. Ingold, M. Fischer, "Drivers of collaboration to mitigate climate change: An illustration of Swiss climate policy over 15 years," *Global Environmental Change* 24, 2014, no. 1, pp. 88–98; Y. Sun-Jin, "Climate policy networks in South Korea: Aliances and conflicts," *Climate Policy* 14, 2014, no. 2,

energy transition is defined by various factors, the aggregation of which justifies distinguishing at least five categories of transformation drivers, including (1) legal drivers, (2) organizational drivers, (3) social drivers, (4) technological drivers and (5) commercial drivers. These drivers are interconnected and reinforce each other, thereby increasing the synergistic effect of energy transformation. Later in the article – in accordance with its subject matter – the attention will be focused on the legal and organizational drivers determining the quality of changes in the area of energy transition, or rather, on a specific aspect of these two categories of drivers, namely networking. The objective of the paper is to present the two fundamental networking mechanisms of energy transition, which, in the Polish legal order, are energy clusters and energy cooperatives, and to compare the two mechanisms with each other. The paper uses the method of content analysis of legal regulations (EU and national) and specialised literature on the subject. The article is interdisciplinary in nature, not limiting itself to an analysis of legal regulations but referring to findings from other scientific disciplines. Since energy clusters and energy cooperatives represent a business model for local energy generation and balancing, it is reasonable to refer to the literature on the subject especially in the area of management science, sociology. Restricting oneself to an analysis of legal regulations makes it impossible to explain the mechanism of operation of these two mechanisms of local energy production from RES.

1. Networking

Networking can be defined as a pattern of ties (relationships) between any objects of a collaborative and simultaneously horizontal nature, which are created to achieve compatible objectives.² The term “networking of legal solutions” can

pp. 283–301; T. Ylä-Anttila (et al.), “Climate change policy networks: Why and how to compare them across countries,” *Energy Research & Social Science* 45, 2018, pp. 258–265; D.J. Gordon, “The orchestration of global urban climate governance: Conducting power in the post-Paris climate regime,” *Environmental Politics* 26, 2017, no. 4, pp. 694–714; B. Huybrechts, H. Haugh, “The roles of networks in institutionalizing new hybrid organizational forms: Insights from the European renewable energy cooperative network,” *Organization Studies* 39, 2018, no. 8, pp. 1085–1108; N. Long, R.M. Krause, “Managing policy-making in the local climate governance landscape: The role of network administrative organizations and member cities,” *Public Administration* 99, 2021, no. 1, pp. 23–39.

² The concept of networking originates from the analysis of the rate of change and the nature of interpersonal relationships, the so-called social networks, which have certain ways in which individuals communicate; by establishing relationships they share tangible and intangible resources. See: J. Naisbitt, *Megatrendy*, Poznań 1997. John Barnes introduced the concept of social networks into the scientific discourse as early as in the 1950s and, at that time, it was an allegory of the social connections between people, which spread through societies on the principle of a network, while the relationships between individuals started to “entwine” societies. See: J.A. Barnes, “Class

be analysed on two intertwining planes. The first is the axiological plane, which is determined by the values, intentions, principles and rules of operation and management of activities constituting the area of energy transformation, which are present in the EU regulations and reflected in national law. One of the values attributed with significance in the transition processes is cooperation, which is simultaneously considered to be an important level in energy transformation. Article 22 of the Directive of the European Parliament and of the Council (EU) of 11 December 2018 on the promotion of the use of energy from renewable sources, colloquially referred to as the RED II Directive,³ exposes the significance of the establishment and operation of energy communities, also referred to here as energy collectives,⁴ the logic of operation of which is based precisely on the collaboration of entities of various provenance. An energy community is a legal entity in which membership is based on the principles of voluntariness, cooperation and openness.⁵ The activity of energy communities which assumes the form of cooperation has both a conceptual dimension – the theoretical structure of a model of energy management – and an adaptive dimension – the implementation of model-specific solutions. By taking into account the dual nature of the activity of energy collectives, each of them can be seen to be of a unique nature and creates a unique ecosystem which is appropriate to itself. Simultaneously, within the framework of this activity, the RED II Directive requires Member States to provide energy communities with the right to: (1) generate, (2) consume, (3) store and (4) sell renewable energy. Furthermore, the provisions of the Directive require Member States to provide tools to energy collectives or entities that would like to start to collaborate within such organizational solutions, which help them gain access to information and financing, as well as to establish mechanisms at the level of the Member States for promoting and developing them. Therefore, the Member States have the role of creating an institutional (regulatory) environment for the effective functioning of energy communities within their areas.

and committees in a Norwegian Island parish,” *Human Relations* 7, 1954, no. 1, pp. 39–58. It should be emphasized that it had already been noticed then that the logic of networking was based on minimizing the importance of hierarchical (vertical) ties and maximizing the importance of horizontal (horizontal) ties.

³ OJ L 328/122 of 21.12.2018.

⁴ The RED II Directive does not introduce a legal definition of an energy community, leaving Member States with the discretion to choose the organizational forms in which such initiatives can be “enclosed,” restricting themselves to purely specifying the domains in the chain of the energy market processes in which these communities can operate. The distinguishing feature of an energy community is cooperation to satisfy the energy needs of its members.

⁵ An energy community is an initiative that is open to all; its participants can be household consumers using energy for satisfying individual needs as well as prosumers, enterprises with systems used for generating renewable energy. However, the involvement of enterprises in energy cooperatives must not constitute their primary (main) business or professional activity.

The second – organizational – plane is determined by the organizational and legal forms of energy communities adopted in the legislation of the individual Member States, which actually constitute the organizational and legal forms that distributed energy can take in a given Member State. Simultaneously, these organizational and legal forms should be treated as an element of the process of implementing and adjusting national regulations to the provisions of the RED II directive. The Polish legislator specifies two fundamental organizational and legal forms of energy communities in the area of dispersed energy, namely energy clusters and energy cooperatives.

2. Energy clusters

The legal definition of an energy cluster was introduced into the Polish legal order by the Act amending the Act on Renewable Energy Sources and certain other acts of 22 June 2016 (hereinafter the RES Act).⁶ An energy cluster is formally a civil law agreement, which can include natural persons, legal persons, scientific entities, research institutes and local government units. It addresses the generation and balancing of demand, distribution or trading of energy from renewable energy sources or other sources or fuels within a distribution network, with a rated voltage of less than 110 kV, within the area of operation of this cluster that does not extend beyond the borders of one county in the meaning of the Act on the County Government of 5 June 1998,⁷ or 5 municipalities, in the meaning of the Act on Municipal Government of 8 March 1990⁸; the energy cluster is represented by a coordinator who is a cooperative, association, foundation or any member of the energy cluster appointed for this purpose in a civil law agreement, hereinafter referred to as “energy cluster coordinator.” On 1 October 2023, the amendment to the RES Act came into force, which implements another part of the RED II directive into the Polish legal order. The amendment to the RES Act accelerates and at the same time facilitates the development of energy clusters. The amendment modifies the definition of an energy cluster; it broadens the personal scope of cluster participants – at least one local government unit has to be an obligatory participant in a cluster, and it broadens the scope of its activities to include energy storage. After the amendment, clusters may operate in the area of one county, five neighbouring municipalities and additionally in the area of one distribution network operator (DSO).⁹

⁶ Journal of Laws of 2016, item 925.

⁷ Journal of Laws of 2016, item 814.

⁸ Journal of Laws of 2016, item 446.

⁹ The amendment also introduces a register of clusters. It also establishes rules for cooperation and their settlement with the DSO. By the end of 2026, at least 30% of the energy produced and fed

The legal definition of an energy cluster sets the general framework and mechanisms of operation of energy clusters in Poland; it strongly highlights the concept of locating energy generation close to the places to which it is supplied, which, apart from financial issues,¹⁰ seems to be an important determinant of the perceived activity in creating energy clusters in Poland. The specification and simultaneously the desired simplification of the legal definition of an energy cluster justifies the description of this structure as one based on a cooperation agreement between diverse locally operating entities which generate, consume, store and sell electricity, heat, cold, electricity and fuels. It is estimated that Poland currently has approximately seventy energy clusters, the logic of operation of which is based on the concept of a network organization. A network organization is constituted by horizontal cooperation relations between entities that are organizationally and legally independent, the activities of which are targeted at achieving a common objective. The cooperation that is typical of network organizations is the manifestation of so-called positive interdependence.¹¹ From the point of view of a network organization, an energy cluster is a relatively permanent group of autonomous and specialized business entities operating in the same or related sectors, as well as entities providing services to these business entities, and local government administration and scientific entities. The literature on the subject refers to four elements that give a universal meaning to the term energy cluster:

Nucleus of the cluster – key participants of a cluster (consumers, generators, cluster coordinator).

into the grid by the parties to the cluster agreement must come from RES, and the total power of the installations put into operation in the energy cluster – must not exceed 150 MW, and must enable no less than 40% of the total annual demand of the parties to the energy cluster to be covered during the year.

¹⁰ The financial benefits of the participants of an energy cluster arise from the ability of the producers (generators) operating within the cluster to obtain higher prices from the sale of energy, while being able to meet consumer demand more cheaply.

¹¹ Positive interdependence is one of the three types of social interdependence identified by the American psychologist Morton Deutsch, who also distinguished a state of negative interdependence (competition) and a state of deficit of interdependence (isolation). See: M. Deutsch, "A theory of cooperation and competition," *Human Relations* 2, 1949, no. 2, pp. 129–152. Positive interdependence arises when there is a "positive" correlation between entities pursuing autonomous (individual) objectives. Positive interdependence is a state in which, when interpreting specific economic, technological, legal, social, etc. conditions, a particular entity concludes that it can achieve its individual objectives if and only if another entity operating in the same conditions is able to achieve its individual objectives. The existence of a group of entities pursuing objectives that are not in conflict with each other and which share the same system of values, convictions and expectations can constitute the impetus for seeking structural methods of consolidating their compatible aims, activities and interests. Network organizations are among these structural methods of consolidating compatible interests, which are always dependent on the specific socio-economic context.

Supporting sectors – business entities that serve and support the nucleus of the cluster.

“Hard” infrastructure – necessary for achieving the cluster’s objectives. This especially applies to the distribution infrastructure; the creation of an energy cluster is not always related to the need to create its own distribution infrastructure, as it is possible to use existing energy distribution network media. However, in certain cases the design of the cluster’s own distribution infrastructure will be the most financially advantageous solution for its nucleus.

“Soft” infrastructure – research facilities, local government institutions, business development agencies and stakeholders.

The logic of creating energy network collectives encompasses the activation of local communities in terms of cooperation and the generation of energy from renewable sources. The energy cluster, as a network organization, is intended to enable energy self-sufficiency to be achieved in the municipality and to bring about an increase in the level of energy security. The pursuit of an objective presented in this way requires a high level of investment in technical, generation and metering infrastructure and therefore the commitment of private capital, knowledge and activity. Energy clusters are therefore a networking formula for achieving the planned objective, which is achievable through cooperation with the involvement of external capital.

The essence of a network organization is to achieve the effect of synergy through the cooperation of its participants. Therefore, the coordination mechanisms that are typical of an energy cluster, which have a subjective and an objective dimension, play an important role within the energy cluster. The so-called coordinator of the network organization is responsible for the efficiency of coordination in the subject dimension.¹² The legislator emphasizes the role of the coordinator as a link that represents the cluster’s interests externally,¹³ while the logic of operation forces the coordinator (the network creator, broker, network centre) to simultaneously play an important role directed towards the inside of the cluster – to secure the ability to pursue the individual interests of the members of the cluster and reconcile the often conflicting and particular interests of its members. The need for the coordinator’s inward-looking activity arises from the

¹² The Act on RES (Article 2[15a]) stipulates that the coordinator representing the cluster’s interests externally is a cooperative, association, foundation, or any member of the energy cluster specified in the civil law agreement, who is appointed to represent the cluster (it can also be an entity established for this purpose, e.g. a partnership or a company). The coordinator’s functions laid down by the legislator are to manage and represent the energy cluster in business dealings, regarding the projects that are being implemented. The coordinator may be and, in practice, often is the initiator and founder of the cluster, or a new entity specified by the participants in the cluster contract. The Act does not specify the scope and principles of representation by the coordinator in the cluster; it leaves the freedom to make this decision to the members of the cluster.

¹³ The statutory emphasis of the activities of the cluster’s coordinator, which are externally oriented, arises from the lack of personality and legal capacity of this network form of cooperation.

duality of relations that are typical of an energy cluster, i.e. the simultaneous presence of competition and cooperation.¹⁴ The phenomenon of simultaneous competition and cooperation that exists in clusters is referred to as coepetition (from the combination of the words cooperation and competition).¹⁵ The cluster coordinator is responsible for preparing the rules and harmonizing cooperation between the network participants and the stakeholders. The ability to cooperate despite the existence of frequent individual competing objectives in economic, technical and organizational terms is important, namely those of electricity consumers, local government, which is responsible, among other things, for preparing energy supply plans, as well as generators and distributors. Coordination in the objective dimension in energy clusters is created by two mechanisms: contractual and relational. The source of the identification of these two coordination mechanisms lies in the division of organizations into formal and informal ones.

The criteria for the typology of network organizations are sought in various areas which cannot be discussed exhaustively because of the restrictions on this article. The determinants of the delimitation of organizational networks, which are of significance in the context of the analysis of the logic of the operation of energy clusters, include the criterion from the praxeological theory of organization of the division of organizational relations into formal and informal relations,¹⁶ which simultaneously enables a distinction to be made between formal and informal network organizations.

Formal network organizations are established via a contract as the legal basis for the establishment of the cooperation. The contract should provide a general legal framework, which is optimal for cooperation and trade taking place within the network organization, as well as between the organizational network and the consumers. In the English language literature, the operation of formal network organizations is identified with the presence of so-called mechanisms of contractual coordination, of which open, formalized and written contracts are an attribute.¹⁷ The contractual relations between the contracting parties form the object of the

¹⁴ The definition of clusters in the Polish legal system, which was introduced in the Regulation of the Minister of the Economy of 2 December 2006 on the award by the Polish Agency for Enterprise Development of financial aid not related to operational programmes, also emphasizes this duality, defining a cluster as “a spatial and sectoral concentration of at least 10 entities working for economic development or innovation. When performing their activities within one or several neighbouring voivodships, they compete and cooperate with each other in the same or related sectors and are connected by an extensive network of relations of a formal and informal nature” (Journal of Laws of 2006, no. 226, item 1651).

¹⁵ See: K. Mucha-Kuś, M. Sołtysik, K. Zamasz, “Rola koopetycji w klastrach energii,” *Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki Politechniki Gdańskiej*, 2017, no. 53, pp. 31–34.

¹⁶ See: M. Bielski, *Formalna i rzeczywista struktura organizacyjna*, Warszawa 2003.

¹⁷ See: R.S. Achrol, G.T. Gundlach, “Legal and social safeguards against opportunism in exchange,” *Journal of Retailing* 75, 1999, no. 1, pp. 107–124; J.J. Li, L. Popo, K.Z. Zhou, “Relational mechanisms, formal contracts, and local knowledge acquisition by international subsidiaries,” *Strategic Management Journal* 31, 2010, no. 4, pp. 349–370.

mechanisms of contractual coordination, by setting the formal framework for the exchange of various types of goods, services and information. Therefore, a formalized contract is considered a key element of the economy ensuring the security and efficiency of transactions. The rights and duties of the parties arise from the wording of the contract, the most important elements of which are: (1) the written form specifying the rights and duties of the parties, (2) the specification of the subject matter of the performance, and (3) a presentation of the consequences of the possible failure to perform or the improper performance of the contract.¹⁸

The operation of energy clusters is based on a contract, which is referred to in the Act on RES as a civil law contract. Essentially, the term “civil law contract” used by the legislator refers to contracts, the wording of which is an emanation of the will of the parties to a specific legal relationship – so-called unnamed contracts. The development of unnamed contracts in practice is a consequence of the intensification and increase in the complexity of the relationships into which public and private sector entities enter. An unnamed contract is a type of contract that has not been regulated by the legislator in any act of law. Such a legal relationship is based on contractual freedom, as regulated in Article 353 of the Civil Code,¹⁹ with limitations on the freedom of forming the contractual relationship (the properties of the contractual relationship, the provisions of the law and the principles of social co-existence), which also apply to the cluster contract. With the reservation of the need to comply with the required legal form of a given transaction, their breach will result in the sanction of unconditional invalidity of a contract that is in conflict with the law, as provided for in Article 58 of the Civil Code. The impulse for the parties to a specific legal relationship to stipulate “innovative” wording of the contract is usually the need to create a new type of business relationship, especially if the contractual terms defined by the provisions of the law prove to be insufficient. In the Act on RES, an unnamed contract, which is referred to as a civil law contract, seems to be one of the elements of the creation of modern economic law, the attribute of which is flexibility. Flexibility refers to the freedom of the parties to shape the relations and relationships that will appear between them as participants of the cluster. Flexibility is expressed in the creation of a new type of contract of a compilation, individualized nature, tailored to the needs of the parties to the contract.

The establishment of a cluster on the basis of an unnamed contract is a convenient solution for entities that would like to take advantage of this networking form of cooperation. This firstly arises from the high degree of de-formalization of such a contract, as a result of which there is no need to incur additional costs related to the formation of a cluster and, secondly, it gives the parties a great deal

¹⁸ See: D. Vandaele (et al.), “How to govern business services exchanges: Contractual and relational issues,” *Journal of Management Review* 9, 2007, no. 3, pp. 237–258; M.D. Ryall, R.C. Sampson, “Formal contracts in the presence of relational enforcement mechanisms: Evidence from technology development projects,” *Management Science* 55, 2009, no. 6, pp. 906–925.

¹⁹ The Polish Civil Code of 23 April 1964 (Journal of Laws of 2020, items 1740, 2320).

of autonomy and the said flexibility in specifying the rights and duties of the participants. Essentially, two types of contractual coordination mechanisms should be distinguished in the cluster's activities, as presented in Figure 1.

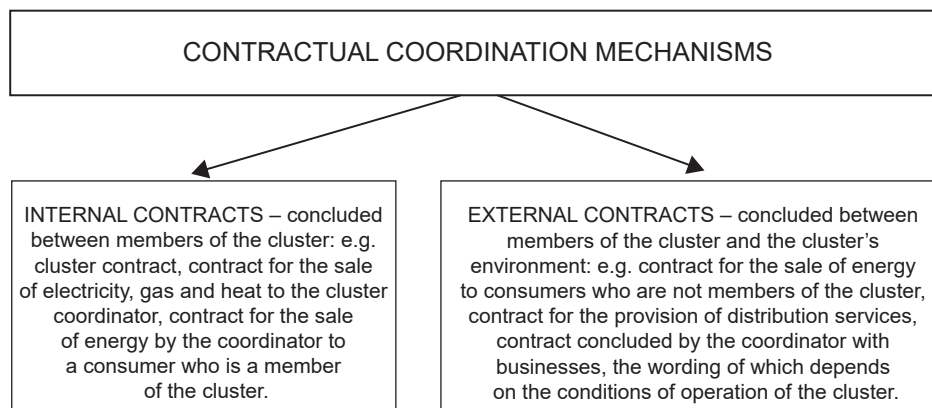


Figure 1. Two types of contractual coordination mechanisms in energy clusters

Source: own study.

The distinction of the formal categories of network organizations is an appropriate reason for drawing attention to the function of the law in creating relations in an organizational network such as an energy cluster. At least three interconnected functions of the law should be mentioned. The first – coordination – is reflected in the creation of a framework for cooperation within the energy cluster. Specific sub-functions can be identified within the coordination function: (1) integrative, bringing together compatible interests of the cluster's participants, (2) stabilizing, facilitating the resolution of potential conflicts between members of the cluster, (3) distributive, specifying roles and influence within the cluster, (4) adaptive, enabling the modification of the content of the contract and therefore the principles of cooperation between participants of the cluster to the changing internal and external conditions.

The second function of the law – reduction – refers to the ability to reduce the asymmetry of information accompanying the conclusion of any contract. The function of reducing information asymmetry is reflected in the creation of the so-called network rent. Network rent is the sum of the savings obtained as a result of the conclusion of a contract creating a network organization and the savings arising from the principles of cooperation, communication and horizontal coordination contained in that contract.²⁰ Network rent is simultaneously the added value reflected in the financial benefits obtained by entities from their participation in the network, as well as in the external benefits that are a positive type of so-called externalities. The concept of externalities introduced into economic theory by

²⁰ See: J. Niemczyk, *Strategia. Od planu do sieci*, Wrocław 2013.

Alfred Marshall,²¹ is now considered one of the most important analytical categories in environmental economics.²² Externalities are divided into two types: negative (external costs) and positive (external benefits). Negative externalities arise when horizontally-connected organizations can pass on the costs of their operations to entities that cannot participate in the benefits of those operations and who are not parties to the contract. An example of negative externalities is the environmental degradation caused by the conventional energy sector – e.g. transport based on first generation biofuels. Therefore, the Directive 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/EC²³ has not only started the momentum of the transition to higher-generation biofuels, but has also started the long-term process of levelling out this example of negative externalities.

Positive externalities arise when horizontally-connected organizations provide benefits from their operations to other entities without directly receiving compensation for this. Examples of positive externalities are the processes of creating energy clusters, which, while starting up network rent directly for its participants, simultaneously transfer the effects of their existence to other entities in the form of benefits identified at local and/or regional level, which include an increase in energy security, a reduction in the economy's energy consumption, the creation of new jobs, an increase in the attractiveness of investment land by reducing the costs of energy supply, the stimulation of economic development, the availability and development of low-carbon public transport and the reduction of harmful gas emissions. The third function of the law – optimization – involves the creation of a legal basis for the conclusion of a contract and the execution of its provisions, enabling the participants of the cluster to reduce transaction costs.²⁴ The concluded contract creating the energy cluster is a result of the clash of interests of the parties to the contract, who, due to their awareness of the existence of

²¹ See: A. Marshall, *Zasady ekonomiki*, Warszawa 1925.

²² See: A. Graczyk, "Pojęcie ekologicznych kosztów zewnętrznych," *Ekonomia i Środowisko* 26, 2004, no. 2, pp. 7–29.

²³ D L140/16 of 23.04.2009.

²⁴ This applies to three types of transaction costs: *ex-ante*, *in tractu* and *ex-post*. *Ex-ante* transaction costs arise at the stage of preparation of the contract, examples being the costs of finding a partner for the cooperation, the costs of the negotiations, the coordination costs of establishing mutual obligations, information processing and exchange, the costs of preparing analyses and expert studies related to the subject matter of the future contract. *In tractu* costs appear during the cooperation; these include costs of monitoring the activities of the other participants of the network (with regard to the performance of the provisions of the contract) and the costs of renegotiating the provisions of the contract. *Ex-post* transaction costs arise after the end of the cooperation and are primarily related to the enforcement of unfulfilled provisions of the contract. See: A. Chrisidu-Budnik, *Od biurokracji do New Public Governance. Perspektywa izomorfizmu instytucjonalnego*, Wrocław 2019.

the already mentioned positive interdependence, are looking for appropriate ways to formalize the terms of cooperation and therefore improve exchange within the network organization. The optimization function enables the efficiency of each participant in the cluster, as well as the whole of the socio-economic system, to be increased. This is because, if the participants of a network organization “win” within the framework of a specific contract, the whole economy ultimately wins.²⁵ The essence of a network organization is therefore to achieve synergy through the cooperation of the participants of the cluster, whereby this effect is achieved through the participant’s ability to align his individual operational activities to the principles of operation of the whole of the network organization.

Informal network organizations are created on the basis of the standards of trust and reciprocity. In the English language literature, the operation of a network of this type is identified with the presence of so-called relational coordination mechanisms and interpersonal capital.²⁶ The acceptance of the issue of relational coordination mechanisms in the analysis of energy clusters enables their significance to be highlighted in two stages of operation of such energy collectives. Stage 1, which is referred to in the literature as the pre-cluster stage²⁷ and applies to activities constituting the so-called cluster initiative, which is the initial stage of forming specific and distinctive connections between the participants of the cluster.²⁸ At the pre-cluster stage, the presence of informal networks of connections and trust constitutes a stable foundation for future processes of formalizing cooperation between the parties. Stage 1 refers to the situation where the formal basis of cooperation is still *in statu nascendi*, in the sense that the network organization is

²⁵ M. Łolik, *Współczesne prawo kontraktów – wybrane zagadnienia*, Warszawa 2014.

²⁶ See: Y. Li, M.W. Peng, “Formal control and social control in domestic and international buyer–supplier relationships,” *Journal of Operations Management* 28, 2010, no. 4, pp. 333–344.

²⁷ J. Gronkowska, “Polityka wsparcia tworzenia i rozwoju klastrów energii w Polsce,” *Zeszyty Naukowe Instytutu Gospodarki Surowcami Mineralnymi i Energią Polskiej Akademii Nauk* 2017, no. 97, pp. 216–230.

²⁸ Various criteria for classifying clusters are distinguished in the literature on the subject. In order to analyse energy clusters, it is important to take account of the life cycle phase of the energy cluster, on the basis of which the following can be distinguished: 1. Embryonic energy clusters formed as a result of initiative, innovation and the ability to attract and consolidate participants of importance to the successful fulfilment of the cluster’s interests (pre-cluster stage); 2. Growing energy clusters already have a formalized form of functioning, acquire learning capabilities and attract new value-adding participants. The growth potential of an energy cluster largely depends on institutional support, namely the introduction of legal regulations supporting the rate of their growth (acceleration stage); 3. Mature energy clusters have stable formal and informal rules of cooperation, a lower risk of activities, an increase in efficiency and cost reductions arising from knowledge and the effects of synergy (petrification stage); 4. Energy clusters in decline, the distinguishing feature of which is the substitutability of their product with a more innovative one (erosion stage). Energy clusters are not static entities, but are continuously evolving, which is determined by their complexity, while the rates of change of the external and internal context of their operation are their components.

not yet formalized, i.e. a civil law contract has not been concluded.²⁹ In stage 2 – acceleration – combined with the operation of an already formalized network organization, the presence of relational coordination mechanisms is based on the existence of trust and standards of reciprocity between the participants of the cluster. Standards of reciprocity refer not only to the manoeuvrability and symmetry of the relationship, but also to learning to cooperate and communicate. Learning is a process that is inherent in the cooperation rather than being its result, and, in this sense, standards of reciprocity are dialogical standards. Reciprocity is a standard that stabilizes cooperation in already formalized network organizations, because it ensures complementarity of the rights and duties of the participants.³⁰ The effectiveness of energy clusters depends on the rational and effective use of tangible and intangible capital. Tangible capital is formed by locally available energy resources, renewable energy sources, innovativeness and entrepreneurship in energy generation, transmission, distribution, as well as the management of energy consumption. Intangible capital is jointly created by two mechanisms of coordination: contractual and relational. The quality of the contractual coordination mechanism is a derivative of the ability to design an economically efficient mechanism which fully reflects the intention of the parties to the contract. The primary function of the contractual coordination mechanisms is the development of legal norms which, in the context of both internal agreements between members and external agreements between the energy cluster as a network organization and the business entities in its environment, ensure optimal trade. Relational coordination mechanisms have a complementary function to contractual coordination mechanisms, and specifically the internal component identified in Figure 1. At stage 1, the presence of relational standards (trust and reciprocity) facilitates the conclusion of a contract constituting an energy cluster, because it reduces *ex-ante* transaction costs and, just like the optimizing function of the law, reduces information asymmetry. The relational coordination mechanisms at stage 2 enable the elimination of the inevitable conflicts of interest which arise during the cooperation between the participants of the energy cluster and therefore create contracts improving the principles of cooperation between them (the learning effect). Essentially, contractual and relational coordination mechanisms are interrelated, because they affect

²⁹ The “transition” process of the cooperation from non-formalized to formalized applies not only to energy clusters. It is, for example, a qualitative determinant of the interaction between public administrations and environmental organizations with regard to environmental protection. In practice, the successful course of informal horizontal interactions is a significant impetus for strengthening and deepening this cooperation through its formalization. The legal basis for the transition from informal cooperation to formalized interoperation is contained in Article 45(1) of the Act on the provision of information on the environment and its protection and environmental impact assessments of 3 October 2008 (consolidated text: Journal of Laws of 2020, item 283, as amended).

³⁰ See: T. Wilkinson-Ryan, “Transferring trust: Reciprocity norms and assignment of contract,” *Journal of Empirical Legal Studies* 9, 2012, no. 3, pp. 511–535.

the quality of the performance of the processes and investments within the energy clusters, the use of resources by their participants, the level, measurement and analysis of the results and the management of relations with the environment.

A legitimate question is: what is the appropriate unit of analysis of the environment of a network organization which is an energy cluster? One of these areas of analysis is the ecosystem concept.³¹ An ecosystem – or the ecosystem of a cluster – is a comprehensive system, the elements of which are the cluster's nucleus, the entities from the supporting sectors, the entities serving the “hard” infrastructure and the entities forming the “soft” infrastructure. What is important is that all four elements co-create the ecosystem and, in this perspective, the energy cluster does not adapt to the environment, but co-creates it. The reference to the issue of the unnamed agreement as the basis for the creation of the cluster justifies the argument that the legislator accepted the need to deformalize this type of network form of cooperation and granted the participants autonomy in the area of freely shaping the rights and duties of the cluster's nucleus, the objectives, as well as the methods and means of their implementation. Viewing the autonomy contained in the cluster agreement from the point of view of the concept of an ecosystem makes it clear that the achievement of the cluster's objectives, which are to ensure the energy self-sufficiency of municipalities, to increase and rationalize the use of local energy resources, to ensure the sustainable development of distributed energy sources, including renewable sources, and finally the ability of the individual participants to obtain financial benefits, depends on (1) the appropriate selection of participants of the cluster according to, among other things, technical criteria, (2) the optimal configuration of cooperation relations between them and (3) appropriate access to hard infrastructure from the point of view of the ability to generate a profit.

3. Energy cooperative

The other local form of energy collective in addition to the energy cluster is the energy cooperative. An energy cooperative is an organizational and legal form of association of citizens interested in generating energy from renewable

³¹ The concept of the business ecosystem as a tool for thinking about the environment in which a network organization operates was created by J.F. Moore. See: J.F. Moore, *The Death of Competition: Leadership and Strategy in the Age of Business Ecosystems*, New York 1996. An ecosystem is a population of entities constituting a dynamic structure formed by business entities, universities, research centres, local government units, public sector organizations and other entities which have an impact on the shape of the ecosystem, which are connected through formal and informal relationships. See: M. Peltoniemi, E. Vuori, “Business ecosystem as a tool for the conceptualisation of the external diversity of an organization,” [in:] *Proceedings of the Complexity & Science and Society Conference*, 2005, Liverpool 2005, p. 8.

energy sources. The objective of associating is to ensure energy security for its members, while the essence of its operation is cooperation based on democratic principles. Like energy clusters, energy cooperatives are locally activated mechanisms of support in the generation of energy from renewable energy sources. The Act amending the Act on Renewable Energy Sources and certain other acts of 19 July 2019³² intensified efforts to achieve a 15% share of energy from renewable sources in final energy consumption. The legislator attaches particular importance in this to energy cooperatives, while creating a system of institutional support for such energy cooperatives. An energy cooperative is a cooperative in the meaning of the Cooperative Law of 16 September 1982³³ or the Act on Farmers' Cooperatives of 4 October 2018,³⁴ the objects of which are the generation of electricity or biogas or heat, in renewable energy source installations and balancing the demand for electricity or biogas or heat, exclusively for the energy cooperative's own needs and those of its members, who are connected to a power distribution network within a defined area with a rated voltage of less than 110 kV or a gas distribution network, or a district heating network.³⁵ The statutory reference to cooperative law means that the energy cooperative is subject to the regime of provisions which are appropriate to cooperative law, which apply to the requirements for establishing and registering the cooperative, the principles of conducting operational activities and the principles of laying down internal regulations.³⁶

The objects of the energy cooperative are the generation of electricity or heat or biogas in renewable energy facilities owned by the energy cooperative or its members. Additional conditions for the operation of an energy cooperative include:

1. conducting business within a rural or urban and rural municipality in the meaning of the provisions on public statistics or in an area of no more than three such municipalities directly neighbouring with each other;
2. it must have less than 1,000 members;
3. if its business involves the generation of (a) electricity: the total installed electrical capacity of all renewable energy source installations is to enable no less than 70% of the needs of the energy cooperative and its members to be covered during the year and is not to exceed 10 MW, (b) heat: the total achievable thermal capacity is not to exceed 30 MW, (c) biogas: the annual capacity of all installations is not to exceed 40 million m³.

³² Journal of Laws of 2019, item 1524.

³³ Journal of Laws of 2018, item 1285; Journal of Laws of 2019, items 730, 1080 and 1100.

³⁴ Journal of Laws of 2018, item 2073.

³⁵ Journal of Laws of 2020, item 275.

³⁶ An energy cooperative may start to operate after its data has been entered into the list of energy cooperatives kept by the Director General of the National Agricultural Support Centre, which was established by the Act on the National Agricultural Support Centre of 10 February 2017 (Journal of Laws of 2020, item 481). If the details of the energy cooperatives are contained in this list, they acquire the right to benefit from the system of discounts previously intended exclusively for prosumers.

Furthermore, the energy cooperative's area of operation has been clearly defined – it can operate within the territory of only one distribution system operator and supply electricity to the cooperative's members, but only those whose installations are connected to that operator's network. The area of the cooperative's operation has been defined in exactly the same way as for the energy cluster, namely through the points of connection of generators and consumers who are members of the cooperative. The legal regulations that were introduced have created the ability for the cooperative to be treated as a prosumer. This means that it can be billed through the application of a discount system, or in other words, the vendor bills the energy cooperative for the amount of electricity introduced into the power distribution network less the amount of electricity taken from that network at a ratio of 1:0.6.

Energy clusters and energy cooperatives are organizational and legal forms of operation of energy communities and simultaneously mechanisms of energy transformation based on decarbonization, digitization and decentralization. Selected indicators describing and comparing these two forms of energy collectives are presented in Table 1.

Indicator	Energy cluster	Energy cooperative
Legal personality	None	Present
Participants	Natural persons, legal persons, research units, local government units	Natural persons, legal persons
Nature of participation	Voluntary and open	Voluntary and open
Boundaries	Blurred	Clear
Relationship with the environment	Co-creation of the environment	Adaptation to the environment
Freedom to form relationships	High	High
Nature of the relationships	Network	Association
Contractual coordination mechanisms	Cluster contract	Articles of association of the cooperative
Relational coordination mechanisms	Necessary	Necessary
Representation	Coordinator	The authorities of the cooperative
Coverage	Five municipalities or one county / according to the points of connection of the members	Rural or rural and urban municipalities, maximum of three neighbouring municipalities, up to 1000 members / territory of one distribution system operator, according to the points where the members are connected
Energy distribution	Yes	No
Energy sales	Yes	Yes
Type of energy	Any	Only RES

Table 1. Selected indicators of energy communities

Source: own study.

4. Conclusions

Alongside energy cooperatives, energy clusters have been treated by the Polish legislator as two basic forms of creation of support mechanisms for generating energy from RES. Both models – energy clusters and energy cooperatives – have their advantages in terms of energy production and distribution. Ultimately, which model is more beneficial for a region depends on the individual needs and conditions of the local community. Energy clusters occur as groups of organisations and companies pooling their resources to produce and distribute energy on a larger scale. The cluster initiative is often based on innovative technological solutions, resulting in more efficient use of energy sources and increased production efficiency. Energy cooperatives, on the other hand, are organisations owned by members of the local community who jointly manage the production and distribution of energy. This type of initiative is very often based on a participatory model, and this allows for greater involvement of local residents. The legal regulations can no doubt create incentives for the development of energy collectives. Examples of impulses supporting development by energy cooperatives include the opportunity to apply discounts for billing for electricity that is generated and consumed by the members of the cooperative who have been granted the status of prosumers by the law. An analysis of the legal regulations shows that, compared to energy clusters, energy cooperatives have gained a much larger scope of institutional support for their operation. The legislator has given priority to energy communities this type as a fundamental component of distributed energy. However, the examination of the establishment of energy collectives in Poland reveals a certain paradox, namely that there are already several dozen energy clusters which have not yet received support in Poland, while energy cooperatives with such support are not actually being established. This situation arises from the presence of the determinants of the energy transition and their impact on its effectiveness.³⁷ The interaction between legal and social conditions and the barriers to change that exist within them is significant. The legal regulations, as well as the attitudes, convictions and awareness of members of a given community, determine whether it is possible to make any changes, as well as the quality of these changes. The perceived lack of activity in establishing energy cooperatives arises precisely from the social conditions, namely barriers in the form of their negative perception in Poland, which are perceived as a relic from the times of the People's Republic of Poland. The legal and social conditions can be positioned on matrix of changes in the area of energy transformation (Figure 2).

³⁷ The article has addressed the existence of conditions (legal, organizational, social, technological and commercial) which are interrelated and therefore exert an influence on the effectiveness of the transformation.

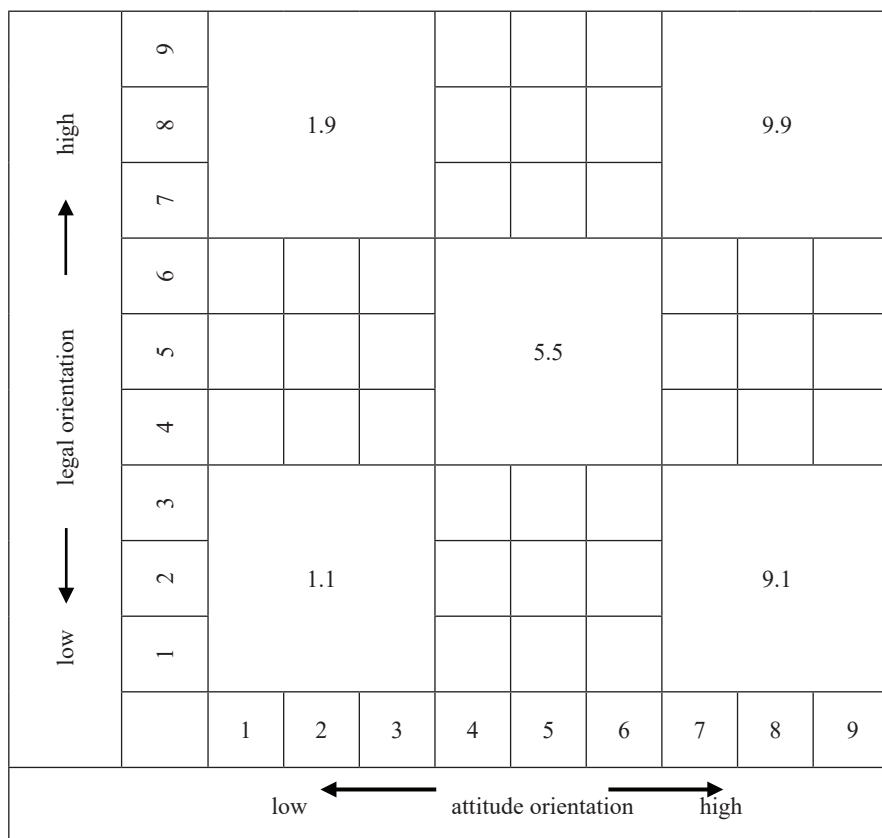


Figure 2. Matrix of changes in energy transformation

Source: own study.

The design of the matrix is based on axes scaled from 1 to 9, on which two orientations in the introduction of changes are presented: the orientation to conduct transformations on the basis of legal regulations (so-called hard levers) and the orientation to conduct transformations on the basis of changes in the ways of thinking, the perception of the environment, attitudes and habits (soft levers). It becomes possible to distinguish five ways of bringing about change on this basis:

1. Box 1.1 is a passive attitude to the initiation of changes in the regulations and a change in mind sets, habits and practice.
2. Box 1.9 is an approach focused on changes in the law, while abandoning efforts to change the state of mind prevailing in the given population.
3. Box 9.1 reflects a strong orientation towards transforming existing attitudes, while downplaying the significance of the hard levers.
4. Box 5.5 can be described as a balanced (moderate) orientation in the transformation of legal regulations and attitudes, convictions and practices.

5. Box 9.9 is very much oriented towards making harmonious changes in the law, as well as people's awareness.

The matrix of changes in energy transition can be treated as an analytical tool for implementing solutions to achieve the EU's climate protection objectives. The relatively high level of activity of business entities in the creation of cluster initiatives arises from the advantages created by the network organization and the dissemination of the idea of clustering. The expansiveness of this form of energy community should be included in box 9.1. The slow pace of the establishment of energy cooperatives that was discussed in this article can be positioned in box 1.9, even though the creation of institutional support for this form of energy collective, namely the attitude to the idea of cooperatives in Poland, is negative; this largely arises from the fact that cooperatives have so far been systemically weakened, liquidated and perceived as a relic of a centrally planned economy and, after all, energy cooperatives are an example of decentralized civic energy generation.

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