UDC 351.824.11

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LOCAL COOPERATION FOR ENERGY SECURITY - OPPORTUNITIES AND THREATS

The work is conceptual in nature. Its aim is to propose a model for coordinating the cooperation of local entities in support of electricity security, and to identify the associated opportunities and threats. The proposed value chain concept is based on our research conducted in 2012, but it has been adapted to reflect new legal regulations that enable the establishment of energy cooperatives and energy clusters under the Renewable Energy Sources Act of 2015, as amended [7, 8].

Furthermore, the European Union (EU) has adopted the 2030 Agenda and the 17 Sustainable Development Goals. In 2019, the EU adopted the document «European Green Deal», which aims to achieve climate neutrality by 2050. A key component of this document is the concept of a just transition, which seeks to ensure that the transition towards the Green Deal does not result in social or economic marginalisation [4].

In parallel with the implementation of climate policy and the development of green energy, increasing research attention is being paid to the issues of energy poverty and threats to energy security. On 14 July 2021, as part of the European Green Deal, the European Union announced the «Fit for 55» package – a set of legislative proposals aimed at revising climate, energy and transport laws and introducing new legislative initiatives to align EU regulations with climate targets [5].

Meanwhile, in Poland, on 2 February 2021, the document entitled Poland's Energy Policy until 2040 (PEP 2040) was adopted. This document outlines the framework for the country's energy transformation and considers the challenges of adapting the national economy to EU regulatory conditions. The three pillars of PEP 2040 are: just transition, a zero-emission energy system, and good air quality. Local and civic energy are mentioned in the second pillar, which is indicated as the long-term direction for energy transformation [4].

Distributed energy is an important and rapidly developing area of the power sector. It is closely linked to Renewable Energy Sources (RES) and smart power grids. Distributed energy has a significant impact on Poland’s energy transition towards renewables and climate protection, as well as ensuring energy security, the competitiveness of Polish enterprises, and the development of modern industry serving the needs of the energy sector (Adamska, 2020) [3].

The development of distributed generation increases energy security through the diversification of fuels and energy production. Distributed power systems offer greater flexibility in managing energy production, and their proximity to or direct location with consumers can reduce the need for costly power grid infrastructure.

One of the key benefits is the use of local energy sources (such as solar, wind, or biomass), which improves the reliability of supply and quality of energy at the local level and reduces transmission losses. The growth of distributed energy is connected with new forms of cooperation, such as energy cooperatives, energy clusters, and virtual power plants. In this way, the development of distributed energy contributes to greater independence and thus increases regional energy security and sustainable economic development. The development of the aforementioned forms of cooperation requires the coordination of various independently operating installations and dispersed entities, such as energy producers and consumers. Potential collaborating parties most often include: local government units (municipality, county, voivodeship), energy companies (mainly distribution system operators), prosumers, energy consumers, entrepreneurs, installation companies, financial institutions, consultancy firms, and others.

The tasks of municipalities and energy companies are defined by legal regulations. A municipality, in fulfilling its statutory responsibilities, may establish local (civic) energy initiatives (Dyląg et al., 2019). However, such activities require coordination. A fundamental element of any kind of coordination is the existence of a transparent system of information flow between the coordinating entity and the coordinated parties. Without this, effective coordination is not possible. It is also essential that the flow of information is synchronised in time and that the information is reliable.

Therefore, a necessary condition for effective coordination in support of electricity security is access to, and efficient exchange of, information regarding the progress in implementing interlinked functions that connect individual entities in the process of achieving a common goal.

Energy sector entities have specific rights, responsibilities, and obligations defined by applicable legal regulations, including those related to ensuring local coordination for electricity security. Local entities (municipalities) will play a fundamental role in the coordination model. These entities are obligated to develop spatial development plans or studies on conditions and directions of spatial development. These plans must be consulted with energy companies in the context of their transmission and distribution network development plans.

Municipalities are also expected to: create conditions for investment in innovative technologies based on renewable and distributed energy sources, Support energy storage, smart grids, virtual power plants, microgrids, training, and workforce development, ensure energy planning, formulate and implement strategies for the development of local energy economies, Influence consumer behaviour in the energy market.

The aim of coordination at the municipal level should also include the effective utilisation of local (energy) resources – for instance, by improving the efficiency of distribution system devices to reduce network losses and emissions resulting from energy generation. Municipalities should also take care of the natural environment, foster cooperation with investors and suppliers of products and devices, support local entrepreneurship, offer consultancy in renewable energy, create thermal insulation programmes, and promote the creation of new jobs.

The coordination of these activities within the municipality should be carried out in a way that maximises synergistic effects.

Another group of entities requiring coordination are energy communities (such as energy clusters, energy cooperatives, and prosumers). These actors play a key role in ensuring the continuity of energy supply to end users at the local level and in the development of distributed energy systems.

A crucial aspect will be the cooperation of these communities with the local Distribution System Operator (DSO). This cooperation should be based on a partnership approach, with a coordinator acting on behalf of all market participants [6]. The coordinator would also oversee the legal and regulatory aspects of collaboration between local governments and the aforementioned entities.

The participation of DSOs in energy communities presents an opportunity to increase demand for innovative services, products, and processes in the electricity distribution market, particularly those related to the growth of renewable distributed energy sources.

Municipalities, acting as local energy market regulators with legal competencies in energy planning, should be key participants in energy communities, alongside market entities and energy consumers.

Despite the statutory obligations imposed on individual entities – whether related to planning, ensuring continuity and reliability of energy supply, or carrying out coordination activities in specific areas – it would be advisable to appoint a local coordinator for energy security cooperation.

To effectively carry out coordination functions, the following are necessary: access to knowledge, efficient information exchange. Therefore, the coordinator's tasks must include: developing and maintaining databases. Making this data available to interested entities responsible for local energy policy (such as municipalities), energy companies, suppliers, producers, investors in energy infrastructure, and other market participants.

Real threats include: technical failures of energy infrastructure and IT systems responsible for data access and information flow, Lack of trust among cooperation participants, limited energy resources, e.g., a shortage of water resources during dry summers. Thus, a critical function of the coordinator is real-time planning of the operation of local distributed energy sources and cooperation with the distribution and/or transmission system operator.

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