Waldemar DOŁĘGA

THE ROLE OF ELECTRICITY GENERATION COMPANIES IN THE CONTEXT OF ENERGY SECURITY – THE CASE OF POLAND

ABSTRACT *This paper examines the role of electric energy producers in the context of energy security, using Poland as an example. Analysis of the role of electric energy producers in ensuring energy security in legal and technical domain is shown. Moreover, the assessment of possibilities and effectiveness of solution applied in Poland for electric energy producers from a point of view assurance of energy security is described. Special attention is paid to system operator – electric energy producer relations.*

Keywords: *energy security, power system, electric energy producer*

1. INTRODUCTION

Energy security is often defined as the security of supplies of energy at any time, in different forms, in a sufficient quantity, at possibly the lowest (optimum) price and in compliance with the environment protection regulations. The assurance of energy security at the national level is the primary goal of the energy policy of the state.

Issues and regulations relating to energy security have been contained in the Energy Law (EL) – the key act for the operation of the energy sector

Waldemar DOŁĘGA, Ph.D.
e-mail: waldemar.dolega@pwr.wroc.pl

Institute of Electrical Power Engineering
The Wrocław University of Technology

PROCEEDINGS OF ELECTROTECHNICAL INSTITUTE, Issue 258, 2012

in Poland. The EL regulations are comprehensive and cover, among other things, electricity generating companies.

In the light of the regulations, electricity generating companies are of key importance for the operational security of the National Electric Power System (NEPS). They are obliged to generate electric energy or remain on standby for this purpose and, if necessary, to assure the quality of the supplied energy and the continuity and reliability of electric energy supplies to consumers or to avoid any threat to the safety of persons, or material losses (art. 9j [1]). In addition, such companies are obliged to maintain generation capacity reserves and to provide other system services, in the amount and way specified in the agreement concluded with the transmission system operator (TSO), to maintain the capacity of the sources to generate electricity in the amount and of the quality specified in the concluded sales agreements and agreements for the provision of electric energy transmission or distribution services and to collaborate with the electric power system operator to whose network the source is connected.

2. PRODUCER DUTIES STEMMING FROM ENERGY SECURITY

An electric energy producer is obliged to care for its production property and to take proper measures in order to ensure the proper functioning of the electric power system and its reliable operation. The producer is obliged to collaborate with the operator to whose network the source is connected. The collaboration covers, among other things, passing essential information about the condition of the generation equipment to the operator and carrying out his/her commands on the principles and conditions specified in the Energy Law [1], the proper directives and other regulations, the Transmission Network Operation and Maintenance Instructions (TNO&MI), the Distribution Network Operation and Maintenance Instructions (DNO&MI) and the agreement concluded with the proper operator. However, DNO&MI's directives are binding for the producer only when the latter is connected to the 110 kV or MV network belonging to the given distribution system operator (DSO).

The transmission system operator performs the most important role as regards energy security and his/her collaboration with the producers covers the areas essential for the secure functioning of the electric power system and ensuring the power capacity of the electric energy sources [5]. TSO specifies, among other things, technological requirements for the generation units, the way of reporting new or changed technological parameters of the generation

units, the way of coordinating scheduled outages connected with a repair of the generation units and reporting capacity losses, the principles of synchronizing and shutting down the generation units, the way of collaborating in developing plans of preventing and eliminating failures and hazards to the secure operation of the NEPS, and so on.

In order to ensure electric power supply security, in accordance with the action plans, the procedures and plans relating to the introduction of electric power supply and consumption curtailments, DNO&MI, and the provisions of the electrical power transmission agreements concluded with the system users, TSO's dispatching services issue switching commands to the producer's proper services which are obliged to carry out the commands.

The producer is obliged to coordinate the scheduled outages connected with the repair of the generation units with TSO. The producer is also obliged to immediately report data on any electric power generation capacity curtailments or losses of the generation units' capacity, relative to the generation capacity or the maximum output capacity determined by the current technical condition of the units, specifying the causes of the curtailments or the losses.

The producer whose generation units are connected to the transmission network or to the coordinated 110 kV network is obliged to make accessible information essential for TSO to ensure the operational security of NEPS and to fulfil the information and reporting duties defined in the Energy Law [1] and in some of the associated executive acts (e.g. [2]).

The TSO-producer relations are particularly important in situations when a threat to electric energy supply security arises. Then TSO in collaboration with the electric power system users, including the electric energy producers, takes all possible measures, using the available means, to eliminate this threat and to prevent its negative consequences. In addition, he/she may introduce electric energy supply and consumption curtailments on the territory of the Polish Republic or its part until a government order introducing the curtailments comes into force, but not for longer than 72 hours.

In a situation when a threat to electric energy supply arises as the consequence of the above mentioned events, the proper TSO services take, in particular, the following measures:

- issue the proper producer services commands to switch on, switch off, change its load or disconnect a centrally administered generation unit from the network;
- make emergency purchases of capacity or electric energy;
- issue the proper DSO commands to switch on, switch off, change its load or disconnect a generation unit, which is not a centrally administered unit, connected to the distribution network on his/her operating territory.

In the period when measures are taken to eliminate a threat to energy supply security the system users, including the electric energy producers, are obliged to comply with the commands issued by the proper system operator services, provided the execution of the commands does not pose an immediate hazard to human life or health. For noncompliance with TSO commands, in a situation of a threat to electric power system operational security, the President of the Energy Regulatory Office (ERO) may impose a fine [6].

In the period when a threat to electric energy supply security is present the system operators may curtail the electric energy transmission or distribution services to a degree necessary to eliminate this threat.

The costs borne by the system operators in connection with the necessary measures taken to eliminate a threat to electric energy supply security constitute justified operating costs. The system operators cover the costs borne by the producers in connection with the measures taken.

The assurance of energy security requires the proper planning of NEPS development. Although it is mainly the operators who are responsible for this process, also some producers are obliged to participate in it. This applies to power companies generating electric energy in sources with a total generating capacity of not less than 50 MW. The power companies are obliged to draw up 15 year forecasts covering, in particular, the volume of generated electric energy, projects aimed at modernizing and expanding the existing sources or building new sources, technical and economic data on the type and size of the sources, their location and the type of fuel used to generate electric energy. Moreover, such companies must update their forecasts every three years and inform the President of ERO and the system operator to whose network they are connected about the update.

The electric energy producers connected to the transmission grid or the coordinated 110 kV network pass information about the structure and size of the generation capacities adopted in their plans or forecasts, in accordance with TNO&MI provisions.

The passing of any information between the producers and the operators takes place in keeping with the regulations concerning the protection of classified information and other legally protected information.

Energy companies engaged in electric energy generation from conventional sources are obliged to keep fuel reserves sufficient to maintain the continuity of electric energy supplies to consumers (art. 10 [1]). The size of the fuel reserves, the way of storing the fuels and a detailed procedure for checking the level of the reserves are defined by directive [3].

The producer may bring down the level of fuel reserves below the quantities specified in directive [3], if this is necessary to ensure the continuity of electric energy supplies, in the case when:

- by command of the proper system operator, electric energy is generated in a quantity greater than the average quantity of electric energy generated in the same period for the last three years;
- an unexpected significant increase in electric energy production occurs;
- for reasons independent of the energy company, a significant curtailment in the supply of fuels used for electric energy generation occurs.

3. ASSESSMENT OF DUTIES OF PRODUCERS AND OPERATOR-PRODUCER RELATIONS FROM ENERGY SECURITY POINT OF VIEW

Thanks to the energy security solutions contained in the amended Energy Law, energy companies can properly carry out their tasks and duties in this field.

The operator-producer relations in this respect stem from, among other things, the division of powers and placing the responsibility for ensuring electric energy supply security on all the major users of the electric power system. Some of the responsibility for electric energy supply security has been transferred from TSO to the producers and the responsibility for network operational safety has been divided among the transmission system operators and the distribution system operators, with TSO designated as the most important entity in the energy security area. Its role in this area has been recognized as key and it has been strengthened to enable TSO to efficiently and effectively carry out its tasks and duties relating to the operational safety of NEPS.

Moreover, the TSO-producer relations and the DSO-producer relations follow from the EL solutions aimed at enabling system operators to take effective measures when power shortages occur in the system, by, among other things, introducing an emergency procedure and defining the duties of system operators and users in the case of a threat to electric energy supply security and by granting TSO the right to curtail electric energy supply and consumption in the case of a threat to electric energy supply security, before the government order introducing the curtailment comes into force [6].

Therefore duties relating to: electric energy generation, generation capacity reserve maintenance, drawing up forecasts concerning, among other things, the modernization, expansion and building of new electric energy sources, collaboration with system operators, informing about the fuel consumption, the fuel stock level and its decline and the stock replenishment

by a specified deadline have been imposed on energy companies engaged in electric energy generation.

The aim of obliging the producers to maintain the supply capacity of the electric energy sources is to meet the electric energy quality and security requirements and to carry out electric energy sale agreements.

The establishment of the principles and scope for commands issued by TSO to distribution system operators and to other system users and the indication of the primacy of commands issued by the TSO services is of major importance for energy supply security since now proper and coordinated measures can be taken when a security threat arises. The aim of this regulation is to prevent, among others, the producers and the distribution system operators from questioning the execution of commands issued by TSO, which may pose a serious hazard to electric energy supply security or may make it difficult to eliminate threats arising in NEPS. This is of critical importance since the implementation of the measures imposed by TSO, by the producers and the distribution system operators often has serious technological and economic consequences for these entities. Therefore the solution adopted in EL provides TSO with a legal basis for issuing commands to, among others, the producers and the distribution system operators, concerning the supply and consumption of electric energy from the transmission grid or the coordinated 110 kV network in accordance with the adopted procedures and the criteria defined in the regulations, the instructions and the agreements. This also covers situations in which a threat to electric power system operational security arises. TSO issues commands directly to the centrally administered generation units or indirectly – by issuing an command concerning the centrally administered generation units to DSO.

The operator-producer relations are particularly vital in situations of threat to electric energy supply security. EL covers various aspects of a threat to electric energy supply security, including definitions, procedures, a course of actions, duties, requirements and so on [6]. This is critical in the context of the necessary measures to be taken by the operators and the producers to eliminate such a threat. The measures may affect the commercial standing of the companies and be incompatible with their business objectives, such as the maximization of profits, and they result in serious technological and economic consequences (e.g. a change in the technological conditions in which the generation units operate) for them. In addition, they entail the necessity to bear substantial expanses involved in implementing the measures. Therefore it is advisable to compile a catalogue of such measures and to obligate all the system users to carry out the commands issued by the TSO dispatching services, provided this does not pose an immediate hazard to human life or health. Moreover, it is essential that TSO covers the costs involved in the

measures taken by the producers towards this end, required by TSO in a situation when this is not specified in the direct agreement between the operator and the producer and to recognize the expenses incurred to implement measures aimed at eliminating a security threat, as justified costs of producer business activity.

The definition of the conditions of collaboration and the principles of passing information between system operators and producers, with regard to administering the power of the generation units and acting in emergency situations is important for energy safety. Particularly important are action plans in case of failure in NEPS and dispatching service emergency procedures in case of failure hazard or failure in NEPS and the restoration of the latter after a failure. As part of these plans and procedures, TSO defines, among other things, the way and scope of administering the capacity of the generation units. The adopted solutions should be consulted with the producers in order to avoid or limit the generation of unjustified additional costs in these entities and to protect the producer property against damage.

The duties of coordinating planned outages connected with their repair with TSO and immediately reporting any curtailments in their electric energy generation capacity and any losses in their available power relative to their generation capacity determined by their current technical condition to the operator and the President of ERO have been imposed on energy companies engaged in electric energy generation. The aim of these solutions is to ensure up-to-date information about the generation capacity in NEPS and to enable early prevention of threats to electric energy supplies.

In addition, the duties of planning and forecasting electric energy generation in connection with the preparation of development plans and their periodic updating have been imposed on electric energy producers with a total source output of 50 MW. This is vital for the making of proper forecasts of electric energy and power demand in NEPS and the planning of its development by TSO.

The maintenance of fuel reserves at a level ensuring the continuity of electric energy supplies to consumers is a major duty of the producers in the energy security context. Hence in EL it is specified on one hand, who and in what situations may release the fuel reserves and on the other hand, the information duties of the energy company in this regard and the deadline for replenishing the reserves used are specified. This solution is right since the previously binding regulations did not provide for a situation in which fuel reserves may be dispensed due to circumstances independent of the producer. Because of the lack of such a solution, each producer depleting the required fuel reserve, irrespective of the reason, could be obligatorily penalized.

4. CONCLUSIONS

The proper definition of the role and duties of the producer in the energy security area and the establishment of the proper operator-producer relations in this regard in the national legal regulations is of key importance for ensuring energy security.

The amendment of EL, consisting in the introduction of several solutions aimed at strengthening energy security, has considerably improved the existing law in this area, properly shaping, among other things, the role and duties of the producer and the operator-producer relations.

The role and duties of the producer and the operator-producer relations in the energy security area stem mainly from the introduced distribution of powers and the placing of the responsibility for ensuring electric energy supply security on all the major users of NEPS as well as from enabling the system operators to take effective measures when power shortages occur in the electric power system.

The model of operator-producer relations adopted in the legal regulations is a direct consequence of the recognition of the transmission system operator as the key entity in the energy security area and the significant strengthening of the role of TSO so that the latter is able to more efficiently and effectively carry out the tasks and duties relating to the operational security of NEPS.

LITERATURE

1. Act of 10 April 1997 – The Energy Law (Journal of Laws of 2006 No. 89, Item 625, with later changes). (in polish)
2. Ordinance of Ministry of Economy from 4.05.2007 on detailed conditions for the operation of the power system (Journal of Laws of 2007 No. 93, Item 623). (in polish)
3. Ordinance of Ministry of Economy, Work and Social Policy from 12.02.2003 regarding reserves of fuels in energy enterprises (Journal of Laws of 2007 No. 39, Item 338). (in polish)
4. Transmission Network Operation and Maintenance Instructions. General Part. Version 1.2. PSE-Operator Joint-Stock Company, Warsaw 2006. (in polish)
5. Dołęga W.: The role of transmission system operator in the context of energy security – the case of Poland, Modern Electric Power Systems MEPS'2010, Wroclaw, September 20-22.09.2010, Wroclaw University of Technology.
6. Dołęga W.: Evaluation of legal solutions in the amended act "Energy Law" in aspects of energy security, Rynek Energii, notebook no. 1, May 2010.

Manuscript submitted 18.04.2012

ROLA WYTWÓRCÓW ENERGII ELEKTRYCZNEJ W KONTEKŚCIE BEZPIECZEŃSTWA ENERGETYCZNEGO NA PRZYKŁADZIE POLSKI

Waldemar DOŁĘGA

STRESZCZENIE *W artykule przedstawiono rolę wytwórców energii elektrycznej w aspekcie bezpieczeństwa energetycznego. Przeprowadzono analizę w obszarach: prawnym i technicznym oraz dokonano oceny możliwości i skuteczności stosowanych w Polsce rozwiązań w procesie zapewnienia bezpieczeństwa energetycznego, zwracając szczególną uwagę na relacje operator-wytwórca.*

Słowa kluczowe: *bezpieczeństwo elektroenergetyczne, system elektroenergetyczny, wytwórca energii elektrycznej*