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The Polish capacity market proposal vs the British model

ABSTRACT: Recently there has been a significant debate about the possible implementation of a centralized capacity mechanism in Poland. Despite the fact that capacity adequacy is currently being discussed at the national level as a long-term issue, the lack of sufficient capacity and insufficient demand flexibility has already been observed on a number of occasions. In July 2016, the Polish Ministry of Energy expressed its support for the implementation of a market-wide capacity mechanisms. In view of these recent events, the aim of this paper is to shed some light on the possible implementation of a capacity market in Poland. The paper presents a brief overview of the key problems that the Polish power sector faces and provides a comparative analysis between some of the main elements of the Polish capacity market proposal and the GB capacity market.

KEYWORDS: capacity remuneration mechanisms, capacity markets, capacity adequacy

Introduction & Background

The on-going and ambitious plan set out by the European Commission (EC) to create a fully-integrated internal energy market (IEM) has turned out be a challenging problem. The wide number of energy market actors across the European Union (EU) (at the national and EU level)

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and the specific interests of each actor (e.g., national interests, energy taxation) have significantly affected the roadmap for the integration of the EU electricity markets. Furthermore, the establishment of uncoordinated national capacity remuneration mechanisms (CRMs) —which the EC views as “a last resort instrument to ensure generation adequacy”— pose a challenge to the free flow of energy (cross-border bidirectional connections) and ultimately to cross-border competition (Van Nuffel et al. 2016). Although the main goal of a single European energy market is to pave the way for a “reliable and affordable energy supply for all EU citizens and businesses”, a number of Member States (MSs) have expressed their concern regarding the supply reliability and capacity adequacy of their own internal energy-only markets (EOM) (European Commission 2015). Faced with impending capacity shortages, and depending on the country specifics of each energy market (e.g., peak demand, grid constraints, increasing share of renewables), a number of MSs have taken the crucial step of implementing a CRM. Figure 1 maps the different capacity remuneration mechanisms existing in Europe.

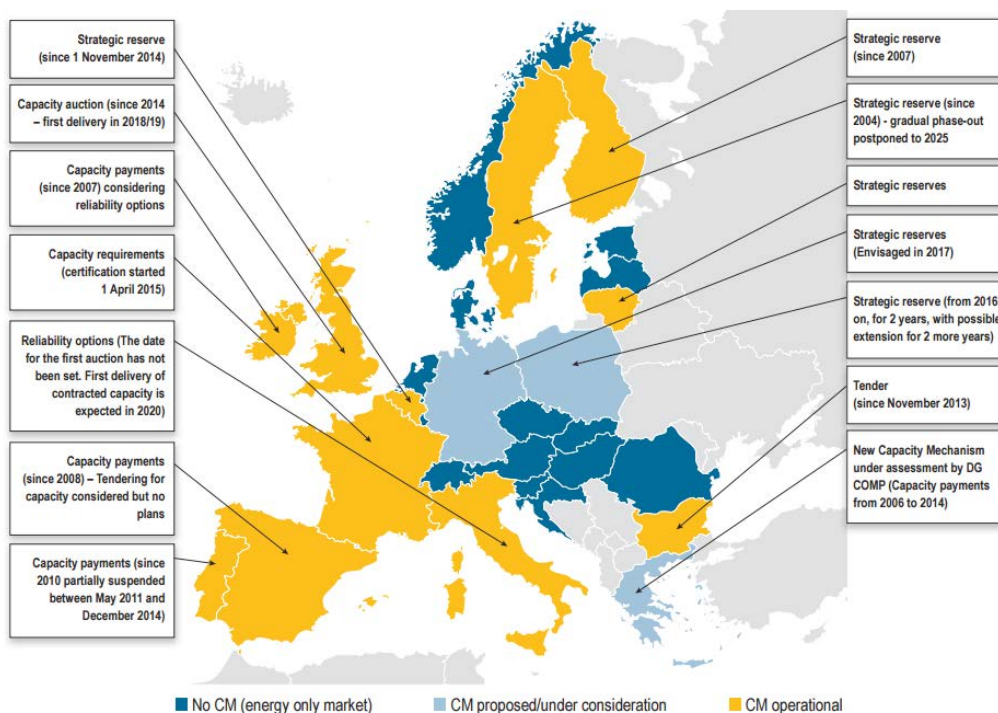


Fig. 1. Capacity remuneration mechanisms in Europe, 2015

Source: ACER 2016

Rys. 1. Mechanizmy wynagradzania mocy wytwórczych w Europie w 2015 roku

In recent years, there has been a significant debate in Poland regarding the possible implementation of a centralized capacity mechanism, showing the continuously changing reality of the Polish energy sector. Since 1989, the Polish power sector has undergone a major technical

and economic transformation (see Kaminski 2009; Gawlik et al. 2015; Wierzbowski et al. 2017). This transformation, which initially started with the electricity market liberalization has significantly affected the primary components of the electricity supply and has rearranged the structure of the Polish power sector. Although it has been argued that the liberalization process of electricity markets around the world (especially in the US and in the UK) has delivered considerable substantial economic benefits, it is worth noting that in some countries the liberalization process has also created a “new investment paradigm” in which investment decisions have been “pushed to the last minute” (IEA 2005). As pointed out by Cramton & Ockenfels (2012), for the majority of European countries the liberalization of electricity markets took place during a period of excess generation capacity. Nonetheless, from a historical point of view, it has been argued that some European countries were given relatively little time to adapt to the liberalization process (Newbery 2002), hampering the development of necessary regulatory and legislative tools that could have led to a successful liberalization process.

In Poland, as the liberalized electricity market began to mature, with the increase in electricity demand, aging of the conventional capacity, and tightening of environmental regulations, some observers have argued that the current energy-only market is afflicted with a number of imperfections. Moreover, in recent years, there is a growing concern that its current electricity market may be suffering from the “missing money” problem. In other words, the current state of the energy-only market is not providing the necessary investment incentives to secure a reliable mid- and long-term generating capacity.

Despite the fact that capacity adequacy is currently being discussed at the national level as a mid- and long-term problem (5–20 years), the lack of sufficient capacity and insufficient demand flexibility has been already observed in Poland on a number of occasions. The capacity shortage on August 10th, 2015 that led the Polish Transmission System Operator (PSE) to impose a number of power supply limitations to industrial consumers demonstrated the urgency for government intervention (PSE 2015) (Fig. 2). Thus, in July 2016, the Polish Ministry of Energy expressed its support for the implementation of a market-wide capacity mechanisms that could mitigate market failures and launched a public consultation on the possible implementation a capacity market.

In view of these recent events, the aim of this paper is to shed light on the possible implementation of a capacity market in Poland. The paper presents a brief overview of the key problems that the Polish power sector faces and provides a comparative analysis between some crucial features of the Polish capacity market proposal and the GB capacity market¹. The next section (Section 2) outlines some of the troubling issues of the Polish power sector, which have been identified in literature, and that will need to be addressed in the upcoming years. Section 3 describes the CRMs currently implemented in Poland and Section 4 the compatibility of the proposed Polish capacity mechanism with the EU law. Section 5 presents a comparison of the key elements of both capacity auction mechanisms (GB and PL). The paper ends with concluding remarks (Section 6).

¹ At the time of writing (April, 2017).

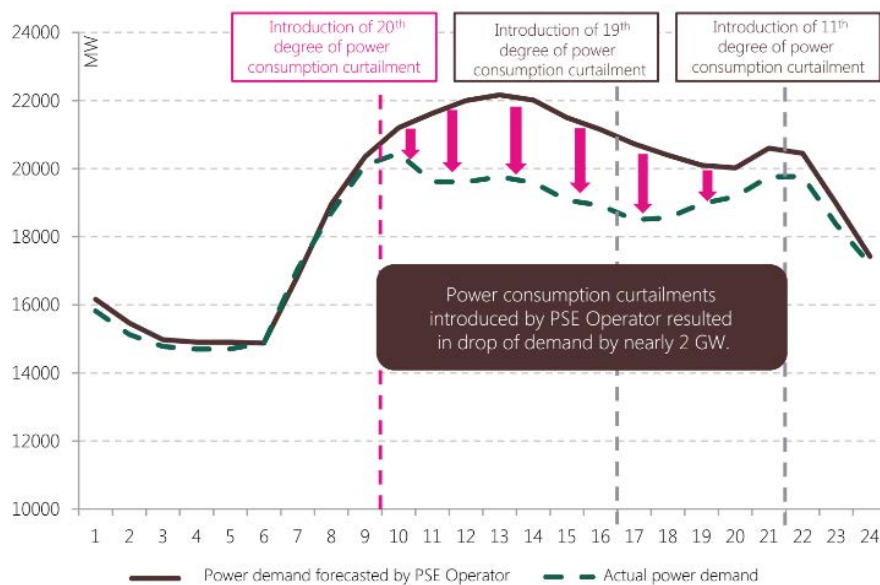


Fig. 2. Situation of the National Electricity System on August 10th, 2015
 Source: PKEE 2016

Rys. 2. Stan Krajowego Systemu Elektroenergetycznego 10 sierpnia 2015 r. (PKEE 2016)

1. Challenges facing the Polish energy sector

A number of studies suggest that the imminent retirement of coal-fired capacity (approximately 80% of the electricity in Poland is generated from coal), the future growth of electricity demand, and the numerous environmental challenges facing the Polish energy sector have demonstrated the urgent need for legislative action and the need for solutions that would improve the investment conditions of new capacity (Zamasz et al. 2014). Additional challenges that the Polish energy sector must address are listed below:

- ◆ Modernization of the electric power transmission network and minimization of power transmission losses,
- ◆ Diversification of the energy mix,
- ◆ Energy efficiency improvements,
- ◆ Cross-border interconnections.

According to the Polish Electricity Association (PKEE), nearly 10GW of generating capacity may retire by 2025; and by 2030, the total cost of energy unserved could reach up to 37.6 billion zł. Furthermore, through a model-based assessment of generation adequacy, the PKEE suggests that the introduction of a capacity market (CM) in Poland could represent an improvement in social welfare of approximately 1.93 billion zł a year (when compared to an energy-only market

scenario) (PKEE 2016). Figure 3 shows the Polish electricity generation by source in 2015. Figure 4 displays the age of boilers and turbo generators in the energy sector (2015).

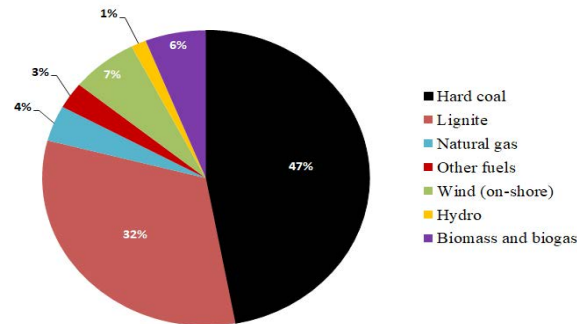


Fig. 3. Electricity Production by source, Poland (2015)
Source: ARE 2016

Rys. 3. Produkcja energii elektrycznej wg. źródeł w Polsce w 2015 roku

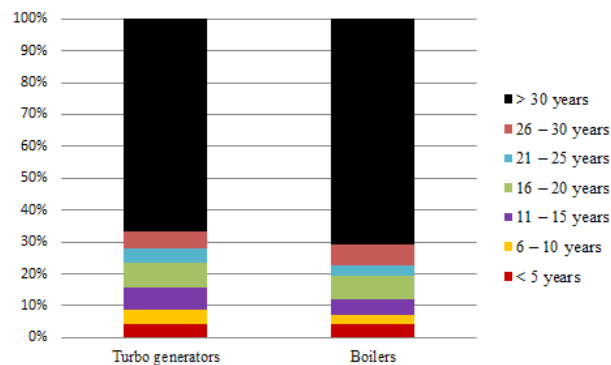


Fig. 4. Age of boilers and turbo generators in Poland (2015)
Source: ARE 2016

Rys. 4. Wiek kotłów I turbozespołów w Polsce w 2015 roku

Moreover, in 2016 the Polish Transmission System Operator (PSE) published a study for the years 2016–2035 that confirmed the need for new capacity. The study presents two different scenarios (for more information see PSE 2016):

- ◆ “BAT modernization scenario” – assumption of possible modernization investments of existing units. The modernization of the existing units will enable them to comply with the Best Available Technology (BAT) conclusions and extend the lifetime of the units,
- ◆ “BAT decommissioning scenario” – assumption of an accelerated retirement of units from the system in order to avoid costly upgrades.

Both scenarios indicate a growth in peak demand for the next two decades and show that by 2035 over 15.8 GW (BAT modernization scenario) of new generating capacity will need to

be built to ensure the security of energy supply in a mid- and long-term perspective. It is worth noting that both analyses include the construction of new, ongoing and planned power plants (about 5.8 GW) as well as a planned nuclear power plant (1.65 GW). Figure 5 shows the amount of capacity needed, according to the PSE, by the year 2035.

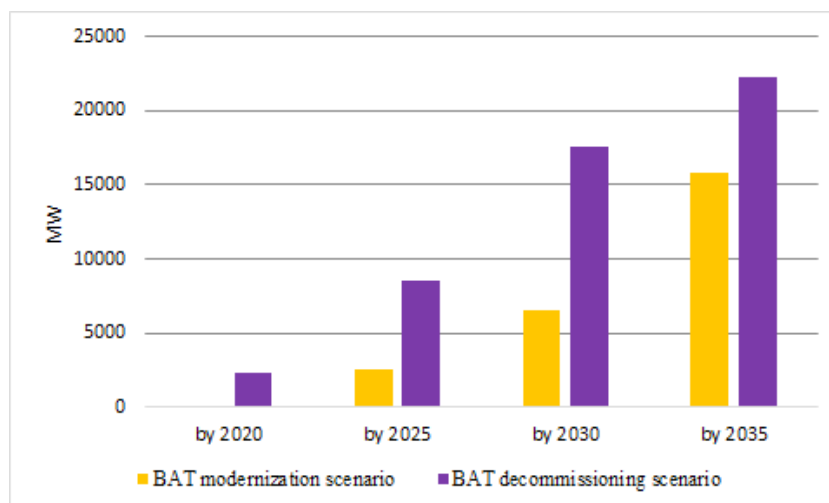


Fig. 5. Aggregate new capacity needed (2020–2035)

Source: PSE 2016

Rys. 5. Łączny przyrost nowych mocy wytwórczych wymaganych w latach 2020–2035

2. Capacity remuneration mechanisms in Poland – (2014–2017)

Since the liberalization of the electricity markets, which took place in the late 1980s, several CRMs have been implemented worldwide. In the US, capacity markets have been widely recognized as long-term instruments capable of mitigating energy-only market failures, while encouraging investment in new capacity and reducing investment risk (Spees et al. 2013; Cramton et al. 2013). Currently, Poland's energy market has three capacity measures in place – (i) Strategic reserve (also referred to as “cold intervention reserve”), (ii) operating reserve and (iii) Demand Side Response (DSR) contracts.

The strategic reserve (“cold reserve”) mechanism was introduced by PSE in 2014 and commenced operation in 2016. In this mechanism, power plants that are scheduled for decommissioning (due to age, economic reasons or that do not comply with emission standards set by the Directive 2010/75/EU of The European Parliament and of the Council) are kept on stand-by, in accordance with contracts concluded between the PSE and generators. The units contracted as “cold reserves” are excluded from the market (consequently postponing their retirement) and are

only activated for operation when there is a capacity shortfall (Ministry of Energy 2016a, Hancher et al., ed. 2015). Currently, the cold intervention reserve consists of 830 MW of contracted capacity. Because the reserves may interfere with functioning of the energy market and do not create incentives for new generation, only a small amount of capacity has benefited from this mechanism.

Besides the implementation of a strategic reserve, in 2014 the PSE also introduced an operating reserve mechanism. In this type of reserve, eligible units (defined as centrally dispatched units (JWCD)) receive payments for unused capacity, which is available to the system and at PSE's disposal. Contrary to units that are part of the cold reserve, centrally dispatch units can participate in the market (Ministry of Energy 2016a). Since its implementation, PSE has modified the rules of the operating capacity reserve mechanism on a number of occasions.

Demand side response (DSR) contracts is a scheme where medium and large end-customers commit to reduce consumption at peak times (turn-down DSR) in exchange for payments (Hancher et al., ed. 2015). The payment is determined by means of tenders. By the end of 2015, the Polish TSO had contracted approximately 182 MW of capacity (Ministry of Energy 2016a).

According to the Polish Ministry of Energy, the aforementioned mechanisms have been introduced as interim measures and cannot be considered long-term solutions since neither of the mechanism create investment incentives (Ministry of Energy 2016a). Thus, a possible reform and an auction-based capacity mechanism have been proposed. Furthermore, it is believed that a CM would make the strategic and operating reserves no longer necessary and they could be phased out starting from the first (capacity auction) delivery year.

3. Compatibility of the proposed Polish capacity mechanism with the EU law

The solution to resource adequacy – a centralized market with a forward capacity auction – that has been proposed by the Polish Ministry of Energy largely resembles other capacity market schemes implemented in the US and in the UK. Because the GB capacity market is one of the few mechanism that has been “successfully negotiated and approved by the European commission” (Hancher et al. ed. 2015), and with the assumption that a similar scheme for Poland would be approved, the preliminary concept of the Polish capacity market carry significant similarities to the mechanism implemented in the UK. Yet, since its conception and after the first stages of the consultation procedure, various modifications have been proposed hoping to include the participation of key players of the Polish energy market.

Similar to the UK electricity market reform, the Polish state authorities will be required to notify the Commission of their intent to adopt a CM. This procedure initiates the so-called pre-notification process. After a positive opinion about the project has been issued by the President

of the Office of Competition and Consumer Protection and the Council of Ministers, the project is then submitted to European Commission (Deloitte 2017). The EC conducts a preliminary investigation in which a full documentation of the bill is necessary. The moment when a full documentation is obtained, the formal notification procedure begins. In accordance with this procedure, the Commission has 2 months to decide whether the bill is considered state aid, or if it is compatible with EU rules.

Based on the British and French negotiations with the Commission for the adoption of a capacity remuneration mechanism, a similar process can be expected for the approval of the Polish capacity market. Firstly, the CM will need to be assessed with respect to compliance with EU state aid rules. State aid is generally prohibited in the European Union, clearly underlined in The Treaty on the Functioning of the European Union, Article 107 (ex 87 TEC): “any aid granted by a Member State or through State resources in any form (...) in so far as it affects trade between Member States, be incompatible with the internal market.” (TFEU 2012). Thus, if Poland would like to adopt a centralized capacity mechanism, it will need to negotiate and obtain an authorization from European Commission confirming its compatibility with internal market. Furthermore, since the Commission makes an assessment of State aid projects based on the “Guidelines on State aid for environmental protection and energy 2014–2020 (2014/C 200/01)”, the Polish government will be required to demonstrate the need for state intervention. Moreover, it will need to show that the proposed CM will lead to a relatively stable and continuous supply of electricity (capacity adequacy) and that it will provide equal access for all operators and cross-border participation.

In recent months, much attention has been given to the European Commission’s “Winter Package”. The possible introduction of new emission limits (550 kg CO₂/ kWh) for generation units that would like to participate in capacity mechanisms could pose a challenge to the introduction of a capacity market scheme in Poland and it could have a significant impact on the final mechanism design. Currently, this issue is being addressed informally between the Ministry of Energy and the European Commission.

4. Cross-comparison of the Polish CM concept and the British CM

The central elements of the Polish capacity market concept have been outlined in two documents:

- ◆ Functional Solutions of the Capacity market (published September 30th, 2016),
- ◆ Draft act on the Capacity market (published December 5th, 2016).

This section provides the key features of the concept of the Polish capacity market (PL) and compares some of its key elements to the Great Britain (GB) capacity market. Table 1 summarizes key elements of the Polish and the British capacity models.

TABLE 1. Key elements of the Polish and British capacity markets

TABELA 1. Kluczowe elementy brytyjskiego rynku mocy oraz polskiej propozycji

	Great Britain	Poland
Centralization level	Centralized	Centralized
Participants	Existing, new and refurbishing generator units, DSR, storage, inter-connectors	Existing, new and refurbishing generator units, aggregated generator units with capacity smaller than 2 MW (total capacity of aggregation must be between 2 and 50 MW, DSR)
Contracting capacity	Dutch auction	Dutch auction
Length of Capacity Agreements	Main Auction: 1 year – existing units, up to 3 years – modernized (refurbishment) units, up to 15 years – new units; Supplementary Auction: 1 year for all units	Main Auction: 1 year – existing units, up to 5 years – modernized (refurbishment) units, up to 15 years - new units; Supplementary Auction: 1 quarter of the year for all units
Loss of Load Expectation	LOLE < 3	LOLE < 3
Participation in the market	Mandatory for General Certification or optout notification (Main and Supplementary Auction)	Mandatory for General Certification, voluntary for Certification to Main and Supplementary Auction
Consequences of lack of supplies	Financial penalties	Financial penalties
Delivery Year	4 years ahead for Main Auction (n – 4), 1 year ahead for Supplementary Auction	5 years ahead for Main Auction (n – 5), 1 year ahead for Supplementary Auction
Results of auction	Same price of all units	Possible price differentiation between existing units and new/modernized units
Secondary Market	Yes	Yes
First Capacity Agreements	2014	TBD
First Delivery Year	2018/2019	TBD

Source: Own study.

a) Certification

Three stages of capacity unit certifications have been proposed in the Polish capacity market: General certification, main auction certification and supplementary auction certification. All units that successfully complete the main auction or the supplementary auction certification process will be allowed to participate in the CM as Certified Capacity Market Units (CCMU). Not every unit that takes part in the general certification will have the opportunity to participate in further certifications necessary for both auctions. Furthermore, units that benefit from other support schemes, or have contracts to provide ancillary services are excluded from the CM, except for high-efficiency CHP units, multi-fuel plants, and hybrid system units (as defined in the Renewable Energy Sources Bill).

CCMUs consist of two types of Units:

- ◆ Capacity Market Units – Generation (CCMU G) – unit (or group of units) which generate electricity,

- ◆ Capacity Market Units – DSR (CCMU DSR) – unit (or group of units) which commit to reduce demand.

In order to obtain the most accurate information on the available capacity in the system, generators (with a gross achievable capacity no lower than 2 MW) are obliged to participate in the General Certification. The Polish capacity market has been designed to support not only centrally dispatched units but also small independent units, including aggregate capacity. CCMUs may participate in the auction if the aggregate capacity is between 2 and 50 MW, with a threshold of 10 MW for one unit within the aggregate. The limit of 10 MW does not apply to DSR CCMUs (Ministry of Energy 2016c).

Although the general concept of the Polish certification process is similar to the eligibility and pre-qualification process established in the GB capacity market, a key difference between the two schemes lies in the eligibility criteria of each mechanism (Benalcazar & Kamiński 2016). Exceptions to the eligibility requirements of certain units (e.g., capacity providers in receipt of support from other schemes), and the fact that the current concept of the Polish capacity market does not specify the eligibility requirements for interconnectors, could pose a problem when it is evaluated by the Commission. It has been argued that the current proposal is not in line with the principles of technology neutrality and competitiveness of the EU internal market (Ministry of Energy 2016c; Kukuła & Stoczkiewicz 2017).

b) Auctions

Generating units that took part in the General Certification have the opportunity to participate in the Main and Supplementary auction certification. Furthermore, CCMUs are compelled to provide information about their achievable capacity as well as technical and economic parameters. In addition, units that are granted a main or supplementary auction certification are obliged to participate in their respective auctions

In the Polish capacity auction concept, the product offered by CCMUs has been defined as a “Capacity Obligation”. Capacity Obligations and subsequently Capacity Agreements (contracted capacity) might be offered for quarterly or yearly delivery periods. The length of capacity agreements (obligation period) vary from 1 up to 15 years (Ministry of Energy 2016b):

- 1) for existing CCMU G and CCMU DSR – 1 year delivery,
- 2) for modernized CCMU G – up to 5 years delivery,
- 3) for new CCMU G – up to 15 years delivery.

Main Auction and supplementary auction

Similar to the British scheme, the Polish capacity market will be based on a “descending clock” format (also referred to as Dutch auction system) and a “pay as clear” basis (Hancher et al. ed. 2015). In this type of auction, the asking price is gradually reduced and participants have the choice to stay or exit the auction. The final price of the auction is determined by a Net Welfare Algorithm or by Exact match (Yiakoumi & Rouiax 2016). In addition, both auctions are conducted on the base of predetermined auction parameters, which define the total amount of capacity to procure in the capacity market (Ministry of Energy 2016c).

A fundamental difference between the Polish concept and the British capacity market is the auction frequency. A five-year-ahead auction (n-5 Delivery year) has been proposed for the Polish CM. The reasoning behind this argument stems from the case of the GB capacity market, where auctions at the end of (n-4) year give in fact only 3 years for the investors to prepare for their delivery obligations. Furthermore, in order to increase the participation of intermittent energy sources, the Polish capacity market includes a supplementary auction with quarterly capacity agreements. The Supplementary Auctions will be held from the first quarter of (n-1) year, and participants can take part in more than one quarter of each delivery year (Ministry of Energy 2016b).

A general similarity can be found in the classification of CMUs between the Polish and the British capacity schemes. The Polish proposal presents a simplified classification, taking into account existing, new, modernized CCMU G and DSR, while the British classification of CMUs is much more extensive and includes “Existing Generating CMU, New build CMU, Refurbishing CMU, Proven DSR CMU, Unproven DSR CMU and Storage facilities. Although the latest documents published by the Polish Ministry of Energy only offer a preliminary idea of the envisioned CM, it has been proposed that separate auction parameters will be implemented for new and modernized units (based on particular technology groups).

c) Secondary Market

Similar to the British capacity market, the secondary market in the Polish scheme allows CCMUs to physically trade their capacity obligations and consequently minimize the risk of not delivering their contracted capacity. The Polish proposal describes two types of transactions (Ministry of Energy 2016c):

- ◆ Transfer after supplementary auction – Transfer of the Capacity Obligation to another entity in whole or in part,
- ◆ Relocation – Possibility to cover the Capacity Obligation through another CCMU in surplus.

Moreover, CCMUs are allowed to trade their Capacity Obligations in the Secondary Market at any time (Ministry of Energy 2016b).

5. Concluding remarks

In recent years, a number of Member States have voiced concerns about energy-only markets and their ability to provide enough financial incentives for new capacity investments. As a result, some MSs have taken the crucial step of implementing capacity remuneration mechanism. Studies suggest that the imminent retirement of coal-fired units, the low prices at the wholesale electricity market, and the future growth of electricity demand pose a significant threat to the Polish energy system. Despite the fact that capacity adequacy is currently being discussed at the

national level as a long-term problem (5–20 years), the lack of sufficient capacity and insufficient demand flexibility has already been observed in Poland on a number of occasions. For instance, the capacity shortage on August 10th, 2015 that led the Polish Transmission System Operator (PSE) to impose a number of power supply limitations to industrial consumers demonstrated the urgency for reform. Furthermore, studies from PSE, the Polish Electricity Association and independent researchers have confirmed the need for solutions that would improve the investment conditions of new generating capacity. This paper presents an overview of the challenges facing the Polish energy sector and describes the three capacity measures – Strategic reserve (also referred to as “cold intervention reserve”), operating reserve and Demand Side Response (DSR) contracts – that PSE has implemented. Besides the implemented strategic and operating reserves, the Polish Ministry of Energy has proposed the introduction of a centralized capacity market with a five-year forward procurement auction that largely resembles other capacity market schemes implemented in the US and in the UK. This paper provides a comparative analysis between some of the key elements of the proposed Polish capacity market and the established GB capacity market. Results from the cross-comparison show that some of the elements presented in the current CM proposal may not be in line with the principles of technology neutrality and competitiveness of the EU internal market.

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Propozycja polskiego rynku mocy vs model brytyjski

Streszczenie

W ostatnim czasie rozpoczęła się ważna debata na temat możliwego wdrożenia scentralizowanego mechanizmu mocowego w Polsce. Mimo tego że adekwatność zasobów jest obecnie omawiana na szczeblu krajowym jako kwestia długoterminowa, wielokrotnie podkreślano brak wystarczającej mocy i niewystarczającą elastyczność popytu. W lipcu 2016 roku polskie Ministerstwo Energii wyraziło poparcie dla wdrożenia mechanizmów mocy o zasięgu rynkowym. Biorąc więc pod uwagę ostatnie wydarzenia, celem niniejszego artykułu jest rzucenie światła na możliwość wdrożenia rynku mocy w Polsce. Praca prezentuje zwięźle omówienie kluczowych problemów polskiego sektora wytwarzania i dostarcza analizy głównych elementów propozycji polskiego rynku mocy w kontekście rozwiązań wdrożonych w Wielkiej Brytanii.

SŁOWA KLUCZOWE: mechanizmy wynagradzania zdolności wytwórczych, rynki mocy, adekwatność zasobów