5 Myths of the Polish Power Industry 2014

4th edition of PwC and ING Bank report

May 2014

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Dear Readers,

This is already the fourth edition of our report. In 2011, we addressed the methods of financing investment; in 2012 we discussed the development opportunities of the gas-fired energy generation, and in 2013 we reported that the emphasis in the electricity sector had moved from the widely discussed issues regarding solely generation to other parts of the value chain.

From the perspective of 2014, we do not want to touch on topics analysed in the previous editions. Today, they are dealt with in the strategies and activities of market players.

Instead, we want to deal with the myths regarding the electricity sector that are commonly expressed by the representatives of various organizations, and which shape the consciousness of the recipients of such messages.

We have made an attempt to confront 5 myths that address key issues related to the sector, but which, in our opinion, express a number of simplifications.

It is widely believed that the action of the ,,invisible hand'' is the healthiest system that ensures development and eliminates inefficiencies of the market. Adapting the present perspective of the generation sector, we refute the first myth that **"The free market has created a sound basis for the development of power generation".** Not only do we believe that the free market has failed in creating a basis for the development of generation, but we also think that, because of its structure, it will not have such a possibility in the future.
"The capacity market is a universal solution that can be copied in Poland" is the second myth which we disagree with. The meaning of the ''capacity market'' slogan is very broad, and certainly it is not a universal solution. Considering the introduction of the capacity market, Poland must first define what its goals are and only later think about the form of their implementation (for example, whether to adopt the model of capacity obligations or capacity auction, or whether the term of the contracts should be different for new and for existing capacities).

In an era when slogans like ,,Energy is too expensive'' are very common, we confront the third myth: **"Customers did not benefit from liberalization of the market"**. We show that the sales segment has evolved, and that the customer has benefited from it. Competition in the sector has forced a decrease in margins, and customer service is undergoing a transition: the consumer is no longer an applicant, but a genuine customer. The current customer's perception that energy is too expensive will not disappear, as electricity is perceived as a commodity that is always present and available, and whose value the customer is not conscious of.

"Smart power industry starts with meters" is the fourth myth that arises from discussions on smart meters, even though today's trends in Europe are changing in the direction of smart grid first, with smart meters coming second, especially, considering the fact that 82 % of the respondents are not at all familiar with the concept of a smart meter.

Last but not least, the fifth myth: **"It is stability that will be provided by regulation and not competition".** Based on the example of the renewable energy sector, we challenge the traditional convention that stability is a crucial aspect in regulation. We agree entirely and are not going to contradict this view, but we also add that ''competitiveness is of key importance'' here as well. When regulating and supporting an area, we should try to do it at the lowest possible cost for the end users, while maintaining a fair return for the investor.

We invite you to read the report.

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Myth No. 1. The free market has created a sound basis for the development of power generation

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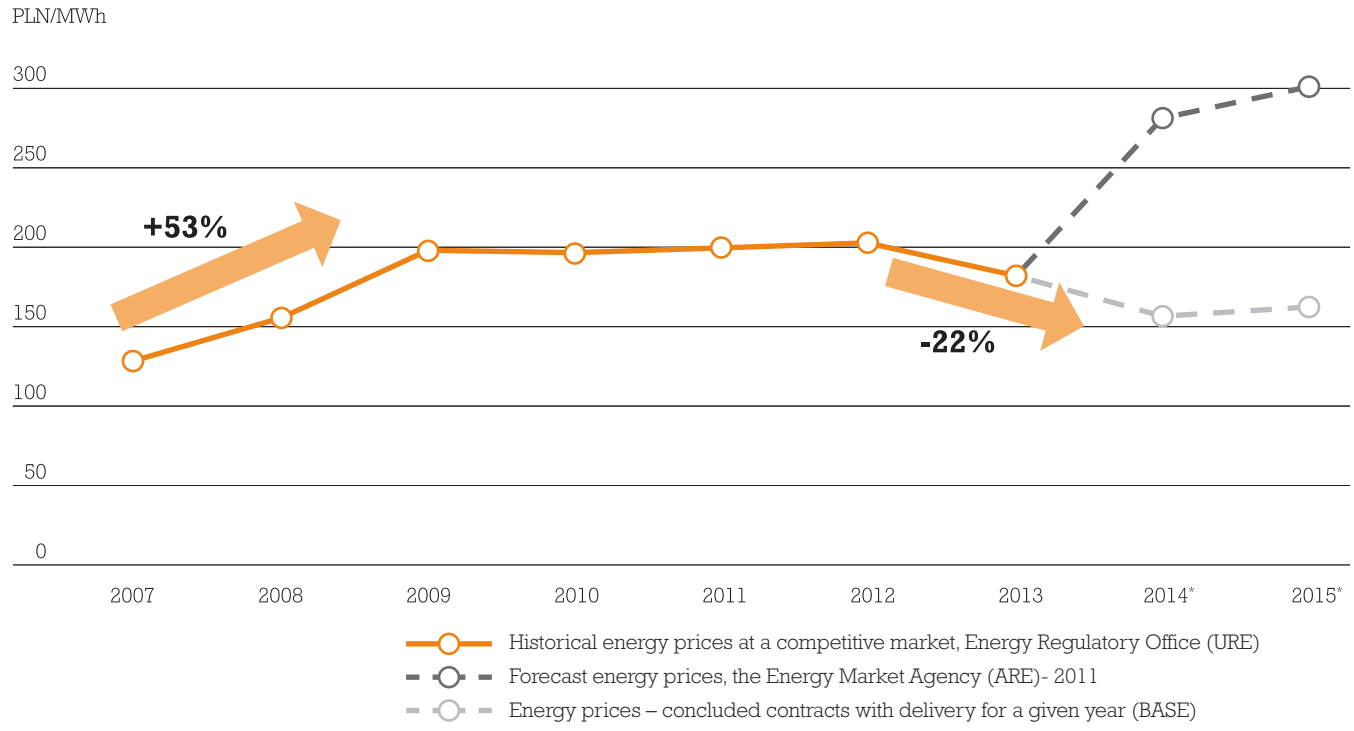
The origins of market liberalization and views on the future

One can say that the year 2007, when the tariff obligation was abolished for all customers except for households, and the year 2008, when long-term contracts were terminated, witnessed market liberalization and the ,,invisible hand of the market'' began to direct the development of the energy sector.

The years 2008-2009 were marked by a significant increase in electricity prices (53% in 2007-2009), and a strong upward trend in the following years was predicted in every forecast. There was a common belief that without a strong price increase it would not be possible to carry out the new investments required to replace obsolete units in the system. According to the forecasts, the 2014 electricity price was to be around 275 PLN/MWh[1] in nominal prices. Currently, the electricity price equals 156.45 PLN/MWh (BASE contracts for 2014) and is therefore significantly below earlier expectations.

One of the main reasons for the increase in electricity prices in the ensuing years was to be the cost of CO_2 emission allowances. These allowances are a component of the variable cost of electricity production – every quantity of CO_2 produced by a power generation unit under the European Emissions Trading Scheme (EU ETS) must be covered by an appropriate allowance (,,EUA''). One EUA unit covers the equivalent of one tonne of CO_2 emissions. The current allowance prices are at a level of about 5 EUR/tCO_2[2], whereas three years ago it was expected that the price in 2014 would be at around 30 EUR/tCO_2[3].

Historical and forecast electricity prices (nominal prices)



Source: PwC analysis based on the data of the Energy Regulatory Office (URE) and the Polish Power Exchange (TGE). Inflation forecast based on NOBE
*) average weighted BASE contracts for a given year. Volume for 2013 – 66.4 TWh, 2014 – 100.1 TWh, 2015 – 28.6 TWh.

[1] Forecast of wholesale electricity prices used in the document Updated Forecast of Fuel and Energy Demand until 2030 prepared in 2011 by ARE is 256.2 PLN (in 2009 prices), which gives about 275.7 PLN / MWh in 2013 prices.
[2] Applies to supply contracts in December 2014, as at April 2014. Source: ICE Futures Europe in London.
[3] CO_2 forecast used in the document Updated Forecasts of Fuel and Energy Demand until 2030 prepared in 2011 by ARE is 29.27 EUR/t in prices of 2009.

Other financial injections

Since 2008, free market operations of energy producers were supported by additional ,,financial injections'' in the form of compensation for early termination of long-term contracts, free CO_2 allowances received under derogation and sale of their surplus on the market, as well as certificates of origin from the co-firing of biomass. With the price level allowing for the generation of margins, and with ,,capital injections'', the generation sector looked to the future with optimism. The proof of the above was developed investment programs, which in 2008 included 21.5 GW of new capacities.

The 2011 energy price of 198.90 PLN/MWh together with the prices of hard coal and CO_2 from the analysed period would ensure profitability of investment in the construction of a new coal plant, assuming, however, that it would work for 7000 hours per year (load factor of about 80% per year).

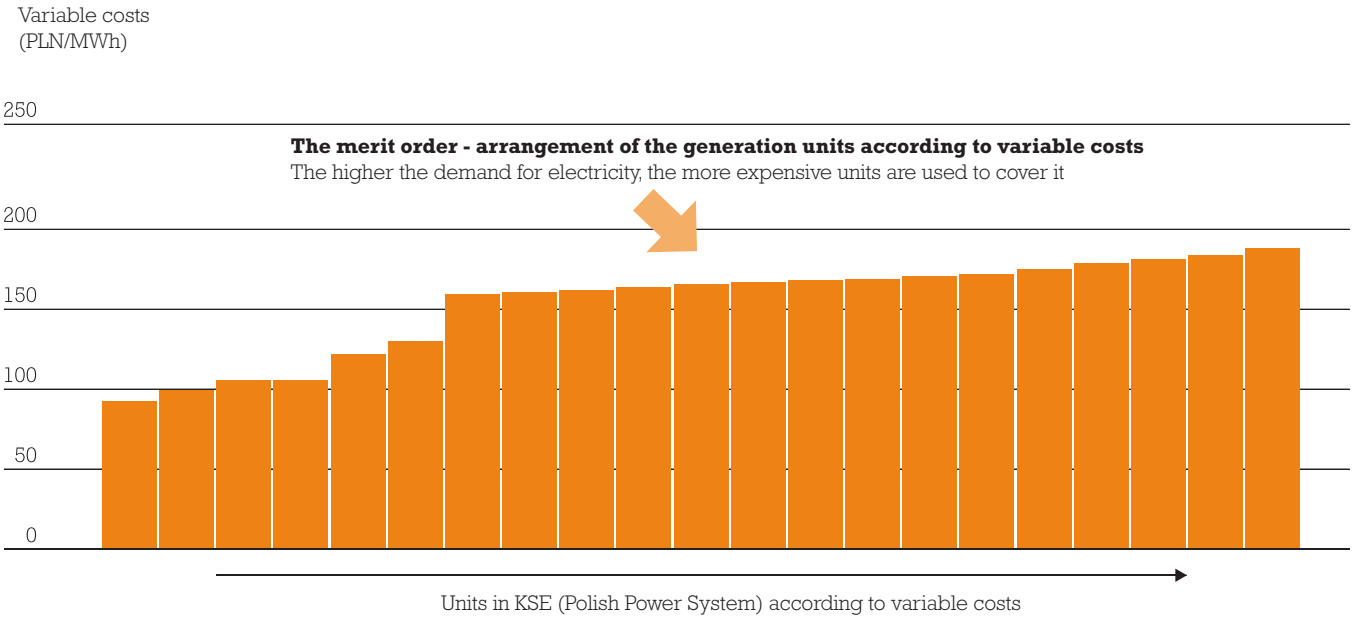
Changing price expectations

A slower than expected growth in electricity demand, decreasing allocations of free CO_2 emission allowances, the expiration of compensation for early termination of long-term contracts, the strong increase in renewable energy sources, along with a decrease in the price of green certificates, and finally a fall in electricity prices have significantly changed the perception of investment in new generation units. The above market events affect not only the view of the future, but also the existing units. However, the level of the impact, depends on the efficiency of the existing unit and its position in the merit order (,,stack'').

What is merit order?

Merit order (,,stack'') is a way of ranking generation units according to the variable cost of production. This tool is used for modelling the electricity market, the behaviour of market players, and electricity prices. The shape of the stack is one of the key factors determining the shape of the generation market. In short, the generation units on the market are admitted to the system in accordance with the variable costs: the higher the demand, the more expensive units enter the system to cover it. The market price of electricity is thus determined based on the variable costs of units closing the stack (marginal cost).

Simplified diagram of the merit order (,,stack'') in Poland



Source: PwC analysis. The presentation of variable costs of generation units is only illustrative. Data based on publicly available sources.

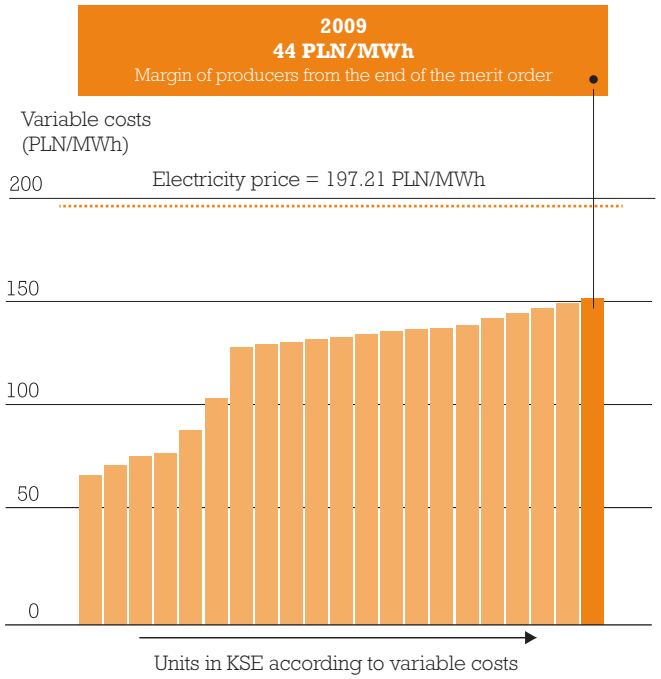
Merit order vs. inefficient units

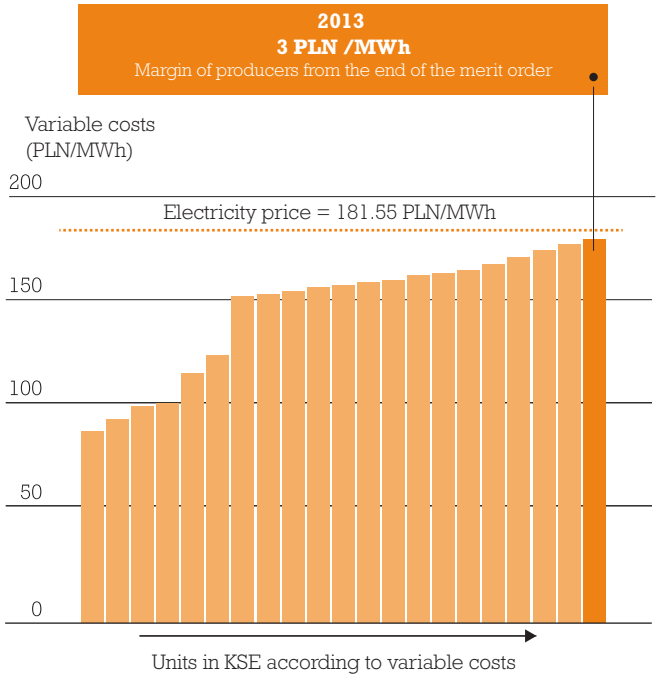
The economics of the generation activity of the units which close the merit order has undergone a substantial transformation over the past four years. The decrease in electricity prices has led to a situation in which the generation activity is balancing on the edge of profitability, which takes place already at the level of variable costs.

In 2013, the units of the lowest efficiency could expect to realize a margin above the variable cost in the amount of about 3 PLN/MWh. This amount is insufficient to cover total fixed costs, let alone the cost of the employees' salaries. With the price of energy in 2015 based on the currently concluded BASE contracts, there is the risk that units will not even be able to cover their variable costs

Moreover, low electricity prices obviously reduce margins for all units in the system.

Estimated margins over variable costs in 2009 and 2013 (PLN/MWh)





[4] For example, for a 200 MWe class unit, it would be possible to cover the cost of salaries of about 28 people without the general administrative expenses, additional labour costs, bonuses, etc.

Merit order vs. a new unit in the system

The market mechanism leads to a situation in which the units from the ,,tail'' of the merit order cannot expect to realize revenues at a level sufficient to cover the costs of their operation. Nowadays, there do not seem to be any strong incentives that would change the situation of this class of units in the future, especially, in the context of the introduction of new units into the system.

1 **A new unit in the system –** a new unit, for example a hard coal unit, is introduced into the national system

2 **Shifts in the merit order** – because the new unit has high efficiency, it will be ranked in the merit order before older coal-fired units

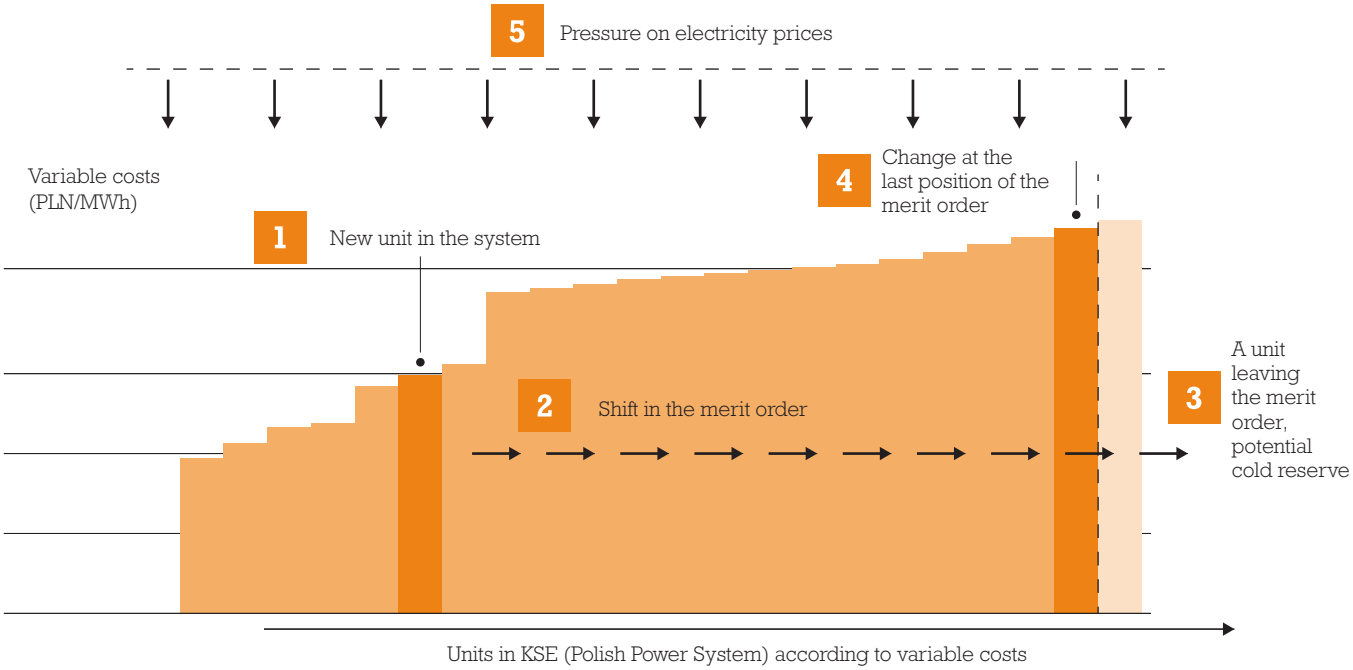
3 **A unit leaves the merit order –** due to an abrupt increase in capacity, a unit from the position closing the stack is not needed to meet the demand for electricity; consequently, it leaves the merit order and ceases to affect electricity prices

4 **Change at the last position of the merit order** – as a result of the entry of a new unit, the last position of the stack is occupied by an entity which was previously second to last in the ranking

5 **Pressure to decrease prices** – due to a shift in the merit order, units of lower variable costs than hitherto are needed to close the demand, which is the first incentive to price reduction; the result of the competitive pressure and the desire to place the electricity volume on the market is the pressure to reduce electricity prices (while the prices of production factors remain unchanged).

The above steps are a simplified scheme of this phenomenon, which omits the technical side of the work of units and the Polish Power System (KSE). Despite all these simplifications, the scheme adequately captures the essence of the problem of ensuring profitability in the case of the units at the end of the merit order. Additionally, the entry of a new unit into the system may result in a pressure to reduce prices, which obviously will not lead to higher margins for producers.

Consequences of introducing new capacities into the power system



Source: PwC analysis. The presentation of variable costs of generation units is only illustrative. Data based on publicly available sources.

Consequences of today's market model

In a situation of supply and demand interplay, entities which cannot cover the costs of their activity should be eliminated from the system, according to the viewpoint of market players. However, from the perspective of the security of the power system, it is necessary to maintain adequate capacity reserve, which naturally creates an oversupply in the system.

By virtue of its design, the Polish market is not able to develop mechanisms to ensure the profitability of the units which are needed in the system, as the number of hours they work per year and the level of the production costs they generate make it impossible to achieve adequate profitability. In addition, such a market model does not give rise to a pressure to increase electricity prices

Units leaving the Polish Power System because of their lack of cost-effectiveness constitute a problem for the Polish Power System, which requires additional mechanisms that would make it possible to keep the economics of their operation. At the same time, any actions taken by the Electricity System Operator, entailing financial incentives for producers and improving the profitability of the units, will result in additional costs paid by the end customer. In fact, it is the end customer who will bear the cost of a stable power system.

Units leaving the Polish Power System because of their lack of cost-effectiveness constitute a problem for the Polish Power System, which requires additional mechanisms that would make it possible to keep the economics of their operation. The cost of it, however, will be borne by the end customer

Myth No. 2. The capacity market is a universal solution that can be copied in Poland

Producers may not be able to afford to maintain some units, and therefore, from a purely business perspective, they should shut them down. However, one must take into account the needs and the security of the power system, for which someone has to pay. The capacity market may be the answer that will allow the producers to conduct business and raise awareness as to their role as guarantors of energy security. It is an open question whether the capacity market can also be a system that creates the conditions for investment in new generation capacities, assuming that the level of electricity prices alone in the current market model will not create such a stimulus.

The capacity market has already been implemented in, to name just a few, the following European Union countries:

- Spain – in a model of capacity payments
- Portugal – in a model of capacity payments
- Ireland – in a model of capacity payments
- Italy – in a model of capacity payments; currently a change to the model of capacity auction is planned
- Greece – in a model of capacity obligations,
- Romania – in a model of capacity obligations,
- Finland – in a model of strategic reserve
- Sweden – in a model of strategic reserve
- The Netherlands – a model of strategic reserve has been prepared but not launched yet

Work on solutions in this area is carried out in, among others, the UK (capacity auctions), France (capacity obligations), Germany (the British and the French models are taken into consideration), Belgium (subsidies for new CCGT units), and Poland.

Why the capacity market?

The key task of the power system is to guarantee stable supplies of electricity to its users. The demand for and supply of electricity are balanced on an on-going basis to ensure the level of resources necessary to cover the total demand for electricity (including peak demand).

The leaving of units of the Polish Power System because of the economic inefficiency of their production is a major threat to the system's security. The development of renewable energy sources, which on the one hand, benefit from a privileged position in the power system, and on the other, are characterized by large fluctuations in production (intermittent sources), requires changing the approach to the management of the power system. Hence, the biggest challenge for the system is to maintain stability in situations in which the demand for and supply of electricity from intermittent sources change in opposite directions, i.e.

- in a situation in which demand is growing at peak hours, and production in intermittent sources is falling,
- in a situation in which the off-peak demand is decreasing, and production in intermittent sources is growing.

Therefore, from the perspective of the security of the Polish Power System, the units which from the economic viewpoint (ranking of variable costs) are ,,pushed out'' by a more efficient source are of key importance. These units are the next closest production facilities and can ensure stable operation of the Polish Power System in situations in which the supply from the intermittent sources as well as the demand are volatile. As indicated above, the owners of these sources do not have an economic interest in maintaining them. Therefore, it is necessary to provide appropriate support to maintain the profitability of their production.

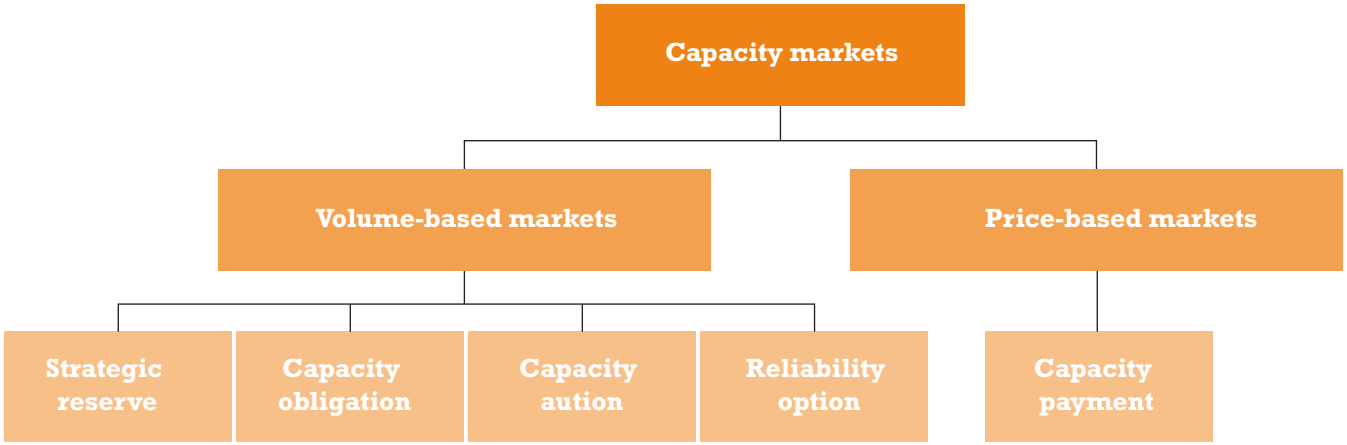
One of the solutions regarding support of these sources is the capacity market. Its purpose is to introduce additional financial incentives for producers, which stabilize their income and make it possible to maintain profitability even at a low level of operation (limited work time).

Typology of the capacity market models

Despite the variety of organizational solutions of the capacity market, their models can be divided into two main categories:

- volume-based capacity markets,
- price-based capacity markets.

Division of capacity market models



Volume-based capacity markets

The first group are volume-based capacity markets with four basic models:

- strategic reserve,
- capacity obligation,
- capacity auction,
- reliability option.

Strategic reserve

Strategic reserves comprise mainly units that are kept in the power system for the purpose of covering energy demand in emergency situations, such as special weather conditions or catastrophic failures.

Units remaining in the strategic reserve do not take an active part in the electricity market. They are dispatched by the TSO only in emergencies, when the electricity market price reaches the level of the maximum price, in theory similar to the VoLL value[6].

Contracting of the strategic reserves can be performed by the TSO under announced tenders, and it may include particular volumes of the capacity reserve in specific periods of time (e.g. in one year). If the contracting process is implemented early enough, then also installations that have not started operating yet may participate in tenders for strategic reserve.

There are different pricing models for producers for maintaining the strategic reserve. The simplest constitutes an auction organized by the TSO, in which the purchase of strategic reserve is proposed, and the supplier is selected. As a rule, the entity contracted as a strategic reserve stops participating in the energy market. In this respect, however, individual solutions prepared by the TSO are possible. For example, the unit remaining in the strategic reserve and outside the energy market may participate in the balancing market when the market cannot be balanced by other participants.

Fees paid by the TSO for the installations remaining in the strategic reserve are usually transferred on to the electricity consumers under transmission charges. Due to the relatively low level of the required strategic reserve, the costs borne by the end users connected with such a solution are relatively low.

[6] VoLL (Value of Lost Load), is the estimated marginal price of energy, which the end customer is willing to pay to avoid interruptions and disruptions in the supply of energy

Since the units remaining in the permanent reserve will work over a very limited number of hours per year, and may even be dispatched once every few years, this reserve would probably include:

- units which are being withdrawn from operation, or
- new units built for the purpose of such a reserve using equipment and installations which are being withdrawn from on-going operation (e.g. aircraft engines).

Because of the idea of maintaining a strategic reserve and because of its designation, the preparation of a new source exclusively for the purpose of providing back-up services may be unprofitable from the perspective of a potential investor. At the same time, payments for the maintenance of the strategic reserve can be a source of additional financing for the producers who have some sources which are economically inefficient and, by definition, remain outside the market because of a high variable cost. In such a situation, such units could be made available to the Transmission System Operator as strategic reserve.

The strategic reserve model is the simplest capacity market model in terms of its implementation, but it addresses only the requirement to ensure stability of the system in emergencies, such as specific weather conditions or catastrophic failures

The strategic reserve is similar to the residual capacity market and addressed to a small group of generating units. A solution similar to permanent reserve is cold operational reserve contracted by PSE S.A. (Polish Transmission System operator) in Poland, described in more detail further in this report.

Capacity obligation

The capacity obligations system consists in the necessity for the sellers (or large electricity consumers) to ensure proper capacity, covering their planned sales (or consumption, in the case of large electricity consumers), incremented by a certain level of the system reserve specified by the TSO or the Regulator. Under this market model, producers can sell a capacity volume corresponding, in maximum, to their total available capacity. To ensure security of the energy system, the available capacity should be verified by an independent expert (e.g. the Regulator, TSO).

The capacity obligations market model assumes primary and secondary trading in capacities between producers, sellers and large energy consumers. Practically, capacity contracted at a given moment will be physically delivered during any period. Therefore, both the units under construction as well as the units to-be-built could participate in the market provided capacity is contracted ahead of the electricity sale periods (e.g. in year n-4).

The primary challenge for capacity market participants in the model of capacity obligations is estimating electricity demand within a 1-4 year horizon, respectively to the dates of capacity sales. Although the system of capacity obligations assumes secondary trading in the capacity available even during the n+1 period, appropriate estimation of the demand (in the case of large customers) or sales forecast (in the case of electricity suppliers) is in this situation of key importance for effective closure of the commercial position of the demand part of the capacity market.

The capacity obligations model can be implemented in various forms with different levels of centralization. It is possible to implement a fully decentralized market in which capacity obligations are traded freely between the electricity producers and electricity suppliers as well as large customers under bilateral agreements.

One of the variants of the decentralized capacity market model based on capacity obligations is the introduction of a system of capacity certificates, which constitute the obligation of the energy producer to provide capacity to generate a given quantity of electricity at a given point in time and for a given period. Capacity certificates are issued for electricity producers by the Regulator and apply to all units which have undergone external qualification and assess their available capacity properly. Capacity certificates, as standardized products, can be, similarly to certificates of origin for electricity, subject to wholesale trading on the exchange market. In such a construction of the capacity market, the TSO may:

- participate in trade, independently purchasing capacity to cover the necessary system reserves,
- remain outside the capacity market and specify only the level of capacity surplus to cover the necessary reserves which the electricity suppliers and large customers must purchase.

In the capacity obligations model, the demand side is responsible for fulfilling the obligation to provide the power system with adequate capacity. This may be achieved by appropriate bilateral agreements, or by redemption of capacity certificates. Regardless of the form, capacity providers and energy sellers are individually obliged to balance their trading positions.

In the capacity obligations model, regardless of the form of its implementation, all sources are treated in a uniform way, and the capacity provided by these sources is a homogeneous product. The level of revenues of electricity producers is the result of market forces. Neither the generation technology nor the position of the generating unit in the system are important. Payments for the sale of capacity (also through capacity certificates) may constitute an important component of revenues and improve the profitability of operations covering a part of fixed costs.

In the capacity obligations model, all sources are treated in a uniform way, and the capacity provided by these sources is a homogeneous product. The producers' revenues from sales of capacity are the result of market forces, and in an extreme case may equal zero

Capacity auctions

The concept of the capacity auction model is similar to the solutions of the capacity obligations model. The differences regard:

- the method of determining the price of capacity: the price is determined during auctions organized by the entity purchasing the capacity,
- the method of purchasing capacity: capacity to cover the entire reported demand for electricity is purchased by one entity (SPV, TSO), which is responsible for assessing future demand for electricity, taking into account peaks and the necessary reserve.

As in the model of capacity obligations, the producers can sell the entire available capacity which has been verified by an independent expert (e.g. the Regulator, TSO).

The capacity price in organized auctions is determined according to the price-power curves (capacity demand curves), defined by the entity responsible for the purchase of capacity based on demand forecasts. Typically, the maximum capacity price (a price cap) in an auction is the cost of entry of OCGT units into the system, and the price decreases with the increase in the available capacity.

The contracting of capacity between producers and the entity responsible for the purchase of capacity takes place at auctions organized by that entity. The clearing price is not fixed in advance, but results from bids submitted by auction participants and can be determined as the price of the last participant who won the auction (marginal price). In this case, all the participants of the auction that managed to sell capacity receive the same unit remuneration. However, it is possible that in the next auction the capacity prices will be at a different level, depending on the offers made at that auction. Consequently, in contrast to the model based on capacity obligations (also capacity certificates), unit capacity prices may be different for various generation units. The differences can result from the decision of asset owners (in which auction to participate and to what extent) and the entity purchasing capacity from producers (how to organize auctions in the context of the purchased volumes, dates of contracting, etc.).

The contracting of capacity between producers and the entity responsible for the purchase of capacity takes place at auctions organized by that entity. The clearing price is not fixed in advance, but results from bids submitted by auction participants. In contrast to the model based on capacity obligations, capacity unit prices may be different for various generation units

Reliability options

Reliability options are instruments similar to the call option. Parties to transactions involving reliability options are producers of electricity (asset owners) and electricity suppliers that can be represented in the market, e.g. by the Regulator or the TSO. Trading in reliability options can be conducted at auctions organized by the Regulator or the TSO.

Reliability options are defined products consisting of:

- a financial part under which the purchaser of the reliability option (the demand side) has the right, but not the obligation, to purchase electricity from the writer of the option (the producer) at the strike price specified in the option, instead of the reference price. In return, the writer of the option receives a fixed payment – a premium,

- obligations of the option writer (the producer) to a physical delivery of electricity at the time of exercising the option. In a situation where the writer is unable to meet this obligation, the writer may be required to pay a penalty.

As a result of purchasing a reliability option:

- the demand side (electricity suppliers) receives a guarantee for the availability of capacity in the power system that meets its needs, even in emergency situations, and a guarantee of electricity prices when such an emergency occurs,

- the supply side (electricity producers) is free to determine the capacity included in an option, stabilizes the revenue stream, and receives additional remuneration in the form of premiums for the issued option.

Reliability options are not a standard tool securing the risks of fluctuations of electricity prices, but are designed to ensure the stability of the power system in emergency situations. Therefore, the option strike price should be determined administratively (by the Regulator or the TSO) at a level close to the price of electricity in such situations (much higher than a standard derivative).

Therefore, the capacity market model based on reliability options requires a developed and competitive energy market. Only in such a market is it possible to determine the boundary between price fluctuations resulting from a standard market interplay of supply and demand, and emergency situations in which the stability of the power system is threatened.

> The capacity market model based on reliability options requires a developed and competitive energy market

Moreover, also the amount of premium for the issuance of options and the level of penalties for failure to meet the conditions of reliability should be determined administratively.

In practice, the premium obtained by the producer of electricity issuing an option is a fixed fee for its available capacity. Thus, in the model based on reliability options, all producers receive the same unit remuneration provided the options are a standardized and homogenous product both in the part concerning the premiums and the strike price, as well as the rules for determining the reference price.

Theoretically, the strike price shall be determined at the level of electricity prices in emergency situations. The TSO or the Regulator may, however, make the strike price dependent on, for example, the cost of entry of a marginal unit into the system and the price of fuel used by it or set a reference price depending on the price at the wholesale market, the balancing market, or the VoLL index.

Price-based capacity markets

Capacity payments

The market model based on capacity payments is a basic example of the price-based capacity market. This is the simplest solution for the capacity market involving direct payments to energy producers, made by an independent entity (SPV, TSO).

In contrast to the volume-based capacity markets model, in the case of the capacity payments model, the starting point for the process of contracting is the price offered by the capacity purchasing entity. On this basis, producers determine the volume they are willing to offer in exchange for the proposed price.

Depending on the purpose of the capacity market and the needs of the power system, the capacity payment system can be directed at different generating units. For example:

- payments may refer to all existing or existing and planned generating units,

- capacity payments may apply to selected generating units, if their functioning is essential from the perspective of the stability of the power system, and the economic balance indicates unprofitable production in these units,

- capacity payments may apply only to new generating units, if their purpose is to support the restoration of gene-

ration capacities. Moreover, in this case, the contracting of capacity should be carried out early enough, so that any capacity payments can be taken into account by investors when calculating the profitability of new generating units,

- capacity payments can also apply to units of a certain type (e.g. peak sources) or at sources based on a particular fuel (e.g. gas sources), depending on the needs of the energy system or the adopted national energy policy as a tool supporting the management of the fuel mix.

The producers' remuneration for capacity can be determined in various ways. The fee may be calculated based on the average fixed costs of a hypothetical unit. Then, all market participants, regardless of the type of generating assets held, receive the same fee. Other possible solutions calculate the remuneration level in such a way so as to ensure the appropriate level of profitability for a given technology, taking into account the fixed and variable costs as well as revenues from the sale of electricity. This solution allows the manager of the capacity market to discriminate or promote particular technologies and is a tool for managing both the fuel mix as well as the directions of the development of generation capacities.

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Capacity market in Poland

Currently, the capacity market in Poland is in the design phase. A suitable market structure must be prepared for it to operate correctly and to achieve the goals assigned to such solutions. Although there are several potential capacity market models, the multitude of their implementation options can lead to distortion of the anticipated effects. The shape of the market can significantly limit some generation technologies and lead to the unintended distortion of market mechanisms. In some variants, the capacity market can also be regarded as one of the important tools supporting the investment policy of energy companies.

According to the current forecasts for the years 2016 – 2018, the Polish power system may experience capacity shortages caused by the decommissioning of old and inefficient power units and the lack of alternative sources, which (despite the fact that they are currently under construction) will not even start operating yet.

Last year, work began on the capacity market. Probably, solutions in this area could come into effect in 2016/2017.

Preparing for the implementation of the capacity market model, Poland must define what goal such a market should achieve:

- Providing the required reserves by units whose work is not economically justified? - It seems that solutions addressing such challenges have already been implemented (as is described in more detail later in this document), and they can be extended to the next generation units which, in the subsequent years, will replace the gradually decommissioned units.

- An additional source of revenue for producers who do not have the possibility of working at their full production capacity? – Will solutions based on competitive mechanisms of supply and demand bring the desired effect, and will the conditions of administrative allocation of funds not upset the competitiveness of the sector?

- Support only for new units? Support for selected technologies? - In this area, will stabilization of the system in the perspective of four years, typical for the capacity market, be enough? Or maybe, in the case of new units, a 15-year-long support is necessary as in some variants of the implementation of the capacity market?

Without answers to the above questions, it is difficult to predict the benefits and costs of introducing the capacity market. Nonetheless, only defining the goals of the implementation allows the design of its structure. For example, the introduction of solutions based on the model of capacity certificates, the price of which results from the interplay of market forces, will not allow for support of new generation units.

Without an answer to the question what the purpose of the implementation of the capacity market in Poland is, it is difficult to predict the benefits and costs of its operation, and to design its structure. For example, the introduction of solutions based on the capacity certificates model, whose price results from the interplay of market forces, will not allow for dedicating support for new generation units

In parallel to the work on the target solution, in 2014 implemented bridging instruments are already working, i.e. the cold intervention reserve and the operational capacity reserve.

Cold intervention reserve

Cold intervention reserve refers to payments to the TSO for keeping units in the ready-to-work mode. The services of the cold intervention reserve can be provided by energy producers whose plans set out the decommissioning by 2017 of the units which are the oldest, and least cost-effective (often unprofitable). According to the cold intervention reserve model, producers can keep these units in the reserve in exchange for fixed payments made by the TSO. The estimates of PSE (Polish Transmission System Operator) indicate that the cold intervention reserve should be maintained at around 1,000 MW capacity.

So far, for the purposes of the cold intervention reserve, 454 MW from two units of Zespół Elektrowni Dolna Odra have been contracted. The agreement is valid for the years 2016 and 2017, with an option to extend it for a further two years by the end of 2019. For one hour of maintaining readiness for intervention supply, PSE will pay an average of 24 PLN per each MW of available capacity.

Operational capacity reserve

According to the applicable Transmission Grid Code, the operational capacity reserve means the generating capacities of Power Generating Scheduling Units which are in operation or shut down, representing the excess capacities available to the TSO over and above the electricity demand covered by the Power Purchase Agreement and at the Balancing Market under free generation.

Payments for the services of the operating capacity reserve are made based on the reference price of the hourly operational reserve, which corresponds to the average unit technical fixed cost of the generating capacity of a given Power Generating Scheduling Unit, excluding depreciation and expenses of administration and sale, adjusted by an efficiency coefficient at the level of 0.93. For 2014, the value of the reference price is 37.13 PLN/ MWh.

The capacity market and contracts for difference (CFD) – the UK experience

The Energy Market Reform (EMR) in the UK is to introduce tools supporting investment in low-carbon generation sources. The basic elements of this reform are the capacity market and contracts for difference (CFDs). CFD's task is to stabilize the revenue from low-emission sources, and thus reduce the cost of financial investments in such generation units. CFDs are to replace the existing support schemes for renewable energy in the United Kingdom, while the capacity market is to provide the producers as well as the demand side capable of reducing the demand with fixed payments for readiness to provide additional capacity to the system or reduce the demand for electricity in situations of limited supply. The task of the capacity market is thus to reduce the risk of blackouts.

Under CFDs, electricity producers will receive a guarantee of a fixed price for the produced electricity (the so-called strike price). The reference price is contingent upon the generation technology. The producers who conclude a CFD will sell electricity on the wholesale market, and then they will settle the sales with a special entity set up by the UK government to handle CFDs. In a situation where the average market price of electricity, determined on the basis of a relevant index, is lower than the reference price determined in a CFD, the producers will receive adequate compensation, up to the level of the reference price. In a reverse situation, when the market price is higher than the reference price, the producers will be required to pay the excess of revenues over the reference price for the company settling CFDs.

The solution introduced in the reform of the energy market successfully reduces the exposure of producers to fluctuations in wholesale electricity prices. The objective of a CFD is to provide investors with greater predictability of revenues and financial stability in the long-term perspective. It is assumed that CFDs will be concluded for a period of 15 years, with the exception of the nuclear power sector, where a 35-

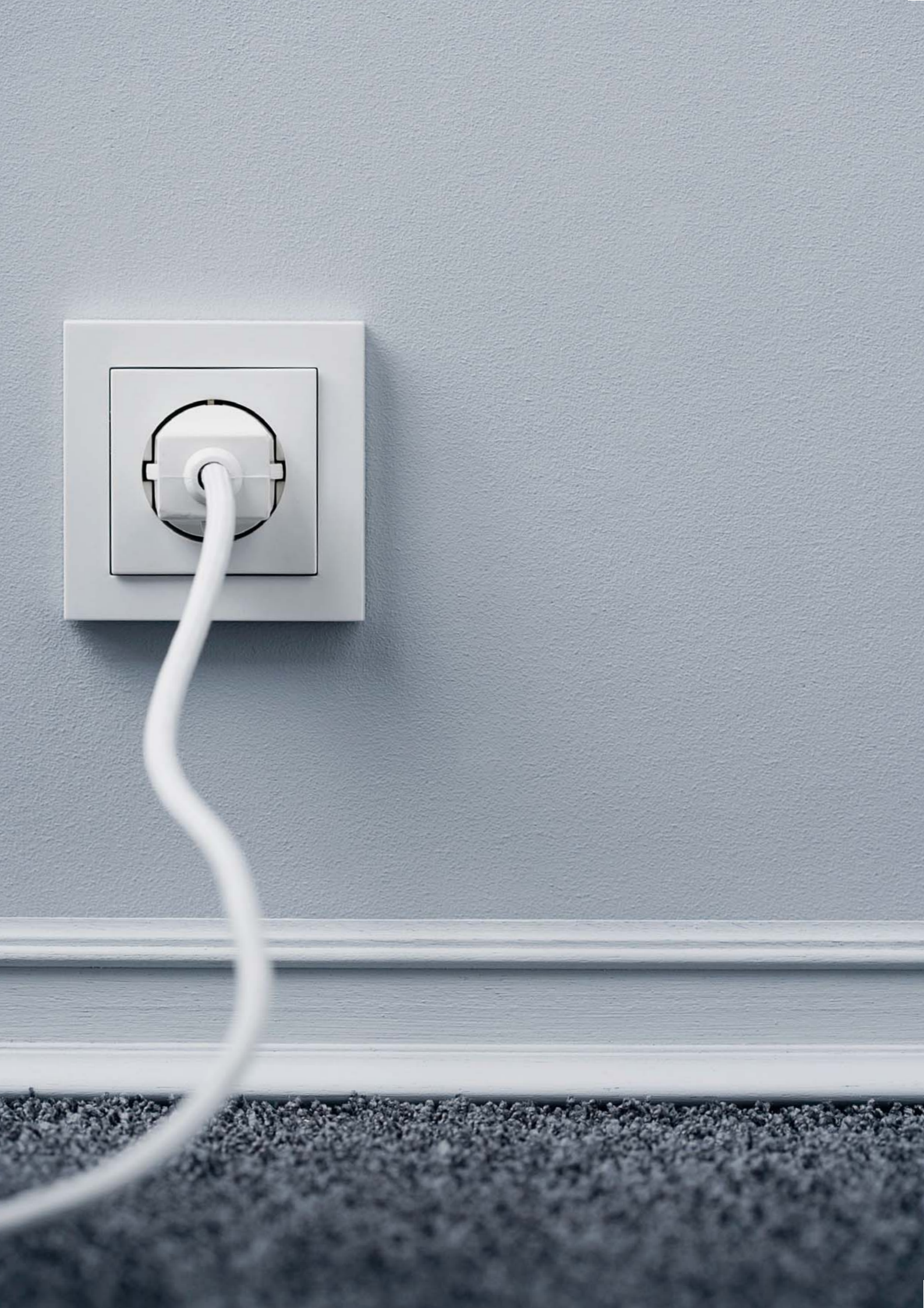
year term of the contract is envisaged.
CFDs are designated for new low-emission generation sources based on different technologies. It is worth noting that this category includes both renewable and nuclear energy sources as well as sources equipped with the CCS installation. The units that wish to apply for a CFD must meet some administrative criteria, contingent upon a given production technology (eligible generators).

In principle, the framework regulations included in the CFD will not be different for particular technologies. Nonetheless, some adjustments may be necessary to adequately address the needs and requirements of investors, depending on the chosen technological solutions and the conditions of a specific project. However, the scope of potential changes will be determined precisely. Currently, work in this area of the EMR regulation is in progress. CFDs are not addressed to producers participating in the capacity market. These producers are explicitly excluded from the CFD market.

Under the current proposals, installations based on the technologies under development will be able to apply for CFDs based on the 'first come, first served' principle, and will receive a contract with a fixed price for a given technology. After this phase of CFD allocation, whose length has not yet been finally determined, the CFDs will be distributed in a competitive auction based on price.

Regulations regarding CFDs are currently under close scrutiny by the European Commission, which is examining them in terms of compliance with the rules on public aid and the observance of the conditions of competition. Currently, the EC agrees to public aid only for RES. However, in the British model, CFDs are designated for all low-emission technologies, and ultimately their task will be to replace the existing regulations on support for renewable energy sources. Moreover, the British include nuclear technology in this category as well.

If the European Commission, after the procedure, decides that solutions based on CFDs in the energy sector are not prohibited public aid for the construction of new nuclear power plants in the UK, it will be possible to use similar solutions for the Polish nuclear program. However, recent information published by the European Commission in December 2013 calls the possibility of a positive decision in this regard into question.



Myth No. 3. Customers did not benefit from liberalization of the market

As early as 16 years ago, the largest industrial customers (>500 GWh of annual electricity consumption) on the Polish market obtained the right to change their electricity retail supplier. In 1998, this group consisted of slightly more than 10 customers, but year after year the opportunity to benefit from the TPA principle was offered to more and more groups of business customers, with a decreasing border volume of consumed energy required to be eligible to this right. Finally, on 1 July 2007, each of over 16 million of customers in the energy sector in Poland gained the right to change their retail supplier. But the year 2007 was marked by another breakthrough: this was the time when the tariff obligation for all energy customers except for households was abolished. From that moment on, in the segment of sale, the market has been opened. Still, because household tariffs have been maintained, the market has not been entirely deregulated. However, Poland is by no means an exception on the map of Europe in this respect: there are at least several markets that are liberalized and at the same time regulated with respect to the segment of individual customers. Has this inhibited first attempts at winning customers? Looking at the changes in market practices, the level of knowledge among business customers – after all, they are now those who dictate the rules of the game and force energy companies to learn customer-centric behaviour – as well as the opportunities of an individual customer today as compared with several years ago, it is hardly questionable that progress has been made in the segment of energy sales.

Is energy expensive in the eyes of the customer?

Leaving aside the fact that the Polish consumer, including an energy customer, has a low purchasing power in general (the purchasing power of Poles amounts to less than 50% of the European average figure), in the eyes of the customer his or her energy bill will usually be "too high", irrespective of its actual amount. This is due to the fact that energy is perceived by customers, especially by individual ones, as an "obvious" good which has always been and should always be available; at the same time it is seen as a good which is "featureless" and whose value is normally not realized. As long as the customer remains unaware as to what he or she receives and what it allows him or her to do, the customer will always be convinced that the price of electricity is overrated, and that the lion's share of his or her bill makes up the profit of the energy company.

In the eyes of the customer his or her energy bill will usually be "too high", irrespective of its actual amount.

Simultaneously, one needs to point out that the bill for electricity has a market nature, simply speaking, only with respect to the so-called "black energy" component. In fact, retail companies have no influence on the rate of electricity distribution fees, which are subject to tariffs, and the part of the bill concerning the obligation to purchase and redeem by trading companies the certificates of origin of renewable energy. And this is what lies behind the bill value perceived by customers.

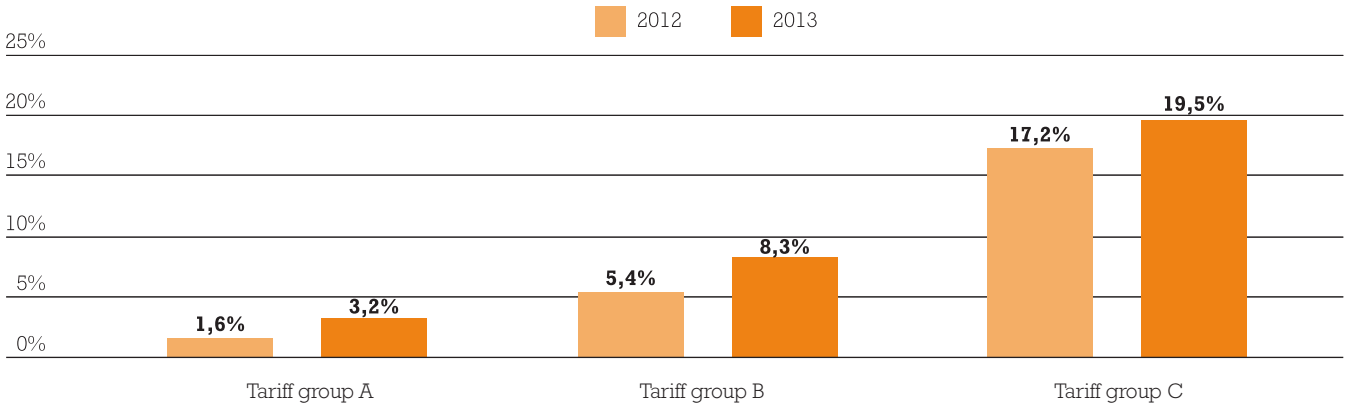
Traditionally, the sale of electricity to customers from tariff groups A (top, strategic clients) and B (big, key clients) was marked by a low, frequently close to zero, margin rate. Energy companies selling electricity to the largest customers actually make almost no profits on those transactions (at the level of unit margin).

It is the tariff group C (SME) which for years used to constitute a segment allowing for generation of a satisfactory margin of even up to a dozen percent. Yet, due to competition, growing groups of mass customers are now able to negotiate lower prices. This is mostly a consequence of the activity of smaller market players whose strategies are targeted at being competitive within particular customer segments, including the SME segment, traditionally marked by top margins

Another issue is the level of margins in the household segment (G tariff). Price regulation with respect to the G tariff led to maintaining low margins on sale; for years they were at the level between zero and merely a few percent. At the same time, due to the sustained low level of energy prices on the wholesale market, the household segment has become profitable. Although not as profitable as it might have potentially become: dropping wholesale prices are accompanied by "enforced" reductions in energy prices for the G group (the tariffs approved by the Polish Energy Regulatory Office, URE, in force since January 2014 have gone down by 6.2% to 6.5%, and this was already the second tariff reduction by several percent in 2013).

In all likelihood, future changes in the margin rate on energy sales to households, following market liberalization, will be correlated with the extent to which the major

Average percentage level of savings* in the price of electricity for business customers using the TPA rule in the years 2012 – 2013



*Percentage difference in the rate of the average price for electricity , excluding excise duty and the VAT, concerning the prices in complex agreements and the prices in separate (TPA) agreements (this applies solely to the fee for electricity, excluding the fee for distribution)

Source: Analysis by PwC based on the data from the Energy Market Agency (ARE S.A.)

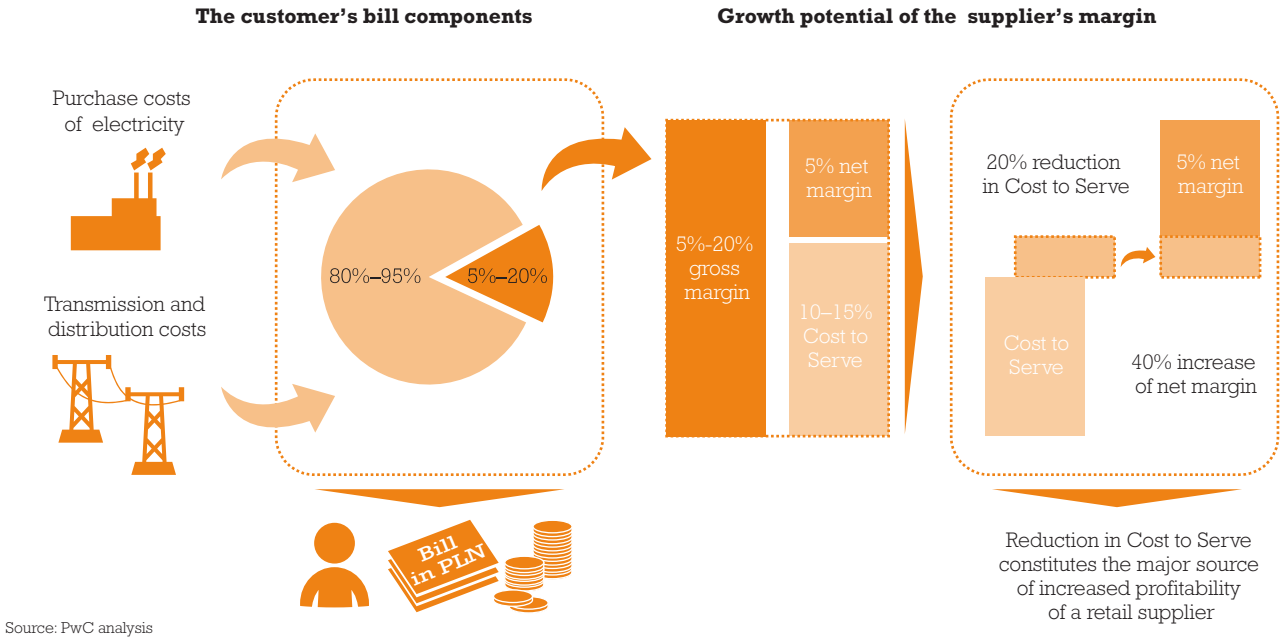
market players are able to prepare for fierce competition. If at the moment of price deregulation the market is ready to compete for the customer, the household margin should be initially subject to further growth – up to the level which legitimizes customer acquisition and retention costs (a classic case of "it needs to be more expensive so that it can become cheaper"). Thus, if a battle for the customer starts after market liberalization, the customer acquisition and service costs should initially go up – this owing to the necessity to increase initial investment for the purpose of customer service system extension or structure optimization of the Customer Service Centres. The next step will be, however, the struggle for better efficiency. Since the purchase costs of electricity on the wholesale market are independent of the electricity retail supplier, the key area where steps need to be taken is process optimization and creation of an efficient client service model (the relationship between optimization at the Cost to Serve level to net margin increase is 1 to 2). The analysis of the current market situation seems to suggest that the years 2014 and 2015 will be a perfect time to make investments: a favourable price structure at the wholesale market along with the level of approved household tariffs provides an opportunity for investments aimed at preparation of suppliers for activities which are to be undertaken in the next years. Under such circumstances, margins in the year 2016 and later may grow even without increasing electricity prices.

Are customers not interested in changing their electricity supplier?

As customers exercise their right, the number of TPA customers grows dynamically every year; at the end of 2013, this figure amounted to 92,600 for business customers and 135,600 for individual customers. Despite the increasing number of customers who change their energy seller, this figure is still considerably lower than on the majority of European energy markets. Poland is lagging far behind developed markets, where the average switching rate – demonstrating the ratio between the number of changes of the supplier in one year to the overall number of customers – varies from a few to about a dozen per cent per annum, whereas on the most developed markets, e.g. in the UK, it is over 20%. Yet, already now one may not ignore the dynamic growth of TPA customers in Poland. The base was very low, but the market is still maturing. It should be remembered that as recently as 5 years ago, business customers exercising the right to change the supplier accounted for less than 0.05% of all customers, whereas the respective figure for individual customers was about 0.007%.

Obviously, following the pattern observable in developed markets, one should expect that only the full deregulation

Diagram of the relationship between the optimization of the Cost to Serve* and the increase of electricity supplier profitability



Source: PwC analysis
* Cost to Serve – a unit cost of customer service.

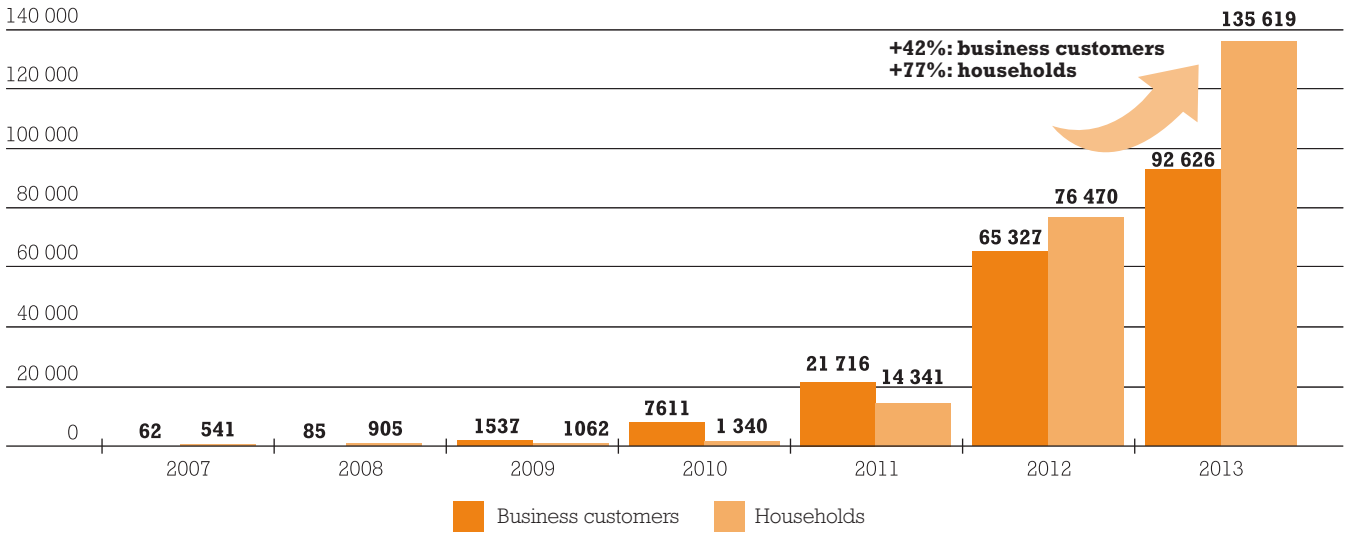
of prices in the household segment will lead to an intense growth of TPA customers; for instance, on the German market after full market deregulation in 2007, the switching rate for individual customers during merely one year reached a level similar to the cumulative figure for almost ten previous years, i.e. about 8%. On the other hand, the customer, efficiently searching for offers and changing the seller, is an educated customer who has access to offer comparison tools (such as online search engines and comparison websites – and those are already available on our market). Further development of the market in this regard is therefore largely dependent on customers' knowledge and awareness stimulated by campaigns run by energy companies, as well as by actions aimed at promoting the switching process – the latter activity is in the competence of the Energy Regulatory Office, URE. To take one example, in 2012, already for the second time, the URE prepared and conducted an educational and informational campaign whose main theme was changing the electricity supplier . The campaign included, among other things, TV spots broadcast in prime time during the European Football Championship 2012, which translated into an increased click-through-rate of URE tabs devoted to the switching process. The number of TPA customers in the group of individual customers went up by 80% in the same year. Such campaigns can indeed exert a practical influence on the knowledge of customers.

Analyses conducted by PwC concerning the experiences of customers on the Polish market demonstrate that individual customers, similarly to small enterprises, are characterized – and hence blocked – by poor abilities to evaluate and compare offers, as well as by low awareness of the market and competitors. In the case of large industrial customers and bigger business this problem is not observed

The aforementioned groups have immense awareness not only of the market and offers, but also of their own value. Those customers manifest particular activity as regards searching for savings, having been educated by the energy sector: they expect the lowest price and a flexible approach to their needs.

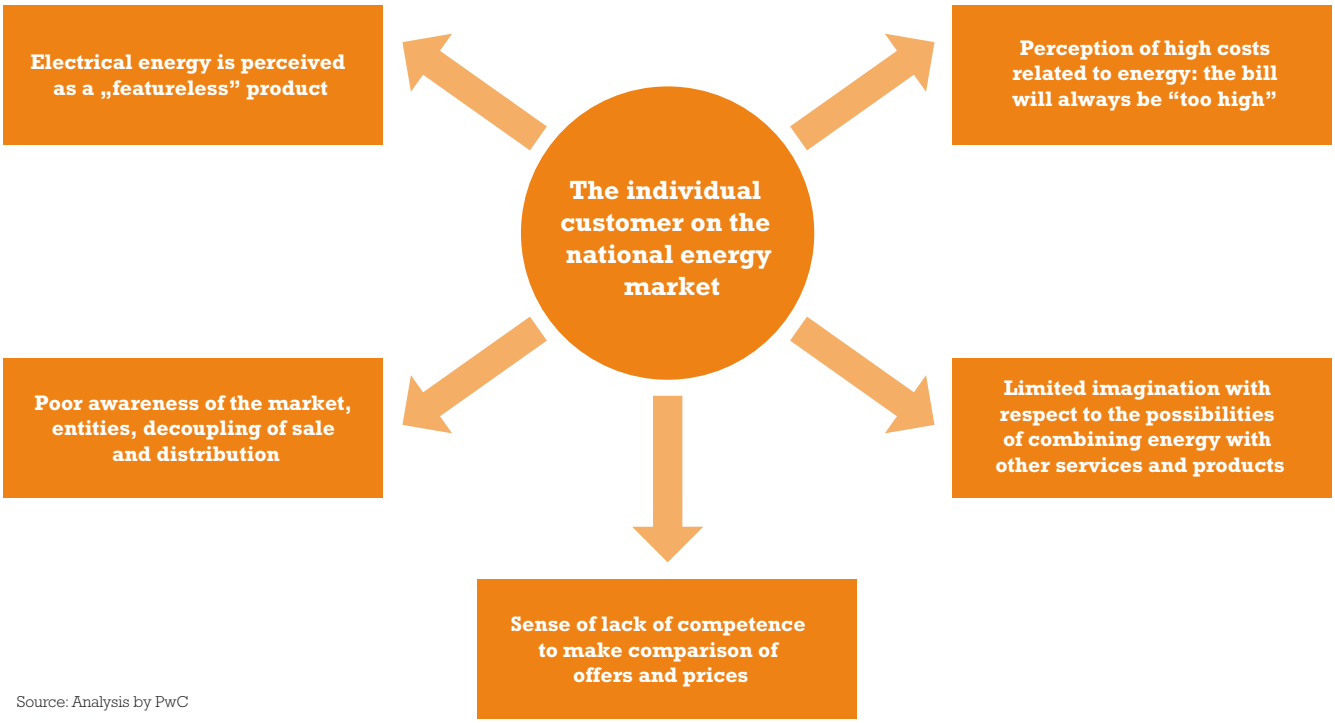
Although in the next 2-3 years the number of TPA customers will grow to several hundred thousand, one should assume that it will be numerous enough to impact the behaviour of suppliers. For instance, a mass reaction of 100 thousand customers to one promotional campaign will suffice to force other suppliers to take action. Thus, year after year, the growth in the number of customers who have become sufficiently mature to change their supplier will lead to the intensification of competitive activities.

Cumulative number of TPA customers in the years 2007-2013



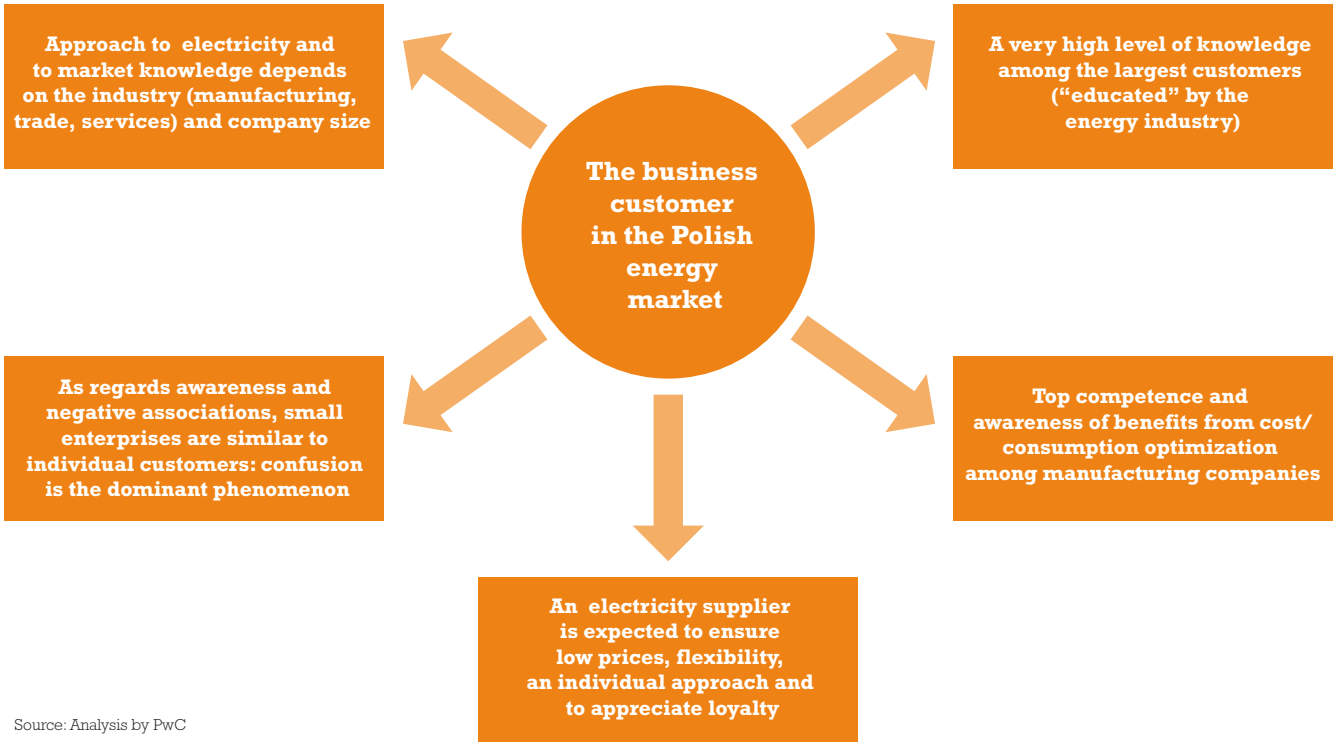
Source: Polish Energy Regulatory Office (URE)

Conclusions from the PwC's analysis concerning experiences of individual customers on the Polish energy market



Source: Analysis by PwC

Conclusions from the analysis by PwC concerning experiences of business customers on the Polish energy market



Source: Analysis by PwC

Is it too early to develop a product and service offer and look for new revenue streams now, when the industry is struggling with fundamental deficiencies?

At the current stage of market development, it is of key importance for all the traditional energy suppliers to safeguard the creation of stable foundations, including information on the customer and the ensuring of an acceptable level of customer service (as compared with other industries, such as banking or telecommunications). Market challenges faced by the majority of energy companies are similar; this means that competitive advantage will be created especially by the rapid pace of implementing improvements. They include mostly harmonizing and bringing order into the billing systems as well as raising the quality of customer services; to this end a change in the organizational culture, standardization and optimization of sale and service processes, and, ultimately, CRM implementation, are necessary.

Consequently, the short- and medium-term goals for electricity suppliers are about creating a more efficient and effective sales and service role enabling them to optimize costs (especially the Cost to Serve figure) and ensuring a competitively-priced offer, at the same time improving the customer's experience.

Those circumstances may evoke the impression that it is considerably too early now to create comprehensive bundled product and service offers (energy and gas, telecommunications services or the internet). After all, in an extreme case, electricity can be seen as a public good or at least as a good of indistinguishable nature. This is why the strategy of acquiring competitive advantage by offering the cheapest electrical energy and an acceptable/good customer service may seem to be appealing:

it allows one to concentrate efforts on key matters and at the same time does not force one out of the comfort zone of what has been traditionally accepted in the energy industry. And yet profits from such an "economical" approach are only apparent. In particular, if one bears in mind the fact that the competition in delivering energy offers stems not only from energy companies, but also, for example, from the telecom sector, once all the key players have created the aforementioned foundations, what will be the market differentiator which will allow one to be on the winning side? Now is the right time to start looking at indispensable steps in a broader perspective and prepare for the future. Cheap and good customer service? Yes, but one should also seek and test sources of additional revenue streams. To be specific, in the long run, we should expect that the improved experience of the customer, resulting from measures taken in the area of the foundations, may translate into increased loyalty and the readiness of the customer to recommend their supplier to others. Undertaken activities can bring about a change in the areas of customer's concentration: from solely price-related aspects – although for the majority of customers, they will remain at the first place – to building the value of the brand and searching for an additional margin by launching a widespread offer of products and bundling of services.

Competitive advantage in the long run will mainly be achieved by the most swiftly acting companies, eager and able to absorb best practices and innovative market solutions; not sitting back, but developing and testing advanced products and services right now. The products and services which the customer may purchase today on the energy market, year after year keep gaining many properties typical of a product offer from developed markets. The business customer may benefit from an offer which is not a far cry from the international offer. Not only are offers of bundled sales of gas and electricity already available on the market, but also offers which bundle electricity with the internet, cable TV, assistance, mobile telephony, or even a subscription to a private chain of health care centres. For the individual customer, price guarantees and tariffs including different rates for particular times of the day have become commonplace. In the years to come, one should expect the development of home assistance services or the greater popularity of offers based on loyalty programs, similarly as in developed markets.

Once all the key players have created the foundations, what will become the differentiator on the market which will allow one to be on the winning side? Cheap and good customer service – yes. But one should also seek and test sources of additional revenue streams. Improved customer experience as a result of measures taken in the area of foundations may translate into increased loyalty and eagerness to make recommendations.

Obviously, in the case of a large group of individual customers, future measures taken by the sellers will be equally focused on ensuring a competitively-priced offer and a good level of customer service, at least meeting the so-called hygienic requirements; for those customers, energy is not an exclusive product with a multitude of versions, but rather a cheap and mass commodity/good. But for the higher-value customers, for whom elimination of the negative association of the energy seller with a public institution and offers of tariff allocation are surely not a reason sufficient to feel satisfied, one should prepare an offer of high-margin products with a broad range of additional services and top-notch customer service. Appropriate segmentation is the key to success: it makes it possible to adjust the offer and the service to the expectations of particular customer groups..

Ranking of criteria encouraging individual customers to change the supplier.

1.	**Low unit price**
2.	**Better quality of service**
3.	**Reliability of supplies**
4.	**Additional services/products/preferences**
5.	**Loyalty programs**
6.	**Supplier's respected brand**

Source: Analysis by PwC based on the data from TNS OBOP

Yet the battle for the customer is not taking place only among traditional energy suppliers, but also among telecommunications enterprises, having an indisputable advantage in the form of access to the billing systems and customer base, or potentially also cable networks and internet providers. And so market conditions force traditio-

nal energy sellers to adapt, for the benefit of the customer, solutions based on best practices from the telecom or banking sectors, including very good sale and communication skills among the staff, building relations and positive associations with the brand, efficient and functional physical contact points, but also web tools.

It is true that on the level of tactics, in the battle for the customer, and the level of service standards, the energy sector is still in its infancy as compared with telecommunications or banking. Indeed, if the reference points are standards from other industries, it is quite undeniable that relations between the company and, say, the banking customer are about developing operational excellence, whereas with the energy customer it is frequently about fixing the basics. However, it is a myth that the Polish customer has not benefited from market liberalization and that it is a rule that instead of asking for a product in an attractive wrapping, he or she ''goes to a public institution asking for tariff allocation''. The industry is faced with the challenge to create a fast, cheap and good customer service, and at the same time to expand its product concepts. But this is already happening right before our eyes.


MAIN GEN & POWER

Myth No. 4. Smart power industry starts with meters

In the years 2014-2015 the number of so-called smart meters installed by the DSOs active in Poland is going to exceed one million. Reaching this threshold means that the smart energy sector in Poland is no longer an idea, but has a reflection in reality. On the other hand, one million smart meters account for market penetration of about 7%, which implies that in order to achieve the planned penetration of 80% in 2020, implementation processes should be considerably accelerated in the period 2016-2020.

Monitoring of the international environment indicates that the future of the smart energy sector will not be defined on the basis of observing progress in meter installation, but it will rather be a result of a change in the philosophy underpinning the goals and implementation methods of smart metering

A discussion on the smart customer would normally start with quoting Directive 2009/72/EC which stipulates that the EU Member States, with some exceptions[6] , are obliged to implement smart metering for 80% of mass customers by 2020. The basic assumption was recognition of the need to install a smart meter as the first step to trigger smart reactions from the mass customer. The next step was about creation of smart grids and homes in order to achieve profits to offset initial investment costs.

The year 2013 was marked by major turns in the discussion owing to a German cost and benefit analysis: realistic evaluation of the economic potential of smart meters ceased to be identified with the fossilized thinking of state monopolies. The German analysis demonstrated that it is viable to install smart meters for customers who consume over 6 MWh a year and for ''prosumers''. Even bearing in mind the specific nature of the German market, where a huge cost component is the multi utility controller – MUC – aimed at ensuring communication between different utility metering devices, and the fact that the target 80% of smart meters will have been finally achieved in 2026 or 2027, the results of the analysis were interpreted as a declaration of a realistic approach to evaluation of smart metering implementation. This message was reinforced by another fact: in the same period Austrian consumers were given the opportunity to decline consent for smart meter installation on the grounds of personal data protection. And in the UK, one of the trailblazers in the creation of the smart market structure, the commencement of a full roll-out was postponed by one year.

Undoubtedly, installation of smart meters along with a two--way communication functionality may bring extensively promoted benefits connected to the reaction of customers, including raised energy awareness and the ability to manage the reaction of the demand side; the emerging sceptical voices do not mean that the roll-out of smart projects will be suspended.

Still, in the face of two argumentation groups, it needs to be re-thought if the smart energy sector should start with the generally mandatory goal of the installation of meters at 80% of end recipients:

1) In two EU states, Italy and Sweden, a full roll-out of smart meters has been completed. One might expect therefore that they have become leaders in innovative tariffs/products and inclusion of customers in an active participation in the smart energy system. However, according to the conclusions from a report[7] published by the CEER (the Council of European Energy Regulators), there is no simple correlation between the advancement level of smart metering implementation and the advancement level of products and intensity of communication with the customer.

2) Economic calculation indicates that from the point of view of benefits for the customer, installation of a smart meter is viable only when his or her consumption is higher than the current average figure for households – in Germany this cut-off point has been determined as 6 MWh. Of course this level/calculation will change together with the predicted drop in costs for devices and technologies and with the decreasing differences between the price for a 'traditional' and a smart meter. Looking at the meters offered in tenders in Poland, one may observe that the cost of a meter went down by over 20% in the period of 3 to 4 years. However, if one was to wait for the moment when prices have fallen enough to justify mass installation motivated by benefits for customer, the next 3 or 4 years would be a stagnation period in this regard.

[6] A cost and benefit analysis conducted in four EU states showed that implementation based on the scenario proposed in the Directive would not be economically viable

[7] Status review of regulatory aspects of smart metering including assessment of roll-out. CEER, September 2013

Customers' reactions constitute only part of the benefits from the creation of a smart metering infrastructure; according to business analyses, there are more material groups of benefits for operators of the distribution system or the whole economy – they could provide justification for smart metering projects. But if the profits are to emerge at the operators' side, it is advisable to change the logic of perceiving investments into smart energy: from the point of view of the customer's meter to the point of view of the grid

This approach should include additional (or even basic) parameters to measure roll-out efficiency: ratios showing the reliability of electricity supplies – SAIDI or SAIFI, instead of added percentage points of advancement in smart meter installation. Obviously, the installation of meters and communication systems enhances the capacities to automatize the grid, but so far the opportunities to implement advanced grid management functions, such as the function of automatic short-circuit detection, isolation of a damaged section and restoration of power supply (FDIR - Fault Detection, Isolation, Restoration), have not been presented as a priority of smart metering projects.

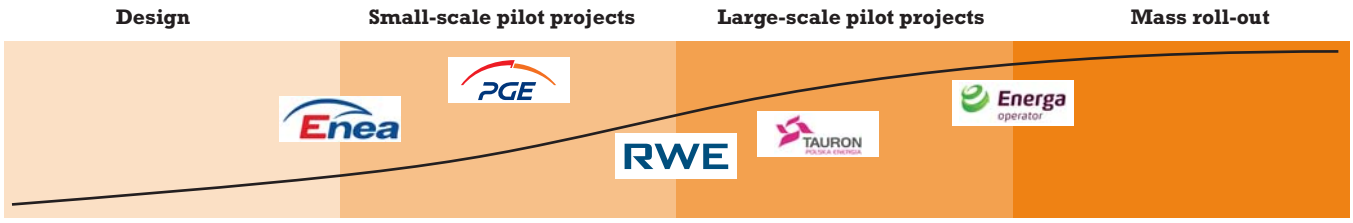
Changing the logic could also provide an answer to the question of how many meters should be installed and in what period. In most of the EU states where roll-out is being conducted, except for the UK, meter acquisition and installation costs are borne by the distribution system operators. Those companies should observe the following business logic: as long as the number and scope of functionalities of meters, and of the communication system, impact the capacities to automate the grid operation, implementation may be financed as part of regular distribution activity. Additional costs, for instance for installation of meters for customers whose volume of distributed energy is lower than 1 MWh annually, will always be a subject of discussion whose aim will be to gain additional funding in various forms. This leads directly to end consumers paying additional costs included in the tariffs. Those fees are not high per one customer, for instance according to the analyses by the Ministry of Economy, in the case of Poland, they will amount to several zlotys a year per one recipient, however, in the times when customers, in all probability, are to finance a number of new market stabilization mechanisms (e.g. the capacity market), every additional cost component raises controversy.

The current debate taking place at the international level is reflected in Poland as well: despite the formally binding goal of smart meter installation for 80% of customers by 2020, the status of implementation at particular DSOs shows considerable discrepancies:

At two opposite poles one can see Energa Operator, who announced a full roll-out of meters for end customers, and Enea, which – so far mainly with respect to the design – represents the ''the grid comes first'' view. Which path will be taken by the operators who are nowadays located in-between? Similarly to other energy segments, a vital role will be played by the support policy of smart meters pursued by the Energy Regulatory Office, URE. The current system of ''additional'' compensation for investments in AMI, in the eyes of investors and analysts, is seen as appealing and was an important element in the assessment of GK Energa's attractiveness when it was going public.

If the current system of AMI compensation is preserved, most of the distribution companies will be likely to build the smart grid starting with meters. But supposing that the impact of meter installation in the SAIDI and SAIFI indices is key, it might happen that for those DSOs who as of today are not advanced in their roll-out, the optimum timeframes for achieving the figure of 80% of customers will go beyond 2020

State of advancement of smart metering pilot projects in Poland



Irrespective of whether the smart energy sector begins in Poland with meters or with the grid, which in all probability will become an international trend, a change must unfold, in particular, in the awareness of customers. In the studies run as part of the "Smart Grid – for home, the environment and the economy" („ISE – dla domu, Đrodowiska i gospodarki") project an analysis was made as to what extent the notions of smart meter or remote meter reading are known; it turned out that 82% of respondents were not familiar with the concept of a the smart meter.

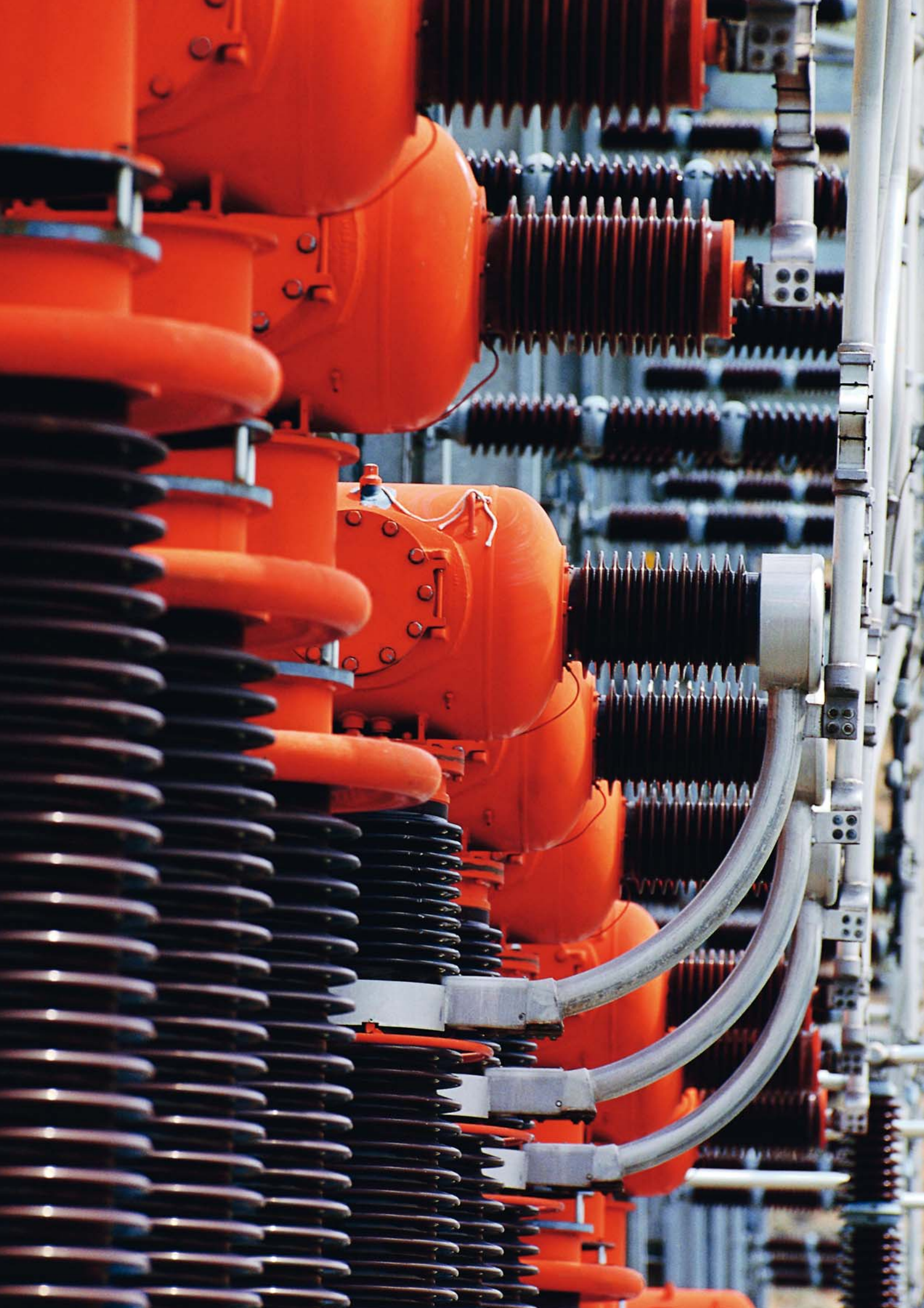
> 82% of respondents are not familiar with the concept of the smart meter

Should this situation remain unchanged, it will be difficult to achieve roll-out results adequate to justify the investment outlays on the level of PLN 6-8 billion by 2020; this figure corresponds to estimated expenses for smart metering installation.

An awareness campaign in Poland will be run in less favourable circumstances than e.g. in the UK, where sellers or independent entities are owners of meters and smart meter installation means for them gaining new opportunities to sell products/services. A Central Delivery Body, appointed to provide communication with customers, manages this activity centrally in a manner reminiscent of the integrated marketing campaigns of service companies. In Poland, PTPIREE, the Polish Association for the Transmission and Distribution of Electrical Energy, has assumed the role of an advocate for raising awareness among customers; yet its activities will need to be complemented by actions on the part of respective DSOs who under the current market model have no extensive customer-oriented function.

In the face of the above, the smart energy sector is most of all about smart distribution grids which, over time, will have to be complemented by smart meters installed with well-informed customers.

(2) A study by GfK Polonia presented as part of the "Smart grid – for home, for the environment and for the economy" („ISE - dla domu, Đrodowiska i gospodarki") project conducted on a sample of 963 respondents.



Myth No. 5. The goal of regulations should be stability and not competitiveness

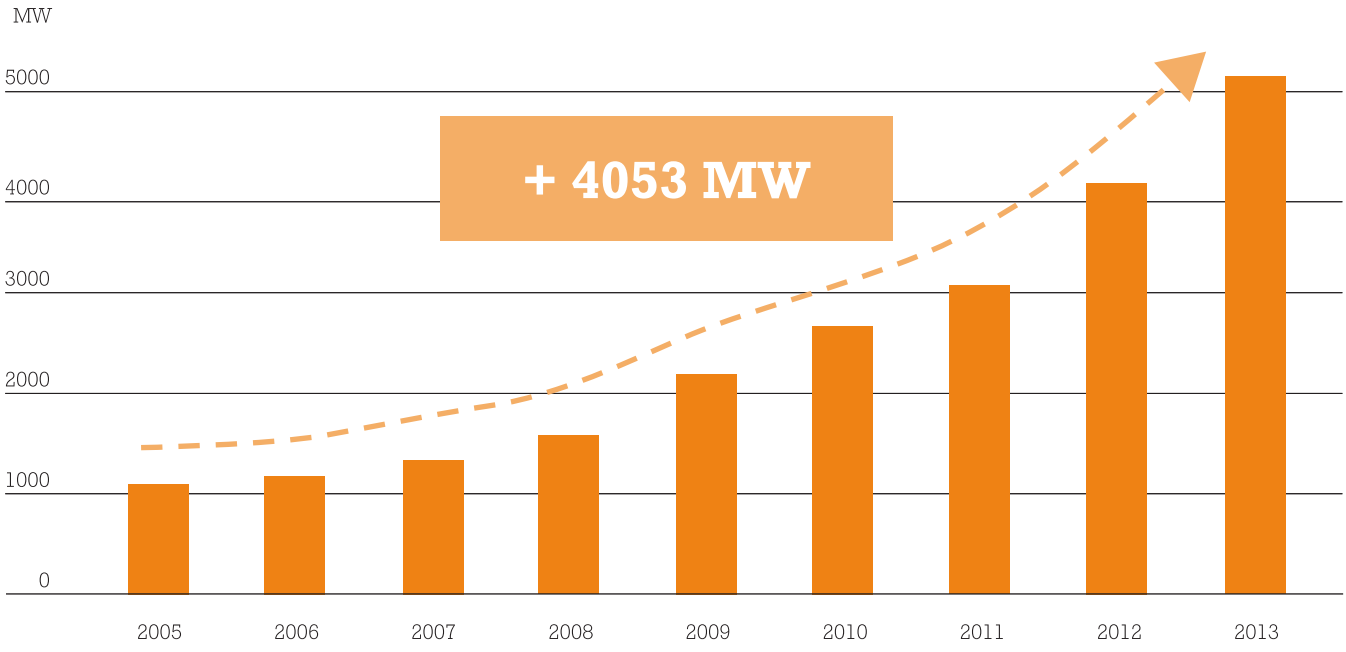
One of the most vividly developing sectors in the energy industry in the recent years has been the renewable energy sector. Since the beginning of 2005, it has been dynamically flourishing, achieving at the end of 2013, over 5 GW of installed capacity in renewable energy sources[8].

The driving force behind the development of RES in Poland is green certificates, i.e. certificates of origin of electrical energy; the entities selling electrical energy to end customers are obliged to submit them for redemption or, alternatively, pay a replacement fee. In fact this is a quasi-market system since the principles of its operation are subject to regulation: the demand for certificates is controlled by indicating the obligatory number of redeemable property rights, whereby the maximum price per certificate is established based on the rate of the replacement fee.

Green certificates: attracting investors

The main reason why certificates encouraged investors to build the renewable energy sector in Poland was the opportunity to generate profits exceeding the rate of return required by the investor to initiate investment; this possibility was a sort of incentive for foreign investors to make them enter a new, unknown market – a market in which their confidence may have been limited. This possibility existed within the system of green energy certificates because investors, irrespective of the quality parameters of a project, would generate similar profits per one unit of generated energy. Consequently, initiatives of low efficiency parameters could count on a considerably low rate of return on investments, while very efficient projects generated high rates of return.

Growth of installed capacity of renewable energy sources in Poland



Source: Analysis by PwC based on data from ARE

[8] Due to the specific nature of biomass co-firing, the capacity in conventional units were biomass is co-fired with coal is not included in the amount of RES capacity.

The colours system allowed for attracting a large number of foreign investors to the country and resulted in better understanding of how the RES business operates. Having gained more knowledge on the market, of the specific nature of carrying out investments, and their costs and technological progress, it is now feasible to optimize the support systems, which is the current subject of legislative works

Differences between the present system and the future one

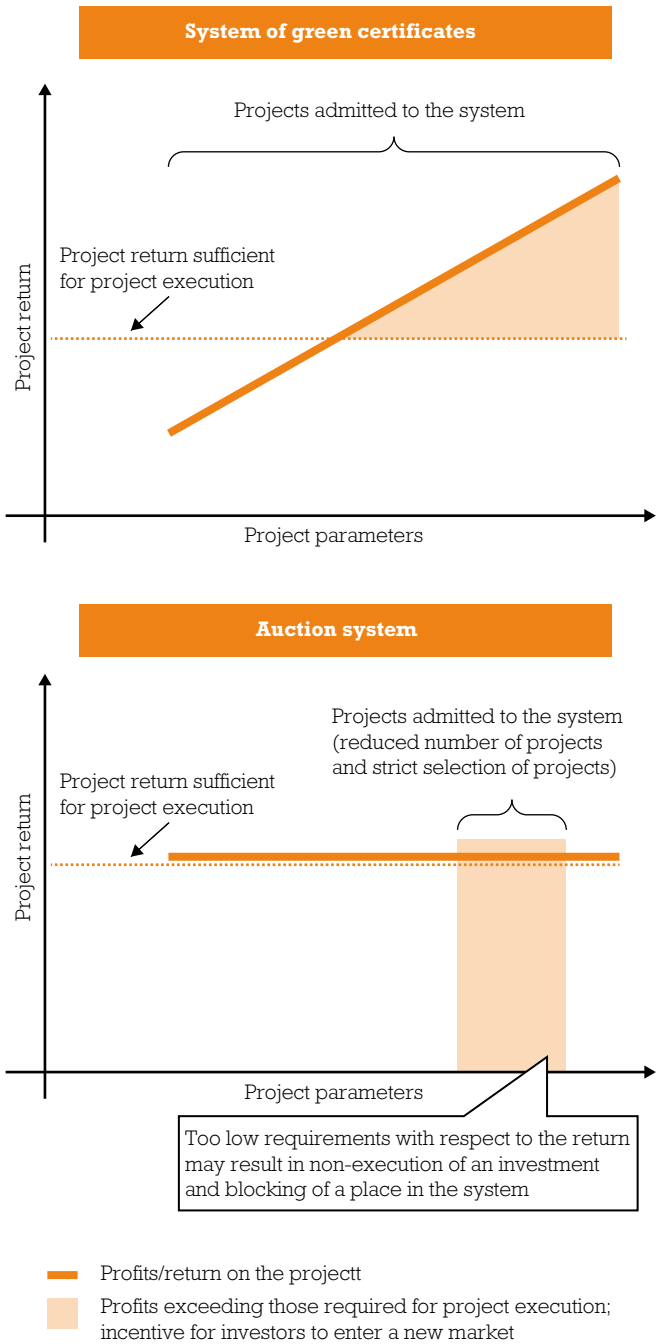
System of green certificates

The essential idea underlying the support system in the form of green certificates is to admit to the system projects regardless of their parameters (such as CAPEX for installation, performance, obtained contracts for energy off-take and certificates etc.). This means that each RES unit may participate in the system, and at the same time competition among them is significantly reduced.

Auction system

The auction system is a complete departure from the system of certificates. Owing to the necessity to bid for sale of electrical energy and compete for a place in the support system, investors are forced to offer prices sufficient for the execution of a project. Potentially excessively high bids, allowing for the generation of extraordinary profits from investment will result in declined entry to the support system. For this reason, requirements with respect to return are limited and the price differs for each investor.

Scheme of differences between the operation of the system of green certificates and the auction system



System pitfalls

Under the new support system, participants in an auction are investments at the design stage. After an auction is finished, the investor may almost fully predict the revenue base of an undertaking. Investors who have won an auction will start closing the financing process and building a RES installation. Thus, the cost base may deviate for key parameters of an investment.

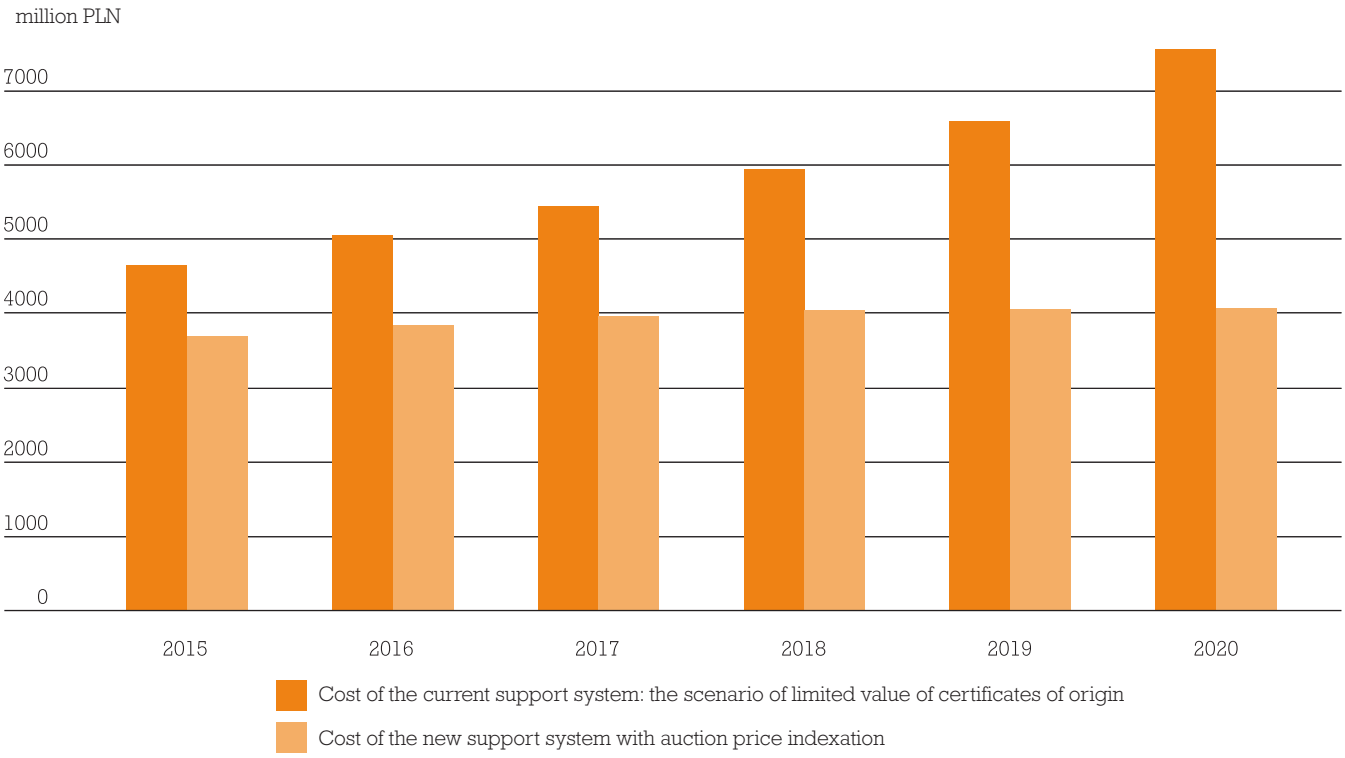
The auction system entails material risk for the development of the RES system. Its basic deficiency is the threat of unreasonable or too low requirements with respect to the return on the project and the required price for energy: if financial conditions or investment costs change, a negligible rate of return may not suffice to cover increasing investment implementation costs. Then, projects which have won an auction will not be implemented on the grounds of lack of profitability, whereas the place in the system, intended for new RES capacities, will remain unused. For the proper operation of the system, reasonableness is required with respect to the behavior of investors and to their bids

The difficulty in submitting realistic bids is aggravated by the low expected frequency of auctions. The RES Act does not provide for the number of auctions per year, but in all likelihood they will be held once a year. Such a low frequency will mean for investors that losing an auction is another year when they cannot continue investment in new capacities. Organizing more auctions will be only possible when the Energy Regulatory Office is equipped with tools adequate to support the process of auction organization. Selection and pre-qualification to an auction will be a time-consuming, work-intensive, and complex task so, if the Energy Regulatory Office is not provided with appropriate tools, i.e. financial resources for administration of the new support system and other solutions to support its activity, the new support system may prove defective in practice.

The savings expected by the Ministry of Economy as regards system operation are achievable, but if auctions are not appropriately organized and the Energy Regulatory Office is not equipped with appropriate tools, the sector growth may be blocked

The system of green certificates is a stable tool allowing for stimulation of the growth of new capacities in the system. However, stability is not the only criterion which should be used to assess regulations. Competitiveness fuelled by the auction system and the simultaneous stability of the system may also make it possible to achieve similar goals, but at considerably lower costs. The specific nature of the auction system forces investors to prepare best possible RES projects and to offer energy at the lowest possible prices. Proper regulation requires stability from the angle of investors, but also the stimulation of competition so as to optimize the costs. For the system to work, it is a prerequisite that auctions are smoothly run by the Energy Regulatory Office, and that they are held more frequently than once a year. Low frequency of auctions may negatively affect the behaviour of investors, making them submit underrated bids and, consequently, end up unable to carry out investment projects

The increase in the installed capacity of renewable energy sources in Poland



Source: Analysis by PwC based on the Assessment of the Effects of the RES Act of 28.03.2014.

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