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Seven temptations of the Polish power sector in 2016

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Dear Reader,

We are pleased to present you with this report authored by experts from PwC's Energy Group. This year we concentrated on seven issues – seven "temptations" that present a challenge not only for energy companies, but also for the state, in its role of shaping the future conditions for the sector's operation.

The year 2016 is one of seeking balance between the goals of investors and those of the state in ensuring generation capacity in Poland over the long term. Today we must face the challenge of creating conditions that ensure the profitability of investments in new power plants. This is also the time when we must decide on the future both of domestic cogeneration and of renewable sources.

In conditions of intensified competition and growing consumer awareness, each company is looking for a source of competitive advantage. Innovations are definitely the right direction – but does every company today have the real ability to absorb innovation? And, in turn, can competitive advantage be built by offering customers as many products as possible? Or perhaps digitisation will ensure victory on the market in the future?

The search for new solutions to ensure competitive advantage is a natural action for rational businesses – it allows them to win over the long term. But faster effects are generated by freeing up the potential inside the organisation – especially the potential that absorbs the benefits of full operational integration.

Happy reading!

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Temptation 1
Withdrawal from the conventional energy market

What is the temptation to withdraw from the conventional energy market about?

Falling wholesale electricity prices and limitations on the working time of generation units are significantly reducing the financial results of the generation sector on the Polish market. For some units, it is increasingly difficult to maintain profitability at a level which allows continuing operations in the mid and long term, and financing of capital expenditure.

Where does the temptation come from?

For investors, unprofitable production units are assets that qualify for divestment once their restructuring potential has been used. If they are necessary to maintain energy security but market mechanisms make them unprofitable, the restoration of the market balance depends on regulation.

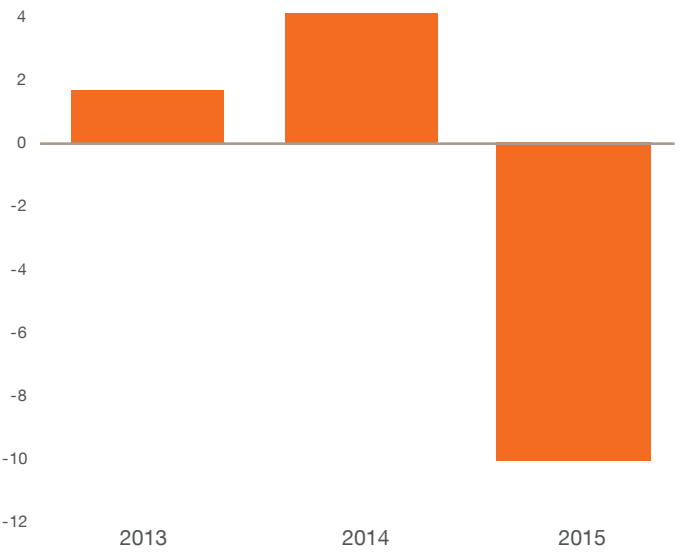
Should we give in to the temptation?

If there is an imbalance on the market, proper regulations are the only factor allowing companies to resist the temptation to withdraw from the generation market. The structure of the regulations makes it possible to maintain return on assets, ensure energy security, and select the optimal energy mix for the economy and cost of the system.

Temptation stronger than ever

The profitability of the Polish conventional generation sector has dropped significantly, which is mainly attributable to continuously low wholesale electricity prices and increasing production by unconventional sources. Largely as a result of impairment write-downs, the current EBIT in the generation sector (for the four largest energy groups: PGE, Enea, Tauron, Energa) has dropped below PLN 10 billion. Electricity produced from lignite is declining in importance, which can be illustrated by the Bełchatów and Turów power plants, whose impaired asset write-downs amount to around PLN 8.2 billion. Hence, for some players on the market, the temptation to leave this segment is great.

EBIT of the generation segments of the four 4 largest Polish energy groups [m PLN]



Source: PwC analysis based on companies' financial statements

"Merit order" – the division according to which the market operates

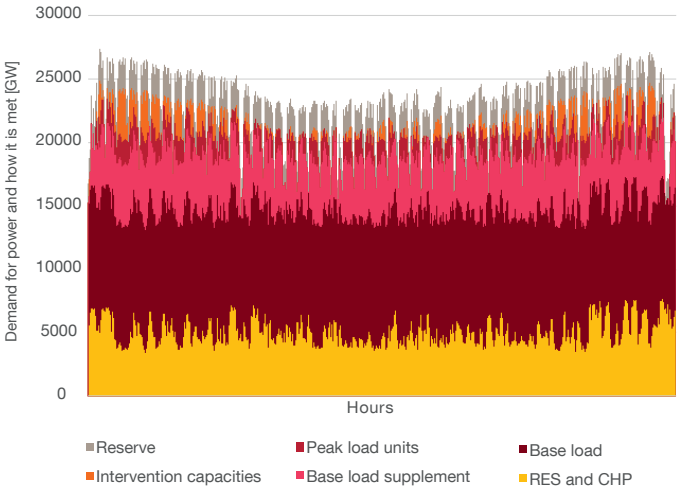
"Merit order"-also known as "the stack"-is a method of ranking generation units with regard to their variable costs. The position of a unit in the ranking depends on its variable costs, and each system has its own merit order. Its structure depends on the level and characteristics of demand for electricity, as well as on the number and type of generation units in the system.

A unit's entry into the system depends on its position in the stack, and on demand. The higher the demand, the more expensive the units that enter the system and set the price. Consequently, cheaper units not only gain higher margins, but also work for more hours in a given year. The structure of the merit order varies depending on changes in the energy mix, which affects wholesale electricity prices and increases the variability of working hours of conventional units.

Because of the limited number of hours of work, the units working during peak hours are at the highest risk of a decline in profitability. However, they have to work in the system in order to balance the energy grid. This causes a conflict between the business objectives of investors, the provision of grid operation continuity by the Transmission System Operator, and maintaining the costs of the system at a rational level from the perspective of the state. In consequence, what becomes of key importance in the energy system is finding a balance between the objectives of the state, the Transmission System Operator, and investors. Reconciliation of their common interests often depends on regulations, such as the Capacity Market or the Operational Capacity Reserve. The application of these regulations in generation units depends on the type of the unit and its position in the merit order.

Maintaining balance in the energy system requires stable operation of the generation units without which it would be difficult to provide grid security. Additionally, each of the above categories, excluding units from outside the merit order, is necessary to maintain energy security. However, from the perspective of an investor, they should also have a certain level of profitability.

An example of a division of the „stack" in the Polish Power System (KSE) in 2015



Source: PwC analysis based on the data of PSE (Polish Transmission System Operator)

An example of a division of the "stack" in the Polish Power System (KSE) in 2015

Categories of Stack division[1]:

	Category	Description	Estimated working time [2] [hours]	Power [3] [GW]
1	RES and CHP	CHP plants and RES units	< 4000	3.4 – 7.7
2	Base load	the cheapest conventional units providing the base load in the grid	8760 - 8000	7.6 – 17.3
3	Base load supplement	units with low variable costs pushed out of the "base load"	8000 - 4000	17.3 – 22.2
4	Peak load units	units meeting peak demand that have difficulties covering their fixed costs due to limited working time	4000 - 2000	22.2 – 23.7
5	Intervention capacities	unit with practically no possibility to cover their operating costs	< 2000	23.7 – 24.9
6	Reserve capacities	TSO units necessary to maintain the security of the grid	< 2000	+ 10% Polish grid demand
7	Units outside the "merit order"	units do not meet the needs of neither investors nor the system, therefore it is necessary to withdraw them from operation	-	-

Source: PwC analysis based on PSE data

What makes financial results decline?

The difficulties faced by the generation sector result from the on-going market battle based on merit order. A decrease in hours of work, and increased pressure on the margin, resulting from declining wholesale prices, lead to a situation where the peak load units are most affected by the worsening economics.

While electricity price fluctuations are compensated for by changing hard coal prices, the reduced time of work of generation units on the market is not subject to any additional factors that would allow the generation margin to be kept at a constant level.

The average decrease in revenues from electricity sales in 2013-2015 amounted to:

- 18% for units providing the base load,
- 13% for units supplementing the base load production,
- 25% for peak load units (excluding the Operational Capacity Reserve).

Within a period as short as two years, peak load units, or the units closing the demand in the system reduced sales revenue on the wholesale market by percentages ranging from 13% to 25%. The probability that this trend will continue leads to a deterioration of their market situation and tempts investors to begin considering withdrawal from the market.

Revenues of generation units in 2013 and 2015

		2013	2015
Unit providing the base load	Hours of work [h]	8 366	8 000
	Price [BASE_Y]	197.76	168.60
	Revenue [PLN/MW/year]	1 654 488	1 348 789
	Revenue delta 2013 vs 2015	**-18%**	
Unit supplementing the base load production	Hours of work [h]	5 462	5 000
	Price [PEAK7_Y]	181.55	171.72
	Revenue [PLN/MW/year]	991 626	858 600
	Revenue delta 2013 vs 2015	**-13%**	
Peak load unit	Hours of work [h]	2 557	2 000
	Price [PEAK5_Y]	226.75	216.43
	Revenue [PLN/MW/year]	579 800	432 864
	Revenue delta 2013 vs 2015	**-25%**	

Intervention and reserve capacities not included due to the nature of the remuneration of units based on regulations or the balancing market

Source: PwC analysis based on PSE data

1. Smaller and bigger number of subdivisions is possible; the most basic market practice divides the market into three categories: must run units (units that access the grid as the first ones), base load units (units covering the base load demand), peak load units (units covering demand during peak hours), which, however, does not illustrate the various ways the units present on the market work
2. Without taking into account grid limitations
3. The work of a given unit depends on the time of year, daily demand for power, and a number of other factors

Lack of regulations vs the temptation to close units

The temptation to withdraw units from the generation market may be enhanced by a situation in which the current regulations, such as the Operational Capacity Reserve, Cold Reserve or the Capacity Market, no longer make it possible to increase incentives for investors involved in generation on the conventional energy market.

The need to maintain an appropriate energy balance and the falling profitability of peak load units are the reasons why regulations have become the key factor in maintaining the system's security.

The current solutions, such as the Operational Capacity Reserve, provide additional compensation for the units that are necessary to maintain the energy balance in peak hours or emergency situations, and thus the temptation to divest from such assets decreases. The current regulations solve only the profitability problem of the units that work during peak hours, but they provide no remedy for the issue of creating new generation capacity.

Today, proper functioning of the generation market is a challenge for most European Union countries. In looking for solutions, regulators are moving to launch capacity markets. The country where such solutions are at the most advanced level of implementation is the UK, where two rounds of auctions securing the availability of generation capacity until 2020 have been completed.

How does the UK resist the temptation of divestment?

Historically speaking, the development of generation capacity on the UK market was accompanied by minor regulations. However, in the current market situation, where:

- around 20% of conventional units will be forced to shut down,
- a further increase in electricity consumption is expected,
- decarbonisation of the energy sector will continue, launching inflexible capacities – nuclear and wind power plants,

In the situation above it is necessary to ensure a sufficient quantity of generation capacity with the appropriate flexibility.

The non-regulated generation market no longer makes it possible to deliver sufficient profitability. According to the DECC (Department of Energy and Climate Change), the reason for this is an insufficient increase in the prices of system balancing, which do not cover the actual costs of continuous grid operation. Moreover, the DECC says that because of a fear that the regulator may impose an upper price limit, investors are limiting the electricity prices offered in peak hours and in situations close to energy shortages.

Thus, the UK regulator decided to help create a national two-product market: a classic electricity market and a capacity market, where power would be sold at auctions with a five-year horizon. The effectiveness of the capacity market solution, including its costs, will be verified in the coming years.

A capacity market is not the only method to solve the problem of the generation market. Nonetheless, it is this solution that most European countries perceive as the way to maintain a balance between investors' interests and the need for energy security, as well as a country's other needs.

Proper regulations may reconcile the objectives of the main market participants

Solving the problem of a lack of balance and flexibility in the energy system is a complex issue, as a balance between the three main objectives of the energy sector must be achieved:

- building return on assets, i.e. maintaining a sufficient return on investment and profitability of operations,
- maintaining energy security, i.e. maintaining a sufficient energy balance in the system,
- maintaining a competitive economy, i.e. selecting an energy mix that is optimal for the economy.

In some situations, proper regulations are the only means to stop divestments and keep investors active on the generation market, without needing to withdraw from it.

Temptation 2
The same support for all cogeneration units

What is the temptation to provide the same support for all cogeneration units about?

This temptation is connected to the architecture and the beneficiaries of the future cogeneration support system. So far, all cogeneration units have received support from a mechanism based on certificates of origin of electricity (certificates of origin); however, this system ends in 2018. Work on the structure of a new solution is now under way. The regulator and the legislature may be inclined to extend the current regulations and to maintain the rules for supporting all cogeneration units. Such an approach, however, may negatively affect the cost of the support scheme and result in an increased energy price for end consumers.

Where does the temptation come from?

The system providing support for all cogeneration units has been operating for several years, and has become a „market practice". Hence, the state may try to maintain the status quo. For generation sources, the system means a stable source of additional income, which does not entail any additional costs. However, it may have a negative influence on the costs of the support scheme, and translate into higher energy price increases for end consumers.

Should we give in to the temptation?

The cogeneration sector requires support from the state, as cogeneration helps improve energy efficiency and contributes to the reduction of CO2 emissions. Nonetheless, support should not be provided for all cogeneration sources. The target architecture of the system should allow variance in the level of support, taking into account not only the type of fuel but also the nature of the source, its age, and the investments made. This will help manage the costs of the mechanism rationally and direct support to those units that truly need it.

What is the current support system like?

Poland's accession to the European Union had a great impact on the development of support schemes for the co-generation system. The first such mechanism was launched on 1 July 2007, and was based on certificates of origin. The directives of the European Parliament and the Council showed the directions and possible measures that could be used by Member States in order to provide support to the cogeneration sector. In light of those regulations, Poland decided to implement a certificate system; the decision resulted from the country's experience of a similar RES support mechanism launched in 2004-2005. The model of the mechanism was based on two main assumptions:

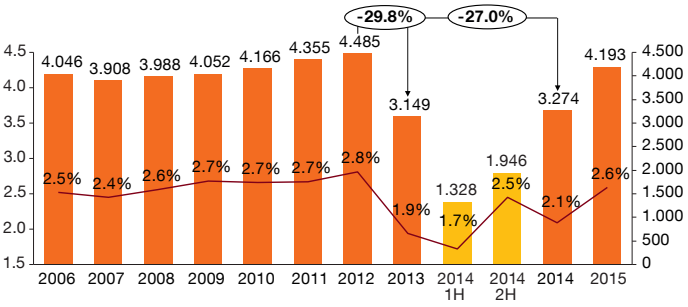
a. units that met the criterion of producing energy in high-efficiency cogeneration were granted certificates of origin,
b. suppliers selling electricity to end consumers were obliged to redeem a specified volume of cogeneration certificates or, if they failed to fulfil the redemption obligation, to pay the substitution fee.

The level of support was also contingent on the power of a given source and the type of fuel used:

a. yellow certificates were designated for entities producing electricity in high-efficiency cogeneration plants fired by gaseous fuels (regardless of the installed capacity) or with total installed electrical capacity below 1 MW,
b. purple certificates, introduced by amendments to the regulations in 2010, were designated for high-efficiency cogeneration units which produced electricity and heat using methane obtained in the process of mine methane drainage and gas from the processing of biomass (so-called biogas),
c. red certificates were granted to generation units with more than 1 MW capacity, fired by fuels other than gas, methane from mines or biogas from biomass.

At the end of 2012 the system of red and yellow certificates expired. As a result, for the next year and a half, cogeneration based on natural gas and coal was not supported in any way, which significantly reduced the production of electricity in cogeneration sources fired by natural gas.

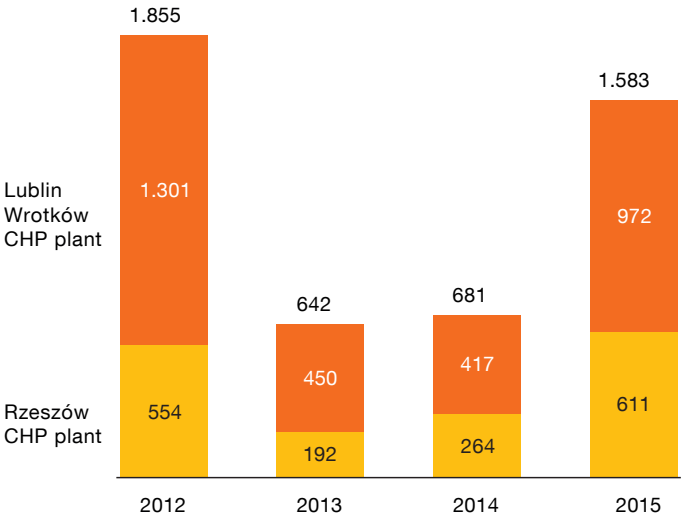
Electricity generation in gas-fired units and its share in total energy production in Poland (GWh)



Source: PwC analysis based on PSE data

Differences in production volumes can also be seen at the level of individual production plants. For example, the natural-gas-fired generation sources that belong to PGE decreased production by more than 50%.

Electricity generation in gas-fired CHP plants of the PGE Group (GWh)



Source: PwC analysis based on PSE data

In the middle of 2014, the system based on certificates of origin for gas and coal cogeneration was reintroduced, though with some adjustments. The rates of the substitution fee were changed, which in practice determined the prices of the certificates of origin. In addition, the experience with the previous support mechanisms, in particular regarding stockpiling and oversupply of certificates of origin, lead to changes in the rules for the redemption of the certificates. According to one such new rule, in order to fulfil the obligation for a given year, only those certificates could be redeemed that had been issued for the energy produced in that year. The reintroduction of the support system led to a resumption of heat production in gas units, reaching levels similar to those from 2012.

The current support system will be in operation till the end of 2018. However, work on a new mechanism and its architecture are already in progress. When developing new regulatory solutions, the following issues should be taken into account:

- What is the purpose of the support system, and what effects should it bring?
- Who should be the beneficiary of the system, and to what extent?

Do we really need a support system?

EU policy supports the development of cogeneration. The first legislative incentives for cogeneration sources were adopted in 2004 as part of the Cogeneration Directive, aimed at improving the security of electricity supply and increasing energy efficiency. The Directive introduced a standardized methodology for calculating the parameters of high-efficiency cogeneration (at least 10% of primary energy savings) that could be supported by Member States.

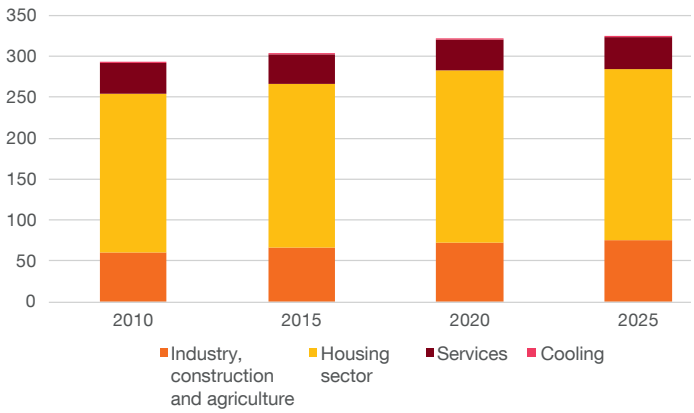
In light of the EU's 2030 climate and energy policy, support for cogeneration became part of the broader context of improving energy efficiency mentioned in the EED, which replaced the previously applicable Cogeneration Directive.

The development of cogeneration fits with the EU's climate and energy policy in two basic ways:

- efficiency, because it is connected to reduced demand for primary energy, as cogeneration systems, producing heat and electricity at the same time, are characterised by higher efficiency than analogous separate installations,
- emissions, i.e. reduced greenhouse gas emissions, because cogeneration systems, producing heat and electricity simultaneously, emit less pollution than comparable separate installations.

Pursuant to the provisions of the EED, Poland was obliged to prepare a study of the potential for the development of cogeneration. The study was prepared and presented by the Ministry of Energy in a document titled "Comprehensive assessment of the potential for the application of high--efficiency cogeneration and efficient district heating and cooling in Poland". The results show significant potential for the development of cogeneration. According to one growth forecast, demand for heat and cooling will reach 324 TWh in 2025. By comparison, consumption in 2015 was at 304 TWh. The fastest growth in heat consumption is expected in the industry, construction, and agricultural sectors (nearly 15% of total growth). Also, significant growth in consumption of cooling is expected (almost by 300%), but the scale of its use will continue to be small (0.2% of total heat and cooling consumption).

Forecast consumption of heat and cooling in Poland (TWh)

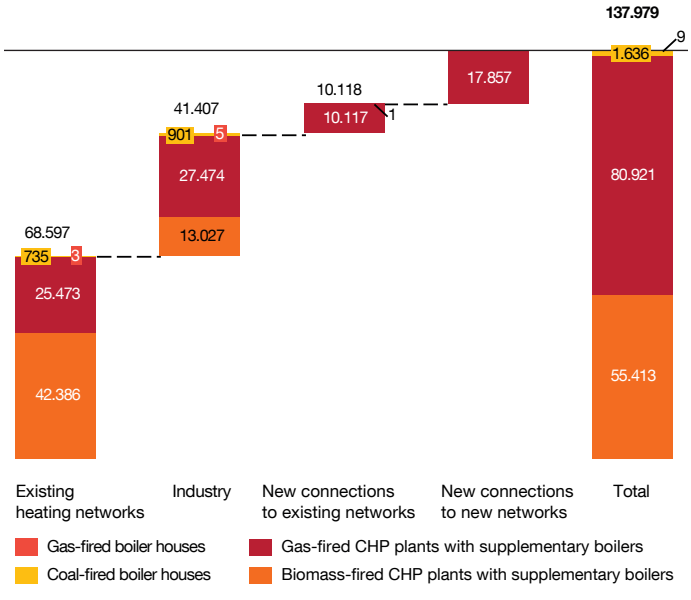


Source: PwC analysis based on data from the Ministry of Energy

4. Directive 2004/8/EC of the European Parliament and of the Council of 11 February 2004 on the promotion of cogeneration based on a useful heat demand in the internal energy market and amending Directive 92/42/EEC
5. DIRECTIVE 2012/27/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC (EED)

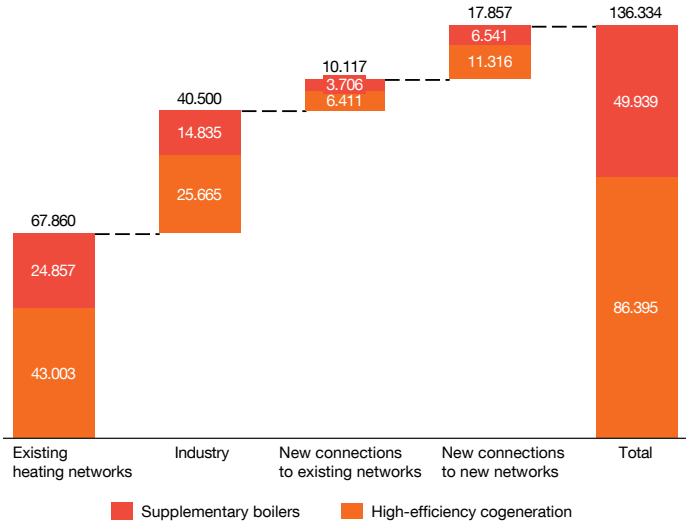
In its study, the Ministry of Energy also estimated the social and economic potential of the development of cogeneration. According to the base-case scenario (an assumed discount rate of 5%, average cost of capital and average fuel prices), in 2025 the installed capacity in cogeneration sources may reach 11,000 MW, which means an increase by 75% in comparison with the current situation (6.1 GW of installed capacity in 2015). At the same time, the study assumes full conversion of existing coal-based sources to gas and biomass.

Heat production potential of cogeneration sources and heating plants (GWh)



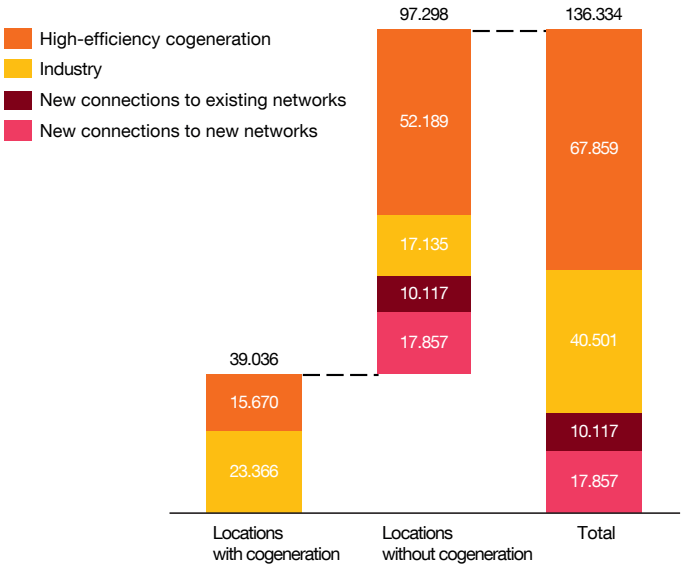
Source: PwC analysis based on data from the Ministry of Energy

Heat production potential of cogeneration sources (by cogeneration and supplementary boilers work) (GWh)



Source: PwC analysis based on data from the Ministry of Energy

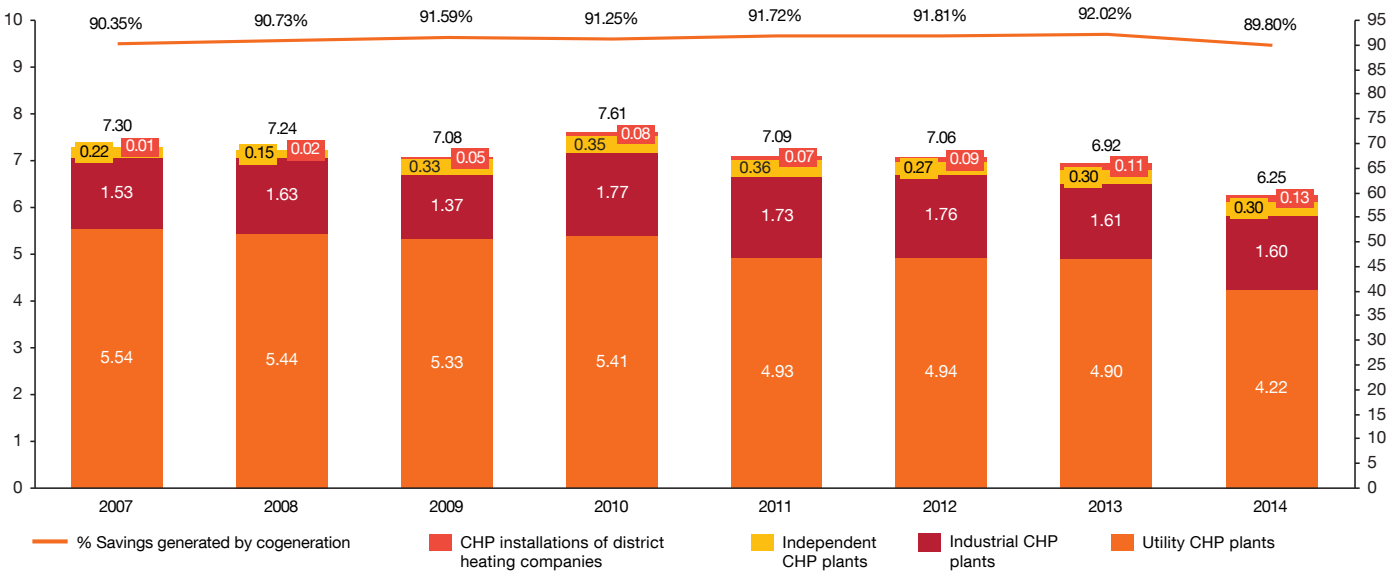
Heat production potential of cogeneration sources (by location and consumers) (GWh)



Source: PwC analysis based on data from the Ministry of Energy

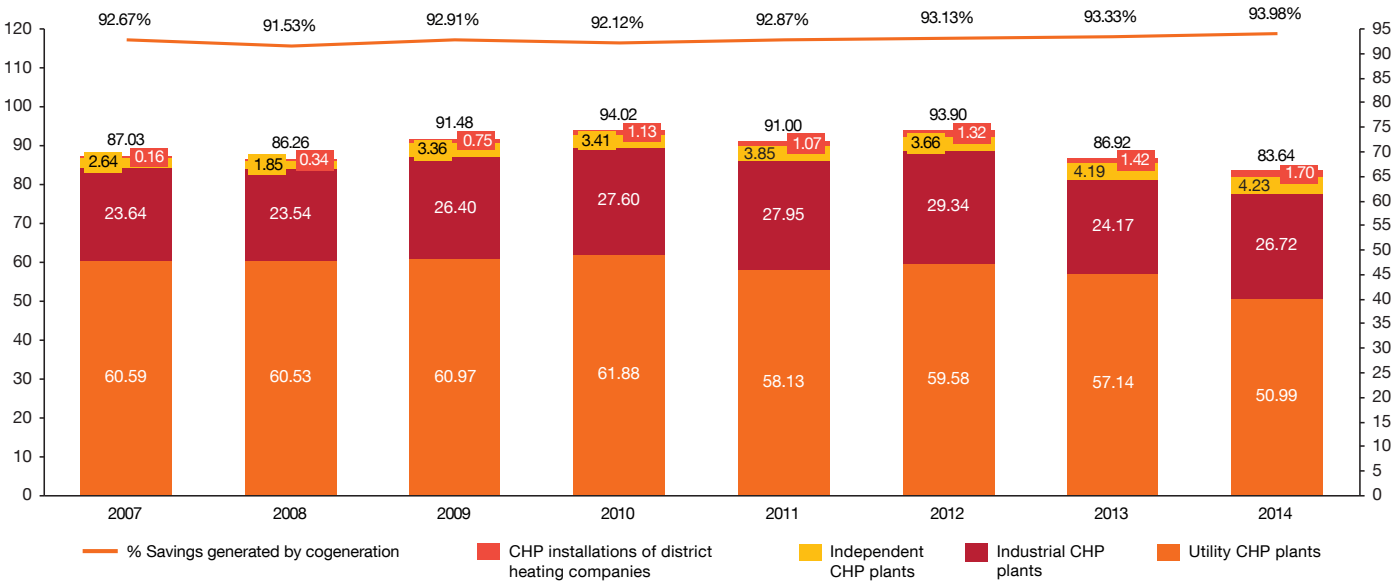
The study of the potential of cogeneration also assessed the current primary energy savings and avoidance of CO2 emissions, resulting from sources producing heat and electricity in cogeneration. According to these estimates, in 2007-2014 primary energy savings were 714 PJ, while avoided CO2 emissions amounted to 56.5 million tonnes.

Estimated primary energy savings in the cogeneration sector (PJ)



Source: PwC analysis based on data from the Ministry of Energy

The estimated level of emissions avoidance (in millions tons) in the cogeneration segment



Source: PwC analysis based on data from the Ministry of Energy

Consequently, given the potential for the development of heat production, including production in cogeneration, as well as the current benefits of primary energy savings and CO2 emissions, the development of cogeneration may be a tool that will make it possible for Poland to meet the emission targets imposed by the EU's climate and energy policy and to improve energy efficiency. Therefore, supporting the development of the cogeneration sector is only reasonable from the Polish perspective.

Why is support for cogeneration needed from the perspective of enterprises?

The construction of a new source, or serious modernisation or conversion of an existing CHP plant, requires significant capital expenditures. Consequently, when deciding whether to invest in the construction of a new unit, the owners must include the estimated capital expenditures (in depreciation costs) and take into account the ability of the CHP plant to pay the financial costs of possible debt. Thus, without covering the costs of investment or modernisation, the development of the CHP sector may be very difficult. Therefore, investment incentives are a challenge that must be met by the support system. This may be achieved by varying the levels of support depending on the capital expenditures incurred.

The necessary condition for the operation of a CHP plant is its ability to cover all (fixed and variable) costs, as well as costs related to financing. In principle, market practice shows that fixed costs (except for depreciation) are higher in existing units than in plants that have been commissioned recently. The reasons for these differences are not only technological solutions, but also the optimisation level and the restructuring processes that have been conducted. If the support system were to also include the needs connected to the necessary financing of fixed costs, its architecture should be an incentive for restructuring processes and reduction of the fixed costs of generation sources.

District CHP plants, especially those undergoing serious modernisation or alteration, may require special attention, as the profitability level of industrial and district CHP plants differs because of the varying number of hours of work and the average quantity of heat consumed in a year. Below is a comparison of the total cost of electricity production (LCOE, Leveraged Cost of Electricity) and the price of heat for reference industrial and district sources. For the purpose of the analysis, the following assumptions were adopted:

- hourly work regime – 4,000h at full load (Full Load Hours) for a district CHP plant and 8,000h of work at full load for an industrial CHP plant,
- the total cost of heat generation, determined based on the heat rate, is covered by revenue from heat sales, and
- technical configuration of the sources is in line with the table below:

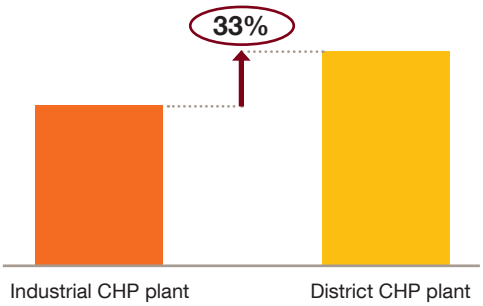
	District CHP plant	Industrial CHP plant
Installed electric power (MWe)	100	400
Installed thermal power (MWt)	75	300

Source: PwC analysis

LCOE of gas sources

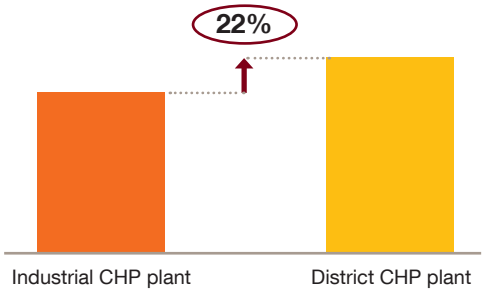
Additionally, the analysis also shows a significant difference in the total cost of heat production, which may affect the tariffs of district and industrial CHP plants.

Comparison of LCOE in a district and industrial CHP plant (PLN / MWh)



Source: PwC analysis

Comparison of the total cost of heat production in a district and industrial unit (PLN / GJ)



Source: PwC analysis

Therefore, to ensure the economic rationality of the construction/conversion and operation of a new generation unit, district CHP plants require much higher support than industrial CHP plants. Consequently, the support system is particularly important from the perspective of district sources.

Is the role of the support system only to ensure the profitability of CHP plants?

The support system may be seen as a tool for shaping the target electricity market model. Depending on priorities it may, though it does not necessarily have to, be directed at all cogeneration units in the same scope.

Goal 1: Development of the energy mix according to the national energy policy. The support system may motivate energy companies to increase their involvement in the CHP sector (by providing general support for cogeneration), as well as to select particular electricity production technologies both for new installations and for those undergoing modernisation. In such a situation it is important to properly diversify the support level depending on the technology that an energy company chooses (size of the source, fuel, etc.).

Goal 2: Intensification of investments. The support system may be a source of investment incentives for energy companies and facilitate the modernisation of the sector.
In such a situation the support mechanism should be contingent upon the level of capital expenditures incurred by an energy company in connection with the construction or modernisation of a source. That goal, however, may not be isolated from the following ones.

Goal 3: Environmental Protection. This aspect is particularly important from the perspective of the state, as the cogeneration sector is characterised by high potential for primary energy savings and reduction of unit emissions.

Thus, the support system may be a tool that will make it possible to direct the investments of energy companies into efficient, low-carbon-emission electricity and heat sources. Therefore, it seems reasonable for the system to promote solutions with a possibly limited impact on the environment and to support the conversion of old, less efficient units to new ones.

Goal 4: The support system may be a tool for securing electricity and heat supplies, especially for meeting demand from the local community. It may turn out that from the social perspective, even less efficient cogeneration solutions are a better alternative than individual heat sources. Therefore, the support system may be directed to existing generation sources, providing them with an economic reason for their operation. However, it should be stressed that the construction of a support system in this sector must simultaneously encourage restructuring and modernisation.

Nonetheless, it is of key importance that the cogeneration system be supported over the long term. The current support mechanism expires in 2018, which means there is little time left for the development of new, consistent solutions that will make it possible for Poland to unleash the entire potential of this segment.

How does the support system for cogeneration look in Germany?

The German support system, modified in January 2016, aids new units operating exclusively based on gaseous fuels, and excludes coal sources. It is diversified with respect to a number of factors:

- the size of the installation,
- whether the installation feeds energy into the grid/ supplies it to end consumers, or whether it produces energy for its own purposes (e.g. in industrial CHP plants), especially taking into account energy-intensive industries,
- participation by CHP plants in the ETS,
- whether modernisation and renovation works have been carried out, fuel conversion from coal to gas.

The final support level for a given installation is a function of all of the above factors.

Support for new cogeneration units

Factor	Subsidy (ct / kWh)				
Installed capacity (kWe)	<50	51-100	101-250	251-2000	>2000
Period of support	60,000 h	30,000 h	30,000 h	30,000 h	30,000 h
Source providing energy to the grid	8	6	5	4.4	3.1
	In the case of converting a coal-fired unit to a gas-fired unit, additional support at the level of 0.6 ct / kWh during the whole period				
Source working for own purposes (apart from energy intensive industries)	4	3	-	-	-
Source providing energy to end users (island operation)	4	3	2	1.5	1
Sources working exclusively for the needs of energy-intensive plants	5.41	4	4	2.4	1.8
Source participating in the ETS	Additional support at the level of 0.3 ct / kWh during the whole period				

Source: PwC analysis based on data from ASUE

Support for the converted and modernised cogeneration units

	Condition	Period of support
Conversion (e.g. a heat plant to a CHP plant)	Five years after the commissioning	15,000 h at full load
	Ten years after the commissioning and with the conversion costs at the level of at least 50% of the new plant	30,000 h at full load
Renovations/modernisations	Modernisation costs at 10-25% of the costs of the new plant	10,000 h at full load
	Modernisation costs at 25-50% of the costs of the new plant	15,000 h at full load
	Modernisation costs above 50% of the costs of the new plant	30,000 h at full load

Source: PwC analysis

Additionally, in the case of sources of more than 2 kWe, it is possible to use a simpler system of a one-off lump sum surcharge based on 4 ct/kWh and 60,000 hours of work at full load (2400 EUR/kW). The current support system runs until 2022.

Due to low electricity prices, there may be no economic rationale behind existing CHP plants supplying heat to municipal networks. For that reason, an additional element of the support system has been introduced: it is addressed at the existing CHP plants (with installed capacity of more than 2 MWe), which may receive support at the level of 1.5 ct / kWh, during 16,000 hours of work at full load; however, not more than 4,000 hours a year and not longer than four years.

Temptation 3
Giving up the renewable sources auction system

What is the temptation to give up the renewable sources auction system about?

This temptation refers to revoking implementation of the auction-based RES support system and keeping the green certificates mechanism instead.

Where does the temptation come from?

This temptation results from the dynamic development of installed RES capacity, as well as estimates that the share of RES in final energy consumption in 2015 exceeded the planned levels in the National Action Plan for RES.

Should we give in to the temptation?

The RES support system based on auctions has a number of advantages over the green certificates system. A major one is full control of the State over the development of RES capacity, as well as preferred technology.

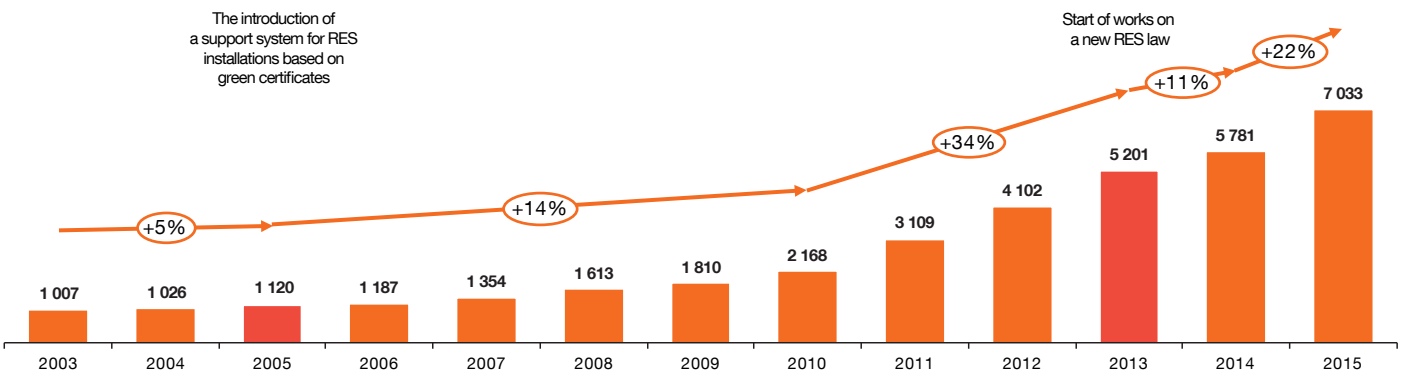
RES in Poland has been developing faster than expected

One of the aims of the amendments to the Energy Law adopted in 2004 and 2005 was to adjust the national RES regulations to the rules applicable in the EU. As a consequence a support system based on green certificates was introduced, which in the following years translated into dynamic growth of installed RES capacity in Poland.

Analysing data on the development of installed RES capacity in Poland, it is clear that the biggest growth was in 2010-2013, which was mainly attributable to the introduction of support scheme for new RES installations, an inflow of foreign investors, and an increase in the competence and experience of RES developers operating in Poland.

However, in 2014 there was a relative decrease in the pace of growth of RES in Poland, which was driven primarily by commencement of legislative works on a new RES Act in previous year. Legislative uncertainty lead to many developers suspending execution of their projects before the completion of work on the new act. Implementation of the new RES Act, including interim provisions for switching period between green certificates and auction based support system resulted in a renewed growth of the RES capacity in Poland. This put many already prepared projects at the risk of receiving no support if they were to enter the auction-based system. To avoid this, many developers sped up their plans to execute their projects (mainly wind projects) so as to make them eligible to the green certificates system, where public support was guaranteed to every new installation connected to the national power grid.

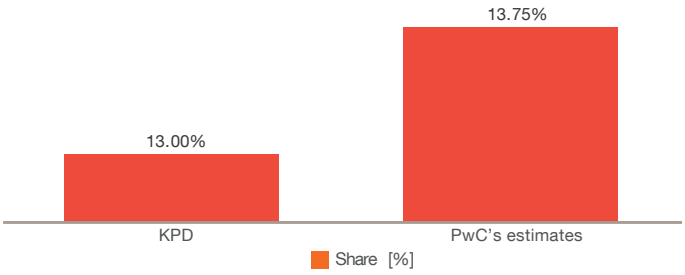
Installed capacity



Source: PwC analysis based on data from ARE

As a result, according to estimates, Poland may even exceed the share of electricity from RES in gross final energy consumption adopted in the National Action Plan for RES in 2015. This raises the temptation not to implement a new auction-based support scheme for RES installations, as a result of dynamic development of installed capacity eligible to the green certificates system. Nonetheless, based on our estimates, the pace of growth of RES installed capacity in Poland in recent years will be difficult to repeat, as it can be explained exclusively by the approaching change to the auction system and the willingness of some investors to stay in the green certificates system, as it guaranteed support for all installations. However, it is the green energy auction-based support system that seems more favourable from the State's perspective. It will help optimize the level of support for RES installations, ensuring that only the most efficient projects receive public support, as well as enable the State full control over the development of the RES capacity in Poland.

Share of electricity from RES in the gross final consumption of electricity in 2015



Source: PwC analysis based on data from ARE and KPD

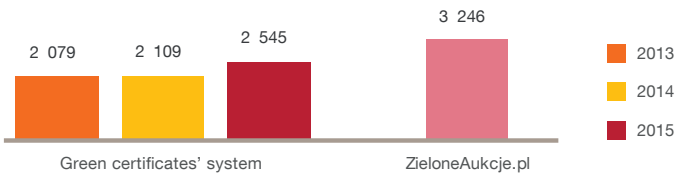
Competition in the auction system will ensure great optimisation of RES projects

The current regulations state that all RES installation connected to the National power grid prior to 1 July 2016 are eligible to receiving public support in the form of green certificates. In contrast, under the auction-based system new projects will have to compete for support in auctions under first-price sealed-bid principle, with the lowest bid winning until exhaustion of volume or budget. This is a significant disadvantage from the investors' perspective, as well as an important advantage for the State and end users of electricity. The need to compete for public support at auctions will force RES investors to maximise the optimisation of their projects.

In May 2015, PwC together with the Polish Wind Energy Association and Domański Zakrzewski Palinka law firm conducted the first simulation of a RES auction in Poland - called ZieloneAukcje.pl. It was based on volumes and budgets allocated to auctions in 2016, and attracted projects with combined capacity of approximately 4 GW.

The results of the auction simulation show that competition will be the strongest among large scale wind projects. However, looking at the current auction algorithm and how much volume is allocated onto wind projects, many projects from the market will not be able to secure support at the auctions. This will force developers to optimise their new projects intended for auction-based support system, which will result in lower public support for those projects. The above mentioned may be confirmed by comparison of productivity of existing wind projects in Poland and projects submitted to ZieloneAukcje.pl. Wind investments reported to ZieloneAukcje.pl have significantly higher productivity per MW of installed capacity as compared to existing wind projects in Poland. Assuming identical fixed costs in both cases, this will translate directly into a lower level of support required per each MWh of electricity generated.

Productivity of wind farms in the green certificates and the auction-based systems [MWh/MW/year]



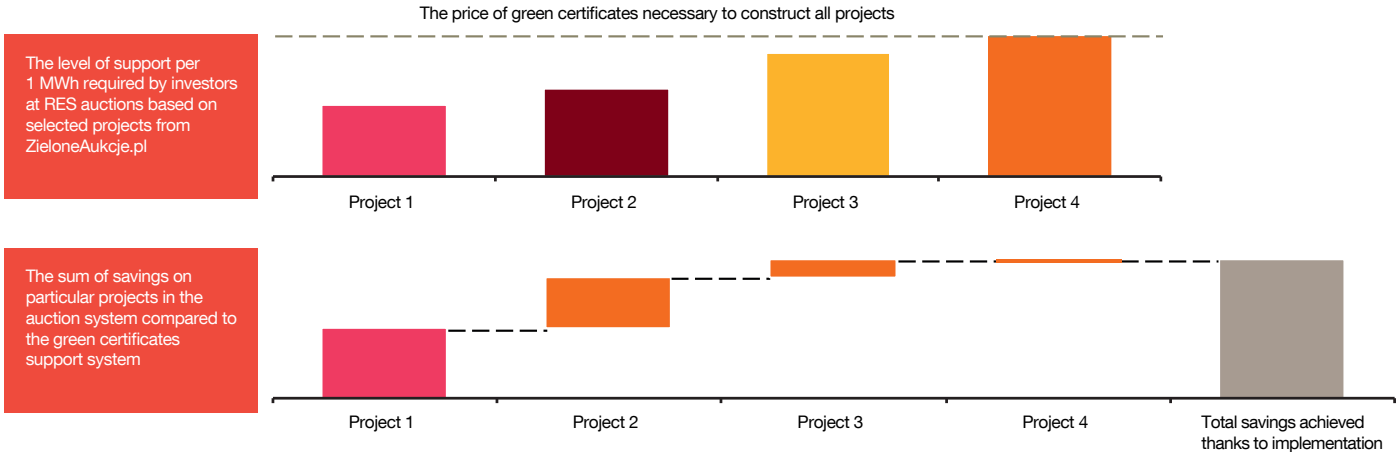
Source: PwC analysis based on data from ARE and ZieloneAukcje.pl

As presented above, productivity of existing wind projects in Poland is significantly lower as compared to wind projects submitted to ZieloneAukcje.pl, mainly due to:

- the average productivity of existing wind projects include data for both modern projects constructed in recent years, as well as older projects with wind turbines of older generations;
- very often projects subject to green certificates' support system were not highly optimised, as developers expected that the price of green certificates would be close to the substitution fee, thus ensuring high profitability of these projects;
- while preparing projects to auction-based support system, developers strive for maximum optimisation, as only this way they can place relatively low bids at auctions, increase their chances for winning volume at auctions and ensure acceptable rate of return

The above mentioned projects' optimisation combined with strong competition at auction will reduce total costs of the support system as compared to the green certificates system, as each project will be subsidized in accordance to its price submitted at auction. Hence the best optimised wind projects will submit relatively low prices in order to maximise their chances of winning the support, which should be lower as public support that would be due to those installations in green certificate system.

Savings resulting from implementation of the auction-based support system in comparison to the green certificates support system



Source: PwC analysis based on data from ARE

Moreover, the auction-based system allows to differentiate support for all winning projects at auctions, which will prevent excessive funding of highly optimised projects. Meanwhile green certificates' support system, remunerates each installation with the same amount of green certificate per each MWh of electricity produced, increasing the total costs of the system.

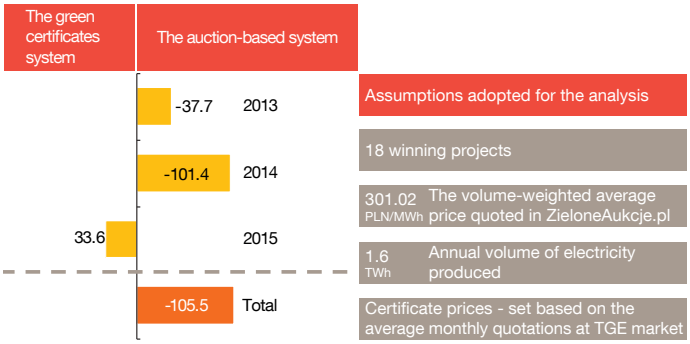
The results of our simulation i.e. ZieloneAukcje.pl (the only simulation of RES auction results available at the moment) confirm this thesis. Comparison of total estimated cost of the auction-based support system and the green certificate system (based on data submitted to ZieloneAukcje.pl and historical performance of electricity market from 2013 – 2015 period) show a visible cost advantage of the auction-based system.

The above analysis shows that the total cost of the auction based support system is significantly lower as compared to total cost of green certificate support system. Higher total cost of support granted for large scale wind farms that won support at ZieloneAukcje.pl in auction-based support system as compared to green certificates' support system in 2015, results primarily from:

- inadequately low green certificates' redemption obligation implied onto final users of electricity in comparison to oversupply of green certificates on the market, leading to a drastic drop in the price of green certificates at TGE (Polish Power Exchange) in 2015,
- the level of the winning bids at ZieloneAukcje.pl,
- the relatively low level (compared to 2014 and 2013) of electricity prices (measured by the average daily electricity price during market sessions, weighted by volume of electricity sold delivered on the next day and two days ahead after closing the transaction),
- the productivity curve adopted for calculation (based on average productivity of all existing installations in Poland).

It should be noted, however, that 2015 was not a representative year, because the prices of green certificates quoted at the TGE were very low, and did not provide a sufficient level of support for RES installations. Therefore, it is important to bear in mind that if the State decides to maintain the green certificates system, meanwhile maintaining the development pace of RES capacities – the State would be forced to influence green certificates' price in order to provide sufficient incentives for investors. This would mean returning to the market conditions from previous years, hence the total cost of the support mechanism based on green certificates would be higher than the green energy auction system.

The annual difference in the total cost of support due to large scale wind farms registered to ZieloneAukcje.pl under the auction and certificate systems [PLN million]



Source: PwC analysis based on data from ZieloneAukcje.pl, TGE (Polish Power Exchange), ARE, and PSE-Operator

In auction-based support system it is the State, who has full control over development of the RES market

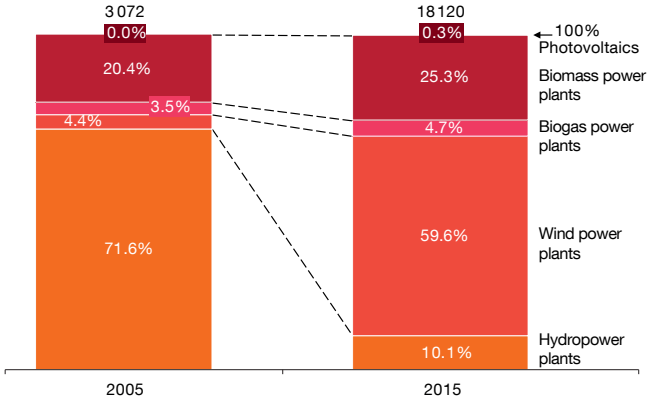
Thanks to volume baskets introduced at RES auctions, it is the State, who has the full control over the RES market, including what types of technology is preferred, as well as new capacities constructed in Poland. Ministerial Decrees, determining volumes and the budgets available at RES auctions, allows the State to increase or decrease volumes for particular groups of technologies (large installations, small installations, controllable and non-controllable ones). Hence the State may support the most cost effective technologies (determined by results of earlier auctions), or support technologies ensuring the most beneficial RES mix – in terms of power grid system's security and costs. Moreover, the State will poses a tool preventing from generating green energy surplus in 2020, which would be an additional cost imposed on final consumers of electricity.

Nonetheless, the auction-based support system carry a risk of investors intentionally trying to move their projects to another basket with smaller competition. In the current version of the auction-based support system there is the risk that large non-controllable installations will deliberately over estimate their productivity in order to enter the basket for large controllable installations. Such behaviour may put investors at the risk of penalties, but at the same time, it guarantees securing public support with a higher price per MWh. Nonetheless, the State can prevent such practices, by including specific provision in this respect in the final version of the auction algorithm.

Having full control over capacities connected to the national power grid by the State is also a significant advanced of this support system for the final users of electricity, who in fact will pay for the development of RES in Poland. On the other hand green certificates' support system gives the government no control over the installed RES capacities, because under those regulations all installation that introduced electricity to the system prior to 1 July 2016 is entitled to the support in this support system.

Since 2005, when the support system based on green certificates was introduced, development of installed RES capacities in Poland has been clearly dominated by a single technology. This was mainly attributable to favourable weather conditions for wind projects in Poland, as well as the relative cost advantage of wind projects in comparison to other technologies, and – most importantly – a single level of support for all technologies.

Share of each technology in electricity generation in 2005 and 2015 [GWh and %]



Source: PwC analysis based on data from ARE

Introduction of the auction-based support system for new RES installations will make it possible for the government to stimulate the development of all RES technologies, including controllable technologies such as biomass and biogas, or non-controllable technologies such as photovoltaics, ensuring the optimal electricity mix in terms of the system's security.

The auction-based system will allow sufficient support for each eligible RES technologies, maximising savings for final user of electricity

The results of the ZieloneAukcje.pl point to significant differences of the required level of the support for execution of RES projects (depending on the technology). The results of the ZieloneAukcje.pl showed a significant price/cost advantage of wind projects.

Winning bids submitted at ZieloneAukcje.pl

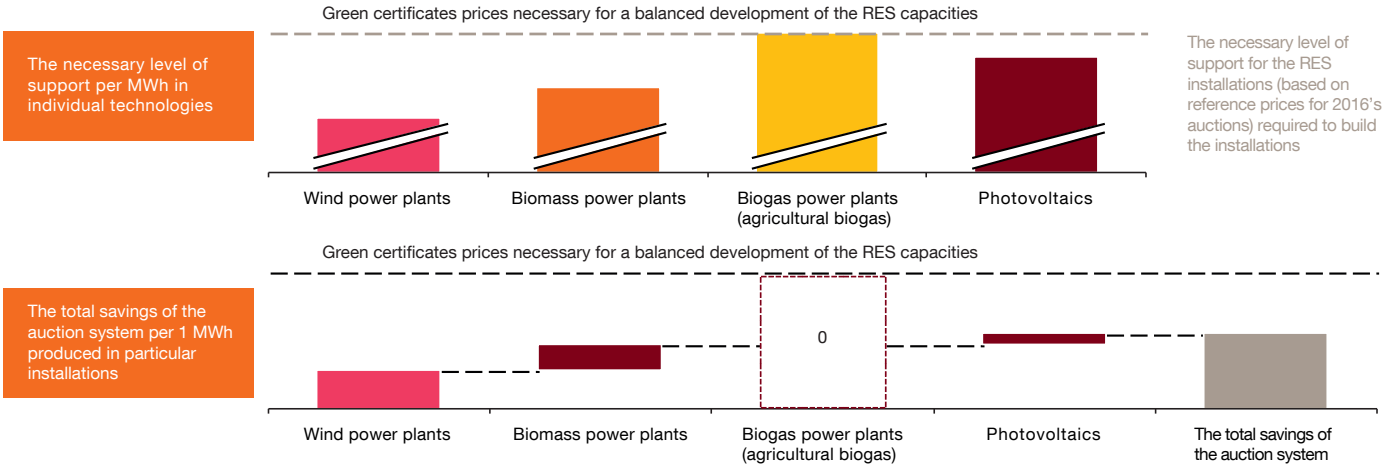
Winning prices at ZieloneAukcje.pl - plants with installed capacity exceeding 1 MW	Minimum price	Maximum price
Onshore wind farms	240.00	323.27
Biomass - a dedicated or a hybrid system	437.50	437.50
Biogas - other	450.00	450.00
Biomass - a dedicated or a hybrid system in high-efficiency cogeneration (power below 50 Mwe)	449.77	522.00

Source: PwC analysis based on data from ZieloneAukcje.pl

Such material differences between bids submitted by each technology is one of the main reasons behind the above-mentioned cost advantage of the auction-based support system over the green certificate system. We would note, that in order to build all projects that had won support at ZieloneAukcje.pl, all projects would have to receive the same amount of public support. It could not be less than the least cost-effective project - in this case, a biomass installation (522 PLN/MWh). This would mean an economically unjustified profit for the other projects, which would translate into additional costs for end consumers.

The auction system, in contrast, makes it possible to diversify the level of support for particular technologies, preventing the monotechnological development that has been observed in Poland in recent years. Also, if the price of green certificates fell, some technologies could not be launched. For example, in the case of ZieloneAukcje.pl, controllable technologies could not be commissioned.

Savings of the auction system resulting from different level of support for each RES technology



Source: PwC analysis

Temptation 4
From today on we will be innovative

What is the temptation to be innovative about?

The temptation to be innovative means striving for quick transformation of a company's operational model in the direction of implementing numerous innovations and achieving quick economic effects from the changes.

Where does the temptation come from?

Signals to increase outlays on innovations come from all areas of the environment surrounding energy companies, and are stimulated by the targets imposed by national and EU policy (regarding innovation, but also environment, RES, energy efficiency, etc.). The temptation is also driven by available pro-investment funds, new business models, the desire to catch up with the competition in terms of key performance indicators (KPIs) regarding innovations, changes in customers' perception of brands and the desire to participate in the trend of investing in start-ups.

Should we give in to the temptation?

Financial outlays on innovation are a necessary but insufficient success factor in sectors which are under as much pressure as the energy industry is. Many companies have taken up the topic of innovation by making an important step: they have built strategies for innovation that define the areas in focus and allocate specific funds. We can talk about success, i.e. actual leadership and overcoming strategic challenges by innovation, only in the case of those companies that transform innovations from cost centres to profit centres. In order to achieve this, time-consuming elements such as combining innovations with the business goals of a company, as well as designing and implementing an operational model of innovation, must be introduced.

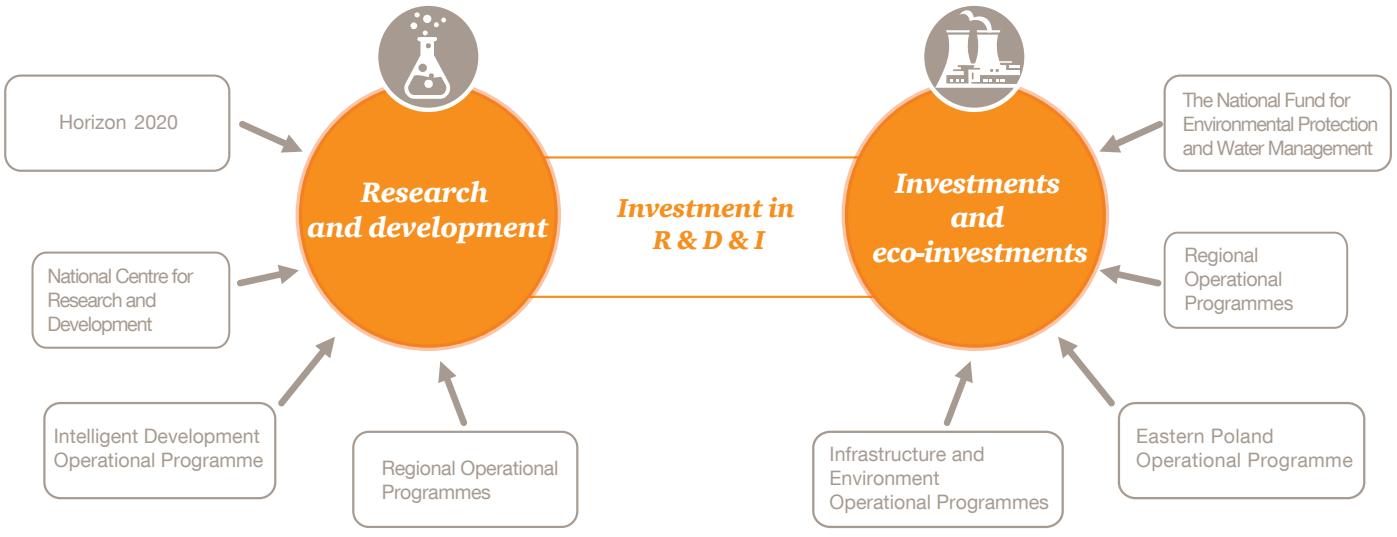
The challenges in the environment of energy companies exert pressure to develop innovation

European energy companies, including Polish ones, are influenced by a number of regulatory, technological and market factors that force the development of innovation along the entire value chain. Previous activity in the generation, distribution and sales segments, the so-called old energy world, is undergoing more or less radical transformations resulting from the factors below, grouped into three categories:

1. regulatory and political factors, manifested in stricter emissions requirements with regard to generation sources, energy efficiency, the share of RES in the energy mix, the level of cross-border exchange; technological requirements with regard to energy grids (e.g. smart metering); as well as diversified financial support in these areas,
2. technological factors, which result from the development of technologies regarding, for example, extraction of fossil fuels, system and distributed generation sources and/or energy transformation (including RES), energy storage, controlling energy consumption, or its use for car transport,
3. market factors, which come from new business models, i.e. moving from the production and sales business model of commodity markets to the sales of services and technical solutions, as well as customer behaviour (e.g. the growing trend of own energy production or conscious control over energy consumption).

One way of responding to the pressure from the environment is to conduct research and development as well as innovative activity, which should be understood both as improvement of the company's operations and as disruptive implementation of new business models or technologies in the areas of products, services, and processes. Such activity, in addition to the need to keep the company competitive, is stimulated by national and EU policies, programmes and institutions providing funding for innovation, as well as for research and development.

The environment of public funds and programmes supporting innovation and R & D



Source: PwC analysis

The first step: defining an innovation strategy

Polish energy companies have already made the first steps in the direction of innovation development by defining their business goals. Many have also developed an innovation strategy, as well as carrying out the first activities directed at stimulation of innovation.

In its strategy for 2014-2020, PGE placed innovation at the centre, with a minimum 1.5% of net profit going to research and development. In 2015, based on the model of open innovation, the company organised programmes including Energia Innowacji (The Energy of Innovation), a contest for scientists to submit innovative projects in areas defined by PGE. The company has also started working with NCBR (National Centre for Research and Development), under which PLN 200 million will be allocated in competitions to finance R&D projects.

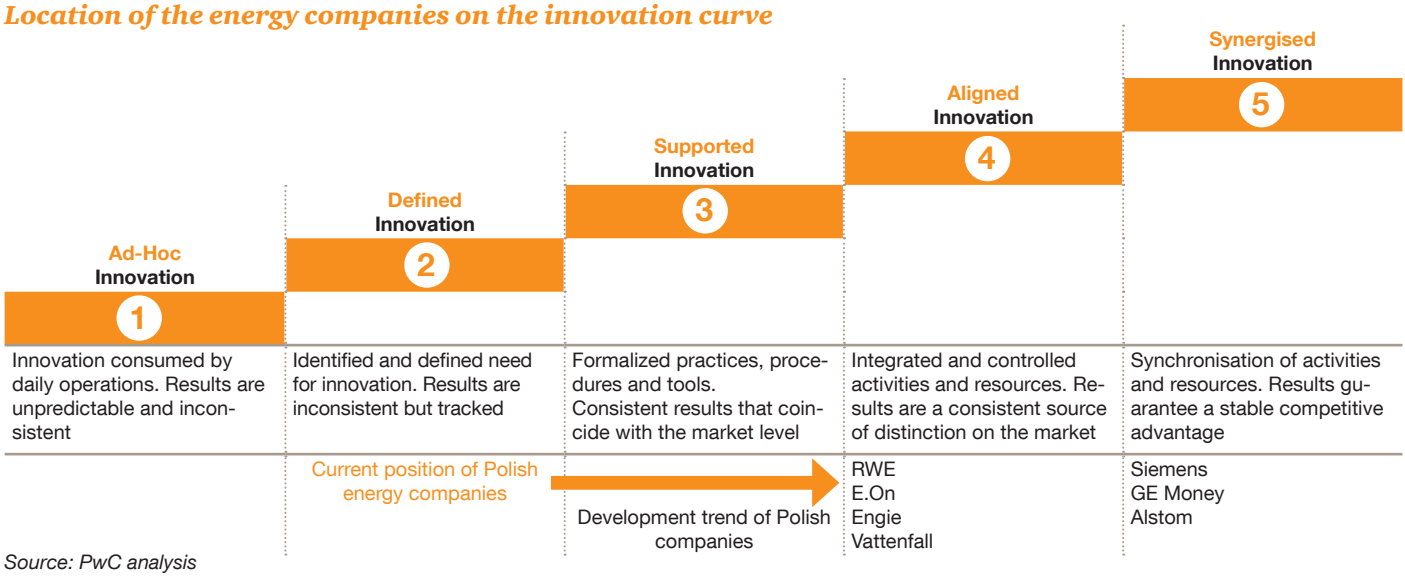
ENEA has also included innovation in its corporate strategy. In 2015, the company organised the Energia + Innowacje (Energy + Innovations) competition, in which more than 30 projects participated. Other co-organisers included Polish Institute of Research and Development, the Giza Polish Ventures fund and NCBR.

Since 2013, TAURON has been preparing for efficient implementation of research and development, according to its strategy. The company is carrying out a number of internal research and development projects in areas such as reduced environmental impact, smart meters and integration with renewable energy sources. However, only the strategy updated in 2016 is to stress the importance of research and development in raising the company's value and to define the portfolio of innovation projects.

ENERGA stimulates innovation through the separate Enspirion company, offering an innovative service of demand-side response. Enspirion implements developmental projects such as Living Lab, in which 300 households are testing smart home solutions.

These strategies define the directions of actions similar to those taken up by Western European enterprises some time ago, which lead to increased outlays on research and development. Polish companies are only at the second stage of the so-called innovation curve. They are defining the key assumptions for innovation, allocating budgets and implementing operational elements that support innovation. However, they are still one step away from the conscious control over innovation that prevails among Western European players, who – thanks to innovation – stand out in the market by commercialising new products and services, or by using their innovations in yet other ways (intellectual property rights, etc.). In this way, high outlays on research and development are compensated for by the revenues and profits from implementing their effects. Companies that deliver technology are still an unattainable model for the energy sector. They use innovations with synergy, guaranteeing a continuous competitive advantage by regularly creating new products and services based on innovation, as well as research and development projects. This is a key condition for the development of these companies.

Location of the energy companies on the innovation curve

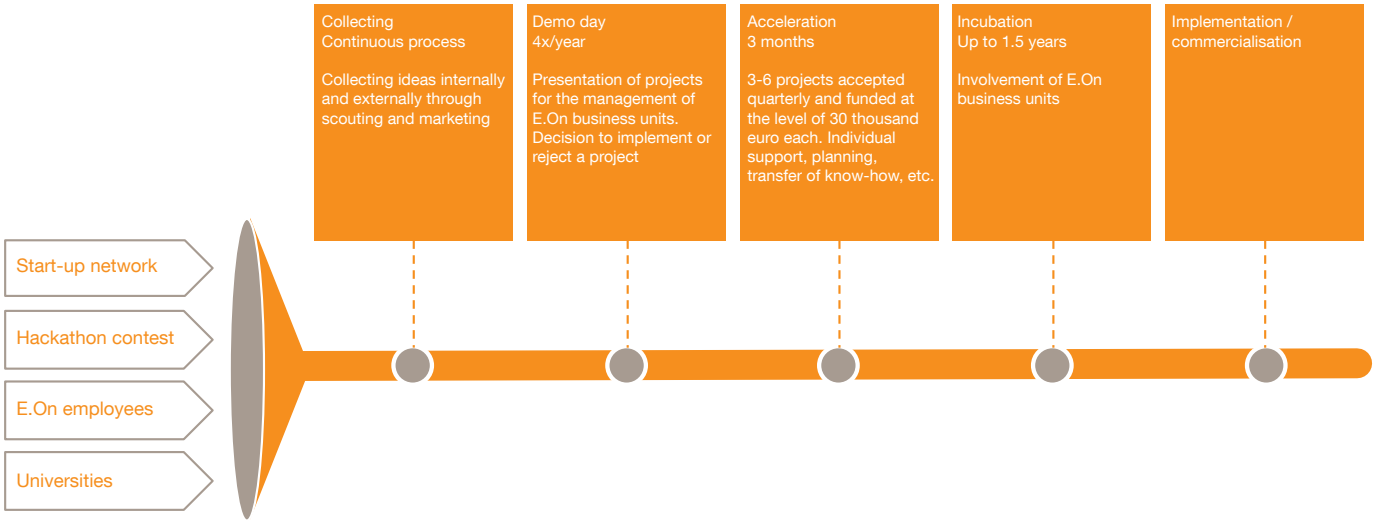


Source: PwC analysis

The use of technologies

One example of how Western European energy companies use advanced innovation models is the :Agile acceleration programme, linked with a venture capital fund, implemented by the E.On Group. Initially, it served as an internal tool for collecting and implementing innovations within E.On. Later it was made more available in the form of an accelerator for external stakeholders. Since October 2014, more than 500 projects have been assessed under this mechanism, and right now 22 are in the phase of acceleration, 14 in the pilot phase and seven in the phase of growth that generates real revenues. The projects concern such things as the use of hydrogen and infrastructure for e-cars, but also induction stoves for developing countries, applications for the management of electricity consumption, systems to exchange operator data and optimisation software for generation assets.

E.On :Agile programmes

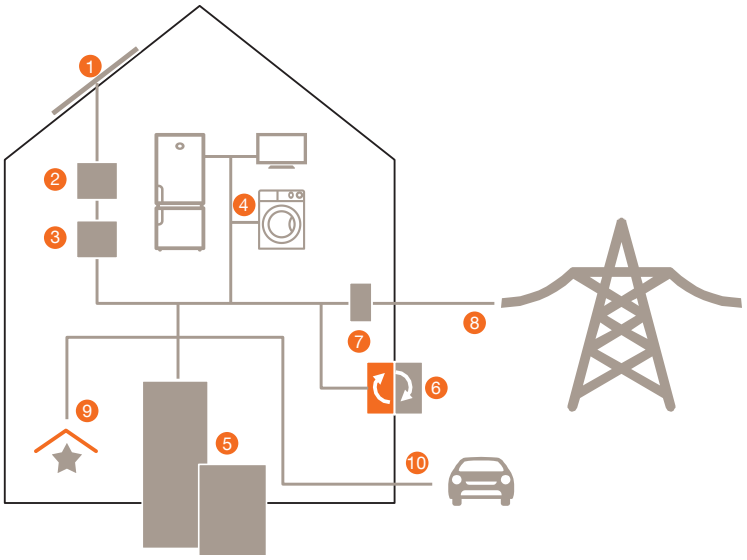


Source: PwC analysis based on data from the E.On :Agile programme

An example of launching a new product developed in the innovation process is the HomePower solar solution promoted by RWE, developed in co-operation with external partners, such as suppliers of batteries and energy consumption controllers. This is an electricity storage system for households, which provides integration with any photovoltaic installations, not only those offered by RWE. It is also integrated with the RWE SmartHome electricity management system. HomePower solar combines a business model that is new for consolidated energy companies (sale and installation of equipment) with technologies (photovoltaics, electricity storage, consumption management). This solution was born based on the so-called open innovation model, i.e. working with external entities focused on efficient commercialisation of innovations, as well as research and development projects.

An example of an energy product created thanks to innovation combining new technologies and business models - RWE HomePower solar

1. Photovoltaic panel
2. Inverter
3. Meter for the PV panel
4. Electrical appliances
5. RWE electricity storage
6. Heat pump
7. Meter
8. Public distribution grid
9. Smart Home RWE Power Controller
10. RWE eMobility charging point



Source: PwC analysis based on data from RWE HomePower solar

To achieve success with innovations, defining goals and setting budgets is not enough

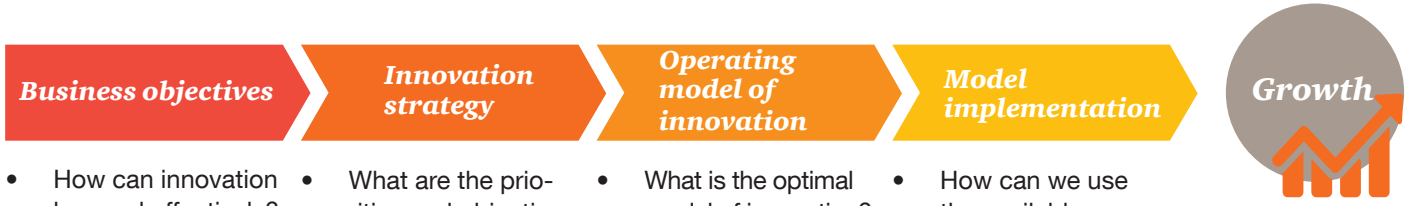
Defining business goals and strategies for innovation is an essential milestone on the way to success. However, it is not enough. Similarly to classic business strategies, innovation strategies include three elements at a minimum:

- the goals to be met through the implementation of innovations (e.g. meeting environmental requirements, improved operational efficiency, creation of new ideas for the development of the business),
- areas of concentration for innovations and R&D, i.e. the areas of the company's operations in the value chain where research and development work and innovation projects will be concentrated,
- outlays for R+D+I – usually defined as a percentage of the company's net profit.

In order to set out a vision for innovation and for what the company should do in the very near future, it is certainly sufficient to specify these elements. However, it is highly probable that this structure will turn innovation into a cost centre. Why?

- Usually, the lack of a clearly defined relationship between the operating model and business objectives (profitability, revenues from new business areas) fails to create the proper motivation to achieve real results. For example, funds are allocated to research activities that coincide with the business areas of a company, but there is no attempt to commercialise the outcomes or achieve measureable financial results.
- No precise definition of a complete operational model of innovation that would include an optimal mix of all the elements that make it possible to achieve business goals.
- No key resources that are separated and placed at the appropriate level in the organisational structure, whose task would be managing the implementation of the operating model of innovation, and who would be responsible for its success.

Implementation stages of an innovation model linked to business objectives



- How can innovation be used effectively?
- Where we will be in 10 years?

- What are the priorities and objectives of using innovation?
- In which areas should we implement R&D&I?

- What is the optimal model of innovation?
- What tools are needed?
- How are innovation projects managed?

- How can we use the available resources?
- How can we maximise the effects?

Status of implementation in Polish energy companies


Specified, but not always linked to the operational model of innovation


In the majority of cases, developed


Developed fragmentarily


At the beginning of implementation, not always supported by dedicated resources at the management board level

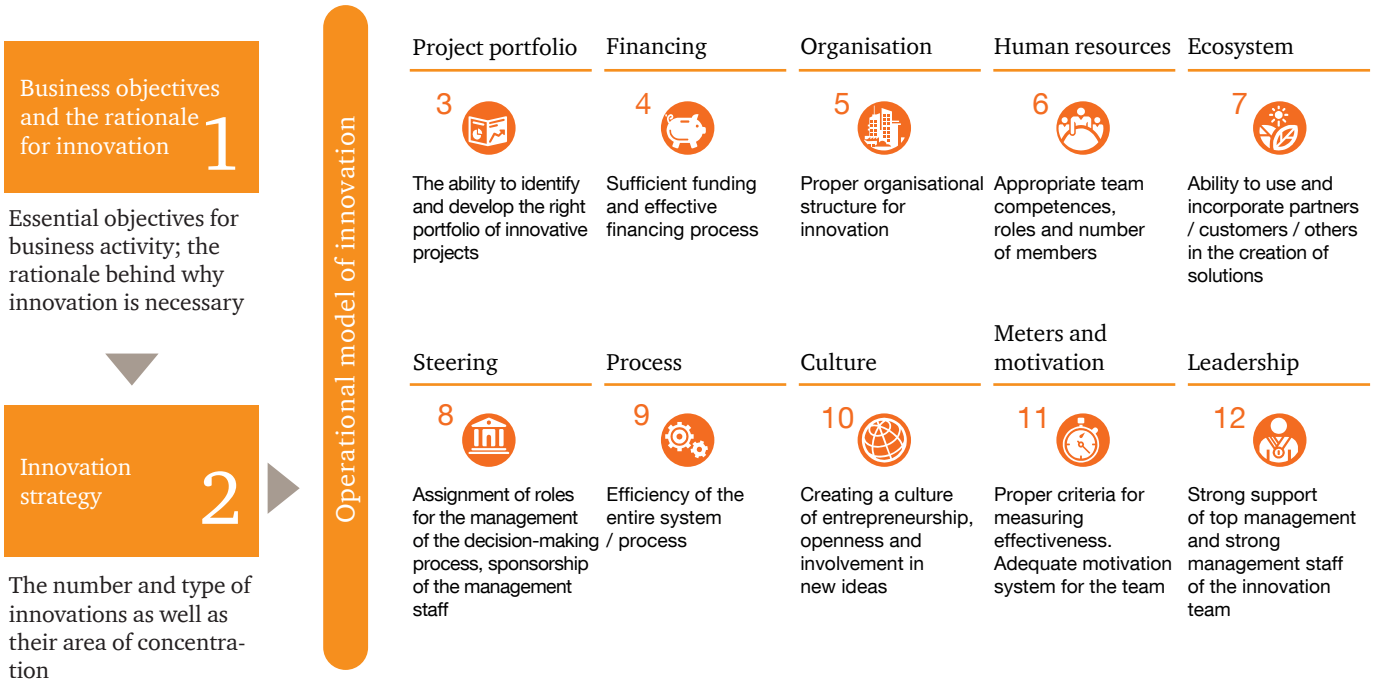
Source: PwC analysis

To achieve success in innovation, a company must go through a profound change

Similarly to any other business strategy, an innovation strategy requires 10-20% of the work. But real success can be achieved only with the 80-90% of work and effort that is directed at designing and implementing a full operational model of innovation that supports the defined strategy.

To achieve success, the company must be equipped with essential elements regarding a number of areas, starting from project portfolio, through processes and organisation, to ecosystems of co-operation with its surroundings.

Essential elements of the operational model of innovation

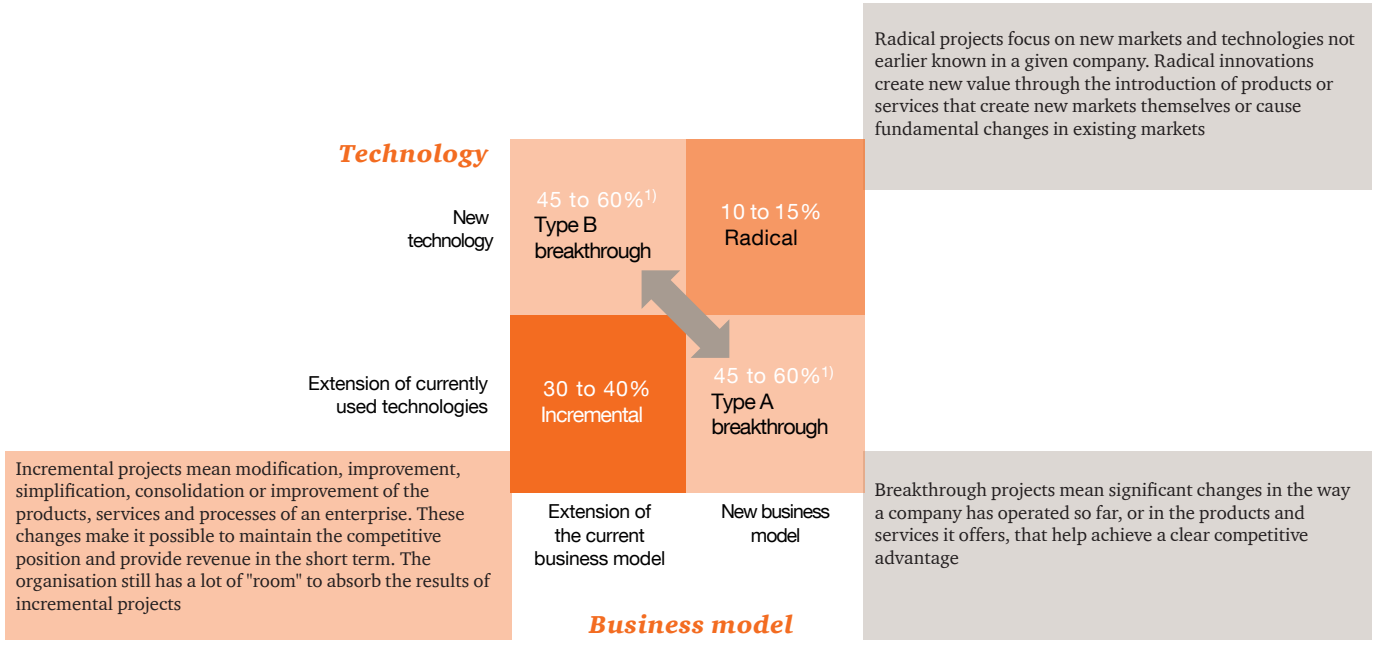


Source: PwC analysis

One important thing, for instance, is to establish an appropriately balanced portfolio of innovation projects, as well as to define the projects and the project management processes. For the capital expenditure allocated to innovations to be effective, it is necessary to specify the ambition level and the risk acceptable for the company. For example, focusing all actions on incremental projects (current technologies and business models) will not meet the challenges that energy companies are facing. A significant part of the projects must have a disruptive, even radical, profile compared with the current activity of other companies.

Not only the structure of the portfolio, but also the processes of steering and managing it are of key importance. They must balance the project risks, budget, and the forecast commercialisation period. The process of managing the life-cycle of projects should take into account the proper decision gates and the control structure of the project portfolio. Finally, what is necessary is a well thought-through commercialisation strategy, which should provide real profits from innovations (through product manufacturing, sale of intellectual property rights, IPOs of start-ups, etc.).

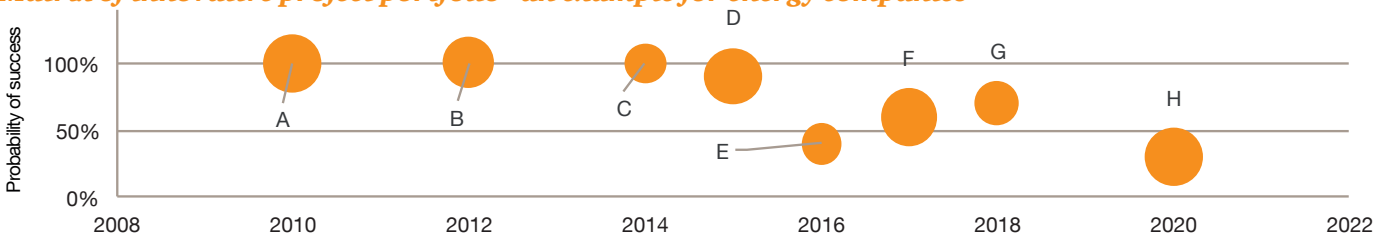
Matrix of innovative project portfolio - an example for energy companies



1) Percentage share split between Type A and Type B breakthrough projects

Source: PwC analysis

Matrix of innovative project portfolio - an example for energy companies



Source: PwC analysis

Key elements of managing innovative project portfolio

- Effective methods of ranking and valuation of research projects
- Risk portfolio assessment and management
- Steering Committee, possibly a gatekeeper
- Decision gates and KPIs
- Integration with internal reporting systems
- Budgeting and controlling of the R&D functions
- Ongoing co-operation with external and internal stakeholders: marketing, sales, etc.

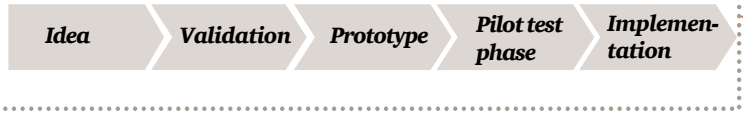
A properly selected model of project portfolio management

- Helps achieve a balanced portfolio
- Enables holistic management of the portfolios of current products and research projects
- Helps maximise expected monetary value
- Allows you to allocate the R&D budget to the most promising projects
- Enables effective portfolio risk management

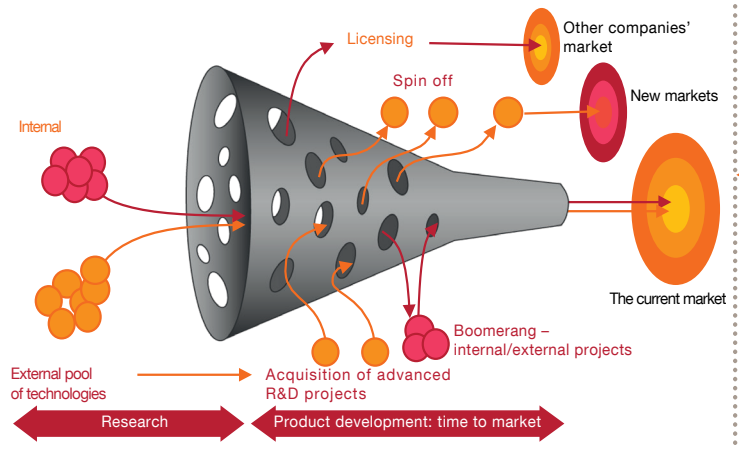
Source: PwC analysis

The process of managing innovative projects and project portfolios

The process of managing innovative projects



Management model of innovative project portfolio



Efficient and structured management of the innovation value chain allows you to build a competitive advantage.

Its key elements are:

- structured process
- tools for project portfolio management

A well-designed system provides a road map for the project manager. In addition, it supports decision-making and management of the project portfolio as well as accelerates the market launch of technologies.

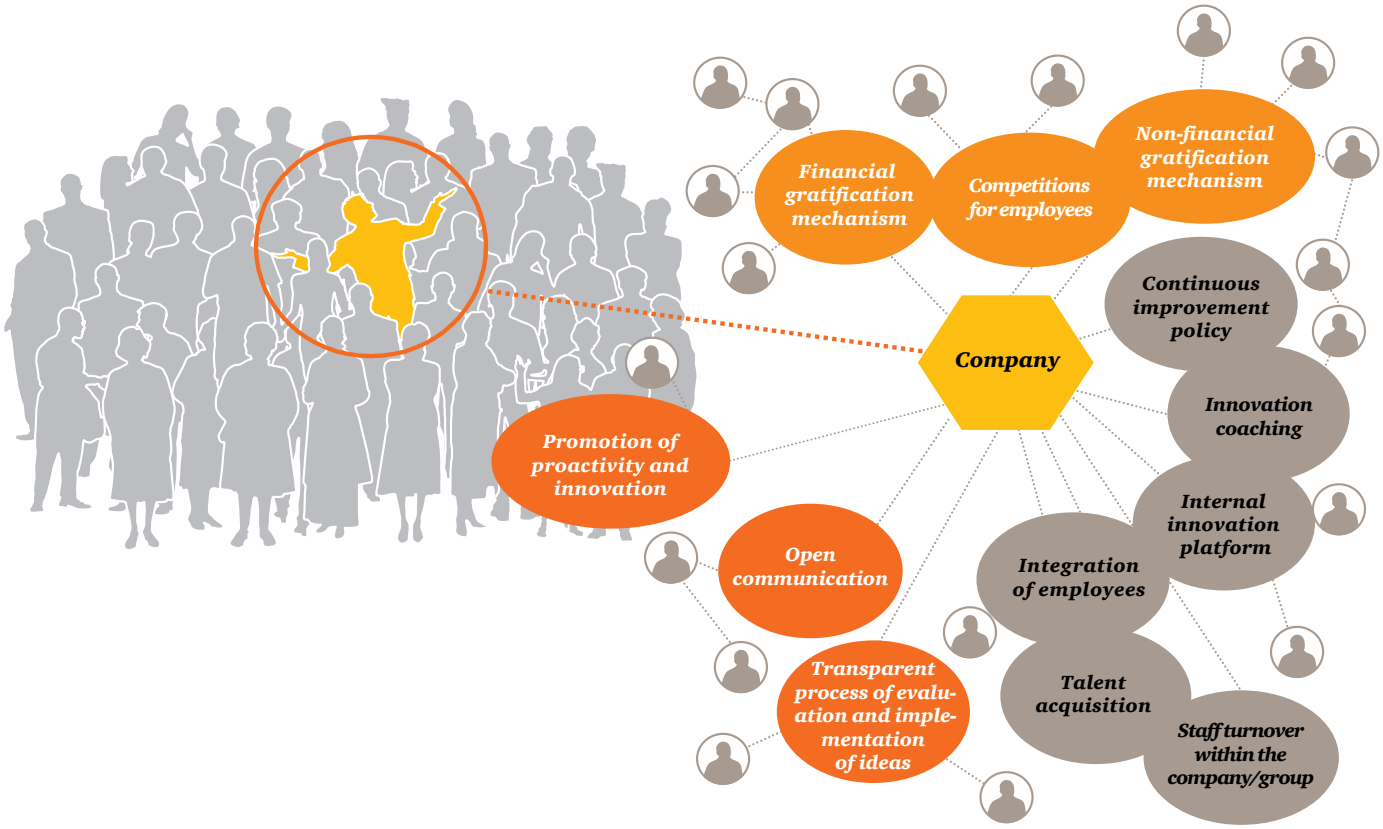
Source: PwC analysis

Still, even the best-designed project portfolio and project management process will not work without proper organisation, human resources, competence and motivation. The following become essential:

- creation of new organisational structures,
- attracting or training completely new employee competences (skills of managing and participating in innovative projects),
- managing investment in research and development,
- effective co-operation with start-ups,
- implementation of a change in the organisational culture so that it will promote innovation(unfortunately, many organisations, also in the energy sector, are afraid of misguided projects and innovators, which kills motivation),
- an incentive system which supports this kind of culture and actually encourages B+R+I actions, according to the company's risk appetite.

It is also critical to ensure proper leadership for the entire organisation at the top management level.

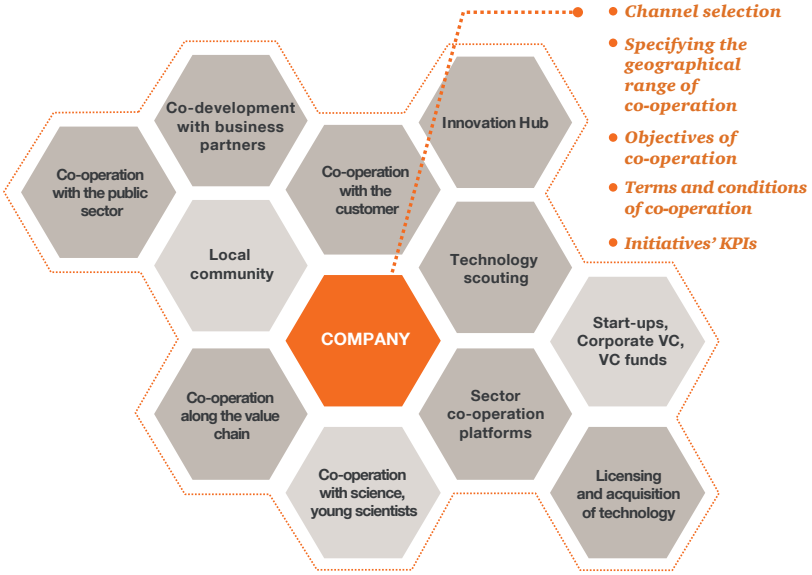
Examples of elements included in the innovative organisation model



Source: PwC analysis

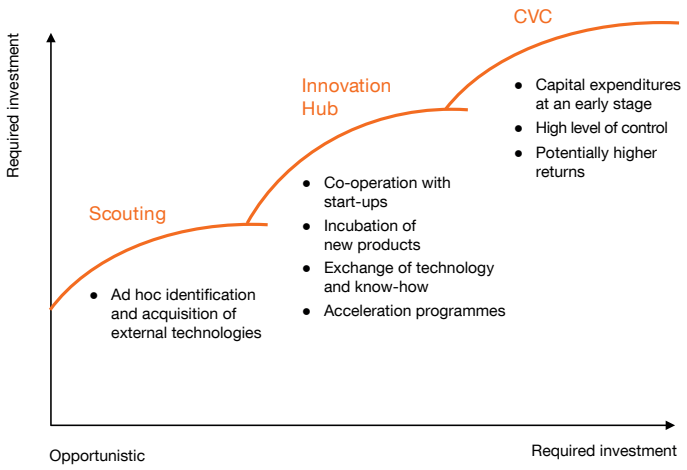
Finally, it is necessary to determine the degree of using the so-called open innovation model – an ecosystem of partners, as well as the methods and goals of working with them. Key elements of open co-operation with outside entities include: with whom, where and through what channels are we going to conduct our research and development projects? What goals should our partners achieve? Are we talking about research institutes or young scientists, start-ups, CVC/VC funds, innovation hubs, etc.? What will the value proposition of our company be for these channels – what can we offer to our partners to attract and keep the best ones? According to what rules and conditions should we work with others?

Elements of an ecosystem of open innovation



Source: PwC analysis

Models for co-operation with start-ups



Source: PwC analysis

The implementation of an effective model of innovation makes it possible to turn innovations into profit centres

The implementation of a complete model of innovation brings many beneficial effects for energy companies. Multiple profits come, first of all, from opening innovation activity to external entities. In the open innovation model, often used by the most innovative organisations, benefits are not only economic in nature, but they provide an advantage on the market, as well as with regard to organisation and technology.

Only the implementation of a complete model of innovation makes it possible to turn innovations into profit centres. According to profitability of investing in research and development, a study conducted jointly by NCBR and PwC, the most innovative companies identify new areas of growth at a much faster pace than others. This enables them to increase their sales twice as fast as the average and three times faster than the least innovative entities. This increase is vital for an industry under such great pressure as the energy sector, to maintain its competitive advantage and profitability growth.

The benefits of comprehensive development and implementation of the open innovation model:

Economic benefits

- Shorter period of commercialisation
- Faster response to potential threats in the project
- Helps reduce research costs by sharing them with partners
- Access to external financing

Market benefits

- Acquisition of new customers / markets
- Identifying / increasing export opportunities
- Raising the company's prestige
- Increasing competitiveness
- R & D alliances make it possible to increase market shares and allow the creation of barriers to entry

Technological benefits

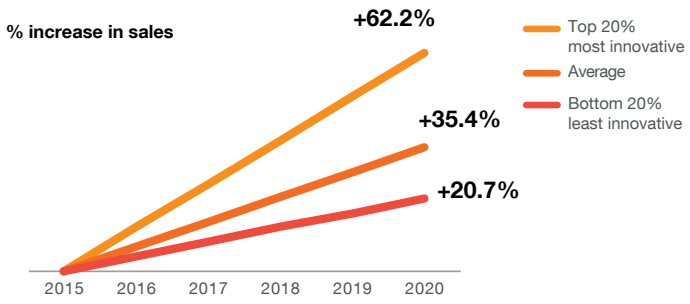
- Higher quality of products / services
- Access to the latest knowledge / know-how
- The opportunity to implement innovative solutions
- Being up to date with the latest knowledge
- Reducing the risk of R&D projects

Organisational benefits

- Transfer of skills
- Development of external relations
- Flexible approach to R&D

Source: PwC analysis

Expected sales growth in 2015-2020, depending on the level of innovation in a company



Source: PwC analysis

Temptation 5
The more products offered to the customer, the better

What is the temptation to maximally expand the product range about?

The temptation is reflected in the desire of energy companies to maximally expand their product ranges to include offerings from other industries.

Where does the temptation come from?

Higher customer awareness and greater competition on the mass energy market have led to a significant increase in customer migration. From the perspective of energy companies, it is necessary to find a new competitive advantage that will stop the loss of customers and help acquire new ones, while maintaining profitability. This is why many energy companies focus on the optimisation of customer service and acquisition costs through a maximum expansion of the product range to include „simple" products from other markets.

Should we give in to the temptation?

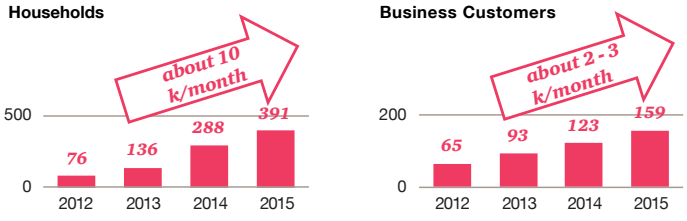
An energy company's value proposal for its customers should be adapted to their expectations and the value they represent for the enterprise. A wide range of uncomplicated products can be a good solution when addressed to a particular group of customers. However, it should be borne in mind that this does not guarantee a sustainable competitive advantage.

Dynamic migrations of customers create pressure for active strengthening of loyalty

The rate of customer migration on the Polish energy market is constantly growing. Currently, about 0.7-1 % of households and 2% of business customers[6] change their energy supplier every year. Taking into account the trends on Western markets (the UK sees migration of about 10% of the customer base annually), this rate should increase in the coming years, as a result of growing customer awareness and market entry by companies focused on active customer acquisition.

New players are expanding their product ranges in order to optimise the costs of customer service and acquisition, at the same time spurring companies that have been on the market for years to follow this trend. Consequently, in recent years the Polish market has witnessed dynamic development of product ranges in the energy sector, including elements from other industries, such as financial services and telecommunications.

Number of changes of the electricity supplier in Poland - incremental (in thousands)



Source: PwC analysis based on data from URE (Energy Regulatory Office)

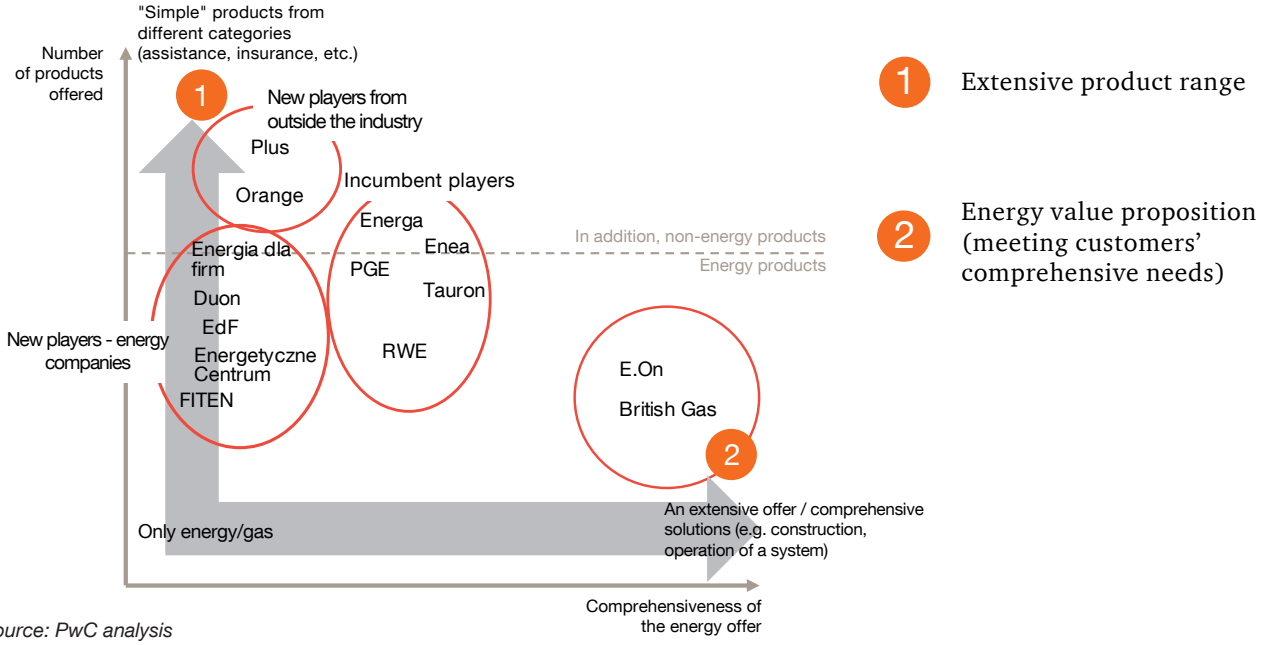
6. GUS data

Energy companies' search for identity in the new reality - possible development directions

In the face of energy market liberalisation and increased customer migration, two main models of product range development can be observed:

1. Product range expanded to include unsophisticated products
2. „Energy value proposition"

Models of product development on the energy market



Source: PwC analysis

1. Product range expanded to include unsophisticated products

Energy companies are trying to maximally expand their product ranges to include elements from other industries. The main objective is to optimise the costs of customer service and acquisition, which is especially important for new players who have not developed the scale of their operations. At the same time, because the incumbent players on the energy market have a very large customer base, cross-selling may be a growth strategy. This is the prevailing trend on the Polish market: the range of services offered by both new and incumbent players is constantly evolving. Besides energy, additional products include financial, telecommunication, medical and legal services.

2. Energy value proposition

This direction of development emphasises providing customers with comprehensive solutions that meet their energy needs. Energy companies are transforming into specialists in the area of energy supply and management; therefore, they are expanding their product range in these areas.

The energy the company supplies is only one of many elements of the value proposition offered to the customer. Energy companies are developing products based on customer needs, not only their historical product. In Poland, companies try to expand their product ranges to include energy-related services, such as efficiency audits. However, their scope is limited and they cannot be called comprehensive offerings.

Nevertheless, there are examples of foreign energy groups, such as British Gas, which have developed a wide range of services supporting the customer in energy management. The company offers a comprehensive package of solutions to secure the customer's energy needs, such as heating the house. This package includes sale of a solution (a heating system), installation and support in operation/ modernisation, as well as an insurance package.

Simple products do not provide a sustainable competitive advantage

Both development strategies come with benefits and costs affecting their attractiveness for the energy company:

Strategic assessment of the two main directions of product development on the energy market

Business parameter	1 Extensive product range	2 Energy value proposition
Sustainable competitive advantage		
Use of energy resources		
Optimisation of customer service and acquisition costs		
Limited short-term business risks		

Source: PwC analysis

Expanding the range to include unsophisticated products has a number of benefits. However, they are largely short-term ones. The business risk of this development strategy is smaller, as it does not require significant capital, and a considerable part of the risk is transferred to the partners, who know the specific characteristics of the service being offered. However, this path of development limits the ability to build a long-term competitive advantage. Energy companies do not develop services around their strategic competences – energy resources – but instead try to optimise costs.

Potentially, such a strategy may support the strengthening of customer loyalty in a relatively immature market. However, the products supplied by other industries may turn out to be more complicated than the fragmented services offered by energy suppliers. If a customer of an energy company values these products (hard to develop for such companies) more than energy (relatively easy to add to the product range of companies from outside the energy industry), they may switch to the competition in the long run.

The expansion of a product range can be profitable, of course provided it is addressed to a select group of customers, for example, low-margin customers who are prone to leave. In their case, the optimisation of the costs of customer service and acquisition is the most important. In addition, the risk of losing customers from this group – as their data are shared with a partner who could become a competitor, in the medium term – will not have such severe effects as in the case of high-margin customers.

Nonetheless, this strategy requires the development of a number of tools. First of all, advanced customer segmentation and identification of their preferences is needed. Secondly, co-operation with partners and a wide product portfolio require proper pricing strategies and management of margin distribution.

Another option is the creation of an energy value proposition focused on providing a solution to meet energy needs. This has a potentially higher business risk, but gives the company the opportunity to use its energy competences, as well as the available technical resources and expertise. These elements are difficult to copy and can provide a sustainable competitive advantage for an energy company.

The analysis shows that in the short term, the development of a product range can be an attractive direction of development, as it limits business risk and brings results quite quickly. However, in the long term it is necessary to build a sustainable competitive advantage.

Does the market give a chance for the development of an energy value proposition?

An energy value proposition means providing customers with a full package of solutions that meet their energy needs, such as home heating or providing power supply for equipment. This package is made up of a value chain, from the sale of the best solution, e.g. energy/installation/source of energy, through its implementation (installation of equipment, operation, etc.) to management.

Examples of comprehensive value proposition in the energy sector

	Elements of the value chain				
Customer's need	***Sales***	***Designing***	***Financing projects***	***Implementation and maintenance of installations, energy sources***	***Power management***
"Home heating"	Offer for comprehensive heat solutions (district heating, electricity, gas boilers, coal boilers, renewable energy sources)	Selection and design of solutions tailored to customer's needs	Support in the financing, acquisition of a partner, help with formalities, etc..	Supply of a heat source, fuels (e.g. gas, coal) Installation, maintenance, renovations, inspections, repairs	Solutions for consumption management, optimisation, control, efficiency, etc.
„Power for devices"	Offer for comprehensive electricity supply solutions, renewable energy sources	Selection and design of solutions tailored to customer's needs and preferences, e.g. eco-friendly attitude	Support in the financing, acquisition of a partner, help with formalities, etc.	Supply of an electricity, e.g. photovoltaics Maintenance, renovations, inspections, repairs	Solutions for consumption management, optimisation, control, efficiency, etc.

Source: PwC analysis

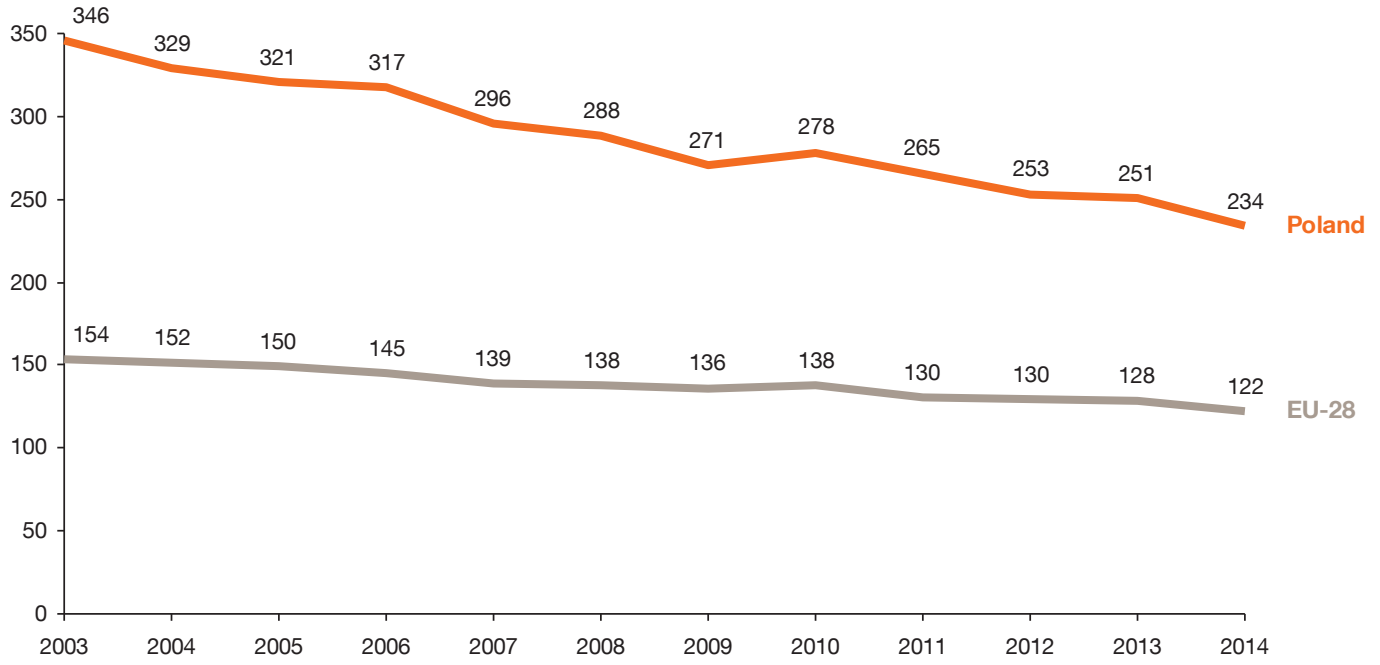
Development of an energy value proposition is more complicated than cross-selling of additional simple products. The decision to expand comprehensive services, often technical ones, entails a number of investment costs, staff training and risk. For this reason, it is necessary to build an appropriate scale of operations or an appropriate business model, so that costs can be covered. However, there are many signs that market conditions support the construction of such a value proposition.

A good example is support in the management of an individual heat source. In Poland, approximately 60% of customers in cities and 4% in the countryside[7] use district heating, although the vast majority rely on individual sources. The spectrum of potential solutions is very wide, so professional help from an energy company may be desirable. The company may provide services related to the sale, installation, and operation (e.g. fuel supply) of such a source.

In addition, because the Polish economy remains more energy-intensive than Western economies, there is high potential for improvement of efficiency, which can be supported by the services of energy companies in the area of energy management.

7. GUS data

Energy intensity of the GDP in Poland and the EU -28 (kgoe per 1000 EUR)[1]



1) Prices in 2010

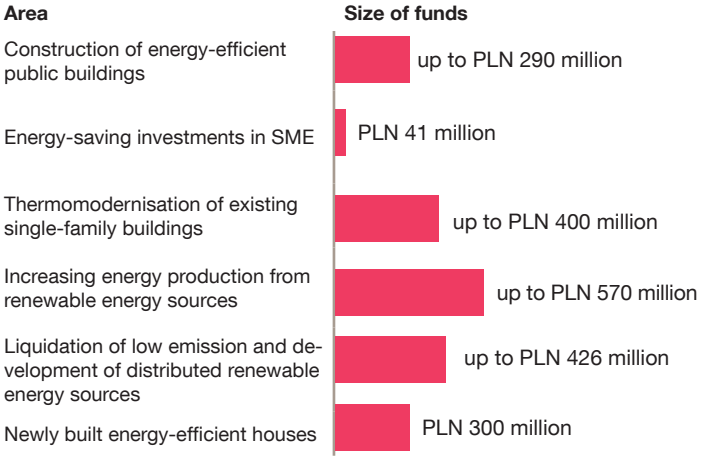
Source: PwC analysis based on data from Eurostat

In addition, changing customer awareness, an eco-friendly attitude as well as the development of support programmes for efficiency measures (funds from NFOŚiGW- the National Fund for Environmental Protection and Water Management) provide an opportunity for complex technical services to develop in this area.

Of course, the development of a profitable business model may require setting up a partnership, at least in areas where the presence of a local company is important (e.g. the maintenance of installations). However, observation of market conditions indicates that from the perspective of general market potential, the desired scale of operations to develop an energy value proposition is possible.

To sum up, from the perspective of customers' potential as well as the supporting tools, the market provides the opportunity to develop complex technical services that create value and are part of an energy value proposition. This is an opportunity for energy companies to gain a sustainable competitive advantage.

NFOŚiGW (the National Fund for Environmental Protection and Water Management) – budget of selected 2015-2020 programmes



Source: PwC analysis based on data from NFOŚiGW

Temptation 6
We have to be digital

What is the temptation of having to be digital about?

We can look at the temptation to be digital from two sides. One is the more superficial desire to be perceived by consumers as a leader in new technologies. The other is the more pragmatic side, namely the desire to focus the organisation on increasing its effectiveness, in its broadest sense, through the use of new technologies, and as a consequence, to achieve positive financial results.

Where does the temptation come from?

Digitisation is a global trend perceived as revolutionary. Business organisations see in it an opportunity for growth, as with other economic revolutions in the past. Thus, the largest companies put digital transformation on their agendas in the context of improving efficiency and building competitive advantage. In the 2015 annual survey of the CEOs of the largest companies in the world, 81% of respondents admitted that technological development is the biggest challenge, and thus an opportunity, for their businesses. In this year's survey, the number increased to 90% [8].

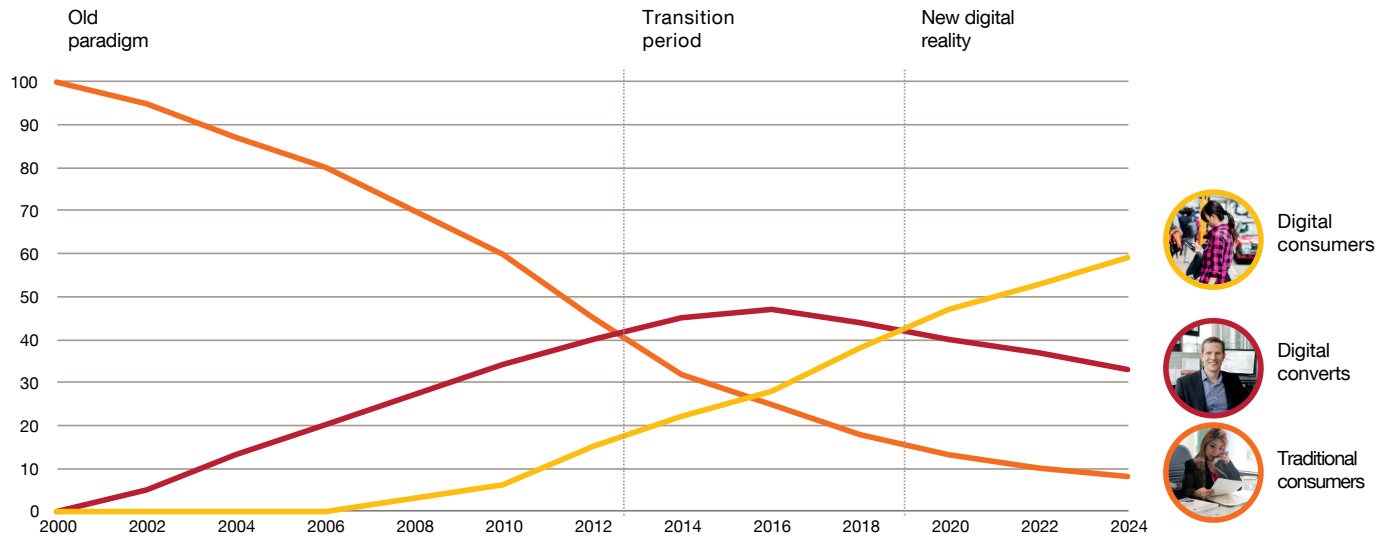
Should we give in to the temptation?

Digitisation is not a fashion, but a necessity. No one can ignore companies that in a short time have achieved unprecedented success and built their entire business model around technologies that disrupt the status quo of entire industries. Two-thirds of CEOs want to have a digital transformation strategy incorporated in their corporate strategies by the end of 2017.

All industries are yielding to the temptation of digitisation, counting on the resulting benefits. Today it is the number one topic in discussions about their development. Depending on its characteristics, every industry uses digitisation to a different degree. For companies from the energy sector, this is a great challenge. The industry has its own pace of changes, which puts it behind the leaders of digital maturity, i.e. banks, the media, consumer goods and telecommunications. It is connected with the historically specific character of the energy sector, which has always been a highly regulated market with high barriers to entry, and a supply side that was monopolised for many years. The specific character is enhanced by the natural lack of substitutes for such a product as generated electricity. Because of all this, the energy industry did not focus its activities on the customer. Digitisation, which is inscribed in the DNA of modern, digital consumers who will soon be the dominant group in the market, also affects the physical world of industry.

8. PwC CEO Survey 2015 and 2016

Digitisation of the consumer



Source: PwC analysis based on publicly available information and demographic data

Companies find themselves in various positions on the map of maturity in terms of their strategies in the era of digitisation. However, they are all aiming at sustainable development in this area.

The development of digital maturity on the example of large companies from different sectors

Digital maturity		Chemical sector	Energy, oil and gas	Agriculture	Automotive industry	Consumer goods	Electronics / IT
Full integration of digitisation into the business model in all business lines	**Leader of digitisation**						Google, Apple
Co-ordinated work on the development of new solutions and change of the business model through digitisation	**Horizontal co-operation**				Tesla	Walmart	Granta, Cisco
Central management and incubation	**Vertical integration**			Agco, John Deere, Wilmar	BMW, Audi	Nestle, P&G, Unilver	Samsung, LG, Philips
Central co-ordination of digitisation	**Digital novice**	DOW, Bayer	EdF, Shell, Engie, Chevron, BP	Cargill	GM, VW		
Decentralised, uncoordinated initiatives	**Below the novice level**	DSM, Du Pont, Sinopec					

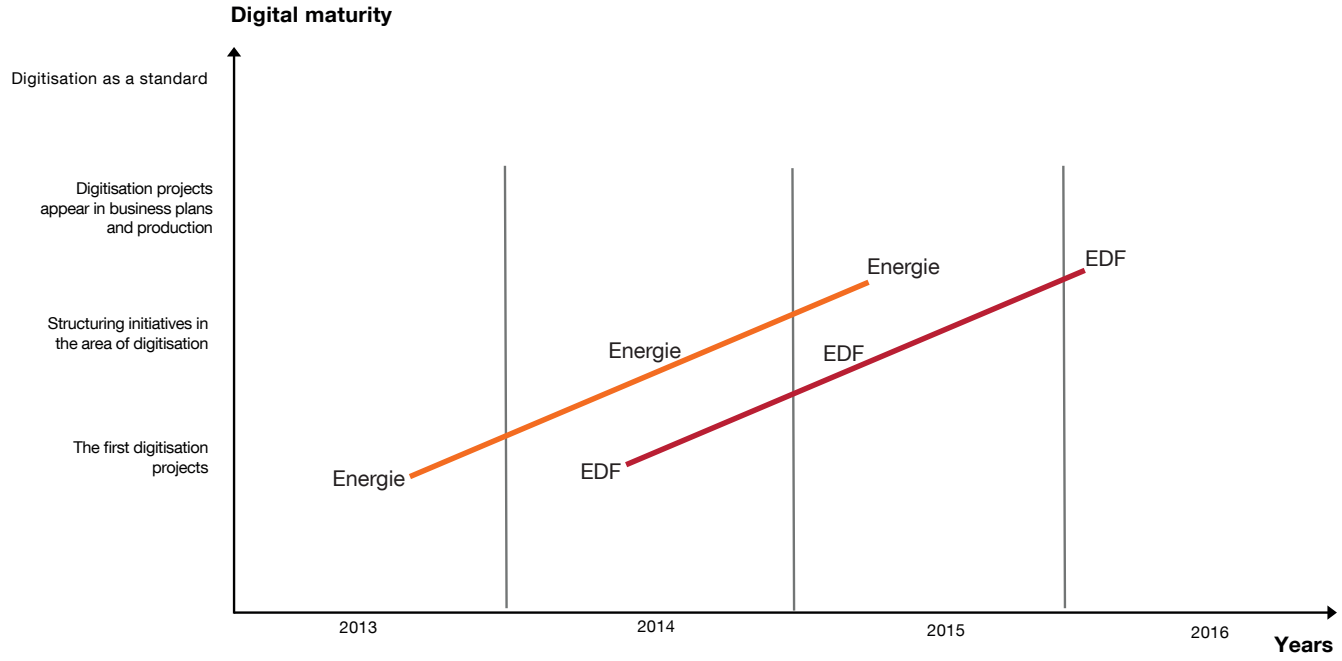
Poland's energy industry on the digitisation curve

Source: Analysis by PwC, Strategy&

IT integration and modernisation as key challenges

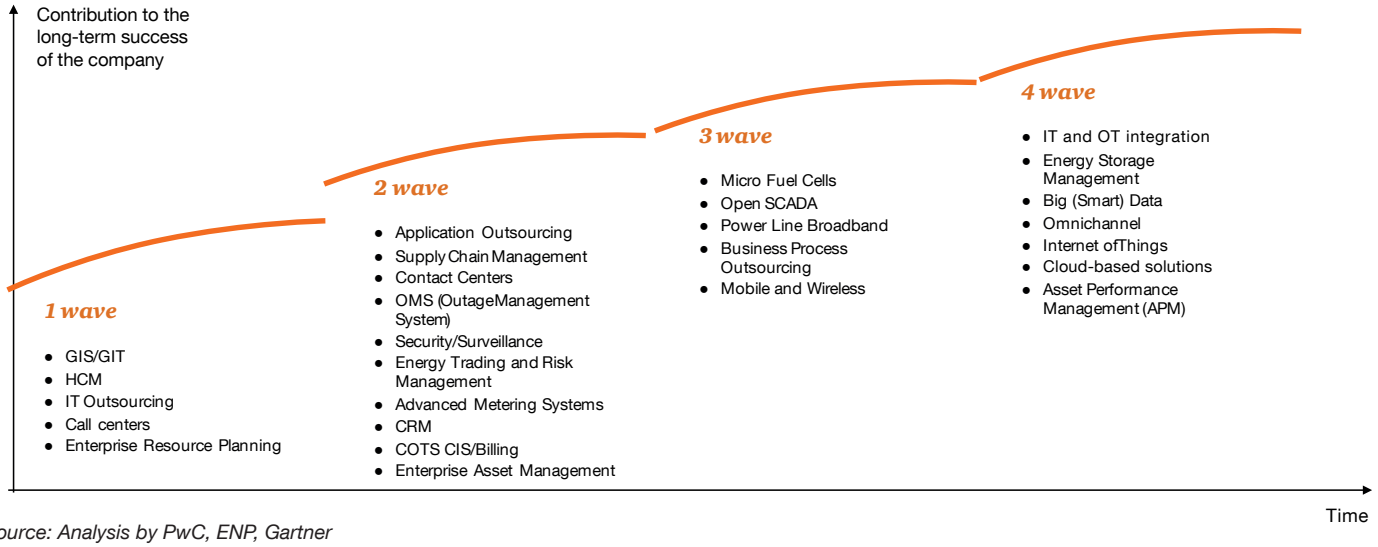
In Poland, digitisation has overlapped with the programme of technological modernisation of the Polish energy sector, whose turning point was the consolidation of the energy market at the beginning of the 21st century. The basis for this modernisation was the progressive liberalisation of the Polish energy market and the search for operational savings. It was very important to integrate multiple systems and technologies, making it possible to link business processes distributed across several units in a company.

The development of digital maturity on the example of companies from the energy sector



Source: Analysis by PwC, Strategy&

Waves of technological modernisation in the global energy sector that coincided with the consolidation of the domestic market



Source: Analysis by PwC, ENP, Gartner

Polish energy companies had to face many waves of modernisation in a short time, whereas the global energy sector could cope with them one at a time. In order to catch up in the technological race with the world's top energy organisations, Polish companies are modernising their technology environments through the implementation of new IT and industrial automation systems (OT - Operational Technology). The following are some of the solutions being implemented:

- Customer Information Systems (CIS), usually solutions that combine the functionalities of CRMs and customer billing systems,
- systems for the management of customer master data (MDM, EDM, etc.),
- Business Intelligence (BI) tools for advanced data analytics (Big Data, Smart Data),
- Content Management Systems most commonly used on the Internet,
- production management,
- asset monitoring and management of asset security (EAM - Enterprise Asset Management systems), which enable the servicing of devices used to predict faults (Predictive/Condition-Based Maintenance and Preventive Maintenance).

Construction of IT maturity and digital maturity should occur in parallel

Initiatives related to the implementation of new solutions often encounter problems and do not end with full success. For example, there are delays in the delivery of the business benefits of projects, deviations from the adopted budgets and a gap between the expectations of the business side and the solutions that are delivered.

The experience gathered during the first implementations quickly showed that IT departments are not always focused on generating business value, functioning as typical cost centres. Their activities focused on the selection of IT tasks and their prioritisation, resulting from existing opportunities, skills, organisational culture, implementation plans focused on effort (e.g. time and material), expenses concentrated on tasks that were relatively short-term and easy to perform, and aversion to risk and change, which results from the organisational culture.

The growing awareness of technologies on the business and IT side created a natural need to focus on the creation of value through technology. In particular, this means: choosing IT tasks and the prioritisation that results from business strategy and business priorities, emphasis on return on investment, receipt of business advantages, and expenses concentrated on work that brings business value regardless of the invested time and effort.

Despite the change that is occurring in the way of thinking about IT as a value creator, we still see some inefficiencies in the areas where it is applied. The key one is a lack of productivity at the interface between business and IT with regard to the rules for planning and implementing projects. Another important factor is the lack of a clear division of responsibilities and rules of IT and OT co-operation in the face of the emerging trend of integration of these areas, the lack of joint planning of road maps for the development of technologies by business and IT, and only partial use of investment budgets on technology.

Building digital maturity entails large implementation programmes consisting of highly dependent projects that change the business processes of entire organisations. Without strong co-operation between the technological and the business sides, and thus, without focusing the IT organisation on the fulfilment of the corporate strategy – for example, through the construction of a corporate architecture – going through digital transformation will be difficult.

Key success factors of IT organisations in the digital era

Success factors

1. Formulation of an IT strategy synchronised with the business strategy of an organisation followed by its supervised implementation. In particular, assigning responsibility for implementing particular elements, creating incentives for execution.
2. Proper communication within the technological departments (IT and OT interface) and with business, which can guarantee balanced implementation of initiatives that are beneficial for entire organisations.
3. Building competences in project management, new technologies and IT management, which will bring results in the context of the increasingly complex digital initiatives that the Polish energy sector is facing. At the same time, using methods appropriate to the technological environment for the implementation of projects.
4. Support from IT organisations in monitoring and responding to digitisation trends and new business models based on technology.

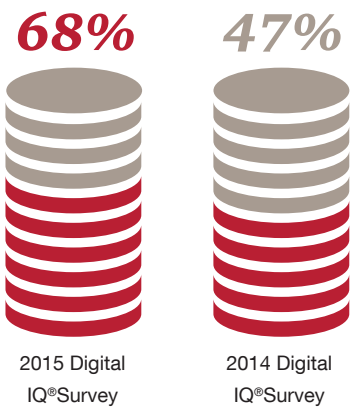
Source: PwC analysis

The Polish energy industry in a better position for further construction of digital maturity

Digitisation is a comprehensive approach to business change with the use of technology. This does not apply only to the implementations of new systems or popular slogans, such as Big Data or Customer Experience, as the changes are much more profound and include the use of technology in the operation of the entire enterprise: from core operations, management and security, to elements related to products and services - particularly in the area of the final customer. Being digital is the combination of two worlds: business and IT, with the goal of joint value building. This process has already begun.

According to PwC's Global Digital IQ Survey, technology is ceasing to be the domain of IT; almost 70% of spending on technology comes from outside IT budgets, and this trend is becoming stronger.

Spending on technology



Source: PwC analysis

What does this mean? Technology is permeating business, while IT organisations are becoming a key carrier of knowledge about state-of-the-art solutions, technologies and innovation. Collecting the requirements of all business lines and participating in the circulation of information about digital trends, IT departments are able to offer specific solutions that improve business metrics. At the same time, the role of business as a sponsor and responsible owner of solutions, not just the recipient, is being emphasized.

Thanks to the experience gained from large implementations, such as CIS systems, and optimisation of the operations of IT organisation, the Polish energy industry will be in a better position for further building of digital maturity. And the benefits of such maturity are significant.

The prospect of digitisation covers the entire value chain: from production, through transmission, distribution and sales, to the increasingly developing „behind the meter" area.

Digitisation in the energy value chain

The growth rate of the value begins to be much higher in the behind-the-meter segment

	Generation	Transmission and distribution	Wholesale and Retail	Meter	Behind-the-meter (BTM)
					*Distributed generation*  *Storage*  *Demand management*  *Electric cars*  *Energy management services*  *Services for the home* 
Value change drivers	• Changed role of energy companies - from producers to supply guarantors • Low utilisation of conventional power plants • Growth in priority renewable sources	• Necessary increase in grid's capacity	• Fierce price competition • Increase in customer churn • Development of energy services market and product range	• Development of AMI in order to optimise patterns of demand • New services based on data analytics	• Growing competition, greater influence of the consumer on the market • Maturing market of distributed generation, energy storage and e-cars technologies • Demand for consumption data • Demand for comprehensive services for the home • The emergence of local isolated island grids
	IT - technology as a carrier of values and innovation				
Technological value levers	• Real-time data monitoring • Dispatching centres monitoring sources' work • Acquisition of generation data and their use in other areas • Remote automation and Smart Data Management	• Smart Grids • Monitoring of assets - smart dashboard • Spatial analytics • GIS and the use of drones • 3D printing – used in grid maintenance	• Dynamic pricing • Customer Journey Mapping and Omnichannel	• AMI • Smart systems managing energy consumption	• Smart city • Internet of Things • The use of geolocation to provide additional services (e.g. assessment of the efficiency of photovoltaic panels) • Supply and demand management based on the entire range of variables

Source: Analysis by PwC, Strategy&

Over the next decade, as technology develops, an abrupt change may take place in some of the most important areas for the energy industry. Some examples of these trends include: the increasing importance of distributed generation, the falling cost of massive scale energy storage solutions, dynamic and safe microgrids, and omnipresent devices behind the meters of the grid. Customers will be looking for greater choice of products and services, a higher degree of co-operation and greater flexibility in their relations with energy companies. These trends are enhanced everywhere by the development of applications of a wide range of technologies: from the „Internet of Things" to drones.

These changes are leading to a transformation of the traditional business model of energy companies. Generally speaking, companies are moving away from strategies focused on assets to solutions concentrated more on the customer.

Technology	Use
Internet of Things	• Remote control of household appliances by energy suppliers that minimises the cost of electricity in households (savings for households and elimination of excessive power consumption in peak hours) • Offering energy tariffs that depend on remote control of household appliances
Drones	• Measurement of the surface of roofs and building facades in order to estimate the potential of photovoltaic cell installation
3D printing	• Printing of spare parts for home wind turbines or photovoltaic installations

Putting the customer first

In this new environment, energy companies have to change the way customers perceive them by becoming more active partners and providers of services and solutions, not just energy suppliers.

Customers' expectations continue to grow. Today it is vital to offer increasingly improved and personalised services that truly help customers in their daily life and increase their loyalty. What is very important is access to services and their providers anywhere, anytime and from any type of devices, in particular mobile devices.

Energy companies' customers expect a similar quality of service as they experience in industries where customers and the battle for customers are vital for the development of enterprises. Therefore, the energy sector should - and increasingly does - treat customers as assets that are just as important as power plants or distribution grids.

Temptation 7
We have already integrated our group

What is the temptation to halt the process of deepening the integration of energy groups about?

The largest Polish energy companies operate in groups that are vertically integrated. They have been conducting the process of integration for years. This temptation is related to a lack of follow-up on integration, attributable to the feeling that the process has been completed.

Where does the temptation come from?

Integration processes are highly complex and need deep involvement of organisational resources for their implementation. At the same time, as a result of the actions taken, many energy companies managed to design and implement a model of relations between the „headquarters" and portfolio companies. From this perspective, company headquarters - the creators of changes - may decide that the integration process has already been completed.

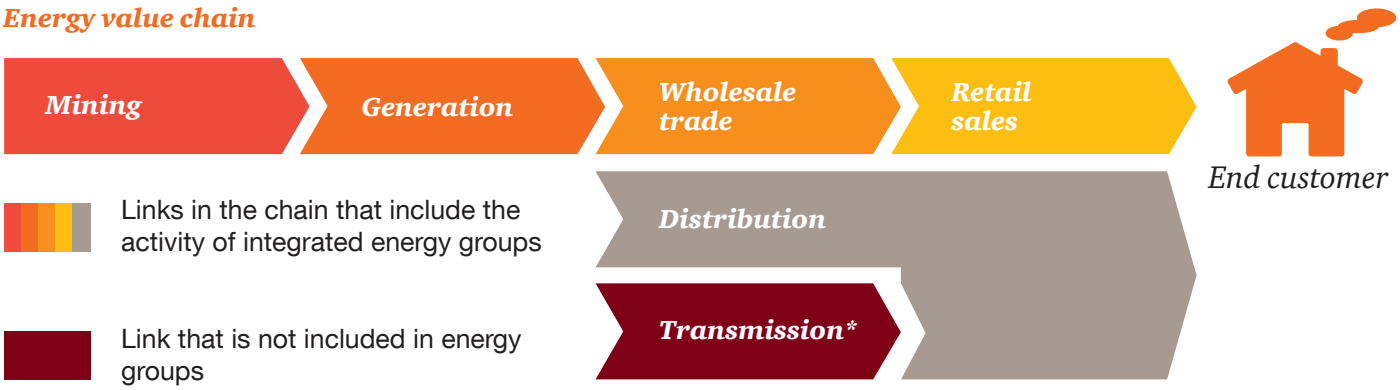
Should we give in to the temptation?

It should be noted that the core of integration is effective co-operation at the operational level, between the portfolio companies, resulting in improved efficiency of the whole group. Consequently, failure to continue the integration processes may result in a group losing its competitive position. Maintaining the current approach, consisting of the perception of the integration process through the prism of headquarters-portfolio companies relations, will strengthen the holding structures and centralised management, and thus result in the construction of silos at the operational level within individual units and business lines. The focus will be on the topics of reporting, controlling and strategy instead of operations. And it is co-operation at the operational level, if managed and coordinated effectively, that has the potential to build advantages, improve efficiency and implement real integration.

The Polish integration perspective

The biggest Polish energy companies operate as vertically integrated entities. Their scope of operations includes the entire value chain: from mining to sales to the end customer.

Energy value chain



* Transmission activity is carried out exclusively by an independent entity: PSE S.A.

Source: PwC analysis

Because the process of building vertically integrated energy companies began in 2005, the enterprises have developed a business model in which one of the basic assumptions was integration of operations. In principle, integration processes were carried out since the energy companies were founded. They concerned mainly:

- ordering the capital and ownership structures; energy enterprises reorganised groups of companies to achieve a standardised corporate model and to build companies or groups of companies responsible for individual business areas, which often included fundamental changes in the internal organisation of the new entities,
- building a corporate model for relations between the headquarters and subsidiaries, which usually involved the areas necessary from the perspective of ownership supervision and control of operations.

The first step is already behind us

As a result of the actions already taken, the foundations for a uniform model of groups of companies has been developed. The consequence of such an integration is that key decisions, from the perspective of the group, are taken or controlled by collective bodies in which the headquarters have the leading role. An example of such an integrated area are investment tasks. Most companies have implemented a solution based on the concept of an investment committee, which may include representatives of various companies (business lines). The body prepares a final recommendation for the management board regarding investment decisions. Meanwhile, the portfolio companies prepare all analyses and documents necessary to issue such a recommendation.

At the same time, the companies implemented solutions for management, reporting and communication between the headquarters and the portfolio companies, particularly in the area of finance (budgeting, controlling), reporting, communication and marketing, procurement, etc. These solutions are based on intragroup procedures governing duties and responsibilities, and the rules of co-operation.

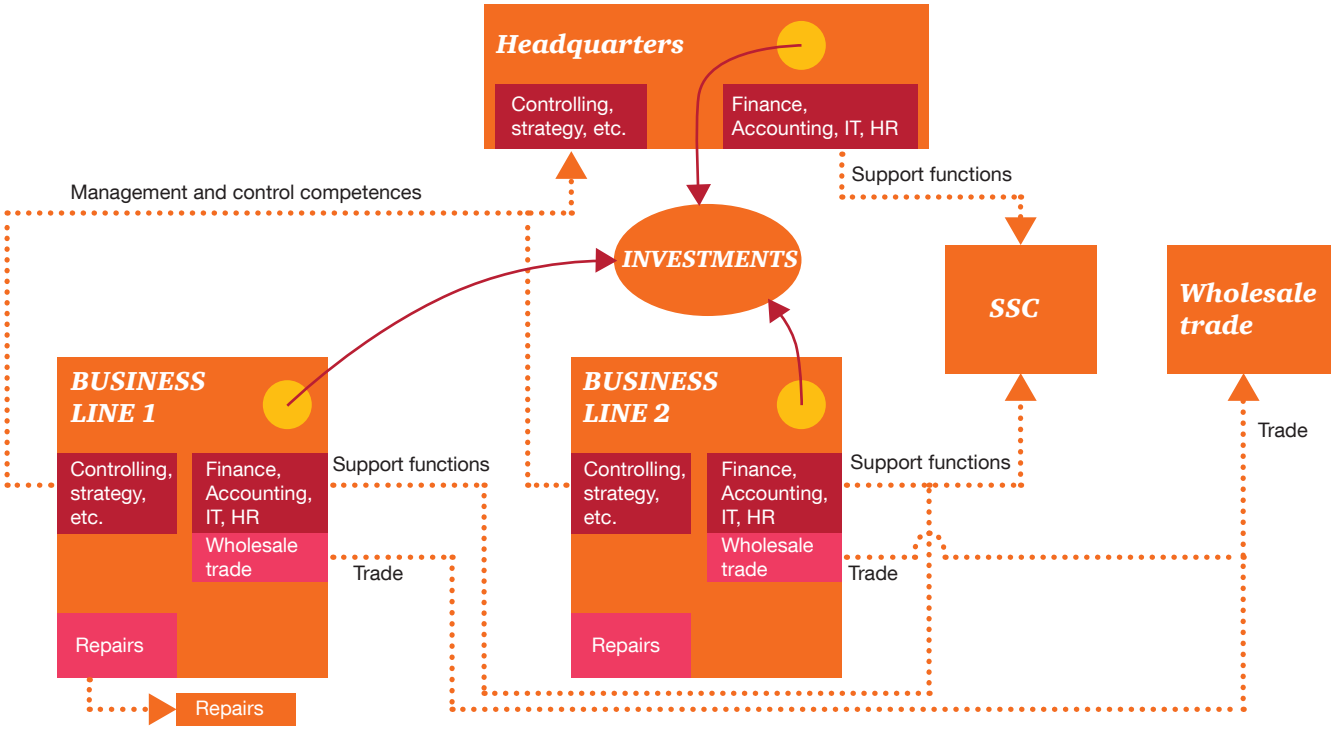
In energy groups, the processes of integration took place along with activities aimed at creating shared services centres (SSCs) both within the existing entities and as separate companies.

As a general rule, SSCs concentrate the tasks and responsibilities from the area of finance and accounting, HR and payroll, IT, as well as customer service. The creation of SSCs contributed to/motivated optimisation and pro-efficiency measures connected to economies of scale.

Wholesale trade was another area subject to integration. All national energy companies implemented organisational solutions based on a single point of contact with the electricity market. The contracting of generation sources, servicing key customers and provision of electricity for retail sales structures are carried out within a single organisation.

Within the operating area, some groups have taken measures related to the integration and separation of the maintenance staff. Before, such actions were carried out primarily within particular business lines. They did not necessarily include the maintenance service in the whole group (e.g. the services supporting mining, energy production and distribution). The following were named as arguments supporting this approach: the specific character of a given business line, the uniqueness of the present or required competences, and consequently the lack of potential synergies.

Energy group integration model



Source: Analysis by PwC

Certainly, the above measures support the concept of integration based on centralisation, and this is where energy groups expected benefits, primarily resulting from the economies of scale. In addition, the purpose of these measures was the implementation of effective control tools, management capabilities, and influence on the direction of development from the perspective of the headquarters. A less important aim was to release the synergies connected to the ownership of the entire value chain by an energy group. For this to happen, integration at the operational level is necessary. As a result of such integration, it is possible to manage the group and the margin achieved by it from the perspective of the entire value chain.

Management along the value chain

On the one hand, changes in the energy market and in its immediate surroundings cause a fall in energy prices, and energy groups are seeing their margins narrow. On the other hand, however, companies have to face a number of investment challenges related to rebuilding the production, distribution, and mining assets they hold. This translates into increased pressure on the operational efficiency of the energy groups, where an opportunity for an improvement of the economic situation and competitive position is rightly observed.

The first steps taken in order to improve efficiency were reviews of the business models of companies and a clear division of business lines between cost centres and profit centres. This served as the basis for the development of assumptions and courses of action aimed at improved efficiency.

The optimisation programmes currently under way are being implemented mainly in two aspects:

- the above-mentioned process of centralisation, concerning mainly the management and support roles, and
- pro-efficiency programmes implemented within individual business lines.

The basis for the optimisation measures was the belief about the existence of many simple reserves within individual business lines, whose release would help reduce the operating costs. Efficiency improvement programmes were aimed at lowering operating costs and often related, first of all, to reduction of employment. Additionally, these programmes were linked to the cost objectives imposed on the management of business lines (of portfolio companies) that saw the reduction of employment as the simplest method to meet these objectives.

These measures produced results in the area of costs. However, in parallel to the improvement of financial parameters, they strengthened the internal organisational silos that had been set up over the company's history. Consequently, the integration measures, despite providing efficient communication and co-operation between the headquarters and the portfolio companies, in practice worked against collaboration initiatives between individual business lines. They led to the perception of the integration process through the prism of relations with headquarters and the efforts of the portfolio companies to maintain the status quo in other areas (not subject to centralisation).

The practices of the energy groups that we have observed show that in principle, no integration programmes with the aim to improve the effectiveness of co-operation between individual portfolio companies or business lines are carried out. Such initiatives should concern primarily current operational issues, daily co-operation between business lines, the use of shared resources, etc. This results from the fact that the basis of operation in energy groups are internal operational processes that have been in place for many years and which are closed within a single business line, and sometimes even within one company from a given business line. So far, only limited measures have been taken that are aimed at horizontal integration of business processes and rules of operation.

Management along the value chain involves the optimisation of horizontal business processes. On the one hand, they do not engage the headquarters of energy groups; on the other, they have a large impact on their results. Usually, these processes are left without any special supervision by the parent company, as they are associated with very „technical" aspects of operations. Such processes include:

Planning the supply of energy and related products

This process is, in principle, centralised and managed horizontally across all energy groups. Typically the wholesale trade division, as the only point of contact with the market, has the leading role in the preparation of plans. Plans for electricity and related products are prepared based on market expectations regarding market growth, concluded trade contracts (for the wholesale and retail markets), and the demand for energy to cover grid losses expressed by the distribution segment.

Practice shows that even though the process of planning the supply of electricity and related products seems correctly implemented in organisations, it still does not cover all the key elements of the collaboration between business lines. In verifying the integration status of this process, it is worth considering the answers to the following questions:

- is the process of production planning able to determine the schedule of maintenance and repair work? The repair works submitted to the TSO may be postponed only in exceptional cases. This usually happens for reasons connected with the stability of the KSE (the Polish Power System). In contrast, minor repair and maintenance works can be optimised from the perspective of the market situation. A properly implemented and integrated planning process should provide the wholesale trade role with the opportunity to impact the schedules of minor repair and maintenance works in order to take maximum advantage of the market situation.
- does the process of planning the supply of energy and related products cover issues connected to the optimisation of fuel logistics and fuel inventory? One of the elements that should be taken into account in the planning process is the aspect of fuel supply, in particular, the issue of contracting and delivery of fuels as well as fuel inventories stored both in the mines and at the generation units. Our observations indicate that special attention is usually given to the stability of fuel supply. Of secondary importance is the optimisation of the logistics and storage processes, and their cost. A properly integrated planning process should allow optimisation of purchase volumes, delivery schedules, and inventories, also from the perspective of their costs.
- does the system of monitoring the implementation of the plan in terms of finances allow tracking the value added by each link of the value chain? Usually, the controlling systems monitor the activities of individual business units. In the case of a horizontal approach, they should allow for ongoing monitoring of the value added by each link, so that better and more efficient planning, verification of market opportunities and the potential for operational optimisation, among other things, will be better and more efficient. The design of the planning system should guarantee regular updates of plans and make sure that the plans include the actual performance in both the technical and, or perhaps above all, in the financial part.

Managing generation assets

The process of asset management is usually carried out separately by individual business lines, and its integration is limited to budget issues. It should be noted, however, that this process is one of the key operational processes that can be seen through the prism of the entire value chain. After successful horizontal integration, the process should be uniform and its scope should include all operating units of a given energy company. Integration of the asset management process allows outcomes including:

- full co-ordination of renovation plans between business lines. Of particular importance here is the interaction of the asset management process with the production planning process. At the same time, as part of the integrated asset management process, all renovation and investment undertakings are conducted in a way that minimises the total time of limited availability of assets,
- better use of technical, engineering, diagnostic, and supervisory competences within an organisation. In the integrated process of asset management, the technical competences of maintenance staff of all organisational units remain at the exclusive disposal of a single unit. This allows for optimisation of these competences between individual business lines, e.g. by increasing the number of maintenance tasks carried out by internal forces and by giving up one external services in this area,
- better use of in-house hardware, machinery and equipment. The equipment used so far by only one business line can be used by other business lines, possibly leading to optimisation of in-house machinery and equipment, as well as helping replace external services with internal ones,
- the ability to achieve economies of scale in the process of contracting repair services. Horizontal integration may be an additional impetus for further optimisation and integration of procurement processes in the asset area.

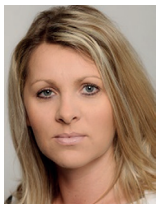
Efficiency measurement system (KPI) as a necessary condition for the implementation of the management model along the value chain

It is common market practice for integrated and mature energy companies to build a system of KPIs according to the division of roles and responsibilities of individual business lines within the group. For example, the role of wholesale trade is usually responsible for the result of the group, while the mining and generation sectors for fixed costs.

Regardless of the KPI system's architecture, the basic principle that guides mature energy company companies is allocation of such sets of indicators to individual business lines whose level the business lines can really affect. For example, the generation sectors are not responsible for the variable cost of production, or the group's result, but only for the level of fixed costs. In addition, the generation sector is usually responsible for the adequate availability of generating equipment, but the level of this KPI depends on the group's policy. The availability indicator in fact stands in conflict to the fixed costs KPI.

The efficiency measurement system adopted by an energy company can support or block management along the value chain. The indicators which should be the basis for assessing the efficiency of individual business lines should take into account the creation of added value for the energy group and promote co-operation under key horizontal processes implemented within the energy enterprise. Consequently, besides the standard set of cost, production, and other indicators, the basis of the system can be KPIs for the process of planning the supply of electricity and related products, the level of plan implementations, co-operation in the field of repairs (schedules), as well as the availability of production capacity taking into account the entire supply chain, etc.

Contacts



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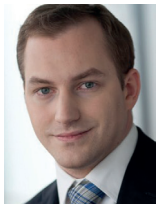

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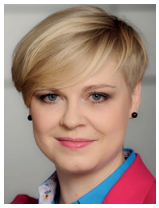

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