National Economic Chamber of Electronics and Telecommunication

Warsaw, January 7, 2014

Aims and objectives of the energy strategy elaborated by the Polish National Chamber of Electronics and Communication

Introduction

The energy strategy elaborated by the Polish National Chamber of Electronics and Communications (Polish: Krajowa Izba Gospodarcza Elektroniki i Telekomunikacji, KIGEiT) is a set of propositions, theses and strategic objectives, based on which the members of KIGEiT define the possible development directions for the ICT industry [1] in the field of energy technologies. The strategy, containing a set of opinions and proposals should be perceived as the Chamber's policy document, coherent with the Digital Agenda for Europe (EAC) and the policy of increasing the country's economic innovativeness. We propose to apply the energy strategy elaborated by KIGEiT for setting new directions for the development of the ICT industry in Poland and increasing the innovativeness of the country's energy sector. Addition of programmatic content to the presented strategic objectives should translate into increased pace of economic development and growth in the share of wages in GDP.

The prerequisite for the achievement of the said objectives is to implement a 15-year programme of State support for technological transformation, focused on developing an energy sector based on the potential offered by the national ICT industry and providing it with an appropriate legal framework. The programme of reconstruction and integration of technical infrastructure should be based on the forecasts for the development of the market of the Internet of Things, Renewable Energy Sources, fossil fuels, energy storages and electric vehicles after the year 2020. Programmes of infrastructure, energy, digitisation, energy efficiency and innovation development should be combined in an appropriate manner, corresponding to the present state of knowledge in the field of technical solutions and production technology. Any further delay in the transition process is likely to entail a structural economic stagnation due to the energy and technical exclusion and consequently lead to the loss of competitiveness

1 The definition of the ICT sector in line with the OECD definition

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By means of its energy strategy, KIGEiT postulates modification of government strategies for digitisation, development of infrastructure and the energy industry, innovativeness and energy efficiency. KIGEiT proposals are consistent with the objectives of the initiative referred to as "Digital Poland", the main goal of which is to include the potential of the ICT industry in the process of increasing the innovativeness of the Polish economy. According to EAC, ICT solution-based technologies and products currently account for 2/3 of all innovations. Therefore, such an ICT-focused approach seems justified, since it enables to switch from high-level strategies to practical action programmes.

The process of technological convergence relies on programming a coherent development for renewable energy sources, shale gas industry, electrical motoring and services based on ICT/power networks.

The purpose of this document is to present the opportunities offered by the Internet of Things (that is, a universal telematic network) and the development of the Ambient Intelligence (AmI) environment. The current stage of technological development provides grounds for elaboration of an environment of mutually-connected machines that cooperate in order to achieve specified goals. At present, telematic solutions are used in cutting-edge industrial plants. Current conditions, however, make it possible to introduce them to network companies and technical devices of common use. We believe that it is particularly important to take part in the global process of energy conversion, which is currently perceived mainly through the prism of the construction of smart grids.

Given the above, we would like to present a six-stage programme, conventionally called the KIGEiT Energy Strategy, which provides solutions to increase the level of innovation and economic growth in line with the global process of energy conversion. Such a “smart-oriented” reconstruction relies on the implementation of ICT-based solutions and makes it possible to increase energy efficiency, at the same time reducing the adverse impact of industry on the environment.

In the past 20 years, Poland has built a strong ICT industry. According to OECD reports, Poland belongs to the elite club of countries that are net exporters of electronics industry. Moreover, 7.5% of Polish exports are products of the ICT industry. Among other EU countries, such high ratios have been obtained only by Germany. The implementation of the ICT solutions in Poland can be perceived as a spectacular success – the industry managed to rise from a profound collapse, gain a stable position and even outgrow other sectors of the Polish economy. We are very proud of the growing quality of ICT and modern e-banking services. We also believe that the aforementioned achievements can provide **a strong foundation for the**

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construction of Poland's industrial specialisation and growth of innovation, which translates directly into an increase in the value added generated by the economy.

The following strategy for the energy sector, focused on innovativeness and the potential of the ICT industry, sets out a vision of an economy based on two pillars:

- Effective, next-generation energy sector fully embracing the economic potential of renewable energy sources,

- ICT industry focused on manufacturing products and services for the Internet of Things (a universal telematic network) market and for the market of renewable energy sources, with a particular focus on products and services designed for smart grids.

We call for the implementation of the six strategic objectives briefly discussed below. We believe that **the adoption of the proposed direction of economic development will help to create during the next decade approximately new 120,000 jobs in the new energy sector, and at least 60,000 new jobs in the ICT, electrical and automotive industry.**

1. Supporting innovation that would generate new jobs

Boosting the innovativeness of the Polish economy is prerequisite for the success of the new economic policy. In order to achieve this goal, KIGEiT presents a set of specific actions that will allow for more efficient use of resources allocated to the development of innovations.

The innovation support policy should be of more selective character and should focus on the programmes and projects from the field of ICT and new energy technologies. The main goal of providing support for innovations should be the development of an industrial specialisation. Given the low capitalisation of the Polish economy, the focus should be on the projects that are most likely to generate greater value added, in the first place through job creation and the use of highly qualified personnel, and only in the second place through significant investments in fixed assets.

The importance of specialisation in innovation and economic efficiency strategy

Actions aimed at supporting innovation growth in the economy should be designed in cooperation with industry representatives and focus on Poland's inclusion in the mainstream of technological transformations that are currently taking place in the global economy. It is possible for Poland to join ranks of developed countries, provided that it chooses specialisation fields in

which it will be able to obtain competitive advantage. There are grounds to believe that such an opportunity may be provided by the energy sector and manufacturing of products and services for Smart Grids (full justification of this thesis can be found in many EU policy documents dedicated to the subject of smart grids).

The success of the programme for the improvement of innovation relies on achieving public acceptance. This is an additional argument for allocating available public resources to support innovative projects which are likely to generate an important value added and result in the creation of a large number of jobs in relation to invested capital.

Job generating innovations

Not all pro-innovative activities lead to the creation of new jobs. Given the fact that entrepreneurs are more willing to implement innovations that reduce the share of labour costs and fixed costs, innovations that generate new jobs should use relatively stronger support mechanisms compared to other types of innovative projects.

An example of such an innovation is the development of the energy sector based on large-scale baseload power plants combined with dispersed energy systems. It seems obvious that such a change requires switching focus from high-expenditure investments revolving around facilities employing a small number of workers to low-cost (i.e. mass-produced) micro-generation systems, associated with much more important expenditures on installation, service and maintenance, that is, in other words – on the creation of new jobs.

Such a manner of supporting innovation strengthens the internal market, raises the employment level, the share of labour costs in the total balance of the country's investments, as well as the level of public acceptance for raising productivity and innovativeness of the economy. This factor seems of particular importance, for it is normal for people to fear changes, thus building a positive perception of innovations is a powerful mechanism driving economic development.

Measuring innovation

A strategic objective is worth achieving only if it can be proved that the expenditures on its implementation translate into measurable effects.

In order to assess the effectiveness of the presented objective, KIGEiT proposes to apply an aggregate innovation indicator (II), which can be used in the adapted strategy for increasing the level of innovation. It should be based on the value added generated by a supported industry (in this case the ICT and energy industry) per one employee. Assuming that the effectiveness of

policies to support innovation manifests by a decrease in unemployment and an increase in the share of wages in GDP along with maintaining a high economic growth rate, we propose to introduce a simple indicator that will combine these three elements, adequately adjusted to the current economic situation of the country.

Since the low level of innovation in Poland manifests particularly in the low share of wages in GDP (i.e. the value added generated in enterprises), we believe that the focus should be put on this particular parameter. The current share of wages in GDP has fallen to around 35%, although even in 2002 it amounted to 42%. Contrary to popular belief, this is primarily due to a low level of innovation. Therefore, the goal of increasing the wages-to-GDP ratio by 10% (to 45%), along with decreasing the unemployment rate to under 7% seems realistic, but can be achieved only through increasing innovation.

2. Construction of a system based on distributed and dispersed generation should become an important economic objective

The objectives to be achieved by 2020 are as follows:

1) 25% share of RES in the country's energy system

2) 20% share of RES in the country's heating industry

3) Providing connection to smart grids to every citizen, in order to initiate prosumer activity - stimulation of civic investment in the production of electricity and heat.

An integrated approach to modernisation and development of technical infrastructure is a prerequisite for achieving this objective.

Objective choice explanation

The most important reason for modifying the current energy policy is an urgent need to stop the steady growth of imports of fossil fuels. The report of the Ministry of Economy shows that a three-fold increase in exports was accompanied by a five-fold increase in import of fossil fuels, which has already exceeded EUR 20 billion per year.

Over the past 25 years, a great number of scientific programmes, as well as research and demonstration projects was launched, which clearly shows that dispersed generation is a thought-

out concept that can serve as a basis for a thorough reconstruction of the country's energy system. The new energy systems will rely mainly on micro-sources and RES.

Such a switch is not a matter of distant future. It is an ongoing worldwide investment process. The structure of the Polish energy industry should be similar to the energy industry structure of Poland's most important economic partner, that is Germany, where around 25% of power comes from renewable sources, producing 16.7% of all obtained electricity (end of 2010). Recent analyses proved that there is a positive correlation between the development of dispersed generation and modernisation, employment growth rate and increase in innovation of the entire German economy. Moreover, the forecasts imply a further decrease in prices of RES and Smart Grid equipment. That is why German policy makers decided to put emphasis on this line of development. Such decision will have a profound impact on the investment policy of Polish export-oriented enterprises.

One of the most important consequences of these decisions is the shift from nuclear power, which, compared to distributed generation, seems a dangerous and unprofitable energy source. It is probable that in the next 10 years, the total cost of 1 MW of installed capacity coming from dispersed generation and the subsequent cost of production of 1 MWh of electricity will be significantly lower than it is in the currently used energy systems. It is expected that the simultaneous development of electrical motoring and smart grids will strengthen the network stabilisation and balancing system in the conditions of variable supply of energy from the sun and wind, through the use of storage systems that are currently being developed. Currently, the focus is on reduction of costs and improvement in operational parameters of electricity and heat batteries, electrolytic cells, hydrogen tanks, etc., which when combined will create a storage system for energy in a chemical (batteries), mechanical and hydrogen (electrolysis-derived) form.

The current system of power industry development relies on massive, unique investment projects, which are usually associated with high costs. Each investment presents low susceptibility to further changes and corrections of potential errors. Once built, the plant must be operated for decades, despite the fact that shortly after its construction it becomes obsolete and inefficient compared to the current level of technological development. A technical analysis of the basic components used in dispersed generation shows that the production cost for 1 MW of power coming from high-efficiency energy sources will be lower than in the case of currently used systems based on large-scale base-load power plants, because in this first case, economies of scale associated with fully automated flow production can be applied.

The current manufacturing process offers the possibility of rapid switch from one technology to another and its constant improvement, along with gained production experience. Most of the currently developed renewable energy sources and high-efficiency co-generation

sources are products of the ICT industry. They are characterised by high flexibility, the ability to continuously reduce manufacturing costs and high potential reductions in unit costs along with a possibility to increase the scale of production. This statement can be proven by a highly dynamic erosion of prices of such elements as photovoltaic cells, or wind turbines, even though currently such devices cannot be perceived through the scope of mass production. We know, however, that the way to a substantial reduction in current prices leads through development of a large output market, because the condition for the profitability of this type production is the demand for mass-produced goods.

The development of dispersed and distributed generation gives an opportunity to fully employ the potential of the Digital Nation as well as provide solid foundations for supporting technical infrastructure networks. Such networks should be based on IPv6 addressing and constitute the cornerstone for the entire telematics. KIGEiT indicates that the expansion of production for passive housing and citizen power generation can be important drivers of economic growth.

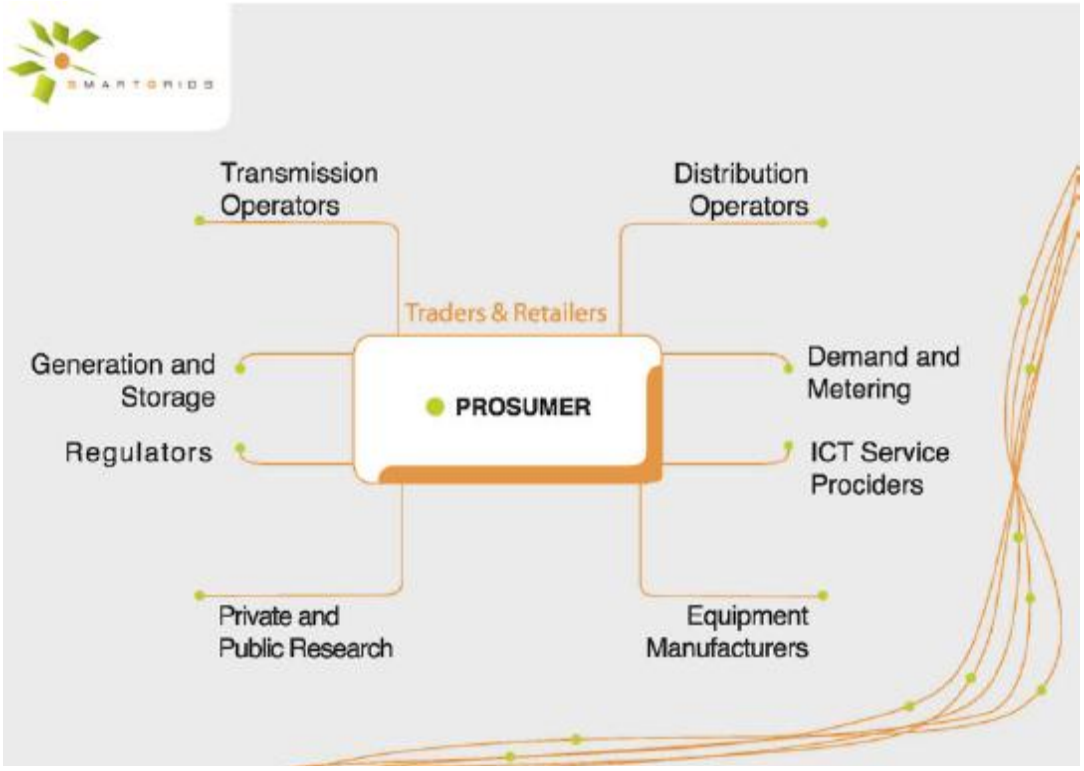
Increasing investments in new energy technologies requires liberalisation of the energy market

The existing legal system determines the behaviour of existing energy companies. In the energy market, new technologies are perceived only as an additional source of cost that will not translate into an increase in revenues. Hence, the entities that currently dominate the market are not particularly willing to introduce new solutions, especially when it comes to dispersed generation. Mechanisms that determine particular behaviours of entities operating in quasi-monopolistic conditions have been well described and observed in the processes of liberalisation of other sectors, such as telecommunications and rail transport. Only the introduction of actual competition, namely the liberalisation of the energy market and economically supported technical transformation can give boost to restructuring and modernisation of the network and development of new energy sources, which will naturally lead to the formation of cost-reducing market mechanisms. Market liberalisation will also pave the way for new investments and new business models. The processes of construction of dispersed and distributed generation systems should involve social capital through the institution of prosumer, and support provided during the transformation process.

The state of natural monopoly combined with the lack of actual competition and an increasing number of non-linear receivers lead to the situation where the quality of electric energy gradually decreases. This is an alarmingly growing problem, manifested by the increasing number of failures of hardware supplied by electrical grid, as well as by collateral losses. We believe that the development of citizen power generation and smart grids should be inseparably linked with investment processes that will provide environment for ameliorating the quality of

electric power. In practice, this means the need to develop quality requirements for all users of power networks. Network upgrade should include the installation of inverters that will improve the quality of electricity through proper filtration and isolation of network from the negative impact of non-linear receivers.

Prosumers can play an important role in improving the quality of electricity in the power grid. European Technological Platform proposes to base a substantial part of future energy networks on prosumers.



In order to ensure efficient prosumer inclusion, it is necessary to create a new class of business operators. Such a class would include both ESCO-type[2] companies and operators

2 ESCO – Energy Service Company, defined by Directive 2006/32/EC on energy end-use efficiency and energy services, adopted on 5 April 2006 as follows: "a natural or legal person that delivers energy services and/or other energy efficiency improvement measures in a user's facility or premises".

specialised in providing telematic services, the main role of which will be to deliver M2M[3] solutions, including prosumer service. The existing participants of the energy market cannot perform such tasks, because of the boundaries set by the energy law. In fact, they should not perform them also because of a conflict of interest: entities engaged in the production and sale of energy cannot support prosumers, as they must perceive them mainly as competitors. The technical condition for the introduction of the institution of prosumer is the development of new infrastructure called the Advanced Measurement Infrastructure (AMI for short). AMI is characterised by a number of layers and levels. Efficient service of prosumers requires operators acting on the subscriber level, involved in services and telematics. The European documents refer to such entities as "Demand and Metering ICT Service Providers".

Evaluating the implementation effectiveness

We believe that the evaluation of implementation effectiveness should be based on the following indicators:

- the percentage of citizens within the range of the Smart Grid Ready network.
- the percentage of citizens within the range of the Prosumer Ready network,
- the share of RES in the country's energy balance,
- efficiency of use of RES installed capacity,
- increase in the efficiency of base-load power plants' installed capacity
- energy consumption per one GDP unit,
- the share of RES / smart grid in total Polish exports.

In this case, the evaluation of implementation effectiveness may also rely on one indicator, e.g. the share of RES in the entire power system. This method, however, will not allow to implement a sustainable development policy or to take appropriate corrective measures.

3 M2M – Machine to Machine – direct communication between machines and systems without human intervention

3. ICT-oriented manufacturing should become Poland's economic specialisation

Developing an economic specialisation should translate into a given sector's ability to produce an importantly higher value added, compared to other industries, and hence, into an increase in exports. Thus, this kind of objective should be expressed quantitatively.

By 2020, Poland should:

1) Rely on its own production capacity in the development of dispersed generation systems (at least 50% of installed capacity and equipment should come from Poland-based factories);

2) Achieve status of a major European exporter of RES and Smart Grids, meeting at least 15% of European demand for dispersed generation and Smart Grid products;

3) Switch to electric motoring at a pace similar to other EU countries

Objective choice explanation

The analysis of indicators describing Polish economy shows that the manufacturing of ICT products and services gradually becomes Poland's economic specialisation. The internal and ownership structure of the industry, as well as weak connections with local research and development facilities lead to a situation where the generated value added is relatively lower than in more developed EU countries, but higher than in other sectors of the Polish economy.

In order to improve the rate of innovation of the ICT industry, Poland should develop its own sectoral specialisation, through which it will be able to achieve world-class competitiveness, and generate higher value added.

The analysis of internal and European conditions shows that we have a good chance to rely the specialisation of the ICT industry on production designed for distributed energy and smart energy systems.

Main operational tasks

The achievement of the aforementioned goals requires cooperation between the industry and Polish economic administration. The most important task is the modernisation of the technical infrastructure and engagement of the country's technical and scientific resources in the projects aimed at supporting the implementation of telematics systems, including Smart Grids.

The depreciated power system is likely to become a receptive market for products of the Polish ICT industry, and the need for large investments in the energy sector may also be a stimulus for the development of the entire Polish economy. Such a situation may occur, provided that the investments are based on economic calculations and a coherent model of the future energy sector.

KIGEiT points out that this kind of potential should be fully used and that the Digital Agenda for Europe supports the creation of a single market for products and services of the ICT industry. It also means that there should be one internal European output market for Smart Grid products. In practice, however, we observe protectionist tendencies, which are particularly strong in sectors strictly controlled by the state. In many EU countries, actions are taken to prevent Smart Grid products from entering local output markets, manifesting e.g. as the necessity to provide detailed technical specifications for every product and system, the requirements for which vary across EU states. Such proceedings can be perceived as an example of imposing non-tariff barriers on the theoretically open single EU market.

There is an urgent need to develop appropriate regulations that will make it difficult for European energy companies to create specific non-tariff barriers, as such actions are aimed at favouring local manufacturers, integrators and service providers. In this way, the output market will open for mass production, and therefore it will become economically efficient.

The development of telematics, the requirements for the security of power networks based on micro-sources, the introduction of more energy-efficient appliances and a more efficient fourth-generation mobile telephony require the widespread use of public IP addresses, efficient encryption, extensive QoS services, etc. Thus, the second important condition for the implementation of the discussed objective is to accelerate the works on the adoption of the IPv6 protocol by the European ICT market. This requires the cooperation of regulators and commercial entities responsible for electronic communication and the technical operation of the AMI networks that are crucial for the development of AmI in the energy sector. We would like to stress that in the past, the lack of compliance with the relevant safety requirements caused trouble with the proper protection of personal data in Smart Grids (e.g. in the Netherlands).

Another important objective, necessary for gaining a competitive position in the context of the discussed specialisation, is to increase the involvement of the Polish industry representatives and experts in the European institutions developing standards for smart grids. We

propose to provide a special support for active participation of the representatives that are aware of the needs and requirements of the Polish ICT industry in the EU organisations, namely ETSI, CEN and CENELEC. We must be aware that in this field, we compete against global corporations that have their competence centres outside the EU.

Implementation indicators

In this case, the proposed indicators are directly linked with the goal to be achieved and are as follows:

- production volume for distributed generation,
- the volume of exports of ICT industry for the smart grids.

4. Poland should launch its own programme for the electric motoring development

The development of electric motoring is determined by two factors combined:

1) supply of electric vehicles at reasonable prices;

2) the availability of infrastructure allowing for widespread shift to electric cars.

The state should create conditions to facilitate the purchase of electric vehicles. The proposed programme should be based on a thorough analysis of the market and continuous monitoring of the situation in the automotive market. This programme should also take into account the impact of electric motoring on public finances. Only then the Polish economy will be able to strengthen the position of its automotive industry in the EU market and avoid the tensions that will rise with such an important transformation in the transport system.

The programme for the automotive industry expansion should be coherent with the programme for the development of RES and gas-fuelled power generation. In the competition between two means of energy storage, i.e. lithium-ion or hydrogen batteries, the winner is still to be determined.

Energy storages are the key element of the entire process of energy generation and motoring modernisation, which is why we postulate to give them high priority in development projects to support innovation, electric motoring development programmes and programmes for the development of power sector and infrastructure.

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Objective choice explanation

Manufacturing of electric vehicles is already a fact both in terms of economy and technology. With the significant increase in the share of electric vehicles in the automotive market, the present power industry will not be able to provide them with enough power. Charging vehicles with fossil-fuel power could lead to an increase in emissions of $CO_2$and other greenhouse gases negatively affecting natural environment. Thus, the development of RES-based distributed energy generation should run in parallel with the transition to electric motoring.

The automotive industry is a well-developing sector of the Polish economy. The approaching technical revolution provides an opportunity for the introduction of further positive changes associated with the main competence and manufacture centres. With the revolution, the number of ICT-based devices in new vehicles will gradually increase. Poland is a major producer of auto parts, as well as electronics and software for the automotive industry. Providing support for the sector in the form of co-financing of innovation aimed at developing energy storage will increase the chances of raising the value added generated by the industry.

In the future, electric vehicles will become a key mechanism for power grid stabilisation. EU forecasts that in 2030 half of the vehicles sold in the EU will be equipped with an electric drive. This means that **in the next 20 years the functioning of the communication infrastructure is likely to undergo significant changes.** It is necessary to plan a reform of public finances, following and adapted to the changing structure of road transport. The programme for development of electric motoring to a very large extent coincides with the development of specialisation oriented on Smart Grid products and services.

The following numbers give insight into the scale of the problem: currently, the number of vehicles in Poland amounts to 15 million. At the same time, the maintenance of a one million electric cars requires 10 GWh of energy per day, that is around 3.5 TWh of energy per year. Assuming that within the next 20 years Poland's automotive industry will reach the level of other European countries, almost half of the Polish drivers will switch to electric vehicles. This means that the production of electricity from RES should amount to over 20 TWh per year. Given the fact that for the most of the time electric vehicles will stay connected to the network, the control system will be able to use them as an energy store, the capacity of which will be almost equal to the total capacity of connected batteries and which will be applied for balancing energy demand network during peak moments.

The development of motoring and passive housing industry has a profound impact on the citizen spending pattern and will have reflection in the expansion of infrastructure. Private

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investments in RES will be attracted, spending on energy efficiency equipment will be increased, and the demand for fuel will drop. The synchronisation of these processes will contribute to the decrease in greenhouse gas emissions and significantly accelerate the return on the required investments.

It is also necessary to elaborate new taxing and support mechanisms that will help to reduce the problem of lowering excise duties on fuels and maximise the benefits associated with reducing greenhouse gas emissions, release of energy prices and the decline in hidden subsidies for energy, as well as many other macroeconomy-associated phenomena. Additionally, changes in the structure of energy and fuel prices will lead to an increase in demand for construction and installation services, insulation materials, etc.

Programme implementation indicators

An obvious aggregate indicator illustrating the efficiency of the implementation is the share of electrical motoring in the entire automotive industry. It should be accompanied by a number of additional indicators that will help to monitor the transformation process. The most important indicators include:

1) the impact of the development of electrical motoring on the costs of transport;
2) the impact of motoring on CO2 emissions;
3) the availability of the necessary infrastructure for popularisation of electrical vehicles;
4) the level of exports of the Polish automotive industry.

5. Poland should actively participate in creating a favourable economic and legal environment to stimulate the reduction of greenhouse gas emissions

In order to achieve this objective, a new model of Polish energy sector should be developed. The model should be consistent with the EU's climate policy and take into account the specificity of the Polish economy, as well as its susceptibility to technological transformations. On this basis, a legal programme of reduction of greenhouse gas emissions linked to the economic activities that stimulate the development of the economy, should be elaborated. In other words, the process of technological transformation should stimulate the development of new industrial plants. The achievement of this goal requires legal transformations, both on the national and on the European level.

Explanation

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The current climate and energy policy pursued by the state causes an increasing divergence in economic paths between Poland and its main economic partners. The implementation of environmental objectives is a necessity which cannot be avoided. The switch from a conservative policy, based on old energy technologies (advocated by the state and energy-intensive sectors) to an "attack policy", designed to place Poland in the mainstream of global technological changes must be seen as an economic necessity.

The proposed objective relies on the use of worldwide pro-ecological investment processes to increase the growth of the Polish economy. The support system for the new technologies must be combined with the mechanisms that will protect the Polish economy from countries that do not respect the natural environment.

It should be noted that the rapid launch of production of RES, power electronics and energy efficient construction materials requires large amounts of energy, and therefore translates into a significant increase in greenhouse gas emissions. At the moment, we are dealing with a situation in which the manufacturing of equipment designed to support the development of environment-friendly energy systems cannot be developed in the EU due to regulations on greenhouse gas emissions. Thus, stimulating the development of distributed energy requires reconstruction of the legal framework for economic transactions in this regard.

For example, the production of silicon wafers, glass and aluminium, i.e. the basic materials for the production of photovoltaic panels, requires large amounts of energy. The time of energy return for this kind of production amounts to about three years (a photovoltaic panel needs 3 years to produce the amount of energy that was used to manufacture it), which is an excellent result considering the fact that the panel durability is estimated at 25-30 years. However, the production process itself is energy-consuming. Ultimately, the production of RES will rely on RES-generated power, but at the initial stage of development, introduction of support solutions is necessary

One of the solutions would be to introduce balancing emission charges on goods, services and electricity from countries where there is no symmetry principle for protecting the climate. In other words, it relies on introducing a charge on goods and services, the production of which is associated with greenhouse gas emissions. This way, it will be possible to strengthen international solidarity in actions aimed at protection of the environment and climate and avoid pushing energy-intensive industries from Europe to countries where there is no emission charges for the industry.

Poland should actively seek for the acknowledgement of the fact that the EU environmental policies should stimulate the analogous behaviour of Poland's business partners to

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preserve the principle of equal access to the market and similar conditions for company management.

It is a necessary condition for the development of the digital industry, namely RES-oriented hardware manufacturing, supporting the development of Smart Grids.

Implementation defectiveness indicators

The objectives that require the establishment of specific legal frames and taking particular legal actions are much harder to evaluate by quantitative means. It is possible, however, to conduct and indirect objective assessment. Assuming that the effect of the proper implementation of this objective is to build the conditions for the production that is energy-intensive by definition, the assessment should rely on the monitoring of the level of domestic production of an appropriately chosen set of 'energy sensitive' products. Without prejudging how this set will be constructed, it can be assumed that the increase in production in this field combined with the increase in the overall economy can be applied as an appropriate measure of the effectiveness of this objective.

6. Construction of high-efficiency methane economy based on natural gas, biogas and coal gasification

We propose to implement this objective as a way of adapting Polish energy policy to the natural conditions of the Polish economy. The objective should be also perceived as a response to the demands of increased energy efficiency associated with pro-ecological activities.

Increasing the share of methane in the energy balance is also a goal closely related to the potential use of the resources of shale gas and the development of coal gasification technology.

Doubling the share of methane in the Polish fuel economy is a realistic and viable goal, provided that it is associated with the use of a proprietary resource base. Switching to methane should be stimulated by the opportunities of investment in high-performance co-generation micro-sources. As part of this objective, actions to build the foundations of a hydrogen economy should also be taken.

Objective choice explanation

The use of methane can be perceived as a transition point between the economy based on fossil fuels and the hydrogen-based economy. Methane is a fossil fuel (and the main component

of natural gas), a product of coal gasification, as well as a renewable fuel being a component of biogas. Fuel cells as the technical basis for construction of micro-sources for distributed co-generation, can be powered both by methane and hydrogen. Hydrogen can be a product of the processing of methane or be produced by electrolysis of water supplied from renewable sources (wind, sun, etc.). The possibility to transform the electricity from RES into hydrogen that may be later used to fuel power cells seems of particular importance. The postulate to develop an economy based on methane is a practical economic purpose which could constitute the first step to develop a so-called hydrogen economy and a way for the construction of the energy sector that to a greater extent will rely on its own resources of fossil fuels.

The implementation of Smart Grids in the gas-based power sector may be seen as an opportunity to use the full potential of Poland's own resources and sources of natural gas. The transition from fossil fuel-based economy to the economy fully exploiting the potential of RES will not mean a significant reduction in the current level of energy production from fossil fuels. The essence of the transition to distributed generation is the maximum utilisation of the heat of combustion of fuels, for their price will continue to grow. For technical, environmental and economic reasons, methane combustion seems the most appropriate solution.

Moreover, **gas source systems, such as turbines, are currently the basis for renewable energy stabilisation systems, compensating for the simultaneous lack of wind and sun**. Such solutions are quite popular, e.g. in Denmark. It is possible to use methane in high-efficiency co-generation, using fuel cells directly in the user's location. In other words, it seems that even today, methane can serve as the basis for high-performance and cost-efficient dispersed co-generation. The condition for development and cost reduction is based on launching mass production of the necessary equipment and providing the institution of prosumer with a legal status, which will allow for optimal use of these elements in the power systems with an implemented smart grid layer.

It seems very probable that the power sources relying fuel cells that can be powered by methane or hydrogen will allow for the most efficient use of energy stored in the form of hydrogen. Methane-powered fuel cell systems can be easily converted to hydrogen when the electrolysis of the latter finally becomes economically effective at the single building level. Thus, during the transition period, there will exist a possibility to power fuel cells in an alternative manner - by hydrogen or methane. The adoption of methane-based economy seems an economically secure cost-effective system solution, which will be possible regardless of when the hydrogen technology will be ready for mass commercialisation.

Moreover, the expected commercialisation of electrolytic tanks will make it possible to use the gas network as an energy storage for distributed generation. The hydrogen obtained by electrolysis of water during the overproduction of solar or wind energy can be easily transmitted

to the gas network. According to the PGNiG group, the concentration of hydrogen in natural gas can reach even 11% without affecting the corrosion processes, at the same time increasing the calorific value of natural gas. To make this possible, the implementation of the Smart Grid layer should include the introduction of a single account unit for all types of supplied energy. This will allow the user to compare particular types of energy carriers and make it possible for telematic network operators to optimise the management of sources and energy receivers.

It should be stressed that the main objective of building the hydrogen-based economy is to minimise the consumption of oil and other fossil fuels. Hydrogen is perceived as an intermediate energy carrier for short-term energy storage. This concept includes the prospect of complete energy independence from fossil fuels. **An important feature of the concept is the fact that gas-based energy production is economically and environmentally attractive regardless of how quickly the technical development of electrolytic tanks will lead to a decrease in costs of production and which of energy storage technologies will prove itself most effective from the economic point of view.**

In consideration of the above, we can state that gas pipelines should be treated as an integral component of the technical infrastructure. All types of power transmission should be connected by one telematic layer - Smart Grids.

Implementation defectiveness indicators

The increase in the use of methane for energy generation purposes may, but should not be used as an indicator of the implementation effectiveness of an objective formulated as creation of a highly effective methane-based economy. We propose to rely on the expected effects, i.e the share of highly effective methane-based co-generation based, with particular emphasis on biogas and methane obtained by coal gasification.

Summary

The condition that must be met in order to implement the presented objectives is to provide the development programmes with legal background, namely the laws on renewable energy sources (RES), transmission corridors, energy efficiency, promotion of innovation, energy, construction, and additional legal acts on the development of passive housing.

National Economic Chamber of Electronics and Telecommunication

Given the above, KIGEiT proposes the Ministry of Economy and the Ministry of Infrastructure and Development to adopt a vision of energy digitisation based on two pillars:

- Distributed and dispersed generation, effective next generation power sector, based on renewable energy sources (RES)

- ICT industry focused on manufacturing of products and services for the Internet of Things (a universal telematic network) market, with a particular focus on products and services designed for Smart Grids.

In order to build these two pillars, the aforementioned 6 strategic objectives must be achieved. The process will be actively supported by Polish ICT market participants.

1. Supporting innovation for new job creation.

2.Construction of a system based on distributed energy should be perceived as an important economic objective.

3. ICT-oriented manufacturing should become Poland's economic specialisation.

4. Development of electric motoring.

5. 5 Support for international solidarity for the protection of the environment and the climate.

6 Construction of a methane-based economy based and future transition to the economy relying on hydrogen, based on Poland's proprietary fossil fuel resources in the form of coal and gas.

Each of these objectives should be translated into a coherent program and a coherent list of specific project tasks. Companies affiliated with the Section of Smart Grids of the National Economic Chamber of Electronics and Telecommunication possess all the necessary technological and technical means to start co-participation in the implementation of this strategy.

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