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ENERGY SECURITY VERSUS THE PURSUIT OF CO_2 EMISSION REDUCTIONS

Abstract: The author tries to answer the question if energy security is consistent with the pursuit of CO_2 reduction. The problem is depicted from four perspectives, that is from international, national, regional and energy consumers' perspective.

Keywords: energy security, CO_2 emission, climate change.

1. Introduction

Energy security is defined as a reliability of energy supplying to final consumers. Security of energy supply means that final consumers have an access to different kinds of energy without any disruptions. In 1970s and in 1980s energy policy was meant mainly as ensuring the supply of oil. It stemmed from the fact that in 1970s fierce oil crises took place, which caused the downturn of the global economy. As a result of the US Middle East policy, oil producers and exporters from OPEC proclaimed an oil embargo in 1973. Oil prices went up enormously causing disruptions in oil supplies to the US and Western European countries.

Since that time the term "energy security" has evolved and now it has definitely broader meaning. Energy policies of many countries focus not only on ensuring undisrupted oil supply but also on increasing reliability of supplying different kinds of energy like gas, electricity, or heat coming from district heating systems. The shift in energy policies results from many blackouts and terrorism attacks which have occurred over a couple of last years.

At present the energy security agenda coexists with the pursuit of CO_2 emission reductions (and also emission of other greenhouse gases). The policy aimed at reducing the emission of greenhouse gases (GHG) originated at Rio Earth Summit in 1992 and targets relating to reduction of these gases were specified in Kyoto Protocol in 1997. The European Union committed itself to reduce emission of GHG by 8% to 2012 (USA – by 7%, but it withdrew in 2001; Canada/Japan – by 6%; Russia – by 5%; Australia – by 8%) in comparison to the emission level in 1990. During the last UN Climate Change Conference in Copenhagen countries tried to set legally binding

GHG emission reduction targets for the period after 2012. Unfortunately, the participants of the Copenhagen Conference failed to set these targets and as a result carbon prices on the European Climate Exchange in London fell dramatically. Apart from the Copenhagen Conference, the European Union set its own GHG emission reduction target which reaches the level of 20% by 2020 and some European Union members, like UK, are even more ambitious. UK claims that it will have reduced GHG emission by 80% by 2050. So, despite the failure of Copenhagen Conference, the climate protection policy will be continued but in my opinion the actions regarding GHG emission reductions will slow down in the next few years.

In my opinion energy security should be considered and ensured at four levels, that is at:

1) international level,
2) national level,
3) regional level,
4) the level of final consumer.

Below I try to explain in what kind energy security can be ensured at these four levels and to which extent it is comprehensive with the pursuit of GHG emission reductions.

2. The policy at the international level

At the international level governments ought to cooperate in international organisations like G8, G20, International Energy Agency, the European Union, and many others. The main aim of this cooperation should be setting up the new ones and enhancing present mechanisms of oil and gas supply, making the energy markets more transparent, and promoting the energy efficiency, which can lower the demand on energy resources. To increase the reliability of gas and oil supply international committees should support developing countries in discovering new deposits of energy sources.

Within Europe the most important is to work out the comprehensive energy policy by all member states of the European Union. In my opinion the European Union should introduce one energy strategy which would foster the diversification of gas and oil supply and building new transport infrastructure like the Southern Corridor project for gas imports to Central Europe from the Caspian and Central Asia or Nord and South Stream projects that would make us able to import more gas from Russia bypassing Ukraine and Belarus.

Unfortunately, working out one comprehensive European Union energy strategy is difficult due to particularisms that play huge role in European politics. Some countries, including Poland, oppose building new gas pipelines from Russia, in particular Nord Stream. Other countries are afraid of dependency on gas supply mainly from one direction, that is from Russia. But this dependency or rather interdependency has also good aspect. I agree with Sebastian Mallaby that energy

interdependence can actually be good for energy security [2]. In my opinion, it can be good not only for the energy security, but generally for the world security. After building the Nord and South Stream the energy dependence on Russia will rise but Russia will be also more dependent on money coming from the European Union. So, mutual ties can minimize the risk of future military conflicts.

In my opinion, enhancing energy security at the international level has a lot in common with the reduction of GHG emissions. Pursuit of gas diversification and enhancing the security of gas supply, in particular across the European Union, can accelerate the switch from coal to gas which is less emissive fuel than coal. At the same time promotion of energy efficiency at the international level reduces the usage of primary energy, that is mainly fossil fuels.

However, I think that even stronger is the inverse relation. So, the policy aiming at reducing GHG emission can enhance energy security. Legally binding targets relating to GHG emission reductions force international community to find out new technologies of delivering energy, mainly based on renewable sources of energy, nuclear energy and so on. The GHG emission reduction targets force us also to develop electric cars and to increase energy efficiency. In the light of depletion of oil deposits such a policy can foster energy security. Some experts claim that oil reserves will become exhausted in 10-20 years because of the fact that present oil consumption is higher than the rate of discovering new oil deposits. In 20 years we can be prepared to the new situation due to the development of new technologies.

3. Activities aimed at CO_2 reduction and increasing energy security at the national level

Governments at the national level have many instruments to enhance energy security. National energy strategies should focus on, among others:

- fostering diversification of energy resources,
- making use of indigenous energy resources,
- building new infrastructure and rehabilitating the existing one,
- promoting energy efficiency,
- promoting renewable source of energy (RSE).

One of the most important instruments enhancing the energy security is diversification of fuel supplies, in particular gas and oil. The best way to do that is building the new infrastructure that allows to import fuels from different countries. In case of gas new pipelines should be built but also ports to import LNG. Due to LNG the structure of the gas market is changing, which can foster the competition among gas exporters but also facilitate the diversification of gas supplies.

Some experts claim that energy security can be increased by discovering and extracting indigenous deposits of energy sources which can make countries less dependent on foreign oil and gas suppliers. As I mentioned before, the interdependence between exporters and importers of fuels is not in opposition to energy security.

However, exploiting indigenous energy sources not only can enhance energy security, but also can be more profitable. Indigenous energy sources are closer to final consumers so they do not require to be transported from distant countries by means of long pipelines or tankers.

On the other hand, climate policy aiming at the reduction of GHG emissions stays in opposition to the above statement. One of the best dispersed and abundant fuels is coal but at the same time this fuel is one of the most emissive. It can be used on-site but climate policy restricts that by imposing regulations regarding GHG emission. So, now we can observe the shift from coal to gas even in such countries as Poland which is very rich in coal. It happens due to the fact that using gas is getting more and more profitable in comparison to using coal which is indigenous fuel but at the same time it is very emissive. From the energy security point of view this phenomenon is not good but it is advantageous in terms of the environment protection. This trend can be altered only by finding new technologies which will allow us to use coal in cleaner way but in short term the energy security in countries like Poland can suffer.

Building new capacity and rehabilitating the existing one foster energy security. It refers not only to building new power plants but also to developing transmitting and distribution systems of electricity. In many countries the generating capacity is obsolete and requires instant investments. The investments in new generating capacities are also required because of rising demand on energy and on electricity in particular. The IEA forecasts that world energy demand will increase by 57% between 1997 and 2020, or at an average annual rate of 2% [1]. So, to ensure reliable supplies of electricity, building new generating capacity is required. To enhance energy security the scarce generating capacity should also exist in national energy systems. This kind of capacity is used in unexpected demand peaks and it guarantees the high reliability of electricity supplies. On the other hand, maintaining scarce capacity is very costly.

The need to build new generating capacity can be perceived as the opportunity to replace obsolete thermal power plants using fossil fuels with power plants using new technologies, including nuclear power plants. So, in this case energy security is not in opposition to the climate policy but on the other hand we have to keep in mind that these new technologies are much more expensive than power plants based on fossil fuels. To create incentives to build new generating capacity based on clean technologies, the price of carbon on international exchanges should reach the level of at least 50 euro/t CO_2.

Rehabilitation of electricity grids is in some countries even much more urgent. Many blackouts that occurred over a couple of last years were caused by the bad technical state of electricity grids. Except for rehabilitation, to ensure reliable electricity supply the proper design of grids is required. For example, to enhance energy security of big cities the grids should be built in the form of rings encompassing the metropolitan areas. These rings should be fed in electricity in a couple of

independent points. Rehabilitation of grids has also good impact on environment because it reduces losses of electricity while transmitting. As a result of that the reduction of usage of primary energy follows, which translates into the reduction of GHG emission.

Building new generating capacity and upgrading electricity grids were stopped to some extent by deregulation of electricity markets, privatization and fostering competition. As a result of this process margins gained from generating and selling electricity decreased enormously which was observable for example in the UK in 1990s. Private investors lost incentives to invest in generating capacity due to low margins. In consequence of this process there is a shortage of generating capacity in some European countries, in particular in the UK, which will deepen in the following years. So, the competition on the electricity market destroyed to some extent energy security.

In case of electricity grids the financial incentive to invest in upgrading the infrastructure is lowered sometimes by improper price regime. In many countries there is price regulation of electricity distribution services because electricity distributors are perceived as natural monopolies. In many cases fees for electricity distribution are set by official regulator on the basis of rate-of-return regulation method or RPI-X method. In such circumstances privately-owned electricity distributors do not have enough financial motivation to invest in upgrading electricity grids. As a result of that distribution networks are getting obsolete and energy security suffers.

Taking into account the above statements, the debate about the extent to which we should introduce competition and deregulation on electricity market and about the proper price regulation of distribution services is needed. It seems that now the energy security is stressed more than the deregulation and competition. As a result of that some symptoms of electricity market reregulation are observable. The above statements refer also to GHG emission reductions because as I showed earlier there are interrelations between building new infrastructure, energy security and reduction of GHG emission.

Ensuring energy security at the national level requires also huge investments in energy efficiency and renewable sources of energy. Increasing energy efficiency can be perceived as the “fifth fuel” and, what is more important, the “indigenous fuel”. So, promotion of energy efficiency can make many countries less dependent on foreign suppliers of different fuels. Decreasing the consumption of energy, in particular oil and gas, can also be very profitable. The development of renewable source of energy has very similar consequences. The renewable sources of energy have rather local character, so increasing electricity and heat generation from renewables can foster energy security. The increase in electricity and heat production from renewables and promotion of energy security translate directly into GHG emission reduction. So, in this case energy security stays in close relationship with environment protection. However, to increase energy efficiency and generation of

electricity and heat from renewables, enormous investments in developing new technologies are required. Increase of expenditures on R&D is needed emergently to foster energy security and reduction of GHG emission.

4. Activities aimed at CO_2 reduction and increasing energy security at the regional level

Local authorities can also act on behalf of energy security. In my opinion the main task of local authorities is:

– planning the development of network infrastructure,
– supporting usage of local energy resources.

Local authorities in most countries are responsible for planning of the development of different kinds of network infrastructure, that is electricity, gas and sometimes district heating network. The infrastructure should be planned and designed in a way that allows to deliver electricity, gas and heat with high level of reliability. So, in the case of outages the number of people who will not be provided with energy should be as small as possible. To reach this target the network infrastructure should be planned in the form of ring that encompasses the densely populated areas.

Local authorities should also support the usage of local energy resources, in particular renewable resources like biogas, biomass, water and solar energy. In every municipality there should be prepared a programme of making use of this sources of energy. For instance, in Northern European countries, in every municipality at least one biogas power plant can be built that would use biogas produced from local waste of organic origin. Local authorities should also prepare programmes of supporting the development of solar energy that can be used by households to produce hot water. All actions like that enhance local energy security.

The actions depicted above can foster both energy security and reduction of GHG emission. Upgraded electricity and heat network infrastructure ensures more reliable supplies of electricity and heat and at the same time reduces the losses of this kind of energy while transmitting. It translates into the reduction of the usage of primary energy and GHG emission. Aiming to maximise the usage of local renewable sources of energy has also very positive impact on environment. So, at the regional level energy security and reduction of GHG emission have a lot in common.

5. Activities aimed at CO_2 reduction and increasing energy security at the level of final consumer

In many cases, final consumers of energy have also to care about their energy security. I mean the consumers who are located or inhibit the areas where the energy supply is unreliable and the cost of outages or cost of lost opportunities caused by outages are high. In particular, some companies running their business in a country with

unreliable electricity supply should be interested in enhancing their own energy security if costs or lost opportunities caused by outages are higher than the costs of improving reliability of energy supplies. There are different types of costs or lost opportunities caused by outages:

- spoilage of food and other products,
- lost data,
- damaged equipment,
- loss of customer goodwill or revenue due to disruptions or inability to provide goods and services.

Some of those risks can be covered by insurance, but not all of them. Sometimes the insurance is costlier than other types of eliminating the risk relating to outages. In this case companies can use such solutions as:

- installation of on-site generators, including small scale CHP,
- installation of UPS,
- fuel storage,
- usage of Transfer Switching Scheme.

The above solutions are extremely popular in countries where electricity network is in poor technical condition. For instance, in Nigeria almost 92% of firms had their own generators in 1990s [1]. The popularity of such devices rose also in California after the blackout that took place at the beginning of the 21st century. Sometimes these devices are also required by law in developed countries where the reliability of energy supplies is quite high. For instance, hospitals in most developed countries have to possess at least two reliable, independent sources of energy supplies.

The energy security at the lowest level has also a lot in common with the reduction of GHG emission. In particular, the installation of small scale CHP directly in the building or industrial hall increases the energy security (given that there is also a connection to national grid) and at the same time it reduces the usage of primary energy in two ways:

- CHP is more efficient than disjunct production of the same amount of electricity and heat,
- CHP located very close to final consumer of heat and electricity makes a contribution to reducing the losses of electricity while transmitting it from a distant power plant.

Small scale CHPs but also other technologies allowing on-site production of heat and electricity can decrease the usage of primary energy and, as a result of that, can reduce the emission of GHG. So, increasing energy security at final consumer level is not in opposition to the environment protection policy.

6. Final conclusions

Summarizing the article I would like to say that I cannot find out many contradictions between the energy security and the pursuit of GHG emission reductions. Maybe, in countries like Poland, where energy industry is dependent in above 90% on one

fossil fuel, that is coal, in medium term the situation is very difficult. In such a case the energy security can be jeopardised in medium term by the climate policy. But even in such countries energy security can be enhanced by climate policy in the long term after the energy industry changes its structure.

Except for energy security we should also pay attention to costs of this security and costs of climate policy. The higher the energy security and the lower the negative impact of energy industry on environment, the higher costs of energy supply. Giving the guarantee of energy supply at the level of 100%, eliminating the risk of outages and the negative impact of energy industry on the environment is almost impossible, let alone very costly. Even if eliminating the total risk of outages and the negative impact of energy industry on the environment were possible, the price of electricity would be so high that it would get unaffordable by most people. The final conclusion is that we should look for new ways of enhancing energy security and lowering the negative impact of energy industry on environment at all depicted levels but in a cost-effective manner.

References

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BEZPIECZEŃSTWO ENERGETYCZNE A DĄŻENIE DO REDUKCJI EMISJI CO_2

Streszczenie: W artykule autor stara się odpowiedzieć na pytanie, czy bezpieczeństwo energetyczne jest spójne z dążeniem do ograniczania emisji CO_2. Ten problem jest przedstawiony z czterech perspektyw: międzynarodowej, krajowej, regionalnej i końcowego klienta.