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DIMENSIONS OF ENERGY SECURITY

Introduction

Security of supply of energy is key element for the functionality of the modern societies. It could be called a primary infrastructure which is the basis for other infrastructures like telecommunication and information systems. Energy can be generated from various primary sources like oil, coal, natural gas, uranium, water and renewable energies. Every form of energy generation has some significance in regard of energy security. Dimensions of energy security could be divided into strategic, political, environmental and system related dimensions of security.

Oil and natural gas has a clear strategic significance because the reserves have been distributed unevenly between different countries. The main bulk of reserves are situated in the Middle East and Russia – especially with regard to natural gas. Coal is more evenly distributed and the reserves are relatively large. Coal does not have any major strategic importance but it has a strong environmental and political loading at least in European countries because of high CO2 emissions. Nuclear power has strong political constrains and also strategic significance due to the non-proliferation treaties. Hydro power is perhaps the best way to generate electricity but there is an important political dimension. So it might be nearly impossible to increase hydro power in most European countries even if there are untapped potentials.

Strategic Dimension of Energy Security

What are the strategic dimensions of an energy source like oil? Large utilisation and dependency are the basis of the strategic importance. Low possibilities of substitution in a short run strengthens the strategic value. These items alone don not however make oil a strategic asset. For instance grain is used everywhere and it is vital for the mankind but it is not considered strategic. Uneven ownership of the sources of relative scarcity, monopolistic control of the markets and the possibility to use energy as a political weapon make oil and also natural gas strategic assets.

Most of the oil and natural gas producing and exporting countries are almost totally dependent of the revenues of these materials. This creates the basic motive to control the price mechanism in order to avoid downward trends. There are obviously other factors which have an influence on prices like demand, level of inventories and spare capacity. Today, there is a relatively small amount of spare capacity, about 1-2 million barrels per day, which means that already 2-4 % growth of the demand pushes the spot price strongly upwards. The control of spare capacity in OPEC countries plays clearly a significant role in the strategy of supply.

The strategic dimension of oil and natural gas builds up a powerful security political issue in many consuming countries, especially in United States. China has also activated its operations and is becoming a global player in oil politics. There is a continuous struggle of dominance of the exploitation of new oil and natural gas

sources, pipeline transmissions and other logistics. Characteristic to the history of oil are instability, political unrest and even wars. In order to be prepared for oil crises all the industrialised countries have oil stockpiles. According to IEA statistics, the member countries have in average oil reserves corresponding the consummation of 4-5 month. All the member countries of IEA released as a collective measure altogether 60 million barrels of oil to the market in order to neutralise the disruption in the US oil supply due to the hurricanes in fall 2005.

Political Dimension of Energy Security

By political dimension we mean a nation's policy regarding the use, regulation and taxation of different energy sources. The existing energy structures have not evolved only through market forces. The states and municipalities have played a dominant role in shaping the market structures. The gradual liberalisation of energy markets has diminished the direct ownership and operation of the public sector, while at the same time the political control and regulation has increased. There is no common or clear energy policy on the European level. The energy structures and policies vary quite a lot from one country to another. The mainstream seems to be the promotion of renewable energies with considerably subsidies. The use of other sources of energy is not promoted but regulated and taxed.

The political uncertainty relating to how to satisfy the growing demand of electricity in the future is a major issue in the European energy policy. Only few countries like Finland consider that enlargement of the existing nuclear capacity is a solution to meet the electricity demand without increasing the CO2 emissions. Many countries have totally refrained from nuclear energy. Some countries like Sweden and Germany which now are producing nearly half of their electricity with nuclear power have made a political decision to abandon this form of production for good. The question how to replace the nuclear energy has been left open so far.

The EU Commission has been worried about the development of security of supply of energy because there are only few options left. Nations have restricted their options by political choices. The inevitable development seems to be a growing dependency on OPEC oil and Russian natural gas. This means that the nations must prepare themselves for lower energy security and larger price risk.

Environmental Dimension of Energy Security

Environmental dimensions in the generation and use of energy have a major influence not only to the allocation of different energy sources but also to overall division of factors of production. This is not a major security issue but the environmental impacts to the energy system can lead to underinvestment of the capacities and structural dependencies. Taxation of fuels and electricity has for along time played important role in the state finances. Nowadays, the relatively heavy taxation of energy use is motivated by environmental objectives even if there are rather modest possibilities for substitution.

The main challenge of the environmental influence on the energy systems are CO2 emissions from the fossil energies: oil, coal and natural gas. Nations representing one half of the world's population have committed themselves to Kyoto process in order

to reduce the emissions of CO2 with regulatory measures. As a consequence, these target levels on emissions and trading system of emission rights have been introduced. Other countries such as the United States, Australia, China and India have not committed themselves to specific target levels and are advocating instead focusing on the development of new technologies which could reduce the emissions.

More or less all the nations are generally supporting the overall reduction of CO2 emissions. The problem is that there are no credible means and measures to achieve the target levels. On the contrary, the IEA projections are referring to a considerable growth of the use of fossil energies within the coming 15 years.

The regulatory approach in the EU to reduce the emissions combined with the liberalised energy markets while other countries do not have the corresponding obligations is leading to substantial price increase of electricity to consumers and industrial users.

System Dimension of Energy Security

The energy supply can also be seen as a system or technical infrastructure. There are complex networks with many interfaces between different technologies. Networks by themselves are vulnerable and exposed to different threats and hazards. Advanced digital communication and information infrastructures are especially vulnerable since it is exposed to physical and cyber hazards. The interfaces of electricity system with communication, information processing and open networks are critical from a security point of view.

In order to create a robust and resilient electricity infrastructure the vulnerabilities should be carefully analysed and taking into account. There should not exist any structural dependency of production capacity. The grids and terminals should be robust and secured by back-up systems. Supervisory control and data acquisition (SCADA) systems should be updated and disconnected from open networks. Market optimisation should not lead to underinvestment in grids and maintenance which would lower the overall security of the system.

How Finland manages its energy dependency with Russia

One of the main doctrines in the energy policy of Finland is the diversification of the use of different imported primary energy source. There should not exist any structural dependency from one country or supplier. Finland is a relatively energy intensive economy due to industrial base, transportation and long heating season. These factors cannot easily be changed – even in a longer run. Only about 30% of the total primary energy is domestically produced, while 70% has to be imported. Neighbouring Russia is very rich in fossil resources. So it has been reasonable from a geographical and logistical point of view to import oil, natural gas, coal and electricity from Russia. According to the statistics of the year 2004, about 70% of the imported energy is imported from Russia. This means that 50% of the total energy use in Finland has a Russian origin. Is this really a diversification of energy procurement or a dependency?

Over 70% of Finland's oil and coal import was of Russian origin. This is undeniably a fairly high share but not necessarily a dependency. The availability of oil and coal is

also possible from other sources so there were no major difficulties to replace the energy deliveries after the collapse of the Soviet Union in the nineties. The Finnish refineries have invested in new technologies in order to take advantage of the Russian heavy crude qualities and logistics. The oil and coal imports from the international markets depends on relative prices and costs of logistics. Since the end of fifties, Finland has regarded oil as a strategic asset and built government controlled stockpiles for disruptions and oil crisis. This thinking is still valid while the national oil reserves exceed the level of international obligations.

In addition, there is a 100% dependency of natural gas from Russia. The share of natural gas is about 10% of the total energy consumption. The pipeline was built in the seventies when Finland had government controlled clearing trade with the Soviet Union. So the adoption of the natural gas to the energy portfolio did not rest on market forces. Even if the deliveries from Russia have continued without any major disruptions, there exists a so called land risk. This is why Finland has prepared to meet the risk with contingency planning, stockpiling of substitute fuels and a special propane gas installation of 350 MW. In the past, there have been various plans to connect the Finnish pipeline to Norwegian sources via Sweden. This would increase the security of supply, but the plans have not yet been implemented. Existing plans supported by the EU are intended to connect the Finnish pipelines to the European network via the Baltic countries. This solution would offer also an important option to stockpile natural gas in Latvia.

Finland imports electricity from Russia with a maximum peak loud of about 1500 MW. There is no structural dependency and the Russian electricity goes to some of the Nordic countries depending on relative prices. There is a common market for electricity in Finland, Sweden, Denmark and Norway. Finland has enough capacity for electricity generation but the use of this capacity depends on the demand and relative prices in the common market.