

STRATEGIC ENERGY SOURCES AND TRENDS OF ALTERNATIVE ENERGIES IN THE EUROPEAN UNION

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Abstract

The present dynamic security environment forced organizations or countries to radically restructure their objectives and strategies. In the last years, the European Union energy strategy has been in the process of a profound objectives transformation. The paper deals with the problem of the energy security in the European Union and the role of renewable energies to security supply in the context of the global energetic crisis, and the role of multiple factors which destroy the equilibrium among the energetic security, economical development and environmental evolution. There are a large range of proposed European projects in the energetic sphere that intend to fulfill the request to increase the security supply in order to weaken the dependence of European countries on the Russian energetic resources.

European energy demand and import dependence continues to increase and primary energy sources are mainly used to cover European energy needs. Considering the energy security is very important for European Union, this paper presents an overview of strategic energy sources and underlines the importance of renewable energy in the way to ensure security supply of energy. Today, the international energy system is characterized by a high level of interdependence, the energy supply and climate change security are the central concerns for policy makers and they give significant dimensions of the long-term quest for a sustainable energy system. In this context one of policies developed by European Union is to promote the renewable energy.

Key-words: *energy, security of supply, classical fuels, renewable energies, European Union*

JEL Classification: Q40, Q41, Q42

1. Introduction

Access to energy is fundamental to our civilization, and economic and social development is fuelling a growing demand for reliable, affordable and clean energy. Energy security is back on political and public agendas and geopolitics is a major factor shaping the world today. Recent events, including the increasing tensions in Middle East and the crisis between Russia and Ukraine, frozen conflicts from Caucas and, of course, the Russian military intervention in Georgia raise the fragility of the world's energy supply system and the concerns over politically motivated supply disruptions and resulting price volatility. These concerns are not based on the overall availability of resources, but on the concentration of strategic energy resources in a few countries.

Global main fossil fuels (oil, gas and coal) reserves will continue the energy supply dominance for the near future. The past couple of years have clearly demonstrated the volatile nature of oil and the world's continuing dependence on this leading energy resource. The doubling of oil prices during the last few years has not, however, been caused by dwindling reserves. The studies demonstrates that global reserves of oil are still large enough to meet the demand for the next few decades, and the continuous improvement in exploration, processing, conversion and end-use technologies may extend this period even further. Concentration of oil resources in a few regions with problems and long supply routes to the main markets are important problems for energy security of European Union.

Security of energy supply is a recurrent concept in national energy policies and also at the European and worldwide levels. In November 2000, the European Commission issued a green paper named „Towards an European Strategy on Energy Supply Security”. This report carried a strong warning about European dependence on imported energy that could increase from 50 percent in 2000 to 70 percent in 2020-2030.¹ The European Parliament and the Council passed their agreements, stressing the importance of minimizing the risks of dependency both by the European Union and the member states.

2. Energy dependence and supply security

The European Union is consuming more and more energy and importing more and more energy products. Community production is insufficient for the Union's energy requirements. As a result, external dependence on energy is constantly increasing.

At this moment, according to statistic reports, current energy demand is covered by 41% oil, 22% gas, 16% coal (hard coal, lignite and peat), 15% nuclear energy and 6% renewable energies. If nothing is done, the total energy picture in 2030 will continue to be dominated by fossil fuels: 38% oil, 29% gas, 19% solid fuels, 8% renewable energies and barely 6% nuclear energy.² Oil reserves are very unevenly distributed across the world, and the European Union in particular has very few. In the applicant countries, the situation is even worse. The Community has eight years of known reserves at current consumption rates (assuming no change in consumption patterns and/or related technologies). Thanks to the North Sea, whose reserves belong mainly to the United Kingdom, the Union produces some 158.3 million toe (1997), representing scarcely 4.4% of world output³. Today, the cost of extracting one barrel of oil in Europe ranges between USD 7-11, compared to a range of USD 1-3 in the Middle East⁴.

¹ *Green Paper – Towards a European Strategy on Energy Supply Security*, European Commission, Brussels, 29 November 2000 (COM(2000) 769 final).

² *Ibidem*.

³ *World Energy Technology Outlook – WETO H2*, European Commission, European Communities, Belgium, 2006.

⁴ <http://www.timesonline.co.uk/tol/news/world/>.

Natural gas reserves are more evenly distributed on the global level, but the European Union is once again unfortunate, having barely 2% of world reserves, or 20 years consumption at present rates, 223.2 million toe were extracted in 1997, representing 12% of world production. Most of these reserves are located in the Netherlands (56%) and the UK (24%). While world energy consumption has risen since the first oil crisis, the EU also succeeded in reducing its energy dependence over this period, from 60% in 1973 to 50% in 1999⁵. Policies focusing on demand management (energy conservation), development of internal resources (North Sea oil) and diversification (revival of nuclear programs research into renewable energies etc.).

It is essential for the Union to maintain satisfactory relations with transit countries in order to have stable access to the energy products it needs. This is especially true for gas, where the main risk lies in transit conditions and continuing diversification of transport routes, not in the status of world reserves. With regard to supplies originating in Russia, the Caspian Sea basin, North Africa and the Middle East, two regions deserve special attention, eastern and north Europe on the one hand and the Mediterranean basin on the other. Russia plays an essential role, providing the Union with more than 40% of its natural gas needs. However, there is also considerable potential for oil and gas production in the countries of the Caspian Sea basin. As a producer, Russia is the world's leading natural gas exporter. It would also like to export more oil, and even electricity, to Europe, establishing new transport routes. A range of transport routes will also be necessary if the resources of the Caspian Sea basin are to be fully exploited. Particular attention should therefore be paid to transit States such as Turkey, the Ukraine, the Baltic States and the Caucasian countries. North Africa is also an important producer region for Europe (Algeria, Libya). In the light of their intention to join the European Union energy policies and objectives should consider what support it could give to Turkey, Bulgaria and Romania, to develop transit facilities for Caspian basin gas and oil, in addition to existing plans for transporting Russian supplies. The natural gas interconnection project linking Greece and Turkey opens up the potential for European access to new sources of natural gas, providing an alternative to seaborne trade. It could also provide an export route for Middle Eastern production. The northern, central and Mediterranean dimensions of energy policy assume primordial importance in this context.

Generally, oil contribution to world primary energy consumption is 37 percent. In European countries, oil contribution varies from 16 to 90 percent of total energy demand⁶. After the first oil shocks, some countries like France or Belgium have lessened their oil dependence by developing nuclear power while others have accelerated natural gas or coal substitution. The world geopolitics of natural gas is very similar than for oil, except for the exceptional position of Russia which holds about one third of world natural gas resources. Russia accounts for about 35 percent of European natural gas imports. Other imports come from Norway, Algeria, Nigeria and Libya.

⁵ *World Oil Outlook*, Organization of the Petroleum Exporting Countries, Vienna, 2008.

⁶ *Global Energy and Energy Security: A New Agenda*, Cambridge Energy Research Associates (CERA) 2001.

The rapid development of LNG and the building of new gas lines should enable Europe to diversify its sources of supply.

A standard definition of supply is a flow of energy supply to meet demand in a manner and at a price level that does not disrupt the course of the economy in an environmental sustainable manner.⁷ The concept is vast, multiform as it encompasses the whole physical and non physical supply chain. It has also important time and space dimensions. It can be more precisely defined as: a reliable supply of energy. Choices both for primary energy sources and geographical suppliers ought to be as plentiful as possible, within a competitive framework, in order to reduce dependence on only one or two. Diversification in these two areas, primary energy sources and suppliers, is the key to ensuring of supply, a reliable transportation of supply. Transportation networks ought to be physically available to qualified players, well maintained, and expended as required, and should offer as many competitive route options as possible, a reliable distribution and delivery of supply to the final customer. Energy ought to be efficiently delivered to the final customer according to particular time and quality standard without discrimination. At reasonable price over a continuous period. As far as oil and gas are concerned, imports of which are increasing, a stronger mechanism ought to be provided to build up strategic stocks and to foresee new import routes.

3. Trends of renewable resources

Although the worldwide production of renewable energy is expected to grow quickly, its share of the global energy mix will hardly increase. Hydropower is the largest and most important renewable resource and generates about 17% of the world's electricity⁸. It is estimated that only 33% of the technically and economically feasible global potential of hydropower has been developed to date, although there are significant regional variations. In Europe and North America, the majority of sites have been developed, while considerable potential for new development remains in Africa, Asia and South America. Large hydropower schemes, however, often face challenges due to their environmental impacts and long-term returns on investment.

Non-hydro renewable are expected to make a growing contribution to global power generation, even if their total share is likely to reach only about 5% in 2030.⁹ Biomass has the potential to become the world's largest and most sustainable renewable energy source. To progress from this potential stage, both production and end-use technologies must be modernized.

Wind is often considered to be the most advanced of the renewable, after hydropower. Offshore projects spur the development of larger machines and wind turbines of up to 5 MW are about to enter the market. However, the electricity systems with an increasing share of wind power in their fuel mix will have to face new challenges. Experience in those countries with a high share of wind in their electricity production demonstrates the problems of integrating an intermittent energy source into

⁷ *Ibidem.*

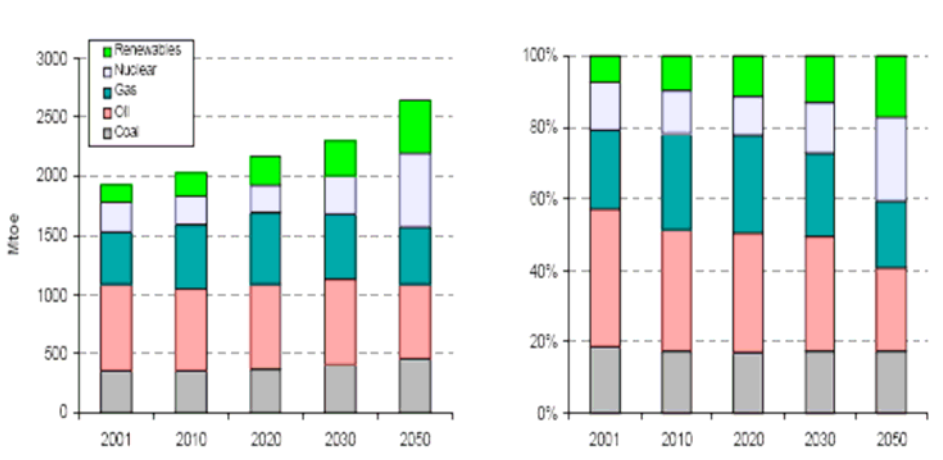
⁸ Survey of energy resources 20th Edition, World Energy Council, London.

⁹ *Ibidem.*

the grid and the implications this can have for the global power system performance, including the need for new concepts for power plant operation scheduling and system control. Geothermal is an important renewable resource and it can be used for base-load electricity production. The best geothermal fields are located within well-defined belts of geologic activity. Geothermal energy converting systems are able to provide electricity with an annual capacity factor of over 90%.¹⁰ Solar radiation, the earth's prime source of energy, is being increasingly used. While photovoltaic (PV) power generation is still the most expensive solar technology, costs are falling and its versatility enables it to find many stand-alone applications.

We live in an increasingly interdependent world. And central to this is the global energy system. Given that fossil fuels will continue to satisfy the overwhelming share of the world's commercial energy needs for the foreseeable future and that there are adequate resources, the challenge going forward is clear. It is making sure that the emphasis is placed on how to develop, produce, transport, refine and deliver oil to end-users in an efficient, timely, sustainable, economic and reliable manner.

Beyond 2012, non-OPEC supply is expected to maintain its growth, particularly from non-crude sources, such as oil sands, and biofuels, mainly in the US, Europe and Brazil. In total, almost 11 mb/d of non-conventional oil supply comes from non-OPEC by 2030 in the reference case, an increase of more than 8 mb/d from the 2006 level. By 2030, total non-OPEC supply reaches 60 mb/d. These forecasts suggest that an additional 12-13 mb/d of OPEC crude will be required by 2030, but the share of OPEC crude is not expected to be markedly different from that of today. Total demand for conventional crude will not exceed 82 mb/d by 2030¹¹. Of course, bringing these supplies to market implies major challenges for the oil industry.



Source: World Energy Technology Outlook – WETO H2

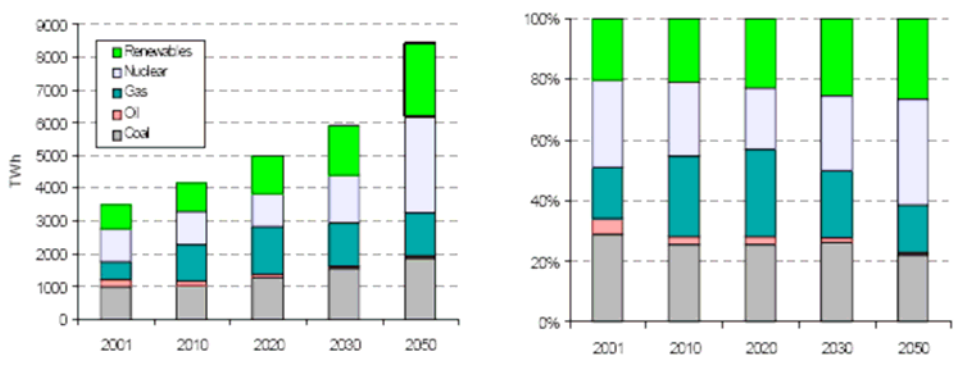
Fig. 1. Primary energy demand in Europe

¹⁰ *Ibidem*.

¹¹ *World Oil Outlook*, Organization of the Petroleum Exporting Countries, Vienna, 2008.

Security of demand is a real issue. It is intrinsically linked to security of supply. It is not just a question of whether there will be enough supply to meet demand; it is a question of whether there will be enough demand to meet current and predicted supply. All of this points to a growing energy interdependence. This, if anything, is the new world of energy; something that all stakeholders will increasingly need to embrace. This new world is nothing new for the energy industry, and the oil industry in particular, which has a long and successful history of adapting to change, and will continue to do so. One fundamental way forward is for a pragmatic dialogue among all parties, a positive dialogue that is cognizant of the needs and responsibilities of oil producers and consumers, oil exporters and importers, developed and developing nations, and present and future generations.

Next figure shows a forecast that by 2050 more than 60% of electricity in Europe comes from renewable energies or nuclear energy.



Source: World Energy Technology Outlook – WETO H2

Fig. 2. Electricity production and fuel-mix in Europe

Europe's citizens and companies need a secure supply of energy at affordable prices in order maintaining our standards of living. At the same time, the negative effects of energy use, particularly fossil fuels, on the environment must be reduced. That is why EU policy focuses on creating a competitive internal energy market, on developing renewable energy sources, on reducing dependence on imported fuels, and on doing more with a lower consumption of energy.

4. Conclusions

Europe's increasing dependence on external energy resources, and the ever-greater distance at which those resources are located are set to increase the burden of both transport costs and transit requirements. The challenges posed by the transit problem have also been significantly complicated by the emergence of the New Independent States (NIS) out of the ruins of the Soviet Union. The gas crisis underlines one of the fundamental weaknesses of European energy policy. Because of national interests, there is no real common European energy policy and efforts to create an internal energy market are also hampered by all kind of obstacles. Securing a diverse energy mix has been identified as a key policy objective in order to shield Europe from

potential external energy crises and achieve supply-security and environmental sustainability in the long term.

Some objectives majors of EU energy policy overriding the European agenda: increasing security of supply, ensuring the competitiveness of European economies and the availability of affordable energy, promoting environmental sustainability and combating climate change

Renewable energies are essential contributors to the energy supply portfolio as they contribute to world energy supply security, reducing dependency on fossil fuel resources, and provide opportunities for mitigating greenhouse gases. A diversified fuel mix is a prerequisite for energy security, stability of prices and supply, and should be taken into consideration when developing national energy plans or long-term business strategies, in particular against the background of the growing short term focus of the liberalized energy markets.

The European Council reaffirms the strategic importance of global warming, together with the need to ensure security of supply and enhance business competitiveness, make it ever more vital and pressing for the EU to put in place an integrated policy on energy combining action at the European and the Member States' level.

The Black Sea region is a production and transmission area of strategic importance for EU energy supply security. It offers significant potential for energy supply diversification and it is therefore an important component of the EU's external energy strategy. Energy supply security diversification is in the interest of our partners in the region, as well as the EU.

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