Energy markets at the beginning of the second decade of the 21st century

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REVIEW

The paper analyzes movements in energy markets at the beginning of the second decade of the 21st century which appeared as a result of developments in the markets, globalisation of all markets, particularly the energy market, and influence of geopolitics. Soaring of energy prices was caused primarily by increased consumption of energy on the wave of industrialisation in the countries in Asia and South America such as China, India and Brazil, including occasional instabilities with global consequences. After 11 September 2001 the impacts of geopolitics intensified and led to sharp increase of oil prices after 2003. This caused steady rise of all energy prices. Additional factor of instability were occasional disturbances in natural gas supply from Russia to Europe due to unresolved relations along the transportation routes.. Thus, in the second decade of the 21st century energy markets entered a new stage of energy crises, political instability and possible major disturbances. Such market conditions aggravate position of energy importers, specifically in Europe and particularly in the SEE region, but they also make the need for energy conservation, advanced solutions for energy efficiency and more intensive use of renewable energy sources ever more topical.

Key words: energy, energy markets, energy price, supply – demand, geopolitics

Introduction

During the last twenty years the author published three articles dealing with similar topics in the Nafta journal. The first article entitled "The world oil market in the 1990s" was published in no. 7-8 of Nafta in 1990, the second article "The oil market structure and changes towards the year 2000" was published in no. 4 in 2000 and the third article "World oil market at the beginning of the 21st century" was published in no. 7-8 of Nafta in 2006.

The first article announced two possible scenarios of oil price movement: one scenario predicted a steady rise and the other a sharp increase of oil prices as a result of geopolitical disturbances, which really happened in 1991 during the Gulf War. The article did not anticipate a decline of oil prices in 1998, the time of large scale mergers of the US and British oil companies.

The article published in 2000 analyzed the global changes that took place after the big mergers and pointed to the changes that were induced by political and strategic interests, which then, behind the scene, influenced events on international stock exchanges. The article highlighted the fact that despite progress in the development of oil market, political relations had strong influence on the relationships in the world oil market. The events that followed confirmed this conclusion: in the last ten years geopolitics remained in the centre of events in the oil and other energy markets.

The third article published in 2006 highlighted globalisation of world oil market with serious consequences on energy consumption, and provided a detailed description of global concentration of Anglo-American oil capital as a preparation for globalisation of energy markets and energy capital. The article stated that the changes in structure of consumption were too slow and depended on oil prices; in the context of growing consumption the issue of depletion of world oil reserves became increasingly important and it had significant impact on oil prices, but also on prices of other energy sources.

This article presents an analysis of recent events on global energy markets, geopolitical influences of these global events on the circumstances and development of energy markets of peripheral regions such as SEE energy markets, including Croatia, the country with relatively small influence and energy consumption.

Energy consumption and the role of energy in economy

Almost nine-tenth of global energy needs was met by fossil fuels in the last fifty years, of which oil and gas accounted for more than 60 percent. Despite the changes that took place recently, the share of oil and gas in global consumption remained high with over 60 percent. Ensuring energy supply and security of supply is still focused mainly on supply of fossil fuels (coal, oil and natural gas) in which oil and gas have priority.

At the beginning of the 21st century, total world energy consumption doubled compared with the year 1970. In the last two decades energy consumption had fast growth, but after 2008 and the recession that followed, energy consumption declined in the developed world. The structure of consumption changed with a decline in relative share of oil, increase of natural gas and decrease in coal consumption in the 1980s. However, the consumption of coal increased again in the 21st century, particularly in fast growing economies of China and India, the countries that with their very size have growing impact on global data on energy structure and consumption.

Globalisation processes, in addition to other effects, had significant impact on setting up unique models and rules of business behaviour as well as the actions taken by government bodies. Quite simple model was established – 'take it or leave it' – according to which the countries that accepted economic development aid, adopted also all recommendations, from IMF rules in designing macroeconomic policy in order to meet obligations as part of the terms for getting access to international capital market and foreign investments. Those who accept international standards can have access to development incentives and investments; otherwise a country can remain on a blind track of isolation, stagnation and underdevelopment.

So, global energy consumption had a growing trend in the past thirty years until recent economic recession and downward trend that followed. According to forecasts, global energy consumption is expected to grow after economic recovery as presented in Figure 1 – IEA global energy forecast till 2030.

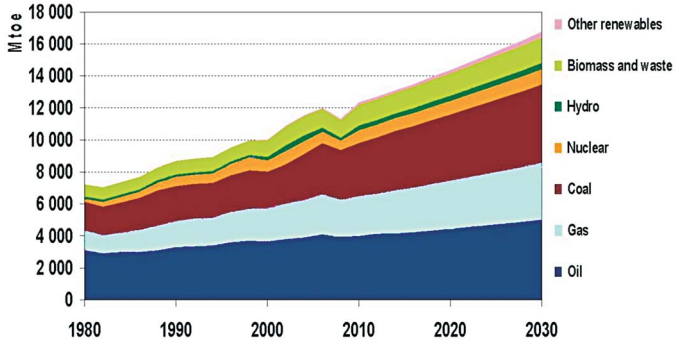


Fig. 1. Global Energy Consumption Forecast by 2030
Sl. 1. Projekcija globalne potrošnje energije do 2030.
(Source: International Energy Agency)

Forecasts on energy consumption in Europe predict fall of consumption as a result of economic recession. Drop in oil consumption has been quite conspicuous in the US, it is also present in Europe, while in Chine oil consumption continued to grow even during global recession, as well as in other BRIC countries: Brazil, Russia and India. In such constellation, it is likely that BRIC countries and other developing regions will have higher growth of energy consumption in the future, while countries in Europe will have lower growth with focus on natural gas and replacement of smaller domestic production.

Key global challenge today is the reduction of greenhouse gas emissions which are generally considered to be the main cause of negative effects on global eco system and climate change and which represent a growing threat to global economic and civilisational achievements. For this reason IEA projections on energy consumption are based on the need for reduction of carbon dioxide and other greenhouse emissions. Figure 2 presents current structure of energy consumption and forecast of global energy consumption in two possible scenarios.

Reference scenario assumes continuation of the present model of energy consumption – 'business as usual'. The '450 Policy' scenario is based on the assumption that emission reduction measures within the scope of policies aimed at mitigating climate change will gradually set conditions after 2012 for stabilization of greenhouse gases concentration on the level of 450 ppm CO_2 equivalent which would, according o estimations, keep increase of average temperature below 2 degrees Celsius by 2050. The '450 Policy' scenario assumes reduction of greenhouse emissions and along with it a dramatic restructuring of the existing economic development model. The reference scenario foresees global increase of energy consumption in 2030 by approximately 40 percent compared to 2008, while '450 Policy' scenario foresees increase of energy consumption by approximately 20 percent compared to 2008.

Energy consumption structure

Despite warnings on depletion of Earth's natural resources, particularly loud during the energy crises of the 1970s, the global energy consumption regained fast growth by the end of the of the 1980s when energy crises ended and oil prices dropped. At the beginning of the 21st century total energy consumption in the world more than doubled the consumption recorded in 1970. Structure of energy consumption changed in a sense that relative share of oil declined while share of natural gas increased, and coal consumption declined in the 1980s. Coal consumption is up again in the 21st century, particularly in the fast growing economies of China and India which, due to their size, have significant impact on global data on consumption and structure of energy consumption.

World energy consumption structure in 1970 and 2010 is presented in figures 3 and 4. The figures show growing share of natural gas and declining share of oil and growth

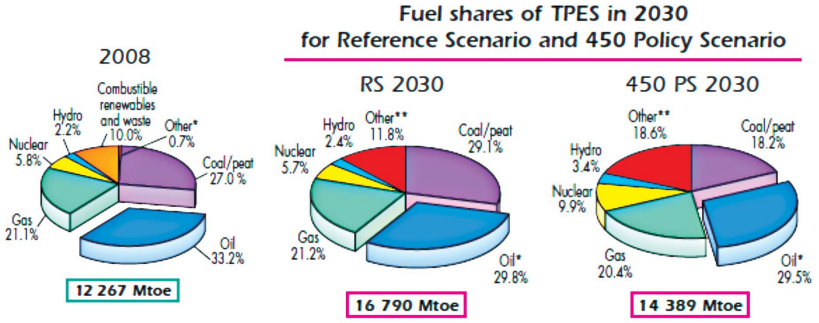


Fig. 2. Present Energy Consumption Structure and Global Energy Consumption Forecast Scenarios
Sl. 2. Sadašnja struktura potrošnje energije i scenariji projekcije globalne potrošnje energije
(Source: International Energy Agency)

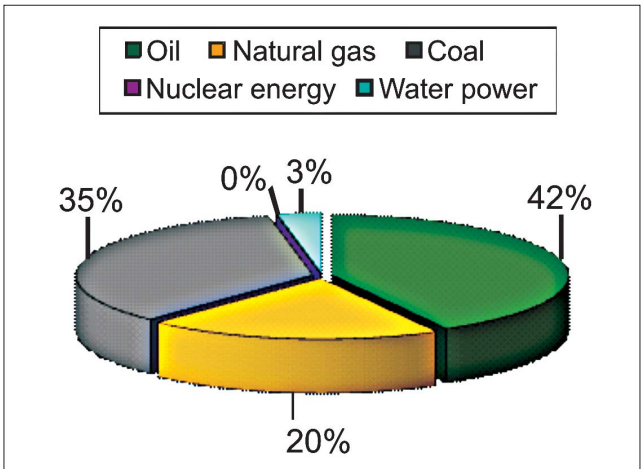


Fig. 3. World energy consumption structure in 1970
Sl. 3. Struktura potrošnje energije u svijetu 1970.
(Source: Dekanić, I.: Rudarska i naftna renta, Zagreb: Nafta, 1982., str. 68.

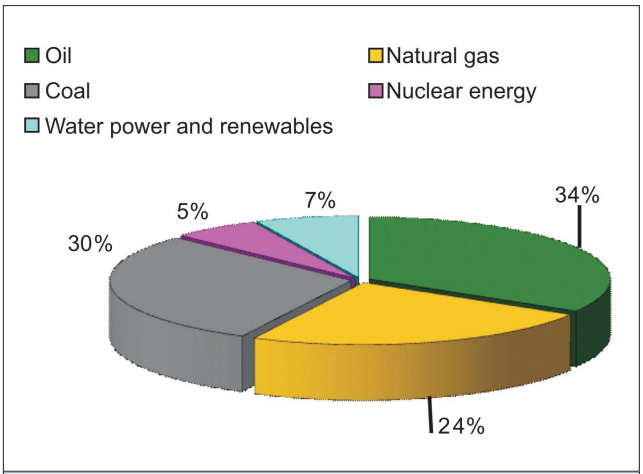


Fig. 4. World energy consumption structure in 2010
Sl. 4. Struktura potrošnje energije u svijetu 2010.
(Source: BP Statistical Review of World Energy 2011, www.bp.com (20.06.2011.)

of total energy consumption. In 2008 the consumption more than doubled the 1970 level, or more precisely it was 2.4 times higher. Despite warnings on limited reserves of fossil fuels, particularly conventional oil and gas, the consumption of these fuels continues to grow. Such circumstances set objective conditions for appearance of global energy paradox which is described further in this article.

Intensive energy consumption and its adverse effects pose a serious threat to sustainability of global eco system and the survival of human civilisation on the planet Earth. Nonetheless, the need for achieving economic growth and industrialisation of numerous still underdeveloped regions, including social and political mindset that continually call for growth and expansion of all types of markets, demand more and more energy. Modern society depends on energy and this relationship points to vulnerability of the modern civilisation structure based on strong mobility of people and goods which demand unlimited growth of energy consumption and thus creates negative effects that could jeopardize the very foundations of global economy stability.

However, despite widely acknowledged awareness about long-term unsustainability of the existing model of energy consumption, it is very difficult to change it. Namely, the current model of industrial development and social structure, impacts of capital on globalised economy, political interests of numerous countries, nations and political elites are so deeply rooted in intensive energy consumption, particularly oil and gas, that it is extremely difficult to change the existing state of affairs, although, on general level of cognition, people are aware that it is unsustainable.

In order to have a better insight into the causes of this contradiction, it is necessary to analyze the root causes and the way how this seemingly inseparable link between industrial development, energy consumption and oil was established, including seemingly really inseparable relationship between economic and political interests that created such structure. Therefore it is necessary to analyze in more detail the relationship between oil, modern economy, politics and military power in global strive for securing access to oil, today quite questionable, but still overwhelmingly attractive energy source, the possession of which ensured political power for almost a century.

Globalisation processes and globalisation of energy markets at the beginning of the 21st century

The term globalisation refers to the globalised market of goods, services and capital dominated by global corporations. Large international banks and globalised financial markets enable business operations around the world and transnational circulation of goods, services, capital and knowledge. Global corporations operate on global market by using capital and moving the capital and resources from one end of the world to the other for the purpose of their growth optimisation and profit. The globalisation has encountered some resistance in the recent years, but the process relentlessly goes on.

The term globalisation is closely related to multinational companies that operate on the global market. Although international corporations, particularly oil companies, appeared already at the beginning of the 20th century, their actual expansion in many industrial activities took place in the 1950s. Their strengths and advantages became fully prominent by the end of the 20th and the beginning of the 21st century as a result of political democratization, flourishing of liberal economies, technological advancements and development of communications, particularly Internet. Another drive for further globalisation in the last decades appeared after break down of the socialist block and global spreading of capital market infrastructure.

Internet in combination with satellite telecommunication network provided a base for global information technology for the future. Wide spreading of internet made communications really global. In the 20th century the mobility and communication of the modern man became

globally possible thanks to oil. At the beginning of the 21st century this role was undertaken by electronic technology, satellite telecommunications and Internet.

Energy activities, as infrastructure for economic activities, developed in tandem with capital and politics, by corporate managers and government representatives. In some cases political influence was very strong, although frequently hidden. Intensity of political control over oil industry differs on various continents. In addition, part of energy activities, which are characterized as natural monopolies due to the nature of network infrastructure in their operations, is of primary interest for any state's fiscal policy. For almost a century oil industry has been a primary source of tax income of a country.

Globalisation is a process which enabled creation of global economy based on unlimited use of natural resources, particularly fossil fuels. It also enabled global spread of technologies and exploitation of global resources. All these factors instigated changes in energy geopolitics. Energy sources and transport routes caused a number of political conflicts, tensions and clashes. Energy and energy reserves, as an important precondition for achieving economic growth, represent one of the most important foundations for planning of the future. In such a context energy is beyond economic or development goals, it becomes a key political interest.

Among fossil energy sources available today, the reserves of coal are the highest; however their exploitation may endanger ecological balance of our planet. New technological solutions propose carbon capture and storage which could make exploitation of coal possible with less harm for the environment. However, geopolitical tensions and issues related to security of energy supply, motivate many countries to establish, keep and increase strategic stocks of oil and gas. Thus, geopolitics has indirect impact on increase of energy prices.

At the beginning of the second decade of the 21st century, and particularly after the crises, it becomes clear that we are about to face significant changes in economy and after that in politics.

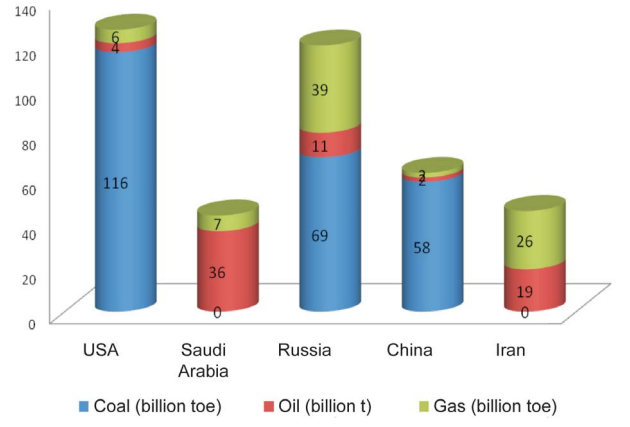


Fig. 5. Concentration of main fossil energy sources
Sl. 5. Raspored glavnih rezervi fosilnih izvora energije

Source: Dekanić, I. Geopolitika energije. Zagreb : Golden marketing - Tehnička knjiga, 2011.

It seems that the world became politically multi-polar once again, but at the same time there is one geopolitical constant – energy and energy resources. Today, it is clear more than ever that economic and political power go hand in hand with lines of force of energy geopolitics.

Figure 5 presents the concentration and structure of reserves of three main fossil energy sources: coal, oil and natural gas and their distribution in 5 largest holders of these reserves. This is the distribution of almost nine-tenth of the current primary energy from conventional resources, the exploitation of which is still most profitable and determines the largest part of today's energy consumption in the world.

It is more and more clear that energy superpowers, the United States, Russian Federation and China have also become economic superpowers. The United States certainly are a superpower for more than fifty years, Russia gains this position as energy prices go up and it possesses huge reserves, and China becomes a superpower by a combination of indigenous coal reserves activation and import of oil. Thus, energy and energy resources have a dominant role in determination of key directions of economic growth, but they also affect repositioning of political power. Energy is certainly a global development factor and energy geopolitics one of key factors for ensuring political power.

The data on distribution of energy reserves, on production and consumption, indicate that at the beginning of the 21st century there are huge reserves of fossil hydrocarbons still available. Despite frequent concerns about peak oil and declining production, it is not likely that oil could be depleted soon. Natural gas reserves are still larger, particularly when we take into consideration unconventional reserves, the exploitation of which will intensify in case of significant increase of gas prices. So, there is no danger of depletion of natural gas reserves, at least for another fifty years.

Nevertheless, a threat that energy reserves may run out has considerable effect on energy economy and is reflected in the fact that importing countries tend to build strategic stocks and pile stocks of oil and natural gas, which then impacts energy markets and speculations on exchanges, with price increase as frequent result, particularly in case of oil. Such situations are typical in times of geopolitical instability, as for example destabilisation and change of political regime in some countries in North Africa and Middle East that took place in the first half of 2011.

New politicisation of the world energy market

A new politicisation of the world oil market, which impacted all other energy markets according to communicating vessels principle, began after blazing up of the War on Terror that followed after September 11, 2001 terrorist attacks on the World Trade Centre in New York.

After the first shock following the tragedy, the United States reacted with rage that called for revenge. The media named the attack a global terrorism and the US President George W. Bush Jr. proclaimed the War on Terror which was soon joined by the NATO and the U.S. allies,

Great Britain and Israel in the first place. The attacks on the Twins in New York and Pentagon were condemned by the international community and overall public.

The terrorist attacks had a significant impact on the U.S. economy. A direct consequence was a loss of 250 thousand jobs, fall of stock values on exchanges and economic recession which spilled over to Europe and other parts of the world. Oil prices rose soon to over 30 $/bbl. Capital markets downsized trading and indexes fell, while prices of gold and oil went up by the end of 2001 and early 2002. Immediately after the attack the Dow Jones index dropped over 14 percent. Only the value of military industry stocks went up.

Soon after that the United States mobilised military forces and a couple of months later the U.S. army with the support of British, Canadian and Australian special troops seized Afghanistan. The Taliban regime was overthrown and a new loyal government installed. The president was elected: it was pro-American, moderate politician, Hamid Karzai. Afghanistan was conquered, but guerrilla anti-American fights began. Assassinations in Pakistan followed, despite the U.S. support to Pakistani government. Instabilities and tensions persisted, moreover, intensified. The first wave of anti-Islamic mood in the United States quieted down, but anti-American mood in the Arabian countries grew.

All these factors pointed to the conclusion that a new war was likely to break out in the Middle East. At the beginning of March 2003 a conflict started between the United States and the Great Britain on one side and Germany and France on the other side over the issue whether military intervention in Iraq required permission by the UN Security Council or not. France and Germany, soon joined by the Russian Federation, required a special debate in the Security Council, while U.S. and Great Britain claimed that Iraqi obstructed the work of UN inspectors on weapons for mass destruction and that it was sufficient reason for military intervention. In the end, U.S. completed concentration of military troops and with the support of UK army the intervention in Iraq started on 20 March 2003.

In three weeks United States and Great Britain forces marched in and conquered Bagdad and soon after that all other towns. Saddam Hussein's regime was overthrown, government institutions shattered and Iraq sank into political chaos. The stabilisation of the country is still not in sight. The coalition forces that defeated Iraqi army and overthrew Saddam Hussein were not ready for occupation of the country. Apart from street plunders, internal clashes that started at the beginning of 2004, the conflicts expanded into open rebellion against occupation. Ally forces put under control oil fields and export terminals.

By mid 2004 the new Iraq government was not elected and the country remained in the state of chaos. Assaults on the American and coalition forces were frequent, particularly in the second half of 2003 and the first half of 2004. In December 2004 the U.S. special forces caught Saddam Hussein and he was sentenced and executed two years later. Nevertheless, departure of Saddam brought no improvement to the country or political consolidation among the U.S. and allies' occupational forces.

Eventually, at dawn on 2 May 2011 in a carefully planned action the U.S. special forces killed Osama bin Laden, the most wanted terrorist of the world, the head of Al-Qaida, the organization that claimed responsibility for the 11 September 2001 attacks.

At the same, numerous and well harmonized terrorist attacks on civil targets in Europe, Africa and Asia showed that global terrorism endangered inner stability of leading Western countries and thus eroded the stability of the global market and democracy. Thus, apart from globalisation of markets and political powers, the modern world has entered into an era of global instability.

With escalation of terrorist activities and deepening of political crises in the Middle East international oil prices started to rise and resulted in price increase of all other energy sources in the second half of the first decade of the 21st century until the mid 2008 when the world was struck by financial crises and the recession continued in 2009 and 2010.

Changes in energy consumption structure

Modern civilisation consumes energy in direct consumption or transformation of one form of energy into another. Direct consumption refers to energy used for fuelling transportation means such as automobiles, planes and ships or for heating or some other types of energy used in industry or households. Energy transformation refers to use of coal, natural gas, uranium or other primary energy source for electricity generation. The more developed a country is, the more energy is consumed in energy transformations. Developed societies use also a diversified mix of primary sources, the so called ženergy mix'. Energy consumption depends on many factors, the most important are: economic growth and structure of economy, or a model of economic structure. Industrialised economies consume more energy, absolutely and relatively. The highest energy consumption growth rate was recorded in the countries with fast growing economies which have intensive industrialisation and do not pay much attention to energy efficiency. In general, the modern society and modern economy are based on growing energy consumption.

In 2008 total consumption of primary energy in the world was around 11.3 billion tonnes of oil equivalent per year and it grew by about 1.4 percent year over year. Distribution of energy consumption on continents reflects the level of global industrial development and development dynamics. North America consumed 26.5 percent of total world energy, of which the United States 22.3 percent. South America consumed 4.8 percent, Middle East 4.9 percent, Africa 3 percent, Asia without Russian Federation and former USSR countries 32.5 percent, Europe, Russian Federation and the former USSR countries together consumed 28.3 percent of total world energy consumption, of which the EU countries consumed around 16.3 percent. The United States are the largest energy consumer with 22 percent of total world energy consumption, 25 percent of total oil consumption and around 23 percent of total natural gas consumption.[4]

Economic crises caused slowdown of energy consumption dynamics, however, according to all available forecasts it will go up again once the crises is over, if we maintain the same patterns and habits in pursuing economic growth or 'business as usual'. However, it is likely that energy consumption will slowdown after the crises, primarily oil derivatives consumption. Despite the fact that industrialised countries consume more oil derivatives than developing countries, in the next twenty years, in the period called the 'Reference Period', the consumption in both developed and developing countries could be in balance. It is expected that industrialised countries will have higher oil consumption in transport where there is no economically viable alternative to oil, while in developing countries energy consumption is likely to grow in all sectors. With improved energy infrastructure people tend to switch from traditional sources such as wood to consumption of electricity.

It is expected that natural gas will overtake primary position of oil in the world energy future. According to forecasts natural gas will have the fastest growth and its consumption in the next twenty years, according to EIA forecasts, could increase by 50 percent. In 1999 natural gas surpassed the consumption of coal, however global consumption of coal grew again and surpassed natural gas due to more intensive consumption in Asia. (19)

The consumption of natural gas is increasing for various reasons: price, environmental protection issues, security of supply, deregulation of markets (of natural gas but also electricity) and since it is an important energy source for economic development. The share of natural gas in industrialised countries is increasing due to its advantage as environmentally acceptable source and for this reason it may become a main choice in future energy production. In developing countries it is expected that natural gas will be increasingly used for electricity generation and industrial use. Consumption of natural gas in developing countries could go up by more than 5 percent per year. Such high increase reflects popularity of natural gas in the recent times. It will certainly affect faster development of rather underdeveloped natural gas markets in the decades to come.

Availability of natural gas, energy policies pursued by some governments and development of infrastructure contributed to higher consumption of gas in Europe. Privatisation and restructuring of energy sector in most Western European countries boosted use of natural gas in electricity generation. In addition, governments supported consumption of natural gas through environmental protection policies. Higher consumption of gas induced also more intensive technology transfer from developed to developing countries. This will have an important role in balancing rise in consumption and the need to reduce fossil fuel emissions. Natural gas is economically and environmentally acceptable and has numerous advantages for developing countries, particularly in case of migration of people from rural areas to urban centres which can overload cities' energy resources.

Natural gas can be defined as an ecologically acceptable fuel and many countries concluded that wider use of gas is an efficient way for curbing greenhouse effects. Many governments promote use of natural gas and development of gas infrastructure. Considerable progress in these areas has been achieved in Eastern European countries where a number of enterprises are still state-owned, however, privatisation and restructuring of energy entities gains momentum. The EE countries accept European market regulation principles and develop natural gas market, albeit the process was slowed down by the recession that spread in 2009. Foreign investments will probably have significant role in future development of gas industry. Russian Federation will soon become the main supplier of the large European gas market, particularly after completion of the North Stream pipeline and after that of South Stream.

In 2008 large natural gas producers and exporters established a gas cartel according to OPEC model. By the end of December 2008 energy ministries from 12 countries gathered in Moscow in order to join the group of producers that hold 73 percent of the world gas production. The so called 'gas OPEC', according to participants' claims, was established as an informal club under the title Gas Exporting Countries Forum (GECF). The members emphasize that the organization's primary goal is to improve gas market and joint exploration. Gas producers must respect long-term contracts which prevail in international gas trading, contrary to oil which is traded on exchanges. Therefore it is not so simple for gas producers to negotiate decrease of production so as to push prices up, as it is the case with oil.

As for coal consumption, it had a downward trend after the 1980s. It is expected that such trend will continue. Today, coal accounts for 22 percent of the total world energy consumption, but this share will decline. Coal consumption would have been even lower if the countries in Asia had not increased consumption of coal which became a leading energy source in these markets, particularly in China and India, the countries that possess huge coal reserves. As the two countries are very large, both in surface and population (one third of the world population lives in India and China), it is no wonder that, according to expectations, 80 percent of total increase of the world coal consumption will refer to these two countries. Most of the produced coal is used for electricity generation, more than 65 percent. China is the only exception; it uses great deal of coal for its fast growing industry. Due to limited reserves of other energy sources China resumed exploitation of available coal reserves. Household consumption of coal is in decline due to new technology advancements.

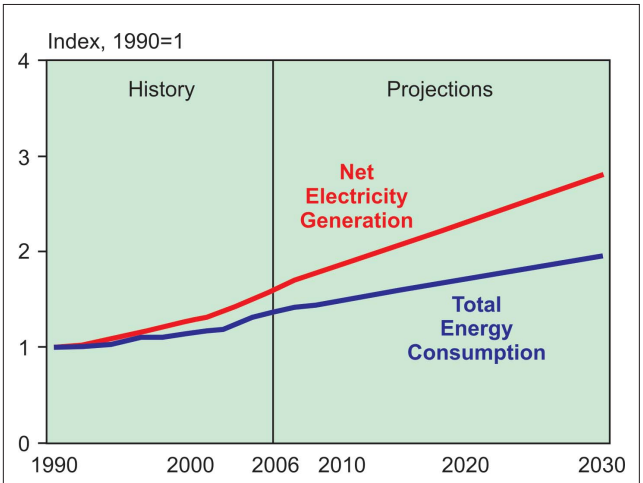
Despite the fact that nuclear energy is not well accepted by the public, higher capacity utilisation and lower than expected number of closures of the existing plants, point to a change in that respect. Industrialised countries frequently ask for the extension of nuclear plants operation. By keeping in operation larger number of plants, the decline of nuclear energy generation is slowed down; moreover, according to forecasts it will grow to over 360 gigawatts. It is expected that developing countries will have the highest consumption of nuclear energy: in the next twenty years this consumption could grow 4.7 percent annually. It is foreseen that Asian countries in transition, China in the first place, will be leaders in expansion of nuclear energy. Nevertheless, after the

earthquake and tsunami that hit the Japanese nuclear plant Fukushima Daiichi on 10 March 2011, and still uncertain destiny of this plant, use of nuclear energy will be the subject of re-examination, as was the case after Chernobyl disaster in 1986.

Renewable energy sources have increasingly important role in the energy sector of the 21st century, although oil and gas have so wide application that we cannot talk about jeopardizing fossil fuels position. The cost of energy generated by renewable sources is still uncompetitive to enable development of wide application; however, its positive impact on the environment paves the way for expansion of renewable energy use. It is likely that the share of renewable energy will grow to 10 percent of global energy consumption or even more (excluding hydro power plants which also make part of renewable energy). Relatively low price of fossil fuels is one of the main obstacles for higher growth of renewable energy share in total energy balance.

Apart from nuclear energy, some other primary energy sources have been challenged and have had their ups and downs in respect to intensity of construction, like hydro power for electricity generation. Hydro power is considered a permanent energy source; it depends on natural and investment potentials of a country, as such projects require large investments, but also on global technological advancements. Large hydro power plants give rise to growing concerns due to negative impacts on the environment. Therefore, some consider that such plants should not be included in renewable sources and should not receive government subsidies like other renewable sources for electricity generation.

Growth in world electric power generation and total energy consumption by 2030 according to U.S. energy Information Administration projections is presented in Figure 6.



Sources: **History:** Energy Information Administration (EIA), *International Energy Annual 2006* (June-December 2008), web site www.eia.doe.gov/iea.
Projections: EIA, World Energy Projections Plus (2009).

Fig. 6. Growth in world electric and total energy consumption
Sl. 6. Projekcija porasta potrošnje električne energije i ukupne energije

According to the projections, world electric energy consumption could double by 2030 compared to global consumption in 2006. It is foreseen that Asia will have the highest increase. Industrialised world will most probably maintain the current level of consumption or have a modest increase. Slow down in population growth and economic development coupled with saturated electric appliances market (air conditions, refrigerators and boilers) and improved efficiency of such appliances can explain a slow down in electric power consumption in the most developed countries.

The impact of economic crises on energy prices

Global economic crises affected weakening of demand for energy in the developed world (Europe, North America and eastern part of Asia) and to certain extent slowed down growth of consumption in the developing countries like China, India, Brazil and others. In addition, the recession of globalised economy that broke out in the middle of 2008 resulted in sharp fall of oil prices and other energy, which grew again in 2009 and 2010. By the end of 2010 oil price neared 100 dollars per barrel; at the beginning of 2011, under the influence of geopolitical instabilities in the North African countries and Middle East, oil price surpassed 100 dollar per barrel and in Europe even 120 dollar per barrel after the break out of riots in Libya.

The effects of global financial crises and recession are reflected in movement of GDP and energy consumption which are presented in figures 7 and 8 according to BP Statistical Review of World Energy (5).

Figure 7 presents consumption of energy according to energy source and regions in 2009 and figure 8 shows prices of energy which affected both the real economy sectors and currency movements.

Hydrocarbons production curve and its impact on energy markets

The issue of mineral resources depletion has been present in scientific and professional geological and mining

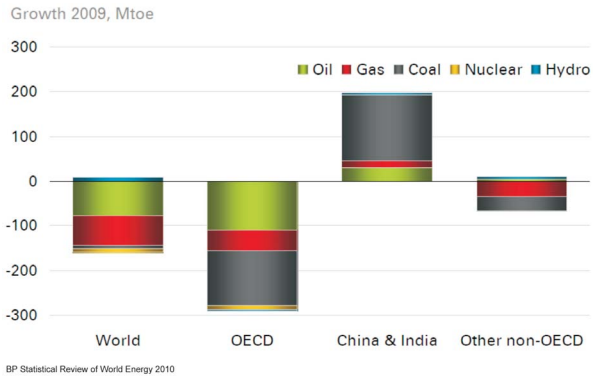


Fig. 7. Consumption of energy according to energy source and regions
Sl. 7. Potrošnja energije po izvorima i regijama[5]

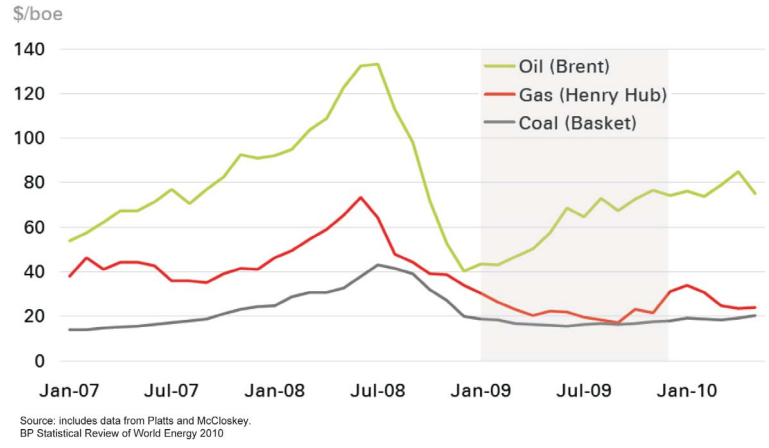


Fig. 8. Prices of energy before and during the recession
Sl. 8. Cijene energije prije i u tijeku recesije[5]

literature for years and it has been raised again whenever single large reserves of important mineral sources got depleted. However, this issue was quite unknown to a wider public until energy crises of the 1970s. Then, an informal group of scientists from the U.S. and European universities discussed possible depletion of energy resources. They were named the Club of Rome according to the venue of one of the conferences. The participants of the Club of Rome published their studies in the book Limits to Growth which became a world hit and instigated a series of discussions about a threat that the world could run out of key resources.

Geologists faced the problem of limited reserves and their depletion, but these analyses did not go out of academic circles and their discussions. For the first time it became known to a wider public when in 1956 an American geologist and geophysicist Marion King Hubbert published the study on future production of oil in the U.S. and the world. He presented the production curve and calculated that around 1970 oil production will start to decline in the U.S. and in the at the beginning of the 21st century in the rest of the world. The curve describing global oil production at certain time is called the Hubbert's curve, and maximum oil output is called the Hubbert's 'Peak Oil' (17). Hubbert's curve is presented in figure 9.

The resource depletion problems and discussions on bell shaped curve of crude oil output or the Hubbert's peak oil, represent one of the key contradictions of the modern energy paradigm. On the other side we are faced with energy demand growth as a result of economic and technological development and particularly as a result of transfer of technologies and capital to developing countries and their fast growth. The long-term contradiction between economic growth and depletion of crude oil reserves represents the essence of the modern energy paradigm at the beginning of the 21st century.

It seems that the basic law in economics, the law on demand and supply is not equally valid for crude oil and other commodities. However, it seems that sometimes analysts forget the basic rule on difference between elastic and inelastic commodity and its effect on demand and supply of such commodities. This rule says that crude oil is a typical inelastic commodity, which means that price oscillations to not automatically change demand for such product.

Namely, in case of price inelastic commodity, demand is changing slowly i.e. with a time lag. It is a characteristic of crude oil: regardless its price, people will continue to drive their cars, demand for automobiles will persist, air transport will not find a substitute fuel for fuelling planes, transport of goods can hardly find alternative fuel or energy source, and weapons, it is not likely that anyone would seek alternative fuel for arms, because anyway, their importance supersedes price considerations. Consequently, price inelasticity of crude oil and its strategic importance in the modern world contributed to a specific behaviour of global market in case of oil price increase.

Precisely for the reason of strategic importance of crude oil in modern economy and civilisation in general, demand and supply are far from ensuring a perfect regulation of the market and trading on commodity exchanges, which is usually the case with other commodities. The demand for oil grows even when its price goes up, moreover, it becomes a target of speculative trading which can be quite lucrative with high gains. All these factors can lead to further increase of demand, despite high prices. This happened at the beginning of the 21st century, along with growing politicisation; despite of that, or better to say because of that, crude oil remained an increasingly precious strategic good.

Efficient energy use, conservation of conventional energy sources and further development and wider use of renewable energy sources are typical mantra of energy policies in crises and these postulates were implemented in the 1970s and 1980s, but not in the years that followed, at least not until skyrocketing of crude oil prices after 2004. Efficient energy use makes part of a development policy based on sustainable development principle, which has been resisted by the United States, the world leading economy. Such policy was also refused by the Russian Federation until Russia eventually signed the Kyoto Protocol in 2004. China and India also tend to get around. Thus, the problem of rational energy consumption and energy saving is far from being a simple issue, and it is not only about adoption of modern technologies or political wish or will of individual states to pursue sustainable development policy.

On the other hand, the need for energy for ensuring economic growth and transfer of technologies, and further strengthening of globalisation processes, make part of the logic and behaviour which does not take into account limitation of resources, Hubbert's curve and possible imminent decline of oil production. In such circumstances, the basic relationship between development, economic growth and energy supply could not go without interference of politics. Political interests, capital and struggle for power, particularly for the control of energy routes, create additional tensions on top of tradi-

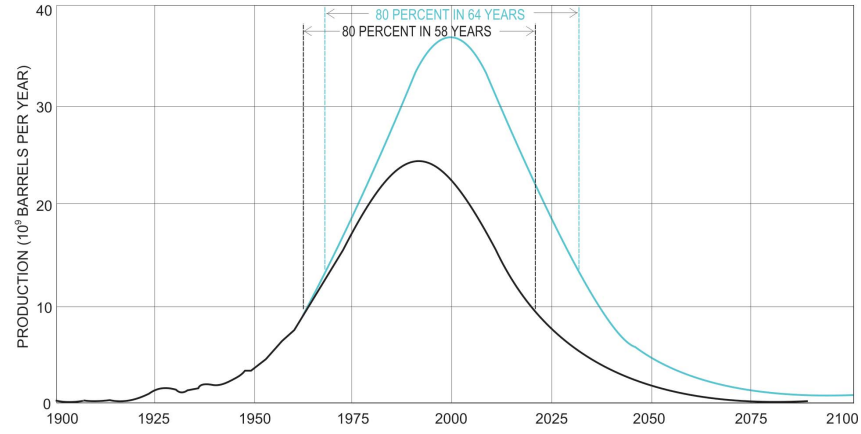


Fig. 9. Hubbert's oil production curve
Sl. 9. Hubbertova proizvodna krivulja za globalnu proizvodnju nafte
Source: Energy and Power, A scientific American Book, 1971, pg 39.

tional political differences, controversies and conflicts, particularly in the Middle East. So, the mathematical logic of Hubbert's peak oil analyses, is in contradiction with the political logic of struggle for power. Consequently, at the beginning of the 21st century we have a paradoxical situation that we can call energy paradox of the modern world.

Global energy paradox at the beginning of the 21st century

Changes in energy sector at the beginning of this century appeared as a result of limitation of reserves of fossil fuels and their global distribution. Geopolitical context of oil and gas world at the beginning of the 21st century, particularly after 11 September 2001 terrorist attacks, is characterized by high level of uncertainty in vicious circle: market – politics – terrorism – oil. Geopolitical role of energy is embedded in a complex system of markets and geopolitical monopolies, marked by constant instability due to growing demand for oil and gas and political disturbances. These issues raised numerous discussions on growing demand for energy and the relationship between energy and population growth.

During the 19th century and particularly in the 20th century, the progress achieved by mankind is closely related to growth of energy consumption. In the 19th century the leading energy source was coal, in the 20th century this role was overtaken by crude oil and in the 21st century it is most likely that natural gas will take a leading role in the structure of primary energy consumption. Coal remains important energy source in emerging economies, however, if disposal of harmful emissions is not permanently resolved, coal consumption will have highly negative impact on the environment. Explosion of population was accompanied by continuous growth of energy consumption during the entire 20th century and the beginning of this century. High mobility of people and goods cause high demand for energy.

Expected shift in people's habits, particularly in the fast growing emerging countries, did not take place. Developing countries reiterate the model of intensive industrialisation and growing energy consumption with extensive effects on human environment and devastation of the last huge intact areas such as the Amazon forests, the jungles in south-eastern Asia or the polar circle of the Arctic.

All these factors contribute to growing uncertainty and the issue of energy consumption becomes one of the key challenges of future global development. Changes in the structure of energy consumption are noticeable, it is likely that in the decades to come they will become more intensive, but it is insufficient for a dramatic change which becomes imperative – global decrease of energy consumption. However, it cannot be achieved without suspension of economic growth and this is something nobody wants, neither political elites nor the citizens of both developed and developing countries: the citizens living in developed countries do not want to be deprived of their comfort based on intensive energy consumption. In the existing globalised economies and global communications, the advantages of luxurious life based on intensive energy use are so attractive that any alternative culturological model could hardly get wide support. Therefore, it seems that the current model of growth and development will persist, albeit it is very dangerous in the long run.

However, there is another challenge which affects the essence of future development, but also the very survival of human civilisation in its current form on the planet Earth. This is the paradox reflected in limited resources and unlimited human desire to achieve growth, which appeared for the first time in history in concrete circumstances and realistic form. Human civilisation's aspirations and unlimited desire for achieving progress are confronted with limitations in material base for achieving such progress. The fact is that modern civilisation requires more and more energy for further progress, specifically, it requires oil and gas, while at the same time oil and gas reserves are declining with the prospect of considerable shortages within the period shorter that average human life.

Hence, for the first time in our history we are faced with the paradox of unlimited human goals and limited possibilities for meeting these goals. Moreover, in its actual meaning and in real time this paradox represents a threat to the very survival of human civilisation in the current shape, the shape that we know and in which most people look for fulfilment of their expectations.

How did this happen? How is it possible that about forty years after the first oil shock and dramatic warnings of the Club of Rome on possible depletion of cheap energy, the world is now confronted with similar situation as in the 1970s? Is it possible that everything that

was said, written and published about the need to switch to sustainable development had been in vain and had no real response in behaviour by most countries and economies? Why all the warnings sent out by scientists on the problem of unlimited use of limited resources and the need for preservation of the environment on the Earth have not been translated into efficient and rational use of natural resources? How is it possible that in the terms of global knowledge and global dissemination of information, a large majority of people simply ignored reasonable messages and recommendations based on that same knowledge?

In other words, the question is how it is possible that in the time of global victory of rationalism the mankind behaves so irrationally.

Nevertheless, the modern world found itself in a paradoxical situation. The collision of interests and reason, short-term and long-term development goals, energy and growth needs, and limitations of available resources, push globalised economy into a new spiral of energy consumption. As a result, limited resources, tense geopolitical relations and ideological prejudices created a new spiral of conflicts which can lead to fierce fight for energy, but also for other natural resources such as potable water and space.

The achieved level of industrial development and technology advancements enable comfortable life to those who have available energy, technology and advantages of modern civilisation. Modern economies provide solutions to fundamental existential issues: health, transport, communication and culture for those who enjoy advantages of modern technology and protection of democratic state. Such way of life requires energy which is now obtained from reserves of fossil fuels deposited in the Earth. However, exploitation of this energy poses new challenges in the form of protection of living conditions on the planet as we know them and to which all living creatures are adjusted. The extension of intensive industrial and economic development based on today's energy and technology foundations, opens up the issue of sustainability of future development for generations to come.

Only future will show whether the world will seek solutions to the problems in ultimate exploitation of existing resources or in search for new resources, in creative application of the existing knowledge or will this knowledge be used for new divisions, global conflicts, or will reasonable compromise resolve energy, economic and political problems. The key problem of the world energy supply system lies in the fact that economic model is based on the existing production technology system driven by fossil fuels which provide relatively cheap energy, but which is unsustainable in the long-term. Considering effects of current sources of energy and energy plants on the environment, we need a radical change in energy orientation and strategy, but due to high costs of alternative energy, such shift is not economically viable, particularly now, during the recession.

Energy has changed modern civilisation, it became its lifeblood, it was a cause of wars and struggle for gaining control over energy routes, and today the world is again on the verge of global conflict, or at least considerable uncertainty.

Europe's energy security and Croatia's position

Croatia adopted European Energy Charter as a part of international commitments in the process of joining integrated European community. Following the resolutions passed by Croatian parliament, in 1997 Croatia ratified the European Energy Charter. The final draft of the European Energy Charter was adopted at the meeting in Lisbon on 16 and 17 December 1994. This document represents one of the cornerstones of liberalisation and regulation of the energy markets.

However, Russian Federation has not accepted the principles of European Energy Charter because the Charter regulation principles foresee separation of control over energy sources from control over transportation infrastructure, which is contrary to the model of organization of energy sector and energy companies in Russia. At the same time this is one of the main stumbling blocks in energy geopolitics between European Union and Russia. Nevertheless, this controversy in energy companies' organization principle has not hindered by now the trading of energy between Europe and Russia.

The principle of separation of energy networks from energy production and trading and establishment of regulated system of energy transmission through energy networks represents the essence of regulated energy market in the European Union. It sets the rules for free access to energy networks and other elements of energy infrastructure, prevents creation of monopolies in managing of energy networks and affects development of energy markets. Implementation of these principles represents the core of the Third Energy Package for regulation of energy markets in the European Union.

In order to resist the terms dictated by international energy giants, energy companies in smaller countries, particularly in Scandinavia, initiated the process of integration and grouping, coupled with various forms of share capital interweaving. Similar models appeared at the beginning of the 21st century in countries in transition in Eastern Europe, which privatised their national energy companies, primarily oil companies. As a result of such processes, several medium-sized oil companies emerged in CEE countries such as Austrian OMV, Hungarian MOL and Polish PKN Orlen. OMV and MOL were the first to privatise their assets and start market expansion.

In addition, the CEE countries experienced economic recovery and thus their energy markets became very attractive. Energy companies in these countries grouped together by establishing consortia for implementation of large international energy projects. However, the financial crises in 2008 and the recession that followed in 2009/2010 slowed down the development of energy projects, particularly in the southern and eastern Europe.

European countries, particularly those in Western Europe, took seriously the lessons of energy crises of 1970s and changed their energy strategy in the direction of more efficient energy consumption and upgrading of

technology base of their economies. In addition, in parallel with transformation of European Community into European Union the energy strategies were redesigned in line with the principles outlined in European Energy Charter which promoted common regulation of energy markets and certain limitations to national energy policies. Basic principles of European energy policy were based on understanding that current situation on international energy market did not favour buyers and importers of energy, therefore western European countries supported EU regulated energy market with free access to all participants.

During ten years on the turn of the century, European Union had sufficient quantities of energy. With some indigenous crude oil and plenty of natural gas from the North Sea, European countries built infrastructure for import of crude oil by sea from the Middle East and North Africa, as well as for LNG import. In addition, import of oil and gas from Russian Federation was organized through the existing pipeline systems. European countries accepted and implemented commitments stemming from the Kyoto Protocol.

Sharp increase of oil prices after 2003 gave new impetus to renewable energy projects, particularly in the western European countries. Availability of oil and gas and access to supply routes created an impression of energy abundance which lasted until the so called Russian-Ukraine gas crises in winter 2005/2006 when Russia reduced supply of natural gas in the most inconvenient time – in the middle of winter. Reductions were partial and relatively short, but all the same they shattered the foundations of European ženergy comfort'. Thus, in addition to the politicisation around supply of oil from Middle East, the supply of gas from Russia was undermined by geopolitics. This was particularly conspicuous during the latest Russian – Ukraine gas crises at the beginning of 2009.

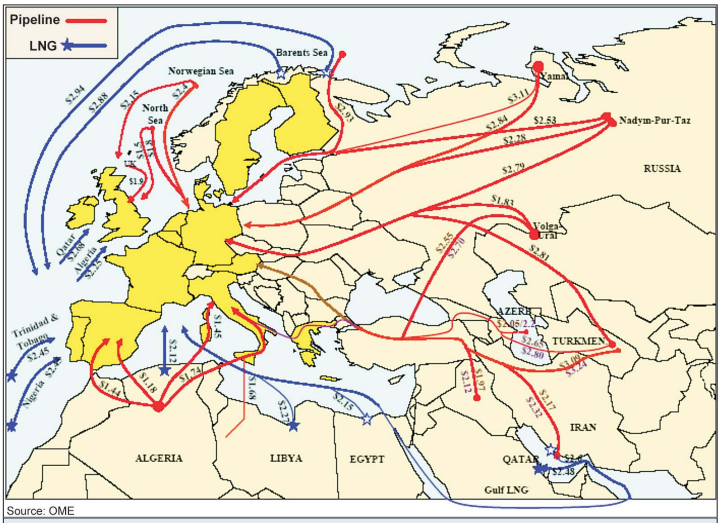
Fig. 10. Oil pipelines and refineries that supply Europe
Sl. 10. Naftovodi i rafinerije nafte za opskrbu Europe

Figure 10 presents a map indicating the existing oil pipelines and refineries that supply oil products to customers in European Union countries. It shows European Union's dependency on foreign suppliers (Russian Federation, Caspian region, Middle East and North Africa). Figure 11 presents main routes of current and future natural gas and LNG supply to Europe.

Croatia and its energy companies will have to adjust their energy policy to the process of globalisation and its requirements, but at the same time to safeguard its national interests and work toward integration into European energy flows, particularly on the southern part of the continent. Currently, Croatia meets about four-fifths of its needs for oil and about 40 percent of needs for natural gas from imports. These volumes will increase in the foreseeable future. Analyses of these figures point to the conclusion about fundamental needs and constraints of future energy consumption and supply in Croatia. It is clear that Croatia predominantly relies on oil and natural gas and that in the near future the import of these energy sources will grow.

Development of energy activities in Croatia should be based on production and consumption of energy by meeting the requirements for the protection of human health, preservation of biological and natural diversity and quality of local, regional and global environment. These are the principles of sustainable development which is the kind of development Croatia, as part of Europe, wants to pursue.

In the last ten years Croatia designed and elaborated its energy strategy and it was a base for the restructuring of energy sector (beginning of privatisation of energy companies, separation of energy transport from production activities, setting up of regulatory agency, etc.). However, in the context of deep changes on global energy markets which emerged in the meantime, increase of oil prices (followed by natural gas and other energy source prices), as well as dilemmas concerning further privatisation of the energy sector – which objectively exist both in political circles and in the public –



Source: OME

Fig. 11. Natural gas pipelines and LNG routes for supplying Europe
Sl. 11. Plinovodi i rute UPP-a (LNG) za opskrbu Europe

Croatia is facing further changes and reorganisation of energy markets within the scope of the Third Energy Package.

As EU member state, Croatia will be obliged to follow European Union's energy strategy. It will include meeting of criteria and rules regulating energy markets which will assume further privatisation of energy companies and probably their take over by some European companies. Privatised oil industry, but also gas and electric power industry that remained state-owned, should strengthen their competitiveness, profitability and operational efficiency.

Considering the above facts, in the next two decades Croatia will continue to rely on existing fossil energy sources; Croatian energy companies will be motivated to get integrated into southern European energy markets and incentives will be provided for more intensive use of renewable energy resources. The main source of Croatia's primary energy supply – crude oil and natural gas will be domestic production from the remaining reserves, and imports from Russian Federation and Caspian region, North Africa and Middle East.

Events that influenced changes on energy markets in early 2011

Some global events that happened in early 2011 had significant impacts on energy sector in Europe and have repercussions on the position of Croatia. These are:

- Political destabilisation of North Africa and Middle East (Tunisia, Egypt, Libya – *crude oil price increased by 15%*, Algeria, Syria and other countries);
- Political destabilisation threat around Persian Gulf: Yemen, Bahrain, Arab Emirates, Saudi Arabia (?);
- Potential destabilisation of regions around Persian Gulf, the main oil export route to Asia and auxiliary export route to Europe and U.S., particularly after liquidation of Bin Laden;
- Re-examination of energy policies by developed countries after the accident in the Japanese nuclear plant Fukushima Daiichi, as for example Germany's decision on temporary suspension of operation of 17 nuclear reactors older than 30 years;
- Increased role of Russia (particularly for European energy sector) – strategic alliance between Russian and Anglo-American oil giants.

Increase of international crude oil prices by 15% after the events in Libya, which is certainly excessive if we take into account objective role of Libya in global oil supply, point to nervous reaction of the markets and strong impact of market speculations, which will most likely characterize energy markets in the future. Another important feature is the link between oil prices and prices of other energy sources. The fact that coal is significantly cheaper than oil does not mean that it will remain so in the future.

It is estimated that the above events will cause re-examination of energy strategies of individual countries, particularly in Europe. It is very probable that nuclear energy will be subject of additional reviews, but when the panic calms down, it is likely that the countries that depend on energy imports such as Japan, France and other, will not abandon nuclear energy. However the tragic accident in Japan will influence introduction of stricter technical standards and safety procedures, which will push up price of electricity generated from nuclear sources. We had similar situation after the oil spill in the Gulf of Mexico in 2010. It caused temporary suspension of deepwater drilling, which has now resumed but with stricter norms and safety regulation, but also higher cost of offshore oil and gas production.

Implementation of energy policy by many countries, particularly SEE countries including Croatia, will force them to face real conditions prevailing on the global energy market and to re-examine their current strategies in the view of global influences and growing uncertainty caused by the events from the first half of 2011.

Conclusion

Energy paradox is a key challenge of modern civilisation at the beginning of the second decade of the 21st century, while energy geopolitics is likely to gain primacy in the decades to come. Namely, until energy paradox becomes a real threat to further growth of global economy, or until scientists find innovative technology solutions for energy supply, energy geopolitics will have more and more influence on production, transport and consumption of energy from traditional sources, fossil fuels, including indirect influence on production of renewable energy. Thus, the energy paradox of modern world and energy geopolitics closed the circle.

Until the mankind solves the problem of continuous energy supply from renewable sources, fossil fuels will have important role and the relations in geopolitics will become even more conspicuous. It seems that energy geopolitics and competition to gain control over energy dominate once again and overpower common sense, principles of sustainable development and restraint. This is happening both on global level and in professional circles and political elites of many countries, particularly global and regional leaders. Comfort and abundance of modern civilisation based on unlimited consumption of energy provide additional incentive for spreading of such conviction. Therefore it can be assumed that energy geopolitics and not global rationalism of sustainability will prevail for some time and affect relationships in energy sector and in planning of overall civilisation development.

Contrary to European Union countries, in the time of energy abundance on the turn of the century, the SEE countries in transition faced numerous problems: from typical transitional problems and privatisation to the problems of expensive European energy infrastructure or back-lag of proper energy industry. The countries that joined EU in 2004 came under the umbrella of the powerful Union, while those that remained outside, like Croatia, are now confronted with the need to start quickly a thorough re-examination and redefinition of their energy strategy.

At the beginning of 2009 the SEE countries found themselves in a very sensitive position during the Russian – Ukraine gas crises which caused cutting of natural gas supply to European countries through Ukraine. As this happened during the most inconvenient time – very

cold winter – the countries without any indigenous production or alternative sources of supply, remained in an extremely difficult position for couple of days. Croatia was also forced to reduce gas supply to some industrial consumers. All these events make the issue of security of supply and energy security of the SEE countries ever more topical.

As in the last few years the SEE countries recorded economic growth, energy consumption increased, but due to limited energy availability, some countries depended on whether condition, specifically in winter. In the forthcoming period, particularly in the next five to six years, most of the SEE countries will be exceptionally sensitive in respect to energy security. For this reason numerous initiatives were proposed for international energy projects on the southern part of Europe, which would improve security of supply and energy security of this region.

Republic of Croatia must ensure sufficient energy for its development; a growing share of which will have to be imported. As Croatia is still not a full EU member, it does not have the advantages and protection granted by this multilateral mechanism. Therefore it must adjust its energy policy to more expensive energy imports, elaborate diversification of sources of imported energy and work toward wider implementation of energy efficiency, but also to stimulate energy production from the remaining conventional resources and increase production of renewable energy. Only with such flexible strategy, together with rational management of domestic oil and gas, diversification of import and incentives for the development of renewable energy sources, will Croatia be able to confront the challenges of energy uncertainty in the second decade of the 21st century.

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