ENERGETSKA BUDUĆNOST HRVATSKE I OPSKRBA PLINOM
CROATIA'S ENERGY FUTURE AND GAS SUPPLY

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U članku se analiziraju karakteristike suvremenih energetskih tržišta te obilježja korištenja nafte, plina i električne energije. Obrađuje se opskrba Europe energijom, novi ciklus politizacije energetike i uloga plina u europskoj energetici te neke suvremene dileme u europskoj energetici nakon okrupnjavanja energetskih trvtki spajanjem i preuzimanjem. Analizira se potrošnja energije u Hrvatskoj, učešće plina, položaj prirodnog plina kao osnovice budućeg razvoja hrvatske energetike, odnosi cijena energenata te cijene plina u Hrvatskoj. Zaključuje se kako je razdoblje jeftine energije iza nas i kako energetski projekti mogu i moraju postati ne samo sredstvo za osiguranje potrebnih količina energije za budući gospodarski razvoj već i prilika za razvoj hrvatskih tvrtki.

The characteristics of the contemporary energy markets are analyzed, as well the use of oil, gas and electricity. Europe's energy supply, the new cycle of the politicization of energetics, the role of gas in European energetics, and several contemporary dilemmas regarding European energetics following the consolidation of the energy companies via mergers and takeovers are discussed. The shares of energy consumption in Croatia, the share of gas, the position of natural gas as the basis for the future development of Croatian energetics as well as the relative cost of energy sources and the price of gas in Croatia are analyzed. It is concluded that the period of cheap energy is behind us and that energy projects can and must not only be the means for insuring the necessary amounts energy for future economic development but also an opportunity for the development of Croatian companies.

Ključne riječi: cijene energije, električna energija, energesko tržište, energija, globalizacija, gospodarski razvoj, prirodni plin
Key words: economic development, electricity, energy, energy market, energy prices, globalization, natural gas

1 UVOD

Energetsko tržište, više od bilo kojega drugoga, ima utjecaj na globalnom planu. Danas se može govoriti o trećem dijelu razdoblja fosilnih goriva u kojem istaknutu ulogu ima plin kao sve češći energent. U suvremenoj globaliziranoj proizvodnji prirodni plin dobiva sve izraženiju geopolitičku ulogu. Na početku 21. stoljeća prirodni plin u Hrvatskoj zauzima oko 25 % ukupne energetske bilance. Potrošnja u proteklih 20 godina bilježi neprekidan rast, s iznimkom ratnih, 1990-ih godina. Plinofikacija, gradnja novih plinskih dobavnih pravaca te liberalizacija plinskog tržišta, uz transparentnu energetsku politiku, trenutačno su iznimno važni elementi za strategiju energetskog razvoja. Razvoj plinskih tržišta utjecat će na globalna kretanja i učešće nafte na tržištu. Međunarodna plinska trgovina stvorit će nove ovisnosti potrošača i proizvođača, uz intenziviranje međunarodne trgovine energijom. Republika Hrvatska mora osigurati dodatne količine i pravce uvoza prirodnog plina, te uključivanje u međunarodnu trgovinu prirodnim plinom. U članku se komentira povezanost razvoja opskrbe prirodnim plinom i proizvodnje električne energije i topline.

1 INTRODUCTION

The energy market has a greater impact on the global plan than any other. Today, it is possible to speak of the third part of the period of fossil fuels, in which gas has the dominant role as an increasingly utilized energy source. In contemporary globalized production, natural gas has a growing geopolitical role. At the beginning of the 21st century, natural gas in Croatia represents approximately 25 % of the total energy balance. Consumption during the past twenty years has grown constantly, with the exception of the war years during the 1990s. Gasification, the construction of new gas supply routes and the liberalization of the gas market, with a transparent energy policy, are elements that are currently exceptionally important in the strategy of energy development. The development of the gas markets will have an impact on global trends and the share of oil on the market. The international gas trade will create new dependencies between consumers and producers, with intensification of international energy commerce. The Republic of Croatia must secure additional quantities and routes for the import of natural gas, and the inclusion of Croatia in the international natural gas trade. The article provides a comment of the connection between the development of the supply of natural gas and the production of electricity and heat.

2 MEĐUNARODNO TRŽIŠTE ENERGIJE

2.1 Struktura potrošnje primarne energije u svijetu

Strukturu potrošnje primarne energije u svijetu prikazuje slika 1. Slika 2 prikazuje strukturu potrošnje po kontinentima odnosno po svjetskim regijama. Vidljivo je kako je, osim na Srednjem istoku, učešće plina najveće u Europi i Euroaziji, tj. u Europi zajedno sa zemljama bivšeg SSSR-a, te u Sjevernoj Americi.

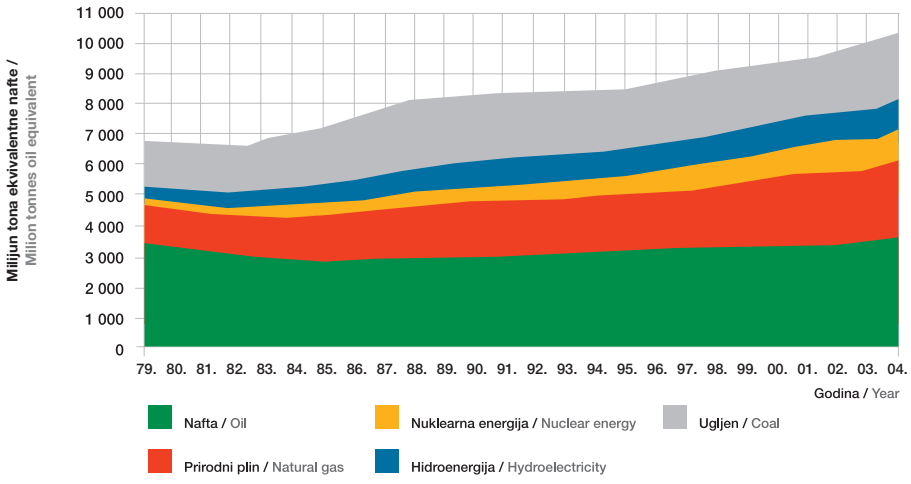
Potražnja nafte nakon početka 21. stoljeća rasla je intenzivnije nego desetljećima ranije. Stope porasta potrošnje nafte tijekom proteklih 15-ak godina kretale su se od 1,5 % do 2 % godišnje, a ukupna svjetska potražnja za naftom u 2004. porasla je za 3,7 % i dostigla gotovo 3,8 milijardi tona. Najveći utjecaj u tome ima gospodarstvo SAD-a, koje troši oko 1/4 svjetske proizvodnje nafte, proizvodi oko 1/3 vlastitih potreba, a tijekom 2004. potrošilo je 3 % više nego godinu prije. U Aziji je potrošnja nafte 2004. porasla 5 %, u čemu je najveći porast u Kini, čak 15 %. Potrošnja nafte u Africi također je počela rasti stopom dvostruko većom od svjetskoga prosjeka. Jedino se Europa i dalje drži na porastu od 1,8 % [1], [2], [3] i [4].

2 THE INTERNATIONAL ENERGY MARKET

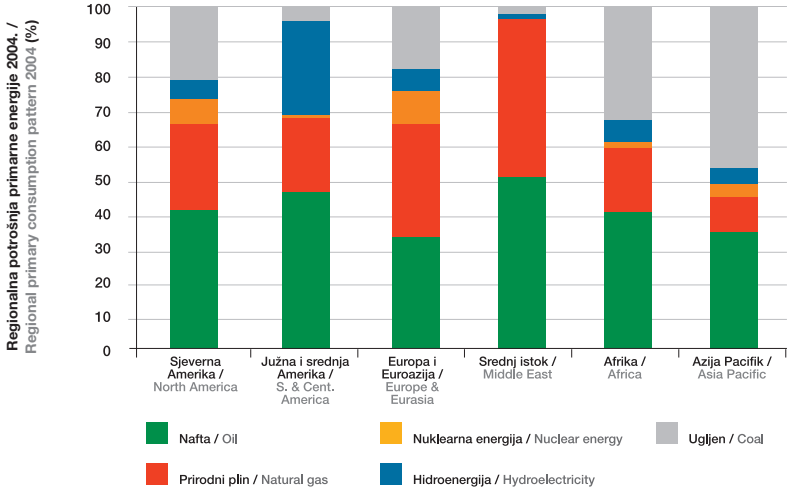
2.1 Structure of the consumption of primary energy in the world

The structure of the consumption of primary energy in the world is presented in Figure 1. In Figure 2, there is a presentation of the structure of consumption according to continents, i.e. according to global regions. We see that, except in the Middle East, the percentage of gas is highest in Europe and Eurasia, i.e. Europe together with the countries of the former Soviet Union, and in North America.

The demand for oil after the beginning of the 21st century has grown at a faster rate than during the previous decades. The rate of growth in oil consumption during the past 15 or so years ranged from 1,5 % to 2 % annually, so that the total world demand for oil in 2004 grew by 3,7 % and reached nearly 3,8 billion tons. The economy of the United States has the greatest impact in this respect, which consumes approximately one quarter of the world oil production, produces approximately 1/3 of the amount it needs for its own use, and during 2004 consumed 3 % more than during the previous year. In Asia, oil consumption increased by 5 % in 2004, with the greatest increase in China - 15 %. Oil consumption in Africa has also begun to increase by a rate that is double the world average. Only in Europe is growth holding steady at 1,8 % [1], [2], [3] and [4].



Slika 1
Struktura potrošnje primarne energije u svijetu
Figure 1
The structure of world primary energy consumption



Slika 2
Regionalni raspored potrošnje primarne energije
Figure 2
Regional distribution of primary energy consumption

Uz pretpostavku kako će svjetsko gospodarstvo do 2030. rasti po stopama od 2,8 do 3,2 % godišnje, energetske će potrebe rasti po stopama od 1,7 % godišnje. Fosilni energenti pokrivaju 80 % potreba u primarnoj energiji, a i u idućem razdoblju imat će jednak utjecaj. Uzajamno će povoljno djelovati napori za smanjenje energetske intenzivnosti i pritisak na zaštitu okoliša, djelujući u smjeru konzervacije energije. Od 1980. do 2003. učešće prirodnog plina u svjetskoj potrošnji primarne energije poraslo je od 18 na 22 %, a u budućem razdoblju očekuje se daljnji porast globalnog učešća plina u podmirivanju energetskih potreba. Podaci o svjetskim rezervama i proizvodnji, odnosno potrošnji prirodnog plina prikazani su u tablici 1.

Assuming that the world economy will grow at annual rates of from 2,8 % to 3,2 % up to the year 2030, energy needs will increase at a rate of 1,7 % annually. Fossil fuels cover 80 % of the requirements for primary energy, and in the coming period they will have an equal impact. Efforts for reducing energy intensity and pressure for environmental protection will have a mutually beneficial effect in the direction of energy conservation. From 1980 to 2003, the share of natural gas in the global consumption of primary energy rose from 18 % to 22 %, and in the future period a continued increase in the global share of gas is anticipated for meeting energy needs. Data on the world reserves and production, i. e.consumption of natural gas are presented in Table 1.

Tablica 1 - Svjetske rezerve plina i proizvodnja (2004.)
Table 1 - World gas reserves and production (2004)

	Zalihe / Reserves $179x10^{12}$ m³	Proizvodnja / Production $2,77x10^{12}$ m³
	%	%
OPEC	49	11
FSU	32	23
OECD	10	51
DRUGI / Others	9	15

Plin je po rezervama i proizvodnji mnogo distribuiraniji od nafte, iako regije bivšeg SSSR-a (FSU) i Bliskog istoka obuhvaćaju 72 % rezervi i isto tako oko 43 % rezervi zaliježe u 20 megagigantskih i supergigantskih proizvodnih polja. Zemlje OPEC-a imaju 50 % ukupnih rezervi u odnosu na 75 % naftnih. Uz realna očekivanja pozitivnih otkrića plina, sa sadašnjim vijekom zaliha koji iznosi do 70 godina, može se očekivati rast na 150 godina.

Nekonvencionalni izvori plina mnogo su veći. Tako se plin proizveden iz ugljena procjenjuje na 250 bilijuna m³, a metanski hidrati na 5 000 do 25 000 bilijuna m³. Međutim, procjenjuje se kako će u razdoblju do 2020. ponuda iz sadašnjih izvora biti za oko 1 000 milijardi m³ godišnje manja od potreba.

Ruska tvrtka Gazprom, koja je u 2004. proizvela 634 milijarde m³ plina, 60 % te količine proizvodi iz već starih polja! Ulogu sadašnjih polja Medveze, Urengoj, Jamburg morat će preuzeti nova (Štokman, Jamal), iako su u mnogo težem klimatskom pojasu. Upravo zbog geografskih pozicija novih nalazišta, kao i zbog bježanja od monopola opskrbljivača i transportera, u velikom je porastu s još većim očekivanjima trgovina ukapljenim prirodnim plinom (LNG).

U tablici 2 i 3 prikazane su stope porasta udjela LNG te ukupni opseg trgovine tim plinom.

Gas, according to reserves and production, is much more widely distributed than oil, although the regions of the former Soviet Union (FSU) and the Near East encompass 72 % of the reserves and approximately 43 % of the reserves lie in 20 mega or super gigantic production fields. The OPEC countries have 50 % of the total gas reserves in comparison to 75 % of the oil reserves. With realistic anticipation of gas discoveries, from the current expectations that reserves will last for 70 years, an increase to 150 years can be anticipated.

Unconventional sources of gas are much greater. Thus, gas produced from coal is estimated at 250 trillion m³, and methane hydrates at 5 000 to 25 000 trillion m³. Nonetheless, it is estimated that in the period up to 2020, the supply from the current sources will be approximately 1 000 billion m³ annually less than required.

The Russian company Gazprom, which in the year 2004 produced 634 billion m³ of gas, produced 60 % of this amount on fields that are already old! The role of the current fields of Medveze, Urengoj and Jamburg will have to be taken over by new ones (Štokman and Jamal), although they are in a much more severe climatic belt. It is precisely due to the geographical positions of the new fields, and in order to escape the suppliers' and transporters' monopolies, that trade in liquefied natural gas (LNG) is greatly increasing - with even greater expectations.

In Tables 2 and 3, the rates of growth in the share of LNG as well as the overall range of commerce in LNG are presented.

Tablica 2 - Stope rasta udjela LNG u razdoblju 1970.-2020.
Table 2 - The growth rates of LNG during the 1970-2020 period

Godina / Year	%
1970.	5,9
1980.	15,6
1990.	23,5
2000.	21,0
2004.	22,0
2010.	30-31
2020.	37-38

Tablica 3 - Rast trgovine LNG
Table 3 - Growth in the commerce of LNG

Godina / Year	(10^9 m^3)
1985.	51
1990.	72
1995.	93
2000.	138
2004.	178
2010.	315
2020.	520

Premda je do 2004. u uvozu LNG veliki udio imala Oceanija, uz Sjevernu Ameriku i Europu, u obzorima 2010. i 2020. očekuje se da će uvoz znatnije rasti upravo u Americi i Europi. U Kataru se priprema projekt GTL, tj. pretvorba plina u tekućinu, drugi nakon onog u Maleziji, ali su ograničena očekivanja daljnjeg rasta. Očekuje se da će u 2010. biti konvertirano oko 12 milijardi m^3 plina s rastom od 60 do 80 % u 2020.

Rusi najavljuju CNG, stlačeni prirodni plin, projekte koji su podobni za manje kapacitete proizvodnje (1 do 3 milijarde m^3) i manje udaljenosti. GTW, iz plina u dalekovod također je opcija o kojoj se razmišlja u uvjetima liberaliziranog tržišta. Očekuje se kako će ukupne investicije u plinsku industriju u sljedećih 10 godina iznositi do 1 200 milijardi američkih dolara. Međutim, GTL, CNG, GTW kao i LNG samo su u funkciji transporta i potrošnje.

Europska energetska strategija dugo je bila utemeljena na pretpostavci kako tržišni mehanizmi uspješno rješavaju opskrbne pravce, cijene i sve dileme oko opskrbe. To je bilo moguće u okolnostima na prijelazu iz 20. u 21. stoljeće, u kojima je dovoljna ponuda energije utjecala na stabilnost cijena. Porast potražnje za naftom i nova politička destabilizacija Bliskog istoka doveli su do neravnoteže ponude i potražnje te porasta cijena nafte, koje su izazvale i promjene odnosa na tržištu, a posebno promjenu energetske strategije u Europskoj uniji. Nova politizacija energetike, porast cijena nafte nakon 2004. i porast uloge plina u opskrbi Europske unije te najave Ruske Federacije o povećanju geopolitičke uloge plina, otvorili su nove dileme, posebno što se tiče zajedničke europske energetske strategije i politike.

2.2 Opće značajke tržišta nafte

Tijekom posljednjih dvaju desetljeća 20. stoljeća ponuda nafte bila je stabilna, a potražnja je, kao posljedica gospodarske konjunkture SAD-a, zapadne Europe, Japana i jugoistočne Azije,

Although Oceania, together with North America and Europe, imported a large share of LNG up to the year 2004, it is anticipated that there will be a significance increase in America and Europe in 2010 and 2020. In Katar, a gas to liquid (GTL) project is being prepared, the second after the project in Malaysia, but there are limited expectations for further growth. It is anticipated that in 2010 approximately 12 billion m^3 gas will be converted, with an increase of 60-80 % by 2020.

The Russians are announcing compressed natural gas (CNG) projects that are suitable for lower production capacities (1-3 billion m^3) and shorter distances. Gas to Wire (GTW) is also an option that is being considered under the liberalized market conditions. It is anticipated that the overall investments in the gas industry during the next 10 years will amount to 1 200 billion USD. However GTL, CNG, GTW and LNG only concern transport and consumption.

The European energy strategy was long based upon the assumption that market mechanisms successfully solve supply routes, prices and all the dilemmas concerning supply. This was possible under the circumstances of the late 20th and early 21st centuries, when the energy supply was sufficient and prices were stable. Growth in the demand for oil as well as the new politics of destabilization in the Near East have led to unequal supply and demand and higher oil prices, which have altered market relationships and required the European Union to change its energy strategy. The new politicization of energy, the rise in oil prices since 2004, the growing role of gas in the supply of the European Union, and announcements by the Russian Federation on the increasing geopolitical role of gas, have posed new dilemmas, particularly regarding the common European energy strategy and policy.

2.2 General characteristics of the oil market

During the last two decades of the 20th century, the oil supply was stable and demand gradually rose in

lagano rasla. Tehnološki razvoj omogućio je pad potrošnje u prvoj polovici 1980-ih, pad cijena nafte sredinom 1980-ih i stabiliziranje tržišta krajem toga razdoblja. U strukturi potrošnje udio nafte je smanjen, ali do značajnijih promjena nije došlo. Tako je završetak stoljeća označio stabilan rast u industrijski razvijenim zemljama, međunarodni protok kapitala i puni zamah globalizacije [1], [5] i [6].

Zbivanja u Europi, koja su kulminirala stvaranjem integriranog tržišta robe, kapitala i znanja na prostoru Europske zajednice, uspostavom parlamentarne demokracije u bivšim komunističkim državama te postavljanjem visokih zahtjeva tržišta Europe u kvaliteti proizvoda, transformirala su i tržište energije u smjeru izgradnje i jačanja tzv. slobodnog energetskog tržišta. Prerastanje zajednice u Europsku uniju otvorilo je neke nove dileme, osobito što se tiče zajedničke europske energetske strategije i politike, ali i o tome će biti više riječi u drugom dijelu članka.

Nova politizacija svjetskoga naftnog tržišta počela je nakon terorističkog napada na SAD 11. rujna 2001. Cijene nafte su porasle 2004., nakon novog ciklusa političke nestabilnosti na Bliskom istoku, terorističkih atentata u Indoneziji, Španjolskoj i Velikoj Britaniji te rasplamsavanja rata u Iraku [7]. Političke napetosti utječu na globalnu nesigurnost proizvodnje i transporta nafte, a ratna opasnost pojačava spekulacije na robnim burzama, brže punjenje strateških zaliha zemalja koje si mogu dopustiti držanje strateških zaliha nafte, a sve to djeluje na porast cijena nafte [8], [9] i [10].

U pozadini globalne političke nestabilnosti i eskalacije političkih napetosti na Bliskom istoku i u drugim zemljama izvoznicama nafte i plina dolazi do jačanja protuglobalističkog raspoloženja, koje sve više poprima oblik političkih prijepora oko raspodjele dobiti od energetskih izvora [11] i [12]. U svjetlu rasta cijena nafte nakon 2004. i napregnute ravnoteže dobave i potražnje, a na drugoj strani informacija o velikim dobitima najvećih naftnih tvrtki, javlja se niz manjih zemalja proizvođača nafte i plina, odnosno režima u tim zemljama za promjene u koncesijskim uvjetima i ugovorima o podjeli proizvodnje. Tako predsjednik Čada prijeti Exxonu i drugim stranim koncesionarima dodatnim posebnim porezom, a i predsjednik Venecuele, Hugo Chavez, najavljuje slične mjere [13]. Početkom svibnja 2006. Bolivija je na inicijativu predsjednika Moralesa nacionalizirala eksploataciju i izvoz prirodnog plina [14].

consequence of the economic trends in the United States, Western Europe, Japan and Southeast Asia. Technological development contributed to a decline in consumption during the first half of the 1980s, a drop in oil prices in the mid 1980s and stabilization of the market at the end of the 1980s. Within the consumption structure, the share of oil was reduced but there were no significant changes. Thus, the end of the century was characterized by stable growth in industrially developed countries, the international flow of capital and globalization was in full swing [1], [5] and [6].

Events in Europe, culminating in the creation of an integrated market for goods, capital and knowledge in the territory of the European Community, with the establishment of parliamentary democracies in the former communist states and the imposition of the high demands of the European market regarding product quality, also transformed energy markets in the direction of the building and bolstering of the so-called free energy market. The subsequent development of the European Community into the European Union posed new dilemmas, particularly regarding common European energy strategy and policy, but this will be discussed further in the second section of this article.

New politicization of the world oil market occurred followed the terrorist attacks against the United States of America on September 11, 2001. There was a rise in the price of oil in 2004, following a new cycle of political instabilities in the Near East, terrorist assassinations in Indonesia, Spain and Great Britain; and the outbreak of war in Iraq [7]. Political tensions affect global uncertainty regarding the production and transport of oil. Wartime hazards increase speculation on the commodity markets and there is accelerated stockpiling of strategic reserves by the countries that can permit themselves to stockpile strategic oil reserves, all of which has an impact on increases in oil prices [8], [9] and [10].

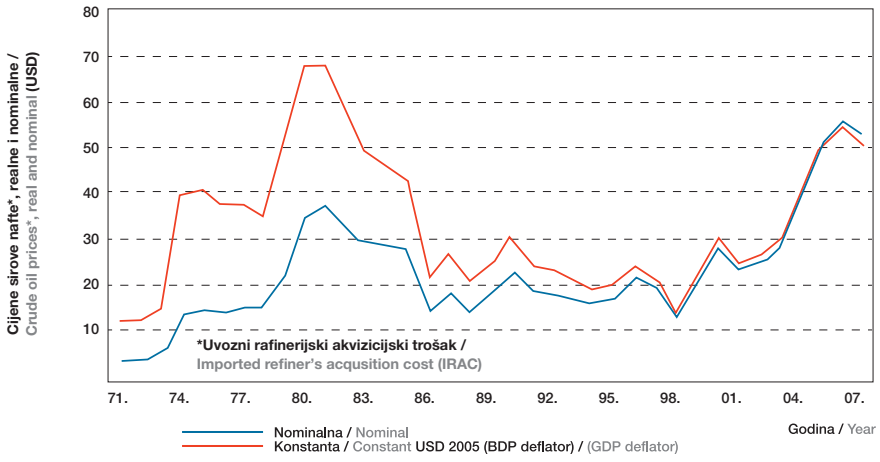
In the background of the global political instability and the escalation of political tensions in the Near East and other countries exporting oil and gas, there have been rising anti-globalist sentiments, which increasingly assume the form of political disputes concerning the allocation of profits from energy sources [11] and [12]. In light of the increases in oil prices after 2004 and the tense balance between supply and demand, and on the other side information about the huge profits made by the largest oil companies, a series of smaller countries which produce oil and gas, i.e. the regimes in these countries, have been calling for changes in the concession conditions and contracts on the distribution of production. Thus, the president of Chad is threatening Exxon and other foreign concession holders with an added special tax, and the president of Venezuela, Hugo Chavez, is announcing similar measures [13]. In early May of 2006, at the

Sve to pokazuje kako je tržište nafte ušlo u novu etapu politizacije i kako globalizacijski procesi, za razliku od očekivanja, nisu donijeli stabilno svjetsko tržište energije, već su stvorili snažna središta otpora globalizaciji i nadzoru od strane najvećih multinacionalnih energetskih kompanija, koja povremeno unose znatnu nestabilnost na svjetsko tržište nafte i plina. To je, uz povećanu potražnju za naftom, rezultiralo novim skokom cijena [15], [16], [17], [18] i [19].

Na slici 3 prikazano je kretanje nominalnih i realnih cijena nafte na svjetskom tržištu. Slika 3 pokazuje dugoročan trend cijena, prema podacima američke statistike u Ministarstvu za energiju (Department of Energy) [4].

initiative of President Morales, Bolivia nationalized the exploitation and export of natural gas [14].
All of this goes to show how the oil market has entered a new stage of politicization and how the globalization processes, contrary to expectations, did not bring about a stable global energy market but instead have created powerful centers of resistance to globalization and supervision from the largest multinational energy companies, which from time to time introduce significant instability on the global oil and gas market. This, together with an increased demand for oil, resulted in sharp new price increases [15], [16], [17], [18] and [19].

In Figure 3, trends are presented in the real and nominal prices on the world oil market. Figure 3 shows the long-term price trend, according to statistics from the United States Department of Energy [4].



Slika 3
Cijena nafte
Figure 3
Crude oil prices

Cijene nafte, kao repernog energenta, bez obzira na Hubbertov vrh, danas (2005.-2007.), sutra (2020.-2030.), psihološki već djeluju na svjetsko tržište. Hubbertov vrh odnosi se na zvonoliku krivulju pravilne statističke raspodjele, s polazištem da su rezerve ograničene i da otkrića ležišta imaju približno simetrični rast i pad. K. Hubbert tom je metodom sredinom 1950-ih godina predvidio vrh zvonolike krivulje za SAD u 1970. i pad proizvodnje nakon toga, što se i dogodilo. Nastavljači te teorije pokušavaju to primijeniti na svijet. Predviđali su vrh u 1990-ima, što se nije dogodilo, zatim u 2006., ali i u razdobljima nakon 2012., 2020., pa sve do kraja prve polovice stoljeća [2] i [20].

Zašto su ta predviđanja za svijet nepouzdana? Dva su temeljna razloga. Prvo, Hubbert je to radio za SAD, na izvrsno uređenim podacima, što nije slučaj za svijet. Neki su podaci nepouzdani. Zloporabe, drugi interesi? Svejedno. Drugi je razlog u napretku tehnologija koje su djelovale

The price of oil, as a reper energy source, regardless of Hubbert's peak, today (2005-2007) and tomorrow (2020-2030), is already psychologically affecting the world markets. Hubbert's peak refers to the bell-shaped curve of regular statistical distribution, based upon the assumption that reserves are limited and the discoveries of deposits exhibit fairly symmetrical growth and decline. In the mid 1950s, K. Hubbert forecast the peak of this bell-shaped curve for the United States in 1970, to be followed by a subsequent drop in production, which also occurred. Proponents of this theory are attempting to apply it to the world. They predicted the peak in the 1990s, which did not occur, then in 2006, but also during the periods after 2012, 2020 and even all the way up to the end of the first half of this century [2] and [20].

Why are these predictions for the world unreliable? There are two fundamental reasons. First, Hubbert worked for the United States, using highly organized data, of a caliber which is not available for the rest of

većom uspješnošću istraživanja i proizvodnje. Primjene metoda unaprjeđenog crpljenja udvostručile su primarni iscrpak, na koji Hubbert nije mogao računati. Prema tome, globalna krivulja proizvodnje pozitivno se deformira i prestaje biti zrcalno simetrična, čime se odgađa pad globalne proizvodnje nafte. Međutim, mogućnost pada proizvodnje nafte psihološki djeluje na cijene na svjetskim robnim burzama pa je i to jedan od uzroka skoka cijena nafte na svjetskom tržištu.

2.3 Uloga plina i glavna obilježja međunarodne trgovine plinom

Tržište prirodnog plina slijedi osnovne trendove nafte, iako su zamjetne i razlike. Za razliku od nafte, tržište prirodnog plina razvijalo se kao skup nacionalnih tržišta čiji se stupanj integracije mogao pratiti na makroregionalnoj razini. Uz to, potrošnja prirodnog plina tijekom proteklih desetak godina stalno je rasla, kako na svjetskoj razini tako i u Europi. U Europi su nastala dva krupna kontinentalna sustava, jedan u zapadnom dijelu kontinenta, a drugi je bio istočnoeuropski plinski sustav, nekad pod nadzorom bivšeg SSSR-a, a danas pod znatnim utjecajem Ruske Federacije.

Kako su nastajali ti sustavi? Dobivanje plina iz ugljena u mnogim europskim državama uključivo i Hrvatsku, ima stoljetnu povijest. Početkom 20. stoljeća prirodni plin bio je usputni proizvod nafte i uglavnom je spaljivan na bakljama. Otkrića ležišta plina korištena su za posebne namjene, proizvodnju čađi, umjetnoga gnojiva ili kao gorivo za neke industrijske procese. Sredinom 20. stoljeća nastaju plinski transportni sustavi u Italiji, Francuskoj, Zapadnoj Njemačkoj i Velikoj Britaniji. Proizvodnja plina iz ugljena i benzina gubi konkurentsku poziciju i nestaje, a sustavi prirodnog plina povezuju komunalne sustave, nastaju regionalni i potom državni.

Međunarodno trgovanje prirodnim plinom niče u 1960-im godinama na temelju ponude ruskog i alžirskog plina, a u 1970-ima na otkrićima plina u Sjevernome moru. Tako je Austrija 1968. počela uvoz ruskoga prirodnog plina preko Ukrajine i Čehoslovačke te transfer prema europskim zemljama. INA-Naftaplin je 1968. počeo pregovore o uvozu plina iz SSSR-a (zajedno s tvrtkama iz Srbije i Slovenije), ali su oni prekinuti zbog političkih napetosti oko ruske okupacije Čehoslovačke. Pregovori su obnovljeni 1974., a uvoz je počeo 1978. Plin se uvozio preko Slovačke i Austrije za Sloveniju i Hrvatsku, a preko Mađarske za Srbiju te Bosnu i Hercegovinu.

the world. Some of the data are unreliable. Misconduct? Other interests? It does not matter. The second reason is technological advances in exploration and production. The applied methods for maximizing oil recovery, have doubled primary recovery. Accordingly, the global production curve has been deformed in a positive manner and ceases to be symmetrical, thereby postponing the global decline in oil production. However, the potential decline in oil production has a psychological impact on the prices on the world commodity markets, which is one of the reasons for the sharp increases in oil prices on the world market.

2.3 The role of gas and the main trends in the international gas market

The natural gas market follows the basic trends in the oil market, although there are distinct differences. Unlike the oil market, the natural gas market developed as a group of national markets, whose degree of integration could be followed on the macro-regional level. Moreover, the consumption of natural gas during the past ten years has increased constantly on both the global and European levels. In Europe, two major continental systems have appeared, one in the western part of the continent, while the other is the Eastern European gas system, at one time under the supervision of the former Soviet Union and today under the considerable influence of the Russian Federation.

How did these systems come into being? Obtaining gas from coal has a history going back a century in many European countries, including Croatia. At the beginning of the 20th century, natural gas was an oil byproduct and generally burned in torches. Discoveries of gas deposits were used for special purposes, the production of soot, artificial fertilizers or as fuel in some industrial processes. In the mid 20th century, gas transport systems appeared in Italy, France, West Germany and Great Britain. Gas production from coal and gasoline lost its competitive position and disappeared, while natural gas systems were connected with municipal systems, became regional and later national.

International trading in natural gas emerged in the 1960s on the basis of offers of Russian and Algerian gas, and in the 1970s on discoveries of gas in the North Sea. Thus in 1968, Austria began to import Russian natural gas via the Ukraine and Czechoslovakia and transfer it via European countries. In 1968, INA-Naftaplin began negotiations on the import of gas from the Soviet Union (together with companies from Serbia and Slovenia) but they were suspended due to political tensions regarding the Russian occupation of Czechoslovakia. Negotiations were resumed in 1974 and import began in 1978. Gas was imported via Slovakia and Austria for Slovenia and Croatia, and via Hungary for Serbia and Bosnia & Herzegovina.

Od početka međunarodne trgovine uvriježeno je pravilo da kupac ugovara kupovinu odvojeno od tranzita i transporta plina. Također su uobičajene klauzule za kupovinu plina plati ili ostavi, što znači obvezu plaćanja bez obzira na to preuzima li ga kupac. Jedina je olakšica u ugovorenom faktoru opterećenja, obično oko 0,9, što znači elastičnost u preuzimanju od 10 %. Transport se također ugovara klauzulom tovari ili plati, a ima značenje obveznog plaćanja zakupljenoga kapaciteta, bez obzira na to koristi li ga ugovaratelj.

Tako se može reći da je međunarodna trgovina prirodnim plinom razvijena tijekom proteklih pola stoljeća. Okrupnjavanje naftne, plinske i energetske industrije u novije doba rezultiralo je novom pojavom, koja se sastoji u tome da pojedine od tih tvrtki nude preprodaju plina iz svojega portfelja, sastavljenoga od kupnje iz različitih izvora. Trgovanje LNG razvija se od sredine 1960-ih godina. Model tehnološkog lanca razvijao se na ulaganju proizvođača u terminale za ukapljivanje, ulaganju specijaliziranih tvrtki u prijevoz metanijerima i dobavljača i/ili kupaca u terminale za uplinjavanje. Nakon deregulacije energetskog tržišta i obveze pristupa trećoj strani, javila se tendencija gradnje prihvatnih terminala kao poduzetničkog ulaganja i ne nužno s kupcima kao ulagačima. Znatan rast udjela LNG u opskrbi globalizira trgovanje plinom, a tržište LNG-a pretvara u tržište prodavača.

Cijene prirodnog plina pratile su cijene nafte. Iznimke su tranzicijske zemlje istočne Europe, koje su prirodni plin dobavljale iz bivšeg SSSR-a, danas iz Ruske Federacije, pri čem su cijene plina iz političkih razloga bile niže nego za europsko tržište. Nakon 2004. i ulaska nekih zemalja istočne Europe u Europsku uniju, dobavljači nastoje nametnuti tržišne uvjete i cijene plina slične onima za isporuke na tržište Europske unije. To je posebno izraženo u odnosima između Ruske Federacije i Ukrajine nakon tzv. narandžaste revolucije, svojevrsnoga političkog odvajanja Ukrajine od Ruske Federacije i tzv. plinske krize potkraj 2005. Time je najavljena sve veća geopolitička uloga prirodnog plina [5] i [15].

2.4 Značajke tržišta i trgovanja električnom energijom

Nema sumnje da je tema tržišta električne energije jedna od najzanimljivijih u energetskim stručnim krugovima u posljednjih desetak pa i više godina. Iako to nije posebno značajno za sam uspjeh tržišta, drži se kako je početak formalnog tržišta u Europi vezan uz početak 1990-tih godina. U svijetu se početkom tržišta smatra reforma u Čileu davne 1982. godine, a u Europi privatizacija

From the beginning of international trade, there has been an established rule that the customer negotiates the purchase separately from the transit and transport of gas. There are also customary take-it-or-leave-it clauses for the purchase of gas, which means that the customer is obligated to pay whether or not the goods are taken. The only concession is in the contracted load factor, generally approximately 0,9, which means 10 % flexibility in receipt. Transport is also contracted with a ship-or-pay clause, which means the customer is obligated to pay for the transportation of the gas, even in the case that the gas is not transferred.

Thus, we can say that international trading in natural gas developed during the past half century. The consolidation of the oil, gas and energy industries in recent times resulted in a new phenomenon. It consists of an individual firm offering the resale of gas from its portfolio, that has been put together through purchases from various sources. The trade of LNG has developed since the middle of the 1960s. The model of the technological chain was developed on the basis of investment by producers in terminals for liquefying, investment by specialized companies in transport via LNG carriers and investment by suppliers and/or customers in terminals for gasification. Following the deregulation of the energy market and the obligation of third party access, a tendency developed to build receiving terminals as entrepreneurial investments, in which the customers were not necessarily the investors. The significant increase of the LNG share in supply has globalized gas trading and transformed the LNG market into a seller's market.

Natural gas prices followed oil prices, except in the transition countries of Eastern Europe which had obtained natural gas from the former Soviet Union and now from the Russian Federation, for whom gas prices were lower than on the European market for political reasons. After 2004 and entry into the European Union by several Eastern European countries, suppliers have been attempting to impose market conditions and gas prices similar to those for delivery to the markets of the European Union. This was particularly evident in relations between the Russian Federation and the Ukraine, after the so-called Orange Revolution, a type of political separation of the Ukraine from the Russian Federation, and the so-called gas crisis at the end of 2005. This heralded an increasing geopolitical role for natural gas [5] and [15].

2.4 Market characteristics and electricity trading

There is no doubt that the topic of the electricity market has been one of the most interesting in professional energy circles during the past decade or more. Although not of particular significance for the success of the market, the beginning of the formal

elektroenergetskih kompanija i uspostava poola u Engleskoj 1990. godine.

Danas su problemi uvođenja tržišta različiti, od netransparentnog odvajanja djelatnosti, bilo pravnog ili funkcionalnog, diskriminacije u pristupu treće strane, netransparentnih tarifnih sustava ili uopće zatvaranja nacionalnog tržišta i sl., a izvorište tih problema leži u činjenici kako su neke zemlje iz EU 15 najprije postale članice, a onda provodile reformu, dok nove članice prije ulaska trebaju u potpunosti reformirati sustav.

Cijena električne energije svakako je jedan od najvažnijih pokazatelja uspješnosti uspostave tržišta električne energije. Prema statističkim podacima realna cijena električne energije padala je sve do 2000. godine, od kada se ponovno uspostavio pozitivan gradijent promjene. Ipak, u realnoj vrijednosti, cijena je 2005. godine niža nego desetak godina prije. U nominalnim vrijednostima cijena je viša za oko 10 %.

Na slici 4 prikazano je kretanje nominalnih i realnih cijena električne energije sa i bez ukupnih dodatnih davanja (bez PDV-a) na cijenu električne energije u kategoriji industrijskih kupaca.

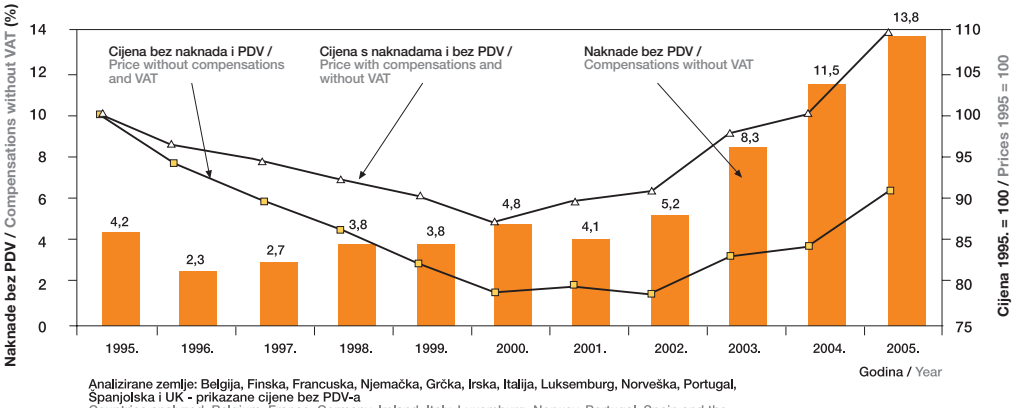
market in Europe is considered be connected with the early 1990s. In the world, the beginning of the market is considered to date back to the reform in Chile in 1982, and in Europe the privatization of electrical companies and the establishment of a pool in England date back the year 1990.

Today there are a variety of problems involved in introducing a market, from the lack of transparency in the separation of operations, whether legal or functional, discrimination regarding third party access, the lack of transparency of the tariff systems or the closing of a national market etc., and the source of these problems lies in the fact that some of the countries of the EU 15 first became members and then conducted reforms, while the new members are required to reform their systems in their entirety prior to entry.

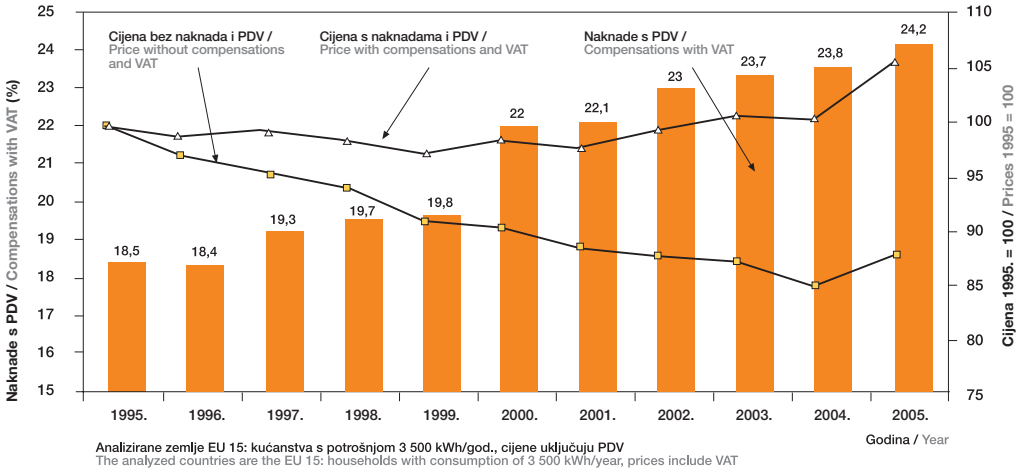
The price of electricity is certainly one of the most important indices of the profitability of the establishment of an electricity market. According to statistical data, the real price of electricity was falling until the year 2000. Since then, it has reestablished a positive gradient of change. Nonetheless, in real value, the price in the year 2005 was lower than a decade earlier. In nominal values, the price is approximately 10 % higher.

In Figure 4, trends are presented in the nominal and real prices of electricity with and without the total additional taxes and contributions (without value-added tax) on the price of electrical energy in the category of industrial customers.

Slika 4
Nominalne i realne cijene električne energije za industrijske kupce [21]
Figure 4
Nominal and real electricity prices for industrial customers [21]



Analizirane zemlje: Belgija, Finska, Francuska, Njemačka, Grčka, Irska, Italija, Luksemburg, Norveška, Portugal, Španjolska i UK - prikazane cijene bez PDV-a
Countries analyzed: Belgium, France, Germany, Ireland, Italy, Luxemburg, Norway, Portugal, Spain and the UK - the prices shown are without VAT



Slika 5
Nominalne i realne cijene električne energije za kategoriju kućanstava [21]
Figure 5
Nominal and real electricity prices for the household category [21]

Sličan dijagram vrijedi i za kućanstva, slika 5, za koja su cijene s PDV-om u 2005. godini u realnim vrijednostima niže za 13 %, a u nominalnim su vrijednostima više za 5 % nego u usporedbi s cijenama iz 1995. godine. Važno je napomenuti kontekst u kojem se definira cijena električne energije od 2000. godine. Cijene energenata, ugljena, tekućih goriva i prirodnog plina, značajno su porasle u posljednjih pet godina. Kako se iz tih energenata u zemljama Europske unije proizvodi približno 51 % ukupne proizvodnje električne energije, porast cijene električne energije potpuno je očekivan. Drugi važan utjecajni faktor dodatna su davanja na cijenu električne energije, bilo da je riječ o porezima ili poticajima odnosno različitim naknadama kako je to i prikazano na slikama 4 i 5.

Tržište električne energije u Europskoj uniji zapravo je suma nacionalnih tržišta. Ključna prepreka uspostavi jedinstvenog tržišta prema tomu je puna provedba direktiva, ali i izgradnja veza između nacionalnih tržišta. Nedostajuća infrastruktura novi su interkonektivni vodovi bez kojih na postojećima dolazi do zagušenja pa se u pojedinim zonama Europske unije formiraju različite razine cijena električne energije. Prekogranična trgovina električnom energijom ne raste zadovoljavajućom stopom pa ona iznosi tek nešto više od 10 % ukupno potrošene električne energije.

Daljnji razvoj tržišta definira se kroz postizanje triju ciljeva: natjecanja u određenim segmentima tržišta energije, odnosno električne energije što vodi do učinkovite dobave ali i potrošnje električne energije, zaštite okoliša kao nespornom cilju današnjice i napose u jednome možda i najvažnijem dijelu, koji se odnosi na sigurnost opskrbe električnom energijom.

A similar diagram also applies to households, Figure 5, in which the 2005 prices including VAT are 13 % lower in real values and more than 5 % higher in nominal values than the prices from the year 1995. It is important to mention the context in which electricity prices have been defined since the year 2000. The prices of coal, liquid fuel and natural gas have risen significantly in the past five years. Since nearly 51 % of the total electricity production in the countries of the European Union comes from these energy sources, increasing electricity prices are to be fully expected. Another significant influential factor is the additional costs for electricity, including taxes, incentives or various forms of compensation, as shown in Figures 4 and 5.

The electricity market in the European Union is actually the sum of the national markets. A key barrier to the establishment of a single market is, accordingly, the complete implementation of directives but also the construction of links among the national markets. The infrastructure lacks new interconnecting lines, without which choking occurs on the existing lines, so that various electricity prices are formed in some zones of the European Union. Cross-border electricity commerce is not growing at a satisfactory rate and it amounts to somewhat more than 10 % of the total electricity consumption.

The continued development of the market is defined through the achievement of three goals: competition in certain segments of the energy market, i.e. electricity, which leads to effective supply but also the consumption of electricity, environmental protection as an undisputed goal of the present and, perhaps most importantly, the security of the electricity supply.

3 EUROPSKA ENERGETSKA POLITIKA

3.1 Opskrba Europe plinom i recentna politizacija energetskog tržišta

Na prijelazu iz 20. u 21. stoljeće Europska unija imala je dovoljno energije. Uz nešto vlastite nafte i dosta plina u Sjevernome moru, razvijena je infrastruktura za uvoz nafte iz Ruske Federacije, uvoz plina iz Ruske Federacije i sjeverne Afrike te uvoz LNG. Europske zemlje redom su prihvatile obveze iz Kyoto protokola, čak su ga jedine i provodile.

Prirodni plin dugo je vremena bio element razmjene na lokalnom ili nacionalnom tržištu, no promjene potkraj 20. i početkom 21. stoljeća dovele su ga na međunarodno tržište pa se može govoriti o globalizaciji plinskih tržišta. Ona je započela izgradnjom međunarodnih i transkontinentalnih plinovoda poput onih od Kanade do SAD-a, od Rusije i Norveške do Njemačke i Francuske, od Alžira do Italije i Španjolske, od Argentine do Čilea, od Bolivije do Brazila, pa sve od Turkmenistana do Irana. Planiranje razvoja prirodnog plina, osobito magistralnih pravaca za opskrbu plinom, postaje sve više stvar političkih odnosa, a ne samo gospodarskog razvoja, investicija i tehničkih mogućnosti za transport i održavanje.

Nakon sukoba europskih zemalja i SAD-a oko povezivanja zapadne Europe plinovodom sa SSSR-om još iz doba Hladnoga rata, obilne dobave plina iz bivšeg SSSR-a, osobito nesmetanom opskrbom plina europskih zemalja iz Ruske Federacije, potkraj 20. i početkom 21. stoljeća, učvrstilo se uvjerenje kako je tržište apsolutni regulator odnosa u energetici. To je stvorilo osjećaj energetskog obilja i sigurnosti koji je trajao sve do tzv. rusko-ukrajinske plinske krize, zimi 2005. na 2006., kad je došlo do redukcija ruske dobave plina u najnezgodnijem trenutku - usred zime i niskih temperatura. Redukcije su bile djelomične i vrlo kratkotrajne, ali su uzdrmale temelje dotadašnje europske energetske udobnosti. Tako je uz politizaciju dobave nafte s Bliskog istoka i dobava ruskoga plina također dobila jasna geopolitička obilježja. Sve je to motiviralo Europsku uniju na promjenu energetske politike i još veće napore u aktiviranju tehnoloških programa razvoja obnovljivih izvora te na poticaj za globalni energetski dogovor s Ruskom Federacijom. Kako će ti dogovori dalje ići pokazat će budućnost, no jedno je sigurno, Europska unija se iznenada suočila s glavnim energetskim problemom, a to je ovisnost o uvozu energije, pa odlučno stimulira obnovljive izvore.

3 EUROPEAN ENERGY POLICY

3.1 Europe's gas supply and the recent politicization of the energy markets

At the end of the 20th century and the beginning of the 21st century, the European Union had sufficient energy. Together with some of its own oil and enough gas from the North Sea, an infrastructure was developed for the import of oil and gas from the Russian Federation, gas from North Africa as well the import of LNG. The European countries all accepted the obligations from the Kyoto Protocol and were the only ones to implement it.

Natural gas has long been an element of exchange on the local or national markets. However, changes at the end of the 20th century and the beginning of the 21st century brought it to the international market and it is possible to speak about the globalization of the gas market. This began with the construction of international and transcontinental gas pipelines such as those from Canada to the United States, from Russia and Norway to Germany and France; from Algeria to Italy and Spain, from Argentina to Chile, from Bolivia to Brazil, and from Turkmenistan to Iran. The planning of the development of natural gas, particularly main supply pipelines, has become increasingly a matter of political relations, and not merely of economic development, investment and technical possibilities for transport and maintenance.

After the conflict between the European countries and the United States concerning the linking of Western European gas pipelines with the Soviet Union during the period of the Cold War, abundant supplies of gas from the former Soviet Union and especially the unhindered gas supply to the European countries from the Russian Federation at the end of the 20th and beginning of the 21st centuries, there was the firm conviction that the market was the absolute regulator of relations in energetics. This created a feeling of energy abundance and dependability, which lasted until the so-called Russian-Ukraine gas crisis in the winter of 2005-2006, when there was a reduction in the Russian gas supply at the worst possible time - in the middle of winter when temperatures were low. The reductions were partial and of very short duration but they undermined the foundations of the heretofore European energy complacency. Thus, together with the politicization of the oil supply from the Near East, the supply of Russian gas also acquired clear geopolitical characteristics. All of this has motivated the European Union to change energy policy and invest greater efforts in the activation of technological programs for the development of renewable sources as well as providing the impetus for a global energy agreement with the Russian Federation. The future will show how far these agreements will go but one thing is certain,

Poskupljenje nafte nakon 2004. ponovno je aktualiziralo programe razvoja obnovljivih izvora energije, osobito u zemljama Europske unije. Europska komisija je 2005. ubrzano pripremila novi strateški program - Zeleni papir o unaprjeđenju sigurnosti energetske opskrbe [22]. Među ostalim, uz intenziviranje razvoja novih energetskih tehnologija te diverzificiranje uvoza prirodnog plina i LNG, Europska unija obvezuje svoje članice na pojačano korištenje obnovljivih izvora energije, a napose na intenziviranje programa razvoja goriva biološkoga podrijetla, poput biodizela ili umiješavanja metanola u motorne benzine. Obveze Europske unije propisane su u dinamičnom porastu, od 5,75 % motornih goriva biološkog podrijetla u 2010. do čak 20 % u 2020.

3.2 Neke suvremene dileme europske energetike

Smjernice Europske unije iz 1999. kojima se energetsko tržište, postupno, otvara do 1. srpnja 2007., potaknule su, izravno i neizravno, okrupnjavanje energetskih tvrtki putem spajanja i preuzimanja. Izravno su poticane temeljem spoznaje menadžmenta o nužnosti rasta, a neizravno mjerama matičnih država koje su ponudile različite olakšice i poticaje za ulaganja u preuzimanja, u drugim državama.

Međutim, države koje to potiču na razini općih načela svim sredstvima sprječavaju preuzimanje tvrtki na domaćem području od stranih kompanija [23]. Tako je Španjolska spriječila nakanu njemačkog E.ON-a da, za ponuđenih 29 milijardi eura preuzme njihovu energetsku tvrtku Endesa. Istodobno se dogodila još jedna demonstracija ekonomskog domoljublja u Francuskoj. Interes talijanske energetske tvrtke ENEL za preuzimanje francuskog SUEZ-a blokiran je i provedeno je spajanje SUEZ-a s Gaz de France. Tek će se vidjeti jesu li istinite glasine o spajanju ENI-a s ENEL-om, dviju talijanskih tvrtki, naftne i elektroenergetske, u jednu novu i donedavno neuobičajenu kombinaciju. Naime, do sada se naftne tvrtke nisu bavile spajanjem, čak ni preuzimanjem elektroenergetskih kompanija.

No i to se mijenja. Početkom svibnja 2006. objavljeno je da su OMV (naftna tvrtka) i Verbund (elektroprivredna tvrtka) dogovorile spajanje i čekaju odobrenje Europske komisije. Tako bi nastala tvrtka vrijedna 20 do 30 milijardi eura, s više od 30 TWh proizvodnje električne energije (50% austrijske potrošnje). Strateški je cilj ekspanzija uz Dunav, do uključivo Turske, uz budući plinovod Nabucco. No austrijski parlament nije odobrio spajanje OMV-a i Verbunda, zaključivši da je plan o spajanju rizik za vlasništvo austrijske

that the European Union has been confronted with its main energy problem, i.e., dependence upon the import of energy, and is decisively promoting renewable sources.

The increases in oil prices after 2004 led to the revival of the programs for the development of renewable energy sources, particularly in the countries of the European Union. In 2005, the European Commission hurriedly prepared a new strategic program - Green Paper for advancing security of the energy supply [22]. Among other things, besides the intensification of the development of new energy technologies and the diversification of the import of natural gas and LNG, the European Union has obligated its members to intensify the use of renewal energy sources, especially the program for the development of fuels of biological origin, such as biodiesel or the mixing of methanol into motot fuels. The European Union has stipulated the requirement for 5,75 % of all motor fuels to be of biological origin in 2010 and 20 % in 2020.

3.2 Some contemporary dilemmas of European energetics

The European Union guidelines from 1999, according to which the energy market will gradually open until July 1, 2007, have directly and indirectly affected the consolidation of energy companies via mergers and takeovers. Incentives are directly based on management's knowledge concerning the necessity of growth and indirectly via the measures taken by those countries that have offered various benefits and stimuli for investments in takeovers in other countries.

However, the countries that promote this on the level of general principles use all their means to prevent the takeovers of companies on their own territories by foreign companies [23]. Thus, Spain thwarted the intentions of the German company E.ON to take over the Spanish energy company Endes for 29 billion euros. At the same time, there was another show of economic patriotism in France. The interest of the Italian energy company ENEL in taking over the French SUEZ was blocked and the merger of SUEZ with Gaz de France was implemented. It remains to be seen whether the rumors are true about the merger of ENI with ENEL, two Italian companies, oil and electricity, into one new and until recently unusual company. Up to now, oil companies did not engage in mergers, not even the takeover of electricity companies.

However, this is also changing. At the beginning of May 2006, it was announced that OMV (an oil company) and Verbund (an electrical company) have agreed upon a merger and are waiting for approval from the European Commission. This

države nad Verbundovim hidroenergetskim postrojenjima.

Istodobno, proces okrupnjavanja velikih tvrtki spajanjem i preuzimanjem, vodi prema sve manjem broju sve većih energetskih kompanija i novim monopolnim situacijama. Sada već i britanski regulator (OFGEM) piše Europskoj komisiji, u svoje ime i u ime potrošača, negodujući što su svi ključni dobavljači plina i struje u vlasništvu njemačkog E.ON-a, jedne od najjačih takvih tvrtki u Europi.

Tijekom ožujka 2006. Europska unija je održala skup posvećen zajedničkoj politici u energetici. Rastući protekcionizam, suprotan procesima liberalizacije, dovodi u pitanje mnoge ranije dokumente koji su imali provedbeni karakter. Protekcionizam koji se ogleda u sprječavanju stranog preuzimanja od strane nacionalnih vlada, u izvornoj je suprotnosti s načelima protoka stranoga kapitala. Zaustavljanje liberalizacije energetskog sektora Europske unije dovodi u pitanje temeljni cilj - rast produktivnosti i konkurentnost u odnosu na glavne ekonomske takmace Europske unije. Kako je ona uvozno ovisna o energiji, u suočenju s rastućim energetskim potrebama ali i mogućim uvoznim ograničenjima, uz poticanje razvoja obnovljivih izvora, ponovno se razmatra nuklearna opcija. Načelno je prihvaćena obveza godišnjeg izdvajanja 120 milijardi eura za daljnja istraživanja obnovljivih izvora i razvoj nuklearne fuzije. Nuklearna energija ima svoje zagovornike (Francuska), Finska je obnovila gradnju nuklearnih elektrana, slično najavljuje i Velika Britanija, ali je šire korištenje nuklearne fisije i dalje stigmatizirano od nekih članica Europske unije.

Idilični prikazi procesa deregulacije, poglavito u zemljama EU 15, trajali su sve do 2006. Nakon krizne situacije u opskrbi plinom, zbog razmirica Rusije i Ukrajine, Europska je komisija početkom 2006. otvorila pitanje sigurnosti opskrbe energijom, a nakon eksplozije protekcionizma na slučajevima sprječenih preuzimanja, već spomenutih francuskog SUEZ-a od strane talijanskog ENEL-a i španjolske ENDESA-e od strane njemačkog E.ON-a, Europska je komisija iznova analizirala stanje provedbe deregulacije, pa se onda kaže kako u EU 25 čak 17 članica ne provodi u potpunosti liberalizaciju energetskog tržišta. Propušta se provesti razdvajanje mreža od proizvodnje i trgovine. Nacionalne vlade štite elektroprivrede od konkurencije, a prekogranična spajanja ili ne postoje ili su nesigurna. Neki analitičari tvrde da se sve svodi na bilateralne odnose, a da jedinstveno tržište ne postoji [24].

would result in a company worth 20-30 billion euros, with electricity production of over 30 TWh (50 % of total Austrian consumption). The strategic goal is expansion along the Danube River, to and including Turkey, along the future Nabucco gas pipeline. However, the Austrian parliament did not approve the merger of OMV and Verbund, concluding that the plan for merger represents risking the Austrian state ownership of Verbund's hydroenergy installations.

At the same time, the process of the consolidation of large companies via merger and takeovers leads to an ever smaller number of ever larger energy companies and new monopoly situations. The British regulator (OFGEM) is currently writing to the European Commission, in its own behalf and on the behalf of consumers, expressing displeasure that all the key suppliers of gas and electricity are under the ownership of the German E.ON, one of the strongest such companies in Europe.

In March 2006, the European Union held a meeting devoted to a common energetics policy. Growing protectionism, contrary to the processes of liberalization, has called many earlier documents into questions that had an implementational character. The protectionism that is reflected in the prevention of takeovers by national governments is essentially contrary to the principles of the flow of foreign capital. Halting the liberalization of the energy sector in the European Union calls into question the fundamental goal - the growth of productivity and competitiveness in relation to the main economic competitors of the European Union. Since the European Union is dependent upon imported energy, confronted by growing energy requirements but also possible import limits, with incentives for the development of renewable sources, the nuclear option is being re-examined. In principle the obligation has been accepted for the annual allocation of 120 billion euros for the further study of renewable sources and the development of nuclear fusion. Nuclear energy has its advocates (France), Finland has revived the construction of nuclear power plants, Great Britain has made a similar announcement, but the broader use of nuclear fission is still stigmatized by several members of the European Union.

Idyllic presentations of the process of deregulation, especially in the EU 15 countries, continued all the way up to 2006. After the crisis situation in the gas supply due to the dispute between Russia and the Ukraine at the beginning of 2006, the European Commission opened the question of the dependability of the energy supply, and after the explosion of protectionism in the cases of the prevention of the takeovers of the previously mentioned French SUEZ by the Italian ENEL and the Spanish ENDESA by the

Kao primjeri disfunkcije tržišta, uz navedene slučajeve protekcionizma, navode se:

- baltičke države nemaju spojeva na Europsku uniju i ovisne su o Rusiji,
- Španjolska i Portugal nemaju energetske spojeve, a optužuju Francuze za izolaciju Iberijskog poluotoka od Europske unije,
- Velika Britanija ne koristi Interconector, unatoč potrebama tržišta za plinom (procjenjuje se na 1 milijardu m^3), radi držanja cijena u Velikoj Britaniji,
- Italija je u rujnu 2003. doživjela raspad elektroenergetskog sustava zbog kvara na visokonaponskoj liniji iz Švicarske,
- kao tvrtke koje dominiraju Europom ističu se GdF, EdF u Francuskoj, te E.ON i RWE u Njemačkoj,
- Poljska je zatražila osnutak svojevrsnog NATO-a za energetiku, nakon što je objavljen plan gradnje novog dovoda ruskog plina u Njemačku preko Baltika,
- Mađarska se našla u neprilici kada joj je prijetio prekid opskrbe zbog rusko-ukrajinskog spora.

Najrazvijenije zemlje svijeta, okupljene u skupini G8, početkom 2006. održale su skup pod predsjedanjem Rusije, pri čem je jedna od glavnih tema bila energetika. O tome je V. Putin objavio neku vrstu programskog članka. Uz načelne teze u tom tekstu ističe se konstatacija: Svi bismo trebali uvidjeti da energetski egoizam u modernom svijetu ne vodi nikamo. Stoga, stajalište Rusije o energetskoj sigurnosti ostaje jasno. Naše je uvjerenje da redistribucija energije, koja bi se posve vodila prioritetima male skupine najrazvijenijih zemalja, ne služi globalnom razvitku. Trudit ćemo se stvoriti energetski sigurnosni sustav, vodeći računa o interesima cijele međunarodne zajednice. Čovječanstvo treba uravnotežene potencijale kako bi se svakoj državi omogućila održiva opskrba energentima uz prohodnost svih kanala međunarodne suradnje [14]. Putinova formulacija o redistribuciji energije opis je moguće energetske opskrbne budućnosti mnogih malih zemalja.

Suvremene dileme Europe i svijeta proizlaze iz sagledavanja energetskih potreba i izvora opskrbe. Potrebe rastu, kako na osnovi sve veće potrošnje po glavi stanovnika tako i zbog brzo rastućih potreba u mnogoljudnim zemljama (Indija i Kina), a osobito zbog demografskog rasta. Samo u posljednjih četvrt stoljeća stanovništvo se povećalo s 4 na 6 milijardi, a ni predviđanja o 10 milijardi nisu u (pre)dalekom obzoru.

German E.ON, the European Commission reanalyzed the status of the implementation of deregulation. Among the EU 25, 17 member countries are not fully implementing the liberalization of the energy market. There have also been failures in the implementation of the separation of the networks from production and commerce. National governments are protecting the electrical energy industry from competition, and cross-border mergers either do not exist or are risky. Some analysts firmly assert that all of this can be reduced to bilateral relationships and that a single market does not exist [24].

As examples of market dysfunction, in addition to the previously mentioned cases of protectionism, the following are cited:

- the Baltic states do not have links with the European Union and are highly dependent upon Russia,
- Spain and Portugal do not have energy links, and they accuse the French for the isolation of the Iberian peninsula from the European Union,
- Great Britain does not use the Interconnector, despite market demands for gas (estimated at 1 billion m^3), in order to maintain domestic prices,
- in September 2003, Italy experienced a breakdown in the electricity system due to a failure in the high voltage line from Switzerland,
- among the firms that dominate Europe, GdF, EdF in France, and E.ON and RWE in Germany are notable,
- Poland has sought the founding of a type of NATO for energy, after the plan was announced to construct a new pipeline for Russian gas in Germany via the Baltic,
- Hungary was surpised when it was threatened by the termination of supply due to the Russian-Ukrainian dispute.

The most developed countries of the world, the G8 countries, held a meeting at the beginning of 2006, with Russia presiding, at which one of the main topics was energetics. V. Putin released a type of program article. Besides the principal thesis in this text, the following statement caught the eye: All of us should realize that energy egoism in the modern world leads nowhere. Therefore, the position of Russia on energy dependability remains clear. It is our conviction that the redistribution of energy, that would be entirely conducted according to the priorities of the small group of the most developed countries, does not serve global development. We shall endeavor to create a dependable energy system, taking account of the interests of the entire international community. Mankind needs balanced potentials in order to make possible a sustainable supply of power sources for each country, with the free passage of all the channels of international cooperation [14]. Putin's formulation on the redistribution of energy is a description of the possible future of energy supply for many small countries.

Opskrba energijom tijekom posljednjih nekoliko godina pod utjecajem je ograničenja koja donose sporazumi o zaštiti okoliša. Šira primjena obnovljivih izvora energije suočena je s mnogim problemima, a nije zanemariva ni njihova relativna skupoća. Nakana Europske unije da uklanjanjem nacionalnih monopola s pomoću deregulacije nađe svoju konkurentsku prednost u odnosu na tržišne takmace, ušla je u fazu stvaranja manjeg broja većih energetskih tvrtki, pa se naziru novi (nadnacionalni) monopoli [24].

Očigledno predstoji nova faza usklađivanja regulatornog režima u Europskoj uniji, sa zadaćama:

- osiguranje pouzdanosti i dostupnosti energije, a plin je u tim sagledavanjima prirodno, važan čimbenik,
- današnji je transportni sustav skup od 25, manje ili više izoliranih podsustava, pa je povezivanje jedan od prioriteta.

Čini se da je provođenje direktive o unutrašnjem plinskom tržištu (1998.) uvođenjem transparentnosti, računovodstvenim razdvajanjem u lancu djelatnosti i uvođenjem prava pristupa trećoj strani iscrpilo svoje dosege. Međunarodna je konkurencija ograničena, a time i konkuriranje plinom plinu. Pritisak na procese privatizacije, posebno u zemljama tranzicije, pogodovao je nastajanju nekolicine velikih tvrtki u Europi. One slijede zakonitosti globalnog tržišta. Kako se tržište globaliziralo, tako su se i kompanije globalizirale, reći će Lord Browne iz BP-a. BP je 1908. imao povod za formiranje tvrtke na prvom otkriću nafte u Perziji. Prije desetak godina BP je imao tržišnu vrijednost od 31,6 milijardi USD, a 2005. godine 200 milijardi američkih dolara. I to je to.

The current dilemma of Europe and the rest of the world stems from the assessment of energy needs and energy supplies. Requirements are increasing due to ever greater consumption per capita, the rapidly growing needs of highly populated countries (India and China), and especially demographic growth. Only in the last quarter century, the population has increased from 4 to 6 billion, and predictions of 10 billion are not so far off on the horizon.

Energy supply during the past several years has been influenced by the limitations imposed by environmental protection agreements. The more widespread use of renewable energy sources has been confronted with many problems, and the relative costliness of such sources is not negligible. The intention of the European Union, to find its competitive advantage in relation to the market competition through the elimination of national monopolies by deregulation, has entered the phase of the creation of a small number of large energy companies, so that new (supernational) monopolies are on the horizon [24].

Obviously, there will be a new phase in the harmonization of the regulatory regime in the European Union, with specific goals:

- the reliability and accessibility of energy should be insured, and in this respect natural gas is a very important factor,
- today's transport system is a group of 25 more or less isolated subsystems, so that their linkage is one of the priorities.

It appears that the implementation of the directives on the internal gas market (1998), with the introduction of transparency, accounting separation in the chain of operations and the introduction of legal third party access, have been exhausted. International competition is limited and thereby also gas-to-gas competition. Pressure on the processes of privatization, especially in the transition countries, has been conductive to the formation of several large companies in Europe. They follow the laws of the global market. As the market has globalized, the companies have globalized, says Lord Browne from BP. In 1908, the BP company was formed when oil was first discovered in Persia. A decade ago, BP had a market value of 31,6 billion USD. In the year 2005, its market value was 200 billion USD. That is that.

4 POTROŠNJA ENERGIJE U HRVATSKOJ I UČEŠĆE PLINA

4.1 Potrošnja energije u Hrvatskoj

Potrošnja energije u nekoj zemlji, pa tako i u Republici Hrvatskoj temeljna je značajka gospodarskih aktivnosti, odnosno posljedica vođenja civiliziranog načina života. U najgrubljim analizama, između ostalih karakterističnih veličina potrošnja energije obilježena je trima veličinama: ukupnom potrošnjom energije, strukturom i naravno trendom potrošnje. Ne postoje dvije zemlje s jednakom energetskom bilancom, odnosno s jednakim trima navedenim veličinama, pa se s pravom može ustvrditi kako je energetska bilanca određene zemlje zapravo njezina krvna slika. To znači da nije moguće izravno uspoređivati energetske bilance bez dublje analize uzroka, uvjeta i načina rada i tradicije potrošnje energije pa takve analize ne mogu dati upotrebljivi rezultat. Slično je i kada se uspoređuju energetske bilance svijeta ili određenih regija s energetskom bilancom promatrane zemlje pa u skladu s tim kritički analizirati energetsku bilance primjerice Hrvatske na temelju svjetskog uzorka ili energetske bilance neke druge zemlje nema posebnog smisla.

Energetska bilanca Hrvatske sastoji se u osnovi iz dvaju dijelova, i to prvoga, koji je odraz potrošnje energije, i drugoga, koji je odraz mogućnosti dobave odnosno transformacije primarnih oblika energije.

Prvi dio bilance, odnosno dio koji se odnosi na potrošnju energije, obično se strukturira prema sektorima potrošnje, i to industriji, uslugama, kućanstvima, prometu, poljoprivredi i ostalim sektorima, ali i prema energetskim oblicima. Poznavanje i definiranje odnosno mogućnost projiciranja ključnih odrednica koje utječu na potrošnju energije temeljne su pretpostavke proračuna potreba za energijom, ali i načina utjecaja na iznos, strukturu i trendove potrošnje energije u budućnosti, što je zapravo prvi dio energetske strategije.

Drugi dio energetske bilance odnosi se na dobavu energije odnosno energetskih oblika. Taj je dio strukturiran od nekoliko važnih segmenata: proizvodnje, uvoza i transformacije primarnih oblika energije te gubitaka, vlastite potrošnje i neenergetske potrošnje. Svaki od nabrojenih segmenata ima posebne značajke i mora biti predmetom posebnih analiza. Naravno da dio energetskog sustava koji se odnosi na dobavu energije nije skup količina primarnih oblika energije nego međusobno značajno umrežen i međuovisan sustav koji je definiran potrebama ali i koji definira sigurnost opskrbe, jednu od

4 ENERGY CONSUMPTION IN CROATIA AND THE SHARE OF GAS

4.1 Energy consumption in Croatia

The consumption of energy in a specific country, and thus in the Republic of Croatia, is based upon the characteristics of economic activities or the consequences of leading a civilized way of life. In the most rough analyses, energy consumption is characterized by three values: total energy consumption, structure and, naturally, the consumption trend. There are no two countries with the same energy balance, i.e. with equal values for the three aforementioned values, so it can be justifiably stated that the energy balance of a specific country is actually its blood profile. This merely means that it is not possible to compare energy balances directly without a deeper analysis of the causes, conditions, manner of operations and traditions affecting energy consumption, so that such analysis cannot yield usable results. It is similar when the energy balances of the world or specific regions are compared with the energy balance of a particular country being studied, and therefore a critical analysis of the energy balance of, say, Croatia, based upon the world model or the energy balance of some other country, would not serve a special purpose.

The energy balance of Croatia basically consists of two parts, the first of which reflects energy consumption and the second reflects supply options or the transformation of primary forms of energy.

The first part of the balance, i.e. the part that refers to energy consumption, is usually structured according to the sectors of consumption, which are industry, services, households, traffic, agriculture and other sectors, but also according to forms of energy. Identifying, defining and the possibility of projecting the key determinants that influence energy consumption are the basic prerequisites for the calculation of energy requirements but also the manner of influencing the amount, structure and trends of energy consumption in the future, which is actually the first part of energy strategy.

The second part of the energy balance refers to the energy supply or the forms of energy. This part is structured from several important segments: production, import and the transformation of primary forms of energy and losses, own consumption and non-energy consumption. Each of the listed segments has special characteristics and should be subjected to separate analysis. The part of the energy system that refers to the energy supply is certainly not a collection of the quantity of primary forms of energy but a significantly mutually networked and interdependent system

najznačajnijih karakteristika energetskog sustava i zapravo drugi važan dio energetske strategije.

S obzirom na energetsku bilancu, koja je zapravo brojčani odraz energetskog sustava, energetski je sustav jedne zemlje specifičan i nije usporediv s istim takvim sustavom ni jedne druge zemlje te kao takav mora imati svoj specifičan razvojni put.

that is defined by requirements, which also defines the security of supply, one of the most significant characteristics of an energy system and actually the second important part of energy strategy.

Bearing in mind energy balance, which is actually the numerical expression of an energy system, it is clear that the energy system of a country is specific and not comparable to the energy system of any other country, and as such must have its own specific path of development.

Tablica 4 - Ukupna potrošnja energije u Hrvatskoj [25]
Table 4 - Total energy consumption in Croatia [25]

	1999.	2000.	2001.	2002.	2003.	2004.	2004.	1999.-2004.
	(PJ)						Struktura / Structure (%)	Stopa porasta / Growth Rate (%)
Ugljen i koks / Coal and Coke	8,04	17,15	19,36	22,89	26,18	29,70	7	29,9
Ogrijevno drvo / Firewood	13,92	15,64	12,24	12,39	15,96	15,88	4	2,7
Tekuća goriva / Liquid Fuels	183,40	160,52	164,25	175,16	192,85	179,62	44	-0,4
Prirodni plin / Natural Gas	94,05	94,98	98,87	101,10	100,45	104,66	25	2,2
Vodne snage / Water Power	61,86	56,93	65,51	52,01	46,48	69,00	17	2,2
Električna energija / Electricity	8,50	14,40	11,36	12,68	14,01	13,19	3	9,2
UKUPNO / Total	369,77	359,62	371,58	376,23	395,93	412,04		2,2

Ukupna potrošnja energije 2004. godine u Hrvatskoj (tablica 4) iznosila je 412 PJ i od 1992. godine ima pozitivan trend porasta. Tijekom 2004. godine (trenutačno posljednje godine za koju postoje potpune energetske bilance) ostvarena je tek nešto niža potrošnja nego maksimalna ostvarena krajem 1980-tih godina. Prosječna stopa porasta ukupne potrošnje energije u posljednjih je nekoliko godina 2,2 %, iako ukupna potrošnja energije ne raste kontinuirano. Najveći udio otpada na tekuća goriva, 44 %, dok je udio prirodnog plina na razini od 25 %. Hrvatska po glavi stanovnika troši 55 % prosjeka zemalja EU 15.

Proizvodnja primarnih oblika energije bila je 2004. godine na razini od 204,4 PJ i od 1999. godine raste prosječno godišnje 1,9 %. U strukturi 2004. godine najveći udio ima proizvodnja prirodnog plina s 38 %, zatim proizvodnja električne energije iz vodnih snaga 38 % i proizvodnja sirove nafte s 21 %. Stopa proizvodnje primarne energije prema tomu je niža od stope porasta ukupne potrošnje energije, a znatno niža od stope neposredne potrošnje energije.

The total energy consumption in Croatia (Table 4) amounted to 412 PJ in 2004. Since 1992, there has been a positive growth trend. During the year 2004 (currently the last year for which there are complete energy balances), there was somewhat lower consumption than the maximum reached in the late 1980s. The average rate of growth in the total energy consumption during the past several years has been 2,2 %, although total energy consumption is not continuously rising. The largest share goes to liquid fuels, 44 %, while the share of natural gas is at the level of 25 %. Per capita, the inhabitants of Croatia consume 55 % of the average for the countries of the EU 15.

The production of primary forms of energy in 2004 was at the level of 204,4 PJ and since the year 1999 the annual average increase was 1,9 %. Within the structure of the year 2004, the greatest share was the production of natural gas with 38 %, followed by the production of electricity from water power with 38 % and the production of raw petroleum with 21 %. The rate of the production of primary energy is accordingly lower than the rate of the increase in total energy consumption and significantly lower than the rate of direct energy consumption.

Uz zanemarivanje strukture energije koja se uvozi i one koja se izvozi, bilanca uvoza i izvoza pokazuje kako je Hrvatska 2004. godine uvezla 318 i izvezla 106 PJ energije. To znači da je u energetskim jedinicama Hrvatska uvezla 212 PJ. Trend uvoza raste, ali raste i trend izvoza, poglavito naftnih derivata.

Treba posebno razmotriti energiju za energetske transformacije te neposrednu odnosno finalnu potrošnju energije. Energija za energetske transformacije podrazumijeva energiju koja se transformira u neki drugi oblik, primjerice u električnu energiju. Po iznosu je praktično konstantna u posljednjih šest godina, ali nije i po strukturi. Raste udio ugljena i prirodnog plina, a opada udio tekućih goriva.

Finalna potrošnja energije je energija predana kupcima i ona u posljednjih nekoliko godina raste s prosječnom godišnjom stopom od 2,9 %. U strukturi najveći udio zauzimaju tekuća goriva sa 44 %, plinovita goriva s 25 % (od čega gotovo 97 % prirodni plin) i električna energija sa 17 %. Prema tome, u hrvatskoj energetici prevladavaju tekuća i plinovita goriva te električna energija.

4.2 Prirodni plin kao osnova budućeg razvoja hrvatske energetike

Prirodni plin kao energent ima znatan utjecaj na razvoj energetike. Daljnji razvoj plinskog sektora zahtijeva investicije između 4 i 5 milijardi eura tijekom idućih 5 godina. Polazeći od nove teorije razvoja, gdje se stope razvoja prosuđuju po doprinosu kapitala, doprinosu rada uključujući i faktor produktivnosti [3], spomenute investicije u energetici zadovoljavaju sva tri navedena kriterija pa mogu imati niz pozitivnih utjecaja na svekoliki razvoj Hrvatske. Dio spomenutih ulaganja treba sagledavati kroz visoke multiplikatore koji višekratno umnožavaju efekte ulaganja, a neke, poglavito one vezane uz terminal za LNG, u funkciji novih tehnologija s posljedicama nove privredne strukture, bez kojih će biti teško prijeći prag BDP-a od 10 000 eura po stanovniku [26].

Na sličan se način mogu karakterizirati i ulaganja INE od oko 1,0 milijardu američkih dolara u modernizaciju rafinerija te ulaganja u istraživanje, odnosno razradu podmorja sjevernog Jadrana, u što su talijanski partneri i INA uložili svaki po 360 milijuna američkih dolara, ali isto tako i nova, daljnja ulaganja u istraživanje i razradu sjevernog Jadrana.

Energetika, kao infrastruktura, preduvjet je razvoja druge privrede, ali generirajući vlastiti razvoj energetika utječe na razvoj drugih koji sudjeluju

Without taking into consideration the structure of the energy that is imported and exported, the import-export balance indicates that Croatia imported 318 and exported 106 PJ of energy in the year 2004. This signifies that in energy units, Croatia imported 212 PJ. The import trend is increasing, as is the export trend - chiefly petroleum derivatives.

It is necessary to consider energy for energy transformation separately, as well as the direct or final consumption of energy. Energy for energy transformation is understood to mean energy that is transformed into some other form of energy, such as electricity. The amount has been practically constant during the past six years but not the structure. The share of coal and natural gas is increasing and the share of liquid fuels is decreasing.

Final energy consumption is energy turned over to customers. In the past several years, this energy has increased by an average annual rate of 2,9 %. Within this structure, the largest share is taken by liquid fuels with 44 %, followed by gas fuels with 25 % (of which nearly 97 % is natural gas) and electricity with 17 %. Accordingly, Croatian energy supply is dominated by liquid and gaseous fuels as well as electricity.

4.2 Natural gas as the basis for the future development of Croatian energetics

Natural gas as an energy source has a significant impact upon the development of energetics. The further development of the gas sector requires investments of between 4 and 5 billion euros during the next five years. Starting from the new theory of development, where the rates of development are assessed according to the capital contribution, labor contribution and the factor of productivity, [3], the aforementioned investments in energetics meet all three criteria and it is self-evident that they could have a series of positive impacts on the overall development of the Republic of Croatia. A portion of these investments should be viewed through high multipliers that multiply the effects of investment many times over, and some, especially those connected with the terminal for the receipt of LNG, in the function of new technologies with consequences of a new economic structure, without which it will be difficult to exceed the BDP threshold of 10 000 euros per capita [26].

In a similar manner, it is also possible to characterize INA's investment of approximately 1,0 billion USD in the modernization of the refineries and in investment in research, i.e. the study of the sea bottom of the Northern Adriatic, in which Italian partners as well as INA have each invested 360 million USD, in addition to new, further investment in the research and development of the Northern Adriatic.

u njezinu razvoju. Kada se uza sve to zna da dio energetike (INA, HEP, Plinacro, Janaf…) pripada, u našim uvjetima, u velika i srednja poduzeća, ona po definiciji daju prostor za rad i razvoj srednjoj i maloj privredi. Energetika, prema tome i prirodni plin, zadovoljavaju jednu od pet osnovnih težnji svakog čovjeka: sigurnost, hranu, potomstvo, izražavanje osobnosti i sklonište (a koje je vezano uz toplinu) [27].

Ulaganja u razvoj plinske infrastrukture zemlje obuhvaćaju:

- ulaganja radi osiguranja dostatnosti,
- ulaganja radi povećanja sigurnosti opskrbe.

Dostatnost se osigurava novim izvorima i transportnim putovima, u našem slučaju to se kombinira s diversifikacijom izvora, što povećava i sigurnost dobave, a s novim podzemnim skladištem povećava se i sigurnost opskrbe. I obratno, rješavanje povećane sigurnosti, npr. izgradnjom novih skladišta i promjenama u strukturi potrošnje, ujedno može riješiti i povećanu dostatnost. Vještina upravljanja potražnjom (DSM), sama po sebi smanjuje i oscilacije u potrošnji, kako dnevne i tjedne tako i sezonske. Grafički prikazana potrošnja sinusoidom, s pomoću DSM-a idealno bi se približila pravcu, horizontalno, paralelno apscisi, gradeći opterećenje za ljetnu potrošnju i režući zimske amplitude.

Ulaganjem u nove izvore, tj. korištenje projekta GEA za vlastitu proizvodnju plina i za uvoz putem SWOP-a, zatim otvaranjem novoga dobavnog pravca preko Mađarske te izgradnjom terminala za LNG zadovoljavaju se kriteriji sigurnosti i dostatnosti opskrbe, s uključenom diversifikacijom, ali se ne će stvoriti svi uvjeti za upravljanje potrošnjom. Za to je nužno izvršiti prekategorizaciju potrošnje tako da se uvede kategorija prekidnih potrošača te da se na razini distributera pozitivno diskriminira komercijalna kategorija.

Međutim, sigurnost i pouzdanost opskrbe krajnjih potrošača ovisi i o organiziranosti, a posljedično i o ekonomskoj snazi distribucijskog sektora, koji broji oko 36 distributera. Sadašnja organizacija većini njih ne omogućuje niske troškove poslovanja, ni akumulaciju iz koje bi mogli investirati u tehnička rješenja sigurnosti opskrbe, dnevna skladišta i/ili instalacije za vršnu potrošnju.

Energetics, as infrastructure, is a prerequisite for the development of other industries but energetics, generating its own development, influences the development of others who participate in its development . When in addition to all of this it is known that some energetics concerns (INA, HEP, Plinacro, Janaf…) are classified, under Croatian circumstances, as large and medium-sized enterprises, then by definition they provide space for the operations and development of the medium-sized and small economies. Energetics, and thus natural gas, meets one of the five basic aspirations that each person has: security, food, posterity, expression of personality and shelter (which is connected with heat) [27].

Investment in the development of the gas infrastructure includes the following:

- investment in order to insure sufficiency,
- investment in order to increase the security of supply.

Sufficiency is insured by new sources and transport routes, and in our case it is combined with the diversification of sources, which also increases the security of procurement. With the new underground storage facility, the security of the supply is increased. Conversely, solutions for increasing security, for example through the construction of new storage facilities and changes in the structure of consumption, can also resolve and increase sufficiency. Demand side management (DSM) in itself reduces oscillations in consumption: daily, weekly and seasonal. A graphic presentation of consumption with a sinusoid, using DSM, would ideally approximate a straight line, horizontal, parallel to the abscissa, constructing the load for summer consumption and limiting winter amplitudes.

Through investments in new sources, i.e. using the GEA project for the country's production of gas and SWOP for import, by opening a new supply route via Hungary and building a terminal for LNG, the criteria would be met for the security and sufficiency of supply, with the inclusion of diversification, but all the prerequisites will not be met for demand side management. For this it is necessary to perform the pre-categorization of consumption, in such a manner that the category of interruptible consumers is introduced and at the level of distributors there is positive discrimination in favor of the commercial categories.

However, the security and reliability of supply to the final consumer also depend upon the degree of organization and consequently also on the economic strength of the distribution sector, that now numbers approximately 36 distributors. The current organization does not make low operational expenses possible for most of them, nor accumulation from which they could invest in technical solutions for security of supply, daily storage and/or installations for peak consumption.

4.3 Cijena plina u Hrvatskoj

Danas hrvatsko tržište opskrbljuje jedan dobavljač (INA d. d.), unatoč tome što su ostvareni zakonski preduvjeti i što postoje tri potrošača u statusu povlaštenih, koji imaju pravo izbora dobavljača. To su HEP, Petrokemija Kutina i Pliva (za potrebe kogeneracije). Razlog što povlašteni potrošači ne koriste svoje pravo je u činjenici što se vodi politika ograničenja cijena u cjelini, znatno ispod cijena na tržištu nabave. Poznato je da se cijene plina i drugih energenata formiraju tržišno, u odnosu na konkurentne energente (plinu su konkurenti teška i laka ulja). U tome je uloga nafte kao reper odlučujuća.

S obzirom na odgodne klauzule u uvoznim ugovorima za plin, cijene se poravnavaju prema referentnim gorivima s vremenskom zadrškom od tri do devet mjeseci. To vrijeme djeluje na poravnavanje skokova koje imaju nafta i naftni derivati te na uprosječivanje cijena u obračunskom razdoblju.

Veliki porast cijena nafte bilježi se tijekom 2004. i 2005. godine, sa stalnom tendencijom rasta. Cijene nafte odraz su prenapregnute ravnoteže ponude i potražnje uz utjecaj špekulativnih i političkih razloga. Naravno, cijene derivata u izravnoj su korelaciji s cijenom nafte (tzv. sirove) na svjetskom tržištu. U Hrvatskoj se cijene derivata formiraju prema onima na tržištu Mediterana, po načelu alternativnih izvora (Alternative cost supply). Vjerojatno smo mogli zaboraviti kako su te cijene rasle u proteklom razdoblju [5], [6] i [9].

Slika 6 pokazuje kretanje cijena mazuta (s 1 % i 3,5 % sumpora) te plinskog ulja.

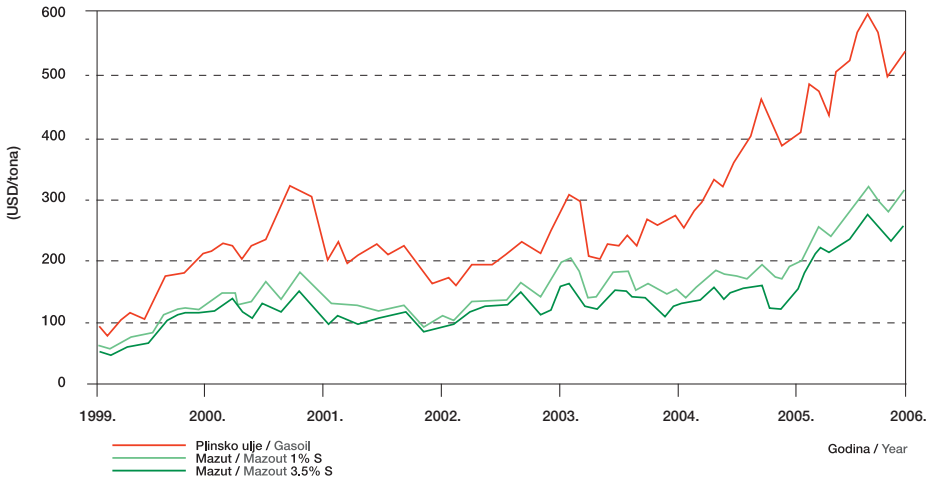
4.3 The price of gas in Croatia

Today the Croatian market is supplied by one supplier (INA d.d.), despite the fact that the legal prerequisites have been met and three consumers have the status of eligibility and are entitled to a choice of suppliers. These are HEP, Petrokemija Kutina and Pliva (for the requirements of co-generation). The reason that the eligible consumers do not exercise their right is due to the fact that there is a policy of overall price limitation, considerably below the price on the procurement market. It is a known fact that gas prices, as well as those of other energy sources, are formed on a market basis, in relation to the competing energy sources (heavy and light oil are competitors of gas). In this, the role of oil as a reper is decisive.

Taking into account the delay clause in the import contracts for gas, the prices level off according to the reference fuels with a time delay of from three to nine months. This time delay evens out the price spikes that oil and oil derivatives are subject to and the averaging of prices during the accounting period.

A great increase in oil prices was recorded during 2004 and 2005, with a constant growth tendency. Oil prices are a reflection of the overstrained balance of supply and demand, with the influence of speculative and political reasons. Of course, the prices of derivatives are in direct correlation with oil prices (so-called raw materials) on the world market. In Croatia the prices of derivatives are formed according to those on the Mediterranean market, following the principle of alternative cost supply. We probably could forget how the prices rose in the past [5], [6] and [9].

Figure 6 shows the trends in the prices of mazout (with 1 % and 3,5 % sulfur) and gasoil.



Slika 6
Kretanje cijena mazuta i plinskog ulja na Mediteranskom tržištu
Figure 6
Trends in the prices of mazout and gasoil on the Mediteranean market

Dekanić, I., Kolundžić, S., Slipac, G., Energetska budućnost Hrvatske...., Energija, god. 55 (2006), br. 4., str. 382-415
Dekanić, I., Kolundžić, S., Slipac, G., Croatia's Energy Future...., Energija, vol. 55 (2006), No. 4, p.p. 382-415

Istodobno, rezultat politike ograničenja cijena poremećaj je pariteta cijena, što se vidi iz tablice 5, u kojoj je prirodni plin dvostruko jeftiniji od lož-ulja ekstra lakog, 2,01 prema 4,33, a ugljen je samo nešto malo jeftiniji od plina! Hrvatska (poput Češke, Mađarske, Poljske, Slovenije i Slovačke) ima cijene plina za kućanstva niže od europskog prosjeka (EU 25). Poznato je da po načelu: Svatko plaća troškove koje svojom potrošnjom izaziva, kućanstva u tržišnim ekonomijama plaćaju najvišu cijenu. Najveće oscilacije u potrošnji ima sektor potrošnje u kućanstvima. Zimska i ljetna potrošnja u Zagrebu se odnose kao 7:1, a slično je i u ostalim dijelovima Hrvatske. Te razlike prevladavaju se dobavom plina iz podzemnog skladišta. (U suprotnom, ako ne bi bilo skladišta, s obzirom na uobičajene klauzule uvoza, dobavljač bi sebi potrebnu dobavu poravnavao u preuzimanju uvoznih količina, plaćajući nepreuzete količine i nekorišteni kapacitet u plinovodu).

Cijene električne energije za kućanstva u Republici Hrvatskoj također su niže od onih u Europskoj uniji, i to za oko 30 %, za industriju su naše cijene oko 20 % ispod prosjeka istog uzorka (EU 25).

At the same time, a result of price limitation policies is the loss of price parity, as evident from Table 5, in which natural gas is twice as inexpensive as extra-light heating oil, 2,01 as opposed to 4,33, and coal is only somewhat less expensive than gas! Croatia (like the Czech Republic, Hungary, Poland, Slovenia and Slovakia) has a gas price for households which is below the European average (EU 25). It is known that according to the principle of everyone paying the costs incurred by their own consumption, households in market economies pay the highest prices. The greatest oscillations in consumption are in the sector of household consumption. Winter and summer consumption in Zagreb has a ratio of 7:1, and it is similar in the other parts of Croatia. These differences are overcome by obtaining gas from an underground storage facility. (Otherwise, if there were no storage facility, due to the customary import clause, the supplier would have to pay for unused imported gas and pipeline capacities in the pipeline).

The prices of electricity for households in the Republic of Croatia are also lower than those in the European Union by approximately 30 %. For industry, our prices are approximately 20 % below the average for the same model (EU 25).

Tablica 5 - Odnos cijena energenata prema cijeni prirodnog plina na jednakom paritetu u širokoj potrošnji (cijene na dan 30.03.2006.)
Table 5 - The ratio of the price of individual energy sources to the price of natural gas of equal parity in mass consumption (prices as of march 30, 2006)

Redni broj / Item no.	Energent / Energy source	Jedinica mjere / Unit measures	Toplinska vrijednost / Heat value	Cijena / Price	Toplinski ekvivalent (TE)/ Heat equivalent (HE)	Paritetna cijena za energiju / Equal parity energy price	Indeks cijene / Price index
		(j. mj.)	(kJ/j. mj.)	(kn/j. mj.)	(kJ/j. mj.) / 33 338,35 kJ/m³	(kn/j. mj.) /TE/HE	
1	Prirodni plin / Natural gas	m³	33 338,35	2,01	1,000	2,01	100
2	Propan-butan smjesa / Propane -butane mixture	kg	48 148,20	7,00	1,444	4,85	241
3	Lož-ulje ekstra lako / Extra-light heating oil	l	36 437,70	4,73	1,093	4,33	215
4	Električna energija / Electricity						
	Plavi tarifni model / Blue tariff model	kWh	3 600,60	0,72	0,108	6,65	330
	Bijeli tarifni model / White tariff model	kWh	3 600,60	0,52	0,108	4,86	241
	Narančasti tarifni model / Orange tariff model	kWh	3 600,60	1,04	0,108	9,60	477
5	Toplinarstvo / Heating plant	kWh	3 600,60	0,21	0,108	1,94	96
6	Ugljen / Coal	kg	20 100,00	0,96	0,603	1,59	79
7	Ogrjevno drvo / Firewood	m³	6 672 500,00	360,00	200,145	1,80	89
8	Motorni benzin - Super 95 / Gasoline -super 95	l	36 100,00	7,84	1,083	7,24	359
9	Motorni benzin - Eurosuper / Gasoline -eurosuper	l	36 100,00	7,98	1,083	7,37	366
10	Diesel / Diesel	l	31 950,00	7,30	0,958	7,62	378
11	Eurodiesel / Euro-diesel	l	31 950,00	7,38	0,958	7,70	382

Sve je to još zornije na dijagramu, slika 7, koji prikazuje da je i ogrjevno drvo skuplje od ugljena i neznatno jeftinije od prirodnog plina!

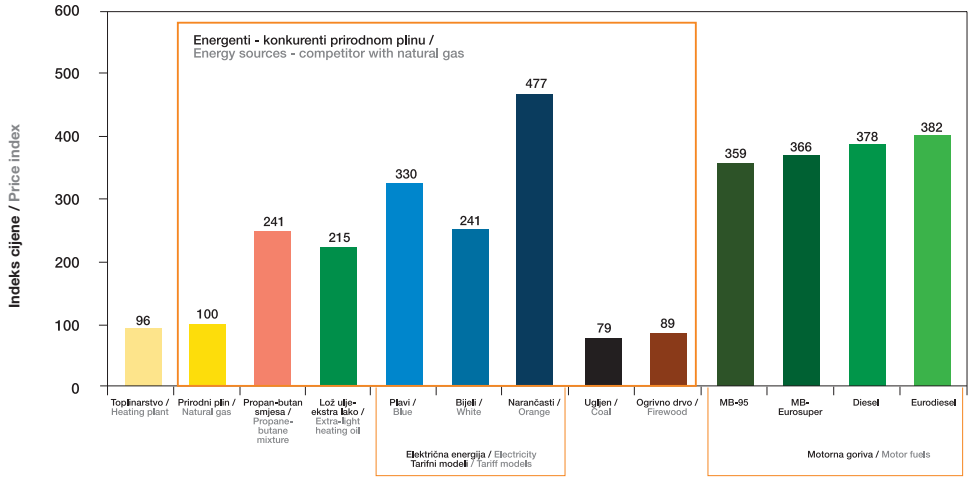
Bilo bi podcjenjivanje čitateljstva kada bi se tumačilo što su to normalni usporedni odnosi po kojima prirodni plin mora imati cijenu iznad one za lož-ulje ekstra lako. Jednako bi bilo nesmotreno objašnjavati da su s aktualnom politikom cijena i slanjem krivih signala štete mnogobrojne, sve do utjecaja na energetsku učinkovitost, povećanje koje jest i mora biti jedan od strategijskih ciljeva hrvatskoga gospodarstva.

Depreciranje cijena plina pripada svojevrsnoj tradiciji hrvatske energetike. Uz teško odustajanje od socijalnih kriterija u politici cijena energenata, zastupnici depreciranja cijena plina pokušavaju naći obrazloženje u kategoriji portfelja plina koji se sastoji od oko 45 % uvoznog i 55 % plina iz domaće proizvodnje. Za tu komponentu domaće proizvodnje pokušavaju se, tobože, odrediti troškovi proizvodnje, sa željom da se dokaže kako nije potrebno slijediti tržišne zakone.

All of this is clearer in the next diagram, Figure 7, which shows that firewood is more expensive than coal and insignificantly less expensive than natural gas!

It would be underestimating the readership to enter into an explanation of the normal comparative ratios, according to which natural gas should have a higher price than extra-light heating oil. It would be equally superfluous to explain that the actual price policy and the sending of the wrong signals are inflicting significant damage, to the point of influencing energy effectiveness, the increase of which is and must be one of the strategic goals for the entire Croatian economy.

Depressed gas prices are part of a type of tradition in Croatian energetics. In addition to the reluctant abandonment of social criteria in the policy for determining the prices of energy sources, supporters of depressed gas prices are attempting to find validation in the category of the gas portfolio, which consists of approximately 45 % imported gas and 55 % from domestic production. For this component of domestic production, there have been ostensible attempts to determine the costs of production, with the intention of proving that it is not necessary to follow market laws.



Slika 7
Odnos cijena energenata prema cijeni prirodnog plina na jednakom paritetu u širokoj potrošnji (cijene na dan 30.03.2006.)
Figure 7
The ratio of the price of individual energy sources to the price of natural gas of equal parity in mass consumption (prices as of March 30, 2006)

Pri tom se zaboravlja da domaća proizvodnja ima relativno visoke troškove jer:

- INA nastavlja intenzivna ulaganja u istraživanje nafte i plina, a troškovi istraživanja moraju teretiti i proizvedenu jedinicu plina i nafte, (kao što se investicije u istraživanje moraju osigurati iz prodanog proizvoda, dakle plina i nafte).
- Oko 70 % proizvodnje dolazi iz podravskih polja, koja opterećuju mnoge specifičnosti

It is forgotten that domestic production incurs relatively high costs, for the following reasons:

- INA is continuing intensive investment in exploration for oil and gas, and the costs of exploration must be debited to the production of a unit of gas or oil, (since funding for investment in exploration must be secured from the sale of products, i.e. gas and oil).
- Approximately 70 % of production comes from the fields of Podravina, encumbered by many

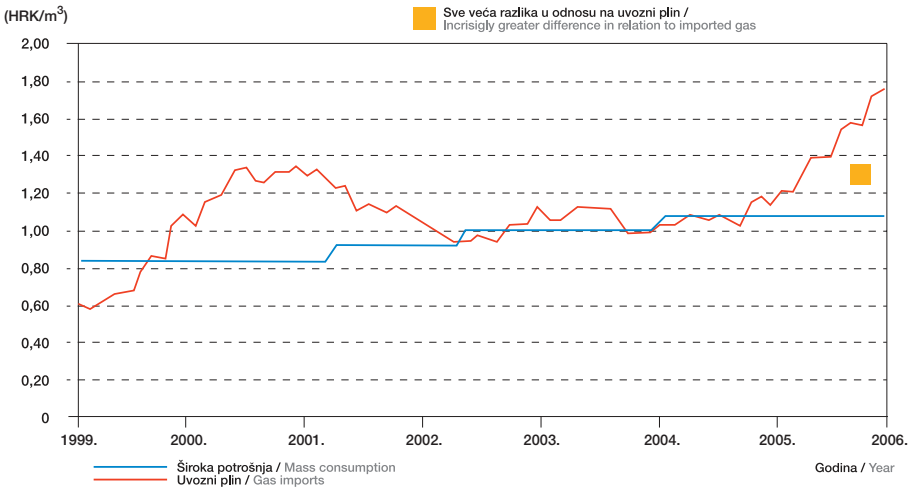
proizašle iz dubine zalijeganja ležišta, visokih temperatura i tlakova te kiseloga svojstva plina. Zbog toga su investicije u razradu i privođenje proizvodnji (čišćenje plina i zbrinjavanje štetnih komponenti), imale znatno veći opseg od klasičnih nalaza plina.
- Rastući udio plina iz podmorja sjevernog Jadrana, već samim tim što je riječ o podmorju, opterećen je velikim investicijskim ulaganjima, što u konačnici ima odraz u visokim troškovima proizvodnje.
- Ostatak plina koji se proizvodi iz desetak ostalih ležišta u Panonu stara su polja (više od dvadeset godina), koja su upravo zbog starosti i opadajuće proizvodnje u fazi rasta troškova proizvodnje.

Prema tome, proizvodnja domaćeg plina nema, na žalost, one troškovne konkurentske prednosti koja bi omogućila zadržavanje cijena na sadašnjoj razini. Istodobno, nakon gotovo dvije godine nepromijenjenih cijena (slike 6, 7, 8 i 9) nastaje raskorak između naplaćene realizacije za prirodni plin i obveza za uvozni plin, a konačni je rezultat da ukupna realizacija jedva pokriva (ili ne pokriva u 2006.) obveze za uvozni plin.

specificities due to the depth of the deposits, high temperatures and high pressures, as well as the acidic nature of gas. Therefore, investments in the development and organization of production (purifying the gas and providing for the harmful components), have a significantly greater range than classical gas deposits.
- The share of gas from the offshore zone of the Northern Adriatic, due to the involvement of the offshore zone, is encumbered by large investments, which in the final analysis are reflected in high production costs.
- The remaining gas that is produced from the ten remaining deposits in the Pannonian Basin are old fields (over twenty years old), that due to their age and declining production are in the phase of incurring rising production costs.

Accordingly and unfortunately, the production of domestic gas does not have the competitive cost advantages that would allow prices to be held at the current level. At the same time, after nearly two years of unchanged prices (Figures 6, 7, 8 and 9) we have a discrepancy between the proceeds from the sales of natural gas and the obligations for imported gas, with the final result being that the total proceeds barely cover (or fail to cover in 2006) the obligations from imported gas.

Slika 8
Kretanje cijene plina u širokoj potrošnji u odnosu na cijenu uvoznog plina
Figure 8
Trends in the price of gas for mass consumption in comparation to the price of imported gas



Prebacivanje socijalnih problema na dobavljača jedan je od krupnih generatora opskrbne nesigurnosti. **Uz sve to, pred nama je vrijeme visokih cijena energije. Upravo zbog toga potrebno je osmisliti strategiju uklanjanja dispariteta cijena energenata.**

Hrvatska energetska opskrba, poput one u Europi, ima visoku uvoznu ovisnost. Budućnost, tragom direktiva Europske unije, nalaže mjere dostatne opskrbe, sigurnu opskrbu i konkurentne cijene.

Shifting social problems to the suppliers is one of the chief reasons for the unsecurity of the supply. **With all of this, we are facing a time of high energy prices. It is precisely for this reason that it is necessary to devise a strategy for eliminating the disparities in the prices of energy sources.**

The Croatian energy supply, like the others in Europe, is highly dependent upon imports. The future, according to European Union directives, requires measures for providing an adequate and

Poput Europe, i Hrvatska se strategijski orijentirala na smanjivanje energetske intenzivnosti. Posredno i neposredno, Hrvatska ne uvećava udio nafte u energetskoj potrošnji, ali udio plina će rasti. Zbog toga ne bi trebalo biti prigovora [2], [7] i [20].

Hrvatsko tržište energije nema drugog izbora, osim preuzimanja europskih rješenja - ugradnje svjetskih cijena u svoje mehanizme i, naravno, proizvode. Ni u Hrvatskoj, kao ni u Europi neće doći u pitanje isplativost proizvodnje električne energije u kogeneracijama, posebno u distribuiranoj filozofiji. Neće doći u pitanje ni kombinirana postrojenja, pogotovo za vršnu potrošnju.

Cijene električne energije morat će se mijenjati prema promjenama na svjetskom tržištu goriva za proizvodnju električne energije. Velik udio hidroenergije u proizvodnji električne energije golema je prednost, ali više od polovice proizvodnje ostaje osjetljivom na promjene cijena na svjetskom tržištu.

4.4 Raspoloživost opskrbe plinom i novi opskrbni pravci

Raspoloživost opskrbe prirodnim plinom treba promatrati u ravnoteži potreba i mogućnosti u vremenu i prostoru. No raspoloživost jučer, danas i sutra nisu jednake, neovisno o potražnji plina.

Dovršetkom plinovoda u gradnji od Pule do Karlovca krajem 2006. ponuda plina na hrvatskom tržištu bit će obogaćena s novih oko 700 milijuna m^3 godišnje iz otkrića u podmorju sjevernog Jadrana. U pripremi je i gradnja plinovoda iz Mađarske koji, ako se ugovori ove godine te ako se ugovori opskrba s ruskim dobavljačem preko Mađarske, u 2009. može osigurati dobavu po mogućoj i potrebnoj dinamici, do punoga kapaciteta od 1,5 milijardi m^3 godišnje.

Kako se vidi na donjem dijelu slike 9, u obzoru 2010. novi uvoz mogao bi imati udjel od 33 %. Taj udjel dodatno povećava prosječnu cijenu portfelja plina.

secure supply at competitive prices. Like Europe, Croatia is strategically oriented to reducing energy intensity. Directly and indirectly, Croatia is not increasing the share of oil in energy consumption but the share of gas will increase. This should not be criticized [2], [7] and [20].

The Croatian energy market has no choice except to accept the European solutions, i.e. the incorporation of world prices into our mechanisms and, naturally, products. As with the rest of Europe, the profitability of electricity in cogenerations will not be called into question in Croatia, especially in the distributed philosophy. Combined plants will also not be called into question, especially for peak consumption.

Electricity prices will have to be adjusted to changes on the world market in the prices of the fuels used in electricity production. The high share of hydroenergy in electricity production is a great advantage but more than half of production remains vulnerable to changes in the prices on the world market.

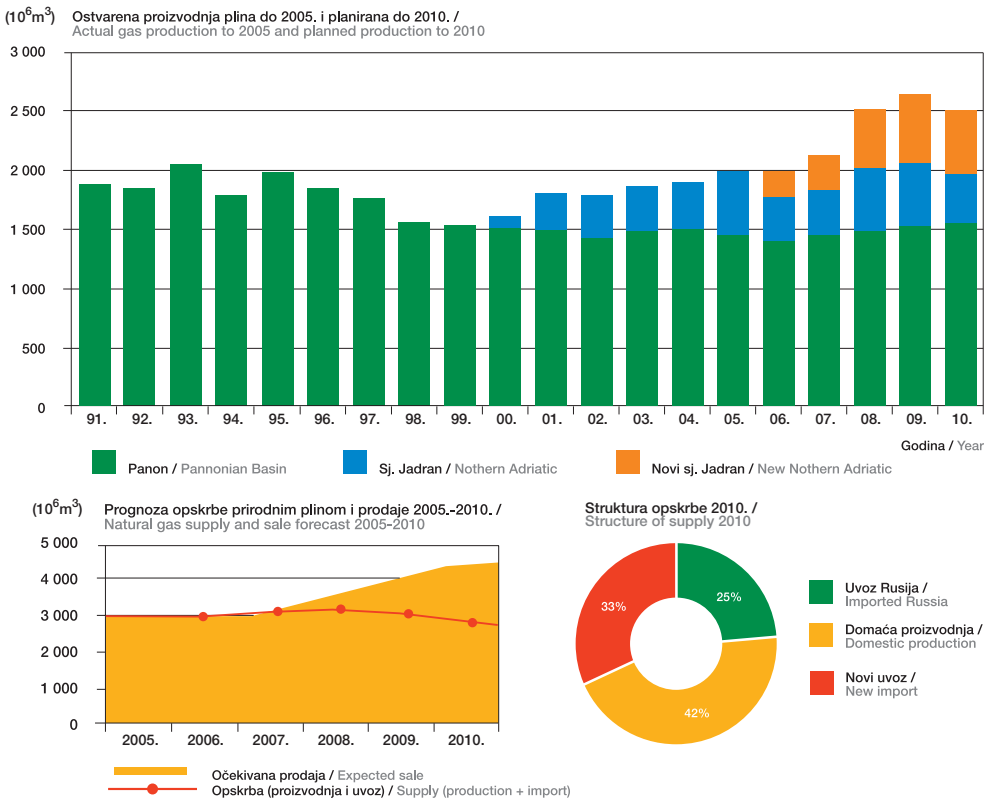
4.4 The availability of the gas supply and new supply routes

The availability of the natural gas supply should be considered in light of the balance between the demand and the possibilities in terms of time and space. However, the availability of gas has not and will not be constant, which is not dependent upon the demand.

The gas supply on the Croatian market, with the completion of the gas pipeline under construction from Pula to Karlovac at the end of 2006, will be enriched by a new 700 million m^3/year from an offshore site in the North Adriatic. The construction of a gas pipeline from Hungary is also in preparation, which, if contracted this year, and if supply is contracted with the Russian supplier via Hungary, will be able to provide up to a full capacity of 1,5 billion m^3/year in 2009, according to the potential and required dynamics.

As seen in the lower part of Figure 9, it is possible that new imports could have a 33 % share in 2010. This share would additionally increase the average price of the gas portfolio.

Slika 9
Ostvarena proizvodnja plina do 2005. i planirana do 2010.
Figure 9
Actual gas production to 2005 and planned production to 2010



Postojeći uvozni pravci prirodnog plina:

- **uvoz plina iz Rusije preko Velke Kapushany (SK) - Baumgarten (A) - Rogatec (SLO)** - kapacitet 1,1 milijarda m^3 godišnje,
- **uvoz plina iz Italije (opcija) Gorizia (I) - slovenski transportni sustav - Rogatec (SLO)** - privremeni uvoz sa sjevernojadranskih plinskih polja, kapacitet 0,4 milijarde m^3 godišnje, mogućnost zadržavanja zakupa kapaciteta s dobavom iz Sredozemlja ili zapadne Europe. Cijena tog plina bit će vrlo visoka.

Budući potencijalni uvozni pravci prirodnog plina:

- **Casalborsetti (I) - platforma Ivana (HR) - Pula (HR) - hrvatski transportni sustav (Mala GEA)** - 0,7 milijardi m^3 godišnje, mogućnost prenamjene u dobavni pravac nakon iskorištenja sjevernojadranskih polja. Eventualni dokup plina od talijanske strane, do punoga kapaciteta GEE, za sada je neizvjestan,
- **Donji Miholjac (HR) - mađarski transportni sustav** - kapacitet 1,5 milijardi m^3 godišnje (2009. g.). Mogućnost dobave plina iz Mađarske, zapadne Europe (Baumgarten), Rusije (Beregovo) i Kaspijske regije izravnim spojem na projekt Nabucco, aktivnosti u

Existing natural gas import routes:

- **the import of gas from Russia via Velke Kapushany (SK) - Baumgarten (A) - Rogatec (SLO)**: 1,1billion m^3/year capacity.
- **the import of gas from Italy (option) Gorizia (I) - Slovenian transport system - Rogatec (SLO)**: temporary import from the Northern Adriatic gas fields, 0,4 billion m^3/year capacity, possibility of retain capacity for imports from Mediterranean or Western Europe. The price of this gas will be very high.

Future Potential Natural Gas Import Routes:

- **Casalborsetti (I) - Platform Ivana (HR) - Pula (HR) - Croatian transport system (Mala GEA)**: 0,7 billion m^3/year; the possibility of transforming it into a supply route after the exhaustion of the Northern Adriatic fields. Eventual purpose of gas from the Italian side, up to full GEE capacity, is uncertain for now,
- **Donji Miholjac (HR) - Hungarian transport system**: 1,5 billion m^3/year capacity (2009); possibility of obtaining gas from Hungary, Western Europe (Baumgarten), Russia (Beregovo) and the Caspian region with a direct connection at the Nabucco project; activities in

tijeku. Međutim, rok je upitan. Dobavljač nudi plin tek za 2012,
- **uvozni pravac preko SCG - hrvatski transportni sustav (Ilok)** - ograničenje 20 bara u transportnom sustavu SCG, mogućnost dobave iz Rusije ili Kaspijske regije spojem na projekt Nabucco neizravno preko Mađarske ili preko Rumunjske. Neizvjestan rok realizacije projekta,
- **ADRIA LNG**; prihvatni LNG terminal na Krku s partnerima iz konzorcija ALSCo-Ruhrgas (Njemačka), Total (Francuska), RWE-Transgas (Češka), OMV (Austrija), Geoplin (Slovenija), INA (Hrvatska) i drugim mogućim partnerima - maksimalni kapacitet terminala 14 milijardi m^3 godišnje, INA participira s 10 %; (2011.g.), a radi se na uključivanju HEP-a s još 10 % (aktivnosti u tijeku).

Uvoz LNG preko terminala u Jadranu potvrđen je za 2012. (završetak gradnje prve faze od 5 do 6 milijardi m^3 godišnje predviđa se u 2011., a druge faze, jednako velike, do 2015.). INA zauzima u svakoj fazi 10 % kapaciteta. HEP izražava nakanu ući, također s 1 milijardom opskrbe iz terminala (vjerojatno istom dinamikom kao i INA).

U 2010. godini, ako se realiziraju navedeni projekti, tržište Hrvatske raspolagalo bi s oko 4,5 milijardi m^3, a u 2012. s 5,0 milijardi m^3, pa i više ako HEP angažira kapacitet za sebe u terminalu. Odnos ponude i potražnje mijenja se, pa je u slučaju niskih cijena povećana potražnja i obrnuto, pri višim cijenama manja potražnja, što je najizglednije. Očekuje se da će se ravnoteža uspostaviti između 4 i 4,5 milijardi m^3 u obzoru 2010. Sve to ipak upućuje na potrebe preispitivanja energetske strategije Republike Hrvatske. U vrijeme izrade aktualne strategije nisu se mogli uzeti u obzir mnogi trendovi u energetici. To nisu samo količine i cijene.

5 RAZVOJ PROIZVODNJE ELEKTRIČNE ENERGIJE IZ PRIRODNOG PLINA

5.1 Prirodni plin i električna energija - umreženi infrastrukturni sustavi

Električna energija i prirodni plin u modelima razvoja energetskih infrastrukturnih sustava imaju status umreženih energenata, koji u odnosu na neke druge energente imaju određene specifičnosti. To se u prvom redu odnosi na potrebu izgradnje infrastrukture, i to od mjesta proizvodnje sve do krajnjega kupca, odnosno do samog trošila u kojem se energija koristi za proizvodnju određene usluge. Ta je infrastruktura

progress. However, there is the question of time. The supplier will not offer gas until 2012,
- **import route via Serbia and Montenegro - Croatian transport system (Ilok)** - 20 bar limit in the transport system of Serbia and Montenegro; possible supply from Russia or the Caspian region indirectly connected at the Nabucco project via Hungary or Rumania. The date for the completion of the project is uncertain,
- **ADRIA LNG**; receiving LNG terminal on the island of Krk with partners from ALSCo consortium-Ruhrgas (Germany), Total (France), RWE-Transgas (Czech Republic), OMV (Austria), Geoplin (Slovenia) and INA (Croatia) and other potential partners: 14 billion m^3/year maximum terminal capacity, INA participates with 10 %, (2011), and there is work on the inclusion of HEP with another 10 % (activities in progress).

The import of LNG via a terminal in the Adriatic has been confirmed for the year 2012 (the completion of the construction of the first phase of 5-6 billion m^3/year is anticipated in 2011 and the second phase, equally large, by 2015). INA holds 10 % of capacity in each phase. HEP has also expressed the intention of entering, with 1 billion m^3 supplied from the terminal (probably with the same dynamic as INA).

In the year 2010, if the aforementioned projects are realized, the Croatian market would have approximately 4,5 billion m^3 available, and in 2012 it would have 5,0 billion m^3, and even more if HEP engages a capacity for itself in the terminal. The supply and demand relationship in the case of low prices moves toward increased consumption and, vice versa, in the case of higher prices, which are the most likely, moves toward lower consumption. It is to be expected that such a balance will be established between 4 and 4,5 billion m^3 by 2010. All of this demonstrates the need to reexamine the energy strategy of the Republic of Croatia. At the time of the preparation of the actual strategy, many trends in energetics could not be taken into account. These do not refer only to quantities and prices.

5 THE DEVELOPMENT OF ELECTRICITY PRODUCTION FROM NATURAL GAS

5.1 Natural gas and electricity - networked infrastructure systems

Electricity and natural gas in models of the development of energy infrastructure systems have the status of networked energy sources that have specific characteristics in comparison to other energy sources. In the first place, this refers to the

kapitalno intenzivna, potrebno je relativno dugo vrijeme pripreme i izgradnje, a dugačak je i životni vijek eksploatacije.

Uz vrlo složenu tehniku rada umreženih energetskih sustava, posebnu pozornost treba posvetiti izgradnji objekata odnosno pojedinih dijelova infrastrukturnih sustava koja mora biti pravodobna, ni prerana ni prekasna. Planiranje razvoja infrastrukture umreženih energenata polazi od planiranja razvoja potrošnje korisne energije koja je temelj definiranja potreba za energijom. Na temelju potreba za korisnom energijom u svim sektorima potrošnje treba analizirati strukturu energenata potrebnih za zadovoljenje potreba za korisnom energijom i definirati ih sukladno odrednicama iz energetske strategije. Prirodni plin i električna energija izravno se natječu u dijelu zadovoljenja potreba za korisnom toplinom. Međutim, najveći utjecaj na planiranje razvoja tih sustava ima proizvodnja električne energije iz prirodnog plina u kombi-plinskim termoelektranama, a kako je osim proizvodnje električne energije učinkovito proizvoditi i toplinu, to se i toplina proizvedena iz takvih elektrana natječe s prirodnim plinom u zadovoljenju potreba za korisnom toplinom. Tako se uz električnu energiju i prirodni plin, u umrežene energetske sustave može ubrojiti i centralizirani toplinski sustav (CTS). Današnje razumijevanje ekonomike tih sustava pokazuje kako se takva postrojenja mogu graditi u blizini većih naseljenih mjesta ili većih industrijskih postrojenja koja u tehnološkim procesima koriste veće količine topline. To, naravno, ne znači da je blizina toplinskoga konzuma jedini kriterij izbora takvih postrojenja.

Prema tome, planiranje razvoja sustava umreženih energenata ne znači samo izgradnju kombi-plinskih termoelektrana, jer je za to potrebno imati razvijen plinski sustav i razvijen centralizirani toplinski sustav, ne znači samo razvijati plinski sustav ako nema potrebe za korisnom toplinom iz prirodnog plina. To znači da je optimum energetskog sustava postignut samo zajedničkim planiranjem umreženih energenata.

5.2 Perspektive objedinjenoga planiranja plinskog i elektroenergetskog sektora

U Europi se uspostavlja tržište električne energije i prirodnog plina u tzv. procesu konvergencije, naravno samo u državama koje imaju razvijenu plinsku mrežu. U malim energetskim sustavima, kao što je hrvatski, nije moguće planirati samo jedan sustav bez interakcije s drugim, odnosno nije moguće postići optimum između triju temeljnih odrednica u energetskoj strategiji Europske unije: uspostave tržišnih odnosa, zaštite

need for the construction of an infrastructure from the place of production to the final customer or to the final facility in which the energy is used for the production of certain services. This infrastructure is capital intensive. Relatively long preparation and construction are required, and exploitation can last a long time.

In addition to the highly complex operational technology of networked energy systems, particular attention should be devoted to the construction of objects or individual parts of infrastructure systems, which must be undertaken at the right time, neither too early nor too late. Planning the development of the infrastructure of networked energy sources starts from the planning of the development of the consumption of useful energy, which represents the basis for the definition of energy requirements. On the basis of the requirements for useful energy use, in all sectors of consumption it is necessary to analyze the structure of the energy sources needed for meeting energy requirements and define them pursuant to the provisions from the energy strategy. Natural gas and electricity directly compete for meeting useful heating requirements. However, the production of electricity from natural gas in combined gas thermoelectric power plants has the greatest impact on the planning of the development of these systems. Since heat is produced during the production of electricity, the heat produced from such plants competes with natural gas in meeting useful heating needs. In addition to electricity and natural gas, it is also possible to include centralized heating systems (CHS) in networked energy systems. The current understanding of the economics of such systems shows that such plants can be built in the vicinity of large communities or industrial plants which use large quantities of heat in technological processes. This naturally does not mean that the vicinity of the heat consumer is the sole criterion for choosing such a plant.

The networking of a system of energy sources does not only mean the construction of a combined gas thermoelectric power plant, because it is necessary to develop the gas and centralized heating systems, does not only mean the natural gas system should be developed if the heat from gas cannot be utilized. This means that an optimal energy system can only be achieved through the unified planning of networked energy sources.

5.2 Perspectives on the unified planning of the gas and electricity sector

In Europe, a market is being established for electricity and natural gas in the so-called convergence process (naturally, only for countries with developed gas networks). In small energy systems such as the Croatian system, it is not possible to plan only one

okoliša i sigurnosti opskrbe energijom, planirajući svaki sustav posebno.

U Hrvatskoj to znači zajednički rad na planiranju razvoja energetskog sustava i njegovih sastavnica. Ponajprije se to odnosi na definiranje strukture finalnih oblika energije potrebnih kao korisna energija. Definiranje te strukture temelj je energetske strategije jer se procesi promjene strukture odvijaju vrlo polako i uz velike institucionalne napore.

Iz toga slijedi da je zajedničko planiranje temelj ostvarenja diversifikacije energenata kao i izvora, koja uključuje izbor i dobavu, odnosno pravce dobave energenata koji će omogućiti sigurnost opskrbe potrošača. To znači uključivanje u međunarodno tržište energije, osiguranje više priključaka na međunarodne mreže i dobavu iz više pravaca za sve umrežene sustave, razvoj prijenosnih i transportnih mreža, razvoj distribucijskih mreža, uvažavanje sigurnosnih ograničenja, državnih interesa i slično.

Nema sumnje kako je zaštita okoliša jedan od prioritetnih ciljeva, što u energetskom sektoru podrazumijeva djelovanje kroz već opisanu energetsku učinkovitost, izbor energenata i primjenu najsuvremenijih tehnologija zaštite, kvalitetno zakonodavstvo i nadzor, utjecaj javnosti i obrazovanja te promociju pozitivnih primjera.

Jedna od temeljnih pretpostavki realizacije navedenoga uspostava je cijena svih oblika energije koje odražavaju troškove. Prema tome, razvoj energetskog tržišta znači ne samo izgradnju infrastrukturnih sustava, izgradnju institucionalnih odnosa nego i uspostavu realnih tarifnih sustava.

Pretpostavka je uvođenju realnih tarifnih sustava određena razina ukupnoga domaćeg proizvoda po stanovniku. Razvoj i izgrađenost elektroenergetskog sustava u nešto manjoj, a plinskog infrastrukturnog sustava u puno većoj mjeri, ovise i o kupovnoj moći stanovništva, odnosno stupnju razvoja određene regije ili države, što osobito dolazi do izražaja u malim zemljama s malim energetskim sustavom.

To znači da je planiranje energetskog sustava potrebno prilagoditi općim načelima energetske politike malih energetskih sustava. Planiranje je vrlo bitna sastavnica dobro osmišljene energetske politike. U tom smislu može se govoriti o perspektivama objedinjenoga planiranja, pa i plinskog i elektroenergetskog sustava kao jedino mogućega.

system at a time without considering its interaction with other systems, i.e. it is not possible to achieve the optimum among the three basic determinants, which are stated in the energy strategy of the European Union: the establishment of market relations, environmental protection and the security of the energy supply.

In Croatia, this means joint planning of the development of the energy system and its components. First of all, this refers to the definition of the structure of the final form of the energy requirements. The definition of this structure is the basis for energy strategy because the processes of structural change occur very slowly and require considerable institutional efforts.

Furthermore, joint planning is the basis for achieving the diversification of energy sources, which includes the choosing of sources and procurement routes that will insure the security of the energy supply. This means, inclusion in the international energy market, providing several connections to the international networks, procurement via several routes from all the networked systems, development of the transport networks, development of the distribution networks, and taking the security limitations, state interests etc. into account.

There is no doubt that environmental protection is one of the priority goals, which is understood in the energy sector to mean operations that emphasize energy efficiency, choice of energy sources and application of the most modern protective technology, quality legislation and supervision, the impact of public opinion and education, and the promotion of positive examples.

One of the fundamental prerequisites for the realization of the above is to set prices for each form of energy that reflect costs. Accordingly, the development of the energy market does not only means the construction of infrastructure systems and the development of institutional relations but also the establishment of realistic tariff systems.

A prerequisite for the introduction of realistic tariff systems is the determined level of the total domestic product per capita. The development and completeness of an electricity system to a lesser extent, and a gas infrastructure to a greater extent, depends upon the purchasing power of the population, i.e. the degree of the development of a specific region or state, which is especially evident in small countries with small energy systems.

This means that the planning of an energy system must be adjusted to the general principles of the energy policies of small energy systems. Planning is a very important component of well-conceived energy policies. In this sense, it is possible to speak about unified planning, and about a gas and electricity system as the only possible system.

6 ENERGETSKI PROJEKTI - RAZVOJNE PRILIKE HRVATSKOG GOSPODARSTVA

Energetski projekti zahtijevaju velika i dugotrajna investicijska ulaganja s dalekosežnim učinkom na gospodarstvo. Njihovo je planiranje značajan razvojni pothvat i izazov. Tijekom proteklih dvaju desetljeća u Republici Hrvatskoj praktično nije bilo većih energetskih projekata. Razlozi su za to događaji oko raspada bivše Jugoslavije, agresija na Hrvatsku i stagnacija u gospodarskom razvoju naše zemlje. U tijeku tranzicije došlo je do zastoja u razvoju gospodarstva i prestanka rada dijela industrije, pa su se energetske potrebe mogle zadovoljiti i bez novih energetskih projekata.

S obzirom na rast hrvatskoga gospodarstva od 4 do 5 % i očekivanja da će se rast nastaviti te dostignuti razinu bruto domaćeg proizvoda od 7 000 eura po stanovniku, budući rast neće biti moguć bez osiguranja nove energije. Rastuće potrebe za energijom neće se moći zadovoljiti bez novih energetskih projekata. Očekuje se pristupanje naše zemlje regionalnim inicijativama poput Ugovora o energetskoj zajednici u jugoistočnoj Europi. Time će se stvoriti mogućnosti za ulaganje međunarodnoga kapitala za nove energetske projekte u našoj zemlji.

Potrebe osiguranja novih količina plina iz uvoza, kao što je obrazloženo u točki 4.4, aktualiziraju planiranje prihvatnog terminala Adria LNG i drugih projekata za uvoz prirodnog plina. Privatizacija energetskih djelatnosti u jugoistočnoj Europi te ulazak inozemnih kompanija na hrvatsko tržište energije i kapitala mogli bi prouzročiti preuzimanje hrvatskih energetskih tvrtki od strane inozemnih ulagača, ali i dati priliku za razvoj hrvatskoga gospodarstva. Prihvaćanje energetske strategije Europske unije potaknut će razvoj novih poduzetničkih inicijativa u hrvatskoj energetici, poput intenzivnije proizvodnje obnovljivih izvora energije. Fond za zaštitu okoliša i energetsku učinkovitost i ostali razvojni fondovi morat će se u većoj mjeri orijentirati na energetske projekte.

Prema sadašnjim procjenama, ukupna ulaganja u energetiku, u razdoblju do 2010., mogla bi biti na razini 5 milijardi američkih dolara. Energetski projekti ne znače samo velika ulaganja, nego su oni i razvojna prilika za hrvatsko gospodarstvo. U svakom od energetskih projekata moguće je veće uključivanje hrvatskih poduzeća. Samo tako energetika i energetski projekti postaju ne samo područje velikih investicija već i sredstvo razvoja hrvatskog gospodarstva.

6 ENERGY PROJECTS - DEVELOPMENT OPPORTUNITIES FOR THE CROATIAN ECONOMY

Energy projects require large and long-term investments with far-reaching repercussions on the economy. Their planning represents a significant developmental undertaking and challenge. During the past two decades, in the Republic of Croatia there were practically no large energetics projects. The reasons for this are related to the disintegration of the former Yugoslavia, aggression against Croatia and stagnation in the economic development of our country. During the course of transition, there has been stagnation in the development of the economy and part of industry ceased operations, so that energy requirements could be met even without new energy projects.

Considering that the growth of the Croatian economy is at 4 to 5 %, it is anticipated that growth will continue and a BDP of 7000 euros per capita will be reached, but that future growth will not be possible without securing new energy. It will not be possible to meet the growing energy requirements without new energy projects. It is anticipated that our country will join regional initiatives, such as the Treaty on the Energy Community of Southeastern Europe. Thus, possibilities will be created for the investment of international capital in our new energy projects.

The need for assuring new quantities of gas from import, as explained in Item 4.4, is being addressed in the planning of the Adria LNG receiving terminal and other projects for the import of natural gas. The privatization of energy activities in Southeastern Europe, with the entry of foreign companies on the Croatian energy market and capital, could result in the takeover of Croatian energy companies by foreign investors but also signify a development opportunity for the Croatian economy. Acceptance of the energy strategy of the European Union will prompt the development of new entrepreneurial initiatives in Croatian energetics, such as the more intensive production of renewable energy sources. The Fund for environmental protection and energy effectiveness, as well as other development funds, will have to be increasingly oriented to energy projects.

According to current estimates, the total investment in energetics during the period up to 2010 could be at the level of 5 billion USD. Energy projects do not only signify large investments but also represent a development opportunity for the Croatian economy. In each of the energy projects, greater inclusion of Croatian companies is possible. Only in this way do energetics and energy projects become not only an area of major investments but also a means for the development of Croatian economy.

7 ZAKLJUČCI

Na završetku 20. stoljeća ponuda nafte bila je stabilna, a cijene relativno niske. Tržište prirodnog plina na početku 21. stoljeća počelo je dobivati obilježja globaliziranog tržišta, poput naftnog, uz sve veći opseg međunarodne trgovine plinom te znatan rast proizvodnje LNG i trgovanja njime.

Do nove politizacije naftnog tržišta došlo je nakon terorističkog napada na SAD 11. rujna 2001. Do porasta cijena nafte dolazi 2004., nakon porasta političke nestabilnosti na Bliskom istoku, eskalacije terorizma te rasplamsavanja rata u Iraku. Političke napetosti utječu na nesigurnost proizvodnje i transporta nafte, što djeluje na porast cijena nafte, politizaciju prirodnog plina i ostalih izvora energije, te time pokazuje nestabilnost globalnog tržišta energije na početku 21. stoljeća.

Tržište električne energije također se intenzivno razvija. Cijena električne energije ključni je pokazatelj uspješnosti uspostave tržišta električne energije. Realna cijena električne energije padala je sve do 2000. godine od kada je ponovno počela rasti. Ipak, realna cijena bila je 2005. godine niža nego desetak godina prije, iako je nominalna cijena viša za oko 10 %.

Na valu jeftine nafte Europska unija provodila je strategiju apsolutiziranja tržišta, uz promicanje otvaranja i internacionalizacije energetskih tržišta, osobito u tranzicijskim zemljama istočne Europe. Smjernice Europske unije iz 1999. kojima se energetsko tržište, postupno, otvara do 1. srpnja 2007., potaknule su okrupnjavanje energetskih tvrtki putem spajanja i preuzimanja. Istodobno, taj proces vodi sve manjem broju sve većih energetskih kompanija i novim monopolističkim situacijama. Tako je na europskom energetskom tržištu stvorena skupina novih energetskih divova.

U takvim okolnostima Hrvatska se tijekom proteklog desetljeća oslanjala na znatne rezerve u energetskim kapacitetima, koje su stjecajem poslijeratne stagnacije gospodarskog rasta, prestanka s radom znatnog dijela industrije i umjerenim porastom energetske potrošnje omogućili sasvim pristojno preživljavanje bez novih energetskih investicija. Međutim, ustaljivanje gospodarskog rasta u Hrvatskoj između 4 i 5 % od 2000. do 2006. te daljnji rast tijekom sljedećih godina dramatično otvara pitanje nedostatka energije nakon 2010., a osobito prirodnog plina i električne energije.

Ako želi osigurati dovoljno energije za gospodarski rast i daljnji napredak, Hrvatska će morati ubrzati projekte za intenziviranje domaće proizvodnje

7 CONCLUSIONS

At the end of the 20th century, the oil supply was stable and prices were relatively low. The natural gas market at the beginning of the 21st century began to acquire the characteristics of a global market, similar to those of the oil market, with an increasingly greater range of international gas trade and significant growth in the production and commerce of LNG.

The recent politicization of the oil market occurred after the terrorist attack on the United States on September 11, 2001. Increases in oil prices occurred in 2004, after the intensification of political instability in the Near East, the escalation of terrorism and the outbreak of war in Iraq. Political tensions have an impact upon the dependability and transport of oil, and also affect oil price increases, politicization of natural gas and other energy sources, and thereby demonstrate the lack of stability of the global energy market at the beginning of the 21st century.

The electricity market is also developing intensively. The price of electricity is a key indicator of the successful establishment of an electricity market. The real price of electricity was declining up to the year 2000, and since then has begun rising again. Nonetheless, the real price in 2005 was lower than ten years previously, although the nominal price was approximately 10 % higher.

On the wave of cheap oil, the European Union pursued a strategy that promoted openness and the internationalization of the energy markets, particularly in the transit countries of Eastern Europe. The European Union guidelines of 1999, according to which the energy markets would gradually open until July 1, 2007, prompted the consolidation of energy companies via mergers and takeovers. At the same time, this process led to an increasingly smaller number of larger energy companies and new monopolistic situations. Thus, a group of new energy giants was created on the European energy market.

Under such circumstances, during the past decade Croatia has relied upon significant energy reserves, which were acquired during the postwar period of stagnation in economic growth. The termination of operations by a significant share of industry and moderate increases in energy consumption permitted survival without new energy investments. However, stabilized economic growth of between 4 and 5 % from 2000 to 2006 and projected growth in the coming years portend an energy shortage after 2010, particularly in natural gas and electricity.

nafte i plina, povećani uvoz prirodnog plina i LNG te izgradnju novih elektrana uz pojačano korištenje obnovljivih izvora energije i niz novih energetskih projekata. U novim energetskim projektima nužno je poticati doprinos domaće industrije i poduzetnika. Sve to nalaže dogradnju energetske strategije zemlje u skladu s promjenama na međunarodnom tržištu energije i potrebama prilagodbe hrvatske energetike pristupu u Europsku uniju.

Insofar as Croatia wants to secure sufficient energy for economic growth and continued advancement, it will be necessary to accelerate projects for intensifying the domestic production of oil and gas, increase the import of natural gas and LNG, build new power plants with greater utilization of renewable energy sources and implement a series of new energy projects. In these new energy projects, it wIll be necessary to provide incentives for contributions by domestic industry and entrepreneurs. All of this means that Croatia's energetics strategy must be adapted to the changes in the international energy market and accession to the European Union.

LITERATURA / REFERENCES

[1] DEKANIĆ, I., The oil market structure and cahanges towarsd the year 2000., Nafta, 51, 4 (2000)
[2] CAMPBELL, C. J., The Coming Oil Crisis, Petroconsultantants, Brentwood, Essex, U.K., Multi-Science Publishing, 1997
[3] BP Statistical Review of World Energy 2005, http://www.bp.com
[4] International Energy Report, http://www.eia.doe.gov
[5] DEKANIĆ, I., KOLUNDŽIĆ, S., KARASALIHOVIĆ, D., Stoljeće nafte: Veza između nafte, novca i moći koja je promijenila svijet, drugo izmijenjeno i dopunjeno izdanje, Zagreb, Naklada Zadro, 2004.
[6] YERGIN, D., The Prize, New York - London, Simon & Schuster, 1991
[7] KLARE, M. T., Krv i nafta: Opasnosti i posljedice rastuće svjetske ovisnosti o nafti, Zagreb, Znanje, 2005.
[8] BRZEZINSKI, Z., Velika šahovska ploča: Američki primat i njegovi geostrateški imperativi, Varaždin, Interland, 1999.
[9] ENGDAHL, F. W., Stoljeće rata, Zagreb, AGM, 2000.
[10] LAURENT, E., BUSHEVIH, R., Tajna jednog sukoba, Zagreb, Znanje, 2003.
[11] PETTIFORD, L., HARDING, D., Terorizam: novi svjetski rat, Zagreb, Mozaik knjiga, 2005.
[12] POLLACK, J., Saudi Arabia and the United States, 1931-2002, Middle East Review of International Affairs, Vol. 6, No. 3, September, 2002.
[13] Pregled novih poteza revolucionarnih vlada u Venezueli i Boliviji, Poslovni dnevnik, 26.04.2006.
[14] Tri prioriteta G-8: energetika, suzbijanje zaraza i prosvjeta, u prijevodu A.Salihbegovića, Jutarnji list, 6.3.2006.
[15] DEKANIĆ, I., KOLUNDŽIĆ, S., KARASALIHOVIĆ, D., A Century of Oil: The Nexus of Oil, Money and Power that has Changed the World, Zagreb, Naklada Zadro, 2005
[16] A National Security Strategy for a New Century, The White House, Washington, October, 1988, http://www.whitehouse.gov
[17] The National Security Strategy of the United States of America, The White House, Washington, September, 2002, http://www.whitehouse.gov
[18] The National Security Strategy of the United States of America, The White House, Washington, March, 2006, http://www.whitehouse.gov
[19] RADOŠEVIĆ, D., Izazovi razvoja, zagovor nove ekonomske politike Hrvatske, Zagreb, Politička kultura, 2005.
[20] DEFFEYES, K. S., Nakon nafte: Pogled s Hubbertova vrhunca, Zagreb, MetroPress, 2005.
[21] EURELECTRIC - Electricity Markets: Getting the Picture Straight and Boosting Market Integration, KEMA report, November 2005
[22] European Commission, Green Paper: Towards a European strategy for the security of energy supply, http://europe.eu.int/index_en.htm
[23] DOBROŠIN, M., Europsku komisiju brine nastanak energetskih monopolista, Poslovni dnevnik, 02.03.2006.
[24] PARKER, G., LAITNER, S., CATAN, T., Lights rut? How Europe is trying to fix a power failure, Financial Times, April 5, 2006.
[25] Energija u Hrvatskoj 2004. - Godišnji energetski pregled, MINGORP, RH / Energy in Croatia 2004 - Annual Energy Review, Ministry of the Economy, Labor and Entrepreneurship, the Republic of Croatia
[26] KOLUNDŽIĆ, S., Plinovodi i naftovodi u Hrvatskoj - strategijska infrastruktura, (čeka objavu u časopisu Nafta)
[27] GIGANTES, P.,Moć & Pohlepa, Kratka povijest svijeta, Zagreb, Izvori, 2003.

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