SIGURNOST OPSKRBE NAFTOM U HRVATSKOJ
OIL SUPPLY SECURITY IN CROATIA

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Zbivanja na globalnom energetskom tržištu, porast tržišne nestabilnosti i sve veća uloga geopolitike u opskrbi energijom, kontinuirano utječu na energetsku sigurnost koja predstavlja glavni postulat energetske politike, ali ujedno i kriterij njezine uspješnosti. Osiguranje nesmetane opskrbe naftom i plinom osnovna je zadaća svake nacionalne energetske politike. Mogućnosti i uvjeti dobave primarnih izvora energije, među kojima su nafta i prirodni plin daleko najvažniji energenti s obzirom na njihov udio u potrošnji energije, te s obzirom na njihovu stratešku važnost, predstavljaju temelj za osiguravanje sigurnosti opskrbe naftom i prirodnim plinom u sklopu nacionalne energetike. Sigurnost opskrbe naftom u Hrvatskoj je usmjerena na utvrđivanje kritične energetske infrastrukture sa stajališta energetske sigurnosti, zatim na kreiranje sustava za kontinuirano analiziranje i praćenje sigurnosti opskrbe naftom, reagiranje u slučajevima kritične opskrbe te razradu mjera za sprječavanje i amortizaciju u situacijama ugroženosti energetske sigurnosti.

The occurrences on the global energy market, increased market instability and the increasingly significant role of geopolitics in energy supply, continually impact the energy supply security which represents the main postulate of the energy politics, as well as a criterion of its successfulness. Assurance of an uninterrupted oil and gas supply is the basic task of each national energy policy. Possibilities and conditions of the supply of primary energy sources, among which oil and natural gas are by far the most important energy sources in relation to their share in energy consumption, and as regards their strategic importance, these represent the basis for assurance of oil and natural gas supply security within the national energy supply. Oil supply security in Croatia is directed towards determining the critical energy supply infrastructure from the viewpoint of energy supply security, towards creating a system for continued oil supply security analysis and monitoring, acting in critical supply situations and towards an elaboration of measures for prevention and amortization in cases of endangerment of energy supply security.

Ključne riječi: energetska sigurnost; sigurnost opskrbe naftom; strateške zalihe nafte
Key words: energy supply security; oil supply security; strategic oil reserves

1 UVOD

Analiza geopolitičkih prilika na međunarodnim energetskim tržištima, procjena opasnosti od poremećaja opskrbe naftom i prirodnim plinom te predviđanja sustava za ublažavanje posljedica u slučaju poremećaja opskrbe naftom, predstavlja značajan element, kako energetske, tako i ukupne nacionalne sigurnosti [1]. Stoga je analiza sigurnosti opskrbe naftom u RH trajna potreba energetske sigurnosti i nacionalne sigurnosti zemlje. S obzirom na činjenicu da Hrvatska oko 70 % svojih potreba u primarnoj energiji podmiruje korištenjem tekućih i plinovitih goriva, odnosno nafte i plina, iznimno je važno raščlanjivanje potreba, okolnosti i stanja dobave nafte.

2 ANALIZA STANJA U HRVATSKOJ S CILJEM UTVRĐIVANJA KRITIČNIH ELEMENATA U OPSKRBI NAFTOM

Kao ulazna pretpostavka analize stanja dugoročno se predviđa prosječna godišnja stopa porasta domaćeg proizvoda od 4,5 % godišnje do 2020. godine i ista dugoročna dinamika rasta do 2030. godine. S obzirom da su rast bruto domaćeg proizvoda, te proizvodnja i potrošnja energije uzajamno povezani, rast bruto domaćeg proizvoda zahtijeva i povećanje potrošnje energije [2]. Potrošnja tekućih goriva u Hrvatskoj predstavlja glavni izvor energije u našoj zemlji. S obzirom na geografske značajke Hrvatske kao i gospodarsku važnost prometa i turizma za budući razvitak, procjenjuje se kako će uloga tekućih goriva u energetskoj potrošnji u Hrvatskoj i dalje biti vrlo značajna te da se njihov udio neće znatnije smanjivati u idućem razdoblju do 2020. godine, pa i do 2030. godine. Očekuje se da će između 2020. i 2030. godine udio tekućih goriva u strukturi potrošnje nešto pasti [3].

Prema podlogama za izradu Strategije energetskog razvitka Hrvatske, u osnovnom scenariju koji uključuje podrobnu analizu finalne potrošnje energije u industriji, prometu i općoj potrošnji, predviđa se porast potrošnje tekućih goriva u neposrednoj potrošnji od oko 2 % godišnje u razdoblju do 2030. godine i na temelju toga se predviđa potrošnja nafte koja je prikazana u tablici 1 i na slici 1 [4]. Osim toga, procjena je uzela u obzir i dodatne pretpostavke za procjenu potrošnje (gospodarski rast, smanjenje gubitaka u preradi nafte, zamjenu goriva pri obnovi rafinerija, prestanak rada termoelektrana na loživo ulje, osiguravanje dodatnih količina nafte

1 INTRODUCTION

Analysis of geopolitical circumstances on the international energy markets, evaluation of the danger of disruption of oil and natural gas supply and the planning of systems for amelioration of consequences in case of oil supply disruption, represent significant elements both of the energetic and the overall national security. Therefore, the analysis of oil supply security in Croatia is a constant requirement of the energy supply security and the country's national security. Considering the fact that Croatia settles about 70 % of its needs of primary energy by using liquid and gaseous fuels, that is, oil and gas, it is extremely important to analyse the requirements, circumstances and situation in oil supply.

2 ANALYSIS OF THE SITUATION IN CROATIA WITH THE AIM TO DETERMINE CRITICAL OIL SUPPLY ELEMENTS

As the input assumption of situation analysis, in the long-term an average annual growth rate of domestic product is predicted at 4,5 % annually until year 2020, and the same long-term growth dynamics are predicted until year 2030. Considering the fact that the growth of gross domestic product, energy production and consumption are interrelated, growth of gross domestic product also demands increased energy consumption. Consumption of liquid fuels in Croatia represents the main energy source in our country. Considering Croatia's geographic characteristics, as well as the economic importance of traffic and tourism for future development, it is estimated that the role of liquid fuels in energy consumption in Croatia will continue to be very important and that their share will not decrease significantly in the following period until year 2020, and even until 2030. It is expected that between 2020 and 2030 the share of liquid fuels in the consumption structure will fall to a certain extent.

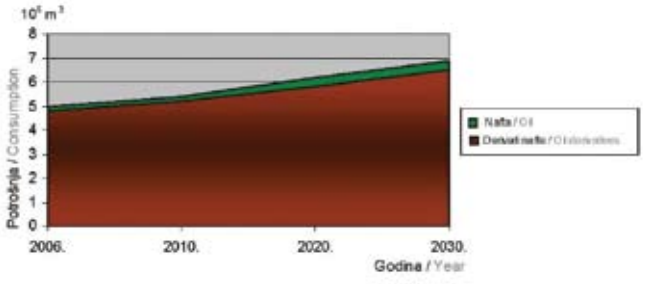
According to the bases for the elaboration of Croatia's Energy Sector Development Strategy, in the basic scenario which includes a detailed analysis of the final energy consumption in industry, traffic and general consumption, a rise in liquid fuels consumption is predicted in direct consumption at about 2 % annually in the period until year 2030 and based on that, fuel consumption as shown in Table 1 and Figure 1 is predicted. Besides that, the estimate took into consideration additional assumptions for estimate of consumption as well (economic growth, decrease of loss in oil processing, exchange of fuels at refineries renovation, termination of operation of fuel oil thermal power plants, provision of additional oil quantities and derivatives for the needs of the

i derivata za potrebe obveznih i strateških zaliha nafte). Na temelju ovih pretpostavki procijenjene su dugoročne potrebe domaćih energetskih tržišta za naftnim derivatima i sirovom naftom [5].

mandatory and strategic oil reserves). Based on these assumptions, long-term needs of domestic energy markets for oil derivatives and crude oil are estimated.

Tablica 1 – Projekcija potrošnje tekućih goriva i potrebe za naftom [4]
Table 1 – Projection of liquid fuels consumption and oil requirements [4]

Godina / Year	2006.	2010.	2020.	Stopa rasta potrošnje / Consumption growth rate, %	2030.	Stopa rasta potrošnje / Consumption growth rate 2020.–2030., %
Derivati / Derivatives 10^6 t	4,8	5,2	5,8	1,3	6,5	1,2
Nafta / Oil 10^6 t	5,0	5,4	6,2	1,6	6,9	1,1



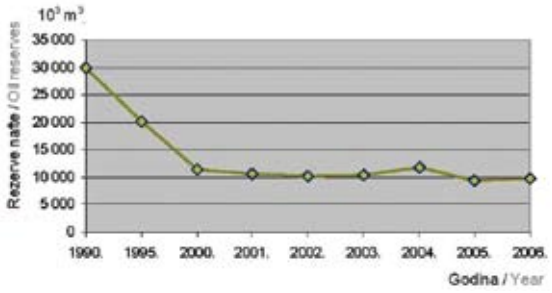
Slika 1 — Projekcija potrošnje tekućih goriva i potrebe za naftom
Figure 1 — Projection of liquid fuels consumption and oil requirements

Proizvodnjom nafte i kondenzata na domaćim eksploatacijskim poljima pokriva se oko 20 % domaćih potreba za sirovom naftom. Kretanja preostalih bilančnih rezervi nafte i kondenzata u Hrvatskoj u razdoblju od 1990. do 2006. godine prikazana su u tablici 2 i slici 2, a proizvodnja na slici 3. One predstavljaju osnovu za procjenu buduće proizvodnje nafte u RH. [3]

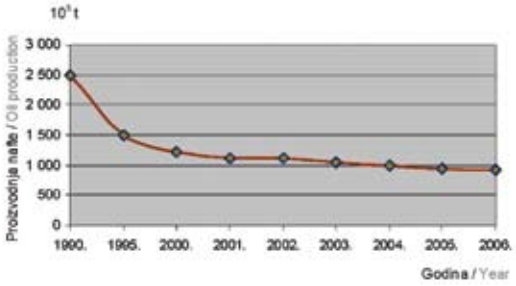
The production of oil and condensates on domestic exploitation fields covers about 20 % of domestic requirements for crude oil. Fluctuations of the rest of the oil and condensates balance reserves in Croatia in the period from 1990 to 2006 are shown in Table 2 and Figure 2, and the production in Figure 3. These represent the basis for the estimate of future oil production in Croatia.

Tablica 2 – Bilančne rezerve i proizvodnja nafte i kondenzata u RH [4]
Table 2 – Oil and condensates balance reserves and production in Croatia [4]

Nafta i Kondenzat / Oil and condensate	1990.	1995.	2000.	2001.	2002.	2003.	2004.	2005.	2006.
Rezerve / Reserves 10^3 m³	29 950	20 044	11 474	10 622	10 153	10 356	11 794	9 331	9 691
Proizvodnja / Production 10^3 t	2 497	1 500	1 214	1 121	1 108	1 052	1 001	946	917



Slika 2 — Kretanje rezervi nafte u Hrvatskoj
Figure 2 — Oil reserves fluctuation in Croatia



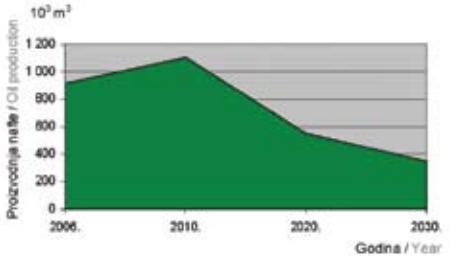
Slika 3 — Proizvodnja nafte u Hrvatskoj
Figure 3 — Oil production in Croatia

Prilikom proračuna projekcija proizvodnje nafte i kondenzata za razdoblje do 2020. godine u obzir je uzeta buduća proizvodnja nafte i kondenzata na postojećim domaćim eksploatacijskim poljima. Nadalje je u obzir uzeta proizvodnja nafte prilikom uporabe metoda za povećanje iscrpka nafte (EOR metode) kao i proizvodnja nafte koja je ocijenjena kao moguća prilikom korištenja novih tehnika i tehnologija. Procjena buduće proizvodnje nafte u RH u razdoblju do 2020. godine prikazana je u tablici 3 i grafički na slici 4.

When estimating the projections of oil and condensates production for the period until 2020, future oil and condensates production on the existing domestic exploitation fields has been taken into consideration. Furthermore, oil production with the use of the Enhanced Oil Recovery Method has been taken into consideration, as well as oil production assessed as possible with using new techniques and technologies. Estimate of future oil production in Croatia in the period until 2020 is shown in Table 3, and graphically in Figure 4.

Tablica 3 – Projekcija proizvodnje nafte u Hrvatskoj [4]
Table 3 – Projection of oil production in Croatia [4]

Godina / Year	2006.	2010.	2020.	2030.
Nafta i kondenzat / Oil and condensate 10^3 t	917	1 100	550	350



Slika 4 — Projekcija proizvodnje nafte u Hrvatskoj
Figure 4 — Projection of oil production in Croatia

3 RAZLOZI ZA STRATEŠKE ZALIHE NAFTE

Na temelju iznesenih procjena, u razdoblju između 2020. i 2030. godine udio domaće proizvodnje u podmirivanju energetskih potreba će i dalje opadati čime će rasti zavisnost gospodarstva Hrvatske o uvoznoj nafti, koja će nakon 2020. godine činiti preko 90 % ukupnih potreba za naftom [3]. Nakon 2020. godine osobito važno postaje uključivanje energetske infrastrukture u infrastrukturu neposrednog i šireg okruženja, te diversificiranje opskrbe novim izvorima i osiguranje novih pravaca uvoza. Glavni razlozi za stvaranje strateških zaliha nafte proizlaze iz temeljne potrebe osiguranja dobave nafte u svim mogućim okolnostima, odnosno osiguranja opskrbe domaćeg tržišta čak u slučaju privremenog prekida stalne dobave nafte s međunarodnih tržišta.

Razvijene zemlje uvoznice nafte već nekoliko desetljeća nastoje opasnosti i potencijalne nestabilnosti međunarodnog naftnog tržišta, kao i njihovo djelovanje na nacionalna energetska tržišta i sustave, umanjiti stvaranjem strateških zaliha nafte [6]. Strateške zalihe nafte organizirane su u obliku logističkog i komercijalnog sustava za uskladištenje određenih količina sirove nafte, koji je pod nadzorom državnih institucija ili tvrtki s javnim nadzorom koje omogućuju skladištenje sirove nafte i njezino puštanje na tržište u slučaju poremećaja [5]. Sustavom strateških zaliha nafte se u slučaju prekida ili smanjene opskrbe domaćeg naftnog tržišta, omogućuje dobava dodatnih količina nafte za osiguravanje normalne opskrbe tijekom trajanja tržišnog poremećaja, odnosno poremećaja uvoza nafte redovitim sredstvima i mehanizmima [7]. Dosadašnje iskustvo pokazalo je kako zemlje uvoznice nafte, koje imaju strateške zalihe nafte, zajedno s obveznim zalihama naftnih derivata, imaju visok stupanj sigurnosti opskrbe naftom i to je značajna komponenta energetske, gospodarske i ukupne nacionalne sigurnosti [8].

4 PROCJENA UGROŽENOSTI HRVATSKOG GOSPODARSTVA U POGLEDU MOGUĆIH PREKIDA DOBAVE NAFTE

Hrvatska samo djelomično podmiruje svoje potrebe za energentima proizvodnjom nafte i prirodnog plina, dok veći dio uvozi. Vlastita opskrbljenost ukupnom primarnom energijom je 1988. godine iznosila 65 %, 2000. godine 50 %, a 2005. godine oko 45 %. Prema predviđanjima, prateći dosadašnji trend smanjenja, 2030. godine vlastita opskrbljenost ukupnom primarnom energijom će iznositi svega 21 % do 23 %. S obzirom na na-

3 REASONS FOR STRATEGIC OIL RESERVES

Based on the presented estimates, in the period between 2020 and 2030, the share of domestic production in the settlement of energy requirements will continue to fall and, because of that, the dependence of Croatia's economy on imported oil will grow and constitute over 90 % of total oil requirements after year 2020. After 2020, what becomes especially important is the inclusion of the energy infrastructure into the infrastructure of the direct and wider environment and the diversification of the supply with new sources and provision of new import routes. The main reasons for creating strategic reserves arise from the basic need of insurance of oil supply in all possible circumstances, that is, insurance of supply for the domestic market, even in the case of temporary disruption of continuous oil supply from international markets.

For several decades now, developed oil importing countries have been trying to ameliorate the dangers and potential instabilities of the international oil market, as well as their impact on national energy markets and systems, by creating strategic oil reserves. Strategic oil reserves are organized in the form of a logistic and commercial system for storage of certain quantities of crude oil and the release thereof onto the market in case of disruption. In case of disruption or decreased supply of the domestic oil market, the system of strategic oil reserves enables the supply of additional oil quantities for insurance of normal supply for the duration of market disruption, that is, for the duration of the disruption of oil import by regular means and mechanisms. The experience so far has shown that oil importing countries, which have strategic oil reserves, along with mandatory oil derivatives reserves, also have a high level of oil supply security and that is an important element of the energetic, economic and overall national security.

4 ESTIMATE OF THE ENDANGERMENT OF CROATIA IN VIEW OF POSSIBLE OIL SUPPLY DISRUPTIONS

Croatia settles its requirements for energy sources only partially by oil and natural gas production while it imports the larger part thereof. Own supply of overall primary energy amounted to 65 % in 1988, 50 % in 2000, and about 45 % in 2005. According to the estimates, and following the former decrease trend, in 2030 own supply of overall primary energy will amount to only 21 % to 23 %.

vedena predviđanja, vidljivo je da će Hrvatska sve više ovisiti o uvozu energenata, prvenstveno nafte. Nakon 2015. godine, proizvodnja nafte će značajnije padati, a uvoz intenzivno rasti. Iz sve veće uvozne zavisnosti proizlazi i porast osjetljivosti energetskog sektora i time cjelokupnog gospodarstva RH o zbivanjima i mogućim poremećajima na međunarodnim tržištima energije. Izloženost gospodarstva Hrvatske oscilacijama međunarodnih energetskih tržišta nakon 2015. godine raste, kad se ocjenjuje da će uvoz nafte prijeći 85 % potreba, te posebno nakon 2020. godine, kad će uvoz nafte premašivati 90 % domaćih potreba, te se ocjenjuje da raste i ugroženost gospodarstva u pogledu mogućih prekida dobave nafte [3].

Za funkcioniranje pouzdanog i održivog energetskog sektora, potrebno je osigurati strateške zalihe nafte i u skladu s time ugovoriti nove količine za dobavu prema postojećim planovima razvoja transportnog sustava i potrošnje, kako bi se u postojećim tržišnim i međunarodnim geopolitičkim prilikama osiguralo maksimalno moguće unaprjeđenje energetske sigurnosti Hrvatske. Cilj je osigurati organizacijske pretpostavke, planove i mjere za razvitak strateških zaliha nafte, pri čemu su tri glavne funkcije strateških zaliha. Sigurnosna, u smislu povećanja sigurnosti opskrbe naftom i podizanja energetske sigurnosti, gospodarska, budući da strateške zalihe stabilizirajuće djeluju na gospodarstvo i njegov položaj u okruženju, te geopolitička, zbog stvaranja konkurentskih prednosti gospodarstva Hrvatske u odnosu na svoje neposredno okruženje.

5 ZAKLJUČAK

U smislu osiguravanja opskrbe naftom u Hrvatskoj je potrebno osposobljavanje energetskog sustava, prvenstveno Hrvatske agencije za upravljanje zalihama naftnih derivata (HANDA) za pripremu, organizaciju i uspostavu sustava za strateške zalihe nafte, te osposobljavanje domaćih kompanija INA, JANAF, i drugih za stvaranje infrastrukturnih pretpostavki formiranja strateških zaliha nafte. Nadalje je potrebna prilagodba organizacijskog i financijskog sustava strateških zaliha u skladu sa zakonskim i drugim propisima.

Prosudba potrebnih skladišnih kapaciteta izvršena je prema projekciji kretanja buduće potrošnje nafte u Hrvatskoj, a uzimajući u obzir minimalno potrebne skladišne kapacitete kao početak razvitka strateških zaliha do razine od 90-dnevne procijenjene godišnje potrošnje nafte. Kako bi se omogućio razvoj strateških zaliha nafte potrebno je osigurati dodatne skladišne kapacite-

Considering the above predictions, it is obvious that Croatia will increasingly depend on the import of energy sources, oil primarily. After year 2015, oil production will fall more significantly, and import will grow intensively. The increasingly extensive dependence on import also gives rise to an increased sensitivity of the energy sector and therefore of the entire economy of Croatia to the events and possible disruptions on international energy markets. Croatia's exposedness to the oscillations of international energy markets after year 2015 rises, when it is estimated that oil import will exceed 85 % of requirements, and especially after 2020, when oil import will exceed 90 % of domestic requirements. Endangerment of the economy in view of possible oil supply disruptions is also estimated as growing.

The functioning of a reliable and sustainable energy sector requires the insurance of strategic oil reserves and, in accordance with that, the contracting of new supply quantities according to the existing plans of development of the transport system and consumption, so as to enable the maximum possible improvement of Croatia's energy supply security in the existing market and international geopolitical circumstances. The objective is to provide organizational assumptions, plans and measures for the development of strategic oil reserves, whereat there are three main functions of strategic reserves. The security function, in the sense of increased security of oil supply and improving the level of energy security; the economic function, because strategic reserves have a stabilizing effect on the economy and its position in the environment; and the geopolitical function, because of creation of competitive advantages of Croatia's economy in relation to its direct environment.

5 CONCLUSION

For the purpose of insuring oil supply in Croatia, it is necessary to capacitate the energy system, primarily the Croatian Agency for Oil Derivatives Reserves Management (HANDA) for the preparation, organization and establishment of a system for strategic oil reserves, and to capacitate domestic companies INA, JANAF, and other for the establishment of infrastructural assumptions for the formation of strategic oil reserves. Furthermore, an adjustment of the organizational and financial strategic reserves system in accordance with legal and other regulations is also necessary.

The estimate of necessary storage capacities has been performed according to the projection of future oil consumption fluctuation in Croatia, and that by taking into consideration the minimum necessary storage capacities as the beginning of the development of strategic reserves up to the

te. Ukupne potrebe za skladišnim kapacitetima procjenjuju se na 1,4 milijuna tona u 2012. godini te oko 1,55 milijuna tona 2020. godine, što odgovara ukupno potrebnim skladišnim kapacitetima oko 1 640 000 m^3 2012. godine, odnosno 1 820 000 m^3 2020. godine.

Također je potrebna izgradnja skladišnih kapaciteta za osiguranje 90-dnevnih potreba Hrvatske do 2012. godine, što uz postojeće skladišne kapacitete od 960 000 m^3 ili oko 820 000 tona, nalaže izgradnju kapaciteta za novih 600 000 tona ili 700 000 m^3 do 2012. godine, te razvoj dodatnih skladišnih kapaciteta i izgradnju novih skladišta od daljnjih 150 000 tona ili oko 180 000 m^3 nakon 2012. do 2020. godine.

Osnivanje značajnijih kapaciteta za strateške zalihe nafte ili za međunarodnu ponudu skladišnih kapaciteta zahtijevala bi obilnije dimenzioniranje skladišta i skladišnih kapaciteta.

level of 90-day estimated annual oil consumption. In order to enable the development of strategic oil reserves, it is necessary to insure additional storage capacities. Total requirements for storage capacities are estimated at 1,4 million tons in 2012, and about 1,55 million tons in 2020, which suits the totally necessary storage capacities of about 1 640 000 m^3 in 2012, that is, 1 820 000 m^3 in 2020.

The construction of storage capacities for the insurance of 90-day Croatia's requirements up to 2010 is also necessary, and this, along with the existing storage capacities of 960 000 m^3 or about 820 000 tons, requires the construction of capacities for another 600 000 tons or 700 000 m^3 until 2012, and the development of additional storage capacities and construction of new warehouses of another 150 000 tons or about 180 000 m^3 after year 2012 and up to 2020.

Creation of significant capacities for strategic oil reserves or for the international offer of storage capacities would require a more extensive dimensioning of the warehouse and storage capacities.

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