Energy Strategy of the Republic of Croatia

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Content

1. Introduction to Energy Strategy of Republic of Croatia (2009)
2. Final energy consumption
3. Planned development of energy infrastructure

In order to increase the security and supply competitiveness Croatia is decided for elastic energy system with various resources and energy supply courses and improvement of energy efficiency.

Introduction - Basic Principles of Strategy

- **Basic energy objectives:**
  - **Security of energy supply**
    - Immediately improving of energy supply
  - **Competitive energy system**
    - Satisfying competitiveness due to diverse energy structure of electricity generation and high share of domestic natural gas production
  - **Sustainable energy sector development**
    - Achieving sustainable energy sector represents the main challenge of energy development

Structure of the Energy Strategy

- Strategy is focused on the **period until 2020** – corresponds with the period of adopted EU energy strategies
- **Strategy structure**
  1. **Situation analysis** – main challenges and opportunities for development of Croatian energy sector
  2. **Vision** of Croatian energy development
  3. **Future perspective** of energy demand
  4. **Strategy goals, priority activities**
     - Oil, natural gas, coal, power and district heating system, renewables, energy efficiency
  5. **Energy Strategy Effects** – technological, economical and environmental

Challenges and Opportunities for Croatian Energy Sector Development

- Global geopolitical context and security of energy supply
  - Increasing dependence on energy imports – 50% current import of energy demand.
  - Primary energy supply - oil 50%, natural gas 25%.
  - Decrease of domestic oil and natural gas production.
- Climate change and other environmental issues
  - Meating international environmental commitments.

Challenges and Opportunities for Croatian Energy Sector Development

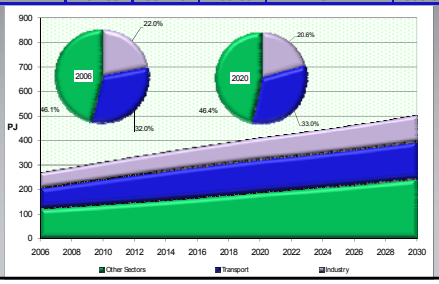
- Energy geo-strategic position and opportunities of the Republic of Croatia
  - Potentially transit country for oil, natural gas and electricity – establishing Croatia as regional energy hub.
  - Physical advantages of maritime country and country with good sites for construction of power generation facilities.
- EU Energy Policy “towards common energy market”
  - Creating conditions for functioning of open energy market with effective market regulation

Challenges and Opportunities for Croatian Energy Sector Development

- Cooperation in Southeast Europe and with neighboring countries
  - political activities for achieving strategic projects such as: Pan-European Oil Pipeline (PEOP), Družba-Adria oil pipeline, Interstate connecting gas pipeline Croatia – Hungary, double 400 kV power line Hungary - Croatia, LNG terminal – island Krk, as well as other announced projects
  - connecting Croatian systems into regional and international systems and intensifying Croatian transit position.

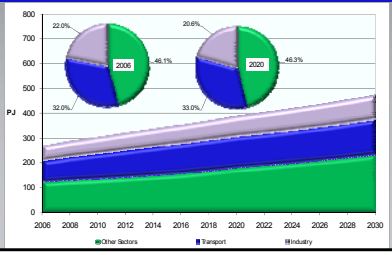
Business as Usual Projection of Final Energy Consumption

PJ	2006	2015	2020	Growth rate 2006-2020, %	2030
Industry	58.86	75.82	84.43	2.6	103.90
Transport	85.63	124.51	135.22	3.3	152.59
Other Sectors	123.40	162.42	189.95	3.1	245.16
Total	**267.89**	**362.75**	**409.60**	**3.1**	**508.83**



Sustainable Scenario of Final Energy Consumption

PJ	2006	2015	2020	Growth rate 2006 - 2020,%	2030
Industry	58.86	72.83	80.32	2.2	97.11
Transport	85.36	119.24	128.54	2.9	144.04
Other Sectors	123.40	153.94	180.32	2.7	232.93
Total final energy consumption	**267.89**	**346.01**	**389.18**	**2.7**	**474.08**
Gross final energy consumption	**278.40**	**358.97**	**404.30**	**2.7**	**492.50**



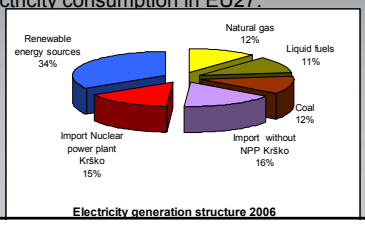
Increase in Energy Efficiency

PJ	2006	2015	2020	Growth rate 2006 - 2020	2030
Consumption according to **Business as usual scenario**	267.89	362.75	409.60	3.1 %	500.83
Consumption after implementation of energy efficiency measures	267.89	345.18	386.84	2.7 %	470.60
Reduction in final energy consumption	**0.00**	**17.57**	**22.76**	**/**	**30.23**

- Increase in energy efficiency in final energy consumption.
- Increase in shares of renewable energy sources and other encouraged structural changes of the BAU projection of used forms of energy.
- Use of distributed energy sources.

Power Sector

- 2000 - 2006 - the annual growth rate of final electricity consumption was 4.1%.
- 3.7% - estimation of the average annual growth of final electricity consumption by 2020
- By 2020 - average electricity consumption per capita in Croatia will reach current average electricity consumption in EU27.



Electricity generation structure 2006

Strategy of Constructing New Electricity-generating Capacities

- Renewable Energy Sources
  - Maintaining the level of 35% of a share of electricity generation from renewable energy sources and large hydropower plants, in total electricity consumption until 2020.
- Large Hydropower Plants
  - New electricity-generating capacities in large hydropower plants in 2020 will amount to 300 MW starting from 2015 (HP Lešće).

Strategy of Constructing New Electricity-generating Capacities

- Thermal Power Plants
  - Thermal power plants of total capacity of 1100 MW will be shut down until 2020 due to their deterioration.
  - Thermal power plants of total capacity of at least 2 400 MW should be built in a period until 2020.
    - Back-pressure cogeneration units of total capacity of at least 300 MW shall be built by 2020.
    - Natural gas-fired power plants of total capacity of at least 1 200 MW should be built by 2020.
    - Coal-fired power plants of total capacity of at least 1 200 MW are expected to be built by 2020.

Strategy of Constructing New Electricity-generating Capacities

- **Nuclear Program**
  - Croatia isn't ready to make decisions on building the nuclear power plant, because no preparation activities have been performed.
  - Croatia initiates the Croatian nuclear program.
  - Decision making on building the nuclear power plant is expected by 2012 at the latest.

Transmission Lines and Distribution Network Development

- As a link between the Middle and Southeast European networks, as well as a part of Mediterranean ring, Croatian transmission network is quite well connected with neighbouring countries' networks (except for Montenegro and Italy) with a large number of interconnection lines on transmission voltage levels (400, 220 i 110 kV).
- The Croatian 400 kV network is of regional and the European significance, and some corridors, north-south and east-west, are included in Trans-European Networks (TEN), which development is of general European interest.

Coal

- Croatia does not have any domestic coal reserves that it can utilize commercially.
- It is assumed that in 2020 around 375 thousand tons of the equivalent coal shall be used in industry, while around 3 millions tons in electricity generation.
- The advantage of Croatia is the possibility of favourable import of the coal of good quality.
- The main advantage of coal is security of supply, competitiveness and relative price stability.

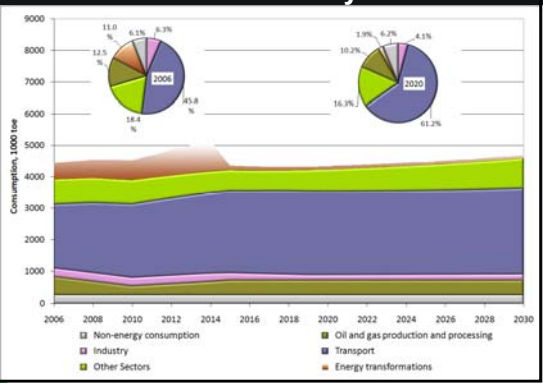
Renewable Energy Sources

- 20% - share of the renewable energy sources in gross final energy consumption in 2020.
- **Development of RES Energy Sector**
  - Biomass potential – planned biomass fired power plants of total power of 85 MW.
  - Production of around 340.000 tons of bio fuels in 2020.
  - The Government shall stimulate a construction of wind power plants.
  - Building at least 100 MW of small hydropower plants by 2020.
  - Building of 20 MW in geothermal power plants by 2020.
  - Installing of 0.225 m^2 of heat collectors per capita by 2020.

Petroleum Energy Sector

- Future oil demand
  - Liquid fuels – main energy source in Croatia
  - The share of liquid fuels in total energy consumption is 50%
  - 1.2% per year is estimated average growth of the liquid fuels consumption in the final energy consumption,
  - Total consumption of liquid fuels in 2020 - 4.3 $\times 10^6$ t

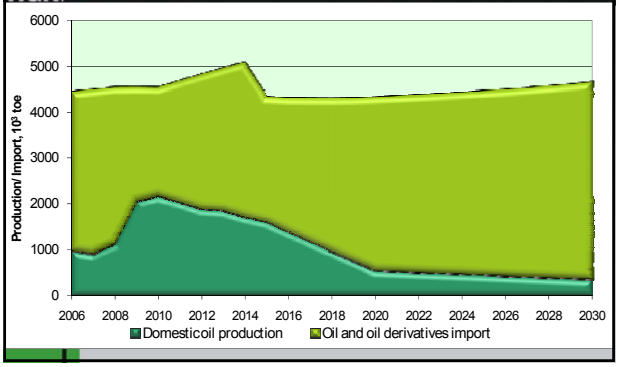
Projection of Consumption of Liquid Fuels in Croatia by 2020



Projection of Consumption of Liquid Fuels in Croatia by 2020

Consumption of oil derivatives	2006	2014	2020	2006	2020	2006-2020	2030
	1000 t oe	1000 t oe	1000 t oe	%	%	%	1000 t oe
Final consumption	3110	3510	3540	70.4	81.6	0.9	3880
Industry	280	270	180	8.9	5.0	-3.1	200
Trasport	2020	2550	2650	65.0	75.0	1.9	2730
Other sectors	810	690	710	26.1	20.0	-1.0	950
Oil and gas production and processing	550	400	440	12.5	10.2	-1.6	440
Energy transformations	490	890	80	11.0	1.9	-11.9	50
Non-energy consumption	270	270	270	6.1	6.2	0.0	270
Total	4420	5060	4330	100	100	-0.2	4650
Total, PJ	190	210	180	100	100	-0.2	190

Oil Production in Croatia



Oil – Transport and Production

Securing New Oil Supply Directions

1. PEOP – in 2007 Croatia, Romania, Serbia, Slovenia, Italy and European Commission signed the Declaration on Pan-European Oil Pipeline.
   - The oil pipeline route - Romanian Black Sea port Constanta - Romania, Serbia, Croatia, Slovenia (underwater oil pipeline is the alternative direction through Slovenia), Italy, -the oil pipeline TAL near Trieste, and connection with the Italian oil pipeline network and further on to Genoa and Marseille.

PEOP

PEOP Benefits

- increased supply security for European and Croatian refineries,
- supplying oil from new directions via land,
- unloading the Adriatic and Mediterranean tanker transport by several dozen million tones of oil per year,
- increasing budget revenue for the local community and country, increasing revenue from transit tariffs and revenue for companies participating in the construction and operation of the oil pipeline.

Securing New Oil Supply Directions

2. Reconsidering the Druzhba Adria Project
   - Analyzing costs and benefits, from the environmental protection point of view.
   - Druzhba Adria project – transport of oil from Russia to Omišalj as a port of shipment through the existing oil pipeline system which is technically integrated
   - It will provide supply of the Urinj refinery by Russian oil by these oil pipelines.

Druzhba-Adria Project

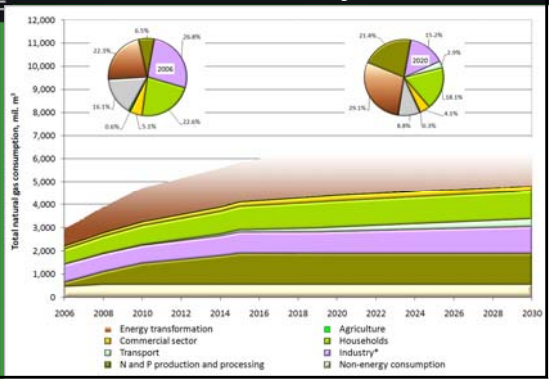
Crating compulsory and operation stocks

- Compulsory stocks of oil and oil products - supply in case of threats to the energy security of the country as a consequence of extraordinary disturbances in supply.
- **Additional storage capacities** will be constructed for the purpose of forming compulsory stocks which will be distributed around Croatia, depending on the level of regional consumption.
- When choosing the location it is vital to primarily use locations that are already used as warehousing facilities for oil and oil products.

Natural Gas Sector

- Future natural gas demand
  - The share of natural gas in total energy consumption is 25% and around 16% in final consumption.
  - Constant growth of consumption over the two decades –
  - 4.2% rate of future growth of natural gas consumption in final consumption by 2020.
  - Natural gas consumption shall depend on the structure and level of the electricity generation on the Croatian territory and in the region.

Projection of Consumption of Natural Gas in Croatia by 2020

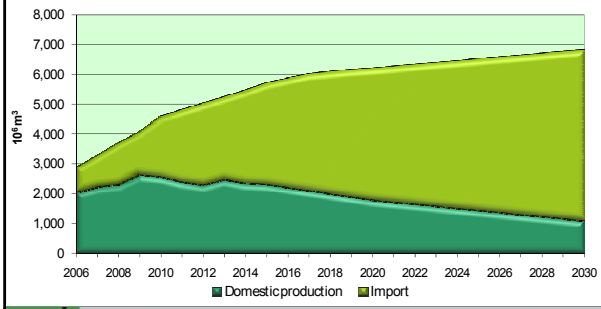


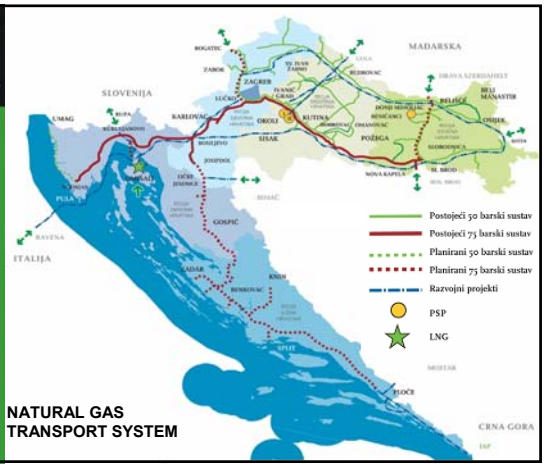
Projection of Consumption of Natural Gas in Croatia by 2020

Gas production	2006	2015	2020	2006	2020	2006-2020	2030
	mil. m^3	mil. m^3	mil. m^3	%	%	%	mil. m^3
Final production	1,590	2,230	2,530	55	47	3	2,940
Industry*	770	910	950	49	37	1	1,160
Transport	0	90	180	0	7	28	330
Other sectors	820	1,240	1,400	51	55	4	1,450
Non-energy consumption	460	1,010	1,000	16	19	6	1,000
Oil and gas production and processing**	190	880	870	6	16	12	870
Energy transformations	640	1,600	1000 - 1800	22	19 (29)	3 (8)	1,200
Ukupno	2,880	5,730	5410-6210	100	100	5 (6)	6,010

* final energy consumption, own electricity and heat & hot water preparation
** Total natural gas losses included

Natural Gas Production in Croatia





NATURAL GAS TRANSPORT SYSTEM

Securing New Supply Directions and Construction of the Natural Gas Transport System

- Inter-state connection pipeline with the Hungarian natural gas transport system.
  - Pipeline Varosfeld gas hub - Slobodnica – a priority project - increasing security of natural gas supply and electricity generation.
  - Start of operating - beginning of 2011.
  - Capacity of 6.5 billions m^3 - transit toward Slovenia, Austria and Italy
- Construction of new natural gas storage capacities – Grubisno Polje

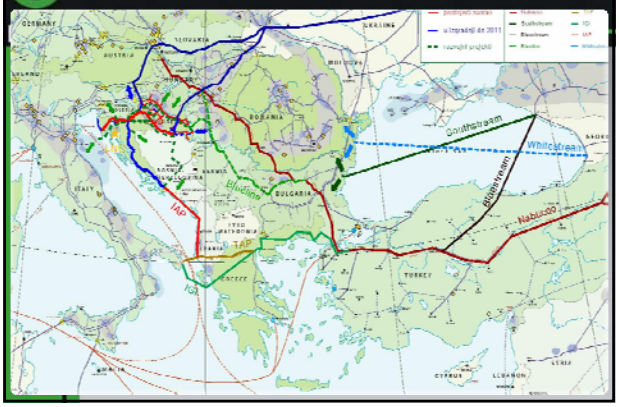
Securing New Supply Directions and Construction of the Natural Gas Transport System

- Construction of the LNG (Liquefied Natural Gas) terminal
  - Location on island Krk - Omišalj
  - Final capacity of 15 billions m^3 per year,
  - Significant and long term improvement of the security of natural gas supply.
  - Diversification of supply directions
  - Integration of Croatia into unique European energy market.

Securing New Supply Directions and Construction of the Natural Gas Transport System

- Adriatic – Ionian pipeline construction
  - 2007 Albania, Montenegro and Croatia - Capacity of 5 bill m^3/year
  - The pipeline route - Albanian port Fier - Ploče, connecting the Croatian gas transport system with the TAP (*Trans-Adriatic Pipeline*)
  - New natural gas supply and transit direction from the Caspian region and Iran to Europe.
- Completing the construction of the 75

Regional Natural Gas Development Projects



NABUCCO vs. South Stream Project

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Instead of Conclusion

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- The Strategy assumes significant investments into Energy sector in amount of around 15 billion Euros within the period from 2009-2020 (NPV)
- The largest investments are expected in power system - 60% of total investments, then in oil and gas 30% and 10% in heating systems.
- Global economic crisis will give “The Final Investment Judgement.

THANK YOU FOR YOUR ATTENTION !

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