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EFFECTIVE COOPERATION OF ACADEMIC AND UNIVERSITY SCIENCE

An interview with Yevstahii KRYZHANIVSKI, the Principal of the Ivano-Frankivsk National Technical University of Oil and Gas, Full Member of the NAS of Ukraine

There are many angles to the issue of independence of Ukraine. It involves political, economic as well as scientific aspects. Among economic aspects it is the energy independence of the country which is the most important one, and which, of course, always has important constituents, political as well as economic ones.

For me, a graduate of the Drogobych Technical School of Oil (the specialty «oil well and gas well drilling») in 1965, it was particularly pleasant to communicate with the Rector of Ivano-Frankivsk National Technical University of Oil and Gas, Full Member of the Academy of Sciences of Ukraine *Yevstahiy Kryzhanivsky* who by the invitation of the management of the Western Scientific Center of NAS of Ukraine and the Ministry of Education and Science of Ukraine at the ceremonial meeting on the occasion of the Day of Science shared with the present research workers the information on the state of energy independence of Ukraine, in particular, in the sphere of gas and oil production.

We would like to offer you our conversation with the member of the Academy of Sciences of Ukraine Yevstahiy Kryzhanivsky on this topic.

Science and industry must do really a lot…

— *Yevstahiy, the issue of energy independence of Ukraine is one of the matters of priority for today. How would you, so to speak, interpret it for our readers as a specialist in particular and the Rector of Ivano-Frankivsk National Technical University of Oil and Gas in general?*

— Pursuant to the Edict of the President of Ukraine No. 5/2015 «On the Strategy of Continuous Development «Ukraine — 2020», the main task of the «Program of Energy Independence» — one of the priority programs — is ensuring energy security.

— *And energy security for Ukraine means...*

It means the ability of the state to provide effective utilization of its own fuel and energy resources, realization of optimal diversifying of sources and means of supply to Ukraine of energy products to support population's vital activity. And what is more — functioning of national economy in the mode of ordinary, extraordinary and military condition, prevention of market fluctuations concerning fuel and energy resources (FER), and creation of conditions for smooth adaptation of the national economy to the growth of prices on these resources.

If to talk about major energy sources, the share of natural gas in the structure of final consumption remains the highest and together with oil exceeds 50 %. And in the structure of fuel import the share of natural gas is also large and for two preceding years constituted almost 57 %.

Some key objectives of the public policy in the sphere of energy independence are:

- to increase the extraction of domestic energy sources;

- to provide the widest possible diversification of ways and sources of supply of primary energy resources, of oil and natural gas, in particular;
- to liberalize the gas market;
- to reform the system of price- and tariff setting on energy and fuel;
- to involve foreign investments into modernization of the unified gas pipeline system of Ukraine;
- to reorganize the management of oil and gas industry in accordance with the Third Energy Package of the European Union.

Adoption of such program and creation of conditions for its implementation are mega issues for Ukraine, taking into consideration that the 21st century from the point of view of power generation must be predominately gas-dependent — as the US Department of Energy asserts. Ukraine that used to be among the pioneers and world leaders of oil- and especially gas production industry, has lost these positions.

— *Is there a possibility to improve the situation?*

— There is. Science and industry can and must do a lot to create and develop the basis for implementation of the key objectives of the public policy of energy independence and avoid failure of domestic fuel and energy complex which is conditioned not by mythical depletion of Ukrainian subsoil resources, but by enormous drop of volumes of deep well drilling and seismic exploration works, unsuccessful economic policy and other negative factors which led to drop of oil and gas extraction.

— *Are the experts of the same opinion?*

— Of course. Professor of the School of Management of the Massachusetts Institute of Technology A. Kirilenko (*Zerkalo Nedeli. Ukraine* of 10.10.2014) regards the activity of *Naftogaz* to be «the key threat to the national security of Ukraine» that is an unchallengeable proof to the urgent need of strong and radical change of technologies, processes, and procedures for the activity management in this area and its enterprises.

I am now using the figures of the International Monetary Fund program revised in this summer. In accordance with the estimates, the anticipated deficit of the whole state budget for 2014 makes UAH 88 billion, whereas for NJSC *Naftogaz of Ukraine,* separately, this figure makes UAH 115 billion that is bigger almost by half. At the same time, an increase in the assets or in the whole financial system is predicted to be UAH 63 billion, while that in the internal bank lending is UAH 51 billion. In other words, to bridge deficit just of *Naftogaz* alone, we need two (!) Ukrainian financial systems in their current scale!

Naftogaz is a money pit in the budget and a major source of corruption, states G. Soros (*Ukrainskaya Pravda*). The economic truth of 13.11.2014). All this is in a striking contrast to scientifically justified prospects of oil and gas content of our country.

— *Where do you see a way out?*

— First of all, in reclamation of deep and superdeep carbohydrate potential within the central part of the Dniprovo-Donetsk basin. And two bored superdeep boreholes over 6.5 and 5.5 thousand m deep in the Poltava region confirmed the forecasts. They received fountains of gas with the flow rate over 100 thousand — up to 1.2 million m^3/day. Scientific bases of drilling of superdeep boreholes were laid in the 70-ies of the previous century during drilling of the well *Shevchenkove-1* in the Ivano-Frankivsk region, which depth was over 7.5 thousand m. Ukrainian science workers also took part in construction of the Kola Peninsula superdeep borehole — (which depth exceeded 13 thousand m.).

— *And what can you say about specific character of the Black Sea shelf?*

— In 30 years of development of the resources of the Black Sea water area the infrastructure has been created, the technology of boring and operation of sea boreholes has been developed; vast volume of research studies concerning safe use of the sea oil fields without environmental damage has been carried out. The system of training of specialists for implementation of complex works under the marine conditions has been created. Unfortunately all this was ruined as the result of annexation of the Crimea by Russia. It is unac-

ceptable that the Russian Gazprom is using the Odessa field which is situated exclusively within the territorial waters of Ukraine in the distance less than 90 km off the coast of the Odessa region. Distance to the Crimea in about 150 km. The gas pipeline was laid to the Crimea, so Ukraine loses nearly 1.5 bn m^3 of gas per year.

The processes of oil and gas extraction are technologically complex at all stages …

— And what do the science workers say?

— The E.O. Paton Electric Welding Institute of the National Academy of Sciences of Ukraine together with the Ivano-Frankivsk National Technical University of Oil and Gas and the Admiral Makarov National University of Shipbuilding developed the method of sea transport of compressed natural gas (CNG) which sets apart from the known LNG and undersea pipelines by simplicity and relatively low cost of infrastructure and flexibility during change of transportation routes.

A possibility of such transportation must add confidence to begin the procedures of returning to Ukraine of the Odessa field, Bezimenny field and Golitsynsky field.

Additional benefits of CNG technology is a possibility of its application for collection of gas from separate boreholes, especially in early stages of the fields development in the absence of extensive industrial gas pipeline infrastructure. For example, in the north-western part of the Black Sea (in the adjacent shelf of the Zmiyiny Island) a number of potentially productive oil and gas bearing plots were discovered. According to preliminary estimates the resource potential constitutes approximately 420 bn m^3 of natural gas. But the potential hydrocarbon resources are in a considerable quantity of small gas-bearing structures which are located in significant distance between each other. For a rapid and effective development of such fields it is practical to apply the CNG- Technologies.

— And how do we cooperate with Romania from this perspective?

— Pursuant to the decision of the International Court of Justice of February 3, 2009, as to delimitation of the continental shelf and exclusive economic zones of Ukraine and Romania in the Black Sea, a line of delimitation of exclusive economic zones between Ukraine and Romania which became a compromise between the Romanian and Ukrainian parties was determined. After the court judgment the sea territory between two states was divided as 2.1:1 in favor of Ukraine. In addition, from 26 oil and gas prospective structures our country got 21.

During evaluation of oil-and-gas bearing prospects of the adjacent shelf of the Zmiyiny Island one needs to take into consideration the results of work carried out in the Romanian Black Sea shelf adjacent to Ukraine. Exploratory drilling was made on 19 from 27 discovered structures. In total 70 exploratory boreholes were drilled in the Romanian shelf. Exploration drilling maturity of the Romanian shelf makes 0.4 thousand km^2 per well. This indicator exceeds the similar one for a Ukrainian sector of the water area of the Black Sea and Azov Sea more than 4 times. Total initial oil-in-place of the Romanian fields makes up to 20 million tons, at a rough estimate. Flush production rate reached 150 tons/day. The development of its own fields gave Romania a possibility to walk out on oil and gas import. This is a good example for Ukraine.

Transportation of natural gas by CNG technology allows to realize new potentially productive means of diversifying gas supply within the Black Sea as one of the most effective methods under the condition of the limited transport capacity of the Bosphorus strait. For example, we can put into effect the route of gas transportation Supsa-Illichevsk or Varna-Illichevsk.

— It is widely stated that a lot of boreholes in our country are abandoned.

— Actually one of the potentially productive sources of our own oil-and-gas recovery is rejuvenation of abandoned depleted wells. In Ukraine the fund of abandoned boreholes is almost 8 thousand. By the earlier existing technologies maximum oil extraction insignificantly exceeded 30 %, gas extraction — was significantly higher.

Availability of new national technologies of rejuvenation of abandoned boreholes through sidetracking allows significant increase of oil and gas recovery. At the expense of systemic rejuvenation of abandoned and idle boreholes it is possible to produce up to 5—6 bn m^3 of gas and 1.5—2 million tons of oil every year.

High yields (almost initial ones) of the boreholes were received during testing of recovery technologies on 10 boreholes. The recovery time is 3—4 months and, accordingly, the cost makes 30—35 % of the cost of a new borehole. One must consider that abandoned boreholes are ecologically dangerous because the casing column deteriorates within a given period under the influence of corrosion which leads to environmental pollution (e.g. big gas contamination of the town of Borislav, oil stains on the surface of old fields in the west of Ukraine, etc.).

Taking it into consideration, as well as the fact that boreholes are expensive engineering structures, it is reasonable to use them again as a thermal energy source. Presence of high volumes of information on the existing boreholes is the most valuable aspect here.

And in general, the processes of oil and gas production are technologically complex at all stages and require in-depth theoretical and experimental studies. Even minor errors can lead to great environmental disasters. And there are a lot of examples to it.

— Can we assert that development of oil and gas industry has adequate scientific support in Ukraine?

— Yes, institutes of the NAS of Ukraine, universities, and sectoral research institutes deal with it. The latter execute mainly project works. Basic and applied research is carried out by academic institutions and universities. Cooperation of academic and university science is particularly effective. Our Ivano-Frankivsk National Technical University of Oil and Gas gives a lot of scientific support to oil and gas industry.

A university's cooperation with the institutions of NAS of Ukraine can serve as an example for achievement of high scientific results. We received important results which give a possibility to state that we have created scientific basis for implementation of «Program of Energy Independence» in Ukraine. And it became possible due to coordination of corresponding studies by the Chairman and Full Member of the NAS Borys Paton himself.

Now the government of Ukraine must take a decision.

A comment by the Head of the Western Scientific Center of NASU and MESU *Z.T. Nazarchuk*:

Scientific community of Lviv Region preparing for the meeting on the occasion of the Day of Science offered the representatives of the bodies of the local authorities to draw the balance and discuss the problems we face. The major milestones of work of WSC for the last year: certain measures undertaken, certain results received...

The main priority: integration of science and industry. There is a number of factors which negatively influence the development of scientific potential: a small percentage of high-tech production facilities, poor support with scientific-technical resources.

Ukraine has technologies ready for implementation. But we need political decisions.

What do we mean? First of all: to increase the yield of operating boreholes we must use the technologies recommended by scientific workers. Secondly: we need to diversify gas supply at the expense of other variants, using compressed gas. And thirdly: we need to use deep well drilling technologies for development of new boreholes and new fields. Because there are explored Black Sea areas and there is the shelf as well.

Thus, the above mentioned requires statesmanlike solutions, both in the economic and scientific perspective. In short, I repeat, we need political decisions.

The conversation was noted down
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