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Increasing stability and security:
Improving the environmental footprint
of energy-related activities in the OSCE region

***Session V: Co-operation and partnerships on new and
emerging environment-friendly technologies in the energy field***

Unconventional gas:
new opportunities for development and risks for environment

The natural gas or methane is one of the modern civilization industrial activity fundamentals, which requires more and more ecologically friendly energy resources. The hydrocarbons which were unavailable for extraction before become available thanks to improvement of existing and emergence of new technologies. The increasing access of people to the natural gas as ecologically friendly energy resource becomes possible due to so called «shale gas revolution» in North America's subregion of OSCE, the USA and Canada. In addition, the extension of consumption of the natural gas instead of the coal has an essential influence on the reduction of anthropogenic emission of CO₂ to the atmosphere.

The result of the US transition to full-fledged production of unconventional gas is a significant decrease in gas prices and the rise of traditional industries, the competitiveness of which in the market depends on the price of gas.

Monitoring, dialogue with the public and risk management during unconventional gas extraction should be of great importance. In contrast to North America, in Europe a quite problematic image of unconventional gas is formed. This is due to the potential risks to the environment. These risks include:

- noise pollutions;
- landscape changes;
- usage of chemical agents and hydrofracturing;
- water processing, utilization and flowback water treatment;
- potential pollution of water aquifers;
- greenhouse gases emission to the atmosphere;
- increase of seismic activity.

Analysis of the North American experience shows that in general, these risks are not greater than risks occurring during the conventional natural gas extraction, where the same technology is used. Besides the Polish experience, nevertheless being very modest on the back of the American one, gives the same evidence. In Poland 48 wells have been drilled, part of them with the use of multiple-stage fracking. This year in August the first shale gas influx was obtained in continental Europe (in Poland).

Despite the tough environmental monitoring, no adverse effects on the environment have been identified. This is because of fact that technology available today and the best practices can minimize the negative impact on the environment.

Let me introduce the directions of risk minimization

The problem of noise pollution can be overcome by keeping the distance from the industrial site to the residential areas, where the noise limits will conform to accepted standards. Provided that if a drilling platform is placed at a distance of 500 m from the residential sector, the noise level will not exceed the permitted limits. It is assumed that the accepted noise level in residential areas is 40-47 dB.

The problem of the landscape change and reducing of the leaner infrastructure impact is resolved by the drilling of several wells from the one well pad. The reduction in the number of wells automatically reduces the traffic of transport required for its service. It is recommended to conserve the upper layer of the soil for the further recultivation of the site. Hydraulic fracturing technology improvement during the last decade lead to the minimization of the potential risks to the environment. The new advancing directions are introduced. Details of the chemicals used, their quantities and their concentrations are subject to rapid development. For example, the experiments are conducted to replace biocides by ultraviolet (UV) purging of the injected fluid. The first such a frack has been carried out in the Texas in May 2011. A similar approach is taken by using corn starch as gelling agent, bauxite as proppant and water as only fracking fluid components.

German consultancy Ludwig-Bölkow-Systemtechnik GmbH (LBST) conducted a risk assessment in the framework of the potential shale gas exploration in Hungary. The main company's conclusion was following: the contamination risk will be low if the toxic substance does not exceed the concentration level of 0,2% in a fluid.

In Canada and France the fracking technologies are developed which do not require water. A Pure Propane Stimulation Technology is one of them. The liquefied propane is injected in the well in combination with proppant such a sand, that helps to open cracks and extract gas. This technology requires neither water no chemicals and is considered as environmentally friendly.

It is recommended to use a drill fluid on the water or synthetic base instead of the drill fluid on the hydrocarbon base. The Closed-Loop Drilling Waste Systems helps to manage the toxic drilling wastes.

During the flowback water utilization in the geological formations it is necessary to keep the vertical safe distance to the aquifer which is not less than 600 m. The advanced quadruple casing protects the aquifer from contamination.

In 2013 the analysis of the Environment Protection Agency of USA showed that the average level of CO₂ emissions for all oil and gas wells in USA composed 0,7%-1,6%, in time when the emissions at the level less than 8% are considered to be beneficial for the environment in the long term.

The increase in seismic activity in areas where unconventional gas is being produced, is not related to hydraulic fracturing, but to the disposal of waste water in the deep horizons. It is

therefore recommended to select carefully the location of the wells for water utilization or use other water disposal technology.

Thus, even this short list gives an idea of the immense potential of reducing the impacts on the environment.

Now I would like to say several words on the topic, which at first sight does not relate much to the discussed problematic. An important task is to solve the problem of disposing the CO₂ in the context of reducing anthropogenic emissions of carbon dioxide. CCS technology, which is today the only possible solution, gives rise of non-perception in the society because of the high risk of CO₂ leakage. We need the improvement of CCS, or principal new technological solutions.

One of these possible solutions is at the junction of two problems - the production of unconventional gas and disposal of CO₂ in the combined form. In this respect promising is the study of gas hydrates (so called burning ice) – a formation similar to ice, consisting of water and dissolved gases (primarily – methane). Methane from gas hydrates is another one of unconventional gas. The planet deposits of methane in the gas hydrates is not less than 250 trillions cub. m. This estimation is quite pessimistic, but prevails the known reserves of conventional natural gas, that by the BP Statistical Review 2011 information stands at 187,1 trillions cub. m. as well as the reserves of the shale gas, tight gas or coal bed methane. About 98% of the world gas hydrates reserves is concentrated in the ocean and only 2% onshore - in the permafrost area. So the gas hydrates are the real perspective. On 12th March 2013 in Japan for the first time in the world the experiment of natural gas (methane) extraction from the undersea gas hydrates deposits was finished with success.

Today the most perspective technology of methane extraction from the gas hydrates is the technology of methane replacement by the carbon dioxide. **So two problems will be resolved simultaneously: the extraction of ecologically friendly energy resource and safer utilization of CO₂ in the connected form in comparison with CCS.**

In the context of abovementioned the Economic and Ecological Forum of OSCE could serve as a platform for the exchange of the best practices and experience in the elaboration of the strategies of risk minimization during the extraction of unconventional gas. OSCE Forum could provide the following directions:

- *initiation of discussion at different levels: academic, in the business circles and in civil society;*
- *accomplishment of geologic exploration in the Europe for the estimation of commercially extractable resource of unconventional gas and the conditions of its extraction;*
- *transfer of advanced technologies between the participating states of OSCE;*
- *encouragement of the elaboration of the adequate regulatory mechanisms between participating states of OSCE;*
- *rising of public awareness concerning risks which occur during the unconventional gas extraction and their minimization.*

In short more cooperation in the OSCE region means more safety and security.

The beginning of XXI century in future could be named by the historians as a birth of Energy&Ecology Synergy. Once the technological improvement takes place, increasing human population gains an offering of new natural gas resources extraction. It is important that this extraction will be as safe as possible for the environment. It seems that such a perspective exists.