

## **Methane to LNG Żory Coal Mine Project**

**Report on:**

### **THE ENVIRONMENTAL ASSESSMENT OF THE MITIGATION OF METHANE EMISSION AND THE TARGETED LNG APPLICATION**

#### **Executive summary**

The report presents an analysis of the environmental effects of CMM capture from the Zory coal mine and its conversion to LNG including:

- the phase of the borehole drilling, and
- the LNG production phase.

In the report, the target applications of the LNG produced in Zory were also considered from the environmental effects viewpoint. They included the transport sector (e.g. diesel locomotives) and power industry.

The analysis of the borehole drilling phase concentrated on the environmental impacts of the performed works with special focus on potential negative effects of the extraction phase. The identified negative effects were associated with the drilling works but occurred only over a limited period of time i.e. when the work was actually performed. The observed negative effects referred to exceeded nitrogen oxides emission and elevated noise levels beyond permissible standards. The waste and wastewater generated during the drilling phase did not affect the quality of the environment

The analysis of the environmental effects of LNG production from the Zory CMM included typical methods used for gas drying and purification taking into account their potential for application in Zory. Based on their overall environmental impact assessment, adsorption on molecular sieves seemed the least burdensome for the environment among the presented methods of CMM dehydration. The analyzed methods of acid gas removal did not represent any particular environmental risks. Since the mercury content in the CMM obtained from the Zory site is small (below 0,001 mg/Nm<sup>3</sup>), its removal will not be necessary for CMM conversion to LNG.

The study of the liquefaction methods showed that they are non-emission technologies and as such do not generate contamination streams emitted to the air, water and soil. The exception is noise emission caused by compressors and/or turboexpanders which are elements of the installations. This equipment may cause exceedances of permissible levels especially in residential areas which however can be prevented by installation of acoustic screens.

LNG application in transport sector (locomotive engines) to replace diesel oil may contribute to reduction of nitrogen oxides and PM emissions. However, the magnitude of the environmental effect is determined by the technical solutions used in the engine, additional cleanup devices (catalysts) and the engine load. The most promising and feasible option seems the application of LNG in engines furnished with a dual fuel system (diesel oil + LNG).

In the case of energy sector, the analysis showed that the use of LNG instead of hard coal may bring environmental effects in a form of a reduced pollutants emission to the air. This reduction may reach 90% for carbon oxide and hydrocarbons and over 99% for sulfur dioxide. The emission of PM, heavy metals and PAHs (polycyclic aromatic hydrocarbons) will be practically eliminated.

It has been assessed that the current methane emission from the abandoned Zory coal mine is on the level of 490 000 m<sup>3</sup> yearly. Recalculated to CO<sub>2</sub> emission, the capture and management of the obtainable methane resources from the Zory coal mine will help avoiding as much as 7371 Mg CO<sub>2</sub> emitted yearly.