

STATUS OF METHANE DEVELOPMENT IN UKRAINE

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ABSTRACT

Ukraine has substantial reserves of methane resident in underground coal seams and surrounding rock strata that, if captured, would constitute a valuable energy resource. During 2002, Ukraine consumed 78 billion cubic meters (bcm) of natural gas and produced domestically only 18 bcm. Ukraine receives approximately 30 bcm per year as a transit fee for the use of their pipeline system to transport gas from their eastern neighbors to Western Europe. The shortfall of approximately 30 bcm must be purchased from foreign sources creating a significant negative balance of trade for Ukraine.

Capture and utilization of methane would reduce the amount of green house gas emitted to the atmosphere. During the period between 1990 and 2001, coal production in Ukraine has declined from 164.8 million tonnes to 83.4 million tonnes with a corresponding decrease in methane emissions to the atmosphere from 3,885 million cubic meters in 1990 to 1,888 million cubic meters in 2001. During 2001, approximately 1,822 million cubic meters of methane was liberated from Ukrainian coal mines and the mines captured approximately 268 million cubic meters of methane through degasification systems (14.7% of the total liberated) and used 135 million cubic meters of the captured methane.

Removing the methane from the coal mines will improve mine safety because excessive amounts of methane in Ukrainian coal mines is the main contributor to the high level of accidents and fatalities currently being experienced. Ukraine has the second worst coal mine fatality rate in the World and has experienced over 4,000 coal mine fatalities since gaining independence in 1991. The major cause of the coal mine accidents that result in multiple fatalities is the ignition of the methane that is released during the mining process.

The renewed interest in methane development projects in Ukraine can partially be explained by the improved economic conditions. The paper will provide a discussion of the current economic conditions in Ukraine and the issues that need to be addressed to attract more foreign investment into Ukraine.

STATUS OF COAL MINE METHANE DEVELOPMENT IN UKRAINE

Ukraine has a vast undeveloped methane resource that has been estimated by Ukrainian natural resource experts to be in excess of twelve (12) trillion cubic meters. In addition to this in-place resource, the coal mines of Ukraine contribute approximately 1.9 billion cubic meters of methane per year into the atmosphere. The extraction and utilization of the in-place methane in combination with the capture and utilization of the methane emissions would provide many benefits to Ukraine. These benefits include an alternative energy source that is vitally needed, the environment would become less toxic in terms of a potent green house gas, and the coal mines would become safer and more productive. This paper will provide background information on each of these benefits and can be used by potential investors as part of their evaluation of prospective development projects in Ukraine.

1.0 METHANE AS AN ALTERNATIVE ENERGY

During the Year 2002, Ukraine relied upon natural gas to supply approximately 43% of its total energy requirements, which equates to the consumption of approximately 78 billion cubic meters (bcm) per year. Of this annual consumption requirement, Ukraine produced domestically approximately 18 bcm, or 23% of the total required. In addition, Ukraine received approximately 30 bcm per year (or, 38% of the total annual natural gas requirement) as a transit fee for the utilization of its pipeline system to carry natural gas from its eastern neighbors to Western Europe. The remainder of the annual natural gas requirement is purchased from Russia and Turkmenistan. Ukraine has signed a natural gas purchase agreement with Turkmenistan at a price of \$44 per thousand cubic meters (tcm) for the Year 2003 which will be paid with a combination of cash and transfer of Ukrainian goods and services.

Any increase in natural gas or methane production from domestic sources would reduce this negative transfer of assets and bolster the national economy. Ukraine has explored the potential to increase its natural gas production with little or no success from its efforts. There may be a potential of increased natural gas production from areas under the Black Sea but these have not been proven and will be expensive to develop if they are found. A more proven method would be to develop the coalbed methane (CBM) resources that are known to exist in Ukraine utilizing technology and equipment that has been successfully used in other countries of the World.

During the past six years, Ukraine has received technical assistance from the US Government to assist and promote the commercial development of methane projects in Ukraine. The US Environmental Protection Agency (US EPA) through a grant with Partnership for Energy and Environmental Reform (PEER) funded one such technical assistant program. To foster methane development in Ukraine, PEER has published a document that identifies twenty-nine properties that are considered to have the highest potential for development. This document can be found on the PEER website and is identified as the following:

“Coal Mine Methane in Ukraine: Opportunities for Production and Investment in the Donetsk Basin”

Vertical well business plans for two of the areas were prepared that included a pilot project of six wells, an evaluation period, followed by a full scale vertical well drilling program that included the drilling of 144 wells. The results of these business plans can be found on the PEER website and are identified as the following:

“Coal Mine Methane in Ukraine: Business Plan for a Development Project at Komsomolets Donbassa”

“Coal Mine Methane in Ukraine: Business Plan for a Development Project at Skochinsky”

The US Government has also funded other programs in Ukraine to promote the development of methane projects. Through funding provided by the US Agency for International Development, two methane development studies have been completed. One of the studies evaluated a horizontal drilling program at the Stakhanova Mine in conjunction with REI Drilling and the second study evaluated a methane enrichment program utilizing the technology developed by BCCK. In addition to these efforts, the Trade and Development Agency (TDA) funded a coal mine methane development project study utilizing vertical drilling.

At the present time there is only one mine in Ukraine that has an active vertical well. This mine collects the methane with the use of a vacuum pump and utilizes the methane as motor fuel for their fleet of vehicles. The Ukraine Ministry of Fuel and Energy has funded the drilling of a few vertical wells during the past three years but this drilling program has not resulted in the production and capture of any commercial quantities of methane.

Ukraine has a market that vitally needs additional domestically produced gas. And, Ukraine has a vast quantity of undeveloped methane resources. The combination of these two factors presents Ukraine as an interesting possibility for the commercial development of new projects in this area.

2.0 METHANE EMISSIONS FROM COAL MINES

Ukraine is a major contributor to the green house gas effect through the emissions of methane into the atmosphere from its coal industry. During 2001, Ukraine released 1,888.3 bcm of methane from its coal mines. However, the level of methane emissions into the atmosphere has declined considerable since 1991 when the emissions reached 3,884.9 bcm.

The capture and utilization of methane when associated with coal mining would support the tenets of the United Nations Framework Convention on Climate Change by reducing the amount of methane that is otherwise emitted to the atmosphere. To provide a benchmark against which future reductions

of methane emissions from Ukrainian coal mines could be measured, PEER has completed the following publications that can be viewed and downloaded from the PEER website:

“Inventory of Methane Emissions from Coal Mines in Ukraine: 1990-2001”

“Inventory of Methane Emissions from Coal Mines in Ukraine: 1990-2000”

“Inventory of Methane Emissions from Coal Mines in Ukraine: 1990-1999”

The methodology for the above Inventories was based on the Intergovernmental Panel on Climate Change and adjusted for the conditions found in Ukraine. These Inventories can be used for the annual preparation of the emissions inventory from the coal industry of Ukraine that would be a part of the national greenhouse gas inventory. The three Inventories have been presented to the officials of Ukraine for their review and analysis. However, these officials were notified that PEER would not be compiling another Inventory but would be available to assist Ukraine in the preparation of future inventories of methane emissions.

Completing these three Inventories in consecutive years allowed for the development of trends that increased the confidence of the reliability of the total methane emissions from the coal industry. In addition, the results were favorably compared with other studies that have been completed using different parameters and techniques.

During the study period of 1990 through 2001, coal production in Ukraine declined from 164.8 million raw tonnes in 1990 to 83.4 million raw tonnes in 2001; correspondingly, methane emissions decreased from 3,884.9 bcm in 1990 to 1,888.3 bcm in 2001. The capture and utilization of coal mine methane in Ukraine continues to increase. During 2001, the mines captured 268.3 bcm of methane that equates to 14.7% of the total methane liberated. Also during 2001, the mines utilized 134.5 bcm of methane, or 50.1% of the amount captured. The utilization of the captured methane include using it as a boiler fuel at the mine, as a fuel for the fleet of vehicles owned by the mine, and in the homes of the local community.

Ukraine, with its large emissions of methane, can be considered as a candidate for new projects to generate carbon credits. As the carbon credit market matures, investment opportunities for carbon credit projects will develop in Ukraine. Project developers will encounter many problems and hurdles but these obstacles can be offset by the lower investments that will be required in Ukraine when compared to other countries. The capture and utilization of the methane from Ukrainian coal mines has not been initiated to any large extent and many attractive low-cost, high return projects can be identified.

3.0 METHANE AND COAL MINE SAFETY

The coal mines of Ukraine are ranked the second most dangerous in the World in terms of annual fatalities. It is estimated by the labor safety officials of Ukraine that over 40% of the fatalities are caused by methane related issues. The next two causes of the high incidence of accidents and fatalities are roof falls and outbursts of coal and rock. The factors contributing to these accidents include the extreme working depths (the average operating depth is at 660 meters), thin seams (averaging 1.2 meters), antiquated mining equipment, and a lack of funds to modernize the mines and provide safety equipment. During 2002, Ukraine experienced 267 coal mine fatalities and has had approximately 4,000 since independence in 1991. However, on a positive note, the coal mine fatalities in Ukraine have declined during the past two years.

As noted, the largest cause of the high rate fatalities in the coal mines of Ukraine is the ignition of the methane that is released during the process of mining. Underground coal mining in Ukraine accounts for 99 per cent of the annual production and, with the exception of a few mines, the longwall method of extraction is utilized. All underground coal mines are required to monitor the methane concentrations in the underground air at various locations in the mine workings. In addition, all mines are required to measure the methane content of the coal being mined. If these data, in combination with other factors, exceed Ukrainian mine safety standards then the mine is considered to be "gassy" under four different ranking criteria. During the period 1990 through 2001, approximately 70 per cent of the total coal production came from mines that had been classified as gassy. If a mine is classified as gassy, it is then required to produce coal under different operating and safety parameters based on the ranking criteria.

The coal mines of Ukraine that have been designated as the gassiest are required to implement an underground degasification system. The common practice is to drill cross measure boreholes that are connected to a collection system to take the methane to the surface. The cross measure boreholes are drilled to a depth of 30 to 50 meters and are drilled either into the coal seam or into the surrounding rock strata. The length of the cross measure borehole is limited by the equipment that is available which does not have the power to increase the depth to expand the area of influence. In addition, modern drill bits are not available that would increase the speed of drilling and the depth of the holes.

The underground collection system that collects the methane from the cross measure bore holes consists of a system of steel pipes that is connected to a vacuum pump that is located on the surface. The steel piping system is, in most cases, not properly maintained which allows some of the captured methane to escape back into the working areas. In addition, the poorly maintained piping system allows the captured methane to be diluted with air thus making it unusable as an alternative fuel on the surface. The introduction of high-density polyethylene piping system in Ukraine would be difficult because such pipe is not manufactured in Ukraine, it would have to be

certified for use in Ukraine underground mines, and it would be more expensive than steel pipe that is produced in large quantities in Ukraine.

The introduction of a modern degasification system that would include both vertical and horizontal drilling utilizing Western equipment and technology would enhance the removal of methane from the coal mines of Ukraine and result in fewer coal mine accidents and fatalities.

4.0 ECONOMIC CONDITIONS IN UKRAINE

4.1 POSITIVE CHANGES

Following independence in 1991, Ukraine experienced nine years of economic decline. However, there has been a turn around and Ukraine has experienced improvements in their economic environment during the past two years, 2001 and 2002. And, based on preliminary information Ukraine is on tract to continue this positive trend through the Year 2003. Examples of these positive developments are:

Gross Domestic Product (GDP): 9.1% for 2001 and 4.6% for 2002; the first six months of 2003 GDP was 7.5% and estimated at 8% for the full year 2003.

Industrial Output: 14.2% for 2001 and 7.0% for 2002; the first six months of 2003 at 12.4% and estimated at 12% for the full year 2003.

Inflation: Inflation for 2001 was 6.1% and for 2002 deflation occurred at the rate 0.6%; inflation for the first six months of 2003 was 4.6% and is projected to be 7% for the full year 2003.

Currency: Hryvna, the local currency, versus the dollar and Euro have been stable for the period 2001, 2002, and for the first half of 2003.

Interest Rates: The discount rate is currently at 7% down from 25 – 30% in 1999. Personal loans are now available for home and auto loans. Home loans to families are now available at 21% for hryvna-denominated loans that were quoted at 45% in 1999. Similar loans for hard currency-denominated loans are now at 14% as compared to 27% in 1999. Personal loans have grown substantially during the past two years because of these lower interest rates, a change in the land code that allows for private ownership, and increases in personal income.

Direct Foreign Investment (DFI): For 2002, the DFI was \$1,075 million; a 32.1% increase from 2001 when it reached \$814 million. Since gaining independence in 1991 through the end of 2002, total DFI in Ukraine has been \$5.3 billion. The United States has been the largest investor at \$900 million followed by Cyprus at \$600 million and England at \$500 million. At the end of 2002 it is estimated that 1,100 US companies are now operating in Ukraine. However, the DFI in Ukraine lags considerably behind other post-Soviet countries.

Payments for Commodities: The payment for the commodities such as electricity, gas, and water has improved dramatically since independence. For 2002, it has been reported that commodity payments have now reached over 90% but still fluctuate on a month-to-month basis. The increase in payments has been attributed to the rising of personal incomes and the installation of more meters to accurately report usage.

4.2 NEGATIVE ISSUES

However, even with these positive indicators of the Ukraine economy, many institutional changes will be required before foreign investors will view Ukraine as a candidate for new large-scale investment projects. Most of these issues have been widely reported but need to be enumerated again to provide a realistic assessment for potential investors in Ukraine.

Permits and Approvals: Investors in Ukraine are still faced with a mirage of permits and approvals before a new project can begin. Permits and approvals for new projects are required at a multitude of different governmental levels and from many different organizations. Obtaining these permits and approvals adds considerable time, expense, and uncertainty for new projects in Ukraine.

Tax Code: The tax code is extremely complicated and businesses are subjected to constant tax audits and inspections. In addition, there have been instances of new projects being implemented that were based on certain tax incentives that were then removed after the investments had been made. Clarity and consistency in a new tax code are vitally needed.

Legal System: The lack of a civil code is a detriment in attracting foreign investors to Ukraine. The resolution of disputes is often not based on the rule of law and many believe that the legal system is often swayed by outside influences.

Corruption: This issue has been widely reported and does not need additional comments. Examples of corruption have been documented at all levels.

4.3 THE FUTURE

Pressure has been exerted on Ukraine to pass laws and regulations to address the negative issues noted above. These pressures have come from such organizations as the IMF, World Bank, WTO, European Union, and a host of individual countries. Positive changes in the laws and regulations have been marginally implemented and many in the Western community believe that the pace of reforms will continue to be slow in the near term future.

The near term future is often defined as the next two years and during that period there is a presidential election scheduled for the Fall of 2004. That is if there is an election as it has been speculated that the election could be postponed for a period of two years if the country adopts a new form of

government. If the presidential election does take place during the Fall of 2004 there is a possibility of a new reform minded government being elected based on the congressional election of 2002.

In general, Ukraine must still be categorized as a country-in-transition. Many positive indicators have been noted during the past two years but considerable tasks remain to be accomplished in the area of institutional reform before significant foreign investment arrives in Ukraine.