

Underground Gas Storage in Georgia

*Gujabidze I.K.,
Barabadze T.G.,
Managadze R.G.*

The project concerns creation of underground gas storage in Georgia. All possible options - from use of different types of caves and abandoned underground constructions to the exhausted oil and gas fields - were studied. The best option determined was creation of the storage in the exhausted oil field. Considering the large size of the storage it is recommended to attract the interest from European countries. Estimated economic indicators of creation of storage are also given.

The analysis of underground natural gas storage possible arrangement options in Georgia shows us that mostly their technical characteristics does not satisfy the existing requirements. In case of using relevant geological structures (Kulevi, East and West Chaladidi, Sagvamicbao) the underground storages capacities may overcome 5-8 billion cubic meters, that is way too far for the consumption needs and economic ability of Georgia. Despite of this Georgia can find common interest, and collaborate with EU and Turkey to find solutions if this kind of project is actual and interesting for them as well.

Europe as a major energy consumer faces a number of challenges when addressing future energy needs. Among these challenges are rapidly rising global demand and competition for energy resources from emerging economies such as China and India, persistent instability in energy producing regions such as the Middle East, a fragmented internal European energy market, and a growing need to shift fuels in order to address climate change policy. As a result, energy supply security has become a key concern for European nations and the European Union (EU). A key element of the EU's energy supply strategy has been to shift to a greater use of natural gas. Europe as a whole is a major importer of natural gas. Although second to Norway as a supplier to Europe, Russia remains one of Europe's most important natural gas suppliers. Europe's natural gas consumption is projected to grow while its own domestic natural gas production continues to decline. If trends continue as projected, Europe's dependence on Russia as a supplier is likely to grow. And, while it could be in Europe's interest to explore alternative sources for its natural gas needs, it is uncertain whether Europe as a whole can, or is willing to, replace a significant level of imports from Russia. Some European countries that feel vulnerable to potential Russian energy supply manipulation may work harder to achieve diversification than others.

Russia has not been idle when it comes to protecting its share of the European natural gas market. Moscow, including the state-controlled company Gazprom, has attempted to stymie European backed

alternatives to pipelines it controls by proposing com-

peting pipeline projects and attempting to coopt European companies by offering them stakes in those and other projects. It has attempted to dissuade potential suppliers (especially those in Central Asia) from participating in European-supported plans. Moscow has also raised environmental concerns in an apparent effort to hinder other alternatives to its supplies, such as unconventional natural gas.

Successive U.S. administrations and Congresses have viewed European energy security as a U.S. national interest. Promoting diversification of Europe's natural gas supplies, especially in recent years through the development of a southern corridor of gas from the Caspian region as an alternative to Russian natural gas, has been a focal point of U.S. energy policy in Europe and Eurasia. The George W. Bush Administration viewed the issue in geopolitical terms and sharply criticized Russia for using energy supplies as a political tool to influence other countries. The Obama Administration has also called for diversification, but has refrained from openly expressing concerns about Russia's regional energy policy, perhaps in order to avoid jeopardizing relations with Moscow. Nevertheless, although supplying natural gas to Europe from the Caspian Region and Central Asia has been a goal of multiple U.S. administrations and the EU, it is far from being achieved in volumes significant to counter Russian exports. To solve the problem of natural gas supply in Europe, most significant issue is to create necessary natural gas reserves, that is related to a permanent insufficiency of strategic purpose underground gas storage facilities. Turkey suffers with identical energy problems.

GSE represents the interests of : 33 Storage System Operators with 110 storage sites in 16 countries in Europe, representing approximately 86% of Europe's technical storage capacity.

Storage volumes in EU 27 current situation EU-27- Slovakia 2.6, Austria 4, Hungary 3.7, Romania 2.3, Bulgaria 0.6, Croatia 0.6, Portugal 0.2, Great Britain 4, Germany 20, Italy 14, France 11.9, Spain 2.7, Poland 1.6, Denmark 0.8, Netherlands 5, Latvia 2.3 etc. The overall working gas volume in EU-27 is around 82 bcm Source. If we compare Europe's gas consumption and the volume of gas storages the EU's efforts to increase the volume of gas storages becomes clear. European commercial storage facilities have played and play a key role in ensuring security of supply.

The good functioning of the commercial storage facilities has been proven during several crisis. The development of commercial storage in a more interconnected market must be fostered in order to reinforce security of supply in Europe.

Southern Gas Corridor is one of the EU's most ambi-

tious energy infrastructure project over the last few years. It is recognized by the European Union as a priority project for its international energy politics and supply security. The concept involves the construction of several existing or planned infrastructure projects such as the SCP, Nabucco, ITGI, WS, TCP, TANAP, SEEP, AGRI pipelines and liquefied natural gas production and supply.

European gas storage development: we will have to develop as much capacity over the next 20 years as we have developed over the last 60 years.

Attracting funding: we have to invest up to 50 billion euros over the next 20 years to face this development in the context of the current economic crisis.

A stable European Regulatory framework that encourages new storage developments as well as the optimal use of existing storage facilities is essential.

This interest to construct underground gas storage facilities in Georgia is obvious. This view is further justified by the EU's existing interests in Georgia that we will further elaborate below.

The gas supply from Azerbaijan and Central Asia is supplied to the European market through the Southern energy corridor bypassing Russia. As we have mentioned above there are several alternative projects being considered. This project is of interest for those countries that do not have strategic gas storages, or the storages are of a limited capacity and are located in the Black Sea area. For example, Turkey, Greece, Moldova, Bosnia-Herzegovina and others. The projects will also be of interest to those countries that either don't have their own gas fields and are completely depending on Russia (e.g. Ukraine, Lithuania, Latvia, Estonia and others). Sweden and Finland do not have own storages are dependent on Latvian and Danish gas storage supply or there is a major dependence of Russia (that is majority of Europe).

In addition, there is a project concept of alternative route to supply gas to the European market that is so called White Stream (WS) route through Romania. The authors of this project consider connecting the planned pipeline to the Southern Caucasus has pipeline system and building a branch on the Georgian territory to the Black sea shore. Than the pipeline will be directed towards Ukrainian Crimea for about 600-650km and connected to the country's main transit system, and with an addition of 300 km offshore pipeline to Romania¹. An alternative option considers a direct 1100km offshore gas pipeline from Georgian Black Sea shore to Romania. The completion of the first stage of the system would result in a capacity to transport 8 billion m³ of gas, than 16 billion m³, and as a result of the third phase with the potential to increase the capacity up to 32 billion m³. The project of the pipeline of Azerbaijan-Georgia-Romania (AGRI) provides transportation of the Azerbaijani gas to the Black Sea coast of Georgia where after liquefaction it will be transported by tankers to Konstantza (Romania).

From Konstantza the regasified gas by means of exist-

ing system of gas pipelines will be delivered to Hungary, Bulgaria and other countries of southwest Europe.

Strategic importance of the project even more increased after Hungary joined it., and Ukraine, a Bulgaria and Latvia made the decision to provide acceptance of the Azerbaijani gas.

In September 2010 presidents of Georgia, Azerbaijan and Romania and the Prime Minister of

Hungary signed the Baku declaration on implementation of the AGRI project. In February 2011 for project implementation by the joint decision of SOCAR (Azerbaijan), ROMGAZ (Romania), MVM Zrt (Hungary) and Georgian Oil and Gas Corporation the SC AGRI LNG Project Company SRL joint venture was formed. The company will provide the feasibility study and preparation of a final decision on the subsequent stages of implementation of the project.

The AGRI project has wide international support, including the European Union and the USA. It should be noted that during the meeting of the world leaders, held in January, 2011 in the USA the AGRI project was including in the list of 100 especially important infrastructure projects.

One of the strongest components of the above mentioned project can become the underground gas storage project that we are proposing to be located on the Black Sea coast of Georgia. The content and the strategic geographical location of our project position it very well among the above-noted projects and considerably strengthens and enriches them.

It should be mentioned that legal framework for cooperation with Europe is currently being developed. In addition, there is a European legal framework in place: Security of supply (2004), Internal market liberalisation (2003) Ensures Third Party Access (TPA) to storage •Gives alternatives for Member states: Regulated / Negotiated•European voluntary guidelines: Guidelines for Good Practices for Storage System Operators (GGPSSO)–Compliance with GGPSSO shows a transparent and non-discriminatory access to storage•3rd Energy Package including a 3rdgas directive2 directives for 2objectives3rd directiveGSE believes that -the choice of access regime should be market oriented-negotiatedTPA should be the preferred choice wherever market conditions allow as this regime best facilitates investments andfurther development of the market.

The goal of the preliminary economic assessment was evaluate the cost and expected economic impact. The assessment was based on international experiences in building gas storage on oil and gas exhausted fields.

As with all infrastructural investments in the energy sector, developing storage facilities is capital intensive. Investors usually use the return on investment as a financial measure for the viability of such projects. It has been estimated that investors require a rate or return between 12 percent to 15 percent for regulated projects and close to 20 percent for unregulated projects². The higher expected return from unregulated projects is due to the higher per-

ceived market risk. In addition significant expenses are accumulated during the planning and location of potential storage sites to determine its suitability, which further increases the risk.

The capital expenditure to build the facility mostly depends on the physical characteristics of the reservoir. First of all, the development cost of a storage facility largely depends on the type of the storage field.

A depleted reservoir costs between \$5 million to \$8 million/Bcf of Working Gas Capacity.

If we consider that: 1 foot = 30,48 cm; the cost of construction of 1000m³ gas storage is \$177-\$212, than 5 billion m³ construction cost is estimated at \$885,000,000 - \$1,060,000,000.[2]

Finally another major cost incurred when building new storage facilities is that of base gas.

The expected cash flows from such projects depend on a number of factors. These include the services the facility provides as well as the regulatory regime under which it operates. Facilities that operate primarily to take advantage of commodity arbitrage opportunities are expected to have different cash flow benefits than ones primarily used to ensure seasonal supply reliability. Rules set by regulators can on one hand restrict the profit made by storage facility owners or on the other hand guarantee profit, depending on the market model.

To understand the economics of gas storage, it is crucial to be able to value it. Several approaches have been proposed.

They include: Cost-of-service valuation, Least-cost planning, Seasonal valuation, Option-based valuation.

The different valuation modes co-exist in the real world and are not mutually exclusive. Buyers and sellers typically use a combination of the different prices to come up with the true value of storage.

Therefore, in our case to store 1,000m³ of gas is estimated at \$0,0565 - \$0,0671, while to store 5billion m³ is estimated at \$282,500 - \$335,487.

Depending on its purpose there are several UGS categories. The UGS we propose is of a strategic nature aimed to store gas long-term to be used in special cases.

Main functions of a strategic UGS are:

1. Storing gas reserves in case of abnormally cold winters (currently, Ukraine increased gas usage from their gas storages to provide additional gas supply to Turkey in the amount of 11 million cubic meters a day);

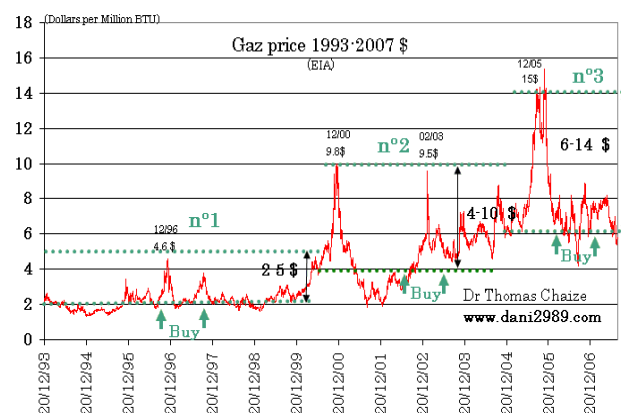
2. Regulation of irregularities in gas exports (e.g. 2008-2009 Russia and Ukraine dispute has reduced the gas supply to Europe; on February 1, 2012 Ukrainian Minister of Energy announced that Russia supplies 12% less gas than it was agreed; Italy received 12% and Austria 20% less gas from Russia).

3. Creation of gas reserves in case of force majeure during gas production and transportation;

4. Regulation of seasonal fluctuations in gas demand (e.g. early February 2012 prices on energy spot markets for natural gas reached maximum price during the last 6 years).

Since early February gas price on the London market increased by 28%, i.e. up to \$520 per 1000 cubic meters)

The below chart shows gas demand grows during cold winters and influences its price.



Unfortunately, due to the political and economic situation in the world and gas price variation, it is difficult to present exact quantitative assessment of the commercial potential of the proposed UGS. However, even considering minimum parameters – supplying 3 billion cubic meters of gas from the UGS and gas price seasonal variation only \$30 per 1000 cubic meters the profit will be \$90M.

Taking into consideration other functions of strategic UGSs, strategic reasonability of the creation of gas storages is indubitable.

List of references:

1. GUEU, The White Steam Project, Technical and economic study (Report), June 2009.
2. Current State of and Issues Concerning Underground Natural Gas Storage.