UNDERGROUND GAS STORAGE PROJECTS OF GAZPROM EXPORT LLC IN EUROPE
Gazprom is the largest gas exporter in the world. In 2016, Gazprom gas sales through Gazprom Export to Far Abroad Countries were 178.3 bcm. Gazprom’s share in European gas consumption in 2016 exceeded 1/3rd reaching its historical record.

Gazprom always considers underground gas storage as a key element of security and reliability of gas supply to Europe, therefore increase of active gas volumes in European UGS is our top priority. Using gas storages is highly advantageous to both gas suppliers and purchasers, as it allows them to balance sharp changes in gas demand with confidence. As assessed by market players, optimum storage capacities for a country with a high share of natural gas in energy balance would comprise 20-25% of annual consumption. Currently Gazprom Group participates in UGS projects in Germany, Austria, Czech Republic, Serbia, and the Netherlands. Besides, Gazprom Group considers opportunities of potential participation in UGS projects in Austria, Slovakia and other countries.

Gazprom Group takes part in underground gas storage projects in the countries which are situated along the main transit corridors for Russian gas supplies to Europe. Due to a long distance from Gazprom natural gas fields to European consumption centers, UGS construction is highly effective from the economic point of view. Gas pipelines are never built on the basis of peak demand, and UGS would allow for compensation of sharp changes in consumption. In addition to balancing seasonal variation of gas demand in Europe and transit risk mitigation, gas storage facilities allow for uninterrupted gas supply during pipeline maintenance works or failures in the gas supply system.
Gazprom Group aims at selecting sites for future UGS construction that would be both geologically optimal and would stand in proximity to gas pipelines and gas delivery points to our customers in Europe. Gazprom Group aims to reach geological, financial and logistical optimization of a project, which is critical for creation of an integrated, reliable and flexible supply chain for Russian gas to our European customers. Today, Gazprom Group is focused on UGS projects with maximum daily output. It ensures high withdrawal rates during working days and periods of peak demand. During the periods of reduced consumption or weekends, when gas demand is low, UGS may switch to injection mode. Generally, the owners of gas storage capacity are Gazprom Group companies and local partners. For example, in Germany Gazprom Group participates in UGS projects through the ownership of WINGAS and astora companies.

**HOW MUCH STORAGE CAPACITY DOES GAZPROM HAVE IN EUROPE?**

Between 2006 and 2016, the volumes of active gas in Gazprom Export’s storages in Europe increased from 1.4 to 5 bcm and the potential daily output from 18.2 to 83 mcm. Gazprom Export aims at increasing its storage capacity up to 5% of annual export volumes.

In September 2015 Gazprom Group significantly increased own storage capacities by fully integrating German WINGAS in the corporate structure.
GAS STORAGE PROJECTS OF GAZPROM GROUP IN EUROPE

GERMANY / REHDEN UGS
UGS partners: WINGAS (astora)
Total capacity: 4.7 bcm

GERMANY / KATHARINA UGS
UGS partners: Gazprom Export, VNG
Design capacity: 650 mcm

GERMANY / ETZEL UGS
UGS partners: Gazprom Germania, BP, DONG Energy
Design capacity: around 1 bcm

GERMANY / JEMGUM UGS
UGS partners: WINGAS (astora), VNG
Design capacity: 900-950 mcm

CZECH REPUBLIC: UGS DAMBOVICE
UGS partners: Gazprom Export, MND
Design capacity: 456 mcm

AUSTRIA / UGS HAIDACH
UGS partners: WINGAS (astora), Gazprom Germania, Centrex, RAG
Total capacity: around 2.8 bcm

SERBIA / BANATSKI DVOR UGS
UGS partners: Gazprom Export, Srbijagas
Total capacity: 450 mcm

NETHERLANDS / UGS BERGERMEER
UGS partners: Gazprom Export, TAQA, BBN
Total capacity: 4.5 bcm (Gazprom has booked 1.9 bcm)

In most cases Gazprom shares gas storage capacity with its partners. UGS capacities represent maximal volumes of natural gas injected into UGS at 20°C. Please note that maximum capacities of storages are shown. Gazprom Group usually owns a part of the total volume.

-250 mcm
The natural gas storage facility in the community of Rehden plays a vital role in maintaining security of supply, needed to meet the demand for natural gas in Germany, which is the largest consumer of Russian gas, as well as in Europe in general. With an active gas capacity of 4.7 bcm, the Rehden storage facility is the largest pore storage in Western Europe. That is about a fifth of the total storage capacity currently available in Germany, sufficient to supply two million households with natural gas for an entire year. The storage covers an area of 8 sq. km.

The Rehden natural gas field was discovered in 1953, converted into a storage facility after its depletion and went into operation in 1993. 16 horizontal wells running through the storage layer are all it takes to cover the entire underground storage volume. The storage reservoir is located at depths of 1990 to 2100 m.

Markus Radmacher, Head of Storage Operations at astora, the operator of the UGS

«The Rehden storage facility is strategically located at the crossroad of German and European gas pipelines. It is linked to the major Central German Gas Link (MIDAL) and Rehden-Hamburg gas (RHG) pipelines as well as to the North European Gas Pipeline (NEL) that is connected to the Nord Stream pipeline running through the Baltic Sea. The UGS is an ideal location for trading activities.»

Technical specifications of Rehden UGS

<table>
<thead>
<tr>
<th>Type of reservoir:</th>
<th>Pore storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active gas volume:</td>
<td>4.7 bcm</td>
</tr>
<tr>
<td>Maximum injection rate:</td>
<td>33.2 mcmd</td>
</tr>
<tr>
<td>Maximum withdrawal rate:</td>
<td>51.3 mcmd</td>
</tr>
</tbody>
</table>
The largest underground gas storage in Austria and Central Europe’s second largest natural gas storage facility in Haidach, Austria. The storage took first gas in 2007, construction works were fully completed in 2011. The capacity of Haidach UGS is around 2.8 bcm of gas. It corresponds to 1/3 of Austria’s annual gas consumption or annual gas demand of 1.2 million households. The Haidach natural gas reservoir was discovered by RAG in 1997 with the use of then state-of-the-art geo-physical methods, and is located 1,600 metres below the surface. The high permeability of the 100-metre thick reservoir provides the ideal basis for the pore storage’s efficient operation. In total 3000 specialists worked on the construction of the storage, with up to 300 specialists per day involved during the peak periods.

The Haidach underground gas storage contributes to strengthening the security of supply for natural gas consumers in several European countries: Austria, Germany, Italy, Hungary, Croatia, Slovenia and Slovakia.

Markus Radmacher, Head of Storage Operations at astora, the operator of the UGS

“The Haidach natural gas storage facility is connected to the German high-pressure grid at the German-Austrian intersection in Burghausen/Haiming. This makes it part of the European gas market, available to customers from municipalities, business and industry as a source to cover their natural gas supply needs.”

Technical specifications of Haidach UGS

- Type of reservoir: Pore storage
- Active gas volume: around 2.8 bcm
- Maximum injection rate: 25.8 mcmd
- Maximum withdrawal rate: 28.3 mcmd
Construction of Dambořice UGS has been completed jointly by Gazprom Group and Moravské naftové doly (MND) in Czech Republic. The storage was commissioned in summer 2016, active storage capacity will reach 456 mcm by 2021. Dambořice UGS is located in South Moravian Region of Czech Republic, 30 km south-east from Brno, and is connected to Czech Gas Transmission System via Brumovice gas metering station. Dambořice UGS is connected to Czech Gas Transmission System via Brumovice gas metering station. Being strategically located, the Dambořice UGS strengthens gas supply system of Czech domestic market, as well as access to gas markets in Germany (Waidhaus and Olbernau stations), Austria (Baumgarten) and Slovakia (Lanžhot). The UGS is intended to ensure stable supply of Russian gas via Nord Stream and OPAL gas pipelines.

Stanislav Pylev, Chairman of the Board of Directors, Moravia Gas Storage a.s.

«Dambořice UGS is located in the heart of Europe, thus giving a possibility to supply gas to any European country. Proximity of the UGS to the gas pipeline system optimizes logistical costs of the storage customers. Geologically unique position of the UGS allows for further expansion of the storage capacity. Dambořice UGS was commissioned on July 1, 2016, and is one of the most advanced gas storage facilities in Europe. The UGS is furnished with high-tech equipment ensuring efficient and safe functioning of the facility».

Technical specifications of Dambořice UGS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of reservoir</td>
<td>pore storage (depleted oil field)</td>
</tr>
<tr>
<td>Active gas volume</td>
<td>456 mcm</td>
</tr>
<tr>
<td>Maximum injection rate</td>
<td>4.6 mcmd</td>
</tr>
<tr>
<td>Maximum withdrawal rate</td>
<td>7.6 mcmd</td>
</tr>
</tbody>
</table>
In Serbia, Gazprom Export together with our Serbian partner Srbijagas has put into operation Banatski Dvor UGS project with effective capacity of 450 mcm of gas. Share of Gazprom Group in the project is 51%. The UGS ensures reliable export of natural gas to Hungary, Serbia, Bosnia and Herzegovina.

Future UGS development is considered within the Memorandum of understanding regarding further cooperation in the sphere of underground storage of gas, gas as fuel and small-scale LNG, dated October 28, 2015, signed by Gazprom PJSC and state-owned enterprise Srbijagas.

Andrey Khakimov, General Director of Banatski Dvor UGS

«The project of Banatski Dvor UGS, one of the largest storage facilities in South-East Europe, implemented jointly by Gazprom Group and Srbijagas, confirms successful bilateral collaboration in the gas sphere between Russia and Serbia. After commissioning of Banatski Dvor UGS, gas supply to South-East Europe (Serbia, Hungary, Bosnia and Herzegovina) became significantly more reliable, and risks for gas transit were reduced. Banatski Dvor UGS showed its efficiency as a gas storage facility and as a tool to compensate volatility in gas consumption in January 2017, when gas withdrawal exceeded design level of 5 mcmd. Thus we have ensured reliable uninterrupted gas supply to consumers of the Republic of Serbia».

Technical specifications of Banatski Dvor UGS

<table>
<thead>
<tr>
<th>Type of reservoir:</th>
<th>pore storage (depleted field)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active gas volume:</td>
<td>450 mcm</td>
</tr>
<tr>
<td>Maximum injection rate:</td>
<td>3 mcmd</td>
</tr>
<tr>
<td>Maximum withdrawal rate:</td>
<td>5 mcmd</td>
</tr>
</tbody>
</table>
Gazprom Export and Verbundnetz Gas AG (VNG) jointly carry out a project of Underground Gas Storage (UGS) Katharina in Germany. The designed active capacity of the gas storage is 650 mcm. Currently active gas volume of the storage is 315 mcm. The storage ensures security of gas supply to Western Europe at points Mallnow, Waidhaus, Gaspool, NCG, as well as for the Nord Stream gas pipeline.

Gazprom and Verbundnetz Gas AG have cooperated successfully in supply of Russian natural gas from Russia to Germany for more than 40 years. The cooperation for construction of the new UGS Katharina Project started in 2006. In 2009 the project company Erdgasspeicher Peissen GmbH (EPG) was founded. The project company is owned by Gazprom Export and VNG Gasspeicher GmbH on a parity basis.

The UGS Katharina is built close to the town of Bernburg in Saxony-Anhalt. After extension it will include 12 gas caverns in a rock salt deposit with a working gas volume of approximately 650 mcm, surface facilities, 37 km long gas pipeline with measuring station and connection to the JAGAL pipeline. With construction and commissioning of 7 caverns on UGS Katharina in 2017, the maximum gas injection rate is 12.9 mcmd and maximum withdrawal capacity reaches 26 mcmd.

Volker Busack, Managing Director, Erdgasspeicher Peissen GmbH

“The UGS Katharina infrastructure project is an example of successful cooperation of Russia and Germany and of Gazprom and VNG–Verbundnetz Gas AG companies to improve the security of natural gas supply to Germany and other countries in Europe. This gas storage will allow to provide reliable gas supplies through JAMAL - Europe and Nord Stream gas pipelines, both during the periods of peak winter consumption and during maintenance activities at the main natural gas pipelines».

Ivan Skoryy, Managing Director, Erdgasspeicher Peissen GmbH

Technical specifications of Katharina UGS

- Type of reservoir: cavern storage
- Active gas volume: 650 mcm
- Maximum injection rate: 12.9 mcmd
- Maximum withdrawal rate: 26 mcmd
The Bergermeer UGS was commissioned in 2014 in the Netherlands. Gazprom Export uses a share in capacity of this storage as well as holds a stake in the project company.

TAQA, the international energy company from Abu Dhabi, is the operator of Gas Storage Bergermeer in the Netherlands. Gas Storage Bergermeer company is an independent operator of this storage. With a capacity of 4.5 bcm, enough to supply 2.5 million Dutch households for a year, Bergermeer is Europe’s largest open-access gas storage. It started full commercial storage operations in April 2015. Gazprom Export has supplied the 4.7 bcm of cushion gas for Gas Storage Bergermeer. As the result of the open auction Gazprom Export received 1.9 bcm of storage capacity.

Gas Storage Bergermeer provides gas retailers and traders the flexibility required to match fluctuations on the European gas market. With the depletion and recent volume cuts of the massive Groningen gas reservoir in the Netherlands, which always provided a large part of this flexibility, storages like Gas Storage Bergermeer play an increasing role in matching this supply and demand on the European market. Moreover the storage is intended to ensure stable gas flows via the Nord Stream pipeline.

**Tom Eikmans, Commercial Manager, Gas Storage Bergermeer**

“Natural gas, the cleanest of all fossil fuels, is the backbone of the Netherlands’ energy supply, now and in the coming years. It will contribute to European security of supply and play a key role in the integration of renewable energy”.

**Technical specifications of Bergermeer UGS**

- **Type of reservoir:** depleted field
- **Active gas volume:** 4.5 bcm
- **Maximum injection rate:** 45 mcmd
- **Maximum withdrawal rate:** 61.4 mcmd
One of Germany’s largest salt cavern storage facilities has been under construction in the municipality of Jemgum. It was put into operation in 2013, and is scheduled for completion in 2019/2020, reaching a total working gas volume of 900 to 950 million cubic metres of natural gas. The natural gas caverns with a diameter of 86 m are located at a depth range of up to 1500 metres. In total there will be 10 caverns.

The Jemgum cavern storage facility is a high-performance storage facility that can inject or withdraw its entire gas volume in a short period of time. Approximately a million cubic metres of natural gas can be withdrawn within an hour, while the entire storage volume can be withdrawn within about 40 days. That means short-term intermediate storage to compensate for supply bottlenecks is possible as well as spontaneously taking advantage of market opportunities.

Markus Radmacher, Head of Storage Operations at astora, the operator of the UGS

“The Jemgum site is ideally connected to the European natural gas network system. Natural gas piped to Germany from Russia via the Nord Stream pipeline in the Baltic Sea will be transported through the Northern European Gas Pipeline (NEL) to Jemgum and stored there. Thanks to its direct connection to the GTS network in the Netherlands and the GASCADE-operated pipeline grid in Germany, Jemgum has cross-border access to two market areas.”

Technical specifications of Jemgum UGS

- **Type of reservoir:** cavern storage
- **Active gas volume:** 900 to 950 mcm
- **Maximum injection rate:** around 15 mcmd
- **Maximum withdrawal rate:** around 24 mcmd
Etzel-Kavernenbetriebsgesellschaft mbH & Co. KG, headquartered in Bremen, was established in 2007 as a joint venture between BP, DONG Energy and Gazprom Germania for the purpose of setting up and operating a cavern storage facility in Etzel (near Wilhelmshaven).

The Etzel storage facility can store natural gas in currently 7, and from 2017 on in 9 salt caverns, up to a working gas volume of about one billion cubic meters. In total there will be 10 caverns. The Etzel salt dome is also particularly suitable for the storage of natural gas, due to its beneficial geological properties, its proximity to major natural gas import pipelines, and the connection to both the German and the Dutch natural gas network. Salt caverns occur at depth of up to 1600 m on area of 17.5 sq.km.

Christian Rohde, CEO of Etzel-Kavernenbetriebsgesellschaft

"With our storage, our customers secure a sustainable, clean energy supply of tomorrow."

**Technical specifications of Etzel UGS**

<table>
<thead>
<tr>
<th>Type of reservoir:</th>
<th>cavern storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active gas volume:</td>
<td>around 1 bcm</td>
</tr>
<tr>
<td>Maximum injection rate:</td>
<td>around 12 mcmd</td>
</tr>
<tr>
<td>Maximum withdrawal rate:</td>
<td>around 21 mcmd</td>
</tr>
</tbody>
</table>
Legal address of Gazprom Export LLC:
2a, Litera A, Ostrovskogo Square, St. Petersburg, 191023, Russian Federation

Our head office is located at:
2a, Litera A, Ostrovskogo Square, St. Petersburg, 191023, Russian Federation

Phone: +7 (812) 646-14-14

Fax: +7 (812) 646-14-15

E-mail:
info@gazpromexport.com
post@gazpromexport.com

Media contacts:
comm@gazpromexport.com

Website: www.gazpromexport.com