Study on Underground Gas Storage in Europe and Central Asia

Working Party on Gas

Geneva, January 19, 2010
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Summary:

• General consideration about Underground Gas Storage (UGS)
• Overview of UGS business from IGU
• The study on UGS in Europe and Central Asia carried out in the 90’s
• Opportunity for updating the UGS study
• Structure of the new UGS study
• Organization of the UNECE Working Group
• Current status of the UNECE UGS study
• Conclusion
UNDERGROUND GAS STORAGE (UGS) TECHNOLOGIES
UGS TYPES

• UGS types
  • Porous rock (depleted fields / aquifers)
  • Salt cavern
  • Mined caverns

• Subsurface facilities
  • Wells

• Surface facilities
  • compressors
  • gas treatment
UGS TYPES

UGS in former oil or gas fields or in Aquifers

- High working capacity
- Low to medium withdrawal rate (60-120 d.)
- Low to medium injection rate (120-180 d.)

1. Covering layer
2. Porous Reservoir
3. Central station
4. Production well
5. Control well
6. Control well in the upper aquifer
7. Upper aquifer
UGS TYPES

UGS in salt caverns

- Relatively low working gas capacity
- High withdrawal rate (15-30 days)
- High injection rate (15-30 days) if necessary

1. Central station
2. Wells
3. Caverns
4. Salt layer
UGS IN OPERATION

- Safety equipment
- Gas treatment
- Gas quality Lab.
- Metering
- Interconnection
- Gas transmission network
- Control room
- Compressors
- Venting system
- Pipes to wells
- Grid from and to the wells
- Well
NEED FOR UNDERGROUND GAS STORAGE
TRADITIONAL NEEDS FOR UGS

• Adjusting supply and demand
  • seasonal modulation (summer / winter)

• Optimising transmission and production infrastructures
  • Balance for Transmission network

• Ensuring security of supply
  • Mitigating risk in case of supply shortage due to technical issues, extreme climatic conditions,...
  • Complying with public obligations
NEW REQUIREMENTS FOR UGS

• Offering more flexibility
  • Weekly: changes due to temperature or holidays
  • Daily: changes (working days / weekends)
  • Hourly: peak consumption morning / afternoon

• For storage customers:
  • Traders/suppliers
  • Gas power production
  • TSO, DSO

• Developing arbitrage
  • coordination between different means of power production (wind farms)
  • Spot market / long term contract
  • LNG/Storage
DURATION AND COST OF UGS DEVELOPMENT

UGS business is capex intensive

<table>
<thead>
<tr>
<th>Type of storage</th>
<th>Average development duration in years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquifers</td>
<td>10 - 12</td>
</tr>
<tr>
<td>Depleted fields</td>
<td>5 - 8</td>
</tr>
<tr>
<td>Salt caverns</td>
<td>5 - 10</td>
</tr>
</tbody>
</table>

Source: Clingendael – the European market for seasonal storage 2006
EUROPEAN REGULATORY FRAMEWORK

Current Regulation of Storage within Directive 2003/55/EC, Article 19(1)

- TPA access to UGS facilities when technically and/or economically necessary
- Member States can choose between negotiated TPA or regulated TPA for UGS or both procedures
- access on transparent and non-discriminatory basis
- exemptions from TPA under art 22
- regulators generally monitor the access conditions to UGS

GGPSSO (Guidelines for Good TPA Practice for Storage System Operators)

- In March 2005, a minimum set of rules required for the organization of the storage market were agreed, after a consultation of European Regulators (ERGEG) with SSOs
Future Regulation of storage within the third Energy Package

- Member States can choose either or both negotiated/regulated access (regulated access implying conditions set by an independent regulator)
- legally binding guidelines (GGPSSO) gives details for management of services and capacity allocation
- legal and functional unbundling
- regulatory oversight
- transparency on and pre-definition of criteria adopted for the definition of capacity for TPA (MS or Regulators define these criteria)

- the 3\textsuperscript{rd} Energy Package (July 2009) will be implemented in 2011

Gas Storage Europe is the interface with the EC.
Overview of Access Regimes to UGS across Europe
MORE NEEDS FOR UGS?

- Increasing distances between production and consumption areas
- Increasing gas demand in the enlarged EU
- Decreasing gas production in Europe

OVERVIEW ABOUT UGS BUSINESS FROM IGU
THE UNECE STUDY ON UGS IN EUROPE AND CENTRAL ASIA
Study on Underground Gas Storage in Europe and Central Asia

The First Study carried out in the 90’s:

- The first study on UGS in Europe and Central Asia started in 1996 and was finalized in 1999.
- It was composed of 6 chapters which dealt with new technologies, current status, new projects, regulation frameworks, costs of storage and trends of market.
- Approx. 75 experts from 35 countries (from UNECE region and USA) participated in this study.
- This study was unique for its multidisciplinary approach and the geographic areas concerned.
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The First Study carried out in the 90’s:

[Map showing underground gas storage sites in Europe and Central Asia]
Study on Underground Gas Storage in Europe and Central Asia

The First Study carried investment costs for aquifers vs sized out in the 90’s:

- Study on Underground Gas Storage in Europe and Central Asia

![Graphs showing investment costs for aquifers vs sized out in the 90’s:](image-url)
Study on Underground Gas Storage in Europe and Central Asia

The First Study carried out in the 90’s:
- investment costs for depleted fields vs size
Study on Underground Gas Storage in Europe and Central Asia

The First Study carried out in the 90’s:
- investment costs for salt caverns vs size

![Graph showing investment cost per working gas and withdrawal rate](image-url)
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The First Study carried out in the 90’s.
- investment cost breakdown
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The First Study carried out in the 90’s:
- « current » transnational modulation.
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The First Study carried out in the 90’s:
- « future » transnational modulation.
Why updating the Study?

- The market became more complex and changed significantly, particularly after the EU Directives for liberalization of gas market (TPA concept): investment decision making then became more difficult,
- Many newcomers entered the market as operators (SSOs) or as customers (TSOs, shippers, DSOs and power producers),
- Due to the further decline of EU gas production, UGS becomes and will become more and more important,
- Investors and developers of Gas Industry need to have benchmark for investment decisions.
Structure of the new study (1st part):

- **Chapter 1 : New and emerging technologies :** identify the main technological improvements in UGS business that may lead to a better cost efficiency,
  *(Heads : Mr A. Iskhakov (Gazprom), Mr H. Spreckels – E-On Gas Storage and Mr C. Gomez-Montalvo - Geostock)*

- **Chapter 2 : Current UGS status :** set up an updated data base for all existing UGS plants in each country,
  *(Head : Mr M. Sandu – Romgaz with support of Mr J. Wallbrecht – BEB / IGU and Mr A. Iskhakov (Gazprom)*
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Structure of the new study (2nd part):

- **Chapter 3**: Market structure and legal framework: describe the legislation and guidelines for UGS market organization (incl. TPA rules) and UGS services,
  
  (Head: G.-H. Joffre – Storengy with support of Ms A. Brandenburger– RWE Gasspeicher and Mr U. Duda – E.On Gas Storage)

- **Chapter 4**: UGS projects: set up a data base for planned projects in each country including criteria for selecting projects,
  
  (Head: Mr F. Favret (EDF) with support of Mr J. Wallbrecht – BEB / IGU, Ms A. Brandenburger– RWE Gasspeicher and Mr U. Duda – E.On Gas Storage)
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Structure of the new study (3rd part):

• Chapter 5: Legal framework for development and operation: provide with all useful information (legislation and procedures) necessary for granting consents and authorizations to SSO,

(Heads: Mr T. Korosi - Hungarian Energy Office and Mr W. Rokosz (PGNiG) with support of Ms A. Brandenburger– RWE Gasspeicher and Mr Z. Czike E.On Földgaz Storage Energy),

• Chapter 6: Tariffs of UGS: provide with information (if available and taking into account confidentiality issues) about TPA tariffs and cost of construction,

(Head: Mr G. Martinus – Gas Terra with support of Mr Z. Czike E.On Földgaz Storage Energy) and Mr W. Rokosz (PGNiG)
Structure of the new study (4th part):

- **Chapter 7 : Outlook and main expected trends of UGS markets**: describe the gas market (supply and demand) evolution and define the UGS needs subject to this evolution. *(Head : Mr G. Martinus – Gas Terra with support of Mr J. Wallbrecht – BEB / IGU, Ms A. Brandenburger– RWE Gasspeicher and Mr U. Duda – E.On Gas Storage)*

- **Conclusion and recommendations**: incl. Comparison with the first study.

- **Annexes**: glossary, contact details, maps, data base, units, bibliography,...
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Organization of the study:

- Appoint Heads of chapters for each chapter,
- Make efficient use of already available data (cooperate with IGU, GSE, ERGEG, IEA?…),
- Use a country by country approach (country representative) for gathering data but also take into account a market area concept,
- Regularly assess the work progress by 3-month intervals meetings in various UNECE member Countries,
- Appoint Country representatives.

Objective:

Finalize the study by the end of 2010.
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Current status of the study:

- 9 meetings were organized since June 2008,
- All Head of Chapters have been appointed;
- All questionnaires are ready to be integrated in the UNECE website,
- A special meeting with IGU and GSE has been organized on 24th November 2009 for sharing databases for existing and planned gas storage plants: as a result, the data collected will be jointly owned by IGU and UNECE and will be updated on the same website.
Conclusion

• Since the study was presented to the UNECE / Working Party on Gas on 20th January 2009, significant progress have been made, particularly by finalizing questionnaires and by strengthening the cooperation with IGU and GSE,

• The first results of the study could be available at the end of the year 2010 and a first be presented to the next WP on Gas session (and a final report at mid 2011)

But, for proceeding,

• we need manpower for supporting the Heads of chapters,
• we need representatives in each UNECE member country (in public bodies or companies).
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Thanks for your attention