

# **Study on Underground Gas Storage in Europe and Central Asia**

## **Working Party on Gas**

### **Geneva, January 19, 2010**

United Nations Economic Commission for Europe  
Committee on Sustainable Energy



# **Study on Underground Gas Storage in Europe and Central Asia**

## **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**

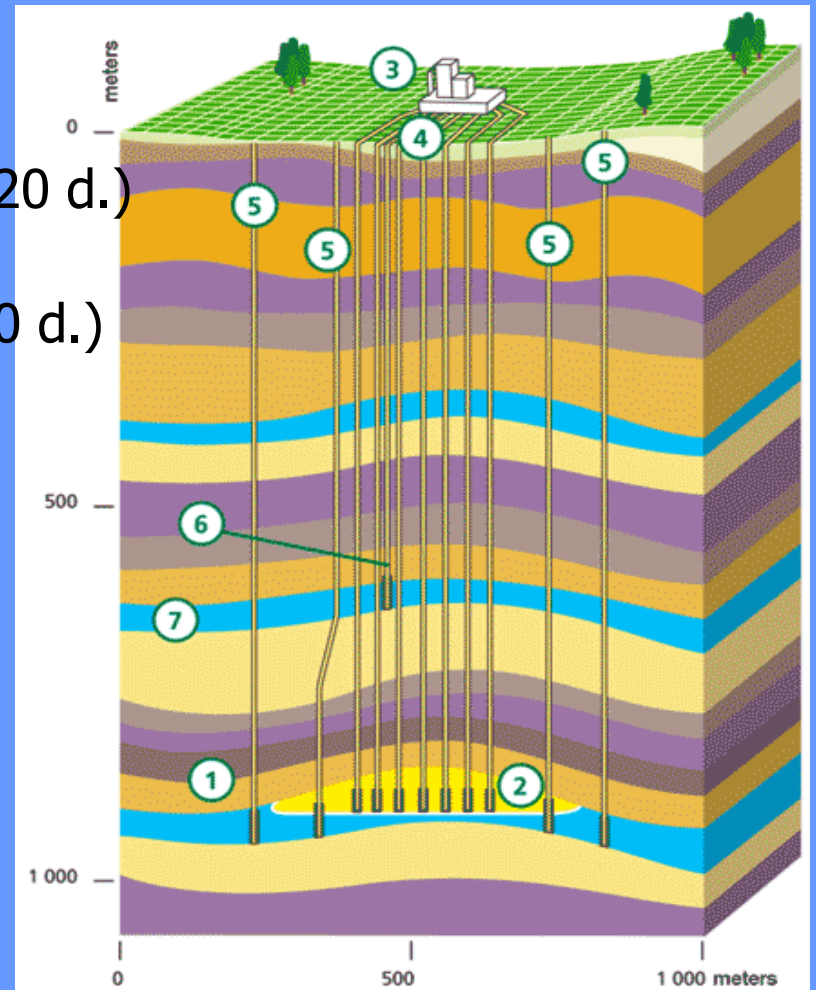
- compressors
- gas treatment

# 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

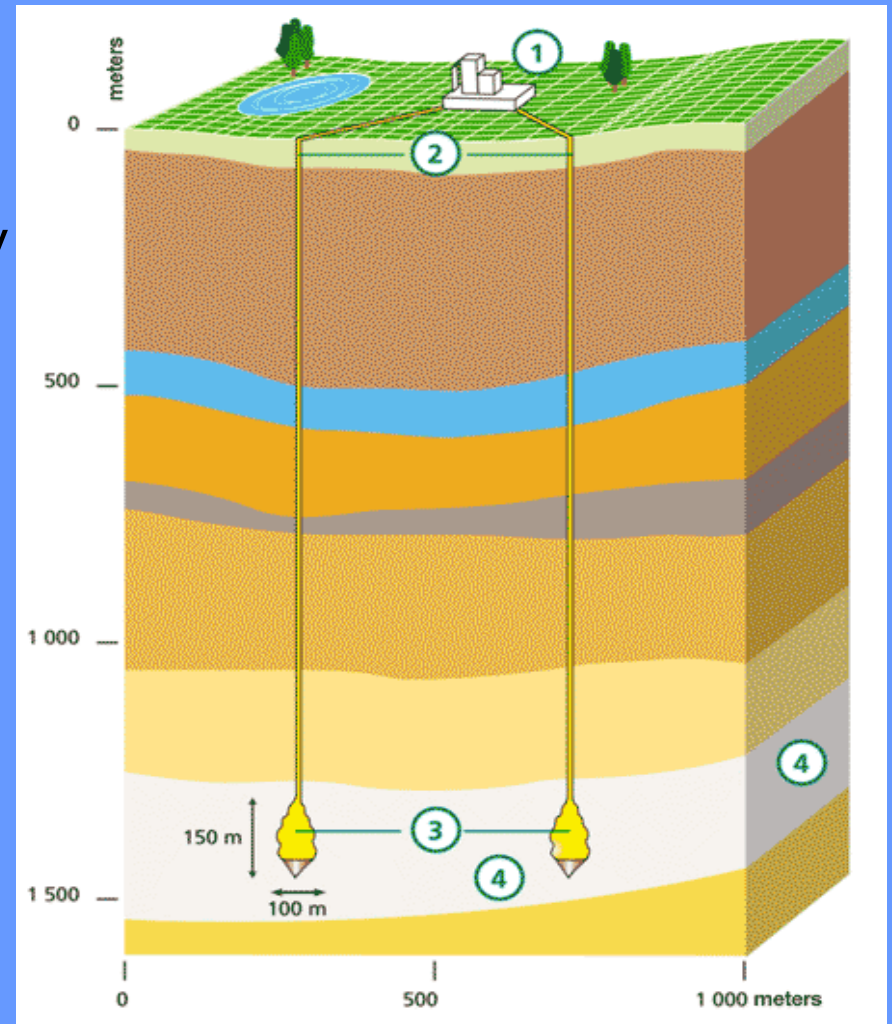


# UGS TYPES

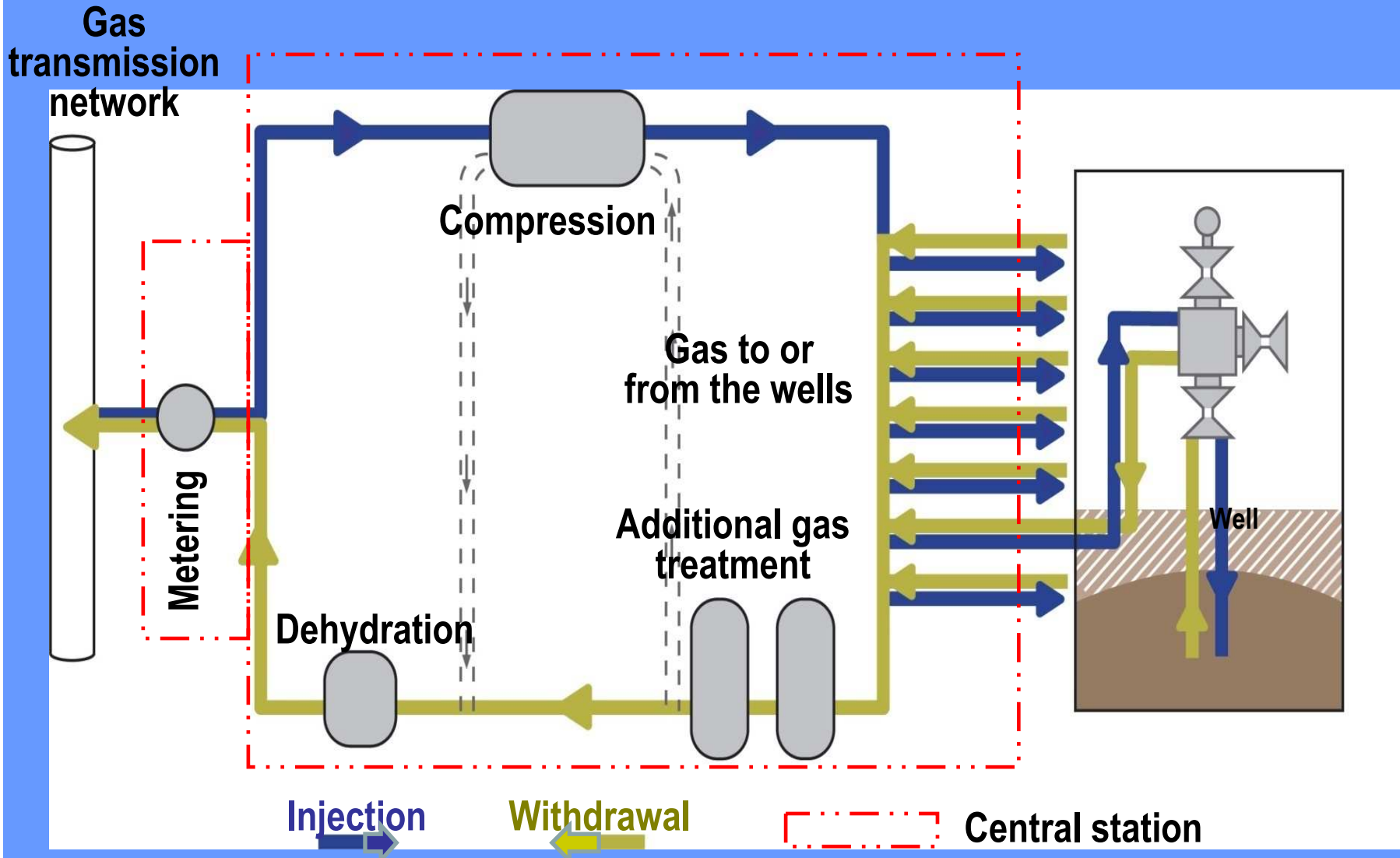
## UGS in salt caverns

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

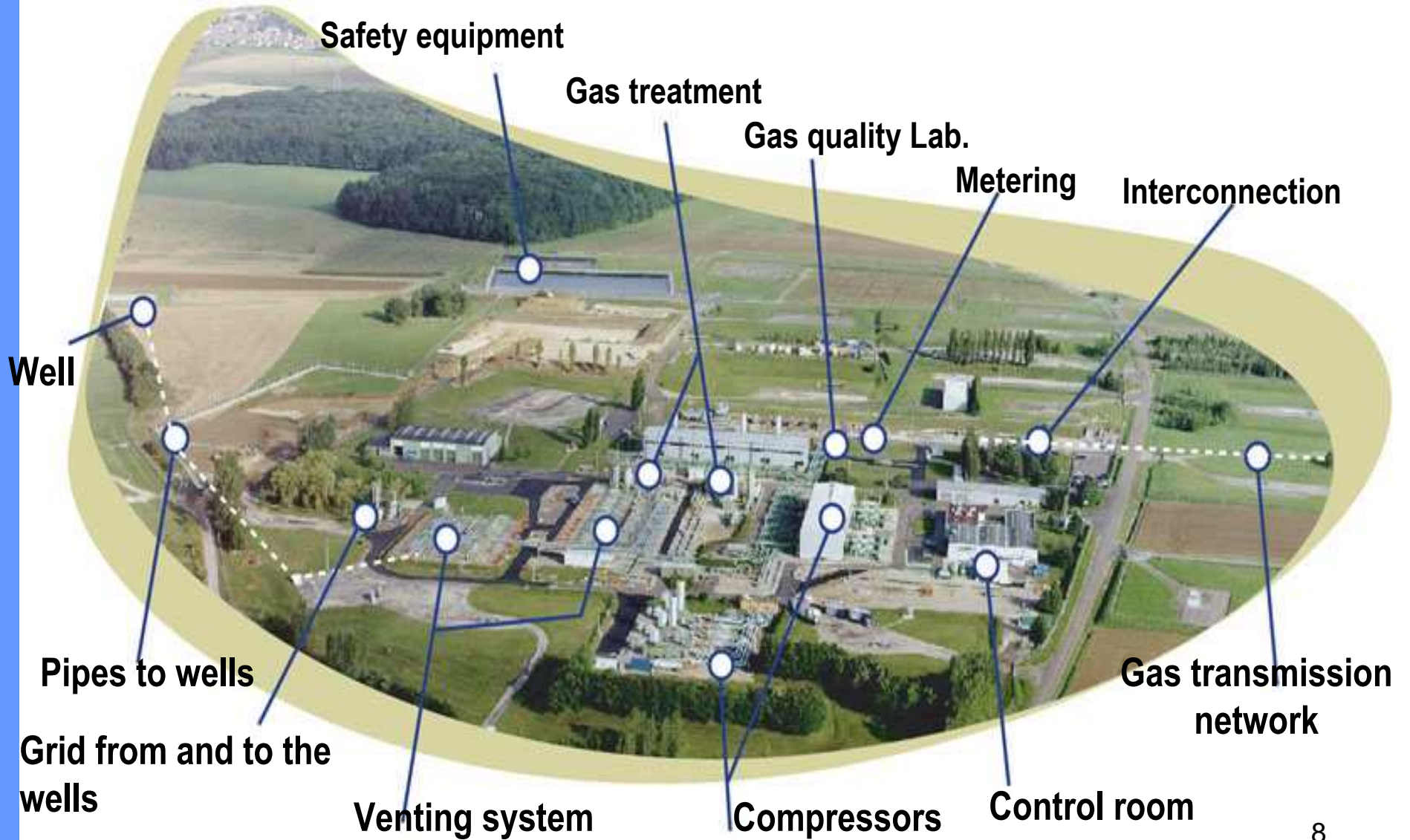
- 1 • Central station
- 2 • Wells
- 3 • Caverns
- 4 • Salt layer



# SURFACE FACILITIES



# UGS IN OPERATION



# **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**

Type of storage	Average development duration in years
Aquifers	10 - 12
Depleted fields	5 - 8
Salt caverns	5 - 10

*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

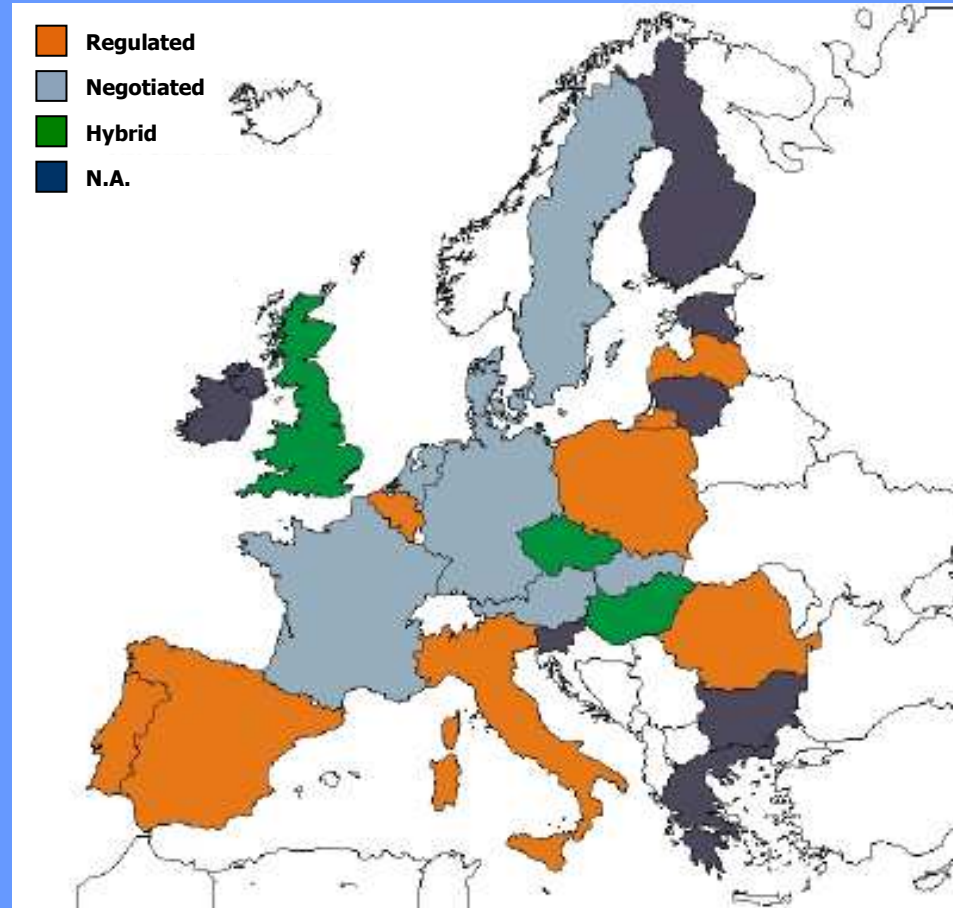
# EUROPEAN REGULATORY FRAMEWORK

## 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<sup>rd</sup> Energy Package (July 2009) will be implemented in 2011**
- **New Security of Supply Regulation (repealing 2004 SoS Directive)**

**Gas Storage Europe is the interface with the EC.** <sup>14</sup>

# Overview of Access Regimes to UGS across Europe

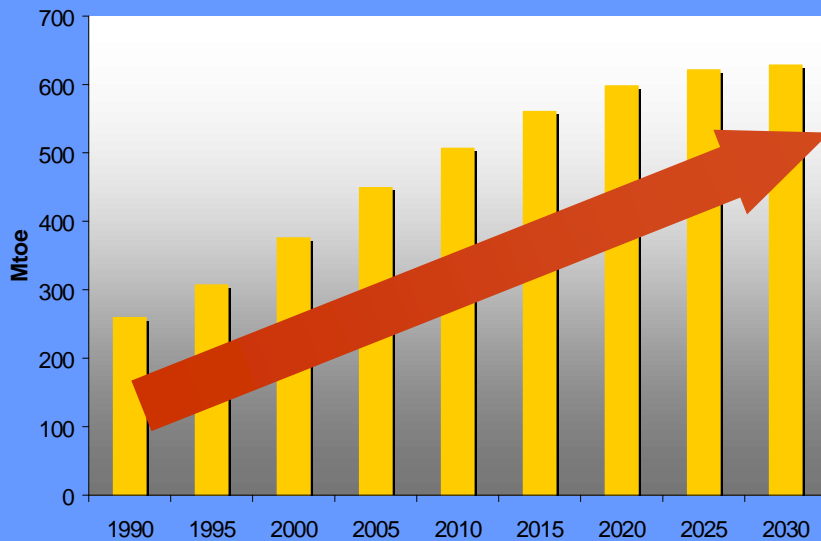


# MORE NEEDS FOR UGS ?

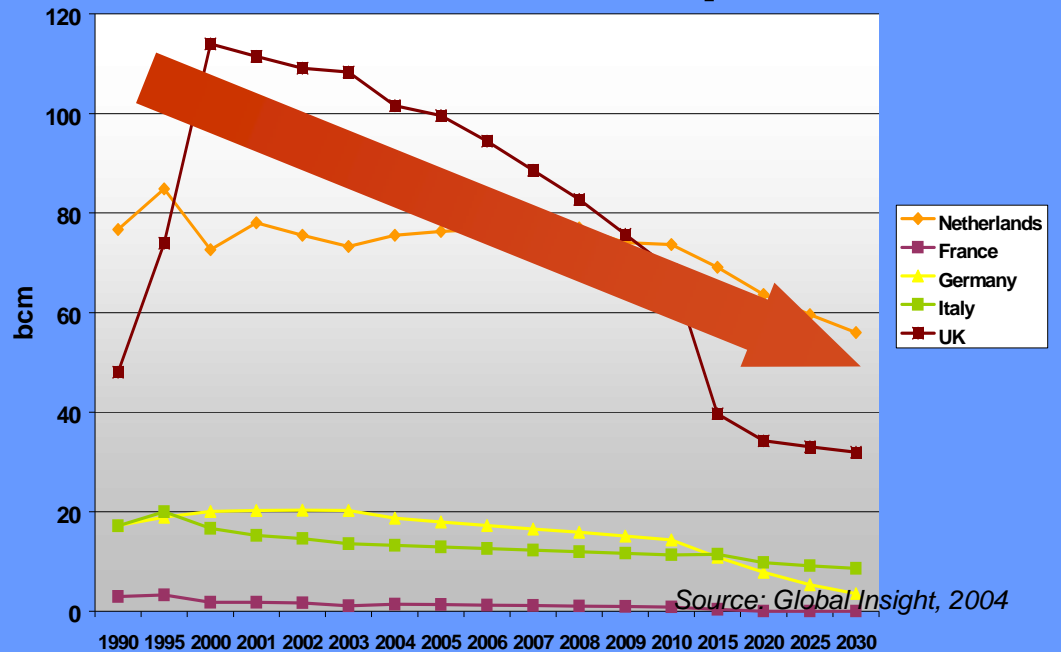
Increasing distances between production and consumption areas

Increasing gas demand in the enlarged EU

Decreasing gas production in Europe



Source: European Commission, 2004.



Source: Global Insight, 2004

# **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**

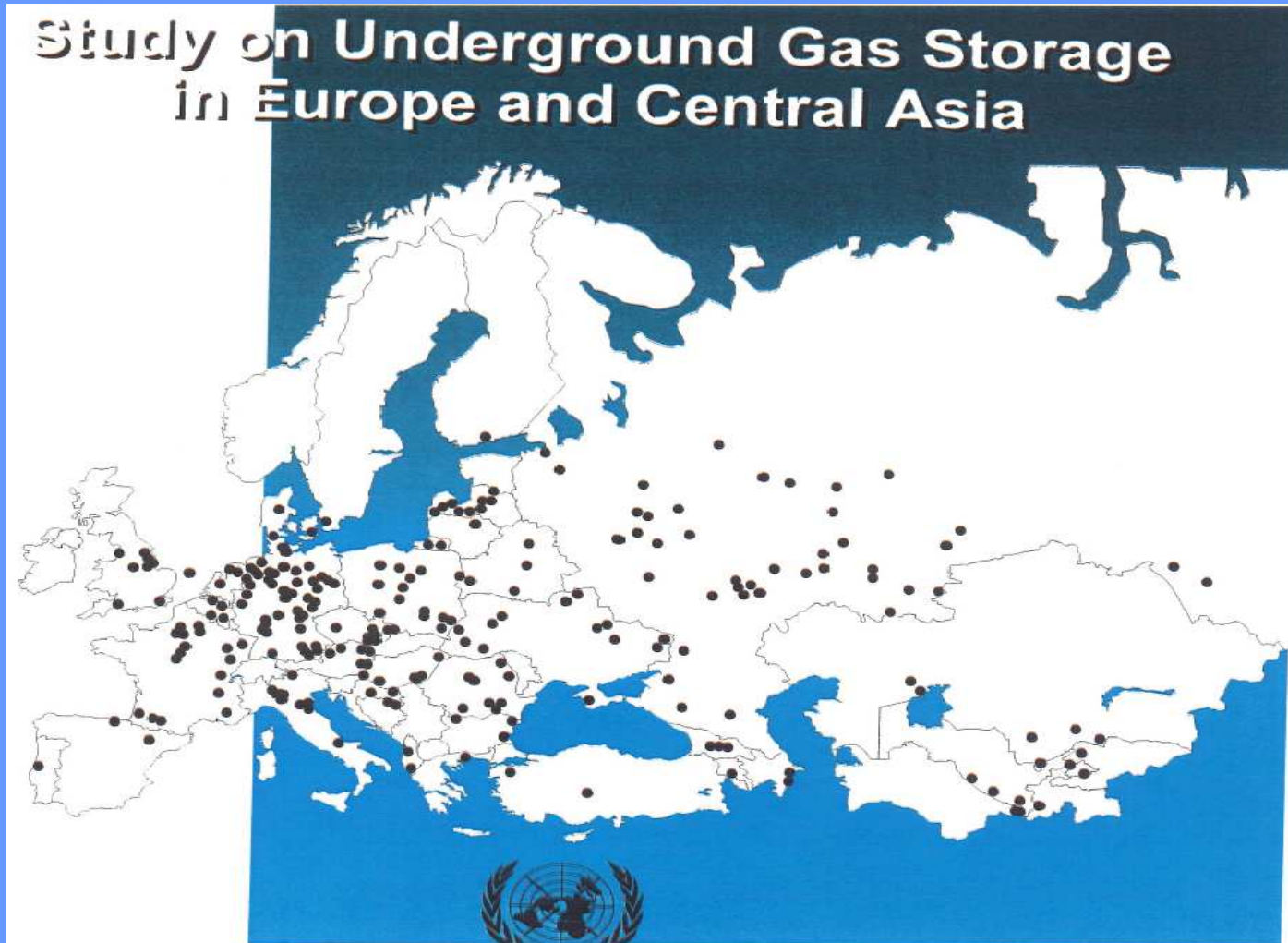
## **The First Study carried out in the 90's:**

- **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.**



# Study on Underground Gas Storage in Europe and Central Asia

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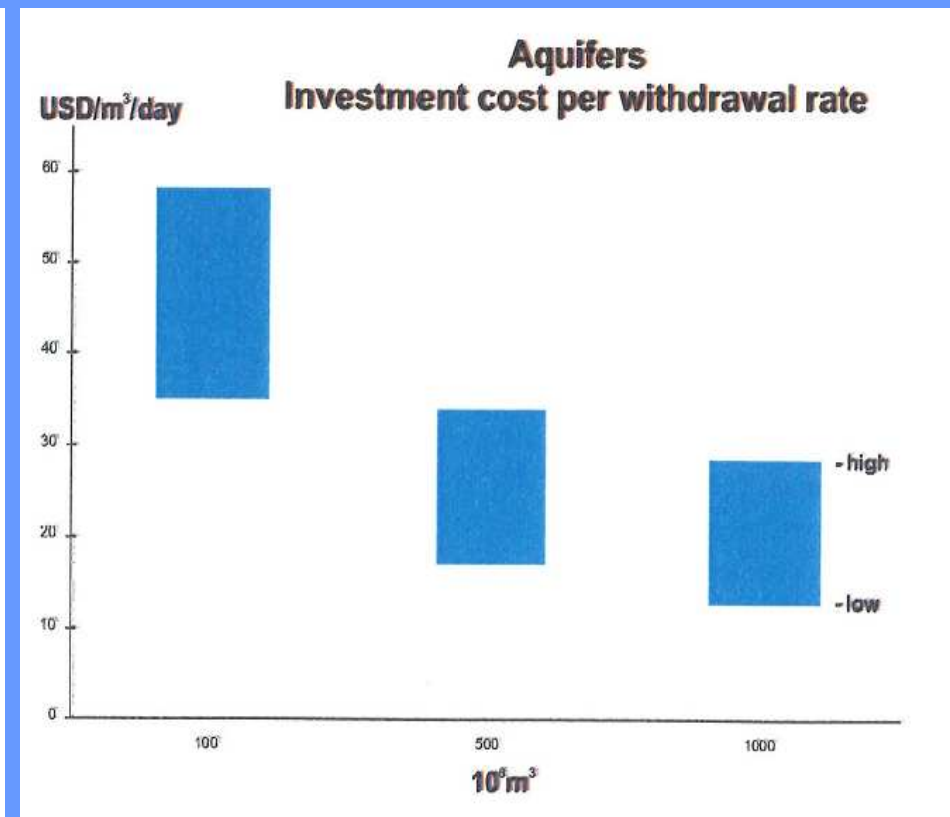
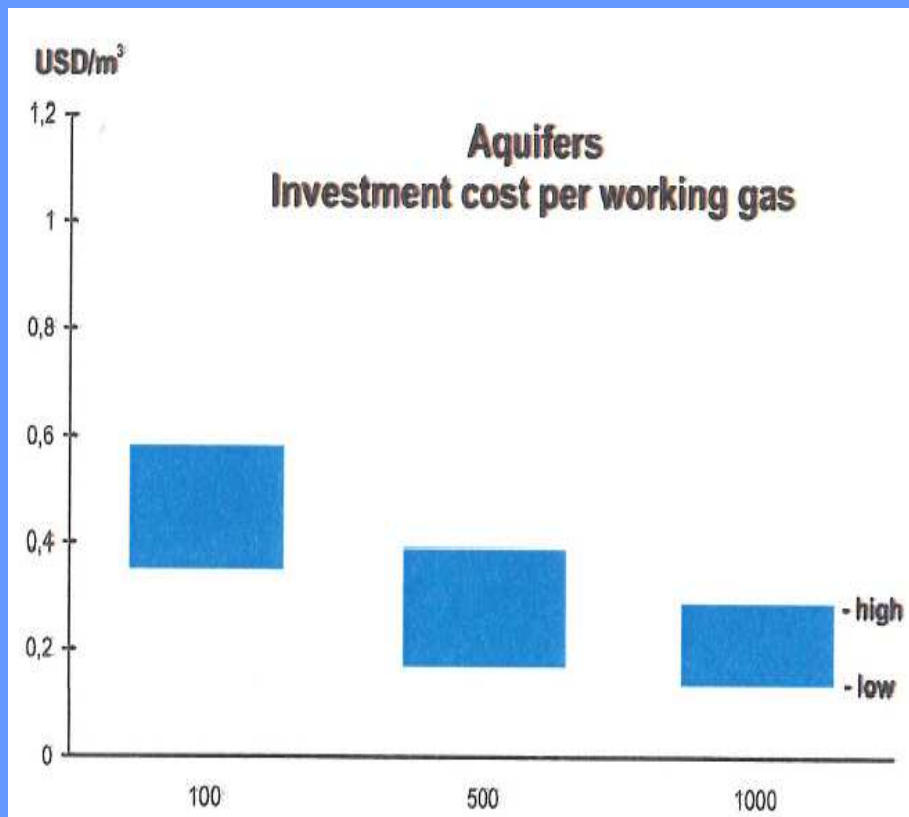


Economic Commission for Europe / Committee on Sustainable Energy



# Study on Underground Gas Storage in Europe and Central Asia

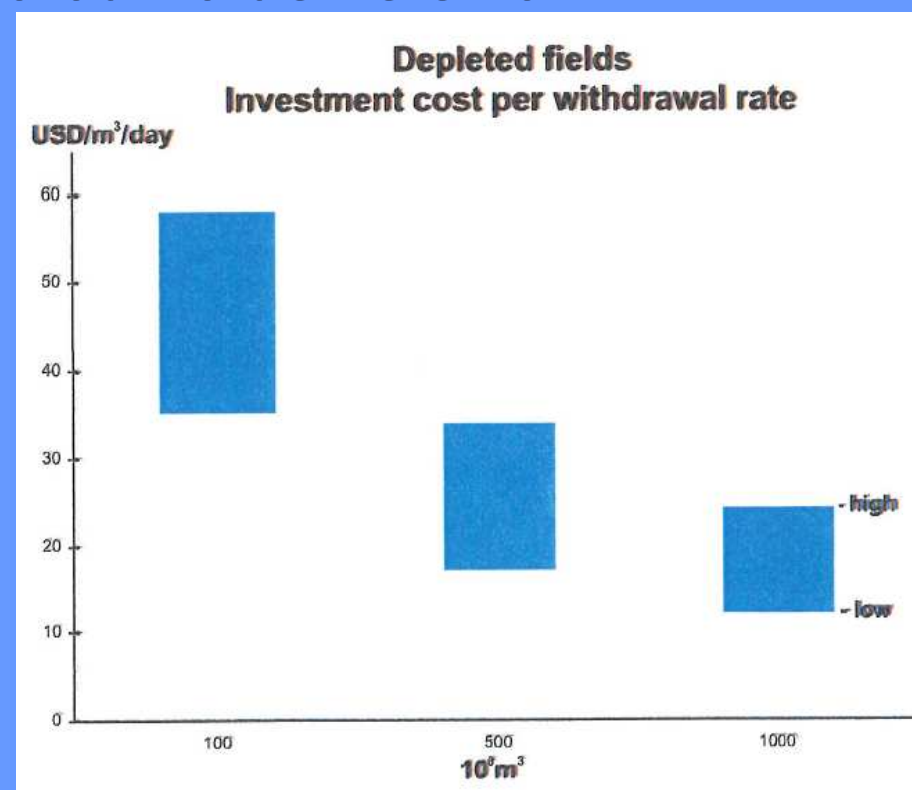
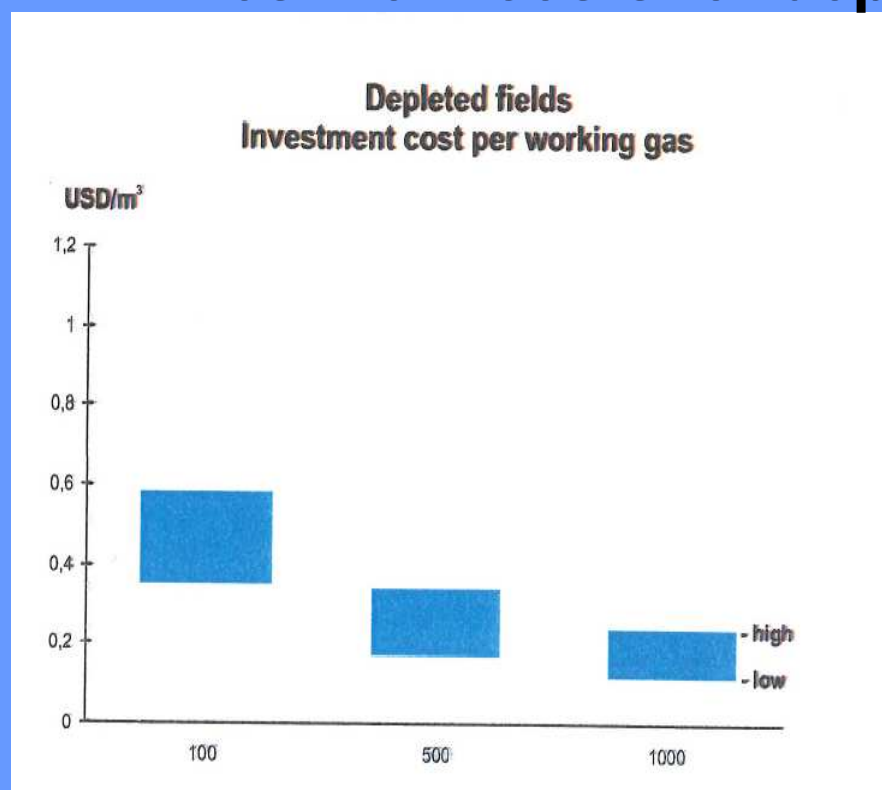
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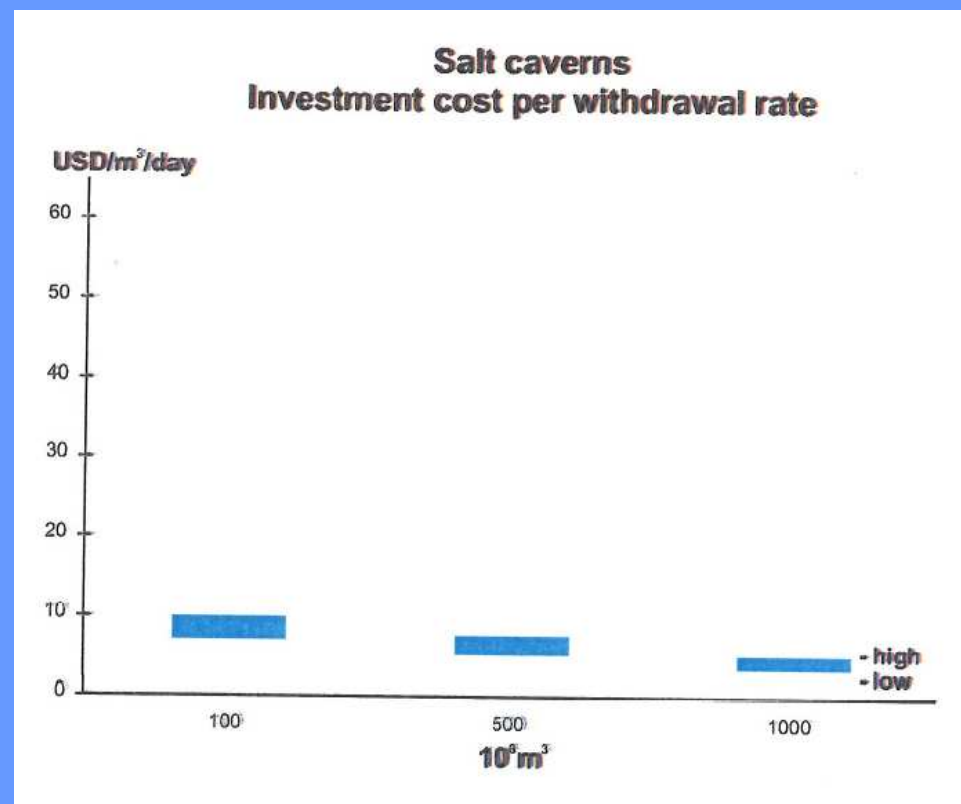
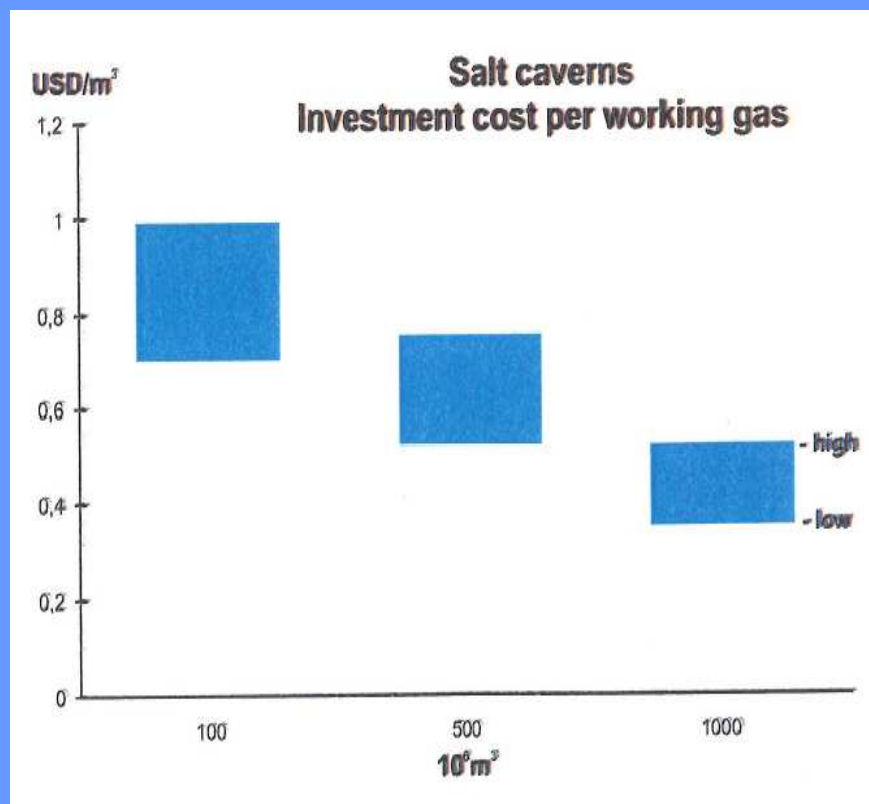
- investment costs for depleted fields vs size



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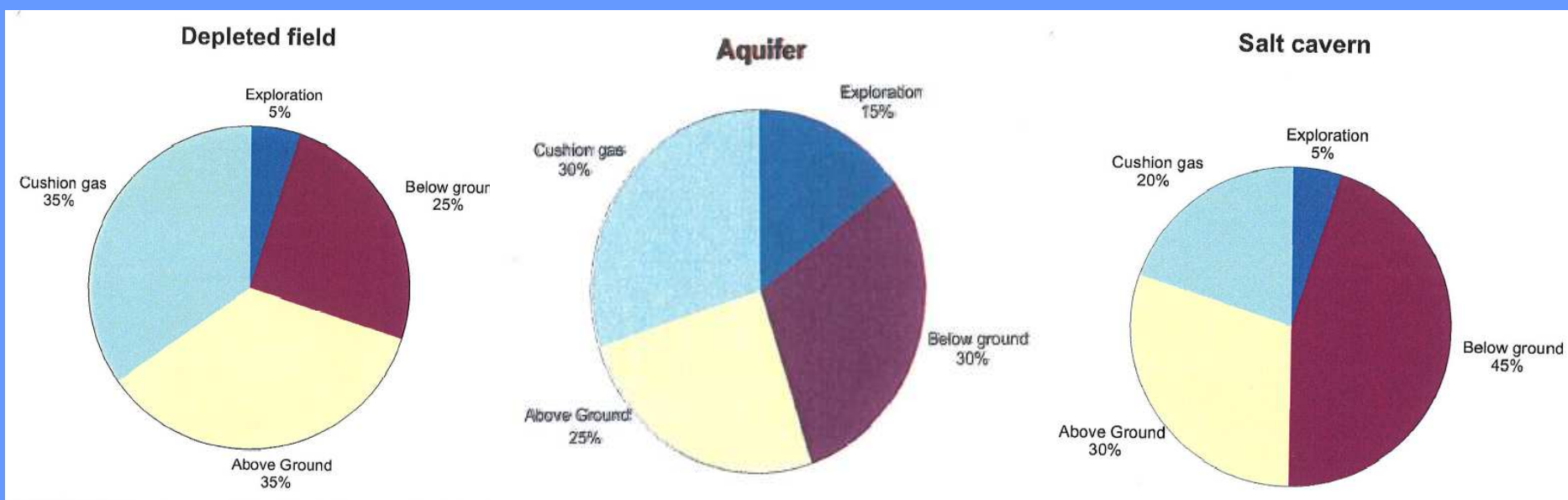
- investment costs for salt caverns vs size



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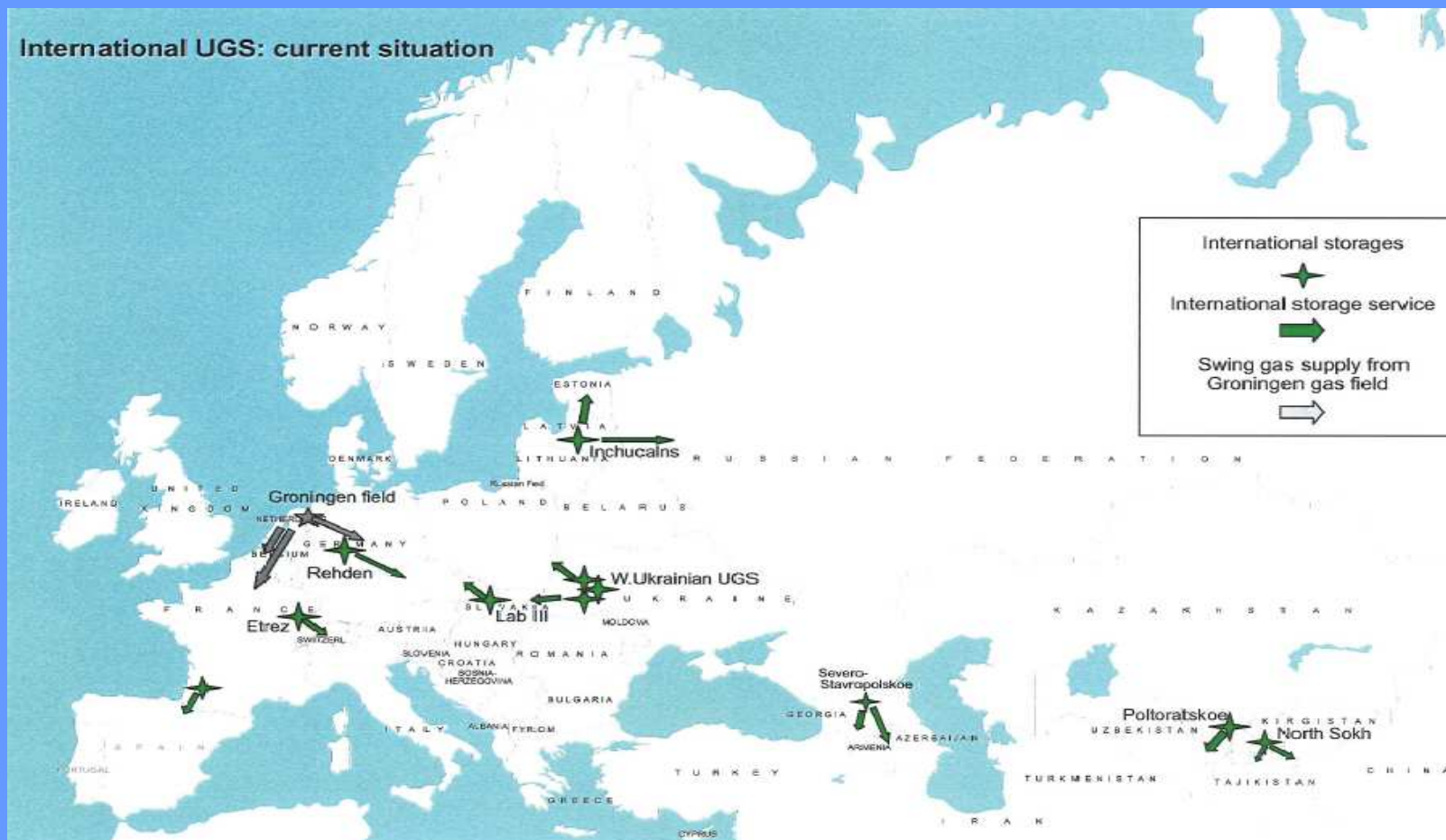
- investment cost breakdown



# Study on Underground Gas Storage in Europe and Central Asia

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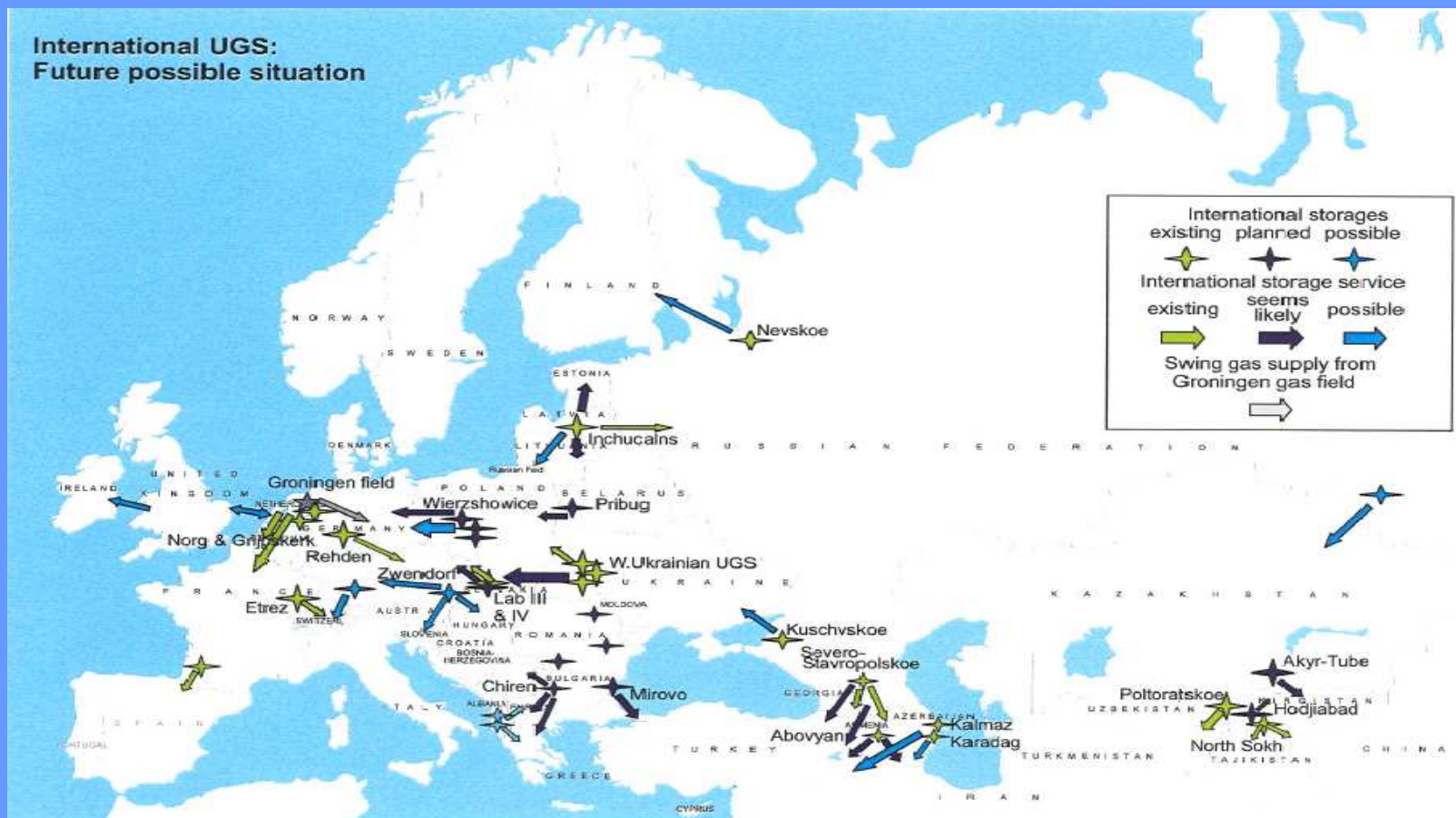
- « current » transnational modulation.



# Study on Underground Gas Storage in Europe and Central Asia

The First Study carried out in the 90's :

- « future » transnational modulation.



# **Study on Underground Gas Storage in Europe and Central Asia**

## **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.**



# Study on Underground Gas Storage in Europe and Central Asia

## 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)*



# Study on Underground Gas Storage in Europe and Central Asia

## 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)*



# Study on Underground Gas Storage in Europe and Central Asia

## 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)*



# Study on Underground Gas Storage in Europe and Central Asia

## 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,...**



# **Study on Underground Gas Storage in Europe and Central Asia**

## **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.**



# **Study on Underground Gas Storage in Europe and Central Asia**

## **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 web site,**
- **A special meeting with IGU and GSE has been organized on 24th November 2009 for sharing data bases 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 web site.**



# Study on Underground Gas Storage in Europe and Central Asia

## 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).



# **Study on Underground Gas Storage in Europe and Central Asia**

**Thanks for your attention**

