

Analysis of the Restructuring Options of NJSC Naftogaz

Part 1: Unbundling options for gas transmission

Part 2: Unbundling options for gas storage

Final report, 9 February 2016

This work is being done as part of Task 1 of the joint EC-WB Facility to support the Ministry of Energy and Coal Industry of Ukraine and NJSC 'Naftogaz of Ukraine' on advisory services and technical assistance for the reform and modernization of the natural gas sector

The views in this report constitute the consultant's views and do not necessarily reflect those of the World Bank or the European Commission



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This task is implemented by Economic Consulting Associates Ltd

Key recommendations

Transitional and target structures for transmission and storage: two-step approach

The overall unbundling process is suggested to be viewed as a two-step approach, with a **transition to full unbundling** being accomplished in two steps

- ❑ The first step, in the short term, would be a transitional structure that needs to achieve, as a minimum, the unbundling of the TSO.
- ❑ Given that the TSO is part of UTG, the proposed transitional structure is for the unbundling of both the TSO (transmission operation and assets) and SSO (storage operation and assets)

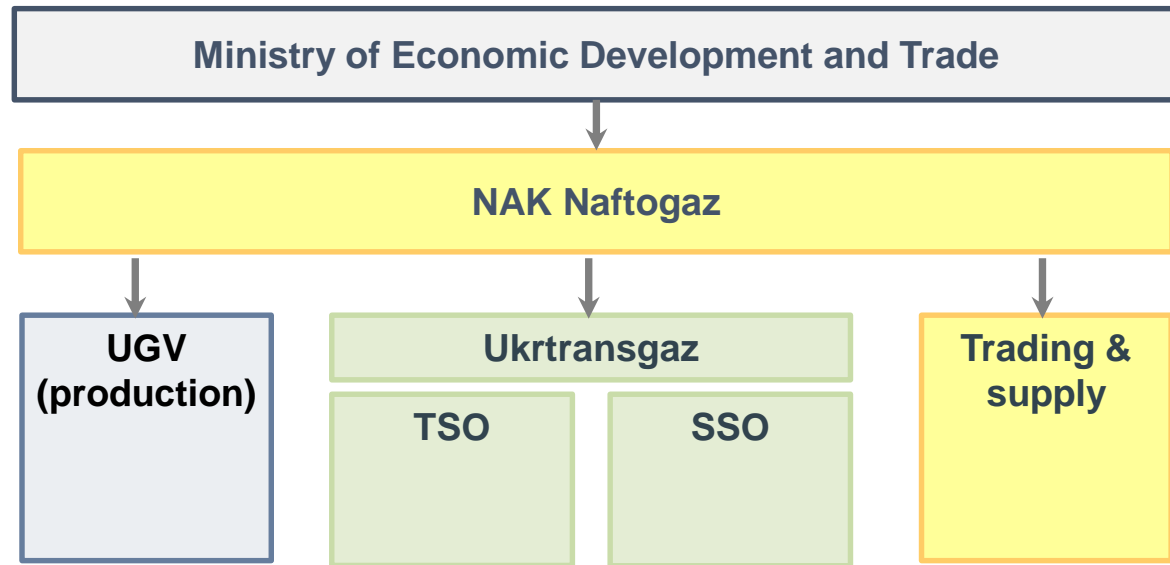
The transitional structure is shown in the next page

- ❑ The longer term possible target structure indicates a fully unbundled system with the main functions of transmission, storage, production and supply/trading separated

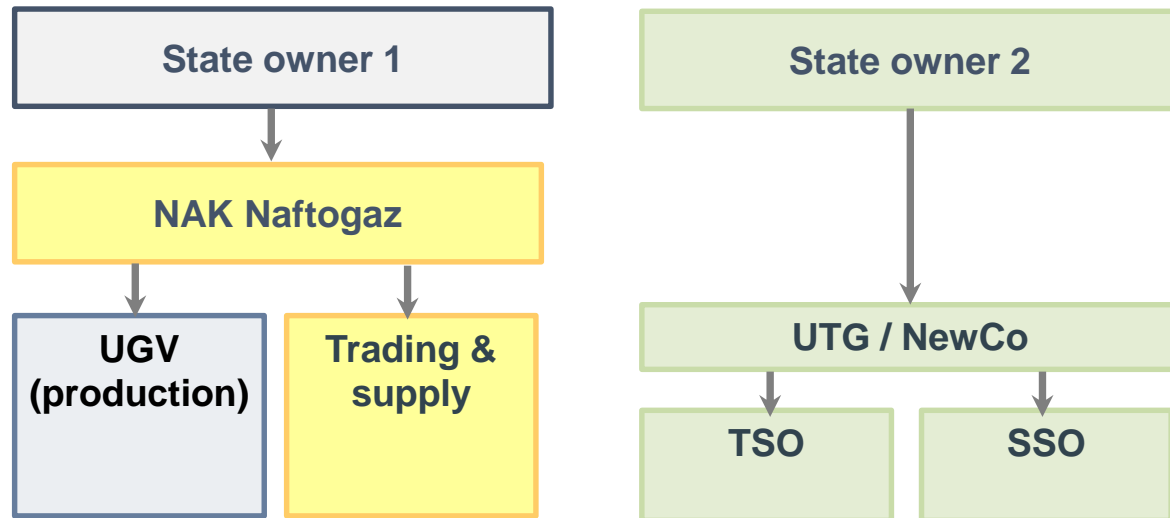
It could be achieved in say 3-5 years

Recommended transitional industry structure

Current structure



Recommended transitional structure



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Introduction

**Description and theoretical assessment of
unbundling options**

Stakeholder views and proposals

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Evaluation of options against agreed criteria

Conclusions and recommendations

Current arrangements for gas transmission and transit in Ukraine – how to unbundle?

KEY MARKET & BUSINESS FEATURES

- ❑ Naftogaz via its wholly owned subsidiary **Ukrtransgaz operates:**
 - ❑ Extensive national **gas transmission and transit pipelines**
 - ❑ The **storage** system
- ❑ The transit and transmission infrastructure is **not separated**
- ❑ **Transit** volumes fell to around **62 bcm in 2014** while **domestic transmission** (in 2012-2014) has been in the order of **40-50 bcm**
 - ❑ However, **transit tariffs represent the bulk (88%) of Ukrtransgaz revenue**
 - ❑ Transmission revenues are earned by Ukrtransgaz directly but transit revenues are received via Naftogaz
- ❑ Naftogaz has a **long term transit agreement** with Gazprom, which expires in 2019
 - ❑ This agreement has **not been assigned** to Ukrtransgaz

KEY LEGISLATIVE CHARACTERISTICS

- ❑ Conformity with 3EP as transposed by Gas Market Law (GML) requires transmission **unbundling** – question is **which model** should be adopted?
- ❑ GML allows only OU and ISO models (not ITO)
- ❑ **Naftogaz and its subsidiaries do not own the transmission and storage assets**
 - ❑ They are owned by the State of Ukraine with some ambiguity as to whether they are vested in the State Property Fund of Ukraine (SPFU) or other state entity
 - ❑ Ukrainian Law specifies that the **State must remain owner** of gas transmission and storage assets
 - ❑ Assets are currently **managed** by 100%-owned Naftogaz subsidiary, Ukrtransgaz
- ❑ We understand that the **state can grant usage rights** over the transmission system and storage facilities (and that such assets would appear on the balance sheet of the operator)
- ❑ 100% of shares of Naftogaz were transferred to the Ministry of Economic Development and Trade (MEDT) on 18 December 2015

The work is being undertaken under the auspices of the European Commission – World Bank Trust Fund

- ❑ Initial assistance to MECI¹, in refining the restructuring concept of NAK² Naftogaz (under **EC-World Bank Trust Fund: Task 1**), also contributed to developing the Gas Sector Reform Implementation Plan (GSRIP)
- ❑ The GSRIP aims to support a stable framework for Naftogaz restructuring and unbundling, covering production and price reform as well as transmission and storage unbundling

- ❑ The work undertaken by this task initially focuses on **restructuring and unbundling analysis** for the **transmission and storage** business areas of Naftogaz
 - ❑ This report focuses on **transmission**
 - ❑ A separate, accompanying report addresses **storage**
- ❑ In a next step it will also include the assessment of options for the **production** business area of Naftogaz

- ❑ The Gas Sector Reform Implementation Plan (forming part of IMF MoU) requires **transmission unbundling to be implemented by June 2016**

- ❑ Decision by the Government according to the GML should be made by January 2016

- ❑ **Working Group established** with representatives of key Ukrainian stakeholders and donors **pursuant to the order of the MECI** to coordinate this work and **facilitate decision on preferred unbundling and restructuring options**

This builds on prior work examining ownership unbundling options for transmission

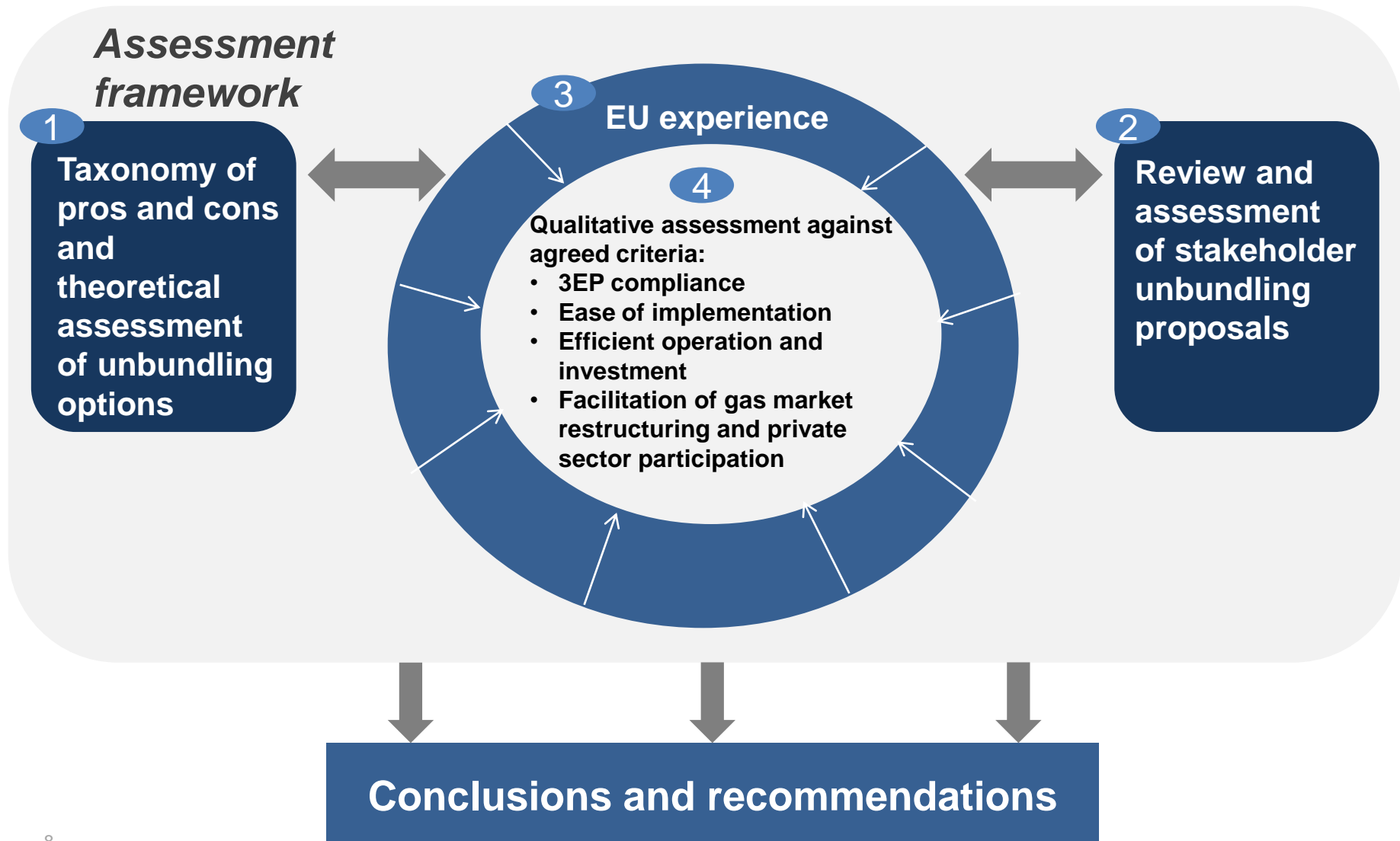
Naftogaz unbundling proposals have gone through changes but have emphasised clear separation of TSO

- An evolution of proposals from **2014 and 2015** on the basis of NAK's evolving business plan and associated implementation plan
- A number of different unbundling proposals formulated on which we provided comments
- Discussion on the implications for the adoption of the **ISO model** compared to the **OU model** in relation to:
 - The requirements for meeting the 3EP/GML unbundling provisions
 - The tension between options for a minority private shareholding with European experience, and the legal requirement to keep fixed assets as state property
- Proposal has since firmed towards a variant of **ownership unbundling** (discussed later)
 - Supported by McKinsey report (June 2015) for Naftogaz demonstrating significant adoption of OU model in EU

What we have previously proposed

- Preferred model **ownership unbundling**, primarily to ensure TSO is incentivised to invest in the upgrade of the transmission system coordinated with system operation needs
- Advised on **legal issues for implementation** to ensure compliance with 3EP
- Highlighted **key issues requiring clarification and resolution**:
 - Analysis of whether **gas transit agreement** with Gazprom can/needs to be assigned to the TSO, or **use of the assets** can be facilitated by direct agreement between NAK/other state entity and independent TSO
 - Clarification that **concessions or other similar form of usage rights over the transmission system can be given** to UTG or other entity whether under public or private (full or partial) ownership
 - How to ensure that **public legal persons exercising ownership and control over different gas activities are separate** and not under common influence (eg by the Cabinet of Ministers)

The aim is to support Government to make an informed decision on the restructuring of Naftogaz



Focus is on the structural options; good corporate governance needed irrespective of the chosen model

- ❑ The report **builds on previous analysis** (by us and others), discussions during the November 2015 Kiev 'mission', subsequent stakeholder proposals, and further meetings and a presentation to the Working Group of our draft report in Kiev in January 2016
 - ❑ We attempt to **distil the main features and issues** requiring to be addressed and resolved to arrive at a decision on the preferred unbundling option for gas transmission/transit
- ❑ The present report examines **transmission in isolation** – storage is assessed separately in an accompanying report
 - ❑ The report **does not propose the specific public body that should exercise ownership control of the TSO** (or of other gas sector commercial activities), but this should be :
 - ❑ a body consistent with the principle of **separating ownership of system operation and transmission from supply and production**
 - ❑ **addressed immediately in the next phase** of the work
 - ❑ consistent with **principles of good corporate governance**

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The unbundling options

EU Third Energy Package:
Ukraine Gas Market Law*:

three unbundling options (OU, ISO, ITO)
prescribes one of only **two** options (OU, ISO)

OU

Vertically
integrated
undertaking

Separate
↔
Owners

Transmission
system
ownership

Transmission
system operation

ISO

Vertically
integrated
undertaking

Separate
↔
Subsidiary

Transmission
system
ownership

Separate
↔
Owners

Transmission
system operation

Available options under the Ukraine Gas Market Law

ITO

Vertically
integrated
undertaking

Separate
↔
Subsidiary

Transmission
system
ownership

Transmission
system operation

increasing regulatory and control requirements

* The Law of Ukraine "On the Natural Gas Market" prescribes the use of either the OU or the ISO option but not the ITO model. Therefore the ITO model is not a possible option in Ukraine

Description of unbundling options - Features and main implementation options

OU

- ❑ **Totally separated** transmission company (from production, supply and trading) owns and operates the system
- ❑ **No common shareholders** between transmission and other activities
- ❑ **No common board or management** members in the respective companies

- ❑ **UTG or newly incorporated company** that is owner or exercises ownership rights over transmission assets (through a concession or other instrument), **and**
- ❑ UTG (or NewCo) shares and system assets **'owned' by different public body** to that having the NAK shareholding

ISO

- ❑ **Assets** may remain with the vertically integrated undertaking, but in a legally and organisationally independent entity, or an independent owner separate from system operation
- ❑ The **network is managed and controlled by** an independent company, the **ISO**
- ❑ Beyond initial costs of certification, **greater regulatory monitoring costs** (approval of contract between owner and ISO, monitoring of communications and relations between the two, dispute resolution, etc)

- ❑ **Naftogaz remains shareholder of UTG, which becomes 'owner' of the system and new company established to be ISO, or**
- ❑ **Other state entity (eg SPFU) owns system assets (via new legal entity), new company set up as ISO**

ITO

- ❑ The vertically integrated company **retains ownership** of network assets, but via a separate legal entity
- ❑ **Organisational and governance measures** to ensure that transmission network activities are separate – and operate independently - from production and supply
- ❑ More **onerous regulatory tasks** – monitoring of commercial and financial relations between different businesses, approval of services provided by related entities, review and approval of Board changes, etc

- ❑ **Naftogaz remains shareholder of UTG, which becomes 'owner' of the transmission system and remains system operator**
- ❑ Requires **detailed rules** regarding independence of management and board, use of contractors, etc

Description of unbundling options - Theoretical advantages



OU

- ❑ **Increased independence** of network management and greater focus on transmission activities
- ❑ **Reduced risk of insufficient investment**
- ❑ **Reduced scope for discrimination** against non-integrated entities, thereby facilitating competition
- ❑ **Facilitation of privatisation** of businesses in competitive sector and/or private sector participation in transmission (profile of investor and expertise in system operation is very different to that for trading/supply)
- ❑ **More transparent**

ISO

- ❑ **Lower** (but non-trivial) **cost** of unbundling
- ❑ **Could facilitate private sector participation**, particularly as the network in Ukraine must remain in public ownership (but this can also be achieved under OU with granting of concession or similar usage right)
- ❑ Addresses the issue of **non-discriminatory access** to the transmission system (but not that of investment adequacy)

ITO*

- ❑ Should **retain incentives for** continued and sufficient **investment** in transmission
- ❑ The **overall cost of capital should not be affected** (as the level of integration and size of the company is largely unaltered), provided NAK, as parent company, develops a strong balance sheet
- ❑ May retain **synergy benefits** (vertical economies of scale and scope), at least within a NAK group perspective, although there are restrictions under 3EP on intra-group transactions
- ❑ Addresses the issue of **non-discriminatory access** to the transmission system

** Note that this option is included for completeness but is not permitted under the GML.*

Also note that the benefits of integration with the holding company accrue to the holding company but not necessarily to competitors

Description of unbundling options - Theoretical disadvantages



OU

- ❑ **One-off transaction costs** to establish new entity (including potential disputes over property rights* with respect to certain assets)
- ❑ **'Double mark-up problem'** if downstream market is not competitive**
- ❑ Potential to **inflate capex** (although the risk of **underinvestment**, eg under the ISO and ITO models, is generally considered to be more detrimental to consumer interests given the 'essential' nature of the infrastructure)

* In practice legal disputes are likely to be limited as between two state owned companies

** Though OU model is the most likely option to promote downstream competition

ISO

- ❑ **Interface problems and misaligned incentives:** Large information flows on operational status
Coordination/duplication in planning, maintaining and expanding the network
Complicates decision-making and **incentives for investment**, leading to **significant risks for underinvestment**
Roles and responsibilities for emergencies
- ❑ Might be too focused on **short-term optimisation** rather than long term infrastructure development
- ❑ **Increased regulatory burden** and costs for ensuring independence, compared to OU
- ❑ Relatively **little experience in large systems**

ITO

- ❑ **Problem of vertical integration** (discrimination against non-affiliated entities) **remains** and may be difficult to police in the absence of strong regulation
- ❑ **Unclear what the benefits of common ownership are**, if legal separation is effective, though assets may play a role in balance sheets
An ownership unbundled TSO in Ukraine will be of sufficient size to be able to attract capital at reasonable and maybe lower cost
- ❑ **Heaviest regulatory burden** and increased requirements for monitoring, eg for new capex for competitors to enter the market

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Part 1: Unbundling options for gas transmission

Introduction

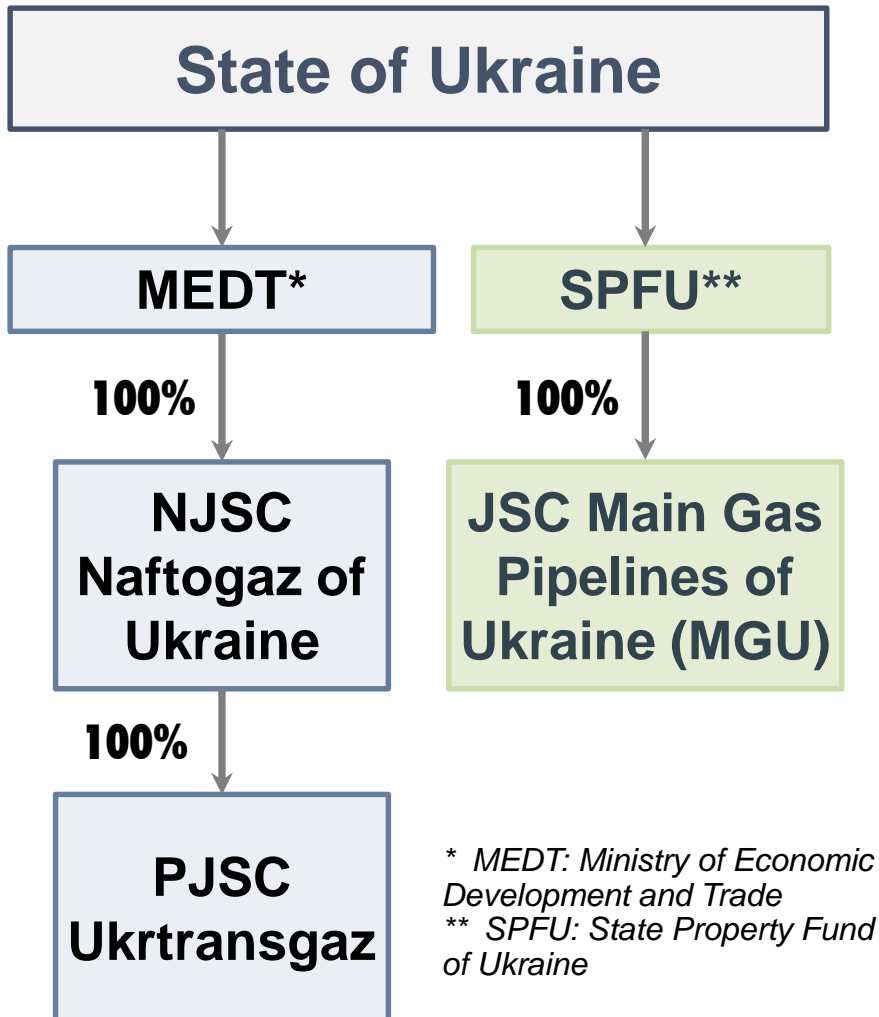
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Naftogaz proposal: *Ownership unbundling, new TSO, without storage, SPFU owner*

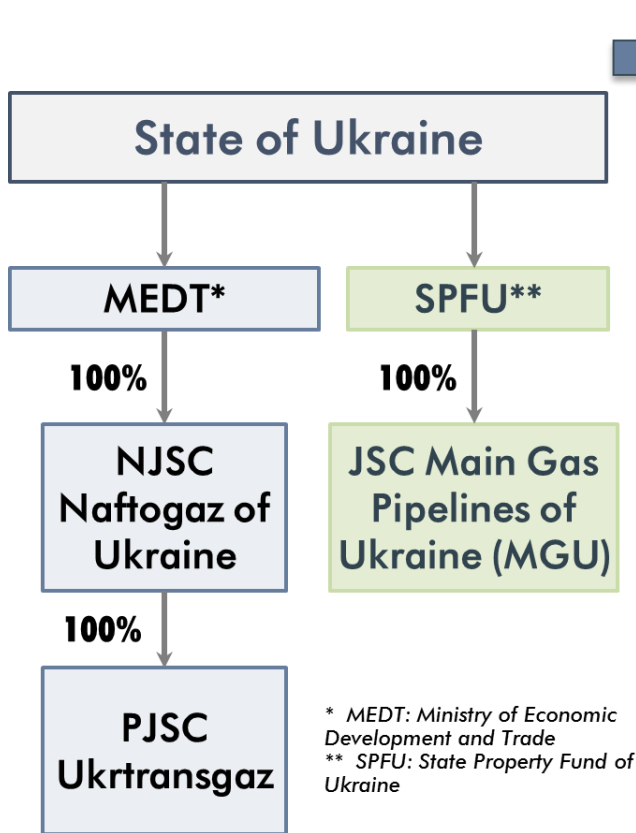


- ❑ Transmission system assets **separated** from storage⁺
- ❑ The **SPFU** exercises **ownership rights** over transmission assets on behalf of the State and also owns TSO
- ❑ A new company, '**MGU**', is assigned TSO; storage (and other non-core functions) remain with Ukrtransgaz which in turn stays within the Naftogaz group
- ❑ MGU exercises “commercial management rights”
- ❑ Might require legislative amendment to ensure:
 - ❑ MEDT* does not exercise control of SPFU for the relevant assets/activities
 - ❑ SPFU does not exercise control over gas and electricity production and supply businesses

+ Storage is considered in accompanying report part 2

Naftogaz proposal

Pros and cons



Might not require changing the ownership of the transmission system assets (if these are indeed vested in the SPFU)

Chance to establish TSO with good corporate governance practices and efficient staffing and operating levels

Ensures 3EP compliance and does not preclude further restructuring of Naftogaz

Conducive to attracting private sector partner (but depends crucially also on predictable and stable regulation)

Requires contracts to be assigned to MGU and for staff to be employed by the new company (delays)

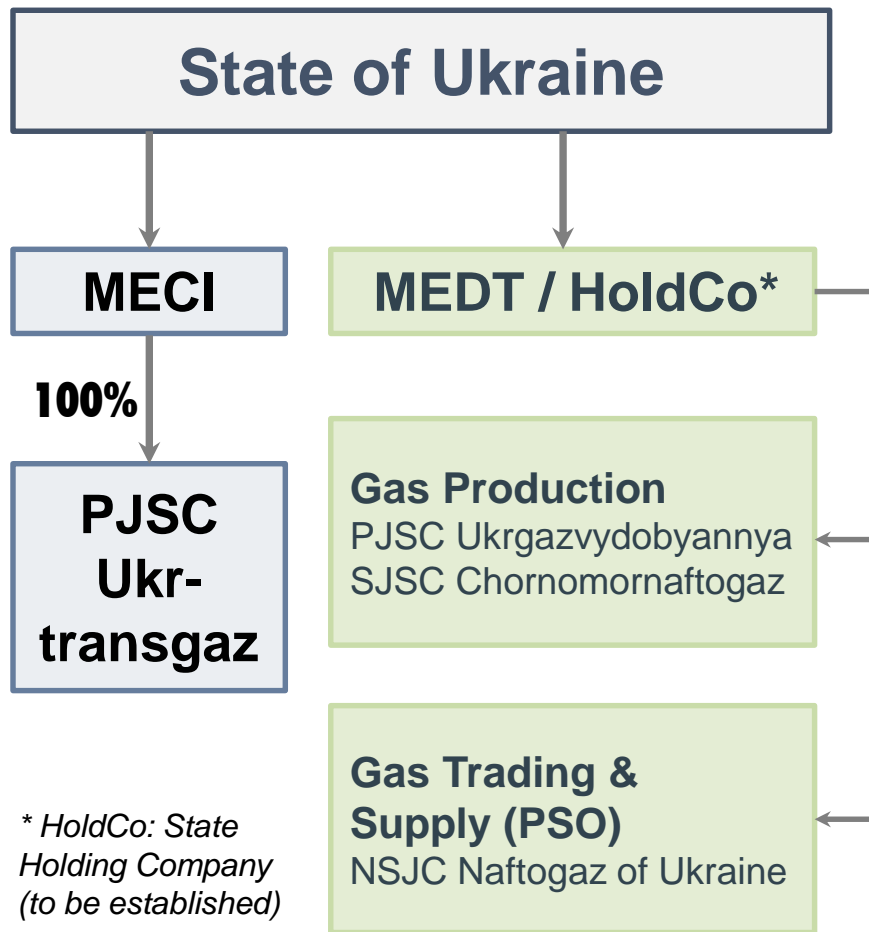
Also requires all relevant assets are identified and transferred to MGU, else risks MGU remaining dependent on UTG

Establishment of a new, self-standing and fully operational TSO would be difficult to achieve in line with the unbundling timetable (ie by June 2016)



***Does the transit agreement with Gazprom need to be renegotiated?
If Gazprom consent to transfer the agreement (from NAK) to MGU is not given, could MGU entitlement to transit revenues be ensured by separate agreement between NAK and MGU?***

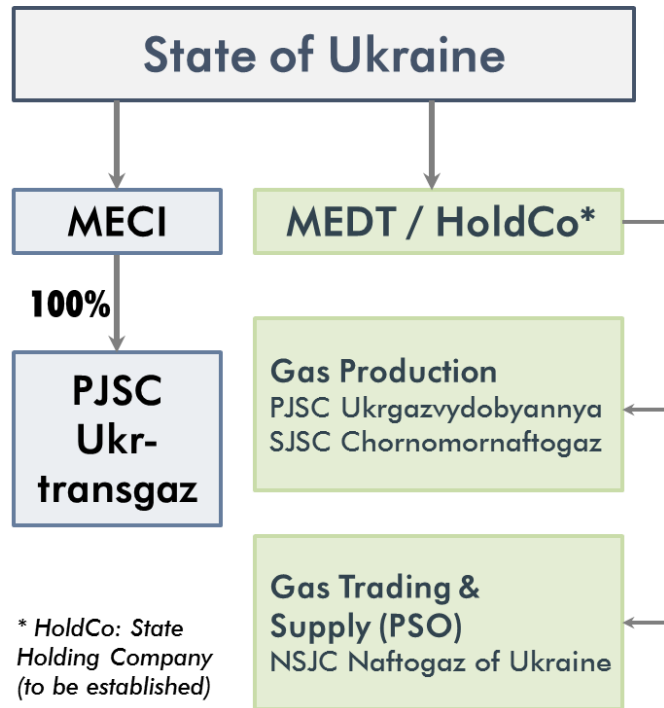
MECI proposal: *Ownership unbundling, UTG remains TSO, with storage, MECI is owner*



- ❑ Transmission system assets **bundled** with storage
- ❑ The **MECI** exercises **ownership** rights over transmission assets on behalf of the State
- ❑ **Ukrtransgaz** is assigned TSO (as per current arrangements) with MECI as shareholder
- ❑ Gas production, trading and supply activities transferred to MEDT (and ultimately HoldCo)
- ❑ Part of broader MECI reform vision for gas, electricity and oil where:
 - ❑ Natural monopoly activities are placed within the purview of MECI
 - ❑ Potentially competitive activities are managed by MEDT and/or privatised

MECI proposal

Pros and cons



Does the transit agreement with Gazprom need to be renegotiated?
If Gazprom consent to transfer the agreement (from NAK) to UTG is not given, could UTG entitlement to transit revenues be ensured through an agreement between NAK and UTG?



Contracts relating to O&M of the transmission system would not need to be transferred to a new operator

Staff would not need to be hired by a new operator

Ensures 3EP compliance and facilitates further restructuring (but requires strong management and regulatory drive)

Unbundling is simpler and therefore feasible by June 2016

There may be a conflict between MECI's policy role for the sector as a whole and its shareholding of Ukrtransgaz⁺

TSO would remain encumbered with costs of large number of staff (~23,000)

Unclear whether MECI and MEDT considered fully 'separate bodies' given common CMU supervision, unless some specific rules added to ensure separate decision making

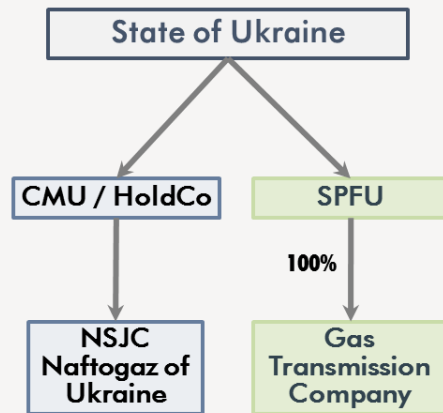
Misses chance to establish new TSO with best practice governance and efficient staffing, but can be achieved with a more feasible timeline over the longer term

⁺ Note: Under 3EP, MECI could not exercise ownership control over both upstream and downstream electricity assets and gas assets

Other stakeholder views (1)

MEDT considerations*

- ❑ *Ownership unbundling, new TSO or UTG, without storage, SPFU owner*



- ❑ *Transmission system assets owned by the SPFU, which would **also own the transmission company***
- ❑ Potentially **competitive sectors** remain with the CMU** (probably, but not necessarily, within Naftogaz) until **HoldCo** for 'strategic' state-owned enterprises (SOEs) is established
- ❑ Preference for **storage to be separated out** as a business independent from both the unbundled TSO and Naftogaz
 - ❑ For reasons of transparency
 - ❑ Because of concerns about abuse of dominant position

Advantages:

- ❑ Does not require changing the ownership of the transmission system assets from the SPFU (if these are indeed vested in the SPFU)
- ❑ If the transmission company remains Ukrtransgaz, avoids need to transfer contracts and staff
- ❑ Ensures 3EP compliance and consistency with broader SOE reform

Disadvantages of MEDT proposal:

- ❑ Unclear whether HoldCo and SPFU considered 'separate bodies' given common CMU supervision
- ❑ May be complications in transferring UTG ownership to SPFU and must ensure that SPFU does not exercise control over competitive gas and electricity activities (but this applies to other options too)
- ❑ If TSO remains Ukrtransgaz, misses chance to establish new TSO with best practice governance and staffing levels
- ❑ Alternatively, if a new company is formed, requires separation of assets, rehiring staff, etc

* *Informal 'proposal' discussed with Ministerial adviser*

** *CMU was NAK owner at the time; presumably this would now be current shareholder, MEDT.*

Other stakeholder views (2)

❑ National Energy and Utilities Regulatory Commission (NEURC)

- ❑ Does not have authority over choice of unbundling option
 - But needs to certify it
- ❑ **Prefers OU** to other models

❑ Presidential Administration

- ❑ Assess **all options** in context of overall vision for sector reform
- ❑ Main criterion for choosing should be **efficiency** and **maximising competition**

❑ Ukrtransgaz

- ❑ Main goal should be to **ultimately attract private partner**
- ❑ Establish **new company** (separate owner) with only those assets in UTG related to gas transport transferred (as per Naftogaz proposal)

❑ Ministry of Finance

- ❑ Key issue is to **ensure legality and separation** of company ownership
- ❑ Naftogaz perhaps owned by HoldCo if formed, with **UTG in SPFU** (as per MEDT proposal)

Summary of stakeholder views and proposals: generally in favour of OU model



- ❑ Broad consensus to:
 - ❑ **Adopt OU model** as the option that better supports gas market development and facilitates efficient operations and investment
 - ❑ Ensure that there is effective **separation of ownership and control** between bodies responsible for transmission and other gas market activities



- ❑ Disagreement about:
 - ❑ Whether to establish **new transmission company** or retain function within **UTG**
 - ❑ **Identity of shareholders;** options are:
 - Naftogaz owned by MEDT/HoldCo
 - TSO owned by SPFU or MECI
 - ❑ Treatment of **storage** facilities (discussed in separate report)

Notwithstanding broad agreement about ownership unbundling, key issues remain to be resolved

Commercial / contractual

- Obstacles might arise to assigning the **transit contract** with Gazprom, especially given ongoing Stockholm arbitration
- An alternative, to avoid the need for obtaining Gazprom consent to assignment, might be to have a back-to-back agreement with the TSO for payment of the transit fees.
 - However, this could limit the possibility of introducing changes, to the tariff setting regime, from distance and volume based tariffs to the proposed entry-exit tariffs (as required by 3EP)
- An assignment could be a first step though would not solve some contract amendments that might be required to remedy provisions in contradiction with 3EP
- This issue would apply to **ITO** and **ISO** models as well as OU

Structural

- Should a **new TSO entity** be created or the **functions be retained within UTG**?
- The latter option would seem **lower cost** to implement (and might cause fewer problems with the transit contract), but new entity might provide better opportunity for **establishing good governance** at the outset

Regulatory

- An **independent and authoritative regulator is critical** to certify the unbundling process, set cost-reflective tariffs and provide incentives for efficient operation and investment

Corporate governance

- Mechanisms for ensuring **effective separation of public 'bodies'** exercising control over the different companies
- Which public bodies should be the shareholders?
 - Only **one shareholder per business entity** provides greater clarity of roles
- Does **separation of sector policy formulation from control over commercial activities** better align roles and incentives?
- **Empowerment of board and management of TSO** and effective governance also for ownership entity

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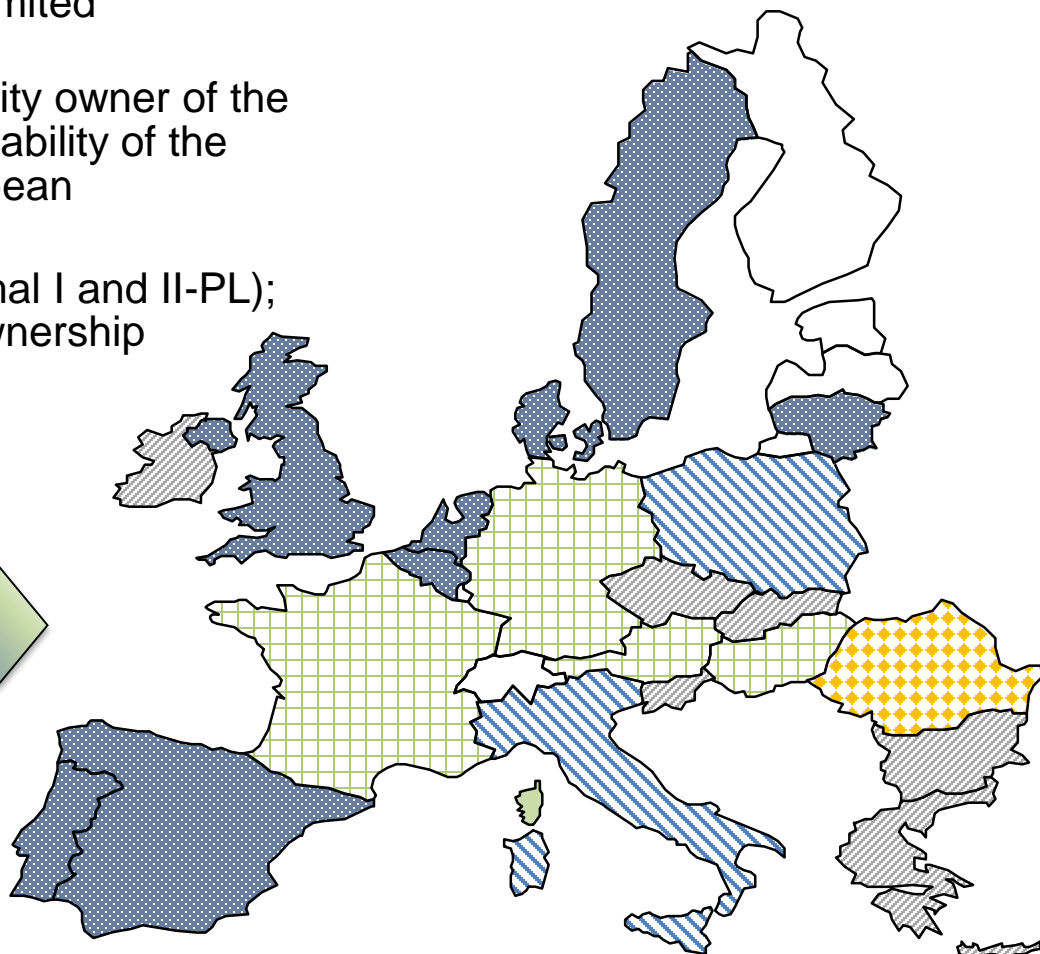
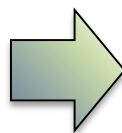
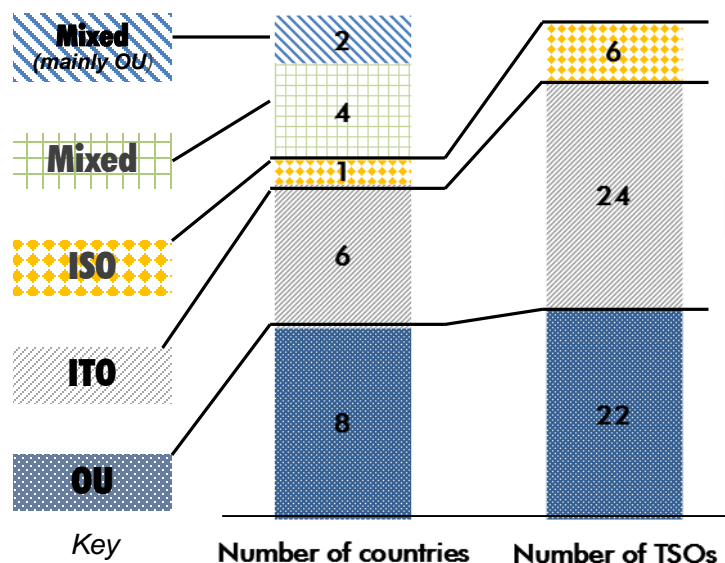
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EU experience* indicates a preference for the ITO and OU models, with more limited adoption of ISO

Most gas TSOs (**88%**) have chosen the options of **OU** (~42%) and **ITO** (~46%)





The ISO model has been implemented in limited circumstances eg:

- ❑ In **Romania**, Tranzgaz (the ISO) is majority owner of the transmission system; therefore the applicability of the model has been questioned by the European Commission
- ❑ For major transit pipelines (TAG-AT, Yamal I and II-PL); in the case of the latter, the ISO is the ownership unbundled TSO








* Based on DG Energy data on notifications received as of 2015

Countries neighbouring Ukraine have variously adopted the available unbundling models

Country	TSO	Model	Ownership	Gas transported (bcm)	Pipe-lines (km)	Gas consumption (bcm)	Key sector features
Hungary 	FGSZ	ITO	100% owned by MOL Group, which in turn is 25% owned by the Hungarian state and 75% by private investors	12	6,000	8	75% imports 25% domestic production (steadily declining) Imports increasingly from W Europe (Russian imports are about 45% of total imports)
Poland 	Gaz-System	OU	100% state-owned, with the Minister of Economy (includes energy portfolio) managing the state's participation (The separate Ministry of Treasury owns and manages other gas activities)	50	10,000	16	70% imports 30% domestic production 80% of imports from Russia, but expected to fall with new LNG terminal Key transit country for Russian gas
Romania 	Transgaz	ISO	Owned by the Romanian State (59%), Fondul Proprietatea SA (15%) and other shareholders (26%)	30	13,000	12	1/3 imports (from Russia) 2/3 domestic production (steadily declining)
Slovakia 	Eustream	ITO	Fully owned by incumbent gas company SPP, active in the trade and supply of natural gas. SPP in turn is 51% owned by the National Property Fund (part of the Slovakian State), and 49% by Czech group EPH	73	2,270	4	Almost 100% imports (from Russia) Key transit country for Russian gas

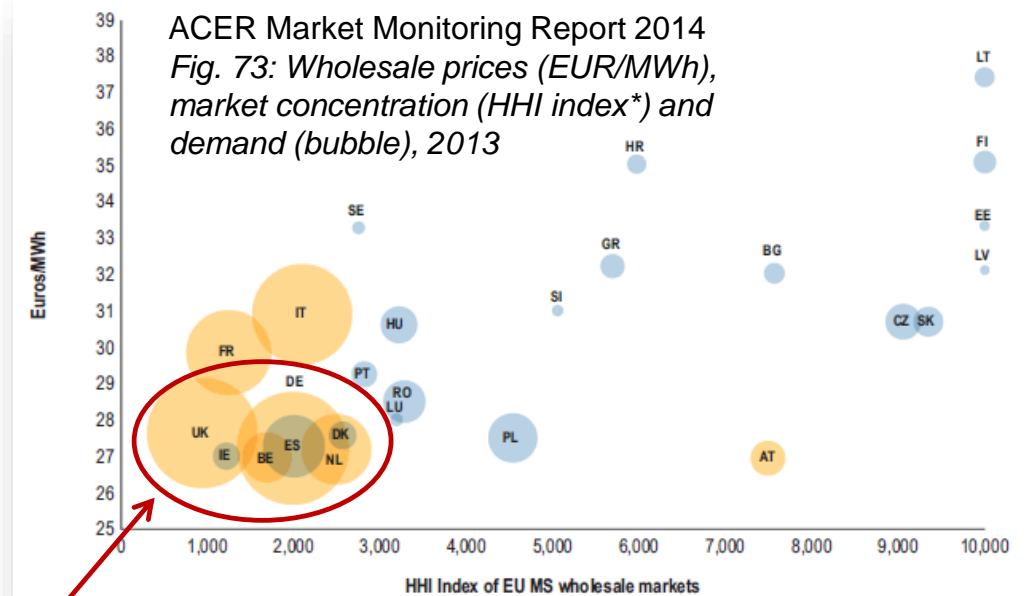
Most of the larger, more mature EU markets have implemented OU (*exceptions are DE & FR, but even here many TSOs are OU*)

Country	TSO	Model	Ownership	Gas transported (bcm)	Pipelines (km)	Gas consumption (bcm)	Key sector features
Belgium 	FLUXYS	OU	Owned by Fluxys Holding (90%). The remaining shares (10%) are quoted on the Brussels stock exchange	40	4,100	15	100% imports from varied sources (Netherlands, Norway, UK, Qatar-LNG)
Italy 	SNAM RETE GAS	OU	Largest of 3 TSOs. Subsidiary of Snam, which is listed on Italian Stock Exchange. "Cassa" has 30% stake, ENI -the incumbent gas company- 8.5% (financial interest), others < 2%	116	32,300	60	90% import dependent, 60% accounted for by Russia and Algeria, followed by Libya, Qatar and Netherlands
Netherlands 	Gasunie Transport	OU	Subsidiary of Gasunie, which transports gas in the Netherlands and the northern part of Germany. Gasunie is 100% state owned. Ministry of Finance represents the state's shareholder interest.	80	12,000	32	Largest EU gas producer Net exporter of gas, but also imports About 40% of the total volume of gas used domestically
Spain 	ENAGAS	OU	State-owned holding company 'SEPI' holds 5%, remaining 95% of shares are on the open market	28	10,000	26	Well diversified supply (60% LNG - 40% pipeline)
UK 	National Grid	OU	Wholly owned subsidiary of National Grid plc, which is listed on the London Stock Exchange	67	7,600	67	From self-sufficiency to significant importer (2/3 of consumption) from varied sources (mostly Neth/lands, Norway and Qatar)

Some key lessons from European experience: OU model more consistent with competition

- Although other factors are clearly at play (such as underlying resource costs, coincident reform efforts, available supply sources, etc), **markets with OU do tend to be characterised by more effective competition** as given by indicators of market concentration and entry-exit activity (and other measures)

- eg Belgium, Denmark, UK, Netherlands and Spain



- Where OU is undertaken within a state-owned sector, the state's shareholder rights are sometimes exercised by a **Minister without the energy portfolio** (eg Netherlands) and other times **by the energy (or other sector responsible) Minister** (eg Denmark and Poland)

* HHI: The Herfindahl-Hirschman Index, a commonly accepted measure of market concentration. It is calculated by squaring the market share of each firm competing in a market, and then summing the resulting numbers. The HHI number can range from close to zero (highly competitive market) to 10,000 (monopolistic market)

Some key lessons from European experience: ISO model not common (in gas or electricity)

- ❑ The **ISO model is rarely adopted** and seems to apply mostly in situations where:
 - ❑ There are **constraints or difficulties for ownership changes** eg transit pipelines such as Yamal I and II
 - ❑ The main (ownership unbundled) **system TSO is certified as an ISO for other parts of the system**
- ❑ The ISO model is also **not widely adopted in EU electricity markets** where reform is much more advanced:
 - ❑ The ISO model is even less common than in the gas sector (only 3 out of 51 notified cases)
 - ❑ **OU predominates – 70%-80% of total electricity TSOs**



Some key lessons from European experience: ITO model popular but markets still evolving

- ❑ The prevalence of the **ITO model** likely reflects that **gas markets remain relatively underdeveloped** in many countries:
 - ❑ Do incumbents resist OU precisely because it will facilitate competition more effectively?
 - ❑ The larger and more mature markets seem to favour OU (eg Netherlands, Spain, UK)
 - ❑ **Some countries that started with ITO have since adopted OU** - eg France (1 of 2 TSOs), Germany (largest TSO) and Italy

Examples of large markets with OU:



NL



ES



U
K

Examples of countries moving from ITO to OU:



FR



DE



IT

Analysis of the Restructuring Options of NJSC Naftogaz

Part 1: Unbundling options for gas transmission

Introduction

**Description and theoretical assessment of
unbundling options**

Stakeholder views and proposals

EU experience

**Evaluation of options against
agreed criteria**

Conclusions and recommendations

Criteria for assessment



1. Compliance with 3EP, facilitation of:

- ❑ Competition in the gas sector
- ❑ TSO independence
- ❑ Non-discrimination between access users
- ❑ Transparency of operation and decision-making

3. Efficiency / effectiveness of future operation and investments

- ❑ Providing incentives for optimal investment and efficient operation
- ❑ Facilitating access to required finance and expertise
- ❑ Promoting the market, upstream, trading, integration with EU
- ❑ Transition to a fully competitive market

2. Practice in EU countries

4. Practicalities/ease of implementation, specifically minimisation of:

- ❑ Implementation costs (including corporate restructuring costs)
- ❑ Ongoing regulatory requirements and costs
- ❑ Other legal and related costs (that might arise eg with existing contracts for transmission)

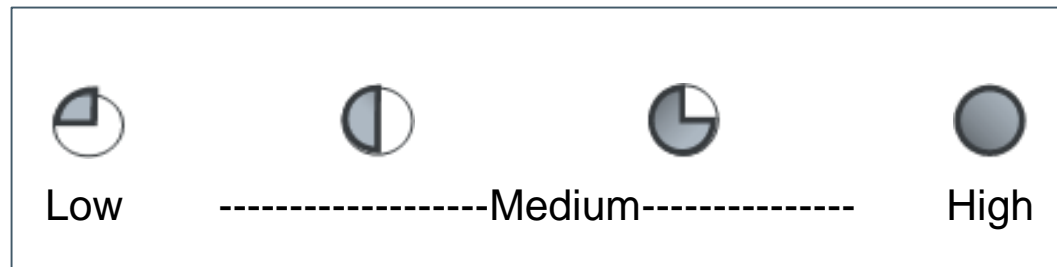
5. Facilitating further NAK restructuring

- ❑ Implications for storage unbundling
- ❑ Any constraints on other restructuring?

6. Attracting possible future JV/equity partner or know-how transfer

The unbundling options are qualitatively assessed against the common set of agreed criteria

- We rate the options against each criterion showing the **degree (from low to high) to which they meet each respective criterion**
- We then determine an **overall ranking** of options
- Such ratings are ***inevitably subjective***, but they do serve to give an overall impression of how we consider the alternative options perform against the agreed objectives









Criteria	Assessment
1 Compliance with 3EP	OU is the preferred 3EP model, but must ensure effective separation within the State given prohibition to privatise transmission assets in Ukraine
2 Practice in EU countries	ITO model is most common currently, but OU is widespread, increasingly chosen by Member States and more strongly correlated with effective competition
3 Efficiency of operation and investments	Fully integrates investment, long run planning and short run operation of the system and provides incentive to make capacity available to facilitate more trading
4 Ease of implementation	Most significant drawback of OU is its upfront costs of reorganisation/physical separation and raises particular contractual issues with respect to transit for Gazprom
5 Facilitating further NAK restructuring	Does not place constraints on (and may promote) restructuring of NAK and likely to be more robust to future evolution of gas industry (competition, etc)
6 Attracting future JV/equity partner	This is more dependent on transparency and stability of regulatory regime, but OU likely to be more conducive to attracting investment compared to asset-light ISO model







Unbundling options	Rating against each assessment criterion					
	1.Compliance with 3EP	2.EU practice	3.Efficiency of operation and investment	4.Ease of implementation	5.Facilitation of further NAK re-structuring	6.Attracting future JV/ equity partner
OU						
ISO						
ITO						









Evaluation of OU model: Most consistent with market development but entails up-front costs

Criteria		Assessment
1	Compliance with 3EP	 OU is the preferred 3EP model (maximises independence and non-discrimination), but must ensure effective separation within overall State ownership in Ukraine
2	Practice in EU countries	 ITO model is most common currently, but OU is widespread, increasingly chosen by Member States and more strongly correlated with effective competition
3	Efficiency of operation and investments	 Fully integrates investment , long run planning and short run operation of the system and provides incentive to make capacity available to facilitate more trading
4	Ease of implementation	 Most significant drawback of OU is its upfront costs of reorganisation/physical separation , but regulatory burden and therefore ongoing costs are lower
5	Facilitating further NAK restructuring	 Does not place constraints on (and may promote) restructuring of NAK and likely to be more robust to future evolution of gas industry (competition, etc)
6	Attracting future JV/equity partner	 This is more dependent on transparency and stability of regulatory regime, but OU likely to be more conducive to attracting investment compared to asset-light ISO model

Evaluation of ISO model: Secures non-discriminatory network access but complicates investment decisions










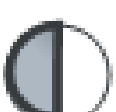








Criteria		Assessment
1	Compliance with 3EP	 Compliance ensured if implemented effectively and should promote non-discrimination of system users , but requires more detailed regulation and oversight
2	Practice in EU countries	 Not commonly adopted ; usually applied where OU is difficult (eg foreign ownership of transit pipelines) and/or where 'main' TSO is operator of other system assets
3	Efficiency of operation and investments	 Generally perceived to be the biggest disadvantage; creates interface problems between asset owner and operator, and generally results in under-investment
4	Ease of implementation	 Initially, simpler to adopt than OU as it does not require assets (and contracts related to these) to be transferred , but ongoing transaction and regulatory costs are larger
5	Facilitating further NAK restructuring	 Does not hinder restructuring options for other NAK business lines, but may be inconsistent with refocusing NAK on production, trading and supply
6	Attracting future JV/equity partner	 Made difficult by interface problems with asset owner and the lack of assets upon which to earn a regulated return (allowing return for ISO would raise costs)

Evaluation of ITO model: fewer upfront costs but not conducive to supporting ongoing reform & investment

Criteria		Assessment
1	Compliance with 3EP	 Compliance can be ensured but requires effective regulation; less consistent with principles of independence, non-discrimination and transparency
2	Practice in EU countries	 Consistent with the most common unbundling model in the EU gas sector. However, ITO is generally associated with lesser developed and less competitive markets
3	Efficiency of operation and investments	 Allows for integrated management of the system but may result in limiting investments which benefit competitors (eg in cross-border capacity with EU neighbours)
4	Ease of implementation	 Simplest of the options to implement (preserves the Naftogaz structure) in the first instance, but ongoing compliance and regulatory costs are higher
5	Facilitating further NAK restructuring	 Inconsistent with the preferred NAK approach and planning; unlikely to further the reform and transformation of the gas sector in Ukraine
6	Attracting future JV/equity partner	 Difficult to encourage private participation , which would entail buying into a wholly-owned subsidiary of Naftogaz rather than investing in stand-alone entity

The overall assessment and ranking favours the OU model, although implementation costs can be high

Rating against each assessment criterion

Unbundling options	1. Compliance with 3EP	2. EU practice	3. Efficiency of operation and investment	4. Ease of implementation	5. Facilitation of further NAK re-structuring	6. Attracting future JV/ equity partner
OU						
ISO						
ITO						

OU ranks highest overall and on most criteria – exceptions are the ease of practical implementation given the higher expected cost of establishing a new separate asset-owning company (although ongoing costs are likely to be lower), and EU practice where ITO is still prevalent

Analysis of the Restructuring Options of NJSC Naftogaz

Part 1: Unbundling options for gas transmission

Introduction

**Description and theoretical assessment of
unbundling options**

Stakeholder views and proposals

EU experience

Evaluation of options against agreed criteria

Conclusions and recommendations

The OU option is preferred based on all assessments, but key implementation issues are still to be resolved

- ❑ Theoretical assessment: **OU**
- ❑ Stakeholder proposals: **OU** (although different implementation options)
- ❑ EU experience: **ambiguous** as between OU and ITO, but:
 - ❑ **ISO not common and mostly applied in non-relevant circumstances**
 - ❑ **OU generally in more competitive, larger markets**
 - ❑ **Some countries moving from ITO to OU**
- ❑ Qualitative assessment based on 6 criteria: **OU**

- ❑ Key issues:
 - ❑ **UTG or NewCo?**
 - ❑ Should the TSO be **unbundled with storage** or on its own?
 - ❑ **Which public body owns transmission assets** and exercises control over these assets?
 - ❑ What legal instrument should be used to grant usage rights over transmission assets to the transmission operator?
 - ❑ Ensuring **whoever exercises control over other state-owned segments** of the gas and electricity sector (production, supply, trading) remains independent of the TSO owner in future*
 - ❑ How can **separation between the respective public bodies** exercising control be ensured?
 - ❑ Are there **constraints arising from the gas transit (and supply) contract** with Gazprom?
 - ❑ **Who is entitled to the transit revenues** and would the restructuring entail the transfer of some Naftogaz debt?
 - ❑ Strengthening of the **independence and capacity of the regulator**

** If the TSO remains under SPFU, then other production, supply or trading entities in the energy sector could not transfer to SPFU for privatisation*

Analysis of the Restructuring Options of NJSC Naftogaz

Part 2: Unbundling options for storage

Final report, 9 February 2016

This work is being done as a part of Task 1 of the joint EC-WB Facility to support the Ministry of Energy and Coal Industry of Ukraine and NJSC 'Naftogaz of Ukraine' on advisory services and technical assistance for the reform and modernization of the natural gas sector

The views in this report constitute the consultant's views and do not necessarily reflect those of the World Bank or the European Commission



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Analysis of the Restructuring Options of NJSC Naftogaz

Part 2: Unbundling options for gas storage

Section 1: Review of options for storage unbundling

**Section 2:
Establishing storage as a separate entity – management and
operational issues**

**Section 3:
Challenges facing Ukraine's storage**

**Annex:
Glossary; gas storage technical and market background; EU
gas storage ownership**

Section 1: Review of options for unbundling storage

Introduction

- ❑ The achievement of a 3EP compliant level of unbundling requires that storage facilities are able to provide **access on a transparent and non-discriminatory basis**
- ❑ This can be achieved within a **variety of ownership and structural options** but other actions are also necessary
- ❑ The range of structural and ownership **options are described** on the following slides **and assessed against a consistent set of criteria**
 - ❑ In several European countries storage companies have remained within the trading and supply incumbent(s) eg Centrica Storage in Great Britain, E.On (now Uniper) in Germany, and Storengy (part of ENGIE formerly GdF) in France
 - ❑ A number of other countries have initially had a structure combining transmission and storage; some still do, eg Belgium, Denmark, Italy
 - ❑ The other common structure, especially where markets are more fully developed, is for transmission and storage to be fully separated in the country, but within Europe it is more complicated as a company may own transmission in one country and storage in another, such as Gasunie (Netherlands) owning TSOs and storage, and ENGIE owning storage in France and Germany while being active in various parts of the gas chain in several other countries
- ❑ Separation also necessitates that the **market has the confidence** that the storage entity can deliver the access requirements without interference from affiliates or owners
 - ❑ This can be an important consideration when deciding on ultimate structure

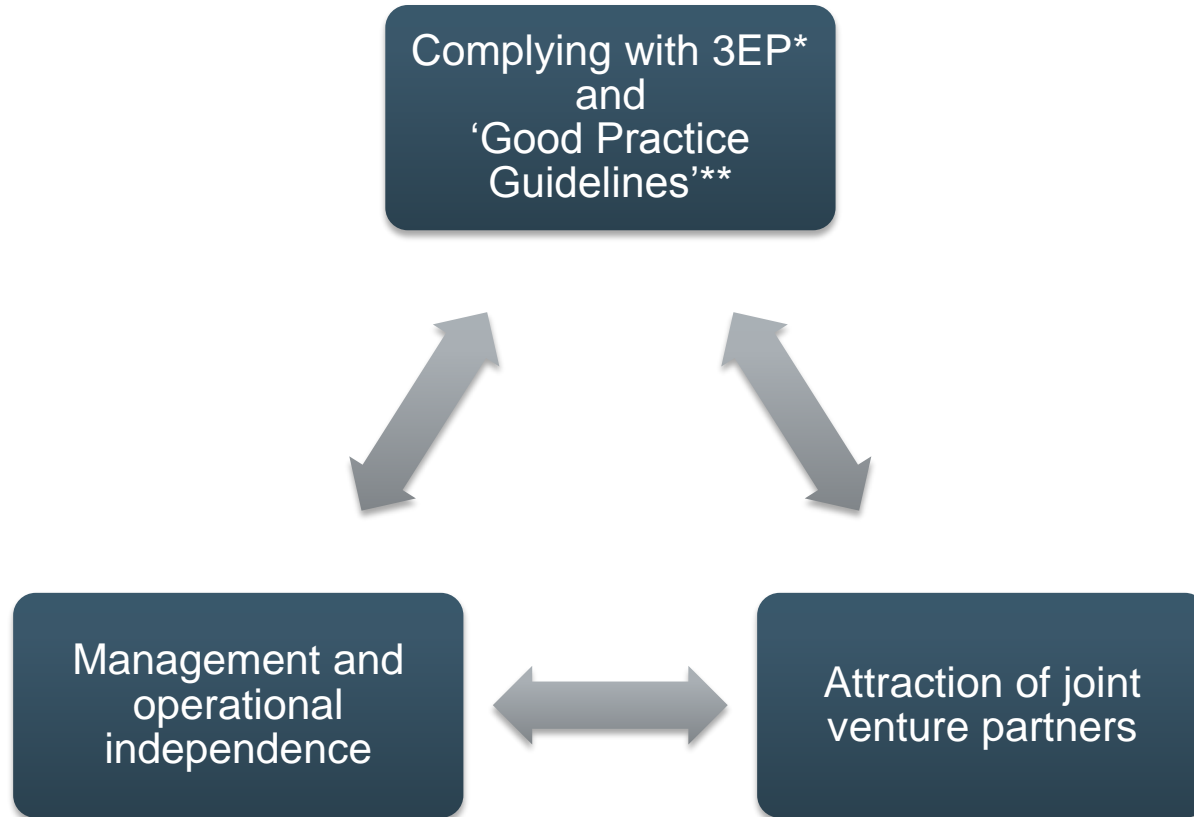
Section 1: Review of options for unbundling storage

Summary of contents

- ❑ **Background to the structural and unbundling options**
 - ❑ Key objectives
 - ❑ Third Energy Package (3EP) requirements and 'good practice'
 - ❑ Further considerations for assessing options
- ❑ **Description and evaluation of options**
 - ❑ Assumptions and options overview
 - ❑ Criteria for assessing options
 - ❑ Option 1 – Naftogaz owns and operates storage subsidiary
 - ❑ Option 2 – Storage and TSO are in the same corporate structure (in various ownership formats)
 - ❑ Option 3 – Independent storage company
 - ❑ Option 4 – Hybrid – with some capacity dedicated to the TSO
 - ❑ Approach to analysing and comparing options
 - ❑ Options compared
- ❑ **Next steps and remaining questions**

Background to the structural and unbundling options:

Key objectives



* See the European Commission's working paper entitled "Interpretative note on Directive 2009/73/EC concerning common rules for the internal market in natural gas: Third-party access to storage facilities", 22 January 2010, for guidance on implementing the Directive (https://ec.europa.eu/energy/sites/ener/files/documents/2010_01_21_third-party_access_to_storage_facilities.pdf)

** See ERGEG "Amendment of the Guidelines of Good Practice of Storage System Operators", 2 February 2011 (http://www.energy-regulators.eu/portal/page/portal/EER_HOME/EER_PUBLICATIONS/CEER_PAPERS/Gas/Tab/E10-GST-14-04_GGPSSO-CAM-CMP_2-Febr-2011.pdf)

Background to the structural and unbundling options: 3EP requirements and 'Good Practice Guidelines'

Element	Description
Unbundling and ownership	Storage facilities to be clearly defined and (subject to some exceptions) operated as entities that are at least legally separate from production and supply , and with separate accounts and operations from all other gas market activities (including transmission and distribution) – See EC Interpretive Note (link on previous slide)
Third Party Access (TPA) regime	Objective, transparent and non-discriminatory TPA regime - either negotiated or regulated . Effectively monitored and enforced by the independent regulator
Capacity booking and allocation	No hereditary rights. Range of capacity products with no restrictions on usage . Clear, non-discriminatory and transparent booking procedures. 'Use it or lose it' (UIOLI) arrangements with secondary capacity trading
Tariffs	Published , non-discriminatory. Transparent basis- either cost or seasonal spread based
Congestion management	Clear procedures. Full details of entry/exit transmission constraints at time of booking and in real time
Information provision	Bulletin board advertising spare capacity. Details of constraints, tariff calculation and levels of usage by facility
New services	Developed in response to customer requirements and allocated as above
Investment	Should be in response to customer requirements and ensure full access through the use of an 'open season' process where possible (this is a procedure where the market is consulted on how much infrastructure it needs and on what terms)

These are deemed to be requirements ultimately essential for the provision of storage services. They may not all be possible immediately but a transition plan needs to be clear to bring them into effect

Background to the structural and unbundling options:

Further considerations for assessing options

- ❑ The extent to which the SSO is a **stand-alone entity** and relies on other organisations to provide services
 - ❑ This includes financial independence and the ability to charge and recover cost-reflective tariffs covering the ongoing operation and maintenance of the facilities and their further development
- ❑ The role that might be played by a **JV partner** with expertise in storage operation
- ❑ How an independent storage entity might operate in terms of **capacity ownership and management**
- ❑ What steps might be necessary in the event that storage utilization levels are such that **security of supply** is an issue
 - ❑ This could require actions from the TSO or possibly legislation in the form of a Public Service Obligation

These issues are further discussed after the structural options have been considered in section 2

Description and evaluation of options:

Assumptions and options overview

□ Assumptions

- The options assume that the storage system operator (SSO) is structured as a **separate legal or operational entity**
 - Ensures **greater transparency and independence and non-discrimination**, though it does not preclude some degree of service provision from third parties that may or may not be shareholders in SSO
- At this stage in the analysis there is no material difference between the **state as a shareholder or a private company** as a shareholder
- **Gas supply** activities remain with **Naftogaz (NAK)**

Why 4 sets of options?

The options have been defined to:

- Examine the differences in the unbundled structures with linkages between storage and other key market participants
- Assess the implications of the nature of those links (ownership or other)

Description and evaluation of options:

Assumptions and options overview

4 main options

- 1. SSO is associated with NAK**
- 2. SSO is associated with the TSO***
- 3. SSO is independent**
- 4. TSO has some links with storage**

*The discussion of unbundling model for TSO has led to the preference for OU, therefore an ISO is not considered within option 2

The options, and their variants, have the following distinguishing main features

- ❑ **Option 1** – NAK owns and operates gas storage through a subsidiary company
- ❑ **Option 2a** – SSO is a division in a joint transmission and storage company (UTG?)
- ❑ **Option 2b** – SSO is a division of a holding company (UTG?) which owns the TSO
- ❑ **Option 2c** – SSO and TSO are separate companies under a holding company (UTG?)
- ❑ **Option 3** – Independent SSO (owned by GOU or private)
- ❑ **Option 4a** – Two SSOs (one TSO owned; one GOU - this could be NAK or another state entity - or privately owned)
- ❑ **Option 4b** – SSO with some capacity¹ reserved for TSO

¹ UTG has suggested 1-2 Bcm (but likely an even lower minimum quantity) is required for key operational purposes

Description and evaluation of options:

Criteria for assessing options

General market structure criteria

- ❑ **Compliance** / compatibility with:
 - ❑ **EU's Third Energy Package (3EP)**
 - ❑ Legal/governance framework for public entities in Ukraine including the provisions of the **Gas Market Law**
- ❑ **Ease of implementation**, predominantly in terms of the initial corporate restructuring costs
- ❑ Development of **competitive markets**
 - ❑ Contribution to efficient gas system operation
 - ❑ Development of a competitive market, by ensuring non-discriminatory access and promoting investment in capacity to support trading
- ❑ **Transparency**
 - ❑ Essential to assist in the development of more transparency in the sector overall

Specific gas storage criteria

- ❑ Improved **security of supply** to the domestic gas market, including through:
 - ❑ Assurance of sufficient capacity for Ukraine's seasonal demand
 - ❑ Sufficient send-out/withdrawal capacity to meet interruption from any one source and peak demand
- ❑ Facilitation of greater **cross-border trade**:
 - ❑ Exploit the growing cross-border trade with EU countries, to help diversify Ukraine's gas supply (while recognising that such trade is currently constrained by the limited export capacity from Ukraine given contractual reservation by Gazprom)
 - ❑ Provide storage services to European gas traders to monetise the value of storage within a more competitive gas environment
- ❑ Improved overall **efficiency of storage use and operation**, including:
 - ❑ Rationalising the set of storage facilities and their roles within the gas network and gas trading to improve overall **efficiency of use**
- ❑ Attracting **investment in storage** facilities, including:
 - ❑ Gaining expertise from experienced European operators through various types of joint venture activity, including options for **attracting investors** and **JV partners** from among experienced European operators

Market perceptions of unbundling options

Market soundings

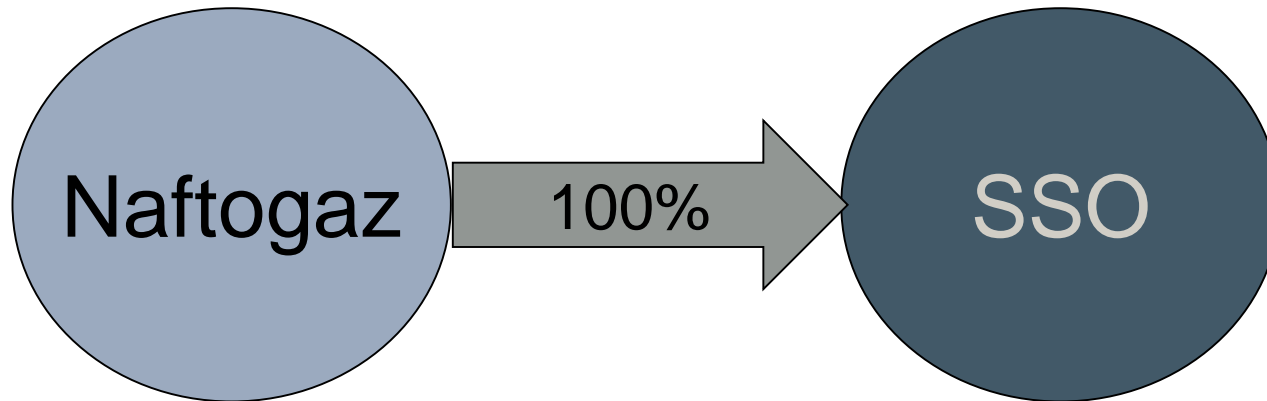
- ❑ The commercial future for storage rests significantly on a future competitive gas market in Ukraine and on gas trade with Europe
 - ❑ Supporting transit
 - ❑ Facilitating cross-border trade
 - As supply source for Ukraine
 - Supporting traders within Europe
- ❑ The study has included seeking views and discussing key issues with market representatives from Europe:
 - ❑ Gas traders
 - ❑ Representatives of European TSOs
 - ❑ Gas producers/suppliers

The issues most frequently raised:

- ❑ **Transparency**, meaning how to use storage, what is available (how to get information, is the information on the website accurate?), how to access, how to use it, and knowing can get gas out when needed
- ❑ Can transparency be improved better inside or outside NAK, bundled with TSO or not?
 - ❑ This could be a key factor for whether to unbundle storage from TSO or not
 - ❑ Views were mixed
- ❑ **Communication** is slow
- ❑ The idea of a **pilot** for (small) part of the storage (since 31 Bcm is far too complicated)
 - ❑ Also smaller storage might better attract a JV
 - ❑ Some storage could be stranded
- ❑ Ukraine's storage was designed to support its own system including transit, not cross-border trading
 - ❑ A possible reason to keep storage with transit and transportation

Description and evaluation of options -

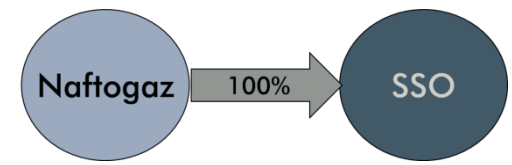
Option 1: NAK subsidiary owns and operates storage



- ❑ SSO is a separate entity, **legally and operationally unbundled**
 - ❑ Storage services are provided on an arms length non-discriminatory basis
 - ❑ The degree of management and operational separation from other group companies would need to be consistent with 3EP requirements
- ❑ **Naftogaz holds 100% of shares** in the legally unbundled SSO
 - ❑ Level of shareholder involvement in management and strategy to be determined but likely to require complete independence with shareholder approval only for major decisions such as change of control
 - ❑ If new TSO company is formed and unbundled from the current NAK group (ie with new owner), the SSO could be UTG

Description and evaluation of options -

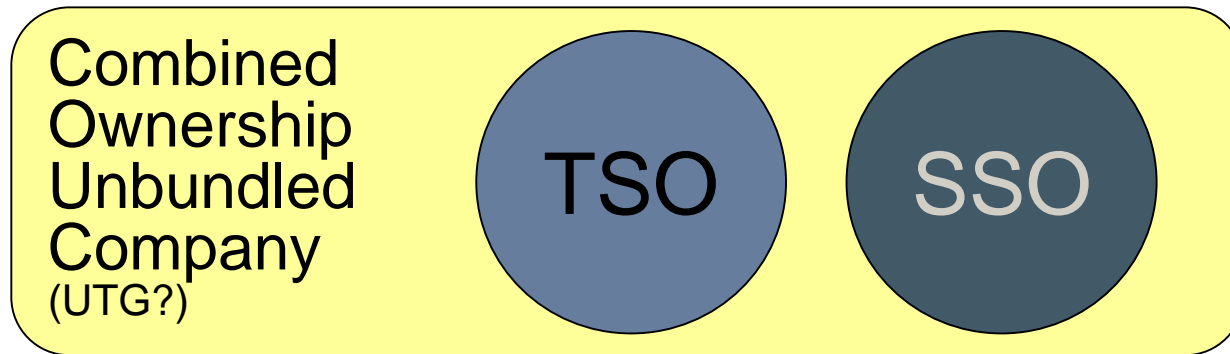
Option 1: Assessment



	Criteria	Commentary
General	Compliance with 3EP and national legislation	Compliant, though need to demonstrate effective legal and functional unbundling from the production and supply businesses
	Ease of implementation	Could take time to create an entity that operates independently from production, transmission and supply, although storage operations and accounts are already being separated from transmission within UTG. Also, might be difficult to immediately separate transmission and storage , which historically have been considered to be integrated
	Development of a competitive market	Competing suppliers who are storage users will have concerns over non-discriminatory access and security of information
	Transparency	Because storage will be owned by the production and supply arms, there will be concerns from other suppliers of discrimination and therefore this is unlikely to demonstrate greater transparency
Storage specific	Security of supply	May reduce willingness of some participants to use storage facilities so security could be damaged
	Facilitating cross-border trade	Could be beneficial for NAK's traders developing cross-border links and capabilities that may be available to the SSO , but less so for competing traders
	Improving efficiency of storage operation/use	Integration with some upstream or supplier based activities including trading may bring limited benefits , but likely to accrue to the incumbent rather than the market
	Attracting investors in storage facilities	Third party investors may be prepared to invest though comments from some market participants suggest that attractiveness may be diminished by poorer prospects for long term utilisation unless storage facilities are unbundled in smaller blocks

Description and evaluation of options:

Option 2a – SSO is division in a joint company with TSO



- ❑ SSO is a separate **operationally unbundled** entity as a division in a joint company with the TSO (which is a separate division of the combined TSO-SSO company)
 - ❑ Storage services are provided on an arms length non-discriminatory basis
 - ❑ The degree of management and operational separation from the TSO entity is to be determined, but the key feature is that the SSO is completely independent from NAK (as compared to option 1)
- ❑ The **combined TSO and SSO company is ownership unbundled** for the TSO to be 3EP compliant
 - ❑ Level of corporate management involvement in strategy and operation of SSO to be determined but could range from complete independence with corporate approval only required for major decisions, to being only operationally separate from other company activities but coordinated for some aspects with TSO (to improve transparency for storage users)
 - ❑ If UTG is unbundled from NAK as part of the transmission unbundling decision, then the combined transmission and storage company could be UTG (but would now be owned by an entity other than NAK and its shareholder)

Description and evaluation of options:

Option 2a – Assessment

Combined
Ownership
Unbundled
Company
(UTG?)

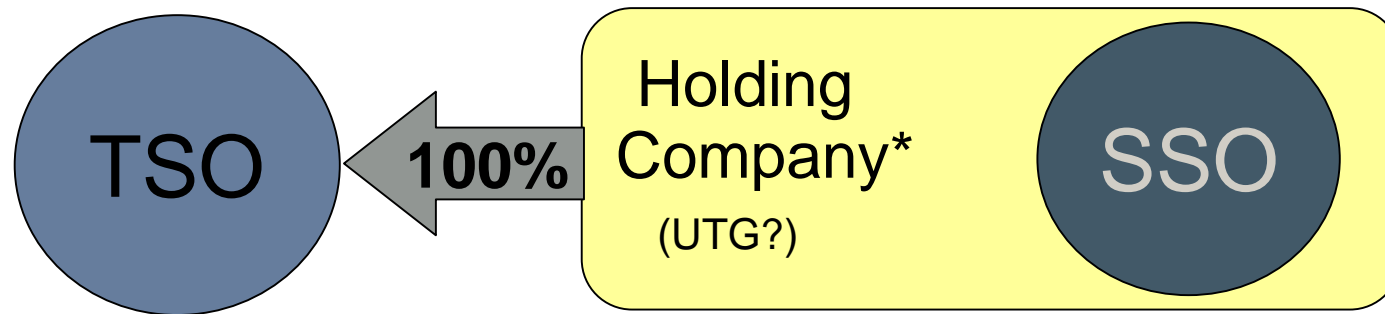
TSO

SSO

	Criteria	Commentary
General	Compliance with 3EP and national legislation	Compliant as storage is unbundled from production and supply. Independence further reinforced by having the company ownership unbundled, but SSO must still be operationally independent from TSO
	Ease of implementation	Could be achieved relatively easily especially if UTG is unbundled from NAK , although must ensure that storage operations are fully independent from transmission in UTG
	Development of a competitive market	Could be supportive of market development so long as the TSO will be incentivised to coordinate with storage to improve information and access for market players under this arrangement
	Transparency	There might be concerns from users that the TSO will seek to gain preferential access to storage , negatively impacting transparency
Storage specific	Security of supply	Should be enhanced by facilitating coordination between SSO and the TSO, but if access to storage by other market players is not improved, the overall impact on security is likely to be relatively minor
	Facilitating cross-border trade	Could be beneficial if access and appropriate products are made more easily available, in coordination between TSO and SSO, with fair access to the preferred storage facilities
	Improving efficiency of storage operation/use	Storage is dependent on the TSO for some services, so these synergies could continue , however transparency and/or access to storage by independent traders could still be difficult if TSO reserves a high amount of preferred facilities or inflates balancing costs
	Attracting investors in storage facilities	Third party investors may be prepared to invest in separated facilities, though comments from some market participants suggest attractiveness may be diminished by the poorer prospects for long term utilisation without sufficient separation from the TSO

Description and evaluation of options:

Option 2b – holding company owns TSO; SSO is a division

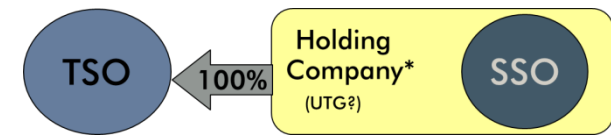


- ❑ A holding company holds 100% of shares in the TSO which is a separate corporate (ie legally unbundled) entity. The **SSO remains as a division within the holding company**
 - ❑ The holding company could be UTG although UTG is a large company with many activities. It would need to be examined whether any of these would compromise compliance with 3EP; also meeting the requirements for corporate governance and guarding shareholders' rights; this role for UTG could also be a temporary or transitional one
 - ❑ The holding company will be responsible for the management and strategy of the SSO
 - ❑ The holding company is independent of NAK (has different owner)
- ❑ SSO is **operationally unbundled** but remains a division within the holding company
 - ❑ Storage services are provided on an arms length non-discriminatory basis
 - ❑ The degree of operational separation within the holding company is to be determined. The SSO is also likely to continue to rely on the TSO for some services which could be provided under one or more arms-length agreements
 - ❑ This option could be an intermediate step towards options 2c or 3

** Note: 'Holding Company' here and on the following pages generically refers to a parent corporation that owns the majority voting stock in the indicated subsidiaries (ie TSO and/or SSO) and should not be confused with the proposed 'HoldCo' or State Holding Company under the Ministry of Economy which is intended to exercise the shareholder role for strategic state owned enterprises*

Description and evaluation of options:

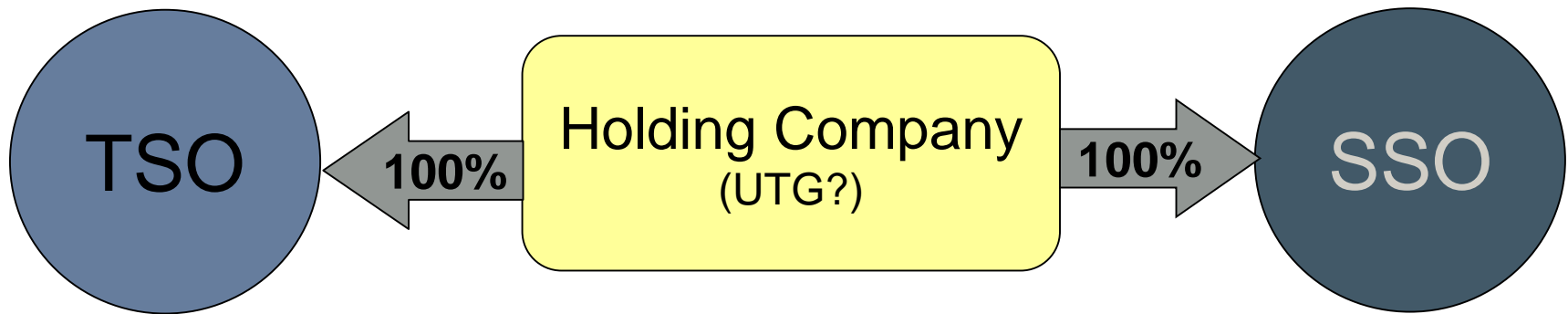
Option 2b - Assessment



	Criteria	Commentary
General	Compliance with 3EP and national legislation	Compliant as storage is unbundled from production and supply, but must also ensure operational independence from transmission in the absence of establishing a completely separate legal entity
	Ease of implementation	Could be achieved relatively easily , but establishing an appropriate arms length relationship with the TSO may take some time, although less so if UTG is unbundled from NAK and is the holding company
	Development of a competitive market	Should be beneficial if SSO is resourced effectively (and internally restructured) to provide the range of services the market requires
	Transparency	Whilst there is clear separation from the TSO, transparency may be compromised by remaining as a division within UTG. For example, cost and accounting information may be opaque
Storage specific	Security of supply	Should be enhanced as coordination between SSO and the TSO is possible, but if access to storage by other market players is not improved, overall impact on security is likely to be relatively minor
	Facilitating cross-border trade	As a division of UTG, the SSO may be more focused on domestic requirements – particularly in the initial stages – though these would include aiming to increase cross-border capacity
	Improving efficiency of storage operation/use	There is the opportunity for significant improvements if a lean and effective management and operational structure can be established within UTG coupled with an appropriate sharing of common services
	Attracting investors in storage facilities	Third party investors will be difficult to accommodate within this structure unless investment is at the level of the UTG holding company or some facilities are spun off

Description and evaluation of options:

Option 2c – A holding company owns separate SSO and TSO

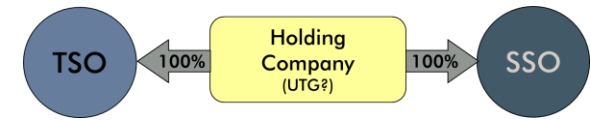


- ❑ A holding company holds 100% of shares in SSO and TSO, both being **separate corporate (ie legally unbundled) entities and subsidiaries**
 - ❑ Level of shareholder involvement in management and strategy to be determined but could range from complete independence with shareholder approval only required for major decisions such as change of control or more direct involvement in company operations
 - ❑ The holding company is independent of NAK (has different owner; similar considerations on the suitability and independence of UTG to be the holding company apply as in option 2b)
- ❑ SSO is **legally and operationally unbundled** entity
 - ❑ Storage services are provided on an arms length non-discriminatory basis
 - ❑ The degree of management and operational separation from other group companies is to be determined though is assumed to be more independent and separate from UTG than option 2a

** Note: 'Holding Company' here and on the following pages generically refers to a parent corporation that owns the majority voting stock in the indicated subsidiaries (ie TSO and/or SSO) and should not be confused with the proposed 'HoldCo' or State Holding Company under the Ministry of Economy which is intended to exercise the shareholder role for strategic state owned enterprises*

Description and evaluation of options:

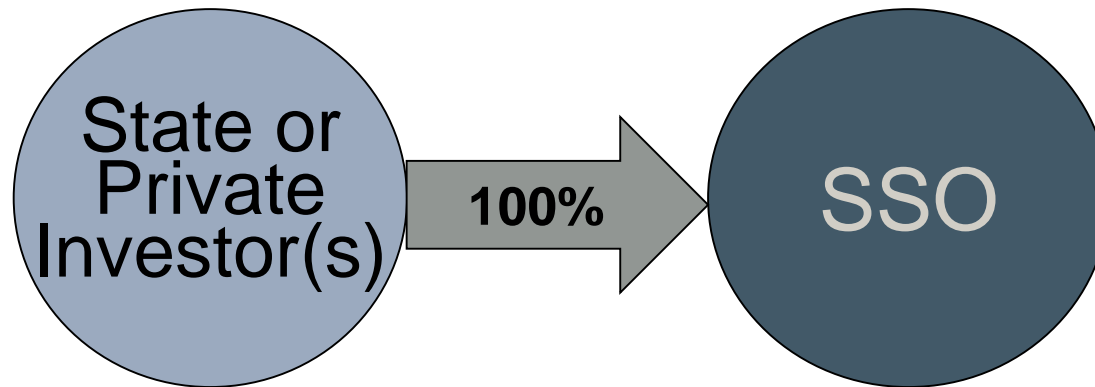
Option 2c - Assessment



	Criteria	Commentary
General	Compliance with 3EP and national legislation	Fully compliant as storage is unbundled from production and supply; independence further reinforced by having separate legal entities for both transmission and storage
	Ease of implementation	Would take more time and resources to establish given the need for a holding company and separate TSO and storage subsidiaries, although less so if UTG is unbundled from NAK and is the holding company
	Development of a competitive market	Should be beneficial if SSO is resourced effectively (and internally restructured) to provide the range of services the market requires
	Transparency	Clear separation from the TSO should encourage maximum transparency , although close coordination of services and information provision is necessary
Storage specific	Security of supply	SSO may develop more innovative products and so could help utilisation and thereby security
	Facilitating cross-border trade	Beneficial , especially if access and new products are developed quickly
	Improving efficiency of storage operation/use	The management independence due to the holding company structure could help to significantly improve efficiency though will require financial and managerial resources to be available
	Attracting investors in storage facilities	Third party investors could be prepared to invest particularly if there was the opportunity to provide management and other services, and sufficient independence within the holding company structure

Description and evaluation of options:

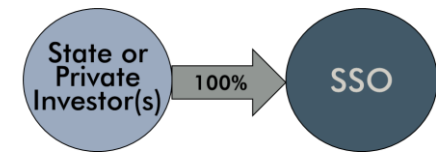
Option 3 – Independent gas storage company



- ❑ **SSO is a separate ownership unbundled entity**
 - ❑ Storage services provided on an arms length non-discriminatory basis
 - ❑ The degree of management and operational separation from other group companies is to be determined, but with ownership in either private hands or a state entity independent from the owner of NAK, independent decision making should be facilitated
 - ❑ Compared to option 2c, neither NAK nor the TSO owner should oversee the management or operation of storage in this option. This could facilitate the transfer of ownership or JV (of some or all storage) to the private sector
- ❑ **State or private investors hold 100% of shares in SSO**
 - ❑ Level of shareholder involvement in management and strategy to be determined but could range from complete independence with shareholder approval only required for major decisions such as change of control, to more direct involvement in the running of the company
 - ❑ If private investors are foreign companies with expertise in running storage companies, the involvement could include full operational control or the provision of services under an arms-length service agreement

Description and evaluation of options:

Option 3 - Assessment



	Criteria	Commentary
General	Compliance with 3EP and national legislation	Highest level of compliance , as it involves ownership unbundling and stand-alone entity separate from all other gas sector activities
	Ease of implementation	Will take some time to establish completely separate company (eg asset transfers) and develop all of the arms length relationships that may be required, and is further complicated by unknown condition of storage and integrated operation with transmission in the past
	Development of a competitive market	Beneficial , especially if SSO is resourced effectively to provide the range of services the market requires
	Transparency	Clear separation from both TSO and supply will give market participants the best potential outcomes in this respect
Storage specific	Security of supply	SSO may develop more innovative products and so could help utilisation and thereby security
	Facilitating cross-border trade	Beneficial if access and new products are developed quickly. Also if transit and domestic supply has to contract for storage in the same way as independent traders/suppliers
	Improving efficiency of storage operation/use	Could be significant though will require appropriate level of financial and managerial resources to be available, and there could be some lost synergies with transmission
	Attracting investors in storage facilities	Third party investors could be prepared to invest particularly if there was the opportunity to provide management and other services. There is a higher likelihood under this option that existing cross-subsidies could be exposed to the detriment of the SSOs profitability

Description and evaluation of options:

Option 4a – Establishment of two separate SSOs



- ❑ **SSO 1** is a separate and **ownership unbundled entity** owning a defined number of storage facilities; storage services are provided on an arms length, non-discriminatory basis, ie commercial services with no requirement to meet obligations of TSO
 - ❑ **State or private investors** hold 100% of shares in **SSO 1**
 - ❑ Level of shareholder involvement in management and strategy to be determined as in Option 3
- ❑ **SSO 2** is a separate **legal entity** owning a defined number of storage facilities, although some storage facilities are offered exclusively to **TSO** (provided 3EP requirements met regarding exclusive reservation only for system stability)
 - ❑ **TSO** holds 100% of shares in **SSO2** and exerts significant control such that it is operated as a division or subsidiary of the **TSO**
- ❑ ***Relative sizes of SSOs 1 and 2 will be critical***

Description and evaluation of options:

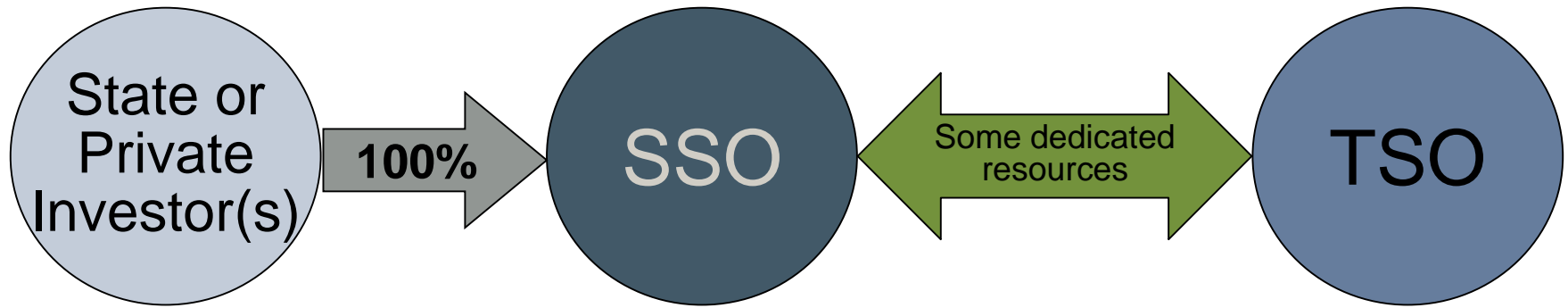
Option 4a - Assessment



	Criteria	Commentary
General	Compliance with 3EP and national legislation	Compliant, but with regard to SSO 2, as the reserved storage capacity could be withheld from the market long-term, the TSO must demonstrate such capacity is required specifically for stable system operational purposes and not available for commercial use
	Ease of implementation	Likely to be complicated and time-consuming to separate into two companies or entities, especially in absence of sufficient understanding of technical and financial state of storage
	Development of a competitive market	Could be beneficial if SSO 1 is resourced effectively and has sufficient market share, but less so if SSO 2 is dominant
	Transparency	Separation of SSO 1 entails clear separation and maximum transparency , but TSO must demonstrate clearly how it will operate SSO 2 to ensure transparency of the latter
Storage specific	Security of supply	TSO ownership of SSO 2 might help security though splitting storage could also be harmful , in case the SSO 2 capacity turns out to be too small, or results in unnecessary withholding of capacity from commercial use
	Facilitating cross border trade	Could be beneficial if SSO 1 is significant, able to improve access and new products are developed quickly
	Improving efficiency of storage operation/use	Facilitates operational synergies between storage and transmission, though the duplication of operators in a potentially oversupplied market (excess storage capacity) may lead to reduced efficiency and increased costs , if rationalisation is delayed
	Attracting investors in storage facilities	Investors might be interested in SSO 1 if it was large enough and there was the opportunity to provide management and other services though there is a risk that any existing cross-subsidies could be exposed to the detriment of the SSO's profitability

Description and evaluation of options:

Option 4b – SSO with some capacity dedicated to TSO



- ❑ **SSO** is a separate and **ownership unbundled entity**
 - ❑ Storage services are provided on an arms length non-discriminatory basis **with the exception of a small amount, say around 1 bcm of storage capacity** that is reserved exclusively for the use of the **TSO** (this is an amount currently suggested by UTG that is needed for system stability but is likely to be an even lower volume given typical withdrawal rates on peak demand days; also, an amount of withdrawal capacity would need to be specified). This is similar to the model currently proposed by NAK; it could be viewed as a variant of option 1 but with advantages from the different ownership (OU structure)
- ❑ **State or private investors** hold 100% of shares in **SSO**
 - ❑ Level of shareholder involvement in management and strategy to be determined but could range from complete independence with shareholder approval only required for major decisions such as change of control to more direct involvement in the company
 - ❑ If private investors are foreign companies with expertise in running storage companies, the involvement could include full operational control or the provision of services under an arms-length service agreement
- ❑ This option is **unlikely to be fully compliant with 3EP** in the Ukrainian context
 - ❑ The Directive does not permit the exclusive use of certain portions of storage facilities for system stability purposes – that is, entire facilities can only be reserved for this purpose
 - ❑ However, such facilities are likely to be relatively small and fast responding (high withdrawal rates) unlike the Ukrainian facilities, which have slow withdrawal rates and are typically used for seasonal balancing

Description and evaluation of options:

Option 4b - Assessment



	Criteria	Commentary
General	Compliance with 3EP and national legislation	Unlikely to be compliant, as only whole storage facilities can be reserved exclusively, while need to also demonstrate that TSO facilities are necessary for reliability in operating the network but not for balancing or seasonal purposes
	Ease of implementation	May take some time to establish completely separate company (eg asset transfers) and develop all of the arms length relationships that may be required
	Development of a competitive market	Beneficial , if SSO is resourced effectively and TSO share is provided in a transparent and non-discriminatory manner
	Transparency	Should encourage greater transparency as long as TSO pays transparently regulated charges for its share of storage
Storage specific	Security of supply	SSO may develop more innovative products and so could help utilisation and thereby security
	Facilitating cross-border trade	Could be beneficial if the direct ownership of storage helps for transparency, access and new products to be developed quickly
	Improving efficiency of storage operation/use	Could be significant though will require appropriate level of resources to be available, ie minimum necessary for TSO and remainder to market – the quantity to be kept under review
	Attracting investors in storage facilities	Third party investors should be prepared to invest particularly if there was the opportunity to provide management and other services though there is a risk that any existing cross-subsidies could be exposed to the detriment of the SSO's profitability

Evaluation of options:

Approach to analysing and comparing options

- Analysis
 - The assessment of options is indicated in an options matrix, where assessment is indicated using scoring symbols (*'Harvey Balls'*)
- Use of scoring symbols
 - Each option is scored on each criterion using a nine graduations scale from very negative to very positive, where:



Zero is neutral – empty circle



Extreme negative scores are indicated by complete red circle



Extreme positive scores are indicated by complete green circle

- Intermediate scores are indicated by one of the following:

- Negative scores



- Positive scores



- Neutral



Evaluation of options:

Options compared

Medium scoring options

Higher scoring options



Options	1 NAK subsidiary owns and operates storage	2A SSO and TSO are divisions of a combined company	2B SSO is division of a holding company (TSO is indep.)	2C SSO and TSO separately owned by a holding company	3 Independent SSO	4A Two SSOs (one with TSO)	4B One SSO with dedicated volume for TSO
Criteria							
Compliance with 3EP and national legislation							
Ease of implementation							
Development of a competitive market							
Transparency							
Security of supply							
Facilitating trade							
Improving efficiency of storage operation/use							
Attracting investors in storage facilities							

Evaluation of options:

Key considerations

Weighing the criteria

- ❑ The suitability of each model for Ukraine **depends on the relative importance of each criterion**; they are not all of equal relevance and value
- ❑ Nevertheless, based on a simple ‘addition’ of the evaluations in the above analysis, the more highly evaluated options are **option 2a** (SSO and TSO as divisions of a combined company), **option 2b** (SSO as division and TSO as subsidiary of a holding company) are indicated with medium evaluations, while **option 2c** (a holding company owning both TSO and SSO subsidiaries, in effect an unbundling of main parts of UTG), and **option 3** (Independent SSO) are indicated with the higher evaluations
- ❑ These options are ones:
 - ❑ That are compliant with 3EP (unlike option 4b)
 - ❑ Without a potentially conflicted owner (NAK as either trader or producer in option 1), or the complication of two (or more) SSOs (as in option 4a)
 - ❑ Where SSO is independent or under a holding company or similar structure with non-conflicted partner company and operational independence
- ❑ Another consideration is the potential for **synergies with coordination of transmission and storage** in promoting efficient trade and use of storage. These benefits are **more likely in options 2a, 2b, 2c** and 4b; though there is a difference between synergies achieved through common ownership (options 2a-c) and synergies through contracts (option 4b), while, as already noted, 4b is also unlikely to be 3EP compliant
- ❑ A final issue is that the TSO is quite advanced in plans to become independent of NAK. The distraction of needing to (rapidly) prepare the SSO for legal or ownership unbundling in coordination with the TSO (**options 2c and 4a**) could **hinder** the effectiveness of TSO unbundling in the short term.

Next steps and remaining questions

Required actions

- ❑ Agree **option or options** to be pursued
- ❑ Options 2c (TSO and SSO subsidiaries of a holding company), or option 3 (Independent SSO) are indicated:
 - ❑ However, these could be preferred in the longer term (say after 3-5 years). The process could be viewed as a two-step approach, with a **transition to legal or ownership unbundling of storage** requiring adoption of one of the other options in the first instance, particularly given the expected implementation costs, and the number and nature of unresolved issues (see right hand panel)
 - ❑ The **preferred options in the first step are then option 2a or option 2b, with the SSO as a division of UTG with separated ownership from NAK**. This also enables the TSO to be ownership unbundled from NAK to meet the 3EP requirements for transmission
- ❑ **Identify those storage facilities that are technically and economically feasible and necessary to support supply and competition** (note that it is only these that need be subjected to an unbundling and access regime according to 3EP)
- ❑ Determine level of **operational, commercial and managerial support** in short and long term
- ❑ Develop an **implementation plan**

Unresolved / other issues

- ❑ **Role of the Regulator**
- ❑ **Transition to alternative tariff regimes** - how realistic is it to assume a RAB-based charging basis from 2016
- ❑ Impact of any **revaluation** of storage assets
- ❑ Treatment of **shared costs, cost of own use gas and any cross-subsidies** that may be revealed
- ❑ **Transition to market-based balancing** rules and the role (if any) of the TSO in providing balancing services
- ❑ The **relationship between transmission and storage tariffs** – discounts to be applied
- ❑ Identifying any **non-core storage assets** and dealing with decommissioning
- ❑ **Ownership of cushion gas** and the treatment of any non-storage gas (also called native gas) that might be produced

Transitional and target structures for transmission and storage

Two-step approach

The overall unbundling process is suggested to be viewed as a two-step approach, with a **transition to full unbundling** being accomplished in two steps

- ❑ The first step, in the short term, would be a transitional structure that needs to achieve, as a minimum, the unbundling of the TSO.
- ❑ Given that the TSO is part of UTG, the proposed transitional structure is for the unbundling of both the TSO (transmission operation and assets) and SSO (storage operation and assets)

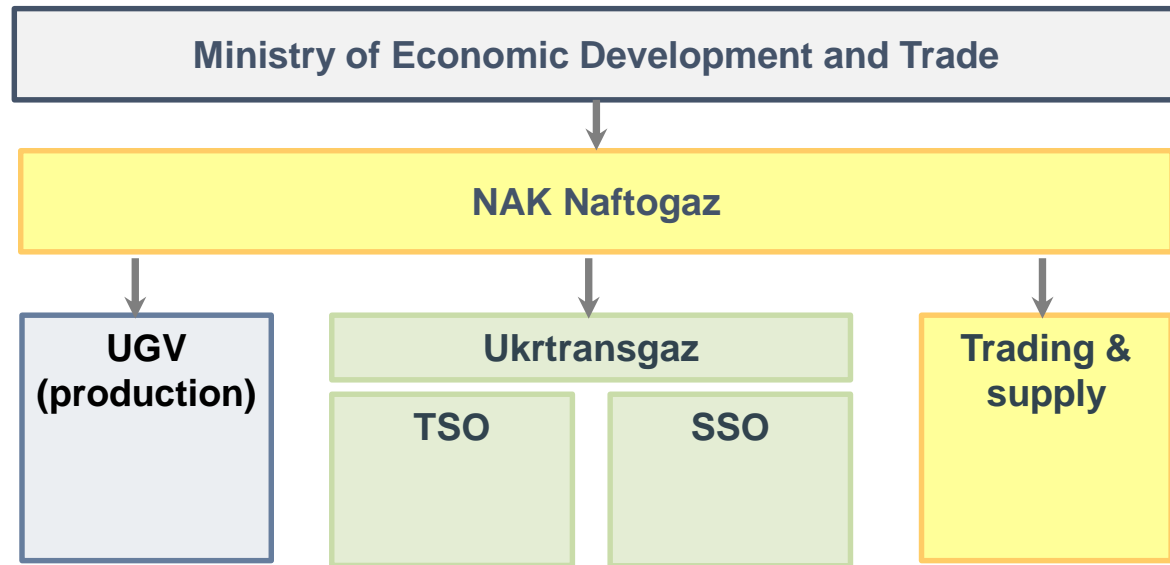
The transitional structure is shown in the next page

- ❑ The longer term possible target structure indicates a fully unbundled system with the main functions of transmission, storage, production and supply/trading separated

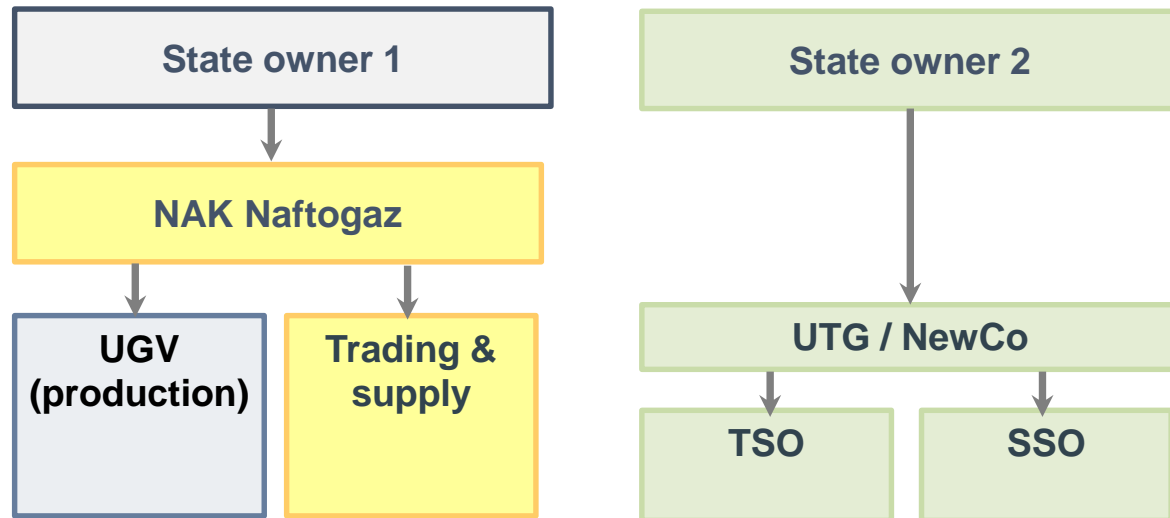
It could be achieved in say 3-5 years and is shown on the following page

Recommended transitional industry structure

Current structure

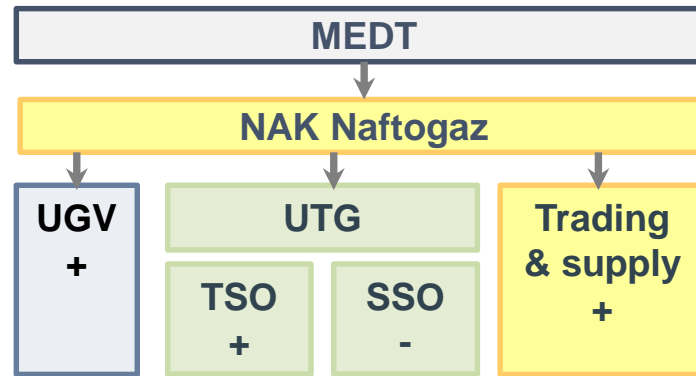


Recommended transitional structure

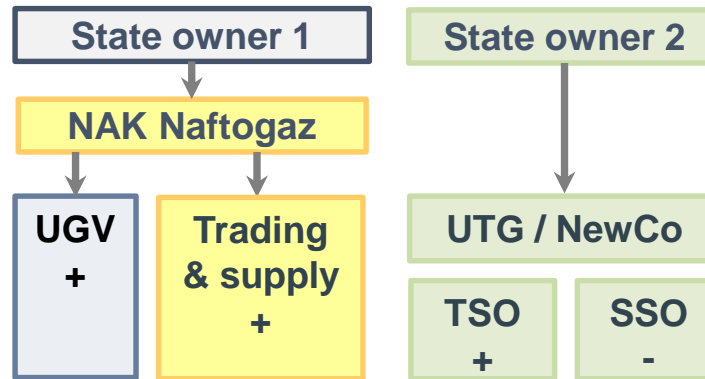


Possible target structure and implementation steps

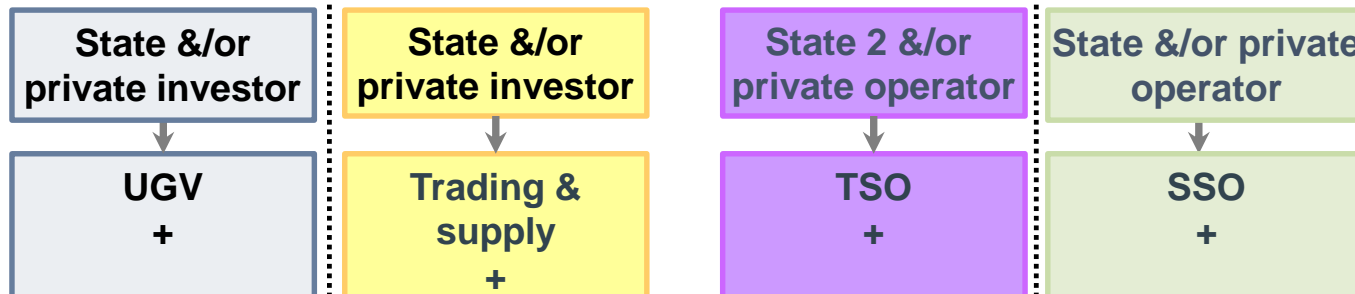
Current structure



Recommended transitional structure



Possible target structure



Possible separation

Possible separation

Implementation actions:

- ❑ Technical and commercial due diligence of storage assets and operations (including role of storage in transit)
- ❑ Regulatory assessment of allowed revenues (to recover reasonable and unavoidable costs)
- ❑ Allocation of transit revenues
- ❑ Separation of TSO and SSO
- ❑ Achieve efficient level of costs

Analysis of the Restructuring Options of NJSC Naftogaz

Part 2: Unbundling options for gas storage

Section 1: Review of options for storage unbundling

Section 2: Establishing storage as a separate entity – management and operational issues

Section 3: Challenges facing Ukraine's storage

Annex: Glossary; gas storage technical and market background; EU gas storage ownership

Section 2: Establishing storage as a separate entity – management and operational issues

Introduction

- ❑ This section briefly outlines issues that would apply to any of the models in the previous section:
 - ❑ The necessary features for ensuring that compliant operation of storage can be achieved under various restructuring options
 - ❑ The role that private sector participants can play in the delivery of services and the typical and prevalent delivery modes
 - ❑ Some additional operational requirements in the context of a liberalised and competitive gas market
- ❑ It covers the following topics:
 - ❑ The Third Energy Package and storage (Directive 2009/73/EC)
 - ❑ Management and operational separation under different storage restructuring options
 - ❑ The possible role of joint venture partners
 - ❑ Additional operational requirements

The Third Energy Package and storage

The requirements of Directive 2009/73/EC

“ It is necessary to ensure the independence of storage system operators in order to improve third-party access to storage facilities that are technically and/or economically necessary for providing efficient access to the system for the supply of customers. It is therefore appropriate that storage facilities are operated through legally separate entities that have effective decision-making rights with respect to assets necessary to maintain, operate and develop storage facilities. It is also necessary to increase transparency in respect of the storage capacity that is offered to third parties, by obliging Member States to define and publish a non-discriminatory, clear framework that determines the appropriate regulatory regime applicable to storage facilities. That obligation should not require a new decision on access regimes but should improve the transparency regarding the access regime to storage. Confidentiality requirements for commercially sensitive information are particularly important where data of a strategic nature are concerned or where there is only a single user of a storage facility.” (Paragraph 24 of preamble*)

- ❑ Article 15: SSOs must be **at least legally and operationally unbundled** from production and supply
- ❑ Article 33: Defines **access criteria**
- ❑ Article 2(9) **can exclude facilities reserved exclusively for TSOs**. This can only apply to facilities that are “technically and in terms of size designed and suitable for system stability purposes..[such as]..fast responding overground facilities.”

Storage facilities used for balancing purposes do not fall within this definition (see *Interpretive note from the Commission dated 22.1.2010*
https://ec.europa.eu/energy/sites/ener/files/documents/2010_01_21_third-party_access_to_storage_facilities.pdf)

*<http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0073&from=EN>

Management and operational separation under different storage restructuring options (1/2)

Element	Full stand-alone entity	Third party arms length provision	Integrated with other entity (could be NAK or UTG)
Board of Directors	Appointed in line with corporate legal norms. If there is a 100% shareholder there may be a case for appointing one or more independent directors	Could appoint one or more specialised non-executive directors	Issue over degree of independence. Can require majority of non-executive directors independently appointed and/or restrictions over certain key decisions
Executive management	Could be seconded from the shareholder(s) or appointed independently	Service contract with an experienced SSO	Degree of separation will be key both in terms of independence of decision making and time devoted to operation in the interests of storage users
Asset management	Sensible to adopt a dedicated asset management capability in due course	Not generally recommended	Could be part of a broader asset management function

This and the next slide provide an overview of key organisational parameters under both integrated and stand-alone restructuring options and also in the case of contracting out certain functions and services to a third party provider

Management and operational separation under different storage restructuring options (2/2)

Element	Full stand alone entity	Third party arms length provision	Integrated with other entity (could be NAK or UTG)
Physical operation and maintenance	Some activities may be performed in-house though specialised areas could be out sourced	Could have a blanket service contract or eg compressor and well maintenance	Most services could be provided on a joint basis though issues over cost allocation
Commercial operation	Important for the organisation to develop capability in pricing and customer service	Basic functions such as data management and invoicing could be outsourced	Users and regulators will have concerns over information provision and conflicts of interest
Support Services	Some expertise in regulatory and corporate affairs required	Most activities could be outsourced	Main issue will be cost allocation
Reporting	Meet company law standards Additional reporting may be required in the interest of transparency	N/A	Separate published accounts may be required

The possible role of joint venture partners

- ❑ Joint Venture (JV) partners would provide **expertise in defined areas of storage operation** with particular emphasis on operation of independent storage facilities in a liberalised market
 - ❑ Will need **clarity** on degree of separation and **access regime**
 - ❑ Participation may be in the form **of equity investment and/or management service contract**
- ❑ Any investment commitment will be based on **expected future cash flows**, not book value of assets
 - ❑ Likely to be **an existing storage operator**, though could be an independent investor such as an infrastructure fund with existing storage asset and proven management capability

The role of transit in Ukrainian gas storage

Known

- ❑ Historically, Russian transit gas has been combined with gas storage in Ukraine in providing gas sales to Europe
- ❑ Transit volumes have been reducing
- ❑ Current contracts due to expire in 2019

Unknown or uncertain

- ❑ Natftogaz is currently in dispute with Gazprom over the gas transit contract
- ❑ The interaction between Russian gas transit and use of Ukrainian gas storage is not known
- ❑ Gazprom is unlikely to want to invest in gas storage in Ukraine
- ❑ Other gas storage legacy arrangements

Implications

In terms of developing an SSO structure, the use of gas storage by transit customers could be considered as just another customer, though there are political factors involved as well as commercial factors

Any future SSO structure needs to take into account the potential impact of gas transit shippers. In practice, one would expect gas transit shippers to book gas storage capacity in a similar fashion to any other customer, but the size of transit and its long term prospects are a very large uncertainty for the storage sector

Additional operational requirements

Additional operational requirements for a SSO under a liberalised market regime (some may be outsourced)

- ❑ Custody tracking system
 - ❑ This is to prevent manipulation, errors and mistakes infecting commercial balances
- ❑ Effective and accurate metering
 - ❑ Custody transfer metering will be an essential part of the development of gas storage development
- ❑ Data collection and validation routines
- ❑ Invoicing and credit management capabilities

Analysis of the Restructuring Options of NJSC Naftogaz

Part 2: Unbundling options for gas storage

**Section 1:
Review of options for storage unbundling**

**Section 2:
Establishing storage as a separate entity – management and
operational issues**

**Section 3:
Challenges facing Ukraine's storage**

**Annex:
Glossary; gas storage technical and market background; EU
gas storage ownership**

Section 3: Challenges facing Ukraine's storage

Introduction

- ❑ Challenges facing Ukraine's storage need to be considered both internally and in the context of overall developments in European storage
- ❑ In Europe, the liberalisation of markets has resulted in **increasing competition amongst forms of flexibility**, including storage
 - ❑ This, coupled with a decline in demand and strong investment in storage in previous years, has resulted in **significant surplus capacity** of storage facilities
- ❑ In this context, **Ukrainian storage would not appear to be offering particular additional benefits**
- ❑ Furthermore, the way storage will be priced suggests that **the value of Ukraine's storage is likely to be some way below its book value** and that some **possibly significant closure** of facilities will be required

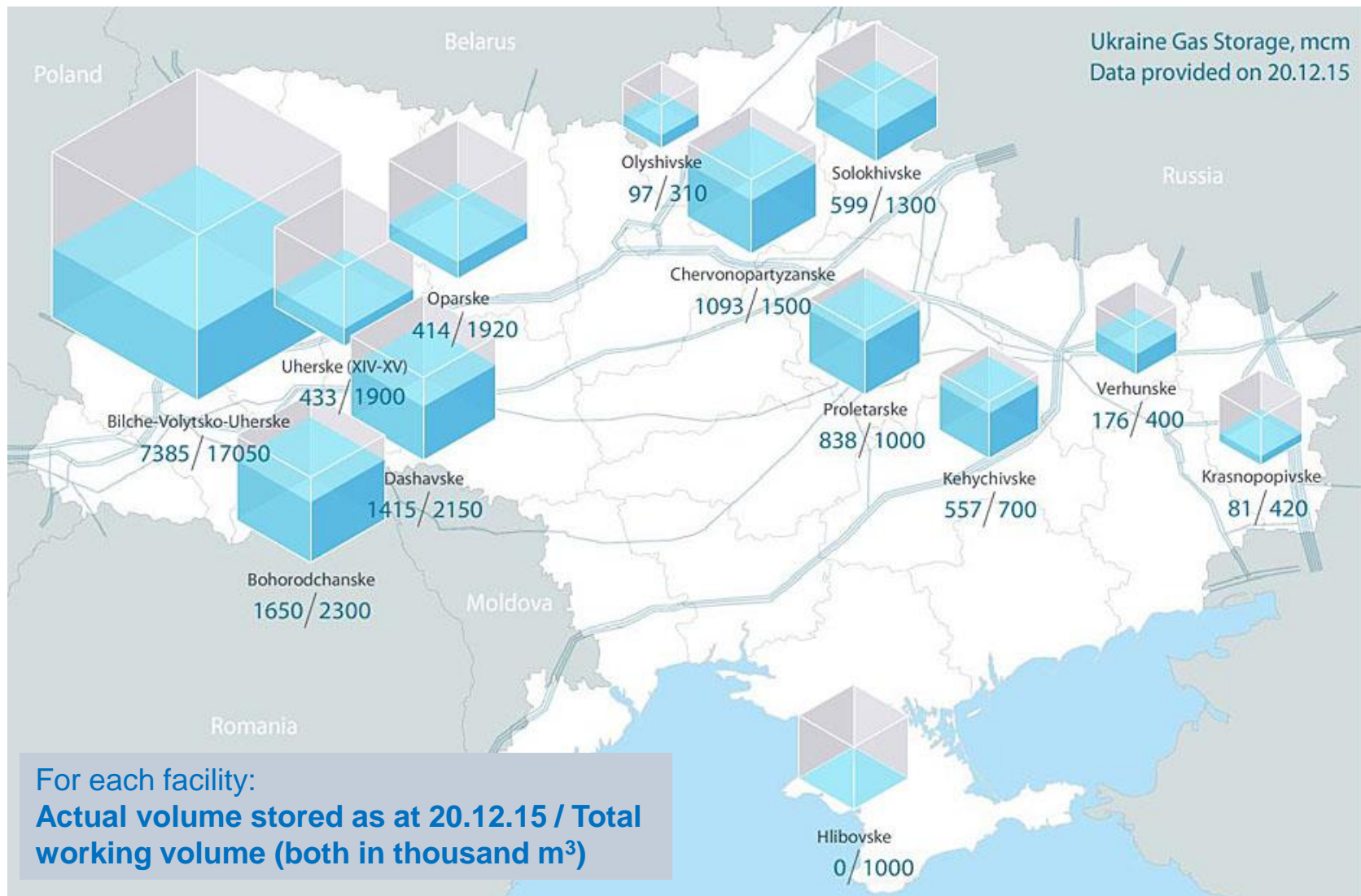
Section 3: Challenges facing Ukraine's storage

Summary of contents

- ❑ Technical overview of Ukrainian gas storage assets
 - ❑ An overview of Ukrainian gas storage facilities
 - ❑ Storage facility specifications
 - ❑ Storage deliverability
 - ❑ Commentary on Ukrainian gas storage facilities
 - ❑ Comparison of Ukraine/Europe supply sources
- ❑ Review of storage in the context of adjacent markets
 - ❑ Comparison of storage facilities and capacities
 - ❑ Comparison of storage operations
 - ❑ Comparisons of storage tariffs
 - Ukrainian storage becoming less competitive
 - ❑ Two case studies on transparency
 - ❑ Comparison of selected trading hubs scores
 - CEGH/VTP front year seasonal price spread
 - Comparison of spreads for selected hubs
 - ❑ Security of supply – N-1 compliance (2013)
- ❑ Summary

Technical overview of Ukraine's gas storage:

An overview of Ukraine's gas storage facilities



(Source: Gas storage facilities in the Ukraine based on 20/12/2015 data, <http://naftogaz-europe.com/article/en/englstorage>)

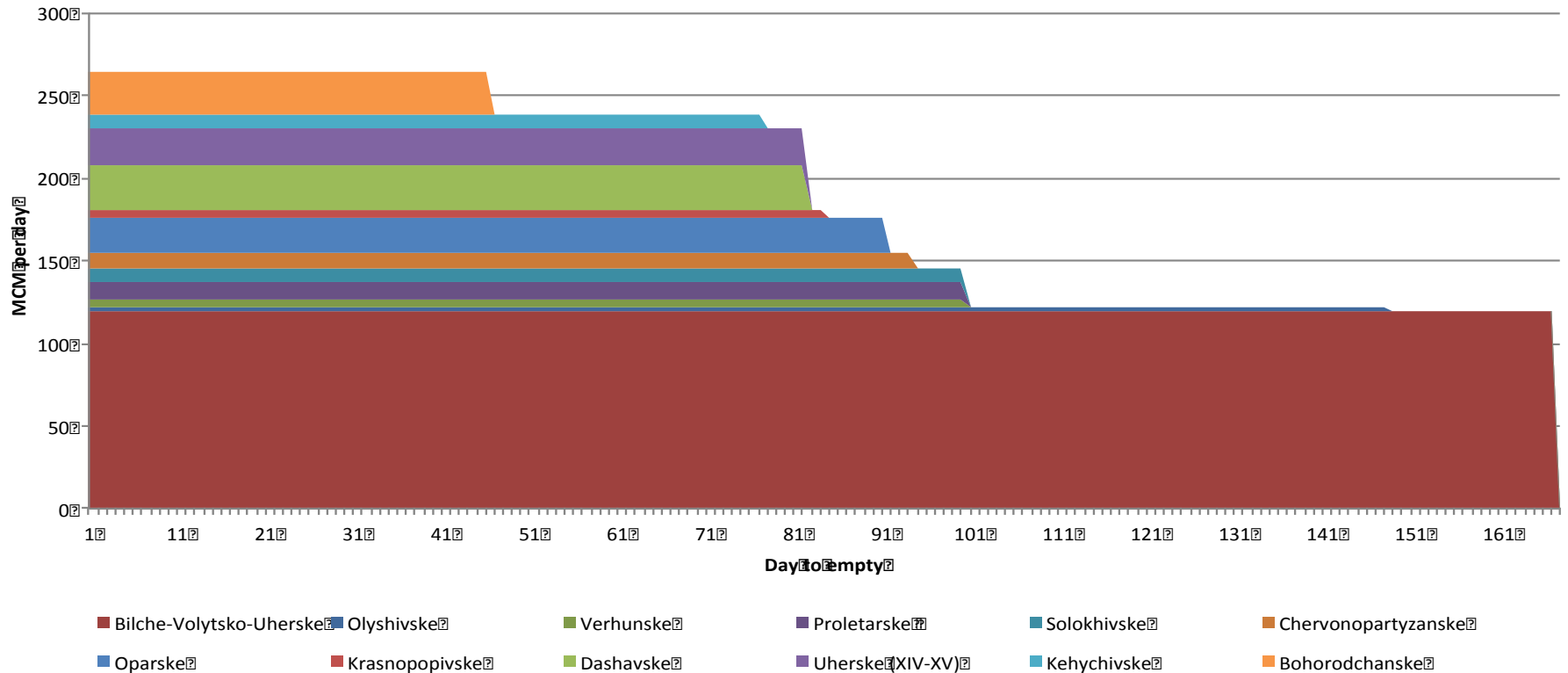
Technical overview of Ukrainian gas storage:

Storage facility specifications

Name of facility	Type	Working Volume (MCM)	Injection (MCM/Day)	Withdrawal (MCM/Day)	Days withdrawal	Speed
Bilche-Volytsko	Depleted Field	17050	102.0	120.0	142	0.7%
Uherske (XIV-XV)	Depleted Field	1900	17.0	17.0	112	0.9%
Oparske	Depleted Field	1920	12.0	14.0	137	0.7%
Dašavs'ke	Depleted Field	2150	26.0	26.0	83	1.2%
Bohorodchanske	Depleted Field	2300	40.0	26.0	82	1.1%
Kegichevsky	Depleted Field	700	8.5	8.5	82	1.2%
Verhunske (Not presently available)	Depleted Field	400	4.0	5.8	69	1.5%
Krasnopopivske	Depleted Field	420	4.0	5.2	81	1.2%
Proletarian	Depleted Field	1000	10.0	10.0	100	1.0%
Solohivske	Depleted Field	1300	12.0	7.9	165	0.6%
Chevonopartisansky	Aquifer	1500	14.0	10.3	146	0.7%
Olyshivske	Aquifer	310	2.1	2.1	148	0.7%
Hlibovske (Crimea)	Depleted Field	1000	4.0	4.5	222	0.5%
Total		30950.00	263.6	257.3	112	0.8%

Technical overview of Ukraine's gas storage: Storage deliverability

Ukraine's gas storage deliverability, using 2015 data



The purpose of this chart, which shows deliverability against days required to empty each of the gas storage facilities in Ukraine, is to provide perspective in terms of size. In particular, it should be noted that **Bilche-Volytsko-Uherske provides 45% of total deliverability**

(Source: GSE database)

Technical overview of Ukraine's gas storage:

Commentary on Ukraine's gas storage facilities

- ❑ All facilities are pore based (hydrocarbon reservoirs/aquifers) so **injection/withdrawal follows annual cycles**
- ❑ **Rapid switching** between injection and withdrawal and back again **is generally difficult and expensive**
- ❑ The lack of fast cycle storage (normally provided by salt caverns) makes storage **less attractive as a trading asset**
 - ❑ Most value is likely to be derived from seasonal spreads (intrinsic value)
- ❑ Average 'speed' (withdrawal rate/working volume) of facilities is 1%
 - ❑ This compares with EU averages of 1% for depleted fields, 3% for aquifers and 5% for salt cavity stores
- ❑ Some facilities have high withdrawal rates relative to working volume and would be emptied in 2 to 3 months if produced at full rates
 - ❑ These are more likely to be **used to meet peak demands**
- ❑ It is understood that at present all facilities are combined for commercial purposes and that users book a single '**virtual storage**' facility
 - ❑ This has **potential drawbacks from a transparency perspective** and is due to be changed under a new Storage Code

Technical overview of Ukraine's gas storage:

Comparison of Ukraine/Europe supply sources

Source	Ukraine 2014	EU 2014	Ukraine Winter 2014-15 ⁽¹⁾	EU Winter 2014-15
National production	51%	29%		25%
Russian imports	36%	29%		22%
Europe imports	13%	n/a		n/a
Norwegian imports	-	25%	-	22%
LNG imports	-	9%	-	8%
North African imports		8%	-	5%
Storage	n/a	n/a		23%

Notes (1) Supply data for Ukraine's Winter 2014/15 to be included when available

Source: http://www.entsog.eu/public/uploads/files/publications/Outlooks%20&%20Reviews/2015/SO0012-151105_WinterSupplyOutlook2015-16_Review2014-15.pdf

Review of storage in the context of adjacent markets:

Comparison of storage facilities and capacities

Ukraine's gas storage

- ❑ Ukraine has the **largest working volumes of storage** in Europe
- ❑ Storage plays a **key role in both supporting domestic requirements and underpinning transit volumes**
- ❑ It is understood that **operationally the facilities are largely managed separately** from the transmission activities

Comparison within EU

- ❑ Working volumes
 - ❑ The closest rival in working volume terms is **Germany** which has extensive **salt cavern capacity**
- ❑ Immediate neighbours
 - ❑ Slovakia, Czech Republic, Hungary and Austria are all **well provided with storage**
 - ❑ Poland and Bulgaria have less capacity relative to consumption

Review of storage in the context of adjacent markets:

Comparison of storage facilities and capacities

Country	Number of facilities			Working Cap (BCM)	WC as % of consumption
	Salt cavity	Depleted Field	Aquifer		
Ukraine	-	11	2	30.9	68%
Germany	38	12	8	24.6	35%
Austria	-	10	-	8.3	100%
Hungary	-	5	-	6.3	75%
Poland	2	7	-	2.8	17%
Slovakia	-	2	-	3.1	84%
Czech Republic	1	6	1	3.5	47%
Bulgaria	-	1	-	0.6	23%
Romania	-	7	-	3.1	26%

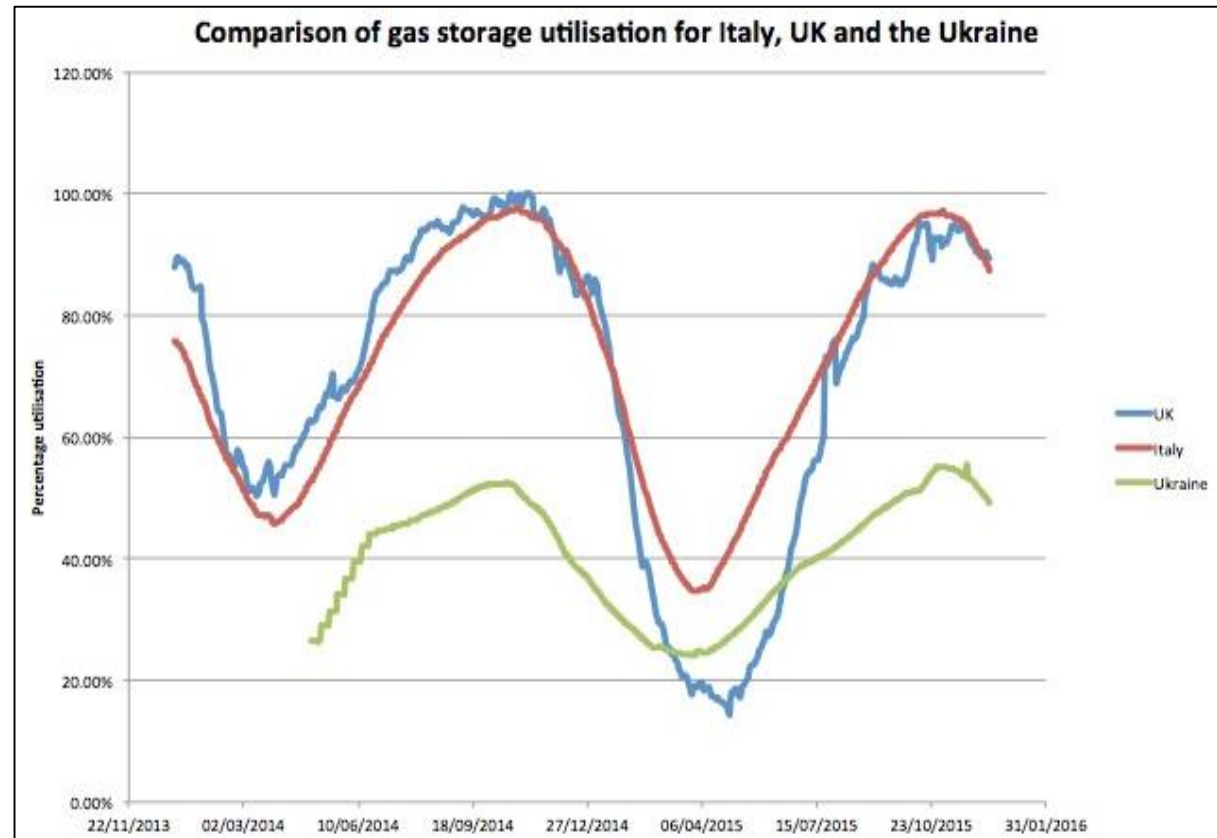
*Table provides a comparison of Ukraine's facilities and capacities with selected EU markets. **Most adjacent markets have adequate storage** with exception of Poland and Bulgaria. Romania has significant domestic gas production*

(Source: Data used from GSE database and BP Statistical Review)

Review of storage in the context of adjacent markets:

Comparison of storage operations

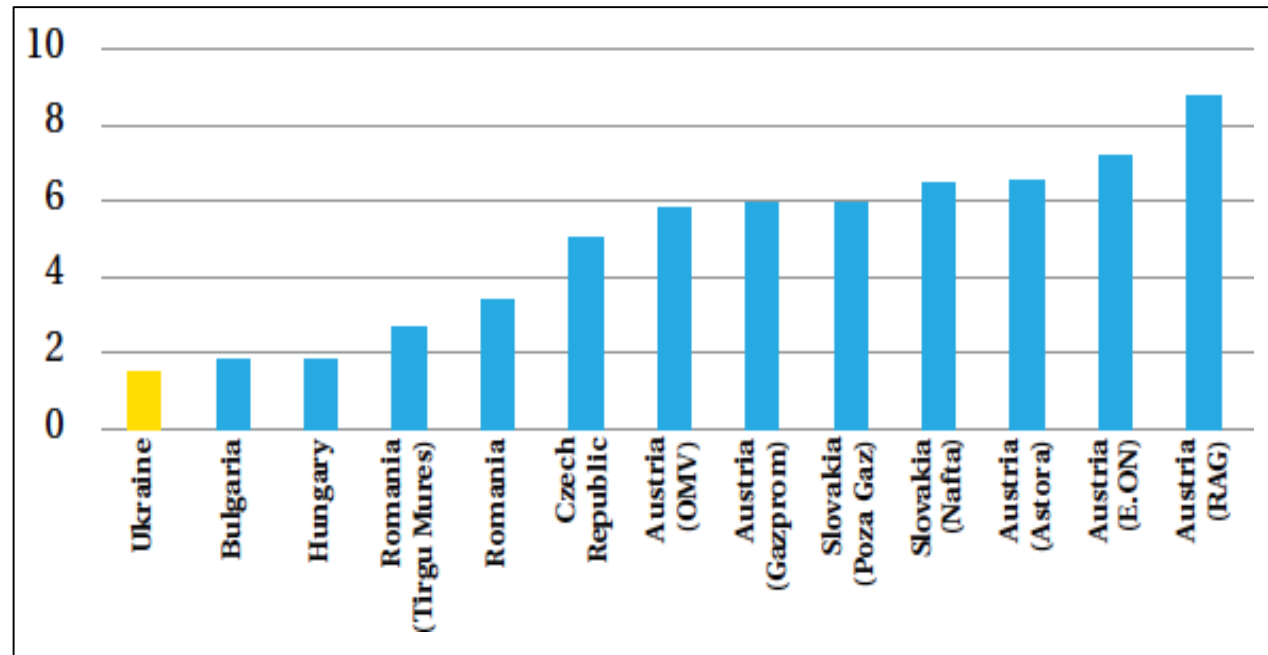
- ❑ Ukraine's storage is **operating significantly below full capacity**
- ❑ Lack of fast cycling facilities means that there are **two modes** – injection during the summer months (typically May to October), withdrawal during the winter
- ❑ This **mirrors picture for Italy (which also has no fast cycle facilities and is a relatively uncompetitive market)**, but differs from the more liberalized UK market which shows injections and withdrawal occurring throughout the year



(Source: GSE database)

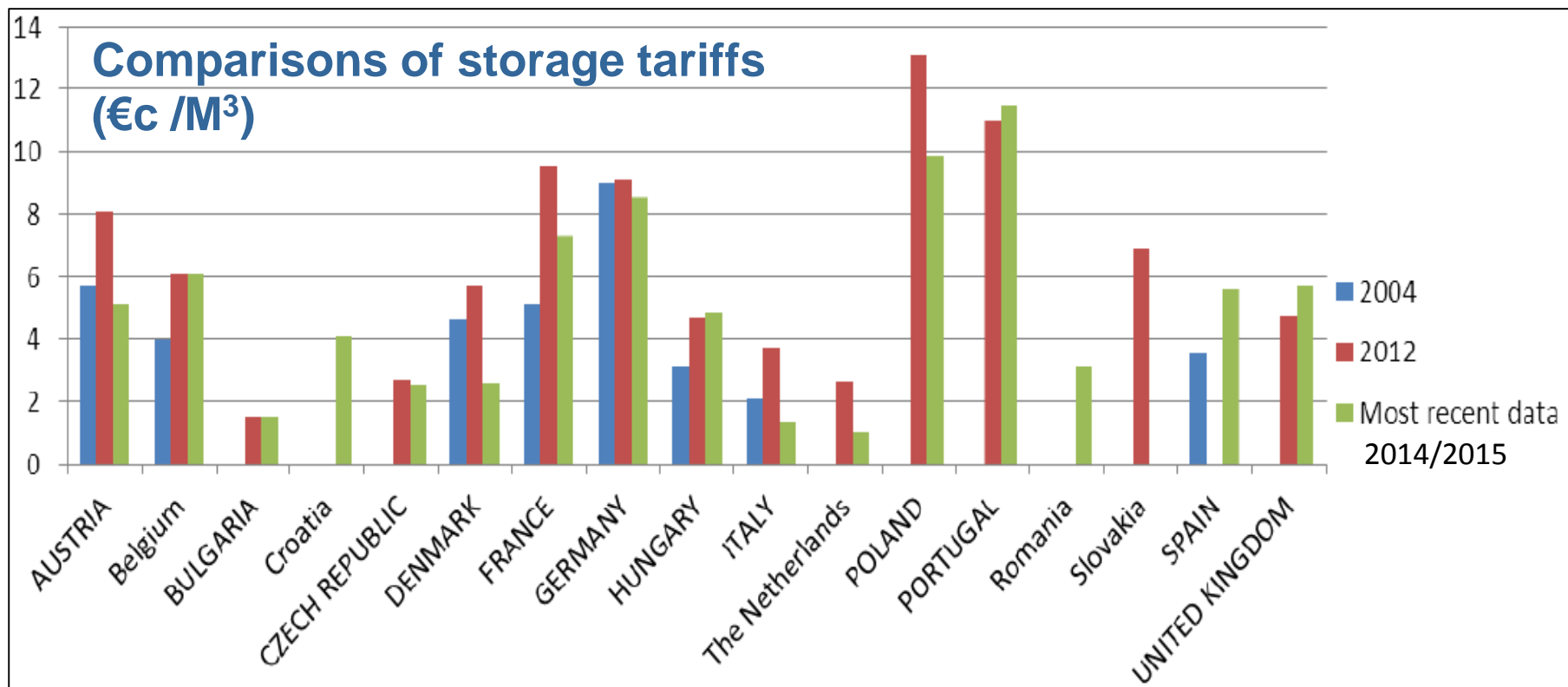
Review of storage in the context of adjacent markets: Comparisons of storage tariffs in 2012* (€/MWh)

- ❑ Ukraine claims to **have low and competitive storage tariffs** compared with competing countries
- ❑ However, tariffs were increased by 2.6 times in 2014; still, the business made a **loss of UAH 3 billion**
- ❑ It is intended to move to a regulated **RAB-based pricing methodology in 2016** in order to “ensure a fair return on assets and improve the results of this segment” (Naftogaz Annual Report 2014)



*Source: Naftogaz Annual Report 2014

Review of storage in the context of adjacent markets: Ukrainian storage becoming less competitive



Source: EC report (2015), The role of gas storage in internal market and in ensuring security of supply, p 69

*The above chart shows the evolution of gas storage prices for EU member states. It is noticeable, where data is available, that the **majority of countries are seeing a reduction in gas storage tariffs from 2012 to the post 2014 data**. This contrasts with the increasing trend of storage tariffs in Ukraine, though currency movements in 2014/15 have largely offset the increase in Hryvnia terms. Also, the previous slide shows that 2014 tariffs in Ukraine were still highly competitive (ie significantly lower) compared to other European countries.*

Review of storage in the context of adjacent markets:

Two case studies on transparency

Hungary

- ❑ Mix of strategic (MOL) and commercial (E.On) storage in 2010
- ❑ Government re-designated some strategic storage as commercial & sold at non-transparent negotiated prices
- ❑ Proportion of strategic storage continues to be varied
- ❑ E.On sold its storage company to state electricity company in 2013
- ❑ **Storage system has been criticized as being extremely expensive, market distorting (tariffs are not cost reflective) and non-transparent**
 - ❑ Withdrawals <20% of winter demand
- ❑ 20 active hub participants in 2014 (ACER)

Czech Republic

- ❑ No strategic storage
- ❑ RWE has linked its 6 storage sites to create one virtual facility with direct access to the virtual trading point (VTP)
- ❑ **Published annual statements** on transmission and storage tariffs
- ❑ **78 active hub participants** in 2014 (ACER)
- ❑ **Withdrawals >50% of winter demand**

Review of storage in the context of adjacent markets: Comparison of selected trading hubs scores¹

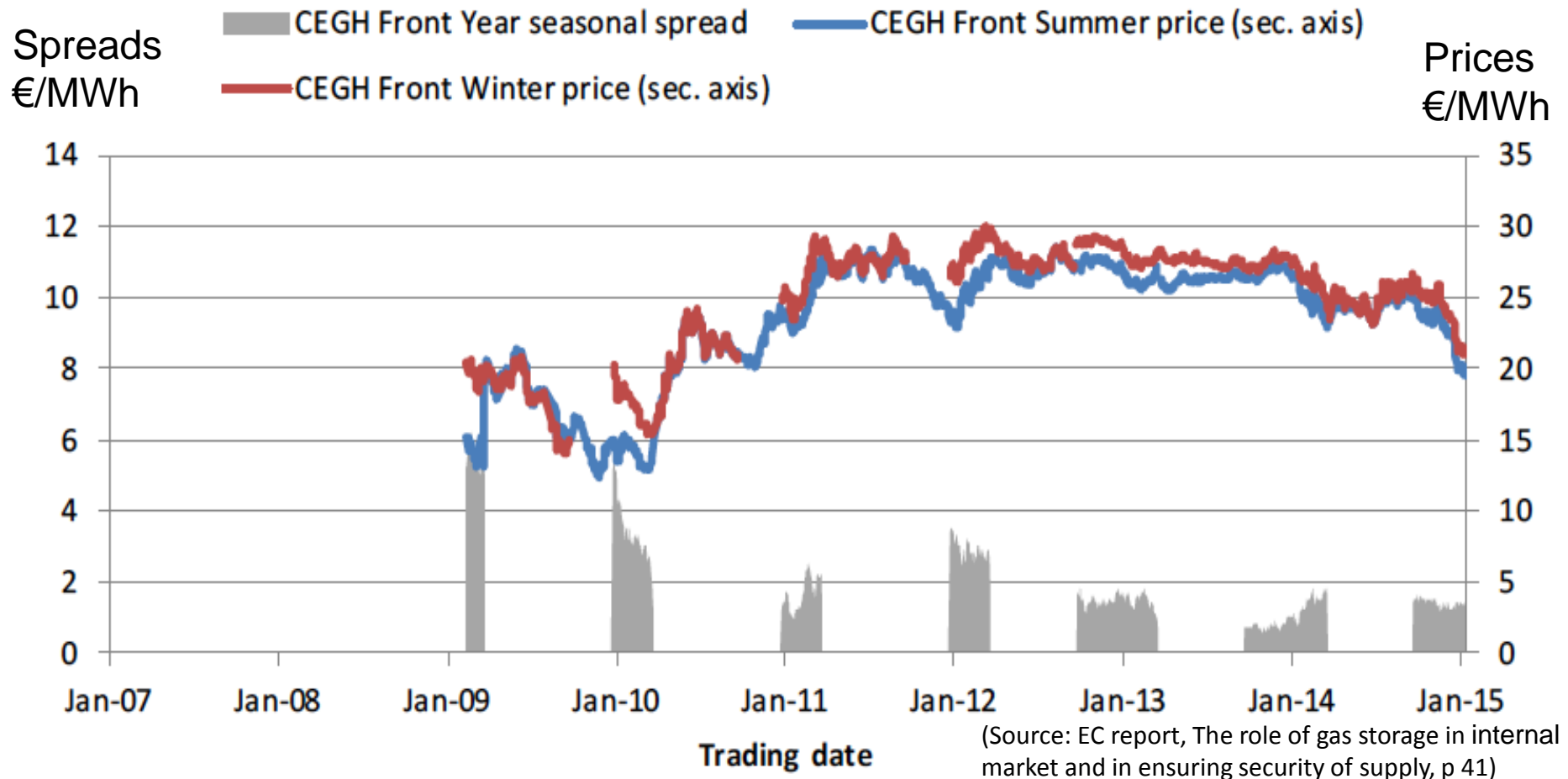
Hub	Score 2014	Score 2015
NBP (UK)	20	20
TTF (Netherlands)	19	19.5
GPL (Germany)	16	19
VTP(Austria)	14	14
VOB (Czech)	8	8.5
VPGS (Poland)	4.5	5.5

(Source: Heather, OIES 2015)

*Whilst on the day trading is understood to be well developed at certain points **in East Europe** the development of broader based hub trading is still to reach the status of NW European hubs such as NBP and TTF. This means a reliable forward price curve has not yet been established which in turn suggests that **a market based pricing mechanism for storage is presently lacking**. Forward price data is available for the CEGH (now VTP) hub in Austria. The fact that it is a less traded market than TTF or NBP suggests that forward curves may not be reliable for other than very short term deliveries. The resultant seasonal spread is shown on the next slide.*

(1) Trading hub scores are a measure of the success or otherwise of gas trading hubs based on churn, liquidity, depth and forward curve developed by European Federation of Energy Traders (EFET). A score of 20 is essentially a perfect hub, with high levels of transparency, liquidity, churn etc. (Source: http://www.efet.org/EnergyMarkets/VTP_assessment)

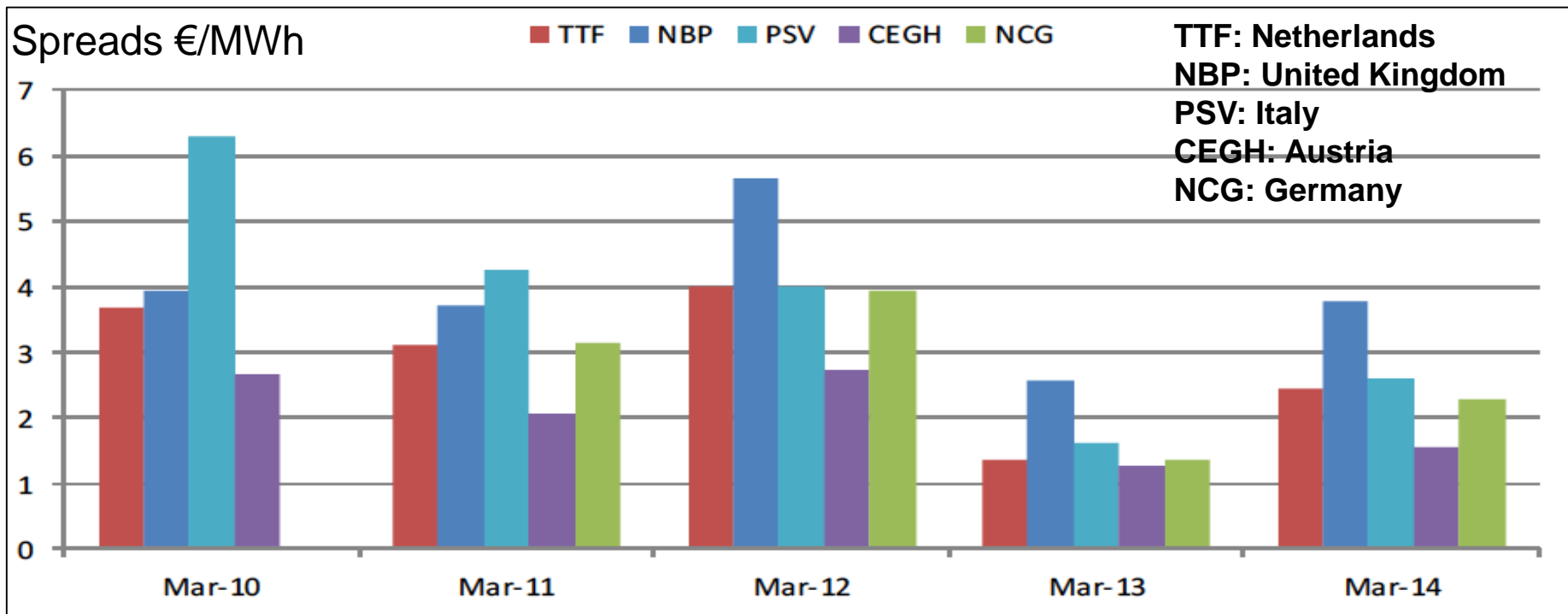
Review of storage in the context of adjacent markets: CEGH/VTP front year seasonal price spread



Leaving aside questions over the reliability of the forward curve it is clear that seasonal spreads have fallen in recent years

Review of storage in the context of adjacent markets: Comparison of spreads for selected hubs

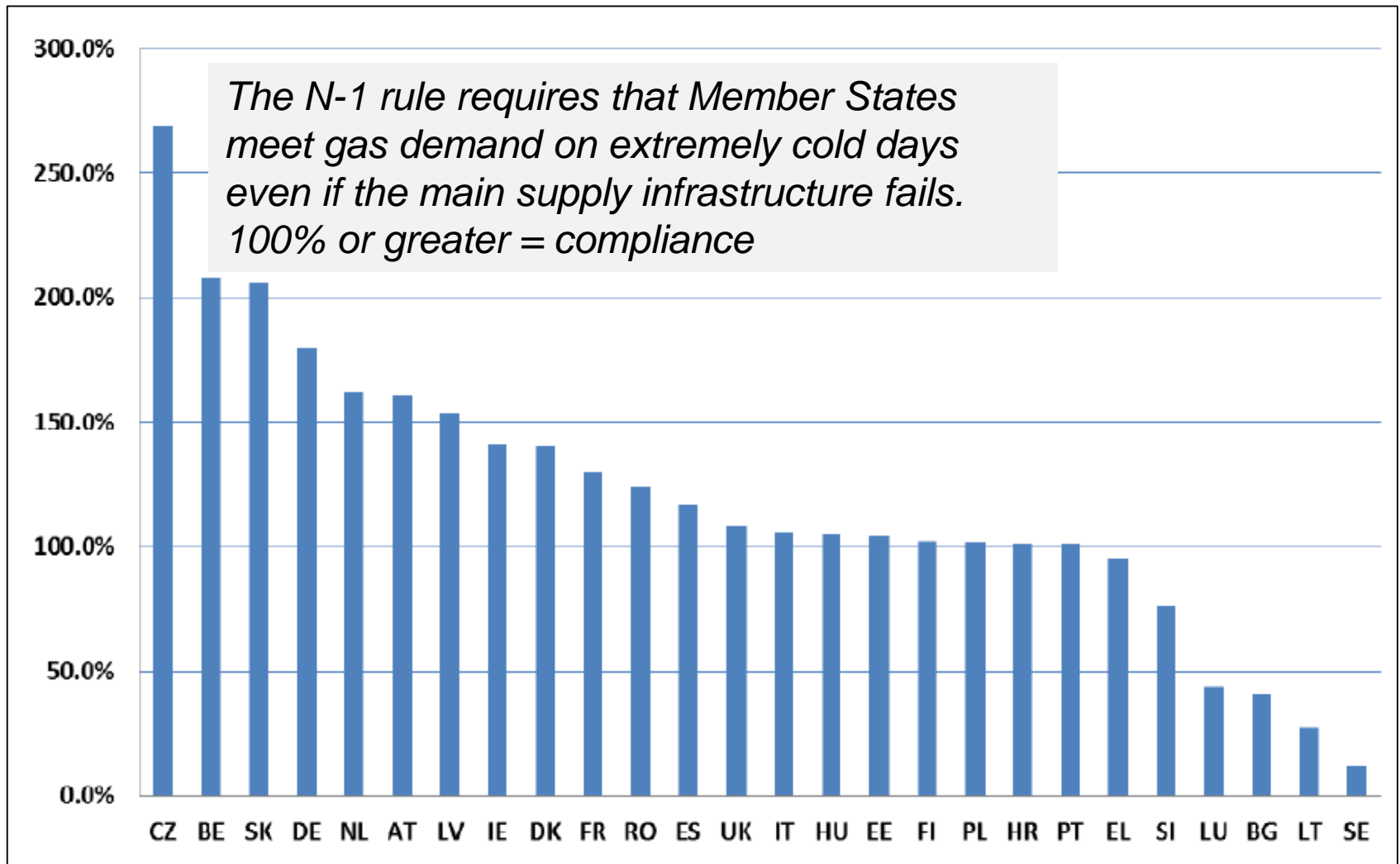
Comparison of the historical front year seasonal price spread, monthly average in March for selected hubs



The chart shows the **declining winter/summer spread across the main gas trading hubs in Europe**, which is the fundamental driver for the value of gas storage. The key point to note is that declining winter/summer spreads **reduce income for gas storage companies**.

(Source: EC report (2015), The role of gas storage in internal market and in ensuring security of supply, p 43)

Review of storage in the context of adjacent markets: Security of supply – N-1 compliance (2013)



(Source:

<https://ec.europa.eu/energy/sites/ener/files/documents/SWD%202014%20325%20Implementation%20of%20the%20Gas%20SoS%20Regulation%20en.pdf>)

Summary of Ukraine's gas storage challenges in the context of EU developments

- ❑ Ukraine has very significant gas storage facilities. However:
 - ❑ They are **operating** well **below technical capacity**
 - ❑ The **lack of fast cycle facilities reduces the attractiveness** as a trading asset
 - ❑ The **storage business is loss making despite some significant tariff increases** and is seeking to move to a RAB- based charging methodology
- ❑ European storage has **suffered from declining revenues**:
 - ❑ Seasonal spreads have fallen
 - ❑ Gas demand is lower
 - ❑ A number of new facilities have come on stream
- ❑ **Ukraine may be able to attract users from adjacent markets** with limited storage (eg Poland) or supply concerns or with more expensive markets

Analysis of the Restructuring Options of NJSC Naftogaz

Part 2: Unbundling options for gas storage

Section 1: Review of options for storage unbundling

Section 2: Establishing storage as a separate entity – management and operational issues

Section 3: Challenges facing Ukraine's storage

Annex: Glossary; gas storage technical and market background; EU gas storage ownership

Glossary

	Glossary
3EP	the EU's Third Energy Package
ACER	Agency for the Cooperation of Energy Regulators
Aquifer	Underground gas storage facility in a non hydrocarbon bearing aquifer
Bcm	one billion cubic metres
Cushion gas	(also referred to as Base Gas) the volume of gas required to be kept in a storage facility in order to maintain operating pressure but that is only produced when the facility is decommissioned
Depleted field storage	Underground gas storage facility located in a hydrocarbon bearing reservoir
EFET	The European Federation of Energy Traders
ENTSO-G	The European Network of TSOs for gas
GOU	Government of Ukraine
JV	Joint venture, in this case usually referring to joint ownership between a private company and a state-owned company
kWh	kilowatt hour
LNG	Liquefied natural gas, natural gas liquefied by cooling to minus 162 degrees Centigrade
Mcm	Million cubic metres
MWh	A unit of energy equivalent to a Megawatt of power over the duration of one hour
N-1	Security standard, the requirement to be able to meet domestic gas demand after the failure of the single largest infrastructure (usually pipeline or import source)
NAK	National Joint Stock Company (NJSC) Naftogaz of Ukraine
NBP	UK's National Balancing Point - a virtual point (hub) in the National Transmission System where gas trades are deemed to occur. It is also used as shorthand for the UK spot gas price.
PSO	Public Service Obligation. Directive 2003/55/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market provides for Member States to impose public service obligations to guarantee security of supply, economic and social cohesion objectives, regularity, quality and price of the gas supply and protection of the environment

Glossary (continued)

	Glossary (continued)
Salt cavern	Underground gas storage facilities contained in salt caverns
SBU	Storage bundled unit
Seasonal spread	The difference between the purchase price of gas in the summer and the sales price in the following winter at any one point in time.
Seasonal storage	Storage that is capable of delivering gas at maximum rates for extended periods – typically in excess of 90 days. These facilities have high working volumes and normally be in either depleted fields or aquifers.
SO	System operator
SSO	Storage system operator (can also be the storage system owner), may be a company set up to operate and own storage facilities
Strategic storage	Gas that is stored for use only in case of an emergency which would be a clearly defined set of circumstances
TSO	Transmission system operator (can also be the transmission system owner)
TTF	Title Transfer Facility – the Dutch trading hub
UAH	Ukraine's national currency, Hryvnia
UIOLI	Use It or Lose It - usually refers to booked but unused (pipeline or storage) capacity that can be offered to the market in the short term
UTG	Ukrtransgaz, Ukraine's existing gas transmission and storage entity, a subsidiary of NAK
VTP	Virtual trading point
WC	Working capacity
Working Gas	The quantity of gas that is normally injected and withdrawn in any one year in a storage facility. Working gas is distinct from 'cushion gas' which is only withdrawn from storage when a storage site is decommissioned

Annex: Gas storage technical and market background

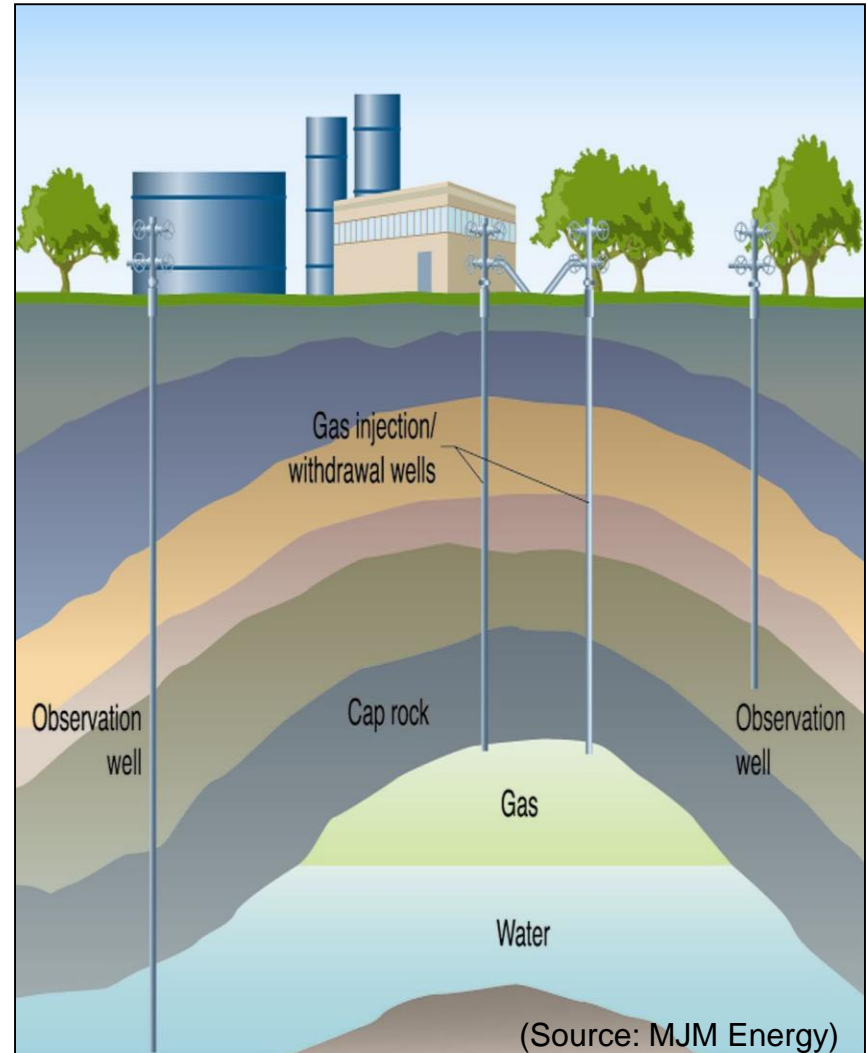
Contents

- ❑ Introduction to gas storage assets
 - ❑ Depleted field storage
 - ❑ Salt cavity storage
 - ❑ Aquifer and LNG storage
 - ❑ Physical characteristics of gas storage
- ❑ Operating gas storage in a liberalised market
 - ❑ Traditional use of gas storage
 - ❑ Commercial use
 - ❑ Valuing storage projects
- ❑ Key issues
 - ❑ Pricing of gas storage products
 - ❑ Security of supply
- ❑ Gas storage developments in Europe
 - ❑ The declining value of gas storage
 - ❑ EU storage facility ownership structure
- ❑ Storage in liberalized markets - summary of key issues

Introduction to gas storage assets:

Depleted field storage

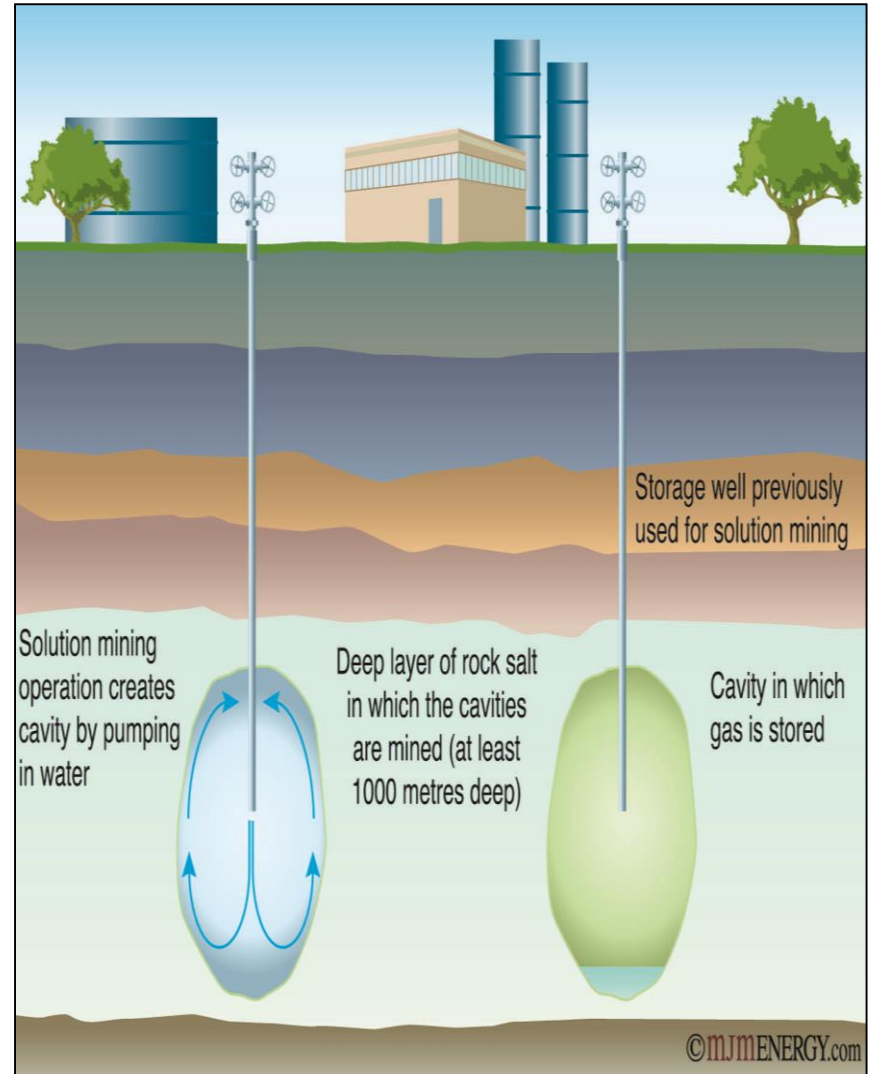
- ❑ Uses existing infrastructure
- ❑ Offshore or onshore
- ❑ Typically comparatively slow withdrawal rate
- ❑ Ukraine facilities
 - ❑ 11 facilities
 - ❑ ~30 BCM working capacity
- ❑ Cushion gas can be an issue
 - ❑ High CAPEX element of new gas storage
 - ❑ Gas used in depleted field and aquifer storage that is not (easily) recoverable
 - ❑ Volume depends on geology and pressure requirements



Introduction to gas storage assets:

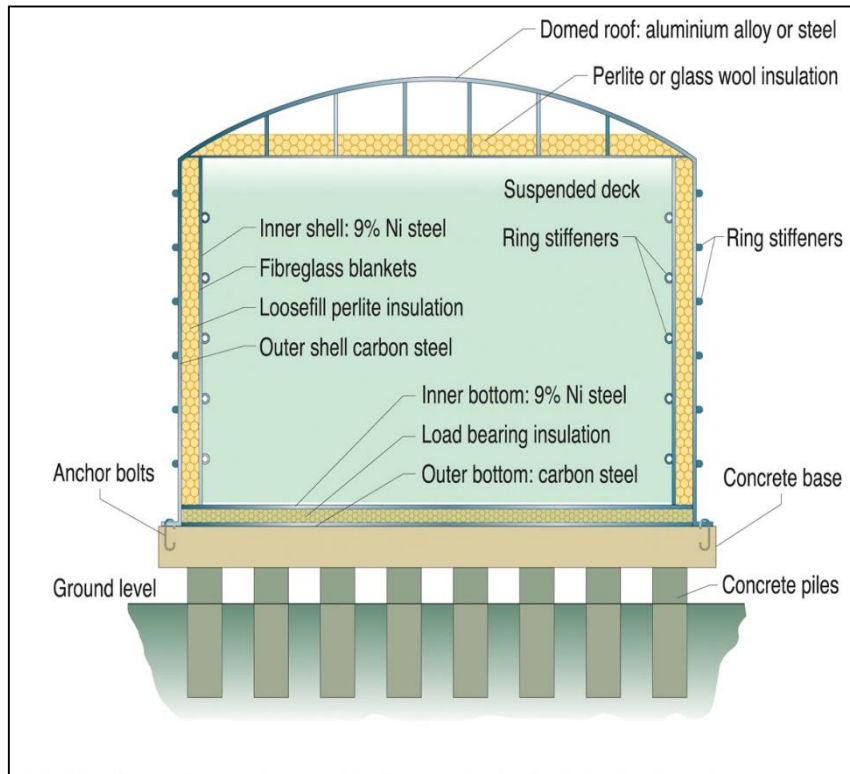
Salt cavity storage

- ❑ Medium size
- ❑ Fast withdrawal
- ❑ Ukraine facilities
 - ❑ None
- ❑ Typical uses
 - ❑ Historically used for short acting seasonal storage, but increasingly used by gas traders due to operational flexibility



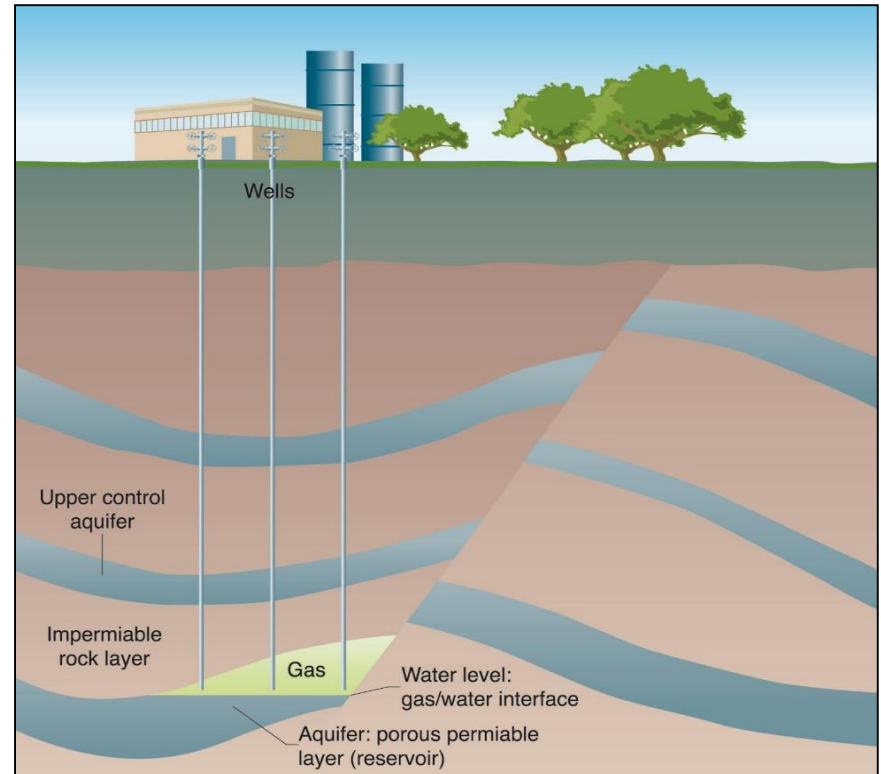
Introduction to gas storage assets:

Aquifer and LNG storage



❑ Peak shaving

- ❑ Built to meet seasonal peaks
- ❑ Can provide transmission support
- ❑ No facilities in Ukraine



❑ Aquifer gas storage

- ❑ Large
- ❑ Comparatively slow withdrawal
- ❑ 2 facilities in Ukraine (1.3 BCM)

Introduction to gas storage assets:

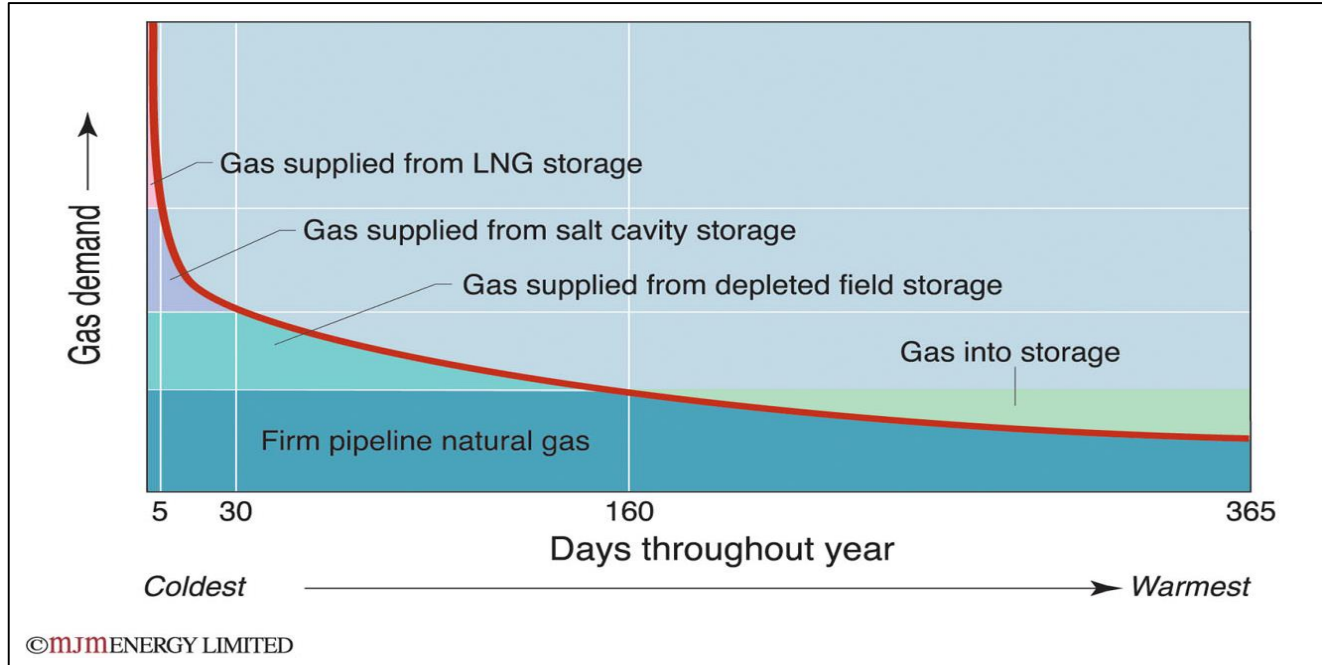
Physical characteristics of gas storage

Factor	Salt cavity	Depleted field	Aquifer	LNG
Main Usage	Multi cycle	Limited multi cycle (small fields) Seasonal Strategic	Seasonal Strategic	Peak shaving System support
Advantages	High injection and withdrawal rates Low cushion gas Phased development	Existing and understood Relatively low cost Large capacity	Large capacity	Very high rates of deliverability
Disadvantages	Small volume in individual cavern Brine disposal Subject to convergence Higher operating cost	High cushion gas requirement Slow injection and withdrawal rates	High cost Extended development time Potential environmental objections	High cost Low capacity Greater safety exposure
Working capacity (mcm)	500	500	500	32
Deliverability mcm/d	23.8	7.2	5.4	5.0
Cushion gas requirements	20% of total capacity	45% of total capacity	55% of total capacity	“Heel” of around 5 to 10%
Cycle rates	6.9	2.1	1.6	n/a
Speed	4.8%	1.4%	1.1%	15.6%
Speed (EU 28)	5%	1.0%	3.0%	28.0%

Operating gas storage in a liberalised market:

Traditional use of gas storage

Traditional use of gas storage: Seasonal supply / demand matching

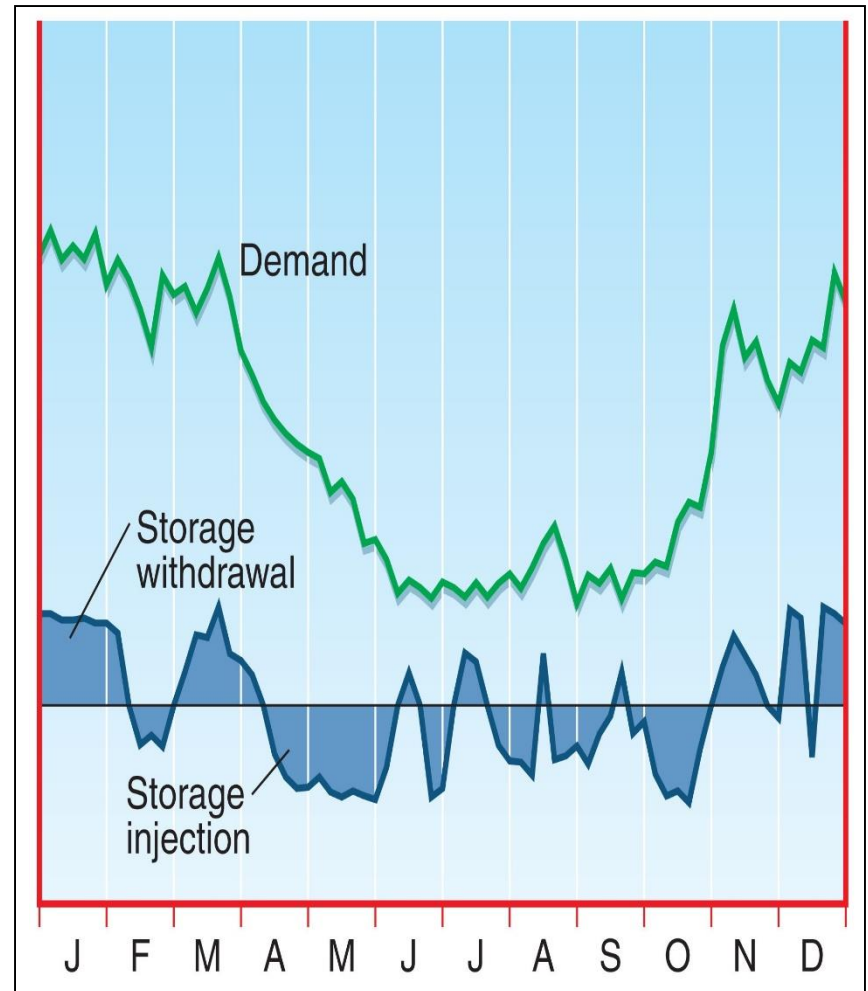


- ❑ Supply-demand matching (daily, seasonal)
- ❑ Peak demands (load duration curve)
- ❑ System balancing
- ❑ Short term disruptions/ network support
- ❑ Security of supply
- ❑ Commercial requirements

Operating gas storage in a liberalised market: Commercial use

Developing role of gas storage in a liberalising gas market

- ❑ All the traditional requirements plus a growing role in terms of energy trading by providing value from both
 - ❑ Intrinsic value (seasonal spread)
 - ❑ Extrinsic value (price volatility)
- ❑ Contractual benefits
 - ❑ Managing take-or-pay contracts
 - ❑ Make-up or carry-forward
 - ❑ Gas supply back-up Optimising production
 - ❑ Managing end user portfolios
- ❑ Exploiting price differentials
 - ❑ Time arbitrage
 - ❑ Seasonal
 - ❑ Short-term
 - ❑ Multi-cycling and fast response useful



Operating gas storage in a liberalised market: Valuing storage projects

The evaluation of storage projects in a liberalised market typically examines two key elements of value:

- ❑ **The intrinsic value** of being able to store gas across seasons that is cheaper to buy in the summer and of higher value in the winter
 - ❑ referred to as the seasonal spread
- ❑ Whilst intrinsic value is effectively captured on an annual basis it can be optimised within year
 - ❑ for example, by altering injection profiles from day to day in order to take advantage of changing spot gas prices
- ❑ **The extrinsic value** from being able to exploit the arbitrage between spot and future prices through injecting and withdrawing gas in multiple cycles in a year and further optimisation through trading around a physical position
 - ❑ This element will be higher the greater the number of cycles that the asset is able to deliver
 - so salt cavern storage will, other things being equal, have a higher extrinsic value than a depleted field facility

Key issues:

Pricing of gas storage products (1/2)

Storage facility	Injection capacity (SBU)	Storage capacity (SBU)	Delivery capacity (SBU)
Rough (GB)	0.35 kWh/d	67 kWh	1 kWh/d
Hornsea (GB)	0.11 kWh /d	18 kWh	1 kWh /d
Kalle (Germany)	1 m3/hour	1,250 m3	3 m3/hour
Epe Hcal (Germany)	3 MWh/d	7.5 GWh	10 MWh/d

- ❑ Prices are normally published tariffs in the case of regulated TPA or subject to negotiation if negotiated TPA rules apply.
- ❑ Need a unit/product for pricing – usually the storage bundled unit SBU
- ❑ Price itself can be cost or market based. In latter case usually determined by auction or linked to seasonal spreads. Seasonal spreads require a fully traded Market

Key issues:

Pricing of gas storage products (2/2)

The pricing of gas storage via the winter / summer spread



(Source: Summer / Winter spreads at NBP using data from Heren)

Key issues:

Security of supply

	Source	Transit	Facility	Operational
Technical risk	Underinvestment in indigenous production	Damage to import pipelines	Storage failure	Telemetry failure
Commercial risks	European supplies divert to higher priced markets	Contractual disputes	Quality issues restrict volumes	Supplies diverted to more liquid hubs
Human	Russia/EU standoff,	Disputes with Russia	Uncertain policy framework leads to underinvestment	Corruption restricts flows to certain markets
Natural	Cold weather in Russia/Europe leads to diversion of supplies	Major global disaster impacts on supplies	Flood damage	Landslip

Key issues

Security of supply - the role of PSOs

- ❑ **Bulgaria:** Mandatory storage obligation, equates to approx. 10% of domestic consumption, applies only to the dominant domestic supplier Bulgargaz
- ❑ **Denmark:** Expected to move from being a net exporter to an importer as domestic production falls. Despite this obligations have been relaxed and a new balancing mechanism introduced in 2014 are much more market based. The TSO retains some access to storage that can only be used in an emergency and if market based measures fail to work
- ❑ **France:** All suppliers should have 80% of their allocated storage capacity filled with gas on November 1 in each year necessary to supply domestic customers and customers providing services of general interest (for example, hospitals, schools) for a 6-month period under normal weather conditions. These arrangements are described by the EC as the toughest in Europe after Hungary
- ❑ **Germany:** Suppliers are legally obliged to meet the demands of residential and district heating customers in both normal and exceptional conditions using all of the measures listed in the EU regulations. No mandatory or strategic storage requirements
- ❑ **Hungary:** Only EU Member State to require both suppliers' storage obligations and strategic storage. The storage obligation requires that suppliers to households store 60% of their customers' previous winter consumption. This amounted to 1.8 bcm in 2012/13. In addition 1.2 bcm of strategic storage is exclusively reserved for household and communal consumption in crisis situations
- ❑ **Italy:** No mandatory storage obligations on suppliers. Strategic storage equivalent to a loss of 50% of peak capacity for 60 days. Importers and domestic producers pay for this in proportion to their volumes. In 2014/15 strategic storage volumes were 4.6 bcm – approximately 8% of annual consumption. The yearly cost is estimated at €60million

No equivalent in GB though Ofgem consulting on DSR tender

Gas storage developments in Europe:

The declining value of gas storage (1/2)

- ❑ Expectations of growth in demand, declining domestic production, growing concerns over security of supply and high seasonal spreads (in some markets) led to a surge in storage investments in the 2000's
 - ❑ *UK*
 - ❑ *Netherlands*
 - ❑ *Germany*
 - ❑ *Hungary*
- ❑ Since 2008 gas demand has fallen and forecasts are for it to remain flat or fall further
- ❑ New storage has come on stream increasing deliverability and capacity
- ❑ Markets have progressively liberalised and the level of interconnection and import capacity has increased significantly
- ❑ Substantial additional volumes of LNG are likely to become available and Europe is well placed to benefit
- ❑ Whilst indigenous output has fallen (mainly UK and Netherlands) it should remain broadly flat for the next 5 years
- ❑ Concerns over disruption to imports persist and a number of security of supply measures have been introduced

Gas storage developments in Europe:

The declining value of gas storage (2/2)

Market opening and falling demand have combined to show that many storage investments are over-valued/loss-making

- ❑ Market opening and falling demand have combined to show that many storage investments are over-valued/loss-making
- ❑ DONG write down - DKK 2.3 billion (€300m) provision for three German storage contracts. “.. liberalisation and greater liquidity ..[means].. the value of access to gas storage facilities has diminished”
- ❑ Lower storage utilisation in Germany leading some companies to review holdings and consider divestment or alternative uses
- ❑ Bergermeer sells 2.9 BCM of its 4.1 WC by Dec 2012. Remaining capacity will be sold short term
- ❑ Dutch gas storage prices show a declining trend.
- ❑ France - lower storage capacity sales and higher transmission tariffs
- ❑ EON have sold its Hungarian gas storage to the local power company.

Gas storage developments in Europe:

EU storage facility ownership structure & related data (1/8)

Country*	Number and type of operational facilities Total working capacity (million m ³)	Working (technical) capacity (million m ³) by facility operator and proportion of total	Storage operators#	With or separate from TSO in relevant country?^ Unbundling model	Ownership structure	Third party access regime+
Austria	10 (Depleted fields)	2 484 (30%)	OMV Gas Storage	Separate from TSO - Legal unbundling	100% subsidiary of integrated OMV Holding Company	Negotiated
	8 250					
		1 393 (17%)	RAG.Energy.Storage	Separate from TSO - Legal unbundling	100% subsidiary of Rohöl-Aufsuchungs Aktiengesellschaft (RAG) a producer and trader of gas	Negotiated
		880 (11%)	astora	Separate from TSO - Legal unbundling	100% subsidiary of Gazprom European holding company, W & G Beteiligungs-GmbH & Co. KG via WINGAS (Gazprom's European trading company)	Negotiated
		1 760 (21%)	GSA LLC	Separate from TSO - Legal unbundling	100% subsidiary of Gazprom export and Gazprom UGS	Negotiated
		1 733 (21%)	E.ON Gas Storage (renamed to Uniper Energy Storage)	Separate from TSO - Legal unbundling	100% subsidiary of German integrated energy company E.ON (now named Uniper)	Negotiated

Source: GSE (Gas Storage Europe), May 2015

* Does not include Ireland, Portugal and Sweden

Main storage operators only for Germany

^ 'With TSO' applies where storage is within the TSO company itself or part of a broader company structure that also includes the TSO for the specific country

+ In some cases, not all capacity is subject to TPA

Gas storage developments in Europe:

EU storage facility ownership structure & related data (2/8)

Country*	Number and type of operational facilities Total working capacity (million m ³)	Working (technical) capacity (million m ³) by facility operator and proportion of total	Storage operators#	With or separate from TSO in relevant country?^ Unbundling model	Ownership structure	Third party access regime*
Belgium	1 (Aquifer) 700	700 (100%)	Fluxys	With TSO - Part of ownership unbundled TSO	Owned by Fluxys Holding (90%). The remaining shares (10%) are quoted on the Brussels stock exchange	Regulated
Bulgaria	1 (Depleted field) 550	550 (100%)	Bulgartransgaz	With TSO – Part of legally unbundled TSO	100% subsidiary of integrated state owned company Bulgarian Energy Holding	Regulated
Croatia	1 (Depleted field) 553	553 (100%)	PSP	With TSO - Part of ownership unbundled TSO	100% subsidiary of ownership unbundled (and state owned) Plinacro Ltd	Regulated
Czech Republic	8 - Aquifer (1), Depleted fields (6), Rock Cavern (1)	2 696 (77%) 'Virtual storage'	RWE Gas Storage	Separate from TSO -Legal unbundling	100% subsidiary of Germany's integrated RWE Group	Negotiated
	3 507	576 (16%)	SPP Storage	Separate from TSO -Legal unbundling	100% subsidiary of Slovak integrated SPP Infrastructure group (SPPI Group)	Negotiated
		235 (7%)	MND Gas Storage	Separate from TSO -Legal unbundling	100% subsidiary of the Czech KKCG private investment group (KKCG Oil & Gas engages in E&P, storage and trading)	Negotiated

Gas storage developments in Europe:

EU storage facility ownership structure & related data (3/8)

Country*	Number and type of operational facilities Total working capacity (million m³)	Working (technical) capacity (million m³) by facility operator and proportion of total	Storage operators#	With or separate from TSO in relevant country?^ Unbundling model	Ownership structure	Third party access regime+
Denmark	2 – Aquifer (1), Salt cavern (1) 998	998 (100%)	Energinet.dk Gas Storage	With TSO - Legally unbundled within ownership unbundled TSO	100% subsidiary of Energinet.dk, the Danish state owned electricity and gas transmission system owner and operator	Negotiated
France	17 – Aquifers (12), Depleted field (1), Salt caverns (4) 12 008	8 747 (73%)	Storengy	Separate from TSO -Legal unbundling	100% subsidiary of French integrated energy company GDF SUEZ (now named ENGIE)	Negotiated
		496 (4%)	Geomethane	Separate from TSO -Legal unbundling	Equally owned by Geosud (which in turn is 56% owned by Total, 14% by Ineos and 30% by Geostock Entrepouse) and Storengy.	Negotiated
		2 765 (23%)	TIGF	With TSO - Part of ownership unbundled TSO	Owned by Italian grid operator Snam (40.5%), Singapore sovereign fund GIC (31.5%), France's EDF (18%) and Credit Agricole Assurances (10%)	Negotiated

Gas storage developments in Europe:

EU storage facility ownership structure & related data (4/8)

Country*	Number and type of operational facilities Total working capacity (million m³)	Working (technical) capacity (million m³) by facility operator and proportion of total	Storage operators#	With or separate from TSO in relevant country?^ Unbundling model	Ownership structure	Third party access regime+
Germany	58 – Aquifer (8), Depleted fields (12), Salt caverns (38)	5 818 (24%)	E.ON Gas Storage	Separate from TSO - Legal unbundling	100% subsidiary of German integrated energy company E.ON (now named Uniper)	Negotiated
	24 566	914 (4%)	RWE Gasspeicher	Separate from TSO - Legal unbundling	100% subsidiary of German integrated energy company RWE	Negotiated
		2 526 (10%)	VNG Gasspeicher	Separate from TSO - Legal unbundling	100% subsidiary of German VNG group, a natural gas wholesaler and importer	Negotiated
		1 932 (8%)	EWE Gasspeicher	Separate from TSO - Legal unbundling	100% subsidiary of EWE AG, an energy supplier (mostly of electricity and heat)	Negotiated
		1 669 (7%)	Storengy Deutschland	Separate from TSO - Legal unbundling	100% subsidiary of French integrated energy company GDF SUEZ (now named ENGIE)	Negotiated
		1 085 (4%)	BES (Berliner Erdgasspeicher)	Separate from TSO - Legal unbundling	100% subsidiary of GASAG group engaged in energy supply	Negotiated
		4 400 (18%)	astora	Separate from TSO - Legal unbundling	100% subsidiary of Gazprom European holding company, W & G Beteiligungs-GmbH & Co. KG via WINGAS (Gazprom's European trading company)	Negotiated

Gas storage developments in Europe:

EU storage facility ownership structure & related data (5/8)

Country*	Number and type of operational facilities Total working capacity (million m ³)	Working (technical) capacity (million m ³) by facility operator and proportion of total	Storage operators [#]	With or separate from TSO in relevant country?^ Unbundling model	Ownership structure	Third party access regime ⁺
Hungary	5 (Depleted fields) 6 330	4 430 (70%)	Hungarian Gas Storage	Separate from TSO - Legal unbundling	100% subsidiary of the state owned Hungarian MVM Group, predominantly a power producer and trader and the electricity ITO but also engaged in gas trading	Regulated
		1 900 (30%)	MMBF	Separate from TSO - Ownership unbundling	Owned by the Hungarian State via the Hungarian Development Bank (51%) and the Hungarian Hydrocarbon Stockpiling Association (49%) funded by member fees with members of the Natural Gas Section comprising gas market licence holders (producers, traders and operators)	Regulated
Italy	10 (Depleted fields)	698 (4%)	Edison Stoccaggio	Separate from TSO - Legal unbundling	100% subsidiary of integrated energy company Edison	Regulated
	16 582	15 884 (96%)	STOGIT	With TSO - Legally unbundled within ownership unbundled holding company that includes TSO subsidiary	100% subsidiary of listed gas infrastructure company Snam spa (engaged in the transport, dispatch, regasification, storage and distribution of natural gas)	Regulated

Gas storage developments in Europe:

EU storage facility ownership structure & related data (6/8)

Country*	Number and type of operational facilities Total working capacity (million m³)	Working (technical) capacity (million m³) by facility operator and proportion of total	Storage operators#	With or separate from TSO in relevant country?^ Unbundling model	Ownership structure	Third party access regime+
Latvia	1 (Aquifer) 2 320	2 320 (100%)	Latvijas Gaze	With TSO – No unbundling, but Energy Law requires legal unbundling of transmission and storage (together) by 1 January 2017	Latvijas Gaze is the only natural gas transmission, storage, distribution and sales operator in Latvia. It is listed on the Riga stock exchange and key owners are Uniper (previously E.ON) Ruhrgas International GmbH (47%), Gazprom PJSC (34%), Itera Latvija SIA (16%)	Regulated
Netherlands	5 – Depleted fields (4), Salt cavern (1) 12 900	300 (2%)	EnergyStock BV	With TSO - Legally unbundled within ownership unbundled holding company that includes TSO subsidiary	100% subsidiary of state owned gas infrastructure company Gasunie	Negotiated
		8 000 (62%)	NAM	Separate from TSO – functional unbundling	NAM is an oil and gas E&P company; its two shareholders are Shell (50%) and ExxonMobil (50%)	No TPA
		4 600 (36%)	TAQA Energy BV (Gas Storage Bergemeer)	Separate from TSO – ownership unbundled (independent SSO)	Owned by TAQA, an international energy and water company listed in Abu Dhabi (60%) and EBN (Dutch State, 40%)	Negotiated

Gas storage developments in Europe:

EU storage facility ownership structure & related data (7/8)

Country*	Number and type of operational facilities Total working capacity (million m³)	Working (technical) capacity (million m³) by facility operator and proportion of total	Storage operators#	With or separate from TSO in relevant country?^ Unbundling model	Ownership structure	Third party access regime+
Poland	9 – Depleted fields (7), Salt caverns (2) 2 754	2 524 (92%)	Operator Systemu Magazynowania Sp. z o.o.	Separate from TSO – Legal unbundling	100% subsidiary of PGNiG group with core business of producing and selling natural gas and oil. It is 72% state owned (Treasury) and 28% free float	Regulated
		230 (8%)	PGNiG	n/a	See above	No TPA
Romania	7 (Depleted fields) 3 050	2 750 (90%)	Romgaz	Separate from TSO – Legal unbundling	Largest natural gas producer and the main supplier in Romania, 70% state owned, 30% free float	Regulated
		300 (10%)	Depomures	Separate from TSO – Legal unbundling	59% owned by French integrated energy company GDF SUEZ (now named ENGIE)	Regulated
Slovakia	2 (Depleted fields) 3 135	2 480 (79%)	Nafta	Separate from TSO – functional unbundling (separate division)	NAFTA is a gas storage and hydrocarbon E&P company. Its main shareholders are SPP Infrastructure (56%) and Czech Gas Holding Investment B.V. (40%)	Negotiated
		655 (21%)	Pozagas	Separate from TSO – Legal unbundling	The shareholding structure of Pozagas is SPP Infrastructure (35%), NAFTA (35%) and GDF International (30%)	Negotiated

Gas storage developments in Europe:

EU storage facility ownership structure & related data (8/8)

Country*	Number and type of operational facilities Total working capacity (million m ³)	Working (technical) capacity (million m ³) by facility operator and proportion of total	Storage operators#	With or separate from TSO in relevant country?^ Unbundling model	Ownership structure	Third party access regime+
Spain	4 – Aquifer (1), Depleted fields (3) 4 103	3 417 (83%)	Enagas	With TSO - Part of ownership unbundled TSO	State-owned holding company 'SEPI' holds 5%, remaining 95% of shares are free float	Regulated
		686 (17%)	Gas Natural Fenosa	Separate from TSO – Legal unbundling	100% subsidiary of Spanish integrated energy group Gas Natural Fenosa (a publicly traded company)	Regulated
United Kingdom	8 – Depleted fields (3), Salt caverns (5) 5 040	3 728 (74%)	Centrica Storage	Separate from TSO – Legal unbundling	100% subsidiary of British integrated energy company Centrica plc (a publicly traded company)	Negotiated
		711 (14%)	SSE	Separate from TSO – Part of 'Wholesale' division (also covering energy portfolio management, generation and gas production)	SSE is an integrated energy business (production, distribution and supply of electricity and gas) and is publicly traded	Negotiated
		50 (1%)	EDF Trading	n/a		No TPA
		283 (6%)	Humbly Grove Energy	n/a		No TPA
		168 (3%)	E.ON Gas Storage UK	n/a		No TPA
		100 (2%)	Storengy UK	n/a		No TPA

Storage in liberalised markets – summary of key issues

❑ Strategic

- ❑ *Moves from a physical component to a competing source of flexibility as price used to incentivise balancing*

❑ Challenges:

- ❑ *Unbundling: degree of separation, structure and ownership*
- ❑ *Competition from other sources of flexibility*

❑ Opportunities

- ❑ *Gas trading*
- ❑ *System optimisation – intrinsic and extrinsic value*
- ❑ *Additional services*

❑ Issues

- ❑ *Regulation*
- ❑ *Security of supply*
- ❑ *Transition*
- ❑ *Transparency*

Deliverability becomes more crucial than capacity

Analysis of the Restructuring Options of NJSC Naftogaz

Part 2: Unbundling options for gas storage

Section 1: Review of options for storage unbundling

Section 2: Establishing storage as a separate entity – management and operational issues

Section 3: Challenges facing Ukraine's storage

Annex: Glossary; gas storage technical and market background; EU gas storage ownership

Analysis of the Restructuring Options of NJSC Naftogaz

Part 1: Unbundling options for gas transmission

Part 2: Unbundling options for gas storage

Final report, 9 February 2016

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