VIS
ECONOMIC & ENERGY CONSULTANTS

Study on the impact of the measures included in the EU and National Gas Storage Regulations

Volume 2

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Abbreviations

ACER	European Union Agency for the Cooperation of Energy Regulators
AGGM	Austrian Gas Grid Management
AGSI	Aggregated Gas Storage Inventory (Link)
ASGM	Austrian Strategic Gas Storage Management
CCGT	Combined- Cycle Gas Turbine
CEER	Council of European Energy Regulators
CfD	Contract for Difference
DSO	Distribution System Operator
EU	European Union
FSRU	Floating Storage and Regasification Unit
GIE	Gas Infrastructure Europe
GSE	Gestore dei Servizi Energetici
IP	Interconnection Point
LNG	Liquified Natural Gas
MoU	Memorandum of Understanding
MS	Member State
NRA	National Regulatory Authority
SSO	Storage System Operator
THE	Trading Hub Europe
TPA	Third Party Access
TSO	Transmission System Operator
UIOLI	Use-It-Or-Lose-It

Executive Summary

The European Union Agency for the Cooperation of Energy Regulators (ACER) and the Council of European Energy Regulators (CEER) commissioned a Study to assess the impact of national storage measures implemented by Member States during the storage year 2022/23[1]. The 1st volume of the Study[2] focused on taking stock of the measures adopted by Member States in 2022/23 and assessing their relevance to the objectives of the EU Gas Storage Regulation (Regulation (EU) 2022/1032). This 2nd volume of the Study aims at **identifying good practices and practices to avoid** in view of the lessons learnt from the implementation of existing regulations **during the 2022/23 period.** These insights can be taken into consideration by national authorities when updating and designing storage measures in the future.

During the storage year 2022/23, Member States applied storage measures to enhance security of gas supply and meet the storage filling targets set by the EU Gas Storage Regulation. Collectively, these measures lead to the storage of over 630 TWh of gas in the European underground facilities[3]. These measures were effective in **filling storage facilities, however not all were efficient**, as some resulted in high costs.

Effectiveness and efficiency of national measures

The measures implemented by the Member States are characterized by **varying levels of effectiveness** (extent to which they succeed in filling storages), and **efficiency** (establishing and maintaining gas stocks in a timely and streamlined manner while avoiding excessive costs and adverse effects in the gas markets), as shown in Table 1. The choice of **measures taken by a country depends on multiple factors**, such as the market characteristics (number of market participants, gas consumption and dependence on Russian gas), the prevailing storage regulation, the diversification of gas supply sources and routes, the size and type of storage facilities, including their relevance to meet winter demand, and the level of gas in storage at the beginning of the injection period.

Table 1: Assessment of storage measures' effectiveness – efficiency – level of required costs[4]

Storage Measure		Effectiveness	Efficiency	Level of costs
Obligations to all gas suppliers		●●●	●●	€€
Obligations to suppliers of protected customers		●	●●●	€€
Obligations to storage users		●● / ●●● (5)	●●	€ - €€
Obligations to a designated entity		●●	●● / ●●● (5)	€€ - €€€€
Filling of last resort		●●●	●	€€€€
Financial incentives to storage users	Discounts on storage tariffs	●●●	●●●	€
	Contracts for differences	● / ●● (5)	●●●	€ - €€
	Direct subsidies	●●●	●●	€€€
Storage filling service		● / ●● (5)	●●●	€€ - €€€
Storage capacity use-it-or-lose-it		●●●	●●●	€
Measure to facilitate capacity booking		N/A	●●●	€

[1] A storage year usually commences on April 1st of one year and ends on March 31st of the subsequent year (the start and end date may differ in some Member States).
[2] Volume 1 of the Study was published in October 2023 (link).
[3] Approximately 53% of the total aggregated storage capacity in the EU. See analysis in Vol. 1 of the Study.
[4] Effectiveness / efficiency ratings: ●: Low - ●●: Moderate - ●●●: High. An analysis of the effectiveness and efficiency of each measure is provided in Section 3.3.
[5] The rating of the measure's effectiveness or efficiency depends on exogenous factors (e.g. market prices).

Design and selection of national measures

The design of storage measures within a Member State begins with the decision of the authorities on the **entities entrusted with the primary role in storage filling**, to safeguard adequate levels of gas in storage. Depending on the selected entities, specific types of measures need to be implemented:

- **Mandatory stockholding by suppliers of final domestic consumers**: Leverages suppliers' access to and knowledge of the gas market and the effects of competition to decrease costs passed through to final consumers. It is more effective if the Member State's storage capacity is small in comparison to its gas demand.
- **Stockholding obligation to an entity not involved in gas supply** (e.g. TSOs, market operators, state stockholding agencies): Provides more control and management of gas stocks but may result in higher costs compared to stockholding by suppliers.
- **Storage users filling targets, linked to their booked capacity:** Leverages market participants' interest to use storage capacity. Financial incentives may be necessary to motivate market participants to book and use capacity. In Member States where storage facilities are used regionally by traders, such obligations could impact their interest in booking capacity.
- **Financial incentives to all market participants to voluntarily use storage capacity**: Market – based storage filling, without administratively set obligations.

The impact of these measures in strengthening security of supply **can be enhanced by complementing** them with additional measures, including support instruments or additional stockholding obligations (Table 2). The utilization of storage capacity can be facilitated if the **storage operators have the flexibility to offer capacity** in accordance with the stockholding needs and market conditions. The application of a **use-it-or-lose-it mechanism can free up unused storage capacity,** either releasing it to entities mandated with stockholding or offering it to the market. Although the filling of last resort is costly, it **serves as a back-up mechanism if all other market-based and administrative measures fail** to ensure that storages are filled.

Table 2: Complementarity of storage measures

Primary stockholding responsibility	Support instruments				Additional stockholding		
	Mechanism facilitating capacity booking	*Storage capacity UIOLI*	*Procurement of filling services*	*Financial incentives*	*Filling of last resort*	*Obligation to suppliers (supply standard)*	*Obligations to a designated entity*
Obligations to suppliers	✓	✓			✓		
Obligations to designated entity	✓	✓	✓			✓	
Obligations to storage users	✓	✓		✓			✓
Voluntary storage filling		✓		✓	✓		

Key lessons learned and recommendations

During the storage year 2022/23, several Member States implemented storage measures for the first time, while others continued applying measures already in place, in view of unfavourable market conditions during the summer of 2022, with highly negative summer–winter price spreads which discouraged market participants from injecting gas into storage, as they would do it at a loss.

Examining the implementation of the national storage measures during 2022/23 provides valuable lessons, which can guide **the design of new storage measures, the adaptation of existing ones and the identification of practices to avoid**. Key findings and recommendations are summarized below.

Table 3: Key lessons learned and recommendations[6]

Lessons learned	Recommendations
Application of support schemes	
Where contracting storage capacity has been linked to specific filling targets, the use of **support schemes** (incentives, penalties, flexible offering of capacity) **has motivated market participants** to use storage facilities.	Support mechanisms should complement storage users' obligations to meet filling targets. This includes: ▪ **Flexibility** in marketing storage capacity according to the market conditions. ▪ **Discounts** on the storage tariffs, and/or on the tariff at the transmission/storage points. ▪ **Financial penalties** for storage filling below targets, high enough to dissuade storage users from not meeting their obligations.
Use of storage filling of last resort	
The use of measures for storage filling of last resort in the summer of 2022, not always coordinated across Member States, and without risk mitigation mechanisms, led to **expensive gas purchases for filling storages**. The release of these gas volumes to the market **may have unintended effects in gas markets' functioning**.	**Higher efficiency in the application of storage filling of last resort** would require: ▪ Sufficient **lead time,** allowing the obligated entities some flexibility when accessing the markets. ▪ Access of the obligated entity to futures markets for **price hedging**. ▪ **Strategy for releasing** the gas back to the market.
Cross-border impacts and cost recovery	
Requiring market participants to **ensure deliverability** of gas stocks maintained in neighbouring countries **may impact the availability of capacity at the IPs**. Furthermore, recovery of costs associated with national measures through **charges or levies at cross-border points has adverse impacts on the functioning of regional markets** (e.g. higher gas hub prices) **and/or the security of supply** (e.g. by impacting gas flow supply patterns)	To avoid negative cross-border impacts when implementing a national measure: ▪ The mechanism for releasing gas stocks to the market should **not oblige the entities to reserve excess capacity** at IPs. ▪ Cost recovery mechanisms should **not include charges and levies imposed at cross-border points**.
Application of use-it-or-lose-it mechanism	
In 2022, the application of use-it-or-lose-it mechanisms **succeeded in releasing over 25 TWh of storage capacity** (booked by Gazprom), and voluntary capacity release procedures transferred unused capacity to other entities, in time to ensure storage filling.	A congestion management mechanism should be put in place, entailing both **voluntary and mandatory release of storage capacity,** irrespective of the stockholding obligations applied. This mechanism should include a **streamlined process** for capacity release, at specific timings.
Offering of contracts for differences	
In 2022, contracts for differences (CfDs) generated **interest** among market participants in some Member States. The payout to the beneficiaries was limited, as the spread between the market and agreed prices was positive. The development of CfD mechanisms **at a short notice was challenging**.	The mechanism for offering contracts for differences should be **put in place well in advance of the injection period**, to be readily available if market conditions are not favourable for storage filling. **Direct subsidies should be offered as a last resort**, and only if interest for CfDs is small, as they make a less efficient use of funds.

[6] Key findings and recommendations are discussed in detail in Section 7.

Impact of suppliers' gas stocks on flexibility

The assignment of stockholding obligations to suppliers, covering a substantial portion of the Member States' storage capacity, **reduced the availability of storage capacity** for system and market flexibility (e.g. short-term trading).	▶	When determining the size of stockholding obligations to be maintained by suppliers, the needs of the market participants to **use the storage for flexibility and price arbitrage should be taken into consideration** (e.g. through market consultations).

1 Introduction

1.1 Objective of the Study

The European Union Agency for the Cooperation of Energy Regulators (ACER) and the Council of European Energy Regulators (CEER) commissioned a Study analysing the national storage measures taken by the Member States in 2022 in compliance with the EU Gas Storage Regulation[7]. The purpose of this analysis is to assess the impact of the adopted measures, their alignment with the EU Gas Storage Regulation's objectives, and to identify lessons learned and draw conclusions from the implementation of the measures during the storage year 2022/23, with a view to enhancing their effectiveness and efficiency.

The Study comprises two volumes.

Volume 1 analysed the measures adopted by the Member States to strengthen the use of underground storage facilities in the EU and their contribution to the objectives of the EU Gas Storage Regulation. This analysis was largely based on information collected from national regulatory authorities (NRAs) and complemented with publicly available information. Volume 1 of the Study was completed in October 2023 and is published on ACER's website (link).

Volume 2, the document at hand, aims to identity good practices and propose recommendations for designing storage measures to enhance their effectiveness and efficiency. Additionally, it seeks to review agreements and burden-sharing mechanisms between Member States with and without underground storage facilities.

1.2 Structure of the document

Volume 2 of the Study is structured into 7 Sections, including this introduction.

Section 2 provides an **analysis of the key design elements for storage measures**, based on the experience from the implementation of national measures by Member States in 2022.

Section 3 describes the **typologies of storage measures** that can be applied to increase storage filling, and assesses their effectiveness, efficiency and level of costs.

Section 4 assesses the **commonalities and differences in the selection of the measures** implemented by **Member States with similar characteristics**.

Section 5 analyses the **rationale for selecting the measures** having a primary role in storage filling, and the prospects of combining these with supplementary measures.

Section 6 includes a **stocktaking of storage arrangements** between Member States with and without storage.

Section 7 discusses the **key lessons learned from the implementation of measures in 2022 and formulates recommendations on good practices for the design of measures** in the future.

[7] Regulation (EU) 2022/1032.

2 Key elements in the design of storage measures

2.1 Design elements of national storage measures

When establishing the national storage measures of a Member State, the authorities responsible for designing these measures must make decisions on several elements that shape their **scope, characteristics and implementation modalities**. The fundamental elements for designing storage measures include the:

- **Scope** of the measure
- **Obligatoriness** of the measure (administratively set or market-based)
- **Stakeholders with** stockholding **responsibility**
- Mechanism for **allocating stockholding obligations**
- **Stockholding duration**
- **Release** of gas stocks
- **Support** instruments
- **Cost recovery** mechanisms
- **Monitoring** responsibilities

Each of these elements is further described below.

2.2 Description of storage measures' design elements

2.2.1 Scope of the measure

A national storage measure may have diverse objectives, such as ensuring storage filling by setting obligatory stockholding responsibilities, promoting the increased use of storage capacity through incentives to market participants, or establishing mechanisms to support the implementation of other measures. The scope of such a measure may concern:

- Assigning **stockholding responsibilities to one or more entities**. To fulfil their obligations, entities may procure **storage filling services** from market participants, through open and transparent procedures.
- Designating a **last resort storage filling** entity, which would come into play in case market participants fail to sufficiently fill storages to meet the European or national targets.
- Providing **financial incentives** to market participants for storage filling, including discounts on storage tariffs, contracts for differences, and subsidies to encourage the utilisation of storage capacities.
- Implementation of **storage capacity congestion management mechanisms**, which allow the release of booked but unused storage capacity to other market participants, ensuring an efficient access to storage capacity.
- **Operational improvements** in **storage capacity allocation mechanisms**, such as increased frequency of capacity auctions to facilitate market participants in booking capacity and storing gas when market conditions arise.

2.2.2 Obligatoriness of measure

The storage measures can be split into two broad categories: obligatory stockholding and market-based measures.

The **obligatory stockholding** is administratively assigned to obligated entities by the authorities responsible for establishing the measure[8]. The obligated entities (see Section 2.2.3) are **legally bound to establish and maintain the necessary stocks** in the volumes and duration stipulated by the measure. Penalties, such as fines and the obligation to release unused capacity, are imposed for non-compliance with the storage filling obligations. Discounts on storage tariffs and/or on tariffs at the transmission/storage network points may also be provided to obligated market participants, to mitigate their financial exposure and risks.

Market-based measures entail incentivising market participants to **voluntarily fill storage facilities** at the foreseen milestones. Such incentives may include financial support schemes to market participants storing gas (in the form of tariff discounts, contracts for differences and/or direct subsidies), or the provision of storage filling services by market participants for a fee.

2.2.3 Stakeholders with stockholding responsibility

In case the measures involve the mandatory establishment of stocks, the responsibilities can be assigned to various entities, such as:

- **All gas suppliers** selling gas to final consumers in the Member State.
- **Gas suppliers exclusively for their sales to specific customer categories**, especially related to supply of protected customers. The obligations may extend to critical sectors such as electricity and hear producers.
- **Storage users holding booked capacity**. In this case, the obligations apply only to those market participants using the underground storage facilities of the Member State.
- One or more **selected entities not involved in gas supply**. Stockholding obligations may be set to stakeholders of the gas sector other than gas suppliers, such as the market operator, TSO, SSOs, or to entities established with the mandate to formulate strategic reserves. The obligations could concern establishing strategic reserves[9], temporarily storing gas if market-driven storage filling is not sufficient or ensuring storage filling of last resort.

The obligated entities may be given the possibility to delegate the responsibility of storing gas to other parties for a fee. For example, suppliers may be allowed to request from third parties to cover their stockholding obligations, while entities such as market operators or TSOs may be allowed to launch tenders for procuring storage filling services.

The market-based measures should provide **incentives to market participants, so that they voluntarily use storage capacity**. The market participants opting to utilize the offered incentives, would have the responsibility to book storage capacity and ensure storage filling in accordance with the measure.

[8] Such authorities typically include the Ministries responsible for the energy sector or NRAs.

[9] The term strategic reserves refers to long-term gas stocks that are maintained in storage in case of an emergency.

2.2.4 Mechanism for allocating stockholding obligations

For measures that assign stockholding responsibilities to market participants, it is important to put in place a mechanism that determines the gas stocks each market participant must establish and maintain. This mechanism should **allocate the obligations in a non-discriminatory and transparent manner, proportionately** to the activities of the relevant market participants:

- The **responsibilities of suppliers** must be proportional to their gas sales to the relevant consumer categories requiring stocked gas.
- The **responsibilities of storage users** should be proportional to the storage capacity that they have booked, taking into consideration the storage filling targets.

If the measure allows market participants to store gas stocks outside the Member State, the mechanism for withdrawing the stocks from the neighbouring countries should avoid creating contractual congestion at the interconnection points and hampering cross-border trade.

The Ministry, the NRA, or another designated entity (e.g. a state organization dealing with stockholding) must be tasked with allocating the stockholding obligations. Typically, this entity should also be involved in **monitoring the measure's implementation and verifying its results**. The mechanism should include a procedure for collecting the data necessary for allocating responsibilities from the obligated entities, calculating their stockholding obligations, and notifying them accordingly.

2.2.5 Stockholding duration

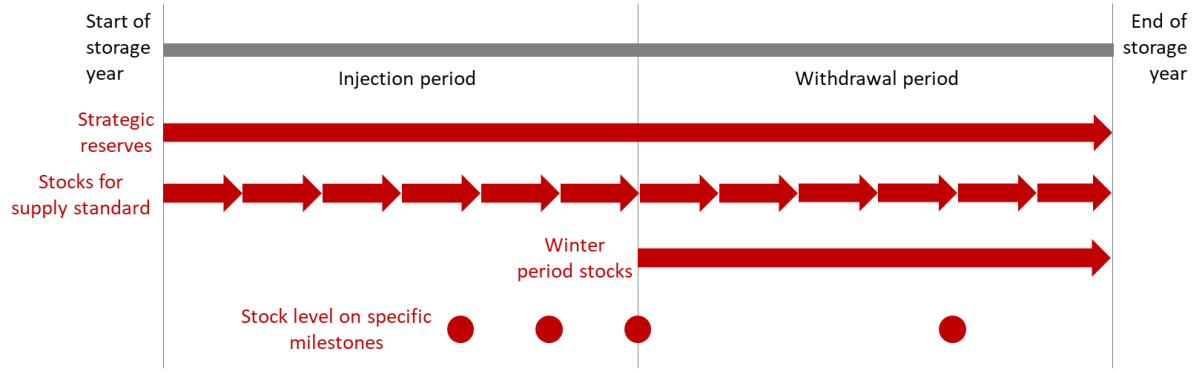
Gas stocks must **remain in storage for varying durations**, ranging from few days to an indefinite period. This depends mainly on the type of the obligated entity and the scope of the measure. The typical options for the duration of the stockholding obligations are presented in the Table below.

Table 4: Duration of gas stockholding

Type of stocks	Stockholding duration
Strategic reserves	▪ The gas stocks are stored until needed in case of emergency (i.e., for an indefinite period) ▪ Related to the establishment of strategic reserves / emergency stocks by obligated entities ▪ If used during an emergency, the stocks have to be replenished
Year-round gas stocks to meet the supply standard	▪ The gas stocks must be maintained throughout the year ▪ Typically associated with using storage as insurance for the supply standard ▪ Suppliers must keep sufficient gas in storage in monthly checkpoints to cover demand of their protected customers and/or other customer categories
Gas stocks released back to market	▪ Gas stocks may be reintroduced into the market several months or even a year after their initial establishment ▪ This may potentially relate to gas stocks resulting from storage filling of last resort or stockholding by suppliers delivering gas to protected customers with a requirement to maintain gas in storage until the next withdrawal period
Winter period gas stocks	The gas stocks must remain in storage for the whole winter period, ensuring adequate level of gas stocks for the duration of the withdrawal period
Specific gas stock levels in specified milestones	Users of the storage facilities may have to keep gas in storage at certain levels on specified dates. These dates usually reflect the targets and milestones foreseen in the EU Gas Storage Regulation[10] (with a minimum storage filling requirement for November 1st and milestones on the filling trajectory).

[10] Obligations for 2022 set in Regulation (EU) 2022/1032 (link), for 2023 in Commission Implementing Regulation (EU) 2022/2301 (link) and for 2024 in Commission Implementing Regulation (EU) 2023/2633 (link).

Figure 1: Timing and duration of stockholding



2.2.6 Release of gas stocks

The way that the stored gas stocks can be released to the market is primarily influenced by the assigned stockholding responsibilities, as shown in the Table below.

Table 5: Release of stocks based on the assigned stockholding responsibilities

Type of stocks	Release of stocks
Strategic reserves	These reserves are withdrawn **only in case of an emergency** and require approval from the state authorities managing the emergency. The final consumers to which the gas stocks can be delivered are determined in the Member State's emergency plan.
Gas stocks stored by market participants	Market participants can **sell them freely to the market**, provided that the conditions set out in the measure are met (e.g. specific storage filling at specific dates). In case of suppliers storing gas to meet the supply standard, the stored gas is sold to their protected customers.
Gas stocks stored by non-market participants	In case the gas stocks were established by entities other than market participants, these have to be **sold back to the market**. Depending on the entity responsible for stockholding, constraints may apply with regards to the customer categories (e.g. protected customers) to which the stored gas can be sold.

The sale at the wholesale market of gas stocks that were established for filling of last resort is an **administrative and not commercial decision**. As a result, release of the stocks may lead to **non-market based signals and create price distortions**. The effects are intensified if the size of the gas stocks is large, and these were procured by the obligated entity at very unfavourable summer-winter spreads. The same impact can be observed if the strategic reserves must be released to the market after some years (i.e. if the stockholding measure is put in place for a definitive period).

To mitigate the impact of releasing gas stocks, ex-ante mechanisms can be taken. These include closely monitoring storage filling, to plan any last resort volume requirements. Additionally, allowing last resort entities to manage market (price) risks through price hedging can help reducing the obligated entity's price exposure to procuring gas under unfavourable market conditions. Once gas has been stored, a **strategy for releasing the volumes to the market** without adverse effects should be established.

2.2.7 Support instruments

To ensure effective implementation of the measure, it is important to offer **incentives and disincentives** to the obligated entities.

Cost reduction incentives: apply **discounts** on the charges for using storage facilities, and/or transmission/storage connection points. Furthermore, **capacity booking should be facilitated to ensure** that the obligated entities will have access to available capacity without tariff premia , possibly via priority booking or separate capacity allocation for obligated entities.

Allow more flexibility in gas storage: where storage filling is market-driven, **the SSOs should be allowed more flexibility to offer storage capacity when market conditions are favourable** (e.g. adjusting the auction calendar to offer capacity when price spreads are positive), to increase the market's interest for booking capacity.

Compliance: to ensure compliance with their stockholding obligations, penalties should be imposed on market participants failing to meet storage filling targets. Such penalties may include **administrative fines** and/or payment of **imbalance charges**, as well as the application of **use-it-or-lose-it mechanisms** through which the SSOs may release any unused capacity. The financial penalties should be dissuasive, i.e. high enough to disincentivize market participants against not meeting their obligations. For example, the penalties could be commensurate to the value of the gas volumes the obligated entity did not put in storage.

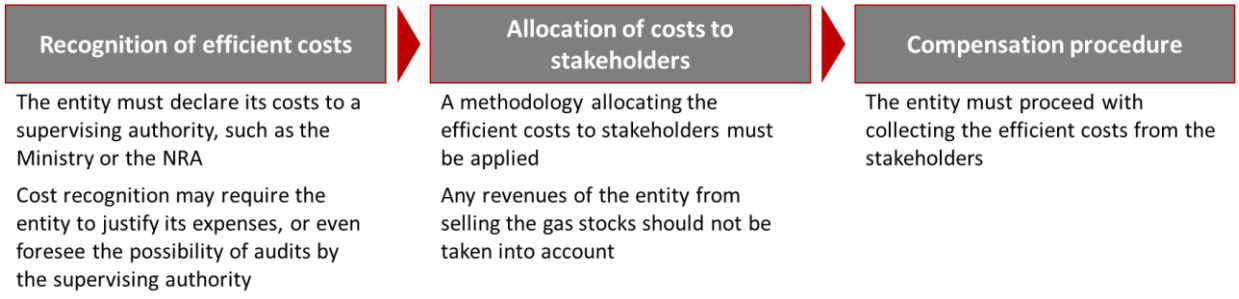
2.2.8 Mechanism for cost recovery

The recovery of costs associated with the measure may vary depending on the type of entity responsible for its implementation.

Where **suppliers undertake stockholding obligations,** they typically recover the costs from their customers. Each supplier incorporates expenses associated with establishing and maintaining gas stocks into market prices, in accordance with its own pricing policy.

For entities other than suppliers, **compensation mechanisms** need to be established, to ensure that the entities can recover all their efficiently incurred costs associated with the implementation of the measure. The cost recovery mechanism should include **recognition** of the efficient costs of the obligated entity, **allocation** of these costs to stakeholders, and **collection** of the costs from the stakeholders (Figure 2).

Figure 2: Elements of a cost recovery mechanism



There are several options for recovering the relevant costs, the most usual of which include:

- Disbursements from the **state budget**.
- Inclusion in the obligated entity's **regulated tariffs** (if applicable)

- Inclusion in the transmission **tariffs applied at offtakes of the system to final consumption** (i.e., exit points to distribution networks and final consumers connected to the transmission system).
- Additional **charges applied at the internal network points** of the transmission system (excluding cross-border points).
- Charges or levies applied to the **final gas consumers**.
- Charges or levies applied to all **final energy consumers**.

The option selected in each case is based on a policy decision by the authorities of the respective Member State, which are designing the measure.

Any charges or levies applied to network points should concentrate only on internal exits from the transmission system to final consumption. Allocating costs of national storage measures to cross-border points should be avoided, as it may adversely affect gas flows and create an uneven playing field between consumers in the Member State implementing the measure and its neighbours.

2.2.9 Monitoring responsibilities

One or more entities must be designated **to monitor the implementation of the storage measure and verify compliance with the storage filling targets**. Typically, this role is assigned to the pertinent Ministry and/or the NRA, or to other state authorities that have been appointed responsible for gas stockholding. The entity responsible for monitoring is often the same entity determining the gas stocks that each obligated stakeholder must establish.

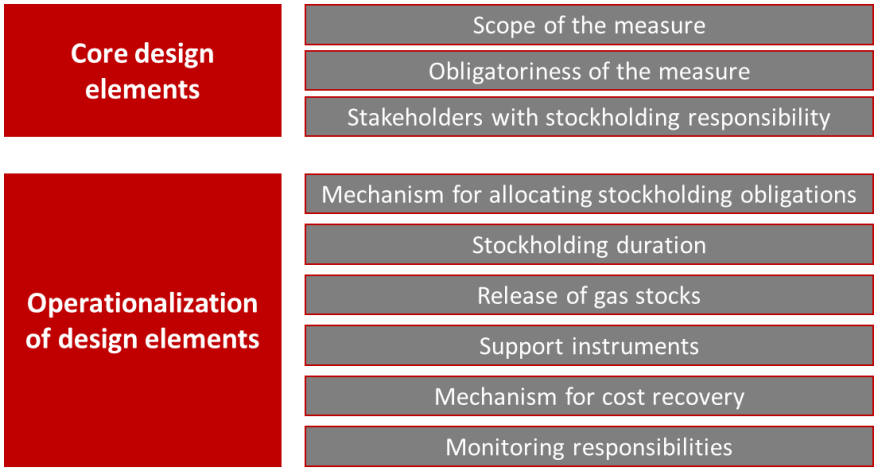
A mechanism should be in place to ensure that the authorities responsible for **monitoring and verification have all the necessary information to perform their relevant tasks**. Such a mechanism involves periodic reporting and ad hoc notifications regarding key information such as the booked capacity and filling storage level for each obligated entity at each storage facility. The reporting may be provided directly from the obligated entities or from other stakeholders, such as the SSOs or TSO.

For transparency, the monitoring authorities or the obligated entities, should **publish information with regards to whether the stockholding obligations are met,** and the storage filling targets achieved.

2.3 Formulation of storage measures

The **core design elements** that must be initially taken into account in order to formulate a storage measure are its scope, obligatoriness and stockholding responsibilities assigned to stakeholders. These form the main characteristics based on which the measure is built. The rest of the design elements listed in Section 2.1 must be then defined to **fully operationalize the measure**. The Figure below summarizes the core and operationalization design elements of storage measures.

Figure 3: Design elements of storage measures



3 Typologies of storage measures

3.1 Identification of the typologies of storage measures

Article 6b(1) of the EU Gas Storage Regulation includes a list of storage measures' typologies applicable in Member States. However, using the Regulation's list to analyse lessons learned and identify good practices within the scope of this Study is challenging. Some of these typologies cover stockholding obligations for entities with different characteristics and others are overlapping. For example, measure "c2. Obligations imposed on designated entities" covers stockholding obligations assigned to various stakeholders, such as suppliers, storage users, market operators, TSOs, etc, while obligations specifically set for storage users may also be covered by the measure "b. Tender of capacity".

For the purposes of this Study, **the typologies of storage measures examined diverge to a certain extent from those included in the EU Gas Storage Regulation**. For the identification of typologies in this Study, the core design elements are considered, i.e. the scope of the measure, obligatoriness and the type of stakeholders to which stockholding responsibilities are assigned.

The Table below provides an overview of the typologies of measures identified in this Study, and their characteristics.

Table 6: Examined typologies of storage measures

Typology	Scope of measure	Obligatoriness of measure	Entity(ies) responsible for stockholding
Stockholding obligations to all suppliers	Stockholding obligation	Administratively set	All suppliers of final customers
Stockholding obligations to suppliers of selected customer groups	Stockholding obligation	Administratively set	Suppliers of specified customer groups
Stockholding obligations to storage users for booking capacity	Stockholding obligation	Administratively set	All storage users
Stockholding obligations to a designated entity	Stockholding obligation	Administratively set	Entity(ies) other than suppliers
Filling of last resort	Filling of last resort	Administratively set	Entity(ies) other than suppliers
Financial incentives to storage users for storing gas	Incentives	Market - based	Market participants benefiting from the incentive
Storage filling service	Filling responsibilities	Market - based	Market participants providing the service
Storage capacity use-it-or-lose-it	Congestion management	Administratively set	All storage users
Measure to facilitate capacity booking	Operational improvement	N/A	N/A

Compared to the list of measures in the EU Gas Storage Regulation, **the above typologies focus more on the responsibilities of the entities involved in storage filling**. It is worth noting that certain measures listed in the Regulation are not covered by the typologies examined in the Study, as these are either not implemented by the Member States or overlap with other measures. The relevance of

the examined typologies with the EU Gas Storage Regulation, and the measures of the Regulation not covered, are described in Table 7 below.

Table 7: Relevance of typologies with EU Gas Storage Regulation[11]

Typology	Relevance to EU Gas Storage Regulation
Stockholding obligations to all suppliers	▪ The Member States applied measure "c2. Obligations imposed on designated entities" by setting obligations to various types of entities with different characteristics, ranging from state-owned agencies to suppliers of final consumers. ▪ This typology focuses specifically on suppliers, i.e. covers only a subset of the entities included in the Regulation's measure (c2).
Stockholding obligations to suppliers of selected customer groups	▪ The EU Gas Storage Regulation measure "a. Minimum volume in gas storage" focuses specifically on suppliers of protected customers. However, in certain Member States, the stockholding obligations extend to other customer categories beyond protected one (e.g. electricity generation). ▪ This typology expands the scope of the Regulation's measure (a), to potentially assign stockholding responsibilities to suppliers not only of protected customers but other customer categories as well.
Stockholding obligations to storage users for booking capacity	▪ The EU Gas Storage Regulation measure "b. Tender of capacities" as applied in the Member States encompasses national measures that concern multiple aspects related to storage capacity allocation: stockholding obligations for storage users, discounts to storage tariffs, changes in the capacity allocation mechanisms and schedule. ▪ This typology focuses specifically on imposing stockholding requirements to storage users.
Stockholding obligations to a designated entity	▪ The Member States applied measure "c2. Obligations imposed on designated entities" by setting obligations to various types of entities with different characteristics, ranging from state-owned agencies to suppliers of final consumers. Obligations to specific entities are also assigned by measures "c1. Balancing stock managed by TSO" and by "h. Strategic storage". ▪ This typology covers the stockholding obligations assigned to entities other than suppliers/traders, foreseen in the Regulation's measures (c1), (c2), and (h).
Filling of last resort	This typology covers the EU Gas Storage Regulation measure "i. Appointment of dedicated entity".

[11] Reference to the typologies of measures of Article 6b(1) of the Gas Storage Regulation is made using the abbreviated titles presented in Annex 1 of Vol. 1 of the Study.

Financial incentives to storage users for storing gas	▪ Financial incentives are included in the EU Gas Storage Regulation measures "f. Financial incentives for market participants" as well as in "j. Discounts on storage tariffs". ▪ This typology covers both measures of the Regulation.
Storage filling service	▪ The obligations assigned to entities under the EU Gas Storage Regulation measure "c2. Obligations imposed on designated entities" may be met with open tenders through which these entities request the offering of storage filling requirements by market participants. ▪ As this is measure is offered voluntarily by market participants, at a fee, it must be examined as a separate typology from the one covering mandatory stockholding by entities.
Storage capacity use-it-or-lose-it	This typology covers the Gas Storage Regulation measure "g. Unused booked capacities".
Measure to facilitate capacity booking	▪ The EU Gas Storage Regulation measure "b. Tender of capacities" as applied in the MSs encompasses national measures that concern multiple aspects related to storage capacity allocation: stockholding obligations for storage users, discounts to storage tariffs, changes in the capacity allocation mechanisms and schedule. ▪ This typology focuses specifically on changes on the tendering procedure.
Measures of the Gas Storage Regulation not covered by the examined typologies are: ▪ Measure "d. Coordinated instruments" – not implemented by Member States ▪ Measure "e. Voluntary joint procurement mechanisms" – not implemented by Member States ▪ Measure "k. Capital and operational expenditures" – overlapping with the cost recovery mechanisms applied for other national storage measures	

3.2 Application of the typologies of storage measures in the Member States

The national measures implemented in each Member State can be categorized into one of the examined typologies of storage measures. This categorization is based on the analysis of the national measures carried out in Vol. 1 of the Study.

The typologies to which the national measures have been allocated are presented in Table 8.

Table 8: Typologies of storage measures applied in each Member State in 2022/23[12]

	Stockholding obligations to all suppliers	Stockholding obligations to suppliers of selected customer groups	Stockholding obligations to storage users for booking capacity	Stockholding obligations to a designated entity	Filling of last resort	Financial incentives to storage users for storing gas	Storage filling service	Storage capacity use-it-or-lose-it	Measure to facilitate capacity booking
AT		✓		✓		✓[13]		✓	
BE			✓			✓		✓	
BG		✓		✓					
CZ		✓	✓	✓		✓		✓	
DE				✓	✓		✓	✓	
DK				✓			✓		
ES	✓				✓	✓			✓
FR			✓		✓				✓
HR			✓	✓					
HU		✓		✓					
IT				✓	✓	✓		✓	✓
LV				✓					
NL					✓	✓			
PL	✓								
PT		✓				✓[14]			✓
RO		✓							
SE	✓								
SK	✓								

[12] Source: VIS analysis based on the national measures applied in each Member State presented in Vol. 1 of the Study.

[13] In Austria, industrial consumers having booked storage capacity would not be cut off for a minimum of 50% of their yearly consumption, in case of an emergency. Although this is not a financial support instrument, it is an incentive to use storage capacity and thus reported in this table.

[14] In Portugal, a discount of 100% has been applied since 2019/20 at the transmission / storage network points.

3.3 Description of the typologies of storage measures

A detailed description of each measure typology is provided below, including an overview of its main design elements, an assessment of its effectiveness, efficiency and level of required costs[15], and an analysis of both its benefits and shortcomings.

3.3.1 Stockholding obligations to all gas suppliers

3.3.1.1 Design elements

Main characteristics of the typology	
Stockholding obligations are assigned to all suppliers that sell gas to final consumers of the Member State. The obligated entities may include final consumers that import gas volumes for own consumption. The obligation does not take into account the volumes that the obligated entities (or other market participants) transit through the system and deliver to other Member States.	
Market based ☐ ☐ ☐ ☐ ■ **Administrative**	The stockholding obligations are mandatory and legally binding for all suppliers.

Operationalization of the typology	
Allocation of stockholding obligations	The stockholding obligations are allocated proportionately to each obligated supplier's gas sales to final consumers (e.g. percentage of monthly consumption or number of days of gas sales). Each supplier must provide information to the entity responsible for calculating these obligations. Typically, the information provided concerns historic sales data or suppliers' forecasts of gas sales.
Stockholding duration	Options include: ▪ Strategic reserves: Gas stocks in place until needed in case of emergency. They are established by the suppliers. ▪ Year-round gas stocks: Gas stocks maintained for the whole year, recalculated and adjusted for the subsequent year. ▪ Seasonal gas stocks: Gas stocks maintained only for specific months, particularly during the winter period. ▪ Gas stocks on specific dates, including November 1st of each year. These dates can be aligned with the milestones of the EU Gas Storage Regulation and with national rules. The measure can include a combination of the above options[16].

[15] **Effectiveness** relates to the extent to which a measure can contribute to increasing storage filling and meeting the related trajectories and targets. **Efficiency** relates to whether the mechanisms and procedures associated with the measure facilitate streamlined and timely management of gas stocks while avoiding high costs and adverse impacts in the gas market. The **level of required costs** relates to the level of costs that have to be incurred to implement the measure, and the possibility to control / optimize them.
The following qualitative rating is used to assess these characteristics:
Effectiveness / efficiency: ●: Low - ●●: Moderate - ●●●: High
Level of costs: €: Very low - €€: Low - €€€: High - €€€€: Very high

[16] For example, in Spain the stockholding obligations assigned to suppliers include maintaining strategic reserves (managed exclusively by the Government) and operating stocks (managed by the Ministry), as well as meeting storage filling targets on November 1st.

Support instruments	Enforcement mechanisms are crucial to ensure supplier compliance with their obligations. Penalties, including administrative fines, mandatory release of unused storage capacity, or imbalance charges serve as deterrents. Priority access to storage capacity may be granted to the obligated suppliers, to facilitate that they will be able to book the capacity required to meet their obligations. Additionally, support schemes, such as discounts on storage tariffs or offering of contracts for differences, may be implemented to reduce stockholding costs incurred by suppliers.
Mechanism for cost recovery	The costs incurred by the suppliers depend on the stockholding duration: ▪ Strategic reserves: The supplier cannot sell the gas stocks to its consumers. Thus, its stockholding costs include all the expenses for establishing and maintaining the stocks, such as gas procurement costs, transmission and storage charges, as well as financing costs. ▪ Gas stocks maintained for a specific duration, or storage filling targets on specific days: The supplier can sell the gas stocks to its customers. Thus, the main expenses of the supplier concern storage charges for using storage capacity for a longer period than it would if the obligations were not in place. An additional monetary impact is the opportunity cost of the supplier for not being able to use this part of its storage capacity for arbitrage purposes[17]. There is no compensation mechanism for the suppliers. Each supplier recovers stockholding costs through end-user prices. Any support schemes offered to suppliers may be financed from the state budget or recovered through charges applied at exits to final consumption.
Release of gas stocks	Gas stocks can generally be released without constraints as long as the stockholding targets are met. However, this applies to all stocks except for strategic reserves, which must be kept in storage for emergency situations. The release of strategic reserves is contingent upon decisions made by the authorities, according to the emergency plan.
Monitoring responsibilities	Monitoring may be assigned to the pertinent Ministry and/or the NRA, or another state authority responsible for gas stockholding.

3.3.1.2 Effectiveness – efficiency – level of required costs

Assigning stockholding responsibilities to all suppliers of final consumers **can be an effective measure**, as the amount of gas stocks to be established by the suppliers can be set to a level that ensures reaching the storage filling targets.

On the other hand, implementation of this measure **impacts the efficient use of the suppliers' storage capacity**. The portion of capacity dedicated to maintaining the gas stocks **cannot be used by the supplier for price arbitrage**, limiting the flexibility value that the storage could otherwise offer.

[17] The obligation to keep specific gas volumes in place for a specific period of time or at specific milestones does not give to suppliers the flexibility to withdraw and sell gas when prices are high and procure and inject gas when prices are low.

Furthermore, the measure **does not facilitate the efficient adjustment and monitoring of gas stocks**. The level of gas stocks cannot be increased swiftly, as this would require mobilizing co-ordinately all suppliers at short notice. Furthermore, the coordination of the SSOs with the authorities tasked with monitoring the measure is required, to ensure that each supplier has fulfilled its stockholding obligation.

From a cost perspective, the final consumers may not be required to cover all the costs incurred due to the implementation of the measure, as the **suppliers may opt not to pass all expenses through to their end-user prices**, in order to increase their competitiveness. Furthermore, the capability of the suppliers to procure gas and their accessibility to the market, may allow them to **mitigate market risks and manage price fluctuations**. This could favour larger suppliers with a wider and mixed portfolio of consumers.

Effectiveness	Efficiency	Level of costs
●●●	●●	€€

3.3.1.3 Benefits & shortcomings

Benefits	Shortcomings
▪ The weight of establishing gas stocks (and thus of the underlying costs) is allocated to all suppliers. ▪ The mandatory stockholding obligations assigned to the suppliers can ensure that the storage filling targets are met. ▪ Unless the gas stocks must be maintained for a prolonged period of time, the suppliers do not need to procure gas volumes further to those used to supply their customers. The additional expenses of a supplier concern mainly the charges for using storage capacity beyond the intended commercial use of this capacity. ▪ Suppliers have flexibility when passing costs through to their customers.	▪ The additional costs for stockholding may pose a barrier to entry for suppliers of small size, especially if the gas stocks are to be stored for a prolonged period of time. ▪ If the mandatory stocks cover most of the storage capacity, the commercial use of storages is limited, and the possibilities of the suppliers to exploit arbitrage opportunities are decreased. ▪ To meet the storage filling targets, suppliers may be obliged to procure gas when prices are high. ▪ Need of close monitoring of whether the gas suppliers meet their responsibilities. ▪ The possibility of suppliers to not pass all costs through to their customers could favour larger suppliers in the market.

3.3.2 Stockholding obligations to gas suppliers of selected customer groups

3.3.2.1 Design elements

Main characteristics of the typology
The stockholding obligations aim to safeguard the supply of protected customers (e.g. to comply with the supply standard by storing gas) and potentially of other gas consumers that are important for the Member State's energy sector (e.g. gas-fired power generation and district heating). The obligations concern only the suppliers selling gas to the selected customer groups.

Market based ☐ ☐ ☐ ☐ Administrative ■	The stockholding obligations are mandatory and legally binding for the obligated suppliers.

Operationalization of the typology	
Allocation of stockholding obligations	The stockholding obligations are allocated proportionately to each obligated supplier's gas sales to the selected customer groups (e.g. percentage of monthly consumption or number of days of gas sales). Each obligated supplier must provide information to the entity responsible for calculating these obligations. Typically, the information provided concerns historic sales data or suppliers' forecasts of gas sales.
Stockholding duration	Options include: ▪ Strategic reserves: Gas stocks in place until needed in case of emergency. They are established by the suppliers. ▪ Year-round gas stocks: Gas stocks maintained for the whole year, recalculated and adjusted for the subsequent year. ▪ Seasonal gas stocks: Gas stocks maintained only for specific months, particularly during the winter period. ▪ Gas stocks on specific dates, including November 1st of each year, sufficient for the winter consumption of the selected customer groups. These dates can be aligned with the milestones of the EU Gas Storage Regulation and with national rules. The measure can include a combination of the above options.
Support instruments	Enforcement mechanisms are crucial to ensure supplier compliance with their obligations. Penalties, including administrative fines, mandatory release of unused storage capacity, or imbalance charges serve as deterrents. Priority access to storage capacity may be granted to the obligated suppliers, to facilitate that they will be able to book the capacity required to meet their obligations. Additionally, support schemes, such as discounts on storage tariffs or offering of contracts for differences, may be implemented to reduce stockholding costs incurred by suppliers.
Mechanism for cost recovery	The costs incurred by the suppliers depend on the stockholding duration: ▪ Strategic reserves: The obligated supplier cannot sell the gas stocks to its consumers. Thus, its stockholding costs include all the expenses for establishing and maintaining the stocks, such as gas procurement costs, transmission and storage charges, as well as financing costs. ▪ Gas maintained for a specific duration, or stocks established by November 1st: The supplier sells the gas stocks to the customer groups for which the stocks are established. Thus, the main expenses of the supplier concern storage charges for using storage capacity for a longer period than it would if the obligations were not in place. An additional monetary impact is the opportunity cost of the supplier for not being able to use this part of its storage capacity for arbitrage purposes.

	There is no compensation mechanism for the obligated suppliers. Each supplier recovers any stockholding costs through end-user prices. Any support schemes offered to suppliers may be financed from the state budget or recovered through charges applied at exits to final consumption.
Release of gas stocks	Gas stocks can generally be released without constraints as long as the stockholding targets are met. However, this applies to all stocks except for strategic reserves, which must be kept in storage for emergency situations. The release of strategic reserves is contingent upon decisions made by the authorities, according to the emergency plan.
Monitoring responsibilities	Monitoring may be assigned to the pertinent Ministry and/or the NRA, or another state authority responsible for gas stockholding.

3.3.2.2 Effectiveness – efficiency – level of required costs

The contribution **of this typology of measures to storage filling can range**, depending on the suppliers to which the stockholding obligations apply and the size of the country's storage capacity vis-à-vis its gas consumption.

Table 9: Effectiveness of stockholding by suppliers of specific customer groups

Member State	Storage-to-demand ratio 2022[18]	Stockholding obligation	Share of storage capacity in 2022/23[19]
Austria	110%	Meet the supply standard	4%
Czech Republic	40%	Meet the supply standard	5%
Hungary	65%	Sales of universal supplier	30%
Portugal	5%	Protected customers and CCGTs	85%
Romania	30%	Households and district heating	88%

For example, as shown in Table 9, in Austria and the Czech Republic, which both have large storage capacity, the gas volumes stored by suppliers of protected customers, represents only a small fraction of the countries' storage capacity. On the contrary, in Portugal, which has very limited storage capacity, the obligation of storing gas for protected customers and combined cycle gas-fired power plants results in filling the country's storage facility almost to a full.

Assigning stockholding obligations which are linked to the monthly supplies of protected customers is an **efficient way to utilize storage capacity, simultaneously increasing the storage filling level and complying with the supply standard** set by EU Regulation 2017/1938. In this case, gas stocks concern only one month's consumption of protected customers, allowing suppliers to use the remaining capacity for arbitrage purposes.

If obligations extend beyond the consumption of protected customers (e.g. include use of gas for electricity generation), then the size of the gas stocks can limit the storage capacity available for short-term trading. At the same time, as with the case of stockholding obligations to all suppliers (Section 3.3.1.2), the **measure does not facilitate the efficient management and monitoring of the gas stocks**.

[18] Sources: Eurostat annual gas demand in 2022, GIE AGSI+ database storage capacity average for 2022
[19] See analysis in Vol. 1 of the Study.

Regardless of the customer groups on which the stockholding obligations apply, the level of costs required to implement the measure are the same with the ones of stockholding obligations to all suppliers described previously (Section 3.3.1.2).

	Effectiveness	Efficiency	Level of costs
Obligations linked to supply standard	🔴	🟢🟢🟢	€€
Obligations for multiple customer categories	🟢🟢🟢	🟡🟡	

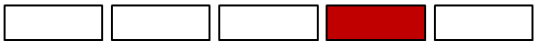
3.3.2.3 Benefits & shortcomings

Benefits	Shortcomings
▪ The stockholding responsibilities of the suppliers can be linked to their obligation to meet the supply standard for their protected customers. ▪ Unless the gas stocks must be maintained for a prolonged period of time, the suppliers do not need to procure gas volumes further to those used to supply their customers. The additional costs for a supplier concern mainly the charges for using storage capacity beyond the intended commercial use of this capacity. ▪ Suppliers have flexibility when passing costs through to their customers.	▪ The measure may not be very effective (in terms of ensuring storing filling) if the Member State has large storage capacity compared to its gas consumption. ▪ The additional costs for stockholding may pose a barrier to entry for suppliers of small size, especially if the gas stocks are stored for a prolonged period of time. ▪ If the mandatory stocks cover most of the storage capacity, the commercial use of storages is limited, and the possibilities of suppliers to exploit arbitrage opportunities are decreased. ▪ Close monitoring of whether the gas suppliers meet their responsibilities is necessary.

3.3.3 Stockholding obligations to storage users for booking capacity

3.3.3.1 Design elements

Main characteristics of the typology
Stockholding obligations are assigned to all the market participants that have booked capacity at the Member State's underground storage facilities. The obligations of the storage users are linked to storage filling targets on specific milestones, which are either set nationally or based on the EU Gas Storage Regulation.

Market based — Administrative 	The stockholding obligations are mandatory and legally binding for the market participants that have booked storage capacity. It is however the market participant's decision whether they will book capacity and undertake the respective obligation.

Operationalization of the typology	
Allocation of stockholding obligations	The stockholding obligation of each storage user is proportionate to the storage capacity it has booked. The entity responsible for calculating the obligations usually receives information on the storage bookings of market participants from the storage operators.
Stockholding duration	The gas stocks must be established on specific dates, including November 1st of each year in accordance with the milestones foreseen by the storage filling targets.
Support instruments	Penalties must be in place to ensure that the storage users keep gas in storage according to their obligations. These may include administrative fines, mandatory release of unused storage capacity, or imbalance charges. Support schemes to reduce the stockholding costs of the storage users could be put in place, such as discounts on storage tariffs or offering of contracts for differences[20].
Mechanism for cost recovery	The market participants with stockholding obligations can sell the gas stocks to the market. Thus, the main stockholding costs concern any additional storage and/or gas purchasing costs, in case the filling targets are not in line with the market participant's commercial practices. An additional monetary impact is the opportunity cost of the user for not being able to use this part of its storage capacity for arbitrage purposes. There is no compensation mechanism for the storage users. Each user recovers any stockholding costs through its regular activities in the gas sector. Any support schemes offered to storage users may be financed from the state budget or the transmission tariffs applied to internal network points.
Release of gas stocks	The storage users have not constraints in withdrawing the stored gas, as long as they meet their filling obligations on the specified dates.
Monitoring responsibilities	Monitoring may be assigned to the pertinent Ministry and/or the NRA, or another state authority responsible for gas stockholding.

[20] In this context, contracts for differences (CfDs) refer to contracts signed between the storage user and another entity (usually the TSO), which pays the difference between the market price and a strike price defined in the contract. See the analysis in Vol. 1 of the Study for further details on the application of CfDs as a measure.

3.3.3.2 *Effectiveness – efficiency – level of required costs*

During periods of negative price signals, the interest of market participants in storing gas may diminish, especially since booking of capacity comes with the contractual obligation to meet specific filling targets. **The measure can become more effective if support schemes are put in place** in order to incentivise storage users to book capacity. Such schemes may include discounts on storage tariffs, financial penalties for not meeting the obligations, and/or allowing SSOs to offer storage capacity when market conditions are favourable.

For example, in France, the obligation of the storage users to meet a national filling target of 85% of their booked capacity by November 1st, 2022, was incentivised by a zero-reserve price at the auctions. Additionally, dissuasive fines of up to twice the value of missing gas are imposed on storage users not meeting their targets. Moreover, CRE allows the SSOs to adjust the auction calendar to offer storage capacity during high positive price spreads mobilising the interest of market participants to buy capacity. Furthermore, the establishment of a "safety net" mechanism[21] may have acted as an additional incentive to the market participants to opt for contracting storage capacity in France, instead of been obligated to do so by the government. The successful implementation of these schemes resulted in full storage capacity bookings by the end of February 2022, and 100% storage filling capacity at the start of the withdrawal period. As an additional incentive for storage users, following requests by market stakeholders, CRE applied in January 2023 a 100% discount on the tariff at the transmission/storage points, for the slow filling storage sites.

Assigning specific storage filling trajectories to the storage users with contracted capacity **efficiently uses the storage capacity allocation mechanism** to ensure timely gas injection into the storage facilities, according to the milestones set by the filling targets. However, the flexibility for storage users to use their contracted capacity for arbitrage are somehow limited by the filling targets.

The costs associated with implementing the measure primarily relate to financial incentives provided to the storage users, especially when there is limited interest to book capacity. There are no other substantial costs, as the storage users' expenses for procuring and storing the gas are the same with those in case no stockholding obligations applied.

Effectiveness[22]	Efficiency	Level of costs[23]
🟡🟡 / 🟢🟢🟢	🟡🟡	€ - €€

3.3.3.3 *Benefits & shortcomings*

Benefits	Shortcomings
▪ The measure combines market participants' interest in commercially using storage capacity with the requirements to establish stocks at specific milestones.	▪ Market participants may not be interested in booking storage capacity in case of negative price signals, unless incentives are offered.

[21] Through the safety net mechanism, the government has the possibility to obligate gas suppliers and/or SSOs to book additional storage capacities (85% of which should be used to store gas) in case the volume of booked capacities is too low to ensure security of supply. Additionally, if this mechanism is triggered, the capacity will no longer be offered at a zero-reserve price.

[22] The effectiveness of the measure depends on the market conditions and the interest shown by the market participants to book capacity if incentives are provided.

[23] The level of costs ranges depending on the financial incentives provided.

▪ Storage users are unlikely to incur additional costs due to the measure, as their stockholding obligation is based on the capacity they have opted to book for commercial purposes. ▪ Once storage capacity has been allocated, there is good visibility of the market-based storage filling. If this is not sufficient, additional stockholding measures can be taken.	▪ To meet storage filling targets, suppliers may be obliged to procure gas when prices are high. ▪ Storage users may lack flexibility to exploit arbitrage opportunities in the market.

3.3.4 Stockholding obligations to a designated entity

3.3.4.1 Design elements

Main characteristics of the typology	
Stockholding obligations are assigned to entity(ies) of the gas sector other than gas suppliers, such as SSOs, market operators, TSOs, state organizations, etc[24]. Such responsibilities may be assigned to an entity in order to maintain a strategic reserve available for emergency situations, or to temporarily increase rapidly storage filling, when market-driven storage filling is not sufficient. In the latter case, gas stocks will have to be released to the market once the filling targets have been met.	
Market based ☐ ☐ ☐ ☐ **Administrative** ■	The stockholding obligations are mandatory and legally binding for the obligated entity.

Operationalization of the typology	
Allocation of stockholding obligations	The stockholding requirements of the entity are determined by the pertinent Ministry, or another state authority responsible for stockholding. The level of gas stocks is based on the needs for stored gas to meet the filling targets and/or to have sufficient gas volumes in place in case of emergency.
Stockholding duration	Options include: ▪ Strategic reserves: Gas stocks in place until needed in case of emergency (or until the measure is terminated). ▪ Seasonal gas stocks: Gas stocks maintained only for specific months, particularly during the winter period. ▪ Operational gas: Gas stocks established by transmission or storage operators for operational and balancing purposes during a specified period.
Support instruments	Priority access to storage capacity may have to be provided to the obligated entity, to ensure that they will be able to book the capacity required to meet their obligations. Furthermore, the capacity released with the application of use-it-or-lose-it mechanisms can be allocated to the entity.

[24] As an exception, in some Member States the designated entity is a single state-owned supplier, which undertakes to establish a strategic reserve or to store gas for a prolonged period of time.

Mechanism for cost recovery	The obligated entity should recover efficiently incurred costs associated with its mandated tasks. Such costs may include gas procurement, transmission and storage charges, admin and financing costs, etc. Cost recovery should include: ▪ A process for cost recognition, confirming that the expenses of the entity were efficient. ▪ A compensation mechanism that allows recovery of all efficient costs for establishing and maintaining the gas stocks. The stockholding costs can be recovered from: ▪ Disbursements from the state budget. ▪ Inclusion in the obligated entity's regulated tariffs (if applicable) ▪ Inclusion in the transmission tariffs applied to offtakes to final consumption (excluding cross-border points). ▪ Additional charges applied at the internal network points of the transmission system (excluding cross-border points). ▪ Charges or levies on final gas consumers. ▪ Charges or levies on all final energy consumers. If the obligated entity sells the gas stocks, the resulting revenues should offset the expenses included in the cost recovery mechanism.
Release of gas stocks	Release of the gas stocks depends on the stockholding duration: ▪ Strategic reserves: The gas stocks are kept in storage for emergencies and are released following decision by the authorities, according to the emergency plan. ▪ Gas stocks for specific duration: The obligated entity must sell the gas stocks to the wholesale market, or to specific customer groups. The revenues are used to recover part of the entity's stockholding costs. ▪ Operational and balancing gas: The TSO and/or SSOs use the gas stocks for the operation and balancing of their system.
Monitoring responsibilities	Monitoring may be assigned to the pertinent Ministry and/or the NRA, or another state authority responsible for gas stockholding (usually the authority that determines the stockholding requirements).

3.3.4.2 Effectiveness – efficiency – level of required costs

The gas stocks that must be established by the designated entities are **usually a relatively small part of the Member State's storage capacity**, with the rest being filled through the commercial operation of storages and/or the application of additional measures. For example, in the year 2022, the gas volumes stored by the dedicated entities did not exceed 30% of any Member State's storage capacity, with Croatia being the only exception (Table 10).

Table 10: Effectiveness of stockholding by designated entities

Member State	Share of storage capacity in 2022/23[25]
Austria	21%
Czech Republic	6%
Denmark	19%
Hungary	30%
Latvia	9%
Italy	28%
Croatia	56%

Assigning the stockholding responsibility to a single designated entity has the **benefit of facilitating the management of gas stocks**. Gas stocks can be modified upwards or downwards if needed, depending on the filling level and security of supply needs. Furthermore, monitoring the compliance with the storage filling targets is more straightforward, requiring limited coordination among stakeholders.

The costs incurred by a designated entity to procure the needed gas volumes can be high, especially if the entity must establish or modify the gas stocks rapidly during a market price surge. For example, in Austria, ASGM, had to establish its gas reserves during very unfavourable conditions in Q2 and Q3 of 2022, at an average price of 200 €/MWh. All expenses incurred by this entity, regardless of their magnitude, have to be passed through to the final consumers (or taxpayers) as the entity has to be cost neutral from carrying out its stockholding obligations.

Effectiveness	Efficiency[26]	Level of costs
🟡🟡	🟡🟡 / 🟢🟢🟢	€€ - €€€€

3.3.4.3 Benefits & shortcomings

Benefits	Shortcomings
▪ The mandatory stockholding responsibilities assigned to the obligated entities can ensure that the storage filling targets are met. ▪ Monitoring and managing the gas stock levels during the stockholding period is more straightforward compared to distributing such responsibilities among numerous market participants.	▪ If the market needs for storage are not properly estimated, the storage capacity used by the designated entity may lead to capacity congestion for other market participants. ▪ All expenses related to the measure's implementation are passed on to final consumers, with no costs absorbed by market participants.

[25] See analysis in Vol. 1 of the Study.

[26] The efficiency and the level of costs depend on the market prices at the time the gas stocks have to be established, with the designated entity having limited flexibility in case it has to procure gas.

3.3.5 Filling of last resort

3.3.5.1 Design elements

One or more entities are tasked with procuring and storing gas to promptly meet the storage filling targets in case all previous measures (either market-based or administratively set) in the Member State have failed to establish sufficient gas stocks by that time. The measure has to be activated late in the injection period, only if previous storage filling is ineffective until that time. All stored gas volumes have to be resold back to the market after the filling targets have been met.	
Market based ☐ ☐ ☐ ☐ ■ Administrative	The stockholding obligations are mandatory and legally binding for the obligated entity.

Operationalization of the typology	
Allocation of stockholding obligations	The stockholding requirements of the entity are determined by the pertinent Ministry, or another state authority responsible for stockholding. The level of gas stocks requested from the entity depends on the gas volumes short of meeting the filling target. The filling of last resort obligations should occur only after other market-based measures have already been implemented and were unsuccessful to ensure adequate storage filling levels. The determination of these obligations should allow sufficient time to the entity to procure and store the gas volumes required at the least possible cost.
Stockholding duration	The obligated entity must keep the procured gas stocks in storage for specific months, during the winter period.
Support instruments	The SSOs must ensure that storage capacity is be allocated to the obligated entity, in order to store the procured gas. If required, capacity can be released with the application of use-it-or-lose-it mechanisms and assigned to the entity.
Mechanism for cost recovery	The obligated entity should recover efficiently incurred costs associated with its mandated tasks. Such costs may include procurement costs, admin and financing costs, transmission and storage charges, etc. Cost recovery should include: ▪ A process for cost recognition, confirming that the expenses of the entity were efficient. ▪ A compensation mechanism that allows recovery of all efficient costs for establishing and maintaining the gas stocks. The stockholding costs can be recovered from: ▪ Disbursements from the state budget. ▪ Inclusion in the obligated entity's regulated tariffs (if applicable) ▪ Inclusion in the transmission tariffs applied to offtakes to final consumption (excluding cross-border points). ▪ Additional charges applied at the internal network points of the transmission system (excluding cross-border points). ▪ Charges or levies on final gas consumers. ▪ Charges or levies on all final energy consumers. After the obligated entity sells the gas stocks, the revenues are netted off the expenses included in the cost recovery mechanism.

Release of gas stocks	After the stockholding period is concluded, the obligated entity must sell the gas stocks to the wholesale market. The timing that the stocks are released may have to be agreed with the Ministry and/or the NRA.
Monitoring responsibilities	Monitoring may be assigned to the pertinent Ministry and/or the NRA, or another state authority responsible for gas stockholding (usually the authority that determines the stockholding requirements).

3.3.5.2 Effectiveness – efficiency – level of required costs

Activation of a storage filling of last resort mechanism is **an effective measure to ensure that storages are full** when there is no interest from market participants to store gas. In 2022, the measure facilitated meeting storage filling targets in Germany, Italy and the Netherlands, as shown in the Table below.

Table 11: Effectiveness of storage filling of last resort

Member State	Share of storage capacity in 2022/23[27]	Storage filling on November 1st, 2022[28]
Germany	20%	99%
Italy	20%	95%
Netherlands	9%	92%

However, accessing the market for procurement of gas for last resort storage filling is deemed inefficient due to the need to acquire significant gas volumes within a very short timeframe. The measure can be costly, since it is activated only if other stakeholders do not store gas, due to a negative and risky gas price market outlook. As a result, last resort gas volumes are generally procured at very high prices. This was observed in Germany and Italy, where gas was procured as a last resort to fill storages in Q3 of 2022 at average prices of 174 €/MWh and 187 €/MWh, respectively. The **release of these gas stocks into the market has the potential to cause distortions in wholesale prices**, with the magnitude of gas stocks influencing the potential impact.

The price risks, and the potential impact to the market can be mitigated to an extent, with **accurate estimation of the gas volumes** required, application of mechanisms to **manage market risk**, and a **framework for releasing the stored gas** to the market.

Effectiveness	Efficiency	Level of costs
🟢🟢🟢	🔴	€€€€

3.3.5.3 Benefits & shortcomings

Benefits	Shortcomings
▪ Ensures that storages will be filled up to the targeted levels and within the specified timeframes, even in the absence of interest from market participants to store gas.	▪ The gas stocks have to be procured within a very short time frame, regardless of the market conditions, exposing the obligated entity to market risks.

[27] See analysis in Vol. 1 of the Study.
[28] Source: GIE.

▪ The measure can be complementary to any other market-based or administratively set measure.	▪ Activating the measure prematurely, before exploring market-based storage filling possibilities, may lead to the procurement of excessive gas volumes and use of capacity that may otherwise have been used by other market participants. ▪ Large gas stocks procured as a last resort may impact wholesale prices upon their release into the market.

3.3.6 Financial incentives to storage users for storing gas

3.3.6.1 Design elements

Main characteristics of the typology	
Financial incentives are offered to market participants aimed at lowering their expenses associated with procuring and storing gas, in order to increase storage filling. These incentives are contingent upon meeting specific storage filling targets. Incentives include discounts on storage tariffs, contracts for differences, and direct subsidies.	
Market based — **Administrative**  [29]	The financial incentives aim to encourage market participants to voluntary use storage facilities. In the case of direct subsidies, however, tariffs will not be fully cost reflective, making the measure less market-driven.

Operationalization of the typology	
Allocation of stockholding obligations	The storage filling targets linked to the incentive are determined by the Ministry, NRA or other state authority providing the incentive.
Stockholding duration	The incentives set storage filling obligations on specific milestones, in line with the Member State's targets.
Support instruments	The storage user shall not receive the incentive in case it does not meet the filling targets. Additional financial penalties may be imposed to the storage user.
Mechanism for cost recovery	Cost recovery depends on the incentive provided: ▪ Direct subsidies and contracts for differences: The required funds come from the state budget. ▪ Discounts on storage tariffs: any revenue deficit incurred by the SSOs are usually compensated through the transmission charges.
Release of gas stocks	The storage user receiving the incentive can withdraw gas from storage without restrictions, as long as the storage filling targets associated with the incentive are met.
Monitoring responsibilities	The authority providing the financial incentive usually ensures its implementation and verifies that the filling targets are met.

[29] The measure is market based if the incentives concern discounts on storage tariffs, or contracts for differences. If direct subsidies are offered the measure is less market oriented.

	Specifically for discounts on distribution tariffs, the NRA decides on discounts or oversees or this aspect as part of its task to monitor the activities of the SSOs.

3.3.6.2 Effectiveness – efficiency – level of required costs

The effectiveness and efficiency of the measure depends on the type of financial incentives provided to market participants:

Discounts on storage tariffs:

Lowering the cost of storage capacity (in some cases combined with discounts at the transmission/storage delimitation points) has **proven to be an effective incentive for market participants** to book and use storage capacity. In 2022, the zero-reserve price in France and the discount on tariffs in Belgium, contributed to motivating storage users to fully book the storage capacity and undertake the respective storage filling obligations. Additional discounts were offered in France in 2023, on the tariffs of the transmission/storage points ('PITS') for the slow filling storage sites in response to requests from the market participants.

The measure **efficiently helps increase contracting of storage capacity** without altering the capacity allocation mechanism or necessitating dedicated support schemes for storage users. Despite the discounts, the SSO fully collects its regulated revenues through the cost recovery mechanism that has been selected.

Contracts for differences:

The **effectiveness of the contracts for differences offered in 2022 varied**. In the Czech Republic and the Netherlands, incentives resulted in a storage filling corresponding to 12% and 9% of the respective Member States' capacity, requiring additional measures, such as the use of storage filling of last resort in the Netherlands[30]. In Italy, the impact of CfDs was minimal, contributing to filling just 1% of the country's storage capacity.

For CfDs to be effective, they should not be combined with other direct subsidies. In Italy, storage users showed a very strong preference for the unconditional compensation provided by the offered stock premium (direct subsidy) over the contracts for differences available. This preference is due to the simplicity of the stock premium scheme, as well as due to fact that with the premium the storage users would be compensated regardless of the market conditions, contrary to the CfDs.

CfDs efficiently leverage market conditions to optimize compensation to storage users, with payments contingent upon the price spread between injection and withdrawal periods. For example, in the Netherlands, no compensation was paid to storage users in 2022 because the market price exceeded the agreed price in storage users contracts.

Direct subsidies:

In 2022, direct subsidies were offered to Italian storage users, resulting in facilitating the filling 43% of the country's storage capacity. Such **subsidy schemes provide straightforward incentives** to market participants to book and use storage capacity. However, these subsidies are offered to all storage users, including those that may have intended to store gas without incentives. This results in an **inefficient allocation of funds**.

[30] The subsidy mechanism put in place in the Netherlands in 2022 resembles that of contracts for differences.

	Effectiveness	Efficiency	Level of costs
Discounts on storage tariffs	🟢🟢🟢	🟢🟢🟢	€
Contracts for differences	🔴 / 🟡🟡	🟢🟢🟢	€ - €€[31]
Direct subsidies	🟢🟢🟢	🟡🟡	€€€

3.3.6.3 Benefits & shortcomings

Benefits	Shortcomings
▪ Discounts on storage tariffs: ○ Can be promptly applied during the allocation of storage capacity. ○ Auction premia still apply, capturing the market participants willingness to pay for capacity. ▪ Contracts for differences: ○ Financial support is provided to market participants only when price spreads are negative. ○ Each market participant determines the strike price based on which the payment difference between parties is calculated. ▪ Direct subsidies: ○ Easy to design and implement. ○ Clearly comprehensible by all market participants. ○ Market participants receive a stable subsidy, unaffected by price fluctuations.	▪ Direct subsidies will be paid to market participants even if market conditions improve and price signals are positive. ▪ The mechanism of CfDs can be challenging to design if the support scheme needs to be launched promptly. ▪ All subsidies are paid through the state budget (no costs borne by market participants).

3.3.7 Storage filling service

3.3.7.1 Design elements

Main characteristics of the typology
The entity responsible for ensuring that the storage filling targets are met (usually a designated entity with stockholding obligations)[32] can launch tenders, requesting from market participants to provide a storage filling service at a fee (contract for storage filling requirements). The tenders must be transparent and non-discriminatory. Market participants are responsible for booking the required transmission and storage capacity to fulfil the service.

[31] The level of costs depends on the summer-winter spreads, and the corresponding compensation to be paid to the beneficiaries of the measure.

[32] Gas suppliers to which stockholding obligations have been assigned may be allowed to outsource these responsibilities to other parties. These cases do not fall into this typology, as suppliers are not required to follow open and transparent procedures when procuring such services.

Market based	Administrative	
■	□	The market participants are free to decide whether to provide the storage filling service or not.

Operationalization of the typology	
Allocation of stockholding obligations	The entity responsible for ensuring achievement of storage filling targets determines the gas stocks that will be requested through the tender. The storage filling requirement of each market participants is in accordance with its bid at the tender.
Stockholding duration	The gas stocks must be established on specific dates, including November 1st of each year in accordance with the milestones foreseen in the contract for the storage filling requirements.
Support instruments	Financial penalties must be imposed on the market participants providing the storage filling service, in case they fail to meet the contracted filling requirements.
Mechanism for cost recovery	The entity procuring the storage filling services must be compensated for the fees paid to the providers of these services. The costs can be recovered from: ▪ Disbursements from the state budget. ▪ Inclusion in the obligated entity's regulated tariffs (if applicable) ▪ Inclusion in the transmission tariffs applied to exits to final consumption. ▪ Additional charges applied at the internal network points of the transmission system (excluding cross-border points). ▪ Charges or levies applied to the final gas consumers. ▪ Charges or levies applied to all final energy consumers.
Release of gas stocks	The storage users have no constraints in withdrawing the stored gas, as long as they meet their contacted storage filling requirements.
Monitoring responsibilities	The entity contracting the storage filling requirements is also responsible for monitoring that the respective targets are met.

3.3.7.2 Effectiveness – efficiency – level of required costs

The **effectiveness of this measure is subject to the interest of market participants** to offer storage filling services to the entity that launched the respective tender. During periods of price surges, market participants may prefer not to take part in the tender, avoiding the obligation of storage filling, or may offer the services at very high prices. In such cases, there is a significant risk that the tender is cancelled. For example, most of the tenders conducted by Energinet in Denmark to procure filling services in 2022 had poor to no results[33], due to the high fees the bidders requested. In Denmark and Germany, the tenders for storage filling services that were launched in 2022 resulted in filling 16% and 34% of the Member States' storage capacity, respectively.

While the measure could be considered administratively efficient, as the entity launching the tender assigns stockholding responsibilities to third parties with existing market and storage access, there

[33] In Denmark, in the tenders of April and May 2022 Energinet awarded just 21% and 33% of the requested gas volumes respectively, while in the tender of September 2022 no services were procured. Only in the tender of June 2022 Energinet awarded 61% of the requested volumes.

can be some **cost inefficiencies in procuring storage filling services**. Storage users that would store gas even without the measure, can offer their services at a fee, incurring costs that could have been avoided. Furthermore, the fees to be paid to the providers of the storage filling service reflect the risks that the service provides undertake, depending on the market conditions, and may be significantly high in case of unfavourable price signals (negative summer-winter price spreads).

Effectiveness [34]	Efficiency	Level of costs
🔴 / 🟡🟡	🟢🟢🟢	€€ - €€€

3.3.7.3 Benefits & shortcomings

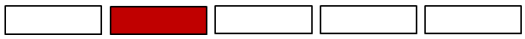
Benefits	Shortcomings
▪ The entity responsible for ensuring storage filling can meet the targets without having to procure gas stocks of its own. ▪ The fee offered to the market participants incentivises them to fill the storage facilities. ▪ Procurement of the storage filling services through tenders results in competitive offering of the services.	▪ Market participants that intend use the storage facilities for commercial purposes can take part in the tenders and benefit from the fee offered for the storage filling service. ▪ If price signals are negative, market participants may request high fees for offering the storage filling service, resulting in high costs or even cancellation of the tender. ▪ The measure is not suitable in case the number of market participants is not enough to ensure that the tender can be competitive.

3.3.8 Storage capacity (long term) use-it-or-lose-it

3.3.8.1 Design elements

Main characteristics of the typology
Application of a long term use-it-or-lose-it mechanism for storage capacity by the SSOs (not only day-ahead), that releases capacity of storage users not meeting their storage filling requirements. Depending on the other measures applied, the released capacity may be allocated directly to entities undertaking stockholding obligations or offered to the market. This may constitute a stand-alone measure, or a support instrument for other obligatory or market-based measures.

[34] Effectives of the measure depends on whether the market conditions are conducive to the participation of bidders in the tenders for the provision of the storage filling services.

Market based — Administrative 	The typology incentivises market participants to use the storage capacity that they have booked. Resale of unused capacity to other parties is also possible, facilitating market-based storage filling.

Operationalization of the typology	
Allocation of stockholding obligations	The storage users must meet their obligations for minimum gas in storage, in accordance with the storage capacity they have contracted. The use-it-or-lose-it mechanism applies without discrimination to all market participants that have booked storage capacity.
Stockholding duration	Not applicable – this typology does not concern assigning stockholding obligations.
Support instruments	The storage user losing its capacity must pay the corresponding storage charges until the capacity is booked by another storage user.
Mechanism for cost recovery	Upon activation of the use-it-or-lose-it mechanism, the SSOs receive the storage charges either from the storage user releasing its capacity or the new storage user booking it. If the SSO incurs any additional administrative fees due to the application of the mechanism, it can recover these costs from the storage user releasing its capacity.
Release of gas stocks	Not applicable – this typology does not concern assigning stockholding obligations.
Monitoring responsibilities	The NRA is responsible for monitoring implementation, within the frame of its task to monitor the activities of the SSOs.

3.3.8.2 Effectiveness – efficiency – level of required cost

The release of storage capacity that has been booked but unused can effectively increase storage filling. Depending on the other storage measures in place, the released capacity can either be directly allocated to entities with stockholding obligations (for administratively set measures) or sold back to the market and used by other market participants (for market-based measures). In 2022, the measure was effectively applied in Austria and the Czech Republic, where 21 TWh (22% of Austria's capacity) and 4.2 TWh (11% of Czech Republic's capacity) of unused capacity were respectively reallocated to other entities, facilitating the achievement of the storage filling targets.

Any administrative costs borne by the SSO to implement the use-it-or-lose-it mechanism can be claimed from the storage user having its capacity released. This approach ensures that the **SSO is not burdened with any additional costs** associated with the implementation of this measure.

Effectiveness	Efficiency	Level of costs
●●●	●●●	€

3.3.8.3 Benefits & shortcomings

Benefits	Shortcomings
▪ The mechanism ensures the utilisation of any unused storage capacity booked by market participants, either by other market participants or obligated entities. ▪ The SSO is compensated for the booked capacity either from the old or the new storage user. ▪ If the storage access rules already include anti-hoarding mechanisms, the measure can be implemented by setting up checkpoints linked to attaining the storage filling targets.	▪ Released capacity must be swiftly reallocated to other entities, otherwise the storage filling targets may not be met. ▪ If the mechanism is designed to be too short term, the flexibility of storage users could be heavily impacted and their interest to book capacity could decrease.

3.3.9 Measure to facilitate capacity booking

3.3.9.1 Design elements

Main characteristics of the typology	
Changes made to the storage capacity allocation procedure by the SSOs, to ensure availability of capacity for entities with stockholding obligations (e.g. priority access to booking, dedicated capacity allocation, etc.), or facilitate booking of capacity by market participants and thus storage filling (increased frequency of capacity auctions, flexibility to conduct auctions at favourable market conditions). This may constitute a stand-alone measure focusing on tendering of capacity, or a support instrument for other obligatory or market-based measures.	
Market based ☐ ☐ ■ ☐ ☐ Administrative	The typology does not concern obligations or incentives for entities, and thus cannot be characterized as either market-based or administrative.

Operationalization of the typology	
Allocation of stockholding obligations	Not applicable – this typology does not concern assigning stockholding obligations.
Stockholding duration	Not applicable – this typology does not concern assigning stockholding obligations.
Support instruments	Not applicable – this typology may be a support instrument for other measures.

Mechanism for cost recovery	The additional costs incurred by the SSOs for providing priority access to obligated entities, or for conducting more frequent auctions to facilitate storage booking by market participants are recovered through the storage charges[35].
Release of gas stocks	Not applicable – this typology does not concern assigning stockholding obligations.
Monitoring responsibilities	The NRA is responsible for monitoring implementation, within the frame of its task to monitor the activities of the SSOs.

3.3.9.2 Effectiveness – efficiency – level of required cost

The measure does not result in storage filling by itself. It does, however**, increase the efficiency of other measures**, since:

- For administratively set measures it ensures that there is sufficient capacity available for the obligated entities to establish their gas stocks.
- For market-based measures it facilitates booking of storage capacity by market participants.

To accommodate the changes in the capacity allocation mechanism, the SSO needs to make small modifications in its procedures, processes and systems. The cost of such modifications would not be significant.

Effectiveness	Efficiency	Level of costs
N/A	●●●	€

3.3.9.3 Benefits & shortcomings

Benefits	Shortcomings
▪ The operational changes required by the SSOs to facilitate capacity booking of obligated entities and market participants are limited. ▪ Increase of capacity auctions, and provision of priority access to obligated entities would incur small additional costs for the SSOs.	▪ Market participants may not be interested to take part in additional tenders for storage capacity if price signals are negative, unless financial incentives are offered.

[35] When part of the storage capacity is allocated for stockholding obligations, the remaining capacity made available to the market may not be sufficient to cover the market participants' demand and may increase the costs for storage users. This is a result of the stockholding measure applied, and not the measure typology examined here.

4 Drivers impacting the application of storage measures in Member States

4.1 Framework for analysing the application of national measures

The selection and design of the storage measures by Member States' authorities depend on multiple factors. These factors include characteristics of the gas market, such as its size and storage capacity, the access regime to storage infrastructure, the dependence on Russian gas and the main consumers of gas. At the same time, political choices play a role, for example building on existing regulations and involving entities responsible for fuel stockholding. Non-market-based measures designed to rapidly increase gas in storage if the filling levels are low, or applying mechanisms to release systematically unused storage capacity can also be considered.

This Section examines the key characteristics of the gas markets to assess their potential impact on the storage measures implemented by the Member States. Member States with similar characteristics are grouped together to identify commonalities and different approaches in the applied measures.

Member States are grouped based on the following criteria:

1. **Third-party access regime to storage infrastructure** (regulated / negotiated). This grouping aims to examine whether the TPA regime in place affects the measures applied, with emphasis on those that seek to ensure or facilitate access to storage capacity.
2. **Dependence of the Member State on Russian gas imports**. This grouping aims to examine whether high dependence on a single gas source, particularly Russian gas, affects the applied measures, specifically concerning the establishment of strategic reserves.
3. **Member States in which Gazprom held storage capacity in 2022**. This grouping aims to identify the application of measures targeting the management of contractual congestion and the use of capacity normally booked by Gazprom from other market participants.

The information used to determine the groups of Member States for points (1) and (2) above is presented in Table 12.

In addition to the above groupings, **the Member States that have assigned similar stockholding obligations to suppliers and other entities are examined together**. This analysis highlights the approaches followed by the Member States in combining different measures in a complementary manner to increase their effectiveness in storage filling.

Table 12: Characteristics of Member States' gas markets

Member State	Average annual demand 2022 (TWh)[36]	Storage capacity 2022 (TWh)[37]	Storage-to-demand ratio 2022 (%)	Storage TPA access regime[38]	Filling level (%)[39]			Dependence on Russian imports (2021)[40]
					01/11/2020	01/11/2021	01/11/2022	
AT	88	97	110%	negotiated	91%	56%	93%	57%
BE	167	8	5%	regulated	98%	92%	100%	7%
BG	30	6	20%	regulated	95%	75%	90%	79%
CZ	82	33	40%	negotiated	97%	86%	95%	98%
DE	854	245	29%	negotiated	94%	73%	99%	63%
DK	26	9	35%	negotiated	98%	82%	99%	0%
ES	366	35	10%	regulated	95%	83%	95%	0%
FR	433	131	30%	regulated	101%	95%	100%	22%
HR	29	5	17%	regulated	94%	82%	97%	19%[41]
HU	102	66	65%	regulated	95%	77%	86%	80%
IT	727	195	27%	regulated	99%	88%	95%	44%
LV	9	23	256%	regulated	98%	78%	58%	100%
NL	305	141	46%	negotiated	87%	62%	92%	16%
PL	194	36	19%	regulated	97%	97%	99%	56%
PT	64	3	5%	regulated	93%	68%	100%	0%
RO	109	33	30%	regulated	93%	74%	97%	22%
SE	9	0.1	1%	negotiated	80%	7%	93%	0%
SK	49	37	76%	negotiated	93%	71%	91%	68%

[36] Source: Eurostat annual gas demand.
[37] Source: GIE AGSI+ database storage capacity average for 2022.
[38] TPA regime according to ACER Report on Gas Storage Regulation and Indicators (April 2022).
[39] Source: GIE AGSI+ database.
[40] Source: Share of Russian piped-gas deliveries (deliveries of Russian LNG are not taken into account in this ratio) to the total gas supply (imports + production) using Eurostat 2021 annual data.
[41] Piped-gas imports in Croatia in 2021 (source: HERA)

4.2 Storage third-party access regime

The similarities in the national storage measures applied by Member States with the same third-party access regime for their underground storage facilities are examined in Table 13.

Table 13: Member States grouped according to their storage TPA regime

MS	Access regime	Stockholding responsibilities					Support measures to facilitate capacity booking
		Obligation to suppliers	Obligation to storage users	Obligation to other entities	Filling of last resort	Market-based measures	
BE	Regulated		✓				Frequency of auctions decided by SSO
BG		✓		✓			No information
ES		✓			✓	✓	Open subscription for obligated entities
FR			✓		✓		Changes in scheduling and frequency of auctions
HR		✓	✓				Capacity of other storage users could be sold to HEP
HU		✓		✓			HUSA stores strategic stocks in its own facility
IT					✓	✓	Frequency of auctions for monthly capacity products increased
LV				✓			Storage capacity required is deducted from the available capacity offered by the SSO
PL		✓					Priority to applicants of long-term capacity
PT		✓					Priority for obligated entities
RO		✓					Priority for obligated entities
AT	Negotiated	✓		✓			N/A
SK		✓					N/A
CZ		✓	✓	✓			N/A
DK				✓		✓	Capacity marketed after TSO has contracted its needs
DE					✓	✓	N/A
NL					✓	✓	Interruptible capacity offered
SE		✓					Capacity assigned directly by Swedegas

The national measures implemented by the Member States with either regulated or negotiated storage access are quite diverse. Therefore, **the applied TPA regime does not appear to significantly affect the selection of the entities to whom the authorities of the Member States assign the stockholding responsibilities**.

The majority of the Member States with regulated storage access **have put in place mechanisms that facilitate access to storage** for entities involved in the implementation of the measures. In Romania, Portugal and Spain, priority access is provided to suppliers of final consumers that are obliged to establish gas stocks, through either exclusive auctions or open subscription of capacity. In France and Belgium, the NRAs provide the SSOs with the flexibility to conduct capacity auctions during periods of favourable summer-winter price spreads for market-based capacity booking. Finally, in Italy, auctions

for monthly storage capacity products in 2022 were scheduled more frequently than usual, to facilitate interested market participants to book capacity in time to meet the storage filling targets.

4.3 Dependence on Russian gas imports

The similarities in the national storage measures applied by Member States with similar levels of dependence on imports of Russian gas are examined in Table 14.

Table 14: Member States grouped[42] according to their dependence on Russian gas imports

MS	RU Dependence[43]	Obligation to suppliers	Obligation to storage users	Obligation to other entities	Filling of last resort	Market-based
BG	79%	✓		✓		
CZ	98%	✓	✓	✓		
HU	80%	✓		✓		
LV	100%			✓		
AT	57%	✓		✓		
DE	63%				✓	✓
IT	44%				✓	✓
PL	56%	✓				
SK	68%	✓				
BE	7%		✓			
DK	0%			✓		✓
ES	0%	✓			✓	✓
FR	22%		✓		✓	
HR	19%	✓	✓			
NL	16%				✓	✓
PT	0%	✓				
RO	22%	✓				
SE	0%	✓				

The most noteworthy observation from examining this group of Member States is that Latvia, the Czech Republic, Hungary and Bulgaria, which had **high dependence on Russian gas imports in 2021, have all established strategic reserves**. In most of these countries (Latvia, the Czech Republic, Hungary) the measure was amended in 2022 to increase the amount of gas stored. The actual level of the strategic reserves differs in each country, without having a clear correlation with the respective storage capacity to gas consumption ratio (Table 15).

Table 15: Share of strategic reserves in storage capacity of each Member State

MS	Storage-to-demand ratio 2022 (%)[44]	Share of strategic reserves in total storage capacity[45]
BG	20%	Up to 12%
CZ	40%	6%
HU	65%	30%
LV	256%	9%

[42] The following ranges of dependence on Russian gas are applied: 1st group 100% - 80%, 2nd group 80% - 40%, 3rd group 40% - 0%.

[43] Dependence can range from 100% - full dependence on Russian imports, to 0% - no dependence on Russian imports. Dependence is calculated using Eurostat 2021 annual data.

[44] Sources: Eurostat annual gas demand in 2022, GIE AGSI+ database storage capacity average for 2022.

[45] See analysis in Vol. 1 of the Study.

4.4 Booked but unused storage capacity[46]

In all the Member States where Gazprom had booked storage capacity during the winter of 2021/22, **measures were implemented to manage contractual congestion** (Table 16). Austria, the Czech Republic and Germany applied a use-it-or-lose-it mechanism. In contrast, in the Netherlands no congestion management procedures were applied for storage capacity. Instead, the capacity for which Gazprom had usage rights was made available to the market (including to EBN, the entity responsible for providing storage filling of last resort) on an interruptible basis.

Table 16: Member States with storage capacity booked by Gazprom in 2021[47]

MS	Measure managing contractual congestion
AT	Use-it-or-lose-it mechanism (capacity of 21 TWh booked by Gazprom was released in 2022)
CZ	Use-it-or-lose-it mechanism (capacity of 4 TWh booked by Gazprom was released in 2022)
DE	Use-it-or-lose-it mechanism (no capacity was released in 2022)
NL	Capacity booked by Gazprom is used as interruptible

4.5 Stockholding obligations assigned to stakeholders

The Member States that apply similar national measures are examined jointly, to identify any commonalities with respect to the additional measures implemented. The Member States are grouped based on the stakeholders to which stockholding responsibilities are assigned (Table 17).

Table 17: Member States grouped according to the stockholding responsibilities

MS	Obligation to suppliers	Obligation to storage users	Obligation to other entities	Filling of last resort	Market-based
AT	✓ (selected customers)		✓		
BG	✓ (selected customers)		✓		
CZ	✓ (selected customers)	✓	✓		
HU	✓ (selected customers)		✓		
HR	✓ (selected customers)	✓			
PT	✓ (selected customers)				
RO	✓ (selected customers)				
ES	✓ (all customers)			✓	✓
PL	✓ (all importers)				
SE	✓ (all customers)				
SK	✓ (all customers)				
BE		✓			
FR		✓		✓	
LV			✓		
DK			✓		✓
DE				✓	✓
IT				✓	✓
NL				✓	✓

[46] Member states with storage capacity booked by Gazprom.
[47] Based on inputs from NRAs in Vol. 1 of the Study.

In several Member States where **suppliers of protected customers must maintain gas stocks**, additional **obligations may also be assigned to other entities** (Austria, Bulgaria, the Czech Republic, Hungary and Croatia) to increase the filling levels. The additional measures taken depend on how the size of the storage capacity compares to gas demand. For example, in Austria and the Czech Republic, which have large storage capacity (110% and 40% of annual gas consumption, respectively), gas stocks established by suppliers of protected customers to meet the supply standard accounted for just 4% - 5% of capacity. Consequently, other entities needed to establish significantly larger additional gas stocks[48].

The Member States that require **suppliers of all final consumers to maintain gas stocks** (Poland, Slovakia, Spain, Sweden) **do not assign additional stockholding obligations** to other stakeholders. Spain, however, has implemented additional measures related to last resort filling and incentives for storage users.

In Germany, Italy and the Netherlands, the market-based measures applied are **combined with the activation of a measure for storage filling of last resort**. This was because the market-driven storage filling by market participants was not sufficient to meet the trajectories and targets. Storage filling of last resort is also in place in France, to complement the obligations assigned to storage users and to ensure that the filling trajectories and targets of the EU Gas Storage Regulation are met[49]. However, there was no need to activate this mechanism in 2022, as storage capacity was fully booked by February 2022, resulting in a 100% filling by the storage users in the beginning of the withdrawal period.

[48] In Austria, apart from the arrangements needed to meet the national targets, Austria and Germany concluded an agreement on the responsibility to reach the EU filling targets for the commonly used storage capacity Haidach and 7fields. As the storages are located in Austria only the Austrian measures could be implemented to fill these storages.

[49] In France, the national storage filling target of 85% on November 1st is ensured by setting relevant filling obligations to storage users that have booked capacity, and by having in place the "safety net" mechanism if booking of capacity is not sufficient to meet security of supply objectives. The additional obligation assigned to the SSOs for storage filling of last resort was introduced in 2022 to be activated in case gas in storage on November 1st is below the 90% target of the EU Gas Storage and/or below the filling trajectories at the respective milestones.

5 Selection of storage measure typologies

The main factor in determining the storage measures applicable in a Member State lies in the decision of the authorities on **which types of entities will be entrusted with the primary role and responsibility for storage filling**, with a view to enhancing security of supply and ensuring that the filling targets of the EU Gas Storage Regulation are attained.

Depending on the type of entities selected, the corresponding typology of storage measures is implemented:

- **Suppliers of final customers**, to which mandatory stockholding obligations are imposed.
- An **entity not involved in gas supply**, tasked with mandatory stockholding obligations.
- **Storage users**, to which filling targets have been assigned for the storage capacity they have contracted.
- Incentivization of **all market participants** to voluntarily use storage capacity.

The measures assigning filling responsibilities to these entities vary in terms of effectiveness, efficiency and level of cost required. The **preference for implementing one measure over the others is driven by these characteristics**, as discussed in the Table below.

Table 18: Drivers for selecting the measure typology with the primary role in storage filling

	Effectiveness	Efficiency	Level of costs required	Key drivers for selecting the specific measure
Stockholding by suppliers of all consumers	🟢🟢🟢	🔴	€€	▪ Lower stockholding costs compared to assigning the obligation to a designated entity. ▪ Suppliers have better access to the market than other entities. ▪ Effective if storage capacity is not large vis-à-vis gas demand.
Stockholding by designated entity	🟡🟡	🟡🟡 / 🟢🟢🟢	€€ - €€€	▪ Efficient management of stocks is preferred over the risk of having increased costs. ▪ High dependence on a single import source requires maintaining strategic reserves. ▪ Remaining storage capacity is expected to be filled by market participants.
Filling targets assigned to storage users[50]	🟡🟡 / 🟢🟢🟢	🟡🟡	€ - €€	▪ There is expected to be large interest in the market for capacity booking, even if the possibilities for arbitrage are decreased. ▪ There is limited need for strategic reserves, or these are established through another measure.

[50] The effectiveness and the level of costs depends on the market conditions, which affect the market participants' interest to book capacity and the need to offer additional incentives to increase effectiveness.

Incentivization of market participants[51]	🔴 / 🟢🟢🟢	🟡🟡 / 🟢🟢🟢	€ - €€€	▪ The incentives offered to the storage users are expected to stimulate interest for storage filling at the foreseen milestones. ▪ There is limited need for strategic reserves, or these are established through another measure.

The experience with the application of storage measures in 2022/23 by the Member States has indicated that, depending on the drivers mentioned in Section 4, **the selected measure typology to serve as the primary mechanism for ensuring storage filling can be supported by other complementary measures**. This is done to ensure effective storage filling and/or to increase the overall efficiency of implementation. The sections below analyse good practices for applying measures that are primarily used for stockholding and how these measures can be combined with complementary measures that enhance their effectiveness and efficiency.

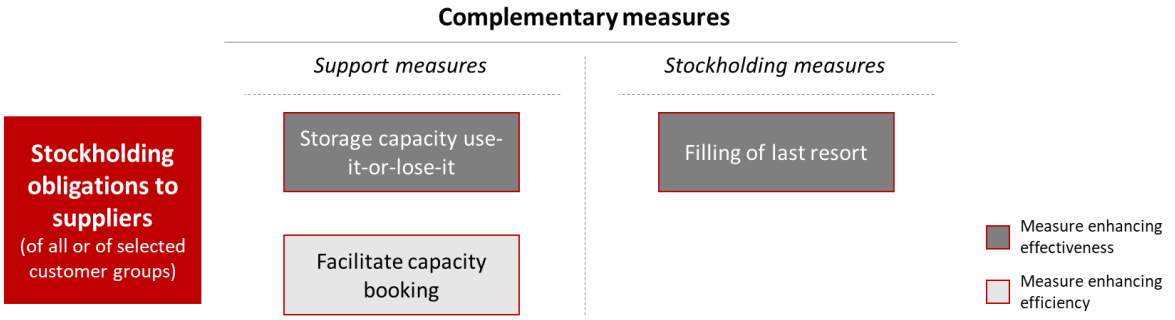
5.1 Mandatory stockholding by suppliers

The key factor in deciding on the types of gas consumer groups for which gas stocks will be maintained is the relative proportion of the Member State's storage capacity to its gas consumption. If storage capacity can cover only a small part of gas demand, assigning stockholding obligations only to suppliers of protected customers and potentially other customers essential for the country's energy supply (e.g. CCGTs, district heating) can be adequate to safeguard security of supply. On the contrary, if the ratio of storage capacity to gas demand is large, mandating all gas suppliers of final consumers to store gas may not be sufficient to establish a considerable level of storage filling.

The stockholding obligations of each supplier should be proportional to its gas sales to the groups of final consumers for which the measure applies. Any remaining storage capacity could be offered to the market for commercial use. **The size of each supplier's gas stocks should reflect the market's reasonable needs for security and continuity of supply**, in order to avoid putting any unnecessary stockholding burden to the suppliers, which may affect their participation in the market, and constraining their flexibility to use the remaining part of their storage capacity for arbitrage purposes.

The measures that could be combined with the mandatory stockholding by suppliers, in order to enhance the effectiveness and efficiency of storage filling, are presented in Figure 4.

Figure 4: Mandatory stockholding by suppliers – complementary measures



[51] Effectiveness and efficiency depends on the type of incentives offered to market participants.

The establishment of a **use-it-or-lose-it mechanism is an effective and efficient measure** that serves both as a penalty for suppliers not complying with their obligations, and as an instrument for ensuring that the storages will be filled in time to comply with the foreseen trajectories and targets[52]. The risks of contracted capacity not being used are decreased, by providing to storage users the possibility to surrender or resell capacity within specific milestones and requiring the SSOs to release any unused capacity to other market participants, or to entities designated with storage filling.

Unless the whole storage capacity is dedicated exclusively to the stockholding responsibilities of the suppliers, **priority access should be given to suppliers for contracting the capacity needed to store the gas stocks**. For example, capacity can be implicitly allocated to suppliers based on their obligations, or an open subscription procedure can be carried out only for the capacity used for stockholding, before the regular capacity allocation mechanism. Without such a measure in place, suppliers are subjected to risks of capacity unavailability, not allowing them to meet their obligations, or requiring them to pay premia for booking capacity.

As a safeguard to ensure that the storage filling targets are met, an entity can be tasked with **responsibilities of filling of last resort**. Establishment of such a measure adds value **if the stockholding obligations of the suppliers cover only part of the storage capacity**, with the rest being free for use by market participants. On the other hand, if the suppliers' stockholding concerns the majority of capacity, then storage filling of last resort would only be required if a supplier fails to meet its obligations.

5.2 Mandatory stockholding by a designated entity

The entity designated to establish and maintain gas stocks should have the **capability to procure gas from the market and to contract capacity** for transporting and storing it. The timing for procuring gas is determined by the storage filling needs and is not based on business decisions. This may **subject the obligated entity to unfavourable market conditions**, without flexibility to delay gas purchases. To mitigate such risks, and purchase gas more efficiently, the entity must have in place **risk mitigation mechanisms**, such as price hedging.

The size of the designated entity's gas stocks and its use of storage capacity depends on the purpose for which the stocks are established:

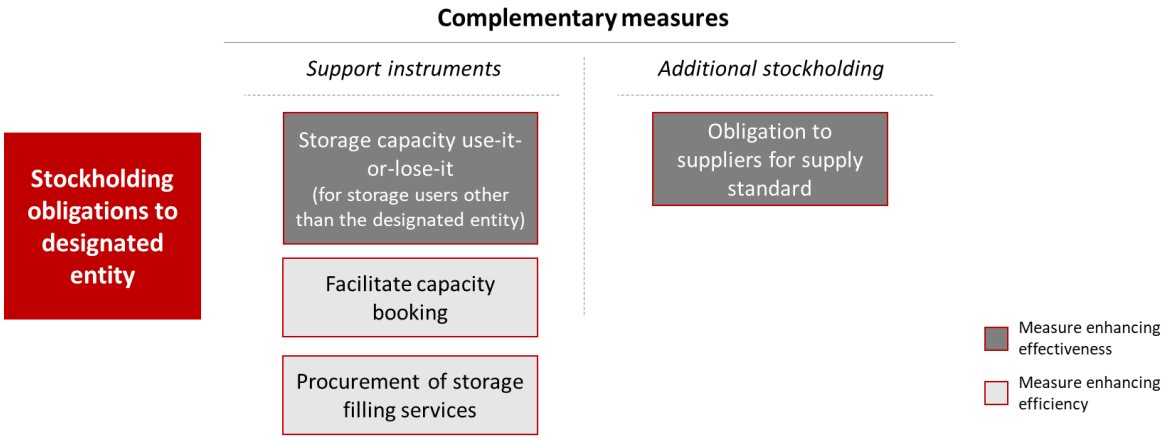
- Where the designated entity is tasked with maintaining **strategic stocks, these should take priority over other uses of the storage capacity**. The strategic stocks should be at a level that **ensures security and continuity of supply**, while the remaining capacity can be made available to the market.
- On the other hand, if the designated entity must **temporarily store gas**, then the **gas stocks are used to compensate for storage filling** that cannot be covered by the market. In this case, the level of its stocks should take into account the expected use of the storage capacity by market participants for commercial purposes, so as to **avoid inadvertently leading to contractual congestion or reducing the system's flexibility**.

[52] Although the need for a UIOLI mechanism was of high importance for some Member States in 2022 to release capacity held by Gazprom, it can still provide a safeguard to avoid capacity being booked but not used by market participants.

With a designated entity managing the stocks, there is no need for assigning separate responsibilities for storage filling of last resort. If market-driven storage filling is insufficient, the designated entity may be required to increase its gas stocks up to the targeted level.

The measures that could be combined with the mandatory stockholding by a designated entity, in order to enhance the effectiveness and efficiency of storage filling, are presented in Figure 5.

Figure 5: Mandatory stockholding by a designated entity – complementary measures



The establishment of a **use-it-or-lose-it mechanism** shall ensure that the capacity contracted by market participants is utilized in time to meet the filling targets. Through such a mechanism, any booked but unused storage capacity can be **promptly released from the storage user and allocated to the designated entity**.

The dedicated entity should have sufficient storage capacity to meet its stockholding obligations. To avoid cases of capacity unavailability, the necessary **capacity should be allocated to the entity before** capacity is made available to the market participants.

Instead of procuring and storing gas on its own, the designated entity can opt to procure storage filling services from market participants. Such services can **reduce the administrative burden of the entity** related to the establishment and management of stocks. It can also **provide an additional incentive to market participants** to store gas. However, the drawback is that, depending on market conditions, interest for providing filling services may be limited or offered at high prices.

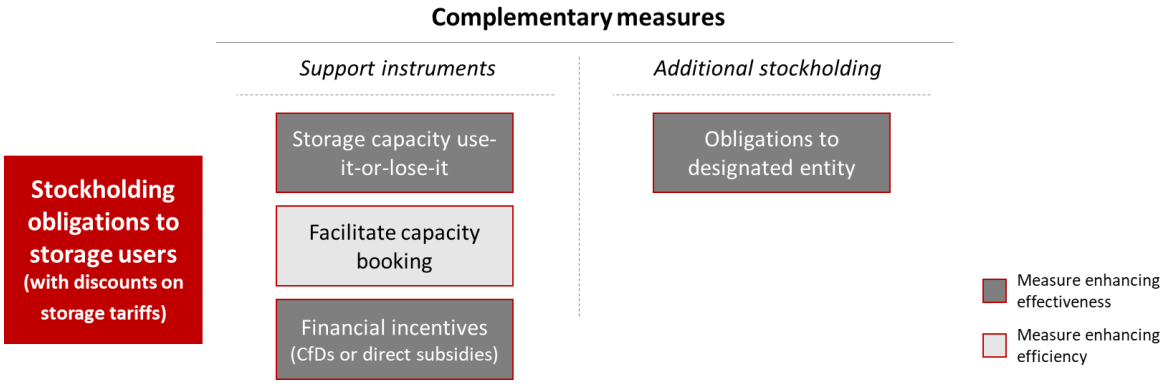
Strategic reserves maintained by the dedicated entity **can be supplemented with stockholding by suppliers, especially in Member States with large storage capacity**. The monthly gas volumes that the suppliers of protected customers need to secure to comply with the supply standards, can serve as the minimum gas stocks for the suppliers.

5.3 Storage filling targets to storage users

The effectiveness of the measure **depends on the interest of the market participants to book storage capacity** while simultaneously undertaking the corresponding filling responsibilities, which can reduce their possibilities to exploit price arbitrage opportunities. **Limiting the costs of storage tariffs** provides an incentive to storage users to reduce their costs. To ensure non-discriminatory access to storage, the stockholding responsibilities assigned to storage users should concern the entire capacity available for market participants at the facilities covered by the measure.

The measures that could be combined with the responsibilities assigned to storage users, in order to enhance the effectiveness and efficiency of storage filling, are presented in Figure 6.

Figure 6: Storage filling targets to storage users – complementary measures



The establishment of a **use-it-or-lose-it mechanism is essential for safeguarding that the filling targets are met.** Mandatory release of booked but unused capacity at specific milestones allows its allocation to other storage users or, if additional measures are applied, to a designated entity.

The SSOs can **increase the frequency of storage capacity auctions** during the injection period (if third party access is regulated), if market participants show increased interest in contracting capacity. Conversely, limited demand for capacity can flag the need for setting up additional stockholding measures.

Additional **financial incentives**, in the form of contracts for differences or direct subsidies, can **increase the interest of the market participants for using storage**. However, these incentives should be made available only under negative market conditions and when the interest in capacity booking is so limited that meeting the minimum filling targets is at risk.

Upon concluding the procedure for booking long-term storage capacity, there is visibility on the storage filling obligations undertaken by the storage users. If necessary, it is possible to introduce additional measures early during the injection period, and in particular to **assign supplementary stockholding responsibilities to a designated entity**. The entity can access the markets with sufficient time to procure gas under the best possible conditions.

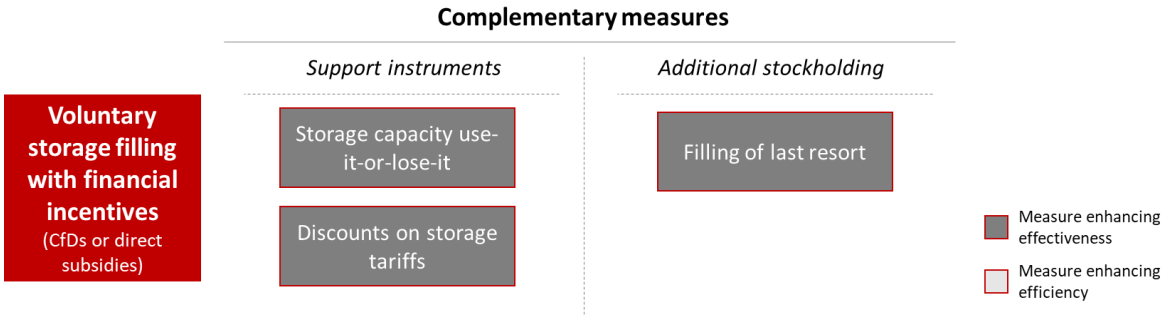
5.4 Voluntary storage filling by market participants with incentives

Maintaining gas in storage at specific milestones is **voluntary and market-driven**. Financial incentives, either contracts for differences or direct subsidies, should be offered to market participants only when interest for storage capacity is limited, typically due to negative summer-winter spreads prevailing in the market.

The financial incentives offered to market participants **may apply either to the entirety or to part of the available capacity** of the facilities covered by the measure. To optimize the use of funds, the expected use of these facilities by the market without offering incentives should be taken into account.

The measures that could be combined with the incentives offered to storage users, in order to enhance the effectiveness and efficiency of storage filling, are presented in Figure 7.

Figure 7: Voluntary storage filling by market participants with incentives – complementary measures



Implementing a use-it-or-lose-it must be in place so that unused capacity can be returned to the market or allocated for storage filling of last resort. **Additional incentives** (such as zero-reserve prices) may apply to the released capacity, if interest for booking the capacity is limited.

To address potential shortfalls in market-driven filling, **an entity should assume responsibilities for storage filling of last resort**. The measure should be activated only when market participants are not expected to store any other gas volumes, despite the offered financial incentives.

6 Storage arrangements by Member States without storage

Article 6(c) of the EU Gas Storage Regulation requires Member States without underground storage facilities[53] to ensure that their market participants store gas in storage facilities of neighbouring countries. Additionally, this Regulation allows Member States without storage capacity the possibility to enter into burden-sharing agreements[54] with Member States with storage capacity, as an alternative to assigning stockholding obligations to market participants.

Most of the Member States without underground storage facilities (Estonia, Finland, Greece, Lithuania, Luxembourg) have established obligatory measures, assigning stockholding responsibilities to suppliers of final consumers and other designated entities, while Slovenia follows a market-based approach (see Section 3.2 of Vol. 1 of the Study)[55]. To date, according to the information reported by NRAs, **none of these Member States has developed a burden-sharing mechanism jointly with Member States with storage**. Other arrangements between the Member States, such as governmental agreements and memoranda of understanding (MoU), seeking to facilitate stockholding in neighbouring storage capacity, are limited (Table 19).

Table 19: Storage arrangements between Member States with and without storages

Member State	Burden-sharing mechanism	Other arrangements
Estonia	No	Estonia has signed an MoU with Latvia for security of supply (not for storage arrangements)
Finland	No	No storage arrangements in place
Greece	No	Greece has signed MoUs with Italy and Bulgaria for storage year 20222/23 regarding the use of their underground storage facilities
Lithuania	No	No arrangements in place with MS with storage
Luxembourg	No	No arrangements in place with MS with storage
Slovenia	No	No arrangements in place with MS with storage

In May 2023, Estonia and Latvia signed a MoU [56] aiming to ensure gas supply for both Member States during a potential crisis. The collaboration involves analysing potential security of supply options and identifying additional emergency supply routes, including the potential joint chartering of an FSRU. However, the MoU does not specify particular arrangements related to the use of the underground storage facility of Inčukalns in Latvia.

The Greek Ministry of Environment and Energy signed MoUs with the competent Ministries of Italy, in September 2022[57], and of Bulgaria, in early 2023[58]. These arrangements aim to facilitate access to

[53] Cyprus, Malta and Ireland are exempt from this obligation, as they are not interconnected with gas systems of other Member States.
[54] Agreements through which Member States without storage can use storage facilities of neighbouring Member States, while sharing the financial burden of filling obligations.
[55] As of 2023, in Slovenia suppliers responsible for balancing groups have the obligation to store on the 1st of November each year a volume of gas, corresponding to 15% of balancing group's average gas consumption over the last five years, in one of the neighbouring countries under market conditions.
[56] The MoU is available here.
[57] "Greece signs agreement with Italy on natural gas storage", 10 September 2022 (Link)
[58] "Greece, Bulgaria sign memoranda that 'change the energy map of SE Europe'", 16 February 2023 (Link)

the neighbouring storage facilities as part of Greece's compliance with the storage obligations set by article 6c of the EU Gas Storage Regulation. The duration of both MoUs was 1 year. The MoU with Italy concerned the storage of 1.5 TWh of gas to Italian storage facilities during the winter period of 2022. This corresponds to the maximum gas volume that can be delivered from Greece to Italy, via the virtual reverse flow of the Trans-Adriatic Pipeline. The MoU with Bulgaria allowed Greek suppliers to register for the use of the Bulgarian transmission system and for access to the underground storage facility in Chiren. In turn, Bulgarian suppliers can reserve capacity at the Greek LNG terminals (including the one under development in Alexandroupolis). Both MoUs did not create any legally binding or financial obligations between the signatory parties[59].

Despite these MoUs, in 2022/23 Greece could only meet part of its filling obligations due to technical constraints at the interconnections with both Italy and Bulgaria. For the year 2023/24, technical restrictions did not allow Greece to store any gas in underground storage facilities of its neighbours:

- The capacity at the Italian storage facilities was fully booked. At the same time, the IP from the Trans-Adriatic Pipeline into the Greek system was fully booked with very high premia.
- The import-export capacity in Bulgaria, and the storage capacity at the Chiren UGS were fully booked.

Overall, **it appears that the Member States without storage facilities have relied on their own measures to meet their stockholding obligations** under the EU Gas Storage Regulation, rather than entering into binding agreements with neighbouring Member States to secure access to storage under special rules and arrangements.

[59] The complete text of the MoUs is not publicly available.

7 Key lessons learned and recommendations

This Section discusses the key lessons learned from the implementation of national storage measures in Member States during the storage year 2022/23 and formulates recommendations on good practices for the design and application of measures in the future.

1. Support schemes are effective and efficient mechanisms to increase storage utilization by market participants

In Member States where contracting of storage capacity has been linked to specific filling targets, the use of support schemes, such as discounts on storage tariffs, financial penalties for non-compliance with storage users' targets, and flexible capacity offering by SSOs, **has proven to be an important factor in motivating market participants to book and use storage capacity**.

For instance, in France, where storage users are assigned with filling targets, all capacity for the storage year 2022/23 was contracted by February 2022, and storages were 100% full on November 1st, 2022. **The success of the support mechanisms to storage users, which incentivised the use of storage** despite the negative market conditions in 2022, can be attributed to a number of factors:

- The SSOs began **offering capacity for storage year 2022/23 before 2022**, and most storage capacity for 2022/23 was already booked before the end of 2021. To facilitate capacity booking for the storage year 2023/24, a CRE Decision of October 2022 allows SSOs to have a flexible auction calendar and to offer storage capacity when price spread levels are favourable.
- A **zero-reserve price** at storage auctions for capacity in the coming year, provided a strong incentive for market participants to book capacity. SSOs recover any negative difference between the revenues from selling capacity and the regulated revenue through a dedicated charge collected by the TSOs on the transmission tariffs paid by domestic consumers. In January 2023, to further facilitate storage booking for the storage year 2023/24, CRE applied a 100% discount on the tariff at the transmission/storage points ('PITS') for the slow filling storage sites.
- If a storage user does not comply with its filling target, it receives a **fine of up to twice the value of the gas** not in storage. Even if the fine is imposed, the user still has the obligation to fill the storage, and failure to comply may result in the suspension of the storage user's license for up to a year.
- The **"safety net" mechanism** acted as an additional incentive for market participants. If the interest in storage booking was limited, then all suppliers would be forced to book capacity at an administrative price, instead of the zero-reserve price applied at auctions.

Belgium also succeeded in achieving 100% storage filling at the start of the 2022/23 withdrawal season. Stockholding obligations of storage users were supported by discounts on the reserve price, and CREG allowed SSOs to conduct auctions when market conditions were favourable.

In Spain, offering of a zero-reserve price, conditional upon meeting specific storage filling targets, was one of the drivers leading to high demand for capacity, and to storage users paying premia.

Recommendations

Where the responsibility of storage filling is assigned to storage users, the following **support mechanisms should be put in place**:

- SSOs should have flexibility to **adjust the timing of offering storage capacity** based on the market conditions.
- **Discounts** should apply on the storage tariffs, and/or on the tariff at the transmission/storage points.
- **Financial penalties should be in imposed** if storage filling is below the target. These penalties should be dissuasive, i.e. high enough to discourage storage users from not meeting their obligations.

2. Storage filling of last resort should not cause adverse effects to the market

Without proper mechanisms in place, **storage filling of last resort can lead to inefficient and costly gas purchases, which can negatively impact prices when released to the market**.

In 2022 in Germany, due to the risk of market participants not meeting the required storages levels, THE had to take over the filling of the gas storages on a very short notice before the filling targets deadline and had to purchasing gas on the market. The gas volumes that THE was called to buy amounted to 50 TWh, corresponding to 20% of the country's storage capacity. Gas was purchased at a high cost, averaging around 175 €/MWh, due to a number of reasons[60]:

- THE had to **procure gas on short notice**, limiting its flexibility in accessing the market during a period of extraordinarily high prices.
- Due to the small injection rate and large capacity of the Rehden storage facility, THE had to **buy and store gas on almost a daily basis** in order to reach its filling target.
- THE **accessed the futures market very late** in the injection period (October 2022) and not to a full extent, due to insufficient liquidity to perform secured trading.
- There was **uncertainty on the legal admissibility and commercial and tax treatment** of buy-backs of gas by THE in the futures market.

THE sold part of the gas stocks in 2022, with 37 TWh still in storage at the beginning of 2023. In November 2023 THE began releasing the remaining gas volumes to the market[61].

Recommendations

Although storage filling of last resort should ideally be avoided, it may be necessary if all other market-based or administrative measures fall short of meeting filling targets. If such a measure must be applied, **planning** for the required volumes and **managing of price risks** can reduce the long open position of the obligated entity, while a **framework for releasing gas** to the market can mitigate impacts on wholesale prices. To this end, an efficient application of the measure requires:

- **Sufficient lead time**: Establish checkpoints during the injection period to closely monitor the effectiveness of the measures in place and to identify as early as possible any risks of missing the filling targets. This provides some flexibility to the entity tasked with filling of last resort when accessing the markets.

[60] The reasons described are based on the assessment of the experiences from storage management by THE in the storage year 2022/23, performed in the study "Strategies for the management of Gas storage by Trading Hub Europe" by BET and DCE on behalf of BNetzA (link).

[61] Reuters, "German gas trading hub to sell up to 37 TWh of gas from storage", November 16th, 2023 (link).

- **Treatment of slow-filling facilities**: Consider offering incentives to market participants for filling facilities with slow-filling characteristics, to avoid injecting large gas quantities into storages at a short notice.
- **Price hedging**: The entity should procure gas quantities on the futures market and hedge them for the planned physical withdrawal period. The entity should have the technical, personnel, financial and legal capability to access the futures market and the option to repurchase quantities if necessary to reduce its open position.
- **Strategy for gas release**: If large volumes have been released to the market, they should be gradually released to avoid oversupplying the market and providing non-market-based signals.

3. The application of national measures should not adversely impact cross-border gas exchange

Some storage measures allow market participants to make use of storage facilities in neighbouring countries to maintain stocks. However, the implementation modalities of such measures **may create unnecessary constraints at the interconnection points and hinder cross-border trade**. For example, in Poland, the obligation of the importers to ensure deliverability of the gas stocks they maintain in storages of neighbouring countries can result in overbooking of cross-border capacity and limit the possibilities of cross-border trade[62].

The **application of charges or levies at cross-border points** to recover costs associated with the implementation of national measures **can also have a detrimental effect on the regional markets and on security of supply**. The non-market-driven uplift in the cross-border transport costs impacts gas flows, increases price spreads between Member States, and may pose a barrier to the diversification of supply sources. **The impact is amplified if the costs to be recovered concern inefficiently procured gas for storage filling**.

The gas storage neutrality charge applied at all offtakes of the German transmission system, including cross-border points, has raised such concerns. European gas traders and governmental officials from neighbouring Member States have voiced their objections to this cost-recovery mechanism[63], particularly due to its impact on the market prices in the region and the constraints it poses to displacing Russian gas with alternative sources (e.g. Norwegian gas, LNG). These concerns are intensified by the steep increase of the levy which has more than tripled over a period of around 1 year (from 0.59 €/MWh in October 2022 to 1.45 €/MWh in July 2023 and 1.86 €/MWh in January 2024)[64], as well as by the expected extension of its application by two years, to the end of 2027.

Recommendations

In principle, market participants should be allowed to use storage facilities of other Member States to meet the supply standard. However, such measures **should not obligate the entities to reserve excess capacity at cross-border points**.

[62] European Commission Press Release: "The European Commission decides to refer Poland to the Court of Justice of the European Union for measures imposing additional costs on cross-border gas trade", 16th November 2023 (link)

[63] ICIS, "Traders call for EU probe into German gas storage fee", 21st December 2023 (link) – Argus, "German gas storage levy against EU law: AGGM", January 9th, 2024 (link).

[64] THE Website, Fees and neutrality charges (link).

Charges and levies recovering the costs of implementing national storage measures should not be applied at cross-border points, to avoid adverse effects to gas exchanges. This is of particular importance for measures requiring the procurement of gas stocks by obligated entities, as this may require the recovery of high costs.

4. Management of contractual congestion of storage capacity is an important instrument for ensuring that the filling trajectories and targets are met

In 2022, the **hoarding of storage capacity by Gazprom was an important constraint** that some Member States had to address in order to increase their storage filling. In Austria and the Czech Republic, the SSOs had to release significant amounts of capacity held by Gazprom, accounting respectively for 22% and 11% of the countries' total capacity, and to allocate it to other stakeholders. To allow the SSOs to withdraw unused capacity, Austria amended its existing use-it-or-lose-it mechanism, while the Czech Republic introduced a new mechanism. Both cases included **a streamlined process for capacity release** (**UIOLI mechanisms), with triggers at specific timings**.

Voluntary release of unused capacity is equally important, especially when filling targets are assigned to storage users. In Croatia, storage users unable to meet their obligations opted to resell or lease their capacity to HEP, the entity responsible for stockholding, using a mechanism introduced in 2022.

Recommendations

A congestion management mechanism should be put in place irrespective of which entities have the primary role in storage filling. The mechanism should allow both voluntary and mandatory release of capacity, with specified milestones for checking storage utilization. Taking into consideration the application of such measures in 2022, an efficient mechanism should entail the following:

- A clear **definition of "systematically unused" capacity**, with storage users required to meet specific filling requirements at specific milestones, monitored by the SSO.
- The storage user must be **contractually obliged to resell** (or potentially lease) to other users, **or surrender to the SSO**, any unused capacity. Capacity must be made available in a timely manner for contracting with other users to meet the filling targets.
- A process, **allowing the SSO to promptly withdraw the systematically unused capacity** of a system user, should be in place.
- The rights and obligations of the user having its capacity released **remain until this capacity is contracted to another user**. This includes paying the respective storage tariff.
- The SSO should be compensated from the user having its capacity released for **any administrative costs incurred** due to the activation of the mechanism.

5. Contracts for differences can provide efficient incentives to market participants to store gas

In 2022, the contracts for differences made available in the Czech Republic and the subsidy scheme applied in the Netherlands **stimulated some interest from market participants** resulting in storing

gas corresponding to 12% and 9% of the respective Member States' storage capacity. While the contribution of these incentives was limited, due to the changes in the outlook for the evolution of the summer – winter spreads during the injection period, the overall efficiency was noteworthy. From a cost perspective, the **payouts to the beneficiaries were limited**, and in the Netherlands the storage users were not compensated as the difference between the market price and the agreed price turned out to be positive. Overall, **the incentives can be deemed efficient in 2022**, as they triggered storage filling with limited needs to mobilize state funds.

However, the joint offering of contracts for differences and direct subsidies proved to be challenging in Italy. In 2022, where both types of incentives were made available, market participants strongly **preferred the stock premium**, which offered a steady subsidy irrespective of the market conditions, while the **use of the CfDs was minimal**.

The **need to launch the incentives as early as possible within the injection period of 2022 made their design challenging**. In the Czech Republic, the Ministry had limitations in setting up auctions for CfDs and resulted in a complex process involving many stakeholders. In Italy, ARERA faced difficulties in establishing the mechanism for the CfDs within the short time available.

Recommendations

To enhance the efficiency of contracts for differences, the mechanism should **be in place before the injection period, readily available for launch if prevailing summer-winter spreads limit market participants' interest in using storage.** The contracts should be offered through a streamlined procedure, involving limited parties, similar to the approach applied in the Netherlands.

Conversely, **direct subsidies should be offered as a last resort**, and only if interest for CfDs is small, as they make a less efficient use of funds.

6. Stockholding responsibilities of gas suppliers should not impact the flexibility offered by storage

Assigning stockholding obligations on gas suppliers proves effective in ensuring the filling of storages, particularly in countries where the storage capacity is relatively small in proportion to its gas consumption.

In the Member States where this measure was applied in 2022, it resulted in nearly complete storage filling, with the gas stocks being stored for extended periods. In Spain, on November 1st, 2022, 94% of storage capacity was filled with gas stocks established by the suppliers, with approx. 62% of the stored volume being strategic reserves that cannot be sold to their customers unless authorised by the Government or the Ministry. In Portugal, the storage obligations of the suppliers filled 85% of the capacity. Finally, in Romania the gas stocks of the suppliers, corresponding to 88% of capacity, could only be withdrawn after the end of the winter period.

While these stockholding obligations effectively contribute to storage filling, they also impose significant constraints on gas withdrawals and **reduce the storage capacity available for flexibility and potential arbitrage opportunities**. As a result, demand for storage exceeded the marketed capacity both in Spain and Portugal.

Recommendations

Where suppliers are the entities responsible for stockholding, the determination of the level of storage filling dedicated to gas stocks should take into consideration, to the extent possible, the needs of the market participants for **using the storage for flexibility and price arbitrage** (e.g. through market consultations). It is crucial ensuring that the assigned stockholding obligations strike a balance between achieving storage targets and maintaining the necessary flexibility for market participants.