

# **Storage Specification Jemgum Underground Storage Facility**

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## Article 1 Introduction

1. The **Storage Specification** for the Jemgum **Storage Facility** defines all the details required to enable **astora** to provide **Storage Services** at the Jemgum **Storage Facility**.
2. The definitions for the storage of **Gas** contained in the **General Terms and Conditions for Storage Access** shall apply. Terms used in the singular also include the plural and vice versa, assuming this has not been expressly agreed otherwise or is obvious from the respective situation.
3. Upon the conclusion of a **Storage Services Agreement** the **Storage Specification** of the **Storage Location** on which the **Storage Services Agreement** is based shall form an integral part of the **Storage Services Agreement**.
4. The validity of all the **Storage Services Agreements** shall be subject to the condition precedent of the effective realisation of the Jemgum **Storage Facility** including the required storage connection pipelines. In order to minimise the uncertainties resulting from Sentence 1 **astora** will notify the **Storage Customer** as soon as possible of any postponement of the agreed **First Utilisation Day** of the **Storage Period** and of any adjustment of the amount of contracted **Storage Services** according to Article 3, which might occur in this context.
5. To grant a non-discriminatory marketing and to satisfy as many requests as possible during the planned, incremental commissioning, **astora** shall be entitled to reduce the requested **Storage Capacities** corresponding with said planned, incremental commissioning by up to 50%.

## Article 2 Storage Services

### Article 2.1 astora-pack

1. The **astora-pack Storage Service** shall be a **Bundled Storage Service** with a minimum term of one (1) **Year**. In case **astora-pack** is only available for a period within a **Storage Year** less than the aforementioned term, **astora** shall be entitled to deviate from this minimum term.
2. At Jemgum **astora-pack** shall comprise the following **Storage Capacities**:
  - a) **Injection rate**: 6.60 kWh/h and
  - b) **Withdrawal rate**: 10.00 kWh/h and
  - c) **Working gas volume**: 10,000.00 kWh

3. The minimum quantity of **astora-pack** shall be 500 bundles. In case **astora-pack** is only available for a quantity less than the aforementioned quantity **astora** shall be entitled to deviate from this minimum quantity.
4. The availability of **astora-pack** shall be subject to the limitations of the applicable **Injection** and **Withdrawal Curves** according to Article 16.

#### **Article 2.2 astora-add**

1. The **astora-add Storage Service** shall be an **Unbundled Storage Service** with a minimum term of one (1) **Storage Day** which **Storage Customers** can contract in addition to **astora-pack**.
2. The availability of **astora-add** shall be subject to the limitations of the applicable **Injection** and **Withdrawal Curves** according to Article 16.

#### **Article 3 Adjusting the Availability of Storage Services**

1. If the availability of the **Storage Capacities** differs from the planning, **astora** shall be entitled to adjust the availability of the **Storage Services**, to the availability of the **Storage Capacities**.
2. Should, due to an adjustment according to Section 1, the amount of **Storage Services** that have already been contracted by all **Storage Customers** exceed the amount of available **Storage Services**, **astora** shall be entitled to adjust all **Storage Customers'** amount of contracted **Storage Services** proportionally to the amount of available **Storage Services**.
3. The **Storage Customer** shall be entitled to terminate its **Storage Services Agreement** with immediate effect to the extent the **Storage Services** according to Article 2 of the **Storage Services Agreement** has not been made available within 24 months after the agreed **First Utilisation Day** of the **Storage Period**. This right of termination can be executed within 20 **Working Days** after receipt of the notification by **astora** according to Article 1, Section 4.

#### **Article 4 Storage Services Fee**

1. The **Storage Customer** shall be obligated to pay the respective **Storage Services Fee** for the **Storage Capacities** made available by **astora**. The claim to payment of this **Storage Services Fee** shall arise at the start of the **First Utilisation Day** of the respective **Storage Services Agreement**.
2. The **Storage Tariff** that applies to the **Storage Services Fee** shall be calculated on the basis of the **Basic Storage Tariff** according to Article 5 and the provisions defined in Article 6.

3. To determine the **Storage Services Fee** the number of contracted **Storage Services** shall be multiplied by the **Storage Tariff** according to Section 2 and a grand total of all **Storage Services** is formed.
4. In case **Short-term-** or **Long-term Factors** should apply, the **Storage Services Fee** calculated according to Section 3 shall be multiplied by the respective factors according to Article 7 and Article 8.
5. For **Storage Periods** less than one (1) **Year** the annual **Storage Services Fee** calculated according to Section 3 and Section 4 shall be divided by twelve (12) in order to calculate the **Storage Services Fee per Month**. In order to calculate the **Storage Services Fee per Storage Day** the **Storage Services Fee per Month** according to sentence 1 shall be divided by thirty (30).
6. In case seasonality factors according to Article 9 should apply, the **Storage Services Fee** calculated according to Section 5 shall be multiplied by the respective factors.

#### Article 5 Basic Storage Tariff

1. The **Basic Storage Tariff** for **astora-pack** according to Article 2.1 shall be:  
€105.00 per **Year** per bundle.
2. The **Basic Storage Tariff** for **astora-add** according to Article 2.2 shall be:
  - a) **Injection Rate:** € 3.79 per kWh/h/a
  - b) **Withdrawal Rate:** € 4.95 per kWh/h/a
  - c) **Working Gas Volume:** 0.49 ct/kWh/a
3. All the prices listed here are net prices; any statutory turnover tax that is due shall be charged separately at the applicable tax rate.

#### Article 6 Adjusting the Storage Tariff

1. Based on the **Basic Storage Tariff** according to Article 5 the **Storage Tariff** that applies to billing and payment shall be adjusted on April 1 every year according to the following formula:

$$E = E_0 \times \left( 0.50 + 0.25 \times \frac{I}{I_0} + 0.25 \times \frac{L}{L_0} \right)$$

In this formula the terms mean:

E = **Storage Tariff** in €/year or €/month.

E<sub>0</sub> = **Basic Storage Tariff** as per Article 5.

I = Average annual value of the Capital Goods Price Index in the calendar year preceding the adjustment date.

The Capital Goods Price Index is published in Series 17 of the German Federal Statistical Office; Prices; Series 2; – Index der Erzeugerpreise gewerblicher Produkte (Inlandsabsatz) (Producer Price Index (domestic sales)).

I<sub>0</sub> = 102.4 points = Value of Index (2005 = 100) in base year 2009.

L = Average annual value of the Contractual Wage Index in the Energy Industry of the calendar year preceding the adjustment date.

The Contractual Wage Index for the Energy Industry (together) is published in Series 16 of the German Federal Statistical Office; Series 4.3; Index der tariflichen Stundenverdienste im produzierenden Gewerbe und im Dienstleistungsbereich; Basis 2005 = 100; Früheres Bundesgebiet; WZ 35 (Contractual wage index in industry and service business, former federal territory).

L<sub>0</sub> = 111.6 points = Value of Index (2005 = 100) in base year 2009.

- If the **Working Gas Volume** comprised by the **astora-pack Storage Service**, which is mentioned under Article 2.1 Section 2 c), is reduced according to Article 13 to a value less than 10,000.00 kWh, the **Storage Tariff** according to Section 1 will be adjusted by applying the following formula:

$$E_{\text{new}} = E - 0.85 \times \frac{E}{E_0} \times A \times (10,000.00 \text{ kWh} - V)$$

In this formula the terms mean:

E<sub>new</sub> = Adjusted **Storage Tariff** for **astora-pack**.

E = **Storage Tariff** for **astora-pack** according to Section 1.

E<sub>0</sub> = **Basic Storage Tariff** for **astora-pack** as per Article 5 Section 1.

A = **Basic Storage Tariff** for **astora-add** applying to **Working Gas Volume** according to Article 5 Section 2 c)

V = **Working Gas Volume** in kWh comprised by the **astora-pack Storage Service** as stated under Article 2.1 Section 2 c)

- The adjusted **Storage Tariff** for **astora-pack** according to Section 2 comes into effect on the first day of the month following the lowering of the **Working Gas Volume** pursuant to Article 13.
- In case any of the quotations or indices mentioned under Section 1 will not be published anymore or in an altered way being incomparable to the

way in which they have been published before, **astora** shall - from the time, when the publication in the original way was suspended - be entitled to determine quotations or indices reflecting the economic keynote of the rule for adjusting the **Storage Tariff** as precisely as possible.

## Article 7 Long-term Factors

In Jemgum in case of a long-term booking of **Storage Capacities** in the form of the offered **Storage Services astora-pack** and **astora-add** as per Article 2, the following **Long-term Factors** shall apply:

contract duration	factor
≥ 24 months	0.9850
≥ 36 months	0.9700
≥ 48 months	0.9550
≥ 60 months	0.9400
≥ 72 months	0.9250

## Article 8 Short-term Factors

For booking the **astora-add Storage Service** in the Jemgum **Storage Location** with duration of less than one **Year** the following **Short-term Factors** shall apply:

contract duration	factor
≥ 6 months	1.050
≥ 3 months	1.100
≥ 1 storage day	1.200

## Article 9 Seasonality Factors

For booking the **astora-add Storage Service** with duration of less than one **Year** the following seasonality factors shall apply for certain **months** depending on the type of single service:

- a) **Injection Rate** from April to September: 1.1000
- b) **Withdrawal Rate** from October to March: 1.2000
- c) **Working Gas Volume** from July to December: 2.0000



## Article 10 Fee for Exceeding the Storage Capacities

1. The **Fee for Exceeding the Storage Capacities** will be calculated daily by using the **Tariff for Exceeding the Storage Capacities** according to the following Article 11 on the basis of the maximum hourly volume which exceeds 100% of the **Storage Capacities** per **Storage Day**.
2. In case the **Storage Customer's Storage Level** is less than zero (0), **astora** shall be entitled but not be obliged to buy and to inject **Natural Gas** which is needed for balancing the **Storage Customer's Storage Account**. The **Storage Customer** shall be obliged to pay 150% of the purchase price as well as all the related costs.

## Article 11 Tariff for Exceeding the Storage Capacities

1. The **Tariff for Exceeding the Storage Capacities** shall be:
  - a) **Injection rate:** 2.2 ct/(kWh/h)/d
  - b) **Withdrawal rate:** 2.8 ct/(kWh/h)/d
  - c) **Working Gas Volume:** 13.7 ct/MWh/d
2. All the prices listed here are net prices; any statutory turnover tax that is due shall be charged separately at the applicable tax rate.

## Article 12 Rounding procedure

To round the calculations of this **Storage Specification** up or down the intermediate calculations shall be rounded up or down to four (4) decimal places and the final results to two (2) decimal places. If the fifth (5th) or third (3rd) decimal place respectively should be five (5) or more, the sum shall be rounded up, if it is less than five (5), it shall be rounded down.

## Article 13 Convergency

1. During the utilisation of salt caverns for natural gas storage, as being conducted in the Jemgum **Storage Location**, the rock pressure may lead to a diminution of the salt caverns in the course of time (convergency). Consequently the serviceable **Working Gas Volume** diminishes.
2. If the Jemgum **Storage Location** is affected by convergency, **astora** shall be entitled to reduce the **Working Gas Volumes** stated under Article 2.1 Section 2 c) and Article 2.2 Section **Fehler! Verweisquelle konnte nicht gefunden werden.** at any time. This entitlement shall exist irrespective of the **Storage Services Agreement's First Utilisation Day**.
3. The reduction of the **Working Gas Volume** stated under Article 2.1 Section 2 c) and the **astora-add Working Gas Volume** stated under



Article 2.2 that has been contracted at the time of the reduction is limited to the detected ratio of the diminution of the serviceable **Working Gas Volume** in the overall Jemgum **Storage Location**. **astora** will endeavour to realise the required reduction of the overall **Working Gas Volume** predominantly by reducing offered **astora-add Working Gas Volume** according to Article 2.2 which has not been contracted.

4. The reduction of the **Working Gas Volume** according to Section 2 shall apply to all **Storage Services Agreements**. In case the **Working Gas Volume** stated under Article 2.1 Section 2 c) is reduced, the adjustment of the **Storage Tariff** pursuant to Article 6 Sections 2 and 3 shall apply.

#### Article 14 First Gas Injection into Caverns

1. After completion of the leaching process the salt caverns are ready for first gas injection. At this moment the salt caverns are still filled with brine and **Natural Gas** has to be injected into them in order to displace the brine (first gas injection).
2. The periods scheduled for first gas injection in the Jemgum **Storage Location** will be disclosed to the **Storage Customer** as early as possible.
3. During first gas injection the Jemgum **Storage Location's** capability for physical gas withdrawal may be shortened.
4. Should the capability of physical gas withdrawal due to a shortening according to Section 3 be insufficient to fulfil the **Nominations** of the **Storage Customers** within their contracted **Withdrawal Rate**, **astora** shall be entitled to adjust these **Nominations** proportionally to the capability of physical gas withdrawal.
5. **astora** will endeavour to conduct the first gas injection of caverns within the period from April 1<sup>st</sup> to October 1<sup>st</sup>.

#### Article 15 Technical Limitations

1. All **Storage Capacities** of the **Storage Services** described in 4 shall be subject to the technical limitations listed in Sections 2 to 8, which the **Storage Customer** is informed of according to the **General Terms and Conditions for Storage Access** via the **Nomination Procedure** that is regulated in the **Operating Agreement**.
2. For the operation of the Jemgum **Storage Facility** the following minimum rates shall be required for injection and withdrawal:

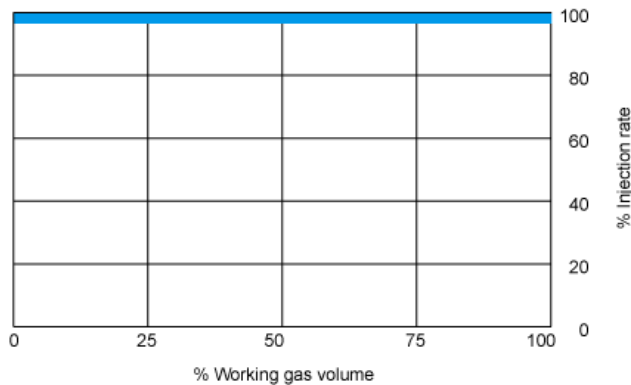
Injection:	100,000 m <sup>3</sup> /h
Withdrawal:	100,000 m <sup>3</sup> /h
3. In the operation of the Jemgum **Storage Facility** the following times have to be considered:

- Lead time for injection: up to 2.0 h
- Lead time for withdrawal: up to 2.0 h
- Flow reversal time injection/withdrawal: up to 2.0 h
4. In the Jemgum **Storage Location** the time required to process a **Renomination** shall be four (4) hours.
  5. The sum of all **Customers' Storage Levels** must not stay below 10% of the Jemgum **Storage Location's** overall **Working Gas Volume** for a period longer than 30 consecutive **Storage Days** per **Storage Year**.
  6. The sum of all **Customers' Storage Levels** must not stay below 20% of the Jemgum **Storage Location's** overall **Working Gas Volume** for a period longer than 90 consecutive **Storage Days** per **Storage Year**.
  7. Should the sum of all **Customers' Storage Levels** fall to 0, it has to reach 85% of the Jemgum **Storage Location's** overall **Working Gas Volume** in the following period from September 1<sup>st</sup> to October 1<sup>st</sup> of a **Storage Year**.
  8. In order to comply with the limitations according to Sections 5, 6 and 7 **astora** shall be entitled to demand from all **Storage Customers** at any time an adequate injection, which may exceed their contracted **injection rates**.

## Article 16 Injection and Withdrawal Curves

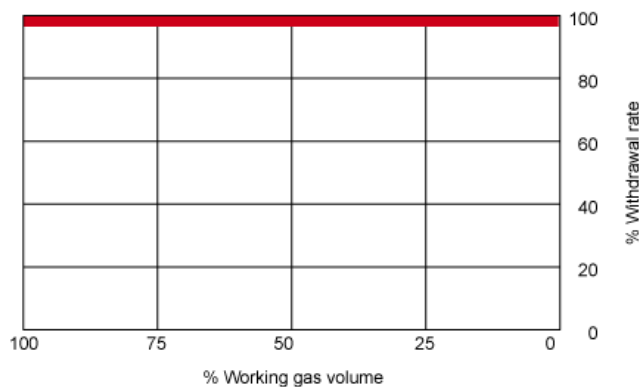
1. The usage of the **Storage Services** as per Article 2.1 and Article 2.2 is limited by the **Injection and Withdrawal Curves**.
2. The **Injection and Withdrawal Curves** of the Jemgum **Storage Facility** assumed shall apply herein in combination with the **Storage Services** as per Article 2.1 and Article 2.2 also for the corresponding **Storage Services Agreements**.
3. If a percentage of the stored **Working Gas Volume** as per Sections 4 and 5 should be reached, **astora** may lower the **Injection** or **Withdrawal Rate** to the percentage specified according to Sections 4 and 5.

- The **Injection Curve** shows the **Injection Rates** as a function of the **Storage Customer's Working Gas Volume** which it shall be entitled to use.



The available **Injection Rates** of the **Storage Customer** (IR) equal 100% of the contracted, maximum **Injection Rate** at each **Customer's Storage Level of Working Gas Volume** (WGV).

- The **Withdrawal Curve** shows the **Withdrawal Rates** as a function of the **Storage Customer's Working Gas Volume** which it shall be entitled to use.



The available **Withdrawal Rates** of the **Storage Customer** (IR) equal 100% of the contracted, maximum **Withdrawal Rate** at each **Customer's Storage Level of Working Gas Volume** (WGV).

## Article 17 Delivery Points

- The **Points of Injection and Withdrawal** shall correspond to the points at which the Jemgum **Storage Location** is connected to the **Neighbouring Natural Gas Networks**. The **Neighbouring Natural Gas Networks** of the Jemgum **Storage Location** are the natural gas networks operated by GASCADE Gastransport GmbH, Kassel (D), and Gas Transport Services B. V., Groningen (NL).

2. The **Allocation Procedure** in Jemgum shall be declaratory.

## Article 18 Gas Quality Specifications

For the Jemgum **Storage Facility** the following quality parameters shall apply at the **Delivery Points** listed under Article 17 Section 1. If necessary, the quality parameters will be adjusted in order to comply with the provisions of Network Interconnection Agreements concluded by **astora** with the **Neighbouring Network Operators**.

Gross calorific value min.*	kWh / m <sup>3</sup>	10.97
Gross calorific value max.*	kWh / m <sup>3</sup>	11.61
Wobbe index min.*	kWh / m <sup>3</sup>	14.14
Wobbe index max.*	kWh / m <sup>3</sup>	15.00
Hydrocarbon dew point	°C	-2 °C @ 1 - 70 bar (a)
Water dew point	°C	-10 °C @ 70 bar (a)
Max. oxygen	ppm	5
Max. carbon dioxide	mol-%	2
Max. hydrogen sulfide	mg (S) /m <sup>3</sup>	5 (incl. COS)
Max. mercaptanes	mg (S) /m <sup>3</sup>	6
Max. total sulfur	mg (S) /m <sup>3</sup>	20

\*) The technical combustion parameters relate to a reference temperature of 298.15 K for the combustion of **Standard Volumes** with the reference conditions of 1.01325 bar and 273.15 K.

## Article 19 Changes in the Storage Specification

1. **astora** shall be entitled to change the **Storage Specification** at any time except for Article 4, Article 5 and Article 6. Regardless of Sentence 1 **astora** shall be entitled to changes according to Article 3, Article 6, Section 4, and Article 13 under the conditions stated there. Additional to that **astora** shall be entitled to change Article 4, Article 5 and Article 6 at any time as far as these changes are economically neutral updates or amendments without any impact on existing **Storage Services**.
2. With regard to changes in the **Storage Specification** Article 44 of the **General Terms and Conditions for Storage Access** shall apply accordingly. This shall not apply for changes according to Article 3, Article 6, Section 4, and Article 13 as well as changes of Article 15 Sections 5 to 7 and Article 18 of this **Storage Specification**.