Evaluation of the probability of interruption, as established in the Commission Regulation (EU) 2017/460, 16th March

VIP Ibérico and High-pressure Network / LNG Terminal Interconnection

Gas Year 2025 / 2026

Version 1 - Rev. 1

Data: 2025-05-31

Contents

1 Framework

The publication of Commission Regulation (EU) 2017/460 of 16th March 2017 establishing a network code on harmonised transmission tariffs structures for gas (Tariff Network Code) has defined, among others, the rules for the calculation of reserve prices for standard capacity products for interruptible capacity. In particular, Article 16 (1) specifies that reserve prices for standard capacity products for interruptible capacity should be calculated by applying a discount to the reserve prices of their respective firm standard capacity products, according to the following formula[1]:

$$Discount_{ex-ante} = Pro \times A \times 100\% \qquad (1)$$

- (Pro) – probability of interruption;
- (A) – adjustment factor, applied to reflect the estimated economic value of the type of standard capacity product for interruptible capacity.

Additionally, Article 174 (13) of the Portuguese Tariff[2] Regulation for the gas sector regarding the information to be delivered to the NRA, foresees that, for the establishment of the prices to be applied to standard capacity products for interruptible capacity for the use of the high-pressure network, the transmission system operator must provide to the NRA, on an annual basis, the evaluation of the probability of interruption, according to the above-mentioned Comission Regulation. This assessment shall include:

1) a list of all types of standard capacity products for interruptible capacity offered, including the respective probability of interruption and level of discount to be applied;
2) an explanation on how the probability of interruption is calculated for each type of product;
3) the data used to calculate the probability of interruption.

Regarding the prices for standard capacity products for interruptible capacity, according to Article 154 (2) of the Portuguese Tariff Regulation, the transmission system operator shall also suggest a value for parameter A, the adjustment factor that reflects the estimated economic value for each of these products, as also mentioned in Article 16 of the (EU) 2017/460 of 16th March 2017.

This document sets out the proposals of the transmission system operator for each of these parameters, in accordance with the definitions considered in the Tariff Regulation for the gas sector, for the application of the ex-ante discount on the following points:

- VIP Ibérico;
- Interconnection between the high-pressure network and the LNG Terminal.

[1] As an alternative to applying ex-ante discount, as established in Article 16 (4) the National Regulatory Authority may decide to apply an ex-post discount, whereby network users are compensated after the actual interruptions incurred.

[2] Regulation nº 825/2023 of 28th July.

2 Methodology

2.1 Probability of interruption

The probability of interruption must be calculated for each type of standard capacity product offered, for which the following equation shall apply, according to Article (16) of the (EU) 2017/460 of 16th March 2017:

$$\mathrm{Pro} = \frac{\mathrm{N} \times \mathrm{D_{int}}}{\mathrm{D}} \times \frac{\mathrm{CAP_{av.\,int}}}{\mathrm{CAP}} \qquad (2)$$

- (N) is the expected number of interruptions over D;
- (Dint) is the average duration of expected interruptions (in hours);
- (D) is the total duration of the respective type of standard capacity product for interruptible capacity (in hours);
- (CAP av.int) is the expected average amount of interrupted capacity for each interruption where such amount is related to the respective type of standard capacity product for interruptible capacity;
- (CAP) is the total amount of interruptible capacity for the respective type of standard interruptible capacity product.

2.1.1 Capacity Management in the interconnection points

In practice, when all firm capacity (where additional capacity is included) is contracted for a certain gas day, its underutilisation, either due to a low nomination or to a decrease in a renomination cycle, will produce an interruptible capacity, as shown in figure 1.

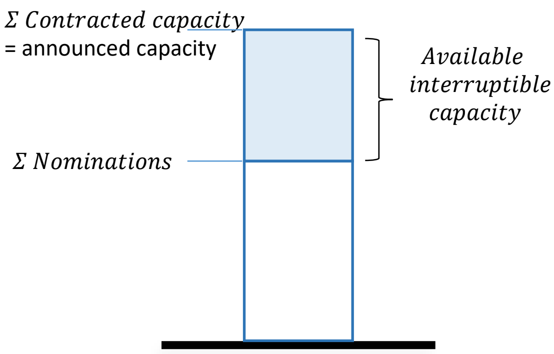

Figure 1: Schematic representation of the interruptible capacity provision mechanism

Such interruptible capacity may be contracted as shown in Figure 2, according to the rules defined in (EU) 2017/459 of 16th March 2017.

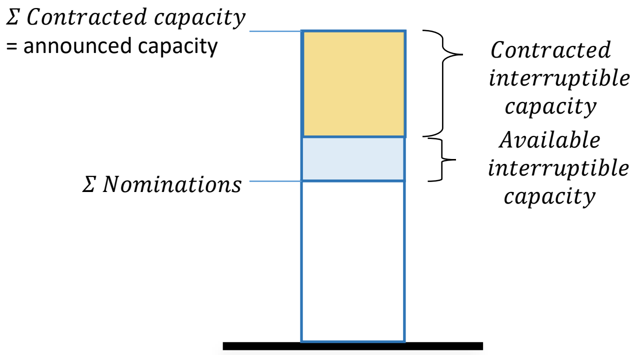

Figure 2: Schematic representation of the interruptible capacity contracting process

Under these circumstances, any further renominations for higher values within the respective firm capacity contracted, will imply a shortage on the previously announced interruptible capacity. This occurrence may affect the interruptible capacities that had already been assigned, and thus creating an interruption of capacity, as shown in Figure 3.

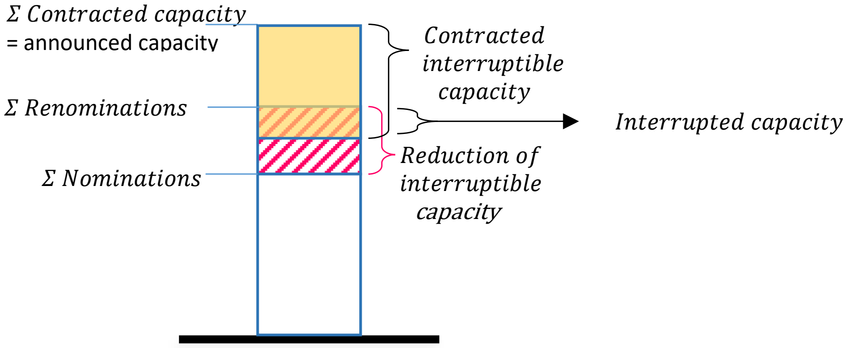

Figure 3: Schematic representation of the interruption of contracted interruptible capacity

2.1.2 Interruption of interruptible capacity

Interruptible capacity products may be offered when all firm capacity is contracted but is not being requested and thus not being used. This idle capacity, although eventually previously confirmed could be interrupted due to the subsequent renominations performed by the network users entitled to the corresponding firm capacity.

Assuming that the market's historical behaviour regarding the use of the contracted firm capacity has identical statistical significance in situations where the firm capacity is sold out, it is reasonable to accept that the probability of interruption of interruptible capacity on a given gas day results from the product between (i) the probability of contracting available interruptible capacity due to underuse of contracted firm capacity, illustrated in Figure 1, and (ii) the probability of reducing the available interruptible capacity (variation of use by renomination to a higher value), illustrated in Figure 3.

The following equation (3) shall apply:

$$\frac{N \times D_{int}}{D} = C \times PC(d) \times PR(d) \times R \qquad (3)$$

- (C) - Ratio of the number of days on which interruptible capacity is expected to be contracted, in relation to the period considered.
- (PC(d)) - Probability of contracting a certain interruptible capacity on gas day d.
- (PR (d)) – Probability of reduction of a given interruptible capacity available on gas day d, obtained as a function of increases in the use of firm capacity in renomination processes occuring in a relevant historical period.
- (R) - Ratio of the number of days on which the increase in the use of firm capacity is expected in renomination processes, in relation to the period considered.

As it is not possible to measure the behaviour of the market when it is contracting interruptible capacity, it is assumed that the frequency of occurrences in the contracting interval PC(d) behaves identically to the frequency distribution found for PR(d).

It is considered that variable C is maximized to the unit value, in order to simplify the methodology and because, for the time being, there is not sufficient data available for its modelling.

2.2 Factor ‘A’

In accordance with the Article 154 of the Portuguese Tariff[3] Regulation, Factor ‘A’ must reflect the estimated economic value of the type of standard capacity product for interruptible capacity, calculated for each, some or all interconnection points, and shall be no less than 1.

For the present analysis, it is appropriate to apply a unit value (A=1) to each of the standard capacity products for interruptible capacity at any of the interconnection points concerned.

[3] Regulation nº 825/2023 of 28th July.

3 Analysis of the VIP Ibérico

3.1 Offer of standard capacity products for interruptible capacity

Regulation (EU) 2017/459, establishing a network code on capacity allocation mechanisms in gas transmission systems, requires transmission system operators to offer standard capacity products for interruptible capacity in VIP Ibérico according to the following:

- daily capacity product for interruptible capacity in both directions at interconnection points where the respective standard capacity product for firm capacity was sold out day-ahead or was not offered, to be allocated through an auction process;
- within-day capacity products for interruptible capacity, in both directions, shall only be allocated when firm capacity (additional capacity included), is sold out and shall be allocated through an over-nomination procedure.

These products shall be offered according to the rules defined in Regulation (EU) 2017/459, regarding capacity allocation mechanisms in gas transmission system.

3.2 Historical use of capacities

The virtual interconnection point, VIP Ibérico, had no interruption of interruptible capacity due to physical congestion during the period under analysis. The following graph, Figure 4, presents the utilisation of this interconnection point, in both directions, between October 2016 and September 2024, in which a positive flow corresponds to an entrance to the Portuguese system (flow direction from Spain to Portugal).

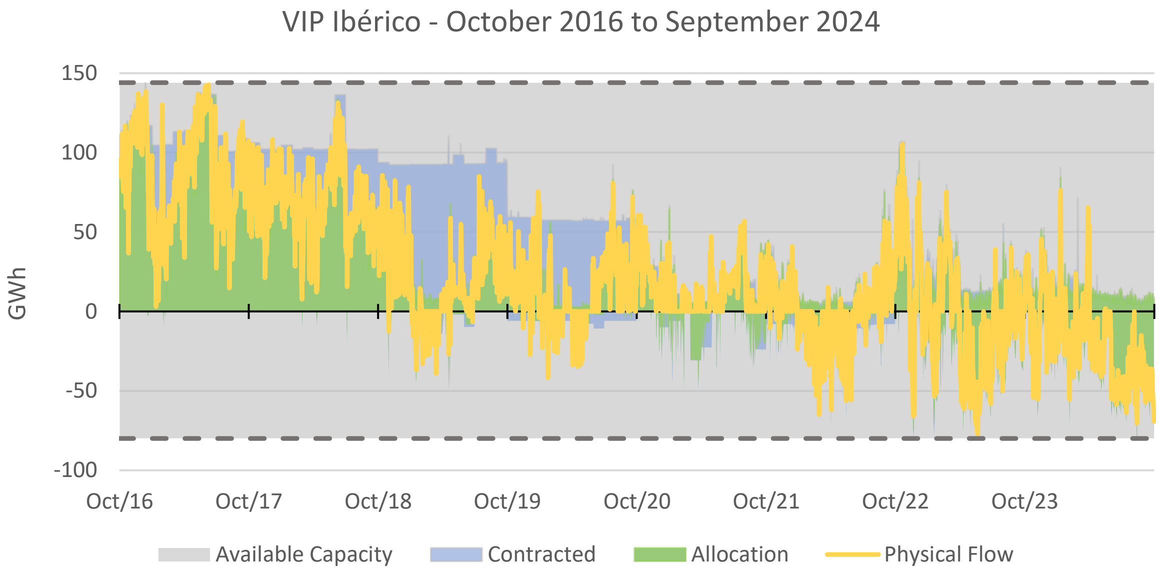

Figure 4: Use of capacities in VIP Ibérico between October 2016 and September 2024.

The following Tables (1 and 2) show the levels of contracting and utilisation of contracted capacities referred to the contracting of firm capacities in VIP Ibérico in biannual periods from October 2016 to September 2024.

- Direction Spain - Portugal

Table 1: Contracting capacities and utilisation of contracted capacity levels referred to firm capacities – SP -> PT

Biennium	*% Contracted*	*% Utilised*
2016/17 and 2017/18	76.92%	71.11%
2017/18 and 2018/19	69.46%	47.27%
2018/19 and 2019/20	53.00%	26.97%
2019/20 and 2020/21	27.29%	39.79%
2020/21 and 2021/22	11.66%	79.39%
2021/22 and 2022/23	14.46%	81.27%
2022/23 and 2023/24	15.23%	81.24%

- Direction Portugal - Spain

Table 2: Contracting capacities and utilisation of contracted capacity levels referred to firm capacities – PT -> SP

Biennium	*% Contracted*	*% Utilised*
2016/17 and 2017/18	0.12%	99.93%
2017/18 and 2018/19	3.59%	83.99%
2018/19 and 2019/20	9.24%	64.42%
2019/20 and 2020/21	12.74%	68.28%
2020/21 and 2021/22	17.83%	72.05%
2021/22 and 2022/23	27.10%	84.77%
2022/23 and 2023/24	37.02%	98.01%

The highest levels of contracting were verified in the direction Spain - Portugal, between 2016 to 2018, prone to higher dynamic renomination cycles, compatible with the assumptions of statistical significance of the methodology applied. Therefore, the period between October 2016 and September 2018 is considered the relevant historical period that best characterizes the expected occurrence of interruption of interruptible capacity products for the gas year 2025/2026. It is also worth mentioning that the capacity utilization levels in the Portugal - Spain direction were reviewed for past biennia, standardizing the calculation method between the two directions. The following graphs (Figures 5 and 6) detail the capacity utilization in the specified period.

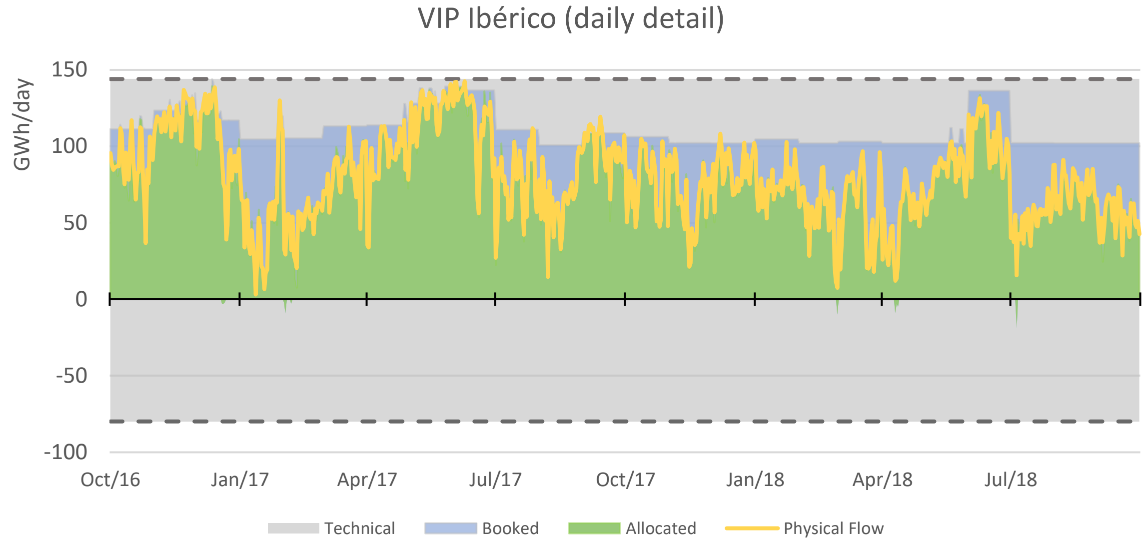

Figure 5: Utilization of capacities between October 2016 and September 2018.

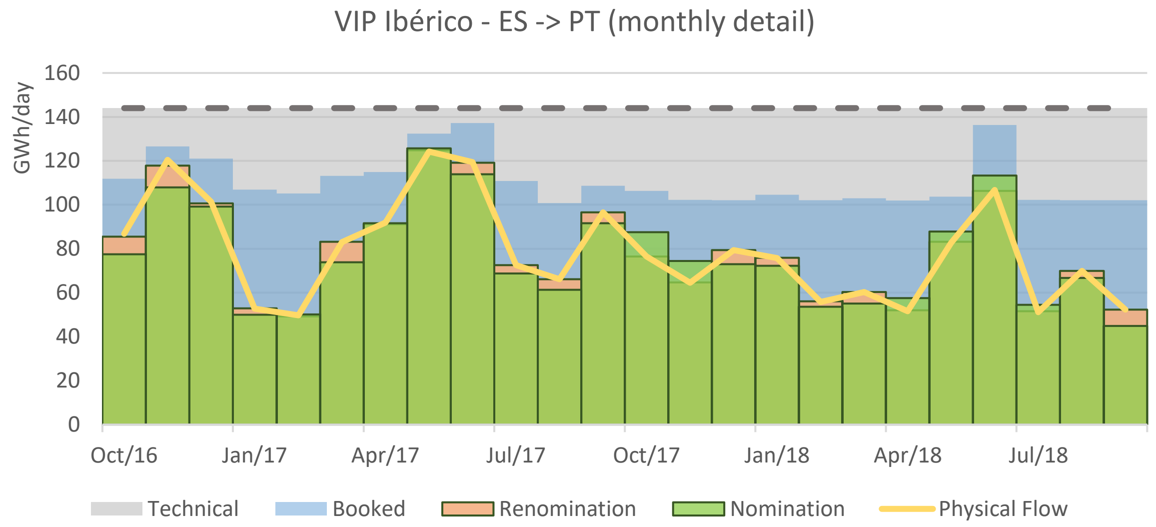

Figure 6: Average monthly use of capacities between October 2016 and September 2018. Renomination quantities above nominations displayed in orange; renomination quantities below nomination displayed in dark green.

3.3 Calculation of the probability of interruption for the period 2025/2026

Through the analyses of the increase in the use of capacity resulting from the renomination processes, it was possible to calculate the frequency of reduction applied to the interruptible capacity (referred to the available interruptible capacity), thus determining the distribution of reduction of this capacity, PR(d), expected on gas day d, as shown in Figure 7.

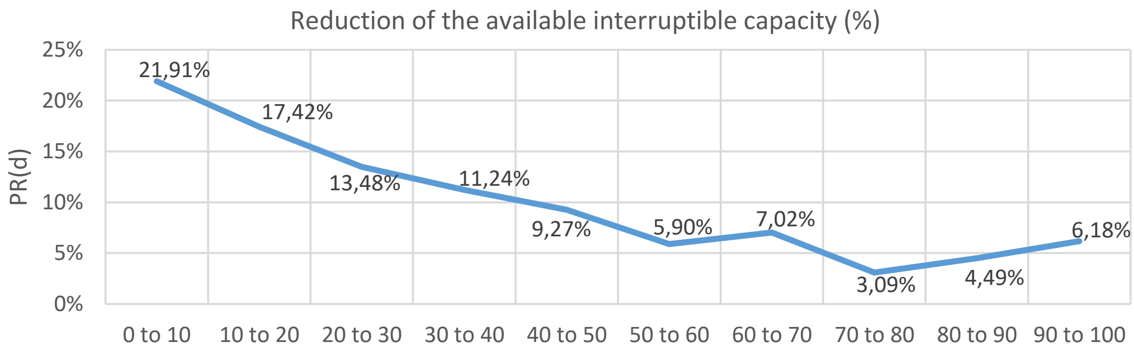

Figure 7: Reduction of interruptible capacity for each gas day PR(d)

As already mentioned in paragraph 2.1.2, it is assumed that the probability of contracting interruptible capacity, PC(d), presents the same distribution as the reduction of the available interruptible capacity, determined for PR(d), with the former competing with the latter in the reduction of this capacity, but in the opposite direction. The expected number of interruptions for each set of interruptible capacity reduction hypothesis by contracting, PC(d), and by renomination, PR(d), for each available interruptible capacity interval, is shown in the matrix in Table 3, by multiplying the second by the third term of the equation (3).

Table 3: Expected interruptions for each set of hypotheses of reduction of interruptible capacity, by contracting, PC(d), and by renomination, PR(d).

		0 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100
		PR(d)									
	PC(d)	21,91%	17,42%	13,48%	11,24%	9,27%	5,90%	7,02%	3,09%	4,49%	6,18%
90 to 100	6,18%	1,354%	1,076%	0,833%	0,694%	0,573%	0,365%	0,434%	0,191%	0,278%	0,382%
80 to 90	4,49%		0,783%	0,606%	0,505%	0,417%	0,265%	0,316%	0,139%	0,202%	0,278%
70 to 80	3,09%			0,417%	0,347%	0,286%	0,182%	0,217%	0,095%	0,139%	0,191%
60 to 70	7,02%				0,789%	0,651%	0,414%	0,493%	0,217%	0,316%	0,434%
50 to 60	5,90%					0,547%	0,348%	0,414%	0,182%	0,265%	0,365%
40 to 50	9,27%						0,547%	0,651%	0,286%	0,417%	0,573%
30 to 40	11,24%							0,789%	0,347%	0,505%	0,694%
20 to 30	13,48%								0,417%	0,606%	0,833%
10 to 20	17,42%									0,783%	1,076%
0 to 10	21,91%										1,354%

No interruption:
PC(d) x PR(d) = 0

Example: If in a given time when there is available interruptible capacity, a level of contracting of this capacity occurs in the interval up to 10% (an event which has a probability of occurrence PC(d) = 21.91%), the reduction of interruptible capacity up to 90% cannot have any impact. Only when the level of reduction in the capacity level is in the 90 to 100% range (independent event with probability of occurrence PR(d) = 6.18%) will an interruption occur, with a 1.354% probability. The same interpretation should be made for each contracting interval, but for this purpose the accumulation of probabilities along the intervals of successively reduced capacities should be taken into account.

For each interval of available interruptible capacity, the quotient between the interruptible capacity hypothesis ($CAP_{av.int}$) and contracted interruptible capacity (*CAP*) is the interrupted contracted interruptible capacity. The matrix in Table 4 shows the contracted interruptible capacities likely to be interrupted for each combination of the variables mentioned ($CAP_{av.int}$) and (CAP). With the definition of this variable, it will be possible to quantify the amount affected by each expected interruption record, from Table 3.

Table 4: Interrupted contracted interruptible capacity for each set of hypotheses of interrupted capacity ($CAP_{av.int}$) and contracted interruptible capaciy (CAP): $CAP_{av.int}$/ CAP

		0 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100
		Interrupted Capacity (C)									
	Contracted Interruptible Capacity (L)	5%	15%	25%	35%	45%	55%	65%	75%	85%	95%
90 to 100	95%	0%	11%	21%	32%	42%	53%	63%	74%	84%	95%
80 to 90	85%		0%	12%	24%	35%	47%	59%	71%	82%	94%
70 to 80	75%			0%	13%	27%	40%	53%	67%	80%	93%
60 to 70	65%				0%	15%	31%	46%	62%	77%	92%
50 to 60	55%					0%	18%	36%	55%	73%	91%
40 to 50	45%						0%	22%	44%	67%	89%
30 to 40	35%							0%	29%	57%	86%
20 to 30	25%								0%	40%	80%
10 to 20	15%									0%	67%
0 to 10	5%										0%

Example: Each entry in the table results from the application of the following expression: Max{L+C-100%;0}/L - where "C" and "L" correspond to each value in the "interrupted capacity" column and to each value in the "contracted interruptible capacity" line, respectively. Applying the example described, "C" = 25%, "L" = 85%, and so the contracted interruptible capacity interrupted will be Max. {85%+25%-100%;0}/85% = 12%.

Taking as reference the days where the use of firm capacity increases in renomination processes, the probability of interruption will be obtained through the product of the probability of occurrence of an interruption (CP(d) x PR(d)), from Table 3, by the contracted interruptible capacity affected, i.e. interrupted ($CAP_{av.int}$/CAP), referred to the available interruptible capacity (Table 4). The result of this operation is shown in Table 5.

Table 5: Product beween the probability of occurrence of an interruption, PC(d) x PR (d) from Table 3, by the interrupted contracted interruptible capacity, CAPav,int/CAP

		0 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100
		Interrupted Capacity									
	Interrupted Contracted Interruptible Capacity	5%	15%	25%	35%	45%	55%	65%	75%	85%	95%
90 to 100	95%		0,113%	0,175%	0,219%	0,241%	0,192%	0,274%	0,141%	0,234%	0,362%
80 to 90	85%			0,071%	0,119%	0,147%	0,125%	0,186%	0,098%	0,166%	0,261%
70 to 80	75%				0,046%	0,076%	0,073%	0,116%	0,064%	0,111%	0,178%
60 to 70	65%					0,100%	0,127%	0,228%	0,134%	0,243%	0,401%
50 to 60	55%						0,063%	0,151%	0,099%	0,193%	0,331%
40 to 50	45%							0,145%	0,127%	0,278%	0,509%
30 to 40	35%								0,099%	0,289%	0,595%
20 to 30	25%									0,242%	0,667%
10 to 20	15%										0,718%
0 to 10	5%										
							Σ [PC(d) x PR(d) x $CAP_{av,int}$/CAP] =				9,527%

By applying the sum to the set of probability distributions calculated in the matrix presented in Table 5, it is possible to calculate the probability of interruption, considering the days of increase in firm capacity due to renomination processes as a reference. Since the probabilities calculated so far were determined in the scope of the ratio of available firm capacity increase in renomination processes, R, it is necessary to transpose this reality to the referential of the period considered in the study, applying the last term of equation (3). The value calculated for R for the period under consideration is 48.77%, resulting in a calculated PRO of

$$PRO = \Sigma \left[PC(d) \times PR(d) \times \frac{CAP_{av.int}}{CAP} \right] \times R = \mathbf{4.646}\%,$$

being this the probability of interruption (PRO) that shall be considered, applied equally to both directions.

4 Analysis of the high-pressure network/LNG Terminal connection

4.1 Types of standard capacity products for interruptible capacity

According to *Manual de Procedimentos de Acesso às Infraestruturas* do setor do gás natural, published in Directive No. 07/2020, Procedure No. 4 establishes that the transmission system operator shall offer standard interruptible capacity products for:

- within-day interruptible capacity on regasification, in case all firm capacity, including additional capacity eventually offered, has been sold-out, to be confirmed through a renomination mechanism.

These products shall be offered according to the same rules that apply to VIP Ibérico, as defined in Regulation (EU) 2017/459, establishing capacity allocation mechanisms in gas system networks, applied to the regasification capacity.

4.2 Historical use of capacities

The following graph (Figure 8) presents the utilisation of the connection point between the high-pressure network and the LNG Terminal between October 2016 and September 2024.

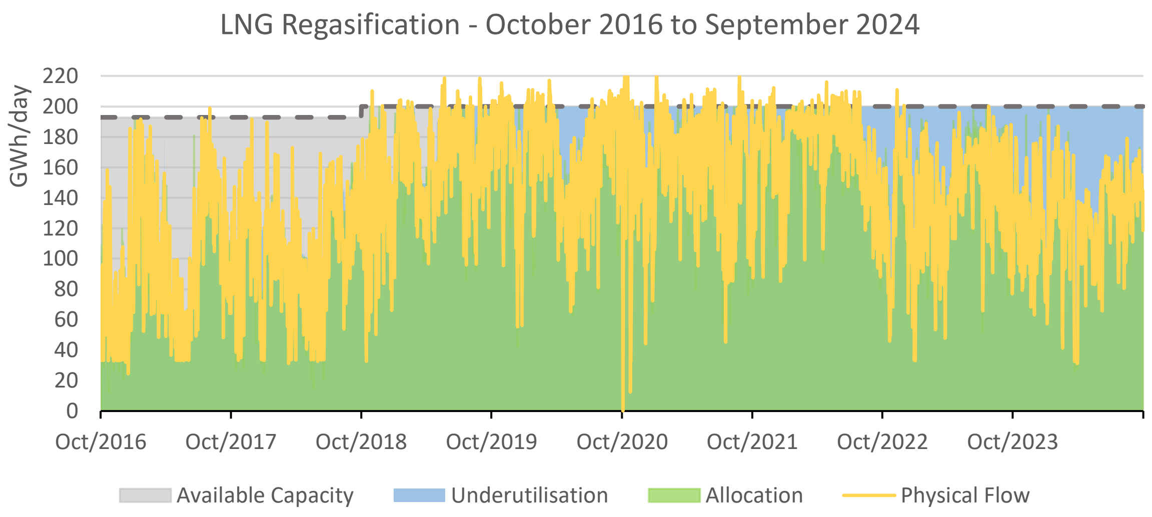

Figure 8: LNG Regasification between October 2016 and September 2024

As a result of the renewed *Manual de Procedimentos de Acesso às Infraestruturas* for the gas sector, published on March 2020, interruptible capacity products started to be offered on October 2020. Contracting of this product has been registered since gas year 2020/21 by overnomination mechanisms as well as capacity interruption resulting from an increase in capacity related to renomination processes.

4.2.1 Evaluation of the total interrupted capacity

From the analysis of the capacity contracting and capacity interruption processes of interruptible capacity, the following data, presented in Table 6, were obtained.

Table 6: Contracting capacities and utilisation of contracted capacity levels referred to firm capacities – Regasification

Interruptible Capacity	2020/21	2021/22	2022/23	2023/24
Contracted by overnomination	930.0 GWh	88.4 GWh	108.6 GWh	35.0 GWh
Interrupted capacity due to renomination	76.7 GWh	1.3 GWh	0 GWh	0 GWh
Percentage of interruption	8.2%	1.5%	0%	0%

It can be observed that interrupted capacity due to renomination has been decreasing, reducing from around 8.2% in the gas year of 2020/21 to 0% of total interruptible capacity contracted in gas years 2022/23 and 2023/24. Further analysis to the interruption occurrences during gas year of 2023/24 can be found in Appendix A.

4.2.2 Determination of the reference period

The following table shows the levels of contracting and utilisation of contracted capacities referred to the contracting of firm capacities in VIP Ibérico in biannual periods from October 2016 to September 2023.

Table 7: Contracting capacities and utilisation of contracted capacity levels referred to firm capacities – Regasification

Biennium	% Contracted	% Utilised
2016/17 and 2017/18	55.86%	92.09%
2017/18 and 2018/19	74.61%	89.29%
2018/19 and 2019/20	94.65%	87.06%
2019/20 and 2020/21	100.00%	82.89%
2020/21 and 2021/22	100.00%	84.52%
2021/22 and 2022/23	100.00%	79.37%
2022/23 and 2023/24	100.00%	67.39%

It is observed that the highest levels of contracting were reached in recent biennia, since 2019/20, more prone to higher dynamics of renomination compatible with the assumptions of statistical significance of the methodology in application. However, and taking into account the decreasing evolution of gas capacity interruptions recorded in the last four years, culminating in a null value, as explained in 4.2.1, as well as the reduction in the percentage of regasification capacity utilization in recent two-year periods, the assumptions made for calculating the interruption probability for the 2024/25 gas year remain valid. Therefore, more recent data will be incorporated into this model that, in some way, may better reflect the expected utilization of this capacity in the coming years, taking as the reference period for applying the methodology the biennium 2022/23 and 2023/24, during which a maximum contracting percentage of this capacity was also observed.

The following graphs (Figures 9 and 10) show the levels of contracting and utilisation of regasification capacity during the period from October 2022 to September 2024. Throughout this period, it is observed that the utilization of regasification capacity decreased in the 2023/24 gas year, having reached a peak utilization of about 87% in 2021/22. Market agents' interest in supplying their customers via LNG increased during the 2019/20 and 2020/21 period, with the market successively contracting more capacity and for longer periods, culminating in the sale of all capacity for the 2019/20 gas year. Since then, and up to the most recent gas year considered in this analysis, this scenario has remained unchanged, with demand for regasification capacity at the annual capacity auction reaching 100% of the announced technical capacity.

However, the actual utilization of this capacity has seen a significant decline, registering 71% in 2022/23 and 63% in 2023/24. This reduction is mostly explained by the decreased consumption recorded in the National Gas System during the last year, particularly from combined cycle power plants. Although, this decline is offset by an increase in the utilization of the Iberian VIP connection towards Spain, alongside a stabilization of the utilization in the opposite direction, Spain-Portugal, resulting in an increased physical flow in the export direction. Despite these changes, the predominance of LNG Terminal in supplying the National Gas System remains.

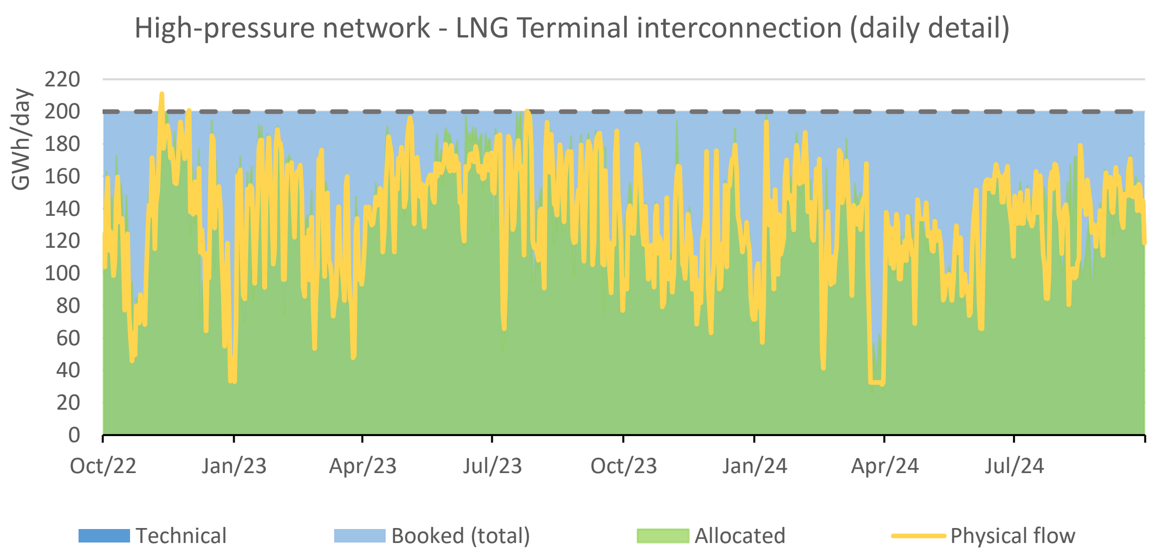

Figure 9: Capacity utilisation during the reference period.

As can be seen on the previous graph, there were a few days when the physical flow was greater than the available capacity. These values correspond to a TSO's management choice resulting from the operating conditions verified in the high-pressure network, LNG Terminal and storage infrastructures.

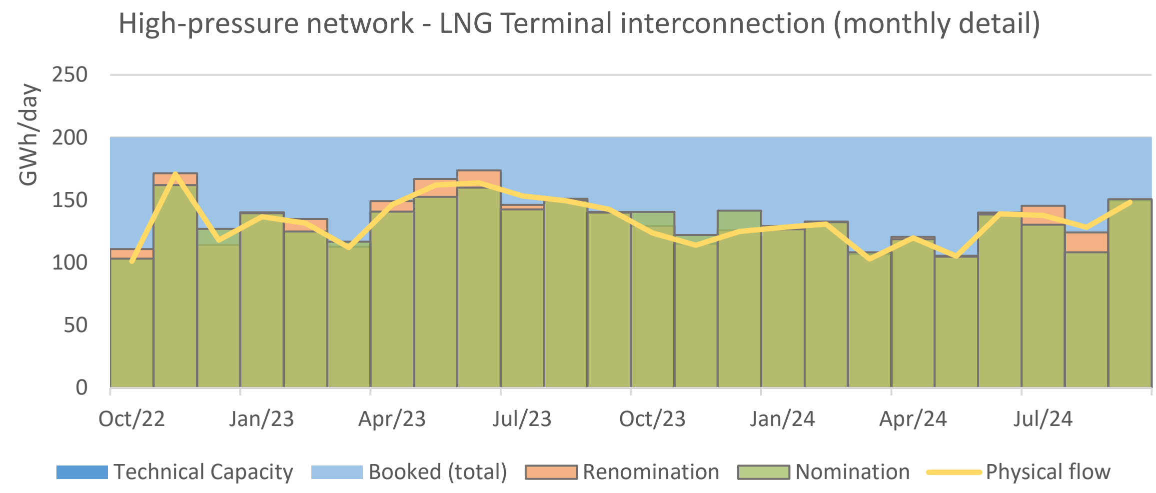

Figure 10: Monthly average capacity utilisation during the reference period. Renomination quantities to superior values displayed in orange.

4.3 Calculation of probability of interruption for 2025/26

By analysing the history of occurrences of capacity utilisation increase due to renomination, registered in the biennium 2022/23 and 2023/24, it was possible to calculate the frequency of interruptible capacity reduction experienced, determining the distribution of this capacity reduction, PR(d), expected on gas day d, as shown in Figure 11.

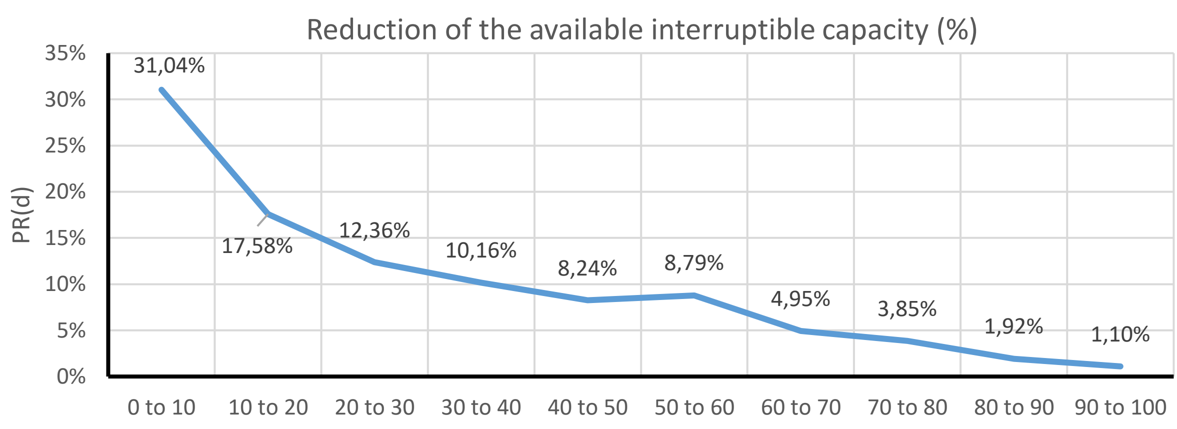

Figure 11: Reduction of interruptible capacity expected for each gas day PR(d)

As already mentioned in 2.1.2, it is assumed that the probability of contracting interruptible capacity, PC(d), presents the same distribution as the reduction in available interruptible capacity, determined for PR(d), with the former competing with the latter in the reduction of this capacity, but in opposite directions.

The expected number of interruptions for each set of interruptible capacity reduction hypothesis by contracting, PC(d), and by renomination, PR(d), for each available interruptible capacity interval, is shown in the matrix in Table 8, by multiplying the second by the third terms of equation (3).

Table 8: Interruptions expected for each set of hypotheses of reduction of interruptible capacity, contracted, PC(d), and renominated, PR(d)

		0 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100
		PR(d)									
	PC(d)	31,04%	17,58%	12,36%	10,16%	8,24%	8,79%	4,95%	3,85%	1,92%	1,10%
90 to 100	1,10%	0,341%	0,193%	0,136%	0,112%	0,091%	0,097%	0,054%	0,042%	0,021%	0,012%
80 to 90	1,92%		0,338%	0,238%	0,195%	0,158%	0,169%	0,095%	0,074%	0,037%	0,021%
70 to 80	3,85%			0,475%	0,391%	0,317%	0,338%	0,190%	0,148%	0,074%	0,042%
60 to 70	4,95%				0,503%	0,408%	0,435%	0,245%	0,190%	0,095%	0,054%
50 to 60	8,79%					0,725%	0,773%	0,435%	0,338%	0,169%	0,097%
40 to 50	8,24%						0,725%	0,408%	0,317%	0,158%	0,091%
30 to 40	10,16%							0,503%	0,391%	0,195%	0,112%
20 to 30	12,36%								0,475%	0,238%	0,136%
10 to 20	17,58%									0,338%	0,193%
0 to 10	31,04%										0,341%

No interruption: PC(d) x PR(d) = 0

Example: if in a given time when there is interruptible capacity available, a level of contracting of this capacity occurs in the interval of up to 10% (an event which has a probability of occurrence PC(d) = 31.04%), the reduction of interruptible capacity up to 90% cannot have any impact. Only when the level of reduction in the capacity level is in the 90 to 100% range (independent event with probability of occurrence PR(d) = 1.10%) will an interruption occur, with a 0.341% probability. The same interpretation should be made for each contracting interval, but for this purpose, the accumulation of probabilities along the intervals of successively reduced capacities should be taken into account.

For each interval of available interruptible capacity, the quotient between the interruptible capacity hypothesis ($CAP_{av.int}$) and contracted interruptible capacity (CAP) is the interrupted contracted interruptible capacity. The matrix in Table 9 shows the contracted interruptible capacities likely to be interrupted for each combination of the variables mentioned, $CAP_{av.int}$ and CAP. With the definition of this variable, it will be possible to quantify the quantity affected by each expected interruption record, from Table 8.

Table 9: Interruption of contracted interruptible capacity for each set of hypotheses of interrupted capacity ($CAP_{av.int}$) and contracted interruptible capacity (CAP): $CAP_{av.int}$/ CAP.

		0 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100
		Interrupted Capacity (C)									
	Contracted Interruptible Capacity (L)	5%	15%	25%	35%	45%	55%	65%	75%	85%	95%
90 to 100	95%	0%	11%	21%	32%	42%	53%	63%	74%	84%	95%
80 to 90	85%		0%	12%	24%	35%	47%	59%	71%	82%	94%
70 to 80	75%			0%	13%	27%	40%	53%	67%	80%	93%
60 to 70	65%				0%	15%	31%	46%	62%	77%	92%
50 to 60	55%					0%	18%	36%	55%	73%	91%
40 to 50	45%						0%	22%	44%	67%	89%
30 to 40	35%							0%	29%	57%	86%
20 to 30	25%								0%	40%	80%
10 to 20	15%									0%	67%
0 to 10	5%										0%

Example: Each entry in the table results from the application of the following expression: Max{L+C-100%;0}/L - where "C" and "L" correspond to each value in the "interrupted capacity" column and to each value in the "contracted interruptible capacity" line, respectively. Applying the example described, "C" = 25%, "L" = 85%, and so the contracted interruptible capacity interrupted will be Max. {85%+25%-100%;0}/85% = 12%.

Considering as reference the days where the use of firm capacity increases in renomination processes, the probability of interruption will be obtained through the product of the probability of an interruption occurrence (PC(d) x PR(d)), from Table 8, by the contracted interruptible capacity affected, i.e., interrupted ($CAP_{av.int}/ CAP$), against the available interruptible capacity (Table 9). The result of this operation is shown in Table 10.

Table 10: Product between the probability of occurrence of an interruption, PC(d) x PR (d) in Table 8, by the interrupted contracted interruptible capacity, CAPav.int/CAP

		0 to 10	10 to 20	20 to 30	30 to 40	40 to 50	50 to 60	60 to 70	70 to 80	80 to 90	90 to 100
		Interrupted Capacity (C)									
	Interrupted contracted interruptible capacity	5%	15%	25%	35%	45%	55%	65%	75%	85%	95%
90 to 100	95%		0,020%	0,029%	0,035%	0,038%	0,051%	0,034%	0,031%	0,018%	0,011%
80 to 90	85%			0,028%	0,046%	0,056%	0,080%	0,056%	0,052%	0,030%	0,020%
70 to 80	75%				0,052%	0,085%	0,135%	0,101%	0,099%	0,059%	0,039%
60 to 70	65%					0,063%	0,134%	0,113%	0,117%	0,073%	0,050%
50 to 60	55%						0,141%	0,158%	0,184%	0,123%	0,088%
40 to 50	45%							0,091%	0,141%	0,106%	0,081%
30 to 40	35%								0,112%	0,112%	0,096%
20 to 30	25%									0,095%	0,109%
10 to 20	15%										0,129%
0 to 10	5%										
							Σ [PC(d) x PR(d) x $CAP_{av,int}$/CAP] =				3,519%

By applying the sum to the set of probability distributions calculated in the matrix in Table 10, it is possible to calculate the probability of interruption, considering the days of increase in firm capacity due to renomination processes as a reference. Since the probabilities calculated so far were determined in the scope of the ratio of firm capacity increases in renomination processes, R, it is necessary to transpose this reality to the referential of the considered period, applying the last term of equation (3). The R value calculated for the period under consideration is 49.79%, resulting in a calculated PRO of:

$$PRO = \Sigma \left[PC(d) \times PR(d) \times \frac{CAP_{av.int}}{CAP}\right] \times R = \mathbf{1.752\%}$$

5 Conclusions

Considering the application of an ex-ante discount when determining tariffs for interruptible capacity in the 2025/2026 gas year, the transmission system operator submits a reasoned proposal for the parameters set out in the Tariff Regulations for the gas sector. These parameters are: (i) the probability of interruption of interruptible capacity (Pro); (ii) adjustment factor to the estimated economic value of the type of product (A).

In the study regarding the determination of the probability, a common methodology was applied both to VIP Ibérico and to the high-pressure network and LNG Terminal interconnection. This option was based on the fact that, in both cases, the offer of interruptible capacity and the respective interruption results from the nomination behaviour and subsequent renomination, regarding the specificities in the use of the infrastructures in each point. This approach incorporates quantitative elements of the use of the respective points during a historically relevant period, considering for this purpose the biennium with the highest level of contracting.

Apropos of the high-pressure network and LNG Terminal interconnection, 100% of the firm capacity made available has been contracted in recent biennia, however with different levels of utilization (see Table 7). Given the decreasing evolution of registered interrupted capacity in the last four gas years (see Table 6), as well as a lower use of the regasification product, also supported by the greater availability of interruptible capacity, had already prompted the need, as of last year, to take into consideration more recent utilization data for this product. This is based on the premise that such data more accurately reflect the current market conditions and the foreseeable utilization of this infrastructure.

This approach intends to prevent a crystallization of the probability of interruption value at this interconnection point, intrinsically associated with a two-year period of high use of the LNG Terminal regasification product, in dissonance with the current trend.

With the extension of the period for which actual interruption data is available, it is concluded that the assumptions which motivated the revision of the discount proposal remain valid, and therefore the approach adopted will remain unchanged.

Hence, the interruption probability value is weighted based on the historical data from the most recent biennium (1.752%) and the value proposed in the previous year and approved by the NRA (13.509%), thereby providing greater stability to the discount rate applicable in the following year. This safeguards the model from significant fluctuations, while still taking into account the evolving market conditions regarding the use of this product. The application of this weighting results in a proposal for the 2025/26 year equal to the average of these two values: 7.631%.

For the purposes of the proposal for factor 'A', it was considered appropriate to maintain the application of a unit value (A=1) to each of the standard interruptible capacity products at any of the entry and exit points of the transport network in question, considering as neutral the variation in the economic value of each product in relation to the respective probability values determined by the methodology. The following table presents the transmission network operator's proposal for the aforementioned parameters, offering a comparison with the discount values approved by the NRA for the gas year 2024/25:

Table 10: Probability of capacity interruption and ex-ante discount proposal for 2025/26

Interconnection points with High-Pressure Network	Product	Probability 2024/25	Proposal to 2024/25 (approved by the NRA)	Probability 2025/26	Proposal to 2025/26
VIP Ibérico (Spain-Portugal)	Daily Within-Day	4.646 %	4.646 %	4.646 %	4.646 %
VIP Ibérico (Portugal-Spain)	Daily Within-Day	4.646 %	4.646 %	4.646 %	4.646 %
Interconnection with LNG Terminal (Regasification)	Within-Day	11.757 %	13.509 %	1.752 %	7.631 %

Appendix A - Analysis of regasification interruptible capacity in 2023/24

During the gas year 2023/24, 26.78 TWh of interruptible capacity on the high-pressure network/LNG Terminal interconnection (Regasification) was offered, which represents an increase of 19% comparatively to the previous gas year (in which 22.54 TWh were offered) and corresponds to around 36.58% of the total firm capacity available to the market. This data is coherent with an inferior utilization of this product, as identified in 4.2.2. The next figure presents the monthly distribution of interruptible capacity with reference to the firm capacity available.

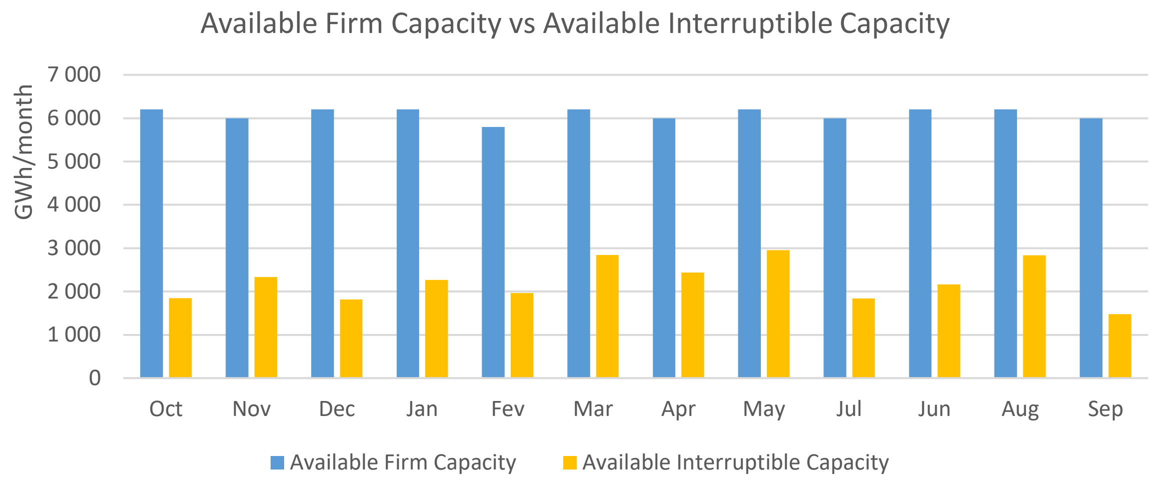

Figure A1: Monthly available capacities: firm and interruptible

From the above graph, it can be easily concluded that the difference between these two quantities is quite significant, corresponding the contracted interruptible capacity to around 34.99 GWh during the period between October 2023 to September 2024, which results in less than 1% of the available interruptible capacity. Regarding the contracting of the available interruptible capacity, the distribution was the following:

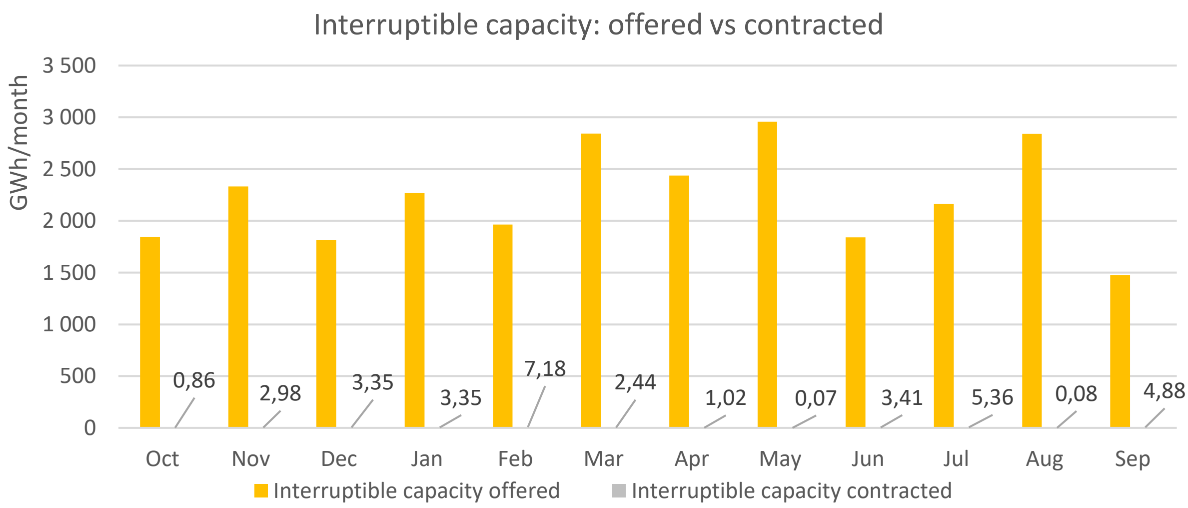

Figure A2: Monthly distribution of interruptible capacity: available and contracted

For the gas year under the scope of this analysis, a total of 34.99 GWh of interruptible capacity was contracted, from which 34.69 GWh were confirmed, resulting on an effective utilization of around 99.1%. From this numbers we can conclude that there was a reduction of this product.

This reduction might occur in two different ways: either there is a reduction by renomination, when the market agent renominates to an inferior value or the market agent, which had contracted firm capacity, renominated to a superior value, resulting in interruptible capacity interruption. The overall values for the gas year of 2023/24 are presented in Table 1.

Table A1: Interruptible Capacities in 2023/24: contracted, confirmed and reduced.

Interruptible Capacity Contracted [kWh]	34 985 757
Confirmed Quantities [kWh]	34 684 734
Reduction by renomination [kWh]	301 023
Reduction by interruption [kWh]	0

Figure A3 provides insight into the distribution of daily interruptible capacity contracted, sorted in descending order based on the volumes contracted.

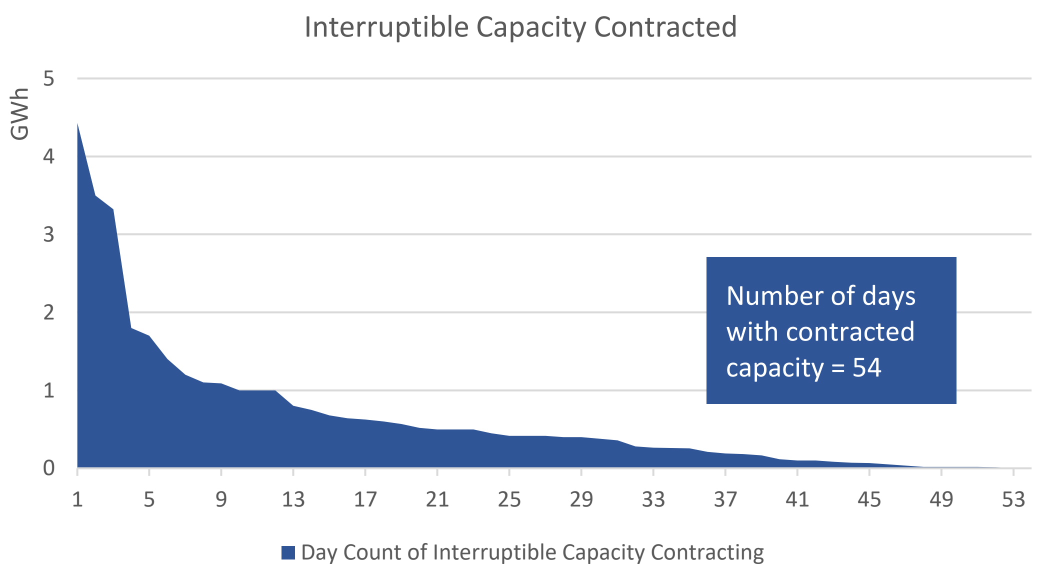

Figure A3: Distribution of the daily occurrences of interruptible capacity contracting, in descending order.

Transposing the regasification data for the 2023/2024 gas year into the model established under Article 16 of the Tariff Network Code yields the following analysis:

Rate of interruption occurrence:

Days of interruptible capacity contracting	54
Days of interruptible capacity interruption	0
Expected number of interruptions N	0/54 = 0

Affected capacities:

Average contracted capacity [GWh/d]	0.648
Average interrupted capacity [GWh/d]	0
CAP av. Int / CAP	0/0.648 = 0%

Assuming the period under analysis corresponds to the gas day, which comprehends 24h:

Interruption duration

Dint [h]	24
D [h]	24
D Int / D	24/24 = 1

Thus, applying formula (2),

$$\mathrm{Pro} = \frac{\mathrm{N} \times \mathrm{D_{int}}}{\mathrm{D}} \times \frac{\mathrm{CAP_{av.\ int}}}{\mathrm{CAP}} \qquad (2)$$

the calculated probability of interruption is:

$$Pro = \frac{0 * 24}{24} \times \frac{0}{0.648} = 0\%$$