DESFA
Hellenic Gas Transmission System Operator S.A.

April 2020

Annual Gas Balancing Planning for the Year 2021

1. Introduction

The present plan is developed in terms of Paragraph 2.γ of Article 68 of the Law 4001/2011 according to which the Operator of National Natural Gas System (DESFA S.A.) (hereinafter 'Operator') is responsible for balancing of the National Natural Gas System (NNGS) as defined in the NNGS Network Code (hereinafter 'Code') and the provisions of Article 46 regarding the Annual Gas Balancing Planning.

In terms of paragraph 1 of Article 46 of the Code, the Operator submits to the Regulatory Authority for Energy (RAE) the Annual Gas Balancing Planning for the next Year, which, as well as each modification thereof shall be approved by RAE and published at the Operator's responsibility.

Within the framework of its above-mentioned competence and in accordance with the provisions of Chapter 8 of the Code, the Operator shall undertake Balancing Actions through (a) the purchase and sale of Balancing Gas in the form of Short Term Standardized Products (hereinafter STSPs) auctioned at the Operator's Balancing Platform and/or (b) use of Balancing Services through Balancing Services Agreements that may be concluded by the Operator, either following a relevant tender, either in accordance with the provision of paragraph 1 of Article 91 of the Law 4001/2011, with Users or third parties concerning the supply and delivery of Balancing Gas Quantities to the NNGS, following the approval of the Annual Gas Balancing Planning by RAE.

According to paragraph 2 of Article 46 of the Code, the Annual Gas Balancing Planning includes in particular: (a) The Operator's forecast for the evolution of the demand in Natural Gas per category of Customers in relation to the existing Transmission Capacity of the Transmission System, (b) a forecast regarding the necessary Quantities of Balancing Gas, such as the total annual Quantity of Balancing Gas for purchase and/or sale, its estimated allocation during the Year, as well as an estimation for the part of said Quantity that is expected to be covered through the use of Balancing Services, (c) a determination of the necessary characteristics of the agreement or combination of agreements that the Operator must conclude, at its discretion, to procure Balancing Services and (d) an estimate regarding the part of the NNGS Capacity which may be used by the Operator for Gas Balancing.

In accordance with paragraph 3 of Article 46 of the Code, for the development of the Annual Gas Balancing Planning, the Operator takes into consideration particularly the NNGS Development Plan, the total demand for Natural Gas serviced via the National Natural Gas Transmission System (NNGTS), the geographical distribution of consumption, the elimination of technical limitations affecting the operation of the System and, especially, each event that has led to, or may lead to, in

its estimation, congestion or Emergency Level Crises, the maintenance requirements of the NNGS sections, the existing Gasification Capacity and Transmission Capacity at Entry and Exit Points, relevant historical data, as well as the criteria of the provision of paragraph 2 of Article 8 of Regulation (EU) No 312/2014.

2. Gas Balancing

Balancing Gas is considered to be the Natural Gas required for the gas balancing of the NNGTS. The Balancing Gas Quantity is injected to / received from the NNGTS over a specific period of time in order to balance the Natural Gas Deliveries with Receptions (during the same period of time) in order to ensure in each case the reliable, safe and efficient operation of the NNGS.

The Operator undertakes Balancing Actions to:

a) maintain the NNGTS within its operational limits, which refer to the minimum and the maximum NNGTS Linepack at 20.5 and 26 million Nm^3, respectively, at the end of a Day; and/or

b) achieve the NNGTS Linepack within the range of [22.3 – 24.3] million Nm^3 at the end of a Day, in order to ensure the cost-effective and efficient operation of the NNGTS during the Day.

When performing Balancing Actions, the Operator considers at least the following:

1. its estimations about the Natural Gas demand;
2. the most recent data on Confirmed Natural Gas Delivery and Reception Quantities of the Transmission Users at the NNGTS Entry and Exit Points, respectively;
3. the most recent measurement data;
4. the prevailing NNGTS pressure at any given time; and
5. the possibility of storing Natural Gas in the NNGTS.

3. Estimation of Natural Gas demand for the Year 2021

Taking into consideration the NNGS Development Study for the period 2020-2029, the historical data of Natural Gas consumption, the Distribution System Operators' and the Users' estimation of the Natural Gas demand for the Year 2021 and the expected completion date of the ongoing or planned expansion projects of the NNGS, it is estimated that the Natural Gas consumption will reach the level of **5,382 mil. Nm^3** in the Year 2021. The estimated Natural Gas demand per consumer category is presented in more detail in Table 1 of the next page.

2021	Power Production (Nm^3)	Other Consumers (Nm^3)	Total Consumption (Nm^3)
January	353,077,597	270,803,129	623,880,726
February	255,549,893	215,741,066	471,290,959
March	210,532,367	194,296,243	404,828,610
April	231,565,745	132,653,258	364,219,003
May	206,053,803	129,384,578	335,438,381
June	294,058,518	129,289,819	423,348,337
July	302,388,207	133,665,688	436,053,895
August	342,245,885	125,000,330	467,246,215
September	311,782,984	129,631,342	441,414,326
October	270,110,627	137,526,627	407,637,254
November	325,724,807	177,463,044	503,187,851
December	268,034,822	235,522,300	503,557,122
Total	**3,371,125,255**	**2,010,977,424**	**5,382,102,679**

Table 1: Forecast of Natural Gas demand per consumer category for the Year 2021

4. Balancing Gas Quantities

As of 01.07.2018 the 4th amendment of the NNGS Code was implemented, under which the Operator executes Balancing Actions through (a) the purchase and sale of Balancing Gas in the form of STSPs auctioned at the Operator's Balancing Platform and/or (b) the use of Balancing Services. Before 01.07.2018, the calculation of the Balancing Gas injected in the NNGTS was performed outturn on a Daily basis, as the difference between the total Quantity of Natural Gas measured at the NNGTS Entry Point 'Agia Triada' during each Day and the total Natural Gas Quantity which was confirmed by the Operator to be injected to the NNGTS through that Point, during that Day, on behalf of all Transmission Users who had booked Transmission Capacity for Delivery at that Entry Point.

Considering the above, and in order for the Operator to extract as reliably as possible an estimation of the necessary Balancing Gas Quantities for purchase ($BG^{P}_{\mathrm{M},2021}$) and sale ($BG^{S}_{\mathrm{M},2021}$) required for each Month of the Year 2021, the Operator used the historical data of the period 01/2018 – 03/2020[1] and applied the following methodology:

[1] *The Months April and May of the Year 2018 were not taken into account in the calculations of Balancing Gas Quantities for purchase, as the LNG Revithoussa Station remained closed during the specific Months for upgrading works and therefore it was not possible to inject Natural Gas Quantities to the NNGTS through the Entry Point "Agia Triada".*

$$BG^{P}_{\mathrm{M},2021} = \bar{X}^{P}_{\mathrm{M},2021} * ER_{\mathrm{M},2021}\text{, and}$$

$$BG^{S}_{\mathrm{M},2021} = \bar{X}^{S}_{\mathrm{M},2021} * ER_{\mathrm{M},2021}\text{,}$$

where:

- $\bar{X}^{P}_{\mathrm{M},2021}$: The average participation rates of the Balancing Gas Quantities for purchase during the Month M of the period 01/2018 - 03/2020 to the Natural Gas Receptions of the same Month (see Appendix 2);

- $\bar{X}^{S}_{\mathrm{M},2021}$: The average participation rates of the Balancing Gas Quantities for sale during the Month M of the period 01/2018 – 03/2020 to the Natural Gas Receptions of the same Month (see Appendix 2);

- $ER_{\mathrm{M},2021}$: Estimated monthly NNGTS Natural Gas Receptions for the Year 2021 (see Table 1 above); and

- M : Month of a Year

For the calculation of the above value $\bar{X}^{P}$ for every Month of the Year 2021, the Operator took into account:

i. the Balancing Gas Quantities injected to the NNGTS through the Entry Point 'Agia Triada' during the same Months within the period 01/2018 – 03/2020; and
ii. the historical data of the purchased Balancing Gas Quantities auctioned through STSPs in the Balancing Platform during the same Months within the period 07/2018 – 03/2020.

Furthermore, for the calculation of the above value $\bar{X}^{S}$ for every Month of the Year 2021, the Operator took into account:

i. its estimation of the Balancing Gas Quantities for sale through STSPs, which would be auctioned in the Balancing Platform during the same Months within the period 01/2018 – 06/2018, where the Platform was not in operation, so as to maintain the NNGTS Linepack less than 24.3 mil. Nm^3; and
ii. the historical data of Balancing Gas Quantities sales through STSPs auctioned in the Balancing Platform during the same Months within the period 07/2018 – 03/2020.

In Diagram 1 below the following are presented:

- The Monthly Balancing Gas Quantities for purchase during the period 01/2018 – 03/2020, through STSPs auctioned in the Balancing Platform or via Balancing Services; and
- The Monthly Balancing Gas Quantities for sale as estimated by the Operator for the period 01/2018 – 06/2018 and the actual Quantities during the operation of the Balancing Platform for the period 07/2018 – 03/2020,

as a percentage of the respective Monthly Natural Gas Receptions.

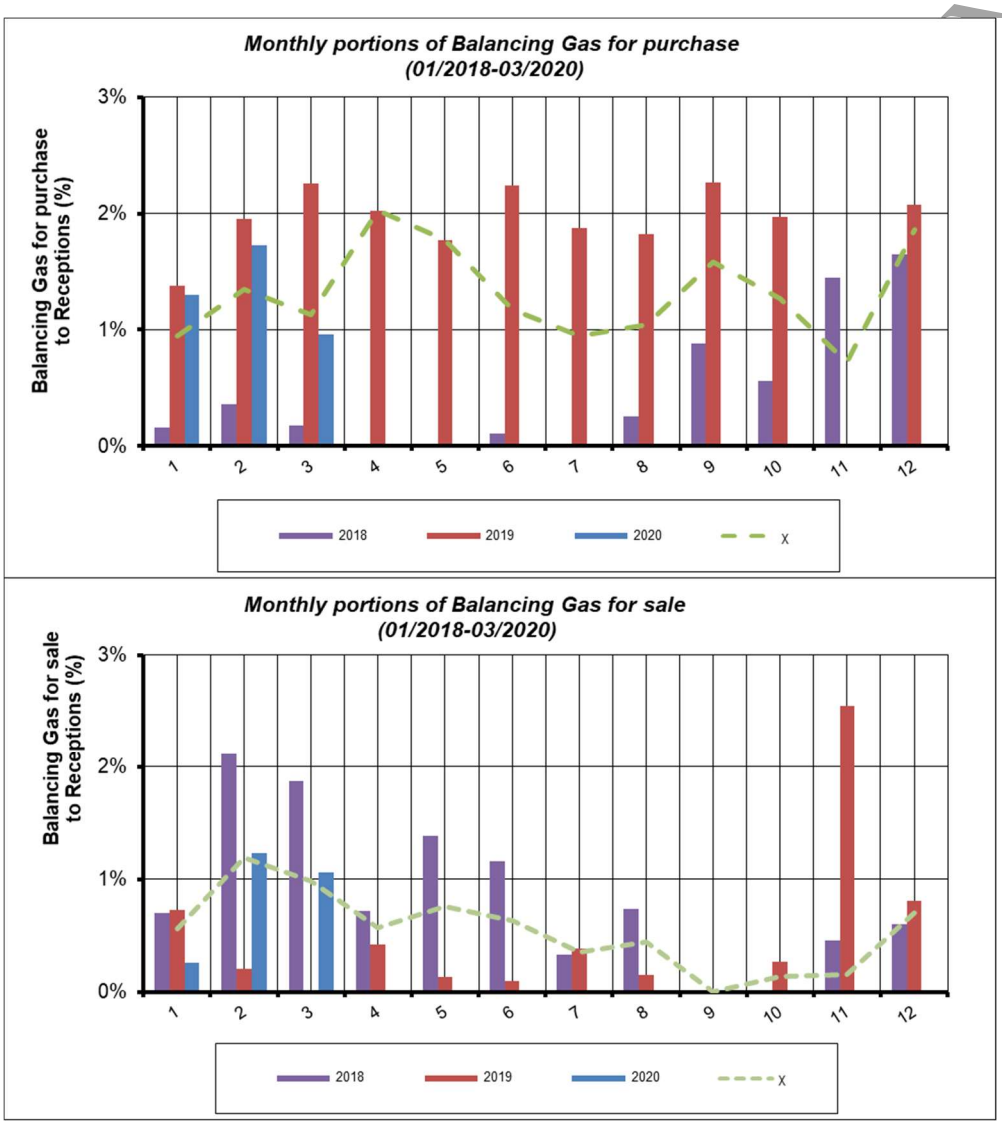

Diagram 1: Monthly portions of Balancing Gas Quantities to Natural Gas Receptions for the period 01/2018 –03/2020

The results of the calculations in case of Balancing Gas purchase and sale are presented separately in Table 2 below.

Month of the Year 2021	Balancing Gas Purchase $(\overline{X}^{P})$ %	Balancing Gas Sale $(\overline{X}^{S})$ %
January	0.95	0.56
February	1.35	1.19
March	1.13	0.98

April	2.03	0.57
May	1.77	0.76
June	1.17	0.63
July	0.95	0.35
August	1.04	0.44
September	1.58	0.00
October	1.27	0.14
November	0.72	1.50
December	1.86	0.70

Table 2

Taking into consideration the above methodology, the Operator's estimations for the Monthly distribution of Balancing Gas purchase and sale for the Year 2021 are presented in Table 3[2] below – an overall Table with the Operator's estimation of the Monthly Natural Gas demand per consumption category and the estimation of the Balancing Gas purchase and sale for the Year 2021 is presented in Annex 1.

Month of the Year 2021	Balancing Gas Purchase (kWh)	Balancing Gas Sale (kWh)
January	68,929,462	40,632,104
February	73,995,037	65,225,255
March	53,202,171	46,139,936
April	85,988,100	24,144,442
May	69,050,326	29,648,728
June	57,605,432	31,018,309
July	48,177,415	17,749,574
August	56,514,364	23,909,923
September	81,111,648	0
October	60,208,430	6,637,150
November	42,134,938	87,781,121
December	108,928,470	40,994,585
Total	**805,845,792**	**413,881,126**

Table 3: Estimation of the Monthly distribution of Balancing Gas purchase and sale for the Year 2021

In accordance with the provisions of Article 44A of the Network Code, the Operator undertakes Balancing Actions through:

1. The purchase and sale of Balancing Gas in the form of Short-term Standardized Products (STPSs) through auctions in the Balancing Platform; and/or
2. The use of Balancing Services when the following reasons are met:
    - it was not possible to purchase/sell the required Balancing Gas Quantity through Short-term Standardized Products; and/or
    - in its estimation, it is unlikely to purchase/sell the required Balancing Gas Quantity

[2] *For the conversion of the volume units (Nm^3) to energy units (kWh), the weighted (flow) average of the Gross Calorific Value of the Entry Points of the NNGTS for Year 2019 was used, i.e.11.63 kWh / Nm^3*

through Short-term Standardized Products; and/or

- in its estimation, the use of these products is not, or is not likely to provide, the necessary response to maintain the Transmission System within its operational limits; and/or
- due to the urgent need for safe, cost-efficient and effective operation of the NNGS, an auction cannot be conducted.

Based on the above and taking into account the period since the entry into force of the 4th Amendment of the Code, i.e. 07/2018 - 03/2020, the Operator calculated the percentage $Z\%$ of the estimated Balancing Gas Quantities expected to be covered through the use of Balancing Services, for the Year 2021, on the basis of the following methodology:

$$Z\% = \frac{\sum_{i=1}^{n} BG^{service}}{\sum_{j=1}^{k} BG^{P}} * 100$$

where:

- $\sum_{i=1}^{n} BG^{service}$: The sum of Balancing Gas Quantities injected into the NNGTS through the Entry Point 'Agia Triada', via usage of Balancing Services for each Day (i) for the period 07/2018 – 03/2020;

- $\sum_{j=1}^{k} BG^{P}$: The sum of Balancing Gas Quantities purchased through STSPs auctioned in the Balancing Platform and/or via usage of Balancing Services for each Day (j) for the period 07/2018 – 03/2020;

- n : The amount of Days of the period 07/2018 – 03/2020 during which Balancing Gas Quantities were injected into the NNGTS via usage of Balancing Services; and

- k : The amount of Days of the period 07/2018 – 03/2020 during which the Operator purchased Balancing Gas Quantities through STSPs auctioned in the Balancing Platform and/or via usage of Balancing Services.

Based on the above, it appears that during the period 07/2018 - 03/2020, 41% of the Balancing Gas Quantities for purchase was covered through the use of Balancing Services, which is also adopted as an estimate of the percentage of the Balancing Gas Quantities for purchase that will be covered through the use of Balancing Services by the Operator for the Year 2021, in relation to the total estimated Balancing Gas Quantities for purchase for the same Year.

5. Balancing Services Agreement

Taking into consideration the provision of Article 47 of the Code, aiming firstly at the proper, cost-efficient and effective operation of the NNGS during the Year 2021, the Operator will enter into Balancing Services framework agreement with Natural Gas suppliers, which will be chosen after an international bid, according to paragraph 2.c of Article 68 of the Law 4001/2011, for the supply of Balancing Gas during the period 01.01.2021 07:00 – 01.01.2022 07:00.

The supply of Balancing Gas will take place in the context of fulfillment of requests for supply of Balancing Gas issued by the Operator to the selected Suppliers. The choice of the supplier will be based on criteria that will be specified in the framework agreement and relate, among others, with the lower supply price offered and the fulfillment of the Operator's request in terms of the Balancing Gas quantity and the delivery date.

Furthermore, taking into consideration:

i. The NNGTS topology and construction features;

ii. The NNGTS Technical, Booked and Available Capacity at the Entry Points;

iii. The NNGTS geographical Natural Gas Receptions allocations; and

iv. The current framework regulating the Greek Natural Gas market;

the supplied Balancing Gas Quantities will relate solely to Liquefied Natural Gas (LNG) delivered to the Operator at Revithoussa LNG Facility.

Also, taking into consideration:

- the Revithoussa LNG Facility Storage;
- the requirements of the Code and particularly Chapter 11 regarding the terms of access to the Revithoussa LNG Facility (Temporary LNG Storage Period, Minimum Re-gasification Capacity); and
- the size of LNG vessels that are available in the Liquefied Natural Gas market;

the Balancing Services framework agreement will provide the authority to the Operator to specify, in each request to suppliers, the LNG quantity and the delivery date, so that the smooth operation of the

greek Natural Gas market is not upset, in accordance with the requirements of the Code.

Given the impossibility to confirm the Operator's estimations regarding the required Natural Gas Quantities for balancing purposes for the Year 2021, the abovementioned framework agreement will not contain imposing restrictions such as minimum supply quantity or payment clauses, irrespective of LNG deliveries.

6. Part of the NNGS Capacity for Gas Balancing for the Year 2021

The Operator, taking into account the significant variation of the required Daily Balancing Gas Quantity during a Year, proposes the methodology of determining the part of the NNGS capacity - which according to Section 5 above refers to part of the LNG Facility Re-Gasification Capacity and the Transmission Capacity for Delivery at the NNGTS Entry Point 'Agia Triada' - which can be used for Balancing Actions through the use of Balancing Services by the Operator during the Year 2021, aiming to the effective and cost-efficient operation of the NNGS and to improving the level of Transmission and LNG Facility services to Users.

The Operator, taking into account the historical data from the period 01/2018-03/2020 (see Annex 3), the above mentioned in Section 4 herein, according to which 41% of the estimated Balancing Gas Quantities will be covered through the use of Balancing Services, and correlating the maximum Daily Balancing Gas Quantity that was injected in the NNGTS per Month with the corresponding sum of the Users' Booked Transmission Capacity for Reception, proposes the application of the following methodology for the calculation of the Monthly NNGS Capacity estimated to be required for Balancing Services by the Operator during the Year 2021:

$$\Delta E_{M,2021} = 0,41 * (OA_{M,2021} * E\Delta M_{M,2021}),$$

where:

- $OA_{M,2021} = \dfrac{\dfrac{AQ_{E\Xi(\max)_{M,2020}}}{\Delta M_{M,2020}} + \dfrac{AQ_{E\Xi(\max)_{M,2019}}}{\Delta M_{M,2019}} + \dfrac{AQ_{E\Xi(\max)_{M,2018}}}{\Delta M_{M,2018}}}{3}$, [3]

- $AQ_{E\Xi(\max)_{M,Y}}$: the maximum Daily Balancing Gas Quantity (kWh/Day) of the Month M of the Year Y, that was purchased either through the STSPs that were auctioned in the

[3] *For the calculation of the Monthly Capacity of the NNGS, for the Year 2020 only historical data for the first quarter of Year 2020 were used*

Balancing Platform or through Balancing Services;

- $\Delta M_{M,Y}$: the sum of the Booked Transmission Capacity for Reception (kWh/Day) that was booked by all Users, during the Day of the injection to the NNGTS of the maximum Daily Balancing Gas Quantity of the Month M of the Year Y; and

- $$E\Delta M_{M,2021} = \frac{(\Delta M_{M,2020} + \Delta M_{M,2019} + \Delta M_{M,2018})}{3}$$

Based on the above methodology, the Operator's Monthly estimation of the NNGS Capacity that will be required for Gas Balancing is shown in Table 4.

Month of the Year 2021	NNGS Capacity for Gas Balancing (kWh/Day)
January	3,280,028
February	7,986,456
March	1,770,314
April	12,479,170
May	2,826,432
June	6,997,356
July	4,743,937
August	2,783,597
September	3,848,175
October	3,752,488
November	4,771,749
December	4,939,530

Table 4

ANNEX 1

Monthly Estimation of Natural Gas Demand per Consumption Category and Estimation of Balancing Gas Quantities

2021	Power Production	Other Consumers	Total Consumptions		Balancing Gas (kWh)	
	Nm^3	Nm^3	Nm^3	kWh	Purchase	Sale
January	353,077,597	270,803,129	623,880,726	7,255,732,843	68,929,462	40,632,104
February	255,549,893	215,741,066	471,290,959	5,481,113,853	73,995,037	65,225,255
March	210,532,367	194,296,243	404,828,610	4,708,156,734	53,202,171	46,139,936
April	231,565,745	132,653,258	364,219,003	4,235,867,005	85,988,100	24,144,442
May	206,053,803	129,384,578	335,438,381	3,901,148,371	69,050,326	29,648,728
June	294,058,518	129,289,819	423,348,337	4,923,541,159	57,605,432	31,018,309
July	302,388,207	133,665,688	436,053,895	5,071,306,799	48,177,415	17,749,574
August	342,245,885	125,000,330	467,246,215	5,434,073,480	56,514,364	23,909,923
September	311,782,984	129,631,342	441,414,326	5,133,648,611	81,111,648	0
October	270,110,627	137,526,627	407,637,254	4,740,821,264	60,208,430	6,637,150
November	325,724,807	177,463,044	503,187,851	5,852,074,707	42,134,938	87,781,121
December	268,034,822	235,522,300	503,557,122	5,856,369,329	108,928,470	40,994,585
Total	**3,371,125,255**	**2,010,977,424**	**5,382,102,679**	**62,593,854,157**	**805,845,792**	**413,881,126**

Note:

For the conversion of the volume units (Nm^3) to energy units (kWh), the weighted (flow) average of the Gross Calorific Value of the Entry Points of the NNGTS for Year 2019 was used, i.e.11.63 kWh / Nm^3

ANNEX 2

Historical data of Balancing Gas Quantities for the period 01/2018 – 03/2020

Year	Month	Injected Balancing Gas Quantity (kWh)	Balancing Gas Quantity for purchase via STPSs (kWh)	Balancing Gas Quantity for sale via STPSs (kWh)	Total Natural Gas Reception (kWh)
2018	January	8,759,834			5,378,022,418
2018	February	16,799,158			4,636,666,451
2018	March	6,507,829			3,642,557,277
2018	April	0			3,238,885,477
2018	May	0			3,529,953,163
2018	June	3,944,415			3,812,258,469
2018	July	183,931	710,000	14,030,000	4,281,120,737
2018	August	0	10,180,000	29,810,000	4,056,894,712
2018	September	8,371,411	30,040,000	0	4,338,945,334
2018	October	9,875,297	16,200,000	0	4,657,785,731
2018	November	35,902,881	32,700,000	21,670,000	4,736,732,473
2018	December	45,585,788	55,700,000	36,720,000	6,139,458,904
2019	January	39,833,972	63,300,000	54,470,000	7,462,186,360
2019	February	57,900,080	48,070,000	11,000,000	5,413,394,923
2019	March	8,131,680	86,530,000	0	4,184,429,465
2019	April	30,436,999	48,350,000	16,400,000	3,890,585,683
2019	May	20,362,676	43,160,000	4,600,000	3,582,834,854
2019	June	65,259,542	31,890,000	4,300,000	4,331,393,663
2019	July	55,602,269	45,350,000	20,440,000	5,371,406,832
2019	August	16,067,887	73,550,000	7,150,000	4,908,829,257
2019	September	37,218,934	70,300,000	0	4,737,635,261
2019	October	39,036,838	50,050,000	12,250,000	4,518,050,140
2019	November	0	0	109,300,000	4,283,440,311
2019	December	48,395,298	53,350,000	39,420,000	4,899,116,591
2020	January	43,411,455	43,210,000	17,220,000	6,673,061,563
2020	February	51,880,453	38,750,000	65,010,000	5,259,719,736
2020	March	3,610,796	43,710,000	52,640,000	4,946,915,433

ANNEX 3

Historical data of Maximum Balancing Gas Quantity and Booked Transmission Capacity for Reception by Users

Month	Year	Maximum Balancing Gas Quantity (kWh/Day)	Sum of all Users' Booked Transmission Capacity for Reception on the Day of the Maximum Balancing Gas Quantity (kWh/Day)
January	2020	12,066,391	263,048,518
	2019	11,011,665	254,036,785
	2018	2,150,961	205,017,055
February	2020	14,132,596	219,939,476
	2019	28,104,572	215,116,524
	2018	16,137,286	210,528,114
March	2020	2,215,827	268,791,994
	2019	5,949,745	195,071,448
	2018	3,919,103	186,784,415
April	2019[4]	30,436,999	201,727,119
May	2019	6,893,735	233,802,846
June	2019	17,066,721	210,292,066
	2018	0	
July	2019	22,879,145	182,936,426
	2018	710,000	175,532,917
August	2019	3,242,141	187,953,396
	2018	10,180,000	179,996,518
September	2019	13,408,022	226,369,338
	2018	5,830,000	194,479,993
October	2019	8,626,815	239,056,866
	2018	9,198,446	177,782,720
November	2019	0	
	2018	11,638,412	185,949,678
December	2019	12,065,798	261,669,302
	2018	11,992,457	241,181,201

[4] *May and April of the Year 2018 were not taken into consideration due to the Revithoussa LNG Facility shutdown during those Months for the Facility upgrade works*