
# Annual Gas Balancing Planning for 2018

**April 2017**

## 1. Introduction

The present plan is developed in terms of Paragraph 2.c of Article 68 of the Law 4001/2011 that assigns liability to the Hellenic Gas Transmission System Operator (DESFA) S.A. for gas balancing of the National Natural Gas System (NNGS) and according to the provisions in the Article 46 of the Network Code for the regulation of Natural Gas System (hereafter 'Code'), referring to the Annual Gas Balancing Planning and the Operational Gas Offsetting.

In terms of paragraph 1.A of Article 46 of the Code, the Operator submits to the Regulatory Authority of Energy (RAE) the Annual Gas Balancing Planning for the following Year that is approved by RAE and published under the Operator's responsibility. Furthermore, in accordance with the provisions of paragraph 1.C of Article 46 of the Code, the Operator proposes to RAE with regard to the NNGS capacity part booked by the Operator for Gas Balancing.

Under the aforementioned competence and in accordance with the provisions of paragraph 2.c. Article 68 of Law 4001/2011, the Operator may conclude, following a tendering procedure, and through transparent, non-discriminatory and market-based rules contracts with Suppliers for the purchase and delivery of Natural Gas for Gas Balancing purposes, under the approved (by RAE) Annual Gas Balancing Planning.

In accordance with paragraph 2 of Article 46 of the Code, the Annual Gas Balancing Planning includes in particular: (a) Forecasts of the Operator for the development of Natural Gas demand per category of Customers with regards to the existing Transmission Capacity of the Transmission System, (b) forecast with regards to the necessary Quantities of Natural Gas for Gas Balancing, such as the total annual Quantity of Natural Gas for Balancing, the estimated allocation thereof during the Year, the maximum Supply and the maximum daily Quantity of Natural Gas for Balancing and (c) determination of the required characteristics of the Balancing Agreement or combination of Balancing Agreements that the Operator must enter.

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 of Natural Gas served via the National Natural Gas Transmission System (NNGTS), the geographic distribution of consumptions, the elimination of technical limitations concerning the operation of the System and, particularly, each event that has led to, or is going to lead to, as per its discretion, congestion, Emergency, access denial or Transit prohibition, the maintenance requirements of the NNGS components, the existing Natural Gas Transmission Agreements, the existing LNG Facility Usage Agreements, as well as the Connected System Agreements entered.

## 2. Balancing Gas

Balancing Gas is the quantity of Natural Gas injected into the NNGTS by the Operator during a specified time period in order to reach balance between the Deliveries and Off-takes of Natural Gas in that time period and to ensure the reliable, safe and efficient operation of NNGS. In terms of its competency and liability, the Operator secures the aforementioned balance, taking into consideration the losses and the stored quantities of Natural Gas in the NNGTS.

The Operator undertakes Balancing Actions so as to:

a) maintain the Transmission Network within its operational limits; and

b) achieve a state of storage in the Transmission Network pipeline other than the predicted according to the expected Deliveries and Off-takes in that Gas Day, which is consistent with the economic and efficient operation of the Transmission Network.

When performing Balancing Acts, the Operator takes into account the following:

a) its estimations about the Natural Gas demand;

b) the Daily Nominations of the Transmission Users as well as information about the allocated and measured Natural Gas quantities; and

c) the Natural Gas pressure in the NNGTS.

## 3. Forecast for Natural Gas demand in Year 2018

Taking into consideration the NNGS Development Study for the period 2017-2026, the historical data of Natural Gas consumption in the NNGTS, the Users' estimation of the Natural Gas demand for the Year 2018 and the expected completion date of the ongoing and planned expansion projects in the NNGTS, it is estimated that the Natural Gas consumption will be at **3,655 mil. Nm$^3$** in the Year 2018. The estimated Natural Gas demand per consumer category is presented in more detail in Table 1.

| 2018 | Power Production ($Nm^3$) | Other Consumers ($Nm^3$) | Total Consumption ($Nm^3$) |
|---|---|---|---|
| **January** | 237,024,380 | 194,480,018 | 431,504,398 |
| **February** | 141,657,332 | 137,469,690 | 279,127,022 |
| **March** | 165,938,135 | 143,252,899 | 309,191,034 |
| **April** | 121,873,063 | 95,337,019 | 217,210,082 |
| **May** | 179,247,193 | 71,332,251 | 250,579,445 |
| **June** | 165,162,196 | 64,507,883 | 229,670,080 |
| **July** | 158,033,229 | 85,669,990 | 243,703,219 |
| **August** | 185,737,697 | 87,676,613 | 273,414,309 |
| **September** | 198,427,368 | 110,056,738 | 308,484,106 |
| **October** | 173,513,497 | 120,700,800 | 294,214,297 |
| **November** | 223,755,775 | 143,120,432 | 366,876,207 |
| **December** | 243,987,508 | 206,923,748 | 450,911,256 |
| **Total** | **2,194,357,375** | **1,460,528,079** | **3,654,885,454** |

*Table 1: Forecast of Natural Gas demand per consumer category in Year 2018*

## 4. Natural Gas Balancing Quantities

During the Year 2017 as well as in the previous Years, the calculation of the Balancing Gas is 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 quantity of Natural Gas which was nominated to be injected to the NNGTS through the said Point during the same Day on behalf of all Transmission Users who had booked Delivery Transmission Capacity at the above Entry Point.

In Diagram 1 below, the Monthly Balancing Gas Quantities that were injected into the NNGTS within the period 04/2014 – 03/2017 are shown, as a percentage of the respective Monthly Natural Gas Off-Takes.

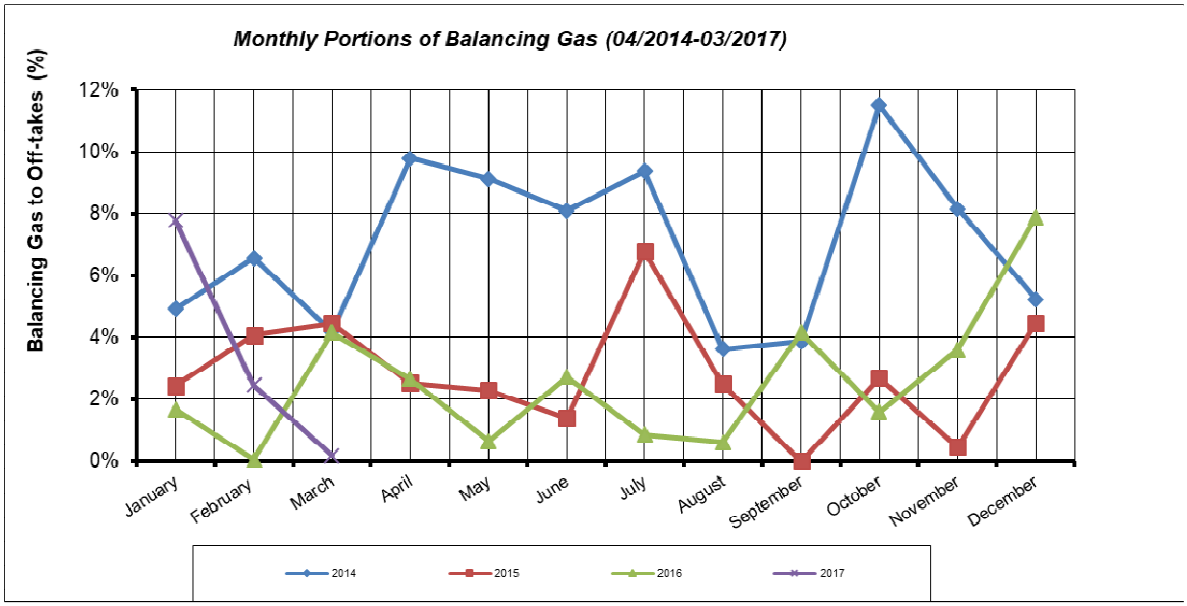


*Diagram 1: Monthly Portions of Balancing Gas to Total Natural Gas Off-takes in the period 04/2014 –03/2017*

Taking the above into consideration, so as for DESFA to extract an (as possible) reliable estimation of the Balancing Gas Quantity that will be required during the Year 2018, the methodology described below was followed:

- Calculation of the average participation rates of Balancing Gas to Natural Gas Off-Takes $\overline{(x)}\%$ per Month using the sample of the thirty-six (36) values of Balancing Gas of each Month during the period 04/2014 - 03/2017 (see Annex 2). The results of this calculation are presented in Table 2 below:

| Month | $\overline{(x)}\%$ |
|---|---|
| January | 3.97 |
| February | 2.19 |
| March | 2.93 |
| April | 4.99 |
| May | 4.02 |
| June | 4.07 |
| July | 5.68 |
| August | 2.24 |
| September | 2.68 |
| October | 5.26 |
| November | 4.07 |
| December | 5.87 |

*Table 2*

- Calculation of the estimated Balancing Gas for each Month of the Year 2018 by multiplying

the average participation rate of the Balancing Gas to the respective Monthly Natural Gas Off-Takes during the period 04/2014-03/2017 (see Table 2 above) with the Operator's estimations of the respective Monthly Natural Gas Off-Takes in the NNGTS for the Year 2018 (see Table 1 above).

Taking into consideration the above methodology, the Operator's estimation for the Monthly distribution of Balancing Gas in Year 2018 is calculated and listed in Table 3 – an overall Table with the Operator's forecast for the Monthly demand of Natural Gas per consumption category and estimation of the Balancing Gas in Year 2018 is given in Annex 1.

Finally, taking into consideration the latest Operator's Natural Gas demand forecast for the Year 2018, it is estimated **that the maximum Daily consumption in Year 2018 will be 18,300,000 Nm$^3$ (approximately 211,000 MWh).**

| Month in 2018 | Balancing Gas (Nm$^3$)[1] | Balancing Gas (MWh) |
|---|---|---|
| January | 17,130,725 | 197,517 |
| February | 6,112,882 | 70,482 |
| March | 9,059,297 | 104,454 |
| April | 10,838,783 | 124,971 |
| May | 10,073,294 | 116,145 |
| June | 9,347,572 | 107,778 |
| July | 13,842,343 | 159,602 |
| August | 6,124,481 | 70,615 |
| September | 8,267,374 | 95,323 |
| October | 15,475,672 | 178,434 |
| November | 14,931,862 | 172,164 |
| December | 26,468,491 | 305,182 |
| **Total** | **147,672,776** | **1,702,667** |

*Table 3: Estimation of the Balancing Gas quantities allocation in Year 2018*

According to the Operator's proposed Revision 3 of the NNGS Network Code, as submitted for approval to RAE, the Transmission Users have the capability of submitting Daily Nominations and Daily Renominations, as well the capability of submitting unbalanced Daily Nominations and Daily Renominations, while the modification of the Tolerance Limits for the Transmission Users is also provided. The above may affect the estimated NNGTS Load Balancing Natural Gas Quantities for the said Year.

[1] *For the conversion of volume units (Nm$^3$) to energy units (MWh) the flow-weighted average Gross Calorific Value for the Year 2016 was used, i.e. 11.53 MWh / 1000 Nm$^3$.*

## 5. NNGS capacity booking for Gas Balancing in 2018

During the Year 2017 (as well as in the previous Years), the NNGTS balancing needs were covered by the Entry Point 'AGIA TRIADA'. For the Year 2018 the Operator taking into account:

i. the topology and the construction characteristics of the NNGTS;

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

iii. the geographic allocation of the Users' Natural Gas Off-takes in the NNGTS;

iv. the evolution of the NNGS expansion and upgrade projects;

v. the connection of new consumers in the south part of the NNGTS; and

vi. the currently in force framework regulating the Natural Gas market in Greece,

proposes the continuation of the Balancing Gas injection via the same Entry Point (i.e. 'AGIA TRIADA').

The Operator, taking into account the strong variation of the required Daily Balancing Gas quantities during a Year, proposes the methodology of determining the part of the NNGS Capacity that should be booked for Gas Balancing during the Year 2018, considering the NNGS efficient and economic operation and the improvement of the level of provided Transmission and LNG Facility Usage services to Users. Below, the maximum Daily quantity of Balancing Gas per Month of the Year 2018 is estimated, taking into account the seasonal variations based on historical data, and the Re-gasification Capacity of LNG Facility and the Delivery Transmission Capacity that should be booked in the Entry Point 'AGIA TRIADA' for Gas Balancing purposes per Month of the Year 2018 are determined accordingly. In this way, the part of the NNGS that needs to be booked for Balancing Gas purposes during the said Year is estimated with the utmost precision and the available, for the NNGS Users, Transmission and Regasification Capacity is maximized.

The Operator, taking into account the historical data of thirty-six (36) Months (see Annex 3) of the period from 04/2014 to 03/2017 and correlating the maximum Daily Balancing Gas Quantity per Month with the corresponding sum of the Users' Booked Transmission Capacity, proposes the application of the following methodology for the calculation of the Monthly Booked Re-gasification Capacity of LNG Facility and the Delivery Transmission Capacity in the Entry Point 'AGIA TRIADA' for Gas Balancing during the Year 2018:

$$\Delta E_{M,2018} = OA_{M,2018} * E\Delta M_{M,2018}\,,$$ [2]

where:

- $OA_{M,2018} = \dfrac{\dfrac{AQ_{E\Xi(max)_{M,2016}}}{\Delta M_{M,2016}} + \dfrac{AQ_{E\Xi(max)_{M,2015}}}{\Delta M_{M,2015}} + \dfrac{AQ_{E\Xi(max)_{M,2014}}}{\Delta M_{M,2014}}}{3}$;

- $AQ_{E\Xi(max)_{M,Y}}$ : the maximum Daily Balancing Gas Quantity (MWh/Day) used by the Operator during the Month M of the Year Y;

- $\Delta M_{M,Y}$ : the sum of the Booked Reception Transmission Capacity (MWh/Day) that was booked by all Users, according to the Transmission Contracts that had been concluded with the Operator, during the Day of the maximum Daily Balancing Gas Quantity in the Month M of the Year Y; and

- $E\Delta M_{M,2018} = \dfrac{(\Delta M_{M,2016} + \Delta M_{M,2015} + \Delta M_{M,2014})}{3}$.

**Based on the above methodology, the Operator proposes the Monthly Re-gasification Capacity of LNG Facility Booking ($\Delta E_{M,2018}$) and equal Transmission Capacity at the corresponding Entry Point 'AGIA TRIADA' for Gas Balancing purposes during the Year 2018, according to the following Table 4:**

[2] *For the calculation of the Monthly Booked Re-gasification Capacity of LNG Facility for the Months January to March of the Year 2018 the historical data of the corresponding Months of the Years 2017, 2016 and 2015 was taken into account.*

| Month of the Year 2018 | Monthly Re-gasification Capacity of LNG Facility Booking and equal Transmission Capacity at the corresponding Entry Point 'AGIA TRIADA' ($\Delta E_{M,2018}$) (MWh/Day) |
|---|---|
| January | 29,650.299 |
| February | 10,820.695 |
| March | 16,272.688 |
| April | 29,259.407 |
| May | 13,568.746 |
| June | 14,847.760 |
| July | 31,489.026 |
| August | 15,847.464 |
| September | 12,600.412 |
| October | 22,453.299 |
| November | 20,983.704 |
| December | 32,955.347 |

*Table 4*

In case of approval of the Operator's proposed Revision 3 of the NNGS Network Code, as referred to in Section 4 above, in conjunction with the application of short-term standardized balancing products, the procurement of which will take place on a balancing platform, in the said Year, the NNGS booking capacity for NNGTS Load Balancing during the Year 2018 may be affected.

## 6. Gas Balancing Agreement

Aiming at the orderly, economical and efficient operation of the NNGS during the Year 2018, the Operator will conclude a framework agreement with Natural Gas suppliers, which will be chosen after an international bid, as it is defined in paragraph 2.c of Article 68 of the Law 4001/2011 and in paragraph 2 of Article 47 of the Code, for the supply of Balancing Gas during the period 01.01.2018 08:00 – 01.01.2019 08:00.

The supply of Balancing Gas will take place in the context of a request fulfillment of the Operator to supply Balancing Gas issued by the Operator to the prequalified 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 LNG

quantity and the delivery date.

Furthermore, taking into consideration:

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

in the framework agreement for the LNG supply for Gas Balancing purposes, the authority of the Operator to specify the LNG quantity and its time delivery will be established, so that the smooth operation of the Greek Natural Gas market is not upset, in accordance with the requirements of the Code. Given the lack of confirmation of the Operator's estimations about the required Natural Gas Quantities for balancing purposes for the Year 2018 and the procedure of choosing the final Supplier, the abovementioned agreement will not contain imposing restrictions such as minimum supply quantity or payment clauses irrespective of LNG deliveries.

## ANNEX 1

## Operator's forecast for Monthly Demand of Natural Gas per Consumption Category and Estimation of Balancing Gas in Year 2018

| 2018 | Power Generation | Other Consumers | Total Consumption | | Balancing Gas | |
|---|---|---|---|---|---|---|
| | $Nm^3$ | $Nm^3$ | $Nm^3$ | MWh | $Nm^3$ | MWh |
| January | 237,024,380 | 194,480,018 | 431,504,398 | 4,975,246 | 17,130,725 | 197,517 |
| February | 141,657,332 | 137,469,690 | 279,127,022 | 3,218,335 | 6,112,882 | 70,482 |
| March | 165,938,135 | 143,252,899 | 309,191,034 | 3,564,973 | 9,059,297 | 104,454 |
| April | 121,873,063 | 95,337,019 | 217,210,082 | 2,504,432 | 10,838,783 | 124,971 |
| May | 179,247,193 | 71,332,251 | 250,579,445 | 2,889,181 | 10,073,294 | 116,145 |
| June | 165,162,196 | 64,507,883 | 229,670,080 | 2,648,096 | 9,347,572 | 107,778 |
| July | 158,033,229 | 85,669,990 | 243,703,219 | 2,809,898 | 13,842,343 | 159,602 |
| August | 185,737,697 | 87,676,613 | 273,414,309 | 3,152,467 | 6,124,481 | 70,615 |
| September | 198,427,368 | 110,056,738 | 308,484,106 | 3,556,822 | 8,267,374 | 95,323 |
| October | 173,513,497 | 120,700,800 | 294,214,297 | 3,392,291 | 15,475,672 | 178,434 |
| November | 223,755,775 | 143,120,432 | 366,876,207 | 4,230,083 | 14,931,862 | 172,164 |
| December | 243,987,508 | 206,923,748 | 450,911,256 | 5,199,007 | 26,468,491 | 305,182 |
| ***Total*** | **2,194,357,375** | **1,460,528,079** | **3,654,885,454** | **42,140,831** | **147,672,776** | **1,702,667** |

**Note:**

For the conversion from volume units ($Nm^3$) to energy units (MWh), the flow-weighted average of the Gross Calorific Value for the Year 2016, i.e 11.53 MWh /1,000 $Nm^3$, was used.

**ANNEX 2**

**Historical Data of Balancing Gas in the period 04/2014-03/2017**

| Year | Month | Balancing Gas (MWh) | Total Natural Gas Off-takes (MWh) |
|---|---|---|---|
| 2014 | April | 233,828 | 2,387,452 |
| 2014 | May | 169,081 | 1,852,339 |
| 2014 | June | 177,268 | 2,188,495 |
| 2014 | July | 244,848 | 2,611,102 |
| 2014 | August | 77,925 | 2,151,066 |
| 2014 | September | 87,247 | 2,252,278 |
| 2014 | October | 244,825 | 2,126,091 |
| 2014 | November | 235,136 | 2,880,373 |
| 2014 | December | 169,023 | 3,227,694 |
| 2015 | January | 88,157 | 3,606,647 |
| 2015 | February | 124,483 | 3,060,913 |
| 2015 | March | 123,982 | 2,787,944 |
| 2015 | April | 51,037 | 2,023,024 |
| 2015 | May | 37,943 | 1,656,990 |
| 2015 | June | 22,813 | 1,635,570 |
| 2015 | July | 208,034 | 3,063,913 |
| 2015 | August | 60,826 | 2,438,362 |
| 2015 | September | 0 | 2,558,138 |
| 2015 | October | 94,938 | 3,535,893 |
| 2015 | November | 13,451 | 2,965,947 |
| 2015 | December | 214,260 | 4,793,191 |
| 2016 | January | 75,015 | 4,458,886 |
| 2016 | February | 1,454 | 3,002,898 |
| 2016 | March | 131,067 | 3,152,072 |
| 2016 | April | 73,292 | 2,754,800 |
| 2016 | May | 17,626 | 2,736,860 |
| 2016 | June | 100,630 | 3,696,335 |
| 2016 | July | 32,207 | 3,747,988 |
| 2016 | August | 19,821 | 3,256,920 |
| 2016 | September | 142,130 | 3,421,348 |
| 2016 | October | 64,057 | 4,045,317 |
| 2016 | November | 151,286 | 4,195,402 |
| 2016 | December | 478,634 | 6,066,568 |
| 2017 | January | 542,288 | 6,964,620 |
| 2017 | February | 117,503 | 4,794,304 |
| 2017 | March | 6,597 | 3,601,852 |

## ANNEX 3

## Historical Data of the Maximum Balancing Gas Quantity and the Booked Reception Transmission Capacity of Users

| Month | Year | Maximum Balancing Gas Quantity (MWh/Day) | Sum of Booked Reception Transmission Capacity of all Users during the Day of the Maximum Balancing Gas Quantity (MWh/Day) |
|---|---|---|---|
| Januray | 2015 | 22,403.849 | 237,284.175 |
| | 2016 | 17,822.103 | 202,560.240 |
| | 2017 | 48,013.217 | 214,206.300 |
| February | 2015 | 22,190.280 | 201,680.861 |
| | 2016 | 955.569 | 159,780.820 |
| | 2017 | 11,562.495[3] | 198,229.448 |
| March | 2015 | 18,742.249 | 174,709.615 |
| | 2016 | 22,917.471 | 140,134.730 |
| | 2017 | 4,850.896 | 178,267.409 |
| April | 2014 | 35,570.048 | 96,729.800 |
| | 2015 | 22,109.858 | 160,692.815 |
| | 2016 | 22,534.280 | 132,702.807 |
| May | 2014 | 16,652.215 | 102,048.800 |
| | 2015 | 9,801.407 | 156,597.785 |
| | 2016 | 10,959.804 | 148,415.807 |
| June | 2014 | 16,943.989 | 125,416.000 |
| | 2015 | 156,597.785 | 143,191.815 |
| | 2016 | 15,130.269 | 163,851.227 |
| July | 2014 | 34,592.621 | 107,557.000 |
| | 2015 | 28,547.658 | 138,710.185 |
| | 2016 | 23,178.977 | 189,064.970 |
| August | 2014 | 12,099.019 | 119,185.000 |
| | 2015 | 24,592.738 | 135,671.815 |
| | 2016 | 9,181.212 | 165,872.307 |
| September | 2014 | 14,825.781 | 122,964.000 |
| | 2015 | 0 | 0 |
| | 2016 | 23,152.507 | 173,516.277 |
| October | 2014 | 23,752.580 | 136,268.140 |
| | 2015 | 19,948.877 | 158,517.925 |
| | 2016 | 22,221.044 | 189,817.520 |
| November | 2014 | 33,585.641 | 157,920.300 |
| | 2015 | 10,265.328 | 125,961.945 |
| | 2016 | 20,681.216 | 169,003.460 |
| December | 2014 | 25,530.572 | 177,042.600 |
| | 2015 | 32,000.601 | 177,113.495 |
| | 2016 | 41,742.996 | 230,850.060 |

[3] *It is noted that the Balancing Gas Quantity required on 13.02.2017, .e. 32,321.041 MWh, was not taken into consideration due to Alert Status 2 in the NNGS during the said Day. The Balancing Gas Quantity required on 20.02.2017, i.e. 11,562.495 MWh, was used for the calculations.*