Hellenic Gas Transmission System Operator

Annual Planning of Load Balancing for 2015

April 2014

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 load 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 "Network Code"), referring to the Annual Planning of Load Balancing and the Operational Gas Offsetting.

In terms of Paragraph 1.A, Article 46 of NNGS Network Code, the Operator submits to the Regulatory Authority of Energy (RAE) the Annual Planning of Load Balancing for the following Year (as well as any amendment) that is approved by RAE and published by the Operator. Furthermore, in accordance with the provisions of paragraph 1.C of Article 46 of the Code, the Operator proposes to RAE related to its Booked Balancing Gas Capacity in the NNGS.

With its aforementioned authority, the Operator signs load balancing contracts in accordance with the approved (by RAE) Annual Planning of Load Balancing, either after a tender or in terms of Paragraph 2.c, Article 68 of the Law 4001/2011.

In terms of Paragraph 2 of Article 46 of Network Code, the Annual Planning of Gas Balancing includes in particular: (a) Forecasts of the Operator for the development of Natural Gas demand per category of Customers and the Stated Transit 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.

According to the Paragraph 3 of Article 46 of the Network Code, for the development of Planning, the Operator takes into consideration particularly the NNGS Development Plan, the Annual Planning for Gas Balancing, the total demand of Natural Gas served via the NNGTS, the geographic distribution of consumptions, the elimination of technical limitations concerning the operation of the System and, particularly, each event that has lead, or is going to lead, as per his discretion to a 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 National Transmission System by the Operator during 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 authority and liability, the Operator secures the balance, taking into consideration the losses and the stored quantities of Natural Gas in the National Transmission System.

The Natural Gas National Transmission System undertakes the following balancing acts so as:

a) to maintain the Transmission Network within the operational limits, and

β) to 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 of the Natural Gas Transmission Network shall take into account the following, concerning the Balancing Zone:

a) estimations of the Natural Gas Transmission Network Operator relating to the Natural Gas demand,

b) Daily Nominations of Natural Gas and information about the allocation and the calculated Natural Gas flows, and

c) the Gas pressure in the Natural Gas Transmission Network.

3. Forecast for Natural Gas demand in Year 2015

Taking into consideration the NNGS Development Study for the years 2014-2023, the historical data of Natural Gas consumption in NNGTS, the Users' estimation of Natural Gas consumptions for the Year 2015 and the expected completion dates of the ongoing and scheduled expansion projects in NNGTS, it is estimated that the Natural Gas consumption will reach at **3.522 mil. Nm^3** in Year 2015. The estimated Natural Gas consumption per consumer category is presented in more detail in Table 1.

2015	Power Production (Nm^3)	Other Consumers (Nm^3)	Total Consumption (Nm^3)
January	184,161,988	230,819,609	414,981,597
February	113,901,718	193,374,778	307,276,496
March	168,797,288	169,285,332	338,082,620
April	106,455,810	104,471,815	210,927,625
May	122,123,580	92,826,077	214,949,657
June	118,100,247	76,573,237	194,673,484
July	244,427,118	77,668,623	322,095,741
August	205,296,684	68,923,600	274,220,284
September	217,983,916	97,438,707	315,422,623
October	159,246,208	102,543,783	261,789,991
November	192,574,327	131,248,675	323,823,002
December	155,068,638	188,387,176	343,455,814
Total	**1,988,137,522**	**1,533,561,412**	**3,521,698,934**

Table 1: Forecast of Natural Gas consumption per consumer category in Year 2015

4. Natural Gas Balancing Quantities

During the current Year, as in previous Years, the calculation of the Balancing Gas is Daily performed, taking into consideration the total Natural Gas Quantity that is measured at the Entry Point 'Agia Triada' of the National Transmission System during that Day and the total LNG quantity declared to be injected into the National Transmission System during the same Day for all the Users that have a contract with the Operator for the utilization of the LNG facility. Hence, the quantity of Balancing Gas generally depends on the daily declared nominations of Natural Gas Deliveries and Off-takes that are submitted by the Transmission Users to the Operator every day and the real daily needs of the consumers.

In the Diagram 1 below, the Monthly of Balancing Gas Quantities that were injected into the NNGTS is shown, as a percentage of the relative Monthly Natural Gas Off-Takes for the period of 04/2011 to 03/2014.

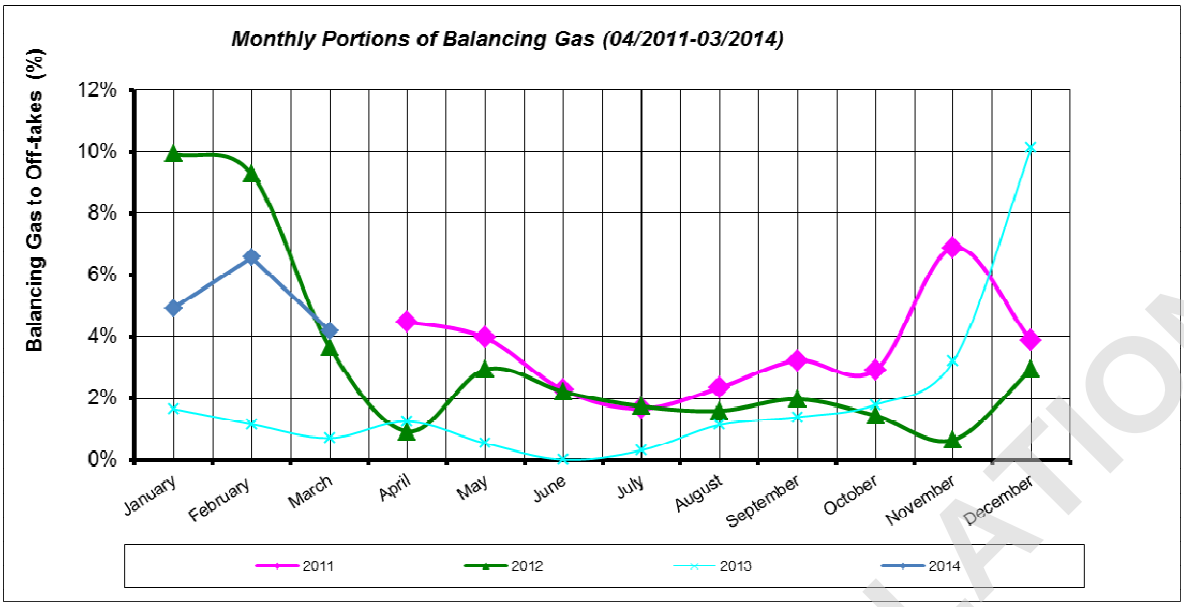

Diagram 1: Monthly Portions of Balancing Gas to Total Natural Gas Off-takes in Time Period 04/2011 –03/2014

Taking the above into consideration, so as DESFA will extract as possible a reliable assessment concerning the Balancing Gas Quantity that will be demanded during the Year 2015, the methodology described below was followed:

- Calculation of mean value ($\overline{x\%}$) for the sample of the fifty-one (36) values of the Balancing Gas during the period of 04/2011-03/2014 (see Annex 2) for each Month. It is noted that during March 2014 the Balancing Gas Quantities and the Total Natural Gas Off-takes are estimated, due to that this report was conducted before the certification of the Natural Gas Quantities of that Month. The results of the calculation are presented in Table 2 below:

Month	$(\overline{x})\%$
January	5.51
February	5.67
March	2.86
April	2.23
May	2.49
June	1.50
July	1.24
August	1.70
September	2.20
October	2.06
November	3.59
Devember	5.65

Table 2

- Calculation of the estimated Balancing Gas for each Month of the Year 2015 by multiplying the average participation rate of the Balancing Gas and the relative Monthly Natural Gas Off-Takes during the period of 04/2011-03/2014 (see Table 2 above) to the Operator's estimations related to the Monthly Natural Gas Off-Takes in the NNGTS during the Year 2015 (see Table 1 above).

Taking into consideration the above method and the demand of Natural Gas in Year 2015 (see Table 1 above), the Operator's estimation for the monthly distribution of Balancing Gas in Year 2015 is calculated and listed in Table 3 - overall Table with the Operator's forecast for the monthly demand of Natural Gas per consumption category and estimation for the balancing gas in Year 2015 is given in Annex 1.

Finally, taking into consideration the consumption historical data and the expected penetration of Natural Gas in the home, commercial, industrial and power production section (new units), it is estimated **that the maximum daily consumption in Year 2015 will reach at 219,000 MWh (approximately 19,200,000 Nm^3).**

Month in 2015	Balancing Natural Gas (Nm^3)[1]	Balancing Natural Gas (MWh)
January	22,865,486	260,588
February	17,422,577	198,558
March	9,669,163	110,195
April	4,703,686	53,606
May	5,352,246	60,997
June	2,920,102	33,279
July	3,993,987	45,518
August	4,661,745	53,128
September	6,939,298	79,084
October	5,392,874	61,460
November	11,625,246	132,488
December	19,405,253	221,153
Total	**114,951,663**	**1,310,054**

Table 3: Estimation of the Balancing Gas quantities allocation in Year 2015

5. Capacity Reservation in LNG Facility for Load Balancing in 2015

For the Current Year (as also for the previous Years), the NNGTS balancing need are covered by the Entry Point "AGIA TRIADA". For the Year 2015 the Operator, taking into account:

[1] *For the reduction of volume units (Nm^3) to energy units (MWh) the average (relative to flow) Gross Calorific Value for the Year 2013 was, i.e. 11,40 MWh / 1000 Nm^3.*

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 works,

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

vi. The availability of Balancing Gas procurement from more than one Suppliers,

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

The Operator, taking into account (i) the approved Pricing Regulation, which is active since 01.02.2013 and (ii) the strong variation of the required Daily Natural Gas quantities during a Year, proposes the methodology of determining the portion of the NNGS Capacity that should be booked for Balancing Gas during the Year 2015, considering the NNGS efficient and economic operation and improve the level of provided Transmission services and LNG Facility Use to the User. Below, the estimated maximum Daily quantity of Balancing Gas per Month for the Year 2015 is presented, considering the seasonal variations shown, the historical data, that size and accordingly determines the LNG Regasification Capacity and the Deliveries Transmission Capacity that should be booked in the Entry Point "AGIA TRIADA" for Balancing purposes per Month in the Year 2015. In this way the portion of NNGS that needs to be booked for Balancing Gas purposes during that year is estimated with the utmost precision and the available, for the Users, Transmission and Regasification Capacity is maximized.

The Operator, taking into account the historical data of thirty-six (36) Months (see Appendix) of the period from 04/2011 to 03/2014 and correlating the Daily Balancing Gas Quantity per Month with the corresponding sum of the Users Booked Transmission Capacity, recommends the application of the following methodology for the calculation of the Monthly Booked LNG Regasification Capacity and the Delivery Transmission Capacity in the Entry Point "AGIA TRIADA" for Balancing Gas During the Year 2015:

$$\Delta E_{M,2015} = OA_{M,2015} * E\Delta M_{M,2015}$$ [2]

[2] *For the calculation of the Monthly Booked Regasification Capacity of the LNG Facility for the Months April to December of the Year 2015 the historical data of the Years 2011, 2012 and 2013 was taken into account due to lack of past data for the*

where:

- $$OA_{M,2015} = \frac{\frac{AQ_{\text{EΞ(max)}_{M,2014}}}{\Delta \text{M}_{M,2014}} + \frac{AQ_{\text{EΞ(max)}_{M,2013}}}{\Delta \text{M}_{M,2013}} + \frac{AQ_{\text{EΞ(max)}_{M,2012}}}{\Delta \text{M}_{M,2012}}}{3}$$

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

- $\Delta \text{M}_{\text{M,Y}}$: the sum of the Booked Transmission Capacity (MWh/Day) that was booked by all Users, according to the Transmission Contracts that were signed with the Operator, during the Day of the maximum Daily Balancing Gas Quantity during the Month M of the Year Y, and

- $\text{E}\Delta \text{M}_{M,2015} = \frac{(\Delta \text{M}_{M,2014} + \Delta \text{M}_{M,2013} + \Delta \text{M}_{M,2012})}{3}$.

Based on the above methodology, the Operator proposes the Monthly Regasification Capacity Booking at the LNG Facility ($\Delta \text{E}_{M,2015}$)and equal Transmission Capacity at the relevant Entry Point "AGIA TRIADA", for Balancing Gas purposes during the Year 2015, according to the following Table 4:

Month of the Year 2015	Monthly Regasification Capacity Booking at the LNG Facility and equal Transmission Capacity at the relevant Entry Point "AGIA TRIADA" ($\Delta \text{E}_{M,2015}$) (MWh/Day)
January	**42,988**
February	**29,585**
March	**18,743**
April	**17,274**
May	**18,081**
June	**13,447**

corresponding Months of the Year 2014.

July	**18,416**
August	**21,750**
September	**14,767**
October	**11,937**
November	**29,103**
December	**28,085**

Table 4

6. Balancing Gas Contract

Aiming at the orderly, economical and efficient operation of the NNGS, during the Year 2015, the Operator will sign a contract with a N.G. supplier, who will be chosen after an international bid, as it is defined in paragraph 2c in the article 68 of the Law 4001/2011 and in paragraph 2 in the article 47 of the Natural Code, for the supply of Balancing Gas during the time period 01.01.2015 08:00 – 01.01.2016 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 relative Operator to the prequalified Shippers. The choice of Shipper will be based on criteria that will be specified in the contract-framework 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 Storage Area of LNG Facility,
- the ever increasing demand (from Users' sides) for access to the LNG Facility,
- the requirements in the Network Code of NNGS and particularly in Chapter 11 for the terms of access to the LNG Facility (Temporary LNG Storage Period. Minimum Regasification Capacity),
- the size of LNG vessels that are available in the LNG Market,

in the LNG supply Contract-Framework for Balancing Gas, the authority of the Operator to specify the LNG quantity and the time delivery for balancing purposes will be established, so that the smooth operation of the Greek Natural Gas market is not upset, in accordance with the requirement of the Network Code of NNGS. Given the lack of confirmation of the Operator's estimations relating to the

Natural Gas Quantities demanded for the Year 2015 for Balancing and the procedure of choosing the final Shipper, the abovementioned contract will not contain imposing restrictions such as minimum supply quantity or payment clauses irrespective of LNG off-takes.

ANNEX 1

Operator's forecast for Monthly Demand of Natural Gas per Consumption Category and Estimation of Balancing Gas in Year 2015

2015	Power Generation	Other Consumers	Total Consumption		Balancing Gas	
	Nm^3	Nm^3	Nm^3	MWh	Nm^3	MWh
January	184,161,988	230,819,609	414,981,597	4,729,369	22,865,486	260,588
February	113,901,718	193,374,778	307,276,496	3,501,899	17,422,577	198,558
March	168,797,288	169,285,332	338,082,620	3,852,984	9,669,163	110,195
April	106,455,810	104,471,815	210,927,625	2,403,852	4,703,686	53,606
May	122,123,580	92,826,077	214,949,657	2,449,690	5,352,246	60,997
June	118,100,247	76,573,237	194,673,484	2,218,611	2,920,102	33,279
July	244,427,118	77,668,623	322,095,741	3,670,788	3,993,987	45,518
August	205,296,684	68,923,600	274,220,284	3,125,172	4,661,745	53,128
September	217,983,916	97,438,707	315,422,623	3,594,737	6,939,298	79,084
October	159,246,208	102,543,783	261,789,991	2,983,509	5,392,874	61,460
November	192,574,327	131,248,675	323,823,002	3,690,473	11,625,246	132,488
December	155,068,638	188,387,176	343,455,814	3,914,220	19,405,253	221,153
Total	**1,988,137,522**	**1,533,561,412**	**3,521,698,934**	**40,135,304**	**114,951,663**	**1,310,054**

Note:

For the conversion from volume units (Nm^3) to energy units (MWh), the weighted average (regarding the flow rate) of the Gross Heating Value for the Year 2013, 11.40 MWh /1,000 Nm^3, is used.

ANNEX 2

Historical Data of Balancing Gas in time period 04/2011-03/2014

Year	Month	Balancing Gas (MWh)	Total Natural Gas Off-takes (MWh)
2011	April	178,887	3,984,368
2011	May	153,446	3,868,713
2011	June	89,051	3,922,048
2011	July	79,691	4,769,537
2011	August	87,502	3,724,042
2011	September	128,011	3,959,608
2011	October	113,459	3,878,824
2011	November	327,457	4,752,485
2011	December	182,212	4,703,444
2012	January	571,458	5,751,140
2012	February	513,634	5,542,416
2012	March	169,225	4,618,416
2012	April	28,012	2,987,063
2012	May	94,858	3,221,059
2012	June	65,280	2,939,329
2012	July	68,602	3,931,588
2012	August	51,433	3,216,331
2012	September	67,153	3,392,642
2012	October	47,074	3,256,661
2012	November	22,637	3,370,714
2012	December	143,331	4,859,392
2013	January	72,030	4,338,906
2013	February	43,303	3,704,069
2013	March	23,036	3,170,101
2013	April	33,604	2,663,735
2013	May	15,163	2,764,231
2013	June	733	3,450,947
2013	July	12,128	3,797,580
2013	August	40,536	3,529,914
2013	September	46,614	3,343,058
2013	October	54,734	3,047,919
2013	November	97,268	3,022,643
2013	December	478,531	4,726,813
2014	January	190,417	3,872,371
2014	February	226,574	3,447,859
2014	March (estimation)[3]	116,535	2,785,774

[3] *It is noted that during March 2014 the Balancing Gas Quantities and the Total Natural Gas Off-takes are estimated, due to that this report was conducted before the certification of the Natural Gas Quantities of that Month.*

ANNEX 3

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

Month	Year	Maximum Balancing Gas Quantity (MWh/Day)	Sum of Booked Capacity of all Users during the Day of the Maximum Balancing Gas Quantity (MWh/Day)
Januray	2012	68,488.174	321,898.073
	2013	21,359.393	345,420.059
	2014	34,618.181	204,051.000
February	2012	47,412.710[4]	321,898.073
	2013	11,063.306	224,425.170
	2014	30,180.088	175,252.000
March	2012	26,285.920	328,057.237
	2013	9,317.808	207,891.000
	2014	18,605.522	158,241.299
April	2011	42,489.075	280,689.363
	2012	7,525.117	263,889.237
	2013	5,850.678	195,756.000
May	2011	21,105.546	280,689.363
	2012	18,105.618	306,529.529
	2013	14,114.170	187,689.000
June	2011	30,639.622	280,587.603
	2012	12,737.126	282,106.059
	2013	172.271	213,083.000
July	2011	26,087.127	280,587.603
	2012	18,356.632	343,545.755
	2013	11,096.858	212,938.000
August	2011	36,060.938	280,587.603
	2012	19,662.496	343,230.755
	2013	10,160.157	212,708.000
September	2011	15,415.263	280,587.603
	2012	19,835.461	327,976.059
	2013	9,482.776	196,914.000
October	2011	12,376.002	299,897.073
	2012	7,383.802	281,791.059
	2013	13,631.348	196,802.000
November	2011	30,910.846	307,893.100
	2012	7,396.172	281,791.059
	2013	42,074.206	211,310.000

[4] *Note that the Balancing Gas quantity on 03.02.2012, i.e. 66.590,310 MWh was not taken into account due to assessment of Emergency in the NNGS during that Day and the next Balancing Gas value of 47,412.710 MWh, held on 07.02.2012 was used for the calculations.*

December	2011	25,482.058	329,897.073
	2012	25,959.609	302,105.059
	2013	30,555.324[5]	236,603.000

[5] *It is noted that the Balancing Gas Quantity on 12.12.2013, i.e. 71,976.300 MWh was not taken into consideration due to Early Warning situation in the NNGS that Day and the next amount of 30,555.324 MWh of Balancing Gas was used that took place on 05.12.2013*