DESFA

Hellenic Gas Transmission System Operator

Annual Planning of Load Balancing for 2012 and Load Balancing Update for 2011

May 2011

1. Introduction

The present plan is developed in terms of Paragraph 2.c of Article 8 of Act 3428/2005 that assigns liability to the Hellenic Gas Transmission System Operator (DESFA) S.A. for balancing the load of the National Natural Gas System (NNGS) as per the provisions in its Network Code. 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. In terms of Paragraph 1.C of Article 46 of Network Code, the Operator proposes the capacity portion of NNGS to be reserved for load balancing.

With its aforementioned authority, the Operator signs load balancing contracts in accordance with the approved (by RAE) annual load balancing planning, either after a tender or in terms of Paragraph 1, Article 38 of Act 3428/2005.

In terms of Paragraph 2, Article 46 of Network Code of NNGS, the Annual Planning of Load Balancing mainly includes: (i) forecast of the Operator for the level of demand of Natural Gas per customer category and the declared transfer nominations in relation to the existing Transmission Capacity of the Transmission System. (ii) forecast for the required quantities of Natural Gas for load balancing, like the total annual quantity of Natural Gas for balancing, the maximum supply and the maximum daily quantity of Natural Gas for balancing and (iii) specification of the required aspects of the load balancing contract, or set of contracts, required to be ex ecuted by the Operator.

The Annual Planning of Load Balancing is reviewed by the Operator if, its view, there is to be significant modification in the way NNGS operates, such as new additional transmission and LNG contracts, changes in the geographical distribution of the load, significant changes in the availability of NNGS equipment, start of operation of new equipment, substantial change in the demand of Natural Gas, etc.

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 l iability, the Operator secures the balance, taking into consideration the losses and the stored quantities of Natural Gas in the National Transmission

System. For the time being, the balancing requirements of the National Transmission System are met only by means of the Liquefied Natural Gas (LNG) on the island of Revythousa.

3. Updated forecast for Natural Gas demand in Year 2011

Taking into consideration the rise in the Natural Gas demand the first four (4) Months of the Year 2011, which is due to the greater use of Natural Gas as fuel either in the domestic home consumption or in the domestic electricity production, the historical data of Natural Gas consumption in NNGS and the continuous maturation of the liberation of the Natural Gas market, there is an update in the forecast of Natural Gas in Year 2011 to the point of **4,441 mil. Nm^3** (instead of 3,777 mil. Nm^3 that was shown in the approved RAE decision no. 1784/2010 for the Load Balancing in Year 2011). The estimated Natural Gas demand per consumer category is presented in more detail in Table 1.

Month of Year 2011	Power Production Nm^3	Peak Power Production Nm^3	Other Consumers Nm^3	Total Consumption Nm^3
January	225,252,391	169,719	170,650,912	396,073,021
February	204,942,069	156	164,112,468	369,054,693
March	264,580,127	157	166,990,262	431,570,547
April	228,632,227	32	120,015,443	348,647,701
May	237,350,854	0	99,766,036	337,116,891
June	238,966,010	0	102,470,560	341,436,570
July	262,592,877	0	95,717,592	358,310,469
August	252,893,147	0	72,779,477	325,672,624
September	232,592,395	0	124,886,684	357,479,079
October	238,804,887	0	130,258,083	369,062,970
November	236,138,378	0	162,245,818	398,384,196
December	239,966,711	0	168,633,986	408,600,697
Total	**2,862,712,074**	**170,063**	**1,578,527,320**	**4,441,409,457**

Table 1: Forecast for Natural Gas demand per consumer category in Year 2011

In the estimation of Natural Gas demand for the Year 2011 the following assumptions are taken into consideration:

- It is considered that during the end of the Year 2011 the industrial installations of the company "ALOYMINION S.A." at Antikira in Viotia, which consume fuel oil for the time being, will be supplied with Natural Gas. It is estimated that the Natural Gas consumption in Year 2011 will rise to 70 mil. Nm^3

- Finally, for the time being, the only NNGS peak power producer is HERON and its consumption is directly related to the needs of the Electric Power System. From historical data it is observed that during the last Months, it is not put into operation and therefore it is considered zero for the rest Months also.

4. Natural Gas demand forecast in Year 2012

Taking into consideration the historical data of Natural Gas consumption in NNGTS, the updated data of consumption forecast in Year 2011 and the expected completion dates of the ongoing and scheduled expansion projects in NNGTS, it is estimated that the Natural Gas consumption in Year 2012 will reach at **4,646 mil. Nm^3**. The estimated Natural Gas consumption per consumer category is presented in more detail in Table 2,

Month of Year 2012	Power Production Nm^3	Peak Power Production Nm^3	Other Consumers Nm^3	Total Consumption Nm^3
January	244,370,945	0	187,626,928	431,997,872
February	233,617,684	0	176,314,998	409,932,682
March	233,606,986	0	160,833,189	394,440,176
April	231,006,129	0	125,063,204	356,069,333
May	242,873,218	0	108,857,525	351,730,743
June	247,302,321	0	114,949,070	362,251,391
July	271,315,925	0	109,129,661	380,445,586
August	260,492,723	0	85,502,636	345,995,359
September	239,322,860	0	132,667,421	371,990,281
October	243,375,573	0	148,331,007	391,706,580
November	242,268,911	0	178,954,373	421,223,284
December	246,098,925	0	182,387,624	428,486,549
Total	**2,935,652,200**	**0**	**1,710,617,635**	**4,646,269,836**

Table 2: Forecast of Natural Gas consumption per consumer category in Year 2012

For the estimation of Natural Gas consumption in Year 2012 the following assumptions were taken into consideration:

- During the Year 2012, two (2) new combined cycle power plants fueled by Natural Gas will be added. More specifically, the 400 MW unit "ALIVERI V" of Public Gas Corporation at Aliveri in Evia and the 437 MW unit "Corinthos Power" at Corinthos.

- The yearly Natural Gas consumption in the industrial installations of the "ALOYMINION S.A." company will reach at 120 mil. Nm^3 for the Year 2012.

- The yearly Natural Gas consumption of peak power generators will be zero in Year 2012.

- The connection to the NNGTS of the power plant unit of 850 MW at Megalopolis and the start of its test operation will nearly take place at the end of Year 2012.

5. Balancing Natural Gas Quantities

Resolution No 2129/2008 of RAE specifies the calculation method of LNG quantity, which after regasification is utilized by the Operator for load balancing of the National Transmission System.

The calculation of the balancing gas is performed at the end of each day according to Annex 1, Article 2 of Resolution No 2129/2008 of RAE, taking into consideration the total quantity of Natural Gas that is measured at the Entry Point 'Agia Triada' of the National Transmission System during that Day and the total quantity of LNG 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 deliveries and off-takes of Natural Gas that are submitted by the Transmission Users to the Operator every day and the real daily needs of the consumers.

In Table 3 below, historical data of Natural Gas Off-takes and Balancing Gas in time period 01/2008 – 04/2011 are presented, while in Diagram 1 the Monthly portions of the total Natural Gas Off-takes are presented during the same period.

Historical Data of Balancing Gas in time period 01/2008 – 04/2011			
Year	***Month***	***Balancing Gas (MWh)***	***Total Natural Gas Off-takes (MWh)***
2008	January	306,337.95[1]	4,500,972.59
2008	February	80,916.51[1]	4,231,473.47
2008	March	140,589.28[1]	4,176,917.83
2008	April	185,696.29[1]	3,164,356.38
2008	May	96,295.32[1]	3,592,414.49
2008	June	241,146.81[1]	3,991,693.86
2008	July	184,741.79[1]	4,472,372.12
2008	August	137,181.87[1]	3,850,221.56
2008	*September*	*61,759.13*	*3,801,935.80*
2008	*October*	*88,533.81*	*3,124,133.19*
2008	*November*	*66,880.04*	*2,945,020.44*
2008	*December*	*142,696.77*	*3,295,346.25*
2009	***January***	***1,506,613.07[2]***	***3,231,725.60***
2009	*February*	*196,341.04*	*2,740,043.39*
2009	*March*	*113,386.66*	*2,367,662.27*
2009	*April*	*241,152.40*	*2,249,339.40*
2009	*May*	*77,528.88*	*2,977,330.49*
2009	*June*	*54,486.59*	*2,929,149.60*
2009	*July*	*89,210.23*	*3,463,468.50*
2009	*August*	*226,917.86*	*3,040,362.18*
2009	*September*	*123,864.07*	*3,288,252.36*
2009	*October*	*113,013.27*	*3,792,675.94*

[1] For Year 2008 the assumption of applying the balancing procedures from the beginning of the year is introduced in order to calculate the balancing gas for the months of 2008, in which there was no contract of natural gas sale from DEPA to DESFA for balancing purposes.

[2] The contribution of balancing gas in January 2009, during the dispute between Russia and Ukraine, is not included in any calculation.

2009	November	182,950.93	3,870,229.17
2009	December	155,648.33	3,993,177.62
2010	January	269,670.85	3,944,192.61
2010	February	51,321.25	3,540,047.71
2010	March	53,208.93	3,409,219.38
2010	April	60,663.09	2,911,372.26
2010	May	99,018.47	3,178,857.66
2010	June	50,595.86	2,827,402.89
2010	July	242,961.47	3,720,294.65
2010	August	174,982.17	4,083,913.00
2010	September	67,278.75	3,019,067.00
2010	October	153,451.26	3,669,285.00
2010	November	100,476.25	3,180,865.00
2010	December	300,736.22	4,062,802.00
2011	January	320,768.77	4,505,776.00
2011	February	229,454.70	4,208,617.00
2011	March	177,743.89	4,955,267.00
2011	April	178,887.00	3,984,367.71

Table 3: Balancing Gas historical data for the period 01/2008 – 04/2011

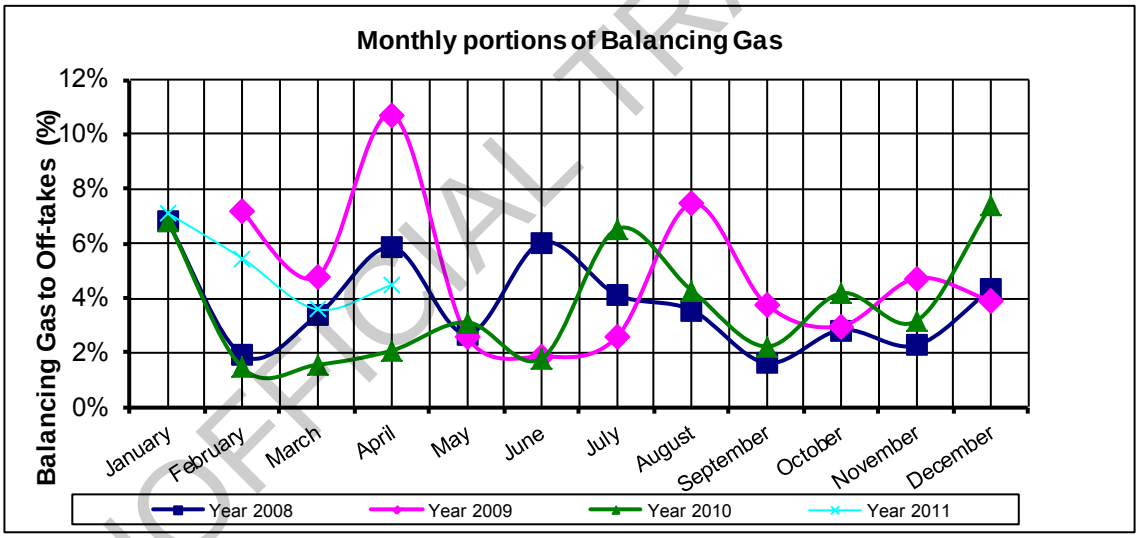

Diagram 1: Monthly Portions of Balancing Gas to Total Natural Gas Off-takes in Time Period 01/2008 – 04/2011 (01/2009 is not included),

Taking the above into consideration, so as DESFA will do as possible a reliable assessment concerning the balancing gas quantity that will be demanded during the Years 2011 and 2012, the methodology described below was followed:Computation of mean value ($\overline{x\%}$) and of standard error of the mean value ($\sigma_{\overline{x\%}}$) and their sum $\left(\overline{x}+\sigma_{\overline{x}}\right)\%$ for the sample of the thirty-nine (39) values of the Balancing Gas in the Table 3 above (January 2009 not included) for each Month according to the Table 4 below:

Month	$(\bar{x})\%$	$(\sigma_{\bar{x}})\%$	$\left(\bar{x}+\sigma_{\bar{x}}\right)\%$
January	6.92%	0.10%	7.02%
February	3.99%	1.38%	5.38%
March	3.33%	0.67%	3.99%
April	5.79%	1.82%	7.61%
May	2.80%	0.16%	2.96%
June	3.23%	1.41%	4.64%
July	4.41%	1.15%	5.56%
August	5.10%	1.20%	6.30%
September	2.54%	0.64%	3.18%
October	3.33%	0.43%	7.76%
November	3.39%	0.72%	4.10%
December	5.21%	1.10%	6.31%

Table 4: Mean value, standard error for mean value and their sum for the historical data for every Month of previous Years

Because of the uncertainly introduced by the lack of historical data on the actions of new Users and their Suppliers, it is selected to use the maximum estimated probability for the balancing gas. i,e, $BG = \left(\overline{x\%} + \sigma_{\overline{x\%}}\right) \cdot NGO$, where NGO refers to the Operator's estimate for Natural Gas off-takes at all the Exit Points of the National Transmission System in Year 2011, as presented in Table 1. It is noted that the above increase of the balancing gas with respect to the overall consumption is justified by the introduction of new consumers in the south part of the National Transmission System that results in more unequal distribution of Natural Gas loads between north and south.

Taking into consideration the above method and the demand of Natural Gas in Year 2011 (see Tables 1 & 2), the Operator's estimation for the monthly distribution of balancing gas in Years 2011 & 2012 are computed and listed in Tables 5 & 6 (overall Tables with the Operator's forecast for the monthly demand of Natural Gas per consumption category and estimation for the balancing gas in Years 2011 & 2012 are given in Annexes 1 & 2, respectively).

Month in Year 2011	Natural Gas for Balancing purposes (MWh)
January (outturn)	*320,769*
February (outturn)	*229,455*
March (outturn)	*177,744*
April (outturn)	*178,887*
May	*111,719*
June	*177,281*
July	*223,237*
August	*229,863*
September	*127,227*
October	*155,381*

November	*183,102*
December	*288,914*
Total	***2,403,578***

Table 5: Re-estimation of Balancing Gas quantity allocation in Year 2011

Month in Year 2012	Natural Gas for Balancing purposes (MWh)
January	*339,669*
February	*246,968*
March	*176,349*
April	*303,513*
May	*116,562*
June	*188,088*
July	*237,028*
August	*244,207*
September	*132,392*
October	*164,914*
November	*193,599*
December	*302,975*
Total	***2,646,264***

Table 6: Estimation of the Balancing Gas quantities allocation in Year 2012

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 Years 2011 and 2012 will reach at 218,400 MWh** (about 19,500,000 Nm^3) **and at 235,200 MWh** (about 21,000,000 Nm^3), respectively.

6. Capacity Reservation in LNG Facility for Load Balancing in 2011

The Annex 1 of Resolution No 2129/2008 of RAE specifies the method of capacity reservation in LNG Facility by the Operator for load balancing of Users. Due to the fact that all the values for calculating the OA_y parameter are not available, the Operator, based on historical data, **proposes the reservation of 43,752 MWh as Gasification Capacity (GC) of LNG for balancing purposes in Year 2011**, as it is included in the Resolution No1784/2010 of RAE for the Load Balancing Planning in Year 2011.

7. Capacity Reservation in LNG Facility for Load Balancing in 2012

For Year 2012, following the definitions of the Annex 1 of the Resolution No 2129/2008 of RAE it is required to reserve 73,602 MWh as Gasification Capacity (GC) of LNG for balancing purposes in Year 2012.

Given thatm, according to the Resolution No 2129/2008, RAE considers that:

- For load balancing purposes the Operator constitutes a distinct User for the Entry Point "Agia Triada", and
- While exercising its powers, the Operator must reserve the absolutely necessary NNGS capacity, so as to ensure the task of providing balancing services to Users and to maximize the NNGS available capacity for reservation of Users.

And given that in the beginning of Year 2012 the Compressor Station at Nea Mesimvria at Thessaloniki will start its normal operations, which are expected to help in the optimization of the hydraulic stability of NNGTS and the minimization of the uncertainty that is imported by the behaviour of new consumers that have already or going to be connected to the southern part of NNGTS, the Operator proposes **the reservation of 48,127 MWh as Gasification Capacity (GC) of LNG for balancing purposes in Year 2012**, which means a rise of 10% considering the reservation of Year 2011 (see Paragraph 6 above), and not calculated to 73,602 MWh according to the Resolution No 2129/2008 of RAE.

8. Balancing Contract

For the period 01.01.2012 08:00 – 01.01.2013 08:00 and taking into consideration:

i. the topology and the construction properties of the National Natural Gas Transmission System,

ii. the technical, reserved and available capacity of the Entry Points of the National Natural Gas Transmission System,

iii. the geographical distribution of consumption in the National Natural Gas System,

iv. the progress in the expansion and upgrade projects in the National Natural Gas System,

v. the start of the commercial operation of the N. Mesimvria compressor, which, for the time being, is considered to take place the first quarter of the Year 2012 and not earlier than February 1st of the Year above,

vi. the connection of new consumers in the south part of the National Natural Gas

System,

it is considered appropriate for the safe, smooth and efficient operation of the National Natural Gas System, the injection of Balancing Gas through the Entry Point “Agia Triada”.

Aiming at the orderly, economical and efficient operation of the NNGS, during the Year 2012, the Operator will sign a contract with a N.G. supplier, who will be chosen after an international bid, as it is defined in article 8 par.2.c of the Law 3428/2005, for the supply of Balancing Gas during the time period 01.01.2012 08:00 – 01.01.2013 08:00,

Due to:

- the restricted storage capacity of the 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 Storage Period. Minimum Regasification Capacity),
- the size of LNG container vessels that are available in the LNG Market,

in the LNG supply Contract, among others, 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, without 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 2011

Month in 2011	Power Generation	Peak Power Generation	Other Consumers	Total Consumption		Balancing Gas
	Nm^3	Nm^3	Nm^3	Nm^3	MWh	MWh
January (outturn)	*225,252,391*	*169,719*	*170,650,912*	*396,073,022*	*4,505,776*	*320,769*
February (outturn)	*204,942,069*	*156*	*164,112,468*	*369,054,693*	*4,208,617*	*229,455*
March (outturn)	*264,580,127*	*157*	*166,990,262*	*431,570,547*	*4,955,267*	*177,744*
April (outturn)	*228,632,227*	*32*	*120,015,443*	*348,647,701*	*3,984,368*	*178,887*
May	***237,350,854***	***0***	***99,766,036***	***337,116,891***	***3,775,709***	***111,719***
June	***238,966,010***	***0***	***102,470,560***	***341,436,570***	***3,824,090***	***177,281***
July	***262,592,877***	***0***	***95,717,592***	***358,310,469***	***4,013,077***	***223,237***
August	***252,893,147***	***0***	***72,779,477***	***325,672,623***	***3,647,533***	***229,863***
September	***232,592,395***	***0***	***124,886,684***	***357,479,079***	***4,003,766***	***127,227***
October	***238,804,887***	***0***	***130,258,083***	***369,062,970***	***4,133,505***	***155,381***
November	***236,138,378***	***0***	***162,245,818***	***398,384,196***	***4,461,903***	***183,102***
December	***239,966,711***	***0***	***168,633,986***	***408,600,697***	***4,576,328***	***288,914***
Total	***2,862,712,074***	***170,063***	***1,578,527,320***	***4,441,409,457***	***50,089,939***	***2,403,578***

Notes

1. For the conversion from volume units (Nm^3) to energy units (MWh), the assumption that 1,000 normal cubic meters of Natural Gas are thermally equivalent with 11.2 MWh is made.
2. For the time being, the only peak power generator of NNGTS is HERON and its consumption is directly related to the needs of the Electric Power System, therefore consumption estimation for peak power generation may only be provided on annual basis without distributing it monthly.

ANNEX 2

Operator's forecast for Monthly Demand of Natural Gas per Consumption Category and Estimation of Balancing Gas in Year 2012

Month in 2012	Power Generation	Peak Power Generation	Other Consumers	Total Consumption		Balancing Gas
	Nm^3	Nm^3	Nm^3	Nm^3	MWh	MWh
January	***244,370,945***	***0***	***187,626,928***	***431,997,872***	***4,838,376***	***339,669***
February	***233,617,684***	***0***	***176,314,998***	***409,932,682***	***4,591,246***	***246,968***
March	***233,606,986***	***0***	***160,833,189***	***394,440,176***	***4,417,730***	***176,349***
April	***231,006,129***	***0***	***125,063,204***	***356,069,333***	***3,987,977***	***303,513***
May	***242,873,218***	***0***	***108,857,525***	***351,730,743***	***3,939,384***	***116,562***
June	***247,302,321***	***0***	***114,949,070***	***362,251,391***	***4,057,216***	***188,088***
July	***271,315,925***	***0***	***109,129,661***	***380,445,586***	***4,260,991***	***237,028***
August	***260,492,723***	***0***	***85,502,636***	***345,995,359***	***3,875,148***	***244,207***
September	***239,322,860***	***0***	***132,667,421***	***371,990,281***	***4,166,291***	***132,392***
October	***243,375,573***	***0***	***148,331,007***	***391,706,580***	***4,387,114***	***164,914***
November	***242,268,911***	***0***	***178,954,373***	***421,223,284***	***4,717,701***	***193,599***
December	***246,098,925***	***0***	***182,387,624***	***428,486,549***	***4,799,049***	***302,975***
Total	***2,935,652,200***	***0***	***1,710,617,636***	***4,646,269,836***	***52,038,222***	***2,646,264***

Notes

1. For the conversion from volume units (Nm^3) to energy units (MWh), the assumption that 1,000 normal cubic meters of Natural Gas are thermally equivalent with 11.2 MWh is made.
2. For the time being, the only peak power generator of NNGTS is HERON and its consumption is directly related to the needs of the Electric Power System, which is calculated almost zero.