REPORT ON THE SECURITY OF NATURAL GAS SUPPLY IN GREECE

According to the provisions of article 4 of Law 3428/2005, concerning the Liberalisation of the Natural Gas Market

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REGULATORY AUTHORITY OF ENERGY
REPORT FOR THE COUNTRY'S SECURITY OF NATURAL GAS SUPPLY

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Foreword

This report is submitted within RAE's competences for the monitoring of the country's security of natural gas supply, according to the provisions of article 4 of Law 3428/2005 (Government Gazette A' 313, 27.12.2005) concerning the Liberalisation of the Natural Gas Market.

The security of supply is one of three pillars of the European Union's energy policy and one of the country's long-term energy planning aims, as they are determined in paragraph 1 of article 3, of Law 2773/1999. The long- and short-term energy sufficiency and its supply to consumers under reasonable conditions, including prices, require the safeguard of energy sources, the development of infrastructures and the smooth operation of the energy market. It is also clear, that the achievement of the desirable level of security of supply must take place within the framework and under the restrictions imposed during the simultaneous effort for the satisfaction of all the other aims of the energy policy, meaning the protection of the environment and the economy's competitiveness. Especially under the conditions of the national energy markets' liberalisation and unification, the security of supply is a complex matter, and its handling requires careful planning of the markets' operation and of the infrastructure development, as well as the balanced allocation of duties and obligations to all involved.

On a European level, the security of natural gas supply involves the added complication of it being an imported fuel by approximately 61% of gross consumption, with a forecast for an increase of this percentage to 73% in 2020[1]. This fact makes the constant monitoring of supply, demand and development of productive and transportation dynamics in the global natural gas market imperative, and adds to the matter the geopolitical factor.

The matter of security of supply is particularly complex for the natural gas sector in Greece, given the fact that it is an exclusively imported fuel, very recently added to the country's energy balance. The market's liberalisation and the sector's reorganization took place recently, while at the same time natural gas is a fuel that participates greatly to the production of electricity, and has a determinant importance to this market's competitiveness development, through the development of IPPs.

Within this framework, the aim of this first RAE's report is the charting of the existing situation concerning the security of supply, the estimate about the conditions which will emerge in the near and distant future and the submission of relevant proposals.

In the introductory section of this report, we present the institutional framework concerning the security of natural gas supply on a European and national level and the allocation of duties to all parties involved.

In the first section of the report, we examine the existing infrastructures' capacity and the capability of satisfying the demand for natural gas, including transit, we detect the National Natural Gas System's (NNGS) congestion points and we present possible ways and steps required for the maximization of its capacity.

In the second section of this report, we analyze the relationship between natural gas supply and demand in the country, on a short- and long-term basis, with the aim of

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[1] EU Energy Security and Solidarity Action Plan: 2nd Strategic Energy Review, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52008DC0781:EN:HTML:NOT

detecting a possible supply gap and an estimate about possible supply sources for the required additional quantities.

The third section of this report presents the different possibilities of handling and managing emergencies in the NNGS, as well as estimates about the possibility of handling such situations today, with reference to historical data.

Finally, in the fourth section of this report, we present RAE's conclusions, as well as proposals for the reinforcement of the security of supply level in the future.

In this report, the responsibility of which had RAE's Systems' Analysis Unit, we took under consideration the equivalent report of the Hellenic Gas Transmission System Operator, DESFA S.A. (hereinafter TSO), data which were supplied by the Public Gas Corporation (DEPA S.A.) and the three Gas Distribution Companies (EPA) in their five-year development plans, as well as every relevant fact at RAE's disposal, within its competences.

Moreover, the future demand for natural gas presented in the second section of this report, was estimated taking under consideration assumptions and calculations' results of several studies, such as the Study for the Development of the Transmission System for the period 2008-2012 by the electricity Hellenic Transmission System Operator (DESMIE S.A.), the 1st Report for Greece's Long-Term Energy Planning for the period 2008-2020, as well as the recent report under the title "Measures and means for a viable and competitive energy policy", by the National Energy Strategy Council.

The historical data included in this report concern the years up to 2007. Historical data concerning 2008 will be included in RAE's next report.

Michalis Karamanis

President of RAE

1. Introduction

Law No 3428/2005 (Government Gazette A' 313, 27.12.2005) concerning the liberalisation of the natural gas market (Law), sets the framework of the natural gas market in Greece. The Law transposed into the Greek legislation the Directive 2003/55/EC "concerning common rules for the internal market in natural gas" and the Directive 2004/67/EC "concerning measures to safeguard security of natural gas supply".

1.1 European legislation

The most important provisions of the aforementioned directives, from which arise the member states' obligations regarding the security of supply, are quoted below:

1.1.1 Directive 2003/55/EC

Member states:

- Shall implement appropriate measures to achieve the objective of security of supply. More specifically, such measures may include the provision of adequate economic incentives for the maintenance and construction of the necessary network infrastructure, including interconnection capacity.

- Shall ensure the monitoring of security of supply issues. They monitor, among other things, the supply/demand balance on the national market, the level of expected future demand and available supplies, as well as the envisaged additional capacity under planning or construction. The competent authorities shall publish a yearly report, outlining the findings resulting from the monitoring of such issues.

- In the event of a sudden crisis in the energy market, they may temporarily take the necessary safeguard measures. Such measures shall cause the least possible disturbance to the functioning of the market and shall not be wider in scope than is strictly necessary to remedy the sudden difficulties which have arisen.

1.1.2 Directive 2004/67/EC

Member states:

- Shall define, in establishing their general policies in respect to ensuring adequate levels of security of gas supply, the roles and responsibilities of the different gas market players and specify adequate minimum security of supply standards, which must be complied with by the players of the natural gas market. Such standards shall be implemented in a non-discriminatory and transparent way and shall be published.

- Shall ensure that supplies for household customers inside their territory are protected in the event of a partial disruption of natural gas supply at a national level, or extremely cold temperatures, or periods of exceptionally high gas demand, statistically occurring every 20 years. These criteria are referred to as "security of supply standards".

- Shall prepare in advance the national emergency measures, which they publish and communicated to the Commission. Such emergency measures

ensure, where appropriate, that market players are given sufficient opportunity to provide an initial response to the emergency situation.

- Shall participate to a Gas Coordination Group, with the objective of coordinating the security of supply measures within the European Union.

1.2 National legislation

The most important provisions of the national legislation, from which arise the competences of RAE and DESFA S.A. regarding the security of natural gas supply, are quoted below:

1.2.1 Competences of RAE

RAE is responsible for monitoring the country's security of natural gas supply. In this framework, RAE:

- Recommends the necessary measures and sets forth suggestions for the security of supply, taking under consideration data provided by the TSO, the customers and the natural gas companies.

- Prepares yearly this report, which summarises the relevant conclusions and recommendations.

1.2.2 Competences of the TSO

The TSO, as exclusively responsible for the operation, maintenance, development and utilization of the National Natural Gas System, among other things:

- Ensures the prompt and efficient handling of emergencies. For this reason, they prepare an Emergency and Crisis Management Plan. This plan is approved by the Minister of Development, following RAE's opinion.

- Compiles an interruption of natural gas supply schedule for customers, in the event of an emergency, which is approved by the Minister of Development, following RAE's opinion.

- Enters into contracts with major customers for the interruption of natural gas supply by priority, in the event of an emergency. This contract is signed mandatorily with the electricity production licensees who maintain stocks of alternative fuel.

- In the event of an emergency, interrupts by priority:

  o Unterruptible customers .

  o Other customers, according to the interruption schedule.

- Issues orders to Suppliers who supply not only Major Customers, so that, in the event of an emergency, they shall supply continuously natural gas to customers that are not Major Customers. For the fulfillment of this obligation, the aforementioned Suppliers are fully compensated, as provided for in their licenses.

- Collects a security of supply levy from the Users.

A. Infrastructure

2. National Natural Gas System

2.1 General Description

The National Natural Gas System (NNGS) includes the main high pressure gas transmission pipeline from the Greek-Bulgarian borders to Attica (Elefsina location Patima), the high-pressure branches linking various areas of the country with the main pipeline, including the branch connecting the main pipeline with the Greek-Turkish borders, the Liquefied Natural Gas (LNG) facility at Revythoussa island, as well as additional facilities and infrastructure that service the entire Gas Transmission System.

2.1.1 Natural Gas Transmission System (NGTS)

Natural Gas is injected to the NGTS through three Entry Points, Sidirokastro, located at the Greek-Bulgarian borders, Kipi Evros, located at the Greek-Turkish borders, and Agia Triada, on the coast opposite to Revythoussa island. Table 1 describes the capacity of all the Entry Points, before and after the ongoing upgrade in Sidirokastro and Agia Triada Entry Points.

Table 1: Existing and future capacity of NGTS Entry Points

Entry Point	Before the Upgrade	After the upgrade
Sidirokastro	437 x 10^3 Nm^3/h	660 x 10^3 Nm^3/h
Kipi Evros	856 x 10^3 Nm^3/h	-
Agia Triada	260 x 10^3 Nm^3/h	580 x 10^3 Nm^3/h

2.1.2 LNG facility at Revythoussa island

Revythoussa LNG facility is the third Entry Point of the NGTS and contributes significantly to the security of supply, through its storage capacity, as well as through the possibility it offers to the Greek market to diversify its' supply sources. The LNG facility consists of:

1. Two storage tanks, with a total capacity of 135,000 m^3 LNG (useful capacity 126.500 m^3).

2. Vaporization Units with total capacity of 1,000 m^3 LNG/hour (about 14 million Nm^3/day).

3. A twin offshore pipeline of 600m length and 24" diameter, which connects the LNG terminal with the NGTS.

4. Facilities for unloading ships with maximum length of 290m, draught which does not exceed the difference [12.7m - 10% x vessel draught] for berthing and under keel clearance (distance between the keel and the sea bottom) of at least 1 m.

2.2 NGTS Transmission Capacity

2.2.1 *Theoretical import capacity of natural gas to the NGTS*

The theoretical maximum annual import capacity of the NGTS is calculated from the hourly capacity of all Entry Points (Table 1). Values in Table 2 are in billion cubic meters (bcm) per annum and are calculated based on the assumption of a 90% annual load factor .

Table 2: Theoretical import capacity of natural gas to the NGTS, based on known characteristics of upstream gas systems

Entry Points	Capacity (bcm/annum)
Kipi Evros	6.7
Sidirokastro	5.2
Agia Triada	4.6
Total	**16.5**

It is worth noting that the above values are calculated solely by using the operational margins of the metering units at each NGTS entry point. Therefore, the theoretical import capacity of natural gas should not be confused with the total actual capacity of the Transmission System (i.e. the actual firm capacity for serving demand anywhere in the system). The latter can be affected, either by limitations of the upstream transit natural gas systems with regard to injecting gas to the NGTS Entry Points, or by potential physical congestion while transporting gas to the System's South Exit Points, as analysed below.

2.2.2 *Limitations of the upstream systems*

Regarding the limitations of the upstream systems the TSO (DESFA) is reporting the following [1]: "*Based on historical data and also on relevant reports of the operating company of the Bulgarian transit system (Bulgartransgas), the quantity of natural gas which can be delivered on a daily basis cannot exceed 11.5 million Nm^3*". According to the above statement, the present import capacity of Sidirokastro Entry Point is not exceeding 3.8 bcm per annum, assuming a load factor of 90%, due to existing upstream transit system's limitations.

Regarding the entry point "Kipi" the following are reported: "*The above entry point became operational during the last November (2007) and thus, there are not sufficient operation data of the upstream data…*". Therefore, the actual import capacity of the Entry Point Kipi Evros is assumed to be at least equal with the maximum annual contracted quantity set in the gas supply contract between DEPA S.A. and the Turkish BOTAS after 2009 (see paraFigure 4.1).

Agia Triada Entry Point is supplied exclusively from the Revythoussa LNG terminal and is affected by the limitations of this facility. Regarding this issue the TSO reports the following: "*Because of the limited storage capacity of the terminal a more frequent arrival of LNG ships is demanded (around every 4 days, in order to keep the maximum regasification rate of the terminal) with result the direct dependence of terminal's supply from the weather… while it preventing the use of LNG vessels with a capacity of more than 90,000 m^3*". Furthermore, it must be noted that part of the regasification capacity of the facility is used by the TSO with a very low annual load factor, for balancing. For the above reasons and in an effort to avoid inaccurate

deductions, the actual import capacity of the Entry Point Agia Triada is calculated just for illustrative purposes with the assumption of an (annual) load factor of 40%, which corresponds to an arrival frequency of ships (with a capacity of 75,000 m^3), of every 8 days[2].

Table 3 summarizes the aforementioned facts and highlights the importance of the upstream systems' limitations in calculating the actual natural gas import capacity in the country.

Table 3: Estimated transmission capacity of natural gas towards the NGTS

Entry Points	Capacity (bcm/annum)
Kipi Evros	0.7
Sidirokastro	3.8
Agia Triada	2.0
Total	**6.5**

2.2.3 *Limitations in transmitting gas to the south*

As already mentioned, for the calculation of the NGTS's actual firm transmission capacity, apart from the actual import capacity, one has to consider how the demand is allocated between different regions This attributed to the fact that the network's topology and the absence of a compressor unit on the main pipeline place limitations to the Transmission System within the country. This fact becomes very important in the event of a supply disruption at the Entry Point Agia Triada, as emerges from the TSO's report on this matter: "*Because of the absence of a compressor unit in the system, the role of the LNG terminal becomes very important in controlling NGTS' operating parameters… Moreover, the lack of a compressor unit restricts indirectly the capacity of the Entry Points Sidirokastro and Kipi, in levels which are directly depended on geographical load distribution. This problem is expected to grow when the branches connencting Corinth and Aluminum de Grece (Powerplant) become operational".*

Consequently, it can be derived from the above that the actual potential of serving demand (for a given scenario of geographical demand distribution) and therefore, the actual capacity of transmitting gas from the Entry Points to the Exit Points of the NGTS, depends highly on how much gas is imported from each of the three Entry Points.

2.3 Impact of the Transmission System's topology on the security of supply

The TSO, in his report concerning the weaknesses in the network's topology, mentions the following: "*The lack of alternative supply routes for areas supplied by NGTS branches (except the Komotini branch) may result in a supply interruption for these areas, in the event of an incident where the flow of gas to these branches is disrupted…*"

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[2] It should be noted, that under an optimum schedule of LNG ship arrival and unloading (e.g. partial unloading) combined with the maximum regasification rate, the import capacity of the LNG facility becomes significantly higher. However, with the available storage space, these optimum conditions cannot be maintained for a long period of time.

The above statement calls for prioritizing infrastructure projects which create loop pipelines, with the aim of minimizing any implications which may arise in the event of a supply branch failure.

2.4 Development of the NGTS

Infrastructure development is an effective tool towards achieving security of supply goals and towards facilitating the development of competition in the natural gas market.

According to article 10 of the Gas Law, the development of the NGTS is realized according to the development plan prepared by the TSO following a relevant study, is approved by the Minister of Development, following the consenting opinion of RAE, and is published. During the transitional period, article 6 par. 4 of the Law provides that the first Development Plan of the NGTS comprises in essence the infrastructure projects which were already planned and decided before the enactment of the Law by the vertically integrated DEPA S.A. This list of projects was approved by the Minister of Development under the M.D. Δ1/Γ/1588/23.01.2007 (Government Gazette B' 60/24.02.2007).

Among these NGTS development projects, the most important ones for the security of supply are the following, as they relate directly or indirectly with the increase of import and transmission capacity:

- Unloading and regasification capacity upgrades of the Revythoussa LNG terminal, completed in June 2007.

- Capacity upgrade of metering stations in Entry Points Sidirokastro and Agia Triada, not yet completed.

- The installation of a compressor unit in the main pipeline (at Nea Mesimvria), planned for 2010.

As mentioned in paragraph 2.2, the planned for 2010 installation of a compressor unit at Nea Mesimvria will increase considerably the quantities of gas that could be transmitted through the System from Entry Points in the north to Exit Points in the south, where the major part of demand exists, upgrading essentially the total transmission capacity of the System. For this reason any delays to the realization of this project, should be avoided.

Furthermore, the TSO has informed RAE of their intention to include in the new NGTS Development Plan a project for upgrading the LNG storage capacity in the Revythoussa terminal, with the construction of a third tank. If this project is eventually included in the Development Plan, it is estimated that it will be completed by 2013.

For the time being, because of the limited storage space, the facility can offer only temporary storage (i.e. for ships' unloading, LNG regasification and injection of gas to the Transmission System), while a small part of the storage space is used by the TSO in order to maintain a permanent reserve, in order to cover the NGTS security of supply on a short-term basis (i.e. to cover demand peaks, emergency gas interruption incidents from pipelines and for balancing of the Transmission System).

RAE's position is that, in order to exploit the recent regasification capacity upgrade of the LNG facility and to maximize the quantity of gas which can be imported in the Greek System from LNG, it is technically necessary to increase the facility's storage space as soon as possible.

The increase of available storage space will have the following effects:

- Maximization of gas quantity passing through the LNG terminal to the Greek market or the European and Balkan markets, through the existing or future interconnections.

- Greater flexibility and therefore possible usage of the terminal from potential suppliers.

- Possibility of long-term storage and reserve keeping by the TSO or third parties, which will reinforce the capability of dealing with emergency situations and demand peaks.

For all the above reasons, RAE considers the TSO's proposal for the construction of a third LNG storage tank on Revythoussa island absolutely justified.

2.5 Summary of conclusions and proposals

The conclusions of the above analysis of the natural gas infrastructures in the country are summarized as follows:

1. The theoretical natural gas import capacity in the Transmission System through the existing three Entry Points (16.5 bcm/annum), covers the projected domestic demand on a long-term basis (8,1 bcm in 2020, see paragraph 3.2) and moreover permits the transit of gas quantities of an order of 8 bcma.

2. Considering the actual limitations and the lack of sufficient data regarding the capacity of the upstream natural gas systems, the estimated natural gas import capacity in the NGTS according to the most conservative approach (6.5 bcm/annum), can satisfy domestic demand on a short- to medium-term basis.

3. However, the actual natural gas import capacity from each Entry Point and the transmission through NGTS to serve demand, is affected furthermore by the actual geographical allocation of demand and the existing limitations of transmitting natural gas in south Exit Points, because of the network's topology (i.e. a main pipeline from Greek-Turkish and Greek-Bulgarian borders to Attica area without loops) and the absence of a compressor unit along the main pipeline. Furthermore, the System's topology affects negatively the capability of dealing with emergency situations, especially if incidents occur to specific System's branches.

4. The existing, as well as the under elaboration Development Plan of the National Natural Gas System, include projects (e.g. installation of a compressor unit in the main pipeline and construction of a third LNG storage tank) which will increase significantly the transportation and storage capacities of the System , with a direct positive effect on the security of supply level on a short- to medium-term basis.

Concerning the above issues, RAE's proposals are the following:

1. The TSO should introduce a process of calculating annually the actual capacity of every Entry Point of the Transmission System, over the next five-year period. Relevant calculations must take under consideration the possible geographical demand distribution scenarios and any limitations of natural gas transmission within the country. Beyond serving the aims of security of supply of Gas, the publication of such calculations would serve the development of

competition in the natural gas market, since gas companies interested to supply the market will thereby have access to information, which is essential for importing natural gas in the country.

2. It is essential to proceed without delay with the installation of the compressor unit in the main pipeline, as well as to accelerate the procedures for upgrading the LNG storage space at the Revythoussa LNG terminal.

3. During the preparation of any measures for increasing natural gas security of supply, it is also essential to consider issues related to the System's topology, such as the prioritization of development projects which result to the creation of loops, in order to minimize the impact of a possible System's branch failure.
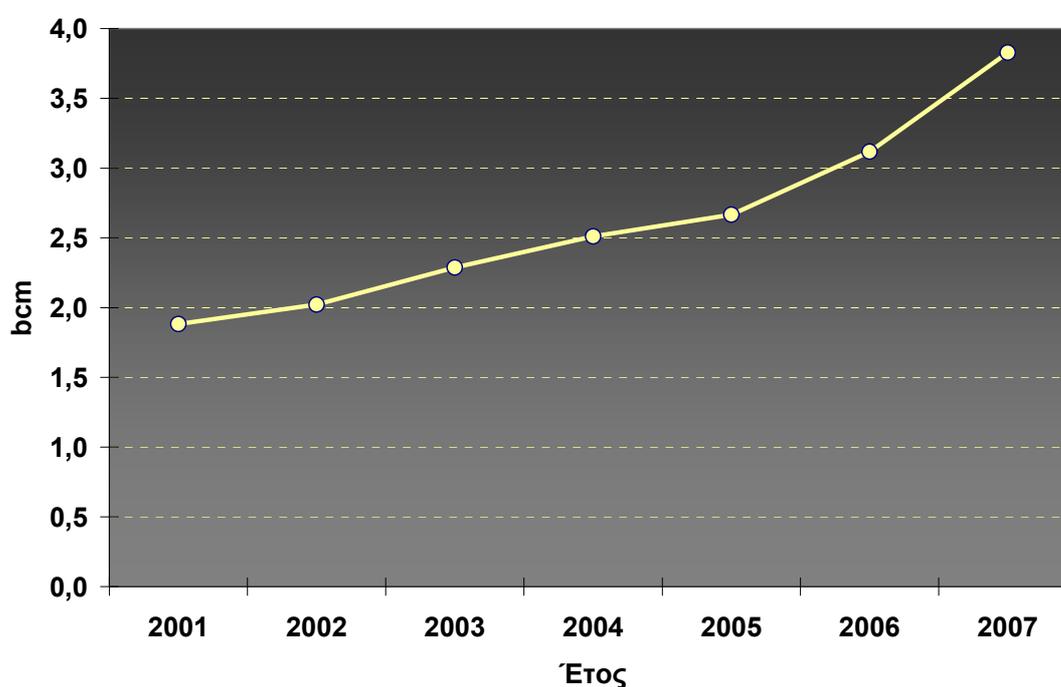
B. Demand and supply of natural gas

3. Demand of natural gas

3.1 Historical demand data

During the past seven years, the demand for natural gas has been increasing at a CAGR of above 12%, as shown in Figure 1. Thus, during 2007, natural gas demand was almost double that of 2001.

**Figure 1: Historical evolution of natural gas demand**

3.1.1 *Qualitative characteristics – Demand by sector*

Sectoral demand shares are presented in

 below, for the years 2004 and 2007. It is noted that during this period the household-commercial sector share was increased, due to the continuous development of gas distribution networks from the three distribution companies (EPA).

If the households-commercial consumers' share continues to rise in the coming years, it is essential for the TSO to analyze in which way the qualitative characteristics of demand, such as the peak demand, the load factor and the load peak in connection with the ambient temperature will be affected, in order to extract useful conclusions regarding the required measures (e.g. Demand Side Management from the Gas Distribution Companies), and the LNG facility capacity required to cover peak demand (peak-shaving).

Figure 2: Demand by consumption sector for the years 2004 and 2007
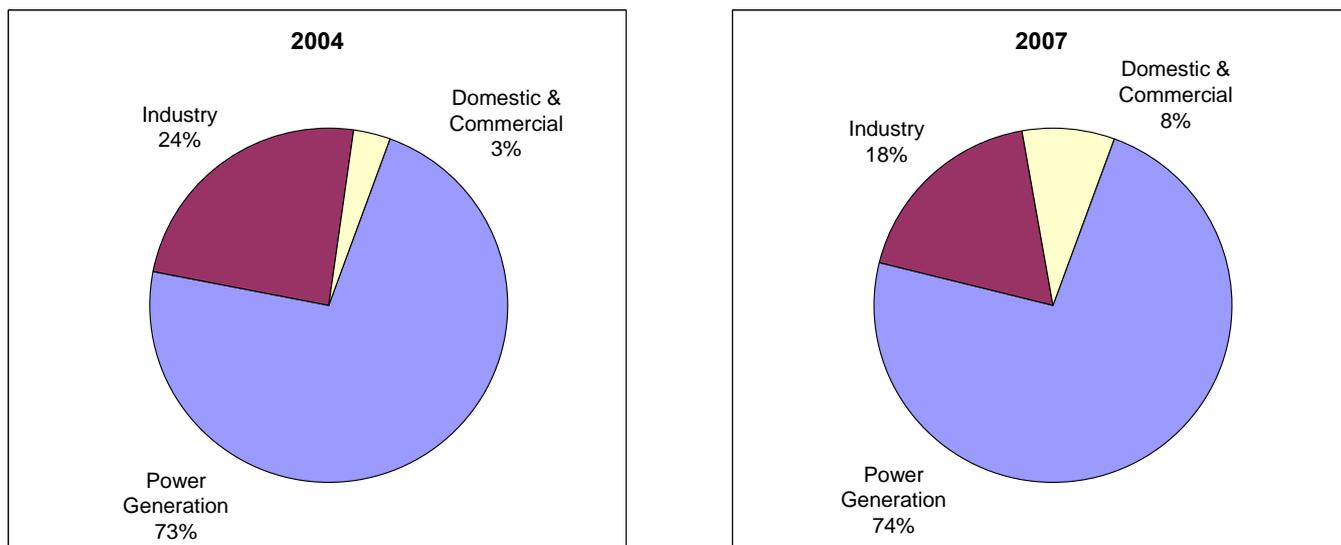
3.1.2 Qualitative characteristics – Peak demand

Peak demand was significantly increased during the period 2004-2007, as shown in Table 4. The power generation share in peak demand is around 70%, with a slight downward trend.

Table 4: Daily natural gas demand peak

Year	Peak (Nm^3 x 10^6) / day	Power generation share in the daily peak
2004	9.9	73%
2005	12.2	70%
2006	13.5	71%
2007	16.1	67%

The fall of the power generation share in peak demand was anticipated, according to what is mentioned in paragraph 3.1.1 regarding the increase of natural gas penetration in household-commercial consumption.

3.2 Demand Forecasts

This section includes medium-term (up to 2010), as well as long-term (up to 2020) demand forecasts.

3.2.1 Medium-term demand forecast (2008-2010)

The natural gas demand for the next three years is expected to rise, as shown in Figure 3, due to further increase of consumption by customers served by GDCs, as well as due to the commissioning of new natural gas power plants, in order to cover rising demand for electricity.
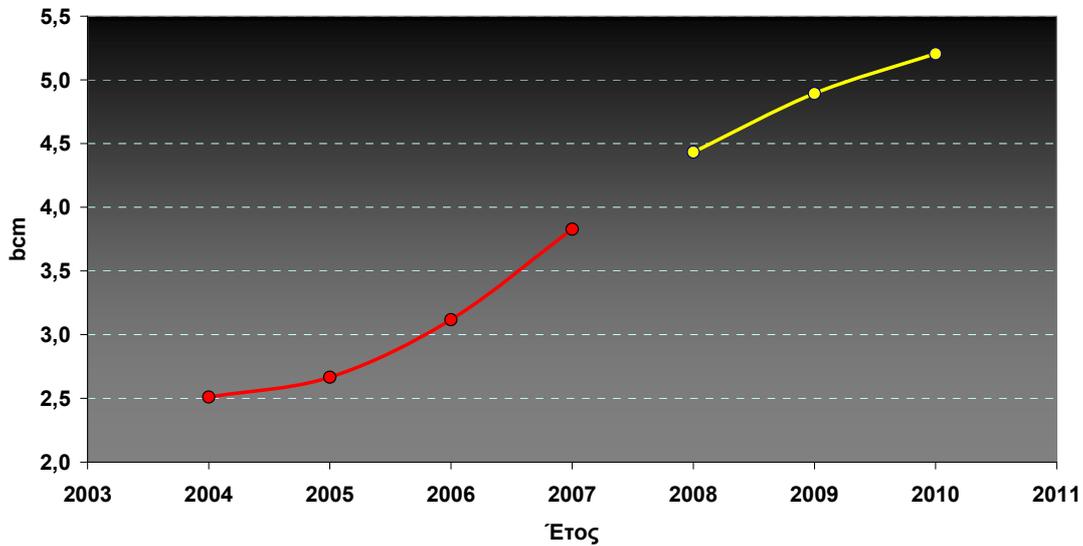
Figure 3: Medium-term demand forecast

Table 5 shows the estimated demand of natural gas by sector for the period 2008-2010.

Table 5: Short-term demand forecast by sector

	2008		2009		2010	
	bcm	**Mtoe**	**bcm**	**Mtoe**	**bcm**	**Mtoe**
Power generation	3.3	3.1	3.6	3.5	3.8	3.6
Industry	0.7	0.69	0.8	0.72	0.8	0.77
Commercial sector and Households	0.4	0.40	0.5	0.49	0.6	0.60
Total	**4.4**	**4.2**	**4.9**	**4.7**	**5.2**	**5.0**

The above forecast was based on the following data:

- The most recent five-year development plans of the three gas distribution companies (GDCs), which are submitted to RAE for approval.

- Forecasts by DEPA S.A. [2].

- The anticipated commissioning of new natural gas power plants, using available data submitted to RAE by the holders of the relevant electricity production licenses.

- Projections of DESMIE (the electricity TSO) regarding future electricity demand in the National Interconnected Electricity Transmission System (base scenario) [3].

3.2.2 Role of the power generation sector

Power generation was considered the corner-stone for the introduction of natural gas in the country's energy mix, by providing the necessary anchor loads for the conclusion of long-term supply contracts and the development of necessary

infrastructures. As already mentioned, the share of power generation in total gas demand is, even today, around 70%. Still, until the recent past, the share of natural gas in the (overall) power generation's energy mix was low.

However, the contribution of natural gas-fired power plants to the electricity production balance is expected to rise significantly in the three-year period up to 2010, covering a major part of the electricity demand increase. Figure 4 presents the evolution of natural gas share in the centrally dispatched power generation of the country, from 2005 to 2010.

Figure 4: Natural gas share in the centrally dispatched power generation of the country.
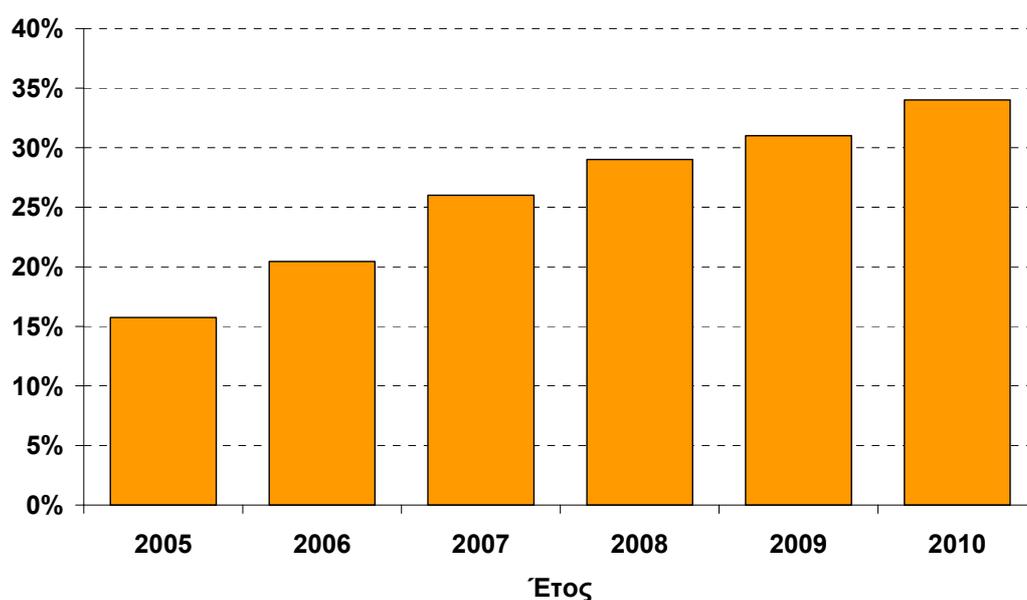
From the above, it can be concluded that the natural gas share in the electricity production balance is expected very soon to surpass 1/3 of the total energy produced from centrally dispatched power plants in the interconnected system.

Therefore, it is obvious that, at least in the short-term, the security of electricity supply depends upon the security of natural gas supply, a fact not true or maybe not so obvious until recently. For this reason, the security of natural gas supply measures shall have to ensure to a degree possible the continuous operation of power plants, according to article 4 paragraph 2 of the Directive 2004/67/EC.

3.2.3 Demand evolution for the period 2010-2020

Any attempt for a long-term demand forecast incorporates a great degree of uncertainty. This has become especially obvious today, when strong actions have been taken towards addressing the climate change, on a European and hence, national level. The climate change (action) is expected to affect strongly the competitiveness of the various energy sources.

Given this uncertainty, it is necessary to present, beside DEPA's demand forecasts [2], published projections of the energy balance in the economy, as well as a small scale sensitivity analysis in reference to some parameters which affect the demand of natural gas for electricity production.

Table 6 shows DEPA's natural gas demand forecast, as well as a gas demand forecast based on estimations of the primary energy balance in the electricity sector, included in the 1st Report for Greece's Long-Term Energy Planning for the period 2008-2020 [4] ("Forecast A" in Table 6), and estimations included in the National Energy Strategy Council's report "Measures and Means for a Viable and Competitive Energy Policy" [5] ("Forecast B" in Table 6).

Table 6: Long-term natural gas demand forecast

Scenarios		2015		2020	
		bcm	Mtoe	bcm	Mtoe
1	**DEPA S.A.**	8.1	7.8	8.8	8.5
2	**Forecast A' [4]**	5.9	5.6	6.2	5.9
3	**Forecast B' [5]**	5.7	5.5	6.6	6.4

Depending on the scenario, there is a substantial difference between the demand forecasts presented in Table 6, and this highlights the uncertainty of any attempt to estimate a future supply gap and the time in which this may arise. This fact hinders suppliers' efforts to plan ahead and estimate what will be the future market needs, in order to conclude long-term supply contracts with their suppliers.

In order to better demonstrate the demand forecasts' sensitivity on the primary energy mix used in electricity production, Table 7 shows the impact that the three following parameters may have on the annual natural gas demand for electricity production: (a) the introduction of a new solid fuels power plant of 600 MW, (b) the introduction of new wind turbines with a capacity of 1,000 MW, and (c) the need to cover electricity supply gaps, due to either shortages in the import/export balance, or a reduction in hydroelectric production as a result of hydrological cycles.

Table 7: Sensitivity analysis of natural gas demand for electricity production

Demand sensitivity parameter	Change in electricity capacity	Natural gas demand difference (bcm)
New solid fuels power plant	600 MW	-0,8
New wind capacity	1000 MW	-0,4
Reduction of hydro production or/and shortage in the import-export balance	-1500 GWhe	+0,3

It can be seen from the above table that there is a substantial decrease in natural gas demand for electricity production, firstly due to the commissioning of a new solid fuels power plant and, secondly, due to the commissioning of new wind energy plants of 1,000 MW.

4. Natural Gas Supply

Until today, DEPA S.A. remains the exclusive natural gas supplier in the country. Through three long-term contracts, they supply the internal market with imported gas from Russia, Algeria and Turkey.

## 4.1 Existing long-term contracts

Table 8 presents the annual quantity of natural gas that DEPA S.A. has ensured through the three existing long-term contracts, before and after 2009, during which a provision for increased deliveries from one of the three contracts is activated.

Table 8: Available quantities of natural gas through long-term supply contracts

	bcm	Mtoe
Until 2009	3.9	3.7
After 2009	4.2	4.0

The annual evolution of natural gas supply from the aforementioned contracts is presented in Figure 4, wherein are represented the total annual contractual quantities until 2021, when the last existing contract ends.

Figure 4: Natural Gas Supply with regard to existing long-term supply contracts

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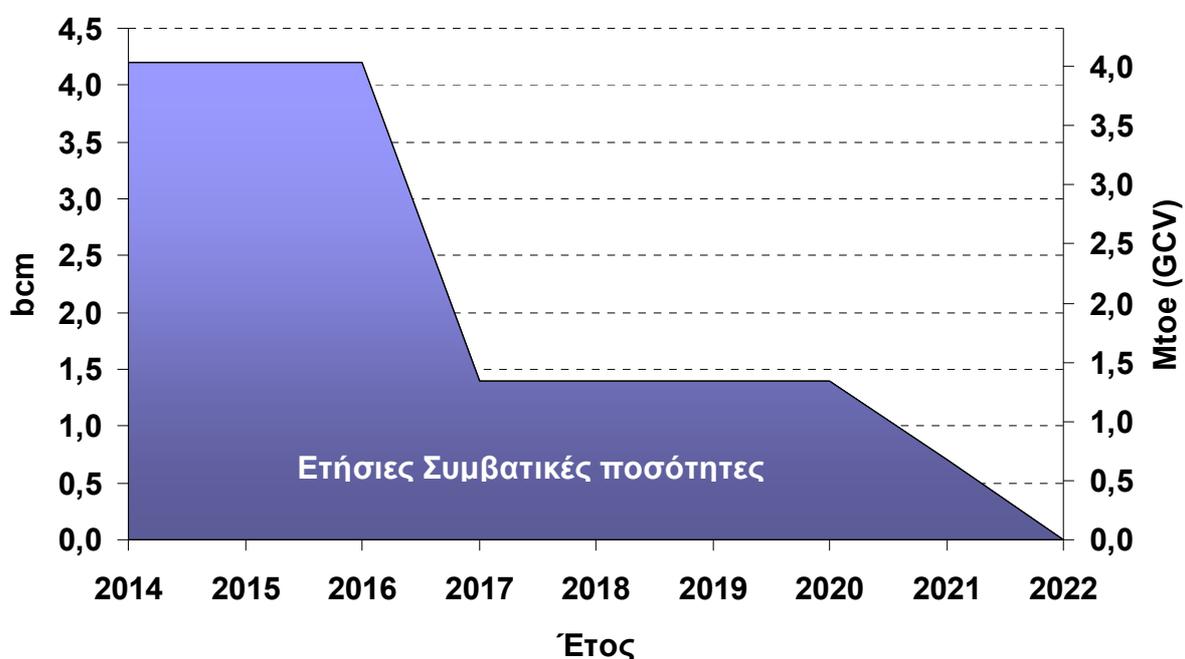
4.2 Supply of the Greek market during the year 2007

During the past year, demand exceeded for the first time the contracted quantities of DEPA's long-term supply contracts. The gap was covered with additional LNG shipments, which were acquired through short-term contracts from the international market and with the import by DEPA of gas quantities, beyond those contracted from Russia. The origin of the gas as a percentage of total imports during 2007 is shown in Table 9.

Table 9: Share of different natural gas sources in the natural gas supply in Greece during 2007

Origin	% of total
Russia	76.7%
LNG (mainly from Algeria)	22.5%
Turkey	0.8%

4.3 Future gas sources through pipeline

The completion of the Greek and Turkish natural gas systems' interconnection (Turkey Greece Interconnector - TGI) in November 2007, made possible on the one hand the further diversification of the Greek market's supply sources and, on the other hand, the transmission of natural gas through Greece towards the European market, after the development of the relevant infrastructures.

Given the congestion of the Bulgarian natural gas transmission system to Greece (see paragraph 2.2.2 above), the TGI pipeline provides the only, so far, possibility for diversifying the country's natural gas supply sources, beyond LNG import. With the completion of the interconnection, the contract between DEPA S.A. and Botas for the import of Azerian gas in the country, was activated. The Azerian gas' share to the total supply rose to approximately 1% during 2007 (see Table 9) and is expected to increase tenfold in 2008, improving significantly the level of diversification of the country's supply sources.

On a medium-term basis, the possibility of further natural gas quantities being supplied from the Caspian and the Middle East is directly affected by geopolitical, regulatory and technical factors, such as the conclusive decision for the development of the Shah Deniz II gas field in the Caspian's Azerian area, the possibility of natural gas exports from Iran and Iraq, the interconnection of the Turkish natural gas system with the Arabian Pipeline (Mashreq area) and, finally, the conclusive arrangement for transmitting gas through Turkey and the technical capabilities of the Turkish system.

Obviously, the conditions for the supply of natural gas to the Greek market from the aforementioned areas improve as the interest for transmitting gas from the same areas to the European market through the country, increases. In the context of agreements concerning large scale gas supply for export to Europe, the securing of quantities for a part of the Greek market is more probable. In the same time, the familiarization of natural gas transit players with the regulatory framework which governs the Greek market and the market's conditions, favors their participation in the market as new suppliers.

The importance of developing new transit pipelines for the diversification of the European Union's natural gas supply sources, which will have direct positive effects

on the level of the Greek market's security of supply, is highlighted also in the European Union's Second Strategic Energy Review, which describes the creation of the Natural Gas South Corridor.

In this context, the most important proposed projects for transmitting natural gas through Greece, are the following[3]:

4.3.1 Italy Greece Interconnector (IGI)

The IGI pipeline is an extension to the west of the Greek-Turkish pipeline, aiming in transmitting natural gas to Italy. The project's planning includes an onshore section, 600 km in length, from Komitini to Thesprotia's coastline, and an offshore section from Thesprotia's coastline to Italy's Otranto, approximately 200 km in length (Poseidon Pipeline). The onshore section is integrated in the NNGS's first development program and will be constructed by DESFA S.A.

From April 2007, companies Edison SpA and DEPA S.A., the Poseidon Pipeline's sponsors, have submitted a request for reserving transmission capacity through the onshore section of the Greek-Italian pipeline of 6.4 and 1.6 billion cubic meters of natural gas per annum, respectively, from the Greek-Turkish borders to Thesprotia, where the offshore section of the pipeline will begin.

According to the project's sponsors, Edison Spa and DEPA S.A., possible supply sources are the areas of the Caspian and the Middle East.[4]

4.3.2 Trans Adriatic Pipeline (TAP)

In June 2008, the company Trans Adriatic Pipeline (TAP) submitted to the Ministry of Development and to RAE an application for a license to construct an Independent Natural Gas System (INGS) from Nea Misimvria near Thessaloniki to the Albanian borders, through which the company wants to transit natural gas to the Italian market.

In the same time, the company's shareholders, the Swiss company EGL and the Norwegian company StatoilHydro, submitted to DESFA and communicated to RAE requests for reserving capacity in the NNGS. Each of the submitted requests concerns reserving capacity for transmitting 5 billion cubic meters per annum, from Kipi Entry Point at the Greek-Turkish borders to Nea Mesimvria, aiming to supply the aforementioned INGS with a total annual quantity of 10 billion cubic meters of natural gas and to transit this quantity to Albania and Italy.

According to the project's sponsors, possible supply sources are the areas of the Caspian and the Middle East[5].

4.3.3 South branch of the South Stream Pipeline

The South Stream project consists of the construction of a pipeline system, which, through the Black Sea, will export Russian natural gas to Europe through two branches. Its sponsor will be the Russian company Gazprom. The project's south branch includes the construction of a pipeline with a yearly capacity of 10 billion cubic meters, which will enter the Greek territory from the Greek-Bulgarian borders and run through the country's northern regions, with alternative exit points the

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[3] Data regarding all the licenses for the Independent Natural Gas System and reserved capacity in the Greek-Turkish pipeline requests that have been submitted to RAE are presented in RAE's webpage, http://www.rae.gr/lic/GAS/index.html

[4] http://www.igi-poseidon.com/english/project.asp#javascrpt:void(0)

[5] http://www.trans-adriatic-pipeline.com/tap-project/concept-2_.html

Greek-Albanian borders or the Ionian coastline and ending in Italy. An agreement has been signed between the Greek and Russian Democracies, which was validated by the Greek Parliament (Government Gazette A' 200/2.10.2008), in which the supply of the Greek market through the pipeline is provided for.

4.4 Future sources of liquefied natural gas

With regard to LNG's availability and the possibility of its import to the Greek natural gas market, we note the following:

The International Energy Agency (IEA) estimates that the LNG demand in a global level will reach 340 bcma in 2015 [7]. This quantity corresponds to an increase of about 50% in comparison to 2007 levels (226 bcma) [8]. For covering this level of demand, about 132 bcma of additional yearly liquefaction capacity are under construction globally [9].The new capacity is anticipated to become available gradually, with an average integration rate of about 33 bcma and 17 bcma yearly, in the periods 2008-2010 and 2011-2012 respectively. Therefore, and provided there are no delays to the construction of the new liquefaction stations or serious consequences from the current economic crisis, there is LNG availability to the international market for covering demand until 2015.

With regard to the under development liquefaction capacity, about 60% is located in areas with a geographical interest for the Greek market (Algeria, Libya, Qatar). Given that Algeria's and Libya's new capacity is not anticipated to be available before 2012, the possibility of short- and long-term contracts of LNG quantities from Qatar's new capacity could be investigated, possibly even Yemen's, as well as the utilization of LNG availability of existing liquefaction stations (Egypt, Nigeria, Algeria).

An important factor which has a negative effect on the possibility of importing LNG in the Greek market is that the limited storage space of Revythoussa's LNG terminal allows the complete unloading of ships smaller than 100.000 m3, which are limited in number and availability [10]. The unloading of bigger vessels could take place in combination with other destinations (partial unloading), a fact which reduces the LNG supply chain's flexibility. The limited number of small ships and the need for partial unloading of big ships, set considerable limitations to the security of supply and highlight the need for the construction of a third tank on Revythoussa's terminal.

Taking under consideration all the above, RAE's opinion is that the potential for entering into (new) short- and long-term LNG contracts for the Greek market requires, on the one hand the pursuit of suppliers with a LNG supply portfolio, aiming at serving the Greek market's demand as part of a regional market, and on the other hand, combining the supply of more Eligible Customers together, attempting to attract LNG suppliers through the increased gas volumes and the achieved economies of scale.

5. Natural Gas supply/demand balance

In this section we present short- and long-term estimates for the evolution of the country's natural gas supply/demand balance, based on demand forecasts which are described in section 3 and the annual long-term contracted quantities, as presented in section 4.

5.1 Supply/demand balance until 2010

According to data by DEPA S.A. and the TSO, the natural gas demand in 2007 was covered by 92% from the existing long-term supply contracts.

Table 10 depicts RAE's estimate concerning the natural gas supply gap until 2010, based on existing long-term contracts and the demand estimate of paragraph 0

Table 10: Estimate of natural gas sufficiency until 2010 based on existing long-term contracts

	2008		2009		2010	
	bcm	**Mtoe**	**bcm**	**Mtoe**	**bcm**	**Mtoe**
Demand	4.4	4.2	4.9	4.7	5.2	5.0
Annual contracted quantities	3.9	3.7	4.2	4.0	4.2	4.0
Expected gap	**0.5**	**0.5**	**0.7**	**0.7**	**1**	**1**

From the above data, a gap of natural gas supply is noted, which ranges from 0.5 bcm in 2008 to 1 bcm in 2010. According to DEPA S.A., this gap will be covered by a combination of the following:

- Supply of LNG on a spot base, through short- or medium-term agreements.
- New long-term contracts of DEPA S.A.
- Involvement of other gas suppliers or self-supplied Eligible Customers.

5.2 Supply/demand balance until 2020

Figure 5 illustrates the supply/demand balance based on effective terms of existing contracts until 2020 and on the long-term demand estimates of paragraph 0.

From the data depicted on the Figure, there arises on the one hand the need for compensating for the quantities that will fade out with the gradual expiration of the existing contracts after 2017, and on the other hand, the need for finding additional quantities of at least 2 bcm annually from 2015 onwards, through long-term (supply) contracts.

Figure 5: Long-term estimate of required natural gas quantities under different demand scenarios
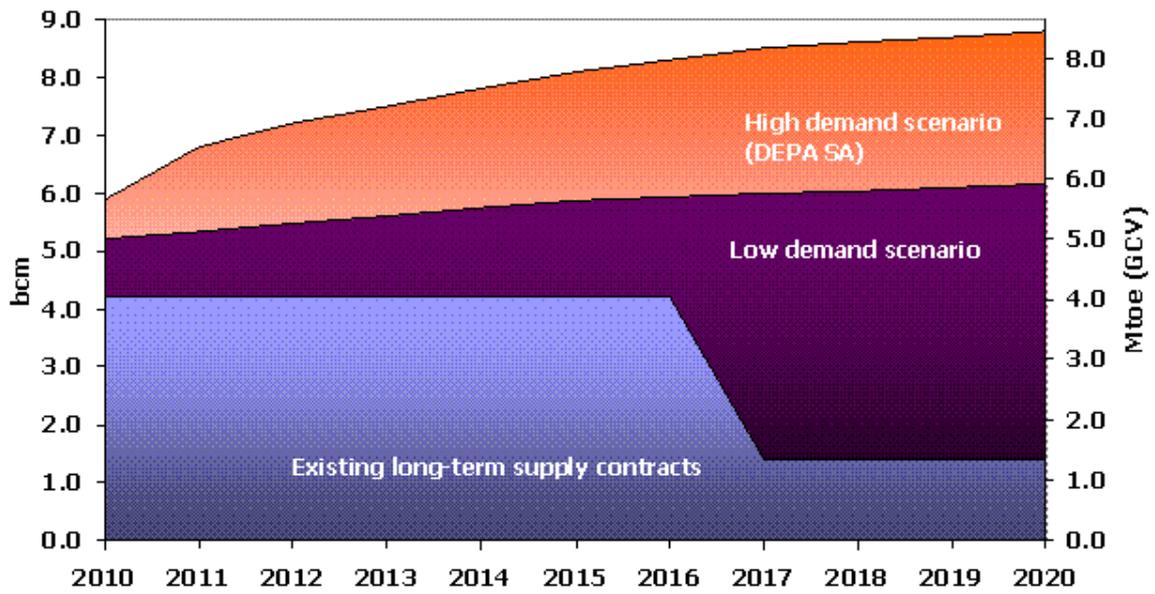
C. Emergency Management

6. Management of emergency situations

In this section, we attempt to estimate the capability of managing emergency situations with regard to partial or total interruption of natural gas supply at the NNGS's Entry Points. First we describe the technical and conventional means of managing emergency situations which are outlined in the effective legislation, then we present grouped cases of reduced supply from the recent past and finally, we present RAE's conclusions with regard to the level of security of supply which is achievable with current standards.

6.1 Means for managing emergency situations

6.1.1 Interruptible gas supply Contracts

Interruptible gas supply contracts are one of the most common tools for enhancing the security of supply internationally (Great Britain, Spain, Denmark, United States, Singapore, etc.).

The signing of contracts for a compensated interrupted natural gas supply between the TSO and consumers is included in the provisions of article 14 of the Law. This particular provision is implemented conditionally in the case of Major Customers and mandatorily in the case of electricity producers with units that have the potential to use an alternative fuel. For the fulfillment of its obligations according to these contracts, the TSO collects from all Users a security of supply levy.

For the time being, this particular possibility is the TSO's obligation which remains pending as, according to the TSO [10], important issues concerning the fulfillment of DESFA SA's contractual obligations towards the Users that have signed a Transmission Contract remain to be clarified.

RAE's opinion is that certain issues, such as the procedures to be followed in the event of an emergency requiring a supply interruption to the customers, as well as the principles for calculating the fuel's differential cost, have already been addressed with the M.D. Δ1/Γ5510 (Government Gazette B' 517/2007), concerning the "regulation of the NNGS's management issues during the scheduled upgrade of the LNG terminal on the island Revythoussa", which was composed by RAE.

Consequently, it is deemed necessary for the TSO to give priority to the settlement of all other pending issues that prevent the signing of interruptible contracts, at least with the licensees of dual fuel powerplants, as today the TSO cannot readily interrupt natural gas deliveries (to powerplants) without affecting (the operation of) the electricity market.

6.1.2 Security of supply levy

With the security of supply levy, on the one hand the TSO reclaim the costs of remunerating customers in the event of a natural gas supply interruption and, on the other hand, customers are incentivized to enter into such contracts, which provide for paying reduced security of supply levy as compensation.

The unit charge of the security of supply levy and the allowed highest limit of the security of supply account are determined by a decision of RAE, according to the provisions of article 14 of Law No 3428/2006.

Obviously, the calculation of the security of supply levy requires the clarification of the interruptible gas supply contracts' provisions and the TSO's obligations which arise from them (conditions for the remuneration, responsibility limits for TSO and Users, maximum remuneration amount).

6.1.3 Alternative fuel at electricity stations

Until September 2006, the administrative practice was the imposition of a special term in the electricity production licenses, concerning the licensees' obligation to install equipment with dual fuel capability (diesel oil), as well as maintaining of adequate reserves of this fuel for the station to operate for 5 days with full charge.

In 2006, this obligation was reconsidered by RAE, due to extensive reports and speculations by PPC S.A., as well as by other production licensees, concerning the cost and the complexity of maintaining alternative fuel.

The aim of this reconsideration was the short-term optimization of the available resources, with the disposal of part of Revythoussa's storage space for long-term storage of LNG from electricity stations operating only on natural gas and, in the long run, with the construction of new natural gas storage spaces.

This reconsideration led to the imposition of a term which provides the electricity production licensees with the possibility to choose between, (a) keeping a competent quantity of liquid fuel within the station and, (b) keeping an equivalent quantity of natural gas in a (gas) Storage Facility. The quantity to be kept should, in any event, support the station's continuous operation for at least five (5) days at full load.

However, until today it is not determined which part of the existing storage space at Revythoussa could be disposed for long-term storage. This fact renders in effect inactive the second choice of the aforementioned special term of the electricity production licenses, at least for the licensees that are currently ordering their units' equipment.

RAE considers that adequate storage space will be available medium-term, with the construction of the third tank at Revythoussa. In any event, in the under consultation plan of the NNGS's Network Code, a mechanism for third parties' access to Revythoussa's terminal is suggested, through which the Users will be able to keep LNG reserves in the tanks for periods longer than the LNG temporary storage period, a practice which could, under certain conditions, be an acceptable way of fulfilling the second option of the relevant term.

6.1.4 Establishment of security of supply standards

As mentioned in paragraph 1.1.2, member states establish security of supply standards as criteria for designing measures for the safeguard of household customers' supply. The scope of these measures could be extended to other small customers and could include measures for the security of the national electricity system, if it depends on gas supplies.

The security of supply standards shall provide, where appropriate, the market players sufficient opportunity to respond and eliminate or limit the cause of the emergency.

The establishment of security of supply standards for the Greek market needs to be realized in two stages:

First, it is necessary to assess the TSO's ability to manage emergency situations, with the means at their disposal today. This is attempted in paragraph 6.2.

Secondly, the quantitative assessment of the required level of security of supply, and the evaluation of alternative choices of its achievement should be performed. RAE's proposal is that this should be done with the cooperation of DESFA S.A. in the immediate future.

6.2 Assessment of the capability to manage emergency situations

6.2.1 Cases of NNGS's reduced supply in the years 2005-2007

In the following Table we present historical cases of gas delivery interruptions at the Sidirokastro Entry Point, in the years 2005-2007. The cases concerning this Entry Point are divided in three categories, which are presented by waning importance:

Table 11. Cases of reduced deliveries at Sidirokastro

Case category	Occurrence Frequency	Maximum duration	Average duration
Total delivery interruption	3	67 hours	44 hours
Partial delivery interruption	3	4 months	1½ months
Pressure < minimum Contractual	3	30 days	15 days

With regard to the Agia Triada entry point, cases of two categories are reported:

- Interruption of gasification from the LNG station, due to electricity supply interruption, with a few hours duration and maximum duration of 5 ½ hours.

- Limitation and, subsequently, interruption of gasification from the LNG station, due to low level in the tanks, with a duration of 5 days and 9 hours respectively.

With the operation of the CHP unit at the Revythoussa LNG Facility, cases of the first category are expected to be limited, or even eliminated.

6.2.2 Emergency measures in the event of supply reduction in the NNGS

The TSO has prepared a National Emergency Measures Plan in the event of supply reduction in the NNGS, according to Directive 2004/67/EK and the Law. The Plan includes a priority schedule for the interruption of supply at electricity production units, as well as an estimate of the extent of the interruption required, under 24 alterative scenarios for the interruption of supply at the NNGS entry points.

The National Emergency Measures Plan provides an idea of the probable extent and duration of the interruption of natural gas deliveries, in the event of an emergency situation. It is unquestionably a useful source of support for quick decision making during crises.

However, it is deemed necessary to determine within the National Emergency Measures Plan procedures concerning the communication and coordination of all Users, operators (EPA, DESMIE) and major customers involved during an emergency situation. Also, it is necessary to determine clearly the roles of all parties involved (DESFA, DESMIE, DEPA, EPA and other Users). Finally, it is advisable to provide for a crisis management team, which will convene at situations that are expected to exceed in intensity or duration the average scenario which the TSO could handle successfully with the means at their disposal.

6.2.3 Scenarios' analysis

From the analysis of the scenarios of the National Emergency Measures Plan, it ensues that in the event of an emergency due to the limitation of deliveries at one of the three entry points for a considerable period of time, arises the need for interrupting the supply to almost all the electricity stations which have the potential of using an alternative fuel, whereas in the event of losing more than one entry points it may be required to interrupt the supply even to stations that do not have this potential. In the event of a supply interruption from the northern Entry Points, the aforementioned interruptions can be limited, provided that a steady unloading of LNG cargos at the Revythoussa terminal is ensured.

In the following Figure we present the daily demand during the week with the highest demand during 2006 (12-18 November), as it was recorded by the TSO, as well as the demand on respective days after the hypothetical interruption of deliveries to dual fuel power stations.

It is noted that, while the actual demand of the whole week (143,000 m^3LNG) exceeds the total capacity of Revythoussa's LNG tanks, the demand after a hypothetical interruption of supply to PPC's stations at Komotini and Lavrio IV, to Heron Thermoelectric SA's open cycle gas turbine and to T-Power's CCGT, would correspond only to 67% of this capacity.

This fact means that, even in the event of a complete interruption of deliveries from the country's northern borders, the supply of at least the non-electricity producers could be ensured, if either the Revythoussa tanks' completeness exceeded 67%, or a delivery of an LNG cargo was scheduled within this week.

Figure 6: Daily consumption in week 12-18 November 2006
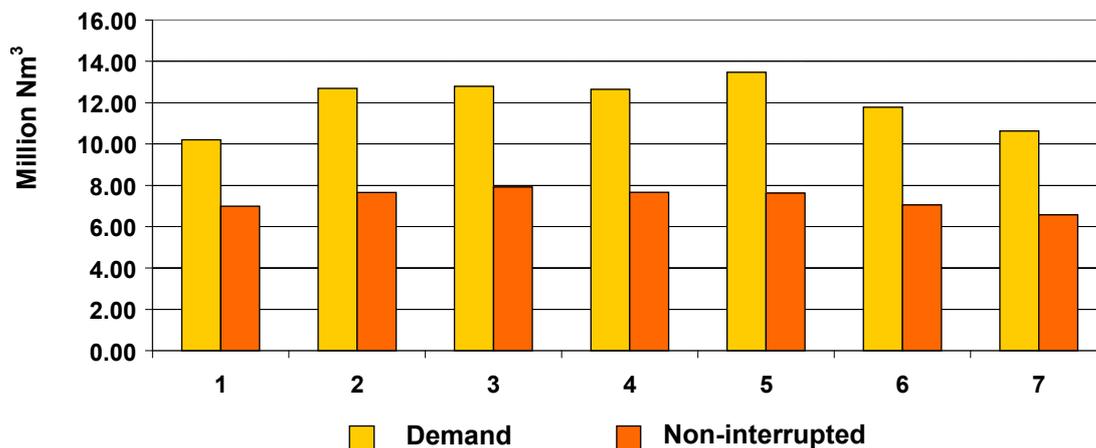
6.2.4 Conclusions

From the above and mainly from the results of the TSO's calculations mentioned in paragraph 6.2.3, we deduce the capability for managing crises that do not last more than a week, if the existing stations with alternative fuel are ready for an immediate transition from gas to liquid fuel.

Additionally, the management of crises with minimum deliveries' interruptions is possible if the level of the LNG terminal tanks is maintained at high levels. Consequently, it would be advisable for the TSO to develop and describe in the National Emergency Measures Plan a monitoring procedure of the tank's level and of the keeping of an adequate security reserve, which will enable the handling of emergency situations with greater ease, according to the security criteria which will be adopted.

D. Conclusions and Proposals

7. Conclusions

RAE's conclusions are summarized as follows:

7.1 Infrastructures

- The theoretical import capacity of the Transmission System through the three existing Entry Points (16.5 bcm/annum), covers the anticipated domestic demand for natural gas in the long-term (8.1 bcm in 2020, see paragraph 3.2) and allows additionally the transit of natural gas quantities of approximately 8 bcm/annum.

- Taking under consideration the actual limitations as well as the lack of sufficient information regarding the capacity of the upstream natural gas systems, the estimated import capacity to the NNGS according to the most conservative approach (6.5 bcm/annum) covers the domestic demand in the short-medium-term.

- However, the actual import capacity of each Entry Point as well as the transmission capacity in the NNGS, are further affected by the geographical distribution of demand and the existing limitations of the transmission of natural gas to the southern Exit Points, due to the System's topological characteristics (one main pipeline from the Greek-Turkish and Greek-Bulgarian borders to Attica, without loops) and the lack of a compressor on the main pipeline. The Transmission System's topology negatively affects the ability to handle emergency situations, especially if they concern isolated parts of the System.

- Both the existing and the currently under preparation Development Plan of the National Natural Gas System, includes projects (a compression unit at the main pipeline and the construction of a third tank at Revythoussa's LNG Facility), which will significantly increase total transmission and storage capacity of the System. This will positively affect the level of security of supply in the short/medium-term.

7.2 Demand and supply of natural gas

- The ever increasing share of natural gas in electricity generation henceforth inextricably links the security of natural gas supply, at least in the short-term, with the security of electricity supply, a fact that did not apply or wasn't obvious until the recent past. For this reason, the measures for the security of natural gas supply should be able to safeguard as much as possible the continuous operation of electricity generation units, according to paragraph 2 of article 4 of Directive 67/2004/EC.

- The continuous increase of the share of the household-commercial consumers in the demand for natural gas, results in the continuous decrease of the system's load factor, which renders necessary to ensure the capability of managing peak demand.

- Based on DEPA's existing long-term supply contracts and under the prevalent scenario of short-term demand forecast, a gap of natural gas supply of the order of 1 bcm/annum is anticipated for each year until 2010.

- In the long-run, after 2017, it is required to compensate for gas quantities that will not be available anymore, due to the gradual expiration of the existing long-term supply contracts. Also, it appears necessary to secure additional quantities of at least 2 bcm/annum from 2015 onwards.

- The possibility of further import of gas quantities from the Caspian region and the Middle East is directly affected by geopolitical, regulatory and technical factors. Obviously, the conditions for supplying gas to the Greek market from the aforementioned areas are optimized as the interest for transiting gas from the same areas to the European market through Greece is increasing. Securing of extra quantities to cover a part of the Greek demand is more probable in the framework of large scale gas supply agreements for export to Europe. At the same time, the familiarization of entities transiting gas through Greece with the regulatory framework and the conditions of the Greek gas market enhances the possibility of them participating in the market as new gas suppliers.

- The possibility of signing short- and long-term LNG contracts for the Greek market requires: (a) Targeting LNG suppliers with supply portfolio, that they can combine the supply of the Greek market as part of a larger regional market and, (b) the combined supply of more Eligible Customers together, so that the increased gas volumes could attract LNG suppliers due to exploitation of economies of scale.

7.3 Crisis management

- The management of crises that do not last more than a week is possible, if the existing power plants with alternative fuel are ready for immediate transition from gas to liquid fuel. Additionally, management of crises with minimum interruption of deliveries to consumers is possible if a high level of LNG stocks is maintained in the LNG terminal.

- With all data available today, it is anticipated that the existing infrastructure as well as the current and under preparation legal framework safeguard the continuous natural gas supply in the event of crises that in terms of duration do not exceed the period of one week and in terms of intensity involve interruption of deliveries from only one Entry Point. It is also clear that under current conditions, crises of longer duration or higher intensity would not be easily manageable only by TSO's actions.

8. Proposals for the reinforcement of security of supply and following steps

8.1 Proposals

In order to enhance the level of security of supply, RAE proposes the following:

1. It is essential to avoid any delays in the installation of the compressor unit at the main pipeline as well as to accelerate the procedures for increasing the storage capacity at Revythoussa LNG terminal. The additional storage space, apart from providing the TSO with more operational flexibility, will allow the for long-term natural gas storage.

2. The TSO should introduce a procedure for calculating the actual import capacity for each Entry Point of the Transmission System, for every year over the next five-year period. Relevant calculations must take under consideration the possible geographical demand distribution scenarios and any limitations of natural gas transmission within the country. Beyond serving the aims of security of supply of gas, the publication of such calculations would serve the development of competition in the natural gas market, since gas companies interested to supply the market will thereby have access to information which is essential for importing natural gas in the country.

3. It is imperative to put the effort for signing interruptible contracts between the TSO and the electricity generation authorization holders that have the potential to use alternative fuel, until the summer of the this year. It is recommended to examine in priority the application of interruptible contracts by the Danish TSO, as it appears to be in perfect agreement with the provisions of article 14 of the Law while, adopting directly this scheme, could significantly accelerate the procedure. According to these contracts, the TSO returns directly to the interruptible customers a percentage of the security of supply levy, as compensation for the service.

4. The calculation of the security of supply levy by RAE could be done in parallel with the preparation of the interruptible contracts by the TSO and the completion of the relevant provisions of the NNGS's Network Code. The calculation will be done taking into account the desired security of supply standard, which we recommend to be instituted initially as the N-1 criterion over a five-day period. That is to say, the supply of non-interruptible customers should be ensured in the event of a total interruption of natural gas deliveries from any Entry Point with duration of no more that five days. This period of time aims at providing market players with the opportunity to respond and eliminate the cause of the emergency.

5. In the draft Network Code that is currently under consultation, a mechanism for third party access to Revythoussa's LNG terminal is presented, through which the Users shall be able to keep LNG reserves in the tanks for periods longer than the LNG temporary storage period. This option could, under certain conditions, allow the implementation by the electricity production licensees of the second option of their licenses' relevant term, meaning the keeping of reserves of natural gas and not of alternative fuel, without aggravating the third party access to the LNG Facility. With the implementation of the Code's provisions, the production licensees who have

chosen the second option of the license term will have to prove the holding of stocks in the terminal's tanks. Otherwise, they will have to comply with the relevant term's first option i.e. the holding of oil reserves.

6. It is advisable that the TSO to develop and describe in the National Emergency Measures Plan, a procedure for monitoring the level of LNG stocks in the Revythoussa LNG Facility.

7. If the share of household-commercial consumers in the total demand continues to increase in the following years, it is necessary that the TSO studies more extensively how the demand's quality characteristics will be affected, such as peak demand, load factor and the connection between the load peak and the ambient temperature, in order to draw conclusions about the necessary actions (e.g. Demand Side Management by the EPAs), as well as the LNG Facility's necessary capacity to cover the peak demand (peak-shaving).

8. It is advisable that the NNGS's development should advance, where appropriate, in such a way as to give priority to the projects which contribute to the creation of looping branches. The aim should be the minimization of the consequences, in the event of a branch loss.

9. The management of the estimated natural gas demand-supply gap, on a short- or long-term basis, requires (a) the completion of the market's regulatory framework, to facilitate the entrance of new natural gas suppliers in the country, and the utilization of any import potential directly from Eligible Customers, (b) the signing of appropriate cooperation agreements with natural gas producing countries and, (c) shaping the conditions for accelerating of the proposed projects for the transit of natural gas through the country.

8.2 Following steps

Keeping the conclusions of the previous section as a starting point, RAE intends, in cooperation with DESFA, to proceed within 2009 to a quantitative assessment of the desirable level of security of supply, and to an estimation of cost/benefit relationship of the instruments listed in the Annex of Directive 2004/67/EK, and especially the following:

1. The signing of operating balancing agreements (OBAs) between DESFA and the TSOs of adjacent gas systems, for managing supply crises.

2. The use of alternative fuel in power plants.

3. The storage of natural gas and LNG in underground gas storage or LNG Facilities respectively.

Following the completion of the abovementioned study, RAE will make specific recommendations for the enhancement of the security of natural gas supply level in the long-term.

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