



N.N.G.S.
DEVELOPMENT
PLAN

2016-2025

Athens, May 2016

Table of contents

| | |
|--|----|
| ABBREVIATIONS..... | 4 |
| CHAPTER 1: INTRODUCTION..... | 5 |
| CHAPTER 1.1. COMPLIANCE OF NNGS DEVELOPMENT PLAN WITH ENTSOG’S TEN-YEAR DEVELOPMENT PLAN (TYNDP) AND GAS REGIONAL INVESTMENT PLAN (GRIP)..... | 7 |
| CHAPTER 2: DEVELOPMENT PLAN 2016-2025 | 8 |
| CHAPTER 2.1. PROJECTS INCLUDED FOR THE FIRST TIME IN DEVELOPMENT PLAN 2016-2025 | 8 |
| CHAPTER 2.1.1. PROJECTS FOR USERS CONNECTION | 8 |
| CHAPTER 2.1.2. PROJECTS FOR NNGS DEVELOPMENT | 8 |
| 2.1.2.1. UPGRADE OF LNG LOADING ARMS AT REVITHOUSSA LNG TERMINAL..... | 8 |
| 2.1.2.2. TRUCK LOADING PILOT STATION | 8 |
| 2.1.2.3. LNG TERMINAL BOIL-OFF GAS COMPRESSOR STATION..... | 10 |
| CHAPTER 2.2. PLANNED PROJECTS | 11 |
| CHAPTER 2.2.1. PROJECTS INCLUDED IN THE APPROVED DEVELOPMENT PLAN AND THEIR IMPLEMENTATION IS ONGOING IN THE REFERENCE PERIOD OF THE CURRENT DEVELOPMENT PLAN | 11 |
| 2.2.1.1. CONSTRUCTION OF HIGH PRESSURE PIPELINE FROM MANDRA ATTIKIS TO THE FACILITY OF ELPE IN ELEFSINA FOR THE CONNECTION WITH NNGS AND RELEVANT METERING STATION | 11 |
| 2.2.1.2. CONSTRUCTION OF HIGH PRESSURE PIPELINE MAVROMATI (VAGIA)-LARYMNA AND NECESSARY METERING STATION FOR THE CONNECTION OF LARCO GMM SA WITH NNGS..... | 12 |
| 2.2.1.3. COMPRESSION STATION IN KIPI..... | 12 |
| 2.2.1.4. M/R STATION IN KOMOTINI | 13 |
| 2.2.1.5. M/R STATION IN N. MESSIMVRIA FOR THE CONNECTION OF NNGTS TO TAP | 14 |
| 2.2.1.6. KOMOTINI-THESPROTIA HIGH PRESSURE PIPELINE (PART OF NNGS) | 15 |
| 2.2.1.7. 2ND UPGRADE OF LNG TERMINAL ON THE ISLAND REVITHOUSSA | 16 |
| 2.2.1.8. CONNECTION OF PROTERGIA S.A P/P UNIT. IN AGIOS NIKOLAOS VIOTIA | 18 |
| 2.2.1.9. EXPANSION OF NNGTS FROM THE MAIN PIPELINE TO THISVI | 18 |
| 2.2.1.10. CONNECTION OF KORINTHOS POWER S.A. P/P UNIT IN AG. THEODOROI..... | 19 |
| 2.2.1.11. 2 ^{HD} UPGRADE OF BOARDING METERING STATION (BMS) OF SIDIROKASTRO..... | 20 |
| 2.2.1.12. DESIGN, SUPPLY, INSTALLATION AND OPERATION OF EQUIPMENT SCADA FIELD | 21 |
| 2.2.1.13. UPGRADING OF ELECTRICAL AND ELECTRONIC EQUIPMENT, BILLING SYSTEM AND EQUIPMENT SCADA FIELD IN STATIONS M/R OF 1ST GENERATION (1995-2000)..... | 21 |
| 2.2.1.14. EXTENSIONS AND UPGRADES OF METERING STATIONS OF NORTH AND EAST THESSALONIKI | 22 |
| 2.2.1.15. UPGRADE THE SYSTEM OF FIXED COMMUNICATION OF NNGS | 23 |
| 2.2.1.16. IT & TELECOMMUNICATIONS PROJECTS..... | 24 |
| 2.2.1.17. UPGRADING PROJECTS OF NNGS | 26 |
| 2.2.1.18. UPGRADING PROJECTS OF NNGS -2 ND GROUP | 28 |
| 2.2.1.19. INSTALLATION OF M/R FARSALA..... | 29 |
| 2.2.1.20. INSTALLATION OF M/R KAVALA..... | 30 |

CHAPTER 2.2.2. PROJECTS THAT HAVE ALREADY BEEN INCLUDED IN THE LIST OF SMALL PROJECTS AND THEIR IMPLEMENTATION IS ONGOING IN THE REFERENCE PERIOD OF THE SUBMITTED DEVELOPMENT PLAN..... 30

CHAPTER 2.3. PROJECTS OF THE THREE YEAR DEVELOPMENT PERIOD 30

CHAPTER 3. PLANNED PROJECTS THAT WERE NOT INCLUDED IN THE DRAFT DEVELOPMENT PLAN 2016-2025 30

ANNEX I 32

IMPORTANT NOTE: The English translation is not binding. In the event of discrepancies between the Greek and English version, the Greek text prevails.

ABBREVIATIONS

INGS: Integrated Natural Gas System
L/V: Linevalve
DESFA: TSO of the Greek Natural Gas System
TSO: Transmission System Operator
NNGS: National Natural Gas System
NNGTS: National Natural Gas Transmission System
NSRF 2007-2013: National Strategic Reference Framework 2007-2013
PA 214-2020: Partnership Agreement for the Development Framework 2014-2020
EIB: European Investment Bank
CHP: Combined Heat and Power unit
P/P: Power Producer
O&M Centers: Centers of Operation and Maintenance
BMS: Boarding Metering Station
IISNG: Integrated IT System for Natural Gas
RAE: Regulatory Authority of Energy
RAB: Regulated Asset Base
LNG: Liquefied Natural Gas
HP: High Pressure
Bcma: Billion cubic meter per annum
BCC: Back up Control Center
CCTV: Closed Circuit Television
DCS: Distributed Control System
GCC: Gas Control Center
IGB: Interconnector Greece Bulgaria
IGI: Interconnector Greece Italy
M/R: Metering/Regulating station
Nm³: Normal Cubic meter
PLC: Programmable Logic Controller
REM: Remote
RTU: Remote Terminal Unit
SCADA: Supervisory Control and Data Acquisition
TAP: Trans Adriatic Pipeline
TDM/PDH: Time Division Multiplexing/ Plesiochronous Digital Hierarchy
TM: Tele-metering

CHAPTER 1: INTRODUCTION

In accordance with paragraph 2g of Article 69 of Law 4001/2011 as valid, the Hellenic Gas Transmission System Operator (DESFA) conducts the Development Plan and the Regulatory Authority for Energy (RAE) approves and overviews the implementation of it, which establishes the projects for the development, enhancement and interconnections of the National Natural Gas System (NNGS) for the next ten (10) years.

The above mentioned clauses are specified within par. 1-7 of art. 92 of the NNGS Administration Code as valid (Network Code).

For the preparation of the Development Plan, the Development Study is taken into consideration as well as:

- a) data of the current and the estimated supply and demand of natural gas
- b) the fulfillment of public service obligations and the assurance of natural gas supply in a credible and cost-effective way
- c) the improvement of the NNGS efficiency and the ensuring of its smooth operation aiming at the prevention of congestions, emergencies and refusal of access for new Users
- d) the supply of new areas with natural gas and the ensuring of new Users' potential access
- e) the protection of the environment
- f) the European development plan and the regional investment programs in accordance with the provisions of part (b) of paragraph 3 of Article 8 and of paragraph 1 of Article 12 of Regulation 715/2009
- g) the sustainability of projects that are included in the Plan and their potential financing outside the framework of the Development Plan."

The Development Plan includes projects that their construction is scheduled to begin within the timeframe of the Plan (i.e. for the period 2016-2025) as well as the Planned Projects that their construction has not been completed yet.

The TSO substantiates the feasibility of the inclusion of the newly proposed projects in the Development Plan and includes information about the construction method, the estimated budget, the time schedule of the implementation, the way of financing the relevant investments as well as the cost recovery method.

In the following paragraphs the projects of the Development Plan of 2016-2025 are presented, including for each project all the necessary elements arising from the Network Code for the regulation of NNGS (Article 92).

The Development Plan is structured as follows:

I. Projects that are included for the first time in the Development Plan of NNGS 2016-2025 (Chapter 2.1)

- i. Projects for the Connection of Users
- ii. Projects for the Development of NNGS

II. Planned Projects (Chapter 2.2)

- i. Projects included in the approved Development Plan and their implementation is ongoing during the reference period of the current Development Plan
- ii. Projects included in the List of Small Projects and their implementation is ongoing during the reference period of the current Development Plan

III. Projects included in the Three-Year Development Period (Chapter 2.3)

According to par. 3 of article 92, the TSO is obligated to justify in the Development Plan any reasons for not including any planned project.

For each project a summary table, as presented below, of the following information is given: type of project (Planned Project/New Project, the type of the investment (Pipeline, metering station, LNG/CNG, UGS, compressor, equipment for the transmission system and/or LNG facility), expected benefit (according to the criteria of art. 92 par. 5 of NNGS Administration Code as valid), the current status (under feasibility study, under technical study/authorization, under the process of award for the construction/ implementation, under construction), whether the Final Investment Decision has been taken or not, the current budget of the project and the part of which is considered maintenance capex, the estimated date that the project will be ready for operation.

Maintenance capex is considered to be any addition or replacement to NNGS assets in order the latter to be maintained in their initial operational capability as long as possible.

The following definitions are proposed by DESFA to RAE, in the framework of the amendments on the Administration Code for the regulation of Natural Gas System that DESFA submitted to RAE in November 2015.

Start date of the project, is considered the date of inclusion of an unplanned project in the Draft Development Plan or in the List of Small Projects, as those are published to the TSO's website. Start date may be accompanied by certain requirements about the project realization.

As Final Investment Decision (or Resolution to Construct), is considered the approval decision for the implementation of the project without any technical, commercial or financial preconditions. The Final Investment Decision of the project follows a) the approval of the Development Plan or the publication of the List of Small Projects, b) the signature of the Connection Agreement when it concerns a project for the connection of Users, c) the project funding decision, at least as regards the equity and possible grants and d) the approval of its Environmental Terms. Any supply agreement about construction materials shall be signed following the Final Investment Decision.

Completion date of the project is referred to the date that the project construction has been completed, the final check and control of the project is done and all of its subprojects are ready to operate. The completion dates of the subprojects that constitute the final result are determined by the relevant supervisor with the issue of a certificate about their mechanical completion or in case of in house supervising, by the TSO. Minor projects that do not affect the functionality of the project may be completed after the Completion date of the project.

When new projects are included in the Draft Development Plan, their impact on the average usage tariff of the NNGS is calculated.

Furthermore, the financing plan and the recovery method of the investment are presented for each project.

| Project Summary | |
|--|--|
| Type of project | |
| Type of investment | |
| Current Budget | |
| <i>Of which Maintenance Capex</i> | |
| Expected benefit | |
| Start date | |
| End date | |
| Connection Agreement with User (Projects for the connection of Users only) | |
| Resolution to Construct/FID | |
| Current Status of Project | |
| Financing plan | |
| Recovery method | |
| Impact on the average tariff for the usage of NNGS (for new projects only ¹) | |

Following the project summary of each project, a short description of the scope of it and any other necessary relevant information is given.

CHAPTER 1.1. COMPLIANCE OF NNGS DEVELOPMENT PLAN WITH ENTSOG's TEN-YEAR DEVELOPMENT PLAN (TYNDP) AND GAS REGIONAL INVESTMENT PLAN (GRIP)

In compliance with Regulation 715/2009/EC Transmission System Operators are obliged to establish a regional cooperation in the framework of European Network of Transmission System Operators for Gas (ENTSO-G). Specifically, the TSO publishes every two years a non-binding ten years system development plan, as well as the gas regional investment plan (GRIP).

The purpose of these documents is to provide information to stakeholders about the new projects that will create opportunities for transporting natural gas in each country.

NNGS Development Plan for 2016-2025 is compatible with the latest approved TYNDP as well as the current regional investment plan.

It should be mentioned that GRIP only examines projects from a regional perspective rather than from a national point of view.

¹ Projects that are part of the Development Plan for the first time

CHAPTER 2: DEVELOPMENT PLAN 2016-2025

CHAPTER 2.1. PROJECTS INCLUDED FOR THE FIRST TIME IN DEVELOPMENT PLAN 2016-2025

CHAPTER 2.1.1. PROJECTS FOR USERS CONNECTION

(art. 92 par. 4A. of the Network Code of the NNGS as applicable)

No such projects are included in the current Development Plan.

CHAPTER 2.1.2. PROJECTS FOR NNGS DEVELOPMENT

(art. 92 par. 4B of the Network Code of the NNGS as applicable)

2.1.2.1. Upgrade of LNG Loading Arms at Revithoussa LNG Terminal

| Project Summary | |
|--|---|
| Type of Project | New Project |
| Type of investment | LNG facility |
| Current budget | 0.9 million € |
| <i>Of which Maintenance Capex</i> | <i>0.9 million €</i> |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Apr-16 |
| End date | Dec-16 |
| Resolution to Construct/FID | No |
| Current Status | Under feasibility study |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion in RAB |
| Impact on the average usage tariff of the NNGS | 0,030% |

The project scope is replacement of electrical and mechanical equipment of the LNG loading arms at Revithoussa LNG Terminal in order the LNG loading to be effected with equipment of modern technology. Latest technology electro pneumatic equipment shall be installed as well. Additionally maintenance of the existing cryogenic equipment shall be executed after 15 year operation. The project is deemed necessary for the safer and easier connection of the loading arms on the vessel (ship to shore connection) which is the most crucial and hazardous operation during LNG unloading.

The inclusion of the project in the Development Plan is justified since it will enhance efficiency and will maintain and upgrade safety of operations. The estimated cost of the project is 900.000 €. The cost of the project will be included in the RAB and it will increase the average usage tariff of the NNGS by 0,030%.

Commencement of construction works is estimated in October 2016 and the project will be completed and operational in December 2016.

2.1.2.2. Truck Loading Pilot Station

| Project Summary | |
|--|--|
| Type of Project | New Project |
| Type of investment | LNG facility |
| Current budget | 5 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Apr-16 |
| End date | Dec-17 |
| Resolution to Construct/FID | No |
| Current Status | Under basic design study |
| Financing plan | DESFA's own equity, possible grant from PA 2014-2020 |
| Recovery method | Inclusion in RAB |
| Impact on the average usage tariff of the NNGS | 0.270% (excluding grants) |

Since May 2015 the Basic Design study for the implementation of the 1st truck loading station in Revithoussa is being executed.

Taking into account that NNGTS was developed mainly in the east geographical part of Greece and the consumers on the west part of Greece are not facilitated with natural gas supply, this application of Truck loading will transport liquefied natural gas to consumers' installations for gasification and therefore it is estimated that gas penetration to the market will be increased.

The market has soundly expressed interest for the said application during the public consultation of NNGS Development Plan for period 2013-2022.

The station will be one point for trucks loading with a capacity of 50 m³ and loading flow of 100 m³/h.

The project also includes:

- Measurement of LNG loaded via weighbridge
- Control of the truck loading station from the LNG Terminal Control Room and DESFA SAP system for the issuance of invoices and other required documentation
- Traffic arrangements within DESFA property as well as on the access road to Revithoussa.

DESFA has performed techno- economic assessment study by a specialized consultant in order to identify the optimum route for long trucks (approx. 16 m) from the LNG truck loading station to the National highway and from there to the locations of the prospective customers.

The cost of the project that will be included in the RAB will increase the average usage tariff by 0.270%. The above calculation does not take into consideration any possible grants, which in any case if they are obtained will reduce the increase in the tariff.

Demand study for this new service is in the published NNGS Development Study for 2015-2024.

Revenues from the operation of the project are considered to be added to revenues from LNG usage and are taken into consideration in the calculations of the above study.

The cost for loading includes transportation cost of trucks by sea from the coastline to Revithoussa island. Revenues from Loading Fee have been calculated as preliminary considering similar fees in other European countries.

The station is programmed to be completed in the end of 2017.

2.1.2.3. LNG Terminal Boil-off Gas Compressor Station

| Project Summary | |
|--|--|
| Type of Project | New Project |
| Type of investment | LNG facility |
| Current budget | 3.132 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Apr-16 |
| End date | Dec-18 |
| Resolution to Construct/FID | No |
| Current Status | Under study |
| Financing plan | DESFA's own equity, possible grant from PA 2014-2020 |
| Recovery method | Inclusion in RAB |
| Impact on the average usage tariff of the NNGS | 0.097% (excluding grants) |

The compressor will be installed at Revithousa LNG Terminal in order to receive boil off gas from LNG process in the tanks and piping instrumentation, convey via Ag.Triada Metering Station and inject them into the NNGTS.

The current necessary combustion of boil off gas in the flare when the LNG Terminal is not in operation will be terminated with this environmental friendly project.

The gas that is conveyed to the flare for combustion is approx. 3.500 kg LNG / h. The proposed project, apart from saving of LNG significantly for the users of the station is an important environmental benefit by eliminating the carbon dioxide emissions during the period of non-operation of the Terminal.

The budget of the project is 3.132 million € for the installation of a 400 kW reciprocating compressor, which will receive boil off gas from the two existing LNG tanks and the third tank which is being constructed. The additional variable operating costs required for the operation of the new reciprocating compressor is estimated approx. 165 k€ / year assuming that the consumption of the LNG will be equivalent to the one of the years 2014 and 2015.

The project cost will be added to RAB. This addition combined with firstly the slight increase of operating costs due to the operation of the reciprocating compressor and with secondly the decrease of the purchase rights for the CO2 emissions market (EU ETS) due to lower combustion of gas in the flare, will increase the Average Fee for the Usage of NNGS by 0.097%. This percentage has been calculated without taking into account possible grants for the project, and therefore it may be further reduced if the DESFA achieves the co-funding of the investment from the PA 2014-2020.

The benefit for the users of LNG facility due to lower LNG Losses is estimated to be much larger. Based on the technical analysis performed by DESFA the LNG that will be injected into NNGS and not conveyed to flare for combustion will be approx. 150 MWh / day during the days that the LNG Terminal will not operate.

The economic benefit for the LNG user is estimated approx. about 3.5 million € / year considering that the LNG price will be approx. 20 € / MWh in 2018, year of boil-off gas compressor operation, and estimate 150 days / year (average for the years 2014 to 2015) the days that the LNG Terminal will not operate.

The invitation for the tendering for the project detailed design -procurement - construction is estimated to take place in January 2017 and is estimated the project to be operational in December 2018.

Effect on the Average Tariff for the Usage of NNGS

The inclusion in the RAB of the above mentioned projects (2.1.2.1- 2.1.2.3) increases the Average Tariff for the usage of NNGS by 0.397%.
 The benefit achieved from the above mentioned projects compensates for the increase.

CHAPTER 2.2. PLANNED PROJECTS

CHAPTER 2.2.1. PROJECTS INCLUDED IN THE APPROVED DEVELOPMENT PLAN² AND THEIR IMPLEMENTATION IS ONGOING IN THE REFERENCE PERIOD OF THE CURRENT DEVELOPMENT PLAN

2.2.1.1. Construction of High Pressure Pipeline from Mandra Attikis to the Facility of ELPE in Elefsina for the Connection with NNGS and Relevant Metering Station

| Project Summary | |
|--------------------------------|---|
| Type of Project | Planned Project |
| Type of investment | Pipeline Metering Station |
| Current budget | 5.9 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Nov-12 |
| End date | Aug-16 |
| Connection Agreement with User | Yes |
| Resolution to Construct/FID | Yes |
| Current Status | Under construction |
| Financing plan | DESFA's own equity |
| Recovery method | -Connection Fee by User -Transmission contract |

The project consists of:

- Pipeline of 6.5 km, DN 250 (10 inch diameter) which will start from line valve “Mandra” crossing the railway lines and the new national road of Athens-Corinth will connect in the facility of ELPE.

² Decision No 458/2015/27-11-2015 by RAE concerning the “Approval of NNGS Development Plan 2015-2024”.

- Metering station that will be installed in land provided by ELPE

2.2.1.2. Construction of High Pressure Pipeline Mavromati (Vagia)-Larymna and necessary Metering Station for the Connection of LARCO GMM SA with NNGS.

| Project Summary | |
|--------------------------------|--|
| Type of Project | Planned Project |
| Type of investment | Pipeline Metering Station |
| Current budget | 17,5 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Jun-13 |
| End date | - ³ |
| Connection Agreement with User | Pending |
| Resolution to Construct/FID | No ⁴ |
| Current Status | Under technical study/permitting |
| Financing plan | DESFA's own equity, EIB loan, possible grant |
| Recovery method | -Connection Fee by User -Inclusio in RAB (excluding grants) |

The project consists of:

- Pipeline of 36 km, DN 250 (10 inch diameter) which will start from the main natural gas pipeline line valve station "Mavromati (Vagia)" and ends up in the facility of LARCO.
- Metering station that will be installed in land provided by LARCO

2.2.1.3. Compression Station in Kipi

| Project Summary | |
|-----------------------------|---|
| Type of Project | Planned Project |
| Type of investment | Compressor |
| Current budget | 70 million € ⁵ |
| Expected benefit | Technical adequacy of NNGS, increase of flexibility |
| Start date | 19-Jul-07 ⁶ |
| End date | - ⁷ |
| Resolution to Construct/FID | No ⁸ |
| Current Status | Under technical study ⁹ |

³ Connection Agreement has not been signed yet

⁴ Pending necessary contractual commitments by the applicant User

⁵ Preliminary estimation for the maximum flow

⁶ Approval time of basic design

⁷ It has not been taken

⁸ Final construction decision has not been taken yet and the cost of the project is not included in RAB

⁹ The technical study has been completed / preliminary authorization for the case of maximum flow

| | |
|-----------------|-----------------|
| Financing plan | Not defined yet |
| Recovery method | Not defined yet |

{Part of Planned Project “2.2.1.3 Compressor station in Kipi and M/R stations” that was included in NNGS Development Plan 2015-2024, which is distinguished in the current Development Plan 2016-2025 in projects “2.2.1.3 Compressor station in Kipi”, “2.2.1.4. M/R station in Komotini” and “2.2.1.5 M/R station in Nea Messimvria for the connection of NNGTS to TAP”}

The project aims at increasing the Transmission Capacity of NNGS and to enable supply of larger natural gas quantities to the Greek and European markets via NNGS and/or via the INGS which are foreseen to be developed in the region (IGI, IGB).

The project is included in PCI list of November 2015 (Delegated Regulation 89/2016).

Considering that the market needs are not defined yet the size of the compressor station has not been specified. However in the case of maximum flow for transit projects 3 compression units with centrifugal compressor and a turbine of 9,7 MW each will be installed.

The preliminary budget for the project is 70 million € including the upgrade of the current existing metering station in “Kipi”. The time schedule of the project depends on the request of the market.

2.1.2.4. M/R Station in Komotini

| Project Summary | |
|-----------------------------|-------------------------------------|
| Type of Project | Planned Project |
| Type of investment | Metering Station |
| Current budget | 7.5 million € |
| Expected benefit | Security of supply |
| Start date | 19-Jul-07 ¹⁰ |
| End date | _ ¹¹ |
| Resolution to Construct/FID | No ¹² |
| Current Status | Under technical study ¹³ |
| Financing plan | Not defined yet |
| Recovery method | Not defined yet |

{Part of Planned Project “2.2.1.3 Compressor station in Kipi and M/R stations” that was included in NNGS Development Plan 2015-2024, which is distinguished in the current Development Plan 2016-2025 in projects “2.2.1.3 Compressor station in Kipi”, “2.2.1.4. M/R station in Komotini” and “2.2.1.5 M/R station in Nea Messimvria for the connection of NNGTS to TAP”}

The project consists of Metering/Regulating station in Komotini for the foreseen connection of NNGTS with transit projects (IGB, IGI etc.) that are scheduled to be developed in the area.

¹⁰ Approval time for the basic design

¹¹ Resolution to construct has not been taken yet

¹² Same as before. The project’s cost has not been added to RAB

¹³ The technical study has been completed / preliminary authorization for the case of maximum flow.

The preliminary budget of the project is 7.5 million €. The time schedule for the completion of the project is dependent to the request of the Users and the booking of Transmission Capacity according to the provisions of the NNGS Network Code.

2.2.1.5. M/R Station in N. Messimvria for the Connection of NNGTS to TAP

| Project Summary | |
|-----------------------------|--|
| Type of Project | Planned Project |
| Type of investment | Pipeline, Metering Station |
| Current budget | 10 million € |
| Expected benefit | Security of supply |
| Start date | 19-Jul-07 ¹⁴ |
| End date | 2019 |
| Resolution to Construct/FID | No ¹⁵ |
| Current Status | Under technical study ¹⁶ |
| Financing plan | EIB loan, own equity, possible grants |
| Recovery method | Inclusion in RAB (excluding possible grants) |

According to the provisions of the Host Government Agreement (HGA) in section 7.2a and those in paragraph 4.7.4 of Joint Decision of Greek, Albanian and Italian Regulators for the exemption of TAP from articles 9, 32, 41(6), (8) and (10) of Directive 2009/73/EC (Decision of RAE 269/2013 Gov. Gaz. 1833/29.07.2013) at least one (1) Tie In Point between NNGS and TAP pipeline should be realized, with a technical capacity of 10 mil. Nm³/ day and bi-directional flow capability. The cost of construction of the above mention investment will be covered by DESFA and will be recovered through the tariffs of the Users of the National Natural Gas System.

A study was conducted by DESFA to find the optimal interconnection point from a technical and economic point of view. The study was submitted to RAE. The optimum interconnection point is in Nea Messimvria. DESFA has begun the examination of the exact tie in point with TAP. The preferable option would be to implement the connection in a neighboring to the existing O&M center plot as this would facilitate the permitting procedure.

According to the regulatory framework the tie in point must be bidirectional. Flow from TAP to NNGTS due to the difference in the operating pressure (93 barg and 66,4 barg accordingly) requires only the installation of a Metering/Station. However flow from NNGTS to TAP requires also the installation of a compressor station. The preliminary budget of the project is 10 million € and includes a) engineering-procurement-construction of the Metering/Regulating station b) engineering-procurement-construction of a small connecting pipeline between the two systems c) purchase of land for the M/R and compressor station.

With the proposed investment the uni-directional flow from TAP to NNGTS is secured (1st phase of the project) while to ensure the bi-directional flow a compressor station will be installed in the future (2nd phase of the project).

The project is included in the PCI list of November 2015. DESFA has requested co-financing for the FEED study from 2016 call of Connecting Europe Facility (CEF).

¹⁴ Approval time for the basic design

¹⁵ Same as before. The project's cost has not been added to RAB

¹⁶ The technical study has been completed / preliminary authorization for the case of maximum flow.

The project increases the Average Tariff for the usage of NNGS is 0.243%.

For the above calculation DESFA took into consideration that the capex of 10 million € will be disbursed in 2018 and 2019, no new volumes are added and opex remains the same.

Since the project is already planned as it was included in the development plan (MD 1588/Jan 2007) it is not added in the calculation of the effect of the new projects on the Average Tariff for the usage of NNGS.

The increase in the tariffs is compensated by

- a) the positive effect on gas prices that the addition of one more supply source will bring
- b) the increase in security of supply

Successful co-financing by CEF will decrease accordingly the cost of the project that is added to RAB therefore the increase on the tariffs will be lower. Detailed time schedule and cost will be available during the execution of the FEED study.

For the above mentioned reasons the project of the Metering /Regulating station in Nea Messimvia that in the approved Development Plan 2015-2024 was part of project “2.2.1.3 Compressor station in Kipi and Metering/Stations”, is presented here separately as it will be the 1st interconnection point between NNGTS and TAP.

2.2.1.6. Komotini-Thesprotia High Pressure Pipeline (part of NNGS)

| Project Summary | |
|-----------------------------|---|
| Type of Project | Planned Project |
| Type of investment | Pipeline, Metering Station |
| Current budget | 1100 million € ¹⁷ |
| Expected benefit | Diversification of supply sources, security of supply |
| Start date | 19-Jul-07 ¹⁸ |
| End date | - ¹⁹ |
| Resolution to Construct/FID | No ²⁰ |
| Current Status | Under technical study ²¹ |
| Financing plan | Not defined yet |
| Recovery method | Not defined yet |

Komotini-Thesprotia pipeline project consists of high pressure pipeline (80 barg), 613 km length and DN 1050 (42 inch diameter). The proposed routing of the pipeline starts from the industrial area of Komotini in Rodopi Prefecture and ends near the coast of Thesprotia Prefecture.

The project consists also of above-ground facilities that are necessary for the safe operation such as Operation & Maintenance center, two compressor stations (one in Komotini and one in N.

¹⁷ Preliminary estimation for the case of maximum flow

¹⁸ Approval date of basic design

¹⁹ Resolution to construct has not been taken yet

²⁰ Same as before. The project's cost has not been added to RAB

²¹ The technical study has been completed/ preliminary authorization for the case of maximum flow. Environmental terms are not approved yet.. An update of the studies is required.

Mesimvria), metering and regulating stations, line valves stations, scrapper trap stations and telecommunication equipment. The pipeline is designed in a way to enable a potential future supply of customers in the adjacent urban areas along the routing.

2.2.1.7. 2nd Upgrade of LNG Terminal on the Island Revithousa

| Project Summary | |
|-----------------------------------|---|
| Project Type | Planned Project |
| Type of investment | LNG facility |
| Current budget | 147 million € |
| <i>Of which Maintenance Capex</i> | <i>1 million €</i> |
| Expected benefit | Increase of NNGS flexibility, security of supply, enhancement of competition |
| Start date | 09-Apr-10 |
| End date | Dec-17 |
| Resolution to Construct/FID | Yes |
| Current Status | -Under engineering-procurement-construction (3 rd tank) -Under engineering-procurement-construction (send out rate, M/R Ag. Triada) -Under tender procedure for engineering-procurement-construction (marine facility) |
| Financing plan | -Grants NSRF 2007-2013 (35%) -EIB loan (80 M€)- Own equity (rest of the cost) |
| Recovery method | Inclusion in RAB (excluding grants) ²² |

The scope of the project includes:

a. Increase of storage space of the station with the installment of a new tank of 95.000 m³ capacity

With the addition of the 3rd tank the total storage space will be increased, from 130.000 m³ to 225.000 m³ and the available storage space for Users will be increased from 110.000 m³ to about 200.000 m³ (i.e. 82%)

The installation of the 3rd tank will enhance the safety in the case of a cut-off for the northern entry points. The technical solution that is chosen to be constructed is the one with the highest safety standards and the minimal visual disturbance.

b. Upgrade of marine to accommodate larger ships

The marine works will enable the mooring of larger ships with a capacity of up to 260.000 m³ (Q-max).

Apart from the increased competition due to a greater range for the LNG carriers that the terminal may accommodate, another benefit expected is that the volume and transportation cost per unit of LNG will be decreased as the cargo volume is increased. Consequently, the project is expected to lead to lower gas prices for consumers.

²² The cost of the project (excl. grants) is not yet included in RAB due to the Tariff Regulation provisions regarding Major Projects

The project includes the necessary changes of the existing facility in order to upload gas to ships of 20.000 m³ and above. The investment includes the replacement of pumps in order to increase the capacity of the uploading.

c. Upgrade of gasification rate

The project will include the installation of cryogenic equipment that will increase the rate of gasification in normal conditions (Sustained Maximum Send-out Rate) (i.e. without the use of backup equipment), from 1.000 Nm³/h LNG²³ that is today, to 1.400 Nm³/h LNG (i.e. an increase of 40%). The auxiliary equipment of 250 Nm³/h LNG will remain in use.

The proposed upgrade of the gasification rate will increase the rate of gasification in normal operating conditions (Sustained Maximum Send-out Rate) from 12,47 million Nm³/d to 19,15 million Nm³/d, while in a case of emergency (i.e. use of backup equipment), this rate can be up to 22,57 million Nm³/d.

The technical solution that is chosen for the increase of the gasification send-out rate is the addition of an Open Rack Vaporizer, which is the most environmentally friendly solution. Also three sea water pumps will be replaced, and other works will be performed on piping facilities.

The project includes the necessary mechanical modifications in the existing unloading arms in order to be able to upload ships up to 20.000 m³. The project included the replacement of existing valves in order to increase uploading capacity to 2.400 m³ LNG/hr.



Picture 1: Aerial view of terminal station with the installation of the 3rd tank

d. Upgrade of Ag. Triada Metering Station

This project is considered to be a necessary complement to the upgrade of the gasification rate as stated above.

Construction works of the third tank started on 1st of June 2014 while the EPC contract has been awarded. Also, the upgrade of the gasification rate and the metering station in Ag. Triada has been started. The upgrade of the marine facility is under tender procedure for engineering-procurement-construction.

The completion of the entire project is expected in December 2017 according to the current time schedule. The expected budget is 147 million €.

DESFA has requested financing of the project from NSRF 2007-2013 in order to minimize the impact on tariffs of the investment. The approved grant rate (public expenditure) is 35% of the eligible costs via Public Investment Program (PIP) under NSRF. The amount of the total budget that

²³ 1 m³ of LNG= 570 Nm³ of Natural Gas

will not be co-financed by NSRF (65%) will be covered by own equity and loan. For the loan, DESFA will receive 80 million € from EIB. The 1st tranche of the loan (40 million €) has already been disbursed. In November 2015 the contract for the 2nd tranche of approximately 40 million € was signed between DESFA and EIB. The disbursement is expected within the 2nd semester of 2016. The cost of the investment that will not be subsidized will be added to the RAB and will be recovered through NNGS tariffs. According to the approved Tariff Regulation (art. 20 par. 1.a.iii. Decision 722/2012 of RAE) the cost of the investment will be added to RAB in the first year of the operation of the project.

2.2.1.8. Connection of PROTERGIA S.A P/P unit. in Agios Nikolaos Viotia

| Project Summary | |
|-------------------------------|------------------------------|
| Project Type | Planned Project |
| Type of investment | Metering Station |
| Current budget | 1.85 million € |
| Expected benefit | Enabling access of new Users |
| Start date | 31-Jul-08 |
| End date | May-16 |
| Current Status | Under Construction |
| Contractual Agreement of User | Yes |
| Resolution to Construct/FID | Yes |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee from User |

This Power Plant that is constructed in Agios Nikolaos, Viotia, has a total nominal power of 444,5 MW and entered into trial operation in late November 2010.

Given that the plant was constructed in the same area with the existing Combined Heat and Power (CHP) unit of Aluminum S.A. that is already fueled with natural gas, the investment is related to the construction of a metering station, while the supply pipeline already exists (HP pipeline Mavroneri- Antikira, DN 500 (20 inch diameter). For the first period of operation of the unit the metering station of the power production unit with the necessary pipeline layout (by pass) shall be used as temporary metering station in accordance with the provisions of DESFA's NNGS Administration code.

The contract for the construction and implementation of the relevant Metering Station has already been signed and its construction is expected to be completed on May 2016. The current budget of the project is approximately 1.85 million €. The cost will be covered by the power producer as Connection Fee.

2.2.1.9. Expansion of NNGTS from the Main Pipeline to Thisvi

| Project Summary | |
|--------------------|------------------------------|
| Project Type | Planned Project |
| Type of investment | Pipeline Metering Station |
| Current budget | 14.43 million € |
| Expected benefit | Enabling access of new Users |

| | |
|--|--|
| Start date | 24-Jan-08 |
| End date | Apr-16 |
| Contractual Connection Agreement of User | Yes |
| Resolution to Construct/FID | Yes |
| Current Status | Under Construction (M station) Completed (Pipeline) |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee by User Connection Agreement |

This expansion is designed to serve the energy needs of industrial, residential and commercial sector in the region of Thisvi and Domvraina. At the same time it will feed the new P/P unit of ELPEDISON ENERGY II with nominal power of 421,6 MW.

For the connection of the P/P unit with the NNGS, DESFA has already construct a pipeline of a total length of 26,3 km and a diameter of 20 in and will construct the necessary Metering Station to supply the plant. Up to now, the power plant is fueled with natural gas through a by-pass connection that has already been constructed and the relevant measurement is done by the power plant's own system. The connection point of the feeding pipeline with the main HP pipeline is the L/V Vaya. The project of the metering station is expected to be completed in April 2016.

The cost of the project was 12.3 million € above the initial estimated cost of 2.13 million € for the metering station of the new unit. The Connection Fee, which will be covered by the power producer (part of the pipeline and the metering station).

The remaining cost, excluding the Connection Fee, will be covered by DESFA's own equity while the recovery of the investment will be made through the transmission tariffs, as this is included in the Regulated Asset Base of DESFA.

2.2.1.10. Connection of Korinthos Power S.A. P/P unit in Ag. Theodoroi

| Project Summary | |
|-------------------------------|------------------------------|
| Project Type | Planned Project |
| Type of investment | Metering Station |
| Current budget | 1.7 million € |
| Expected benefit | Enabling access of new Users |
| Start date | 10-Feb-11 |
| End date | Apr-16 |
| Contractual Agreement of User | Yes |
| Resolution to Construct/FID | Yes |
| Current Status | Under Construction |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee by User |

The company Korinthos Power S.A. has proceeded with the implementation of a new thermal power plant fueled by natural gas in the area of Ag. Theodoroi in Korinthos, in a close distance of the premises of Motor Oil.

The unit already operates and the metering of the supply of the unit is done by the metering facility of the power production unit.

The current budget of the project is 1,7 million € and will be covered by the User as Connection Fee. The project is expected to be ready for operation in April 2016.

2.2.1.11. 2nd Upgrade of Boarding Metering Station (BMS) of Sidirokastro

| Project Summary | |
|-----------------------------------|---|
| Project Type | Planned Project |
| Type of investment | Equipment of transmission system |
| Current budget | 3.3 million € |
| <i>Of which Maintenance Capex</i> | <i>2.3 million €</i> |
| Expected benefit | Security of Supply, Efficiency of NNGS, effective operation, enhance of competition |
| Start date | 15-May-12 |
| End date | 1 st phase: May-14 (iv) 2 nd phase: Dec-16 (i-iii) |
| Resolution to Construct/FID | Yes |
| Current Status | Under engineering-procurement-construction (i-iii) In operation (iv) |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion in RAB |

The project includes:

i) the remote control of Border Metering Station (BMS) in Sidirokastro through Supervisory Control and Data Acquisition (SCADA) system from the Gas Control Center in Patima and the Back up Control Center in Nea Messimvria. The remote control is possible by upgrading and automating sub-systems of the Station, that are considered to be technologically out of time and by upgrading the local monitoring & control system (Distributed Control System).

ii) the replacement of the existing orifice meters with ultrasonic meters in order to be compatible with the requirements of measurement standards. The metering system has been constructed based on the standard ISO 5167:1991

iii) the upgrade of the supporting station utilities in accordance with the requirements of remote controlling, taking into consideration the life cycle of the installed equipment

iv) the possibility of permanent reverse flow through BMS Sidirokastro, so that exporting of volumes from NNGS to Bulgaria will be possible in respect to either the European legal framework, concerning security of supply 994/2010/EC, or the 3rd energy package for the liberalization of the energy markets.

The current budget of the project is 3.3 million € and the project is expected to be ready for operation in December 2016. The scope of work (iv) is completed and is ready to operate from late May 2014.

From April 2013, DESFA and Bulgartransgaz submitted to the competent authorities of Greece and Bulgaria a joint proposal for the reverse flow in Sidirokastro interconnection point, according to ar. 7 of Reg. 994/2010/EC. According to that proposal the cost of the investment for the reverse flow (abovementioned item iv) regarding the Greek system is 1 million € and relevant cost for the Bulgarian system is 0.5 million € (this will be performed by Bulgartransgaz).

The proposal was approved by RAE (Decision No 452/2013) and was notified to the European Commission on 9 October 2013.

The investment cost relating to the NNGS (for the whole project including scope of work (iv)) will be covered by DESFA's own equity while the recovery of the investment will be made through the transmission tariffs.

2.2.1.12. Design, supply, installation and operation of equipment SCADA Field

| Project Summary | |
|-----------------------------------|--|
| Project Type | Planned Project |
| Type of investment | Equipment of transmission system |
| Current budget | 0.7 million € |
| <i>Of which Maintenance Capex</i> | <i>0.7 million €</i> |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 16-May-12 |
| End date | Mar-17 |
| Resolution to Construct/FID | Yes |
| Current Status | Under engineering-procurement-construction |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion in RAB |

The project concerns the design, supply, installation and operation of equipment SCADA Field (Remote Terminal Unit), IP technology, at stations of type M/R, M, P, LV and REM of NNGS. The aforementioned equipment will replace the RTU equipment that is in operation by 2000, as the existing one is not available by the manufacturing company and no buffer stock for it exists anymore.

Today, the maintenance of equipment SCADA field is achieved through the impaired stock security of DESFA. The budget of the project is 1,5 million € and the project is expected to be ready to operate in March 2017. The investment cost will be covered by DESFA's own equity while the recovery of the investment will be made through the transmission tariffs.

2.2.1.13. Upgrading of Electrical and Electronic Equipment, Billing System and Equipment SCADA Field in Stations M/R of 1st generation (1995-2000)

| Project Summary | |
|-----------------|-----------------|
| Project Type | Planned Project |

| | |
|-----------------------------------|--|
| Type of investment | Equipment of transmission system |
| Current cost | 3.5 million € |
| <i>Of which Maintenance Capex</i> | 3.5 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 16-May-12 |
| End date | Aug-17 |
| Resolution to Construct/FID | Yes |
| Current Status | Under engineering-procurement-construction |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion in RAB |

The project refers to 15 stations of NNGS (M VFL, M/R PPC Komotini, M/R EKO, M/R Platy, M/R Larissa North, M/R Larissa South, M/R Volos, M/R Athens North, R Ano Liossia, M/R Athens East, M PPC Lavrio, M/R Thriassio, M/R Athens West, M Agia Triada, M/R Inofita) of which the existing equipment for metering and managing invoicing and signaling has overpassed a 10 year operation period thereby creating maintenance problems due to both unavailability of spare parts from manufacturers and equipment compatibility issues.

The SCADA Field equipment in these Stations is non-merchantable (available) by the manufacturing company, which has no longer stock of spare parts, making the maintenance of equipment costly or impossible in some cases.

This results to the increase of operating costs and the low efficiency of the equipment.

The investment will combine the use of common equipment to serve at the same time the operational needs of both the station and the system SCADA and will ensure the smooth operation of the equipment at the lowest possible operating cost, thus satisfying the main objective of the company for safe and reliable transport of natural gas.

The current budget of the project is 4.8 million € and the project is expected to be ready for operation in August 2017. The investment cost will be covered by DESFA's own equity while the recovery of the investment will be made through the transmission tariffs.

2.2.1.14. Extensions and Upgrades of Metering Stations of North and East Thessaloniki

| Project Summary | |
|-----------------------------------|---|
| Project Type | Planned Project |
| Type of investment | Equipment of transmission system |
| Current cost | 2 million € |
| <i>Of which Maintenance Capex</i> | 0.6 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 16-May 12 |
| End date | Dec-16 |
| Resolution to Construct/FID | Yes |
| Current Status | Under construction award |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion in RAB |

The metering - regulatory stations North and East of Thessaloniki are designed to be installed in two phases. The first phase (which has been implemented), included the installation of two lines for regulating and metering (one in operation and one in a standby mode), while the second phase provides installation and setup of a third-line of regulating and metering (two in operation and one in standby mode).

The maximum capacity that was created on the first phase has been used several times in peak loads and therefore the upgrade of the two stations is considered to be necessary, in order the back-up intended degree of the equipment to be ensured, assuring the security of supply of natural gas consumption.

The project includes the design, supply and installation of the third metering control line on the existing stab outs as well as all the electrical and electronic component equipment. It also includes the SCADA upgrade of North and East Thessaloniki metering stations, whose equipment is old resulting in the creation of maintenance problems.

The current budget of the project is 2 million € and the project is expected to be ready for operation in December 2016.

2.2.1.15. Upgrade the System of Fixed Communication of NNGS

| Project Summary | |
|-----------------------------------|--|
| Project Type | Planned Project |
| Type of investment | Equipment of transmission system |
| Current budget | 4.5 million € |
| <i>Of which Maintenance Capex</i> | <i>4.5 million €</i> |
| Expected benefit | Efficiency of NNGS, effective operation |
| Star date | 30-Sep-11 |
| End date | Dec-17 |
| Resolution to Construct/FID | Yes |
| Current Status | Under engineering-procurement-construction |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion in RAB |

The system of fixed communication of NNGS currently consists of fiber optic cable alongside the NNGS, eighty-four (84) knots multiplexing optical fiber gas stations to serve local needs, communications (telephony, remote control & operation, computer field networks and offices), networking equipment in twenty-four (24) gas stations as well as seven (7) call centers located in the Centers of Operation and Maintenance (O&M) and the LNG terminal Revithousa.

Also, the management centers for multiplexing hubs, of telephone exchanges and network equipment are located in Patima's O&M Center.

Communications via fiber-optic are based on technology multiplex-type TDM / PDH and have a total capacity of 34 Mbps, that even though it was adequate when installed (1996), it marginally covers the current needs of DESFA and will not be able to meet the future ones. Namely, for the purposes of the internal computer network and closed circuit television channels of natural gas stations, the connection with agencies O&Ms 100 - 1000 Mbps is required.

Additionally, the call centers that serve today the NNGS are no longer commercially available and their support by the manufacturing company expires in the forthcoming years.

To meet these needs, it is advisable to install new fiber optic multiplexing technology with a capacity of 1-10 Gbps. The capacity requirements are not the same in all parts of the NNGS. The estimated total budget for the project is 4.5 million € and is expected to be ready for operation in December 2017.

2.2.1.16. IT & Telecommunications Projects

| Project Summary | |
|-----------------------------|---|
| Project Type | Planned Project |
| Type of investment | Equipment of transmission system |
| Current budget | 4.15 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 31-May-10 |
| End date | - (Project No.1) Dec-16 (Project No.2) |
| Resolution to Construct/FID | Yes |
| Current Status | Technical Study |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion in RAB |

These projects are related to investments for the development of applications that will facilitate the operation of the company and will upgrade the level of services provided by DESFA. Those projects are presented in Table 1.

Table 1: IT Development applications

| No. | INVESTMENTS | COST(€) | COMPLETION DATE |
|--------------|---|------------------|-----------------|
| 1 | Integrated IT System for Natural Gas - IISNG | 4.000.000 | --- |
| 2 | Development of a disaster recovery plan. Supply and installation of backup IT infrastructure (mirror site). | 150.000 | Dec-16 |
| TOTAL | | 4.150.000 | |

In the following paragraphs the feasibility and technical characteristics of the applications that are presented in Table 1 are analyzed.

1. Integrated Information System for Natural Gas - IISNG

In order to ensure the equal access of Users to the National Natural Gas System (i.e. the National Transmission System and the LNG facility) as well as the smooth functioning of the secondary natural gas market, the current regulatory framework provides a series of actions which take place periodically (on a daily, monthly and yearly level) or occasionally, both by Users of the NNGS and the LNG facilities and by the TSO, under specified procedures. At this stage these actions are carried out mainly manually, with the support of the pilot information system of DESFA. However, while taking into consideration:

- a. the required levels of availability and reliability of the system
- b. the necessity for early integration of the forecasts of the secondary regulatory framework that is developing by the European Network of Transmission System Operators of Gas (ENTSOG), based on the relevant articles of EC 715/2009
- c. the provisions of Regulation 984/2013/EC (CAM) on capacity allocation mechanisms
- d. the provisions of Regulation 312/2014/EC (BAL) on balancing of natural gas
- e. the provisions of Regulation 703/2015 (INT) on interoperability rules
- f. the obligation of a Capacity Booking Platform – CBP between Interconnection Points
- g. the obligation for automatic data exchange with ENTSOG, REMIT and ACER platforms
- h. the provision of operational needs of DESFA as Balancing Operator which includes, balancing mechanisms, platform and exchange system of balancing acts
- i. the provision of operational needs of DESFA as Hub Operator which includes over-the-counter trading

it is considered necessary the development and installation of the Integrated Information System for Natural Gas to be assigned to a specialized software company.

Through IISNG, actions that must be daily conducted both by DESFA and Users are automated, resulting to the drastical reduction of the time of completion and of error occurrence.

Furthermore, IISNG consists one of DESFA's obligations according to the articles of NNGS Administration Code and of Regulation 715/2009/EC, in order to ensure the distribution of necessary information for the transparent operation and use of the National Natural Gas System to interested stakeholders. Also through IISNG it will be possible to perform effectively and reliably the procedures that are provided by the NNGS Administration Code, the NNGS model Transmission contract and the Contact for the Use of Storage Facility, governing the operation of the liberalized market of access services to NNGS and the secondary natural gas market.

The IISNG consists of:

- a) The Electronic Information System which allows any interested party to find all the necessary information about the operation and use of the NNGS in order to be ensured not only the fair, transparent and non-discriminatory access of the interested party in the
a) NNGS, but also the efficient and timely provision of the relevant access services. Through the Electronic Information System Users will be able to fulfill a number of obligations related to the conditions of their access to the NNGS and the LNG facility. Indicatively, the following are stated:
 - the submission of Weekly and Daily Delivery/Receipt Reports of natural gas to NNGS,
 - their information about the quantity of gas allocated for their account during a day at entry and exit points of NNGS,
 - the submission of LNG Reports and Reports for unscheduled Discharge of LNG,
 - their information on the available additional storage capacity of LNG Facility and the submission of the relevant applications for its booking,
 - the Users' information concerning the Annual and Monthly Planning of LNG Cargoes unloading,
 - their information on the LNG ships that have been certified by the TSO and are suitable for unloading LNG in the LNG facility, etc.
- b) the Electronic trading system, through which the TSO will manage the secondary market for Transmission Capacity to NNGS or Gasification Capacity of LNG Facility.
Through this system the stakeholders will have the opportunity to:

- notify their proposals concerning the transferring of Booked Transmission Capacity

| |
|-----------------|
| Project Summary |
|-----------------|

engaged at entry or exit points of NNGS or Gasification Capacity engaged to the LNG Facility,

- submit proposals, accepting the transfer of Booked Transmission Capacity or the transfer of Booked Gasification Capacity

c) Balancing platform, according to Regulation 312/2014,. Regulation 312/2014 set rules and conditions for balancing scheme of transmission system. Users of NNGTS participate in the daily balancing of their gas portfolio through sale and purchase of standard products in

For the implementation of the above a balancing platform needs to be in place. The balancing platform will evolve in a later stage in Virtual Trading Point (VTP). Through VTP interested parties which are not necessary Users of the system cab participated in the natural gas market.

The implementation of the project (a-c) above includes the preparation of tender documents in parallel with public consultation of the NNGS Network Code, the tender procedure, the procurement for the software and services, installation, testing and set in operation.

The preliminary budget is 4 million € and will be defined in detail during the preparation of the tender documents.

2. Development of a disaster recovery plan. Supply and installation of backup IT infrastructure (mirror site)

The central servers of all IT systems of DESFA are gathered in one data center. This makes the company vulnerable in the case of destruction of the data center (eg, fire, terrorism, etc). A back up supply data center, which will be installed in different location and will operate, under normal conditions, in sync with the main data center but in the case of destruction of the main data center will undertake full operation of all systems, is mandatory. A disaster recovery process will also be developed and will provide the steps needed to be followed by staff in the case of a disaster. The aim is to ensure business continuity in any case.

2.2.1.16. Upgrading Projects of NNGS -1st group

| | |
|-----------------------------------|--|
| Project Type | Planned Project |
| Type of investment | Equipment on NNGS |
| Current budget | 2.797 million € |
| <i>Of which Maintenance Capex</i> | <i>2.797 million €</i> |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 31-May-10 |
| End date | Jul-17 to Aug-18 |
| Resolution to Construct/FID | Yes |
| Current Status | Basic Design study (Tab. 2 projects no. 1, 3) Award of engineering-procurement-construction process (Tab. 2 projects no. 2) |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion of cost in RAB |

These projects upgrade the operation of the NNGS. Table 2 presents these projects in a more analytical way.

Table 2. Projects for the upgrade of the operation of NNGGS

| No. | INVESTMENTS | COST (€) | READY FOR OPERATION DATE | CURRENT STATUS |
|--------------|---|--------------------|--------------------------|---|
| 1 | Upgrade of graphical environment of SCADA in control centers | 1.800.000 | Aug-18 | Under Technical Study |
| 2 | Design, supply, installation, system design of daily gas flow | 197.000 | Jul-17 | Under award of construction /implementation process |
| 3 | Design, supply, installation and operation of electromechanical equipment | 800.000 | Apr-17 | Under technical study |
| TOTAL | | 2.797.000 € | | |

Each one of the proposed investments in Table 2 is described in the next paragraphs.

1. Upgrade of graphical environment of SCADA in Control Centers

It includes the supply, installation and operation of new management tools: images, graphics, database and alarm system as well as the replacement of IT network system equipment. It should

be noted that the currently existing equipment is not supported anymore by the manufacturing company, which has no longer stock of spare parts. The investment is expected to upgrade the system capabilities (user-friendliness, better display parameters, a better display of the parameters, ease of designing new graphics images).

2. Design, supply and installation of a daily gas flow system design

The establishment of a system for forecasting-planning-control of daily gas flow will provide DESFA the ability to:

- ✓ estimate the volume of gas that will be transmitted,
- ✓ increase the level of accuracy in the prediction of the volume
- ✓ embody a regular review of the progress of the daily planning of gas and
- ✓ adjust the levels of unexpected consumption or shortages in supply.

The investment will:

- ✓ unburden DESFA from operating costs (overtime of field staff, unnecessary start-up/shut-down of LNG terminal, Compressor N. Messimvria, etc.)
- ✓ optimize the management of Users' reports and
- ✓ provide daily justified gas flow plans.

3. Design, supply, installation and operation of electromechanical equipment

The maintenance of the existing equipment (uninterruptible power supply system, odorization system etc) has serious problems due to its oldness and the unavailability of spare parts from manufacturers. It is estimated that except from the already noted increase in maintenance costs, in the near future a weakness in repairing part of the equipment will be observed with an impact on the safe operation and the reliability of the system.

Replacing parts of the electrical equipment (where the reported problems exist) with new of latest technology will ensure the safe and smooth operation of the system at the lowest possible operating costs for at least another decade.

2.2.1.8. Upgrading Projects of NNGS -2nd Group

i. Upgrade of the system for the corrosion protection of the NNGS

| Project Summary | |
|-----------------------------------|--|
| Project Type | Planned Project |
| Type of investment | Equipment of transmission and LNG system |
| Current budget | 0.384 million € |
| <i>of which Maintenance Capex</i> | <i>0.384 million €</i> |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 28-Jun-12 |
| End date | May-16 to Jan-17 |
| Resolution to Construct/FID | Yes |
| Current Status | Under construction (i – ii) Under Technical Study (iii) |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion of cost in RAB |

The project refers to the installation of defusing induced voltages, metering sensors of the corrosion speed and extension of the existing telemetry system for recording relevant measurements. The estimated budget is 200.000 € and the project is expected to be ready for operation in January 2017.

ii. Restoration of the system for ship approach

It refers to the installation of new sensors and the restoration of IT System in Revithoussa terminal.

The estimated budget is 149.350 € and the project is expected to be ready for operation in May 2016.

iii. Restoration of the visual monitoring field system CCTV

The project refers to the installation of monitors, recording cameras in the Control Room of LNG terminal and their connection with the possibility of central management and recording. The estimated budget is 35.000 € and the expected completion date is May 2016.

2.2.1.19. Installation of M/R Farsala

| Project Summary | |
|-----------------------------|--|
| Project Type | Planned Project |
| Type of investment | Metering Station |
| Current budget | 0.85 million € |
| Expected benefit | Supply on new areas |
| Start date | 17-Oct-12 |
| End date | Dec-16 |
| Resolution to Construct/FID | Yes |
| Current Status | Under engineering-procurement-construction |

| | |
|-----------------|--|
| Financing plan | DESFA's own equity ²⁴ |
| Recovery method | Inclusion of cost in RAB (excluding possible grants) |

The project refers to the installation of an M/R 70/19 station in the area of Farsala line valve. The aim of the project is to supply with natural gas the urban area.

2.2.1.20. Installation of M/R Kavala

| Project Summary | |
|-----------------------------|--|
| Project Type | Planned Project |
| Type of investment | Metering Station |
| Current budget | 3.9 million € |
| Expected benefit | Supply on new areas |
| Start date | 17-Oct-12 |
| End date | - |
| Resolution to Construct/FID | No ²⁵ |
| Current Status | Under feasibility study |
| Financing plan | DESFA's own equity ²⁶ , EIB loan, possible grants |
| Recovery method | Inclusion of cost in RAB (excluding possible grants) |

The project refers to the installation of an M/R 70/19 station in the area of Kavala line valve. The aim of the project is to supply the city of Kavala and the nearby cities of Palaio and Eleftheroupoli.

CHAPTER 2.2.2. PROJECTS THAT HAVE ALREADY BEEN INCLUDED IN THE LIST OF SMALL PROJECTS AND THEIR IMPLEMENTATION IS ONGOING IN THE REFERENCE PERIOD OF THE SUBMITTED DEVELOPMENT PLAN

There are no projects in this category.

CHAPTER 2.3. PROJECTS OF THE THREE YEAR DEVELOPMENT PERIOD

There are no projects in this category.

CHAPTER 3. PLANNED PROJECTS THAT WERE NOT INCLUDED IN THE DRAFT DEVELOPMENT PLAN 2016-2025

²⁴ DESFA will seek financing from EIB and PP for 2014-2020

²⁵ The project has not received Resolution to construct. Time schedule will be in coordination with downstream connected systems.

²⁶ DESFA will seek financing from EIB and PP for 2014-2020

There are no projects in this category.

Annex I

Summary Table of the Projects of the NNGS Development Plan 2016-2025, with distinct reference to the Three-Year Development Period (Article 92, par. 4D of the Network Code of NNGS)

| No. | INVESTMENT | COST (€) | INCLUDED IN THE 3-YR DEVELOPMENT PERIOD (Yes/No) | START DATE | READY FOR OPERATION DATE | NOTES |
|--|--|------------|--|------------|--------------------------|--|
| I. PROJECTS INCLUDED FOR THE FIRST TIME IN THE DEVELOPMENT PLAN | | | | | | |
| A. Projects for the connection of Users (art. 92 par.4A. of NNGS Administration Code as applicable) | | | | | | |
| - | | | | | | |
| B. Projects for the Development of NNGS (art. 92 par.4B. of NNGS Administration Code as applicable) | | | | | | |
| 1 | Upgrade of LNG Loading Arms at Revithoussa LNG Terminal | 900.000 | Yes | Mar-16 | Dec-16 | FID has not been taken yet |
| 2 | Truck Loading Pilot Station | 5.000.000 | Yes | Mar-16 | Dec-17 | FID has not been taken yet |
| 3 | LNG Terminal Boil-off Gas Compressor Station | 3.132.000 | Yes | Mar-16 | Dec-18 | FID has not been taken yet |
| II. PLANNED PROJECTS | | | | | | |
| A. Projects included in the approved Development Plan and their implementation is ongoing in the reference period of the current Development Plan | | | | | | |
| 1 | Construction of a high pressure pipeline from Mandra Attikis to the facility of ELPE in Elefsina for the connection with NNGS and of the relevant metering station | 5.900.000 | Yes | Nov-12 | Dec-16 | |
| 2 | Construction of high pressure pipeline Mavromati (Vagia) - Larymna and the necessary Metering Station for the connection of LARCO GMM SA with NNGS. | 17.500.000 | No | Jun-13 | - | Implementation of the project depends on the contractual commitments by the User |
| 3 | Compression Station in Kipi | 70.000.000 | No | 19-Jul-07 | - | Implementation dependent on the interest of Users |
| 4 | M/R Station in Komotini | 7.500.000 | No | 19-Jul-07 | - | Implementation dependent on the interest of Users |

| | | | | | | |
|----|--|---------------|-----|-----------|---|---|
| 5 | M/R Station in N.Messimvria for the connection of TAP to the NNGS | 10.000.000 | No | 19-Jul-07 | 2019 | FID has not been taken yet |
| 6 | Komotini Thepsrotia H.P. pipeline (part of NNFS) | 1.100.000.000 | No | 19-Jul-07 | - | Implementation dependent on the interest of Users |
| 7 | 2nd Upgrade of the LNG Terminal on the island of Revithoussa | 147.000.000 | Yes | 09-Apr-10 | Dec-17 | |
| 8 | Connection of PROTERGIA S.A. P/P unit in Agios Nikolaos Viotia (metering station) | 1.850.000 | Yes | 31-Jul-08 | May-16 | |
| 9 | Expansion of NNGTS from the main pipeline to Thisvi (metering station) | 14.425.976 | Yes | 24-Jan-08 | Apr-16 | |
| 10 | Connection of Korinthos Power S.A P/P unit in Ag. Theodoroi (metering station) | 1.700.000 | Yes | 10-Feb-11 | Apr-16 | |
| 11 | Upgrade of Boarding Metering Station (BMS) of Sidirokastro | 3.300.000 | Yes | 15-May-12 | In 2 phases: 1o: May-14 (reverse flow) 2o: Dec-16 (rest of the scope) | |
| 12 | Design, supply, installation and preparation for operation of SCADA Field equipment | 700.000 | Yes | 16-May-12 | Mar-17 | |
| 13 | Upgrade of electrical and electronic equipment, billing system and SCADA field equipment in M/R stations of 1st generation (1995-2000) | 3.500.000 | - | 16-May-12 | Aug-17 | |
| 14 | Extensions and upgrades of | 2.000.000 | - | 16-May-12 | Dec-16 | |

| | | | | | | |
|----|--|-----------|---|-----------|--------|--|
| | metering stations in Thessaloniki | | | | | |
| 15 | Upgrade of the system of fixed communication of the NNGS | 4.500.000 | - | 30-Sep-11 | Dec-17 | |
| 16 | Integrated IT System for Natural Gas | 4.000.000 | - | 31-May-10 | - | |
| 17 | Development of a disaster recovery plan. Supply and installation of a backup IT infrastructure (mirror site). | 150.000 | - | 31-May-10 | Dec-16 | |
| 18 | Upgrade of SCADA graphical environment in control centers | 1.800.000 | - | 31-May-10 | Aug-18 | |
| 19 | Design, supply and installation of a programming system for the daily gas flow | 197.000 | - | 31-May-10 | Jul-17 | |
| 20 | Design, supply, installation and preparation for the operation of a new technology electromechanical equipment on Metering and Regulating Stations | 800.000 | - | 31-May-10 | Apr-17 | |
| 21 | Upgrade of the system for the corrosion protection of the NNGS | 200.000 | - | 28-Jun-12 | Jan-17 | |
| 22 | Restoration of the system for ship approach | 149.350 | - | 28-Jun-12 | May-16 | |
| 23 | Restoration of the visual monitoring field system CCTV | 35.000 | - | 28-Jun-12 | May-16 | |
| 24 | Installation of M/R in Farsala | 850.000 | - | 17-Oct-12 | Dec-16 | |

| | | | | | | |
|--|-------------------------------|----------------------|---|-----------|---|--|
| 25 | Installation of M/R in Kavala | 3.900.000 | - | 17-Oct-12 | - | Time schedule is dependent on the time schedule of the downstream Connected System |
| B. Projects that have already been included in the list of small projects and their implementation is ongoing in the reference period of the submitted Development Plan | | | | | | |
| | - | | | | | |
| Total | | 1.410.989.326 | | | | |