DESFA
Hellenic Gas Transmission System Operator S.A.

# Draft NNGS Development Plan 2020-2029

*July 2019*

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## 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: Boarder 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
CNG: Compressed Natural Gas
DCS: Distributed Control System
GCC: Gas Control Center
IGB: Interconnector Greece Bulgaria
IGI: Interconnector Greece Italy
M/R: Metering/Regulating
$Nm^3$: 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

Present Development Plan is conducted in accordance with applicable legislation namely article 14 of L. 4001/2011 and applicable provisions of NNGS 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 safe and smooth operation aiming at the prevention of emergencies, congestions 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, also by expanding the use of natural gas as an alternative, cleaner and more sustainable fuel in maritime and road transportation
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 whose construction is scheduled to begin within the timeframe of the Plan (i.e. for the period 2020-2029) as well as the Planned Projects whose construction has not been completed yet.
The TSO substantiates the feasibility of the inclusion of the new 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 2020-2029 are presented, including for each project all the necessary elements arising from the Network Code for the regulation of NNGS.

The Development Plan is structured as follows:

I. Projects that are included for the first time (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 previously approved Development Plan and whose implementation is ongoing during the reference period of the current Development Plan
ii. Projects included in the List of Small Projects whose implementation is ongoing during the reference period of the current Development Plan

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

The TSO is duly justifying in the Development Plan any reasons for not including any planned project. It is mentioned at this point that according to Article 5A par. 8 of the Tariff Regulation (RAE Decision 539/2019), the Development Projects that are defined as Projects of Major Importance are eligible for an increased return.

For each project a summary table of the following information is given, as presented below:

- the type of project (Planned Project/New Project)
- the type of the investment (pipeline, compressor station, metering station, compressor, equipment for control/management, equipment for the transmission system or the LNG facility, small scale LNG facility, equipment for LNG facility, UGS, truck loading)
- the expected benefit (according to the criteria of art. 92 par. 2 of NNGS Network Code)
- the current status:
  - under maturity, which includes basic design study, environmental authorization procedure and award for the construction, that is all the actions up to the Final Investment Decision according to the definition of the NNGS Network Code
  - under construction, which includes the detailed design, procurement of materials and construction of the project as well as any tests following mechanical completion, that is all the actions from the Final Investment Decision and up to inclusion of the project in the system
- the start date, which is the inclusion of the project to the Development Plan or List of Small Projects
- whether the Final Investment Decision has been taken, as described in the NNGS Network Code
- the current budget of the project, as well as the part of which is considered maintenance capex. *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 estimated Operation Date, as described in the NNGS Network Code, which is the starting date of operation (for testing if necessary) after the mechanical completion of the project
- the scheduled day for Entry into System, which is the start of normal operation (by Users). Entry of a project into the system is performed after the issuance of operation license, where relevant.

- for new projects their impact on the average usage tariff of the NNGS is calculated, as described and provided for in the Tariff Regulation
- the financing plan and the recovery method of the investment are presented for each project.
- whether a commitment with a User has been made for booking of Transmission Capacity for a certain period of time
- whether the project is part of the three-year Development Period provided for in the respective NNGS Code. For projects not included in the 3-year Development Period, no planning is given.

| Project Summary | |
|---|---|
| Type of project | |
| Type of investment | |
| Current Budget | |
| *of which Maintenance Capex* | |
| Expected benefit | |
| Start date | |
| Final Investment Decision | |
| Operation Date | |
| Entry in the system | |
| Current Status of Project | |
| Financing plan | |
| Recovery method | |
| Connection Agreement with User (Projects for the connection of Users only) | |
| Impact on the Average Tariff for the use of NNGS (for "new" projects[1] only) | |
| Inclusion in the 3 year Development Period | |

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

[1] Projects that are included in the Development Plan for the first time.

## 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-year network development plan (TYNDP), 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.
DESFA has taken into consideration the TYNDP 2020 as well as the Southern Corridor GRIP 2018 both under preparation.

# CHAPTER 2: DEVELOPMENT PLAN 2020-2029

## CHAPTER 2.1. PROJECTS INCLUDED FOR THE FIRST TIME IN DEVELOPMENT PLAN 2020-2029

### *CHAPTER 2.1.1. PROJECTS FOR USERS CONNECTION*

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

#### 2.1.1.1. M/R station AdG III

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Metering & Regulating station |
| Current budget | 2 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Apr-11[2] |
| Final Investment Decision | Mar-20 |
| Operation Date | Dec-21 |
| Entry in the system | Mar-22 |
| Current Status | Under maturity |

[2] The Start date refers to the day of the signing of the Connection Agreement.

| | |
|---|---|
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee |
| Connection Agreement with Users | Yes |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | Yes |

The construction of the new ADG III (U-2840) Measuring / Regulating Station (U-2840) in the area of Distomo Viotia includes the dismantling of the existing ADG III station (TM1 / TM5), the installation of the building infrastructure (RCC and Station Building), the construction of the M/R Station with a capacity of 23.500 $Nm^3$ / h with auxiliary installations (gas actuation systems) metal housing for the protection of the Metering skids (Skid Shelter) and connections to the existing ESD L/V (Emergency Shut Down) to supply the final consumer.

#### 2.1.1.2. Metering station at Agios Nikolaos Viotia (AdG IV)

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Metering station |
| Current budget | 1,5 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Apr-18[3] |
| Final Investment Decision | Mar-20 |
| Operation Date | Dec-21 |
| Entry in the system | Mar-22 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee |
| Connection Agreement with Users | Not yet |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | Yes |

[3] The Start date refers to the day of submission of the application for Advanced Reservation of Capacity.

The aim of this project is to install Metering Station in the greater area "Aluminium of Greece-ADG" industry, in order to supply with natural gas, the new installations "New C.C.G.T. Agios Nikolaos II". Project includes construction of Metering skids with capacity of 130.000 $Nm^3/h$, construction of auxiliary installations (gas actuation systems), construction of steel shelter for the protection of Metering skids (Skid Shelter), extension of the existing communication building (R.C.C.), as well as construction of new inlet and outlet Emergency Shut Down valve stations.

### 2.1.1.3. Connection with DEPA's CNG Station in Komotini

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Metering station |
| Current budget | 1,3 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Mar-18[4] |
| Final Investment Decision | Mar-21 |
| Operation Date | Dec-22 |
| Entry in the system | Mar-23 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee |
| Connection Agreement with Users | Not yet |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | Yes |

The project refers to the installation of a Metering station for the supply of DEPA's CNG station at Komotini.

### 2.1.1.4. Connection with DEPA's CNG Station in Tripoli

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Metering station |
| Current budget | 2,35 million € |
| Expected benefit | Enabling access to new Users |

[4] The Start date refers to the day of submission of the application for Advanced Reservation of Capacity.

| | |
|---|---|
| Start date | Mar-18[5] |
| Final Investment Decision | Mar-21 |
| Operation Date | Dec-22 |
| Entry in the system | Mar-23 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee |
| Connection Agreement with Users | Not yet |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | Yes |

The project refers to the installation of a Metering station for the supply of DEPA's CNG station to Tripoli.

### 2.1.1.5. Connection of Kavala Oil plant to the NNGTS

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Pipeline/Metering station |
| Current budget | 3,4 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Nov-18[6] |
| Final Investment Decision | May-21 |
| Operation Date | Jul-22 |
| Entry in the system | Dec-22 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee |
| Connection Agreement with Users | Not yet |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | Yes |

[5] The Start date refers to the day of submission of the application for Advanced Reservation of Capacity.
[6] The Start date refers to the day of submission of the application for Advanced Reservation of Capacity.

The project will be implemented for natural gas supply of the KAVALA OIL plant. For this project a high pressure 6" pipeline, 2 km length approximately, including needed facilities (valve station, scraper station, hot tapping) and a Metering Station for the connection of KAVALA OIL plant with NNTGS. The project also includes land purchase for the valve station and scraper station.

### 2.1.1.6. Connection of ELVAL plant to the NNGTS

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Pipeline/Metering station |
| Current budget | 4 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Dec-15[7] |
| Final Investment Decision | Feb-21 |
| Operation Date | Sept-22 |
| Entry in the system | Dec-22 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee |
| Connection Agreement with Users | Not yet |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | Yes |

The project will be implemented for natural gas supply of the ELVAL SA plant in Inofyta, Viotia, for various thermal uses. A new pipeline (extending the NNGTS), a scraper station (receiver) and a M / R station will be constructed for the supply of ELVAL plant.

### 2.1.1.7. Connection of the FSRU of Alexandroupolis

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Metering & Regulating station |
| Current budget | 10 million € |
| Expected benefit | Enabling access to new Users |

[7] The Start date refers to the day of submission of the application for Advanced Reservation of Capacity.

| | |
|---|---|
| Start date | Jun-18[8] |
| Final Investment Decision | - |
| Operation Date | - |
| Entry in the system | - |
| Current Status | - |
| Financing plan | DESFA's own equity |
| Recovery method | Connection Fee / Additional Connection Fee |
| Connection Agreement with Users | Not yet |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | No |

The project refers to the M/R station for the receiving of natural gas from the FSRU in Alexandroupolis, for which no FID (i.e. Resolution to Construct) has been taken yet. According to the conditions resulted from the hydraulic evaluation study, capacity to be reserved refers to (a) 1,9 mil. $Nm^3$/day on condition of delivery of gas to exit points east of Komotini, (b) 10,7 mil. $Nm^3$/day on condition of delivery of gas to the exit point "Komotini/Connection with IGB" and (c) 0,7 mil. $Nm^3$/day without condition of geographical delivery, based on the current capacity at Kipi Entry Point and an assumed capacity at the entry point "N. Messimvria/ Connection with TAP" at the level of 4,1 mil. $Nm^3$/day.

## *CHAPTER 2.1.2. PROJECTS FOR NNGS DEVELOPMENT*

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

### 2.1.2.1. Booster Compressor for TAP in Nea Mesimvria

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Compressor |
| Current budget | 30 million € |
| Expected benefit | Efficiency of NNGS, effective operation enabling transit flows |
| Start date | Dec-19 |

[8] The Start date refers to the day of submission of the Advanced Reservation of Capacity.

| | |
|---|---|
| Final Investment Decision | Nov-20 |
| Operation Date | Mar-23 |
| Entry in the system | Jun-23 |
| Current Status | Under maturity (preparation of the documents for the procurement of the basic design) |
| Financing plan | Possible grant, EIB loan[9], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 1,70% (without grants)<br>0,87 (with 50% grants) |
| Inclusion in the 3 year Development Period | Yes |

The project concerns the installation of a new Compressor Station in order to supply the Trans Adriatic Pipeline with delivery pressure significantly higher than the NNGS' operating pressure.

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. $Nm^3$/ day and bi-directional flow capability. The cost of construction of the above mentioned investment, based on the exception decision, will be covered by DESFA and will be recovered through the tariffs of the Users of the National Natural Gas System.

According to the regulatory framework the tie in point must be bidirectional. Flow from NNGTS to TAP due to the difference in the operating pressure (66,4 barg vs 93 barg respectively) requires the installation of a Compressor Station.

This investment enables the full bi-directional flow in the interconnection ($2^{nd}$ phase of the project).

The project is scheduled to be included in the PCI list.

The characteristics of the compressor station were preliminary identified to 7 MW ISO plus the spare unit (7MW ISO) or, alternatively, (2+1) x 3,5 MW ISO. The final configuration and the detailed characteristics of the Compressor Units will be defined during the basic design stage. The Compressors will be either Electric Compressors (ELCO) or gas turbine compressors (TUCO) or a combination of the two. The final selection will be defined during the basic design stage, taking into consideration the operational modes of the Station.

[9] Will be pursued.

### 2.1.2.2 Interconnection of IGB Pipeline with the NNGS in Komotini

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Line Valves |
| Current budget | 0,7 million € |
| Expected benefit | Interconnection with n.g. system |
| Start date | Dec-19 |
| Final Investment Decision | Jan-20 |
| Operation Date | Nov-20 |
| Entry in the system | Jan-21 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0,03% |
| Inclusion in the 3 year Development Period | Yes |

The Project is consisting of the following sub-project parts:

(a) Modification of the existing 36'' pipe, which will interconnect (in the future) the NNGTS with the IGI pipeline system (stub-out section with a 36'' ball valve configuration)

(b) The installation of a 28'' Valve Station, including a 4'' by-pass configuration and a 28'' check valve at the point of the interconnection of the NNGTS with the IGB pipeline system.

(c) The installation of a Valve Station (diameter will be determined by the relevant engineering study), including a 4'' by-pass configuration for the interconnection of the NNGTS with the TAP pipeline system (the interconnection of the two pipeline systems will be implemented via a hot-tapping method). This interconnection will provide (if necessary) the flow of gas from the TAP pipeline to IGB pipeline, via the NNGTS.

### 2.1.2.3. Technical Training Centre in Nea Messimvria

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Other NNGS equipment |
| Current budget | 1,6 million € |

| | |
|---|---|
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Jun-17 |
| Final Investment Decision | Nov-19 |
| Operation Date | Apr-21 |
| Entry in the system | Jul-21 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of Non-Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0,07% |
| Inclusion in the 3 year Development Period | Yes |

The project concerns the construction of a Training Center for the theoretical and practical practice of natural gas technicians. The development of such infrastructure will be the first in the Balkan region. It will be used primarily for the needs of the DESFA staff, but it creates an opportunity of additional services for the training of personnel of other TSOs and DSOs, contributing to the reduction of costs for the Greek network users.
In particular, the Training Center will consist of a central building, which will house the administration and operation areas for theoretical education, as well as a separate installation in which the necessary equipment for natural gas networks will be installed for practical training.

### 2.1.2.4. New jetty for small-scale LNG in Revithoussa

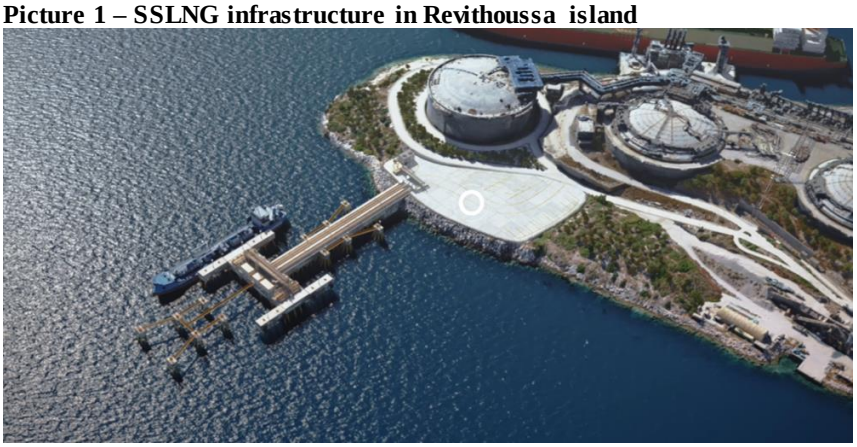
| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Small Scale LNG |
| Current budget | 30 million € |
| Expected benefit | Supply of new areas |
| Start date | Jun-17 |
| Final Investment Decision | Feb-20 |
| Operation Date | 1st phase: Sept-22<br>2nd phase: Dec-26 |
| Entry in the system | 1st phase: Dec-22<br>2nd phase: Dec-26 |
| Current Status | Under maturity |

| | |
|---|---|
| Financing plan | Poseidon Med II Grants (for studies), PA 2014-2020 grants[10], EIB loan[11], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Additional LNG Services |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | Yes |

The project will be an implementation of the ongoing studies under POSEIDON MED II. POSEIDON MED II, under the auspices of the INEA (Innovation and Network Executive Agency), is part of the necessary steps towards adopting liquefied natural gas as a marine fuel in the Eastern Mediterranean, making Greece the focal point for supplying and distributing liquefied natural gas in Southeast Europe, implementing Directive 94/2014 / EU and Law 4439/2016 incorporating the above Directive into Greek law. In this action 26 partners from shipping and gas industry from three EU Member States are involved (Cyprus, Greece, Italy).

The new jetty is planned to be constructed in the northeastern part of Revithoussa and will serve the operation of the loading to small ships (1.000 $m^3$ and up to 20.000 $m^3$). The smallest of them will supply boats, either coastal or seagoing shipping, to the port of Piraeus. The larger ones will supply satellite LNG storage and distribution stations to other ports in Greece or abroad.

**Picture 1 – SSLNG infrastructure in Revithoussa island**



The project is divided into two phases:

**Phase A** which includes:

[10] DESFA has requested 50,93% of the eligible budget.
[11] Will be pursued.

- Construction of a new port facility for the loading of two ships with a capacity of 1.000 $m^3$ - 20.000 $m^3$.
- Electromechanical equipment and LNG loading arms for one loading position

**Phase B** which includes:

- Electromechanical equipment and LNG loading arms for the second loading position

DESFA has proceeded to a financial viability estimate, which showed that, taking into account an expected demand from the bunkering sector appr. 0,2 bcm in 2027 and appr. 0,5 bcm in 2035 and assuming a market tariff comparable to the ones applied by other SSLNG jetty facilities in the Mediterranean, the project is financially sustainable and shall not result to any increase of the average tariff in the 20 years' period of evaluation.

### 2.1.2.5. Virtual Pipeline to Atherinolakkos Crete

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Virtual Pipeline |
| Current budget | 175 million € |
| Expected benefit | Security of Supply |
| Start date | Mar-19 |
| Final Investment Decision | Dec-20 |
| Operation Date | Dec-23 |
| Entry in the system | Mar-24 |
| Current Status | Under feasibility study |
| Financing plan | Possible grant, EIB loan[12], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 9,79% (without grant)[13]<br>4,44% (with 50% grant) |
| Inclusion in the 3 year Development Period | Yes |

[12] Will be pursued.

[13] The effect on the Average Tariff has been calculated considering no additional gas demand related directly either to the Crete power production unit or to the supply of off-grid customers to the island. This is a very conservative approach and expresses the maximum increase of the average tariff considering that 1) the power plant that will be served through this virtual pipeline if not realized in Crete, will be constructed in the mainland (so it is part of the base case demand scenario of DESFA) and 2) if this unit is constructed in the mainland no additional RAB capex will be required.

The project foresees the creation of a virtual pipeline in order to enable the supply of liquefied natural gas (LNG) towards Crete for local power generation. The supply chain contains the infrastructure needed in order to transport, unload, store and regasify the LNG on the island. The supply chain consists of port/jetty facilities on the island, storage tanks and regasification units as well as the building of an LNG transportation (feeder) vessel. The logistic has been defined taking into consideration the availability of the new small scale LNG jetty in Revithoussa.

Crete is an isolated electric network in Greece and its demand is covered mainly by local power plants which use diesel oil and heavy fuel oil (HFO) as a fuel. Costs of power production are covered by the consumers both in the mainland and the islands. In order to reduce the cost of electricity and fully exploit the potential of RES of Crete, the double electrical interconnection of Crete with the mainland was decided. The use of LNG as a complementary source of power production in the island will increase the reliability of the system and ensure the security of supply.

The virtual pipeline will allow to avoid using other more pollutting and expensive fuels and will contribute to the penetration of natural gas in the island of Greece, with environmental and economic advantages for the local economy.

The infrastructure needed for the supply of LNG (excluding Revithoussa small scale LNG jetty, which is planned to be constructed in project 2.1.2.4) includes three main items. First the transportation vessel (preliminary size envisaged 18.500 $m^3$). This feeder vessel will load LNG quantities from Revithoussa LNG terminal and will unload LNG at Atherinolakkos, before return back to Revithoussa LNG terminal. Secondly, the port facilities at Atherinolakkos coasting jetty. These facilities include berthing points, unloading arms, cryogenic pipelines and all other necessary infrastructure in order to unload LNG from the feeder vessel. Finally, the storage and regasification infrastructure that includes a storage tank (preliminary size envisaged 40.000 $m^3$), regasifiers, pumps, flare and all other necessary infrastructure for the storage and regasification of an adequate quantity of LNG for the operation of the local power production station at Atherinolakkos. A truck loading station will be also foreseen at a second stage, in order to supply other energy consumers in Crete (e.g. hotels, maritime fuel, commercial and industrial activities) for substitution of oil.

### 2.1.2.6. Virtual Pipeline to Dodekanise

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Virtual Pipeline |
| Current budget | 120 million € |
| Expected benefit | Supply of LNG to the Dodekanise islands |
| Start date | - |

| | |
|---|---|
| Final Investment Decision | - |
| Operation Date | - |
| Entry in the system | - |
| Current Status | Under feasibility study |
| Financing plan | Not defined yet |
| Recovery method | Not defined yet |
| Impact on the Average Tariff for the use of NNGS | - |
| Inclusion in the 3 year Development Period | No |

The project refers to the creation of a virtual pipeline supply chain in order to enable the supply of liquefied natural gas (LNG) to one focal island of Dodecanese (i.e Rhodes, Patmos, Karpathos, Kalymnos and Kos) for local power generation in a same mode like the virtual pipeline to Crete, considering that all these islands will be electrically interconnected, for the purpose of ensuring security of supply and. establishing a base for LNG bunkering of ships, as well as penetration of natural gas in other commercial and small industrial activities. The supply chain contains the infrastructure needed in order to transport, unload, store and regasify the LNG on the island that will host a power plant. The supply chain consists of port/jetty facilities on the island, storage tank and regasification units as well as the LNG transportation vessel. The budget is very preliminary as the basic studies have not been executed yet.

### 2.1.2.7. Virtual Pipeline to North Aegean islands

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Virtual pipeline |
| Current budget | 120 million € |
| Expected benefit | Supply of LNG to the N. Aegean islands |
| Start date | - |
| Final Investment Decision | - |
| Operation Date | - |
| Entry in the system | - |
| Current Status | Under feasibility study |
| Financing plan | Not defined yet |
| Recovery method | Not defined yet |

| | |
|---|---|
| Impact on the Average Tariff for the use of NNGS | - |
| Inclusion in the 3 year Development Period | No |

The project refers to the creation of a virtual pipeline supply chain in order to enable the supply of liquefied natural gas (LNG) from Revithoussa LNG terminal towards one focal island in the North Aegean (i.e. Chios, Lesvos, Samos, Lemnos, Ikaria) considering that the islands will be electrically interconnected, for local power generation (concept similar to project 2.1.2.5). The supply chain contains the infrastructure needed in order to transport, unload, store and regasify the LNG on the island that will host a power plant. The supply chain consists of port/jetty facilities on the island, storage tank and regasification units as well as the LNG transportation vessel (the latter may be shared with project 2.1.2.5, if confirmed by the studies). The budget is very preliminary as the basic studies have not been executed yet.

### 2.1.2.8. Metering and Regulating Station for connecting South Kavala underground storage

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Metering & Regulating Station |
| Current budget | 7,5 million € |
| Expected benefit | Security of Supply |
| Start date | - |
| Final Investment Decision | - |
| Operation Date | - |
| Entry in the system | - |
| Current Status | - |
| Financing plan | - |
| Recovery method | - |
| Impact on the Average Tariff for the use of NNGS | - |
| Inclusion in the 3 year Development Period | No |

The Metering and Regulating Service is necessary for the injection and withdrawal of gas to the Underground Storage in South Kavala for which no FID has been taken yet.

### 2.1.2.9. Increment of the back-up power availability at the Revithoussa LNG terminal

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Equipment for control/management |
| Current budget | 3,5 million € |
| Expected benefit | Allow for back-up power availability in Revithoussa terminal |
| Start date | Dec-19 |
| Final Investment Decision | Dec-19 |
| Operation Date | Sept-20 |
| Entry in the system | Dec-20 |
| Current Status | Under design |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of LNG Services |
| Impact on the Average Tariff for the use of NNGS | 0,13% |
| Inclusion in the 3 year Development Period | Yes |

The project concerns the increment of the back-up power availability at the Revithoussa LNG terminal, from 9 MVA to 12 MVA, using the existing PPC lines.
After the successful Post Expansion Performance Test for B' Upgrade of Revithoussa LNG Terminal, it was noted that due to the high power consumption of the existing various equipment at the upgraded Revithoussa LNG Terminal, there is no adequate power back up system, so as to cover all the operation modes.
The necessary actions for the increment concern mainly works carried out by HEDNO at the area of existing HV/MV Substation at Megara. All necessary works at the existing electrical installation will also be carried out.

### 2.1.2.10. NNGS Modernization projects – 4th compilation

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Equipment for NNGS & LNG Facility |
| Current budget | 0,54 million € |
| *of which Maintenance Capex* | *0,54 million €* |
| Expected benefit | Increased efficiency of the system |
| Start date | Jun-19 |

| | |
|---|---|
| Final Investment Decision | Dec-19 |
| Operation Date | Dec-20 |
| Entry in the system | Dec-20 |
| Current Status | Under construction (under award for construction) |
| Financing plan | DESFA's own equity |
| Recovery method | Inclusion in RAB of Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0,03% |
| Inclusion in the 3 year Development Period | Yes |

1. **Replacement of (2) Regulating Valves 24'' Mokveld**

The implementation of the project involves the replacement of two (2) Regulating Mokveld Valves 24'' at Border Metering Station (BMS) of Sidirokastro aiming the improvement of controllability and the enhancement of availability during the upcoming unmanned operation of the station. The total required budget for the procurement and installation of the new axial control valves amounts to 350.000 €.

2. **Replacement of two (2) Chiller systems**

The scope of work includes the procurement and replacement of two (2) Chiller YORK systems at the Border Metering Station (BMS) of Sidirokastro aiming the environmental upgrade of the cooling system and its better maintenance. The study is being currently carried out. The budget is estimated at 120.000 €.

3. **Upgrade of three (3) odorant units in Metering Stations**

Procurement and installation of three (3) odorant units in Metering Stations in Alexandroupolis, Komotini and Petropigi is the core of the project with the aim of upgrading the odorant services of NNGTS. The budget is estimated at 70.000 €.

### 2.1.2.11. Upgrade of LNG and O &M Facilities for energy saving

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Equipment for NNGTS & LNG Facility |
| Current budget | 2 million € |
| *of which Maintenance Capex* | *2 million €* |
| Expected benefit | Increased efficiency of the system |
| Start date | Dec-19 |

| | |
|---|---|
| Final Investment Decision | Dec-19 |
| Operation Date | Dec-21 |
| Entry in the system | Dec-21 |
| Current Status | Under maturity |
| Financing plan | Possible grant, DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of Transmission & LNG Services |
| Impact on the Average Tariff for the use of NNGS | 0%[14] |
| Inclusion in the 3 year Development Period | Yes |

1. **Upgrade of LNG Facilities**

This project includes replacing of air conditioners with new type INVERTER, replacement of external lighting with new light fixtures (led). The budget is estimated at 100.000 €.

2. **Upgrade of O&M Facilities**

The aim of the project is the energy upgrading of the Building and Electrical / Mechanical Facilities of the Operation and Maintenance Centers in order to achieve energy savings in accordance with the Energy Performance Regulation of buildings "KENAK" (Government Gazette B 2367/12.07.2017). This upgrade may include, among other things, air conditioning systems, lighting systems and the installation of photovoltaic systems to meet the needs of the center in electricity. The budget is estimated at 1.900.000 €.

### 2.1.2.12. Cathodic Protection System Upgrading

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Equipment for NNGTS |
| Current budget | 2 million € |
| *of which Maintenance Capex* | - |
| Expected benefit | Increased efficiency of the system |
| Start date | Jul-19 |
| Final Investment Decision | Dec-19 |
| Operation Date | Jan-23 |
| Entry in the system | Jan-23 |

[14] Assuming that the savings due to energy conservation cover the relevant capex amount.

| | |
|---|---|
| Current Status | Under maturity |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of the Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0,09% |
| Inclusion in the 3 year Development Period | Yes |

A continuous monitoring of Cathodic Protection can be used as a pipeline integrity diagnostics tool complementary to In-Line Inspection (ILI) enriching with valuable data the Pipeline Integrity Management System (PIMS).

The upgrading of the CPS, involves three main components:

1. **Equipment for remote monitoring and control of CPS:**
   a) Remote monitoring and control of CPS Rectifiers and test posts
   b) Recording of corrosion rates and other CP data at special coupons (ER probes)

2. **Revision - Updating of proximity effects (electrical interference) studies:**
   In order to propose the improvement or extension of the earthing system, including lightning protection of insulating joints

3. **Replacement of DC decoupling devices in the existing pipeline earthing system**
   The project will also include the Protection of insulating flanges from environmental conditions and the replacement of Transformers / Rectifiers with low-cost DC module

### 2.1.2.13. Hydraulics Simulation software of NNGS upgrade in real time

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Project for control/management of the transmission system and the LNG Facility |
| Current budget | 0,35 million € |
| *of which Maintenance Capex* | - |
| Expected benefit | Increased efficiency of the system |
| Start date | Dec-19 |
| Final Investment Decision | Mar-20 |
| Operation Date | Feb-21 |
| Entry in the system | Mar-21 |

| | |
|---|---|
| Current Status | Under maturity |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0,002% |
| Inclusion in the 3 year Development Period | Yes |

Upgrade of the existing simulation software Pipeline Manager. The software package will be adapted to the NNGTS and will offer on-line and off-line simulation for NNGTS operation and management. Real time and historical data will be fetched from the SCADA and load forecast systems. One configurator license to update or modify the model will be included.
The project is necessary in order to enable a new mode of operation of the NNGS, based on real time data collection and analysis, allowing the TSO to introduce predictive maintenance, training on the job of control room operators, automatic fault detection and other important innovative practices that will increase the reliability and the efficiency of the system.

The following features will be supported:

- Hydraulic profiles of pipeline
- Pipeline inventory / line pack management
- Over and under pressure detection at any point of pipeline
- Leak detection and location
- Gas composition tracking and early off-spec warning
- Scraper module (pig) tracking
- Predictive analysis forecasting near future pipeline conditions, running what-if and look-ahead scenarios, performing survival analysis of potential major disruptions or balancing crisis.

### 2.1.2.14. IT Applications upgrade

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | IT Equipment |
| Current budget | 1 million € |
| *out of which Maintenance Capex* | - |
| Expected benefit | Increased efficiency of the system |
| Start date | Oct-19 |
| Final Investment Decision | Mar-20 |
| Operation Date | Sep-21 |

| | |
|---|---|
| Entry in the system | Sep-21 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0,01% |
| Inclusion in the 3 year Development Period | Yes |

TSO ability to efficiently and reliably carry out its duties are increasingly depending on the quality and completeness of its IT and communication architecture and organization.
A study has been carried put in order to identify the main gaps and develop a road map for the upgrade of the IT application landscape, defining opportunities and priorities. The main pillars of this project are the new ERP SAP system, the implementation of the disaster recovery center, the creation of a document management system, the upgrade of the human capital management system, the introduction of modeling tools, an upgrade of the Integrated Project Management System, that will allow a faster, more reliable and efficient operation of the company.
Budget is still preliminary and will be further refined in the following months.

### 2.1.2.15. M/R Station at the prefecture of Poria

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | Metering & Regulating Station |
| Current budget | 3 million € |
| *of which Maintenance Capex* | - |
| Expected benefit | Supply of new areas |
| Start date | Dec-19 |
| Final Investment Decision | Dec-20 |
| Operation Date | Dec-22 |
| Entry in the system | Dec-22 |
| Current Status | Under maturity |
| Financing plan | Possible grant, EIB loan, DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |

| | |
|---|---|
| Impact on the Average Tariff for the use of NNGS | 0,137% (w/o grant)<br>0,07% (with 50% grant) |
| Inclusion in the 3 year Development Period | Yes |

The project consists of an M/R Station at the prefecture of Poria in order to supply with natural gas through pipeline the cities of Kastoria, Argos Orestikon & Maniaki. According to the studies performed for the next twenty years the expected maximum consumption will reach 18.000 $m^3$/h. The gas will be transported to Poria M/R through TAP pipeline.

### 2.1.2.16. CNG Station at the prefecture of Poria

| Project Summary | |
|---|---|
| Type of Project | New Project |
| Type of investment | CNG Station |
| Current budget | 1 million € |
| *of which Maintenance Capex* | - |
| Expected benefit | Supply of new areas |
| Start date | Dec-19 |
| Final Investment Decision | Dec-20 |
| Operation Date | Dec-22 |
| Entry in the system | Dec-22 |
| Current Status | Under maturity |
| Financing plan | Possible grant, EIB loan, DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Non- Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0,046% |
| Inclusion in the 3 year Development Period | Yes |

In connection to project 2.1.2.15 a CNG station is proposed in order to supply with compressed natural gas the city of Grevena. The gas will be transported to the CNG station through TAP pipeline.

### 2.1.2.17. M/R Station at the prefecture of Aspros

| Project Summary |
|---|

| | |
|---|---|
| Type of Project | New Project |
| Type of investment | Metering & Regulating Station |
| Current budget | 3 million € |
| *of which Maintenance Capex* | - |
| Expected benefit | Supply of new areas |
| Start date | Dec-19 |
| Final Investment Decision | Dec-20 |
| Operation Date | Dec-22 |
| Entry in the system | Dec-22 |
| Current Status | Under maturity |
| Financing plan | Possible grant, EIB loan, DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0,137% (w/o grant)<br>0,07% (with 50% grant) |
| Inclusion in the 3 year Development Period | Yes |

The project consists of an M/R Station at the prefecture of Aspros in order to supply with n.g through pipeline the cities of Skidra, Edessa, Naousa, Veria & Gianitsa. According to the studies performed for the next twenty years the expected maximum consumption will reach 70.000m$^3$/h. The gas will be transported to Aspros M/R through TAP pipeline.

***Effect on the Average Tariff for the Use of NNGS***

The inclusion in the RAB of the above projects increases the Average Tariff for the usage of NNGS by 5,96% (assuming all possible grants will be received). The benefit achieved from the above mentioned projects more than compensates for the increase, according to the CBA or financial viability analysis that have been carried out for the most important projects.

## CHAPTER 2.2. ONGOING PLANNED PROJECTS

### *CHAPTER 2.2.1. PROJECTS INCLUDED IN THE APPROVED DEVELOPMENT PLAN[15] AND THEIR IMPLEMENTATION IS ONGOING IN THE REFERENCE PERIOD OF THE CURRENT DEVELOPMENT PLAN*

[15] Decision No 236/2019/21-02-2019 by RAE concerning the "Approval of NNGS Development Plan 2017-2026".

### 2.2.1.1. 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<br>Metering Station |
| Current budget | 17,5 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Jun-13 |
| Final Investment Decision | Aug-20[16] |
| Operation Date | Jun-22 |
| Entry in the system | Sep-22 |
| Connection Agreement with User | Pending |
| Current Status | Under maturity |
| Financing plan | Possible grant, DESFA's own equity or loan |
| Recovery method | Connection Fee by User, possible Additional Connection Fee (based on Article 5 of the Tariff Regulation) |
| Connection Agreement with Users | Pending |
| Inclusion in the 3 year Development Period | Yes |

The project consists of:

- Pipeline of 36 km and 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 in Larymna.
- Metering station that will be installed in land provided by LARCO

Technical studies as well as licenses procedures for the project are in progress. These studies are carried out under DESFA's contract with LARCO for the "Elaboration of studies for the connection of the installations of LARCO SA with NNGS".

### 2.2.1.2. Compression Station in Kipi and Regulating Station in Komotini

| Project Summary |
|---|

[16] It will be taken after the signing of the Connection Agreement and the approval of the environmental terms with no increase the Average Tariff for the Use of the System.

| | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Compressor station |
| Current budget | 15 million € |
| Expected benefit | Technical adequacy of NNGS, increase of capacity of NNGS |
| Start date | 19-Jul-07[17] |
| Final Investment Decision | - |
| Operation Date | - |
| Entry in the system | - |
| Current Status | - |
| Financing plan | Not defined yet |
| Recovery method | Not defined yet |
| Inclusion in the 3 year Development Period | No |

The project aims at increasing the Transmission Capacity of NNGS from East to West and to enable supply of larger natural gas quantities to the Greek market as well as to transit gas to European markets via NNGS to the region of Komotini via new gas projects which are foreseen to be developed in the region.

The project is included in the PCI list that was issued by EC in November 2017. The compressor will operate with smaller capacity (indicatively (1+1) x 2,5 MW ISO) in order to serve the needs of the Greek market west of Komotini for import of gas from Turkey above the current technical capacity of the 4,3 mNm$^3$/ day, and / or to ensure reverse flow to the Sidirokastro in cases of increased flow or increased delivery pressure, and/or to allow the flow of gas to the NNGS from an underground storage in the area of Kavala, according to the relevant simulation studies.

Considering that the market needs are not defined yet, the size of the compressor station (1+1) x 2,5 MW is indicative. The Regulating Station in Komotini is necessary if the CS at Kipi is installed because the MOP of the pipeline west of Komotini is lower.

### 2.2.1.3. 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 |

[17] Approval time of basic design

| | |
|---|---|
| Current budget | 12 million € |
| Expected benefit | Security of supply |
| Start date | 19-Jul-07[18] |
| Final Investment Decision | Taken |
| Operation Date | Oct-20 |
| Entry in the system | Dec-20 |
| Current Status | Under construction |
| Financing plan | INEA Grants (for studies), PA 2014-2020 grants[19], EIB loan[20], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of the Transmission Services |
| Inclusion in the 3 year Development | Yes |

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. $Nm^3$/ day and bi-directional flow capability. The cost of construction of the above mentioned investment, based on the exception decision, will be covered by DESFA and will be recovered through the tariffs of the Users of the National Natural Gas System.

The budget of the project is 12 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 station and compressor station in next future.

With this investment, the uni-directional flow from TAP to NNGTS is secured (1st phase of the project) as well as the land acquisition where the compressor station will be installed in the future, enabling full bi-directional flow in the interconnection.
The project is included in the PCI list of November 2017. The FEED study is co-financed from Connecting Europe Facility (CEF), while the construction of the project is co-financed from PA 2014-2020.

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

[18] Approval time for the basic design
[19] Approved to the level of 59% of the eligible cost.
[20] Will be pursued

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Pipeline |
| Current budget | 1800 million €[21] |
| Expected benefit | Diversification of supply sources, security of supply |
| Start date | 19-Jul-07[22] |
| Final Investment Decision | No[23] |
| Operation Date | - |
| Entry in the system | -[24] |
| Current Status | Under maturity[25] |
| Financing plan | Not defined yet |
| Recovery method | Not defined yet |
| Inclusion in the 3 year Development | No |

The project is part of the Incremental Capacity Project Greece- Italy, submitted to RAE by DESFA's letter n. 120151/11.12.2018.

Komotini-Thesprotia pipeline project consists of high pressure pipeline (80 barg), 613 km length and 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. 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.

The project includes also a Compressor Station at Florovouni Thesprotia (3+1) x 17MW, a Compressor Station increment at the compressor station of Kipi in order for the compression power to reach 22MW ISO (not including stand-by capacity) as well as a new pipeline increment of 7km 32'' from Florovouni to the shore.

[21] Preliminary estimation for the case of maximum flow.

[22] Approval date of basic design

[23] FID will be taken after the performance of market test. A cost of maturing the project might be foreseen, in case of agreement with potential pipe to pipe competing projects, to be evaluated in the framework of the overall general public interest

[24] Decision to construct the project has not been taken yet.

[25] 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.

### 2.2.1.5. 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 for control/management of transmission system |
| Current cost | 3,5 million € |
| *Of which Maintenance Capex* | 3,5 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 16-May-12 |
| Final Investment Decision | Taken |
| Operation Date | Mar-20 |
| Entry in the system | Mar-20 |
| Current Status | Under construction |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of the Tranmsission Services |
| Inclusion in the 3 year Development | Yes |

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-commercially 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.

### 2.2.1.6. Integrated Information System for Natural Gas

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

| | |
|---|---|
| Type of investment | Equipment for control/management of transmission system |
| Current budget | 0,38 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 31-May-10 |
| Final Investment Decision | Taken |
| Operation Date | Dec-19 |
| Entry in the system | Dec-19 |
| Current Status | Under construction |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of the Transmission Services |
| Inclusion in the 3 year Development | Yes |

The purpose of the project is the development, installation and commissioning of the Integrated Information System for natural gas (IISNG), which is to be the main communication / transaction platform between DESFA and NNGTS/LNG Users as well as between NNGS Users / Selected Customers based on the provisions of the Network Code. The IISNG is a regulatory obligation for DESFA under National and European Regulatory Framework for the Gas Market.

The IISNG consists of the Information System through which the management of the primary market for NNGS capacity is implemented (eg booking of transmission capacity and gasification capacity, daily reporting, calculation and notification of quantity allocations, LNG facility storage management, calculation of charges for the usage of NNGTS and LNG etc.)

Through IISNG, actions that must be continuously conducted both by DESFA and Users are automated, as provided for in the relevant regulatory framework.

### 2.2.1.7. Upgrading Projects of NNGS -1st group

| Project Summary | |
|---|---|
| Project Type | Planned Project |
| Type of investment | Equipment on NNGS |
| Current budget | 2,097 million € |
| *Of which Maintenance Capex* | *2,097 million €* |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 31-May-10 |
| Final Investment Decision | Taken (project 1, Table 1)<br>Sept-19(project 2, Table 1) |
| Operation Date | Mar-21 (project 1, Table 1)<br>Nov-20(project 2, Table 1) |
| Entry in the system | Jun-21 (project 1, Table 1)<br>May-21 (project 2, Table 1) |
| Current status | Under maturity |
| Financing plan | PA 2014-2020 grants for the 1st subproject, DESFA's own equity or loan |
| Recovery method | Inclusion of cost in RAB of Transmission Services |
| Inclusion in the 3 year Development | Yes |

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

**Table 1 - Projects for the upgrade of the operation of NNGS**

| No. | INVESTMENTS | COST (€) | FINAL INVESTMENT DECISION | OPERATION DATE | ENTRY IN THE SYSTEM |
|---|---|---|---|---|---|
| **1** | Upgrade of SCADA in dispatching centers | 1.900.000 | Taken | Mar-21 | Jun-21 |
| **2** | Design, supply, installation, system | 197.000 | Sept-19 | Nov-20 | May-21 |

| | |
|---|---|
| design of daily gas flow | |
| **TOTAL** | **2.097.000 €** |

Each one of those investments in Table 1 is described in the next paragraphs.

**1. Upgrade of SCADA in dispatching centers**

The project includes the procurement, installation and operation of a new SCADA system in the main dispatching center in Elefsina as well as in the back up dispatching center in Nea Messimvria.

The new SCADA system in the Control Centers will replace the current system, which began trading in 2006, and will provide DESFA with new tools for managing graphic images, database, system alarms, historical data, and so on. It is noted that the equipment of the existing SCADA Control Center system is not supported by the manufacturing company, which no longer holds a security reserve for it.

The investment will enhance the utilization of the system's capabilities (user friendliness, better display of parameters, ease of designing new graphic images, etc.), improve the management of NNGTS within the European and Greek regulatory framework and ensure the Telepresence and remote control of NNGTS and its extensions for the next decade.

This project is co-financed from PA 2014-2020 with 51,35%.

**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.

### 2.2.1.8. Upgrade of the system for the corrosion protection of the NNGTS

| Project Summary | |
|---|---|
| Project Type | Planned Project |
| Type of investment | Equipment of Transmission System |
| Current budget | 0,280 million € |
| *of which Maintenance Capex* | *0,280 million €* |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | 28-Jun-12 |
| Final Investment Decision | Taken |
| Operation Date | Dec-19 |
| Entry in the system | Dec-19 |
| Current Status | Under construction |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion of in RAB of Transmission Services |
| Inclusion in the 3 year Development | Yes |

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 280.000 € and the project is expected to be ready for operation by the end of 2019.

### 2.2.1.9. Installation of M/R Kavala

| Project Summary | |
|---|---|
| Project Type | Planned Project |
| Type of investment | Metering Station |
| Current budget | 2,01 million € |
| Expected benefit | Supply of new areas |
| Start date | 17-Oct-12 |
| Final Investment Decision | Mar-20[26] |
| Operation Date | Mar-22 |
| Entry in the system | Jun-22 |
| Current Status | Under maturity |

[26] Conditional to the approval for co-financing of the project and the approval of environmental terms

| | |
|---|---|
| Financing plan | PA 2014-2020 grants[27], EIB loan[28], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Inclusion in the 3 year Development | Yes |

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.

### 2.2.1.10. Upgrade of LNG Loading Arms at Revithoussa LNG Terminal

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | LNG facility |
| Current budget | 1,2 million € |
| *of which Maintenance Capex* | *1,2 million €* |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Apr-16 |
| Final Investment Decision | Taken |
| Operation Date | Mar-20 |
| Entry in the system | Mar-20 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of LNG Services |
| Inclusion in the 3 year Development | Yes |

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 15year 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.

[27] DESFA has submitted application for 51,14%
[28] Will be pursued

### 2.2.1.11. Truck Loading Pilot (first) Station

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | LNG facility |
| Current budget | 6,5 million € [29] |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Apr-16 |
| Final Investment Decision | Dec-19 |
| Operation Date | Sept -21 |
| Entry in the system | Sept -21 |
| Current Status | Under maturity (under tender procedure the construction award) |
| Financing plan | Poseidon Med II Grants (for studies), PA 2014-2020 grants[30], EIB loan[31], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Additional LNG Services |
| Inclusion in the 3 year Development | Yes |

The construction of a pilot truck loading station (the characterization of the station as pilot refers to the fact that will be the first station) will give the possibility for the use of natural gas in off grid areas, where the transmission system is not developed yet (e.g. islands and west Greece), along with its use in shipping for the fueling of vessels (for vessels using LNG as marine fuel). The result will be an increased gas consumption and a more efficient use of Revithoussa Terminal.

The market has already expressed interest for the said application both for the supply of off-grid consumers and for bunkering purposes in the framework of data collection for the implementation of the Development Study 2020-2029. The station will have one loading bay for 50 $m^3$ trucks with a loading capacity of 100 $m^3$/h. It will also include provision for a future second bay.

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 issue of bill of lading and other required documentation

[29] Increased budget due to the expansion of the existing port facility at Perama Megaridos area.
[30] Approved with 57,42% of eligible budget.
[31] Will be pursued

- Traffic arrangements within DESFA property as well as on the access road to Revithoussa
- Expansion of the existing jetty at Perama Megaridos port.

The demand study for this new service is in the published NNGS Development Study for 2020-2029.

### 2.2.1.12. LNG Terminal Boil-off Gas Compressor Station

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | LNG facility |
| Current budget | 10,6 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Apr-16 |
| Final Investment Decision | May-20[32] |
| Operation Date | Jun-22 |
| Entry in the system | Sep-22 |
| Current Status | Under maturity (basic design) |
| Financing plan | PA 2014-2020 grants[33], EIB loan[34], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of LNG Services |
| Inclusion in the 3 year Development | Yes |

In order for DESFA to manage with the best possible way the produced boil-off gases (BOG) in the LNG Terminal of Revithoussa from the cryogenic facilities (2nd upgrade) as well as from the unloading/loading phase and mainly to avoid the combustion of the gases in the flair of the facility in the case of no send-out operation, DESFA will install a new compressor station for BOG so as to increase the pressure and inject them to the national natural gas system.

The new project consists of the following parts:

- Compressor station unit of total throughput of 10.000 kg/h and discharge pressure 26÷64 barg
- Knock Out Drum container in the sanction of compressors
- System for water cooling with cooler and re-circulation pumps

[32] Conditional to the approval of environmental terms.
[33] Approved with 60,4% of eligible budget.
[34] Will be pursued

- Metal building for the accommodation of the compressor unit of 420 $m^2$ surface, including the electromechanical infrastructure
- Electrical facility for the power supply to compressors, coolers, pumps and building
- Installation of automation and control of new installations and interconnection with the central control room
- Pipeline networks for the transport of waste water and extension of the existing auxiliary networks of the station (compressed air, nitrogen, water etc.)
- Extension of the plant's fire protection facilities
- Decommissioning of the existing nitrogen facility and relocation to a new location

This 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.

### 2.2.1.13. M station at SALFA A. Liossia

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Metering station |
| Current budget | 0,68 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Jun-17 |
| Final Investment Decision | Taken |
| Operation Date | Jul-20 |
| Entry in the system | Aug-20 |
| Current Status | Under construction |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Connection Fee |
| Inclusion in the 3 year Development Period | Yes |

The project is necessary according to the provisions (art. 5 par. 7) of Tariff Regulation as well as the relevant agreement of Public Gas Corporation "DEPA SA".

### 2.2.1.14. Pipeline Nea Messimvria – Evzonon/ Gevgelija and Metering station

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

| | |
|---|---|
| Type of investment | Pipeline<br>Metering station |
| Current budget | 48,7 million € |
| Expected benefit | Development SEE market, increase of usage of NNGS |
| Start date | Jun-17 |
| Final Investment Decision | Jun-20[35] |
| Operation Date | Jun-23 |
| Entry in the system | Jul-23 |
| Current Status | Under maturity, approval of environmental terms expected by end 2019 |
| Financing plan | PA 2014-2020 grants[36], EIB loan[37], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Impact on the Average Tariff for the use of NNGS | 0% |
| Inclusion in the 3 year Development Period | Yes |

The project aims at the interconnection of natural gas transmission systems of Greece and North Macedonia which will enhance the diversification of supply sources for North Macedonia. The latter one is currently solely dependent on the supply of gas from Trans Balkan Pipeline.

DESFA and MER have signed a Memorandum of Understanding for the project in October 2016.

Access to NNGS, and especially to the LNG terminal of Revithoussa and to natural gas through TAP pipeline, can benefit market competition thus leading to lower prices for the supply of natural gas in the neighboring country. Meanwhile the project enhances the regional development of natural gas market and the involvement of more market players thus enhancing the role of Greece as a hub. Furthermore, it will lead to the increased usage of infrastructure such as the LNG terminal in Revithoussa, in order to reduce the tariffs for the usage of the transmission system in the long term.

The required project within Greece is constituted from:

[35] Conditional to sufficient booking of capacity.
[36] Application submitted for 34,73% of eligible budget.
[37] Application submitted for 50% of the budget.

-A 57 km pipeline of 30 in with 70 barg design pressure and 66.4 barg maximum operating pressure starting from Nea Messimvria (downstream of the current compressor station) an ending to the Border Station U-7550 which belongs to the Administrative limits of the Community of Evzoni, eastern of river Axios.
-A Metering Station, two (2) Scraper Stations, Launcher and Receiver.

**Picture 2 - Routing of the pipeline from Nea Messimvria to the boarder with North Macedonia**

### 2.2.1.15. Compressor Station in Ambelia

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Compressor Station |
| Current budget | 65 million € |
| Expected benefit | Efficiency of NNGS, effective operation in respect to prevent congestion |
| Start date | Jun-17 |
| Final Investment Decision | Nov-20 |
| Operation Date | Mar-23 |
| Entry in the system | Jun-23 |
| Current Status | Under maturity (under tendering procedure the basic design) |
| Financing plan | PA 2014-2020 grants[38], EIB loan[39], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Inclusion in the 3 year Development Period | Yes |

[38] DESFA has requested 50,34% of eligible budget.
[39] Loan will be pursued

The project is necessary on the basis of the hydraulic simulation studies carried out by DESFA and given the expected increase in the transported quantities of natural gas from north to south with the start of the TAP pipeline and its interconnection with NNGTS in New Messimvria. The existing technical capacities at North Entry Points (Sidirokastro + Kipi) are considered to remain as of today.

In order to ensure the hydraulic stability and efficiency of the system, irrelevant of the entry point the Users will select, it is necessary to progressively increase the technical capacity of the NNGS with the installation of a compressor station at the southern part of Greece, which concentrates the larger part of the demand.

The characteristics of the compressor station have been modified (based on a simulation and operational study) from two (2) compressor units of 10 MW into two compressor units plus one spare unit (2+1) x 10 MW. The new design is also reflected in the increased budget.

The detailed characteristics of the units will be defined during the basic design. Furthermore, the station will be designed to provide also the possibility of compression in reverse flow.

### 2.2.1.16. Upgrading Projects of NNGS -3rd group

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Equipment for NNGS and LNG |
| Current budget | 1,1 million € |
| Expected benefit | Efficiency of NNGS, effective operation in order to prevent emergency situations |
| Start date | Jun-17 |
| Final Investment Decision | Taken (project 1 table 2)<br>Sept-19 (project 2 table 2) |
| Operation Date | Dec-20 (project 1 table 2)<br>Jul-20 (project 2 table 2) |
| Entry in the system | Dec-20 (project 1 table 2)<br>Jul-20 (project 2 table 2) |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Inclusion in the 3 year Development Period | Yes |

**Table 2 – Projects for the upgrade of NNGS operation**

| No. | Investments | Estimated cost(€) | Final Investment Decision | Start of operation date |
|---|---|---|---|---|

| | | | | |
|---|---|---|---|---|
| | | | | **& inclusion in the system** |
| **1** | Upgrade of electrical circuit breakers for medium voltage and internal lighting in the control room of LNG facility | 1.000.000 | Taken | Dec-20 |
| **2** | Upgrade of Geographical Information System (GIS) system | 100.000 | Sep-19 | Jul-20 |
| | **TOTAL** | **1.100.000 €** | | |

The following paragraphs analyze the feasibility and the technical characteristics of the projects presented in above table.

**1. Upgrade of electrical circuit breakers for medium voltage and internal lighting in the control room of LNG facility**

It concerns the supply and replacement of medium voltage (6 kV) electrical circuit breakers at the LNG facility (45 pcs.) aiming at the smooth operation of the automation in the distribution of electricity and supply of medium voltage loads (motors and pumps). The upgrade study is in progress.

**2. Upgrade of Geographical Information System (GIS) system**

The project will further develop DESFA's geographic database in order to fully integrate DESFA's assets and their efficient performance through GIS-web applications to the end users.

### 2.2.1.17. Upgrade of physical protection of DESFA facilities - Physical Safety Control Center

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Equipment of NNGS |
| Current budget | 1,2 million € |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Jun-17 |
| Final Investment Decision | Jan-20[40] |
| Operation Date | Apr-21 |

[40] Upon approval for co-financing of the project with inclusion in the RAB up to 600.000 €.

| | |
|---|---|
| Entry in the system | Jun-21 |
| Current Status | Under maturity (under tendering procedure the basic design) |
| Financing plan | PA 2014-2020 grants[41] , DESFA's own equity or loan |
| Recovery method | Inclusion in RAB (up to 600.000 €) of Transmission Services |
| Inclusion in the 3 year Development Period | Yes |

NNGS facilities are considered as European critical infrastructure. Possible shutdown or destruction would have a significant impact on the country and Europe-wide.
The aim of the project is to upgrade the physical security of all DESFA infrastructure due to the rapid development of the technological applications in the sector and the establishment of a Physical Security Control Center covering the requirements of the Directive 2008/114/EC concerning critical infrastructure security, which was incorporated into the Greek law with Presidential Decree 39/2011.
The aim is to prevent, mitigate and eliminate risk threats (examples include theft, sabotage, terrorism, accidents, and natural phenomena).
The project includes:
-Implementing a vulnerability study of all DESFA installations and developing an Infrastructure Safety Management Plan
- Compilation of Technical Specifications of Safety Systems and Physical Security Control Center
- Installation of security systems in DESFA (eg CCTV systems, tamper detectors, alarms, headlamps, access control etc.)
- Development and operation of a Physical Security Control Center for the management and coordination of the security systems of the Infrastructure.

### 2.2.1.18. Improvement of metering accuracy in NNGTS stations

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Equipment of NNGTS |
| Current budget | 0,39 million € |
| *Of which Maintenance Capex* | *0,39 million €* |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Jun-17 |

[41] DESFA has requested 50,67% of eligible budget

| | |
|---|---|
| Final Investment Decision | Taken |
| Operation Date | Sep-20 |
| Entry in the system | Dec-20 |
| Current Status | Under construction (under tendering procedure for the procurement) |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Inclusion in the 3 year Development Period | Yes |

In the context of the public consultation of the Development Plan 2016-2025 it was pointed out that in some distribution networks due to low consumption there are differences between the amount of gas resulting from the sum of the metering systems of the distribution networks and the quantity of gas measured in the M/ R stations that feed the corresponding Distributed Network Exit Point of the NNGTS.
DESFA, (ref. made to the 100240 / 13.12.2016 letter to RAE), shall examine the matter and come back in the next Development Plan or List of Small Projects.
DESFA examined the issue and it concluded that in 17 M/R stations the turbine meters operate for a substantial amount of time outside of their approved metering rates. This occurs due to the low consumption rates in the distribution networks that are connected to the relevant Exits of the NNGTS.
In order to resolve the problem, said turbine meters (31 in total) should be replaced in 17 stations with new ones that combine improved operational features such as lower Qmin requirement and improved minimum / maximum flow ratio-from 1:20 to 1:50.

### 2.2.1.19. Replacement of Metering and control systems on M/R stations of NNGTS

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Equipment for control/management of NNGS |
| Current budget | 4,5 million € |
| *of which Maintenance Capex* | *4,5 million €* |
| Expected benefit | Efficiency of NNGS, effective operation |
| Start date | Jun-17 |
| Final Investment Decision | Dec-19[42] |
| Operation Date | Mar-22 |

[42] Upon approval for co-financing of the project.

| | |
|---|---|
| Entry in the system | Jun-22 |
| Current Status | Under maturity |
| Financing plan | PA 2014-2020 grants[43], EIB grant[44], DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Inclusion in the 3 year Development Period | Yes |

The project concerns the replacement of the Measurement Management and Supervision / Control Systems in thirty (30) existing Metering (M) and Metering / Regulating (M / R) Stations, in order to achieve:

- the compatibility with each other as well as with the under upgrade stations as presented in the planned projects "Upgrading Projects of NNGS -2nd Group" and "Installation of M/R Kavala" herein, through similar equipment and software as well as similar architecture, achieving on the one hand direct economies of scale, by maintaining a smaller number of required spare parts and consumables and on the other hand by the support services of these systems during their operational phase,

- the separation to the maximum extent of the Measurement Management System from the Supervision /Control System at NNGTS Stations, achieving (a) the stations' measurement data to be collected in the SCADA of the Control and Load Distribution Centers (KEKF) of DESFA directly - without intermediate processing - by the certified Multi-Stream Flow Computers which will be installed in the framework of this project at the NNGTS stations and (b) by extension the optimization of the services provided by DESFA under the requirements of European and national regulatory framework (e.g. publication of data, validation of measured quantities etc), and

- to ensure the operation of the Measurement Management and Supervision / Control Systems of the Stations for the next decade as the equipment and software at these Stations operate on average for a decade and is expected not to be supported by the manufacturers in the coming period.

The replacement of the Measurement Management and Supervision / Control Systems in the Stations of DESFA refers to the following elements:

- SCADA & Telecom
- programmable Logic Controller – PLC
- flow computer

[43] DESFA has requested 51,59% of eligible budget.
[44] Will be pursued.

- gas chromatograph, and
- equipment of local stations network.

### 2.2.1.20. New building for DESFA's headquarters

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Equipment for control/management of NNGS and LNG |
| Current budget | 11 million € |
| Expected benefit | Efficiency of NNGS |
| Start date | Jun-17 |
| Final Investment Decision | Dec-19 |
| Operation Date | Dec-22 |
| Entry in the system | Dec-22 |
| Current Status | Under maturity |
| Financing plan | DESFA's own equity or loan |
| Recovery method | Inclusion in RAB of Transmission Services [45] |
| Inclusion in the 3 year Development Period | Yes |

DESFA headquarters are now housed in a rented building. It is considered cost efficient for DESFA to acquire a privately-owned headquarters building, which will constitute a company's fixed asset, contribute to the saving of operating expenses and ensure improved health and safety of work, while it will in parallel promote and represent the vision and the values of the company.

The office area is planned to be approximately 6.500 square meters in line with the existing DESFA headquarters.

The goal is to avoid burdening the NNGS users due to the savings that will be achieved, mainly by the rental cost. It is also estimated that there will be energy savings due to stricter energy specifications of the new building.

The implementation of the project is expected to be finalized until the end of 2022, including also modification works. The building will be depreciated in 40 years.

[45] Under the provision that, with regulatory depreciation of 40 years, there will be a negative impact on the Average Tariff for the use of NNGS.

### 2.2.1.21. Upgrade of Nea Messimvria compressor station

| Project Summary | |
|---|---|
| Type of Project | Planned Project |
| Type of investment | Compressor station |
| Current budget | 15 million € |
| Expected benefit | Efficiency of NNGS, effective operation in respect to prevent congestion |
| Start date | Mar-18 |
| Final Investment Decision | Dec-19 |
| Operation Date | Sep-22 |
| Entry in the system | Dec-22 |
| Current Status | Under maturity (preparation of tender documents for the assignment of construction) |
| Financing plan | PA 2014-2020 grants[46], EIB loan[47], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Inclusion in the 3 year Development Period | Yes |

The project is considered necessary since TAP pipeline is scheduled to be connected to NNGTS downstream of the existing compressor station in Nea Messimvria (Planned project for the Metering/Regulating station in Nea Messimvria for the connection to TAP). In order to ensure the hydraulic stability of the transmission system it is necessary to install a 3rd unit with similar characteristics to the existing ones. The type of compressor, either electrical or turbo gas, is currently under evaluation.
The project is complimentary to compressor station at Ambelia.

## *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*

[46] DESFA has requested 50,27% of eligible budget.
[47] Will be pursued.

### 2.2.2.1. Metering / Regulating Station Livadia U-2710

| Project Summary | |
|---|---|
| Type of Project | Project already included in the Small Projects List |
| Type of investment | MR Station |
| Current budget | 1,98 million € |
| Expected benefit | Enabling access to new Users |
| Start date | Jul-18 |
| Final Investment Decision | Mar-20 |
| Operation Date | Dec-21 |
| Entry in the system | Mar-22 |
| Current Status | Under maturity |
| Financing plan | PA 2014-2020 grants[48], EIB loan[49], DESFA's own equity or other loan |
| Recovery method | Inclusion in RAB of Transmission Services |
| Inclusion in the 3 year Development Period | Yes |

The aim of this project is to install one M/R City Gate Station in the greater area of Livadia, in order to supply the distribution networks (19 barg MP) of Livadia city with natural gas. Project includes building construction and installation (M/R Control Building), construction of Metering and Regulating skid with capacity of 11.500 $Nm^3/h$ and outlet pressure of 16 barg, two (2) phase construction plan (1st phase: 5.750 $Nm^3/h$ - 1 working + 1 stand by -, 2nd phase: 11.500 $Nm^3/h$ – 2 working + 1 stand by - ), construction of auxiliary installations (gas preheating system with central boilers, fuel gas system, gas actuation systems, odorization system), construction of steel shelter for the protection of M/R skid (Skid Shelter), as well as connection with the existing central inlet (4") and outlet (6") Emergency Shut Down valve stations, both with 4" by pass arrangement, for gas supply of final consumers.

## CHAPTER 2.3. PROJECTS OF THE THREE YEAR DEVELOPMENT PERIOD

According to the provisions of ar. 92 of Network Code, Three Year Development period applies to projects for which the final Investment Decision (i) has been taken or (ii) is

[48] DESFA has requested a grant of 51,09% of eligible budget.
[49] Will be pursued.

considered possible to be taken within three (3) years from the publication of the draft Development Plan in DESFA's website.

These projects are mentioned in Annex I.

## CHAPTER 3. ONGOING PLANNED PROJECTS THAT WERE NOT INCLUDED IN THE DRAFT DEVELOPMENT PLAN 2020-2029

There are no ongoing projects that belong to this category.

## Annex I

**Summary Table of the Projects of the NNGS Development Plan 2020-2029, with distinct reference to the Three-Year Development Period (Article 92, par. 4C of the NNGS Network Code)**

**DEFINITIONS:**

1. **Three-Year Development Period**: As defined in the NNGS Network Code. Projects which the final Investment Decision (i) has been taken, (ii) is considered possible to be taken within three (3) years from the publication of the draft Development Plan in DESFA's website (up to 2022)
2. **Final Investment Decision**: As defined in the NNGS Network Code, that is the decision for the award of construction of the project (resolution to construct) after the fulfillment of the financial or commercial prerequisites and after the approval of environmental terms of the project.
3. **Operation Date**: As defined in the NNGS Network Code, that is the date of start of operation in test mode after the mechanical completion of the project
4. **Entry in the system**: The start of commercial operation of the project (ready for use by system Users). The inclusion on the system is performed after the receipt of the operation license where this is relevant.

| Three Year Development projects[50] | | | |
|---|---|---|---|
| | **INVESTMENT** | **COST (€)** | **MILESTONES** |
| **I. PROJECTS INCLUDED FOR THE FIRST TIME IN THE DEVELOPMENT PLAN** | | | |
| **A. Projects for the connection of Users (art. 92 par.4Ai. of NNGS Administration Code as applicable)** | | | |
| **1** | M/R Station AdG III | 2.000.000 | Final Investment Decision: **03/2020**<br>Start of operation: **12/2021**<br>Inclusion in the system: **03/2022** |
| **2** | Metering Station at Agios Nikolaos Viotia (AdG IV) | 1.500.000 | Final Investment Decision: **03/2020**<br>Start of operation: **12/2021**<br>Inclusion in the system: **03/2022** |
| **3** | Connection with DEPA's CNG Station in Komotini | 1.300.000 | Final Investment Decision: **03/2021**<br>Start of operation: **12/2022**<br>Inclusion in the system: **03/2023** |
| **4** | Connection with DEPA's CNG Station in Tripoli | 2.350.000 | Final Investment Decision: **03/2021**<br>Start of operation: **12/2022**<br>Inclusion in the system: **03/2023** |
| **5** | Connection of Kavala Oil plant to the NNGTS | 3.400.000 | Final Investment Decision: **05/2021**<br>Start of operation: **07/2022**<br>Inclusion in the system: **12/2022** |
| **6** | Connection of ELVAL plant of NNGTS | 4.000.000 | Final Investment Decision: **02/2021**<br>Start of operation: **09/2022**<br>Inclusion in the system: **12/2022** |

[50]Projects which the final Investment Decision (i) has been taken, (ii) is considered possible to be taken within three (3) years from the publication of the draft Development Plan in DESFA's website

| Three Year Development projects[50] | | | |
|---|---|---|---|
| | **INVESTMENT** | **COST (€)** | **MILESTONES** |
| **B. Projects for the Development of NNGS (art. 92 par. 4Aii. of NNGS Administration Code as applicable)** | | | |
| **7** | Booster Compressor for TAP in Nea Mesimvria | 30.000.000 | Final Investment Decision: **11/2020**<br>Start of operation: **03/2023**<br>Inclusion in the system: **06/2023** |
| **8** | Interconnection of IGB Pipeline with the NNGS in Komotini | 700.000 | Final Investment Decision: **1/2020**<br>Start of operation: **11/2020**<br>Inclusion in the system: **01/2021** |
| **9** | Technical Training Centre in Nea Mesimvria | 1.600.000 | Final Investment Decision: **11/2019**<br>Start of operation: **04/2021**<br>Inclusion in the system: **07/2021** |
| **10** | New jetty for small scale LNG in Revithoussa | 30.000.000 | Final Investment Decision: **02/2020**<br>Start of operation: **1st phase: 09/2022/2nd phase: 12/2026**<br>Inclusion in the system: **1st phase: 12/2022/2nd phase: 12/2026** |
| **11** | Virtual Pipeline to Atherinolakkos Crete | 175.000.000 | Final Investment Decision: **12/2020**<br>Start of operation: **12/2023**<br>Inclusion in the system: **03/2024** |
| **12** | Increment of the back-up power availability at Revithoussa LNG Terminal | 3.500.000 | Final Investment Decision: **12/2019**<br>Start of operation: **09/2020**<br>Inclusion in the system: **12/2020** |
| **13** | NNGS Modernization projects- 4th Compilation | 540.000 | Final Investment Decision: **12/2019**<br>Start of operation: **12/2020**<br>Inclusion in the system: **12/2020** |

| Three Year Development projects[50] | | | |
|---|---|---|---|
| | **INVESTMENT** | **COST (€)** | **MILESTONES** |
| **14** | Upgrade of LNG and O &M Facilities for energy saving | 2.000.000 | Final Investment Decision: **12/2019**<br>Start of operation: **12/2021**<br>Inclusion in the system: **12/2021** |
| **15** | Cathodic Protection System Upgrading | 2.000.000 | Final Investment Decision: **12/2019**<br>Start of operation: **01/2023**<br>Inclusion in the system: **01/2023** |
| **16** | Hydraulic Simulation Software of NNGS upgrade in real time | 350.000 | Final Investment Decision: **03/2020**<br>Start of operation: **02/2021**<br>Inclusion in the system: **03/2021** |
| **17** | IT Applications Upgrade | 1.000.000 | Final Investment Decision: **03/2020**<br>Start of operation: **09/2021**<br>Inclusion in the system: **09/2021** |
| **18** | M/R Station at the prefecture of Poria | 3.000.000 | Final Investment Decision: **12/2020**<br>Start of operation: **12/2022**<br>Inclusion in the system: **12/2022** |
| **19** | CNG Station at the prefecture of Poria | 1.000.000 | Final Investment Decision: **12/2020**<br>Start of operation: **12/2022**<br>Inclusion in the system: **12/2022** |
| **20** | M/R Station at the prefecture of Aspros | 3.000.000 | Final Investment Decision: **12/2020**<br>Start of operation: **12/2022**<br>Inclusion in the system: **12/2022** |
| **II. PLANNED PROJECTS** | | | |

| Three Year Development projects[50] | | | |
|---|---|---|---|
| | **INVESTMENT** | **COST (€)** | **MILESTONES** |
| **A. Projects included in the approved Development Plan and their implementation is ongoing in the current Development Plan** | | | |
| **21** | 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 | Final Investment Decision [51]: **08/2020**<br>Start of operation: **06/2022**<br>Inclusion in the system: **09/2022** |
| **22** | M/R Station in N. Messimvria for the connection of TAP to the NNGS | 12.000.000 | Final Investment Decision: **Taken**<br>Start of operation: **10/2020**<br>Inclusion in the system: **12/2020** |
| **23** | Upgrading of electrical and electronic equipment, billing system and SCADA field equipment in M/R stations of 1st generation (1995-2000) | 3.500.000 | Final Investment Decision: **Taken**<br>Start of operation: **03/2020**<br>Inclusion in the system: **03/2020** |
| **24** | Integrated IT System for Natural Gas | 380.000 | Final Investment Decision: **Taken**<br>Start of operation: **12/2019**<br>Inclusion in the system: **12/2019** |
| **25** | Upgrade of SCADA in dispatching centers | 1.900.000 | Final Investment Decision: **Taken**<br>Start of operation: **03/2021**<br>Inclusion in the system: **06/2021** |
| **26** | Design, supply, installation of a system for the daily gas flow | 197.000 | Final Investment Decision: **09/2019**<br>Start of operation: **11/2020**<br>Inclusion in the system: **05/2021** |

[51] Under condition the User(s) will book the necessary capacity for transmission

| Three Year Development projects[50] | | | |
|---|---|---|---|
| | **INVESTMENT** | **COST (€)** | **MILESTONES** |
| **27** | Upgrade of the system for the corrosion protection of the NNGTS | 280.000 | Final Investment Decision: **Taken**<br>Start of operation: **12/2019**<br>Inclusion in the system: **12/2019** |
| **28** | Installation of M/R in Kavala | 2.010.000 | Final Investment Decision: **03/2020**<br>Start of operation: **03/2022**<br>Inclusion in the system: **06/2022** |
| **29** | Upgrade of LNG Loading Arms at Revithoussa LNG Terminal | 1.200.000 | Final Investment Decision: **Taken**<br>Start of operation: **03/2020**<br>Inclusion in the system: **03/2020** |
| **30** | Truck Loading Pilot (first) Station | 6.500.000 | Final Investment Decision: **12/2019**<br>Start of operation: **09/2021**<br>Inclusion in the system: **09/2021** |
| **31** | LNG Terminal Boil-off Gas Compressor Station | 10.600.000 | Final Investment Decision: **05/2020**<br>Start of operation: **06/2022**<br>Inclusion in the system: **09/2022** |
| **32** | M Station at SALFA Ano Liossia | 680.000 | Final Investment Decision: **Taken**<br>Start of operation: **07/2020**<br>Inclusion in the system: **08/2020** |
| **33** | Pipeline Nea Mesimvria – Evzonon/ Gevgelija and M Station | 48.700.000 | Final Investment Decision**: 06/2020**<br>Start of operation: **06/2023**<br>Inclusion in the system: **07/2023** |
| **34** | Compressor Station in Ampelia | 65.000.000 | Final Investment Decision**: 11/2020**<br>Start of operation: **03/2023**<br>Inclusion in the system: **06/2023** |

| Three Year Development projects[50] | | | |
|---|---|---|---|
| | **INVESTMENT** | **COST (€)** | **MILESTONES** |
| **35** | Upgrade of electrical switches for medium voltage and internal lighting in the control room of LNG facility | 1.000.000 | Final Investment Decision**: Taken**<br>Start of operation: **12/2020**<br>Inclusion in the system: **12/2020** |
| **36** | Upgrade of Geographical Information System (GIS) | 100.000 | Final Investment Decision**: 09/2019**<br>Start of operation: **07/2020**<br>Inclusion in the system: **07/2020** |
| **37** | Upgrade of physical protection of DESFA facilities - Physical Safety Control Center | 1.200.000 | Final Investment Decision**: 01/2020**<br>Start of operation: **04/2021**<br>Inclusion in the system: **06/2021** |
| **38** | Improvement of metering accuracy in NNGTS stations | 390.000 | Final Investment Decision: **Taken**<br>Start of operation**: 09/2020**<br>Inclusion in the system: **12/2020** |
| **39** | Replacement of Metering and control systems on M/R stations of NNGTS | 4.500.000 | Final Investment Decision: **12/2019**<br>Start of operation**: 03/2022**<br>Inclusion in the system**: 06/2022** |
| **40** | New building for DESFA's headquarters | 11.000.000 | Final Investment Decision: **12/2019**<br>Start of operation**: 12/2022**<br>Inclusion in the system**: 12/2022** |
| **41** | Upgrade of Nea Messimvria compression station | 15.000.000 | Final Investment Decision: **12/2019**<br>Start of operation: **09/2022**<br>Inclusion in the system: **12/2022** |
| **42** | MR Station Livadia | 1.980.000 | Final Investment Decision: **03/2020**<br>Start of operation: **12/2021**<br>Inclusion in the system: **03/2022** |

| Three Year Development projects[50] | | | |
|---|---|---|---|
| | **INVESTMENT** | **COST (€)** | **MILESTONES** |
| | **Subtotal** | **473.857.000 €** | |

| **II. PROJECTS NOT INCLUDED IN THE 3YR DEVELOPMENT PERIOD** | | |
|---|---|---|
| **A. Projects included for the first time in the Development Plan** | | |
| | **INVESTMENT** | **COST(€)** |
| **1** | Connection of the FSRU of Alexandroupolis | 10.000.000 |
| **2** | M/R Station for connecting South Kavala UGS | 7.500.000 |
| **3** | Virtual Pipeline to Dodekanise | 120.000.000 |
| **4** | Virtual Pipeline to North Aegean | 120.000.000 |
| **B. Projects included in the approved Development Plan and their implementation is ongoing in the current Development** | | |
| | **INVESTMENT** | **COST(€)** |
| **5** | Compressor station at Kipi and Regulating Station in Komotini | 15.000.000 |
| **6** | Komotini-Thesprotia pipeline (part of NNGTS) | 1.800.000.000 |
| | **Subtotal** | **2.072.500.000 €** |

| **Total** | **2.546.357.000 €** |
|---|---|