



MYTILINEOS SA

**ENVIRONMENTAL STUDY
FOR THE AMENDMENT OF THE RATED POWER
(to 826 MW from 775 MW) OF AEPO
YPEN/DIPA/82557/5356-17/09/2019,
FOR THE DEVELOPMENT AND OPERATION
OF THE NEW POWER GENERATION PLANT AT
THE EXISTING ENERGY CENTER OF
AGIOS NIKOLAOS VOIOTIA**



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ATHENS, OCTOBER 2019

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1. INTRODUCTION

1.1. GENERAL DATA

This Environmental Study was prepared by the Consulting Company ECHMES Ltd. on behalf of the company **MYTILINEOS SA** (MYTILINEOS) and concerns the modification of the Decision of Approval of Environmental Terms (AEPO) with a.p. RIS/DIPA/82557/5356-17/09/2019 and subject *"Approval of Environmental Terms for the development and operation of a New Power Generation Plant with a rated power of 775MW of the company MYTILINEOS SA./TED Electricity (former PROTERGIA SA) at the Existing Energy Center of Agios Nikolaos, Voiotia "*.

The modification proposed in the present study concerns the increase of the Power of the Power Plant from **775MW** to **826MW** under ISO conditions, new and clean, with a significant improvement of the degree of thermal efficiency of the installation, from **60.8%** to **63.1%**. The requested increase in power is due to the fact that after the submission of the approved EIA, the latest technological developments in the field of electricity generation allow the improvement of the characteristics of the units, in terms of the generated electricity, by increasing the thermal efficiency, which results improving their environmental performance (reduction of CO₂ and NO_x produced, per MWh produced). The proposed small increase in power implies only a small increase in water requirements for the operation of the plant from 10.6m³/h to 12.3m³/h (the new total annual requirements will be 107,748 m³, only 2.4% of the maximum permitted industrial water use from the existing boreholes, as recorded in the existing water use license of MYTILINEOS, which is 4,404,074 m³/year), without however changing any of the other technical characteristics of the Project under study. In particular, the discharges of liquid and solid waste, the needs for seawater replenishment and the discharges of seawater from the cooling towers remain exactly as they have been approved by the recently issued Decision of Environmental Terms (AEPO), with the same quality characteristics. At the same time, the requested increase in power does not cause any change in the temperature of the discharged seawater, due to the proper design of the cooling system. For these reasons, no new Special Ecological Assessment was prepared.

It is also noted that the proposed amendment does not change the area of intervention, ie the site for the location and implementation of the production plant, which remains the same in relation to that licensed under no. prot. 82557/5356-17/09/2019 AEPO (see attached **Topographic Diagram, Annex I**).

It is emphasized that the amendments proposed in the present Study do not bring substantial differences in terms of the effects from the operation of the examined Project, such as those that were evaluated for the issuance of the current AEPO.

For the power plant under study has been issued on 27/07/2018 the Decision no. 744/2018 by the Energy Regulatory Authority (RAE) on *"Issuance of a license to generate electricity from a combined cycle plant with natural gas fuel power of 665 MW, at Agios Nikolaos of the Municipality of Distomo-Arachova-Antikyra of Regional Unit Voiotia" -Business Group*". This Decision was amended, following a relevant application of the company MYTILINEOS SA, based on the RAE Decision no. 904/2019 of 26/09/2019 and subject " Amendment of no. 744/2018 RAE decision for the issuance of a license for the production of electricity from a combined cycle plant with natural gas fuel power of 665MW, at Agios Nikolaos of the Municipality of Distomo-Arachova-Antikyra of *Voiotia*, of the company "MYTILINEOS Business-SA" as to the power of the plant and as to the name of the company holder». The above Decisions are included in **Annex II** of this Study.

The elaboration of the present Environmental Study was carried out on the basis of the provisions of Article 6 of the Law. 4014/2011 (Government Gazette 209/21.09.2011) and **Annex 5** of the Decision YPEKA **170225/20.01.2014** (Government Gazette B 135/27.1.2014).

Based on the above, the structure of the study follows the following structure:

- **Chapter 1:** Introduction
- **Chapter 2:** Description of the licensed project
- **Chapter 3:** Description of the proposed modifications of the environmentally licensed project
- **Chapter 4:** Information on the compatibility of the proposed amendment with the institutional commitments of the region
- **Chapter 5:** Recording of the parameters of the natural and man-made environment of the area
- **Chapter 6:** Results of the monitoring program and controls carried out
- **Chapter 7:** Evaluation of the potential significant effects of the project modification
- **Chapter 8:** Proposals and measures to address potentially significant implications of the requested amendment
- **Chapter 9:** Codification of proposals for the modification of AEPO
- **Chapter 10:** Documentation of the current state of the environment and the licensed project with representative photos
- **Maps and Drawings**

1.2. PROJECT TITLE

Project Title: **"Development and operation of a New Power Generation Plant with a rated power of 775MW of the company MYTILINEOS SA/TED Electricity (former PROTERGIA SA) at the Existing Energy Center of Agios Nikolaos Voiotia"**

The activity under study is environmentally licensed under AEPO:

Decision with ref.no. YΠEN/ΔΙΠΑ/82557/5356-17/09/2019 (ΑΔΑ: 68Γ44653Π8-ΛΤ4) and subject: *"Approval of Environmental Terms for the development and operation of a New Power Generation Plant with a rated power of 775MW of the company MYTILINEOS SA./TED Electricity (former PROTERGIA SA) at the Existing Energy Center of Agios Nikolaos, Voiotia".*

The Environmental Identity Number of the Project is: **ΠΕΤ 1902042017**

The title of the Project after the proposed modification will be

"Development and operation of a New Power Generation Plant with a rated power of 826MW, of the company MYTILINEOS SA/TED Electricity (former PROTERGIA SA) at the Existing Energy Center of Agios Nikolaos, Voiotia ".

1.3. TYPE AND SIZE OF THE PROJECT

The project under study concerns the construction and operation of a New Power Plant with a combined cycle installed capacity of 826 MW using Natural Gas as fuel.

The production process includes **two stages, that of the gas turbine and that of the steam turbine**. In the **first stage**, the electricity generation takes place in the **gas turbine**, which moves with the hot exhaust gases from the combustion of the natural gas. The exhaust gases are then led to the heat recovery boiler to produce steam. In the **second stage** the steam is led to the **steam turbine**, to generate electricity. After the steam is released into the steam turbine, the steam is liquefied in a water-cooled condenser and fed back to the boiler. The condenser is cooled with seawater in a closed circuit with cooling towers.

The Plant will be installed on the approved site next to **the alumina-aluminum industrial unit (ATE)**, the **High Efficiency Electricity-Heat Cogeneration Unit (SITHYA) with a power of 334MW** and the **Independent Power Plant (IPP) 444.48MW**. The proposed position enables the utilization of the existing infrastructure resulting in the cumulative positive impacts and development of synergies from the non-addition of new constructions and networks, the utilization of many years of experience in management and prevention of environmental impacts and maximizing benefits of a wider area, which has already the appropriate infrastructure related to electricity generation, cooling facilities, gas transportation, wastewater management, the road network. At the same time, from the utilization of the existing infrastructures, the interventions in the vegetation from the non-opening of roads and the installation of networks etc. are limited.

the same as the environmentally licensed with no. prot. 82557/5356-17/09/2019 Decision of Approval of Environmental Terms.

The new plant, located on the land section, is adjacent to the protected area with Code GR 2530007 and named "CORINTHIAN GULF", which with the JMC no. 50743/2017 (Government Gazette 4432/B/15-12-2017) on "Revision of the national list of areas of the European Ecological Network NATURA 2000" is included in the Natura 2000 network as a SCI, as a proposed "Site of Community Importance (SCI)" (Sites of Community Importance - SCI) as defined in Directive 92/43/EEC. The land areas of the network of protected areas of the wider area are located at a considerable distance from the area of implementation of the project under study (greater than 8km).

1.4.2. Administrative Subordination

The area of implementation of the proposed project is located in the **Regional Unit of Voiotia**, in the **Municipalities of Levadea** (Municipal Unit of Kyriaki) and **Distomo - Arachova - Antikyra** (Municipal Unit of Distomo).

1.4.3. Geographical coordinates of the project

The geographical coordinates of the site location of the proposed facility in both the Hellenic Geodetic Reference System 1987 (EGSA 87) and the Global Geodetic System 1984 (WGS 84) are given in **Table 1.4-1**.

Table 1.4-1 : Geographical Coordinates of Installation

ΕΓΣΑ 87		WGS84	
X	Ψ	Lon	Lat
385442	4245850	38.3560	22.6906

The site of the installation is located next to the alumina-aluminum industrial unit (ATE), the High Efficiency Electricity-Heat Cogeneration Unit (SITHYA) and the Independent Power Plant (IPP), as described in the topographic diagram of this section.

From the proposed increase of power does not occur any modification in relation to the site of location and implementation of the power plant, as it was licensed with no. prot. 82557/5356-17/09/2019 AEPO.

1.5. PROJECT CLASSIFICATION

According to Decision **No. ΔΠΑ/οικ. 37674 (Government Gazette 2471/B/10-08-2016)** "Amendment and codification of the ministerial decision 1958/2012 - Classification of public and private works and activities in categories and subcategories according to article 1 paragraph 4 of L. 4014/21.9.2011 (Government Gazette 209/A/2011) as it has been amended and is in force. "the project under consideration falls at the 1st Sub-Class A 9th Engineering Group (Industrial facilities and the like) with a/a 209 regarding "power plants with gaseous fuels than biogas" with rated thermal power > 300MW.

The competent authority for category A1 projects is the Ministry of Environment and Energy (YPEN) according to the procedure defined in article 4 of **N. 4014/2011**.

The economic activity classification code is

- **35.11.10.05 Electricity generation from natural gas units**

The degree of nuisance corresponding to the activity under study according to JM 3137/191/Φ.15/2012 is "high".

It is noted that the examined activity falls within the scope of **Directive 2010/75/EC (IED)** "on industrial emissions (Integrated Pollution Prevention and Control)", which was harmonized in Greek law with **JM 36060/1155/E.103/14.06.2013 (Government Gazette 1450/B)**. In particular, the activity is subject to paragraph 1 (1.1) of Annex I of the above JMC. The design of all the facilities of the new Power Plant takes into account the Best Available Techniques (BAT) as defined by Directive 2010/75/EU and the relevant national legislation.

The approved EIA of the Project under study includes as an independent Annex a Report on the application of the provisions of **article 18 of JM 36060/1155/E.103/13 (Government Gazette 1450B)**, based on the procedure defined in **Circular 153914/2 -12-2015** of the Environmental Licensing Directorate of RIS on the subject: "Application of article 18 of JM 36060/1155/E.103/13 (Government Gazette 1450B) regarding the obligation to submit a basic report"

1.6. PROJECT OPERATOR

1.6.1. Company details

Company Name:	Mytileneos SA (former Mytilineos SA - Business Group)
Type of Business:	Industrial Installation,
Address:	Distomou Beach, 320 03, Agios Nikolaos, Boeotia
Head offices address:	Artemidos 8, 151 25 Maroussi, Attica Tel. 210-3448340, fax 210-3448470
Object of Activity:	Electricity generation from natural gas
Name and contact details:	Kyriakos Berdebes, Technical Officer & RES Officer T.E.Δ. ELECTRIC POWER

1.6.2. Company presentation

MYTILINEOS is one of the largest industrial companies in Greece with international development in the fields of Metallurgy & Mining, Construction & Energy Projects EPC (Engineering - Procurement - Construction) and Energy. In 2017, the then MYTILINEOS Group proceeded to a strategic merger of all its subsidiaries into one group, MYTILINEOS SA.

The company is one of the leaders of the private initiative in the field of electricity and is the largest independent producer of electricity in Greece. The competent Electricity Business Sector under the name PROTERGIA brings together the management of all fixed and energy activities of the Company.

The dynamic business development of MYTILINEOS is inextricably linked to the principles of Corporate Responsibility and Sustainable Development. The principles of Corporate Social Responsibility have been incorporated into the company's strategy and business practices, with a major emphasis on Occupational Health and Safety, reducing environmental impact and contributing to the well-being of employees and local communities adjacent to its facilities.

The company fully complies with the current institutional framework and quotas of the European Greenhouse Gas Emissions Trading Scheme, as well as with the limitations of the current Community Framework for large industrial combustion plants. The main goal is to maintain the operation of power plants in the highest degrees of efficiency, by utilizing natural gas as fuel. Natural gas has a lower carbon content compared to other fossil fuels, free of SO₂ and particulate emissions, with lower NO_x emissions (mainly NO₂) in the exhaust than legally permitted and low CO₂ emissions (by 70 %) compared to lignite units.

The **Electricity Sector** of the company implements an **Environmental Management System** (certified with **ISO 14001: 2015**), **Occupational Health & Safety Management System** (certified with **OHSAS 18001: 2007**), as well as **Quality Management System** (certified with **ISO 9001: 2015**).

1.7. ENVIRONMENTAL RESEARCHER

This Study was prepared by the company:



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ECHMES Ltd. is registered in the Register of Design Companies of the General Secretariat of Public Works of the Ministry of Infrastructure with Registration Number **AMG-898** and carries corporate degrees in categories and classes 6/B2, 19/B3, 7/B2 and 27/B3 . The scientific team that conducted the present study consists of the following:

- Ioannis Chalkidis, Architect Engineer, University of Florence Italy, Partner and Administrator ECHMES
- Dr. Ekaterini Adam, Mining Engineer - Metallurgist (MMM) NTUA, M.Sc., Ph.D. D, University of Minnesota, Associate Professor NTUA, Scientific Project Consultant
- Antonis Katsifos, Mining Engineer - Metallurgist NTUA, Partner and Manager of ECHMES
- Ioannis Orfanoudakis, Mining Engineer - Metallurgist NTUA, M.Sc. Geoinformatics
- Karali Asimina, Mining Engineer - Metallurgical Engineer NTUA, M.Sc. Environment & NTUA Development.
- Theodoros Agapitos, Agronomist - Topographic Engineer NTUA, M.Sc. Environment & Development

In **Annex IV** to this study included modeling the dispersion of the air emissions using special software, which was conducted by the following team of scientists:

- Professor D. Lalas, Ph.D. in Aerospace Engineering, M.Eng. in Aeronautical Engineering
- Nikos Gakis, Chemical Engineer, MSc Computational Fluid Mechanics

For the licensed with AEPO YPEN / DIPA / 82557 / 5356-17 / 09/2019 due to the proximity to the area of the Natura 2000 network, with code GR2530007 "Corinthian Gulf" Special Ecological Assessment (EOA) has been prepared for its potential effects under Project study, according to the specifications of YA 170225 / 20.01.2014. The elaboration of the **Special Ecological Assessment**, which is included as an independent Annex in the approved EIA, was carried out by the following group of scientists:

- Dimitris Poursanidis, PhD in Marine Ecology - geographical data analyst, founder of terraSolutions marine environment research (www.terrasolutions.eu)

- Panos Dendrinis - PhD in Marine Biology - founding member of the MOm/Society for the Study and Protection of the Mediterranean Seal
- Costas Mylonakis, diving instructor, gas mix diver, diving operations manager of terraSolutions marine environment research company (www.terrasolutions.eu).
- Ioannis Liardakis, diving instructor, gas mix diver, partner of terraSolutions marine environment research (www.terrasolutions.eu).

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2. DESCRIPTION OF LICENSED PROJECT

This section provides a brief description of the licensed project and a presentation of its key features, as described in the approved studies and environmental terms.

2.1. SHORT TECHNICAL DESCRIPTION

2.1.1. Project Description

The approved combined cycle unit consists of

- H-class gas turbine for operation with 538MW natural gas fuel.
- Exhaust heat recovery boiler for the production of three-stage superheated steam
- 237MW steam turbine
- Three-phase generator with internal hydrogen cooling circuit and external cooling circuit with water
- Steam cycle management system
- Chimney height 50m
- Array of seawater cooling towers: Closed system of wet cooling tower type with recycling water and water supplement (make up) in the towers from the discharged cooling water of SITHYA

Accompanying facilities include:

- Receiving, cleaning, measuring, pressure and temperature control and fuel (gas) systems.
- Seawater water intake infrastructure (cooling tower make up) from the discharged cooling water of High Efficiency Electricity-Heat Cogeneration Unit (SITHYA). The returned seawater, at a temperature approximately the same as that of the inlet water to the cooling system, will be about 75% of this flow.
- Water and liquid waste pumping stations.
- Closed auxiliary cooling circuit.
- Industrial and deionized water storage tanks and possibly a production facility for the production of additional deionized water and EDI water (deionized water of higher purity).
- Storage tanks for industrial acids, alkaline solutions, mineral oils and other additives.
- Firefighting installation.
- Electrical system consisting of a main medium/high voltage transformer, as well as the necessary electrical equipment, which includes, but is not limited to, auxiliary voltage lowering transformers to supply the auxiliary loads of the unit, medium and low voltage panels, batteries, batteries uninterruptible power supply etc.
- Generator set pair approx. 1.700kVA.

- Expansion of the existing Agios Nikolaos KYT of IPTO SA (substation - GIS 400 kV).
- Storage facilities for hydrogen, nitrogen and carbon dioxide cylinders.
- Extra carbon dioxide tank.
- Exhaust gas quality monitoring/recording system.
- Central Control System of the operation of the Plant.
- Staff service facilities
- Warehouse and maintenance building.
- Auxiliary facilities and machinery.

The development of the Project within the plot of MYTILINEOS and in the vicinity of the existing units SITHYA and IPP, of the Energy Center, gives the possibility of using existing infrastructure, which include, among others:

- Auxiliary steam supply during start-up and holding
- Provision of emergency electrical connection with the SITHYA unit
- Use of the existing fire safety, firefighting infrastructure, as well as the means and intervention teams of MYTILINEOS
- Use of health services (ambulance and first aid center) of MYTILINEOS
- Use of the existing certified chemical analysis laboratory of the SITHYA and IPP units
- Road interconnection network with neighboring facilities of the plot of MYTILINEOS.
- Water supply network.
- Existing production facilities for industrial and deionized water
- Existing wastewater treatment plant and municipal wastewater treatment plant.
- Telecommunication network.

The activity is developed in two sections of land (4,600 and 45,000 sq.m.) that have been expropriated for public benefit (establishment of the Aluminum industry) for and at the expense of "Aluminum of Greece SA". The **coverage** area of the facilities is approximately **13.9 acres** and the **building** area is approximately **16.4 acres**.

The individual characteristics of the facilities, based on the approved EIA, are given in the Table below.

Table 2.1-1 : Facility features

a/a	Construction	Description	Floors	Length	Width	Height	Coverage Area (m ²)	Building Area (m ²)
1	ENGINEERING BUILDING	Building	Ground floor	56,72	67,81	33,50	3846,18	3846,18
1a	CO2 FIRE EXTINGUISHING SYSTEM	Equipment	-	9,56	9,98	4,00	95,41	9,56
2	BOILER	Equipment	-	57,42	22,00	35,00	1263,24	2143,24
3	CHIMNEY	Equipment	-	5,21	5,21	60,00	21,32	21,32
4	METAL BUILDING WATER PUMPS	Building- Scaffolding equipment support	-	20,71	16,91	25,00	350,21	700,41
5	METAL AIR FILTER SUPPORT	Equipment support scaffold	-	10,75	13,50	25,00	Included in 1	145,13
5a	METAL PIPELINE SUPPORT	Equipment support scaffold	-	18,96	13,60	12,00	145,00	290,00
5b	METAL PIPELINE SUPPORT	Equipment support scaffold	-	29,21	5,30	12,00	154,81	309,63
6	MAIN TRANSFORMER	Equipment	-	12,98	22,95	10,00	297,89	297,89
7	AUXILIARY TRANSFORMER	Equipment	-	7,15	7,50	7,00	53,63	53,63
8	STIMULATION TRANSFORMER	Equipment	-	9,98	4,08	6,00	40,72	40,72
9	STARTING TRANSFORMER	Equipment	-	9,98	4,07	6,00	40,62	40,62
10	GENERATOR SWITCH	Equipment	-	10,63	8,42	8,00	89,50	89,50
10a	AUXILIARY ELECTRICAL BUILDING	Isobox	Ground floor	6,40	2,18	3,00	13,95	13,95
10b	AUXILIARY ELECTRICAL EQUIPMENT	Isobox	Ground floor	5,70	3,75	4,00	21,38	21,38

a/a	Construction	Description	Floors	Length	Width	Height	Coverage Area (m ²)	Building Area (m ²)
10c	PREFABRICATED ELECTRICAL EQUIPMENT HOUSES	Isobox	Ground floor	34,89	8,63	6,00	308,18	308,18
11	ELECTRICAL BUILDING	Building	Ground floor & 2 floors	30,80	15,40	12,50	490,05	1438,69
12	AUXILIARY GENERATOR	Isobox	Ground floor	4,05	6,80	3,00	43,19	43,19
13	SHED OF INDUSTRIAL GAS CYLINDERS	Shelter	Shelter	7,65	5,96	4,50	61,24	61,24
14	GAS REGULATION SYSTEM	Equipment	-	18,50	10,00	6,00	185,00	185,00
15	CHEMICAL DOSAGE SYSTEM	Isobox	Ground floor	6,25	2,94	3,00	18,38	18,38
16	SAMPLING SYSTEM	Isobox	Ground floor	12,71	2,93	3,00	37,24	37,24
17	BLOW DOWN TANK WELL	Underground Construction	-	10,00	7,83	-	78,30	78,30
18	COOLING TOWERS		-	127,24	24,62	19,00	3148,30	3148,30
19	COOLING WATER PUMP AREA	Underground Construction	-	18,42	11,20	-	206,30	206,30
20	WAREHOUSE BUILDING	Building	Ground floor	45,50	23,65	9,50	1076,08	1076,08
21	GAS COMPRESSORS HOUSE	Shelter	Ground floor	28,05	21,83	8,00	612,33	612,33
22	AREA OF REGULATION AND MEASUREMENT OF GAS	Equipment	-	45,55	6,10	5,50	277,86	277,86
22a	ELECTRICAL GAS EQUIPMENT BUILDING	Isobox	Ground floor	14,25	6,75	3,50	96,19	96,19
23	GENERAL FIRE AND WATER TANK	Tank	-	16,00 Diameter	16,00 Diameter	13,00	201,06	201,06
24	DEIONIZED WATER TANK	Tank	-	16,00	16,00	13,00	201,06	201,06

a/a	Construction	Description	Floors	Length	Width	Height	Coverage Area (m ²)	Building Area (m ²)
				Diameter	Diameter			
25	DEIONIZED WATER DISTRIBUTION PUMPS	Shelter	Ground floor	8,00	4,00	3,00	32,00	32,00
26	CONDENSED STORAGE TANK	Tank	-	8,00 Diameter	8,00 Diameter	8,00	50,27	50,27
27	FIREFIGHTING COMPLEX BUILDING	Building	Ground floor	10,00	7,50	4,50	75,00	75,00
28	NITROGEN GENERATORS HOUSE	Shelter	Shelter	8,00	4,00	4,50	32,00	32,00
29	LIQUID WASTE COLLECTION WELL	Underground Construction	-	6,6	10,36	-	68,38	68,376
30	WATER TREATMENT BUILDING (concerns a space intended for a unit of production of deionized water and/or water EDI, if this results from the capacity study of the existing facilities of the EC)	Building	Ground floor	10,00	15,00	5,00	150,00	150,00
31	OIL SEPARATOR - DRAINING WELL	Well/Underground Construction	-	5.00	2.00	-	Not taken into account in the coverage	Not taken into account in construction
total							13882,25.	16420,18.

2.1.2. Operation description

The power plant, in its full development, consists of a combined cycle thermal power unit with an installed capacity of **775MW** (under ISO conditions). The annual (net) electricity production amounts to about **6,500GWh**, with about **8,600 operating hours**. The unit is on a single axis (common axis of gas turbine & steam turbine and generator) thus providing the possibility of operating the plant with a high degree of reliability and a high degree of efficiency. The operating characteristics of the Plant are given in the Table below.

Table 2.1-2 : Operating characteristics

Load	100%	80%
Mixed power (MW)	772,6	616,3
Net power (MW)	754,2	601,6
Net Degree of Performance (%)	60,8	60,1

The natural gas is distributed at the boundary of the plant, enters a regulating station, where it is cleaned of solid particles and liquids/condensates. The system will also have a flow measuring station with the ability to calculate the total amount of fuel, as well as a chromatograph to determine the composition.

The production process is "combined cycle", consisting of two stages or thermodynamic cycles, with the combination of air turbine - steam turbine operation. In the first stage, the electricity generation takes place in the gas turbine that moves with the hot exhaust gases from the combustion of the natural gas. The exhaust gases are then led to the heat recovery boiler to produce superheated steam. In the second stage the steam is led to the steam turbine to generate electricity. After the steam is released into the steam turbine, the steam is liquefied in a water-cooled condenser and fed back to the boiler. The condenser is cooled with seawater in a closed circuit with cooling towers. The required replenishment water due to the evaporation losses comes from the cooled waste water of SITHYA.

2.1.3. Inputs of raw and auxiliary materials

To supply and meet the energy requirements of the facility natural gas will be used in quantities of approximately 11,900GWh HHV per year. It is noted that the planned modern facilities and the high degree of efficiency reduce the total fuel consumption, further reducing air pollution.

In addition to the use of natural gas as fuel for electricity generation, for the daily operation and maintenance of the Plant, the use of additional raw materials and supplies is provided, as shown in **Table 2.1-3**, which includes their annual consumption.

Table 2.1-3 : Raw materials for the operation of the Plant

Raw materials	Consumption	Use
Diesel Oil	2.3 t	Power generating pairs
Trisodium phosphate	2.4 t/year	Boiler water treatment, for pH control and surface protection
Phosphonic acid solution	60 t/year	Anti-scaling Cooling Towers
Sodium xyl sulfate solution	20 t/year	Biodispersion of Cooling Towers
Carbohydrazide solution	4 t/year	Boiler water treatment for Oxygen capture
Ammonia or amine solution	9 t/year	Adjusting the pH of the boiler steam
H ₂ (under pressure, in cylindrical cylinders)	2t/year	Replenishment of H ₂ losses that cools the generator
N ₂ (under pressure, in cylindrical cylinders)	6 t/year	Flushing of gas pipelines Flush gas turbine burners when maintenance is required. Boiler maintenance during bookings
CO ₂ (under pressure, in cylindrical cylinders and tank)	15 t/year	Means of network inactivation and indoor firefighting
Sodium hypochlorite solution (NaOCl)	210 t/year	Inhibiting the growth of microorganisms in the cooling circuit (ducts, cooling towers)
Mineral Oils/Lubricants	5 t/year	Various lubricants for the operation of mechanical equipment
Corrosion inhibitor	3 t/year	Closed-circuit cooling protection against corrosion
Alkali metal solution (<0.5 ppm)	1 t/year	Gas turbine washing detergent
Anti-scaling	1 t/year	Anti-scaling in the Blow Down Tank
He (under pressure, in cylindrical cylinders)	0.05 t/year	Chromatograph Consumables
Inergen (under pressure, in cylindrical cylinders)	1 t/year	Indoor fire extinguisher

The above quantities are indicative and depend on the annual operating hours, the number of starts and the charging of the Plant.

2.1.4. Use of water

The use of water for the operation of the Plant concerns:

- **Industrial water:** The coverage of the requirements of the new Plant in both industrial and deionized water is foreseen to be carried out by the respective service network of the

adjacent units SITHYA and ASI. The supply of industrial and deionized water is estimated at **10.6t/h**.

- **Water for human use** from the network of MYTILINEOS with an indicative average hourly consumption of **0.4t/h**.
- **Refill water** due to evaporation losses and continuous removal of cooling towers, which will come from the discharged seawater cooling of the adjacent SITHYA unit, through pumps installed near the cooling towers, with an estimated flow of **h 3.706 t /**.

2.1.5. Liquid waste effluents

The effluent discharges of the Plant under study include:

- Industrial waste with an estimated average hourly flow of **8t/h**. The maximum daily supply (including daily start up as transient 2 hours) of liquid waste of the Plant is estimated at **430 t/d** or **1,000 t/d** in the case of start-up after long maintenance. These outputs consist of:
 - Water with small impurities of mineral oils, including waste from transformers and lubricating tanks of gas turbine and steam turbine, waste from condenser losses, waste from closed auxiliary refrigeration as well as cooling coil, and runoff after washing areas that potentially bear traces of oil.
 - Liquids that are produced during the cleaning and maintenance periods of the steam turbine, as well as during the washing of the gas turbine, the heat recovery boiler and the heat exchangers.
- Refrigeration tower discharges, continuous seawater drainage of the cooling towers, hourly flow **2,850 t/h**, discharged into the sea through a closed pipeline together with the discharged seawater of the adjacent Plants.
- Urban wastewater with an estimated flow of **0.4 t/h** that is channeled through closed pipes to the respective treatment plant of MYTILINEOS.
- Unloaded rainwater collected from the plant

The waters with small impurities of mineral oils after being separated in an oil separator with a capacity of at least 3m³ are channeled to the liquid industrial waste network of MYTILINEOS for further treatment and final disposal.

The aqueous phase of the oil separator and the removal of the heat recovery boiler are available directly in the existing liquid waste treatment complex, the alumina-aluminum industrial unit, MYTILINEOS.

For the liquid waste from the washing of the gas turbine compressor, it is planned to collect it in a container of suitable capacity and to receive it from specialized licensed management bodies.

Clean rainwater and fire-fighting water are discharged directly through a sampling well to the final marine recipient through the rainwater network of the MYTILINEOS facility.

The description of the existing wastewater treatment plant and the intended oil separator is given in the relevant sections of the approved Environmental Impact Study.

2.1.6. Solid and hazardous waste

The types and approximate expected quantities of non-hazardous solid waste are given in the table below.

Table 2.1-4 : Non-hazardous solid waste

a/a	EKA code	Description	Estimated quantity (t/year)
1	05 07	Sludge from the fuel purification unit (natural gas)	0,5
2	05 07 99	Waste not otherwise specified (waste from cleaning and gas transport)	0,5
3	15 01 01	Packaging made of paper & cardboard	8
4	15 01 02	Plastic packaging	2
5	15 01 03	Wooden packaging	10
6	15 01 04	Metal packaging	8
7	16 01 03	Tires at the end of their life cycle	0,4
8	16 06 04	Alkaline batteries (except 16 06 03)	0,2
9	16 06 05	Other batteries & accumulators	0,2
10	19 09 01	Solids from primary refining & scrapings	0,5
11	19 09 02	Mud from water clarification	0,5
12	19 09 03	Sludges from the removal of carbonates	1
13	19 09 05	Saturated or depleted ion exchange resins	0,5
14	19 09 06	Solutions & sludges from ion exchange regeneration	0,2
15	20 01	Municipal waste resembling municipal waste and packaging materials	1
16	20 01 36	Disposable electrical and electronic equipment other than those mentioned in 20 01 21, 20 01 23 and 20 01 35	2
17	20 03 01	Mixed municipal waste	2
18	15 02 03	Absorbent materials, filter materials, wipes and protective clothing, other than those mentioned in 15 02 02 *	25
19	16 01 17	Ferrous Metals	10
20	17 04 07	Mixed Metals	2
21	17 02 03	Plastic	10
22	17 04 05	Iron and steel	10

The separation and sorting of solid non-hazardous waste will be done inside the Power Plant, while then they will be stored according to their material in a properly designed space, so that they can be disposed of in licensed recycling units.

Table 2.1-5 summarizes the codes and the estimated annual quantities of hazardous waste from the operation of the new Plant.

Table 2.1-5 : Hazardous solid waste

a/a	EKA code	Description	Estimated quantity (t/year)
1	13 01 11*	Synthetic hydraulic oils	2
2	13 02 05*	Non-chlorinated mineral, gearbox and mineral lubricating oils	100
3	13 03*	Waste insulation and heat transfer oils	0,5
4	13 05*	Waste oil/water separator	20
5	16 07 08*	Waste containing oil	1
6	05 01 11*	Sludge from the fuel cleaning complex	1
7	05 01 03*	Sludge from the periodic cleaning of the diesel oil tank	0,5
8	16 06 01*	Batteries and lead accumulators	70
9	16 02 15*	Hazardous components removed from discarded equipment	0,1
10	20 01 21*	Waste electrical and electronic equipment	0,02
11	15 02 02*	Cloths, towers, etc. contaminated with oils/petroleum/chemicals	4
12	15 01 10*	Packaging containing residues of dangerous substances	4
13	16 05 06*	Chemical Laboratory Waste	1
14	12 03 01*	Turbine washer fluids	30
15	16 05 07*	Disposable inorganic chemicals consisting of or containing dangerous substances	2
16	16 05 08*	Disposable organic chemicals containing or containing hazardous substances,	20
17	20 01 33*	Mixed batteries and accumulators	1
18	11 01 05*	Purifying acids	1
19	20 01 35*	Electrical and Electronic Equipment	0,5
20	15 01 10*	Packaging containing residues of dangerous substances or contaminated with them	4

Hazardous solid waste will be temporarily collected by category in special barrels in a suitable place and will be delivered to specialized licensed management bodies.

2.1.7. Emissions of air pollutants

The gas turbine of the Power Plant will have dry type burners (DLN) of low NO_x emissions for the combustion of natural gas. Given the technology of the burners but also the chemical composition and the specifications of the fuel supplied to the Power Plant, the pollutants contained in the above exhaust gases are nitrogen oxides (NO_x) and in practically negligible amounts of sulfur dioxide (SO₂) carbon (CO).

The technical characteristics of the installation in terms of emissions and volume of exhaust at full load are:

- CO₂: 241.520kg/hr
312,6kg/MWh gross
- NO_x: 30mg/Nm³, dry, Ref 15% O₂
NO_x as NO₂ 112,9kg/h
- CO: 30mg/Nm³, dry, Ref 15% O₂
CO: 49,1kg/h
- Exhaust gas temperature <96°C
Exhaust gas temperature in normal operation 100% load <80°C
- Exhaust gas supply: 1.014kg/s
- Chimney height: 50m
- Chimney diameter: 9.2m

2.2. DEVELOPMENT OF A LICENSED PROJECT

The activity under study is environmentally licensed under the **Decision with no. ΥΠΕΝ/ΔΙΠΑ/82557/5356-17/09/2019** and subject : *"Approval of Environmental Terms for the development and operation of a New Power Generation Plant with a nominal power of 775MW of the company MYTILINEOS SA./TED Electricity (former PROTERGIA SA) at the Existing Energy Center of Agios Nikolaos Voitia »*

No work has been carried out in the development area of the unit under study after the issuance of AEPO.

For the studied Plant 826MW, a Production License has been issued by the Energy Regulatory Authority (RAE) (Decision no. 904/2019) following a relevant application of the company MYTILINEOS SA on " Amendment of no. 744/2018 RAE decision for the granting of a license for the production of electricity from a combined cycle plant with natural gas fuel power of 665MW, at Agios Nikolaos of the Municipality of Distomo-Arachova-Antikyra of Voitia, of the company "MYTILINEOS Business-SA" as to the power of the plant and as to the name of the company holder ».

In **Annex III** of this File are given the Tables of Annex 4.9 of Decision 170225 (Government Gazette 135/B/2014) with the updated data, based on the proposed modification in the capacity of the unit.

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3. DESCRIPTION OF PROPOSED AMENDMENT

3.1. FEASIBILITY OF REQUESTED MODIFICATION

The modifications proposed in the present study concern the increase of the rated power of the installation to **826MW**, compared to 775 MW, under ISO, new and clean conditions.

The modification of the rated power of the unit requested by the present study is dictated by the technological developments in the field of electricity generation. In the field of electricity generation, there are several manufacturers of combined cycle power plants in the market, Europe, USA and Japan, which manufacture gas turbines of different but specific power, each, and which are constantly improving their characteristics, increasing installed capacity, improving environmental performance, as well as their net degree of thermal efficiency. Taking into account these improvements and the needs of the Greek energy market, the Project Authority finally selected the newly developed latest type of General Electric equipment, increasing the power from **775MW** (another manufacturer) to **826MW** (General Standard's new standard size), where the net degree of thermal efficiency of the plant, from **60.8%** will increase to **63.1%**, with a significant improvement of environmental performance (reduction of CO₂ and NO_x, per MWh produced), but also nationally, in the savings imported natural gas

Apart from the increase of the power, **the technical characteristics of the Project under study remain as they have been approved by the recently issued AEPO with Reg.: YPEN/DIPA/82557/5356, 17/09/2019. The intervention site remains the same as the environmentally licensed project.**

The proposed amendments **do not substantially differentiate in terms of potential environmental impacts**, such as those assessed for the originally licensed project, as discussed in **Chapter 7** of this study.

3.2. PRODUCTIVE ACTIVITY

3.2.1. Plant Description

The requested modification concerns the increase of the Power of the Plant to **826MW** under ISO, new and clean conditions. The average annual net electricity production will amount to approximately **5,000 GWh**, with **7,200 operating hours** and an average annual gas consumption of **9,000 GWh HHV**. The Plant in its full development will consist of a single-axis combined cycle thermoelectric unit. The operating characteristics are summarized in the table below.

Table 3.2-1 : Operating characteristics after the requested modification

Load	100%	80%
Mixed power (MW)	826	661
Net power (MW)	806	641
Net Degree of Performance (%)	63,1	62,5

Apart from the increase of power in gas turbine and steam turbine, the technical characteristics of the Project under study remain as they are in the approved EIA.

The Plant will include:

- Gas turbine 9HA.02 of GENERAL ELECTRIC , for operation with **572MW** natural gas fuel.
- Exhaust heat recovery boiler for the production of three-stage superheated steam
- Steam turbine D650 of GENERAL ELECTRIC, power **254MW**
- Three-phase generator W88 by GENERAL ELECTRIC, 990MVA, with internal hydrogen cooling circuit and external water cooling circuit
- Steam cycle management system
- Chimney height 50m
- Array of seawater cooling towers: Closed system of wet cooling tower type with recycling water and water supplement (make up) in the towers from the discharged cooling water of SITHYA

Accompanying facilities include:

- Receiving, cleaning, measuring, pressure and temperature control and fuel (gas) systems.
- Seawater water intake infrastructure (make up of cooling towers) from the discharged cooling water of SITHYA, with an estimated flow of 3.706m³/h. The returned seawater, at a temperature approximately the same as that of the inlet water to the cooling system, will be about 75% of this flow.
- Water and liquid waste pumping stations.

- Closed auxiliary cooling circuit.
- Industrial and deionized water storage tanks and possibly a production facility for the production of additional deionized water and EDI water (deionized water of higher purity).
- Storage tanks for industrial acids, alkaline solutions, mineral oils and other additives.
- Firefighting installation.
- Electrical system consisting of main medium/high voltage transformers, as well as the necessary electrical equipment, which includes, but is not limited to, auxiliary voltage lowering transformers to supply the auxiliary loads of the unit, medium and low voltage panels, systems, batteries uninterruptible power supply etc.
- Emergency power generator approx. 1.700kVA.
- Expansion of the existing Agios Nikolaos KYT of IPTO SA (substation - GIS 400 kV).
- Storage facilities for hydrogen, nitrogen and carbon dioxide cylinders.
- Extra carbon dioxide tank.
- Exhaust gas quality monitoring/recording system.
- Central Control System of the operation of the Plant.
- Staff service facilities
- Warehouse and maintenance building.
- Auxiliary facilities and machinery.

The individual coverage and construction data of the proposed facilities are given in **Table 3.2-2**.

Table 3.2-2 : Elements of coverage and construction of facilities of proposed modification

A/A	CONSTRUCTION	DESCRIPTION	FLOORS	LENGTH (m)	WIDTH (m)	HEIGHT (m)	COVERAGE SURFACES (m²)	BUILDING SURFACE (m²)
1	ENGINEERING BUILDING	Building	Ground floor	31,60	62,95	23,10	1.989,22	1.989,22
				31,40	30,50		957,70	957,70
				7,60	12,70		96,52	96,52
				total			3.043,44	3.043,44
2	BOILER	Equipment	-	34,55	7,15	40,00	247,03	247,03
				53,75	12,90		693,38	1.323,38
				13,15	3,20		42,08	42,08
				30,25	3,15		95,29	95,29
				total			1.077,78	1.707,78
3	CHIMNEY	Equipment	-	11,20	16,80	50,00	188,16	188,16
4	METAL BUILDING FOR WATER PUMPS	Building-Scaffolding equipment support	-	14,15	15,43	11,00	218,33	436,67
				2,95	5,85		17,26	34,52
				total			235,59	471,18
5	METAL AIR FILTER SUPPORT RACK	Building-Scaffolding equipment support	-	8,20	5,95	20,00	48,79	48,79
5a	METAL PIPELINE SUPPORT RACK	Building-Scaffolding equipment support	-	31,10	14,65	12,00	455,62	455,62
				5,05	3,05		15,40	15,40
				10,75	5,95		63,96	63,96
				total			534,98	534,98
5b	METAL PIPELINE SUPPORT RACK	Building-Scaffolding equipment support	-	30,35	10,60	12,00	321,71	321,71
				5,20	8,05		41,86	41,86

A/A	CONSTRUCTION	DESCRIPTION	FLOORS	LENGTH (m)	WIDTH (m)	HEIGHT (m)	COVERAGE SURFACES (m²)	BUILDING SURFACE (m²)
				10,25	11,10		113,78	113,78
				13,00	1,90		24,70	24,70
				total			502,05	502,05
5c	METAL PIPELINE SUPPORT RACK	Building-Scaffolding equipment support	-	29,10	7,21	12,00	209,81	209,81
				3,00	6,15		18,45	18,45
				1,93	4,94		9,53	9,53
				total			237,80	237,80
6	MAIN TRANSFORMER	Equipment	-	17,40	20,90	11,00	Included in 1	363,66
7	AUXILIARY TRANSFORMER	Equipment	-	8,00	9,95	11,00	145,00	290,00
8	STIMULATION TRANSFORMER	Equipment	-	8,40	9,95	11,00	83,58	167,16
9	STARTING TRANSFORMER	Equipment	-	Included in 8				
10	GENERATOR SWITCH	Equipment	-	Included in 1				
11	ELECTRICAL BUILDING	Building	Ground floor & 2 floors	30,80	15,40	12,50	490,05	1.438,69
				5,40	2,95	12,50	15,93	15,93
				total			505,98	1.454,62
12	AUXILIARY GENERATOR	Isobox	Ground floor	6,40	2,60	3,00	32,29	32,29
13	SHELTER OF INDUSTRIAL GAS CYLINDERS	Shelter	Shelter	17,00	4,00	4,50	68,00	68,00
14	GAS REGULATION SYSTEM	Equipment	-	9,40	4,70	6,00	44,18	44,18
15	CHEMICAL DOSAGE SYSTEM	Isobox	Ground floor	6,25	2,94	3,00	18,38	18,38
16	SAMPLING SYSTEM	Isobox	Ground floor	12,70	2,93	3,00	37,21	37,21
17	BLOWDOWN TANK WELL	Underground Construction	-	8,05	6,30	-	50,72	50,72
				3,60	3,20	-	11,52	11,52

A/A	CONSTRUCTION	DESCRIPTION	FLOORS	LENGTH (m)	WIDTH (m)	HEIGHT (m)	COVERAGE SURFACES (m²)	BUILDING SURFACE (m²)
				total			62,24	62,24
18	COOLING TOWERS		-	205,00	24,15	19,00	4.950,75	4.950,75
19	COOLING WATER PUMP AREA	Underground Construction	-	10,15	17,75	-	180,16	180,16
20	WAREHOUSE BUILDING	Building	Ground floor	45,5	23,65	9,5	1.076,08	1.076,08
21	GAS COMPRESSORS HOUSE	Shelter	Ground floor	28,05	21,83	8,00	612,33	612,33
22	AREA OF REGULATION AND MEASUREMENT OF GAS	Equipment	-	45,55	6,10	5,50	277,86	277,86
22a	ELECTRICAL GAS EQUIPMENT BUILDING	Isobox	Ground floor	14,25	6,75	3,50	96,19	96,19
23	GENERAL FIRE AND WATER TANK	Tank	-	15,60	15,60	13,00	191,13	191,13
				Diameter	Diameter			
24	DEIONIZED WATER TANK	Tank	-	16,00	16,00	13,00	201,06	201,06
				Diameter	Diameter			
25	DEIONIZED WATER DISTRIBUTION PUMPS	Shelter	Ground floor	8,00	4,00	3,00	32,00	32,00
26	CONDENSED STORAGE TANK	Tank	-	5,40	5,40	8,00	22,90	22,90
				Diameter	Diameter			
27	FIREFIGHTING COMPLEX BUILDING	Building	Ground floor	10,00	7,50	4,50	75,00	75,00
28	NITROGEN GENERATORS HOUSE	Shelter	Shelter	8,00	4,00	4,50	32,00	32,00
29	LIQUID WASTE COLLECTION WELL	Underground Construction	Ground floor	10,35	6,60	-	68,31	68,31
30	WATER TREATMENT BUILDING	Building	Ground floor	10,00	15,00	5,00	150,00	150,00

A/A	CONSTRUCTION	DESCRIPTION	FLOORS	LENGTH (m)	WIDTH (m)	HEIGHT (m)	COVERAGE SURFACES (m²)	BUILDING SURFACE (m²)
31	OIL SEPARATOR-DRAINING WELL	Well/Underground Construction	-	5,00	2,00	-	Not taken into account in the Coverage	Not taken into account in Construction
32	AUXILIARY ELECTRICAL ROOM	Isobox	Ground floor	8,80	18,10	3,50	159,28	159,28
TOTAL							14.990,47	17.396,95

Based on the data in the above table, the **coverage area of the facilities** amounts to **approximately 15.0 acres** and the building area to **approximately 17.4 acres** (see **Topographic Diagram, Annex I**). There is minimal and insignificant change in relation to the initial sizes of the approved EIA, as they are summarized in **Chapter 2** of the present study (13.9 and 16.4 acres for coverage and construction respectively).

It is noted, however, that the **area of intervention, ie the site for the location and implementation of the production remains unchanged**, as there is no change in relation to what was licensed under no. prot. 82557/5356-17/09/2019 AEPO. In particular, the activity is to be developed in two sections of land (4,600 + 45,000 sq.m.) that have been expropriated for public benefit (establishment of the Aluminum industry) for and at the expense of MYTILINEOS SA. (former ALUMINUM SA)

3.2.2. Gaseous emissions

The technical characteristics of the installation in terms of emissions and volume of exhaust at full load are:

- CO₂: 255.795 kg/h
310 kg/MWh gross
- NO_x: 30mg/Nm³, dry, Ref 15% O₂
- NO_x as NO₂ : 116.98 kg/h
- CO: 30mg/Nm³, dry, Ref 15% O₂
- CO: 116.98 kg/h
- Exhaust gas temperature <96°C
- Exhaust gas temperature in normal operation 100% load <80°C
- Exhaust gas supply: 1026 kg/s
- Chimney height: 50 m (initial estimate)
- Chimney diameter: 9.2 m (initial estimate)

3.2.3. Use of water

The increase in power results in a limited increase in water requirements for the operation of the Plant, without however altering the effluent discharges.

The supply of industrial and deionized water from the respective service network of the adjacent licensed units SITHYA and IPP is estimated at **12.3 m³/h** or **295 m³/d** (total annual requirements: 107,748m³, just 2.4% of the maximum permitted industrial water use, from the existing boreholes, as recorded in the existing water use license of MYTILINEOS, which is 4,404,074m³/year).

It is noted that for the existing IPP unit the Decision with a.p. 23918/1-11-2016 on "Renewal of no. prot. Directorate of EARTH/YPEKA: 160645/14.07.2006 Decision of Approval of Environmental Terms (AEPO), as it was amended from 167271/23.08.2010, 182392/9.04.2013 and 186092/13.01.2014 Decisions and is in force, of the Independent Power Plant (IPP) Combined Cycle of nominal 444.48 MW, of the company PROTERGIA THERMOELECTRIKI AGIOU NIKOLAOU SOCIETE ANONYME OF PRODUCTION AND SUPPLY OF ELECTRICITY (PROTERGIA) which operates in Agios Nikolaos-An. Regarding the existing SITHYA, the Decision with a.p. YPEN/ΔΙΠΑ/90142/3649-07/12/2018 and subject: "Amendment of no. prot. Directorate of EARTH/Ministry of Environment, Physical Planning and Public Works: 160170/7.10.08 Decision of Approval of Environmental Terms (AEPO), as in force, for the operation of all the industrial facilities of the factory "ALUMINUM OF GREECE of the Metallurgy Business Sector of the MYTILINEOS Group SA". (former ALUMINUM SA) and the accompanying projects (Electricity and Heat Cogeneration Plant), port facilities, limestone quarry, solid storage sites waste), which is located at Agios Nikolaos in the Municipality of Distomo-Arachova-Antikyra in the Prefecture of Viotia »

The required quantities of **water** do not change in relation to what is mentioned in the approved study and in Chapter 2 of the present study (**0.4m³/h**).

The needs **for seawater replenishment due to evaporation losses and continuous depletion of cooling towers do not change in relation to the approved EIA** (estimated flow **3,706 m³/h**). These quantities will come from the discarded seawater cooling water of the adjacent SITHYA unit, through pumps installed near the cooling towers, in accordance with the provisions of the approved EIA.

3.2.4. Liquid and solid waste effluents

The **type and quantities of liquid waste effluents as well as the generated solid waste are not changed** in relation to the approved EIA, as summarized in **Chapter 2** of this study.

3.3. ALTERNATIVES

This Environmental Study concerns the modification of the Decision of Approval of Environmental conditions with a.p. YPEN/ΔΙΠΑ/82557/5356-17/09/2019 for the construction and operation of a New Power Generation Plant with natural gas fuel in the existing Energy Center in Agios Nikolaos, Boeotia and in particular in the limited increase of the rated power of the Plant from **775MW** to **826MW**, in ISO conditions, new and clean. The increase was deemed necessary by the fact that after the submission of the approved EIA, the latest technological developments in the field of electricity generation (newer type of gas turbine) allow the improvement of the characteristics of the units, by improving the thermal efficiency, but also their environmental performance.

In fact, since this modification does not create changes in the technical characteristics of the installation, or in the area of intervention and installation in relation to those approved by the above AEPO, in the present study no alternatives are considered in terms of location, size, design, production process and construction process of the unit.

It is specially noted that as already analyzed in the approved EIA and analyzed in the issued Decision of Environmental Terms (AEPO), the option of locating the Plant at the specific point of the company's industrial field, in close proximity to the existing SITHYA and IPP units and the alumina-alumina metallurgical unit such as alumina exposed immediately below, creates positive synergies due to the utilization of existing infrastructure both during the construction phase and during the operation phase that significantly reduce the environmental footprint of the unit in every respect.

In this respect, the zero solution, ie the non-proposed amendment, should be rejected as the amendment does not make any significant differences in terms of the impacts of the operation of the project in question, such as those that were evaluated for the issuance of the current AEPO. Respectively, the proposed amendment further enhances, without even a corresponding environmental burden, the positive benefits from the implementation of the Project under study at local, regional and national level as:

- The operation of the new Power Generation Plant under study using natural gas is considered nationally beneficial, with a significant contribution to Sustainable Development, contributing to meeting the country's electricity needs.
- The operation of the examined Plant contributes to the coverage of the needs of the country in electricity and ensures the balanced use of different sources, while ensuring the economic development along with the protection of the environment through the operation of a new, modern and efficient Plant, utilizing Best Available Techniques. .
- The new Plant under study is fully compatible with the objectives and priorities of the approved National Energy and Climate Plan.
- The construction and operation of the Plant will contribute positively to the social and economic environment of the immediate and wider area, through the strengthening of local employment and the development of the local economy.
- The implementation of the Project implies significant financial benefits at the level of the national economy from the payment of taxes and insurance contributions
- The proposed investment is compatible with the text spatial framework, both at regional and national level.
- The feasibility and utility of the plant has already been evaluated in the context of the issuance of the relevant production license by the Energy Regulatory Authority (RAE), the independent national administrative authority with advisory authority in issuing licenses for electricity generation from conventional fuels and renewable energy sources.

- The dynamic business development of the company is inextricably linked to the principles of Corporate Social Responsibility and Sustainable Development.
- In the context of Corporate Social Responsibility, the company MYTILINEOS SA supports the local community in various ways by implementing programs and initiatives that contribute to tackling unemployment, maintaining and strengthening social cohesion

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4. COMPATIBILITY OF PROPOSED AMENDMENT WITH INSTITUTIONAL COMMITMENTS

4.1. PROVISIONS RELATED TO LAND USES AND BUILDING CONDITIONS

During the period from the elaboration of the EIA of the Project, the issuance of AEPO with a.p. YPEN/DIPA/82557/5356-17/09/2019 and until the submission of this dossier for the modification of the rated power from 775 MW to 826 MW, there have been no changes in the institutional framework governing land uses and building conditions in project area. Therefore no issues arise that differentiate the compatibility of the proposed modification with the licensed project. It is noted that the modification requested in the present study **does not change the scope of intervention for the needs of Plant development**. In the field of location and implementation of the Power Plant **there is no change in relation to the one that was licensed with no. prot. 82557/5356-17/09/2019 AEPO**.

The installation and operation of the new plant on the plot of MYTILINEOS is not only compatible, but strengthens the directions of development and spatial organization of the Industry given in the texts of Spatial Planning at National and Regional level, as analyzed in the relevant sections of the approved EIA and the issued AEPO YPEN/DIPA/82557/5356-17/09/2019.

4.2. PROVISIONS RELATED TO EMISSION LIMITS

During the period from the initial environmental licensing until now, there have been no changes in the institutional framework governing institutionalized emission limits in all environmental parameters related to the construction and/or operation of the project, nor have any new provisions been issued concerning to them.

4.3. PROVISIONS RELATED TO THE CONSTRUCTION OR OPERATION OF THE PROJECT

During the period from the initial environmental licensing until today, there have been no changes in the institutional framework related to the construction or operation of the project or activity, such as BAT implementation, waste management, implementation techniques, etc.

4.4. COMPATIBILITY DOCUMENTATION

Based on the above, the modification requested in the present study is fully compatible with the current institutional commitments in the Project area.

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5. EXISTING ENVIRONMETAL CONDITION

The parameters of the natural and man-made environment in the study area are recorded, analyzed, and evaluated in this chapter based on the current legislation and in particular the Decision no. 170225 (Government Gazette 135/B/27-01-2014) in relation to the requested modification of the activity and the environmental means that it potentially affects. The degree of analysis is proportional to the type and size of project modifications, as well as the expected impact.

As in the study area there have been no changes in the current environmental conditions in relation to those mentioned in the EIA from the date of issuance of the initial AEPO and **the approved plot for the operation and installation of the unit is not changed**, in the following sections the most important data are summarized for completeness, regarding the current state of the environment.

5.1. CLIMATIC AND BIOCLIMATIC CHARACTERISTICS

The study area is classified in the Mediterranean type and is characterized by hot and dry summers and mild winters. The winters are characterized by mild frosts with light rain, while the summers are very dry. More detailed meteorological and climatic data of the area are mentioned in the relevant sections of the approved EIA.

5.2. MORPHOLOGICAL AND LANDSCAPE FEATURES

A key feature of the study area is the strong industrial element and the industrial destination of the area. Landmark of the area are the facilities of the alumina-aluminum complex, the adjacent **High Efficiency Electricity-Heat Cogeneration Unit (SITHYA)** and the existing **Independent Power Plant (IPP)** of MYTILINEOS.

5.3. NATURAL ENVIRONMENT

The Power Plant under study, located on the land section, is adjacent to the protected area with the protected area of the European Ecological Network Nature (Natura) 2000 with code name GR2530007 "CORINTHIAN GULF" with a total area of 236.6 hectares. The wider area of the Corinthian Gulf based on the JMC no. 50743/2017 (Government Gazette 4432/B/15-12-2017) and subject "*Revision of the national list of areas of the European Ecological Network NATURA 2000*" is

included in the network NATURA 2000 as proposed "Site of Community Importance (SCI)" as defined in Directive 92/43/EEC.

The other areas of protected areas network of the wider area are located at a considerable distance from the area of implementation of the project under study.

In the approved EIA, the environmental impacts from the development of the plant have been examined in combination and cumulatively with the other operating industrial installations and no significant burden or exceedance of the approved maximum pollutants and charges has emerged.

The activity is to be developed in two parts of the wider area of 7,035,700 m² that have been expropriated and granted (Government Gazette 138D/01.11.1961) for public benefit and industrial use (establishment of the Aluminum industry) for the benefit and at the expense of "Aluminum of Hellas SA".

5.4. ANTHROPOGENIC ENVIRONMENT

5.4.1. Spatial Planning - Land Uses

As mentioned above, the wider area of the company has an industrial destination and character since the year 1961, since it has been expropriated and granted (Government Gazette 138D/01.11.1961) for public benefit and industrial use (establishment of the Aluminum industry) in favor and at cost of "Aluminum of Greece SA", which has been manufactured and operated since 1964.

In the Special Framework for Spatial Planning and Sustainable Development in Industry, JM 11508/2009 (Government Gazette 151AAP/13.04.2009) reference is made to the industrial activity of the Regional Unit of Voiotia, where the Project is located, while the location of the facilities of Aluminum of Greece (now MYTILINEOS SA), which includes the Plant under study, is noted in a relevant Map as an Industrial Pole.

According to the Regional Spatial Planning Framework of the Region of Central Greece regarding the spatial organization of the production and in particular of the Secondary sector (article 11 par. B3) promotes, among others, the area of the aluminum production factory in the Aspra Spitia as an Individual Organized Receptor Aluminum SA.

Furthermore, in the more specific spatial planning directions (article 11, par. B4) it is mentioned: Support for the construction of the industrial structure with electricity generation, especially "soft", at the organized industrial poles.

5.4.2. Cultural heritage

The implementation area of the proposed plant **does not fall within archaeological sites or protection zones.**

5.4.3. Social and economic environment

The area of the Project is administratively subject to the Law of Kallikratis (Law 3852/2010 FEK 87/issue AD/07-06-2010) to the **Municipal Unit (D.E.) Kyriaki** of the **Municipality of Levadeon** and in the **Municipal Unit of Distomo** of the **Municipality of Distomo-Arachova-Antikyra**, of the Regional Unit (P.E.) of Voitia.

Based on the data of the EL.STAT censuses, the last decade has seen a decrease in the permanent population for the **Municipalities of Distomo - Arachova - Antikyra** and **Levadea** at a rate of **16.5%** and **2.6%** respectively.

The tertiary sector is the main employment sector for both Municipalities, followed by the secondary sector with high percentages in the Municipality of Distomo - Arachova - Antikyra (40%), which are associated with the presence of the industrial facilities of MYTILINEOS SA in Ag. Nikolaos.

5.5. ATMOSPHERIC AND ACOUSTIC ENVIRONMENT

In the wider study area, an atmospheric quality measuring station has been installed and is operating since 2008 in Osios Loukas area, at a distance of approximately 6.5km northeast of the proposed facilities. The station continuously records values for a total of eight (8) parameters. Of these, five (5) relate to meteorological parameters, namely: Relative Humidity (RH,%), Wind Direction (WD, deg), Wind Speed (WS, m/s), Precipitation (Rain, mm), Temperature (T°C) and the rest in concentrations of SO₂ pollutants (µg/m³), NO_x (as NO₂ µg/m³) and PM₁₀ particulate matter (µg/m³) without exceeding the established limits.

In addition, in compliance with the environmental conditions for the operation of the facilities of the alumina-aluminum plant, the SITHYA unit and the Independent Power Plant, measurements of gas emissions are carried out systematically within the facilities (point sources) as well as fluorescent concentrations in the area of interest.

The state of the acoustic environment of the study area is recorded by the company through a monitoring network at selected points within the facilities and at the boundaries of the fields while the corresponding noise mapping is done. The operation of the alumina-aluminum plant, the existing High Efficiency Electricity-Heat Cogeneration Unit (SITHYA), the existing Independent

Power Plant (IPP) and other facilities does not affect, in terms of the acoustic environment, the settlements of Antikyra and the Aspra Spitia, as they are located quite far, while between the settlements and the plot is interspersed with the sea. Respectively, for all the other settlements, the intense relief and the vegetation of the area act as curtains for the propagation of the sound waves, thus excluding the creation of noise problems in the inhabitants and/or in the sensitive receivers.

5.6. WATER

The broader study area is part of the **River Basin District of Eastern Central Greece (EL07)**, while the location of the Project under study is located in the **Asopos Basin (EL0725)**

The area of the facilities in question is **not included in any of the potentially high flood risk zones**.

The wider area includes a hydrographic network of generally short length but significant surface runoff during periods of heavy rainfall. The most important streams are the Kleisoura stream and the Agios Athanasios stream which end in the Kalogerikorema stream, which passes boxed through the facilities of MYTILINEOS.

The implementation area of the project under study is part of the **Antikyra - Kithairona** groundwater system with code EL0700230. The quantitative status of this groundwater system is judged as good and no over-pumping phenomena are observed. Chemical and quantitative status of said GWB judged as good, with no changes from the 1st approved Management Plan.

5.7. RISKS TO HUMAN HEALTH, CULTURAL HERITAGE AND/OR THE ENVIRONMENT MAINLY DUE TO ACCIDENTS OR DISASTERS

The Project under study is located in an area with a dominant feature of industrial use. The wider area of the facility does not present any particularity regarding geological characteristics and is not part of potentially high flood risk areas. Also, the implementation area of the proposed plant not only does not fall within archaeological sites or protection zones.

As already developed in the approved EIA, hazards to human health, cultural heritage and/or the environment in the Project area due to accidents or natural disasters (including extreme weather events) are already addressed by specific Emergency Plans (EMPs), which have been developed by the Project Owner in the context of the operation of the other facilities located in the examined industrial area for the immediate and effective response to emergencies. Emergency preparedness and response plans set out procedures and response measures to minimize risks to

human health and the environment, both natural and cultural. These plans cover all major, unusual situations (such as any fire, explosion, or chemical leak inside the facility, earthquake, flood, or external fire) that may endanger the health and safety of personnel, facilities or the surrounding environment.

To avoid accidents, the company properly trains employees. In particular regarding the issues concerning the safety and health of employees as well as the general organization of safety, the Company has developed a Safety and Health Management System.

The implemented measures and systems have as a long-term goal:

- Raising awareness of the importance of safety and health of workers in the workplace.
- Maintaining and improving the applied safety and health measures and systems.
- The smooth operation of the facilities, in compliance with current legislation, maintaining and improving the social profile of the company both locally and nationally.

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6. RESULTS OF MONITORING AND CONTROLS

6.1. FINDINGS OF AN INITIALLY IMPOSED MONITORING PROGRAM

The requested amendment concerns the power of the new power plant and since in the area no works have started for the construction and operation of the approved with the AEPO YPEN/DIPA/82557/5356-17/09/2019, there are no monitoring results and controls.

It is noted that after the completion of the proposed works, an environmental monitoring program will be implemented based on the provisions of the approved Environmental Impact Study and the Environmental Conditions of the Project.

6.2. FINDINGS OF REGULAR AND EXTRAORDINARY ENVIRONMENTAL INSPECTIONS

During the validity of the AEPO to be amended, **no regular environmental inspections were carried out** by the competent services of YPEN.

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7. ENVIRONMENTAL IMPACT ASSESSMENT AND EVALUATION

7.1. GENERAL

This chapter assesses the potential environmental impacts associated with the proposed modifications of the Project, as described in **Chapter 3** of this Study. The assessment and evaluation is limited to the direct and indirect significant impacts of the proposed modification of the project and the degree of their differentiation from those that have been assessed and evaluated for the initially environmentally licensed project.

As already mentioned, the proposed modifications concern a small increase of the installed capacity, which implies a small increase of the water requirements of the installation and a small difference in the characteristics of the gaseous emissions. The other technical characteristics of the unit during the construction and operation phase, as well as the occupation area, remain as they are in the approved study. From the proposed increase of power does not occur any modification in relation to the site of location and implementation of the production station, as it was licensed with no. prot. 82557/5356-17/09/2019 AEPO. Consequently and as documented in the following sections, the proposed amendments do not differ substantially in terms of impacts from those assessed for the originally licensed project.

In order to evaluate the potential effects on the atmospheric environment during the operation phase of the Project, in the framework of the preparation of the EIA, a modeling of the dispersion of the plant's gas emissions was carried out. This study has been updated in the context of the present study based on the emission characteristics as analyzed in **Chapter 3** and is included in Annex IV hereto.

7.2. ENVIRONMENTAL IMPACT ASSESSMENT

7.2.1. Climatic and bioclimatic characteristics

The work to be carried out during the construction phase of this project is no different from the one originally licensed and is not expected to cause significant atmospheric disturbances, capable of affecting the climatic and bioclimatic characteristics of the immediate and wider area.

The operation of the planned new Electricity Power Plant implies due to the use of natural gas as fuel the production of greenhouse gases (CO₂). The Project Owner already participates in the Emissions Trading System according to the **JMD. No. 181478/965 (Government Gazette 3763/B/2017)**, which is a European measure to achieve an overall reduction of emissions. It is

noted that the use of natural gas as a fuel contributes to the reduction of CO₂ emissions for the country as a whole, compared to other energy resources, due to the lower CO₂ emission factor and the very high degree of thermal efficiency (> 60%).

Given that the proposed amendment does not result in significant changes in emissions and exhaust volume from the operation of the plant, the impacts on climatic and bioclimatic characteristics do not differ from those already assessed for the already licensed project.

7.2.2. Morphological and landscape features

The proposed development site of the new plant is located within a wider area of a total area of 7,035,700 m², which has been expropriated by an act of the Hellenic State (Government Gazette 138/01-01-1962) in favor of the company "ALUMINUM OF GREECE INDUSTRIAL INDUSTRY. E. », of which the company MYTILINEOS is a universal Successor. The location of the new plant next to the alumina-aluminum industrial unit (ATE), the High Efficiency Electricity-Heat Cogeneration Unit (SITHYA) and the Independent Power Plant (IPP) promotes the utilization of existing infrastructure such as building facilities, as well as road access, thus significantly reducing the "footprint" of the Project. In addition, during the operation phase, no substantial alteration of the landscape characteristics is expected due to the industrial character of the area, which remains unchanged for a number of years, the relatively small height of the chimney, but also the distance from neighboring settlements.

The proposed modification does not bring about any change in the occupation area (two sections of area 4,600 and 45,000m²) and the required works for the configuration of the main and auxiliary installations and consequently the effects on the morphological and spatial characteristics of the area do not differ in relation with those already assessed for the already licensed project.

7.2.3. Geological, tectonic and soil characteristics

The nature of the activity in question is not related to alteration of the geological characteristics of the area, unstable states or changes in the geological arrangement of the layers, both during the construction phase and during the operation phase.

Both during the construction phase and during the operation phase, all appropriate measures will be taken for the rational management of any solid or liquid waste generated, in order to ensure the protection of the quality characteristics of the soil. The management of solid waste will be based on current legislation and environmental operating conditions, while the management of

generated wastewater will utilize the existing infrastructure, which serves the other facilities of the company in the area as well as cooperating approved bodies.

Based on the above and since the proposed modification does not bring about any change in the occupancy area and the required landscaping works of the facilities, the effects on the geological, tectonic and soil characteristics from the proposed modification of the Power of the Station do not differ from those already assessed for the already licensed project.

7.2.4. Natural environment

The rational management of solid and liquid waste during the construction and operation phase of the unit in combination with the nature of the fuel used, but also the measures taken to reduce gaseous pollutants (Low-NOx burners) and their successful dispersion (height and velocity) have zero effect on the **flora and fauna** of the area due to gaseous pollution, both short-term and long-term.

The new plant, located on the land section, is adjacent to the protected area with Code GR 2530007 and named "CORINTHIAN BAY". The wider area of the Corinthian Gulf is included in the NATURA 2000 network, with code GR2530007 "Corinthian Gulf" according to the JMC no. 50743/2017 (GG 4432/B/15-12-2017). For this reason, a Special Ecological Assessment has been prepared, which is included as an Annex to the approved EIA. In the context of the preparation of the SEA, an extensive bibliographic research was carried out, as well as field work by specialized scientists, in order to collect sufficient, documented and reliable data and records, and then to draw safe conclusions and estimates. The Special Ecological Assessment aims to provide a detailed ecological survey of the area of the proposed Project and the wider study area, ie the Special Conservation Area (SAC) codenamed "GR2530007 - Corinthian Gulf", of the European Ecological Network Natura 2000, in order to Properly assess the impact of the project in relation to the protected objects and the ecological integrity of the areas.

Based on the appropriate assessment made, it appears that the proposed project will not have a significant impact on ensuring the integrity and ecological functions of the study area. In particular, the implementation of the project is not expected to have an impact on priority habitats of Directive 92/43/EEC. According to the design of the project under study, for the operation of the new unit, no constructions are foreseen to be done in the marine environment. Existing and environmentally licensed submarine facilities will be utilized for the outflow of seawater cooling water. The operation of the Station under study will result in the reduction of the thermal load due to the evaporation processes in the programmed cooling towers.

Based on the evaluation of the special physical characteristics of the proposed Site of Community Importance "GR2530007-Gulf of Corinth", the prevailing environmental conditions, as well as the

technical characteristics of the proposed project, it is estimated that based on the measures to prevent and deal with potential impacts In the design, the project in question will not have a cumulative effect on the integrity of the sites in terms of protected areas, ecological functions and the role they play in the cohesion of the Natura 2000 Network.

The proposed change in the generated power of the new Power Plant does not imply any other change in the technical characteristics of the operation, the quantities and the management of the generated liquid and solid waste and therefore is not expected to intensify or otherwise affect the effects concern the natural environment of the wider area. In particular, with regard to the marine environment, it is noted that the seawater discharges of the cooling towers remain as approved by the recently issued AEPO, while the requested small power increase does not cause a change in the temperature of the discharged seawater, due to the proper design of the cooling system. Consequently the potential impacts on the natural environment are not modified compared to those already assessed for the already licensed project.

It is noted that based on the a.p. 10502/14.06.18 of the circular of the General Directorate of Environmental Policy of YPEN and in particular according to paragraph 2a it is provided that:

*"If in the EIA, on the basis of which the environmental terms were approved and the under-amendment Decision of Environmental Terms was issued, the location of the project or activity (partially or in full) falling within the Natura 2000 area was taken into account, and provided that the Amendment File documents that no substantial differences occur on the environmental impact of the requested change (modernization, improvement, extension or modification) in relation to those which have been examined and evaluated for the elements of the natural environment in the protected area, **then the submission of Special Ecological Assessment is not required** . "*

7.2.5. Anthropogenic environment

The effects concerning the **anthropogenic environment** as well as the **socio-economic impacts** from the construction and operation of the new Electricity Plant do not differ from those mentioned in the original and approved study, as the modification under study concerns only a small scale increase of the production power plant without affecting other parameters regarding the construction and operation of the project.

It is noted that the policy applied by the company regarding the staff is the utilization of human resources from the wider area of the Project. In addition to the immediate job creation that will result from the implementation of the investment, it is estimated that there will be a significant number of new jobs in areas that will be indirectly related to the operation of the activity.

The construction and operation of the unit under study within the existing energy center provides the advantage of sharing the technical infrastructure already used by the units Alumina Factory -

Aluminum, SITHYA and IPP. Therefore, with the installation of the new plant on the plot of MYTILINEOS there is a cumulative positive effect, both from the utilization of existing facilities and the reduction of the environmental footprint of the facility, and from the use of many years of experience in managing and controlling environmental protection measures electric power.

It is noted that the aforementioned aspects of the project remain unaffected by the proposed limited modification to the installed capacity of the new station.

7.2.6. Correlation with anthropogenic pressures in the environment

As already analyzed in the approved EIA, the location of the unit and the positive synergy with the infrastructure and facilities of the company MYTILINEOS SA in the area ensure the sustainable operation of the unit reducing the consumption of natural resources and potential environmental impact. The utilization of the existing infrastructure helps to avoid the occupation of new undisturbed areas, while there is a cumulative positive impact, both from the avoidance of new constructions and networks, and from the utilization of many years of experience in the management and control of environmental protection measures.

The needs for natural resources, industrial and drinking water are covered by the existing facilities that serve the factory and the existing operating units SITHYA and IPP. Regarding the seawater cooling water, the discharged seawater cooling water of the SITHYA unit will be utilized, without the need for additional seawater extraction. That is, the facility will be cooled by the already licensed water supply of the SITHYA unit, a fact that contributes to the reduction of the thermal load of the seawater cooling water discharged into the sea. There is also a positive synergy due to the utilization of the existing reception and liquid and solid waste management infrastructure.

The proposed increase in installed capacity does not differentiate between liquid and solid waste outflows, as well as water refill needs for cooling towers. The discharges of the cooling towers remain as approved by the recently issued AEPO, while the requested increase in power does not cause a change in the temperature of the discharged seawater, due to the proper design of the cooling system.

7.2.7. Gaseous emissions

The effects on the atmospheric environment during the construction phase do not change in relation to what is stated in the approved study, as the development works of the new power plant are not affected by the proposed modification, they will be locally limited in the immediate area of the projects without significant effects on atmospheric environment of the wider area, given the relatively low traffic load and the industrial character of the area.

In order to assess the potential effects on the atmospheric environment during the operation phase of the Project, the modeling of the gas emissions of the plant was elaborated using the latest version of the special software, AERMOD. This modeling has been updated in the context of this Study. Based on the technical and operational characteristics of the power plant the main gaseous pollutant emitted during the operation phase of the Station is nitrogen oxides (NO_x).

The purpose of the modeling carried out is the estimation of the concentrations of nitrogen oxides in the atmospheric environment from the operation of the Station, but also the cumulative-synergistic effects taking into account the NO_x emissions from the operation of the existing power plants and the alumina plant in the area.

Annex IV of the present study includes the relevant report with a detailed description of the methodology followed and the results of the modeling. The following sections summarize the key points.

In conclusion and as it results from the analysis of the results, the concentrations of NO_2 within the neighboring settlements due to the operation of the plant under study and taking into account the synergy of the existing emission sources are very limited and much lower than the respective institutional limits, even under adverse weather conditions and for short periods of one and three hours. **The corresponding concentrations for a reference period of one year are negligible, even very close to the plant, while at the same time, they are significantly lower than the established annual limit for the protection of flora and ecosystems.**

Based on the above, the power increase proposed in the present study does not bring about significant differences in terms of impacts compared to those that were evaluated for the initially licensed project.

7.2.8. Noise - Vibrations

The **noise** from the work performed inside the construction site for the construction of the new unit will affect the immediate construction site while it will be significantly attenuated by moving away from it. At the same time, the maintenance and proper use of the machinery and vehicles of the construction site, which will meet the noise standards, will contribute to the maintenance of noise at low levels.

During the operation phase of the unit the main noise sources are the gas turbine and the steam turbine. However, all necessary steps will be taken to comply with relevant noise nuisance legislation. From the activities of the Station, and the complex of MYTILINEOS in general, no settlements are affected, since the nearest (Ag. Nikolaou, Antikyra and Aspron Spiti) are located quite a long distance from the complex.

The **vibrations** during the construction mainly concern the oscillations caused by the movement of the vehicles transporting construction materials, the vibrations due to excavations and due to the construction works. In order to deal more effectively with the vibrations caused, all appropriate measures will be taken in accordance with the current legislation. In addition, due to the location of the unit, at a considerable distance from settlements, but also the industrial character of the installation site, the effects will be limited and will not cause nuisance in the wider area. Due to the type of activity under study, no vibrations that are perceived in the external environment are caused during the operation of the unit.

In any case, the proposed modification to the Power of the plant will not in any way affect the potential effects related to the noise and vibrations produced.

7.2.9. Electromagnetic fields

As mentioned in the initially submitted EIA, no effects are expected from the operation of the Project related to E/M fields, as the installations of mechanical equipment and cables provided for the new plant are equivalent to the installations of the existing units for the which on the basis of measurements no exceedances are found in relation to the applicable limits.

7.2.10. Water

The potential impacts from the operation of the proposed Project to be modified on surface and groundwater, but also on the marine environment are related to their qualitative and quantitative status. The functions of the programmable installation related to the aquatic environment concern:

- Water use for industrial and water use
- Use of sea water for the operation of cooling towers
- Disposal of liquid industrial waste

From the proposed in the present study the modification in the installed power of the new plant results a limited increase of the requirements of industrial and deionized water in relation to the foreseen in the approved study, from **10.6m³/h** to **12.3m³/h** . The planned installation will use water for industrial and water use from the SITHYA service network, which is supplied by the company's drilling network in the area. The utilization of groundwater to meet the requirements of the Station under study to affect the amount of groundwater aquifer, as according to the hydrogeological survey conducted in the area and the groundwater level measurements in the drillings in the area, there is a dynamic behavior of the pumped drilling, with level recovery after pumping has stopped. It is noted that **the requirements of the studied Station in industrial water**

constitute a very small percentage (approximately 2.4%) in relation to the permitted industrial use of water from the existing wells, which amounts to 4,404,074 m³ per year according to the Water Use License 1544/05-09-2012 of the Decentralized Administration of Thessaly - Central Greece (Water Directorate)

The modification proposed in the present study does not change the quantities produced and the method of managing the generated liquid waste. Both during the construction phase and during the operation phase, all appropriate measures will be taken to avoid any burden on the environment. The liquid industrial waste, after a small treatment inside the stadium of the Station, as well as the municipal wastewater will be channeled through closed pipes to the respective treatment complexes of MYTILINEOS SA. of ATE.

The required replenishment seawater in the cooling towers of the Station, due to the evaporation losses and the continuous discharge with an estimated flow of 3,706 m³/h will be a small part of the currently discharged seawater cooling of the adjacent SITHYA unit of total supply 22,000 m³/h. The discharges of the cooling towers are estimated at 2,850 m³/h and will be through a closed pipeline together with the discharged seawater of the adjacent Stations, at the same temperature. Therefore from the operation of the new Station:

- There will be no pumping of seawater from the Gulf of Corinth but use of part of the already discarded seawater of the adjacent SITHYA unit, before returning to the Gulf of Corinth
- Due to the interference of the cooling towers, the amount of returned water is reduced, from 22,000 m³/h to 21,144 m³/h, resulting in a positive contribution to the heat load discharged into the Gulf of Corinth.

Due to the proximity of the site of the new Station with the protected area of the NATURA network (Corinthian Gulf), as mentioned above, a **Special Ecological Assessment (EOA)** was prepared in the framework of the Environmental Impact Assessment which includes, among others, the in relation to the protected objects and the ecological function of the study area, arguing that the proposed project will not have a significant impact on ensuring the integrity and ecological functions of the study area. It is noted that the design of the Project does not include any mechanical intervention in the marine environment.

From the above it implies that the proposed small-scale change in the installed capacity of the electricity Power Plant under study does not result in a substantial change in the environmental impact in relation to those examined and evaluated for the initially environmentally licensed water project.

7.3. EXPECTED IMPACTS FROM THE PROJECT SENSITIVITY TO RISKS OF SERIOUS ACCIDENTS OR NATURAL DISASTERS

As part of the preparation of the Environmental Impact Study, an analysis of the potential impacts in cases of abnormal operating conditions and the consequences of possible accidents or natural disasters was carried out.

The approved EIA includes the risk assessment from the management of raw and auxiliary materials, such as flammable substances or other hazardous substances, and records the protection and prevention measures incorporated in the design of the facilities. The modification proposed in the present study does not result in any change in the type, quantities and management of the raw materials and auxiliary materials that will be used in the installation.

It is noted that the Project Owner is already taking all appropriate measures in the context of operation and existing facilities to deal with emergencies due to accidents or natural disasters such as fire, leaks, earthquake, extreme weather events, etc.

Risks to human health, cultural heritage and/or the environment in the Project area due to accidents or natural disasters (including extreme weather events) are already addressed by special Emergency Plans (EMPs) developed and implemented by the Project Body for the immediate and effective response to emergencies. In particular, in the Energy Center of Agios Nikolaos, a specific procedure is applied that concerns the preparedness and response to emergency situations, in each of the premises of the facilities and concerns employees, visitors and those who are involved in any way with their operation. The implemented Emergency Plans (EMPs) are analyzed in the approved EIA and cover the following situations:

- EMP 01 - Fire/Explosion
- EMP 02 - Fire in a fuel tank (DIESEL)
- EMP 03 - Fire at the Natural Gas Station or at a Natural Gas installation
- EMP 04 - Fire in the warehouse
- EMP 05 - Car accident - Fire in a vehicle
- EMP 06 - Serious injury to a worker or a third party
- EMP 07 - Leakage (fuel - lubricants - chemicals)
- EMP 08 - Earthquake
- EMP 09 - Storm/Flood
- EMP 10 - Snowfall/Snowstorm/Frost
- EMP 11 - Heat
- EMP 12 - Finding a suspicious object
- EMP 13 - Evacuation of facilities
- EMP 14 - High pressure steam leakage

The company has also designed and implemented procedures to control the risks arising from the operation and maintenance of the facilities. The risk assessment procedure is applied for the analysis of risks that may arise during the works, the recording and supervision of the implementation of the necessary protection measures during the works, as well as the information of the employees.

It is noted that the examined activity falls within the scope of **Directive 2010/75/EC (IED)** "on industrial emissions (Integrated Pollution Prevention and Control)", which was harmonized in Greek law with JMD 36060/1155/E.103/14.06.2013 (Government Gazette 1450/B). The design of all the facilities of the new Power Plant takes into account the Best Available Techniques (BAT) as defined by Directive 2010/75/EU and the relevant national legislation.

Based on the above, it is concluded that the modification proposed in the present study **does not change substantially in terms of the expected impacts arising from the sensitivity of the Project to risks of serious accidents or natural disasters, in relation to those examined and evaluated for the initially environmental permit of the project.** The applied measures for prevention and response to emergencies, as well as the most comprehensive measures taken in the design of the Project, have the effect of preventing potential environmental impacts, reducing the Project's sensitivity to the risk of serious accidents or natural disasters and dealing with the relevant consequences. These measures will be updated and improved by the Project Owner when necessary in order to effectively deal with serious accidents or natural disasters.

7.4. CONCLUSIONS

From the small increase of the installed capacity of the Project proposed in the present study and based on what has been mentioned in the above sections, there are no substantial differences in terms of its impacts on the environment of the area, compared to those already evaluated for the initially licensed project. These impacts will be controlled with the appropriate measures, as provided for in the current AEPO.

The operation of the unit in question contributes significantly to sustainable development at local and regional level. At the same time, the company's commitment to implement measures to prevent potential environmental impacts, ensure the protection of the environment and the long-term enhancement of the positive impacts of the Project on the social and economic environment.

MYTILINEOS SA is one of the largest industrial companies with international development in various sectors, such as metallurgy & mining, construction and energy in the context of sustainable development. The principles of Corporate Social Responsibility have been incorporated into the company's strategy and business practices with an emphasis on Occupational Health and Safety, reducing and mitigating environmental impacts, and contributing to the well-being of employees and local communities.

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8. MITIGATION MEASURES

8.1. ENVIRONMENTAL IMPACT MANAGEMENT

The prevention and avoidance of potential environmental impacts from the development and operation of the unit under study is achieved by taking a series of measures, which are integrated into the design of the Project.

The measures to mitigate the potential impacts are analyzed in the relevant sections of the approved EIA (Chapter 10). The measures aim to prevent and address the potential environmental impacts during the construction and operation phase of the unit under study, and refer to :

- General Measures
- Climatic and bioclimatic characteristics
- Morphological and landscape features
- Geological and territorial characteristics
- Ecosystems, Flora, Fauna
- Anthropogenic environment
- Technical Infrastructures
- Atmospheric environment
- Acoustic environment - Vibrations
- Aquatic environment

and

- Measures during the phase after the end of operation
- Measures to address the effects of the Project's sensitivity to serious accidents or disasters

The conditions, measures and restrictions for the minimization and treatment of potential environmental impacts are analyzed in detail and are defined in Chapter 4 of the AEPO no. prot. RIS/DIPA/82557/5356-17/09/2019 and relate briefly to:

- General settings
- Construction phase
- Operation phase
- Other environmental conditions
- Restoration, partial or gradual or permanent cessation of the activity
- Emergencies of pollution or degradation of the environment
- Monitoring program and reports

Also in the design of all the facilities of the new Power Plant are taken into account the Best Available Techniques (BAT) as defined by the directive 2010/75/EU Integrated Pollution Prevention and Control (IPPC) and the corresponding current Greek Legislation (JMD. 36060/1155/E.103/2013- GOVERNMENT GAZETTE 1450 'B).

The measures to prevent and avoid potential environmental impacts referred to in the approved EIA and AEPO are considered sufficient, as the proposed modification, as already mentioned, concerns technical modifications and does not lead to substantial differences in the potential environmental impacts other than those that have already been evaluated on the basis of the approved EIA and the relevant Decision of Approval of Environmental Conditions.

The control of the environmental performance will be ensured with systematic measurements and monitoring of the operation of the unit, in order to prevent - avoid and minimize any negative environmental impacts and at the same time to strengthen the positive synergies of the Project. These measures, in combination with other actions related to the environmental education and awareness of the employees and the Corporate Social Responsibility of the company ensure the operation of the unit under study in an environmentally responsible manner.

The measures aim in order of priority at the following ways of dealing with the environmental impact:

- **Prevention and avoidance** refers to measures that prevent the effects on the source through proper planning of the project or activity.
- **Reduction of intensity and extent**, concerns measures aimed at reducing the negative effects.
- **Rehabilitation**, refers to measures to restore the environmental means to their original state and are usually applied after the end of the operation of the project or activity

Both during the construction phase and during the operation phase, the measures, terms and conditions defined in sub no. YΠEN/ΔΙΠΑ/82557/5356-17/09/2019 ΑΕΠΟ.

It is noted that the project operator, in addition to the obligation to comply with current Community and National legislation, follows a clear and comprehensive environmental policy that is the basis for the successful operation of the Environmental Management System (EMS), within the requirements of International Standard ISO 14001.

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9. CODIFICATION OF RESULTS AND PROPOSALS FOR THE MODIFICATION OF AEPO

9.1. GENERAL

This Environmental Study was prepared on behalf of the company MYTILINEOS SA. SA/TED Electricity (formerly PROTERGIA SA) for the modification of the Decision of Approval of Environmental Terms (AEPO) for the development and operation of a New Power Generation Plant at the Existing Energy Center of Agios Nikolaos, Voiotia. For the operation of this unit is in force for ten (years) from its issuance no. prot. ΑΕΠΟ ΥΠΕΝ/ΔΙΠΑ/82557/5356-17/09/2019, (ΑΔΑ: 68Γ44653Π8-ΑΤ4).

The modifications proposed in the present study concern the increase of the rated power of the installation to **826 MW** under ISO conditions.

Apart from the small increase in power, the technical characteristics of the Project under study remain as approved by the recently issued AEPO. The proposed amendments do not substantially differentiate the potential environmental impacts, such as those assessed for the originally licensed project, as discussed in **Chapter 7** of this study.

9.2. Suggestions for Amendment

The proposals for the modification of the above AEPO are codified as follows:

Approval of environmental terms for the construction and operation of a New Power Generation Plant with a nominal power of 826MW of the company MYTILINEOS SA. at the Existing Energy Center of Agios Nikolaos, Voiotia.

In **section A**, in **paragraph A.1.1.** to be modified:

<i>Type of activity:</i>	<i>Power Plant of Combined Cycle, using natural gas fuel, rated power 826MW, under ISO conditions, new and clean (rated thermal power: 1.284MW)</i>
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In **section A**, in **paragraph 1.2.** to be modified:

«Capacity: Average Annual Electricity Generation: 5,000 GWh »

«Field Description: next to the alumina-aluminum industrial unit (ATE), the High Efficiency Electricity-Heat Cogeneration Unit (SITHYA) and the Independent Power Plant (IPP), as described in the topographic diagram shown in this section. a.a. (61) (owned by ALUMINUM OF GREECE, within an expropriated plot of land with a total area of 7,035,700 m²) »

In **paragraph 1.4.1.** to be modified:

"The plant includes:

-A gas turbine for operation with fuel gas of nominal power 572 MW, equipped with dry burners of low emission NO_x type

- ...

- A steam turbine, power 254 MW, three pressure stages, with water-cooled condenser

- ...

In **paragraph 1.4.3.** to be modified:

"The use of water for the operation of the Plant concerns:

-.... The supply of industrial and deionized water is estimated at 12.3m³/h or 295m³/d "

In **paragraph 1.4.4.** to be modified:

"To meet the energy requirements of the plant, natural gas is used with an average annual consumption of about 9,000 GWh HHV"

In **paragraph 2.1.3** to be amended

- *from 01/08/2021 to take into account the Executive Decision 2017/1442/EU for the combustion of natural gas:*
 - *NO_x (as NO₂): 30 mg/Nm³ annual average and 40 mg/Nm³ daily average or average of the sampling period*
 - *CO: 30 mg/Nm³ annual average*
 - *For units with a net electrical efficiency (HA) of more than 55% a correction factor may be applied to the upper limit of the range corresponding to the value: [upper limit] x HA/55, where HA is the unit's net electrical output at ISO base load conditions. Therefore the range of emissions for the case of the new Plant is set at 10-34mg/Nm³ ([30] x63.1/55 = 34mg/Nm³).*

The deletion of **paragraph 4.11.1** is **proposed**, given that for the Plant under study has been issued by the Energy Regulatory Authority (RAE) Production License (Decision NO. 904/2019) on "Amendment of no. 744/2018 RAE decision for the issuance of a license for the production of

electricity from a combined cycle plant with natural gas fuel power of 665MW, at Agios Nikolaos of the Municipality of Distomo-Arachova-Antikyra of Boeotia, of the company "MYTILINEOS Business-SA" as to the power of the plant and as to the name of the company holder ", which is included in **Annex II** of the present study.

It is also proposed the correct repetition of the protocol number of the mentioned letter of MYTILINEOS SA, in the preamble of AEPO with a.a. (61), in RIS/DIPA/57481/3613/26-06-2019 instead of the inadvertently written RIS/DIPA/55685/3467/20-06-19.

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10. PHOTOGRAPHIC DOCUMENTATION



Figure 10-1 : Draft Photographic Documentation Map



Location 1 : Auxiliary facilities of a new plant (inside the fenced area)



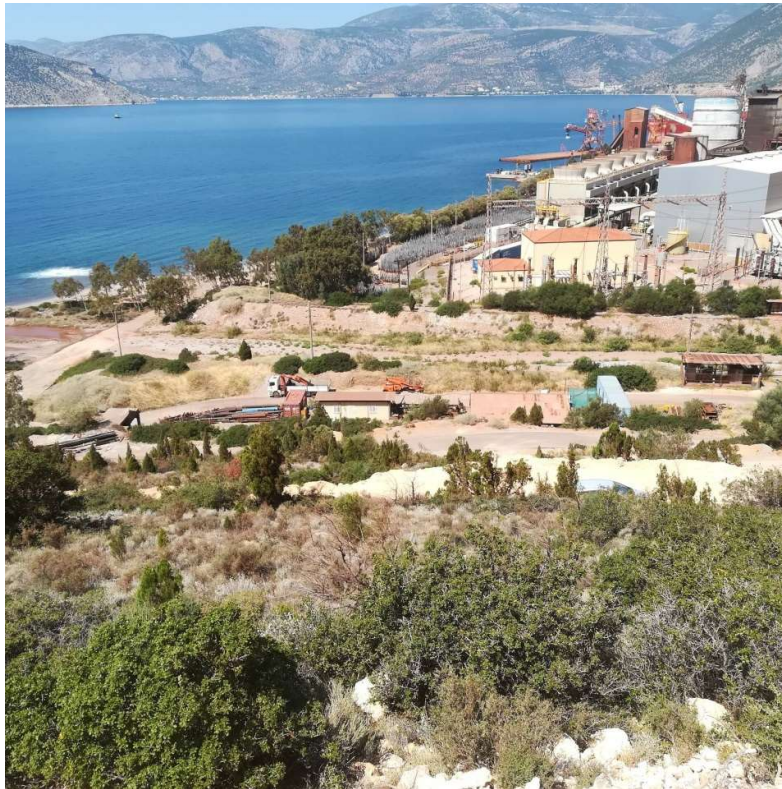
Location 2 : Auxiliary facilities of a new plant (inside the fenced area)



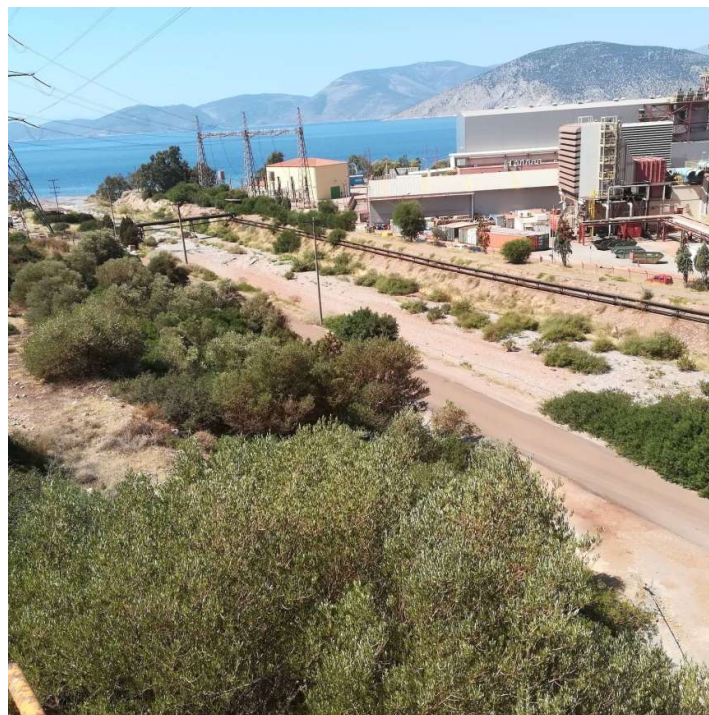
Location 3 : Cooling tower installation site



Location 4 : Construction site of new plant facilities



Location 5 : Construction site of new plant facilities



Location 6: View of a delineated area stream

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S/N	TITLE	SCALE
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2. RAE decision no. 744/2018 "Issuance of a license for the production of electricity from a combined cycle station with natural gas fuel power of 665 MW, at Agios Nikolaos of the Municipality of Distomo-Arachova-Antikyra of the Voiotia Regional Unit to the company" MYTILINEOS SA-Group of Companies "
3. RAE decision no. 904/2019 "Amendment of no. 744/2018 of RAE Decision for the issuance of a license for the production of electricity from a combined cycle station with natural gas fuel power of 665 MW, at Agios Nikolaos of the Municipality of Distomo-Arachova-Antikyra of Voiotia, of the company "MYTILINEOS SA" As to the validity of the station and as to the name of the company holder»

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ANNEX I: MAPS

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