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Do current regulatory frameworks in the EU support innovation and security of supply in electricity and gas infrastructure?

Country Report - Greece

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There is not any specific duty set by the current legislation obliging the TSO to innovate or to promote innovation with regard to the development of the transmission system. The TSO does have duties with regard to security of supply.

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Stakeholders mention that the framework in general supports investments.

High cost projects are categorized as PMIs (projects of major importance) by the NRA. This means that the TSO is only able to recover the costs after the project has been completed successfully, and not during construction which is considered by stakeholders a barrier for investments. However, we understand that this barrier is only relevant for a single project.

Options for improvement

The above discussion shows that the NRF generally provide sufficient incentives for security of supply and especially interconnection projects, which are important for Greece.

We understand that the Greek TSO already invests in innovative projects. Nevertheless, we suggest the following option for improvement in order to ensure that there is a long-term perspective on innovation:

(i) Statutory reference to innovation

Assessment of the NRF and the regulatory practice of the gas sector in Greece

The gas NRF in Greece

The gas TSO in Greece is DESFA SA and the NRA is RAE. The tariff regulation methodology is considered cost-based using rate-of-return regulation.

There is not any specific duty on the TSO to encourage innovation. For the NRA, although the encouraging of innovation is not expressly referred to in the legal framework, it is evident that the NRA has extended responsibilities to monitor and coordinate the plans and procedures for the development and implementation of infrastructure projects in a way that gives priority to new projects. The TSO does have duties with regard to security of supply.

The regulatory practice in the gas sector in Greece

The NRF generally provides sufficient incentives for security of supply and innovation. No barriers are listed, but the future importance of social cost-benefit analysis is stressed. Furthermore, unbundling requirements are considered a barrier for energy storage projects and CNG transmission projects, which cannot be conducted by the TSO.

Options for improvement

The NRF is functional for security of supply and innovation projects and no specific options for improvement are listed.

1. INTRODUCTION

The present Country Report is a deliverable of the study “Do current regulatory frameworks in the EU support innovation and security of supply in electricity and gas infrastructure?”.

The key objective of the study is to analyse how the existing national regulatory frameworks (NRFs) in the EU guide and incentivise the electricity and gas transmission project promoters to undertake investments. The focus of the study is both on investments in new innovative technologies and investments to increase security of supply. The main objective of the study is to map how the regulatory frameworks in the MSs support such investments and how do these frameworks ensure that the necessary investments are made.

This Country Report provides an overview of both the current legal frameworks and their implementation practice related to investments in gas and electricity transmission infrastructure. As part of this analysis, selected specific infrastructure projects in electricity and gas are discussed. Based on this research, options for improvement are formulated, both relating to the implementation practice and to legal changes.

The Country Report is based on previous study deliverables and analyses. It is divided into two main sections, Section 2 which is related to electricity, and 3 which is related to gas. Each of these sections examines the legal framework (Section 2.12.1 for electricity and Section 3.1 for gas), including specific rights and duties of relevant parties, such as TSOs and NRAs (hereafter also referred to as stakeholders), mechanisms for the financing of investment projects and the regulatory rules regarding innovation and security of supply in particular. Having studied the legal regulatory framework, Section 2.2 for electricity and Section 3.2 for gas examine the regulatory practice in Greece, drawing specifically on stakeholder interviews, and paying particular attention to the regulatory practice related to innovation and security of supply. The functioning of the legal framework and the regulatory practice are illustrated by selected specific projects in Greece. Lastly, options for improvement of the regulatory practice and the regulatory framework are discussed in Section 2.3 for electricity and Section 3.3 for gas.

These options for improvement are taken from a long list of best practises that the project team has compiled based on the analysis of regulatory frameworks in all Member States. We acknowledge that we did not do a full analysis of all the costs and benefits of the suggested options. Therefore, some of these options are conditional and there might be reasons that we did not take into consideration not to implement them.

The focus of this report is not primarily on R&D investments and projects, but rather on “innovative” transmission infrastructure related investments. In order to define what “innovative” is in the context of this report, we have introduced the notion of “typological investments” (see Annex I and II). The goal of selecting “typological investments”, which, in our understanding, are categories of investments, was to make the discussion concrete and the investments comparable across countries. The term “typological investment” relates to technical solutions that TSOs can adopt to provide the transmission capacities needed to cover the transmission demand of grid users.

Thus, a typological investment is meant to be a type of solution that can be implemented, in principle, by any TSO in situations in which these solutions are appropriate to provide the desired benefit. Hence, typological investments are not specific to a concrete location or a particular TSO. Annex I provides a list of typological investments in the electricity sector, whereas Annex II provides the same for gas.

Ultimately, these technical solutions contribute to fulfilling the objective to improve or maintain the level of security of supply. It has to be noted that the degree of innovativeness of typological investments can be quite diverse, ranging from construction of conventional assets like AC overhead lines or pipelines with conventional materials and construction methods down to novel concepts of system automation and operation based on recent R&D achievements. Innovation aims at providing the desired level of transmission capacity – determined by the objectives of security of supply (see above) – in a way that is in some way superior to the conventional way, e.g.:

1. by immediately reducing overall cost as compared to a conventional solution;
2. by prospectively reducing overall cost in the future, subject however to a “learning curve” as to the cost level of the innovative solution;

3. by accelerating the process of transmission capacity expansion and thus reducing social welfare loss caused by temporarily insufficient transmission capacities; or
4. by providing improvements with respect to other criteria that are often difficult to monetarise, like environmental or public acceptance aspects.

Innovative investments, especially those whose benefits fall into category ii., iii. and iv. named above, can face certain barriers and market failures. We have identified five categories of innovative projects which might encounter potential regulatory barriers (see also Annex III for more explanation):

a. Capital intensive projects resulting in uncertain future OPEX gains (efficiency improvements / cost reductions) are not incentivised by the regulatory framework;
b. Projects with potential significant benefits, which would benefit primarily the wider society and where the concerned TSOs are not incentivised;
c. A roll out and investment in smart grids substituting planned physical investments may provide a reduction in the regulated asset base, but might not be realised due to an increase in tariffs or regulatory disincentives;
d. Projects with few or no commercial benefits to justify the investment, but with positive social impacts;
e. Projects, which result in a lower TSO TOTEX, but bring about a shift in the CAPEX/OPEX ratio, which is not incentivised by the regulatory framework.

Our understanding of innovative investments and typological investments, and the categorisation of investment projects in relation to possible regulatory barriers are the basis for the research done in the context of the analysis of the implementation practice in this report.

2. ELECTRICITY

2.1. Legal analysis of the NRF in Greece

2.1.1. Overview of the regulatory framework of Greece– legal rules

In compliance with the requirements of EU Directive 2009/72/EC, concerning the legal and operational unbundling of the Transmission and Distribution operations of vertically integrated undertakings which participate in the electricity markets of the EU Member States, the independent company named ADMIE S.A. was established under Law 4001/2011, through the spin-off of the transmission operational units.

In compliance with the requirements of EU Directive 2009/72/EC for the legal and functional unbundling of the Transmission and Distribution functions of vertically integrated undertakings participating in Member States' electricity markets, ADMIE was established under Law 4001/2011 (Government Gazette A' 179/2011) (the "**Law**"), through the spin-off of the transmission business units of the (former) Hellenic Transmission System Operator S.A. ("DESMIE") and PPC S.A. (Public Power Corporation of Greece, owned by the Greek State) into PPC's wholly-owned subsidiary named "Independent Power Transmission Operator S.A." ("**ADMIE**").

According to Law 4001/2011, ADMIE undertakes the role of Transmission System Operator for the Hellenic Electricity Transmission System, which consists of the high-voltage systems (direct lines), the interconnections, through the ground or the sea, established in Greece, as well as all installations, equipment and control installations that are required for the prompt, safe and uninterrupted transmission of electricity from one power station to a substation, from a substation to another substation, or to, or from any interconnection. The projects of interconnection of the non-interconnected Islands to the Hellenic Electricity Transmission System are included in the Hellenic Electricity Transmission System.

To this extent, ADMIE performs all duties of Transmission System operation, maintenance and development that were previously assigned to the Hellenic Transmission System Operator (DESMIE) and PPC's Original Transmission Business Unit. As a matter of fact, the transmission-related organizational units of the above organizations were integrated into ADMIE via the transfer of all relevant organizational functions, personnel and Transmission System assets. As of today, ADMIE is company listed on the stock exchange with a shareholding structure of: 51% ADMIE Holdings Inc., 25% DES ADMIE S.A., 24% State Grid Europe Limited. The Hellenic Republic owns 51% of ADMIE in total. It enjoys complete operational and administrative independence and it is able to make material decisions on its sector.

RAE (Regulatory Authority for Energy in Greece) issued decision no. 672/2012 dated 26.7.2012, which approved the certification of ADMIE, in accordance with the law.

In general, the key players in the energy market in Greece are the **Ministry of Environment** as well as **RAE** (namely, the local Greek NRA) which have the following, general, duties, in accordance with the Law no. 4001/2011, amended:

State supervision and general principles

- Energy-related activities are subject to supervision by the State, to be exercised by the Minister for Environmental Affairs, Energy and Climate Change and the Regulatory Authority for Energy (RAE), within the framework of their remits and Greece's long-term energy plan. The long-term energy plan takes account of existing and projected energy reserves at national, regional and international level, the intra-Community border programme to develop the electricity systems and trends on the international energy market and is designed, among others, to:
  - (a) complete the single internal European energy market by increasing cross-border trade, in order to achieve competitive prices, higher standards of services, improved performance of the sector and, at the same time, strengthen security of supply and sustainability; and
  - (b) safeguard Greece's security of energy supply and the application of a viable policy to combat climate change and strengthen competitiveness within the single European market.

The State ensures that all activities in the energy sector are modernised and developed, in order to guarantee that consumers are provided with technically reliable and affordable energy under conditions of healthy competition, combat energy poverty and apply the rules of the liberalisation of the electricity market (Article 3 of the above Law).

- The energy market is controlled, regulated and supervised, without prejudice to the competence of the Minister for Environmental Affairs, Energy and Climate Change, by the RAE, which was established under Law 2773/1999 and is the national regulatory authority for electricity and natural gas within the meaning of Directives 2009/72/EC and 2009/73/EC;
- The RAE is an independent regulatory authority based in Athens. It has a legal personality and appears independently before courts trying its acts or omissions or legal relations relating to it. The RAE is only subject to parliamentary and judicial control (Articles 4 and 5 of the above Law).

RAE activities and duties

Security of supply

The RAE monitors the security of energy supply, especially with regard to the balance between supply and demand in the Greek energy market, anticipated future demand, anticipated additional electricity production, transmission and distribution potential already programmed or under construction, the standard and level of maintenance and reliability of transmission systems and distribution systems and the application of measures to cover peak demand and conditions on the energy market in terms of the facility to develop new production potential. The RAE prepares a report by no later than the end of July every two (2) years for the electricity sector, summarising the results of its monitoring of the security of supply, with due account for the regular forecasts made by energy transmission and distribution system operators. This report is published and notified to the Minister for Environmental Affairs, Energy and Climate Change, the Hellenic Parliament and the European Commission (Article 12 of the above Law).

Development of infrastructures and monitoring of development plan

The RAE shall rule, following public consultation with existing and potential users, on amendments to the development plans prepared by the competent transmission operators. The RAE publishes the outcome of public consultation and considers:

- (a) if the development plan covers all the requirements identified during the above consultation procedure, especially investment requirements; and
- (b) if the development plan is in keeping with the corresponding non-binding Community wide ten-year development plan for the electricity transmission system prepared in accordance with Regulations (HC) No 714/2009 (OJ L 211) and may then ask competent transmission operators to amend their plan accordingly. If there is any doubt as to whether or not the development programme is in keeping with the corresponding Community-wide plan, the RAE consults the Agency for the Cooperation of Energy Regulators established under Regulation (EC) 713/2009 (Article 14 of the above Law).

2.1.2. Specific legal rights and duties

Role of the TSO

ADMIE in its capacity as Operator of the Hellenic Electricity Transmission System performs all duties stipulated in Article 94 of Law 4001/2011. These duties include the operation, exploitation, maintenance and development of the System (ESMIE), which include the following tasks in relation to development of the network:

1. Ensuring the long term ability of the transmission system to meet reasonable demand for electricity transmission in a financially and environmentally sustainable manner;
2. Granting access to the transmission system to all electricity generation and supply permit holders as well as to those parties which have been legally exempted from permit holding obligations and to High Voltage consumers;
3. Ensuring the safe, reliable and efficient operation of the transmission system as well as the availability of necessary ancillary services including those provided by demand response, insofar as such availability is independent from any other transmission system;
4. Providing system users with all necessary information to ensure their effective access to the transmission system;
5. Granting and managing third party access to the transmission system and giving reasoned explanations when such access is denied;

6. Preparing on an annual basis, upon prior consultation with all current and potential system users, the Hellenic Electricity Transmission System Ten Year Development Plan.

The above tasks of ADMIE were reformed by the subsequent laws nos. 4425/2016 and 4512/2018, as in force.

Undertaking of investments

In accordance with Articles 94, as amended, 108 and 109 of the above Law (4001/2011), the following rules apply:

Development of the Greek Electricity Transmission and powers to make investment decisions ***(Article 22 of Directive 2009/72/EC)***

1. ADMIE SA shall submit a ten-year Greek electricity transmission system development plan to the RAE by 31 March each year, after having consulted all the stakeholders. The plan, which shall cover the period commencing on 1 January of the following year, shall be based on existing and forecast supply and demand and shall contain efficient measures in order to guarantee the adequacy of the system and security of supply;
2. The ten-year Greek electricity transmission system development plan shall in particular:
   a. indicate the main transmission infrastructure that needs to be built or upgraded over the next ten (10) years, including the infrastructure needed for RES penetration;
   b. contain all the investments already included in previous development plans and identify new investments which have to be started in the next three years;
   c. provide a technical and financial cost-benefit study for important transmission works under subparagraph (b) above, especially for international interconnectors and connectors between islands and the transmission system, including a timeframe, estimated cashflow and financing requirements for all investment projects.

ADMIE SA shall provide the investors with all information needed to realise the investment, shall connect the new assets to the Greek electricity transmission system and shall generally make its best efforts to facilitate the implementation of the investment project. The relevant financial arrangements shall be subject to approval by the RAE.

Role of NRA

RAE (Regulatory Authority for Energy) is an independent administrative authority, which enjoys, by the provisions of the law establishing it, financial and administrative independence. RAE was established on the basis of the provisions of Law 2773/1999, in accordance with the Directive 96/92/EC for the liberalisation of the electricity market.

The main duties and responsibilities assigned to RAE relate to the following subjects:

1. Monitoring the operation of all sectors of the energy market (electricity, natural gas, oil products, renewable energy sources, cogeneration of electricity and heat etc.);
2. Collection and processing of information from companies in the energy sector while respecting the principles of confidentiality;
3. Participation in the pre-parliamentary legislative process through recommendation to the Minister of Development of the appropriate measures related to compliance with competition rules and to the overall protection of the consumers in the energy market;
4. RAE issues a report every two years on security of supply both for electricity and natural gas, which is published and submitted both to the Minister of Development and the Commission, pursuant to the provisions of laws 3426/2005 and 3428/2005;
5. Advice under the form of a simple opinion, with respect to the enactment of the secondary legislation, with the exception of the Electricity Grid Operation Code, the Power Exchanges Code, the Distribution Network Operation Code, where RAE enjoys the right of a consenting opinion;
6. Advice under the form of a simple opinion, with respect to the terms and conditions for access to the transmission and distribution networks. Approval of the methodologies for the access tariffs to electricity transmission and distribution networks. The tariffs for third party access to electricity networks are approved by the Minister of Development following a consenting opinion of RAE, whilst RAE gives a simple opinion with respect to tariffs for third party access to natural gas systems;
7. Participation, under the form of a simple opinion, in the process for the granting and revocation of licenses for the discharge of electricity activities;
8. Monitoring of the exercise of the activities undertaken by licensees and access to information;

9. Advice, under the form of a simple opinion, in the procedure for the approval of electricity retail tariffs with the exception of access tariffs.

In accordance with the law 4001/2011 ADMIE is responsible for the operation, maintenance and development of the Hellenic Transmission System under the provisions of the Energy Law. In this context, ADMIE issues on a yearly basis a Ten Years Development Plan (also "**TYNDP**") that is submitted for approval by RAE after an extended consultation with all the involved stakeholders. TYNDP is the primary investment plan of ADMIE. It is binding by law only for the first three years of the examined horizon.

RAE shall open the ten-year Greek electricity transmission system development plan to public consultation in an open and transparent manner, in accordance with the provisions of Article 29 of the Law. The RAE shall evaluate and post the result of the consultation process on its website.

RAE shall examine whether the ten-year Greek electricity transmission system development plan covers all investment needs identified during the consultation process and whether it is consistent with the non-binding Community wide ten-year network development plan referred to in Article 8(3)(b) of Regulation (EC) No 714/2009. If any doubt arises as to the consistency with the Community-wide network development plan, the RAE shall consult the Agency for the Cooperation of Energy Regulators. The RAE may require ADMIE SA to amend its ten-year Greek electricity transmission system development plan as a result of this process.

The RAE shall monitor and evaluate the implementation of the ten-year Greek electricity transmission system development plan and shall prepare and publish a report on it.

2.1.3. Mechanism for financing of investment projects

For electricity, the methodology for the calculation of the Allowed Revenue (also "AR") of the TSO is in accordance with the provisions of article 140 of law 4001/2011, as well as of chapters 50 (Procedure for the Schedule of the System's Development, in particular article 229) and 59 (Tariffs for the Use of the System, in particular article 275) of the Greek Electricity Transmission Operating Code (also "Code", FEK B' 103/2012, as subsequently amended by further decision published in FEK B' 4690/2017) and actually in force following Decisions 339/2014 and 340/2014.

RAE decides on the forecasted AR of the Operator, for the next Regulatory Period (4 years, except the first period where the duration is 3 years), based on the Operator's relevant proposal:

- For the calculation of the AR, for every year of the regulatory period, the following criteria are to be considered:
  - the annual estimated operating expenditure per year,
  - the annual depreciation of the Operator's fixed assets, according to Regulatory Asset Register, and
  - the return (real, pre-tax) on capital employed (based on Weighted Average Cost of Capital and CAPM model), based on the value of the Regulatory Asset Base (RAB) for each year.
- After smoothing the fluctuations of the AR, if needed, RAE calculates the Operator's Required Revenue (RR) for the next year. The RR, is composed by the AR, adjusted by the following parameters:
  - The settlement amounts due to under-recovery or over-recovery (positive or negative sign) of the Required Revenue collected through the application of Use of System charges of previous years;
  - The settlement amounts due to over-investment or under-investment of previous years;
  - Revenues from Interconnection Capacity Rights in previous years;
  - Revenues from the participation in the Inter-TSO Compensation Mechanism for the infrastructure usage in previous years, which constitutes debit or credit (positive or negative sign) for the TSO and as a result is increased or decreased due to possible cost recover;
  - Revenues from other, non-regulated, activities, providing that the capital employed and the operating expenses of these activities are not unbundled in the accounts and have been included in the estimation of the Operator's Allowed Revenue.
- The RR is allocated at 100% to the total amount of Customers of the Hellenic Electricity Transmission System;

- The Methodology, is a hybrid approach, as it is considered incentive–based (revenue – cap) in relation to operating expenditure (OPEX) and cost-of service in relation to capital expenditure (CAPEX). Particularly:
  - Regarding allowed operating costs, at the beginning of each regulatory period the Operator submits a proposal with an ex-ante estimation, based on actual costs in the preceding years and on future needs of the Transmission System[1]. RAE, after assessing the reasonableness and having done all the necessary adjustments, approves the relevant amount, as one of the three parameters of Allowed Revenue, setting a cap (maximum) for the OPEX, which is not subject to any adjustment during the Regulatory Period, apart from cases where: a) the Operator has to cover significant and extraordinary operating costs during this period or b) there has been a major change in the financial, legal or actual data that were taken into account during the approval of the Allowed Revenue;
  - Regarding capital expenditure, there is a different approach:
    - Allowed investments, where new and in progress (whose implementation started in previous years and remain in progress), are forecasted and monitored for every year of the Regulatory Period, in accordance with the TYNDP and the Operator's business plan;
    - Investments related to Projects of Major Importance, in accordance with the approved TYNDP, are included in the RAB during the year of their electrification and are not considered as investments in progress or new investments. The final cost of these projects, also includes a return on capital employed during the construction period, in accordance with article 10 of the Methodology;
    - Possible deviations of previous years' approved investments, are adjusted annually, in line with the realized investments and the approved TYNDP, following TSO's justification in case of major divergence;
    - For investments in progress, where delays from the approved timeline are more than a year, the Operator is obliged to submit a report justifying the delays, in order for RAE to examine and decide whether these projects will continue to be included in the RAB;
    - Depreciation is calculated using the straight-line method, taking into account the economic life of assets. Depreciation for assets that were acquired through Grants and Contributions are not included in the AR;
    - A premium rate of return can be provided, in addition to the rate of return for capital employed, for specific projects that are characterized as Projects of Major Importance in the TYNDP, in accordance with the process described in article 229 of the Code. This extra premium can range from 1% to 2.5% and is decided by RAE distinctly, upon the classification of a Project as of Major Importance in the context of the approval of the TYNDP. The premium rate of return is provided from the electrification of the project until the 12th year from the scheduled year of electrification according to the TYNDP, where it was defined as a Project of Major Importance, in accordance with the process described in article 229 of the Code. This guaranteed rate of return provides confidence to parties investing in Projects of Major Importance.

Relevant projects categories

In Greece, High Voltage (HV) transmission infrastructure investments can be developed either by the national TSO, ADMIE S.A., or by a private investor.

Regarding private investments the ownership, operation and maintenance of the assets is transferred to ADMIE S.A., as is the case when a renewable energy generator develops a new sub-marine interconnection that connects a non-interconnected island to the mainland transmission system.

As already mentioned, the Greek Energy Law No. 4001/2011 frames the Development of the Greek Electricity Transmission system and gives powers to RAE to approve investments in electricity infrastructure.

[1] According to Operator's Business Plan.

According to Article 108 of Law No. 4001/2011, ADMIE SA, the Transmission System Operator, submits for approval a ten-year electricity transmission system development plan to RAE by 31 March each year, after a public consultation. The plan, which covers the period commencing on 1st of January of the following year, is based on existing and forecast supply and demand and contains efficient measures in order to guarantee the adequacy of the system and security of supply.

In particular, the Greek ten-year network development plan (TYNDP):

- (a) indicates the main transmission infrastructure that needs to be built or upgraded over the next ten (10) years, including the infrastructure needed to facilitate RES penetration;
- (b) contains all the investments already included in previous development plans and identifies new investments which have to be started in the next three years, and are binding for the TSO;
- (c) provides a technical and financial cost-benefit study for important transmission works as contained in subparagraph (b) above, especially for international interconnectors and connectors between islands and the transmission system, including a timeframe, estimated cash flow and financing requirements for all investment projects.

According to the Greek Electricity Transmission Operating Code (Code), details regarding the methodology used for the preparation of the technical and financial cost-benefit Study, as mentioned in subparagraph (c) above, and the criteria for assessing the benefits and costs of each project are specified in the Manual entitled "Instructions for applying Cost-Benefit Analysis for projects of the Greek Electricity Transmission System", which is issued by RAE decision following the proposal by the Transmission System Operator.

According to Article 14 of Law No. 4001/2011, RAE, following public consultation with existing and potential users, decides on amendments to the development plans prepared by the competent electricity transmission operator.

2.1.4. Regulatory rules with respect to innovation

Specific duties of the TSO aimed at encouraging innovation

Specific duties of the TSO are detailed in Section 2.1.2 and Section 2.1.5. In addition, article 3 par. 2 of the law no. 4001/2011 provides the following: "*The State shall ensure that all activities in the energy sector are modernised and developed, in order to guarantee that consumers are provided with technically reliable and affordable energy under conditions of healthy competition, combat energy poverty and apply the rules of the liberalisation of the electricity and natural gas markets".*

There is not any specific duty set by the current legislation obliging the TSO to innovate or to promote innovation with regard to the development of the transmission system, although legislation provides benefits/incentives mainly in the field of production of electricity promoting the generation by renewable energy sources.

Specific duties of the RAE aimed at encouraging innovation

There is not any specific legal provision requiring RAE to apply innovative procedures and, in general, be innovative in exercising the duties entrusted to RAE by the relevant legal framework.

2.1.5. Regulatory rules with respect to security of supply

Specific duties of the TSO aiming at safeguarding security of supply

ADMIE in its capacity as Operator of the Hellenic Electricity Transmission System performs all duties stipulated in Article 94 of Law 4001/2011. In relation to security of supply these duties include:

1. Ensuring the long term ability of the transmission system to meet reasonable demand for electricity transmission in a financially and environmentally sustainable manner;
2. Managing electricity flows on the transmission system, taking into account exchanges with other interconnected systems;

3. Ensuring the safe, reliable and efficient operation of the transmission system as well as the availability of necessary ancillary services including those provided by demand response, insofar as such availability is independent from any other transmission systems;
4. Providing other system and network operators, with which the transmission system is interconnected, with all information pertinent to safe and efficient operation as well as to the coordinated development and interoperability of the System with aforementioned systems and networks;
5. Participation in unions, organizations or other entities with the purpose of developing common action rules which are conducive to the creation of a unified internal electricity market, within the auspices of European Community law, and especially to the allocation and provision of electricity transmission rights via the corresponding interconnections as well as to the management of such rights on behalf of the aforementioned operators and especially in the European Network of Electricity Transmission System Operators (ENTSO-E).

Furthermore, Article 95 of Law 4001/2011 enables the TSO to contract capacity for security of supply purposes under market conditions. This requires generators to provide capacity in return for payment. The TSO is also required to perform a special study on generation adequacy and reserve capacity adequacy for the purposes of deciding whether any further capacity is required.

Specific duties of the NRA with respect to security of supply

In accordance with article 12 (security of supply) of the Law no. 4001/2011:

- RAE shall monitor the security of energy supply, especially with regard to the balance between supply and demand on the Greek energy market, anticipated future demand, anticipated additional electricity and natural gas production, transmission and distribution potential already programmed or under construction, the standard and level of maintenance and reliability of transmission systems and distribution systems and the application of measures to cover peak demand and conditions on the energy market in terms of the facility to develop new production potential. RAE shall prepare a report by no later than the end of July every two (2) years for the electricity sector and by no later than the end of July every year for the natural gas sector, summarising the results of its monitoring of the security of supply, with due account for the regular forecasts made by energy transmission and distribution system operators. This report shall be published and notified to the Minister for Environmental Affairs, Energy and Climate Change, the Hellenic Parliament and the European Commission;
- RAE shall monitor the implementation of security measures taken in the event of a sudden crisis on the energy market or where the physical integrity or safety of persons, machinery or plant or the integrity of energy systems are at risk.

2.2. Regulatory practice

2.2.1. Overview over regulatory practice in Greece

Information about the general regulatory framework in Greece

The stakeholders mention that the framework in general supports investments. Due to the recession there has been a decrease in demand for electricity; thus most investments are not demand-driven, but as a result of the need to connect Greece's many islands and integrate RES in the network.

Main regulatory barriers

High cost projects are categorized as PMIs (projects of major importance) by the NRA. This means that the TSO is able to recover the costs after the project has been completed successfully; and not before. In that sense the TSO has to carry the project risk on its own. After the project has been completed the TSO receives a benefit in form of a higher premium for a period of 12 years. This means that expenses during construction are not reimbursed until the project becomes operational.

2.2.2. Regulatory practice related to innovation

The stakeholder recognises the list of typological investments included in Annex A. AC submarine cables could be added to this list (The Peloponnese and Crete interconnector is the longest AC submarine cable in the world).

Examples of innovative project are:

- The connection between mainland Greece with the Island of Crete;
- Overhead lines were replacement with new lines with better efficiency;
- Other examples are innovations in flexibility of system (e.g. windfarm with batteries or development of large storage facilities (2 PCI labelled));
- The Peloponnese and Crete interconnector; and
- The interconnection of Cyclades.

Adequacy of the NRF relating to its support for innovative investments

In general stakeholders are satisfied with how the NRF support innovative investments, but there are issues with cost recovery and the compensation for high-risk projects. According to stakeholders, the main regulatory barrier stems from the high costs of certain projects.

Unbundling requirements are considered a barrier for energy storage projects, which cannot be conducted by the TSO.

2.2.3. Regulatory practice related to security of supply

Security of supply projects

A major driver of investment, in contrast, have been the island interconnections, RES integration, as well as the Industrial Emissions Directive (IED) and the Medium Combustion Plant Directives (MCPD). Many islands are autonomous power systems, which often have security of supply issues and limited RES penetration levels.

Adequacy of the NRF relating to its support for security of supply investments

Stakeholders mention that the framework in general supports security of supply investments.

2.2.4. Illustrative specific projects

The following three projects are examples of approved innovation and security of supply projects and thus they illustrate how the NRF incentivises such projects. However, the first project also illustrates the previously mentioned barrier of the TSO having large project risks. This first project is considered to be very innovative while the other two are more related to security of supply.

Peloponnese and Crete interconnector

Description and aim

This project is not a PCI, but has been included in their TYNDP and is considered of high National Significance. This project is an innovative project due to its length for an AC cabling. The TSO will construct the longest AC submarine cable in the world which poses a lot of technical difficulties.

For this big interconnection project with Crete, the TSO receives compensation after the project has been finished.

EuroAsia interconnector

Description and aim

The EuroAsia Interconnector[2] is a PCI that consists of a plan to connect the electricity networks of Israel, Cyprus and Greece through an underwater DC cable and high voltage DC onshore converters at each connection point, with a total capacity of 2000MW. The development of this project would enable the accomplishment of several targets, such as ending the energy isolation of Cyprus, promoting the development of renewable energy sources and increasing the security of energy supply to the European electricity network.

[2] For more information, see https://www.euroasia-interconnector.com/.

For the first part of Crete – Attica Interconnection with capacity 1000MW, RAE by virtue of its Decisions No. 816 and 838/2018 in the context of TEN-E Regulation 347/2013 has assigned the construction and financing of the Project to the SPV ARIADNE INTERCONNECTION SA under specific terms and conditions.

Cyclades interconnection

Description and aim

This project needs to ensure reliable, economic and sufficient supply of electricity to the islands Syros, Paros, Tinos, Mykonos and Naxos islands with the mainland. The first phase of the interconnection (Attica to Syros, Syros to Tinos-Mykonos-Paros) is already in operation. The second phase (Paros to Naxos and Naxos to Mykonos, upgrading of Evia-Andros-Tinos interconnections) are expected by the second semester of 2019 and Phase 3 (second cable from Attica to Syros) is expected to become operational by the second semester of 2020. Additionally, currently the Greek State is planning the forth phase of small/western Cyclades' interconnection.

2.3. Options for improvement

2.3.1. Options to improve regulatory practice

The above discussion shows that the NRF generally provide sufficient incentives for security of supply and especially interconnection projects, which are important for Greece. Yet, there are issues regarding the implementation of innovative projects, according to the stakeholder especially projects with high costs. As we understand that at the moment this issue is only a potential barrier for a single project (a PMI or project of major importance) and that the Greek TSO already invested in innovative projects, we have not formulated an option for improvement specifically with regard to this barrier. Nevertheless, we suggest the following option for improvement in order to ensure that there is a long-term perspective on innovation:

(ii) Statutory reference to innovation

A long-term strategic perspective can only be developed if the regulatory framework contains an explicit reference to innovation. This long-term strategic perspective could shaped by governmental policies, statutory duties or could be included in the NDP.

2.3.2. National law mechanism(s) for implementing options

As regards to the option of inserting an explicit reference to innovation in the current Greek legislation, this could be implemented by including such an obligation in the Article 94 of Law 4001/2011 where the duties of ADMIE are outlined including the operation, exploitation, maintenance and development of the Transmission System (ESMIE). A similar explicit reference to innovation and, more particularly, the obligation of TSO to promote innovative projects, could also be inserted in Articles 108 and 109 of the same as above law regarding the development of the Electricity Transmission System by ADMIE and the preparation of the ten-year transmission system development plan.

2.3.3. Impact assessment

The long-term strategic perspective on innovation mentioned in option (i) necessitates efforts and coordination between the TSO and the NRA regarding the design of this long-term perspective (e.g. the organisation of stakeholder consultations, determining the scope of the innovation needed, monitoring and evaluating of how the statutory duty is translated into the long-term perspective).

We have not encountered any specific examples of projects that have been cancelled due to the regulatory framework. For this reason we do not expect that any of the suggested changes will result in considerable changes to investment levels. Yet, if the perceived risk of innovative projects is lowered and a long-term strategic perspective on innovation could be attained, the share of innovative projects is expected to increase.

3. GAS

3.1. Legal analysis of the NRF in Greece

3.1.1. Overview of the regulatory framework of Greece– legal rules

The natural gas market and development of Greece is governed by Law 4001/2011 "Regarding the operation of the energy markets of Electricity and Natural Gas, research, production and transmission networks of hydrocarbons and other arrangements" (Official Gazette –FEK-A'176/22.08.2011), which replaced the Law 3428/2005 "Liberalisation of the Natural Gas Market" (FEK no. A '313/17.12.2005) (codified version). Under Law 4001/2011 (hereafter also the "**Law**"), as amended and actually in force, the Directive 2009/73/EC of the European Parliament and the Council of the 13th July 2009 "On the common rules for the internal market in natural gas and repealing of Directive 2003/55/EC" (EE L 211 of 14.08.2009) has been incorporated into national law.

Under Law's 3428/2005 Authorization and with the Presidential Decrees n.33 and 34/2007 (FEK A' 31/20.02.2007), the Operator of the National Natural Gas System (NNGS or ESFA), under the name "National Natural Gas System Operator S.A." (DESFA S.A.), was established and the procedures of staff-moving from DEPA S.A. to the Operator were determined.

DESFA was established on the 31st of March 2007 after the completion of the Legal Unbundling procedure of the Public Gas Corporation of Greece (DEPA S.A.). DESFA fully owns the National Natural Gas System (NNGS).

According to art. 67 of L. 4001/2011, the Greek NNGS currently consists of the main gas transmission pipeline (approximately 512 km in length) and its branches (with a total length of 707 km), the measurement, control, compression and decompression stations, the communication and remote control systems, the operation and maintenance stations, the control centers, the border metering stations, the LNG receiving and regasification terminal at Revythousa island, and, in general, any operation and transmission system supporting installations, as well as any future extensions of the latter.

In general, the key players in the energy market in Greece are the **Ministry of Environment** as well as **RAE** (namely, the local Greek NRA) which have the following, general, duties, in accordance with the Law no. 4001/2011, amended:

State supervision and general principles

- Energy-related activities are subject to supervision by the State, to be exercised by the Minister for Environmental Affairs, Energy and Climate Change and the Regulatory Authority for Energy (RAE), within the framework of their remits and Greece's long-term energy plan. The long-term energy plan takes account of existing and projected energy reserves at national, regional and international level, the intra-Community border programme to develop natural gas systems and trends on the international energy market and is designed, among others, to:
  - (a) complete the single internal European energy market by increasing cross-border trade, in order to achieve competitive prices, higher standards of services, improved performance of the sector and, at the same time, strengthen security of supply and sustainability; and
  - (b) safeguard Greece's security of energy supply and the application of a viable policy to combat climate change and strengthen competitiveness within the single European market.
- The State shall ensure that all activities in the energy sector are modernised and developed, in order to guarantee that consumers are provided with technically reliable and affordable energy under conditions of healthy competition, combat energy poverty and apply the rules of the liberalisation of the natural gas market (Article 3 of the above Law);
- The energy market is controlled, regulated and supervised, without prejudice to the competence of the Minister for Environmental Affairs, Energy and Climate Change, by the RAE, which was established under Law 2773/1999 and is the national regulatory authority for electricity and natural gas within the meaning of Directives 2009/72/EC and 2009/73/EC;
- The RAE is an independent regulatory authority based in Athens. It has a legal personality and appears independently before courts trying its acts or omissions or legal

relations relating to it. The RAE shall only be subject to parliamentary and judicial control (Articles 4 and 5 of the above Law).

Main RAE activities and duties:

Security of supply

The RAE shall monitor the security of energy supply, especially with regard to the balance between supply and demand on the Greek energy market, anticipated future demand, anticipated additional natural gas production, transmission and distribution potential already programmed or under construction, the standard and level of maintenance and reliability of transmission systems and distribution systems and the application of measures to cover peak demand and conditions on the energy market in terms of the facility to develop new production potential. The RAE prepares a report by no later than the end of July every year for the natural gas sector, summarising the results of its monitoring of the security of supply, with due account for the regular forecasts made by energy transmission and distribution system operators. This report is published and notified to the Minister for Environmental Affairs, Energy and Climate Change, the Hellenic Parliament and the European Commission (Article 12 of the above Law).

RAE has been designated as the Competent Authority, (Article 12, par.4 of the above Law) for the implementation of the measures required under Regulation (EU) No 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010.

In this respect, RAE is responsible for the

- Elaboration of National Risk Assessment;
- Establishment of a Preventive Action Plan and an Emergency Plan and the regular monitoring of security of gas supply at national and level.

Moreover, RAE with its capacity as the Competent Authority collaborates for the establishment of the Regional Risk Assessments of the Risk Group Ukraine and Algeria and is coordinator of the Trans Balkan Risk Assessment.

Development of infrastructures and monitoring of development plan

The RAE shall rule, following public consultation with existing and potential users, amendments to the development plans prepared by the competent transmission operators. The RAE publishes the outcome of public consultation and considers:

- (a) if the development plan covers all the requirements identified during the above consultation procedure, especially investment requirements; and
- (b) if the development plan is in keeping with the corresponding non-binding Community- wide ten-year development plan for the natural gas transmission system prepared in accordance with Regulations (HC) No 715/2009 (OJ L 211) and may then ask competent transmission operators to amend their plan accordingly. If there is any doubt as to whether or not the development programme is in keeping with the corresponding Community-wide plan, the RAE shall consult the Agency for the Cooperation of Energy Regulators established under Regulation (EC) 713/2009 (Article 14 of the above Law).

Regulatory measures to safeguard the smooth operation of the energy markets

- Without prejudice to the authority vested in other authorities under the relevant provisions of law, the RAE may, depending on the result it wishes to attain, impose measures and terms on undertakings engaged in energy-related activities which are deemed necessary in order to safeguard the application of the provisions of the present law, conditions of healthy competition and the smooth operation of the market. Within this context, the RAE shall exercise the authority to carry out the investigations referred to in Article 28 and shall cooperate in particular with the Competition Commission and the Capital Markets Committee;
- The RAE shall publish an annual report on compliance of supply prices with general interest service obligations and, if it deems necessary, shall forward it to the Competition Commission (Article 23 of the above Law).

3.1.2. Specific legal rights and duties

Role of TSO

The operation, maintenance, exploitation and development of the NNGS is realized by the Operator under the provisions of the "National Natural Gas Network Code" (FEK B'379/01.04.2010, as subsequently amended by RAE Decisions adopted in 2011, 2013, 2017 and 2018 published on FEKs B' 2227/04.10.2011, B'3131/09.12./2013, B'1549/05.05.2017, B'2159/23.06.2017 and B' 788/07.03.2018 respectively) (the "**Code**"). The Code provides the explicit legal requirements of the TSO to develop the NNGS. The Code introduces detailed procedures and defines rights and obligations, for both DESFA and the NNGS users with respect to the use and administration of the transmission system and the Revythousa LNG terminal.

In order to access the NNGS, a Natural Gas Transmission Contract (for the booking of capacity to the National Natural Gas Transmission System) and a LNG Terminal Use Contract (for the booking of capacity in the LNG Terminal) is required. By RAE's Decision No. 257/2017, RAE approved the Contracts for the Transmission of Natural Gas and Usage of the LNG Terminal which were submitted by DESFA (FEK no. B'1443/27.04.2017).

Undertaking of investments

In accordance with article 68 of Law 4001/2011, as amended within the framework of the above provisions of the law, DESFA SA shall:

- (a) provide users with access to the Greek natural gas system in the most economic, transparent and direct manner and for as long as they wish, without putting at risk the smooth and safe operation of the Greek natural gas system. To that end, it shall enter into transmission contracts, contracts for use of LNG facilities and contracts for use of storage facilities with users, in accordance with the standard contracts prepared and published by DESFA SA on its website following approval by the RAE. DESFA SA may refuse access to the Greek natural gas system only on the basis of lack of capacity, as described in greater detail in the Greek Natural Gas System Network Code, or where access to the Greek natural gas system might prevent DESFA SA from carrying out the public service obligations assigned to it. Refusal to grant access shall be specifically reasoned and the interested user and the RAE shall be advised accordingly. The main criterion of the most economic manner to gain access to the gas system may, in some cases, harm innovation;
- (b) plan deliveries of natural gas to and from the Greek natural gas system, distribute the load to users and ensure that the quality of the natural gas is safeguarded;
- (c) be responsible for load-balancing and compensation for natural losses and own consumption by the Greek natural gas system, in accordance with the requirements of the Code. For that purpose, it may enter into contract with suppliers, following a competition based on transparent and non-discriminatory procedures and market rules, for the supply and delivery of natural gas. It shall agree to these contracts following approval by the RAE of the annual load-balancing plan and the loss and own consumption compensation plan and shall charge users in order to cover its costs, as provided for in the Code;
- (d) collect the security of supply fee from users and keep a separate account (separately to the other activities allocated to TSO by the law) for such activities in accordance with the provisions of the present law;
- (e) apply congestion management rules at entry and exit points, based where possible on market mechanisms and the transparent criteria set out in the Code, in order to promote competition between users or classes of users on a non-discriminatory basis. It shall publish historic data and flow forecasts at every entry and exit point for forthcoming years, in order to provide users with information on potential congestion. It shall notify the RAE, in accordance with the requirements of the Code, where requests to commit transmission capacity at an entry or exit point reasonably gives rise to the possibility of congestion at that point;
- (f) ensure that emergencies are addressed immediately and effectively in accordance with Article 73;
- (g) draft and publish a detailed annual report on the operating of the Greek natural gas system, on changes to technical attributes of the Greek natural gas system, transmission capacity commitments, load-balancing, the level and standard of maintenance, congestion and congestion management and emergencies and how they were dealt with;
- (h) keep a register of transmission capacity commitment holders;

- (i) enter into agreement with independent natural gas system operators, distribution systems and natural gas systems installed outside the Hellenic Republic, with a view to improved interoperability between them, exchanges of information and mutual cooperation;
- (m) publish a list of Greek natural gas system user charges for the services provided to them, regardless of how the prices are adopted;
- (n) notify the RAE of every infringement that comes to its attention of the provisions of the present law or of terms of a licence granted in accordance with the provisions of the said law;
- (o) establish and operate an online natural gas trading system which records offers to enter into natural gas resale contracts, offers to enter into transmission capacity commitment transfer contracts, statements of acceptance of such offers and any other information needed in order to complete trades in the Greek natural gas system in accordance with its Network Code;
- (p) following approval by the RAE, draft the online natural gas trading system regulations, which shall be published in the Government Gazette;
- (r) participate in the European Network of Transmission System Operators for Gas;
- (s) participate in consortia, including with one or more natural gas transmission system operators, natural gas exchangers and other relevant bodies, with a view to developing the creation of regional markets within the market liberalisation process;
- (t) exercise any other powers in accordance with the law, the certification granted to it and current regulations and codes;
- (u) prepare the Greek natural gas system development plan in accordance with the specific provisions of the Greek Natural Gas System Network Code.

Therefore, DESFA is allowed to conduct investment projects, in the frame of its capacity as the developer of the gas transmission's system.

Role of NRA

The local NRA is **RAE (Regulatory Authority for Energy)** which, in accordance with article 4 of Law 4001/2011,

"The energy market shall be controlled, regulated and supervised, without prejudice to the competence of the Minister for Environmental Affairs, Energy and Climate Change, by the RAE, which was established under Law 2773/1999 and is the national regulatory authority for electricity and natural gas within the meaning of Directives 2009/72/EC and 2009/73/EC."

Also, in accordance with Article 5 (Legal form of the RAE) of Law 4001/2011, RAE is an independent regulatory authority based in Athens. It has a legal personality and appears independently before courts trying its acts or omissions or legal relations relating to it. The RAE shall only be subject to parliamentary and judicial control.

Moreover, in accordance with Art. 69 of Law 4001/2011, as amended:

1. The Greek Natural Gas System Network Code shall be adopted by decision of the RAE, on the recommendation of DESFA SA. The Code, which shall be published in the Government Gazette, shall govern the operation, maintenance and development of the Greek natural gas system;
2. The Greek Natural Gas System Network Code regulates, amongst other things, the procedure for preparing the Greek natural gas system development plan and its approval by the RAE and for monitoring and verifying the implementation thereof and any details relating to the development of the Greek natural gas system.

RAE also has the authority to monitor the implementation of the approved project plans and in this respect:
RAE shall rule, following public consultation with existing and potential users, on amendments to the development plans prepared by the competent transmission operators. RAE shall publish the outcome of public consultation and shall consider:
(a) if the development plan covers all the requirements identified during the above consultation procedure, especially investment requirements;
(b) if the development plan is in keeping with the corresponding non-binding Community-wide ten-year development plan for the natural gas transmission system prepared in accordance with Regulations (EC) No 715/2009 (OJ L 211) and may then ask competent transmission operators to amend their plan accordingly.

3.1.3. Mechanism for financing of investment projects

The investment plans are regulated and monitored by RAE regarding the development of the gas transmission network are financed in accordance with the mechanisms provided in article 88 of the Law as well as the relevant provisions of the Greek Gas Network Code, which is enacted pursuant to the said provision of the law.

Article 88 (Charges for basic activities) provides, in particular, the following:
1. The method of determining charges for each basic activity shall be regulated in charging regulations issued by the RAE, subject to paragraph 4, on the recommendation of the competent natural gas transmission system or distribution system operator and following public consultation.

2. The aim when regulating the method for charging for each basic activity shall be to:
- (a) achieve price stability for the benefit of users;
- (b) obtain a reasonable return on the capital used by the natural gas system operator;
- (c) provide services, including public services, in the most reliable, economic and environmentally-friendly way possible;
- (d) cover the costs to the natural gas system operator of discharging the public service obligations assigned to it;
- (e) strengthen free competition on the natural gas market;
- (f) comply with the principles of transparency, equal treatment and non-discrimination;
- (g) provide short-term and long-term incentives for the profitable operation, consistent planning and development of the infrastructure needed in order to exercise the basic activity and to improve the security of supply and support research activities by operators in connection with their areas of competence;
- (h) take account of the specific characteristics of each market, such as any differences in costs due to the topology of the system;
- (i) provide incentives for charges relating to new consumers;
- (j) carry out new investments in natural gas systems in order to guarantee safe supply, viability and satisfaction of anticipated future demand.

3. The charging regulations may stipulate that all or part of DESFA SA's costs for servicing capital and operating and maintaining the basic LNG facility activity shall be covered via charges for DESFA SA's basic transmission activity. This decision shall be taken on the basis of the part played by the LNG facility in balancing the load in the Greek natural gas system, safeguarding security of supply and facilitating the entry of new suppliers to the natural gas market.

Once investments proposed by the gas TSO are included in the Development Plan and approved by RAE, the costs related to those investments are taken into account in the calculation of the natural gas transmission and LNG terminal Required Revenue and usage tariffs. The relevant Required Revenue and tariffs are set according to the Tariff Regulation established in the year 2012, in the form of the Tariff Regulation of the National Natural Gas System (FEK B' 2093/05.07.2012) based on the provisions of the above article 88 of the law no. 4001/2011, as subsequently amended and supplemented by decision no. 644/2018.

A cost based regulation approach (**rate of return**) is used in the Tariff Regulation. This approach guarantees the TSO a certain rate of return on its Regulatory Asset Base, which is calculated on an ex-ante approved formula set in the Tariff Regulation. Required Revenue for each TSO activity (transmission or LNG terminal usage) is calculated for each year of Regulatory Period in nominal terms, as the sum of the Return on the Regulated Asset Base (fixed assets, including work in progress, and working capital), the Depreciation on Fixed Assets, and Operating Expenses. All projects approved in the Ten Year National Development Plan (new investments and investments under construction) are taken into account in the regular procedure of tariff setting, as explained above.

The methodology for recovering any over- or under–recovery of TSO's revenue in relation to its forecasted revenue (Recoverable Difference) is also included in the Tariff Regulation. In case major changes in the parameters used for the calculation of tariffs may occur (such as forecasted gas demand, cost of borrowing, tax rate, average annual Consumer Price Index, etc), an emergency Tariff Revision is also provided for in the Tariff Regulation either at the initiative of TSO or the RA itself.

With regard to tariffs, RAE, when evaluating the TSO's proposal for new tariffs (every 4 years) can either accept as a whole the TSO's proposal, or reject some of the elements to be taken into account, i.e., some of the TSO's operating expenses.

In conclusion, the approach adopted by RAE for tariff regulation of natural gas transmission and liquefied natural gas regasification aims at pursuing the objectives of adequacy, efficiency and transparency in setting tariffs, trying to act in line with the Gas Directive no. 2009/73/EC and respective European Regulation no. 715/2009.

Relevant project categories

In Greece, high pressure gas infrastructure investments can be developed either by the national TSO, DESFA S.A., or by a private investor - in the latter case in accordance with the prerequisites set out in Article 74 of Law 4001/2011.

As far as investments by the national TSO are concerned, the Greek Gas Network Code and the Gas Tariff Regulation set the procedure, methodology and criteria for deciding on new investments.

1. Specific provisions and procedures on ESFA TYNDP

The current Ten Year Network Development Plan (**TYNDP**) for Greece, approved by RAE, is the one prepared and submitted to RAE by the Greek TSO (DESFA) once a year according to the provisions of article 14, 68 and 69 of Law 4001/2011. The Greek TYNDP stipulates the works to be developed and improved and to interconnect the Greek natural gas system which will be implemented over the next ten (10) years, the timetable and method for constructing such works and their related budgets.

According to the provisions included in Chapter 12 of the Gas Network Code, TSO prepares a draft Development Plan which is submitted to RAE for approval by the 30th June of each year. The draft TYNDP is submitted after a first round of public consultation with third parties by the TSO. RAE then performs a second round of public consultation (according to the provisions of article 14 of law 4001/2011). Within two (2) months of the submission of the draft Plan for NNGS Development by the TSO, RAE may propose modifications to the Operator, mainly with regard to: (i) the including of a new project into the draft; (ii) the exclusion of a proposed project from the draft; or (iii) specific conditions so that a specific project can be included in the draft. The TSO is obliged to fully substantiate the reasons why any scheduled project(s) have not been included. RAE has, in this respect, the competence to enforce the TSO to change the TYNDP with regard to the users' requests for new investments.

In accordance with the Network Code, the TSO immediately accepts a user's request if the request can be accommodated through an already planned (in the TYNDP) network expansions/enhancement. Otherwise the TSO proceeds with a feasibility study. According to the provisions in the Greek Gas Network Code, the feasibility study must include at least a technical evaluation of the application and an economic assessment.

Regarding the economic assessment of new projects upon users' requests, the Tariff Regulation (article 5A) foresees that the TSO shall estimate the impact of the implementation of each such new project on the average tariff for the use of the NNGS during the Tariff Calculation Period. Only new investments at a user's request that fulfil the economic feasibility criterion are included in the Ten Year Network Development Plan. The project is considered as fulfilling the economic feasibility criterion (set in detail in the Tariff Regulation) if no increase in the average tariff for the use of the system occurs upon implementation of the project.

The Law no. 4001/2011 includes a general provision that the TSO, when developing the TYNDP and also assessing any application for new/incremental capacity, should take into consideration the contribution of the relevant project to security of supply.

In addition to the above, and according to the provisions of paragraphs 8 to 11 of article 63Θ of the Energy Law, if an investment has been included in the TYNDP, RAE has the power to enforce the implementation of an investment that has been identified as one that needs to be executed in the next three years (in line with the provisions of paragraphs 6 to 8 of article 22 of the Gas Directive).

RAE monitors and evaluates the implementation of the TYNDP. If it declares that DESFA does not execute an investment, which, under the TYNDP, was to be executed in the following three years, other than for overriding reasons beyond its control, RAE can take any of the following

measures to ensure that the relevant investment is executed, if such investment is still required, on the basis of the most recent TYNDP:

- (a) request DESFA to execute the investment(s) in question;
- (b) arrange for a tender process, which will be open to any investors for the investment in question; or
- (c) oblige DESFA to accept a capital increase to finance the necessary investments and allow independent investors to participate in the capital.

Where RAE makes use of its powers under point (b), as above, it may oblige DESFA to accept one or more of the following schemes: (a) financing by any third party; (b) construction by any third party; (c) building the new assets itself; (d) operating the new asset concerned itself.

In the cases above, DESFA shall provide the investors with any information required to implement the investment, shall connect new assets to the National Natural Gas System and generally contribute, using its best efforts, in order to facilitate the completion of the investment project.

The relevant financial arrangements shall be, in any case, subject to prior approval by RAE.

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

3.1.4. Regulatory rules with respect to innovation

Specific duties of the NRA aimed at encouraging innovation

In accordance with article 14 of the Law no. 4001/2011, as amended:
“Development of infrastructures and monitoring of development plan”

The RAE shall rule, following public consultation with existing and potential users, on amendments to the development plans prepared by the competent transmission operators. The RAE shall publish the outcome of public consultation and shall consider:

(a) if the development plan covers all the requirements identified during the above consultation procedure, especially investment requirements; and

(b) if the development plan is in keeping with the corresponding non-binding Community-wide ten-year development plan for the natural gas transmission system prepared in accordance with Regulations (EC) No 715/2009 (OJ L 211),

and may then ask competent transmission operators to amend their plan accordingly. If there is any doubt as to whether or not the development programme is in keeping with the corresponding Community-wide plan, the RAE shall consult the Agency for the Cooperation of Energy Regulators established under Regulation (EC) 713/2009.

Although the encouraging of innovation is not expressly referred to in the above provisions, it is evident that RAE has, through the above legal framework, extended responsibilities to monitor and coordinate the plans and procedures for the development and implementation of infrastructure projects in a way that gives priority to new projects.

Specific duties of the TSO at encouraging innovation

There is no direct duty on the TSO to encourage innovation. Some of the factors that are considered with regard to the regulation of the charging methodology under Article 88 of Law 4001/2011 may indirectly support innovation, such as:

- The provision of short term as well as long term incentives for the benefit of operation, programming and development of gas infrastructures as well as the strengthening of supply security;
- The provision of incentives regarding charges for new consumers and the installation of “clever” metering systems; and
- The realization of new investments in the natural gas systems to secure supply, viability and future facilitating of the latter.

Also, Article 67 of the Law 4001/2011 regarding the national system of natural gas provides, among other matters, that the projects that are included in the system may also be implemented by an entity in which DESFA participates with 51% at least of its share capital and has the control of the latter. This may indirectly allow more innovative projects to be progressed since private equity funds and enterprises of the private Sector may also be activated in this field. Also, the role of the banking institutions is significant in this matter as the Banks provide financing to such projects.

Article 62 sets out provisions that may act as barriers to innovation, in that it provides that the same person(s) cannot perform the functions of supply and TSO in electricity or natural gas. Special permission is required for joint ventures acting as TSO in two or more Member States, so it is not always easy to learn the lessons of other Member States.

3.1.5. Regulatory rules with respect to security of supply

Specific duties of the TSO aiming at safeguarding security of supply

As mentioned above DESFA, among other duties, is also responsible for the load-balancing and compensation for natural losses and deficiencies of the system in accordance with the gas network code. In this respect, DESFA may conclude, following a tender procedure on the basis of transparent, nondiscriminatory process, contracts regarding purchase and delivery of natural gas. DESFA, in accordance with article 68 of law 4001/2011, has also the duty to fulfil the obligations for the providing of utilities and other services of public interest for which is responsible on the benefit of the general economic interest. In order to recover expenses incurred by DESFA, which are due to the fulfillment of the above obligations, separate invoices are approved, in favour of DESFA, based on the said provisions.

According to article 73 of the law 4001/2011:
1. DESFA SA shall prepare an Emergency and Crisis Management Plan in accordance with the provisions of article 10 of Regulation 994/2010 of European Parliament. The plan shall be approved by the RAE. DESFA SA shall take the measures needed to deal with emergencies in accordance with the Greek Natural Gas System Operating Code.

2. A contract shall be executed between DESFA SA and major customers for interruption to the natural gas supply on a priority basis, in return for a consideration, in the event of an emergency. This contract must be executed with natural gas-fired electricity generation licence holders required under the terms of their electricity generation licence to hold fuel reserves.

Specific duties of the NRA aiming at safeguarding security of supply

Article 12 of the above Law (4001/2011), as amended, provides, amongst others, with regard to the security of supply, the following:

1. RAE monitors the security of energy supply, especially with regard to the balance between supply and demand on the Greek energy market, anticipated future demand, anticipated additional electricity and natural gas production, transmission and distribution potential already programmed or under construction, the standard and level of maintenance and reliability of transmission systems and distribution systems and the application of measures to cover peak demand and conditions on the energy market in terms of the facility to develop new production potential. RAE shall prepare a report by no later than the end of July every two (2) years for the electricity sector and by no later than the end of July every year for the natural gas sector, summarising the results of its monitoring of the security of supply, with due account for the regular forecasts made by energy transmission and distribution system operators. This report shall be published and notified to the Minister for Environmental Affairs, Energy and Climate Change, the Hellenic Parliament and the European Commission.
   RAE monitors the implementation of security measures taken in the event of a sudden crisis on the energy market or where the physical integrity or safety of persons, machinery or plant or the integrity of energy systems are at risk.RAE is the competent authority for the application of the measures required under Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard security of gas supply. To this end, RAE has approved, by its decision no. 500/2018, the updated Preventive Action plan in accordance with the above EU Regulation.

3.2. Regulatory practice

3.2.1. Overview over regulatory practice in Greece

Information about the general regulatory framework in Greece

Stakeholders mention that the framework in general supports investments.

3.2.2. Regulatory practice related to innovation

Innovative projects

The stakeholders also indicated that there is a relatively high share of innovative projects in Greece. The stakeholders recognise the list of typological investments included in Annex II and they consider LNG transmission and LNG terminals as innovative as well.

Examples of innovative project are:
- Power-to-gas facility (bio-methane);
- Reverse flows (North-South); and
- LNG terminal services.

Hydrogen, CO2, and LNG transmission projects are currently under investigation for implementation in Greece.

Adequacy of the NRF relating to its support for innovative investments

The NRF seems adequate to support innovative investments. The stakeholders did not identify any barriers or constraints to implementing innovative projects. If projects are included in the development then the TSO will receive remuneration.

3.2.3. Regulatory practice related to security of supply

Security of supply projects

The stakeholders indicate that almost all projects can be categorised as security of supply investments.

A few specific examples of security of supply projects include:
- Reverse flow (North-South);
- Renewable source (solar/wind/bio-methane) injection into the gas grid;
- LNG terminals; and
- Energy coupling.

Adequacy of the NRF relating to its support for security of supply investments

The NRF seems adequate to support security of supply projects as there is a clear security of supply plan and the stakeholders did not identify any barriers.

Unbundling requirements are considered a barrier for energy storage projects and CNG transmission projects, which cannot be conducted by the TSO. Furthermore interviewees indicated uncertainty about the future in regards to CBA. Currently societal benefits are taken into account in a CBA, but there is a worry that they will not be included in the future.

3.2.4. Illustrative specific projects

The following three illustrative projects are successful innovation and security of supply projects and hence illustrate how the regulatory regime works in practice to incentivise both types of investments. All three projects contribute to security of supply, but the high pressure pipeline and the LNG terminal are also considered innovative projects.

High pressure pipeline from Mandra Attiksi to the facility of EL.PE in Elefsina

Description and aim

The project includes the construction of a 6.7 KM (and 10 inches diameter) pipeline.[3] The pipeline will start from the line valve "Mandra" and follow a route below the railway lines and the new national road of Athens Corinth to the facility of EL.PE. (Hellenic Petroleum). The projects also includes the Construction of the Metering Station to supply ELPE premises in Elefsina.

The current budget of the project is €5.9 mln. The project has been commissioned. The recovery method is through a connection fee by the user and inclusion of the remaining amount in the RAB.[4]

Trans Adriatic Pipeline (PCI 7.1.3))between continental Europe to the South Caucasus and Trans Anatolian Pipelines

Description and aim

The Trans Adriatic Pipeline[5] project is the latest extension of the Southern Gas Corridor, and it aims to connect continental Europe to the South Caucasus- and Trans Anatolian Pipelines. Natural gas, together with renewable energy sources, provides a flexible energy alternative to other fossil fuels such as coal and oil. The development of this pipeline will enable the European continent to meet its long-term energy demands and fuel its economic growth during the energy transition process which it is currently undergoing.

The Trans Adriatic Pipeline has been designated a PCI as it will cross Northern Greece, Albania and the Adriatic Sea in order to connect to the Italian natural gas network in Southern Italy. The shareholding of TAP AG, the company that has been established to plan, develop and construct the pipeline, is comprised of BP (UK), SOCAR (AZ), Snam (IT), Fluxys (BE), Enagas (SP) and Axpo (CH).

The total cost of the pipeline is expected to be €4.5 bln. The European Investment Banks approved a loan of €1.5 bln for the project in February 2018[6], and in July the European Bank for Reconstruction and Development approved a loan of €500 mln[7].

2nd upgrading of the LNG Terminal in Revithousa- more specifically the Third LNG tank

Description and aim

This project[8] consists of an upgrade of the Revithoussa LNG terminal in terms of both capacity and operationalization. The second phase of the upgrade will see the construction of a third LNG storage tank with a capacity of 95 000m^3. The marine facilities will also receive an upgrade in order to be accessible in the future for LNG ships 85% larger than what the terminal can currently accommodate. Finally, the project will also see the installation of new cryogenic equipment, which will increase the rate of gasification by 40%.

The aim of this project is to ensure higher energy security and flexibility.

The total cost of the upgrade of the Revithoussa LNG terminal is expected to be €196 mln. The European Regional Development Fund has agreed to contribute €48 mln to the project.

[3] For more information, see http://desfa.gr/en/projects/new-projects-under-constructions.
[4] For more information, see http://www.desfa.gr/userfiles/consultations/Draft-DP-2017-2026.pdf.
[5] For more information, see https://www.tap-ag.com/.
[6] For more information, see http://www.snam.it/en/Media/energy-morning/20180207_1.html.
[7] For more information, see https://www.ebrd.com/news/2018/ebrd-board-approves-up-to-500-million-loan-for-trans-adriatic-pipeline.html.
[8] For more information, see http://ec.europa.eu/regional_policy/en/projects/greece/upgrade-of-liquefied-natural-gas-terminal-in-revithoussa-to-improve-energy-supply-security.

3.3. Options for improvement

3.3.1. Options to improve regulatory practice

The above discussion shows that the NRF is functional for security of supply and innovation projects and no specific options for improvement are listed.

3.3.2. National law mechanism(s) for implementing options

Not applicable.

3.3.3. Impact assessment

Not applicable.

ANNEX I: TYPOLOGICAL INVESTMENTS – ELECTRICITY

Generally, the term typological investment relates to technical solutions that TSOs can adopt to provide the transmission capacities needed to cover the transmission demand of grid users. Thus, a typological investment is meant to be a type of solution that can be implemented, in principle, by any TSO in situations in which these solutions are appropriate to provide the desired benefit. Hence, typological investments are not specific to a concrete location or a particular TSO. In the following, we have listed a selection of typological investments for the electricity transmission sector, that are differentiated in 7 categories that can be considered innovative as compared to conventional solutions. For each of these categories we have provided a number of examples of solutions, based on our existing knowledge, a literature review and interviews. The list might not be completely comprehensive, but should give an idea of our understanding of the different types of typological investments, we are interested in.

Category	Examples of solutions
New transmission lines based on innovative technology or change of technology of existing lines	• New HVDC lines (→allow to control the power flow; less expansive for long distance transport; undergrounding less complex); • Replacement of HVAC by HVDC lines (→less complex and less expensive; more compact design); • Underground cables or GIL (→ more expensive than OHL but can help improving public acceptance and accelerate the authorisation process); • Design of overhead line poles (→can help improving public acceptance and accelerate the authorisation process); • Replacement of conventional overhead line conductors by high-temperature conductors (→more expensive than conventional ones but can allow to provide additional capacity at a lower cost level and more quickly than by building completely new lines).
Introduction of dynamic capacity rating with the aim of utilising existing transmission lines or transformers at higher levels	Spectrum of technological options ranging from a differentiation of rating levels according to fixed time intervals (e.g. seasonal or time-of-day) down to online monitoring of equipment temperature and adaptation of capacity rating in real-time operation.
Installation of power flow control components in order to better adapt power flow patterns to capacities and topology of the existing grid.	• Phase-shifting transformers; • Semiconductor-based FACTS elements (including HVDC converters).
Investment into components contributing to ancillary services provision (reactive power / voltage control, short-circuit power, momentary power reserves and black-start capability)	• Purely phase-shifting generators (→offer operational flexibility and can serve to improve cost efficiency); • FACTS elements (→ see above).
New or extended power system control and automation technology with the aim to lower the risk of disturbances threatening security of supply	• Improvements in observability and controllability based on conventional sensor and actor devices; • Wide-area measurement systems (aiming at synchronously measuring power phasor angles at the grid nodes to improve observability); • Real-time dynamic security assessment tools (aiming at observing stability phenomena beyond static voltage/current measurements).

Category	Examples of solutions
Partial automation of system operation processes aiming at better utilisation of existing grid capacities	Automatic switching of network devices (in connection with adaptive protection schemes) or of generation-side or demand-side flexibilities in case of grid component outages in order to reduce the demand for (n-1) capacity reserves.
Improvement of approaches to curative congestion management providing the possibility to operate systems closer to their technical limits and/or to improve security of supply	• Generation-side flexibilities (especially renewables); • Demand-side flexibilities (DSM/DR); • Storage components; and • Technologies coupling the electricity sector with other sectors (gas, heat, traffic).

ANNEX II: TYPOLOGICAL INVESTMENTS – GAS

Typological investments are meant to be those type of investments whose aim is to promote innovation in the gas transmission systems while ensuring or enhancing the level of security of supply of a region. Hence, by definition, they can be implemented independent of a specific TSO and location.

In the following table, we offer a resume of the typological investments for the gas transmission system we have deemed as innovative compared to "conventional" solutions.

The investments are broken down into four categories each accompanied by examples that emphasise their importance and impact on the gas system.

Category	Examples of solutions
Increased need for flexibility for market development and security of supply.	• (Power-to-gas) Usage of excess pipeline capacity as "energy" storage of excess wind or solar energy by utilizing electrolysis (an efficient utilization of the excess of electricity produced by non-programmable sources of energy); • Increase withdrawal and injection capacity in storages by incentivising investments supporting flexibility (support of gas market liquidity and security of supply level); • Allowance of higher pressure in selected pipeline/routes (increase of flexibility of the supply side).
Incentivise and facilitate upgrade of biogas to the transmission system.	• Investments in upgrade of biogas to transmission system (support of gas market liquidity and security of supply).
Digitalisation of operations, through e.g. drone inspections and artificial intelligence (AI), resulting in a safer and cost-efficient operation.	• Drone inspections and AI in combination with modern SCADA systems can serve as input to reliability based operation and maintenance (lower maintenance cost and reduction of unforeseen/unplanned shutdowns).
In order to support security of supply and add liquidity to the gas market, there is a need to build interconnectors in Europe.	• More reverse flow systems could be considered to increase flexibility in the supply routes (reduction of dependency and power of trading of the large gas suppliers); • Enhancement of available gas supply in situation of supply crisis; • possibility of arbitrage a price convergence between markets to support the development of the internal market.

ANNEX III: POTENTIAL REGULATORY BARRIERS FOR PROJECTS

Regardless of the character of a project (e.g. projects enhancing security of supply or applying innovative technologies, which this questionnaire is focussing on) there might be potential regulatory barriers for implementing projects in general but maybe also barriers for special kind of projects. To give you an impression what kind of barriers we have in mind, we have listed some examples of such barriers in the following. It should be noted that there might be different or even more or less barriers in the regulatory framework of your country.

Type	Description / Explanation
Higher TSO CAPEX but lower expected OPEX within the TSO	the investment upfront is more costly, but has a potential of lowering the operational costs in the future. However, because of its innovative and more risky character the lower OPEX is not guaranteed. If not allowed to put the costs in case of a failure in the tariffs, TSO would not invest in innovative solution.
Higher TSO CAPEX, but benefits go to the wider society, instead of the TSO	This is a situation where higher investment, including in new technologies, is needed on the part of a TSO but benefits in terms of RES integration, RES curtailment or CO2 avoidance benefit other players in the society, while the TSO is only faced with the cost increase. Projects in regulatory frameworks, which do not distribute adequately the benefits to the TSO that bears the costs and takes the risk, are less likely to happen. This could also apply to cross-border investments involving several TSOs.
Investments in smart grid elements /technology aimed at replacing planned grid investments	Investments in smart grids and other smart elements that actually reduce the need of physical construction of lines for example due to a better interactive/intelligent grid management of balancing tools (battery storage) may provide a reduction in the regulated asset base, however with a slight increase of tariffs, might not be realised.
Investments in security of supply – projects without commercial benefits	Projects that ensure security of supply will in some cases never bring enough commercial benefits such as a pipeline would be going to be used only in case of emergency. If the security of supply (e.g. diversification of the sources for gas) is not put into tariffs, a TSO is most likely not willing to invest.
Lower TSO TOTEX but shift in the CAPEX/OPEX ratio	In some member states CAPEX and OPEX are treated differently in the regulatory regimes. Depending on the incentives set by doing so, technical solutions/projects with higher CAPEX might be preferred by the TSOs even if they result in higher total costs.

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