



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

Country Report - Spain



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EXECUTIVE SUMMARY

Assessment of the NRF and the regulatory practice of the electricity sector in Spain

The electricity NRF in Spain

The Ministry of Ecological Transition is responsible for adopting the necessary measures to secure the supply of electricity and the financial sustainability of the electricity system. The CNMC (National Commission for Markets and Competition) acts as the independent supervisor on the performance of the energy sector. Red Eléctrica de España, SA" (REE) is the sole TSO for the Spanish electricity system (there are other owners of certain transmission facilities).

CNMC supervises the investment plans of the TSO and can make recommendations to the Ministry for consideration before the proposals are approved. The Ministry can request changes to investment plans from the TSO.

The remuneration of the TSO is based on reference unit values of investment and of operation and maintenance, unit values that are determined by the Ministry of Ecological Transition following a proposal from the CNMC. There are also financial incentives in place for the availability of the transmission network.

There are no references to innovation in the NRF. REE has the specific responsibility of ensuring the continuity and security of supply and the proper coordination between the transmission system and generator.

The regulatory practice in the electricity sector in Spain

The TSO proposes a National Plan justifying the actions to safeguard security of supply. The Ministry approves the National Plan based on a prior report from the CNMC.

Although there is no ear-marked funding for innovative projects, they are in practice often remunerated. For specific projects, the TSO can obtain approval and funding on a case-by-case basis if they are not on the list with reference unit values.

Options for improvement

The tariff methodology could be improved for innovative projects. To tackle this issue, the following option could be considered:

(i) Statutory reference to innovation.

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

The gas NRF in Spain

CNMC (National Commission for Markets and Competition) supervises and controls the correct functioning of the electricity sector and of the natural gas sector. There are 4 TSOs certified according to Regulation 755/2009. One of them, ENAGAS, as the TSO which owns of most of the gas infrastructure transmission network, is in charge of the technical management of the gas system. As Technical System Manager, ENAGAS is responsible for guaranteeing the correct functioning and the continuity of gas supply of the whole system.

The methodology to determine the remuneration of the regulated activities in the gas sector is based on the concept of an "efficient and well-managed company" according to the principle of carrying out the activity at the lowest cost for the gas system. It pursues the recovery of investments, a reasonable investments' rate of return and a continuously improving management, which must benefit consumers and network users.

A regulatory period of six years is applied. The remuneration parameters may be adjusted every three years for the remainder of the regulatory period in the event that there are significant variations in the underlying revenues and costs.

There is no specific duty to encourage innovation. The TSO is responsible for the operation and technical management of its transmission networks, and the correct maintenance of its network.

The regulatory practice in the gas sector in Spain

The last National Plan was approved in May 2008 and covered the period from 2008 to 2016. No follow-up Plan has been drafted yet. Due to the low level of gas demand compared to the estimates in the last Plan, which led to a situation of overinvestment, up to date the level of investments in the transmission network is low.

There is no mechanism to fund innovative projects, but pilots can be remunerated if they are approved as part of the energy policy legislation.

Options for improvement

The NRF allows investments in security of supply projects that are considered necessary. The process to obtain approval for projects is compared to other Member States ad hoc as there is no approved National Plan. This means that projects are in practice assessed on a case-by-case basis

The tariff methodology could be improved for innovative projects, especially for projects that do not directly benefit the TSO but do result in benefits for other market participants. The following options for improvement are suggested:

- (i) Statutory reference to innovation; and**
- (ii) Consultation on (and approval of) investment plans;**
- (iii) Social cost benefit analysis.**

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 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 Section 3, which is related to gas. Each of these sections examines the legal framework (Section 2.1 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 Spain, 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 Spain. 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 have not carried out 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 Spain

2.1.1. *Overview of the regulatory framework of Spain– legal rules*

Act 24/2013 of the Electricity Sector, sets up the Legal Framework for electricity in Spain. It derives from Act 54/1997, which introduced a framework for the liberalisation of the electricity sector in Spain according to EU Regulations. Act 54/1997 was amended several times and finally it was substituted by the current Act 24/2013.

Act 54/1997 imposed vertical established the principle of third party rights of access to networks. The remuneration regime for networks is set by the Ministry for the Ecological Transition. The management of the system was entrusted to both mercantile and private companies, responsible respectively for financial and technical management.

According to Article 34 of Act 24/2013, the electricity transmission network consists of:

- The primary transmission network: lines, transformers and other electrical elements with nominal voltages equal to or greater than 380 kV, the international interconnection facilities and, where appropriate, interconnections with the electrical systems of the non-peninsular territories;
- The secondary transmission network: lines, transformers and other electrical elements with nominal voltages equal to or greater than 220 kV not included in primary network and those installations with nominal voltages below 220 kV, which fulfil the functions of transmission;
- All those assets for communication, protection, control, auxiliary services, land, buildings and other auxiliary elements, electric or not, necessary for the proper functioning of the specific facilities of the transmission network.

Transmission is carried out under a single transmission agent and system operator scheme. "Red Eléctrica de España, SA" (REE) is the sole TSO for the Spanish electricity system (in fact, there are other owners of certain transmission facilities, but they represent a minor part of the system). REE is also the Technical Manager of the System. Among other duties, REE is responsible for guaranteeing the continuity and security of the electricity supply, ensuring proper coordination between generators and the transmission and distribution networks, and operating and managing the transmission network. REE is a listed company partially owned by the State (20%).

The main regulatory authority is the Ministry for the Ecological Transition that, in general terms, is responsible for adopting the necessary measures to secure the supply of electricity and the financial sustainability of the electricity system. The Ministry authorizes facilities: (i) with an installed capacity of more than 50MW, in the case of generation; (ii) in the case of transmission and distribution lines, when they affect the territorial scope of more than one autonomous community; and (iii) when they are off shore in the territorial sea. Autonomous communities (CCAA) grant the necessary authorizations when the electric infrastructure solely affects their respective territory.

Municipalities grant only the operational work and activity licenses for the assets.

The CNMC, an independent body set up by Act 3/2013 and subject to parliamentary control, acts as the independent supervisor on the performance of the energy sector, not only from a regulatory perspective but also from a competition standpoint.

CNMC also issues reports to the Ministry in relation to regulations, authorization of facilities, energy planning, assets retribution regime, quality of supply, etc. CNMC has particular duties and responsibilities relevant to transmission development that are described in Section 2.1.3.

2.1.2. Specific legal rights and duties

Role of the TSO

The role is described in Act 24/2013, Article 36:

- REE must collaborate with the Ministry in the evaluation and monitoring of the annual and multi-year investment plans in order to meet their objectives in relation to security of supply that are contained in the planning regulations;
- REE must provide the information required by the Ministry and the CNMC to supervise and control its activity;
- REE must guarantee non-discrimination between users or categories of users of the transmission network, providing users with the information they need to efficiently connect to the network; and
- REE must grant permission to connect to the transmission network.

Undertaking of investments

The relevant passages are found in Act 24/2013, Article 36:

- REE must guarantee the development and expansion of the transmission network by executing the investment plans approved by the Ministry; and
- REE must ensure the maintenance and improvement of a network configured under homogeneous and coherent criteria of minimum cost.

Role of (regulatory) authorities

According to article 34 Act 24/2013 and Royal Decree 1955/2000, the planning of the transmission network is approved by the Government in coordination with the CCAA, upon REE proposals as Technical Manager of the System and following the CNMC's report on those proposals.

The planning includes a development plan for transmission infrastructure, which is approved every six years. This development plan is binding on the TSO and determines the yearly investment planning of transmission infrastructure to be developed by the TSO. The TSO is then obliged to execute the approved investments.

CCAAAs are responsible for granting authorisations for transmission assets within their respective territories (the Ministry is competent when a transmission line goes beyond the territory of a single autonomous community).

The TSO proposes National Plan justifying, among other options, many of the actions to security of supply. The Ministry approves National Plan with a prior report from the CNMC.

According to Act 13/2013, CNMC supervises the investment plans of the TSO and may make recommendations to the TSO for their modification before the proposals are submitted to the Government. CNMC are therefore responsible for analysing and evaluating the TSO proposal. The Ministry may require the TSO to adapt its proposals to the criteria of the CNMC before its approval.

Annually, the TSO files with the CNMC a report that certifies the degree of compliance with the investment plan executed in the previous year.

Institutional or procedural constraints on the performance of these roles

The procedural provisions set out a complex mechanism to bring to the table the views of all the actors that play a role in the investment planning process for network development and in the process of determining the remuneration for transmission activities.

2.1.3. Mechanism for financing of investment projects

Article 14.8 of Act 24/2013: transmission network activities receive a regulated remuneration based on the costs of building, operating and maintaining the facilities in accordance with the principle of carrying out the activity at the lowest cost for the electricity system.

Royal Decree 1047/2013 establishes the methodology for calculating the remuneration of the transmission activity upon a single system applicable to all the types of assets integrated in the transmission network. The methodology introduces tools that encourage efficiency in infrastructure construction and also in the operation and maintenance of networks. The main

parameters of the methodology are defined by the Government (it approves the royal decrees) and developed by the Ministry upon a CNMC proposal. The response of the TSO is considered in this process, but the TSO has no power regarding defining or developing the remuneration methodology.

The principles and criteria for setting the remuneration are:

- Regulatory periods of 6 years. The current regulatory period ends in 2019;
- Remuneration for investment will be made for assets in service based on their net value. All assets currently in service are assigned useful life and investment compensation;
- The financial remuneration rate will be linked to the performance of the 10-year State Obligations increased by a spread. In the first regulatory period, this differential is 200 basis points;
- The facilities will be remunerated based on the date on which they entered into service;
- The model is based on reference unit values of investment and of operation and maintenance, unit values that are determined by the Ministry (Order IET/2659/2015), following a proposal from the CNMC;
- The extension of the useful life of the installations is contemplated, setting a remuneration for when this situation occurs in the future;
- Incentives are established for the availability of the transmission network i.e. assets that are available more are rewarded more highly;
- The value of the assets in service for the start of the current regulatory period is established considering:
 - 1. The replacement value for those assets that came into service after 1998 (calculated by applying unit investment values and their individualized useful life);
 - 2. For those assets put into service before 1998, an implicit valuation was made based on the current remuneration received and a minimum average residual life that may be increased by justifying the renewal and improvement carried out in the past.

For the purposes of determining their remuneration, in accordance with article 34.4 of Act 24/2013, the TSO must request from the Ministry the approval of its annual investment plan and the multi-year plans corresponding to a 3-year period, by clearly identifying the actions included in the planning, its main technical characteristics, the necessary parameters for the calculation of its remuneration, the budgets and the execution schedule. These investment plans must also be submitted to the CNMC.

The Ministry for the Ecological Transition, duly authorized by the Commission Delegate of the Government for Economic Affairs and with regard to the CNMC proposal, annually establishes the remuneration for each owner of transmission facilities (as mentioned above, only REE owns the transmission facilities).

CNMC's proposal contains the breakdown of compensation for each one of the company's facilities.

The remuneration for the company will be the sum of the remuneration of each one of the facilities it owns plus the availability incentive. The incentive to the availability that the company will be able to receive in each year can range between +2.5 percent and -3.5 percent of their remuneration per operation and maintenance of that year. The incentive is calculated for each facility taking in consideration the numbers of hours it has been working within the correspondent period (Royal Decree 1047/2013, articles 20-24).

Interconnectors and other so-called special investments are excluded from the approved standards for the remuneration of the assets. According to article 19 Royal Decree 1047/2013, special investments are those whose design characteristics, configuration, conditions or construction techniques are not included in the Ministry Order that sets the mentioned reference unit values for investment and operation and maintenance. Sub-marine lines, direct current lines and converters from alternating current to direct current will be always considered as special investments. For an investment to qualify as a special investment, the TSO (always REE) must make a request to the Ministry, which decides whether it is a special investment based on a report issued by CNMC. The TSO must detail and justify the petition, including the project CAPEX and OPEX. Once the corresponding assets are put into service, their annual remuneration is determined following the same formal procedure as the rest of the transmission assets and through the same administrative decision process.

Relevant project types

As described above, there is a single financing regime applicable for all the types of facilities. The criteria that impacts the remuneration is the date on which the assets entered into operation, in order to assign their investment value.

There is a specific procedure to determine the remuneration parameters for special investments, but once those parameters are determined, the remuneration regime is the same for all types of assets.

2.1.4. Regulatory rules with respect to innovation

Specific duties of the TSO aimed at encouraging innovation

There is no specific duty to encourage innovation but it is matter of fact that the obligations referred to in the previous answers implicitly determine an obligation to innovate in order to get the mandatory continuity and security of supply at a minimum cost.

Article 1.1 of Act 24/2013 states that "the purpose of this law is to establish the regulation of the electricity sector in order to guarantee the supply of electricity, and to adapt it to the needs of consumers in terms of safety, quality, efficiency, objectivity, transparency and at minimum cost."

Specific duties of the NRA aimed at encouraging innovation

There is no specific power or duty to encourage innovation but, according to art. 3 RD 1047/2013, There is no specific power or duty to encourage innovation but, according to article 3 of Royal Decree 1047/2013, the technical and financial parameters that may be reviewed before the start of each regulatory period are: (i) the unit values of reference of investment and operation and maintenance; and (ii) the useful lives of the facilities or the availability objective of the transmission network for the regulatory period. So we could say that CNMC and the Ministry have got a certain implicit mandate to encourage innovation.

2.1.5. Regulatory rules with respect to security of supply

Specific duties of the TSO aiming at safeguarding security of supply

According to Act 24/2013, Article 36):

- REE is in charge of the reliability of the transmission network; and
- REE, as Technical Manager of the System, also has the specific responsibility of ensuring the continuity and security of supply and the proper coordination between the transmission and generation systems.

Specific duties of the NRA with respect to security of supply

According to Article 7 of Act 24/2013, the Government may adopt, for a specified period, the necessary measures to guarantee the supply of electric power in the case of shortages or serious threat to the physical integrity or safety of individuals, equipment or facilities or for the integrity of the transmission or distribution networks. The measures to be adopted by the Government may consist on direct operation of generation, transmission and distribution facilities, the establishment of special obligations regarding security stocks of primary sources for the production of electrical energy, limitation of access rights to networks by third parties, etc. The Government shall also determine the remuneration applicable to those activities that would be affected by the measures.

2.2. Regulatory practice

2.2.1. Overview over regulatory practice in Spain

Information about the general regulatory framework in Spain

A distinguishing characteristic of the Spanish regulatory framework is the role of the model on which allowed revenues are based. This model is based on reference unit values of investment and of operation and maintenance, unit values that are determined by the Ministry of Ecological Transition following a proposal from the NRA.

For interconnectors and special investments, the approval of the Ministry of Ecological Transition is required.

Main regulatory barriers

Interviewees are generally satisfied with the system of reference unit values as it provides flexibility and strong incentives to outperform the benchmark. Not all projects fit within the system of reference unit values.

REE can request certain projects to be placed on the list of the regulator as a special project. According to stakeholders, the regulator will request a lot of information for the particular project. However the information is deemed necessary to be able to admit the exception of the installation in the remuneration framework. The process for approval of special projects does not appear to be a major barrier for investments.

2.2.2. *Regulatory practice related to innovation*

Adequacy of the NRF relating to its support for innovative investments

Due to the system of incentive regulation there are strong incentives to invest in innovative projects that increase the reliability and efficiency of the system.

Although there is no ear-marked funding for innovative projects, they are in practice often remunerated. For specific projects, the TSO can obtain approval and funding on a case-by-case basis if they are not on the list with reference unit values.

With regard to the list of typological projects in Annex 1, REE has projects in many of the categories. The investments in the list are considered innovative. REE has for example a project for the interconnection with France for which they used smarter technology like voltage source converters.

2.2.3. *Regulatory practice related to security of supply*

Security of supply projects

Special projects are usually approved when proposed by the TSO.

The stakeholders consider one of the best examples of what they would regard as a security of supply investment that they have developed operational tools to integrate renewables in a safe and secure way in the market.

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

The regulator justifies many of the new investment projects on the basis of security of supply. Stakeholders remark that the regulatory standards for security of supply are quite demanding. REE cannot change the standards currently. There is no framework that provides clarity on when to invest in network reinforcement and when not.

Regarding special or 'singular' projects stakeholders remark that the decision process could be improved (e.g. single window permitting). Social Cost Benefit Analysis is applied but according to stakeholders not all benefits (including non-monetary) are considered.

Within the current regulatory framework the TSO cannot invest in storage projects. The TSO, due to the separation of activities cannot be the owner of generation facilities. This is considered a barrier to invest in projects that can provide stability to the electricity system.

2.2.4. *Illustrative specific projects*

The following projects are examples of successful innovative or security of supply projects and hence illustrate how the regulatory regime works in practice.

Spain-France sub-marine interconnection (security of supply project)

Description and aim

This new sub-marine electricity interconnection through the Bay of Biscay will enable an increase of the electricity exchange capacity between Spain and France. The new

interconnection between the Gatika substation (near Bilbao, Spain) and the Cubnezais substation (in the French region of Aquitaine) consists of 4 cables, two per link. This underwater and underground direct current dual link will have a transmission capacity of 2 x 1,000 MW. The interconnection was designated as a Project of Common Interest (PCI) in 2013.

At present, this project is in the consultation phase and it is planned that the interconnection will be commissioned in 2024 – 2025.

Approval process and financial mechanisms

This Project is included in the Spanish and French Transmission System Planning (NDPs) issued by the competent Ministries, and as any of the other transmission development projects included in it, REE as Spanish TSO and RTE as French TSO have the legal (regulatory) responsibility to develop it (jointly, in this case of international interconnection). Additionally to the classification of special (or “singular”) according to the Spanish transmission regulation, because of its submarine and HVDC nature, it was subject to CBCA decisions taken by Spanish and French NRAs.

Interconnectors and other so-called special investments are excluded from the approved standards for the remuneration of the assets. According to art. 19 RD 1047/2013, special investments are those whose design characteristics, configuration, conditions or construction techniques are not included in the Ministry Order that sets the mentioned reference unit values for investment and operation and maintenance. For an investment to qualify as a special investment, the TSO (always REE) must make a request to the Ministry of Energy, which decides whether it is a special investment based on a report issued by CNMC. The TSO must detail and justify the petition, including the project CAPEX and OPEX.

Once the corresponding assets are put into service, their annual remuneration is determined following the same formal procedure as the rest of the transmission assets and through the same administrative decision process. According to REE the project did benefit from:

- Provisions to tackle mismatch between realised and expected CAPEX/OPEX;
- Sliding scale/split of costs and benefits.

Submarine Line Morvedre-Santa Ponça (Rómulo Project) (security of supply project)

Description and aim

The goal of the investment is the same as its justification: to substitute part of the electricity consumption of the Balearic islands (that were isolated from the Spanish peninsula grid before this project) with power coming from the mainland, which is not only cheaper but also with less CO₂ emissions (renewable mix in the Balearic islands is still very poor).

Approval process and financial mechanisms

This Project was included in the Spanish Transmission System Planning (NDP) issued by the competent Ministry, and as any of the other transmission development projects included in it, REE as Spanish TSO has the legal (regulatory) responsibility to develop it. As part of the approval process a Social Cost Benefit Analysis was performed. The project does not benefit from any specific incentives.

Almacena project (innovative project)

Description and aim

As part of its commitment to developing new energy storage technologies that optimise system efficiency, REE has launched the Almacena project, consisting of an electrochemical energy storage solution connected to the transmission grid, as well as the installation of a prototype inertia flywheel in the Canary Islands.

According to REE, the project will allow the Spanish TSO to obtain expertise in building, and the operation and maintenance of storage technology.

Approval process and financial mechanisms

The project is co-financed by the European Regional Development Fund (ERDF). This investment is not regulated and we will not receive any retribution for its implementation. The Project received FEDER funding.

AMCOS project (innovative project)

Description and aim

Advanced Modular Compensator System or High-Voltage electricity Transmission Networks Regulation with ultracapacitors. This project involves the development of electronic equipment, in laboratory testing phase, that can control voltage in an electricity substation and allows the frequency of an isolated system to be kept constant. The aim and focus of the project is to design, manufacture, test and validate under laboratory conditions a modular and compact hybrid FACTS prototype device with integrated fast storage systems (ultracapacitors (UC) or other technologies with similar characteristics, such as Li Ion technology) with high charging and discharging rates applied to electricity transmission grids in order to manage voltage and frequency level, as essential parameters that provide stability to an electricity system.

Approval process and financial mechanisms

The project is funded by the CDTI and the European Union through the European Regional Development Fund (ERDF) and supported by the Ministry of Economy and Competitiveness. This device (storage device to improve the stability of the electrical system) is not a regulated activity/equipment.

Connection Navarra-Basque Country (security of supply project)

Description and aim

New AC OHL 400kV double circuit Ichaso-Castejón/Muruarte 400kV (one circuit Castejón-Ichaso, second circuit Muruarte-Ichaso). This project allows to solve today and future congestions associated to RES integration. In addition, it allows the future connection of the cross border project 276.

The ALISIOS project (innovative project)

Description and aim

This project is undertaken in order to assess, in an initial phase, the impact of the installation of an electricity storage system to improve the quality of the frequency of the system, mitigate sudden variations in renewable generation and increase the contribution of these energies to the energy mix under safe conditions in order to ensure the security of supply.

2.3. Options for improvement

2.3.1. Options to improve regulatory practice

The above discussion shows that the NRF is functional for security of supply projects.

The tariff methodology could be improved for innovative projects, especially for projects that do not directly benefit the TSO that do result in benefit for other market participants. In practice, it is possible to obtain funding for innovative projects but this depends on the initiative of the TSO.

(i) Statutory reference to innovation

The stakeholders criticized that there is no long-term perspective on innovative investments. 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 be shaped by governmental policies, statutory duties or could be included in the NDP.

2.3.2. National law mechanism(s) for implementing options

We consider that, with the exception of the following, the above mentioned changes could be implemented using legal powers already available to the NRA or others under the existing NRF. Option (i): The current Article 14 of Act 24/2013, which describes the drivers to set up the remuneration methodology, is very focused on efficiency and security of supply (as mentioned, remuneration is based on the costs of building, operating and maintaining the facilities, based on the concept of an "efficient and well-managed company" and in accordance with the principle of carrying out the activity at the lowest cost for the system) and it does not contain any reference to innovation. This article would be the appropriate place to establish a clear mandate to the Government (who defines the remuneration methodology, i.e. RD 1047/2013, which should be consequently amended) to expressly include in the remuneration scheme a parameter

directly related to innovation. This parameter should then be required to be used by the NRA (the Ministry assisted by the CNMC) in determining the remuneration of the assets.

The process to amend the Act 24/2013 is the ordinary legislative process in Spain. The Government can consequently amend RD 1047/2013 itself, following the previous mandate of the Parliament (i.e. the Act 24/2013 amendment).

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 Spain

3.1.1. *Overview of the regulatory framework of Spain– legal rules*

Act 34/1998, of the Hydrocarbons Sector, in Title IV, establishes the basis for introducing competition in the gas sector, as well as a new market model. Act 34/1998 has been amended several times in order to comply with EU regulations.

Royal Decree 1434/2002 (also amended several times) regulates all the aspects relating to the requirements that companies must fulfil in order to carry out the transmission, distribution and final supply of natural gas, as well as their rights and obligations, which undoubtedly creates a clear framework of relations between the different agents that act in the market.

As a result, regasification, strategic storage, transmission and distribution of gas are all regulated activities and must be carried out by mercantile companies whose exclusive purpose is their respective activity.

The gas system is formed of: the basic network, the secondary transmission network (gas pipelines whose maximum design pressure is less than 60 and greater than 16 bar), the distribution network, and the complementary assets.

The basic network is formed of:

- a. The gas pipelines of primary transmission of natural gas at high pressure (equal to or greater than 60 bar), including the international connections and the connections with natural gas deposits, with storage facilities, with regasification plants, with compression stations, as well as all the assets necessary for their functioning;
- b. The regasification of liquefied natural gas destined to supply the transmission network, and the liquefaction of natural gas; and
- c. The basic storage of natural gas.

Responsibility for planning in relation to hydrocarbons sits with the Ministry for the Ecological Transition with the participation of the Autonomous Communities (CCAA) and it is presented to the Parliament for information only.

CNMC (National Commission for Markets and Competition) supervises and controls the correct functioning of the electricity sector and of the natural gas sector. It is a public body, independent of the Government and subject to parliamentary control. It entered into operation on October 7 2013. Act 3/2013 sets up CNMC's legal regime, functions and duties.

ENAGAS, S. A., is the owner of most of the facilities of the basic gas transmission network and it is responsible for the technical management of the Spanish gas system. ENAGAS is a listed company partially owned by the State (5%). There are several TSOs, but only ENAGAS is the Technical Manager of the gas system. It owns a specific subsidiary company to carry out this activity (ENAGAS GTS). As the Technical System Manager, ENAGAS GTS is responsible for guaranteeing the correct functioning and the continuity of gas supply of the whole system.

3.1.2. *Specific legal rights and duties*

Role of TSO

According to the Article 64 1 of Act 34/1998, ENAGAS GTS (as Technical System Manager):

- can propose to the Ministry of Ecological Transition the inclusion in the basic transmission network of a new facility or the increase of capacity of an existing one; and
- must collaborate with the Ministry in the evaluation and monitoring of the annual and multi-year investment plans presented by the owners of the gas transmission facilities.

According to Article 68 b) of Act 34/1998, TSOs must file with the Ministry and with the CNMC, before October 15 of each year, annual and multi-year investment plans. The annual investment plan will include, at least: data for projects planned for the following year, the projects' main technical characteristics, its budget and implementation schedule.

Undertaking of investments

TSOs must sufficiently demonstrate compliance with the requirements set up in Royal Decree 1434/2002 in terms of their legal, technical and financial capacity to carry out their duties. In particular, they have, as their main obligation in this field, to build and operate the facilities in accordance with the requirements established in the corresponding administrative authorisations.

Role of NRA (regulatory) authorities

The Ministry for the Ecological Transition is the main regulatory authority with regard to infrastructure. The role of the Ministry includes the following:

- to authorize the facilities forming part of the basic network of natural gas, as well as those of other secondary transmission and distribution facilities when they exceed the territory of a single Autonomous Community. In the process for granting the authorizations of those facilities of the secondary transmission network that are the competence of the CCAA, the Ministry issues guidance with binding criteria for the CCAA that must be followed in the authorisation process;
- to give instructions regarding the expansion, improvement and adaptation of gas transmission and distribution infrastructures in order to guarantee adequate quality and secure the supply of gas.

The general position is that it is not mandatory to have a plan for gas. However, this does not apply to facilities that belong to the basic natural gas network and to the secondary transmission network, determination of the total regasification capacity of liquefied natural gas needed to supply the gas system and basic storage of natural gas. In all those cases having a plan is mandatory.

CNMC is responsible for advising the Ministry for the Ecological Transition on the procedures to grant the initial authorisation and the authorisation for the modification, transference or closure of installations on the basic natural gas network. CNMC role is advisory only.

CNMC also issues non-binding reports to the Ministry for the Ecological Transition in relation to the quality of supply and quality of service, the Technical Management Standards of the transmission system and its detailed protocols. These reports assist the Ministry for the Ecological Transition to approve the Standards.

Institutional or procedural constraints on the performance of these roles

The procedural provisions set out a complex mechanism to bring to the table the views of all the actors that play a role in the investment planning process for network development and in the process of determining the remuneration for transmission activities.

3.1.3. Mechanism for financing of investment projects

Act 18/2014, of October 15, approving urgent measures for growth, competitiveness and efficiency, devotes chapter II of Title III to the financial sustainability of the natural gas system. Articles 59 and 60 include the principles of the financial regime and the remuneration of regulated activities. Article 61 sets up the procedure for calculating that remuneration. This Act is amended by Ministerial Order every year to set the yearly remuneration of operators.

The methodology to determine the remuneration of the regulated activities in the gas sector is based on the concept of an “efficient and well-managed company” according to the principle of carrying out the activity at the lowest cost for the gas system. It pursues the recovery of investments, a reasonable investments’ rate of return and a continuously improving management, which must benefit consumers and network users. According to Annex XI of the Act 18/2014, the methodology is determined upon a formula that combines two elements: Availability (investment costs and operation & maintenance costs) and Continuity of supply (efficiency and demand).

The remuneration parameters of the regasification, basic storage, transmission and distribution activities are set for regulatory periods of six years, taking into account the cyclical aspect of the economy, gas demand, the evolution of costs, efficiency improvements, adequate remuneration for these activities and the financial balance of the system during the regulatory period.

The remuneration parameters (except the investments' rate of return) may be adjusted every three years for the remainder of the regulatory period in the event that there are significant variations in the underlying revenues and costs. Every year a Ministerial Order is approved determining the exact figures of TSOs' remuneration for the following year, calculated according to principles and formula established in Act 18/2014. For 2018, this is the Order ETU/1283/2017 of the previous Minister of Energy (now the Ministry for the Ecological Transition).

For regasification, basic storage and transmission assets, the financial compensation rate is linked to the performance of the State's ten-year bonds in the secondary market, increased with an adequate differential that today is 50 basis points (article 65 of Act 18/2014). This financial remuneration rate is set for each regulatory period.

The Ministry for the Ecological Transition approves the specific remuneration for each year within the regulatory period and for each of the companies that own regasification, transmission and basic storage of natural gas facilities. To this end, before October 1 of each year, the CNMC sends to the Ministry a proposal for compensation for each of those companies owning regasification, transmission and storage facilities.

3.1.4. Regulatory rules with respect to innovation

Specific duties of the NRA aimed at encouraging innovation

There is no specific duty to encourage innovation. Nevertheless, every six years, when looking at the new regulatory period, efficiency can be a factor to be taken into account in the proposal of the new regulatory scheme that CNMC issues to the Ministry.

Specific duties of the TSO aimed at encouraging innovation

There is no specific duty in this regard.

3.1.5. Regulatory rules with respect to security of supply

Specific duties of the TSO aiming at safeguarding security of supply

Article 64.1. of Act 34/1998 assigns to ENAGAS GTS responsibility for the operation and technical management of the basic and secondary transmission networks, and the duty to guarantee the continuity and security of the natural gas supply.

In particular, ENAGAS GTS must:

- Determine and control the level of guarantee of supply of natural gas in the system in the short and medium term;
- Provide the TSOs with the necessary instructions for the correct operation of the natural gas system in accordance with the criteria of reliability and safety that are established;
- Coordinate and modify, where appropriate, the maintenance plans of facilities in a way that ensures their operation and availability to ensure the security of the system;
- Propose to the Ministry the emergency plans it deems necessary, detailing the available stocks, their location and period of replacement, as well as their annual reviews;
- Supervise the correct execution by the agents of the system of the measures adopted by the Government in emergency situations and prepare a report on the results of said supervision that will be made available to the Ministry and the CNMC.

Specific duties of the NRA aiming at safeguarding security of supply

See Article 7.1 of Act 3/2013:

CNMC can establish, by means of circulars, prior to a hearing process and with criteria of economic efficiency, transparency, objectivity and non-discrimination:

- The methodology related to the provision of balancing services that provide adequate incentives for network users to balance their inflows and outflows from the gas system;
- The methodology regarding access to cross-border infrastructures, including the procedures for allocating capacity and managing congestion.

CNMC also supervises storage access conditions, including underground storage, liquefied natural gas tanks and gas stored in gas pipelines, as well as other auxiliary services.

CNMC ensures compliance with network security and reliability standards.

3.2. Regulatory practice

3.2.1. *Overview over regulatory practice in Spain*

Information about the general regulatory framework in Spain

The last National Investment Plan was approved in May 2008 and covered from 2008 to 2016. There is not a draft of a future plan known. Due to the recession, there was a decrease in demand, even though there is now a slow recovery trend. The low demand compared to the estimates in the last Plan led the system to a situation of overinvestments. Consequently, up to date the level of investments needed is low.

Main regulatory barriers

There is no regulatory framework or budget for innovation, and this is the main barrier. Thus, there is no remuneration for pilot projects. As there is no framework and if the project is not included in the National Investment Plan, then the promoter has to carry the costs.

All the investment in the National Investment Plan and authorised are regulated and supported by the system. TSOs cannot include not regulated infrastructures in the remunerated asset base, since they developed a regulated activity and their infrastructures are subject to regulated authorisation and economic regimes. If someone (an entity or an individual) decided to build a not regulated infrastructure, then the entity/individual would go ahead with the investment without including it in the National Investment Plan. It requires authorisation, but the infrastructure couldn't be included in the regulatory framework.

3.2.2. *Regulatory practice related to innovation*

Innovative projects

Interviewees mentioned that innovative projects are in the exploration phase, there are few examples of projects that can be considered innovative (a number of years ago a biomethane plant was connected to transmission grid). The share of innovative projects in the total expenditures is relatively small.

Interviewees recognised the list of typological investments mentioned in annex B. In addition to that, projects related to small scale LNG and CO₂ transport were mentioned (CO₂ transmission is considered innovative but is not currently being developed). The interviewee mentions that the TSO is starting to define and develop Power-to-gas projects.

Adequacy of the NRF relating to its support for innovative investments

There is no mechanism to fund innovative projects but pilots can be remunerated if they are recognised by the Energy Policy. According to one of the stakeholders, the uncertainty regarding the funding of pilots could result in underinvestment.

Regarding power-to-gas projects, it was remarked that unbundling requirements imposes limits to what a TSO can do. What TSOs are permitted to do is established in Act 34/1998, Royal Decree 1434/2002 and other regulations that develop them, but according to some stakeholders there is uncertainty of what TSOs are permitted to do.

3.2.3. *Regulatory practice related to security of supply*

Security of supply projects

One of the interviewees defines a project as a security of supply investment/project if it meets the EU or national targets of security of supply. They follow the definition in the investment plan and in the EU regulation. This includes ensuring flexibility and having enough entering capacity through new transmission lines and interconnections if they help meet targets of security of supply (in the long-term there will be less gas and interconnection will be necessary).

One specific example is the STEP Project. This project has some rationale of security of supply in the long-term. In the long-term, if there is a decrease of gas coming from Algeria there will be a need for more interconnection within Europe. This project is not strictly related to security of supply as it also has market integration as an aim.

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

No specific barriers for security of supply investments were mentioned by stakeholders but the lack of an updated investment plan results in uncertainty.

One of the interviewees advocated for including more detailed CBAs in the investment cycle, as there is uncertainty of future demand of gas and more detailed CBAs would result in more efficient investment decisions. Generally, there is a need for more tools to assess what is needed and what is not.

3.2.4. Illustrative specific projects

The following projects are examples of security of supply projects and hence illustrate how the regulatory regime works in practice.

STEP project (TRA-N-161)

Description and aim

The project creates a third physical interconnection point between Spain and France, between Hostalrich (Spain) and Barbaira (France). It consists of a pipeline with a total length of 327 km, from which 120 km are in France and 107 km are in Spain.

In the long-term if, there is a decrease of gas coming from Algeria there may be a need for more interconnection within Europe. This project is not strictly related to security of supply as its main aim is market integration.

Approval process and financial mechanisms

In Spain, the project is made up of a series of infrastructures, which have already been included in the final ENTSOG Ten-Year Network Development Plan (TYNDP) 2017, published in April 2017. In March and April 2018, a public consultation was opened in addition to previous market tests, in order to comply with the requirements established by the cross border cost allocation process contained in Regulation (EU) no 347/2013.

Gas interconnection projects in Spain will be approved and remunerated based on the scheme described in this chapter. There are no specific procedures or incentives for interconnectors.

MidCat project (TRA-N-161 + TRA-N-727)

Description and aim

Enagas is the project promoter of MidCat in Spain. In France, the project promoters are Teréga and GRTgaz.

Approval process and financial mechanisms

The projects requires a series of infrastructures, already included in final ENTSOG Ten-Year Network Development Plan (TYNDP) 2017, published in April 2017.

Gas interconnection projects in Spain will be approved and remunerated based on the scheme described in this chapter. There are no specific procedures or incentives for interconnectors.

3.3. Options for improvement

3.3.1. Options to improve regulatory practice

The above discussion shows that the NRF allows investments in security of supply projects that are considered necessary. The process to obtain approval for projects is compared to other Member States ad hoc.

The tariff methodology could be improved for innovative projects, especially for projects that do not directly benefit the TSO that do result in benefits for other market participants. In practice, it is possible to obtain funding for innovative projects but this depends on the initiative of the TSO.

(i) Statutory reference to innovation

The stakeholders criticized that there is no long-term perspective on innovative investments. 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 be shaped by governmental policies, statutory duties or could be included in the NDP.

(ii) Approval process of investment plans

Regasification, transmission and storage investments in Spain are de facto approved on a case-by-case basis, although only investments included in a previously approved multiyear plan need to be authorized in order to be part of the gas system and be included in the regulated assets base.

The formal approval of a portfolio of projects in an investment plan would provide guidance to the TSO and other market participants about the development of the Spanish gas system. This would reduce the risk that investments for which the benefit to the TSO or other market participants are not done.

(iii) Social cost benefit analysis

The stakeholders point at issues regarding security of supply projects with no commercial benefits. This could be tackled by introducing the requirement to conduct a Social CBA for national projects. This could be done on multiple levels: on the level of the national plan and on project level for larger projects. On project level, the SCBA could be a requirement before approval of the final investment decision.

3.3.2. National law mechanism(s) for implementing options

Option (i): The current Article 60 of Act 18/2014, which describes the drivers to set up the remuneration methodology, is very focused on efficiency and security of supply (as mentioned, remuneration is based on the costs of building, operating and maintaining the facilities based on the concept of an “efficient and well-managed company” and in accordance with the principle of carrying out the activity at the lowest cost for the system) and it does not contain any reference to innovation. This regulation is developed in Annex IX of the same Act, which contains the remuneration methodology parameters. This is what should be amended to expressly include a parameter directly related to innovation in the remuneration scheme. This parameter should then be required to be used when determining the remuneration of the assets.

The process to amend the Act 18/2014 is the ordinary legislative process in Spain.

Option (ii) does not require any changes to national legislation.

Option (iii): To introduce the social CBA in the planning processes, Title I Act 34/ 1998 should be amended by introducing a new article establishing this requirement (which would be made through the ordinary legislative process in Spain). Consequently, RD 1434/2002 (that regulates the authorization processes), should be amended by the Government (which it can do itself, following the mandate of the Parliament, i.e. the Act 34/1998 amendment).

3.3.3. 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.

The mandatory requirement to conduct a SCBA on the level of the national plan or individual (innovative or larger) projects increases the work load of the TSO and of the NRA. Therefore, this option needs to be implemented in a way that keeps the additional workload manageable.

As mentioned in option (ii) above, a structured process for the appraisal and approval of projects would inform the TSO and other market participants about the development of the Spanish gas system. It could also result in a better assessment of all the (social) costs and benefits of projects. A potential disadvantage is that it reduces the possibilities to control network tariffs.

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	<ul style="list-style-type: none"> • 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.	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• (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.	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• 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.	<ul style="list-style-type: none">• 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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