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

Country Report - Hungary

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The electricity NRF in Hungary

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Generally, the NRF is neutral regarding project categories, such as innovative or conventional, PCI or non-PCI. The regulation should ensure that the TSO operates effectively and efficiently. So, if project costs are reasonable, and the necessity and the benefit can be demonstrated, an investment will be approved by the NRA.

The regulatory practice in the electricity sector in Hungary

Interviewees from both TSOs and the NRA were generally satisfied with the NRF in Hungary.

Yet, they also recognize a few of the regulatory barriers mentioned in annex III, even though the barriers are not said be a significant issue in practice:

- "Higher TSO CAPEX but lower expected OPEX within the TSO": interviewees can imagine this type of barrier occurring, because currently there is no mechanism in the NRF to include life time costs of solutions;
- "Lower TSO TOTEX but shift in the CAPEX/OPEX ratio": Possibly a bias towards CAPEX exists, but currently no OPEX intensive projects are planned and usually there is a focus on CAPEX during the approval process.

Generally, the NRF encourages the TSO to always use the most cost-effective technology but some interviewees name uncertainties on how to determine these costs, as they are not necessarily the smallest investment cost. Therefore, it could be considered to overcome this issue by applying an adapted ENTSO-E TYNDP CBA. Currently, as far as we know no CBA is used in the NDP. Also, detailed definitions could be added in the NRF, e.g. for cost-benefit relations within CBA or cost types in terms of what is the most efficient cost.

Options for improvement

Although the NRF seems well-designed for security of supply and innovation, using the issues drawn from the above discussion, the following options for improvement could be applied:
(i) Favouring of OPEX-based solutions;
(ii) Statutory obligation to consider alternatives;
(iii) Statutory reference to innovation;
(iv) Cost benefit analysis.

Option (i) could be implemented by using legal powers already available to the NRA or others under the existing NRF but it may not be easy to implement this in a well-balanced manner. This option risks being be a technology-specific incentive which may not necessarily lead to efficient decisions and may even encourage abuse. This risk must therefore be carefully weighed against the effort of necessary changes to the law that are needed to implement the other options.

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

The gas NRF in Hungary

The general regulatory principle can be described as an Incentive-based Regulation containing a mixture of price cap, revenue cap and quality regulation. Similarly, to the electricity sector we have identified a strong emphasis on a least cost principle, which is unclear whether this encourages or discourages innovation. In the Hungarian jurisdiction, we have found no direct duty to innovate but it may be argued that there is an implied duty to do so due to the general

statutory duties of operating in an efficient, economic and effective manner. Also, the NRA has no explicit statutory power to encourage innovation.

One task of the TSO is to monitor capacity across the gas network to ensure security of supply. Also, the TSO is obliged to prepare and submit to the NRA for approval a development plan for the transmission system to guarantee security of supply for the following 10 calendar years. If the plan is non-compliant with security of supply goals or EU energy policy, contrary to law or restricts competition the NRA will request changes from the TSO. The plan is revised on an annual basis. Furthermore, the NRA checks the compliance against the EU-wide development plan. If an investment is regarded as a “project of crucial interest to the national economy” and meets certain statutory criteria, it can be excepted from some administrative rules.

The regulatory practice in the gas sector in Hungary

The interviewees were generally satisfied with the NRF regarding support of security of supply and ‘innovative’ projects. According to the interviewees, no investments are held back but investments must be regarded as efficient to be approved by the NRA. If new ideas and projects are suggested by the TSO, the TSO faces the risk as to whether or not the NRA accepts the costs. Therefore, it could be considered to introduce an incentive for innovation in a tariff system to reduce the risk for uncertain acceptance of investments in innovative solutions. Also, there might be the general risk of a bias towards CAPEX intensive solutions, but the stakeholders currently see no hinderance related to innovation.

From the interviews we could not derive any urgent need for changes of the NRF in terms of security of supply because a mandatory regulation from EU exists that states what actions to take generally. Based on this regulation Hungary is developing an adapted security of supply regulation. According to the interviewees Hungary is currently in the middle of conception and implementation work. Key aspects of the regulation are, amongst others, mandatory storage obligations and the limitation of consumers demand in case of crisis. Therefore, no further improvements are deemed necessary.

Options for improvement

Although the NRF seems well-designed for security of supply and innovation, using the issues drawn from the above discussion, the improvement options (i) to (iii) already suggested for the electricity sector could be applied in Gas analogously.

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 Section 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 Hungary, 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 Hungary. 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 the 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.:

i. by immediately reducing overall cost as compared to a conventional solution;

ii. by prospectively reducing overall cost in the future, subject however to a “learning curve” as to the cost level of the innovative solution;
iii. by accelerating the process of transmission capacity expansion and thus reducing social welfare loss caused by temporarily insufficient transmission capacities; or
iv. 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 Hungary

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

Through its decision no. 77/2011. (X.14.) OGY the Hungarian Parliament adopted[1] the "*Hungarian Energy Strategy 2030"* (the "**Hungarian Energy Strategy**") which contains a complex set of long-term principles and priorities for the development of the Hungarian energy industry until 2030, with a view to 2050.

The principal piece of legislation in the Hungarian "Legal Framework" is Act LXXXVI of 2007 on electricity (the "**Electricity Act**").

In its Chapter XX, the Electricity Act contains specific delegations of authority for regulating certain specifically defined areas of the Hungarian electricity sector to the following levels of legislation:

- government[2] (the main piece of legislation issued by the government (under the delegation in Section 170(1) of the Electricity Act) is government decree 273 of 2007. (X.19.) on the implementation of the rules of the Electricity Act (the "**Electricity decree**");
- the minister in charge of energy policy[3];
- the minister in charge of industrial policy[4]; and
- the president of the Hungarian Energy and Public Supply Regulator[5] (in Hungarian: "*Magyar Energetikai és Közműszabályozási Hivatal"*) ("**Hungarian Regulator**"). The Hungarian Regulator's legal predecessor (the "Hungarian Energy Office") was established in 1994 by Act XLI of 1994 on gas supply. The currently operating Hungarian Regulator was established by Act XXII of 2013 (the "**Hungarian Regulator Act**") as the general legal successor[6] of the Hungarian Energy Office.

The Electricity Act has been modified to comply with the Third Energy Package[7]. The TEN-E Regulation[8] contains detailed rules as to the roles of the Hungarian Regulator and the Hungarian ITO (defined below). Government decree no 75/2016. (IV. 5.) Korm. contains specific rules for the implementation of the provisions of the TEN-E Regulation (see details in Section 2.1.3 below).

For the purpose of the Legal Framework in Hungary, "transmission" is defined as 132 kV or above[9].

In Hungary, "transmission" (in Hungarian: "*átvitel*")[10] and "transmission system operation" (in Hungarian: "*átviteli rendszerirányítás*")[11] are carried out by one single ITO (Independent Transmission Operator), MAVIR Magyar Villamosenergia-ipari Átviteli Rendszerirányító Zrt. (the "**Hungarian ITO**"). "Transmission system operation" is an activity which may only be carried out under a licence issued by the Hungarian Regulator.[12] The Hungarian ITO's licence for "transmission system operation" was issued by the Hungarian Regulator under no.: 715/2012 and it has been modified several times.

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1 The Hungarian Parliament accepted the "*Hungarian Energy Strategy 2030*" on 3 October 2011. It was extended once by the Hungarian Parliament with decision no 5/2015. (III.20. OGY).
2 Section 170(1) of the Electricity Act.
3 Section 170(2) of the Electricity Act.
4 Section 170(3) of the Electricity Act.
5 Section 170(5) of the Electricity Act.
6 Section 23(1) of the Hungarian Regulator Act.
7 Section 184(1) of the Electricity Act.
8 Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013 on guidelines for trans-European energy infrastructure.
9 Section 25(1) of the Electricity Act, which provides that the Hungarian ITO must prepare its annual network development plans for the networks at 132kV and above.
10 Section 3(1) of the Electricity Act.
11 Sections 14-23 of the Electricity Act.
12 Section 74(1)c) of the Electricity Act.

Another important element of the Legal Framework in Hungary is the network code (in Hungarian: *"Üzemi Szabályzat"*) issued by the Hungarian ITO under the Electricity Act (the "**Network Code**").[13] The Network Code contains "*the rules, procedures and methodologies concerning the electricity network and the transmission network*"[14]. The current Network Code (applicable as of 1 April 2018) was approved by the Hungarian Regulator under no.: 1394/2018. Under the Network Code[15], in connection with the planning and development of the electricity network the Hungarian ITO must take into account the principles set forth in the Hungarian Energy Strategy.

Under the Network Code,[16] the Hungarian ITO must prepare network development guidelines, which must contain the minimum technical requirements of network development. Under the Network Code the Hungarian ITO issued such network development guidelines under the title "*"Planning of the development of networks of 132 kV or above"* (the "**Network Development Guidelines**"). The Network Development Guidelines are applicable to the establishment of new transmission network equipment and to the renovation or extension of existing transmission network equipment.

The currently applicable Network Development Guidelines consist of three separate documents[17]:

- guidelines for the primary equipment of substations (the "**Primary Guidelines**");
- guidelines for the establishment of transmission lines (the "**Transmission Line Guidelines**"); and
- guidelines for the architectural design of substations (the "**Architectural Guidelines**").

Hungarian electricity transmission network

- The ITO must safely, efficiently and reliably operate and maintain the transmission network[18];
- The ITO must maintain, repair, renovate and develop the transmission network with timing such that (i) the transmission network should be suitable for the transmission of electricity for a long time; and (ii) reserves should also be taken into account.[19] With respect to this obligation, the ITO must take into account the "least cost principle" (in Hungarian: *"a legkisebb költség elve"*). In connection with this principle "least cost" means the cost which is necessary and justified at the level of the ITO and the national economy at the same time;[20];
- The ITO prepares, as part of the Network Code, the Network Development Guidelines, which specify the minimum technical requirements for the establishment of new transmission network equipment and the renovation or extension of new transmission network equipment. The current applicable minimum technical requirements are specified in the Primary Guidelines, the Transmission Line Guidelines and the Architectural Guidelines;
- The ITO must prepare annual transmission network development plans (the "**Transmission Network Development Plans**" or "**TNDP**")[21] which must contain:[22]
  - the elements of the transmission network to be established or renovated within the following 10 years;
  - the already approved developments;
  - the projects to be completed in the following 3 years and the timing of the same; and

13 Sections 3(67) and 67 of the Electricity Act.
14 Section 67(a) of the Electricity Act.
15 Section 4.2.8 of the Network Code.
16 Section 4.3.5(A) of the Network Code.
17 The currently applicable Network Development Guidelines are dated 26 September 2017 and were approved by the Hungarian Regulator under no 4856/2017. These documents are accessible at the Hungarian ITO's website at http://mavir.hu/web/mavir/usz-m10.
18 Section 24(1)a) of the Electricity Act.
19 Section 24(1)b) of the Electricity Act.
20 Section 3(43) of the Electricity Act.
21 The most recent Network Development Plan was issued under no MAVIR-RTO-TRV-0036-00-2017-09-27. It is accessible at the Hungarian ITO's website at http://mavir.hu/web/mavir/halozattervezes.
22 Section 25(2) of the Electricity Act.

- a separate analysis on the forecast of consumer needs and the resulting needs in capacity development[23].

The TNDPs are approved by the Hungarian Regulator under the criteria specified in Section 25 of the Electricity Act. These criteria are as follows:

- the Hungarian Regulator publishes the TNDP on its website and publicly negotiates it with the network users[24];
- the TNDP must not be contrary to the Community-wide 10-year network development plan (under Article 8(4) of Regulation No 714/2009)[25];
- the TNDP must not be contrary to any laws and it may not restrict competition[26].

If the TNDP is not in line with these requirements, the Hungarian Regulator obliges the ITO to modify the TNDP.[27]

If the TNDP complies with these requirements, the Hungarian Regulator approves it. In this case, the TNDP becomes binding and the ITO must implement it. The Hungarian Regulator must annually check the implementation of the approved TNDP. The costs incurred in connection with the implementation of the approved TNDP must be taken into account for the regulation of tariffs.[28] See the details on the tariff system in Section 2.1.3 below.

If the Hungarian ITO does not implement the approved TNDP according to the implementation schedule, the Hungarian Regulator must issue an invitation for tenders for the implementation of the relevant developments.[29]

The most recent ten-year Network Development Plan (the "**2017 TYNDP**") is available at the Hungarian ITO's website at http://mavir.hu/web/mavir/halozattervezes. In its point 2 the 2017 TYNDP specifies the three most important criteria of long-term network planning: continuous, reliable and high-quality electricity supply in the context of changing energy and market conditions. In the same point, the 2017 TYNDP specifies the main long-term goals of network planning: the maintenance of the safety of supply and network operation for the benefit of customers and to maintain the Hungarian electricity network's ability to cooperate with the European electricity network.

Point 2 of the 2017 TYNDP also refers to the Hungarian ITO's own network development principles (the "**Principles**"). One of these Principles is the Hungarian ITO's obligation to examine the possibility and necessity of the introduction of new technical solutions, which have not yet been applied.

Electricity transmission lines under the TEN-E Regulation

Under the TEN-E Regulation Hungary belongs to the priority electricity corridor "NSI East Electricity".[30] The role of the Hungarian ITO under the TEN-E Regulation is specified in said regulation.

Undertaking of investments

As indicated above, the Hungarian ITO must, first of all, safely, efficiently and reliably operate and maintain the transmission network[31].

Secondly, the Hungarian ITO must also maintain, repair, renovate and develop the transmission network with timing such that (i) the transmission network should be suitable for the transmission of electricity for a long time; and (ii) reserves should also be taken into account.[32] With respect to this second obligation, the ITO must take into account the "least cost principle" (in Hungarian: *"a legkisebb költség elve"*). In connection with this principle, "least cost" means

23 Section 9(1) of the Electricity decree.
24 Section 25(4) of the Electricity Act.
25 Regulation no 714/2009/EC, Article 8.
26 Section 25(5) of the Electricity Act.
27 Section 25(5) of the Electricity Act.
28 Section 25(6) of the Electricity Act.
29 Section 26/A of the Electricity Act.
30 Section 1/(3) of Annex I of the TEN-E Regulation.
31 Section 24(1) a) of the Electricity Act.
32 Section 24(1)b) of the Electricity Act.

the cost, which is necessary and justified at the level of the ITO and the national economy at the same time.[33]
As indicated above, the ITO carries out its transmission network development duties under the control of the Hungarian Regulator, more specifically under the applicable TNDP. As indicated above, the ITO must implement the TNDPs approved by the Hungarian Regulator.

Role of NRA

The Hungarian Regulator's role in connection with transmission network development is twofold:

- to review and approve the Hungarian ITO's Network Code and the Network Development Guidelines which contain the minimum technical requirements of transmission network development and which are integral parts of the Network Code; and
- to annually review the ITO's Transmission Network Development Plans: to check these from the point of view of the applicable community-wide requirements and the requirements of Hungarian law. As indicated above, in connection with the development of the transmission network the Hungarian Regulator must ensure under Section 24(2) of the Electricity Act that the "least cost principle" is met. This principle (under Section 3(43) of the Electricity Act) means that the costs of the transmission network development to be incurred by the ITO may not be more than what is necessary and justified both at the level of the ITO and the national economy.

We can confirm in general that when the Hungarian Regulator approves a transmission network development plan, under the Electricity Act they must consider all relevant issues in their complexity. These issues are (among others) compliance with the minimum technical requirements specified in the Network Development Guidelines, the long-term safety and sustainability of supply, quality of supply, compliance with the Community-wide 10-year network development plans and the "least cost principle".

Institutional or procedural constraints on the performance of these roles

There are no specific procedural constraints applicable to transmission network development projects.

To the contrary, under Act LIII of 2006 on "projects of crucial interest to the national economy" the government may designate specific projects of crucial interest. The government issues separate decrees for the individual projects specifying the exceptional rules applicable to the project in question within the limitations of the act. The following investments may be designated as projects of crucial interest:[34]

- investments which are wholly or partially financed from EU funds;
- investments which are implemented wholly or partially with budget subsidies;
- investments which are based on agreements concluded for concession-based activities with a minimum cost level of 5 billion HUF;
- investments which are implemented wholly or partially with subsidies based on individual governmental decisions;
- investments with a minimum aggregate cost level of 90 million HUF which create at least 15 new jobs;
- investments which promote environmental, research-development, educational, or health care and social goals;
- investments relating to the maintenance, presentation or development of national memorial locations; or
- investments relating to primary national treasures and monuments.

2.1.2. Specific legal rights and duties

Hungarian transmission network

As to the development of the Hungarian transmission network, we have described the rules applicable to this in the Hungarian Legal Framework. The Hungarian Legal Framework allocates the functions concerning the investment projects concerning the Hungarian transmission network to the ITO and the Hungarian Regulator.

[33] Section 3(43) of the Electricity Act.
[34] Section 1(1) of Act LIII of 2006.

In the case of complex transmission network development projects (e.g., the establishment of a new transmission network line), the following "other parties" have certain roles under Hungarian law:

- **Building Permit Authorities under the Electricity Network Construction Decree[35]:**
  - first instance authority: the technical safety department of the local government office designated by law[36];
  - second instance authority: the technical safety department of the Metropolitan Government Office.

  The building permit procedure starts with the submission of a technical **documentation** to the relevant authority. The mandatory contents of the technical documentation are specified in Annex 3 of the Electricity Network Construction Decree. Under Section 4.6 of Annex 3 of the Electricity Network Construction Decree, the technical documentation must contain the designer's declaration whereby the designer:
  - declares that the planned technical solution complies with the applicable law and the requirements of authorities;
  - declares that the planned technical solution secures the safety of life, health, the environment and cultural heritage; and
  - identifies the technical standards and technical guidelines used for the technical documentation; if such standards or guidelines do not exist, the designer must declare that the planned technical solution reaches the level of safety, which is secured by the harmonized technical standards.
- **Environmental authorities under the Environmental Permit Decree[37]**
  Under Section 17 of the Environmental Permit Decree the applicant of an environmental permit must use the **best available technical solutions** in order to:
  - reduce all possible burdens on the environment;
  - ensure that all materials and energy are used efficiently;
  - reduce emissions to the lowest possible level;
  - avoid the accumulation of waste;
  - avoid incidents resulting in environmental impact; and
  - prevent all contamination in the case of the stoppage of the activity under review.

  The **best available practices** must be checked under the reference documents issued by the European Commission. If no such document exists for the activity under review, the criteria specified in Annex 9 of the Environmental Permit Decree must be taken into account.
- **The "interested public" under the Environmental Permit Decree**
  The "interested public" under Section 2(1) of the Environmental Permit Decree means natural or legal persons or organizations without a legal personality, which may be affected by the decision of the environmental authority in the procedure under review. The "interested public" must be informed about all the details of the project subject to the environmental permit procedure. Public auditions must be held in certain cases specified by Sections 9 and 21 of the Environmental Permit Decree where the "interested public" may give its opinion on the project under review. These opinions are not obligatory but the environmental authority must consider them and analyse them in its decision on the environmental permit request;
- **Environmental NGOs**
  Under Section 98 of the Environment Protection Act,[38] associations established for the protection of the environment ("**Environmental NGOs**") have the status of a "client" in environmental permit procedures in the territory affected by their activities. This means that they may appeal decisions and may start litigation against the decisions of the environmental authorities;
- **Cultural heritage authorities**
  Under Sections 23/B-F of the National Heritage Protection Act[39], in the case of "large investments" preventive archaeological exploration must be carried out. The definition of "*large investments*" is contained in Section 7(6) of the National Heritage Protection Act.

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35 The building permit procedures relating to electricity transmission network-related construction works is regulated by government decree no 382/2007.(XII.23.)Korm (the "**Electricity Network Construction Decree**").

36 Annex 1 of government decree no 365/2016.(XI.29.) Korm.

37 The environmental permit procedures are regulated by government decree no 314/2005.(XII.25.) Korm.

38 Act LIII of 1995.

39 Act LXIV of 2001.

Projects of common interest (PCIs) under the TEN-E Regulation

The Hungarian Regulator and the ITO are both bound by the TEN-E Regulation. This regulation sets up a specific institutional structure for the promotion of projects of common interest (PCIs). The TEN-E Regulation defines the "*project promoters"* in its Article 2(6), which contains "*investors developing a project of common interest"*. Such "project promoters" are not specified in the Hungarian Legal Framework among the players of the development of the Hungarian transmission network. Under the Hungarian TEN-E Methodology, it cannot be excluded that "project promoters" propose projects to the Hungarian Regulator.

2.1.3. Mechanism for financing of investment projects

Financing through transmission network use tariffs regulated by the Hungarian Regulator

Under Section 25(6) of the Electricity Act, the justified costs of transmission network development projects must be taken into account in the transmission network tariffs. In other words, the source of financing for the transmission network development projects goes through the tariffs specified by the Hungarian Regulator within the framework of the following tariff regulation structure.

Under Section 141 of the Electricity Act the transmission network tariffs are tariff caps, which are specified by the Hungarian Regulator in tariff decrees (to be analysed in detail below). The Hungarian Regulator specifies the tariffs "*ex officio"*.[40] The "tariff cap" means that higher tariffs than the tariffs specified by the Hungarian Regulator cannot be applied. However, lower tariffs can be applied according to terms previously published and without discrimination.[41] The network tariffs are regulated in 4-year tariff periods[42] (analysed in detail below). The network tariffs are the same throughout Hungary.[43] The principles of the tariffs under Section 142(5) of the Electricity Act are the following:

- they must be based on the least cost principle;[44]
- they must take into account the justified costs of the efficiently operating licensee (including capital costs);
- they must motivate the licensees to increase (in the short and the long term alike) the efficiency of their operations; and
- they must motivate the licensees to continuously increase the quality of their services and the security of supply.

The transmission network tariffs are specified annually.[45]

Under the general rules in Sections 142 and 143 of the Electricity Act and also based on the delegation of authority in Section 159(1)5 of the Electricity Act, the Hungarian Regulator issued the currently applicable electricity network tariff decree under no 7/2016.(X.13)MEKH (the "**Network Tariff Decree**"). This Network Tariff Decree applies to a 4-year tariff-period between 1 January 2017 and 31 December 2020.[46] During this period, the electricity network tariffs are set by the Hungarian Regulator on the basis of two main criteria[47]: (i) the least cost principle[48] and (ii) the "justified costs" of the licensees. The "justified costs" are costs which are incurred in compliance with applicable law and the relevant entity's licence (i) and which are actually necessary to continuously and securely carry out the **licensed activity**, (ii) and which are actually necessary for the **operation of the company** which carries out the licensed activity (only to the extent that this operation is efficient), including (for both categories), the **capital costs** as well.

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40 Section 141(4) of the Electricity Act.
41 Section 141(6) of the Electricity Act.
42 Section 141(10) of the Electricity Act.
43 Section 142(3) of the Electricity Act.
44 Section 3(43) of the Electricity Act: „the costs incurred by a licensee for the purpose of the licensed activity which is necessary and justified both at the level of the licensee in question and at the level of national economy".
45 Section 143(1) of the Electricity Act.
46 Section 1 of the Network Tariff Decree.
47 Section 3(1) of the Network Tariff Decree.
48 Section 3(43) of the Electricity Act: „the costs incurred by a licensee for the purpose of the licensed activity which is necessary and justified both at the level of the licensee in question and at the level of national economy".

With regard to the amount of the tariffs, the Regulator must take into account the tariffs applied in the previous tariff period and in the course of setting the annual tariffs, the Hungarian Regulator must endeavour to avoid significant changes from one year to another.[49]
With regard to the amount of the tariffs, the Hungarian Regulator must also endeavour to achieve the following:[50]

- the network operators are encouraged to increase the efficiency of their activities (Section 3(3)a) of the Network Tariff Decree)[51];
- the network operators should become interested in complying with the minimum quality criteria specified by the Hungarian Regulator[52];
- the network operators should be motivated to carry out the network developments which are necessary for a sustainable operation[53];
- the network operators should not be interested in promoting the customers' energy efficiency measures[54];
- the network operators' risks should not exceed the limit which is reasonable under the given economic circumstances[55];
- the network operators should be able to make their business policy decisions with due foresight[56]; and
- **the network operators should be motivated to make smart grid-related developments**.

In the first year of the 4-year tariff period the tariffs are specified on the basis of a cost analysis procedure whereby the costs of all individual licensees are separately analysed ("**Initial Cost Analysis**").[57] In the following three years of the 4-year period, the annual tariffs are specified on the basis of the first year's tariff.[58]

During the Initial Cost Analysis, the following cost types must be analysed[59]:

- the operation costs (paragraph a);
- the amortization of equipment (paragraph b);
- capital costs (paragraph c);
- network loss (paragraph d); and
- individual costs and individual revenues.

"Transmission tariffs" must provide coverage for the following:[60]

- the justified operational costs of the ITO (paragraph a);
- the justified amortization and capital costs of those equipment and assets of the ITO which serve the transmission system operation activity (paragraph b);
- the justified costs which are necessary for the purchase of electricity to compensate network loss (paragraph c);
- the justified costs of activities belonging to the ITO's system-related services subject to the "least cost principle" (paragraph d);
- the justified costs incurred by the ITO in connection with the fulfilment of its international market integration obligations (paragraph e);
- the justified costs incurred by the ITO in connection with the fulfilment of obligations under law or a legal act of the European Union (paragraph f).

Financing from funds available in the "Connecting Europe Facility" (CEF)

The government issued a decree under no 75/2016. (IV.5.) Korm. to implement the provisions of the TEN-E Regulation from the point of view of how the funds available in the CEF may be used (the "**CEF Decree**"). Under the CEF Decree, requests for funding from the CEF may be submitted to the European Commission on the basis of the government's individual approval.

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49 Section 3(2) of the Network Tariff Decree.
50 Section 3(3) of the Network Tariff Decree.
51 Section 3(3)a) of the Network Tariff Decree.
52 Section 3(3)b) of the Network Tariff Decree.
53 Section 3(3)c) of the Network Tariff Decree.
54 Section 3(3)d) of the Network Tariff Decree.
55 Section 3(3)e) of the Network Tariff Decree.
56 Section 3(3)f) of the Network Tariff Decree.
57 Section 7(1) of the Network Tariff Decree.
58 Section 10(1) of the Network Tariff Decree.
59 Section 7(2) of the Network Tariff Decree.
60 Section 4 of the Network Tariff Decree.

The government gives such approvals in individual government resolutions published in the Official Gazette of Hungary. Under the CEF Decree, no individual government resolutions have yet been issued in connection with projects relating to the development of the electricity transmission network.

Mechanisms to foster innovation:

As indicated above, the development of the Hungarian transmission network is the duty of the ITO under Section 25 of the Electricity Act. As described above, there is one general financing mechanism applicable to the Hungarian transmission network: the regulation of the transmission tariffs by the Hungarian Regulator. Also, as indicated above, the transmission tariffs specified by the Hungarian Regulator are the primary sources of the transmission network development. Projects, which may typically be accommodated within this framework, are those, which comply with the complex requirements of the Hungarian Legal Framework described above: safety and sustainability of supply, compliance with the "least cost principle" and the tariff regulation requirements.

A special regime applies to transmission network developments under the TEN-E Regulation where CEF funds are used. In this context, the Hungarian government issues individual resolutions for the application for the CEF funds to the European Commission. As mentioned above, under the CEF Decree no individual government resolutions have yet been issued in connection with projects relating to the development of the electricity transmission network.

Measures to establish a balance between investing in new or innovative network infrastructure to meet the needs of current and future users in a timely manner and avoiding investment in stranded assets

As described above, under Section 24(2) of the Electricity Act one of the basic principles of network development in Hungary is the "least cost principle". This must be taken into account in connection with all network developments. On the other hand, the Hungarian ITO is obliged by law (under Section 24 of the Electricity Act) to operate and maintain the transmission network and also to develop it in compliance with the applicable Transmission Network Development Plans approved by the Hungarian Regulator. The main goal of the ITO's statutory obligation to develop the transmission network is to ensure a long-term, sustainable, secure supply of electricity. We described the criteria applicable to the transmission network development plans and the criteria of the tariffs, which are supposed to provide financial coverage for such development.

The special regime applicable to transmission network developments under the TEN-E Regulation from CEF funds are described in detail above. These rules and the CEF financing mechanisms may (beyond the Hungarian Legal Framework) also motivate investments in transmission networks focussing on new innovative network infrastructure.

2.1.4. Regulatory rules with respect to innovation

Specific duties of the TSO aimed at encouraging innovation

The Hungarian ITO's duties relating to innovation are integral parts of their overall duties related to the transmission network they operate. As indicated above, they must prepare annual network development plans, which must aim at a long-term safety of supply (with regard to increasing consumer needs) and must also be in line with the Community-wide 10-year network development plans. The Hungarian ITO's statutory obligation to take all these criteria into account, in our view, implies an encouragement for innovation.

Furthermore, the Network Development Guidelines issued by the Hungarian ITO under the Network Code contains the minimum technical requirements of network planning. As indicated in Section 2.1.12.1.1 above the Network Development Guidelines consist of three separate parts, each regulating in detail the minimum technical standards for the planning of transmission lines, primary equipment and architectural design. The question whether these minimum technical requirements encourage innovation is a question for technical experts to consider.

Specific duties of the NRA aimed at encouraging innovation

Hungarian transmission network

The Hungarian Regulator has the power to approve the Hungarian ITO's Network Code, which also contains the Network Development Guidelines, described in Section 2.1.1 above in detail.

These Network Development Guidelines contain detailed minimum technical requirements for the planning of transmission lines, the primary equipment of substations and the architectural design of substations. Through its power to review and approve these Network Development Guidelines the Hungarian Regulator is able to influence the technical development of the transmission network. The question whether the currently applicable Network Development Guidelines, indicated in Section 2.1.1 above, encourage innovation is a question for technical experts to consider.

The Hungarian Regulator also has the power to approve and enforce the implementation of the ITO's Transmission Network Development Plans. The criteria to be applied by the Hungarian Regulator in connection with its duties concerning the ITO's Transmission Network Development Plans (described in Section 2.1.3 above) ensure that the ITO's transmission network development plans must focus on innovation.

As mentioned above, the primary source of financing for the ITO's transmission network development works through the transmission tariffs.

As mentioned in paragraph 3(ii) above, the transmission tariffs are specified by the Hungarian Regulator under strictly specified principles set forth in the Network Tariff Decree (analysed in detail above). For example, Section 3(3)g) of the Network Tariff Decree specifically provides that transmission tariffs must be specified in such a manner that the ITO (and the distribution network operators) should be motivated to develop smart grid methods.

Projects of common interest (PCIs) under the TEN-E Regulation

Under Article 13(6) of the TEN-E Regulation the Hungarian Regulator has published its "methodology and criteria used to evaluate investments in electricity and gas infrastructure projects and the higher risks incurred by them" (the "**Hungarian TEN-E Methodology**").

We briefly describe the main terms of the TEN-E Methodology as follows.

Compliance with the Community-wide 10-year network development plan

If it is doubtful, whether the ITO's network development plan is in compliance with the Community-wide 10-year network development plan under Regulation No 714/2009/EC[61] the Hungarian Regulator consults with the ACER[62]. If the ITO's network development plan is not in compliance the Hungarian Regulator may oblige the ITO to extend the plan under two conditions (i) if the compensation under Regulation No 838/2010/EU[63] covers the development specified in the Community-wide 10-year network development plan and (ii) if the development in question is justified from the point of view of the security of supply on the Hungarian electricity network. If the ITO does not comply with its obligations under the approved transmission network development plan the Hungarian Regulator may issue an invitation for tenders for the completion of the development, which the ITO refused to implement.

Risk evaluation methodology

General risk evaluation principles

PCIs must promote the following economic goals:

- increase of the security of energy supply;
- increase of the reliability of the network;
- establishment of a European energy market.

The Hungarian regulator examines the general supply-and-demand issues, the specific industrial criteria and the risks associated with the cooperation beyond national level. The primary task of the Hungarian regulator is to get to know the views of all the parties affected by the planned development.

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61 Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network of cross-border exchanges in electricity.

62 Agency for the Cooperation of Energy Regulators.

63 Commission Regulation (EU) No 838/2010 of 23 September 2010 on laying down guidelines to the inter-transmission system operator compensation mechanisms and common regulatory approach to transmission charging.

Specific risk evaluation principles

The Hungarian regulator will examine the documents submitted by the "project promoters". It is of primary importance that all information must be available to the Hungarian Regulator. The Hungarian Regulator may request additional information from the relevant "project promoters". In the course of its evaluation of the risks associated with a proposed project the Hungarian Regulator gives primary importance to the following factors:

- overspending beyond the planned costs;
- reduction of planned turnover;
- liquidity risks;
- planning risks;
- financial risks;
- risks resulting from the completion or non-completion of other projects;
- technological risks;
- evaluation and exchange risks.

It is also important for the Hungarian Regulator that the "project promoters" must do their best to reduce the risks.

All the risk factors must be considered individually indicating the likelihood of its occurrence and the financial impact.

2.1.5. Regulatory rules with respect to security of supply

Specific duties of the TSO aiming at safeguarding security of supply

As indicated above, under Section 24(1) of the Electricity Act the Hungarian ITO's primary duty is the safe, efficient and reliable operation and maintenance of the transmission network. The specific elements of this duty are related to the regular planning of the maintenance, repair and development of the transmission network under the control (and subject to the approval) of the Hungarian Regulator.

Specific duties of the NRA aiming at safeguarding security of supply

Hungarian transmission network

The Hungarian Regulator's main duties are related to the safeguarding of the security of supply for the entire Hungarian electricity sector. Its relevant duties are as follows:

- to ensure that all entities which carry out licensed activities comply with the applicable laws[64];
- to promote an efficient and sustainable competition on the electricity market[65];
- to ensure efficiency and the application of the least cost principle[66];
- **to maintain and increase the security of supply[67];**
- to promote that the transmission system operator and the network users get suitable incentives to increase the efficiency of the electricity network and market integration[68];
- to issue the licenses to those who carry out license-related activities[69];
- to approve the business codes of the licensees[70];
- to approve the electricity supply codes[71];
- **to issue decrees on the principles of the regulation of network usage tariffs and the amount of such tariffs[72];**
- to approve the ITO's transmission network development plan[73];
- to specify, to the relevant licensees individually, the minimum quality requirements of licensed activities[74];

64 Section 158(2)a) of the Electricity Act.
65 Section 158(2)b) of the Electricity Act.
66 Section 158(2)c) of the Electricity Act.
67 Section 158(2)d) of the Electricity Act.
68 Section 158(2)l) of the Electricity Act.
69 Section 159(1)1 of the Electricity Act.
70 Section 159(1)2 of the Electricity Act.
71 Section 159(1)3 of the Electricity Act.
72 Section 159(1)5 of the Electricity Act.
73 Section 159(1)11 of the Electricity Act.
74 Section 159(1)13 of the Electricity Act.

- to continuously check the changes in the availability of power plants, and in the case of unjustified retention of capacities, to specify the mandatory level of capacity to be dispatched by power plants[75];
- to control acquisitions of control over certain types of licensees in the electricity market[76].

In addition to these, the Hungarian Regulator also has duties in connection with the following:

- to avoid discrimination[77];
- to promote efficient competition[78];
- to ensure the application of the unbundling requirements[79]; and
- to protect consumers[80].

The focus of this analysis is the development of transmission networks. Therefore, the Hungarian Regulator's tasks described in this second sub-paragraph of Section 2.1.5 are beyond the scope of this analysis.

European Projects of Common Interest (PCIs) under the TEN-E Regulation

The Hungarian Regulator has issued a methodology of the risk analysis related to electricity and gas PCIs. It is available at its website (www.mekh.hu) in Hungarian only.

2.2. Regulatory practice

2.2.1. Overview over regulatory practice in Hungary

The general regulatory principle can be described as a combined model of Incentive-based Regulation and Cost-plus. Within the legal analysis, (see Section 2.1) we have identified a strong emphasis on a least cost principle, which is unclear if this encourages or discourages innovation.

Main regulatory barriers

The interviewees were generally satisfied with the NRF in Hungary. Yet, they also recognize a few of the regulatory barriers mentioned in annex III, even though the barriers are said to not turned out as a significant issue in practice:

- "Higher TSO CAPEX but lower expected OPEX within the TSO": interviewees can imagine this type of barrier occurring, because currently there is no mechanism in the NRF to include life time costs of solutions. But interviewees also state that this potential barrier did not get a significant relevance in practice up to now;
- "Lower TSO TOTEX but shift in the CAPEX/OPEX ratio": Possibly a bias towards CAPEX exists, but currently no OPEX intensive projects are planned and usually there is a focus on CAPEX during the approval process. So, in practice, this did not turn out to be a substantial issue so far.

Possible improvement of the NRF

Based on the interviews the following improvements to the NRF could be considered:

- Foster application of innovative solutions;
- Find a way to stimulate participation in fields of activity or the application of technologies with high OPEX ratios, especially if (socio)-economic benefit is proven;
- Remove uncertainty how to determine most cost-effective technology.

2.2.2. Regulatory practice related to innovation

Innovative projects

In the NRF, there is no statutory duty for the TSO to innovate. But further we found out that the TSO's network development principles do include a duty to examine the possibility and necessity of introducing new technical solutions that have not yet been applied. Also, the interviewees agreed on having no direct incentive to invest in innovative technology. But the interviewees

[75] Section 159(1)14 of the Electricity Act.
[76] Section 159(1)15 of the Electricity Act.
[77] Section 159(2) of the Electicity Act.
[78] Section 159(3) of the Electricity Act.
[79] Section 159(4) of the Electricity Act.
[80] Section 159(5) of the Electricity Act.

stated that usually the TSO uses the most appropriate technologies available, which also includes innovative solutions. As the NRF encourages the TSO to always use the most cost-effective technology this is an incentive for innovative technologies resulting in lower cost than conventional solutions but might discourage TSOs from applying technologies with higher specific costs but wider benefits, e.g. higher public acceptance.

Nevertheless, the interviewees see the NRF as generally adequate and no projects were reported not being realised due to the NRF. Also, interviewees tell that smaller deviations from the least-cost principle are accepted by the NRA in most cases, e.g. for the use of new type of towers with higher specific cost. This may be because the NRA approves the entire NDP instead of individual projects, which does not mean that the NRA does not require any changes to the NDP.

Even though interviewees' opinions differ on how many innovative projects are carried out, examples of 'innovative' projects, which are being conducted or planned, encompass:

- bird flying deviator mounted on existing lines via drones without switching-off the line, started last year;
- new modular types of towers for 400kV, needing less space on the ground, first usage this year but future applications foreseen, for example in cross-border PCI project with Slovakia;
- high-temperature AC conductors as replacement on an existing line with limited permissible sag, coming into operation next year;
- change of 400kV towers to ones with special shape to increase public acceptance (6-7 years ago).

Adequacy of the NRF relating to its support for innovative investments

There are no provisions in the regulation explicitly facilitating innovation. The NRF is neutral regarding project categories, such as innovative or conventional, PCI or non-PCI. The regulation should ensure that the TSO operates effective and efficient. So, as long as project costs are reasonable, and the necessity and the benefit can be demonstrated, an investment will be approved by the NRA. Regardless of this, interviewees recognised some of the barriers listed in annex III:

- "Higher TSO CAPEX but lower expected OPEX within the TSO": interviewees can imagine this type of barrier occurring, because currently there is no mechanism in the NRF to include life time costs of solutions. But interviewees also state that this potential barrier did not get a significant relevance in practice up to now;
- "Lower TSO TOTEX but shift in the CAPEX/OPEX ratio": Possibly a bias towards CAPEX exists, but currently no OPEX intensive projects are planned and usually there is a focus on CAPEX during the approval process. So, in practice, this did not turn out to be a substantial issue so far.

Generally, the NRF encourages the TSO to always use the most cost-effective technology but some interviewees name uncertainties how to determine these costs, as they are not necessarily only the smallest investment cost. Therefore, it could be considered to overcome this issue by applying an adapted ENTSO-E TYNDP CBA. Currently, no CBA is used in the NDP. Additionally it is worth considering to add detailed definitions in NRF, e.g. for cost-benefit relations within CBA or cost types in terms of what are the most efficient cost.

2.2.3. Regulatory practice related to security of supply

Security of supply projects

One of the key tasks of the TSO in terms of security of supply is the preparation of the NDP. The current plan states long term goals of network planning including continuity of security of supply. The NRA approves and monitors the NDP annually. Additionally, the NRA reviews and approves TSO's network development guidelines regarding their minimum technical requirements. Interviewees tell that benefits for security of supply can typically be demonstrated in calculations, so usually there are no larger discussions during the approval process. Still the necessity of any project aiming at maintaining or enhancing security of supply is reviewed carefully before it gets approved. Once a project is approved for security of supply reasons, its cost will be integrated in the regulatory asset bases and therefore must be borne by the customers.

Project example for an internal SoS project: towers of several lines in the same corridor at a motorway crossing were replaced by stronger ones to reduce risk for cascade in the area of nuclear power plant.

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

Generally, interviewees agree that the regulation is very well equipped to secure security of supply. Enough power plants, routes etc. are existing to guarantee a sufficient level of security of supply. The interviewees did not name any additional issues and we were not able to detect any improvements of the NRF based on the interviews.

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.

No 3.16 of Annex VII to the TEN-E Regulation: specified as a "Project of Common Interest" by Commission delegated Regulation (EU) 2016/89

3.16.1: 400 kV Interconnection between Gabčikovo (Slovakia) - Gönyű (Hungary) and Vel'ký Ďur (Slovakia)

The main purpose of this interconnection is to discharge the existing high voltage lines in the region with regard to the electricity generation capacities in the region and therefore aims at increasing security of supply. The project is currently in the phase of planning which is due to finish by the end of 2018. The Hungarian and Slovakian ITOs signed the Implementation Agreement on 1 March 2017 in Bratislava (Slovakia). The project is indicated as a project to be finished by the end of 2020 in the 2017 TYNDP. In the Ten Year Network Development Plan of the EU for 2016 this project is indicated in the same cluster with the one indicated under no 3.17 below [81]. To assess cost and benefits the CBA method of PCI projects was applied. It is expected that the project will be refinanced by the regular tariff mechanism. Generally, the project did not benefit from any special regulatory treatment, but the usual least-cost-principle was applied. It was said that no regulatory barriers were noticed that might hinder an approval.

No 3.17 of Annex VII to the TEN-E Regulation: specified as a "Project of Common Interest" by Commission delegated Regulation (EU) 2016/89

3.17: 400 kV Interconnection between Sajóivánka (Hungary) and Rimavská Sobota (Slovakia)

The main purpose of this interconnection is to comply with the "n-1" principle applicable to the security of supply. Due to the closure of major electricity generation facilities in the region (Tisza I., II.), the electricity supply of the region is mainly secured by the 220 and 400 kV interconnections between the Ukraine and Hungary, by the Mátra power plant (in Hungary) and another 400 kV Slovakian-Hungarian (Göd-Léva) interconnection. The project is currently in the phase of planning which is due to finish by the end of 2018. The Hungarian and Slovakian ITOs signed the Implementation agreement on 1 March 2017 in Bratislava (Slovakia). The project is scheduled to finish by the end of 2020 in the 2017 TYNDP. In the Ten Year Network Development Plan of the EU for 2016 this project is indicated in the same cluster with the one indicated under no 3.16 above[82]. To assess cost and benefits the CBA method of PCI projects was applied. It is expected that the project will be refinanced by the regular tariff mechanism. Generally, the project did not benefit from any special regulatory treatment, but the usual least-cost-principle was applied. It was said that no regulatory barriers were noticed that might hinder an approval.

2.3. Options for improvement

2.3.1. Options to improve regulatory practice

The above discussion shows that the NRF is well-designed and functional for both security of supply and innovative projects. No significant problems with practical relevance have been reported by the interviewees. Yet, the following improvements could be considered.

[81] Source of information at the Hungarian ITO's website at http://mavir.hu/web/mavir/pci-jeloltek.
[82] Source of information at the Hungarian ITO's website at http://mavir.hu/web/mavir/pci-jeloltek.

(i) Favouring of OPEX-based solutions

Generally, the NRF is considered adequate in supporting investments in security of supply and some kinds of innovative technologies. Currently, there are no indications that the implementation practices provide inadequate incentives to ensure security of supply. Also, a number of innovative technologies are used in recent projects. Respondents point out there might be a bias towards CAPEX-solutions. If this bias develops a significant distortion for the choice of solutions that becomes economically relevant, specific incentives could be introduced for these kinds of OPEX-based solutions, which have been identified as advantageous or necessary.

(ii) Statutory obligation to consider alternatives

A more general approach to foster OPEX-based solutions in the long-term, i.e. beyond a single regulatory period, would be the introduction of an obligation to consider OPEX-related innovative options in the network development plan. The TSO would then have to provide OPEX-based options as alternatives to CAPEX-based projects outlined in the network development plan. This approach necessitates that a framework is developed determining when OPEX-based solutions should be favoured over CAPEX-based solutions. This approach should be coupled with monetary incentives (like option (i)) for the TSO to invest in OPEX solutions to counteract the CAPEX bias.

(iii) Statutory reference to innovation

There are no statutory powers or duties aiming at encouraging innovation. To ensure that innovative projects are still encouraged and supported in the next regulatory period, a statutory reference to innovation could be included into the regulatory framework. This long-term strategic perspective could be shaped by governmental policies, statutory duties or could be included in the TYNDP.

(iv) Cost benefit analysis

The stakeholders criticized existing uncertainties how to determine the most cost-effective technology. A first step in this direction would be introducing the requirement to conduct a CBA in the NDP. To do so, detailed definitions should be added to the NRF, e.g. for cost-benefit relations within CBA or cost types in terms of what are the most efficient cost. If deemed necessary, the CBA could be a requirement before approval of the final investment decision or before approval of the cost recovery.

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.

As regards option (ii) (statutory obligation to consider alternatives), we understand that the legal mechanism for implementing this option would involve the modification of the Electricity Act[83] (by including the general obligation for the Hungarian ITO to consider such alternatives) and the Network Code[84] (where the detailed rules could be incorporated).

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[83] Under Section 6(1) of the Hungarian Constitution, the modification of an Act of Parliament (such as the Electricity Act) may be proposed by the president of Hungary, by the government, by a Parliamentary committee or by any member of Parliament. Resolution of Parliament no. 10/2014. (II. 24.) Ogy. contains the detailed rules of the adoption of an act of Parliament in Hungary (the "**Parliament Rules**"). Under the Rules of Parliament, the debate process consists of two main parts: (i) the general debate, which relates to the necessity and the main principles of the proposal and (ii) the detailed debate, which opens on the week following the closure of the general debate. If Parliament votes in favour of the proposal and its review by the Constitutional Court is not requested, the President of Parliament must send the adopted act to the President of Hungary for signature. If the President of Hungary agrees with the act and does not want to have it reviewed by the Constitutional Court he must sign it within 5 days. If he does not agree with the act, he may once send it back to Parliament for reconsideration. In this case, Parliament must re-consider the act and may modify it or adopt it again without any changes.

[84] Under Section 67 of the Electricity Act, it is the Hungarian ITO's duty to prepare the Network Code in cooperation with other licensees and the representatives of customers. Under Section 70(2) of the Electricity Act the Hungarian ITO must establish a "regulatory committee" (in Hungarian: "*szabályzati bizottság*") for the coordination of the establishment and modification of the Network Code. Under Section 70(3) of the Electricity Act, the detailed rules on the operation of such regulatory committee must be contained in the Network Code itself. The currently applicable Network Code contains these rules in its Chapter 18. According to this Chapter 18 of the Network Code, the regulatory committee

Turning to option (iii) (statutory reference to innovation), we expect that this could be implemented by including a reference to innovation as a general policy goal in the preamble of the Electricity Act[85].

As regards option (iv) (cost benefit analysis), the suggestion of incorporating a mandatory requirement in legislation for the TSO to provide the NRA with a CBA of an individual project in the process of cost recovery approval, could be implemented by the modification of the Network Code.

2.3.3. Impact assessment

Option (i) is not easy to implement in a well-balanced manner. This option risks being be a technology-specific incentive, which may not necessarily lead to efficient decisions and may even encourage abuse. Also, any innovative and socially beneficial OPEX solutions to be favoured by the regulation need to be defined. Such projects would need to be redefined for each regulatory period, possibly in cooperation with the TSO and maybe including a stakeholder consultation in order to ensure technology neutrality. Therefore, depending on the specific implementation the effort for the NRA and the TSO can be high. Additionally, adequate incentives for efficiency must be set to avoid abuse.

The long-term strategic perspective on innovation mentioned in option (iii) 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).

Regarding option (iv) effort and benefit must be weighted strongly against each other. Depending on the implementation, a CBA can result in a highly increased work for the NRA and the TSO. First, unambiguous measurement values must be found for criteria considered. Also, when taking qualitative criteria into account, the risk exists that CBA results are influenced by individual assessments and therefore are not clear.

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. Moreover, if implemented well, option (i) could result in a shift from primarily CAPEX investments to more OPEX investments.

consists of 11 voting members: 3 representing the Hungarian ITO, 2 representing the electricity generators with a capacity over 50 MW and the remaining 6 seats are distributed among the representatives of electricity generators with capacities below 50 MW, distribution network operators, universal suppliers, electricity traders and customers. All modifications of the Network Code must be negotiated in the regulatory committee. Under Section 18.2.1(B) of the Network Code, modifications to the Network Code may be proposed in the regulatory committee. The regulatory committee must have at least one meeting every year. We conclude from the above rules that any voting member of the regulatory committee may propose modifications to the Network Code. The proposal must be negotiated in the regulatory committee and the final wording approved by the regulatory committee must be submitted to the Hungarian Regulator for approval. Under Section 70(4) of the Electricity Act, any modification of the Network Code can only become effective upon the Hungarian Regulator's approval.

[85] See footnote 81.

3. GAS

3.1. Legal analysis of the NRF in Hungary

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

By its decision no. 77/2011. (X.14.) OGY the Hungarian Parliament adopted[86] the "*Hungarian Energy Strategy 2030"* (the "**Hungarian Energy Strategy**") which contains a complex set of long-term principles and priorities for the development of the Hungarian energy industry until 2030, with a view to 2050.

The principal piece of legislation in the Hungarian "Legal Framework" is Act XL of 2008 on natural gas supply (the "**Gas Act**").

Chapter XVII of the Gas Act contains specific delegations of authority to regulate certain specifically defined areas of the Hungarian gas sector to the following levels of legislation:

- government[87] (the main piece of legislation issued by the government (under the delegation in Section 132/A of the Gas Act) is government decree 19 of 2009. (I.30.) Korm. on the implementation of the rules of the Gas Act (the "**Gas decree**");
- the minister in charge of energy policy[88];
- the minister in charge of industrial policy[89]; and
- the president of the Hungarian Energy and Public Supply Regulator[90] (in Hungarian: "*Magyar Energetikai és Közműszabályozási Hivatal"*) ("**Hungarian Regulator**"). The Hungarian Regulator's legal predecessor (the "Hungarian Energy Office") was established in 1994 by Act XLI of 1994 on gas supply. The currently operating Hungarian Regulator was established by Act XXII of 2013 (the "**Hungarian Regulator Act**") as the general legal successor[91] of the Hungarian Energy Office.

The Gas Act has been modified to comply with the Third Energy Package[92]. The TEN-E Regulation (Regulation (EU) No 347/2013) contains detailed rules as to the roles of the Hungarian Regulator and the Hungarian ITO (defined below). Government decree no 75/2016. (IV. 5.) Korm. contains specific rules for the implementation of the provisions of the TEN-E Regulation (see details in point 3(ii) below).

In Hungary, "gas transmission network operation" (in Hungarian: *"szállítási rendszerüzemeltetés")*[93] is carried by one licensee: FGSZ Földgázszállító Zrt. as an Independent Transmission Operator (the "**Hungarian ITO**"). "Transmission system operation" is an activity, which may only be carried out under a licence issued by the Hungarian Regulator.[94] The Hungarian ITO's licence for "transmission system operation" was issued by the Hungarian Regulator under no.: 630/2012. The current length of the Hungarian gas transmission network owned and operated by the Hungarian ITO is 5782 kilometres[95].[96]

Another important element of the Legal Framework in Hungary is the network code of the Hungarian gas network (in Hungarian: *"A Magyar Földgázrendszer Üzemi és Kereskedelmi Szabályzata*") issued by the Hungarian ITO under the Gas Act (the "**Network Code**").[97] The Network Code contains "*the rules, procedures and methodologies on the operation of the gas network, the minimum contents of the agreements relating to trading, metering and data*

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86 The Hungarian Parliament accepted the "*Hungarian Energy Strategy 2030*" on 3 October 2011. It was extended once by the Hungarian Parliament with decision no 5/2015. (III.20. OGY).
87 Section 132/A of the Gas Act.
88 Section 133(1) of the Gas Act.
89 Section 133(2) of the Gas Act.
90 Section 133/A of the Gas Act.
91 Section 23(1) of the Hungarian Regulator Act.
92 Section 159(1) of the Gas Act.
93 Section Section 3(53a) of the Gas Act.
94 Section 114(a)b) of the Gas Act.
95 www.fgsz.hu.
96 Another entity, which carries out the "transmission" of gas in Hungary, is Magyar Gáz Tranzit Zrt. ("**MGT Zrt.**) which operates a gas transmission line with a length of 92 kilometres. MGT's transmission license was issued by the Hungarian Regulator under no 4553/2015.
97 Sections 3(64) and 110 of the Gas Act.

transfer and the rules on daily balancing"[98]. The current Network Code (applicable as of 1 October 2017) was approved by the Hungarian Regulator under no.: 4318/2017.

Hungarian ITO must prepare data base for planning purposes

The continuous supervision of available capacities and the development of the entire Hungarian gas network (including the transmission and the distribution network) is coordinated by the Hungarian ITO[99]. For the planning of network developments, the Hungarian ITO must keep a data base to which all the relevant network operators must contribute the necessary data.[100] The contents and the structure of this data base is approved by the Hungarian Regulator.[101]

Capacity supervisions, network development proposals

All network operators must annually check the capacities of their respective (distribution and transmission) networks[102] and must make 10-year network development proposals to the Hungarian ITO.[103]

Harmonized network development plan – submission to the Hungarian Regulator

The Hungarian ITO harmonizes the results of these capacity supervisions and network development proposals (the "**Network Development Plan**") and submits it to the Hungarian Regulator for approval.[104]

Approval by the Hungarian Regulator

The Hungarian Regulator may notify the Hungarian ITO to modify the Network Development Plan[105]:

- **if it does not comply with the safety-of-supply goals specified by Hungarian law or the EU energy policy**;
- if it may detrimentally affect the national economy;
- if it is otherwise contrary to any law;
- or if it may restrict competition.

The Hungarian Regulator must also check if the Network Development Plan complies with the Community-wide10-year network development plan under Regulation No 715/2009[106].

If the Network Development Plan complies with all the above-mentioned requirements, the Hungarian Regulator approves it.[107]

The Hungarian ITO's consultation paper of its Development Proposal for the period between 2016 and 2025 (the "**Consultation Paper**")[108] contains a general description of the background incentives for the long-term gas transmission network development[109]. It says in general that most transmission network developments are necessary to increase local capacities and to increase the safety of supply in Hungary.

Another important incentive is to increase Hungary's regional and European strategic role in the cross-border transmission of gas by increasing the gas transit volumes, which can only be achieved, by the increase of the integration of Hungary's gas transmission networks into the European integrated gas market.

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98 Section 110(1) of the Gas Act.
99 Section 81(1) of the Gas Act.
100 Section 81(1) of the Gas Act.
101 Section 81(3) of the Gas Act.
102 Section 82(1) of the Gas Act.
103 Section 82(2) of the Gas Act.
104 Section 82(5) of the Gas Act.
105 Section 83(1) of the Gas Act.
106 Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks.
107 Section 83(3) of the Gas Act.
108 The Consultation Paper is accessible at the Hungarian ITO's website at https://fgsz.hu/hu-hu/10-eves-fejlesztesi-javaslat-konzultacio.
109 Page 29 of the Consultation Paper.

Furthermore, the increase of the Hungarian gas transmission network's integration with the European gas transmission networks is also important for the long-term increase of gas-gas competition in Eastern Europe, because this would also result in a decrease in gas prices. According to the Consultation Paper[110], in Eastern Europe the gas prices are still highly influenced by the oil-based price formulas of long-term gas trading contracts. Complex gas price formulas (consisting of oil-related and market prices) also gain in importance but the low liquidity of gas does not make it possible for Hungarian customers to enjoy the benefits of the free-market trading of gas and rather makes the gas prices less competitive. According to the Consultation Paper,[111] the level of interconnections and the capacities of such interconnections are far below the Western European level in Eastern Europe. Furthermore, Eastern European gas transmission networks are mainly suitable for gas transmission from East to West, which is also a hardship for the development of the Eastern European gas markets and is also a risk for the safety of supply in Eastern Europe.

For all these reasons the Consultation Paper emphasises the importance and necessity of the increase of the integration of the Hungarian gas transmission network with regional and European networks in order to enable Hungarian customers to enjoy the benefits of higher gas liquidity in the trading of gas - in the form of a higher security of supply and lower gas prices.

Implementation of development projects

Before the implementation of any developments in the approved Network Development Plan, the license of the relevant network operator must be modified accordingly. All development works may only be started after the licence has been amended.[112]

Failure to implement the approved Network Development Plan

If the Hungarian ITO does not implement any network, development projects within the deadline specified in the Network Development Plan the Hungarian Regulator may issue an invitation for tenders for the implementation of the development in question.[113] In such cases, the Hungarian ITO must duly cooperate with the winning investor.[114] The Hungarian Regulator's approval is required for all financing agreements, which are necessary for the implementation of any network development project.[115]

Establishment of gas transmission lines by entities other than the Hungarian ITO

Based on a modification of the Gas Act applicable since 14 November 2014[116] entities other than the Hungarian ITO (Hungarians or non-Hungarians) may also establish gas transmission lines under an individual licence to be issued by the Hungarian Regulator[117] ("**Non-ITO Transmission Lines**"). The developers of such Non-ITO Transmission Lines may be exempted[118] from:

- the general rules relating to the tariffs applicable to transmission lines;
- the mandatory access requirements applicable to transmission lines; and
- the unbundling requirements applicable to transmission lines.

These exemptions may apply to the entirety or only a part of the Non-ITO Transmission Lines. These exemptions may only be granted if the following conditions are met[119]:

- the new infrastructure increases competition in gas supply, the security of supply and the efficient operation of the gas network;
- the financial and economic risks associated with the new infrastructure are such that the network would not be feasible without the exemptions in question;
- the owner of the new infrastructure is a business organization which has no license to operate those networks to which the new infrastructure is connected;

110 Page 29 of the Consultation Paper.
111 Page 30 of the Consultation Paper.
112 Section 83(4) of the Gas Act.
113 Section 83/A(1) of the Gas Act.
114 Section 83/A(3) of the Gas Act.
115 Section 83/A(6) of the Gas Act.
116 Section 3(1) of Act LIX of 2014 on the amendment of the Gas Act.
117 Section 114(1)j) of the Gas Act.
118 Section 85(1) of the Gas Act.
119 Section 85(1) of the Gas Act.

- a fee must be paid for the use of the new infrastructure; and
- the exemption does not have a detrimental effect on competition and to the efficient operation of the gas network or to the efficient operation of the transmission network or storage facility to which it is connected.

If the Non-ITO Transmission Line is a cross-border infrastructure, the Hungarian Regulator must consult with the regulators of the affected countries.[120]

The Hungarian Regulator must send its proposed decision on the above-mentioned exemptions to the European Commission.[121] If the European Commission agrees with the proposed decision or does not react within 2 months the Hungarian Regulator may issue its decision as originally proposed. If the European Commission asks, the Hungarian Regulator to modify the conditions of the exemption the Hungarian Regulator must modify the decision accordingly.[122]

The asset value of the Non-ITO Transmission Lines, which have received the above-mentioned exemptions, may not be taken into account for the calculation of the transmission network tariffs during the period of the exemption.[123]

Undertaking of investments

As indicated above, the Hungarian ITO is the entity in the Hungarian gas supply system, which coordinates the continuous supervision of capacities and the planning of network development projects. As indicated above, the ITO submits to the Hungarian Regulator the harmonized Network Development Plans for approval. The approved Network Development Plan sets out the individual development projects and the deadlines for their completion. Based on the approved Network Development Plan the Hungarian ITO is obliged to carry out the relevant investments. There are rules for the cases where the Hungarian ITO fails to comply with any of its development obligations: the Hungarian Regulator may issue invitations for tenders for the implementation of such network development projects. In summary, the undertaking of any investment projects by the Hungarian ITO are based on the Network Development Plans approved by the Hungarian Regulator.

Role of NRA

Transmission network owned by the Hungarian ITO

The Hungarian Regulator's role in connection with transmission network development is to annually review the Hungarian ITO's Network Development Plans: to check these from the point of view of the applicable community-wide requirements and the requirements of Hungarian law.

Developments failed by the Hungarian ITO

As described above, if the Hungarian ITO fails to implement a development project approved by the Hungarian Regulator the latter may issue an invitation for tenders for the implementation of the failed project. In connection with such projects, the Hungarian Regulator may impose obligations upon the Hungarian ITO to make sure that the investor chosen in the tender is able to duly carry out the failed development.

Non-ITO Transmission Lines

As indicated above, under Section 114(1)j) of the Gas Act investors (Hungarians or non-Hungarians alike) may apply for a licence to establish a gas transmission line within the Hungarian borders or cross-border and may even be granted certain exemptions from rules otherwise applicable to gas transmission networks if certain conditions are met. The Hungarian Regulator's role in the case of such Non-ITO Transmission Lines is to check if they are in compliance with the strict rules of the Gas Act (described in detail in this Section 3.1.1 above), and if exemptions are granted, to have these approved by the European Commission.

120 Section 85(2) of the Gas Act.
121 Section 85(4) of the Gas Act.
122 Section 85 (4)-(6) of the Gas Act.
123 Section 85(8) of the Gas Act.

Institutional or procedural constraints on the performance of these roles

There are no specific procedural constraints applicable to gas transmission network development projects.

To the contrary, under Act LIII of 2006 on "projects of crucial interest to the national economy" the government may designate specific projects of crucial interest. The government issues separate decrees for the individual projects specifying the exceptional rules applicable to the project in question within the limitations of the act. The following investments may be designated as projects of crucial interest:[124]

- investments which are wholly or partially financed from EU funds;
- investments which are implemented wholly or partially with budget subsidies;
- investments which are based on agreements concluded for concession-based activities with a minimum cost level of 5 billion HUF;
- investments which are implemented wholly or partially with subsidies based on individual governmental decisions;
- investments with a minimum aggregate cost level of 90 million HUF which create at least 15 new jobs;
- investments which promote environmental, research-development, educational, or health care and social goals;
- investments relating to the maintenance, presentation or development of national memorial locations; or
- investments relating to primary national treasures and monuments.

3.1.2. Specific legal rights and duties

Hungarian transmission network

As to the development of the Hungarian gas transmission network, we have described the rules applicable to this in the Hungarian Legal Framework. The Hungarian Legal Framework allocates the functions concerning the investment projects concerning the Hungarian gas transmission network to the Hungarian ITO and the Hungarian Regulator.

In the case of complex transmission network development projects, the following "other parties" have certain roles under Hungarian law:

- **Environmental authorities under the Environmental Permit Decree[125]**
  Under Section 17 of the Environmental Permit Decree, the applicant of an environmental permit must use the **best available technical solutions** in order to:
  - reduce all possible burdens on the environment;
  - ensure that all materials and energy are used efficiently;
  - reduce emissions to the lowest possible level;
  - avoid the accumulation of waste;
  - avoid incidents resulting in environmental impact; and
  - prevent all contamination in the case of the stoppage of the activity under review.

  The **best available practices** must be checked under the reference documents issued by the European Commission. If no such document exists for the activity under review, the criteria specified in Annex 9 of the Environmental Permit Decree must be taken into account;
- **The "interested public" under the Environmental Permit Decree**
  The "interested public" under Section 2(1) of the Environmental Permit Decree means natural or legal persons or organizations without a legal personality, which may be affected by the decision of the environmental authority in the procedure under review.
  The "interested public" must be informed about all the details of the project subject to the environmental permit procedure. Public audiences must be held in certain cases specified by Sections 9 and 21 of the Environmental Permit Decree where the "interested public" may give its opinion on the project under review. These opinions are not obligatory but the environmental authority must consider them and analyse them in its decision on the environmental permit request;
- **Environmental NGOs**

[124] Section 1(1) of Act LIII of 2006.
[125] The environmental permit procedures are regulated by government decree no 314/2005.(XII.25.) Korm.

Under Section 98 of the Environment Protection Act,[126] associations established for the protection of the environment ("**Environmental NGOs**") have the status of a "client" in environmental permit procedures in the territory affected by their activities. This means that they may appeal decisions and may start litigation against the decisions of the environmental authorities;

- **Cultural heritage authorities**
  Under Sections 23/B-F of the National Heritage Protection Act[127], in the case of "large investments" preventive archaeological exploration must be carried out. The definition of "*large investments*" is contained in Section 7(6) of the National Heritage Protection Act.

Non-ITO Transmission Lines

As indicated in "Role of the NRA" above, under Section 114(1)j) of the Gas Act, companies (Hungarians or non-Hungarians) may establish transmission network lines based on individual licenses issued by the Hungarian Regulator. The possible financing mechanisms of such projects are not regulated by the Gas Act but the cost structure of such investments must comply with the requirements explained in Section 3.1.1 above.

Projects of common interest (PCIs) under the TEN-E Regulation

The Hungarian Regulator and the Hungarian ITO are both bound by the TEN-E Regulation. This regulation sets up a specific institutional structure for the promotion of projects of common interest (PCIs). The TEN-E Regulation defines the "*project promoters"* in its Article 2(6), which contains "*investors developing a project of common interest"*. Such "project promoters" are not specified in the Hungarian Legal Framework among the players of the development of the Hungarian transmission network. Under the Hungarian TEN-E Methodology, it cannot be excluded that "project promoters" propose projects to the Hungarian Regulator.

3.1.3. Mechanism for financing of investment projects

Financing through transmission network use tariffs regulated by the Hungarian Regulator

Under Sections 103(2)a) and 104(1) of the Gas Act the transmission network tariffs are tariff caps, which are specified by the Hungarian Regulator in tariff decrees (to be analysed in detail below). The Hungarian Regulator specifies the tariffs "*ex officio"*.[128] The "tariff cap" means that higher tariffs than the tariffs specified by the Hungarian Regulator cannot be applied.[129] However, lower tariffs can be applied according to terms previously published and without discrimination.[130] The network tariffs are regulated in 4-year tariff periods[131] (analysed in detail below). The transmission network tariffs are the same throughout Hungary while distribution network tariffs are specified for each distributor individually [132]. The principles of the transmission network tariffs under Section 105(4) of the Gas Act are the following:

- they must take into account the justified costs of the efficiently operating licensee (including capital costs);
- they must be based on the least cost principle[133];
- they must motivate the licensees to increase (in the short and the long term alike) the efficiency of their operations; and
- they must motivate the licensees to continuously increase the quality of their services and the security of supply.

The transmission network tariffs are specified annually.[134]

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126 Act LIII of 1995.
127 Act LXIV of 2001.
128 Section 104(4) of the Gas Act.
129 Section 104(7) of the Gas Act.
130 Section 104(8) of the Gas Act.
131 Section 104/A(1) of the Gas Act.
132 Section 105(2) of the Gas Act.
133 "least cost" means under Section 3(48) of the Gas Act: the costs incurred by a licensee for the purpose of the licensed activity, which is necessary and justified both at the level of the licensee in question and at the level of the national economy.
134 Section 104/B(1) of the Gas Act.

Under the general rules in Sections 104 and 105 of the Gas Act and also based on the delegation of authority in Section 133/A(1) of the Gas Act, the Hungarian Regulator issued the currently applicable gas network tariff decree under no 8/2016.(X.13)MEKH (the "**Network Tariff Decree**"). This Network Tariff Decree applies to a 4-year tariff-period between 1 January 2017 and 31 December 2020.[135] During this period, the gas network tariffs are set by the Hungarian Regulator on the basis of two main criteria[136]: (i) the least cost principle[137] and (ii) the "justified costs"[138] of the licensees. The "justified costs" are costs which are incurred in compliance with applicable law and the relevant entity's licence (i) and which are actually necessary to continuously and securely carry out the **licensed activity**, (ii) and which are actually necessary for the **operation of the company** which carries out the licensed activity (only to the extent that this operation is efficient), including (for both categories), the **capital costs** as well.

With regard to the amount of the tariffs, the Hungarian Regulator must take into account the tariffs applied in the previous tariff period and in the course of setting the annual tariffs, the Hungarian Regulator must endeavour to avoid significant changes from one year to another.[139]

With regard to the amount of the tariffs, the Hungarian Regulator must also endeavour to achieve the following:[140]

- the network operators are encouraged to increase the efficiency of their activities (Section 3(3)a) of the Network Tariff Decree);[141]
- the network operators should become interested in complying with the minimum quality criteria specified by the Hungarian Regulator;[142]
- the network operators should be motivated to carry out the network developments which are necessary for a sustainable operation;[143]
- the network operators should not be interested in promoting the customers' energy efficiency measures;[144]
- the network operators' risks should not exceed the limit which is reasonable under the given economic circumstances;[145] and
- the network operators should be able to make their business policy decisions with due foresight.[146]

In order to set the tariffs applicable at the beginning of the tariff regulation period the Hungarian Regulator determines the justified costs of the individual network operators ("**Initial Cost Analysis**").[147]

During the Initial Cost Analysis, the following cost types must be analysed[148]:

- the operation costs (paragraph a);
- the amortization of equipment (paragraph b);
- capital costs (paragraph c);
- settlement difference[149] (paragraph d).

The tariffs applicable for the subsequent years of the 4-year period are specified with an effective date of the 1st of October each year.

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135 Section 1 of the Network Tariff Decree.
136 Section 3(1) of the Network Tariff Decree.
137 "least cost" means under Section 3(48) of the Gas Act: the costs incurred by a licensee for the purpose of the licensed activity, which is necessary and justified both at the level of the licensee in question and at the level of the national economy.
138 Section 2(1) of the Network Tariff Decree.
139 Section 3(2) of the Network Tariff Decree.
140 Section 3(3) of the Network Tariff Decree.
141 Section 3(3)a) of the Network Tariff Decree.
142 Section 3(3)b) of the Network Tariff Decree.
143 Section 3(3)c) of the Network Tariff Decree.
144 Section 3(3)d) of the Network Tariff Decree.
145 Section 3(3)e) of the Network Tariff Decree.
146 Section 3(3)f) of the Network Tariff Decree.
147 Section 9(1) of the Network Tariff Decree.
148 Section 7(2) of the Network Tariff Decree.
149 "settlement difference" under Section 9(6) of the Network Tariff Decree means differences resulting from metering and technological criteria.

Under Section 104/B(2) of the Gas Act the Hungarian Regulator has issued a methodology on the calculation rules applicable to the Initial Cost Analysis and the calculation of the tariffs applicable in the subsequent years of the 4-year period.

Financing from funds available in the "Connecting Europe Facility" (CEF)

The government issued a decree under no 75/2016. (IV.5.) Korm. to implement the provisions of the TEN-E Regulation from the point of view of how the funds available in the CEF may be used (the "**CEF Decree**"). Under the CEF Decree, requests for funding from the CEF may be submitted to the European Commission on the basis of the government's individual approval. The government gives such approvals in individual government resolutions published in the Official Gazette of Hungary. Under the CEF Decree, no individual government resolutions have yet been issued in connection with projects relating to the development of the gas transmission network.

3.1.4. Regulatory rules with respect to innovation

Specific duties of the TSO aimed at encouraging innovation

The Hungarian ITO's duties aimed at encouraging innovation are parts of its duties to harmonize the network development of the entire Hungarian gas network. The Hungarian ITO is obliged by law to submit regular network development plans to the Hungarian Regulator and once a network development plan is approved, the Hungarian ITO must implement it.

Under the Consultation Paper, it is an elementary interest of the Hungarian ITO to develop the gas transmission network at the highest possible level in order to make it suitable for its integration with regional and European gas transmission networks. According to the Consultation Paper Eastern Europe's gas, markets are not yet sufficiently integrated with the Western European gas transmission networks and this has a negative effect on gas prices in Hungary. Without such gas transmission network development, the beneficial effects of gas-gas competition cannot be enjoyed by Hungarian customers due to the still existing importance of oil-based gas price formulas in long-term gas trading contracts. Furthermore, this may also have a negative impact on the competitiveness of the Hungarian economy as a whole.

Specific duties of the NRA aimed at encouraging innovation

Hungarian transmission network

The Hungarian Regulator has the power to approve and enforce the implementation of the Hungarian ITO's Network Development Plans. The criteria to be applied by the Hungarian Regulator in connection with its duties concerning the Hungarian ITO's Network Development Plans (described in Section 3.1.2 above) ensure that the Hungarian ITO's network development plans must focus on innovation. For example, one of these powers of the Hungarian Regulator is that they may notify the Hungarian ITO to modify the Network Development Plan if it does not comply with the safety-of-supply goals specified by Hungarian law or the EU energy policy, or if it may detrimentally affect the national economy. As indicated above, by reference to the Consultation Paper, the entire Hungarian economy's evident interest is to increase the integration of the Hungarian gas transmission network with the European gas transmission networks because such integration would, in the long term, result in lower gas prices and, as a result, higher competitiveness for the entire Hungarian economy.

As mentioned above, the primary source of financing for the ITO's transmission network development works through the transmission tariffs.

As mentioned in Section 3.1.3 above, the transmission tariffs are specified by the Hungarian Regulator under strictly specified principles set forth in the Network Tariff Decree (analysed in detail above).

Projects of common interest (PCIs) under the TEN-E Regulation

Under Article 13(6) of the TEN-E Regulation the Hungarian Regulator has published its "methodology and criteria used to evaluate investments in electricity and gas infrastructure projects and the higher risks incurred by them" (the "**Hungarian TEN-E Methodology**").

We briefly describe the main terms of the TEN-E Methodology as follows.

Compliance with the Community-wide 10-year network development plan

If it is doubtful, whether the Hungarian ITO's network development plan is in compliance with the Community-wide 10-year network development plan under Regulation No 715/2009/EC[150] the Hungarian Regulator consults with the ACER[151]. If the Hungarian ITO's network development plan is not in compliance with the above-mentioned Community-wide 10-year network development plan, if it is unlawful or if it restricts competition, the Hungarian Regulator may oblige the Hungarian ITO to modify the plan. If the Hungarian ITO does not comply with its obligations under the approved transmission network development plan the Hungarian Regulator may issue an invitation for tenders for the completion of the development, which the ITO refused to implement.

Risk evaluation methodology

General risk evaluation principles

PCIs must promote the following economic goals:

- increase of the security of energy supply;
- increase of the reliability of the network;
- establishment of a European energy market.

The Hungarian regulator examines the general supply-and-demand issues, the specific industrial criteria and the risks associated with the cooperation beyond national level. The primary task of the Hungarian regulator is to get to know the views of all the parties affected by the planned development.

Specific risk evaluation principles

The Hungarian regulator will examine the documents submitted by the "project promoters". It is of primary importance that all information must be available to the Hungarian Regulator. The Hungarian Regulator may request additional information from the relevant "project promoters". In the course of its evaluation of the risks associated with a proposed project the Hungarian Regulator gives primary importance to the following factors:

- overspending beyond the planned costs;
- reduction of planned turnover;
- liquidity risks;
- planning risks;
- financial risks;
- risks resulting from the completion or non-completion of other projects;
- technological risks;
- evaluation and exchange risks.

It is also important for the Hungarian regulator that the "project promoters" must do their best to reduce the risks.

All the risk factors must be considered individually indicating the likelihood of its occurrence and the financial impact.

3.1.5. Regulatory rules with respect to security of supply

Specific duties of the TSO aiming at safeguarding security of supply

The Hungarian ITO coordinates the network planning activities for the entire Hungarian gas network. As indicated above, one of the reasons why the Hungarian regulator may request the Hungarian ITO to modify the Network Development Plan submitted for approval is if it does not comply with the requirements of security of supply either at a national level or in comparison with the energy policy of the European Union. Therefore, it is one of the Hungarian ITO's primary duties to ensure that long-term security of supply in the gas sector is safeguarded through the continuous development of the transmission network (and the distribution network alike).

[150] Regulation (EC) No 715/2009 of the European Parliament and the Council of 13 July 2009 on conditions for access to the natural gas transmission networks.

[151] Agency for the Cooperation of Energy Regulators.

Specific duties of the NRA aiming at safeguarding security of supply

Hungarian transmission network:

The Hungarian regulator's main duties are related to the safeguarding of the security of supply for the entire Hungarian gas sector. Its relevant duties are as follows:

- to ensure that all entities which carry out licensed activities comply with the applicable laws[152];
- to promote an efficient and sustainable competition on the gas market[153];
- to ensure efficiency and the application of the least cost principle[154];
- **to maintain and increase the security of supply[155];**
- to ensure compliance with the goals of energy policy and sustainable development[156];
- to inform the public[157];
- to protect the interests of customers and licensees[158];
- to prevent the abuse of monopolies and all activities which may restrict competition[159];
- to protect the interests of customers by the efficient operation of a national market[160];
- to protect of the interests of vulnerable customers[161];
- to simplify the changing between traders[162];
- to promote the establishment of a competitive, safe and sustainable national gas market within the European Union and, in order to achieve this, to participate in the establishment of efficiently operating regional markets[163];
- to promote that the transmission network operator and the network users get sufficient incentives to increase the efficiency of the gas network for the purpose of market integration;[164]
- to carry out the duties specified in Regulation No 994/2010(EU)[165] and the relating obligations specified by the government.

European Projects of Common Interest (PCIs) under the TEN-E Regulation:

The Hungarian Regulator has issued a methodology of the risk analysis related to electricity and gas PCIs. It is available at its website (www.mekh.hu) in Hungarian only.

3.1.6. Institutional or procedural constraints on the performance of the TSO's role

There are no specific procedural constraints applicable to gas transmission network development projects.

To the contrary, under Act LIII of 2006 on "projects of crucial interest to the national economy" the government may designate specific projects of crucial interest. The government issues separate decrees for the individual projects specifying the exceptional rules applicable to the project in question within the limitations of the act. The following investments may be designated as projects of crucial interest:[166]

- investments which are wholly or partially financed from EU funds;
- investments which are implemented wholly or partially with budget subsidies;
- investments which are based on agreements concluded for concession-based activities with a minimum cost level of 5 billion HUF;
- investments which are implemented wholly or partially with subsidies based on individual governmental decisions;
- investments with a minimum aggregate cost level of 90 million HUF which create at least 15 new jobs;

[152] Section 126a) of the Gas Act.
[153] Section 126b) of the Gas Act.
[154] Section 126c) of the Gas Act.
[155] Section 126d) of the Gas Act.
[156] Section 126e) of the Gas Act.
[157] Section 126f) of the Gas Act.
[158] Section 126g) of the Gas Act.
[159] Section 126h) of the Gas Act.
[160] Section 126i) of the Gas Act.
[161] Section 126j) of the Gas Act.
[162] Section 126k) of the Gas Act.
[163] Section 126l) of the Gas Act.
[164] Section 126m) of the Gas Act.
[165] Regulation (EU) No 994/2010 of the European Parliament and of the Council of 20 October 2010 concerning measures to safeguard security of gas supply.
[166] Section 1(1) of Act LIII of 2006.

- investments which promote environmental, research-development, educational, or health care and social goals;
- investments relating to the maintenance, presentation or development of national memorial locations; or
- investments relating to primary national treasures and monuments.

3.2. Regulatory practice

3.2.1. Overview over regulatory practice in Hungary

The general regulatory principle can be described as an Incentive-based Regulation containing a mixture of price cap, revenue cap and quality regulation. Analysing the legislation, (see Section 3.1) we have identified a strong emphasis on a least cost principle, which is unclear if this encourages or discourages innovation.

Main regulatory barriers

The interviewees were generally satisfied with the NRF regarding support of security of supply and 'innovative' projects. Some stakeholders see uncertainties of the acceptance of innovative projects and suggest introducing an incentive for innovation in tariff system to reduce the risk for uncertain acceptance of investments in innovative solutions.

Possible improvement of the NRF

From the interviews, the following improvements to the NRF could be derived:

- Reduce the risk for uncertain acceptance of investments in innovative solutions;
- Eliminate CAPEX bias if the economically efficient choice of solutions is significantly distorted.

3.2.2. Regulatory practice related to innovation

Innovative projects and adequacy of the NRF relating to its support for these projects

The legal response from Hungary states that the Hungarian jurisdiction has no direct but an implied duty to innovate due to the general statutory duties of operating in an efficient, economic and effective manner. Also, the NRA has no explicit statutory power to encourage innovation.

Regardless of this, the interviewees note to undertake several innovative projects, e.g.:

- Bypass section with mobile compressors during maintenance;
- Usage of highly efficient heaters and heat exchangers at gas delivery stations.

Yet, from analysing the legislation, one can conclude the following issue: In order to implement any gas investments in Hungary, the TSO requires their licence to be amended. This facilitates investment by allowing the NRA to impose time limits for completing investments directly on the TSO through their licence. This does, however, raise a potential indirect barrier to investment because the licence amendment must be completed before any works are carried out, which may cause delay. But, within the interviews, none of the stakeholders named this issue having a significant relevance in practice.

Generally, no part of the TSO's budget is labelled to innovation but a specific innovation allowance requested from the TSO in its PR4 price review was granted.

According to the interviewees, no investments are held back but investments must be regarded as efficient to be approved by the NRA. If new ideas and projects are suggested by the TSO, the TSO faces the risk whether the NRA accepts the costs or not. Therefore, it could be considered to introduce an incentive for innovation in tariff system to reduce the risk for uncertain acceptance of investments in innovative solutions. Also, interviewees see the general risk of a bias towards CAPEX intensive solutions, but the stakeholders currently see no hinderance related to innovation.

Despite this, there seem to be no relevant barriers in the framework, generally.

3.2.3. Regulatory practice related to security of supply

Security of supply projects and adequacy of the NRF relating to its support for these projects

One task of the TSO is to monitor capacity across the gas network to ensure security of supply. Also, the TSO is obliged to prepare and submit to the NRA for approval a development plan for the transmission system to guarantee security of supply for the following 10 calendar years. If the plan is non-compliant with security of supply goals or EU energy policy, contrary to law or restricts competition the NRA will request changes from the TSO. The plan is revised on an annual basis. Furthermore, the NRA checks the compliance against the EU-wide development plan. If an investment is regarded as "project of crucial interest to the national economy" and meets certain statutory criteria, it may be exempt from some administrative rules.

Examples of security of supply projects, which are being conducted or planned, encompass:

- Strategic storage (2009), Storage under the control of ministry to supply valuable protected customers in times of crisis (under the impression of first Ukraine Russia gas crisis);
- PCI ROHUAT-interconnection;
- PCI Italian-Slovenian-Hungarian interconnector is under consideration to establish a first connection between Slovenia and Hungary;
- PCI Eastring: participation but leader is Slovakia;
- Strengthening of internal grid parts (some kind of islanded parts) to cover decreasing imports from east;
- Only 2 connections without physical reverse flow but commercially not needed, so no actions taken.

Interviewees see no urgent need for changes of the NRF because a mandatory regulation from EU exists that states what actions to take generally. Based on this regulation Hungary is developing an adapted security of supply regulation. Interviewees state that Hungary is in the middle of conception and implementation work. Key aspects of the regulation are, amongst others, mandatory storage obligations and the limitation of consumers demand in case of crisis. Therefore, no further improvement needs are deemed necessary.

3.2.4. 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.

No 6.23 of Annex VII to the TEN-E Regulation: specified as a "Project of Common Interest" by Commission delegated Regulation (EU) 2016/89

6.23: Hungary-Slovenia interconnection: Nagykanizsa – Torniyszentmiklós (Hungary) – Lendava (Slovenia) – Kidricevo (Slovenia) (increase of security of supply and market integration)

The purpose of the project is to interconnect the gas markets of Hungary and Slovenia. Slovenia is Hungary's only neighbour which is not yet connected to the Hungarian gas transmission network. The length of the transmission line in Hungary is 41 km[167]. To assess cost and benefits the CBA method of PCI projects was applied. It is expected that the project will be refinanced by the regular tariff mechanism. Generally, the project did not benefit from any special regulatory treatment, but the usual least-cost-principle was applied. It was said that no regulatory barriers were noticed that might hinder an approval.

No 6.24 of Annex VII to the TEN-E Regulation: specified as a "Project of Common Interest" by Commission delegated Regulation (EU) 2016/89

"ROHUAT/BRUA" bidirectional gas transmission corridor (increase of security of supply and market integration)

The purpose of the project is to enable a 1.75 bcm/a capacity in the first phase between Hungary and Romania and a 4.4 bcm/a capacity in the second phase along the entire length of the corridor. One of the purposes of this project is to ensure the transmission of Black Sea gas to Western Europe.[168]
This project consists of 9 separate projects:

[167] (Consultation Paper, pages 6, 42).
[168] (Consultation Paper, pages 5, 40).

6.24.1: Romanian-Hungarian reverse flow: 1st phase of the Hungarian section – compressor station at Csanádpalota;
6.24.2: Development on the territory of Romania;
6.24.3: Development on the Austrian side: compressor station at Mosonmagyaróvár;
6.24.4: Development in Hungary: Városföld, Ercsi, Győr pipeline;
6.24.5: Development in Hungary: Ercsi-Százhalombatta pipeline;
6.24.6: Városföld (Hungary) compressor station;
6.24.7: Expansion of the transmission capacity in Romania towards Hungary up to 4.4 bcm/year (2nd phase);
6.24.8: Development in Romania (Black Sea shore);
6.24.9: Romanian-Hungarian reverse flow: Hungarian section 2nd stage compressor station at Csanádpalota or Algyő (Hungary).

To assess cost and benefits the CBA method of PCI projects was applied. It is expected that the project will be refinanced by the regular tariff mechanism. Generally, the project did not benefit from any special regulatory treatment, but the usual least-cost-principle was applied. It was said that no regulatory barriers were noticed that might hinder an approval.

No 6.25 of Annex VII to the TEN-E Regulation: specified as a "Project of Common Interest" by Commission delegated Regulation (EU) 2016/89

"EASTRING" Pipeline system from Bulgaria to Slovakia (increase of security of supply and market integration)

The track of the pipeline is optional: it will start either at the border between Bulgaria and Turkey or at the border between the Ukraine and Romania, it goes through Romania and Hungary, and ends at Velke Kapusany (Slovakia). The entire length of this "eastring" pipeline would be approximately 832-1015 km. The purpose is to establish bidirectional capacities at each border connection point. The capacity of this pipeline would be 20 bcm/a in the first phase and could reach 40 bcm/a in the second phase. The Hungarian section of the "Eastring" would be established between Csengersima (at the Hungarian-Romanian border) and Zemplénagárd (at the Hungarian-Slovakian border). The length of this Hungarian section would be approximately 102-112 km[169]. To assess cost and benefits the CBA method of PCI projects was applied. It is expected that the project will be refinanced by the regular tariff mechanism. Generally, the project did not benefit from any special regulatory treatment, but the usual least-cost-principle was applied. It was said that no regulatory barriers were noticed that might hinder an approval.

3.3. Options for improvement

3.3.1. Options to improve regulatory practice

The above discussion shows that the NRF is well-designed and functional for both security of supply and innovative projects: there is flexibility to include extra funding within one regulatory period and an innovation allowance has been set up for the current regulatory period. A concern is, however, that projects having wider societal benefits are not incentivized. Furthermore, the lack of a mandate for innovative projects on part of the regulator and limited funding for innovation are seen as issues.

(i) Favouring of OPEX-based solutions

Generally, the NRF is considered adequate in supporting investments in security of supply and some kinds of innovative technologies. Currently, there are no indications that the implementation practices provide inadequate incentives to ensure security of supply. Also, a number of innovative technologies are used in recent projects. Respondents point out there might be a bias towards CAPEX-solutions. If this bias develops a significant distortion for the choice of solutions that becomes economically relevant, specific incentives could be introduced for these kinds of OPEX-based solutions, which have been identified as advantageous or necessary.

(ii) Statutory obligation to consider alternatives

A more general approach to foster OPEX-based solutions in the long-term, i.e. beyond a single regulatory period, would be the introduction of an obligation to consider OPEX-related innovative options in the network development plan. The TSO would then have to provide

[169] (Consultation Paper, page 41).

OPEX-based options as alternatives to CAPEX-based projects outlined in the network development plan. This approach necessitates that a framework is developed determining when OPEX-based solutions should be favoured over CAPEX-based solutions. This approach should be coupled with monetary incentives (like option (i)) for the TSO to invest in OPEX solutions to counteract the CAPEX bias.

(iii) Statutory reference to innovation

There are no statutory powers or duties aiming at encouraging innovation. To reduce the uncertainty as to whether or not an innovative project will be approved and to ensure that innovative projects are still encouraged and supported in the next regulatory period, a statutory reference to innovation could be included into the regulatory framework. This long-term strategic perspective could be shaped by governmental policies, statutory duties or could be included in the TYNDP.

3.3.2. 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.

As regards option (ii) (statutory obligation to consider alternatives), we understand that the legal mechanism for implementing this option would involve the modification of the Gas Act[170] (by including the general obligation for the Hungarian ITO to consider such alternatives) and the Network Code[171] (where the detailed rules could be incorporated).

Turning to option (iii) (statutory reference to innovation), we expect that this could be implemented by a reference to innovation as a general policy goal in the Gas Act[172].

3.3.3. Impact assessment

Option (i) is not easy to implement in a well-balanced manner. This option risks being be a technology-specific incentive, which may not necessarily lead to efficient decisions and may even encourage abuse. Also, any innovative and socially beneficial OPEX solutions to be favoured by the regulation need to be defined. Such projects would need to be redefined for each regulatory period, possibly in cooperation with the TSO and maybe including a stakeholder consultation in order to ensure technology neutrality. Therefore, depending on the specific implementation the effort for the NRA and the TSO can be high. Additionally, adequate incentives for efficiency must be set to avoid abuse.

The long-term strategic perspective on innovation mentioned in option (iii) necessitates efforts and coordination between the TSO and the NRA regarding the design of this long-term

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[170] Under Section 6(1) of the Hungarian Constitution, the modification of an Act of Parliament (such as the Electricity Act) may be proposed by the president of Hungary, by the government, by a Parliamentary committee or by any member of Parliament. Resolution of Parliament no. 10/2014. (II. 24.) Ogy. contains the detailed rules of the adoption of an act of Parliament in Hungary (the "**Parliament Rules**"). Under the Rules of Parliament, the debate process consists of two main parts: (i) the general debate, which relates to the necessity and the main principles of the proposal and (ii) the detailed debate, which opens on the week following the closure of the general debate. If Parliament votes in favour of the proposal and its review by the Constitutional Court is not requested, the President of Parliament must send the adopted act to the President of Hungary for signature. If the President of Hungary agrees with the act and does not want to have it reviewed by the Constitutional Court he must sign it within 5 days. If he does not agree with the act he may send it back to Parliament for reconsideration once. In this case, Parliament must re-consider the act and may modify it or adopt it again without any changes.

[171] Under Section 110 of the Gas Act, it is the Hungarian ITO's duty to prepare the Network Code. Under Section 110(2) of the Gas Act, the Hungarian ITO must take into account the opinion of the "regulatory committee" (in Hungarian: "*szabályzati bizottság*"). The Hungarian ITO must annually review the Network Code and must obtain the regulatory committee's opinion for such a review. Proposals for the modification of the Network Code, together with the regulatory committee's opinion, must be submitted to the Hungarian regulator for approval by 31 May every year. Sections 116-117 of the Gas Decree contains the main rules of operation of the regulatory committee. Under Section 117(1) of the Gas Decree, the Hungarian ITO must convene the regulatory committee before September 30 every year. All minutes of the meetings of the regulatory committee must be sent to the Hungarian Regulator. All modifications of the Network Code become effective with the approval of the Hungarian Regulator. Under Section 110(6) of the Gas Act, after approval by the Hungarian Regulator, the Hungarian ITO must publish the modified (consolidated) version of the Network Code and the Hungarian Regulator's approval on its website.

[172] See footnote 165.

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. Moreover, if implemented well, option (i) could result in a shift from primarily CAPEX investments to more OPEX investments.

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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