European Commission

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

Country Report - Latvia

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March– 2019

EUROPEAN COMMISSION

Directorate-General for Energy
Directorate B — Internal Energy Market
Unit B.1 — Networks & Regional Initiatives

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Directorate-General for Energy

2019

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Luxembourg: Publications Office of the European Union, 2019

ISBN: 978-92-76-03969-3
Doi: 10.2833/75226

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The Latvian electricity NRF

The key participants in the Latvian electricity transmission sector are AS Augstprieguma tīkls (hereinafter – the "Electricity TSO"), a state-owned company, who represents the sole transmission system operator operating in Latvia[1], Latvijas elektriskie tīkli AS, owned by the State via the company Latvernergo AS, is the owner of the power transmission assets (RAB) and provides for the monitoring and management of Latvian power transmission network assets, and the regulation of energy supply is performed by a centralized public services regulatory institution (herein referred to **the "Regulator"**) established in accordance with the Law on Regulators of Public Utilities[2]. In accordance with Section 76 Paragraph one of Energy Law, management of the energy industry shall be carried out by the Cabinet and the Ministry of Economics and the Minister responsible for the energy industry shall implement it.

The Regulator issues licence to a system operator (including a transmission system operator) which is valid for 20 years.[3]

The principle of the "cost-allocation" model ensures that tariffs are determined such the users cover economically substantiated costs of public utilities, as well as ensure profitability of the public utilities, unless special laws of a sector provide for other tariff determination principles.[4]

As stated in the Electricity Market Law, AS Augstsprieguma tīkls shall in the role of TSO be responsible for the: i) operation, maintenance and safety of the system, ii) management and development of the system, iii) connection with other systems, and iv) the ability of the system to ensure transportation of electricity in correspondence with the expected demand.[5]

There is no express duty on the TSO and NRA to encourage innovation in the NRF. However, innovation is supported indirectly within the TSO's and NRA's duties expressed in the Energy Law.

The transmission system is developed according to the Latvian power transmission System Development Plan and the European Ten Year Network Development Plan and the Baltic Energy Market Interconnection Plan (BEMIIP).

The Latvian regulatory practice in the electricity sector

The NRA adopts no definition of innovation despite fostering innovative solutions in the transmission system. It may be seen as part of the TSOs' obligation to ensure a safe and efficient/economically viable operation.

A challenge that the interviewees mentioned is that innovative capital-intensive investments may hinder the TSO from investing in infrastructure projects given their repercussions on the current tariffs, which, according to the users, are already high compared to the average national income level.

With respect to security of supply, the NRF is generally considered appropriate.

Options for improvement

The following option for improvement is considered:

- Make budget for innovative projects

[1] Article 11 of the Electricity Market Law.
[2] Article 83 of the Energy Law.
[3] Article 7 (1) and 7(2) of the Energy Law.
[4] Article 20 (1) of the On Regulators of Public Utilities.
[5] Article 9 (1) of the Electricity Market Law.

Assessment of the NRF and the regulatory practice of the Latvian gas sector

The Latvian gas NRF

The regulation of energy supply is performed by a centralized public services regulatory institution (the **Regulator**) established in accordance with the Law on Regulators of Public Utilities[6]. Together with the TSO, AS Conexus Baltic Grid (hereinafter – the *TSO*) they are the key participants in the Latvian gas transmission sector. The TSO is a unified natural gas transmission and storage system operator operating in Latvia.[7] Conexus was set up in 22 December 2016, when Joint Stock Company Latvijas Gāze was unbundled and, consequently, transmission and storage was handed over to the newly established TSO. Management of the energy industry is carried out by the Cabinet of Ministers (the Government of the Republic of Latvia) and the Ministry of Economics.

The TSO is responsible for the operation, service and safety of the energy transmission system and natural gas storage facility, system management and development in the licence operation area, connection to other systems, as well as for the long-term capability of the system to ensure energy transmission or conversion or natural gas storage according to the demand.[8] The TSO can in return charge tariffs stipulated by the Regulator.

The Latvian regulatory practice in the gas sector

The current NRA is, in general terms, adequate to support current innovation and security of supply in Latvia. The following barriers have been idetified:

- Attention has been drawn to the current regulatory cost-based model which, notwithstanding that it is deemed adequate to bolster investment in the transmission system, is inadequate to recoup costs associated with development, operation and maintenance of the gas storage (UGS); However, since the interviews were conducted, and after long discussions with TSO and traders in April 2018, NRA approved new flexible UGS tariffs. For example, new market product (tariff) in summer session changes depending on changes in markets;
- The interviewees point out that investing in innovative solutions oftentimes implies investing upfront in capital intensive solutions to lower future operational costs (OPEX) and may turn out being a tedious choice. The expected cost reduction is not always guaranteed. Given the inherent high risk innovative solutions bring along, and the TSO should be obliged to bear the burden of the investment in case putting costs in tariffs would not be allowed.

Options for improvement

The following options for improvement are considered:

- Earmarking a budget for innovative projects;
- Include explicit reference to innovation in the NRF.

6 Article 83 of the Energy Law.
7 Article 111 (1) of the Energy Law.
8 Article 15 (6) of the Energy Law.

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 analysis. It is divided into two main sections, Section 2 which relates to electricity, and Section 3 which relates to gas. Each of these sections examines the legal framework (Section 2.1 for electricity and Section 3.1 for gas), including specific rights and duties of relevant parties, such as TSOs and NRAs (hereafter also referred to as stakeholders), mechanisms for the financing of investment projects and the regulatory rules regarding innovation and security of supply in particular. Having studied the legal regulatory framework, Section 2.2 for electricity and Section 3.2 for gas examine the regulatory practice in Latvia, 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 Latvia. Lastly, options for improvement of the regulatory practice and the regulatory framework are discussed in Section 2.3 for electricity and Section 3.3 for gas.

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

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

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

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

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

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

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

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

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

2. ELECTRICITY

2.1. Legal analysis of the NRF in Latvia

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

The Latvian Legal Framework is governed by following two acts:

The Energy Law

The Energy Law regulates the energy industry as well as the economic sector regarding the acquisition and use of energy resources for the production of various types of energy (including electricity), the conversion, purchase, storage, transmission, distribution, trade and use of energy[9].

In accordance with Section 76 Paragraph one of Energy Larw, management of the energy industry shall be carried out by the Cabinet and the Ministry of Economics and the Minister responsible for the energy industry shall implement it. While the former determines the procedures by which new objects of an energy supply (including transmission (facility) system) are installed[10], the latter is responsible for:

- managing the development of draft laws and regulations for the implementation of the national energy policy;
- promoting the efficient and economic utilisation of energy resources supplied to energy users; and
- promoting the attraction of investments to the energy industry and to the renovation and construction of the facilities of energy supply merchants[11].

The Electricity Market Law

The Electricity Market Law governs the types of activities to be performed in the electricity market, which include the production of electricity, transmission of electricity, distribution of electricity, trade of electricity as a free circulation commodity, along with the provision of services necessary for the trade thereof. This Law shall determine the competence of the ministry responsible for the energy industry and the Regulator in the function of monitoring and regulation of the electricity market[12] .

Pursuant to the Electricity Market Law, an electricity power system consists of electricity production equipment, transmission and distribution systems and electricity consumption equipment, which are interconnected and are necessary for the transmission of electricity from a producer to a customer.

The procedures for the system management and utilisation, and the activities of market participants, are defined in the Network Code[13]; the latter shall be devolved by the TSO and approved by the Regulator.

The Regulator

The regulation of energy supply is performed by a centralized public services regulatory institution (herein referred to **the "Regulator"**) established in accordance with the Law on Regulators of Public Utilities[14]. The Regulator shall comply with the national energy policy (Article 84(2)) and implement the national energy programme of Latvia.[15] Within its competence, the Regulator shall determine the norms regulating the energy supply and provide interpretation thereof[16].

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9 Article 2 of the Energy Law.
10 Article 76 (1) and (2) of the Energy Law.
11 Article 77 of the Energy Law.
12 Article 3 of the Electricity Market Law.
13 Article 4 of the Electricity Market Law.
14 Article 83 of the Energy Law.
15 Article 84 of the Energy Law.
16 Article 85 of the Energy Law.

The Regulator is in charge of the following activities:
- promoting efficient operation of energy supply merchants;
- facilitating the utilisation of local and renewable energy resources in energy supply; and
- promoting efficient utilisation of energy supplied to users.

Moreover, the Regulator issues licence to a system operator (including a transmission system operator).[17] A licence for the transmission of electricity is issued for 20 years.[18] The licence issued to an energy TSO or DSO, shall specify the duty of the energy supply merchant to ensure and maintain the objects (except the licence for energy trade) necessary for the provision of energy supply, the duty of an energy supply merchant to perform planned development of operations thereof and to participate in the planning, provision and development of co-ordinated and efficient energy supply; the duty of an energy supply merchant to regularly provide the Regulator with information regarding the operation thereof and changes in energy supply.[19]

AS Augstsprieguma tīksi

AS Augstsprieguma tīkls (hereinafter – the "Electricity TSO"), a state-owned company, represents the sole transmission system operator operating in Latvia[20]. The TSO is a subsidiary of the stateowned company Latvernergo AS. Stated in the Electricity Market Law, a system operator shall be responsible, within the area and the term of the licence, for the activities outlined in Section 2.1.2.

2.1.2. Specific legal rights and duties

Role of the TSO

Stated in the Electricity Market Law, a system operator shall be responsible, within the area and the term of the licence, for:
- operation, maintenance and safety of the system;
- management and development of the system;
- connection with other systems; and
- the ability of the system to ensure transmission of electricity in correspondence with the expected demand.[21]

In accordance with the model implemented in Latvia, the TSO leases the assets necessary to provide electric power transmission network services from its owner Latvijas elektriskie tīkli AS which is indirectly owned by the State. TSO Augstsprieguma tīkls is responsible for monitoring and management of transmission system assets, and construction of new grid. Latvijas elektriskie tīkli as owner of transmission assets is resonsible for financing of transmission system activities and development. Electricity Marker law, Article 21. 2

Transmission tasks

In compliance with the Electricity Market Law, the TSO[22]:
- provides transmission system services and ensures balancing and stability in the transmission system in accordance with the principles of fairness, openness and equality, and the procedures for the implementation thereof laid down in the Network Code;
- is responsible for the balancing in the transmission system and the calculations of the balancing;
- is responsible for the safety of the electricity supply, reservation of electricity production capacities and energy flow management, taking into account the exchange of electricity between other connected transmission systems, ensuring an adequate transmission network capacity and stable operation of the system;
- is responsible for elimination of possible transmission system congestion and overload if the congestion or overload occurs as a result of the intended trade transactions, as well as for the stability of the interconnected transmission system and the compatibility thereof with the energy systems of foreign states; and

17 Article 7 (1) of the Energy Law.
18 Article 7 (2) of the Energy Law.
19 Article 8 of the Energy Law.
20 Article 11 of the Electricity Market Law.
21 Article 9 (1) of the Electricity Market Law.
22 Article 13 of the Electricity Market Law.

- shall be responsible for the planning, construction and handing over for commissioning of a new transmission infrastructure object in the developing the Latvian transmission system.

The TSO carries out service and maintenance of fixed assets of the transmission system, as well as development of the transmission system, construction of new networks, rebuilding and renewal of the existing ones that is not related to the generation, supply and distribution of electricity as of 30 January 2015. The TSO ensures the operation and daily maintenance of power transmission system (330 kV and 110 kV power lines and substations / distribution points), previously serviced by Latvijas elektriskie tīkli AS, as well as the construction of new networks and reconstruction or repairs of the existing grid.

Limited non-regulated activities

The TSO is not involved in non-regulated activities.

2.1.3. Mechanism for financing of investment projects

Tariffs

The TSO's primary mechanism to ensure the financing of investments in the transmission network is ultimately through its tariffs and fees determined according to the Methodology for Calculation of Tariffs for Services of the Electricity Transmission23.

Pursuant to this methodology, the TSO uses the cost allocation model and it must co-ordinate the basic tariff principles and their introduction with the Regulator. The total costs of the transmission system operator are divided into two groups:

- (i) costs associated with transmission of electricity; and
- (ii) costs associated with the maintenance, development of the transmission system and necessary for ensuring the operation and safety of the transmission system, and supply of specific power to users regardless of the volume of electricity transmitted.

The Regulator shall evaluate the draft tariffs and the costs making up the tariffs referred to in the draft tariff calculation within 90 days from the receipt thereof. If the Regulator determines that the draft tariffs have been calculated incorrectly or the costs making up the tariffs referred to in the draft tariff calculation are not substantiated, the Regulator may entrust a provider of public utilities to perform recalculation of the draft tariffs or reject the draft tariffs within 10 business days.[24]

Tariffs shall be determined at such levels in order for the tariff payments made by the users to cover economically substantiated costs of public utilities and to ensure profitability of the public utilities, unless special laws of a sector provide for other tariff determination principles.[25]

The "cost-allocation" model

The tariffs of the transmission system services (hereinafter - tariffs) shall be determined by the Regulator in accordance with the procedures laid down in the Law On Regulators of Public Utilities or by the TSO in accordance with the methodology of tariff calculation stipulated by the Regulator if a permission of the Regulator has been received[26]. The Regulator shall evaluate the draft tariffs and the costs making up the tariffs referred to in the draft tariff calculation within 90 days from the receipt thereof. If the Regulator determines that the draft tariffs have been calculated incorrectly or the costs making up the tariffs referred to in the draft tariff calculation are not substantiated, the Regulator may entrust a provider of public utilities to perform recalculation of the draft tariffs or reject the draft tariffs within 10 business days.[27] The term for submission of additional information or documents requested by the regulator shall not be included in the evaluation period of the tariff.[28]

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23 Methodology for Calculation of Tariffs for Services of the Electricity Transmission approved by the Council Decision No 1/6 of the Regulator on 26 February 2015.
24 Article 19 (2) of the On Regulators of Public Utilities.
25 Article 20 (1) of the On Regulators of Public Utilities.
26 Article 16 (1) of the Electricity Market Law.
27 Article 19 (2) of the On Regulators of Public Utilities.
28 Article 19 (13) of the On Regulators of Public Utilities.

Tariffs shall be determined at such levels in order for the tariff payments made by the users to cover economically substantiated costs of public utilities and to ensure profitability of the public utilities, unless special laws of a sector provide for other tariff determination principles.[29]

Costs to be included in the calculation of transmission tariffs consist of capital costs, operational costs, taxes and cost adjustment associated with deviations of the projections of the preceding periods. Based on the capital costs, the Regulator shall analyse the profitability of the operations of the TSO and the system owner, as well as sufficiency of financial resources.

The Regulator shall once per annum, by 1st September, prepare calculation of the rate of return on capital, and approve it by its decision. The rate of return on capital determined by the Regulator shall be applied by the TSO by developing a tariff proposal, the effective date of which shall be planned in the next calendar year following the date of adoption of the decision of the regulator on determination of the rate of return on capital.

If the projections of the transmitted volumes, consumption structure and other indicators used to approve the present tariffs differ from the actual quantities of these indicators and it affects the net turnover of the operations of the TSO or costs associated with the provision of the transmission system services, the TSO shall take these differences into account and reduce or increase the planned income and, respectively, the tariffs, in the next tariff proposal by the deviation of the projected amount:

- if the actual profit of the TSO from provision of the transmission services exceeds the amount of the planned profit included in the calculation of the effective tariffs, the amount of cost adjustment in the calculation of transmission tariff proposal shall be determined so as to reduce the costs included in the tariff proposal for the next period by the amount exceeding the planned profit. If the adjustment amount exceeds the planned turnover profitability included in the calculation of the effective tariffs, the adjustment shall be made gradually over several years, so that the annual adjustment amount included in the tariff calculation would not exceed the planned turnover profitability for the respective year;
- if the actual profit of the TSO from provision of the transmission services is less than 50% of the amount of the planned profit included in the calculation of the effective tariffs, the amount of cost adjustment in the calculation of the transmission tariff proposal shall be determined so as to increase the costs included in the tariff proposal for the next period by the difference between 50% of the amount of the planned profit included in the calculation of the effective tariffs and the actual profit of the transmission system operator from provision of the transmission services.

If factors that affect tariffs (for example, profitability) change, the Regulator may suggest a review of tariffs and request a public service provider to submit a calculated tariff proposal within a specific deadline together with justification of costs that form such tariffs.

Compensation to an electricity system owner (AS *Latvijas elektriskie tīkli)*, which ensures an adequate return from the transmission system and new investments therein, if the investments have been made in accordance with the plan prepared by the TSO, as well as costs related to the collection, administration of the mandatory procurement component and performance of the settlement of accounts duty with the public trader shall be included in transmission tariffs.[30]

The Ten-Year Network Development Plan

The transmission system is developed according to the Latvian power transmission System Development Plan and the European Ten Year Network Development Plan. Those Latvian projects are included in the European Ten-Year Network Development Plan that are strategically important not only nationally, but for the Baltic Sea Region in general, and inclusion in the European Ten Year Network Development Plan is one of the preconditions for the projects to be able to apply for European co-funding.

Each year the Regulator approves the 10 Year Transmission (power) System Development Plan drafted by the TSO and supervises the fulfilment thereof[31]. The plan is the planning document

[29] Article 20 (1) of the On Regulators of Public Utilities.
[30] Article 16 (3) of the Electricity Market Law.
[31] Article 15[1] (1) of the Electricity Market Law.

formulated by the TSO in which development of the transmission system and the financial investments required for the installations of the TSO for the subsequent 10 years are determined. The TSO shall prepare the plan taking into account the security requirements of electricity systems specified in the Network Code and information provided by electricity system participants and transmission system operators in countries with which the transmission system has cross-border interconnections. The plan shall substantiate the necessary financial investments into the transmission infrastructure, indicating which financial investments are to be performed in the next three years and regarding which financial investments the TSO has already decided, indicating the source of financial investments[32].

2.1.4. Regulatory rules with respect to innovation

Specific duties of the TSO aimed at encouraging innovation

There is no express duty on the TSO to encourage innovation in the NRF; however, despite indirectly, innovation is supported in general within the TSO's duties described in Section 2.1.2.

Specific duties of the NRA aimed at encouraging innovation

There is no express duty on the Regulator to encourage innovation in terms of the statutory framework; however, the duty to encourage innovation is likely implicit in the more general duties on the Regulator to ensure that it secures the efficient and economic execution of activities by licensees.

2.1.5. Regulatory rules with respect to security of supply

Specific duties of the TSO aiming at safeguarding security of supply

Duties, including those applicable to security of supply, are described above in Section 2.1.2 and 2.1.3.

In addition, the TSO shall draft a report regarding the assessment of the conformity of the transmission system supply and consumption and the safety and provision of State electricity supply with the production capacities for a time period of up to 10 years. The TSO evaluation report shall be submitted annually to the Ministry of Economics and the Regulator[33].

Energy supply merchants, upon commencement of the construction or installation of new facilities as well as expansion of the existing facilities, shall use or install only such equipment, devices and installations used in energy supply that comply with the requirements for energy efficiency, quality and safety[34].

Specific duties of the NRA aimed at aiming at safeguarding Security of supply

Legal powers and duties of the Regulator in terms of security of supply have been described in Section 2.1.1.

2.2. Regulatory practice

2.2.1. Overview over regulatory practice in Latvia

Main regulatory barriers

The NRA adopts no definition of innovation despite fostering innovative solutions in the transmission system may be seen as part of the TSOs' obligations to ensure a safe and efficient/economically viable operation.

A challenge that the interviewees underline is that innovative capital-intensive investments may hinder the TSO from investing in infrastructure projects given their repercussions on the current tariffs, which, according to the users, are already high compared to the average national income level.

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32 Regulation Regarding the Electricity Transmission System Development Plan, Adopted 23 November 2011 by the decision No.1/28 of the Board of the Public Utilities Commission.
33 Article 15 (1) (2) of the Electricity Market Law.
34 Article 54 of the Energy Law.

2.2.2. Regulatory practice related to innovation

Innovative projects

The following PCI projects are representative of innovative solutions, and thus how current regulation does provide opportunity for innovative projects:

- 330 KV electricity transmission line connection "Kurzeme Circle";
- The third Estonian – Latvian 330 kV interconnection.

Among the categories of Typological investments outlined in the study, interviewees would add investment in electrochemical storage to the list of potential Typological investments.

Possible improvement of the NRF

The interviewee deems the NRF as adequate for the ongoing and current type of investments.

Adequacy of the NRF relating to its support for innovative investments

The interviewees do not recognising any barrier for innovative investments in the current regulation, the interviewees deems the NRF as adequate to bolster projects that may be considered as "innovative" in the country.

2.2.3. Regulatory practice related to security of supply

Security of supply projects

The same PCI projects mentioned in Section 2.2.2, are examples of how the current regulation provide projects that increase the security of supply:

- 330 KV electricity transmission line connection "Kurzeme Circle";
- The third Estonian – Latvian 330 kV interconnection.

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

While general delays in permitting and processing of EC co-financed projects are indicated as aspects to ameliorate, the current NRF is deemed adequate to support security of supply related projects.

Possible improvement of the NRF

Interviewees did not mention any need for improvement.

Adequacy of the NRF relating to its support for innovative investments

The NRF is adequate to support innovative investments.

2.2.4. Illustrative specific projects

The following PCI projects are representative of innovative and security of supply driven solutions, and thus illustrate how current regulation does provide opportunity for innovative and security of supply projects.

330 KV electricity transmission line connection "Kurzeme Circle"

The Kurzeme Circle is a project of energy infrastructure envisaging the construction of a 330 kV overhead high voltage power transmission line in the western part of Latvia to eliminate the impossibility of connecting increased capacity electricity producers and users in Kurzeme that have been there so far. The Kurzeme Ring constitutes a part of the larger Baltic - Nordic Countries project, NordBalt, within the implementation of which a DC underwater interconnection cable between Lithuania and Sweden has been successfully constructed and commissioned in 2016, ensuring closer integration of Baltic countries in the Nordic electricity market.

Latvian transmission system operator Augstsprieguma tīkls AS is responsible for the implementation of the Kurzeme Ring project.

The third Estonian – Latvian 330 kV interconnection

The third 330 kV Estonia-Latvia electric power transmission line from Harku, Estonia, to Riga, Latvia is a strategic infrastructure project. It is a PCI project.

The new 330kV overhead power line removes a bottleneck at the Estonia-Latvia border, increasing transmission power by up to 600 MW. In addition, the new overhead power line creates opportunities for connecting additional electricity producers to the power transmission grid in West-Estonia.

2.3. Options for improvement

2.3.1. Options to improve regulatory practice

(i) Make budget for innovative projects

Considering the high level of attention to tariffs by the market participants and TSO, there is a careful approach towards investment in infrastructure. This cautious approach may eventually prevent innovative and CAPEX intensive projects with uncertain benefits from being approved by the NRA. A remedy for this may be found in earmarking a yearly budget for investing in innovative projects to be inserted in the national network development plan.

2.3.2. National law mechanism(s) for implementing options

As far as option (i) ("Make budget for innovative projects") is concerned, we expect that this could be implemented in the Energy Law including such a requirement in Article 54 through the Latvian Legislative Process[35].

[35] Pursuant to the Constitution of Latvia (*Satversme*) draft laws (bills) may be submitted to the Parliament (*Saeima*) by the President, the Cabinet of Ministers or parliamentary committees at Parliament (*Saeima)*, by no less than five members of parliament, or, in accordance with the procedures and in the cases provided for in the Constitution, and by one-tenth of the electorate. However, it should be noted that in Latvia, mostly the Cabinet of Ministers develops draft laws (bills) sent to the Parliament (*Saeima*). Such draft laws are to be developed by the competent ministry, which is also responsible for submission thereof to the Cabinet of Ministers. At the Cabinet of Ministers draft laws are initially promulgated and considered at State Secretaries' meeting. An elaborated bill of the competent ministry shall be endorsed with the line ministries and other institutions indicated in the minutes of the State Secretaries' meeting. If ministries and other institutions have supported the draft law with no objections or have expressed only proposals, the draft law is considered as endorsed, and the competent ministry prepares the draft law for its submission for consideration to the sitting of the Cabinet of Ministers. If opinions on the promulgated draft include objections and proposals, the competent ministry shall consider them and revised the draft law. If the competent ministry has taken into account the objections raised by the endorsement participants, and if, upon the delivery of the revised draft, no objections are received from the endorsement participants, the revised draft is considered to be endorsed and the competent ministry prepares the draft for its submission to the sitting of the Cabinet of Ministers. In order to reach an agreement on the disregarded or partly applied objections, the competent ministry convenes a joint inter-ministerial (inter-institutional) meeting. If during such inter-ministerial (inter-institutional) meeting or electronic endorsement the agreement on all expressed objections is reached, and if no objections have been received the draft law shall be considered as endorsed and submitted for its consideration in the sitting of the Cabinet of Ministers. If during the inter-ministerial (inter-institutional) meeting or electronic endorsement on disregarded or partly applied objections the agreement is not reached, the competent ministry shall submit the draft law for its consideration to the State Secretaries' meeting or to the meeting of the Cabinet Committee. Decisions on the legislative bills submitted for their consideration shall be adopted unanimously by members of the State Secretaries' meeting. If no agreement is reached, the submitter presents the draft law for its consideration at the Cabinet Committee's meeting. The decision on progressing the draft law for its consideration at the sitting of the Cabinet of Ministers shall be unanimously adopted by the Cabinet Committee. If the Cabinet Committee rejects the bill, the State Chancellery removes the control over the bill, and, if needed, resumes the control over fulfilment of task, also setting a deadline for the task – a month counting from the date of the Cabinet Committee's meeting, and notifies the competent ministry. The draft law (bill), which has been approved by the Cabinet of Ministers sitting, shall be sent to the Parliament (*Saeima*). After receiving the draft law, the Presidium of the Parliament (*Saeima*) reports to the Parliament (*Saeima*). The Parliament (*Saeima*) forwards the draft law to committees and appoints the responsible committee. The responsible committee prepares its opinion and explanatory notes regarding the draft law. The Presidium of Parliament (*Saeima*) includes the draft law on agenda of a plenary meeting. The Parliament (*Saeima*) debates general principles of the draft law (if necessary, declares the draft law to be urgent), passes the draft law in the 1st reading and sets a deadline for proposals. The responsible committee examines proposals and prepares its opinion and prepares the draft law for the 2nd reading. The Presidium of Parliament (*Saeima*) includes the draft law on agenda of the plenary meeting. The Parliament (*Saeima*) debates the draft law article by article, votes on proposals, passes the draft law in the 2nd reading (adopts the statutory act under urgency procedure) and sets the deadline for proposals. The responsible committee examines proposals and prepares a conclusion and prepares the draft law for the 3rd reading. The Presidium of Parliament (*Saeima*)

2.3.3. Impact assessment

We have not encountered any specific examples of projects that have been cancelled due to the regulatory framework. It is also not clear to what extent potentially welfare-enhancing projects have not been initiated due to inadequate incentives. For this reason, we do not expect that any of the suggested changes will result in considerable changes to investment levels.

includes the draft law on agenda of the plenary meeting. The Parliament (*Saeima*) reviews only submitted proposals and adopts the draft law. The responsible committee examines voting results and prepares the final version of the statutory act. The Presidium of Parliament (*Saeima*) forwards the statutory act to the President. The President shall promulgate laws passed by the Parliament (*Saeima*) not earlier than on the tenth day and not later than on the twenty-first day after the statutory act has been adopted. The statutory act shall come into force fourteen days after its proclamation unless a different timeline has been specified in the act. The President of Latvia promulgates the act in the official journal "Latvijas Vēstnesis". Within ten days as of the adoption of the act by the Parliament (*Saeima*), the President, by means of a written and reasoned request to the Chairperson of the Parliament (*Saeima*), may require that the act be reconsidered. If the Parliament (*Saeima*) does not amend the act, the President then may not raise objections for a second time.

3. GAS

3.1. Legal analysis of the NRF in Latvia

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

Natural Gas Supply Act

The Energy Law forms the backbone of the Latvian legislation regarding natural gas and lays down the legal framework for transmission of gas in Latvia. It regulates the energy industry as well as the economic sector that covers the acquisition and use of energy resources for the production of various types of energy (including electricity), the conversion, purchase, storage, transmission, distribution, trade and use of energy[36].

The Energy Law also governs the types of activities to be performed in the natural gas market, which include the production of natural gas, transmission of natural gas, natural gas of electricity, trade of natural gas as a free circulation commodity, along with the provision of services necessary for the trade thereof.

The purpose of this Law is:

- to ensure the energy user with efficient, safe and qualitative energy supply in the quantity demanded and for justified prices, diversifying the types of energy resources to be used, increasing the safety of the energy supply and observing the environmental protection requirements;
- to promote efficient use and balanced consumption of energy; to promote economically justified competition; to determine the procedures for the management of energy industry and the principles for organisation and regulation of operation of energy supply merchants;
- to facilitate the use of local, renewable and secondary energy resources; and
- to promote the positive impact of energy industry on the environment and the use of environmentally friendly technologies.[37]

Management of the energy industry is carried out by the Cabinet of Ministers (the Government of the Republic of Latvia) and the Ministry of Economics. The former is responsible for the energy industry, the latter determines the procedures by which new objects of an energy supply (including transmission (facility) system) are installed[38]. Moreover, the Minister of Economics manages development of draft laws and regulations for the implementation of national energy policy, promotes the efficient and economic utilisation of energy resources supplied to energy users, promotes the attraction of investments to the energy industry, and also to the renovation and construction of the facilities of energy supply merchants[39].

The Regulator

The regulation of energy supply is performed by a centralized public services regulatory institution (the Regulator) established in accordance with the Law on Regulators of Public Utilities[40].

With the aim of ensuring continuous, safe and qualitative public utilities services, including energy transmission, whose tariffs (prices) conform to economically substantiated costs, as well as to promote development and economically substantiated competition, the Regulator shall perform the following functions[41]:

1. protect the interests of users and promote the development of providers of public utilities; determine the methodology for calculation of tariffs;
2. determine the tariffs if special laws concerning the sectors do not provide for other procedures for determining the tariffs;
3. licence the provision of public utilities or register the provider of public utilities;

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36 Article 2 of the Energy Law.
37 Article 3 of the Energy Law.
38 Article 76 (1) and (2) of the Energy Law.
39 Article 77 of the Energy Law.
40 Article 83 of the Energy Law.
41 Article 9 of the Law on Regulators of Public Utilities.

4. examine disputes;
5. promote competition in the regulated sectors and supervise compliance of the public utilities with the conditions of the licence, provisions of the general authorisation, specific quality requirements, technical provisions, standards, as well as contract provisions;
6. upon request of the ministries responsible for the regulated sectors, provide information to them and make recommendations to such ministries on issues regarding the regulation of public utilities; and
7. inform the public of its activities and also of the activities of providers of public utilities in the provision of public utilities.

In the implementation of energy supply regulation, the Regulator shall promote efficient operation of energy supply merchants, facilitate the utilisation of local and renewable energy resources in energy supply, promote efficient utilisation of energy supplied to users. The Regulator shall comply with the national energy policy and implement the national energy programme of Latvia.[42] Within its competence, the Regulator shall determine the norms regulating the energy supply and provide interpretation thereof[43].

The Regulator issues licence to a system operator (including a transmission system operator).[44] A licence for the transmission of gas shall be issued for 20 years.[45] The licence issued to an energy supply merchant, including to the transmission system operator, inter alia, shall specify the duty of the energy supply merchant to ensure and maintain the objects (except the licence for energy trade) necessary for the provision of energy supply, the duty of an energy supply merchant to perform planned development of operations thereof and to participate in the planning, provision and development of co-ordinated and efficient energy supply; the duty of an energy supply merchant to regularly provide the Regulator with information regarding the operation thereof and changes in energy supply.[46]

The Regulator shall approve regulations for the use of natural gas transmission and storage system or regulations for the use of natural gas storage facility drawn up by the natural gas transmission and storage, and also liquefied natural gas system operator, which shall be objectively based, economically justified, fair, equal, transparent and accessible to all system users and applicants who request access to the relevant system. Natural gas transmission and storage, and also liquefied natural gas system operators shall submit proposals to the regulator in a time period stipulated by the regulator regarding the system use regulations or natural gas storage site use regulations. The regulator is entitled to make changes in these regulations.[47]

As such, the Regulator is involved on a quite detailed level, as seen with approvals that are project-specific, and detailed tariff approvals.

AS Conexus Baltic Grid

AS Conexus Baltic Grid (hereinafter – the *TSO*) is a single joint natural gas transmission and storage system operator operating in Latvia.[48] Conexus was set up in 22 December 2016, when Joint Stock Company Latvijas Gāze was reorganized and, consequently, transmission and storage was handed over to the TSO. The TSO owns the assets necessary for performance of natural gas transmission activity (including transmission system) and it owns or has been delivered into use for the period of validity of the respective licence the Inčukalns underground gas storage facility or a part thereof.[49]

42 Article 84 of the Energy Law.
43 Article 85 of the Energy Law.
44 Article 7 (1) of the Energy Law.
45 Article 7 (2) of the Energy Law.
46 Article 8 of the Energy Law.
47 Article 15 (7) of the Energy Law.
48 Article 111 (1) of the Energy Law.
49 Article 111 (1) 1) and 2) of the Energy Law.

3.1.2. Specific legal rights and duties

Role of the TSO

Transmission tasks

The TSO shall ensure for all system users and applicants, who so request, an equal and transparent access to the relevant system and provide them natural gas transmission gas services.[50]

The TSO, inter alia, has the following obligations:[51]

1. to ensure safe, efficient and economically viable operations of the natural gas transmission system, its technical operation and development;
2. to ensure supply of natural gas to the distribution system pursuant to a substantiated request of the natural gas distribution system operators;
3. to ensure natural gas flow management in the natural gas transmission system in line with the technical capacity of the system and subject to non-discriminatory rules concerning receipt of natural gas from abroad and transmission of natural gas abroad;
4. to ensure activities of Inčukalns underground gas storage facility, its technical operation and development, in order to provide services of the natural gas storage facility;
5. to store gas reserves owned by individual energy users on the account of these users, if the technical capacity of the Inčukalns underground gas storage facility allows for it;
6. to ensure sufficient cross-border transmission capacities in order to integrate in the European natural gas transmission system infrastructure, meeting all economically substantiated and technically feasible requirements regarding the supply safety of the system's capacities;
7. to implement cooperation among the natural gas transmission operators on the European and regional level.

In addition, the TSO has an obligation to ensure safe, efficient and economically viable operations of the natural gas transmission system, its technical operation and development.[52]

The TSO is liable for the operation, service and safety of the energy transmission system or natural gas storage facility, system management and development in the licence operation area, connection to other systems, as well as for the long-term capability of the system to ensure energy transmission or conversion or natural gas storage according to the demand.[53]

Once a year the TSO shall submit a report to the regulator regarding accomplished and planned activities[54].

The duties imposed on the TSO in the Regulation (EU) 2017/1938 of the European Parliament and of the Council of 25 October 2017 concerning measures to safeguard the security of gas supply and repealing Regulation (EU) No 994/2010 also applies to the TSO.

The undertaking of investment projects

The TSO is required to carry out any investment projects to deliver on their legal/regulatory duties as described above in Section 3.1.2. It shall submit to the Regulator once a year by 31 March the investment plan for the next five years and a report on performance of the investment plan in the reporting year.[55]

The investment projects may be funded from various sources:

- The principal sources of funding is the natural gas transmission tariffs as well as natural gas storage tariffs determined according to the Methodology for the Calculation of the Tariffs on the Natural Gas Transmission System Services and Methodology for the Calculation of the Tariffs on the Natural Gas Storage System Services and approved by the Regulator;
- It is possible to attract European co-funding.

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50 Article 110 of the Energy Law.
51 Article 112 of the Energy Law.
52 Article 113 1) of the Energy Law.
53 Article 15 (6) of the Energy Law.
54 Article 10 of the Energy Law.
55 Regulation regarding submission of information in the energy sector, Council Decision No. 1/36 of the Public Utilities Commission, Riga, 21 December 2017.

3.1.3. Mechanism for financing of investment projects

The TSO is required to carry out any investment projects to deliver on their legal/regulatory duties. It shall submit to the Regulator once a year by 31 March the investment plan for the next five years and a report on performance of the investment plan in the reporting year.[56] The investment projects may be funded from various sources:

- The principal sources of funding is the natural gas transmission tariffs as well as natural gas storage tariffs determined according to the Methodology for the Calculation of the Tariffs on the Natural Gas Transmission System Services and Methodology for the Calculation of the Tariffs on the Natural Gas Storage System Services and approved by the Regulator;
- It is possible to attract European co-funding.

Tariffs

The TSO shall provide transmission services for the tariffs stipulated by the Regulator or for tariffs, which have been specified by the relevant service provider in accordance with the tariff calculation method stipulated by the Regulator if a permit has been obtained from the regulator.[57]

System of setting the tariffs

The Regulator shall evaluate the draft tariffs and the costs making up the tariffs referred to in the draft tariff calculation within 90 days from the receipt thereof. If the Regulator determines that the draft tariffs have been calculated incorrectly or the costs making up the tariffs referred to in the draft tariff calculation are not substantiated, the Regulator may entrust a provider of public utilities to perform recalculation of the draft tariffs or reject the draft tariffs within 10 business days.[58]

Tariffs shall be determined at such levels in order for the tariff payments made by the users to cover economically substantiated costs of public utilities and to ensure profitability of the public utilities, unless special laws of a sector provide for other tariff determination principles.[59]

Currently the tariffs on the transmission system service (tariffs specified in accordance with the costs for the reservation of the capacity of a specific entry or exit point, by which the user pays for the reservation of entry or exit point capacity) are determined according to the Methodology for the Calculation of the Tariffs on the Natural Gas Transmission System Services Methodology[60].

The duration of a tariff review cycle is one year. In the calculation of the tariffs, the TSO shall accurately and unambiguously indicate the capacity reservation service costs related to the regulatory asset base (the RAB) and the provision of the capacity reservation service.

The TSO shall use the cost allocation model whose basic principles and introduction shall be coordinated with the regulator. The costs to be included in tariff calculation shall be formed of the capital costs of the cross-border transmission system and the transmission system of regional supply, operating costs and taxes, applied to the cross-border transmission system and the transmission system of regional supply.

Once a year, by 1 September, the Regulator shall prepare the calculation of the return rate on capital and approve the return rate on capital with a decision. The system operator shall apply the return rate on capital defined by the regulator when preparing the draft tariff the entry into effect of which has been planned for the next calendar year after the date when the regulator's decision on defining the return rate on capital was adopted. On 24 August 2017, the Regulator laid down the rate of the return on capital in amount of 4.70% for drawing up of the natural gas transmission system and storage service tariff project, whose entry into force is scheduled for 2018.

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56 Regulation regarding submission of information in the energy sector, Council Decision No. 1/36 of the Public Utilities Commission, Riga, 21 December 2017.
57 Article 15 (1^1) of the Energy Law.
58 Article 19 (2) of the On Regulators of Public Utilities.
59 Article 20 (1) of the On Regulators of Public Utilities.
60 Methodology for the Calculation of the Tariffs on the Natural Gas Transmission System Services, Decision No. 1/29 of the Board of the Public Utilities Commission, adopted 28 November 2016.

This methodology for tariffs calculation does not contain special provisions applicable to funding mechanisms that would directly encourage the development of any specific projects.

3.1.4. Regulatory rules with respect to innovation

Specific duties of the TSO aimed at encouraging innovation

There is no express duty of the TSO to support innovation in terms of the statutory framework despite general commitments described in Section 3.1.2 indirectly encourage innovation.

Specific duties of the NRA aimed at encouraging innovation

There are no express duties on the Regulator to encourage innovation in terms of the statutory framework, although the duty to encourage innovation is implicit in the more general duties.

Accordingly, many of the mechanisms outlined in Section 3.1.1 are aimed specifically at promoting innovation.

3.1.5. Regulatory rules with respect to security of supply

Specific duties of the TSO aiming at safeguarding security of supply

Specific duties of the TSO applicable to security of supply are described in Section 3.1.2.

Specific duties of the NRA aiming at safeguarding security of supply

As it holds legal powers and duties in terms of security of supply, the Regulator exercises these duties largely through the mechanisms outlined in Section 3.1.1.

3.2. Regulatory practice

3.2.1. Overview over regulatory practice in Latvia

Main regulatory barriers

The current NRA is, in general terms, adequate to support current innovation and security of supply in the Latvia. Attention has been drawn to the current regulatory cost-based model, which, notwithstanding that it is deemed adequate to bolster investment in the transmission system, is inadequate to recoup costs associated with development, operation and maintenance of the gas storage (UGS). However, since the interviews were conducted, and after long discussions with TSO and traders in April 2018, NRA approve new flexible UGS tariffs. For example, new market product (tariff) in summer session changes depending on changes in markets.

The interviewees point out that investing in innovative solutions oftentimes implies investing upfront in capital intensive solutions to lower future operational costs (OPEX) and may turn out being a tedious choice. The expected cost reduction is not always guaranteed. Given the inherent high risk innovative solutions bring along, and the TSO should be obliged to bear the burden of the investment in case putting costs in tariffs would not be allowed;

Options for improvement

The following options for improvement are considered:

- Earmarking a budget for innovative projects;
- Include Social Cross Border Cost Benefit Analysis in TYNDP and national network development plans;
- And, include explicit reference to innovation in the NRF

Possible improvement of the NRF

The interviewees suggested the following improvements:

- Obligations from NRA to support innovation and security of supply should be more explicitly described in the NRF and Regulation No.347/2013;
- As to Cross Border Cost Allocation (CBCA), Regulation No.347/2013 has also been suggested to undergo amendments to limit the possibility of changes once CBCA related

implementation decisions are taken, exception made for the cancellation of any underlying cross-border project by the project promoter.

3.2.2. Regulatory practice related to innovation

Innovative projects

The interviewees have mentioned the following general barriers in innovation:

- Uncertainty in obtaining the expected OPEX reduction through innovation and CAPEX recouping through tariffs, especially for capital intensive innovative investments regarding the gas storage in Latvia;
- Lack of general provisions (such as specific earmarking of budget for investment in innovation, social cost benefit analysis) in the NRF and at European legislation level (Regulation No.347/2013).

The lack of suitable innovative projects illustrate the regulatory challenges.

Possible improvement of the NRF

The interviewees name the following improvements to the NRF:

- The framework should consider earmarking a budget to encourage investment in innovative projects and reduce the risk of mismatch between realised and expected costs (i.e. OPEX and/or CAPEX);
- Explicit reference to support innovation and security of supply projects in the statuary duties (included PCI projects).

Adequacy of the NRF relating to its support for innovative investments

The interviewees deem the current NRF is poorly adequate to support current innovation projects as unable to respond to the new gas market players' need and facilitate the ongoing market liberalization process.

3.2.3. Regulatory practice related to security of supply

Security of supply projects

In the questionnaire, the following barriers were mentioned by the interviewees:

- The generalised lack of clarity in the regulation often leads to misinterpretation of provisions aiming at finding a fair trade-off between infrastructure investments' needs for safeguarding security of supply and accommodating the gas market players' demand, and financing risk the TSO is exposed to; and
- The project approval process.

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

Generally, the NRF is considered adequate in supporting security of supply investments.

3.2.4. Illustrative specific projects

Examples of projects related to security of supply in Latvia that show how the regulation promotes investment in projects that generate security of supply includes:

- The improvement of gas capacity storage of Inčukalns gas storage (PCI); and
- Increase of the interconnection capacity between Latvia and Lithuania (PCI).

3.3. Options for improvement

The recent unbundling of the Latvia gas system has paved the path of a new liberalised gas market, which has challenged the current national NRF.

3.3.1. Options to improve regulatory practice

(i) Earmarking a budget for innovative projects

Considering the high level of attention to tariffs by the market participants and TSO, there is a careful approach towards investment in infrastructure. This cautious approach may eventually prevent innovative and CAPEX intensive projects with uncertain benefits from being approved by the NRA. A remedy for this may be found in earmarking a yearly budget for investing in innovative projects to be inserted in the national network development plan.

(ii) Include explicit reference to innovation in the NRF

Although indirectly addressed in the current duties of the NRA and TSO, fostering investments in innovative projects explicitly through general provisions, such as special budget allocation for innovation or WACC premium.

3.3.2. National law mechanism(s) for implementing options

As far as option (i) ("Earmarking a budget for innovative projects") is concerned, we expect that this could be implemented in the Energy Law by including such a requirement in Article 54 through the Latvian Legislative Process.

As regards to option (ii) ("Include explicit reference to innovation in the NRF"), it is our understanding that the legal mechanism implementing this option would involve the amendment of Article 20 of the Law on Regulators of Public Utilities through the Latvian Legislative Process.

3.3.3. Impact assessment

We have not encountered any specific examples of projects that have been cancelled due to the regulatory framework. It is also not clear to what extent potentially welfare-enhancing projects have not been initiated due to inadequate incentives. For this reason, we do not expect that any of the suggested changes will result in considerable changes to investment levels.

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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MJ-01-19-476-EN-N

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doi: 10.2833/75226