CONCEPT NOTE
for the Study Visit to Portugal

21–25 October 2019

1. Background

The terms of reference for the implementation of the EU project for improving the functioning of electricity and gas markets in line with the EU requirements (hereinafter referred to as the Project) provides for improving the capacity of the Energy Market Regulation Authority (EMRA) by the development of new performance-based tariff calculation mechanisms, including a social tariff, based on European experience.

As part of this task, it is planned to conduct a study visit to one of the European countries, the purpose of which is to familiarize with European practice to learn from EU best practices that can be adapted to support improvement of performance-based tariff setting for transmission and distribution system operations at Turkish electricity and natural gas markets.

2. Objectives

Considering that the Project implements seven tasks, we suggest that the following topics be included in the program of the study trip:

- Analysis of tariff structure and performance-based tariff structure
- Tariff setting for transmission and distribution system operations

The 5-day study visit (excluding travel) will have its focus on regulators and other institutions working in relation to tariff setting and monitoring in the EU.

Portugal is selected as a host country due to its relevance for Turkey, as follows:

Portugal is a Mediterranean country, with a similar climate, whereas the size of the economy and population number is lower than in Turkey. Portugal is an energy import dependent country, similar to Turkey. Moreover, both countries have the same performance indicators, namely SAIDI and SAIFI, even though Portugal also monitors performance by looking into various other indicators. The incentive-based mechanism in Portugal is mixed, whereas it is revenue-based in Turkey. It is of interest to compare these two systems and to discuss the differences and communalities and exchange experiences on this. Moreover, Portugal is regulating from a TOTEX perspective for their tariff methodology. Turkey, has currently a CAPEX-OPEX approach and again it is of interest to compare and discuss these different approaches.

Hosting organisations:

- Energy Services Regulatory Authority – ERSE
- General Directorate for Energy and Geology – DGEG
- National Electricity Networks – REN
- Portugal Energies – EDP
- Research Institution - INESC TEC

3. Implementation and Logistical arrangements

In accordance with the ToR for the Project the study visit should be 5-day long, excluding travel for 7 electricity and natural gas staff.

4. Expected Accomplishments

The working visit is intended to increase the capacity of a representative group composed of experts from EMRA. The study visit activities will be facilitated by the Team leader and the Project director.

The working visit will contribute to the implementation of the following project results:

Result 1: A methodology for performance-based tariff calculation is developed

Result 2: Energy market monitoring system of EMRA is improved

Result 3: EMRA´s capacity to regulate the market through the use of performance-based tariff is enhanced

As a result of the working visit, it is expected that the Turkish experts will be able to discuss, get direct hands-on experience, and learn important lessons from observing EU best practices for performance-based tariff structure for both gas and electricity.

Logistics will be provided for the whole working visit including transportation, international and in the hosting country, and hotel arrangements, assistance with visa procedure is undertaken by Human Dynamics managing office in Ankara.

Participants will be briefed by the Team Leader before the visit on issues related to the objective of the visit, expected results, agenda, suggested approach to the meetings, logistical arrangements, report and follow up.

The Working visit participants will be responsible for the preparation of a brief summary report on working visit results, lessons learnt and possibility for further follow-up activities. The report will be presented to their respective institutions and in the course of the post-working visit workshop which will be organised by the project for that purpose after the finalisation of working visit.

5. Institutions

The following institutions were identified to be the most important for the Project objective and results:

Entidade Reguladora dos Serviços Energéticos (Regulator)

The mission of ERSE is to regulate the electricity and natural gas sectors, being an effective tool for the efficient and sustainable operation of the respective markets while ensuring the protection of consumers and the environment, transparently and impartially. In the scope of this public service mission, ERSE is given a range of powers by law and its Statutes. These powers include, most notably: protecting consumers' rights and interests as regards prices, services and service quality; monitoring compliance with public service obligations and all other legal, regulatory and similar requirements;

guaranteeing economic and financial balance to the activities of the regulated sectors exercised in the public interest companies within the framework of appropriate and efficient management; promoting competition in the energy markets between all their players. (http://www.erse.pt/eng/erse/Paginas/default.aspx)

ERSE - Electricity

The supply of electricity to the consumers, both qualitatively and quantitatively is a fundamental objective of the activities developed by the National Electricity System (SEN) under the principles of efficient utilization of resources in all activities of the electricity sector.

The electricity supply is subject to public service obligations which are the responsibility of all who participate in the electric sector and includes: (i) safety, regularity and quality of the supply; (ii) guarantee that the service provided is universal; (iii) guarantee the connection of all clients to the networks; (iv) protection of consumers namely in terms of tariffs and prices; (v) promotion of the energy efficiency, protection of the environment and the feasibility of the use of renewable and endogenous resources; (vi) the convergence of SEN, in terms of solidarity and cooperation with the electrical systems of the Autonomous Regions of the Azores and Madeira.

To the operators, in the various activities of the electricity sector are assured: (i) freedom of access to the exercising of the activities; (ii) no discrimination; (iii) equal treatment and opportunities; (iv) impartiality of decisions; (v) transparency and objectivity in rules and decisions; (vi) access to information and safeguarding of the confidentiality of commercial information considered to be sensitive, and (vii) freedom to choose their electricity supplier.

In this framework, the regulation of the National Electricity System is aimed at contributing to ensuring the efficiency and feasibility of the activities in transparent, competitive, non-discriminatory terms, through a continuous exercise of supervision and monitoring, integrated in the objectives for the realisation of the internal electricity market.

The following activities of the electric sector are subject to regulation: (i) Transmission; (ii) Distribution; (iii) Last Resort Supplier; (iv) Logistic Operations for Switching Supplier and (v) Management of Organised Markets.

ERSE - Gas

Portugal has no natural gas resources of its own. The supply of natural gas to the Portuguese market is carried out through long term take-or-pay contracts where the main suppliers are Algeria and Nigeria.

The organisation of the Portuguese Natural Gas System (SNGN) is fundamentally based on the exploitation of the public network which is formed by the National Transmission Network, the Underground Storage Facilities, the LNG Terminal and the National Distribution Network.

The supply of natural gas is subject to public service obligations which are the responsibility of all operators in the natural gas sector including: (i) safety, continuously and quality of supply; (ii) ensuring that the service provided is universal; (iii) ensuring the connection of all clients to the networks; (iv) protection of customers namely in terms of tariffs and prices; (iv) promotion of energy efficiency and protection of the environment.

The following rights are guaranteed to the agents and consumers of this sector: (i) freedom of access to the exercising of the activities; (ii) no discrimination; (iii) equal treatment and opportunities; (iv) impartiality of decisions; (v) transparency and objectivity in rules and decisions; (vi) access to information and the safeguarding of the confidentiality of commercial sensitive information, and (vii) freedom to choose their natural gas supplier.

In this context, the regulation activity carried out by ERSE is aimed at contributing to ensure the efficiency and feasibility of the activities in transparent, competitive and non-discriminatory terms through their continuous supervision and monitoring, integrated in the objectives to achieve an internal and liberalized market.

The following activities are subject to regulation: reception, storage and LNG regasification, underground storage, transmission, distribution and natural gas supply as well as logistic operations for the switch of supplier.

In the webpage above it is available information about ERSE's intervention as regulator of the natural gas sector: (i) Liberalization of the natural gas sector; (ii) Creation of the Iberian Natural Gas Market (MIBGAS); (iii) Monitoring of activities and sector agents; (iv) Definition of tariffs and prices for regulated activities; (v) Promotion and ensuring to achieve appropriate levels of quality of service; (vi) Preparation of natural gas sector codes.

The General Directorate for Energy and Geology (DGEG)

DGEG is the Portuguese Public Administration body whose mission is to contribute to the design, promotion and evaluation of policies related to energy and geological resources, with a view to sustainable development and guaranteeing the safety of the supply. The mission of DGEG includes, the need to make citizens aware of the importance of such policies, in the context of the desired economic and social development for the country, informing them of the instruments available for the implementation of political decisions and disseminating the results of its monitoring and implementation. The following are competencies of the DGEG:

- Contribute to the definition, implementation and evaluation of the implementation of energy policies and the identification and exploitation of geological resources, aiming at their valorization and appropriate use and monitoring the functioning of the respective markets, companies and products;
- Promote and participate in the preparation of the appropriate legislative and regulatory framework for the development of systems, processes and equipment related to the production, transport, distribution and use of energy, in particular with a view to security of supply, diversification of energy sources, energy efficiency and preservation. of the environment;
- Promote and participate in the elaboration of the legislative and regulatory framework related to the development of policies and measures for the exploration, exploitation, protection and valorisation of geological resources and the respective business and contractual context;
- Support the participation of the IEM in the Community and international domain, in the area of energy and geological resources, as well as promote the transposition of Community directives and monitor their implementation;
- Carry out inspections in the fields of energy and geological resources, in accordance with the legislation applicable to the respective sectors;

- Support the Government in decision-making in crisis or emergency situations, within the scope of the law, and provide the means for the permanent operation of the Emergency Energy Planning Commission.

(http://www.dgeg.gov.pt/ **)**

National Electricity Networks - REN has two main business areas: electricity and natural gas. In Portugal, we operate the main transport infrastructure and we undertake the overall management of the National Electric System and the National Natural Gas System. We also have a natural gas distribution concession in the northern coastal region of Portugal.

(https://www.ren.pt/en-GB **)**

Electricity

The number of generators in mainland Portugal has increased significantly as, in addition to the old, large thermoelectric and hydroelectric power stations, there are now many others with lower power using co-generation or generation from renewable sources.

REN - Redes Energéticas Nacionais is operates the National Transmission Grid (RNT), which connects generators to consumption centres and ensures a balance between energy supply and demand. It is the only electricity transmission entity in Portugal under a concession agreement with the Portuguese state. The RNT delivery points feed the distribution network that supplies most final consumers. Electricity supply companies are responsible for managing relations with end consumers, including billing and customer service.

Generation - Electricity generation is open to competition and has two legal schemes: (i) ordinary status generation for electricity generated from traditional, non-renewable sources and at large hydroelectric power stations and (ii) special status generation referring to co-generation and electricity generated from renewable energy sources.

Distribution - Electricity is distributed in the National Distribution Network, which consists of high, medium and low voltage infrastructures. The low-voltage distribution grids are operated under concession contracts between municipalities and distributors.

Markets and supply - The organised electricity markets operate freely and are subject to authorisation from the Portuguese state. Ordinary status generators, suppliers and special status generators can become market agents if they wish to do so. Suppliers can buy and sell electricity freely and are entitled to access the transmission and distribution grids on payment of access tariffs fixed by the regulator, ERSE. They are subject to public service obligations with regard to quality and a continuous electricity supply and must give their customers access to simple, understandable information.

Transmission - The transmission of extra high voltage electricity (150, 220 and 400 kV) is done in the RNT, under a concession granted by the Portuguese state in the form of a public service provided exclusively by REN - Redes Energéticas Nacionais. The concession includes the planning, construction, operation and maintenance of the RNT and also covers planning and overall technical management of the National Electricity System to ensure the harmonised functioning of its infrastructures, service continuity and a secure electricity supply.

Gas

Today, all the natural gas used in Portugal comes from third countries. A part is received by high-pressure pipeline and the other by sea (in the form of liquefied natural gas - LNG).

REN Gasodutos operates the National Natural Gas Transport Network (RNTGN), which receives the natural gas at the Spanish border, as it leaves storage facilities (REN Armazenagem) or at the regasification terminal (REN Atlântico) and delivers it to distributors or high-pressure end users. REN Gasodutos holds the concession for the high-pressure transport of natural gas, which includes overall technical management of the National Natural Gas System, through which it coordinates the operation of natural gas distribution and transport infrastructures, which guarantee the continuity and security of supply. It is also responsible for proposing development of the system.

Reception, storage and regasification of LNG and underground storage and transport of natural gas are carried out under 40-year concession contracts with the Portuguese state. More specifically, REN Atlântico holds the concession for the reception, storage and regasification of LNG at the Sines LNG terminal and REN Armazenagem holds a concession for underground natural gas storage in Carriço in the municipality of Pombal.

With the acquisition of REN Portgás, REN - Redes Energéticas Nacionais started to incorporate into its asset base an important Natural Gas distribution infrastructure, under a concession agreement entered into with the Portuguese State until 2048.

As in the electricity system, the supply of natural gas and the management of the organised markets are open to competition.

Provisioning - The gas pipeline is interconnected to the Spanish and European network, from which it receives natural gas in gaseous form at high pressure. At the Sines terminal, the natural gas is received in liquid form (LNG) from gas tanker ships and pumped into intermediate storage tanks.

Distribution - Natural gas is distributed in medium- and low-pressure pipelines under concessions and licences granted by the Portuguese state. Natural gas from high-pressure RNTGN pipelines is transferred to medium-pressure branches through regulation and metering stations. These pipelines and the low-pressure networks branching from them belong to distribution companies that deliver the natural gas to end users. There are also distribution networks supplied from UAG - Autonomous Gasification Units that receive LNG from the Sines terminal through tanker trucks. In addition to REN-Portgás, integrated into REN - Redes Energéticas Nacionais, there are ten other distributors linked to RNTGN, or distributed through UAGs.

Markets and Sales - The natural gas markets are operated on an open-market basis and require authorisation from the Portuguese state. The natural gas is sold to end consumers by the suppliers, which buy and sell it freely on the open market or in bilateral contracts.

Transport, Storage and Regasification - The natural gas is received at the border and transported by high-pressure National Natural Gas Transport Network pipelines connected, through pressure metering and reduction stations, to the medium-pressure pipelines operated by the distribution companies. At the underground storage facilities in Pombal, the high-pressure natural gas is stored in gaseous form in caverns created inside salt formations at depths of over 1,000 metres. At the Sines terminal, the gas is received in liquid form (LNG). After being unloaded from the tanker ships, the LNG is sent to intermediate storage tanks where it awaits a regasification order from the owner of the gas. At the end of this process the natural gas (now in gaseous form) is compressed and injected into the high-pressure network at the terminal's delivery point. Storage in gaseous or liquid form ensures security of supply and flexibility for market agents and consumers

INESC TEC

INESC TEC is a private non-profit research institution, dedicated to scientific research and technological development, technology transfer, advanced consulting and training, and pre-incubation of new technology-based companies.

As an institution operating at the interface of the academic and business worlds, bringing closer together academia, companies, public administration, and society, INESC TEC typically applies the knowledge and results generated as part of its research in technology transfer projects, seeking value creation and immediate social relevance.

The institution is focused on traditional and emerging areas of Power and Energy Systems, for planning and operation purposes, with an emphasis on the integration of renewable energy sources (RES), deployment of electric vehicles, management of distributed energy resources (DER), demand response (DR), smart grids and energy analytics. For that, the cluster uses steady state and dynamic network analysis, reliability models and tools, optimisation and soft computing, and forecasting. Their main research areas are;

- Co-simulation in Electrical Networks
- Multi-energy Networks
- Large-scale Modelling of Energy Systems
- Weather Intelligence Applied to Power Systems
- Stochastic Optimization of Energy Systems
- Predictive Maintenance and Asset Management
- Towards 100% RES Integration and Massive Integration of Power Electronic-based Interfaces
- Smart-grid Hardware
- New Marketplaces for Energy Services
- Cybersecurity of the Grid
- System Resilience, Power System Planning, Energy Efficiency

(https://www.inesctec.pt/en/research/power-and-energy-17#about**)**

EDP

EDP is a multinational, vertically integrated utility company. 40 years of history and being present in 16 countries, in 4 continents. With more than 11.500 employees. It is the fourth largest wind energy production company in the world and almost 70% of its energy is produced from renewable resources. Provide electricity and gas to almost 11 million customers. Electricity distribution networks are made up of High, Medium and Low voltage cables and lines. Substations, transformation substations and public lighting facilities are also part and parcel of the distribution networks, as well as the necessary connections to consumer facilities and generation centres. EDP operates in three electricity distribution markets, Portugal, Spain and Brazil, having distributed, in 2017, 78,788 GWh, through a network with more than 246 thousands km. In Portugal, the company operates throughout the mainland. In Spain, EDP operates in some autonomous communities, especially in the Asturias region. In Brazil, EDP operates in the states of Espírito Santo and São Paulo, through EDP Escelsa and EDP Bandeirante respectively. EDP's electricity distribution strategy is focused on the implementation of smart networks and related services, in order to meet future challenges and become an electricity distribution benchmark. In recent years, the expansion and modernization of systems in the three

countries where EDP operates, as well as the expansion of the telemeters network in the distribution network's transformation substations, have been important strategic factors for EDP. By the end of 2017, the company had more than 2 million smart meters installed in the Iberian Peninsula.

(https://www.edp.com/en/aboutedp)

5) Key issues to be discussed

T1.1 Delivering Tariff Structure Assessment and Recommendations Report for both electricity and natural gas sectors

(the draft information we have collected for electricity distribution is shown in tables)

- What is the current tariff methodology used in Portugal?

Tariff Methodology	Period	Main elements for Determining the Revenue Cap
Price-cap and rate of return (HV/MV) and TOTEX (LV)	3 years (current period 2018-2020)	Non-controllable and controllable costs, RAB, WACC, efficiency benchmark, inflation, incentives, general economic interest costs

- What are the key characteristics of the Regulatory Asset Base in Portugal?

Components of RAB	Regulatory asset value	RAB adjustments
Fixed assets deducted from third parties contributions	3,002 million € for 2016 (historical costs)	Each year the RAB allowed for year t is adjusted in order to consider new investments, write-offs and depreciation

- What is the rate of return used in Portugal?

Type of WACC	Determination of the rate of return on equity	Rate of return on equity before taxes	Use of rate of return
Nominal, pre-tax	Capital Asset Pricing Model (CAPM)	8.5%	WACC is currently based on 55% debt and 45% equity applied to RAB

- What depreciation method is used in Portugal?

Depreciation Method	Depreciation Ratio	Consideration
Straight line	5-40 years	Part of CAPEX

- Which indicators are used for long and short interruptions?

Long Interruption-Index	Long Interruption-Weighting	Short Interruption-Index
SAIFI HV, SAIDI HV, END MV, AIT MV (TIEPI), SAIFI MV, SAIFI LV, SAIDI MV, SAIDI LV	SAIFI and SAIDI: weighted by delivered points (transmission, HV and MV) and by the number of customers (LV); TIE (Distribution – TIEPI) and END (distribution): weighted by installed power; ENS (transmission): estimated; TIE (transmission): energy not supplied and energy supplied.	MAIFI (EHV, HV and MV).

- What are the losses in the Portuguese distribution and transmission network?
- How are the distribution tariffs determined for consumers?
- Can the performance-based tariff structure of Portugal be used as a benchmark for Turkey?

T1.2 Delivering Data Requirements and Harmonization and Standardization of Data Report

- Identification of data requirements necessary for the proposed performance-based tariff structure.
- Guidelines for harmonization and standardization of the data coming from different sources to make them possible to be used in the tariff calculations.

T2.1 Market Monitoring Assessment and Recommendations Report

- Benchmarking market monitoring regulation
- Identify data requirements for monitoring
- Prepare guidelines for harmonization and standardization of data from different sources to monitor

T2.2 Delivering analysis of existing data management systems

- Analyses and assessment of the scope and possibilities within the existing database systems that can be used for monitoring
- List the steps needed to improve usage of the existing data management system
- Recommendations for optimal use of the existing system in line with tariff methodology

T3: Incorporating incentive mechanism into tariff structure to enhance innovation capabilities of regulated entities

T4: Preparation of Smart Grid Road Map and Required Methodological Tariff Approaches

T5: Preparation of Vulnerable Consumers Action Plan and Social Tariff Methodology

T6: Preparation of Regulatory Measures and Tariff Structure for supplier of last resort (SoLR)

T7: Institutional capacity of EMRA for handling customer complaints and using the data on customer complaints in tariff calculations