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Technical Assistance for Improvement of Performance-Based Tariff Regulation of EMRA for Turkish Energy Markets through Introducing an Enhanced Monitoring System

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Second Study Visit for Task 1.3

Austria

CFCU

human dynamics
public sector consulting

REBUBLIC OF TURKEY
ENERGY MARKET
REGULATORY AUTHORITY

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Table of Contents

Abbreviations

BOTAS	Turkish Petroleum and Gas Transmission Pipeline Company
CAPEX	Capital Expenditures
CFCU	Central Finance and Contracts Unit
DSO	Distribution System Operator
EDVARS	Electricity Distribution Data Storage and Reporting System
EMRA	Energy Market Regulatory Authority (for Electricity, Petroleum and Natural Gas)
EPIAS	Market Financial Settlement Centre
EU	European Union
EUD	European Union Delegation
EXIST	Energy Exchange Istanbul
FIT	Feed-in tariff
HD	Human Dynamics
MENR	Ministry of Energy and Natural Resources
OPEX	Operational Expenses
OSOS	Automatic Meter Reading System
PM	Project Management
PSC	Project Steering Committee
R&D	Research and Development
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SoLR	Supplier of Last Resort
TAT	Technical Assistance Team
TEIAS	Turkish Electricity Transmission Co.
ToR	Terms of Reference
WACC	Weighted Average Cost of Capital

1 Introduction

The Terms of Reference (ToR) 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.

Austria was approved by EMRA as a host country for the second study visit (SV) to achieve the goals under the task 1. Among the EU countries, Austria, was chosen because of similarities with Turkey. The main purpose of the study visit was to gain a deeper understanding of how the methodology was developed for performance-based tariff calculation. This study visit was organized to understand the regulators and other institutions working in relation to tariff settings and monitoring in the EU countries. A total of 6 participants from EMRA's electricity and gas departments participated to see differences in the performance tariff structure for both gas and electricity and to observe EU best practices.

The following topics were 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;
- Vulnerable Consumers;
- RIIO Model;
- Customer Complaints.

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 Austria?

	Tariff Methodology	Period	Main elements for Determining the Revenue Cap
Power, distribution	Price Cap	2014-2018 (5 years)	Efficiency scores and general productivity offset, network price index and expansion factors
Power, transmission	Cost+ regulation	Yearly	Costs of t-2, ex ante costs according to network development plan
Gas, distribution	Hybrid	2018-2022	Efficiency scores and general productivity offset, network price index and expansion factors, efficiency dependent WACC
Gas, transmission	Incentive regulation – price cap	4 years	Efficiency scores increase in WACC for taking full volume risk

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

	Components of RAB	Regulatory asset value	RAB adjustments

Power, distribution	Intangible and fixed assets, book values	Historic cost approach	Expansion factor for investments during a regulatory period leads to changes of the regulatory cost base
Power, transmission	Intangible and fixed assets, book values and ex-ante determination of investments according to the network development plan	Historic cost approach	None
Gas, distribution	Intangible and fixed assets, book values	Historic cost approach	RAB developments during a regulatory period are taken into account and lead to changes of the regulated cost base

- What is the rate of return used in Austria?

	Type of WACC	**Determination of the rate of return on equity**	**Rate of return on equity before taxes**	**Use of rate of return**
Power, distribution	Nominal WACC pre-taxes	rE=(nominal risk-free rate + levered Beta x MRP)/(1 - tax rate)	8.97% (nominal pre-tax, set in 2013)	WACC nominal pre-taxes * RAB (book values)
Power, transmission	Nominal WACC pre-taxes	rE=(nominal risk-free rate + levered Beta x MRP)/(1 - tax rate)	8,16% (nominal pre tax, set in 2017) =(1,87%+0,85*5%)/(1-0,25)	WACC nominal pre-taxes * RAB (book values)
Gas, distribution	Nominal WACC pre-taxes (equity share 40%, debt share 60%, beta transformation: Modigliani-Miller)	rE=(nominal risk-free rate + levered Beta x MRP)/(1 - tax rate)	8,16% (nominal pre tax, set in 2017, granted for the average efficient DSO) =(1,87%+0,85*5%)/(1-0,25)	WACC nominal pre-taxes * RAB (book values)

- What depreciation method is used in Austria?

	Depreciation Method	**Depreciation Ratio**	**Consideration**
Power, distribution	Straight line	Depending on asset type: lines 2-3%, transformers 4-5%, substations 4%	Depreciation of new investments during the regulatory period is a pass through. Depreciation of the base year is adjusted with an individual productivity offset
Power, transmission	Straight line	Depending on asset type: lines 2-3%, transformers 4-5%, substations 4%	Pass through
Gas, distribution	Straight line	Depending on asset type: lines 2-3%, transformers 4-5%, substations 4%	Pass through

- Which indicators are used for long and short interruptions?

	Long Interruption-Index	Long Interruption-Weighting	Short Interruption-Index
Power, distribution	SAIDI, SAIFI, ASIDI, ASIFI, CAIDI, (CML, ENS).	Weighted by both the transformer stations affected and by the number of customers.	MAIFI
Power, transmission	SAIDI, SAIFI, ASIDI, ASIFI, CAIDI, (CML, ENS).	Weighted by both the transformer stations affected and by the number of customers.	No specific indicator.

- What are the losses in the Austrian distribution and transmission network?
    - No loss rates were shared
- How are the distribution tariffs determined for consumers?
    - Via detailed benchmarking method using DEA and COLS with equal weights.
- Can the performance-based tariff structure of Austria be used as a benchmark for Turkey?
    - There are various elements of interest in the Austria tariff structure
- How is demand side flexibility managed in Austria?
    - There is not much need due to high level of flexible hydro. The APG meeting showed an example where due to EU rules AT nearly failed to balance supply and demand.
- Which methodology is used for the design of electricity and gas tariffs?
    - DSOs use incentive-based regulation.
- Which regulatory tools are used for managing costs and revenues?
    - Mainly via benchmarking using DEA and COLS with equal weights.
- What are the roles and activities of the regulator?
    - The regulator is fully independent and is a think tank. Also, meetings with various stakeholders are common for informing the regulatory process.
- What is the structure and design of the LNG terminal tariffs?
    - There are no LNG terminals in AT, but the oil is imported from Trieste (IT).
- What is the structure and design of the electricity and gas transmission tariffs?
    - TSO is still regulated with the cost-plus method
- What is the structure of the tariff of last resort?
    - Only available to very small proportion of the population to reach out to vulnerable customers.

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

- Identification of data requirements necessary for the proposed performance-based tariff structure.
    - Only 38 operator's data are used non-parametrically.
- Guidelines for harmonization and standardization of the data coming from different sources to make them possible to be used in the tariff calculations.
    - Step 1. Collect data via an electronic system, step 2. Company visits. Next: data consolidations via auditing of the data to assess the appropriateness of the costs declared and the amount of costs indicated. Step 3. Benchmarking calculations using DEA and MOLS.

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
    - Step 1. Collect data via an electronic system, step 2. Company visits. Next: data consolidations via auditing of the data to assess the appropriateness of the costs declared and the amount of costs indicated. Step 3. Benchmarking calculations using DEA and MOLS.

T2.2 Delivering analysis of existing data management systems at e-Control

- 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
    - Step 1. Collect data via an electronic system, step 2. Company visits. Next: data consolidations via auditing of the data to assess the appropriateness of the costs declared and the amount of costs indicated. Step 3. Benchmarking calculations using DEA and MOLS.

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

- Innovation has briefly been discussed during the meeting with E-control.

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

- Smart grids have briefly been discussed during the meeting with E-control.

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

- Vulnerable customers are treated very peculiarly in AT; see first day of visit to E-control

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

- In AT SoLR coincide with vulnerable customers.

T7: Institutional capacity of e-Control for handling customer complaints and using the data on customer complaints in tariff calculations.

- Customer complaints have briefly been discussed during the meeting with E-control.

Hosting Organizations are:

- Visit AFRY office with experts: Mr. Wolfgang
- Vienna Technical Museum
- DAI HD office with expert: Dr. Garett Davies
- E-Control (2 days)
- Austrian power grid TSO

2 Visited Institutions and Lessons Learned

2.1 Presentation and Technical Discussion with Wolfgang Pospischil

The first day of the programme (20th of January) was spent in the premises of Pöyry. Mr. Wolfgang gave an introduction to the electricity and natural gas topics in the morning for two hours. The main topics covered were: fundamental market model, new plans; such as future cities, and renewable energy plans etc. His speech was the introduction to study visit for the upcoming events and gave an overview of the Austrian policy and the legal framework and the practices related with the national energy market.

Meeting notes:

AFRY engineering and AFRY Consulting have 350 employees in Vienna.

Main activities in Turkey are hydro, whereas the Ankara office in same building as Andritz.

He worked on the Sakarya pumped storage power plant project in Turkey.

Moreover, there are 26 market models with BID3 together with underlying models for gas, coal and oil.

District Heating (DH) companies are quite popular in Austria.

Strategy for Verbund is to reach 9 GW installed capacity, it is the largest utility in Austria. Wien energie is related to distribution.

Company electric cars is a boom in Austria. E-car is free, whereas fossil fuel can go up to 900 euro per month.

Charging stations is an important issue.

DD in Turkey: AFRY can cover all topics in DD. Management consulting division only has 400 employees, out of 17,000 employees in total at AFRY. But these are mainly engineers. There are 20 investment bankers in London. Future smart cities are one of the new topics of interest for AFRY.

Turnover is 2.1 b€ and 1.1 b€ for infrastructure alone. Linz is the 3rd biggest city in Austria and has the main industry. Gas Connect is the main gas TSO. There are 136 distribution grids. Wiener Netze is the DSO.

Rural and city needs for tariffs may differ completely.

DH is not under regulation. There is a competition between DH connection and gas network connection.

Three CCGTs are used to power the Wien DH grid.

Austria is on the way to become fully carbon neutral by 2040. There is already 75% of renewable generation at present. New renewable scheme will have a tremendous impact on the tariffs. 9 GW solar and 20 GW wind is aimed at. This would make AT 100% renewable in electricity generation by 2030, but this does not account for imports.

There is now a "border" with DE; now prices in AT are now higher than in DE. A physical border of 4.9 GW. Gas from Russia is stored in AT. Largest demand for gas is in IT.

Biogas gains in importance. Gas is mainly used for heating and power generation.

Hydrogen is also an important topic. APG is 100% owned by Verbund. They have a trial hydrogen plant.

Demand is 70 TWh in AT and may grow to 90 TWh by 2030.

Q&A: grid versus off grid trade off especially for very remote locations.

The regulator does not have access to all the physical locations of the power and gas grids. It is not shared by the distribution companies. If E-control would receive this data, they would use this in their benchmarking analysis (DEA and MOLS); for that reason, the DSOs do not want to share this data. Instead E-control will make assumptions to fill these data gaps.

DH with gas in Turkey may be a problem if no CCGT electricity is needed. Here heat demand could be given priority.

Smart meter roll-out is almost completed; these are high costs to the DSOs.

Should the charging station be considered as supplier or consumer? This will impact the way it will be treated in the tariffs. All public charging stations are from Wiener Netze. It is more top-down in AT.

Public transport is cheap in AT and very popular in Wien.

CNG is used in Turkey in remote village to supply them natural gas.

In rural areas in AT there is mainly biomass and wood. There is much wood waste.

Setting up a DH system in a liberalised market is very difficult, due to high costs of the pipeline systems. (UK example: house isolation is poor in the UK too).

Heat pumps in combination with PV and high levels of insulation is gaining in importance and popularity. These are not part of the tariff methodology. If this roll out continues, the tariffs will have to go up, which will further incentivise off grid solutions.

What is the main commodity? Power or gas or even hydrogen? In the end it is all about storage. This is the key question for a transition to carbon neutrality. Where should storage be?

About Dr. Wolfgang Pospischil: Dr. Wolfgang Pospischil holds the AFRY-wide lead for the Future Cities Business Area, and he is the Managing Director of the Vienna office, where he is in charge of the management of large international energy projects in Central, Eastern Europe and Turkey. He has more than 20 years of experience in the industry and consultancy from leading positions in Austria and Great Britain. He is experienced in all project phases from strategy development and market entry studies, to the implementation phase. He has also been involved with Financial and Technical Due Diligence as well as M&A and divestment support.

2.2 Technical Museum of Vienna

During the first day of the study visit, in the afternoon a visit was organized to the technical Museum of Vienna. On this occasion, the attention was drawn to the subject of 'energy', which included electricity and natural gas.

On electricity, the delegation was able to see the history of the electricity generation from times of pre-industrial age and learn more about power stations and supply of electricity during industrialization. Finally, on electricity, the visit included information about now a days, networks, and main power supply.

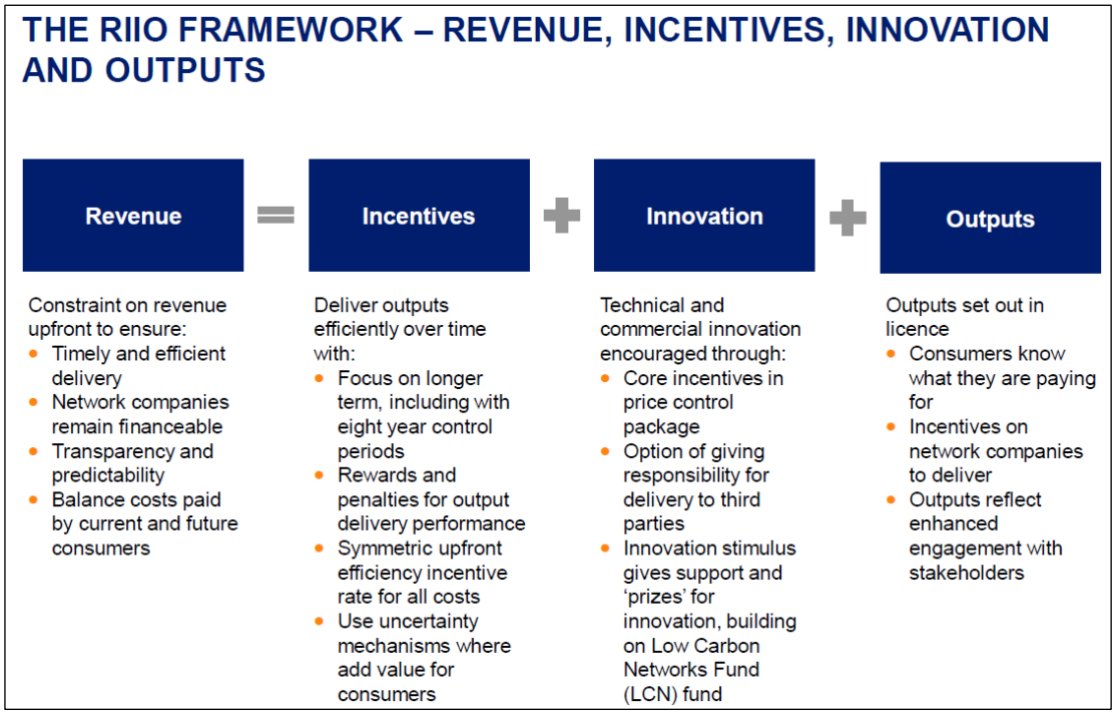
On natural gas, the delegation accessed the information on importance of the natural gas. Natural gas evaluation in Austria and the interplay between the oil, natural gas, human beings, the environment, the technology, and the transportation of natural gas in the country including to several locations.

2.3 Presentation and technical discussion with Dr. Gareth Davies

On second day (21st Jan. 2020), Dr. Gareth Davies welcomed the delegation at the Human Dynamics main office. His planned presentation was for 3 hours; however, due to Professor Gareth's extensive knowledge of RIIO model and the knowledge of electricity and natural gas, the participants wanted to extend this meeting. The visit to Wien Energie was considered not be very efficient due to bad weather conditions and the fact that the delegation was highly interested in the discussions with Dr. Gareth.

Meeting notes:

Dr Davis has worked on "price control" since 1996. He is not econometrician and cannot provide details about the DEA method, for example.



Presentation of price controls in the RIIO model of the UK.

RIIO and RIIO-2. RIIO handbook has been published in 2010. RIIO-1 phase is completed. Next price controls to start in 2021. RIIO is a TOTEX type of approach in Europe. NL does TOTEX only partially (yardstick method).

IT DSOs are not used to have forward looking business plans, but the IT TSO has been much forward looking.

Smaller DSOs are regulated with relative price control. But larger DSOs serving 1.5-2 m customers go through the full price control RIIO process.

Decarbonisation of power generation by 2030. DSOs' challenge is how to integrate distributed generation.

Setting revenues through incentives to obtain innovation and outputs = RIIO.

After initially an 8-year price control, OfGem has gone back to a 5-year price control, which appears more manageable. The regulator does not want to allow too much revenue. Uncertainty is linked to some outputs. Mechanistic compensation can be considered with an allowed revenue per unit of output. Another example is the smart meter roll-out.

Companies are typically risk averse and not likely to undertake much innovation.

Allowed revenue is a key element of RIIO and consists of 4 elements.

- Base revenue: with lot of emphasis on cost assessment

- Output:
- Uncertainty mechanisms:
- Innovation: for example, through a 750 m£ competitive fund where the results will be shared among the market players to show the innovation works or not and how.

Data templates and excel sheets to outline the business plan for particular projects by DSOs. All these templates are available at the OfGem website. There are specific web-locations for each company. There is a yearly reporting requirement.

TOTEX works with capitalisation rate, varying between 60-80% and largely based on past performance, which share is equivalent to the CAPEX and is called “slow money”, the remaining part is called “fast money” and is used for OPEX.

Efficiency sharing mechanism: part of the savings can be retained and used in future years.

Transition from RPI (producer) to CPI (consumer) index.

Previously depreciation period of 20 years. This will be increased to 45 years to new investments.

Prior to determining the TOTEX, each company presents a plan which is scrutinised by OfGem to verify its appropriateness. This will determine the course of action of the company. Example of 100 kms network replacement at 10 pound per km: is this really needed? Both the distance and the unit price will be scrutinised.

Cost of debt is not fixed over the lifetime period. The actual cost of debt is adjusted for the 10-year moving average of this cost. Previously a market cost of debt was considered, which can vary too much from year to year.

Outperformance can be underspending of the TOTEX allowance, and to reach more outputs than planned/required. Currently, companies tend to outperform quite a bit, rather than underperform.

Regulatory equity = RAB – gearing. RAB = RAV but said in a different way.

Depreciation is 10 years for electricity and 22 years for natural gas in Turkey.

What would be considered quality factor in Turkey is an output in the RIIO model.

Three types of outputs: license obligations, price control and deliverables, and ODIs output delivery incentives. About 270 ODIs have been proposed by the key company groups: 1 gas transmission, 3 power transmission, 12 gas distribution and 14 power distribution companies. But these are organised in 6 groups.

OfGem’s starting point is that customers know what they want; companies’ proposals can be measured and monitored. Different thresholds may be possible for different companies.

To replace two assets with risk rating of 8 to be reduced to risk rating of 6. Instead of replacing the assets, another measure has been taken, the risk rating goes down, which is sufficient overall. So individual investments are not monitored, as the overall system has improved, which is the key output aimed at.

OfGem has access to many VOLL and willingness to pay studies which can be used to decide on the price control parameters.

Data quality is tested with relative benchmarking.

A relatively good BP can get up to 2% extra revenue allowance; whereas a bad BP can see up to 2% lower revenue allowance. This is an incentive to provide a detailed and clear BP. Even though it may be subjective to judge the quality of the BP.

Customer and stakeholder satisfaction surveys gets a relatively high incentive; around 25 m£.

12-15% of the retail bill is related to distribution costs.

BP contains the number of customers, but more importantly the types of customers. It is expected that the number of heat pump users and EV owners will increase, who have typically different consumption patterns, which may affect the needs from the distribution network.

Network innovation allowance: use it or lose it (same in Turkey). There is not the level of scrutiny as that is being used for the ODI. How to recognise if an innovation is still new or has become base case/BAU?, which needs to be implemented by all companies. The size of these projects is between 25-100 m£.

Strong division between asset owner and the asset operator. For that reason, DSOs and DNOs are dealt with quite differently.

IQI information quality index. This there to incentivise the companies to reveal the "truth" to not overstate their targets. But the system is not very transparent and not liked. They are moving away from this IQI matrix system.

Transmission is simpler due to fewer companies and most complicated for distribution companies.

Catchup period depends on how far away the company is from the efficient frontier. Can be 5 years but also longer if reasonably needed.

OfGem works still with excel and word which are shared by email. A web-based system is under development, but not yet operational.

What is the information that is delivered on a regular basis and work from there? Do not copy-paste the RIIO templates, as much of this information may be missing and hard to obtain for the companies.

About Gareth Davis: Dr. Gareth has 23 years of experience in energy policy analysis, energy regulation and energy market economics. He has advised companies and regulatory authorities on a range of price-control issues across the utility sectors both in the UK and internationally. Dr. Gareth worked on numerous retail and network price-control reviews in the energy and utilities sector. He was project manager for Oxera when acting as lead economic consultant to Transco for the 1996 price-control review and Monopolies and Mergers Commission inquiry and subsequently led work on several regulatory reviews on gas and electricity network businesses in Great Britain and Northern Ireland. During this time, he also supported the development of regulatory regimes for district cooling in Hong Kong and gas pipelines in Australia. In 2012, Dr. Gareth was Chair of the British Institute of Energy Economics. Gareth has a PhD. and a master's in economics from the University of Oxford and an MA (Cantab) in Economics from the University of Cambridge.

2.4 Two-day visit to E-Control

On third and the fourth days of the study visit were dedicated to Regulator which is called E-Control. During the first day, presentations were held by Christina Veigl-Guthann, Norbert Fürst, Gert Feisberger, Ulrich Rührrnossl, Tobias Kaloud. Five presentations were prepared and delivered by E-Control.

Meeting notes:

Complaint handling, vulnerable customers, SoLR and commercial quality. Not only a focus on AT but also for European customers.

Liberalisation in AT means that all customers became free to choose their energy supplier; which is from 2001 for power and 2002 and natural gas. This also gave the need for a regulator and e-Control Ltd. (100% belonging to the ministry of Energy) was created. Today e-Control dropped Ltd, due the EU third package requirements, and has become fully independent, only to report to the parliament. “The market is not as free as one might think.”

Stakeholder interaction is important in AT, even though such stakeholder meetings are held in a formal manner. E-Control based fully in Vienna. E-control also mediates in consumer’s rights.

E-control is a think-tank, they publish reports and they also try to shape/influence secondary legislation policy formulation, so that the targets of e-Control can be reached. In the field of energy, the rules are quite well settled, which is produced in Brussels (by ACER) and not by the AT parliament.

ADR alternative dispute resolution board: There is Wiener Netze (DSO, which is regulated) and Wien Energie (supplier, which is liberalised) which are actually two different contracts. If the consumer switches to another supplier, there will be two bills: one to the DSO (2/3rd) and the another to the alternative supplier (around 1/3rd of the bill).

Some suppliers give high rebates in the first year; but charge very high rates in the second year. There is a very low switching rate in AT; around 5%.

SoLR (grundversorging) is only available for rare cases (only 300). The supplier has an obligation to take the customer, even if the customer is in debt. Here a standard charge (regular price) is applied; no extra charge and no rebate. There is a right to be connected, but a consumer in debt may be pursued to pay the bill. This consumer will have to pay the bill (based on monthly instalments) otherwise they may be disconnected, and it is over and out.

If a supplier goes bankrupt another procedure for SoLR goes into operation. This is more related to the functioning of the market.

In AT there is a very strong connection with vulnerable customers.

The power and gas act have written the disconnection flat fee (30 euros). Often the people that get disconnected who are in need.

There are about 130,000 vulnerable customers. 3.7 million customers in AT.

There is a procedure for a disconnection.

Smart meter coverage is 19-20%. IT was one of the first to reach 100% smart meter roll out; mainly to reduce theft.

Analogue meter reading is done once year, sometimes only once in the three years.

40 m€ were spent on meter reading in Turkey on yearly basis.

Energy poverty is not automatically taken up by any ministry and to fill this gap, e-Control is dealing with this issue. Currently it is a more informal role. The right to energy access is defended here; not the issue of poverty at large. The level of theft is rather low in AT.

In general, the satisfaction with the energy sector is quite high. It is difficult to reach out to the people that had a complaint. It is not clear how these customers have been treated.

In Turkey, there are many complaints on the electricity retail. Mainly high electricity prices are considered a problem.

Benchmarking is an important activity at e-Consult. Tariff department has 1 head and 14 staff.

State-of-the-art benchmarking exercises. European benchmarking exercise is done by CEER.

Austrian Law dictates RPI-X method using CPI index. E-Control constructs a network price index: 50% CPI for materials and 50% for wage index for staff expenses to determine OPEX. This method is not recommended for frontier shifting.

Input price minus productivity shift becomes the output price.

AT follows at t-2 approach. The maximum amount of equity is 40%, but if the equity is less than 36% than the WACC is revised downwards. Otherwise there would be an incentive for higher gearing, which is undesired.

Where does the money come from and where is it used for? One example of pensioners only, where the pension deferrals add up to more than RAB, which is actually an example of negative equity value.

There is a **revenue cap** method in AT. However, the price is set by the EU, where the DSO cannot change the unit selling price, neither higher nor lower prices are allowed; this could be considered a price cap method.

The 38 largest DSO is AT, whereas the others are considerably smaller.

The RAB in AT has different WACCs applied to three-year blocks.

Three grades of unbundling: Accounting unbundling, Legal unbundling, Ownership unbundling (not mandatory in Europe).

WACC: E-control approach is to estimate a reasonable rate of return. The WACC level is important to incentivise sufficient level of investments.

The individual WACC differs by DSO depending on their level of efficiency. More efficient DSOs get a higher WACC and the other way around for less efficient DSOs.

Individual WACC for assets up to 2016 (about 90% of total assets), normal WACC for assets for 2017 and 2018, where the new assets from 2019 forward get a WACC plus an add-on.

Benchmarking of the individual benchmarking. Here the DEA and MOLS methods are used. Only 38 operator's data are used non-parametrically. We need to be aware of the "curse of too many outputs". Better to use outputs that are crucial for the industry.

Using two types of TOTEX, one based on accounting methods and another one based on standardised methods. The efficiency differences are expected to be corrected within 7.5 years (= realisation period).

During the second day, presentations were made by Gerol Felsberger, Norbest Fürst, Silviya Deyanova, Tobias Kaloud, Markus Krug, Patriciaa Valda, and Karin Emberger. The following presentations were delivered on the second day:

Meeting notes:

The original tariff system was established about 20 years ago, but changes are needed to encompass e-mobility, RES, and other changes. About 60 network operators are directly audited by E-control. Mainly one big TSO in AT; E-control participates in EU-wide benchmarking for TSOs.

Who has to pay how much? Cost cascading mechanism. TSO costs increased which were mainly passed on to industry customers and had a 25% cost increase, whereas others say only 3-5% cost increase. Main reason was congestion management, where more expansive CCGTs needed to be dispatched significantly more for balancing reasons.

There are 15 tariff region and there 60 audited system operators. One tariff region has 20 DSOs, Some DSOs earn too much and some too little, mainly due to the composition of their customer base, not due to efficiency differences and this needs to be corrected for to achieve equitability. The tariff is calculated here as if there would be only one large DSO in the region and do the correction for each DSO afterwards.

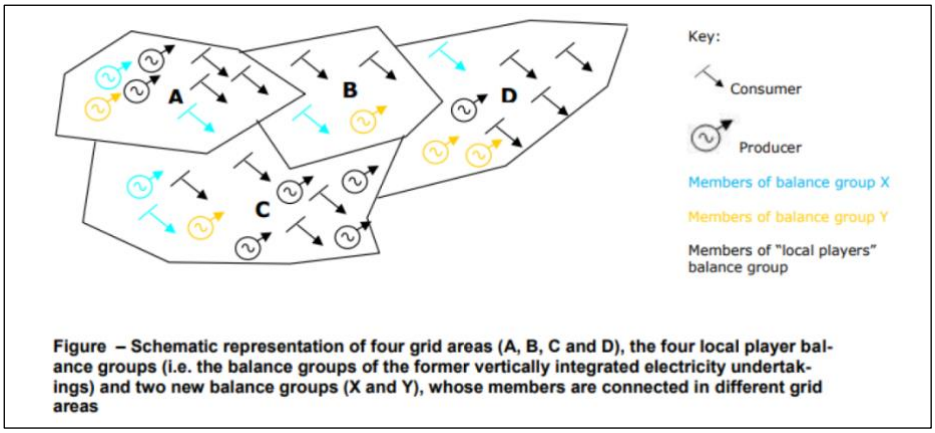


Figure – Schematic representation of four grid areas (A, B, C and D), the four local player balance groups (i.e. the balance groups of the former vertically integrated electricity undertakings) and two new balance groups (X and Y), whose members are connected in different grid areas

There is a metering charge, namely 2.40 Euro per month for small customers, and relatively much lower for large consumers and generators. This is a small part of the system charges, which may be eliminated from the tariff in the future.

The depreciation period of gas pipelines used to differ among gas DSOs from 20 to 50 years. First it was harmonised to 40 years, but after the Paris agreement it was shortened to 30 years, as gas networks may no longer be needed after 2050.

Step 1. Collect data via an electronic system, step 2. Company visits. Next: data consolidations via auditing of the data to assess the appropriateness of the costs declared and the amount of costs indicated. Step 3. Benchmarking calculations using DEA and MOLS, as explained on Wednesday.

Presentation of the cost reductions since liberalisation. These are still around 400 m€ since 2001 levels. But these reductions were already achieved in the first three years, since then there have been increases as well off setting further decreases.

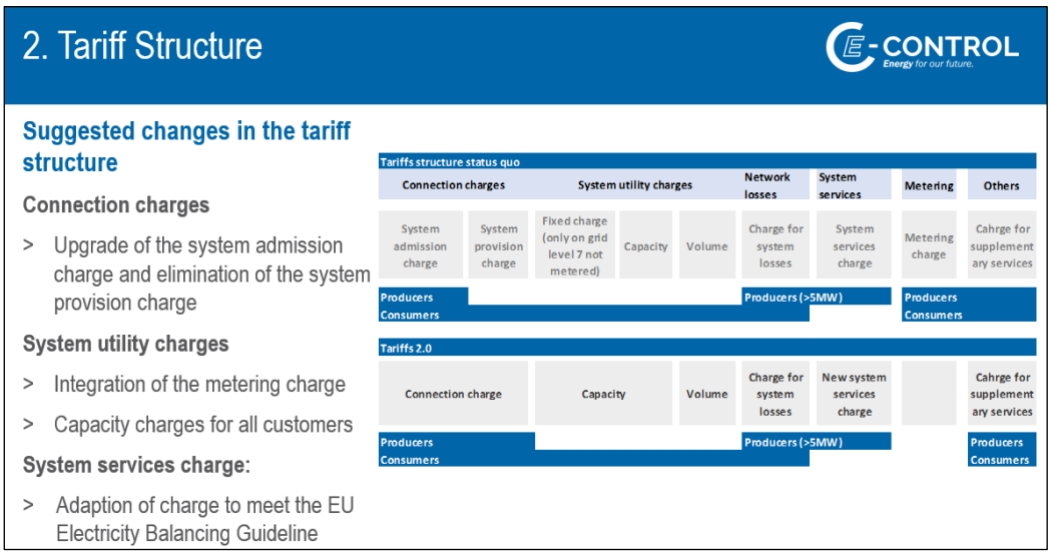
In one example case it became clear that some assets were included in the RAB which were used by another company. These assets had to be removed from the RAB.

There may be companies that will apply for additional CAPEX to E-control, due to additional needs in the network. Recent storms for instance may require additional CAPEX to repair the damages. The insurance rates are quite high. Hence, not all companies are insuring themselves. If this is made compulsory it should be added to the allowed revenues.

Is it possible to charge an efficiency parameter to a single TSO. This can only be done via an international benchmarking. For instance, by using the CEER benchmarking report. AT two TSO s do not participate into the benchmarking process, as they believe to be fully efficient, where the benchmarking analysis may conclude otherwise. The comparability with other country TSOs can be questionable.

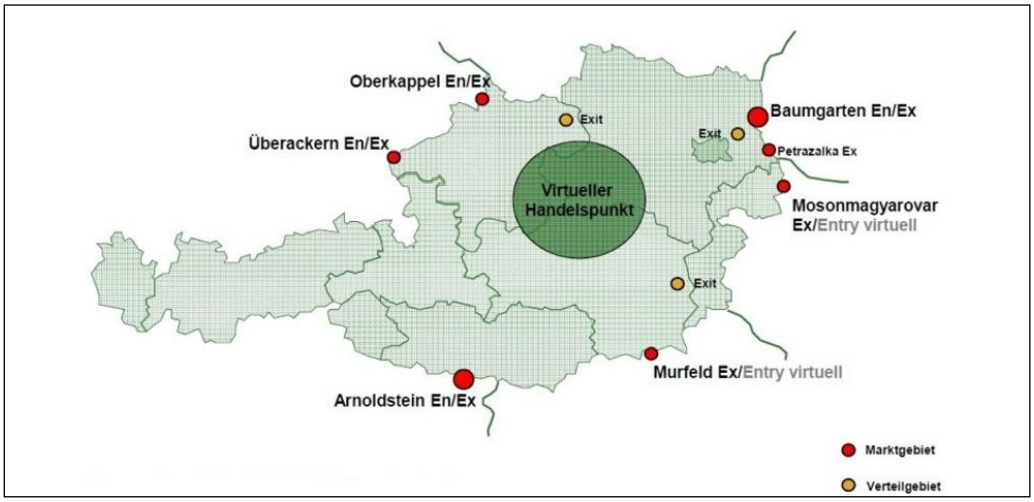
The new tariff structure "2.0" and their considerations will be considered. Mainly related to smart meters and intensive users should pay more distribution costs, and not yet focussing on full decarbonisation.

Tariff 2.0 is also the name of a position paper published by E-control. A transition to smart meters will significantly reduce the meter reading costs, which will be nearly fully automated. Flexibility is a huge topic and needs to be included into the network tariffs. Ideally, tariffs should be known in advance. It becomes in-transparent if there is too much flexibility in the tariff.



Energy communities. They can be organised in groups to enable new technologies; they will be more flexible and more innovative. Ultimately, these energy communities may be subject to alternative tariffs, because of different usage of the grid, due to more embedded generation, lower peak capacity from the distribution grid, and so on. However, there are no examples yet in AT. There quite a number of energy communities in Norway, they emerged historically and fit well into this new definition.

Tariff setting process for gas transmission and distribution. TSO of natural gas; there are no direct customers; mainly intended for transit. The power plants are connected to the distribution grid. E-control is currently checking the costs of the DSOs. The TSO is a virtual trading point. In the past there were three TSOs related to three exit points, but now there are two TSOs for gas.



Baumgarten entry point is the main node, and the virtual trading point is close to that. There is mainly one single tariff for the distribution region.

After the consultation, the fuel gas will get the same cost as gas to get aligned with EU rules. This consultation document is available.

There are 9 federal states in AT and each have their own gas distribution tariffs. Levels are based on pressure (bar), whereas zones depend on the amount of gas consumed (kWh or m3).

System admission charge is actually cost-reflective.

Smart grids = dealing with flexibility.

Clean energy package will require involvement of the DSO.

Hydro installed capacity is well above 50%, there is runoff river in the Danube and many dams in the Alp plus around 4 GW pumped storage backup capacity.

Quality of supply is currently not used in regulation. SIADI numbers are affected by extreme weather events. There is a power quality index calculated, but it is not used in tariff methodology.

Example shown on how the CAPEX is calculated in AT.

About E-control: The first European countries moved to liberalise their electricity and gas markets in the early 1990s. Austria followed suit in 2001 (electricity) and 2002 (gas). For competition to emerge market participants need clear rules of the game. As the regulator, E-Control is responsible for drawing up and enforcing these rules. E-Control's regulatory functions for the electricity and gas market include:

Drawing up electricity and gas market codes together with the market participants and publishing them in an appropriate way;

Drawing up, in cooperation with the network operators, proposals for technical and organizational rules for the operators and users of networks and make these rules available to them;

Compiling and publishing electricity and natural gas price comparisons for consumers;

Taking the appropriate measures in the area of cross-border supplies necessary to ensure compliance with European Union requirements;

Publishing general information about our activities in an appropriate way.

2.5 Visit to the Austrian Power Grid - TSO

During the last day of the study visit (24th of January,2020), the delegation visited APG premises in Vienna. First part of the presentation was made by Carmen Reithiuger and Lukas Mader who are the experts of APG. Their main topics were on Network development, regularity systems, and also WACC parameters. In the afternoon at the meeting, another colleague of theirs, Halmut Staudinger, joined them for the details of the presentations and questions. The following presentations were made:

Meeting notes:

Austrian Power Grid (APG).

WACC is fixed for five years and stands at 4.88% nominal. The WACC in Turkey for TEIAS is 13.30% in real terms (and 14.60% for distribution companies). Almost 70% of AT is covered by the Alps.

There is great difficulty in building new overhead lines. It is a long procedure to get the environmental permits and next there are organised local protests, insisting on underground lines, which will be quite more expensive. The grid is also getting older and older, whereas it is getting more difficult to get new lines in place.

Half the revenues of APG come from energy purchases which is not a classical TSO task but more a task of a market facilitator, which shows the changes in the business model of APG.

The tariff system is CAPEX biased. Even though no new investments are needed as much. OPEX does not generate any profits (only reimbursement of expenses), whereas CAPEX would still give some profits.

Legislation wise the EU third package had a major influence and led to a revised Electricity Act of 2010. These changes are mainly related to unbundling.

TSO is still regulated with the cost-plus method, whereas DSOs have moved forward to incentive-based regulation.

There is no working capital reservation in the OPEX, this is granted via the WACC on equity and CAPEX.

Are there pass-through uncontrollable costs? The purchase of energy would fit into this category, but also technical losses, ancillary services. This is determined in paragraph 59 in the Electricity Act.

The market risk premium of 5.00% is considered a bit too low by APG.

The congestion issue leading to market splitting with Germany increased the costs of APG considerably. APG was appealed against by the Chamber of Commerce. Finally, APG made some concessions and the appeal has been withdrawn.

APG Business Model.

Two responsibilities at E-control: board and regulatory commission. Chamber of labor and chamber of commerce are heavily involved in the process. Re-dispatch costs increased in 2018 where the share of the retail bill of TSO increased to 5%, whereas the share of the DSO decreased somewhat.

Balancing regime in AT based on the Scandinavian model. This transition happened in 2001. The advisor was KPMG.

First step is to give more power to ACER and reduce the power of local TSOs. Everything needs to be set d-2 (two days ahead of time). Balancing is not only within AT, but also trading with other countries via the interconnectors.

APG is cooperating with TenneT, one of the large DE TSOs. Third package is not clear on what would happen if due to a miscalculation a black-out would occur.

AT's is very well interconnected to neighbouring markets. Between 60-80% hydro, 5% wind (close to Vienna), 1 GW PV and thermal CCGT (mainly in the biggest cities). There is a phase-shifter between AT and SI. IT used to be importer only, but due to PV, IT is sometimes an exported too.

There is a trade-off between reaching a 70% trading role, and a higher share of renewables. This was challenged during dry summer day (example of 27/8/2019, which led to a nearly black out). In addition, the existing lines are getting too old, whereas new investments are not coming about quick enough. An extension can be asked for. But even if the grid is upgraded, it is not clear if it can handle the planned extra wind. There is a long distance between the pumped-storage and the wind generation, which makes balancing in AT more challenging.

Wind and PV can be built very quickly, whereas transmission lines are built very slowly, as environmental permits and needed and there is strong local resistance.

The green energy deal: Mainly focussed on gas: such power to gas (P2G). AT has large natural gas storage capacity. This is even serviced to IT and DE. Also, East-AT is the hot spot for wind generation, which is well prepared for the P2G. The 70% is not only average yearly, it should be adhered to on an hourly basis.

Presentation on TEIAS to APG.

Second half of the program included EMRA presentations about thie institution; TEİAŞ and BOTAŞ and details about the continuing work progress. The presentations were made by Gülşah Kınacı and Abdul Cebbar Karaoğlu.

About 8000 people work for TEIAS. Around 600 personnel at EMRA.

Not only natural gas at EMRA, but also petrol (white hydro-carbon).

The issue of storage is on the table for Turkey. There is a plan, but it is not yet decided. There is an R&D project dealing with this topic, funded by EMRA.

Quality factor (Q) only for distribution, currently only positive, but planned to be revised for the next regulatory period starting from 2021 to both upwards and downwards incentives.

There is a difference between operation performance (more staff related) and cost performance (more related to materials).

Last resort tariffs in Turkey is different from Europe. In Turkey applied to eligible consumers who could not conclude bilateral contracts. In Europe is generally applied non-eligible customers.

Botas has a WACC of 10.2%, but more than 14% for gas DSOs.

Revenue cap method used for storage facilities, but the method is applied flexibly to ensure sufficient investments as more storage is needed in Turkey.

The Austrian Power Grid AG aims to provide all market participants with the data relevant to the market via the power grid in a transparent and non-discriminatory manner. APG has recently had to reduce the transmission capacity at certain limits to ensure compliance with the operational safety limits. The amount of the reduction depends on the forecast overall energy situation or the load flow situation. Top-qualified experts take care of the smooth operation of the APG systems and look after the control and safety systems, which are becoming increasingly complex in the course of digitization. In the event of malfunctions, the APG management team takes care of the quick troubleshooting to keep supply interruptions as short as possible. The cooperation with the network operators of our European neighbors, APG coordinates and controls the cross-border flow of electricity and ensure the long-term and sustainable supply of Europe as part of the ENTSO-E (European Network of Transmission System Operators for Electricity), the association of European transmission system operators.

3 Feedback and conclusions

3.1 General evaluation of the study tour

The participants have stated that in their evaluation forms that they are in general glad and satisfied with the study tour. Since the tour combined different types of organizations, most of the participants found interesting and applicable presentations in each institute. All visited institutions first gave a presentation, and it was continued with a question and answer (Q&A) version and most of the questions to the lecturers have been answered. All the participants see the potential in using the new knowledge obtained during the study tour in their professional life.

3.2 Feedback from the participants

Wollfgang Pospischil:

- General overview of Austria energy sector.
- To overview about technical discussion on the hot topics of the related countries energy markets the tariff system and to understand the difference between two countries.
- There wasn't PPT presentation. I would be nice to have to follow up the meeting.

Technical Museum of Natural Gas and Electricity Exhibition:

- Technology was displays at the museum.

Dr. Garett Davies:

- Beneficial and interesting because of the details were given on English RIIO model
- Presentation about RIIO was very instructive.
- Comparison between English and Turkish tariff were made.

E-Control:

- Learned insight about the Austria tariff application.
- Learn about how regulation was made in Austria.

- For electricity and natural gas transmission/ distribution tariff model was presented.
- Tariff structures, tariff calculations in details.

Austrian Power Grid TSO

- Beneficial to exchange information.
- Can understand topics on transmission side; capex, based tariff structure.
- Explained how the tariff calculations were made.

Recommendations for future study tours:

- Distribution company visits should be added as specific sessions.
- All presenters should have presentations ready so that it will be easier to catch up.
- Regulatory institutions could be scheduled for 3 days.
- Next study visits, there should be no museums included into the visit.
- More focus on the tariff making process could be beneficial.

Annex 1 – Agenda of the study visit and list of participants

19th January – Sunday	
06:05	Arrival to Vienna with flight TK1897
7:30	Breakfast at Wandl hotel
9:00	City Tour- Vienna
13:00	Lunch at Regina Margherita
14:30	City Tour - Vienna
16:30	Back to Wandl Hotel
19:30	Dinner at 1516
20th January – Monday	
09:30	Pick up from Hotel to the AFRY office
10.00 – 12.00	Presentation and technical discussion with Mr. Wolfgang
12.00 – 14.00	Lunch Break
14.30 – 18.00	Vienna Technical Museum natural gas and electricity exhibitions
21st January – Tuesday	
09:45	Meeting at the HD Office
10.00 – 13.00	Presentation and Technical Discussion by energy expert from the U.K Dr.. Garett Davies
13.00 – 15.00	Lunch break at **Gmoa Keller (am Heumarkt)**
15.30 – 17.00	Visit to Wien Energy and Guided by a Technical Specialist of the company Mr. Bacher and followed by technical questions
19:30	Dinner at Do & Co Albertina

22nd January - Wednesday	
09:30	Pick up from Hotel to the E-Control
10.00 – 12.00	Welcome to e-control, Austrian Tariff system
12.00 – 14.00	Lunch Break at Café Aera
14.00 – 16.00	Presentation Austrian Tariff system, concluding remarks
19:30	Dinner at Hansen
23th January - Thursday	
09:30	Pick up from Hotel to the E-Control
10.00 – 12.00	Austrian Tariff System
12.00 – 14.00	Lunch break at Café Diglas im Schottenstift
14.00 – 16.00	Presentation Smart Grids, Electric Vehicles Regime for Vulnerable customers, supplier of last resort and customer complaint handling
19:30	Dinner at Trattoria Santo Stefano
24th January – Friday	
08:35	Pick up from Hotel to Austrian Power Grid TSO
09.00 – 09.15	Registeration (ground floor and 23rd floor)and Welcome
09:15 – 11.15	APG and the Regulatory system in Austria
11.15- 12.00	Turkish Regulatory system
12.00 - 13.30	Lunch break Restaurant Uno
13.30 – 14.30	Implications of CEP and Questions & Answers
19.30	Dinner at Restaurant Ofenloch
25th January - Saturday	
08:20	Check-out from hotel and transfer to Vienna Airport for flight TK1884 at 10:20

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 Austria.

List of participants:

Name- Last name	Title	Department
Serkan ŞEN	Group Head	Financial Risk Analysis Group
Görkem Yusuf TOPÇU	Energy Expert	Hydrocarbon Markets Tariffs Group
Abdul Cebbar KARAOĞLU	Energy Expert	Electricity Markets Tariffs Group
Gülşah KINACI	Energy Expert	Hydrocarbon Markets Tariffs Group
Derya KARAMAN	Junior Energy Expert	Electricity Markets Tariffs Group
Necmettin BAŞER	Junior Energy Expert	Electricity Transmission and Distribution Investments Group
Valter Anacleto	TAT	Project Manager
Naz Yazıcıoğlu	TAT	Project assistant
Wietze Lise	TAT	Team Leader
Mehmet Kocaoğlu	TAT	Senior Expert

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