This project is funded by the European Union

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

Task 4.2 – Preparation of Smart Grid Road Map and Required Methodological Tariff Approaches for Natural Gas Market – Gap Analysis and Regulatory Recommendations

Workshop

16th September 2020, EMRA, Ankara

This project is funded by the European Union

Agenda

- Legislative and Regulatory Recommendations
- AS-IS Scada Implementation in Botas
- Proposed Smart Grid RoadMap for Botas
- Roles and Responsibilities for implementation of the RodMap

This project is funded by the European Union

Legislative and Regulatory Recommendations

	Rationale	Recommendation
1	As shown recently in the EU Hydrogen Strategy, relevant investments will be required to modernize the TSOs and the other energy players. On the other hand, the risk of under-utilization of assets requires a careful and deep analysis of the investment proposed by the TSOs in the authorization process.	• Review the TSO investment approval process by EMRA, to be sure that the information provided by BOTAS cover all the relevant elements, • The introduction of a cost-benefit analysis (CBA) could help the Regulator assess all the relevant aspects of the investment (from the demand forecast requesting the investment, to its cost up to its social and environmental impacts), • The involvement of all the key stakeholders into the investment approval process has proved very useful in the European experience, • BOTAS should publish in its website the Investment Development Plan

This project is funded by the European Union

Legislative and Regulatory Recommendations

	Rationale	Recommendation
2	The European NRAs are discussing the future gas model and regulatory changes to support decarbonization and the new roles of gas TSO;	EMRA and BOTAS should • discuss/formulate proposals to present to the Government to support the decarbonization target, • identify any regulatory obstacle which might hinder the decarbonization process;

This project is funded by the European Union

Legislative and Regulatory Recommendations

	Rationale	Recommendation
3	European NRAs are introducing incentive schemes or funds to support gas TSOs to carry out pilot project (e.g. injection of hydrogen and biofuels into the gas pipelines)	EMRA and BOTAS should • Define a procedure to approve innovative pilot projects, • consider incentives to fund initiatives proposed by BOTAS regarding usage of renewable gas o sector coupling

This project is funded by the European Union

Legislative and Regulatory Recommendations

	Rationale	Recommendation
4	In order to get a better understanding of the changes that are taking place in the European Gas Model	EMRA and BOTAS should increase the information exchanges with equivalent European institutions and players

This project is funded by the European Union

As-Is SCADA Implementation in Botas

- In Turkey as in all the European countries, SCADA system is the key tool to manage the transportation pipelines and collect all the relevant information in real time. Its design and functionalities have recently (August 2017) been reviewed. Also, BOTAŞ-select vendor, Siemens, has been conducting the "SCADA Renewal and Backup Project".

- Besides the common challenges that gas transmission IT systems face nowadays (Security of Supply, Cyberattacks and Asset Utilization / Management), the liberalization of the gas market and redefinition of tariff structures will put stronger emphasis on allowed investment – revenue calculations, and hence cost item follows, according to the 2017 analysis.

- The main conclusions in the EU-IPA Project as far as the SCADA Design System focused on a suggested higher degree of centralization, since a fully integrated SCADA is very useful for a TSO with a complex network and a large amount of monitoring and controlling services in place, as is the case of BOTAŞ TSO.

This project is funded by the European Union

As-Is SCADA Implementation in Botas

Suggested Module Implementations and Integrations		Rationale and Benefits
Recommended GIS Integrations	GIS and Enterprise Asset Management	This provides control over all assets, for the full life cycle (design, construction, commissioning, operation, maintenance, decommissioning and renewal) of the assets defined on GIS and in the Enterprise Asset Management ("EAM") software. It also allows to be fully compliant with respect to mandatory legislation, with respect to asset safety, monitoring, etc. Combining as-built network data with financial data for projects and investments can justify tariff propositions for BOTAŞ.

This project is funded by the European Union

As-Is SCADA Implementation in Botas

Suggested Module Implementations and Integrations		Rationale and Benefits
Recommended GIS Integrations	GIS and Outage Management	Static data can be visualized; hence outages can be detected over the asset data and outages can be removed more swiftly; which would result in improved Key Performance Indicators (KPIs) such as System Average Interruption Duration Index (“SAIDI”) and System Average Interruption Frequency Index (“SAIFI”).

This project is funded by the European Union

As-Is SCADA Implementation in Botas

Suggested Module Implementations and Integrations		Rationale and Benefits
Recommended GIS Integrations	GIS and Workforce Management, Mobile	Based on the GIS data and outage location, and taking work force proximity to the affected location, crews can be sent rapidly to the incident site. Further Mobile integration with IP phones, tablets, etc. enhances quality and speed.
	GIS and Document Management	Documents are linked to the GIS assets, so that any construction work, as-builts, operation manuals and other technical documentation can be found.

This project is funded by the European Union

As-Is SCADA Implementation in Botas

Suggested Module Implementations and Integrations		Rationale and Benefits
Recommended Simulation Integrations	Simulation and Outage Management	This integration will help dispatchers predict critical situation and the network behaviour in such situations, especially for the area of interest. Dispatcher decisions will hence be supported via Simulation scenarios.
	Simulation and Contract Management	Simulation results will take existing contracts into consideration. This is especially important for long-term contracts rather than day-to-day operations of nomination, allocation and confirmation.
	Simulation and EAM	Simulation can be utilized for theoretical scenarios for strategic planning. Design and test changes can be applied over the existing assets in the network.

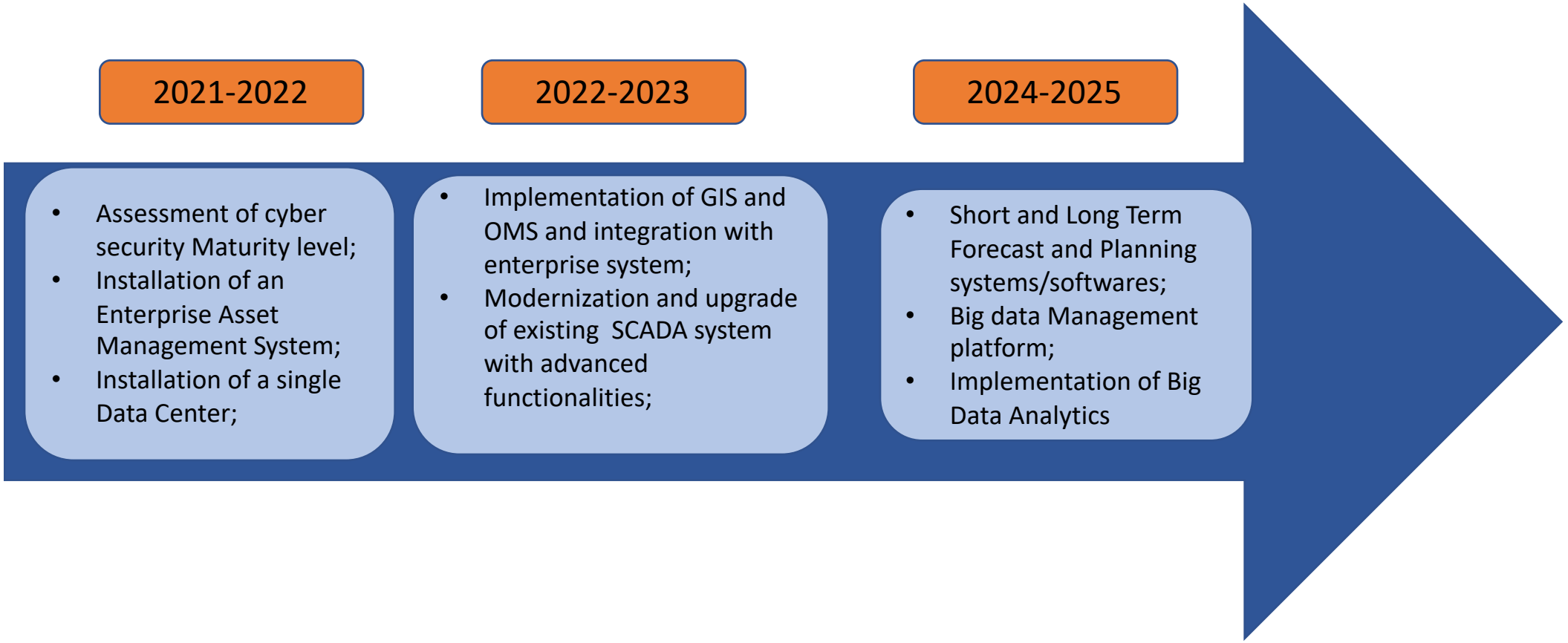
This project is funded by the European Union

As-Is SCADA Implementation in Botas

Suggested Module Implementations and Integrations		Rationale and Benefits
Recommended Demand Forecast Tool Integrations	Short-term Demand Forecasting and Electronic Bulletin Board (EBB)	Short-term demand forecasting shall be integrated with the EBB to allow Demand Forecast Tool to capture the nominations entered by the market participants. This will allow Gas Control Management to track nominations / re-nominations on a near real-time basis to update their forecasts, arrange line pack calculations and perform operational management of contractual obligations. According to the outcome of demand forecasting, confirmations can be sent to nomination holders.
	Long-term Demand Forecasting and Enterprise Asset Management (EAM)	to provide forecasts up to 15 years and coordinate output of GIS, EAM and Demand Forecasting to prioritize asset risks are and needs into an optimised investment plan.

This project is funded by the European Union

Proposed Smart Grid RoadMap for Botas



This project is funded by the European Union

2020-21 Assessment of Cyber Security Maturity level

- As mentioned by the Energy Expert Cyber Security Platform in 2017 for the European Commission, digital technologies are playing an increasingly important role in the energy sector. A smarter energy system can perform transmission, network management and market related tasks with better precision and faster response times than a human-dependent system, thereby optimising energy management, prioritizing usage, and setting policies for quick response to outages.

- Currently, the energy sector consists of both legacy and next generation technologies. New technologies are introducing new intelligent components (e.g. gas meters, digital valves or pumps) to the energy infrastructure that communicate in more advanced ways (two-way wired and wireless communications) than in the past. These new components are typically based on information and communication technology (ICT) that can be interconnected to local networks. Typically, ‘analog’ components are replaced by new digital systems as spare parts are not available anymore or obsolete.

This project is funded by the European Union

2020-21 Assessment of Cyber Security Maturity level

- Ensuring resilience of the energy supply systems against cyber risks and threats are becoming increasingly important as wide-spread use of ICT and data communication is becoming the foundation for the functioning of infrastructures underlying the energy systems.

- The digitalisation of the energy sector also raises the question of how to face the risks and threats of cyber incidents and attacks affecting personal data and strategic energy infrastructure data, which are sometimes crucial for the security of the energy supply.

- The focus of cyber security in the energy sector is to support the reliability and resilience even in the event of a cyber-attack. Unlike IT systems, a control system in the energy sector that is under attack cannot be easily disconnected from the network as this could potentially result in safety issues, brownouts or even blackouts.

This project is funded by the European Union

2020-21 Assessment of Cyber Security Maturity level

- In cyber security, three commonly accepted protection goals are defined: Confidentiality, Integrity and Availability (CIA). In the energy sector, the highest priority objective depends on the industry specific applications. For example, in generation and transmission, availability and integrity are the most important. Altered or delayed data could result in misconfiguration of a device that eventually could impact system reliability. For the advanced metering infrastructure, confidentiality of customer personal data is the most critical.

- It is therefore very important for BOTAS to assess the security of its systems against cyber-attacks, to counter any attempts to the availability and integrity of data.

This project is funded by the European Union

2020-21 Installation of an Asset Management System

- Given the increasing relevance of investments in the new gas model, it becomes essential to manage efficiently the entire lifecycle of BOTAS' physical assets.

- As in the case of Snam Rete Gas, who has chosen SAP Enterprise Asset Management, an Enterprise Asset Management System should provide:

  a) Asset information management
  b) Risk and criticality assessment
  c) Failure modes and effects analysis.

- The system will maximize asset performance with real-time analysis, simulations and predictive maintenance. It can also be integrated with work order management (to handle work orders and notifications, time parts, etc) and with geographic information system.

This project is funded by the European Union

2020-21 Installation of a single Data Center

- We recommend the creation of a single Data Centre, which should consolidate different server system in one location, to avoid data misalignment, conflicting data and other possible data distortions. A single Data Centre would also make it easier to check for completeness of data and would allow to perform data analytics in a more efficient way.

- The data centre planning should aim to provide:

  a) Maximum uptime
  b) High energy efficiency
  c) Full scalability
  d) Utmost security and safety.

- Besides, as discussed in the cyber security section, a unique data centre would reduce the risk of cyber-attacks.

- As shown before, there is a rationale for integration between

  a) GIS and Enterprise Asset Management, Outage Management, Workforce Management Mobile and Document Management,
  b) OMS and simulation.

This project is funded by the European Union

2022-23 Modernization and Upgrade of existing SCADA system

- Information and Communication Technologies (ICT) has caused a paradigm shift in all the energy system by enabling advanced functionalities to ensure its safe and reliable operation; thus, giving rise to smart grids. Consequentially, the Supervisory Control and Data Acquisition (SCADA) system is also undergoing a transition.

- Traditional SCADA systems constantly monitor equipment at a site or pipeline and record sampled data to a local historian. The real-time data is visually represented on operator screens and is used to evaluate alarm conditions. Most systems provide a summary of the collected data to show trends and identify anomalies, as well as showcase design queries and reports that summarize the data for operational maintenance and management. The data is exported from the historian regularly for further analysis in other data management systems, where it is augmented with rate schedule details, maintenance management data, modelled data, weather data and more.

- Since a SCADA system already stores plant operational data, it might make sense to incorporate advanced analytics and performance management functionality into the same SCADA system rather than add external systems, reducing overall operation complexities and costs. On top of this, collecting data in real time allows for performance issues at plants or pipelines to be more readily addressed.

This project is funded by the European Union

2022-23 Modernization and Upgrade of existing SCADA system

- Introducing integration to a gas transportation management system enables the utility to monitor critical functions in real-time and to incorporate Automated Generation Control (AGC) to control the functioning of the system. Advanced SCADA systems may include:

  a) Satellite weather/forecasting: Integrating one or multiple weather services to augment network information with area weather observations and forecasts helps to estimate better gas consumption levels,
  b) Meter settlement: Integrating meter reading systems ensures accuracy in settlements.
  c) Billing systems: With complex gas transportation rates and components, the billing process can produce wrong or late invoices. Having to export the SCADA system data into a separate, complex spreadsheet and then enter that data into an accounting system is time-consuming. However, when integrating billing into a SCADA system, this process can be automated, creating invoices without manual manipulation.
  d) Document management: Rather than storing engineering, contract, compliance and procedure documents in a document management system, the system can be integrated into the SCADA system. Documents can be easily accessed from the SCADA system for ease of organization and control.

This project is funded by the European Union

2024-25 Short and Long-Term Forecasting and Planning Software

- Most of European TSOs include market and network studies in their National Development Plans.

- Market studies cover projections of gas market fundamental data: supply, demand, peak demand capacity and prices.

- Network studies i.e. hydraulic simulations carried out to determine the ability of the network to flow gas and to cover stress in high demand situations. The network studies are carried out using software solutions and are based on detailed network topology data. Such network modelling is used, in some cases, for both routine network operations and for simulating network developments under different scenarios (physical volumes and entry/exit flow configurations).

- To develop such studies, the most used modelling software are:
  a) Simone (Belgium, Croatia, Germany, Hungary, Slovak Republic),
  b) Pipeline Studio (Ireland Greece),
  c) Sire200 (Italy),
  d) Sinergi Software (UK).

This project is funded by the European Union

2024-25 Short and Long-Term Forecasting and Planning Software

- At European level, ENTSOG has developed a modelling approach since 2010, based on a specific structure facing the need to consider simultaneously network and market dimensions. The network model represents the gas market within the geographical scope of the TYNDP. The tool used by ENTSOG to perform the TYNDP assessment is the ENTSOG NeMo Tool. The tool reflects the physical characteristics of the gas infrastructure relevant from the Union-wide TYNDP perspective.

- NeMo Tool It is both a Network and Market Simulation Model. It

  a) Builds on TSO expertise and hydraulic modelling of national infrastructure.
  b) Models the European infrastructure with the most relevant accuracy.
  c) Enables the national assessment of relevant risks affecting the security of gas supply.
  d) Considers the Union wide simulation of supply and infrastructure disruption scenarios.

- NeMo is used in the TYNDP in order to verify the feasibility of different flow situations, handle the supply adequacy outlook, assess the resilience of the system, identify the infrastructure gaps and assess projects.

This project is funded by the European Union

2024-25 Big data Platform

- The degree to which smart devices have become pervasive is exponential rather than linear, resulting in a deluge of data from so many assets. This can become overwhelming for fledgling digital transformation efforts. To help make sense of the data and provide the structure for curating the most important data, create and evolve a smart asset model or template that normalizes tagging and assets characteristics in order to enable a rollout of this model at scale when ready. The best approach is to start small and with some forethought in mind to handle the massive amounts of data.

This project is funded by the European Union

2024-25 Big data Platform

- The various types of data which are generated, stored, and analysed can be in different sizes and formats (text, image, audio or video). In a more technical way they can be classified as:

a) Structured data: the majority of oil and gas generated data from SCADA systems, surface and subsurface facilities, drilling data, and production data are structured data. These data could be time series data which have been recorded through a certain course of time. Another source of structured data includes the asset, risk, and project management re- ports. There would be also external structured data sources such as market prices and weather data, which can be used for forecasting.

b) Semi-structured data: The sources of semi- structured data include processed data as a result of modelling and simulation. There are various practices of experimental and computer simulation in the oil and gas industry to generate data for further analysis. These data can be categorized as semi-structured data and later to be used with Big Data tools

c) Unstructured data: the sources of unstructured data in oil and gas industry include well logs, daily written reports of drilling, and CAD drawing

This project is funded by the European Union

2024-25 Big data Platform

- Defining how the data is now stored to support the organization's digital transformation initiatives is imperative. While early implementers of a digital transformation strategy believed that all data would be poured into a massive 'data lake' in the cloud, the reality is that this unorganized approach could become a 'data swamp' where users get bogged down.
- Best practices suggest that a hybrid data lake strategy — in which data is thought of as an asset and can therefore be contextualized, organized in an assets hierarchy, and managed through an "operational chart of accounts" model — enables the flexibility to access data, regardless of whether it is stored on-premise or in cloud-based locations. A fit-for-purpose hybrid data lake strategy stores the data where it makes the most sense.

This project is funded by the European Union

Roles and Responsibilities for Implemention of the RoadMap

Suggested Timeframe: 2020-2023

Review of the Investment Authorization process	Establish a Committee with the key shareholders	Benchmark with significant European cases	Define a regulatory framework to incentivize pilots	Identify modifications in the regulatory framework	Suggestions/proposal to the Government to define a New Gas Model
• Identify all the elements to be analyzed; • Introduction of the Cost Benefit Analysys? • Involvemnt of stakeholders; • Transparency of the Process	• To implement the strategy of the Government; • To discuss the New Gas Model for Turkey and the role of TSO; and • To suggest initiatives	• To be aligned with the most relevant initiatives; • To follow closely the changes in the regulatory framework; • To identify gaps to be addressed and examples to follow;	• To create a regulatory framework supporting innovation and pilot;	• The final aim is to identify legal and regulatory bottlenecks for the definition and establishment of a New Gas Model	

This project is funded by the European Union

Step 1 – Review of the Investment Authorization Process

- The first step of the roadmap, as a pre-condition for all the other initiatives, is a review of the investment authorization process managed by EMRA, in order to be sure of the effectiveness and efficiency of the investment proposed by the TSO and to avoid the risk of under-utilization of the assets.

- The investments should also be put in a **multi-annual framework**. (10 years as in Europe, for instance, with regular updates in order to take into consideration all the required modification) and should be published by the TSO, in order to increase the transparency of the process and the involvement of all the key stakeholders.

This project is funded by the European Union

Step 1 – Review of the Investment Authorization Process

As an example, the Italian Regulator requires the TSO to publish a Ten-Year Plan with the following information:

a) A detailed description of the status of transportation network three year before the presentation of the Plan, to highlight the criticalities and existing congestions,
b) The main infrastructure to be built, upgrade or renew in the following next ten years, and their correlation with the criticalities mentioned above,
c) The main maintenance interventions to be carried out on the infrastructure in the next ten years,
d) The projects which will be considered PICs projects,
e) The investment decided and the new investments to be realized, with a proper justification in the next three years,
f) The expected results (costs, benefits and other impacts) with the realization of the development plan,

This project is funded by the European Union

Step 1 – Review of the Investment Authorization Process

- The operators should present together with the plan:

  a) An annex containing the details for each of the investments contained in the plan,
  b) A report monitoring the developments already carried out in the Plan or contained in previous Plans.

- The details to be provided for each of the investments are:
  a) Context information,
  b) The information about the intervention,
  c) The results of the CBA (carried out also to consider how the uncertainties have been evaluated and to show contributions already received),
  d) The quantitative indicators.

- The Regulator also specifies the elements of the CBA to be performed.

This project is funded by the European Union

Step 1 – Review of the Investment Authorization Process

- Besides CBA, the following indicators of economic performance should be provided:

  a) NEV – net economic value
  b) B/C – cost/benefit relation
  c) PBP – payback economic period,

As well as other quantitative indicators (N-1 Indicator; IRDI – indicator of diversification of the sources of supply; BPI – index of bidirectional capacity).

- This approach has been applied by Snam, in its "Ten Year Network development plan 2014-23", where the Italian TSO has analysed the investment proposed and the risks connected, according to the European and Italian legislative and regulatory framework, the National Energy Strategy, ENTSOG Ten Year Network Development plan, ten year scenarios to meet natural gas market development , information submitted by third parties and the general strategy of Snam.

This project is funded by the European Union

Step 2 – Establish a Committee with the Key Stakeholders

- The discussion under way in the European Union about the new Gas Model to implement to achieve the decarbonizing targets and the New Green Deal and Hydrogen Strategies is in its early phase, with the changes in the regulatory framework under development.

- Therefore, the main suggestions behind the suggested roadmap are:

a) To follow closely what it is happening within the European Union,
b) To identify the regulatory and technological solutions gaining acceptance and relevance,
c) To check whether it is possible/desirable to transpose them in the Turkish regulatory framework and in the operational activities of the TSO,
d) To identify possible regulatory bottlenecks to innovation and operational pilots.

This project is funded by the European Union

Step 2 – Establish a Committee with the Key Stakeholders

- The uncertainty in the future new Gas Model which will prevail in the European Union suggest also the timeframe to implement this roadmap, which is quite short (3 years), in order to allow EMRA and all the other stakeholders to quickly adapt to any changes in the aforementioned discussion.

- To transpose/modify what it is happening in the European and international energy markets in the Turkish framework and to define the new Gas Model for Turkey and the role of TSO, we suggest the establishment of a Committee, led by EMRA, with all the key Turkish energy stakeholders:

  a) To discuss proposals,
  b) To build a consensus on the way forward,
  c) To analyse the future scenarios of the Turkey energy markets.

This project is funded by the European Union

Step 3 – Benchmark with Significant European Cases

- We suggest increasing the relationships between EMRA and BOTAS and the equivalent European institutions, in order

  a) To understand better the transformation under way both at the regulatory and operational level,
  b) To be aligned with the most relevant initiatives,
  c) To follow closely the changes in the regulatory framework,
  d) To identify gaps to be addressed and examples to follow

This project is funded by the European Union

Step 4 – Define a Regulatory framework to incentivize pilots

- In this phase of building the new Gas Model, EMRA should incentivize innovations and support pilots proposed by the TSO, allowing the Transporter to recover the costs and providing “regulatory sandbox” to perform experimental activities.

- A special funds might be created (like in the UK case) to award the two best innovative projects by energy stakeholders (TSOs, DSOs, but also Suppliers and Shippers) in order to foster an innovative climate and spur stakeholders to propose initiatives.

This project is funded by the European Union

Step 5 – Implement Modifications in the Regulatory Framework

- The final aim is to identify legal and regulatory bottlenecks for the definition and establishment of a New decarbonized Gas Model. Modifications might be required in the regulatory framework, eliminating bottlenecks that stifle innovation and introducing new regulations to manage the new scenarios.

- Also, in this case we recommend the active involvements of all stakeholders and to establish a transparent process. The associations of TSOs and the Regulators have been and are particularly active in participating in the decision-making process, advancing proposals and suggesting regulatory changes.

This project is funded by the European Union

Step 6 – Suggestion/proposals to the Government to define a New Gas Model

- EMRA should work to consolidate thew different proposals and innovations into a coherent New Gas Model, to be presented to the Government as base for future legislative actions.

- The interrelations and the constant flow of information between EMRA and the stakeholders involved in these discussions should prepare and inform the Government and the other legislative bodies involved in the definition of the energy legislation of the challenges that the Turkish energy sector is facing and of the suggested options coming from the energy sector.

Thank You / Teşekkürler

16th September 2020, EMRA, Ankara