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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

Task 4.2 – Preparation of Smart Grid Road Map and Required Methodological Tariff Approaches for Natural Gas Market – Future Gas Market Design and Regulatory Framework

Workshop

16th September 2020, EMRA, Ankara

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Agenda

- CEER's «Study on the future role of gas from a Regulatory perspective» (2018)
- ACER-CEER's "The Bridge beyond 2025" (2019)
- ENTSOG 2050 Roadmap for gas grid
- ACER-NRA Survey on Hydrogen, Biomethane and Related Network Adaptations (July 2020)

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CEER's "Study on the future role of gas from a Regulatory perspective" (2018)

- The Council of European Energy Regulators (CEER) has addressed the regulatory implications of paradigmatic changes under way in the energy sector in its "Study on the future role of gas from a Regulatory perspective".
- The development of future gas demand affects the traditional natural gas infrastructure. Since a reduction in the consumption of gas in the long period (beyond 2035) is expected, there is risk to have gas pipelines financed by the system but employed for a period not long enough to recover the investment (the so-called "stranded assets").
- To address **under-utilisation and stranding of network assets**, Regulators could apply different approaches such as depreciation policy (accelerated depreciation), asset valuation, adjustment of cost of capital and explicit compensation outside of network tariffs.

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CEER's "Study on the future role of gas from a Regulatory perspective" (2018)

- From a regulatory point of view, CEER recommends to improve the coordination between the electricity and gas sectors and to actively support and foster renewable gases and new technologies with specific programmes, such as financing innovative pilot projects. The utilization of existing gas pipeline to carry renewable gases can attenuate the stranded asset risk, helping the system in the decarbonizing process and in integrating electricity and gas sectors.

- As far as infrastructure for renewable gas are concerned, Regulators should accompany and steer the transition towards higher hydrogen quantities blended in the gas networks. There will be the need to adjust the technical specifications for the blended natural gas and regularly amend the relevant regulation. On the transmission level, there may be a need to revisit the Interoperability Network Code (INC) and the CEN provisions on gas quality. Moreover, regulators should steer the technology roll-out in terms of time and targeted penetration zones where the hydrogen quantities will gradually grow. They will need to develop the design of the commercial and access arrangements of such a system.

- With respect to biomethane, regulators should set clear connection rules including connection charges, technical connection requirements, responsibilities for setting and maintaining the relevant product quality norms and metering and compression. Regulators may consider providing explicit incentives in national regulation to the parties injecting biomethane into the natural gas networks via the reduction of network tariffs/connection charges.

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CEER's "Study on the future role of gas from a Regulatory perspective" (2018)

- CEER supports the idea of innovation and decarbonization incentives as part of the regulatory framework as this facilitates development and drives improvement in processes and technology application in the gas sector.
- National regulators should set clear objectives and qualification criteria for what projects would be subject to innovation incentives. For example, innovation incentives can be provided for a new or unproven technology or operational practice directly related to the gas network. The innovation project should relate to the development, and research in a field, or technology that could help achieve certain targets such as decarbonization by the possibility of using biogas, CNG/LNG or hydrogen.
- Innovation and decarbonization incentives can be incorporated into the regulatory framework by using a special allowance. The allowance would be based on a proportion of the allowed revenues. In addition, regulators can apply special arrangements to specific investments in decarbonization/innovation initiatives such as accelerated depreciation allowances or/and WACC premium.

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ACER-CEER's "The Bridge beyond 2025" (2019)

- Trying to mirroring the "Clean Energy for all Europeans" Package (CEP) for electricity, ACER have presented a list of recommendations to update legislation and policies to facilitate decarbonization, improve market functioning and maximize the opportunities arising from sector coupling. Their key recommendations include:
  - Decarbonized gases should be able to be integrated into existing gas markets, with full valuation of their environmental benefits, and captured in market monitoring through sustainability indicators published alongside European Gas Target Model (GTM) metrics. Clear definitions and categorization of decarbonized gases, including carbon capture and use or storage, should be established in European legislation, and consistent principles should be applied across the EU to facilitate the blending of decarbonized gases. Legislation should be sufficiently flexible to allow the emergence of new gases/technologies.

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ACER-CEER's "The Bridge beyond 2025" (2019)

- To improve market functioning and address emerging issues, a new system of dynamic and targeted regulation should be established in EU law, based on the Agency's market monitoring and NRA analysis and action. In order to maintain flexibility to adjust metrics and thresholds over time and to decide on appropriate interventions at national or regional level, the detailed indicators and thresholds should not be fixed in legislation but rather established transparently by the Agency in collaboration with the NRAs.

- A technology-neutral, level playing field should be established between different conversion and storage facilities across the energy sector, so that they face equivalent categories of costs in network tariffs and levies, and equivalent recognition of environmental and security of supply benefits.

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ACER-CEER's "The Bridge beyond 2025" (2019)

- New assets and activities should be facilitated through regulation, including a **sandbox model at EU level for pilot, small scale projects** and appropriate differentiation between competitive and monopoly activities. Any subsidies are a matter for governments rather than regulators and should not take the form of discounts on or exemption from network tariffs in any case. TSOs and Distribution System Operators (DSOs) should only be allowed to undertake potentially competitive activities under strict rules and as a last resort. While it is too early to be definitive, large-scale hydrogen networks could be expected to provide regulated third party accessing.

- For **infrastructure planning**, an effective regulatory framework at EU level, similar to that existing in some Member States, is needed to ensure a **level playing field for new solutions**. The existing network operators face challenges from decentralized solutions and can no longer be regarded as completely neutral. Improvements in network code governance introduced in the CEP for the electricity sector are needed in the gas sector as well.

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ACER-CEER's "The Bridge beyond 2025" (2019)

- New investment in natural gas assets should be checked to ensure consistency with decarbonization targets. Re-use of existing assets should be explored prior to any decommissioning, with due consultation of neighbouring authorities and stakeholders where their markets may be affected.

- For tariffs, both regulators and stakeholders find that, at present, tariff design does not appear to be causing major issues at a pan-EU level and therefore the implementation of the Tariffs Network Code shall remain a priority. However, there are concerns in some regions and legislative changes can unlock better regulatory tools to address any instance where cross-border tariffs become a barrier to trade and where there is a risk of foreclosure of cross-border capacity.

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ENTSOG 2050 Roadmap for gas grid

- The development of smart grid in gas is the framework which envelopes the European gas Transmission System Operators (TSOs)'s roadmap to make gas grid ready for decarbonization.

- The emergence of **new gases** – in particular biomethane and hydrogen- requires from the TSOs the ability to solve the technical problems connected – by blending, conversion, flow management, etc. The grid companies will have to invest in and operate such facilities, in particular for **digitalization** (related to smart metering, gas quality detection, certification and data sharing) and for data provision by and between the gas grid companies and consumer appliances.

- A significant level of digitalization and data provision should also be required to define the certificates expressing the **climate value and the energy content of the gas** -irrespective of its composition and of the content of biomethane, hydrogen and natural gas, in order to maintain and develop the gas-to-gas competition which has been widely achieved in the European gas market.

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ENTSOG 2050 Roadmap for gas grid

- Digital and automated handling through the gas value chain will also be required, in order to track and transfer the climate value of a given source of gas, providing a trustworthy EU-wide **Guarantees of Origin** (GOs). Such system will ensure that biomethane, hydrogen and other renewable, low-carbon gasses can be tracked from production and import to consumption, across borders and across types of energy, i.e. Power to Gas (P2G).

- To maintain and develop a single European gas market, notwithstanding the above mentioned disruptive changes (if not correctly managed), ENTSOG proposes the following recommendations:

  - Aim for existing gas legislation to include hydrogen and strengthen the role of biomethane,
  - Technical layer: Include in TSOs' services and establish the principles for reasonable remuneration of services provided by the gas grid companies: blending, conversion, flow management, digitalization and data provision, providing the flexibility for energy system,
  - Energy value: Continue to trade biomethane, hydrogen and natural gas based on energy content
  - Climate value: Document and track climate value of a given source of gas, a trustworthy EU-wide GOs/certificate system should be established.

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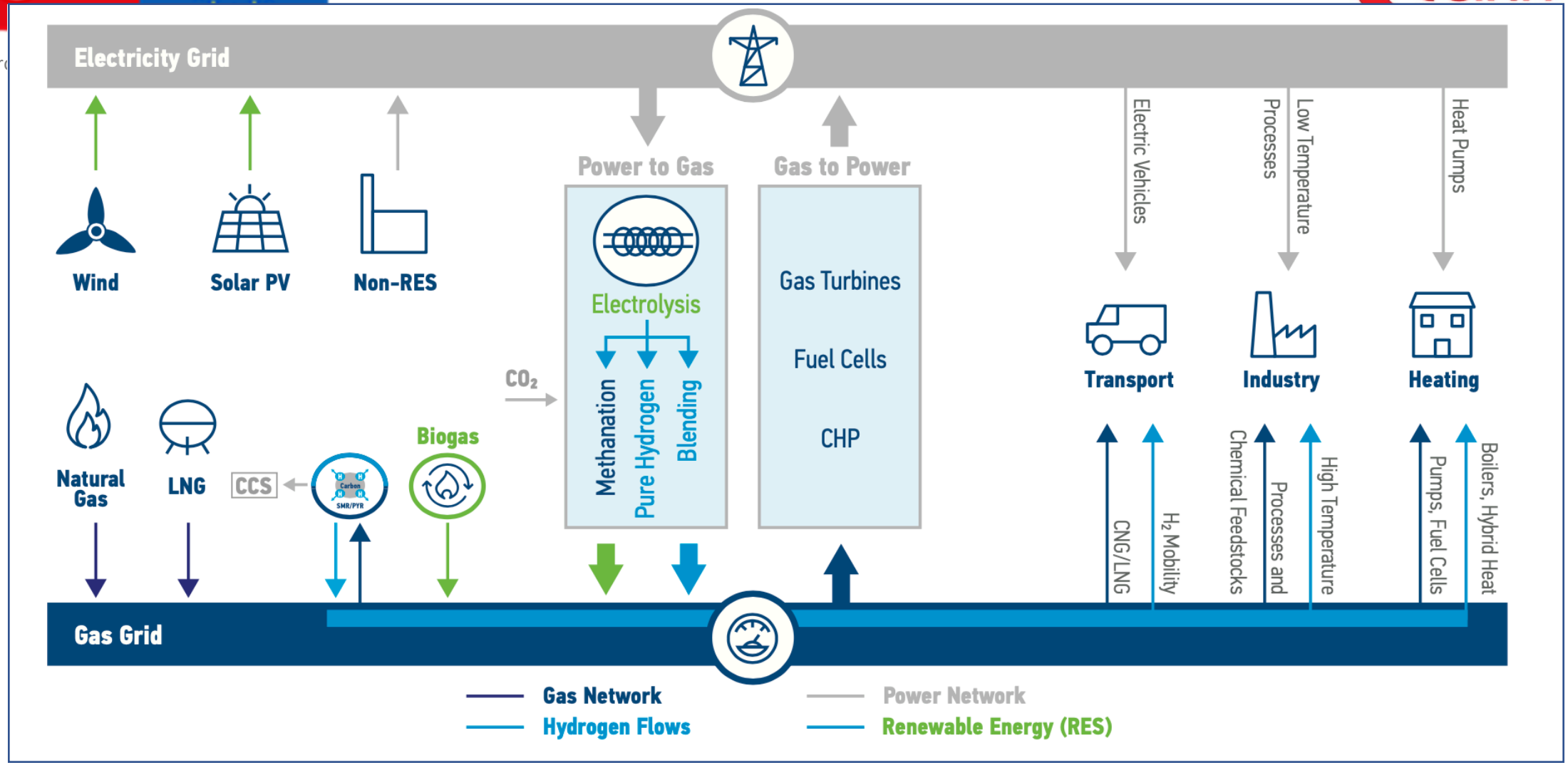
ENTSOG 2050 Roadmap for gas grid

- Sector Coupling. ENTSOG strongly believes that the future EU energy system should be built on a Hybrid Energy System, an interlinkage between the gas and electricity systems based on synergies between the two. The Hybrid Energy System will allow the EU economy to meet decarbonization targets, obtain flexibility, storage options, cross-border transportation capacities and security of supply in the most efficient way, realizing synergies between the existing infrastructures and building on new technologies.

- Among the benefits provided by a Hybrid Energy System, sector coupling will alleviate the challenges the electricity system is facing regarding the production of large quantities of renewable energy and the need for long-term energy storage, handling peak production and consumption as well as facilitating long distance transportation.


Electricity Grid
Wind
Solar PV
Non-RES
Power to Gas
Gas to Power
Electrolysis
Methanation
Pure Hydrogen
Blending
Gas Turbines
Fuel Cells
CHP
CO_2
Natural Gas
LNG
CCS
Carbon
SMR/PYR
Biogas
Electric Vehicles
Low Temperature Processes
Heat Pumps
Transport
Industry
Heating
CNG/LNG
H_2 Mobility
Chemical Feedstocks
Processes and High Temperature
Pumps, Fuel Cells
Boilers, Hybrid Heat
Gas Grid
Gas Network
Hydrogen Flows
Power Network
Renewable Energy (RES)

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ENTSOG 2050 Roadmap for gas grid

- The Power to Gas (P2G) concept alleviates local/regional infrastructure congestions in electricity infrastructure and can contribute to avoiding curtailment of non-dispatchable renewable electricity, reducing as well the occurrence of negative/very low electricity wholesale prices.

- Since the present market conditions do not seem to sufficiently support an up-scaling of commercial activities needed for optimizing gas and electricity functioning, ENTSOG proposes that **TSO ownership of P2G facilities should be considered,** as a way of socializing costs as well as ensuring third-party access to such infrastructure. In this proposal, P2G should be considered as conversion facilities – converting from the electricity system to the gas system.

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ENTSOG 2050 Roadmap for gas grid

- In this perspective, ENTSOG recommends to
  - Establish the regulatory framework for the Hybrid Energy System,
  - Align regulatory framework for electricity and gas where relevant,
  - Coordinate planning of electricity and gas investment in infrastructure at national and EU level,
  - Consider P2G definition as a conversion facility in gas legislation,
  - Clarify the roles and responsibilities of the electricity and gas players,
  - Clarify attribution of costs and benefits between gas and electricity consumers,
  - Address distortion by taxes/levies on P2G in the context of sector coupling, since neither electricity consumed, nor hydrogen produced by P2G should be subject to end-user taxes and levies before the produced energy is being finally consumed.

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ENTSOG 2050 Roadmap for gas grid

Regulatory Sandbox. To provide the regulatory framework to develop the new necessary technologies to support the transformation of gas smart grids, ENTSOG suggests a wide-spread use of regulatory sandboxes, at EU level and also at national level under the supervision of NRAs. They will allow R&D activities to be handled under more flexible terms regarding some general rules such as state aid, funding access criteria, ownership unbundling, costs socialization via regulated assets and based on a specific regulatory oversight and cross-sectoral consultation.

Especially when the markets are not ready, regulatory sandboxes can provide support for early business models and immature technologies to scale up.

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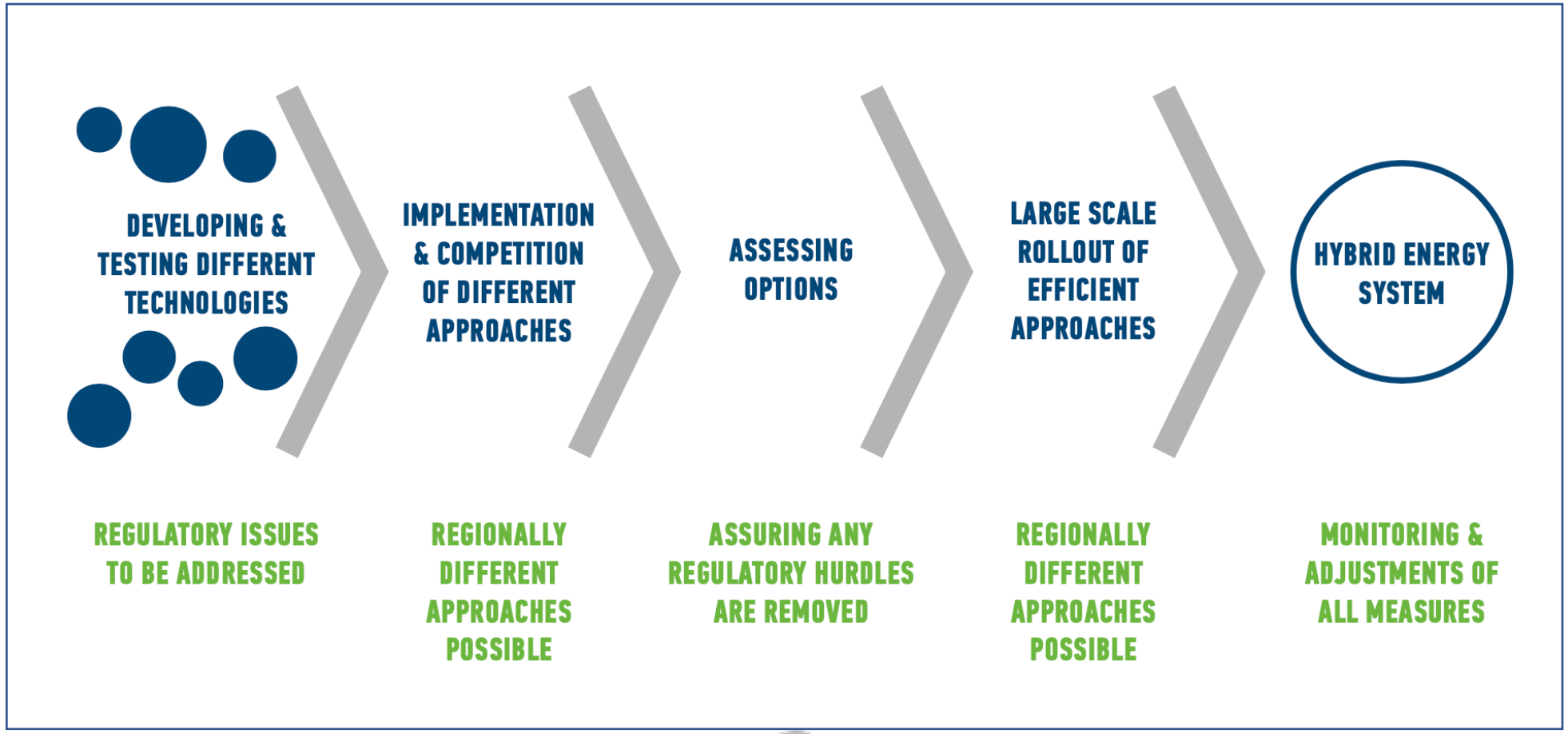
ENTSOG 2050 Roadmap for gas grid



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ENTSOG 2050 Roadmap for gas grid

- **Future gas grid configuration**. Depending on the evolution of hydrogen, biomethane and natural gas supply potential and user demand, smart grid functioning will change, depending also on Member States' choice of technologies (e.g. P2G, biomethane, CCUS) best serving their national needs and circumstances.

- Smart grid configurations are likely to evolve over time and co-exist, interoperate and complement each other in a a given territory, where local conditions dictate.

- The three decarbonization pathways under discussion in the EU:

    - Methane pathway, including biomethane and post-combustion CCUS
    - Blending of methane and hydrogen pathway
    - Hydrogen pathway

will have different impacts on the gas market design and on the role of TSOs and Regulators.

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ENTSOG 2050 Roadmap for gas grid

Pathway	What it is missing	Role of TSO	Regulator
Methane	European GOs/certificates, Principles for CO_2 transportation.	- The TSOs role could be to invest in connection of biomethane production plans, to invest on reverse flows from distribution to transmission or grids or to invest in biogas upgrade to biomethane, - TSOs can promote biomethane with a capacity tariff discount and could be investors in connections of biomethane plants, - TSOs should be allowed to invest, own and/or operate CCUS facilities and CO_2 networks as regulated business, - TSOs can use existing (not fully used) gas pipelines as CO_2 infrastructure;	-The new roles of TSOs as investor or promoter of biomethane plants/connections should be allowed by NRAs with adequate coverage in tariffs, - Regulation for promoting the deployment of CCUS systems can be applied in three ways: Natural monopoly position, TPA or Regulated Tariffs.

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ENTSOG 2050 Roadmap for gas grid

Pathway	What it is missing	Role of TSO	Regulator
Blending of Methane and Hydrogen	European gas quality services, Principles for sector coupling;	The injection of hydrogen and the interaction with the electricity system via renewable electricity will make the gas TSOs role more complex, This will require a more flexible and robust gas system to allow TSOs to respond to these challenges, TSOs will have to address the intermittence and decentralization of operations due to renewable electricity production/renewable hydrogen, Besides dispatching the fuel, the TSOs will also manage the consumer gas quality conversion services necessary for cross-border flows to maintain security of supply and market integration.	A regulatory framework for P2G should be established to ensure necessary cooperation mechanisms for electricity and gas operators, Establish the framework of regulatory sandbox to allow TSOs to co-shape the hydrogen injection strategy and invest in conversion facilities.

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ENTSOG 2050 Roadmap for gas grid

Pathway	What it is missing	Role of TSO	Regulator
Hydrogen	A dedicated hydrogen network to transport and store hydrogen molecules, Market design ensuring non-discriminatory Third-Party Access to hydrogen infrastructure.	The TSOs will manage hydrogen pipelines, providing infrastructure optimization and cost savings as a result of coordinated planning reflecting the development needs of the sector (e.g. blending and/or dedicated pipelines; full/partial conversion to hydrogen of existing pipelines, etc.), The TSOs may own and operate P2G as conversion facilities without ownership of the commodity on a TPA basis, The TSOs shall ensure non-discriminatory TPA regime for market players to the hydrogen network. The TSOs should allow potential integration of hydrogen and (bio/synthetic) methane markets to deliver one price signal for gaseous energy, in a manner similar to the integration of H gas and L gas in some EU markets (Germany and France, for instance).	Definition of the regulation for TPA non-discriminatory access to hydrogen networks. .

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ACER – NRA Survey on Hydrogen, Biomethane and Related Network Adaptations

- For the European Union (EU) to be climate neutral by 2050, gas networks will have to be gradually adapted to carry green gases such as biomethane and hydrogen.

- In July 2020, a survey to the EU Agency for the Cooperation of Energy Regulators (ACER) has summarized the current situation provided by 23 national regulatory authorities (NRAs), which have looked into the current possibilities for admixing hydrogen and injecting biomethane or transporting pure hydrogen via existing gas networks, as well as network adaptations to allow this in the future. The survey follows by few weeks the unveiling of the EU Hydrogen Strategy by the European Commission.

- The results show that **65% of the responding NRAs reported that the transmission system operators (TSOs) do not accept the injection or allow hydrogen volumes into the gas transmission network yet.**

- The survey also included questions on national strategies on hydrogen, technical and regulatory aspects, specific projects and investments needed.

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ACER – NRA Survey on Hydrogen, Biomethane and Related Network Adaptations

- Main findings:
  - The readiness of gas transmission networks to accept hydrogen or biomethane is very diverse across the EU.
  - In most cases, developments are at an early stage, driven mainly by pilot projects.
  - Most national regulators would support an EU-wide approach for setting hydrogen admixing limits, in pursuit of cross-border gas trading and market integration.
  - Pure hydrogen networks could be built in parallel with the blending of hydrogen in the existing networks, depending on the specific market and network situation.
  - **Gas quality standards** may need to be revised at EU level to ensure interoperability between Member States.
  - Regardless of the actual choice of a hydrogen concentration limit, **some network adaptations and selected investments will be needed**. These investments will deserve greater attention in gas network development plans.
  - It seems that blending of hydrogen would not initially require major changes in the current market design and legislation.

- In particular, the survey finds that "regardless of the actual choice for a H2 concentration limit, essential **network adaptations** are required in order to allow H2 injections. Metering equipment requires upgrades or chromatograph replacement in order to be able to measure H2 concentrations. Gas turbines, compressor stations, CNG tanks and some types of storage can only accept low H2 concentration (< 5%) and may also need retrofitting".
- Moreover, end-user equipment may not accept higher or variable quantities of H2, which necessitates further detailed studies.
- Network readiness to start H2 injection deserves appropriate attention in network development planning. TSOs may get additional responsibilities in order to enable H2 blending, in particular in terms of dispatching and gas quality (blending quality) control in the system.
- Not surprisingly, the results of the survey show that developments regarding the readiness of the gas transmission network to accept H2 and to allow the injection of biomethane are **at an early, to a large extent experimental or pilot, stage**. It seems that blending of hydrogen would not initially require major changes in the current market design and legislation.

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11 European TSOs - Hydrogen Backbone Plan – July 2020

- In July 2020, a group of eleven European gas infrastructure companies from nine EU member states has presented a plan for a dedicated hydrogen transport infrastructure. New research shows that existing gas infrastructure can be modified to transport hydrogen at an affordable cost.
- The plan has been developed by Enagás, Energinet, Fluxys Belgium, Gasunie, GRTgaz, NET4GAS, OGE, ONTRAS, Teréga, Snam and Swedegas. The companies foresee a network gradually emerging from the mid-2020s onwards to an initial 6,800 km pipeline network by 2030, connecting 'hydrogen valleys'. By 2040, a hydrogen network of 23,000 km is foreseen, 75% of which will consist of converted natural gas pipelines, connected by new pipeline stretches (25%).
- Ultimately, two parallel gas transport networks will emerge: a dedicated hydrogen and a dedicated (bio)methane network. The network can be used for large-scale hydrogen transport over longer distances in an energy-efficient way, also taking into consideration hydrogen imports.
- Creating this network has an estimated cost of €27 to €64 billion, which is relatively limited in the overall context of the European energy transition.

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Thank You / Teşekkürler

16th September 2020, EMRA, Ankara