Piloting Hydrogen Injection into Natural Gas Distribution Networks

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ERRA HYDROGEN WEBINAR

Mehmet Şerif SARIKAYA
GAZBİR – GAZMER
Project and International Manager
SAFER, SMARTER, GREENER

Use of Hydrogen:
- Zero Carbon Emissions
- Energy Storage and Carrier

Calorific Value of Unit Mass of Gas Hydrogen, 2.1 times of Natural Gas
Natural Gas Sector in Transition to Hydrogen

Priority investments and issues for the transition from natural gas to hydrogen

1. Political Support and Public Investment Partnership
2. Regulations
3. Development of Hydrogen Pipeline Infrastructure
4. Converting Domestic Devices

Cost of using hydrogen in natural gas systems

Legislation studies on the use of hydrogen in natural gas systems

Source: Imperial College London, Navigant, IEA, BCC analysis.
HYDROGEN INJECTION PROJECTS IN NATURAL GAS SYSTEMS

HYDROGEN INJECTION PROJECTS BY COUNTRY

United Kingdom | USA | Russia | Ukraine
---|---|---|---

Japan | Netherlands | Germany | Portugal

South Korea | Canada | Australia | France

2040 European Hydrogen Backbone

Germany National Hydrogen Infrastructure

Source: GuideHouse

Source: OGE
HYDROGEN FUTURE PERSPECTIVE

Exchange of Gas in Network

Resource: Gas For Climate

Decarbonization

2050 Target Decarbonization of 13% of Natural Gas

Saving

Annual Savings of 140 Billion Euros Up to 2050 with the Use of Renewable Gas

Employment

600,000 new jobs by 2050 as renewable gas production increases and uses in Europe

Investment

A cost of 27 - 64 Billion € is predicted in Europe by 2040
CLEAN GAS CENTER PROJECT

Duration of Project : 2 Years

Green Hydrogen Production

Hydrogen up to 5-10-15-20% and Natural Gas up to 95-90-85-80% were Mixed

Natural Gas Hydrogen Mixture was be Performed and Burned in Domestic Appliances Such as a Gas Stove, Boiler and Interior Installation

Clean Gas Center was Planned as an Renewable Gas R&D Center in the Long Term

First Power To Gas Project in Turkey

Schematic view of the project
CLEAN GAS CENTER PROJECT

- Leak Tests
- Tightness and Durability Test
- Chemical Analysis
- Bending Test
- Pressure Test
- Carbon Emission Tests
- Flash Back
- Gas Flow Rate
- Gas Quality
PRIORITY ISSUES FOR THE TRANSITION TO SAFE AND SECURE HYDROGEN

- Setting a Working Group
- Gas Quality and Safety
- Technical Compliance Studies
- Transition and Integration Process
- Natural Gas Users
- Human Resource
- R&D and Investment
- Regulation Studies
- Market Creation
### Road Map of Turkey in Transition to Hydrogen in Natural Gas Sector

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<thead>
<tr>
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<tbody>
<tr>
<td>- Safety Studies in Residences, Distribution and Transmission Networks</td>
<td>- Hydrogen Injection to Networks on a Regional Basis (up to 10%)</td>
<td>- Creating Hydrogen Lines</td>
<td>- Extensive Use of Hydrogen in Housing and Industry</td>
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<td>- Pilot Studies for Hydrogen Uses in Housing and Industry</td>
<td>- Creating a Renewable and Low Carbon Gas Market</td>
<td>- Increasing Hydrogen Generation</td>
<td>- 100% Hydrogen Compliance of Distribution Lines</td>
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<td>- Tests for Domestic Devices</td>
<td>- Allowing Renewable and Low Carbon Gas Mixture to Current Networks</td>
<td>- Accelerating the Transformation in Industrial and Domestic Devices and Increasing Domestic Production</td>
<td>- Initiating the Hydrogen Export</td>
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<td>- Supporting the Hydrogen Innovation and Demonstration Projects</td>
<td>- Establishing Small Scale Facilities for Hydrogen Generation, Storage and Transportation</td>
<td>- Increasing Hydrogen Injection to Networks on a Regional Basis (min 20%)</td>
<td>- Creating Sufficient Hydrogen Generation and Storage Capacity</td>
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<td>- R&amp;D Studies on Hydrogen Generation and Storage</td>
<td>- Initiating the 100% Hydrogen Usage Tests</td>
<td>- Determining Pilot Sites with 100% Hydrogen Use</td>
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<td>- Creating Blending and Technology Targets</td>
<td>- Increasing Industry Incentives for the Production of Convertible Devices</td>
<td>- Creating Special Hydrogen Storage Areas</td>
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<td>- Initiating the Legislation Studies</td>
<td>- Continuing Improvement in Industrial and Domestic Devices</td>
<td>- Connecting Industrial Clusters to Hydrogen Storage and Production Facilities with Hydrogen Lines</td>
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<td>- Initiating the Hydrogen Awareness Studied for Consumers</td>
<td>- Initiating the Government Incentive for Hydrogen Market Formation</td>
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<td>- Determining Human Resources Strategy and Policy</td>
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**2021-2025:** R&D studies

**2025-2030:** Minor-scale integration - Low hydrogen concentration

**2030-2040:** New infrastructures - Increase in hydrogen concentration

**2040-2050:** Gas infrastructure which is 100% compatible with hydrogen
CONCLUSION

Moving to a fully hydrogen-based supply system is a distant future and will require significant government support.

Initial steps in the transition to hydrogen may include temporary demonstration projects or small-to-medium scale projects. These projects can inject hydrogen into existing distribution networks to mix with natural gas to a safe limit.

The current regulatory and commercial framework for the gas supply system will need to be adapted in these early stages of the hydrogen transition.

Establishing competitive of hydrogen and natural gas, balancing energy and pricing transportation

The need for the use of new generation devices and gas meters

Initiation of preliminary studies for regulation

Developing a Hydrogen Roadmap in the Natural Gas Sector
THANK YOU