

## Renewable Gas Injection in the DEDA Natural Gas Network in the region of Eastern Macedonia & Thrace

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Greece has incorporated in its National Plan the European Green Deal (Green Deal), along the main axes of delignification of the domestic electricity production and the expansion of the share of RES in the gross final energy consumption to at least 35% by 2030.

It is estimated that the economic crisis and the recent pandemic will not affect long-term energy planning and a recovery will be led by green investment. A first approach to planned investments in the energy market raises their value to € 15 billion over at least 5 years. During this period, projects are expected to be launched focused on the PV networks and electricity, thermal units, energy storage infrastructure, RES, but also on innovative infrastructure related to biomethane, green hydrogen and CO<sub>2</sub> capture and storage. A key enabler in this effort is the Recovery Fund, from which Greece is expected to receive 32 billion euros in the period 2021-2026. 6.2 billion euros, a percentage of 38% of the total subsidies, will be granted to investments for the Green Transition.

Biomass, bioenergy and biofuels offer integrated solutions and contribute significantly to the above goal, can boost entrepreneurship and contribute to the recovery of the economy, while protecting the environment and helping to tackle climate change.

The present study concerns the possibility of producing and using biomethane, a renewable gas deriving from the upgrading of biogas, in the distribution networks of the Public Gas Distribution Networks SA (DEDA) in the wider area of 20 Municipalities in the Region of Eastern Macedonia & Thrace. The ultimate goal of this endeavour is the gradual upgrade of DEDA networks to "BHR" (Biomethane & Hydrogen Ready) networks ready to receive biomethane and "green" hydrogen that will be distributed as a "mixture of renewable gas" together with Natural Gas (PV). DEDA S.A. is a leading Greek company that owns, develops, operates, and provides maintenance services to the natural gas low and mid- pressure distribution networks in the majority of regions in Greece. The company is strategically planning to introduce biomethane, a renewable energy carrier, into the network and thus to provide "renewable gas" to its customers. To do so, it aims to extend the gas network to 39 Greek cities, including the Region of Eastern Macedonia and Thrace as well as lignite-producing regions, targeting to build a 1.880 km natural gas pipeline in more than 50.000 connections.

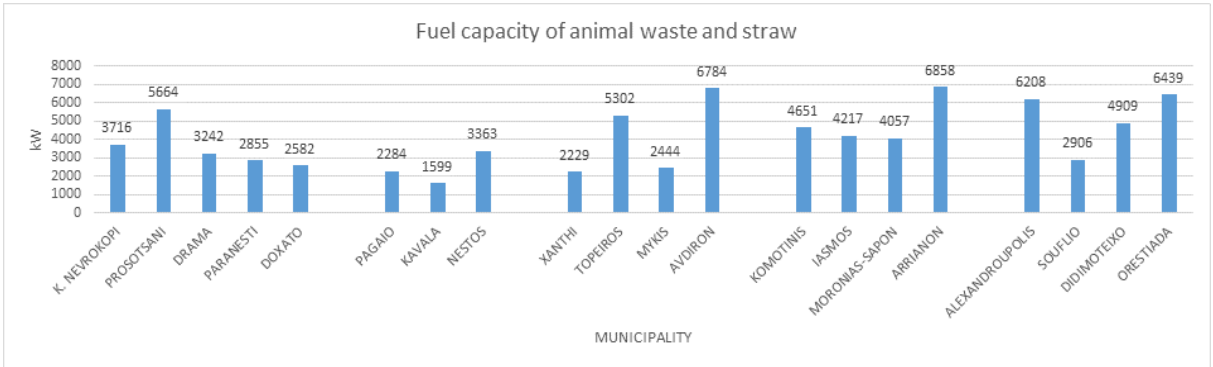
The reference point of the study is the estimation of the theoretical biomass potential in the wider area of each Municipality, the estimation of the produced biogas through the technology of Anaerobic Digestion (AD) and the consequent production of biomethane. To this end, biomass availability in the region is assessed and characterised. The residues to be used as raw materials for biomethane production are in accordance with Annex XI of the amended Energy and Climate Directive (RED II).

The outcome of this study is to build scenarios for biogas upgrading and injection facilities of three different capacities (240, 400 & 1200 Nm<sup>3</sup>/h), according to the biomass availability in the region. Feedstock mobilisation strategies and the possibility of combined use of several raw materials (i.e manure and straw) are being assessed. The biogas is produced by anaerobic digestion plants from which biomethane is generated and delivered/injected into the natural gas network. Given the

diversified origin of the biogas (i.e. manure, agricultural residues, organic fraction of MSW, etc), technical specifications of existing similar biogas plants are assumed.

The biomass assessment referred to regional available and suitable to biogas production biomass types, the acreage they cover, crop-to-residue ratios, water content and fuel characteristics of the collected biomass. Seasonal availability, transportation and mobilisation strategies were also calculated and relevant chains were set.

According to our first results, in the Region of Eastern Macedonia & Thrace, the theoretical potential of biomass from livestock manure, grain straw, agro-industrial waste and sludge amounts to 2,574,211 tons/year, with energy content of biomethane 694,135 MWh/year. The theoretical potential of the organic fraction of the municipal wastes that can be used in the future amounts to 87,979 tons/year, with a biomethane energy content of 66,436 MWh / year. The total fuel capacity of only the animal waste and straw in the 20 municipalities is expected to amount to 82,3MW.



It is especially important that for the supply or purchase of biomass fuel (biomass) contracts will be issued. Apart from the legal commitments of the producer to deliver a certain amount of biomass in a specific period of time, fuel contracts also provide the required quality characteristics of biomass desired by the investor of the biogas / biomethane station. The availability of biomass production throughout the year in the wider area of the region is guaranteed by at least 40% if it is accompanied by contracts with the farming communities.

The results indicate that around 10 biogas upgrading plants could be established in the region, of 2580 kW per unit.