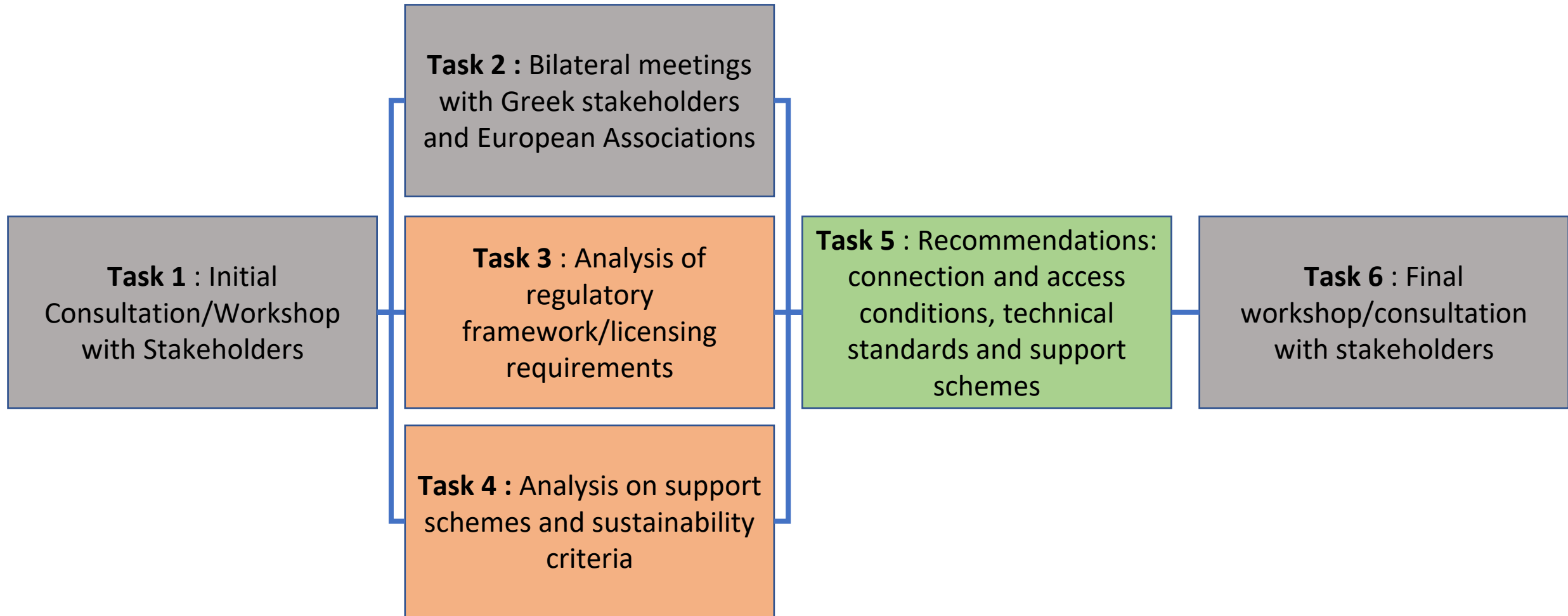


Current legal/regulatory framework and status in Greece

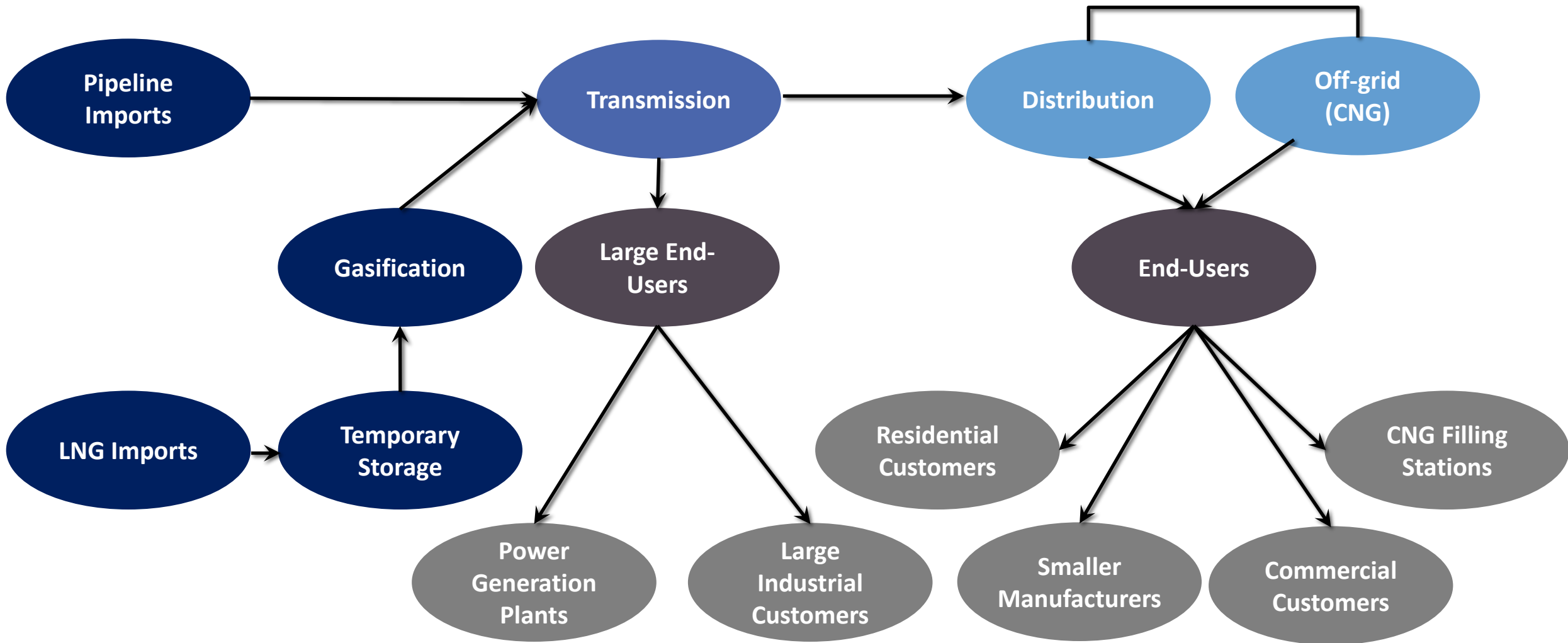
KATERINA SARDI



Methodological Approach



Traditional Gas value chain in the Greek Legislation



Legal & Regulatory Framework for natural gas (1/2)

Laws, MDs and RAE decisions	Description
Law 4001/2011	Operation of the energy markets of Electricity and Natural Gas, for research, production and transmission networks of hydrocarbons and other arrangements
M.D. No. 178065/08.08.2018 (Government Gazette B' 3430/17.08.2018)	Natural Gas Licenses Regulation
M.D. No. 174842/10.05.2018 (Government Gazette B' 1969/1.6.2018)	Natural Gas Supply Code to Customers
RAE Decision 1035/2020 (Government Gazette B' 2840/13.7.2020)	National Natural Gas Transmission System Network Code (5 th Revision)
RAE Decision 539/2019 (Government Gazette B' 2601/28.06.2019)	Tariff Regulation of the National Natural Gas Transmission System (4 th Revision)
M.D. Δ1/A/7754/2010 (Government Gazette B' 584/6.5.2010)	National Natural Gas Transmission System Measurement Regulation






Legal & Regulatory Framework for natural gas (2/2)

Law	Description
RAE Decision 589/2016 (as revised by RAE Decision 298/2018 & amended by RAE Decision 642/2018)	Natural Gas Distribution Network Code
RAE Decision 328/2016 (Government Gazette B' 3067/26.09.2016)	Tariff Regulation of Basic Activities of the Natural Gas Distribution Network of Attiki, Thessaloniki, Thessalia and the rest of Greece Distribution Networks
RAE Dec. 643/2018 (Government Gazette B' 3334/10.08.2018)	Framework for the Development of Remote Distribution Networks by using CNG/LNG
RAE Decision 235/2019 (Government Gazette B' 4818/24.12.2019)	Distribution Network Metering Regulation
RAE Decision 125/2018	Methodology for determining their consumption characteristics and generating typical consumption curves, according to Article 21 of the Distribution Network Code

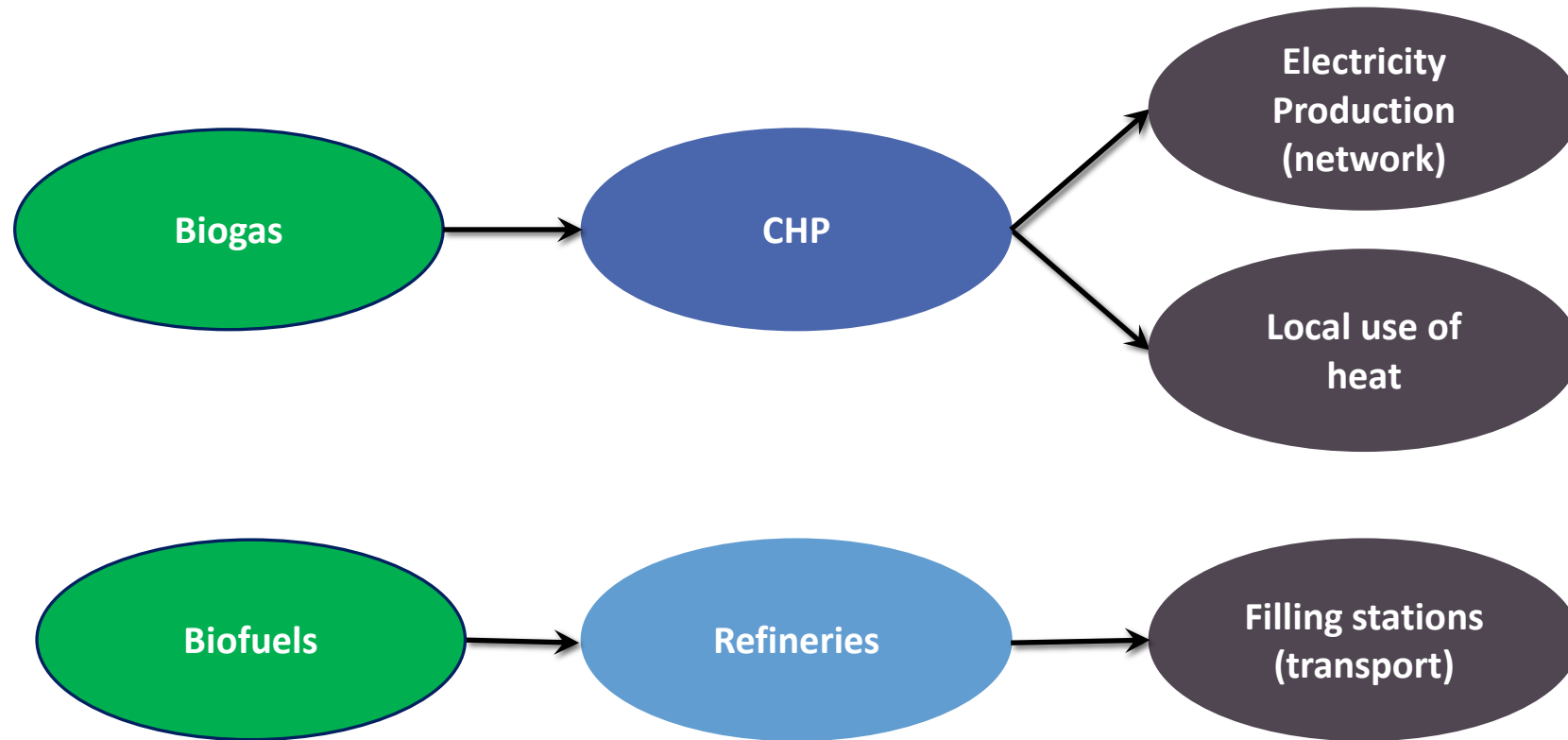
Assessment of the applicability of the existing Legal & Regulatory Framework for natural gas to New-Gases (1/2)

Topic	Assessment
Law 4001/2011	<div data-bbox="759 801 835 872"></div> <div data-bbox="937 418 2275 775"><ul style="list-style-type: none">▪ The provision of Directive 2009/73/EC regarding the acceptability of other types of gases into the network is transposed to the national framework▪ Clear definition of natural gas as a combustible gas extracted from geological formations consisting mainly of methane (at least 75% in moles ratio) and hydrocarbons of higher molecular weight and possibly small amounts of nitrogen, CO₂, oxygen and trace elements to which odourisation may have been added▪ Further clarification that Natural Gas refers to a mixture in any physical condition including compressed and liquid forms</div> <div data-bbox="937 832 2275 1239"><ul style="list-style-type: none">▪ No definition of new gas and new gas production facilities▪ No obligation upon system operators to connect and accept other types of gases▪ Lack of clarity as to whether system operators can be involved in production▪ No obligation for suppliers to disclose the carbon and/or renewable content of their fuel mix▪ No provisions for the regulation of new gas facilities in the Directive▪ No obligations for TSO/DSO cooperation to maximize RES penetration▪ No obligation for flexibility of services offered by operators subject to NRA approval▪ No obligations upon the NRA to promote RES gas injection and innovation in networks</div>

Assessment of the applicability of the existing Legal & Regulatory Framework for natural gas to New-Gases (2/2)

Topic	Assessment	
Network Codes for transmission and distribution		<ul style="list-style-type: none"> No provisions for the injection of new gases
Tariff regulation		<ul style="list-style-type: none"> No specific provisions for the connection of gas producing facilities. For transmission a gas producing facility may be interpreted as a new Entry Point and up to an extent be addressed by current tariff regulation. Still adjustments are necessary
Gas quality metering		<ul style="list-style-type: none"> Hydrogen injection at transmission level implies a need to replace/modify existing gas chromatographers and meters to account for hydrogen. At distribution level there is an overall need for a redesign of the role of the DSO. Currently DSOs have neither obligations nor control over the quality of gas
Network expansion		<ul style="list-style-type: none"> No criteria for network expansion due to new gas injection
Technical regulations		<ul style="list-style-type: none"> Technical regulations for pipelines at various pressures, other network components, internal installations and end-used appliances need to be carefully reviewed and revised if necessary to address different quality characteristics of new gases

Biogas value chain in Greek legislation



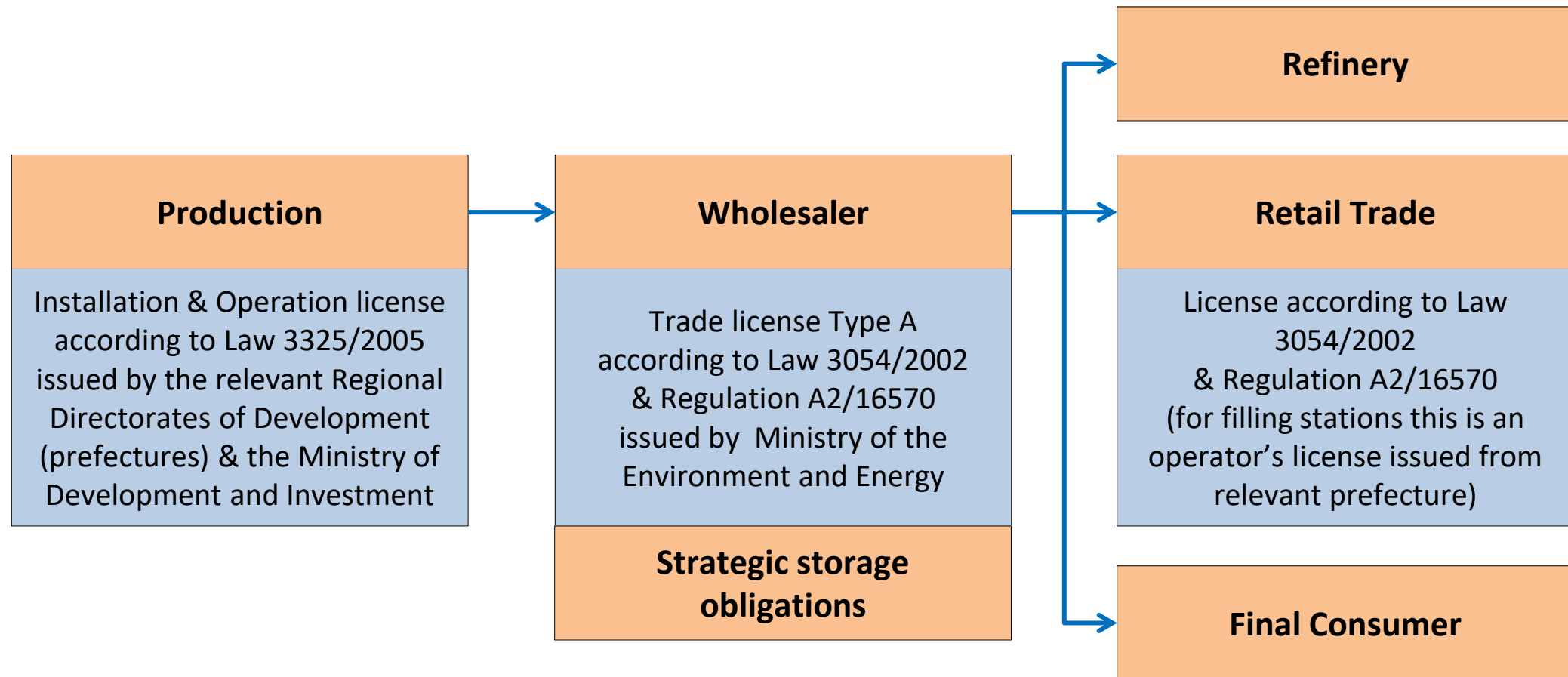
Legal Framework in relation to RES, biomass, biogas, biofuels (1/2)

Law	Description
Law 3054/2002	Organization of the market on petroleum products governing amongst others the use of biofuels (gas and liquid) in transport including provisions & definitions for biofuel production facilities, biofuel trade, trade at retail level, & transport of biofuels
Law 3325/2005	Installation & operation licenses of industrial - craft facilities in the context of sustainable development and other provisions
Law 3468/2006	On production of electricity from renewable sources and high efficiency combined heat and power generation
Law 3851/2010	Accelerating the development of Renewable Energy Sources to deal with climate change and other provisions relating to the jurisdiction of the Ministry of Environment, Energy and Climate Change
Law 4254/2014	On measures for the support and development of the Greek Economy and other provisions (revising Law 3468/2006)
Law 4414/2016	On a new support regime for Renewable Energy Power Plants and High Efficiency Electricity and Heat Cogeneration





Legal Framework in relation to RES, biomass, biogas, biofuels (2/2)

Law	Description
A2/16570 (Government Gazette B' 1306/2005)	Licensing Regulation on petroleum products and biofuels setting the rules and the procedures for obtaining wholesale license
Decision ΥΑΠΕ/Φ1/14810 (Government Gazette B' 2373 / 25.10.2011)	Regulation of Licenses for the production of electricity using RES and CHP





Licensing obligations in the context of Law 3054/2002 for biofuels (including gaseous biofuels)



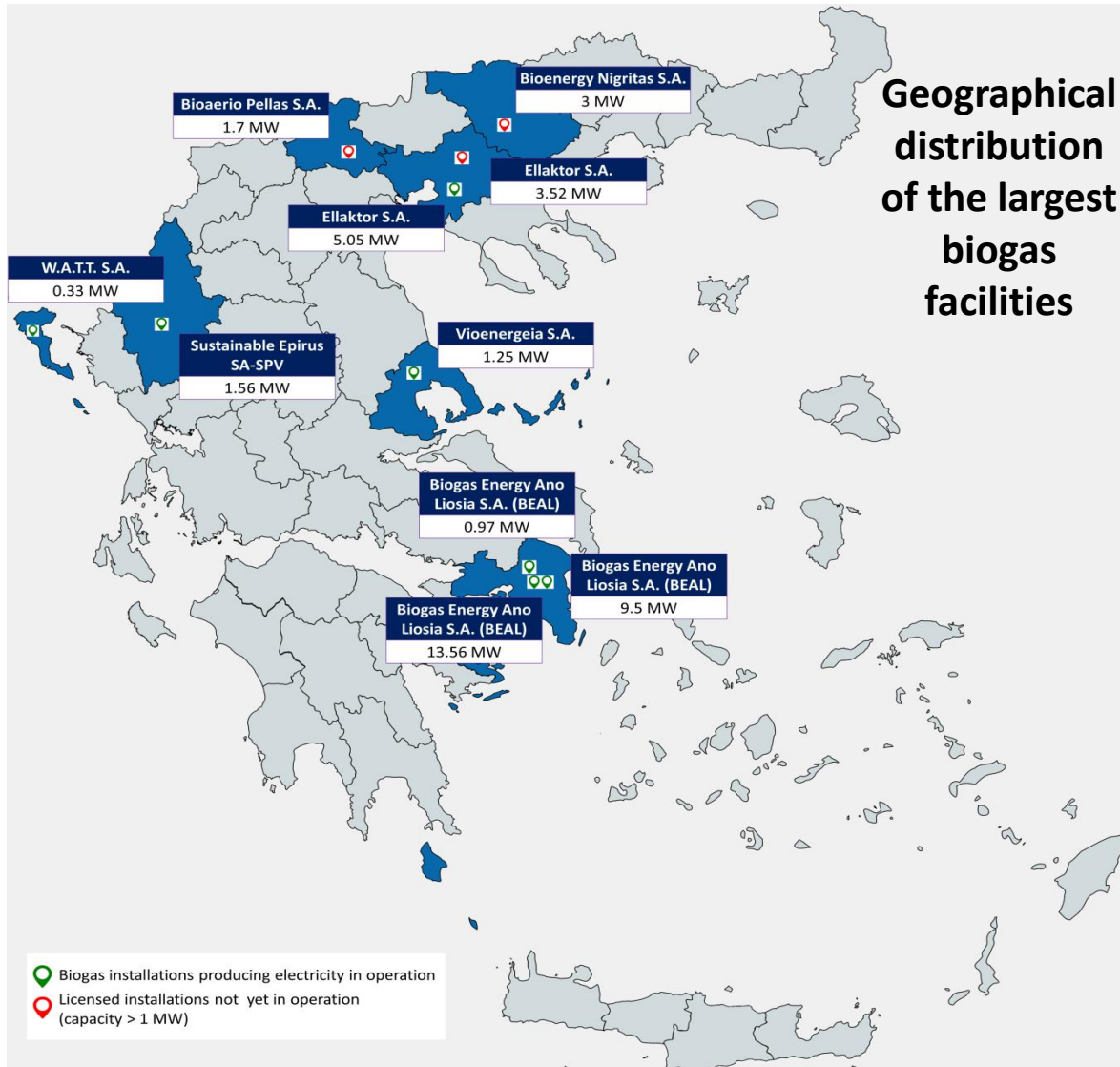
Assessment of the applicability of the existing Legal & Regulatory Framework for biofuels to New-Gases

Topic	Assessment	
Licensing of new gas production facilities (Law 3325/2005)		<ul style="list-style-type: none"> ▪ A biomethane and also a hydrogen production facility can be licensed according to the general framework for industrial facilities (Law 3325/2005) however there is complete lack of specific provisions ▪ There is no common record (registry) of licensed facilities
Definition of a biofuel production facility (Law 3054/2002)		<ul style="list-style-type: none"> ▪ As defined in the Law 3054/2002, gaseous biofuels stem solely from biomass. Other renewable gases are excluded as well as production facilities for gases of reduced carbon content
Wholesale license for biofuel trade (Law 3054/2002)		<ul style="list-style-type: none"> ▪ Law 3054/2002 adds an obligation to players in the upstream biofuel market to obtain a trade license. No such obligation exists for natural gas wholesalers ▪ Holders of a wholesale license for biofuel trade need to be either biofuel producers or have contracts with other biofuel producers in Greece or abroad. The Greek and EU framework on natural gas does not impose such kind of obligations to gas suppliers ▪ Wholesale license holders bear strategic storage obligations as is the case with petroleum products in the context of Directive 119/2009/EU ▪ As the definition of gaseous biofuels excludes all other types of new-gases except those produced from biomass there is lack of clarity on the applicable framework for other gases
Transport of biofuels (Law 3054/2002)		<ul style="list-style-type: none"> ▪ The law provides only for the transport of biofuels by track. There is no option for pipeline injection

Current Legal & Regulatory Greek Framework: Assessment of RES Legal/Regulatory framework in relation to new gases

Topic		Assessment
RES Licensing Regulation (Government Gazette B' 2373/25.10.2011)		<ul style="list-style-type: none"> ▪ The Regulation is explicit to the production of electricity from biogas, biomass etc. ▪ No provisions for biomethane or hydrogen production for injection into gas networks are included
Law 3468/2006 (as amended by Law 3851/2010 and was significantly revised by Law 4254/2014)		<ul style="list-style-type: none"> ▪ The framework is specific to the promotion of the electricity produced from RES sources and high efficiency cogeneration through FiT scheme and does not account for new gas injection into networks or generally injection of gaseous biofuels to networks ▪ Introduction of a definition for biofuel as gaseous and liquid fuels produced from biomass extending further from the equivalent of Directive 2009/28/EC where biofuels are solely liquid fuels (with the gaseous form denoted in the Directive as biogas)
Law 4416/2016		<ul style="list-style-type: none"> ▪ The framework includes the current support scheme for RES including also biogas-biomass installations producing electricity and targeting to the integration of RES and cogeneration in the electricity sector given also the implementation of the EU Electricity Target Model and the State Aid Guidelines of 2014-2020 ▪ Introduction of a Feed-in-Premium (FiP) approach ▪ The framework is specific to electricity produced from RES sources and high efficiency cogeneration and does not account for new gas injection into networks
Directive (EU) 2018/2001		<ul style="list-style-type: none"> ▪ The provisions of Directive (EU) 2018/2001 regarding renewable gases are not transposed into national legislation yet

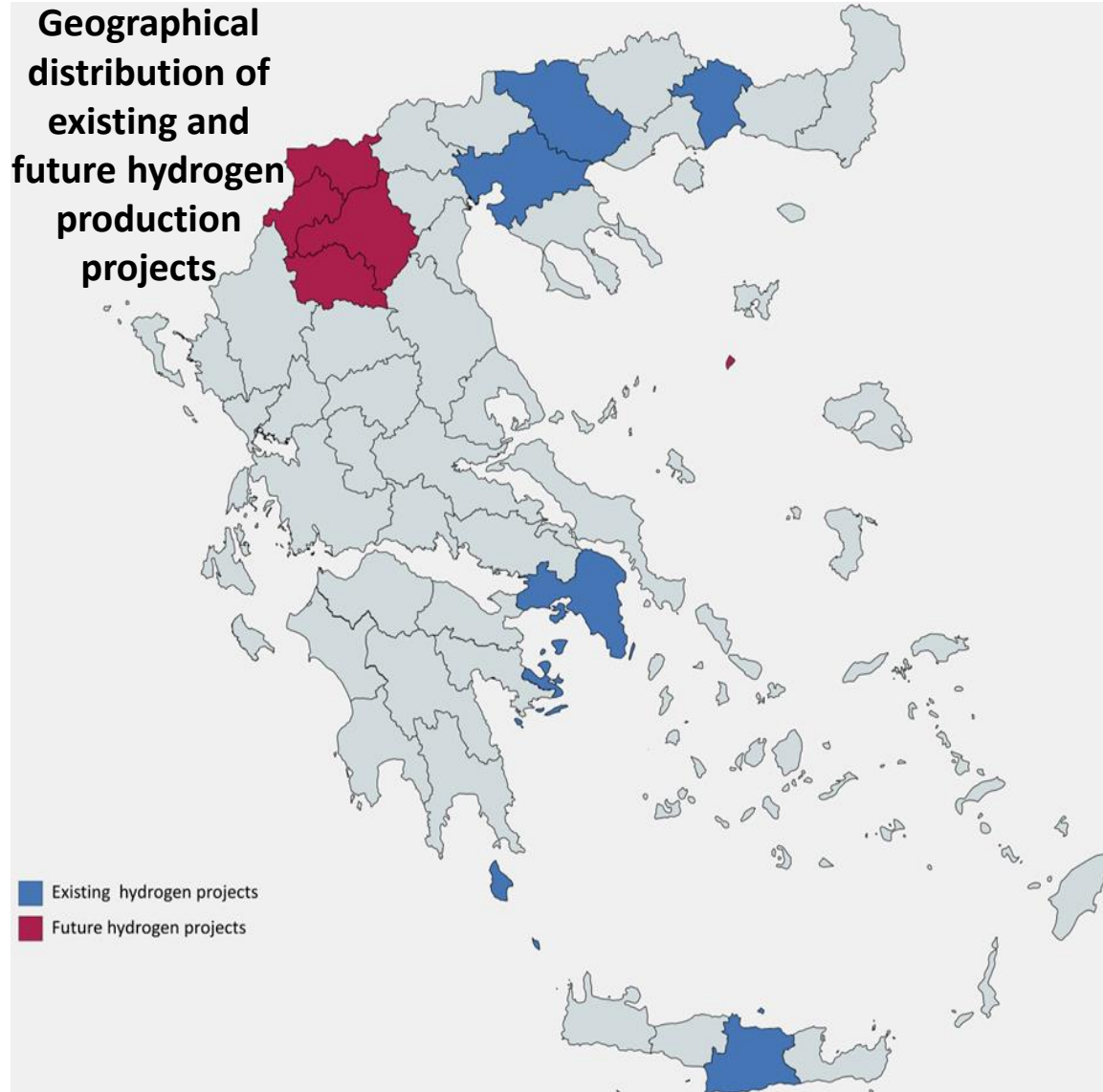
Biogas installations in Greece



Biogas-biomass in electricity generation

Figures	2017	2018	2019	2020 (by May)
Electricity production from biogas-biomass (GWh)	280	298	366	176
% total electricity production from biogas-biomass	0.66%	0.78%	0.93%	1.31%
% RES electricity production from biogas-biomass	2.43%	2.44%	2.75%	2.76%

Hydrogen projects in Greece



- 10 research hydrogen projects of a total budget of € 28 million have been implemented under EU through FCH JU

Existing demonstration hydrogen projects

Project name & location	Technology	End-Use Sector	Installed Capacity (MWe)	Major Funding Sources
Neo Olvio of Xanthi	PEM	power (fuel cells)	0.0042	n.a.
H2 SusBuild (Lavrion Technological and Cultural Park)	Unknown PtX		0.022	Seventh Framework Programme (FP7) for European Research and Innovation (EC)
REMOTE- Greece (Agkistro - Serres)	PEM		0.025	FCH JU (EC)

Future hydrogen projects in Greece

Project name & location	Technology	End-Use Sector	Installed Capacity (MWe)	Project's Partners
Agios Efstratios	Unknown PtX	- power (fuel cells) - heat	0.0042	n.a.
White Dragon (Western Macedonia)	Reversible solid oxide cell		- Electrolyser: 670MW - Fuel Cell Power: 167 MW - District heating: 90 MW	- Greece (Region of Western Macedonia, Public Power Corporation) - Italy (SOLIDpower, MBN Nanomaterialia) - Germany (Hydrogenious LOHC Technologies) - Belgium

CNG for transport

- In 2019, 14 CNG filling stations were in operation.
- The network for the supply of CNG vehicles is in development, The NECP envisages 55 CNG refueling stations operational by 2030
- An opportunity time window seems to exist for CNG and also biomethane for transport although current gas penetration rates in vehicles are extremely low.

CNG Vehicles Categories (Road Transport Sector)		Figure	2016	2017	2018
Passenger Cars	Number		496	701	920
	% CNG-Vehicles in the total passenger cars population		0.010%	0.013%	0.017%
Commercial Vehicles (including Light Commercial & Heavy Commercial Vehicles)	Number		131	169	239
	% CNG-Vehicles in the total commercial vehicles population		0.010%	0.013%	0,018%
Buses and Coaches	Number		310	226	247
	% CNG-Vehicles in the total buses and coaches population		1.168%	0.853%	1.569%
Total	Number		937	1,096	1,406
	% CNG-Vehicles in the total road vehicle population		0.011%	0.013%	0.019%

Feedstock availability for biomethane production

- The Study “Assessment of new fuels and technologies for the use of renewable energies in the Greek transport sector” commissioned by GIZ reported on the availability of feedstocks for the production of advanced biofuels and renewable gases:
 - **Feedstock types taken into consideration:** biomass fraction of mixed municipal solid waste (MSW), biomass fraction of industrial waste, straw, animal manure and sewage sludge, fruit tree pruning, grape narcs and wine lees, used cooking oil (UCO), crude glycerine, perennial crops, CO₂ feedstocks from industrial sources and plastics
 - **Conclusion:** The production of advanced biofuels and renewable gases could amount to 9.6% (in 2020) up to 12.6% (in 2050) of the total energy consumed in the transport sector (considering the total technical energy contribution of fuels)
- Barriers for biomethane’s production in Greece:
 - Absence of a specific National strategy on the Bio-economy,
 - The new National plan on waste management for the period 2020-2030 does not make reference to the use of waste to the production of renewable gases for grid injection,
 - Gap in the legal framework in the upstream due to lack of waste collection strategies and obligations-upon penalty- to recycle/further utilize agricultural or other residuals,
 - Absence of a transparent biomass market with proper price revealing mechanisms at feedstock level

Operation Support schemes for electricity producing biogas installations

- New plants of capacity over 500 kW (Law 4414/2016) receive a Feed-in-Premium (FiP).
- It is noted that small scale biogas-biomass power plants below 500 kW, non-interconnected islands and demonstration projects continue to receive a fixed price equal to the reference price for the total amount of the electricity produced
- A support period of 20 years is guaranteed for the producers

Power Plant Category	Plant Size	Reference Price (€/MWh)
Biomass (or bioliquids) utilized through thermal processes (combustion, pyrolysis) besides gasification process (excluding municipal biodegradable waste fraction)	≤1MW	176
Biomass (or bioliquids) utilized through gasification process (excluding municipal biodegradable waste fraction)	≤1MW	185
Biomass (or bioliquids) utilized through thermal processes (combustion, gasification, pyrolysis)	>1 MW- 5 MW	153
	> 5 MW	133
Landfill gases, gases from biological treatment plants and biogas from anaerobic digestion of the biodegradable waste fraction and organic sludge/biological treatment sludge	≤ 2 MW	123
	> 2 MW	99
Biogas from the anaerobic digestion of biomass (energy crops, green silage of agricultural crops, livestock and agro-industrial organic residues and waste, waste of edible oils and fats, expired food)	≤1MW	219
	>1MW - 3MW	209
	> 3 MW	192

National funding schemes (1/2)

Investment Law (Law 3908/2011)

- The main financial tool for the economic development of private companies (existing or start-up) through the establishment of investment support schemes
- Eligibility of the waste management sector. The investment's contribution in environmental protection being one of the evaluation criteria
- Financial support to new investment projects for the production of sustainable biofuels other than food-based biofuels and for the conversion of existing food-based biofuel plants into advanced biofuel plants
- No specific reference to new-gas production, such kind of activities could be well considered in the context of general investment plants (Article 6.1 of the Law) and also in the context of technological development and regional cohesion
- The maximum level of support amounts to 50% of the total project's cost

Green Fund




- Provision of funding mechanisms for the deployment of investments related to sustainable energy, climate change and circular economy,
- Eligibility of funding for the development and the implementation of projects and actions related to waste management (i.e. feedstock for biogas/biomethane) according to Law 3889/2010 and the M.D. 4503/23.11.2012
- Funding is usually in the form of subsidies, loans, equity investment, etc.
- In May 2020, the fund issued a call for tenders for an action plan for sustainable energy and circular economy in the West Macedonia region linked to the decommissioning of the PPC lignite plants

National funding schemes (2/2)

Programs and actions strengthening local government and that could be extended to touch upon new gases

- **"PHILODIMOS I"**: a Special Investment Loan Program of a total budget of € 2 billion for Local Government Organizations (OTA), the Municipal Enterprises for Water Supply and Sewage (DEYA) and Local Governments' associations
- **"Antonis Tritsis"**: a total amount of about € 2.5 billion financed from the Deposits and Loans Fund and the EIB (€ 1.5 billion) has been announced by the Hellenic Ministry of the Interior covering the period by 2023. The funding will be in the form of development loans to the bodies of the OTA which will be repaid by the Public Investment Program of the Ministry of Interior and the financing of the Ministry of Development and Investment
- The restoration of the uncontrolled waste disposal areas consists one of the main priority axes of these programmes

Support schemes new gases

Topic		Assessment
Support schemes in relation to new gases		<ul style="list-style-type: none"> No provisions and no specific long term plan for the development of new gas production facilities
Earmarked projects and budget		<ul style="list-style-type: none"> No earmarked projects and no specific national budget allocated to the promotion of new gases.
National strategy to evaluate costs and benefits of new gases		<ul style="list-style-type: none"> There is no such a study. The NECP provides only high level information

The national strategy to 2050 in the context of the EU Governance Regulation



ΕΛΛΗΝΙΚΗ ΔΗΜΟΚΡΑΤΙΑ
Υπουργείο Περιβάλλοντος
και Ενέργειας

Μακροχρόνια Στρατηγική για το 2050



MINISTRY OF
ENVIRONMENT
& ENERGY

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Deutsche Gesellschaft
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Zusammenarbeit (GIZ) GmbH



Federal Ministry
for Economic Affairs
and Energy

20 November 2020

E³Modelling
Energy Economy Environment

New-Gases Outlook for Greece: Scenarios for long term (2050)

- **NECP-2030** assumes that the targets set by the National Energy and Climate Plan are met by the year 2030 as foreseen:
 - no further objectives or additional policy priorities and measures after 2030
- **NECP-2050** evolves as NECP-2030 until 2030, whereas post 2030, the scenario consists a no-regrets option encompassing the following policy priorities which are considered unchanged in all scenarios of the long-term strategy:
 - Improving energy efficiency in all sectors, with emphasis on large-scale energy upgrading of homes and buildings,
 - Development of RES in all sectors and in particular in the field of electricity generation while reducing CO₂ emissions coal from the combustion of solid fuels in electricity generation,
 - Electrification of transport and heat in parallel with the reduction of the carbon footprint of electricity,
 - Development of domestic fuels and biomass gas with advanced techniques,
 - Further expansion of interconnections for electricity and gas systems and completion of the coupling of markets in the wider region
- A number of additional scenarios for the long-term strategy (2050) were considered and defined:
 - **EE EU2 Scenario:** Energy Efficiency and Electrification limiting temperature rise to 2°C
 - **NC2:** New energy carriers for 2°C
 - **EE1.5:** Electrification and improvement of energy efficiency for 1.5°C
 - **NC1.5:** New energy carriers for 1.5°C

New-Gases Outlook for Greece

Projected consumption of natural gas and new-gases in the demand sector							
Demand [ktoe]	2030	2050					
	NECP-2030	NECP-2030	NECP-2050	EE2	NC2	EE1.5	NC1.5
Natural gas	1,668	1,723	1,851	1,192	648	351	42
Synthetic Methane	0	0	0	0	913	0	1,143
Hydrogen	0	2	120	103	542	116	916
Biogas	14	28	326	408	452	238	463

Share of new-gases in the demand sector							
Demand [% total gas demand]	2030	2050					
	NECP-2030	NECP-2030	NECP-2050	EE2	NC2	EE1.5	NC1.5
Synthetic Methane	0%	0%	0%	0%	36%	0%	45%
Hydrogen	0%	0%	5%	6%	21%	16%	36%
Biogas	1%	2%	14%	24%	18%	34%	18%

Summary

- Currently there are substantial gaps in the national legal and regulatory framework and no dedicated funding mechanisms and support schemes
- Structured actions in multiple directions are necessary if short and longer term projected penetration is to be reached.

Impediments to the development of new gases in the existing networks in Greece

1. Increased capital costs added to the regulated asset base of networks:

- The Greek networks are comparatively new. Capital costs are rather significant in comparison to gas volumes serviced leading to high network tariffs in comparison to other EU MS.
- Many areas in mainland Greece are still not gasified.
- Penetration of gas in new areas without dense population may be challenging.

2. Natural gas has comparatively low penetration at distribution level

- Penetration rate of gas at distribution level remains comparatively low (60% is a best case scenario, new tariff approval decisions of RAE allocate a “bonus” if penetration reaches 25%).
- Non-market barriers including lack of cash flow needed for investment (despite the fact that the cost of gas-based heating is competitive to oil-based or electricity-based heating)
- An eventual increase in the cost of gas due to the high cost of renewable gases may limit further switching to gas: This is also valid for the case of RES-GAS extra charges imposed upon consumers to recover FiTs for incentivizing renewable gas projects

3. Low penetration of CNG vehicles in the road transport sector

Opportunities regarding new gas system developments in Greece

- **The potential of biogas supply and injection into the grid could benefit from economies of scale** in the main 3 dense population areas with existing gas infrastructure (namely Athens, Thessaloniki and Thessalia)
- **The government's commitment regarding the decommissioning of the PPC lignite plants in Western Macedonia and Megalopoli opens substantial opportunities for new development and innovation**
- **A number of stand-alone distribution networks that shall be fed by CNG** are under development in Thessaloniki and Thessalia and in selected areas (DEDA):
 - **Pilot scale biomethane plants** can be developed at the vicinity of these networks or even pilot scale electrolyser facilities. Through hydrogen injection, technical testing on blending issues can also be achieved
- **The industrial sector, mainly oil refineries, steel industry, petrochemicals and fertilizers can have interest for greening hydrogen in the longer-term subject to relevant policies being in place.**
- One of DESFA's shareholders, Snam Rete Gas, is within the most active operators in Europe regarding testing of hydrogen blends