Before going through the content of each specific Project Fiche, please read the introduction document.

Project Group EAST_08 - South Kavala UGS

Reasons for grouping [ENTSOG]

Project group is composed by UGS project South Kavala (UGS-N-1092) and enabler projects in the Greek transmission network:
> Meetering station to connect to the Greek Transmission network (TRA-N-1092)
> Kipi compressor station (TRA-N-128). Kipi CS enables injection/withdrawal flows to/from storage into/to the National Transmission network.

Objective of the project(s) in the group [Promoter]

The project group aims at improving the Security of supply and the competition in the Region by providing an important amount of storage space close to the existing and future interconnections of the Greek Transmission System with those of neighbouring countries (namely, existing interconnection with Bulgaria, IGB, TAP, North Aegean FSRU, interconnection Greece-North Macedonia).

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	4th PCI List Code	First Comm Year	Last Comm. Year	Compared to TYNP 2018
TRA-N-0128	Compressor Station Kipi	DESFA S.A.	GR	Less-Advanced	6.8.1	2024	2024	Rescheduled-
UGS-N-385	South Kavala Underground Gas Storage facility	Hellenic Republic Asset Development Fund	GR	Less-Advanced	6.20.3	2023	2023	Rescheduled
TRA-N-1092	Metering and Regulating Station at UGS South Kavala	DESFA S.A.	GR	Less-Advanced	6.20.3	2023	2023	Rescheduled

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0128	-	-	18
TRA-N-1092*	-	-	-

*No technical information is displayed as project involves construction of a Metering and Regulating station.

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0385	5	4	720

Capacity Increment

The capacity increment values for each project are provided at all related Interconnection points (IP), both for “exit” and “entry” directions, being indicated the operator of the IP as well as the associated commissioning years of the capacity increments.

This information is presented in the table below and should be read per each line as follows: a certain project, TRA-N-123, can bring at a specific “Point Name” operated by “Operator X” an “exit” capacity increment “From System Y” “To System Z” which has associated an “Increment Commissioning Year”. Equally, for the same “Point Name” and operated by the same “Operator X”, an “entry” (reverse) capacity increment can be available to system “Y” from system “Z” which at its turn has associated an “Increment Commissioning Year”.

TYNDP Project Code	Point Name	Operator	From System	Exit Capacity [GWh/d]	Increment Comm. Year	To System	Entry Capacity [GWh/d]	Increment Comm. Year
TRA-N-1092	UGS South Kavala (GR)	DESFA S.A.	Transmission Greece (Komotini)	55	2023	Storage Greece	44	2023
TRA-N-128	Komotini (DESFA) - GR / IGB	DESFA S.A.	Transmission Greece (Komotini)	62.5	2024	Transmission Interconnector Greece-Bulgaria Bulgaria	0	-
TRA-N-128	Kipi (TR) / Kipi (GR)	DESFA S.A.	Transmission Turkey (Imports)	0	-	Transmission Greece (Komotini)	44	2024
TRA-N-128	Komotini (DESFA) Bottleneck	DESFA S.A.	Transmission Greece (Komotini)	0	-	Transmission Greece	44	2024
UGS-N-385	UGS - GR - DESFA/Energean Oil&Gas	Hellenic Republic Asset Management Fund	Storage Greece	44	2023	Transmission Greece	55	2023

B. Project Cost Information

During the TYNDP 2020 Project Data Collection, promoters were asked to indicate whether their costs were confidential or not. The following tables display the costs provided by the promoters (as of June 2019, end of TYNDP 2020 project collection). The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential, alternative costs have been provided by the promoter. The alternative costs are identified with "*".

	TRA-N-1092	TRA-N-128	UGS-N-385	Total Cost
CAPEX [min, EUR]	15	15	320	**350**
OPEX [min, EUR/y]	0.4	2.8	4.8	**8**
Range CAPEX (%)	25	10	25	-
Range OPEX (%)	25	25	25	-

Description of costs and range [Promoter]

Costs are representative of the best estimations of the promoters at the time of the data collection for the TYNDP 2018. Updated CAPEX and OPEX estimates will be available after the completion of the ongoing pre-feasibility phase

C. Project Benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

National Trends

Benefits explained (but Sustainability) [ENTSOG]

> Security of Supply:

The project group **provides additional remaining flexibility** in Greece under all climatic stress cases (2-weeks, 2-weeks dunkelflaute and peak-day) from 2025 for all infrastructure levels, reaching higher levels of remaining flexibility in the low and advanced infrastructure levels.
In **case of disruption of single largest infrastructure of Greece (SLID-GR)**, in the existing and low infrastructure levels, the project group **reduces the risk of demand curtailment** from 2025 in Greece.

> Competition:

In the existing infrastructure level, the project group will allow Greece **to access to Azeri gas** from 2025 (Azeri gas supply flowing through Turkey). In the low and advanced infrastructure levels, Greece will already have access to Azeri gas from 2021 due to the commissioning of the full supply chain connecting Azeri gas fields with Europe, the project group will increase the access in Greece to Azeri gas, however the increase in these infrastructure levels is lower compared to the existing infrastructure level, since low and advanced projects allow as well many other European countries to access Azeri supplies.
By giving access to a new supply source, the project group slightly **decreases the dependence of Russian gas** for Greece in 2025 in the low infrastructure level. Additionally, it also slightly decreases the Russia dependence in Bulgaria, North Macedonia, Serbia and Bosnia and Herzegovina in 2040. These benefits are further spread in the Southern European countries in the low infrastructure level thanks to the implementation of FID projects.

> Market integration:

The project group brings benefits in monetised term as a **reduction of the cost of gas supply**. In the reference supply price configuration these benefits can be estimated around 47 MEur/y (on average) in the existing infrastructure level. Such benefits are driven by the fact that the project group allows Greece to further benefit from Azeri gas thanks to Kipi compressor station (that allows to flow more gas through Turkey to Greece), additionally, this gas could also be injected into the South Kavala underground storage. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (36 MEur/y) that also can be attributed to the connection to this new supply source.
Additional benefits compared to the reference situation can be observed in the case of cheap Southern gas 79 MEur/y, expensive LNG supply 59 MEur/y and expensive Russian gas 58 MEur/y (on average) in existing infrastructure level. Such benefits are driven by the fact that the project group allows Greece to further benefit from a decrease in the Azeri gas while at the same time to rely on alternative sources in case of more expensive LNG or Russian gas prices.
In the low and advanced infrastructure levels, the project group brings less benefits (almost negligible) compared to existing infrastructure level driven by commissioning of competing projects that allow Azeri gas to flow into other European countries.

Distributed Energy

Benefits explained (but Sustainability) [ENTSOG]

> **Security of Supply:**

The project group **provides additional remaining flexibility** in Greece under all climatic stress cases (2-weeks, 2-weeks dunkelflaute and peak-day) from 2025 for all infrastructure levels, reaching higher levels of remaining flexibility in the low and advanced infrastructure levels.
Regarding disruption of the main infrastructure:
In the case of **SLID-Greece**, the project **fully mitigates the risk of demand curtailment** in Greece in 2040 in the existing infrastructure level and **reduces the risk of demand curtailmen**t in Greece in 2025 and 2030 in the existing and low infrastructure levels.

> **Competition:**

In the existing infrastructure level from 2025 the project group **increases the access to Azeri gas** in Greece (limited Azeri gas supply arriving to Turkey through TANAP). In the low and advanced infrastructure levels, Greece will already have access to Azeri gas from 2021 due to the commissioning of the full supply chain connecting Azeri fields with Europe, the project group will increase the access in Greece to Azeri gas, however the increase in these infrastructure levels is lower compare to the existing infrastructure level, since Low and Advanced projects allow as well many other European countries to access Azeri supplies.
By giving access to a new supply source, the project group slightly **decreases the dependence of Russian gas** in Greece in 2025 in the low Infrastructure levels. Also, in this infrastructure level and thanks to the implementation of FID project, the project group slightly **decreases dependence to Russian gas** in Bulgaria, North Macedonia Bosnia and Herzegovina, and Serbia in 2030 in the low infrastructure level.

> **Market integration:**

The project group brings benefits in monetised term as a **reduction of the cost of gas supply**. In the reference supply price configuration these benefits can be estimated around 24 MEur/y (on average) in the existing infrastructure level. Such benefits are driven by the fact that the project group allows Greece to further benefit from Azeri gas thanks to Kipi compressor station (that allows to flow more gas through Turkey to Greece), additionally, this gas could also be injected into South Kavala underground storage. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (18 MEur/y on average in the reference supply price configuration) that can be attributed to the connection to the Azeri supply source.
Additional benefits compared to the reference situation can be observed in the case of cheap Southern gas 53 MEur/y, expensive LNG supply 30 MEur/y and expensive Russian gas 30 MEur/y (on average) in existing infrastructure level. Such benefits are driven by the fact that the project group allows Greece to further benefit from a decrease in the Azeri gas while at the same time to rely on alternative sources in case of more expensive LNG or Russian gas prices.
In the low and advanced infrastructure levels, the project group brings less benefits (almost negligible) compared to existing infrastructure level driven by commissioning of competing projects that allow Azeri gas to flow into other European countries.

Global Ambition

Benefits explained (but Sustainability) [ENTSOG]

> **Security of Supply:**

The project group **reduces the risk of demand curtailment** under peak day climatic stress condition and **fully mitigates the risk of demand curtailment** during 2-week dunkelflaute climatic stress case in Greece in 2030 in the existing infrastructure level. This situation improves in the low and advanced infrastructure level, with the implementation of FID and advanced projects, the project group **fully mitigates the risk of demand curtailment** in Greece also during peak day in 2030. Additionally, in the advanced infrastructure level, the project group fully mitigates the risk of demand curtailment during peak day in 2030 in Greece and North Macedonia, as the interconnection between these two countries included in this infrastructure level allows for further cooperation.
The risk of demand disruption in Greece is higher for Global Ambition demand scenario when Compared to National Trends or Distributed Energy demand scenarios where the project group increases remaining flexibility for all climatic stress conditions, in Global Ambition Greece has a higher gas demand mainly due to the lower level of electrification assumed for this demand scenario. Moreover, the project group also **increases remaining flexibility** in Greece from 2025 for all climatic stress cases (except peak day in 2030 where same demand curtailment remains) and in North Macedonia in 2030 for peak case in the advanced infrastructure level.
Regarding disruption of the main infrastructure:
In the case of **SLID-Greece**, the project **reduces the risk of demand curtailment** in Greece in all infrastructure levels and in North Macedonia in the advanced infrastructure level thanks to the interconnection between these two countries included in the advanced infrastructure level that allows the cooperation between North Macedonia and Greece required due to the higher demand in Greece assumed in Global Ambition scenario.

> **Competition:**

In the existing infrastructure from 2030 the project group will allow Greece to **increase access to Azeri gas** (Azeri gas supply flowing through Turkey). In the low and advanced infrastructure levels, Greece will already have access to Azeri gas from 2021 due to the commissioning of the full supply chain connecting Azeri gas fields with Europe, the project group will increase the access in Greece to Azeri gas, however the increase in these infrastructure levels is lower compare to the existing infrastructure level, since low and advanced projects allow as well many other European countries to access Azeri supplies.

The project group **decreases the dependence of Russian gas** for Greece in 2025 GBC in the low Infrastructure level and it also decreases the Russia dependence from 2030 in Bosnia and Herzegovina, Bulgaria, North Macedonia and Serbia.

> **Market integration:**

The project group brings benefits in monetised term as a **reduction of the cost of gas supply**. In the reference supply price configuration these benefits can be estimated around 36.5 MEur/y (on average) in the existing infrastructure level. Such benefits are driven by the fact that the project group allows Greece to further benefit from Azeri gas thanks to Kipi compressor station (that allows to flow more gas through Turkey to Greece), additionally, this gas could also be injected into South Kavala underground storage. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (26 MEur/y on average in the reference supply price configuration) that can be attributed to the connection to this new supply source.
Additional benefits compared to the reference situation can be observed in the case of cheap Southern gas 69 MEur/y, expensive LNG supply 46 MEur/y and expensive Russian gas 52 MEur/y (on average) in existing infrastructure level. Such benefits are driven by the fact that the project group allows Greece to further benefit from a decrease in the Azeri gas while at the same time to rely on alternative sources in case of more expensive LNG or Russian gas prices.
In the low and advanced infrastructure levels, the project group brings less benefits (almost negligible) compared to existing infrastructure level driven by commissioning of competing projects that allow Azeri gas to flow into other European countries.

Sustainability benefits [Entsog]

The ENTSOG analysis shows that, in yearly assessment, the project group will enable fuel switch savings in the maximal amount of 2.9 MEUR/y and minimal amount of 0.2 MEUR/y. The table below shows the related reduction in terms of CO2eq/y for each scenario and infrastructure level and over the 25-years assessment period of the project group. The contribution of the project group to the CO2eq/y emissions (positive number indicate reduction in CO2eq/y emissions) is also displayed for the three simulation configurations that consider different level of tariffs for the project group.

		Reference								
Sustainability		**EXISTING**			**LOW**			**ADVANCED**		
CO2 and Other externalities (KtCO2 eq/y)	Reference	3 / 8	17 / 21	41 / 51	0 / 1	0 / 10	0 / 9	0 / 0	0 / 0	0 / 0
	Lower Tariff Sensitivity	3 / 8	17 / 21	41 / 51	1 / 1	0 / 1	2 / 3	0 / 0	0 / 0	0 / 0
	Higher Tariff Sensitivity	3 / 8	17 / 21	41 / 51	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0

The minimum and the maximum values displayed in the table above refer respectively to the CO2eq/y savings in case emissions from the additional gas demand increase not replacing other more polluting fuels are counted in the overall CO2eq emissions assessment or they are considered neutral. For more information, please consult the Project Fiche introduction document and the TYNDP 2020 Annex D.

Savings have been allocated to the project group based on the actual use of the project group as it results from ENSTOG simulations under the reference supply price configurations and according to the methodology described in TYNDP 2020 Annex D. Such methodology is also based on the assumption that the use of the infrastructures already included in the different infrastructure levels (versus which the project group is assessed) is always prioritised. Therefore, the highest contribution of the project is observed under the existing infrastructure level.

Observing the evolution of benefits among the assessed years (section C.3), in National Trends scenarios it can be noted that most of the benefits materialise in the period 2023-2030 with the project group contributing to fuel switch towards natural gas in Greece (especially in the power sector). The project is assessed by ENTSOG from its first full year of operation, in this case year 2023. In this period, the projects group is expected to allow for more extended replacement of fuels with higher carbon content such as oil (largely used in Greece for space heating and transport) and lignite (used for power generation) by making available adequate quantities of natural gas, also at the peak demand periods occurring in winter.

In addition to the benefits observed in the period 2023-2030, in DE and GA scenarios the project group further contributes to fuel switch in Greece beyond 2030 (fuel switch happening mostly in the transport sector).

TYNDP 2020 ENTSOG and ENTSO-E scenario storylines have identified for Distributed Energy and Global Ambition scenarios the need for hydrogen imports to satisfy the hydrogen demand that cannot be covered by European production of hydrogen (e.g. through power-to-gas). In the future, hydrogen demand not satisfied by locally produced hydrogen could be covered by directly imported hydrogen through hydrogen-compatible infrastructures and/or by natural gas through natural gas pipelines or LNG terminal. In TYNDP 2020 ENTSOG has considered fuel switch benefits from hydrogen import in the form of natural gas import then converted into hydrogen in Europe. For project group EAST_08, such benefits represent, on average, 60% of the benefits from fuel switch in Distributed Energy and Global Ambition scenarios in 2030 and 2040. This also explains the difference when compared to the benefits observed in National Trend scenario.

In addition to ENTSOG's analysis on Sustainability, the promoter complements this analysis with the following country-specific information: similar benefits will be enabled in the neighbouring countries, through the existing and future interconnections of the Greek Transmission System with those of neighbouring countries. (existing interconnection with Bulgaria, IGB, Interconnector Greece – North Macedonia).

Sustainability benefits [Project Promoter]

No additional benefits were provided by promoters.

C.2 Quantitative benefits [ENTSOG]

The following tables display all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

EXISTING Infrastructure Level – National Trends

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			NT			NT		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition												
Commercial Supply Access (CSA)												
Greece	3	4	1	3	4	1	3	4	1	3	4	1
Security of Supply												
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				42%	59%	17%	67%	87%	20%	51%	69%	18%
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				36%	53%	16%	34%	50%	16%	28%	43%	15%
Remaining Flexibility Peak day (%)												
Greece	47%	65%	17%	20%	34%	14%	26%	41%	15%	22%	37%	15%
Single Largest Infrastructure Disruption (SLID)-Greece												
Greece	34%	17%	-17%	46%	32%	-14%	43%	28%	-15%	45%	31%	-15%

LOW Infrastructure Level – National Trends

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			NT			NT		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition												
MASD-RU												
Bosnia Herzegovina										13%	10%	-3%
Bulgaria										13%	9%	-4%
Greece				16%	12%	-4%						
North Noth Macedonia										13%	10%	-3%
Serbia										13%	10%	-3%
Security of Supply												
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				76%	93%	17%				86%	100%	14%
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				68%	85%	16%	66%	82%	16%	58%	73%	15%
Remaining Flexibility Peak day (%)												
Greece	82%	99%	17%	48%	62%	14%	56%	71%	15%	51%	66%	15%
Single Largest Infrastructure Disruption (SLID)-Greece												
Greece				18%	4%	-14%	14%	0%	-14%	16%	2%	-15%

ADVANCED Infrastructure Level – National Trends

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			NT			NT		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply												
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				76%	93%	17%				69%	87%	18%
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				68%	85%	16%	62%	78%	16%	37%	53%	15%
Remaining Flexibility Peak day (%)												
Greece	82%	99%	17%	48%	62%	14%	51%	66%	15%	30%	45%	15%

EXISTING Infrastructure Level – Distributed Energy

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			DE			DE		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition												
Commercial Supply Access (CSA)												
Greece	3	4	1	3	4	1	3	4	1	3	4	1
Security of Supply												
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				42%	59%	17%	16%	28%	12%			
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				36%	53%	16%	6%	17%	12%	26%	39%	13%
Remaining Flexibility Peak day (%)												
Greece	47%	65%	17%	20%	34%	14%	5%	17%	11%	47%	59%	13%
Single Largest Infrastructure Disruption (SLID)-Greece												
Greece	34%	17%	-17%	46%	32%	-14%	47%	36%	-11%	13%	0%	-13%

LOW Infrastructure Level – Distributed Energy

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			DE			DE		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition												
MASD-RU												
Bosnia Herzegovina							16%	7%	-9%			
Bulgaria							15%	8%	-7%			
Greece				16%	12%	-4%						
North Noth Macedonia							16%	8%	-8%			
Serbia							15%	8%	-8%			
Security of Supply												
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				76%	93%	17%	41%	53%	12%			
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				68%	85%	16%	29%	41%	12%	52%	65%	13%
Remaining Flexibility Peak day (%)												
Greece	82%	99%	17%	48%	62%	14%	28%	39%	11%	72%	85%	13%
Single Largest Infrastructure Disruption (SLID)-Greece												
Greece				18%	4%	-14%	25%	13%	-11%			

ADVANCED Infrastructure Level – Distributed Energy

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			DE			DE		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply												
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				76%	93%	17%	39%	51%	12%			
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				68%	85%	16%	26%	38%	12%	34%	48%	13%
Remaining Flexibility Peak day (%)												
Greece	82%	99%	17%	48%	62%	14%	24%	36%	11%	54%	66%	13%

EXISTING Infrastructure Level – Global Ambition

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			GA			GA		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition												
Commercial Supply Access (CSA)												
Greece	3	4	1	3	4	1	3	4	1	3	4	1
MASD-LNGall												
Greece										4%	2%	-2%
Security of Supply												
Curtailment Rate 2-Week Cold Spell (%) --- DF												
Greece							-10%	0%	10%			
Curtailment Rate Peak Day (%)												
Greece							-19%	-10%	9%			
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				42%	59%	17%	2%	14%	11%	30%	43%	13%
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				36%	53%	16%	0%	1%	1%	3%	14%	11%
Remaining Flexibility Peak day (%)												
Greece	47%	65%	17%	20%	34%	14%				1%	11%	10%
Single Largest Infrastructure Disruption (SLID)-Greece												
Greece	34%	17%	-17%	46%	32%	-14%	61%	52%	-9%	46%	36%	-10%

LOW Infrastructure Level – Global Ambition

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			GA			GA		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition												
MASD-RU												
Bosnia Herzegovina							27%	19%	-8%	7%	2%	-4%
Bulgaria							26%	21%	-5%	7%	4%	-4%
Greece				16%	12%	-4%						
North Noth Macedonia							27%	20%	-7%	7%	3%	-4%
Serbia							26%	20%	-6%	7%	3%	-4%
Security of Supply												
Curtailment Rate Peak Day (%)												
Greece							-1%	0%	1%			
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				76%	93%	17%	25%	36%	11%	56%	69%	13%
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				68%	85%	16%	11%	21%	10%	25%	36%	11%
Remaining Flexibility Peak day (%)												
Belgium							53%	56%	3%			
Greece	82%	99%	17%	48%	62%	14%	0%	8%	8%	21%	31%	10%
Single Largest Infrastructure Disruption (SLID)-Greece												
Greece				18%	4%	-14%	43%	34%	-9%	26%	16%	-10%

ADVANCED Infrastructure Level – Global Ambition

Sum of Value	Column Labels											
	2025						2030			2040		
	CBG			GBC			GA			GA		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply												
Curtailment Rate Peak Day (%)												
Greece							-4%	0%	4%			
North Noth Macedonia							-4%	0%	4%			
Remaining Flexibility 2-Week Cold Spell (%)												
Greece				76%	93%	17%	23%	35%	11%	43%	56%	13%
Remaining Flexibility 2-Week Cold Spell (%) --- DF												
Greece				68%	85%	16%	8%	19%	10%	10%	22%	11%
Remaining Flexibility Peak day (%)												
Greece	82%	99%	17%	48%	62%	14%	0%	5%	5%	6%	16%	10%
North Noth Macedonia							0%	70%	70%			

C.3 Monetised benefits [ENTSOG]

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios. In line with the CBA Methodology, promoters could provide additional benefits related to Sustainability or Gasification. In the tables below these benefits are displayed separately from the ones computed directly by ENTSOG and are labelled as "(Promoter)".
More information on how to read the data in this section is provided in the Introduction Document.

Reference										
		EXISTING			LOW			ADVANCED		
Benefits (Meur/year)		NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION
EU Bill benefits With Tariffs	Reference Supply	47.2	23.9	36.6	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	79.3	53.1	68.6	26.1	15.9	24.2	1.5	1.5	1.5
Security of Supply	Design Case	1.3	1.3	1.8	1.3	0.7	1.4	0.0	0.0	0.4
	2-weeks Cold Spell	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2-weeks Cold Spell DF	0.0	0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.0
Sustainability	CO2 and Other externalities savings	0.2 / 0.4	1 / 1.2	2.4 / 2.9	0 / 0.1	0 / 0.6	0 / 0.5	0 / 0	0 / 0	0 / 0
	Additional benefit (Promoter)	0	0	0	0	0	0	0	0	0

Comparison between the assessed SCENARIOS

ENTSOG runs the assessment for 5-year-rounded years (2020, 2025, 2030 and 2040) and interpolates these results to compute the benefits for the 25-years economic lifetime of projects. The following tables show the benefits as computed in the specific assessment years.

Year of assessment		*2020*									*2025*								
		EXISTING			LOW			ADVANCED			EXISTING			LOW			ADVANCED		
Benefits (Meur/year)		NT	DE	GA	NT	DE	GA	NT	DE	GA	NT	DE	GA	NT	DE	GA	NT	DE	GA
EU Bill benefits With Tariffs	Reference Supply	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.4	54.4	54.4	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86.5	86.5	86.5	29.3	29.3	29.3	7.7	7.7	7.7
Security of Supply	Design Case	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.3	1.3	1.3	1.3	1.3	0.0	0.0	0.0
	2-weeks Cold Spell	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2-weeks Cold Spell DF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sustainability	CO2 and Other externalities savings	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	1.5 / 2	1 / 2	1 / 2	0 / 1	0 / 1	0 / 1	0 / 0	0 / 0	0 / 0
	Additional benefit (Promoter)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Year of assessment		*2030*									*2040*								
		EXISTING			LOW			ADVANCED			EXISTING			LOW			ADVANCED		
Benefits (Meur/year)		NT	DE	GA	NT	DE	GA	NT	DE	GA	NT	DE	GA	NT	DE	GA	NT	DE	GA
EU Bill benefits With Tariffs	Reference Supply	44.9	43.4	47.8	0.0	0.0	0.0	0.0	0.0	0.0	45.7	0.0	22.8	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	77.0	75.6	79.9	25.9	25.8	29.0	0.1	0.0	0.0	77.8	26.3	54.7	24.9	4.5	19.1	0.0	0.0	0.0
Security of Supply	Design Case	1.3	1.3	2.6	1.2	1.3	1.5	0.0	0.0	1.2	1.3	1.3	1.3	1.3	0.0	1.3	0.0	0.0	0.0
	2-weeks Cold Spell	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2-weeks Cold Spell DF	0.0	0.0	17.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sustainability	CO2 and Other externalities savings	0 / 0	2 / 2	2 / 3	0 / 0	0 / 1	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	3 / 3	0 / 0	0 / 0	0 / 1	0 / 0	0 / 0	0 / 0
	Additional benefit (Promoter)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivities analysis on monetised benefits [ENTSOG]

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches. Independently from the source of the input as described in C3 (ENTSOG or Promoter), the sensitivity analysis has been caried out by ENTSOG and according to the criteria in the approved CBA Methodology.

EXISTING Infrastructure Level

		Commissioning Year Sensitivity			*Lower Tariff Sensitivity*			*Higher Tariff Sensitivity*			*Cost of Disruption Sensitivity*		
Benefits (Meur/year)		NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION
EU Bill benefits With Tariffs	Reference Supply	46.8	21.7	35.3	52.7	27.0	42.0	36.1	18.4	25.7	47.2	23.9	36.6
	Supply Maximization	79.0	50.7	67.4	84.9	57.2	74.1	68.2	45.3	57.7	79.3	53.1	68.6
Security of Supply	Design Case	1.3	1.3	1.3	1.3	1.3	1.8	1.3	1.3	1.8	0.0	0.0	1.1
	2-weeks Cold Spell	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2-weeks Cold Spell DF	0.0	0.0	6.5	0.0	0.0	6.5	0.0	0.0	6.5	0.0	0.0	14.5
Sustainability	CO2 and Other externalities savings (MEUR)	0.1 / 0.3	1 / 1.1	2.4 / 2.9	0.2 / 0.4	1 / 1.2	2.4 / 2.9	0.2 / 0.4	1 / 1.2	2.4 / 2.9	0.2 / 0.4	1 / 1.2	2.4 / 2.9
	Additional benefit (Promoter)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

LOW Infrastructure Level

		Commissioning Year Sensitivity			*Lower Tariff Sensitivity*			*Higher Tariff Sensitivity*			*Cost of Disruption Sensitivity*		
Benefits (Meur/year)		NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION
EU Bill benefits With Tariffs	Reference Supply	0.0	0.0	0.0	1.2	0.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	25.9	14.9	23.7	30.1	18.9	27.3	21.6	12.2	19.7	26.1	15.9	24.2
Security of Supply	Design Case	1.3	0.6	1.3	1.3	0.7	1.4	1.3	0.7	1.4	0.0	0.0	0.1
	2-weeks Cold Spell	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2-weeks Cold Spell DF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sustainability	CO2 and Other externalities savings (MEUR)	0 / 0	0 / 0.5	0 / 0.5	0 / 0.1	0 / 0.1	0.1 / 0.2	0 / 0	0 / 0	0 / 0	0 / 0.1	0 / 0.6	0 / 0.5
	Additional benefit (Promoter)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED Infrastructure Level

		Commissioning Year Sensitivity			*Lower Tariff Sensitivity*			*Higher Tariff Sensitivity*			*Cost of Disruption Sensitivity*		
Benefits (Meur/year)		NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION	NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION
EU Bill benefits With Tariffs	Reference Supply	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	1.5	1.5	1.5	1.7	1.7	1.7	2.4	2.4	2.4	1.5	1.5	1.5
Security of Supply	Design Case	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0	0.5
	2-weeks Cold Spell	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2-weeks Cold Spell DF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sustainability	CO2 and Other externalities savings (MEUR)	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0	0 / 0
	Additional benefit (Promoter)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact [Promoter]

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the promoter.

TYNDOP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
UGS-N-0385	Underground storage		Protected areas are not affected
TRA-N-1092	Above Ground Installation	Approximately 10,000 m2	Protected areas are not affected

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Noise, exhaust gas emissions	Turbo-compressor units placed in enclosures and housed in building, appropriate height of chimney and distance from inhabited areas.	Not yet estimated	Not yet estimated
No adverse impact is foreseen	Not applicable	Not applicable	Not applicable

Environmental Impact explained [Promoter]

Environmental impact assessments for the projects have not indicated any substantial and irreversible impacts on the environment. In order to ensure that environmental assessments are correct, environmental monitoring is carried out before, during and after the construction of the infrastructure.
Specifically, regarding the environmental impact during construction and operation, all available mitigation measures will be taken in order to avoid the noise and exhaust gas emission generated during the gas injection period like the use of enclosures for the turbo-compressor units, the appropriate height of the chimney etc.

The facilitation of the penetration of natural gas in the residential and commercial sector, by making available adequate quantities of gas during the peak demand period will enhance the substitution of the more polluting oil and the drastic reduction of the associated emissions of SOx, NOx and PMs which is not taken into account in the benefit monetization of the PS-CBA and should be considered for the drafting of the full picture of the project's environmental benefits.

E. Other Benefits [Promoter]

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2020 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained

Additionally to the benefits already captured, the project will have a positive impact on the level of competition in the region as it will enable more traders to take advantage of supply contracts with delivery terms that may not match the demand pattern, thus offering lower prices
Furthermore, the project will enhance diversification of gas sourcing in the region by allowing market participants to purchase and store gas quantities during off-peak periods

F. Useful Links

The project website: https://www.hradf.com/en/portfolio/view/26/south-kavala-natural-gas-storage
Network Development Plan: https://www.desfa.gr/en/announcements/public-consultations