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1. General Considerations

ENTSOG is the European Network of Transmission System Operators for gas.

ENTSOG's TYNDP 2020 edition has the important role of identifying the remaining infrastructure gaps through the assessment of the overall gas infrastructure.

TYNDP 2020 System Assessment Report defines the basis against which the project-specific cost-benefit analysis (PS-CBA) of PCI candidates is run.

In accordance with European Regulation (EU) 347/2013, ENTSOG had run within the TYNDP 2020 a project-specific cost-benefit assessment (PS-CBA) for all projects having declared their intention to apply to PCI during the TYNDP 2020 project data collection and TYNDP 2020 assessment phase. The results are published in this document in the form of Project Fiches.

Both TYNDP 2020 and PS-CBAs were carried out by ENTSOG in accordance with the adapted version of the 2nd Cost-Benefit Analysis Methodology (CBA Methodology) and accompanying documents, published by ENTSOG on 23 October 2018 and approved by the European Commission, with Regulation (EC) 715/2009 and Regulation (EU) 347/2013. PS-CBAs were performed considering the legal requirements as set out in Regulation (EC) 347/2013. The PS-CBA should not be perceived as a complete assessment of PCI candidate projects.

The Project Fiches included in this document represent a summary of the relevant project(s) information and PS-CBA results in a harmonised, synthetic and comparable manner. This allows to provide all the relevant information while ensuring a level-playing field and a transparent assessment towards all stakeholders.

2. Project-Specific Assessment (PS-CBA)

Following ENTSG 2nd CBA Methodology, and depending on the maturity of each project, the PS-CBA assessment evaluates the impact of projects under different infrastructure levels:

- > Existing infrastructure level
- > Low infrastructure level (Existing infrastructure level + projects having FID status at the time of TYNDP 2020 project collection)
- > Advanced infrastructure level (Low infrastructure level + Advanced Projects)

The infrastructure levels represent the counterfactual situation in terms of level of development of the gas infrastructure against which the project is assessed. The infrastructure levels are consistent across the different assessed projects.

Generally, benefits generated by projects tend to be higher in the Existing and Low infrastructure levels, where the infrastructure grid is less developed (only existing infrastructure and FID projects), whereas in the Advanced infrastructure level, the infrastructure gaps might be already (partially) fulfilled by possible competing projects. In the same way, higher benefits in the Advanced infrastructure level can be triggered by the presence in this grid of projects complementary to the one(s) assessed (e.g. enhancers).

Additionally, a number of functionally related projects need to be implemented for their benefit(s) to materialise. For such reason, the PS-CBAs have been performed by ENTSG at group level. The impact of a project is therefore measured by comparing the situations “with the project” and “without the project” (Incremental Approach) in each considered infrastructure levels and per each demand scenarios¹.

¹ For more details on TYNDP 2020 demand scenarios consult the TYNDP 2020 Scenario Report available [here](#).

3. ENTSOG 2nd CBA Methodology, Multi-Criteria analysis and how to read the Project Fiche

Each Project Fiche offers a summary of the main information related to the projects forming a specific assessed project group. More detailed information can be found in TYNDP 2020 Annex A (Project Table file and Project Sheets files) as well as in TYNDP 2020 Annex C (Annex C1 and Annex C2).

The TYNDP 2020 Project Fiches include contribution by both ENTSOG and project promoters. Results have been calculated according to ENTSOG methodology unless differently stated.

The first section of each Project Fiche includes all relevant technical details related to the projects forming the assessed project groups. This section reflects the information submitted by the concerned project promoters during the TYNDP 2020 project data collection that was run from 30 May 2019 to 26 July 2019. In the cases when projects were commissioned between the project data collection and the publication of the Project Fiches, the project status have been updated accordingly in the relevant Project Fiche(s).

Section B “Project Cost Information”, includes the cost for the overall group and for the project forming this group. It displays the costs provided by the promoters (as of TYNDP 2020 project collection). The cost values represented in Section B are not discounted.

Section C, “Project Benefits”, describes the main benefits stemming from the realisation of the project group against the four policy criteria. Benefits are calculated for all TYNDP 2020 scenarios and infrastructure levels. Section C is composed of 4 different sub-sections:

- > sub-section C.1 “Summary of Project Benefits” analyses the benefits stemming from the realisation of the projects as resulting from ENTSOG assessment and displayed in the other subsections C.2, C.3 and C.4
- > sub-section C.2 “Quantitative Benefits” includes all quantitative indicators results (more detailed in section 3.1). The same benefits are also provided in a separate excel file
- > sub-section C.3 “Monetised Benefits” includes all monetised benefits, unless differently specified (more detailed below in chapter 3.2).
- > sub-section C.4 “Sensitivity on Monetised Benefits” includes all sensitivities run by ENTSOG on the monetised benefits.

Results should be always carefully interpreted.

Chapters 3.1 and 3.2 provide more background on the assessment and on the indicators used. More information is also available in TYNDP 2020 Annex D.

3.1. Quantitative Benefits

ENTSOG 2nd CBA Methodology is a multi-criteria analysis with monetised elements and non-monetised or quantitative elements.

Benefits have been calculated for the years: 2020, 2025, 2030 and 2040.

Sub-section C.2 displays all quantitative benefits results,

The results displayed in sub-section C.2 are described and analysed in sub-section C.1.

The tables presented in this section show values from the CBA Methodology quantitative indicators with and without the project, as well as the project impact (delta) for each indicator. Benefits are displayed according to the relevant policy criteria.

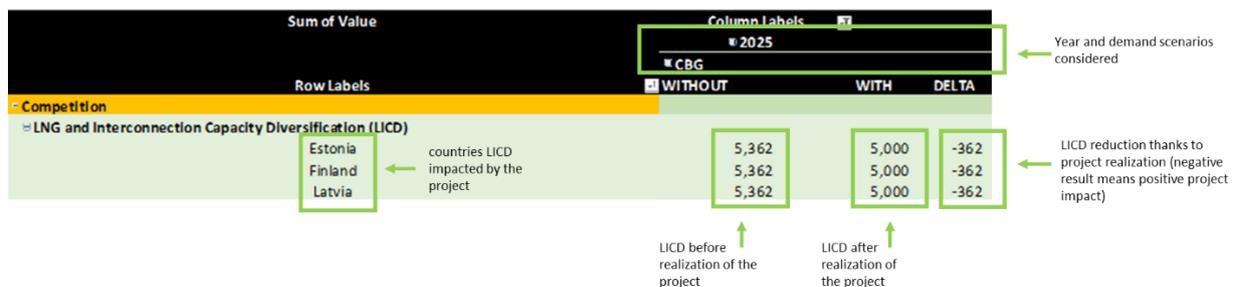
Some indicators are expressed in percentage of demand of a given country and therefore the impact of a project must be understood accordingly (e.g. depending on the market size of the impacted country a 10% impact could be significantly different).

Indicator results are shown only for countries impacted by the assessed project group.

Below a short explanation on how to read the indicators and the associated quantitative benefits.

Competition

The indicator “**LNG Interconnection Capacity Diversification**” (LICD) shows the results for the incremental projects impact on the LICD indicator. It measures how diversified and balanced are the different entry points. A negative number in the DELTA indicates that, thanks to the implementation of the project, a country increases diversification of its entry points. The indicator is based on an HHI indicator and ranges from 0 (diversified) to 10,000 (not diversified). Since this indicator is influenced by the number of borders a country has, for some countries 5000 is the maximum level of diversification that can be reached (i.e. in case of countries with no more than two borders). The precision for the calculation of this indicator is set at 100, equal or lower differences are not considered.



Sum of Value		Column Labels			
Row Labels		2025	WITHOUT	WITH	DELTA
- Competition					
= LNG and Interconnection Capacity Diversification (LICD)					
Estonia	← countries LICD impacted by the project	5,362	5,000	-362	← LICD reduction thanks to project realization (negative result means positive project impact)
Finland		5,362	5,000	-362	
Latvia		5,362	5,000	-362	

↑ LICD before realization of the project ↑ LICD after realization of the project

The indicator “**MASD-source**” shows the results for the projects incremental impact on the Minimum Annual Source Dependence (MASD) indicator for a specific supply source.

It should be understood as the minimum share of a given source (e.g. Russia [RU] or LNG) a country has to rely on to satisfy its gas demand.

A negative % in the DELTA column indicates a positive impact of the project in reducing country(ies) dependency from a specific supply source.

Sum of Value		Column Labels		
		2025		
		CBG		
Row Labels		WITHOUT	WITH	DELTA
Competition				
MASD-RU				
	Estonia	35%	23%	-12%
	Latvia	35%	23%	-12%
	Lithuania			

Year and demand scenarios considered

countries MASD impacted by the project

MASD before realization of the project

MASD after realization of the project

MASD reduction thanks to project realization (negative result means positive project impact)

The indicator “**Commercial Supply Access**” (CSA) shows the incremental project impact on the commercial access to supply sources for each balancing zone, being access to different supply sources a prerequisite for competition. The table shows the number of sources a country has access to in the situation without and with the project.

The access to supply sources is measured based on the SSDi (sub-)indicator for each supply source and with a threshold of 20%², which means that a decrease in the price of this supply source would impact at least 20% of the country supply bill. A positive number X in the DELTA column indicates that, thanks to the implementation of the project, a country can increase by X the number of sources it has commercially access to.

Sum of Value		Column Labels		
		2040		
		NT		
Row Labels		WITHOUT	WITH	DELTA
Competition				
Commercial Supply Access (CSA)				
	Denmark	2	3	1
	Sweden	2	3	1

Year and demand scenarios considered

countries CSA impacted by the project

CSA before realization of the project

CSA after realization of the project

CSA increase thanks to project realization (positive result means positive project impact)

Security of Supply

The indicator “**Curtailment rate**” (CR) shows the results in terms of projects incremental impact on the avoided curtailed demand (in %) in case of:

- climatic stress (peak day; 2-weeks peak day; 2-weeks peak day under Kalte Dunkelflaute³)

² Different thresholds are however shown in the TYNDP 2020 Assessment Chapter ([link](#)).

³ (cold) dark doldrums” expresses a climate case, where in addition to a 2-week cold spell, variable RES electricity generation is low due to the lack of wind and sunlight.

- supply disruption (disruption of flows from Algerian pipe / Baltic and Finland⁴ / Belarus / Ukraine)

A negative value in the DELTA column indicates a positive impact of the project in reducing a country(ies) risk of curtailed demand under climatic stress or supply disruption. A project may have positive impact in more than one supply disruption (e.g. in both Belarus and Ukraine). If the project brings benefit already in case of climatic stress (i.e. no supply disruption or infrastructure disruption), the same value is included in all the supply disruptions. When monetising it, ENTSG has duly considered this aspect and removed any double counting.

The indicator “**Single largest Infrastructure Disruption (SLID)**” shows the results for the incremental projects impact on the avoided curtailed demand (in %) in case of disruption of the single largest infrastructure⁵. A positive value in the DELTA column indicates a positive impact of the project in reducing country(ies) risk of curtailed demand under single largest infrastructure disruption. A project may have positive impact in more than one single largest infrastructure disruption (e.g. in SLID-Country A and SLID-Country B).

The disrupted infrastructure might change from an infrastructure level to the other.

When monetising it, ENTSG has duly considered this aspect and removed any double counting.

Sum of Value		Year and demand scenarios considered		
Row Labels		2040	GA	
		WITHOUT	WITH	DELTA
Security of Supply				
Supply route affected by the disruption	Baltics Finland Disruption Curtailment Rate Peak Day (%)	-9%	0%	9%
	Lithuania			
	-Belarus Disruption Curtailment Rate Peak Day (%)	-9%	0%	9%
	Lithuania			
Country single-largest infrastructure affected by the disruption	Single Largest Infrastructure Disruption (SLID)-Lithuania	9%	0%	-9%
	Lithuania			

↑ Risk of demand curtailment before realization of the project

↑ Risk of demand after realization of the project

Decrease in risk of demand curtailment under CR indicator thanks to project realization (positive result means positive project impact)

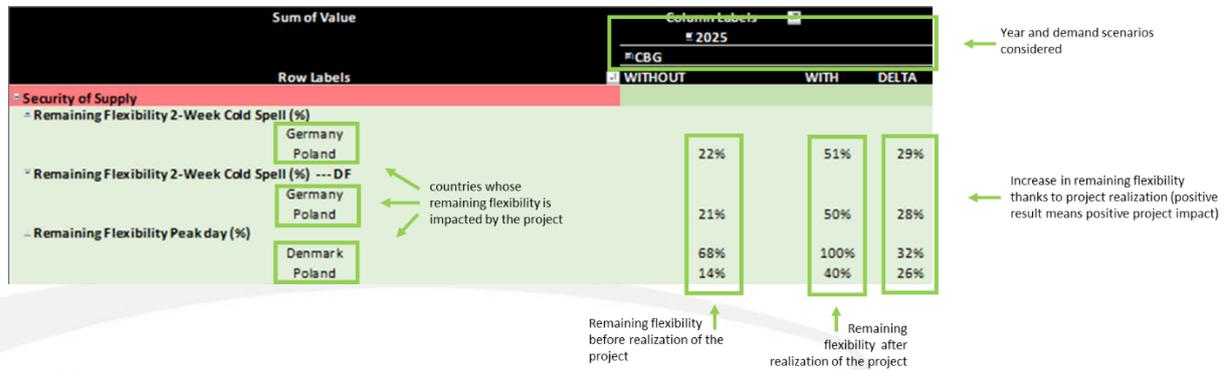
Decrease in risk of demand curtailment under SLID indicator thanks to project realization (negative result means positive project impact)

The indicator “**Remaining Flexibility**” (RF) shows the incremental project impact on the resilience only in case of climatic stress (i.e. no supply disruption or infrastructure disruption). A positive % in the DELTA column indicates a positive impact of the project in increasing country(ies) flexibility. This flexibility is measured by the increase of demand an area can accommodate before an infrastructure or supply limitation is reached somewhere in the European gas system. The value is expressed as a percentage of the demand for a given area and up to 100%. A zero value would indicate that the country is not able to fulfil any additional

⁴ Disruption of all imports to the Baltic states and Finland.

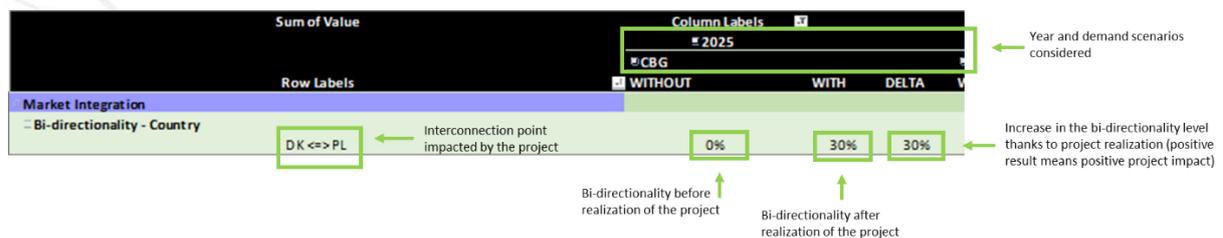
⁵ The list of SLID capacities is published by ENTSG as part of TYNDP 2020 Annex D – SLID Values.

demand without perturbing other countries and a 100% value would indicate that it is possible to supply twice the level of its demand.



Market Integration

The indicator “**bi-directionality**” shows the results for the incremental projects impact on the balance between the capacities in each direction of an interconnection. Measuring the bidirectionality of capacities is an indication of the physical integration of markets and can by nature only be calculated for transmission projects. A positive number in the DELTA column indicates that, thanks to the implementation of the project, a country can increase the balance between capacities of the same interconnection point (IP).



3.2. Monetised Benefits

Monetised elements are shown in sub-section C.3.

As per the quantitative benefits, a description and analysis by ENTSG of the monetised benefits is included in the Project Fiche sub-section C.1.

The following indicators/benefits are monetised as part of the PS-CBA assessment.

The indicator “**Supply costs savings**” (EU Bill) captures the benefits stemming from projects reducing overall European cost of gas under different demand scenarios along the assessment period. It is calculated at European level and it takes into account also tariffs at European borders. A project group can bring benefits in terms of reduction in the cost of gas supply

when connecting to a (new) cheaper source, when providing an alternative and cheaper route (i.e. tariff arbitration through lower tariffs), or both.

In order to better identify when the positive effect from the project is related to the connection to a (new) cheaper supply source or to the utilisation of an alternative route, ENTSOG has also carried out sensitivities on the tariffs value to be used with the projects.

Supply cost savings are calculated under the reference supply price configuration, where each supply source has a given price (please refer to TYNDP 2020 - Annex D for more information). Supply cost savings are calculated also under alternative five supply price configurations, where one specific supply source at a time is considered being more expensive or cheaper by 5 EUR/MWh than the others.

Each Project Fiche displays benefits from the reference supply price configuration and the maximum benefit from the five supply price configurations (called "Supply Maximisation").

Taking into account stakeholder feedback on TYNDP 2018, the initial spread of 5 EUR/MWh used in the simulation has been ex-post reduced to 2 EUR/MWh when monetising the delta between the changes in the amount of gas triggered by the minimisation/maximisation compared to the situation under the reference supply price configuration.

These configurations are based also on the minimum and maximum supply potentials defined in TYNDP 2020 Scenarios Report that represent a limit to the supply that can be used in the different price configurations. Independently from how cheap a source can be, projects cannot bring more than the maximum amount defined in the supply potentials. Additionally, the Minimum supply potential can be considered as a proxy of supply long-term contract at European level.

Supply cost savings are computed by ENTSOG for four assessment years (2020, 2025, 2030 and 2040) and interpolated to cover 25-years of project economic lifetime. Savings are displayed in the Project Fiche in Meur/year.

Benefits (Meur/year)		LOW		
		NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION
EU Bill benefits With Tariffs	Reference Supply	0.00	0.66	0.00
	Supply Maximization	1.24	1.39	1.45
Decision Case		0.00	0.00	0.54

Infrastructure level against which the project groups has been assessed

Demand scenarios

Supply cost savings, under reference supply price configuration, thanks to project implementation

Supply cost savings, under max supply price configuration, thanks to project implementation

Reduction in security of supply (SOS) constraints under different stress condition is monetised by ENTSOG and reflected in sub-section C.3. It measures the benefits derived by the implementation of the project reducing or fully mitigating demand curtailment along the assessment period and under defined demand scenarios. The indicators calculated under several stressful conditions (see sub-section C.2), has been monetised by using:

> a uniform Cost of Disruption of Gas (CoDG) of 600 EUR/MWh with a probability of occurrence of 1-20 years (i.e. 5%) in order to take into account the lower probability of occurrence of peak and stressful situations.

> a country-specific CoDG from ACER “Study on the estimation of the cost of disruption of gas supply in Europe”⁶, as part of PS-CBA sensitivities.

In the Project Fiche, results are displayed per scenarios and per climatic stress situation (peak day for gas demand (Design Case) / two-weeks cold spell / two-weeks cold spell under Dunkelflaute).

Savings are computed by ENTSG for four assessment years (2020, 2025, 2030 and 2040) and interpolated to cover 25-years of project economic lifetime. Savings are displayed in the Project Fiche in Meur/year. Benefits for design case refer to the monetised value of demand curtailment under peak demand conditions plus the maximum of the additional disrupted demand under the different supply route disruptions under peak case and the maximum of the additional disrupted demand under largest infrastructure disruptions. Whereas benefits under 2-weeks cold spell/DF refer to the monetised value of demand curtailment under 2-weeks cold spell/2-weeks DF climatic stress case plus the maximum of the additional disrupted demand under the different supply route disruptions for these climatic stress cases (2-weeks cold spell/2-weeks DF).

Benefits (Meur/year)		LOW		
		NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION
Security of Supply	Design Case	0.00	0.00	0.54
	2-weeks Cold Spell	0.00	0.00	0.00
	2-weeks Cold Spell DF	0.00	0.00	0.00

← Infrastructure level against which the project groups has been assessed

← Demand scenarios

← Project contribution to avoided risk of demand curtailment under CR indicator and SLID indicators

For TYNDP 2020 ENTSG has assessed and allocated **sustainability benefits** by considering the contribution of project to CO2 reduction (and other externalities reduction such as PMx, NOx and SOx) based on the actual flows resulting from the projects simulations at yearly level and complemented by a sensitivity on the projects tariff values.

Promoters could then further complement this assessment by providing additional consideration on the project impact on sustainability.

These benefits are included in the tables in sub-section C.3. but in a separate row.

Benefits (Meur/year)		EXISTING		
		NATIONAL TRENDS	DISTRIBUTED ENERGY	GLOBAL AMBITION
Sustainability	CO2 and Other externalities savings	0.9 / 0.9	7.2 / 7.3	7.5 / 8.8
	Additional benefit (Promoter)	95.1	95.1	95.1

← Infrastructure level against which the project groups has been assessed

← Demand scenarios

← Emission savings allocated to projects based on flows from simulations

← Additional sustainability benefits provided by the project promoters

⁶ Available [here](#).

For more information on the methodology applied, please consult TYNDP 2020 Annex D.

3.3. Monetised Benefits (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 tables in this section show the benefits as computed in the specific assessment years.

3.4. Sensitivities on Monetised Benefits

The sensitivity on the monetised benefits is shown in sub-section C.4 “Sensitivities analysis on monetised benefits” of the project fiche.

In line with ENTSG Adapted 2nd CBA Methodology, ENTSG has also run sensitivities on the following relevant assumptions:

> for **tariffs**, both upper sensitivity (double of the projects reference tariffs) and lower sensitivity (half of the projects reference tariffs) have been simulated. The inclusion of tariffs has impact only on the “Supply costs savings” indicator (EU Bill Benefits) and on the sustainability benefits allocated based on the flows resulting from the simulations. It is important to compare results in the no-sensitivity assessment (sub-section C.3) with the results under the tariff sensitivity (sub-section C.4) in order to capture the impact of the tariffs in the project benefits. For example, in case of presence of benefits related to tariffs savings, the EU Bill or the sustainability savings in sub-section C.4 will be lower than the ones in sub-section C.3.

> for **commissioning year**, while the reference approach considers as commissioning year of the whole assessed group the year of realisation of the first project (part of the group) to be commissioned, in the sensitivity it has been considered as commissioning year of the whole assessed group the year of realisation of the last project (part of the group) to be commissioned. A project group might in fact already start bringing some benefits before the completion of all the phases of the group, with the realisation of the first capacity increment. This sensitivity has an impact on all monetised indicators.

Example1: two projects forming a group, one with commissioning year 2020 and one 2025.
Example2: Group formed by a single project but with different phases and different years (again 2020 and 2025). For both project groups the sensitivity will assess the group as commissioned in 2020 (reference assessment) and in 2025 (sensitivity). In case a group is formed by a single project that has no different phases, the sensitivity will show the same results.

> for the **Cost of Disruption of Gas (CoDG)** used to monetise the avoided demand curtailment thanks to the project implementation ENTSG has introduced a sensitivity by using also the country-specific values from ACER study as alternative to the uniform value with a 1 in 20 probability of occurrence used by ENTSG. Country-specific values can be found in the TYNDP2020 Annex D Methodology. For the sensitivity on the Cost of Disruption, country values were considered when a particular country(s) were disrupted under the different climatic stress cases or supply disruptions.

3.5. Other Impacts and Benefits

Any gas infrastructure has an impact on its surroundings. This impact is of 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.

Section D “Environmental Impact” further elaborates on the mitigation measures taken by the project promoter. It is responsibility of the project promoter to submit such measures in form of qualitative and/or quantitative information. These impacts are unrelated for the benefits in terms of emission savings calculated by ENTSG and Promoters in section and displayed in sub-section C.3.

In section E “Other Benefits”, promoters have indicated any benefit which may be not captured by the current application of the 2nd CBA Methodology. It is responsibility of the project promoter to submit and substantiate such information. When such benefits are included in section C.3 it is clearly stated the origin (i.e. “Promoter”).

Section F “Useful Link”, includes any link as provided by the promoters.

3.6. Gasification projects

A specific assessment has been carried out by ENTSG and promoters with regards to the so called “gasification projects”. These are projects that aim at bringing gas to countries or areas not reached by natural gas yet. The traditional indicators cannot be computed for those projects since they would show only negative results.

For example, in the case of supply source dependence indicator, a gasification project will increase the dependence of that country/region to gas since before the dependence was 0% due to the fact that before the project realisation the country/region did not have access at all to gas.

Therefore, benefits from the realisation of “gasification projects” can be measured only in terms of:

- > natural gas replacing more polluting or expensive fuels.
- > access to a new gas supply source.

List of PS-CBA project groups

No	PS-CBA group code	PS-CBA group name
1.	WEST 03	Melita Trans Gas Pipeline Malta-Italy interconnection
2.	WEST 04	France and Belgium L/H gas conversion
3.	EAST 01	Poland-Slovakia interconnection (with enhancer North-South Gas corridor in Eastern Poland)
4.	EAST 03	Slovakia-Hungary interconnection
5.	EAST 05b	LNG KrK (2nd phase)
6.	EAST 06a	IGB + IBS + Enabler Bulgaria
7.	EAST 06b	IGB + enhancer projects Kipi CS + IBS + enabler Bulgaria
8.	EAST 07a	Alexandroupolis LNG
9.	EAST 07b	Alexandroupolis LNG
10.	EAST 08	South Kavala UGS
11.	EAST 09	Depomures
12.	EAST 10	Sarmasel UGS
13.	EAST 11a	Slovenian-Hungary interconnection
14.	EAST 11b	Slovenian-Hungary-Italy interconnection
15.	EAST 12b	BRUA (phase I + phase II)
16.	EAST 12c	BRUA (phase I + phase II)+ Slovakia-Hungary interconnection
17.	EAST 13	Eastring
18.	EAST_14a	Slovenia-Austria interconnection
19.	EAST_14b	Croatia-Slovenia interconnection
20.	EAST_14c	Croatia-Slovenia-Austria interconnections

21.	EAST 15	North Bosnia-Croatia interconnection
22.	EAST 16a	South Bosnia-Croatia interconnection
23.	EAST 16b	South Bosnia-Croatia interconnection + IAP
24.	EAST 19	FSRU Poland
25.	EAST 20	Bilciuresti UGS capacity increase
26.	EAST 23	UGS Chiren
27.	EAST 24a	Modernization Bulgarian GTS+ Interconnector IBS and IGB+ UGS Chiren expansion
28.	EAST 27	Grubisno Polje UGS
29.	EAST 28	Interconnection Croatia-Serbia
30.	SGC 02a	Azeri Supply Chain with expansion projects (SCPF, TANAP X and TAP X)
31.	SGC 02b	Azeri Supply Chain with expansion projects (SCPF, TANAP X and TAP X) and enhancer project IAP
32.	SGC 03a	Trans Caspian pipeline + Azeri Supply Chain with expansion projects (SCPF, TANAP X and TAP X)
33.	SGC 03b	Trans Caspian pipeline + Azeri Supply Chain with expansion projects (SCPF, TANAP X and TAP X) (including enhancer project IAP)
34.	SGC 04	Cyprus gasification project (Cyprus Gas2EU)
35.	SGC 05b	Gas supply chain mediterranean (including off-shore section of Poseidon pipeline)
36.	BEMIP 01	Enhancement of Latvia-Lithuania interconnection
37.	BEMIP 03	Enhancement of Latvia-Lithuania interconnection + Inculkalns UGS
38.	BEMIP 04	Baltic pipe project
39.	BEMIP 05a	GIPL
40.	BEMIP 05b	GIPL + Enhancement of Latvia-Lithuania interconnection
41.	BEMIP 10	Skulte LNG