
Selection of Projects of Energy Community Interest and Projects of Mutual Interest (PECIIs and PMIs)

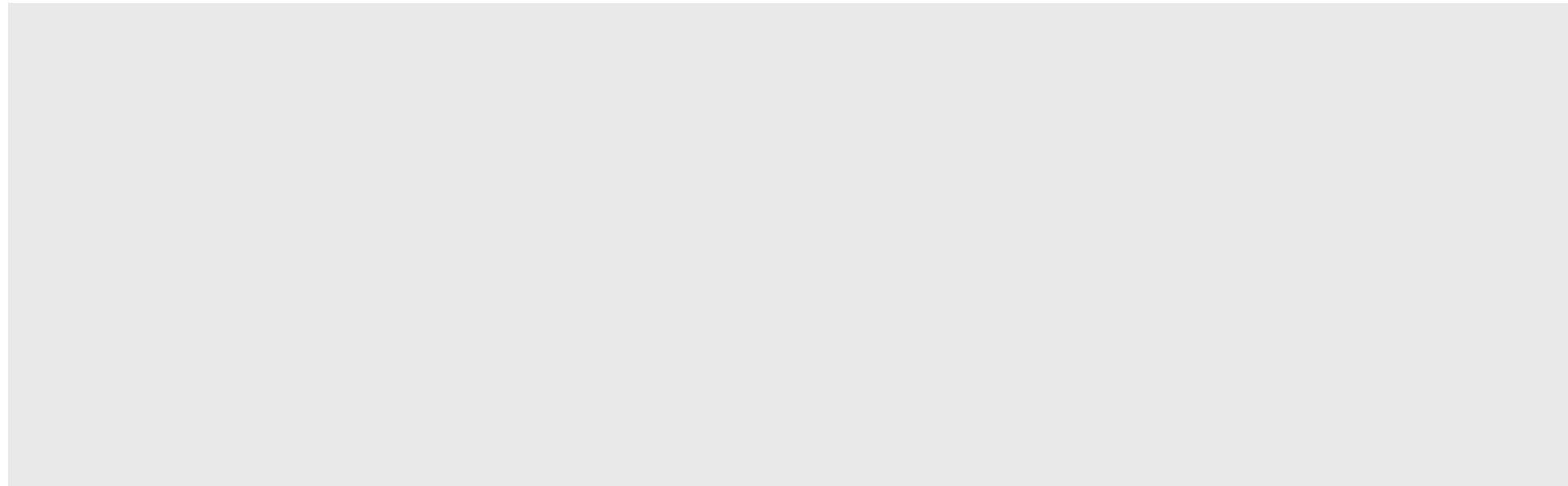
Draft results – gas infrastructure projects

Presentation REKK / DNV GL

Vienna 30.06.2016

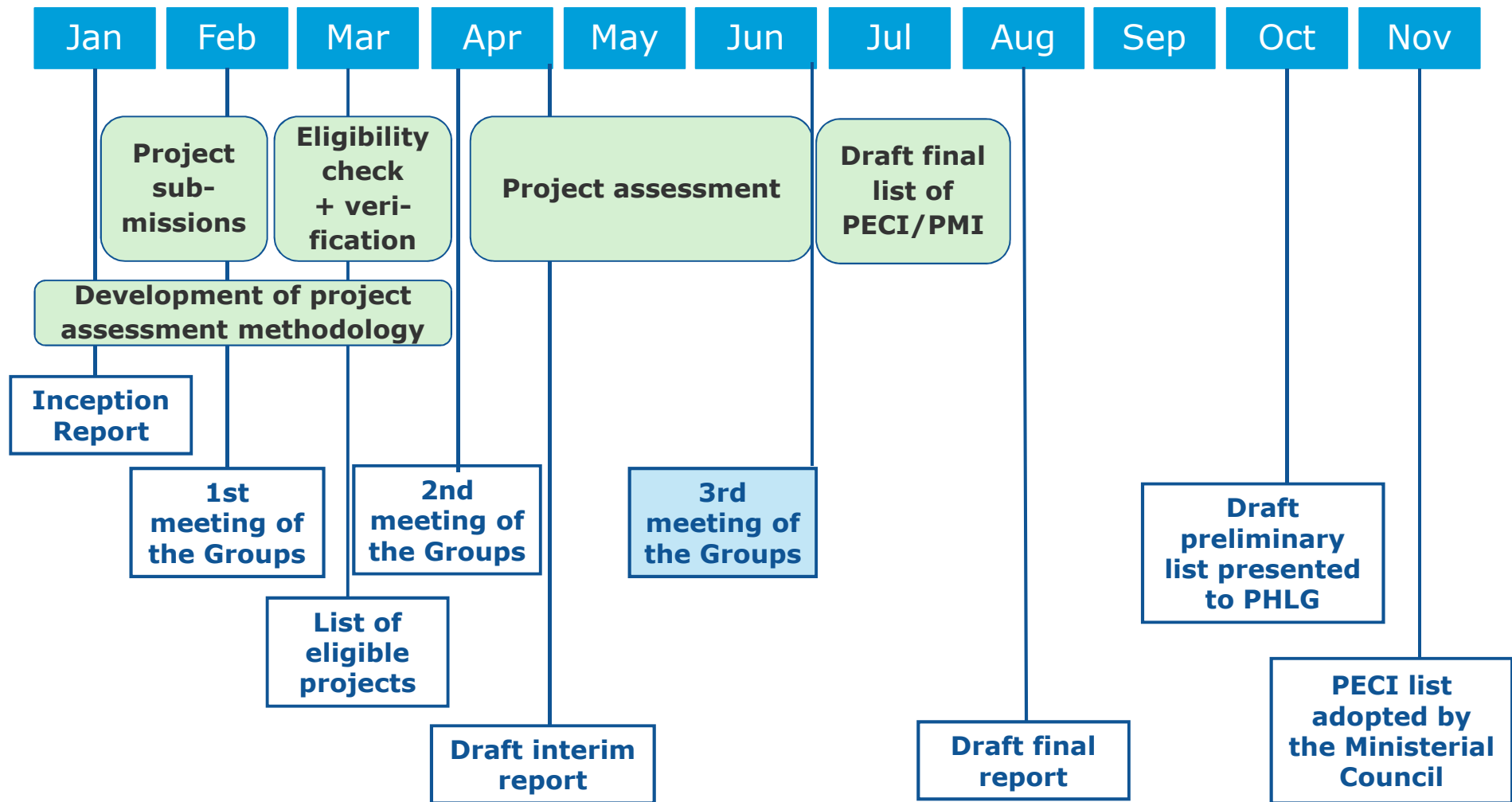
Agenda

1. Overview on Assessment Methodology
2. Submitted Projects and Results of Project Verification
3. Gas Market Modelling
 - Input data and main assumptions
 - Reference case scenario for 2030
 - Evaluation of CO₂ emissions
4. Multi-Criteria Assessment
 - Indicators and scoring
5. Assessment Results
 - Cost benefit results (NPV)
 - Multi criteria assessment (scores and relative ranking)
6. Sensitivity Analysis
7. Assessment Results for Individual Projects

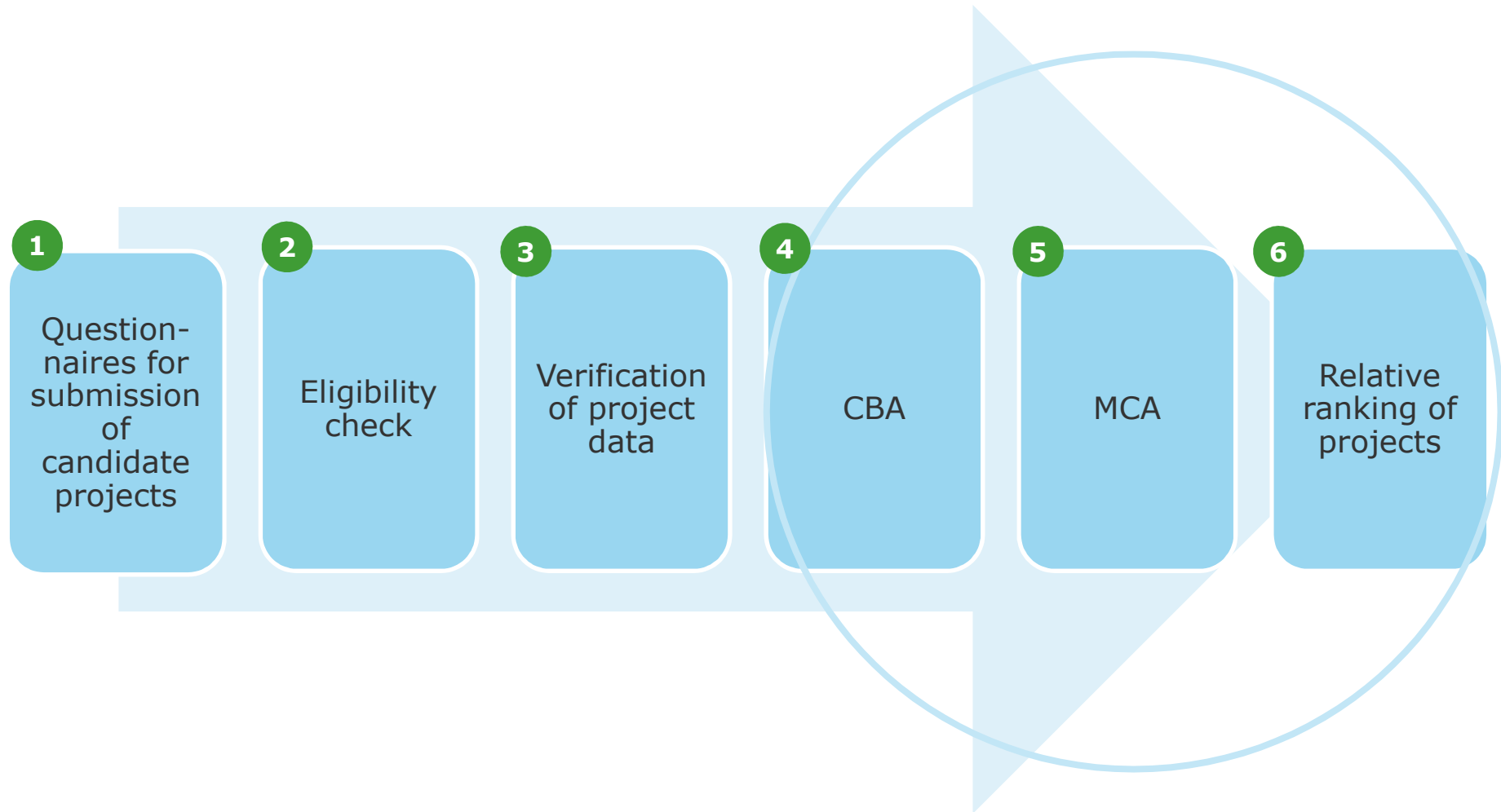


Assessment Methodology

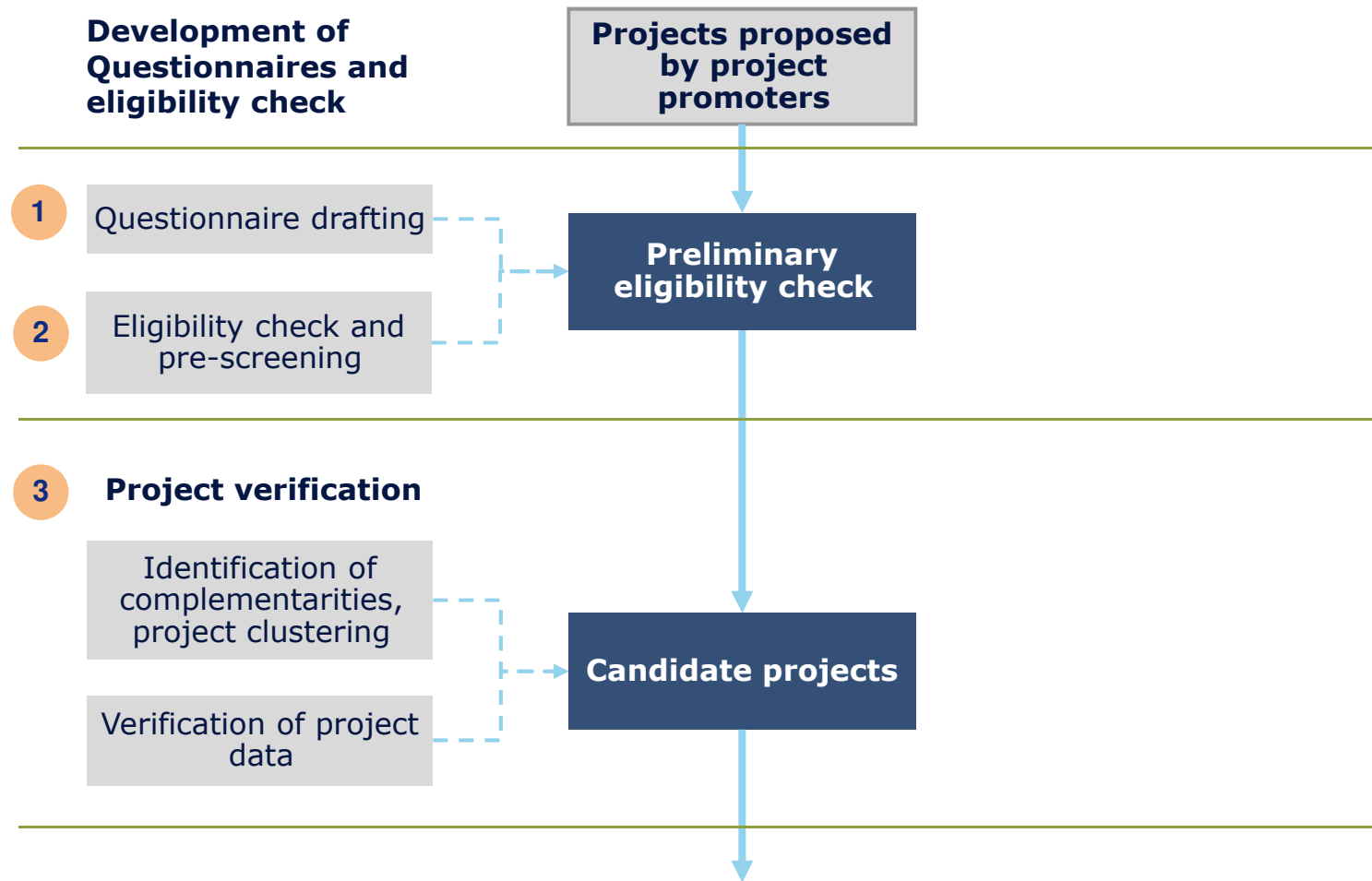
Project Timetable



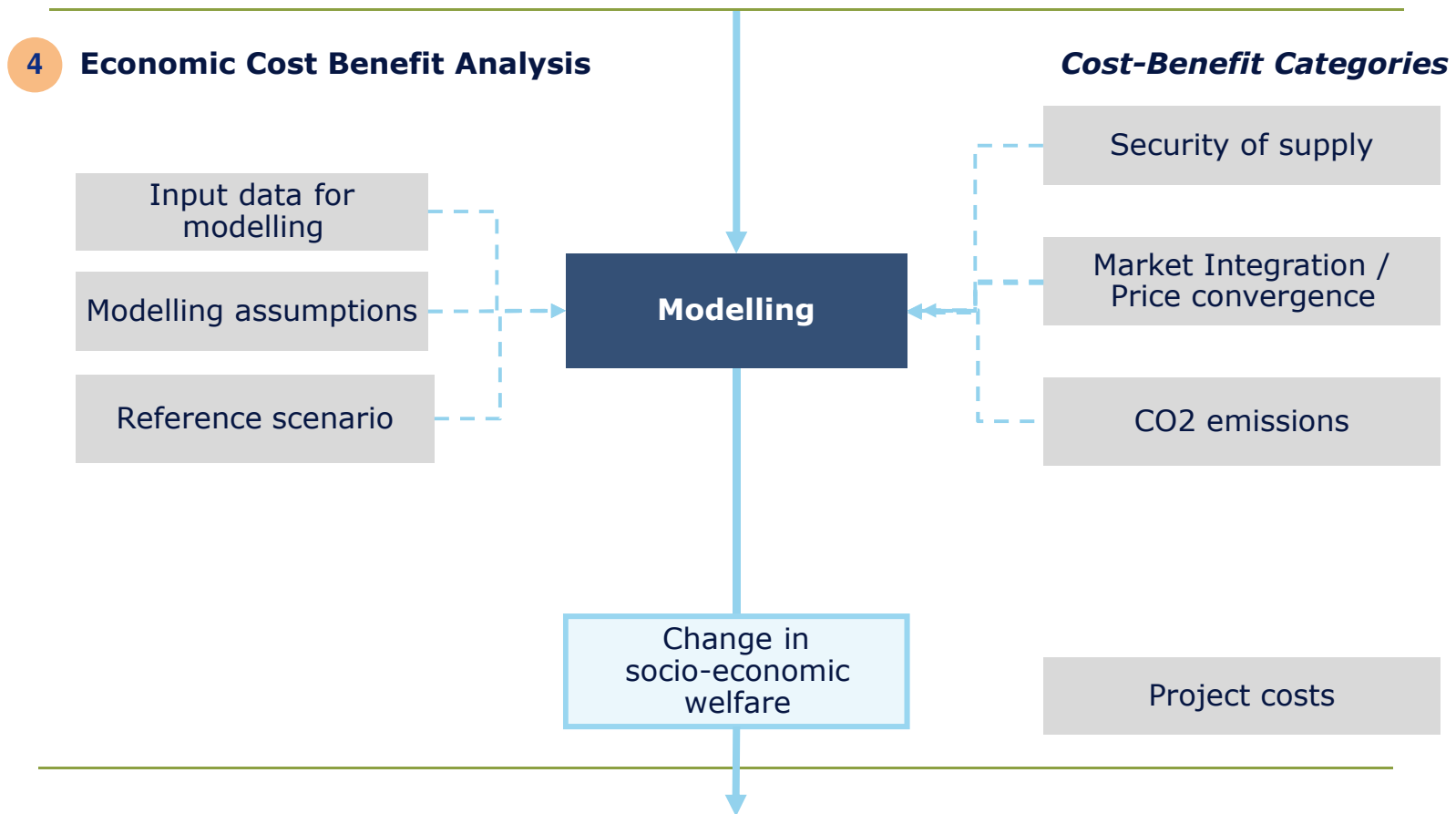
Project Workflow



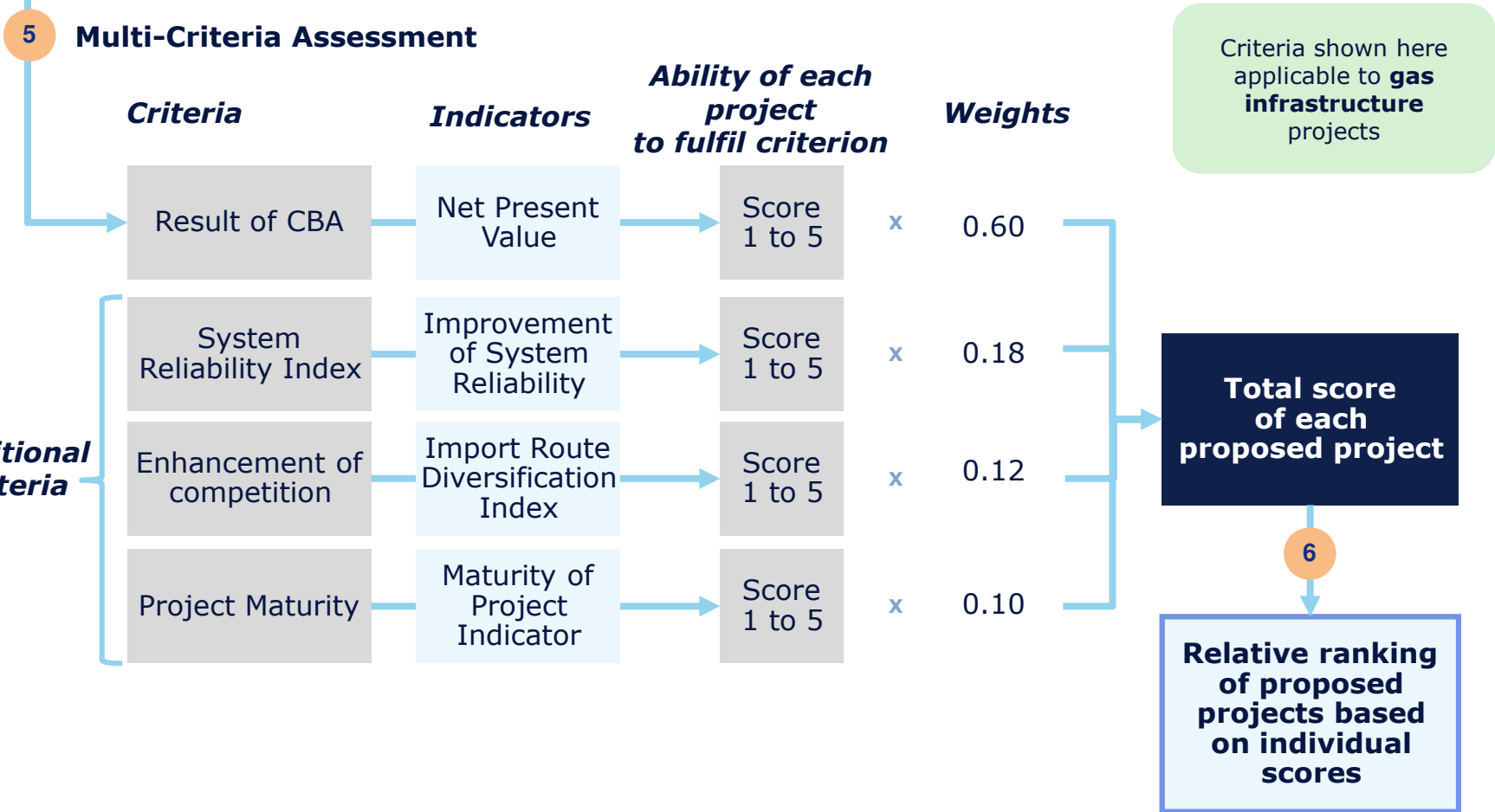
Overview of the Project Assessment Methodology

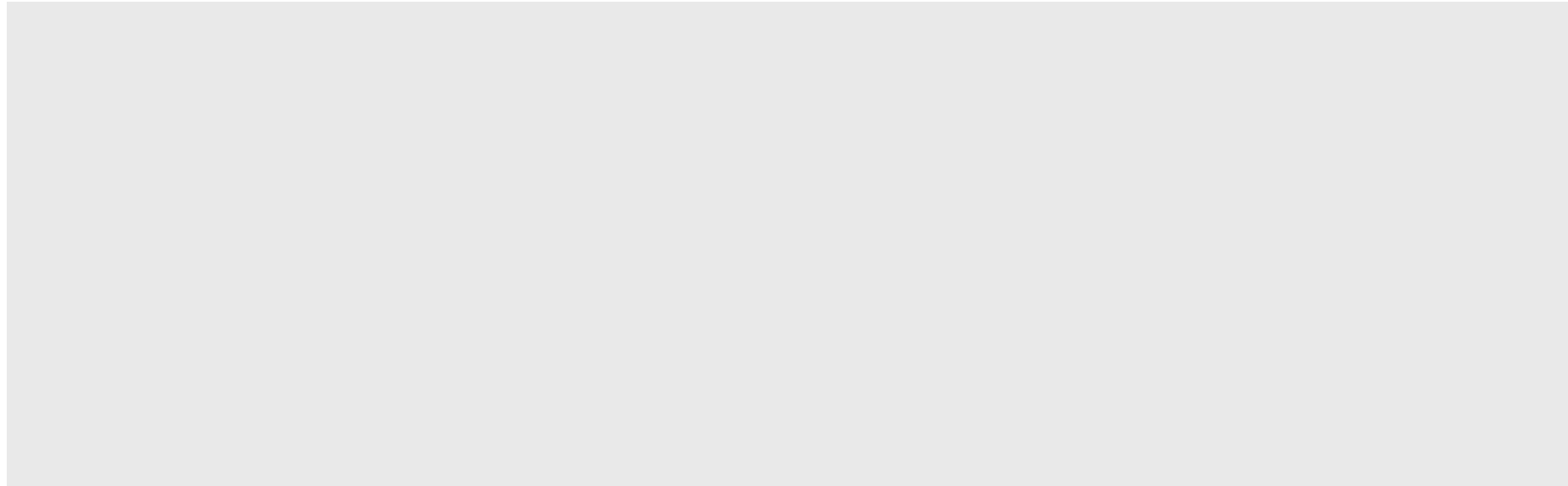


Overview of the Project Assessment Methodology



Overview of the Project Assessment Methodology





Verification of Projects

Projects submitted by categories

	Electricity transmission	Electricity storage	Gas transmission	Gas Storage	LNG	Smart Grid	Oil	Total
Submitted projects	13	0	16	0	1	3	1	34
Eligible projects	12	-	16	-	1	0	1	30
Submitted investment cost	Ca.1200 million €		Ca. 2350 million €				490 million €	Ca.4040 million €

- Out of the 34 submitted projects two electricity and three smart grid projects did not meet the criteria of the adopted Regulation
- All gas projects and the only oil project submitted qualified for further evaluation and data verification.
- Submitted investment CAPEX for all projects: 4000 million €, more than half of it goes to gas infrastructure. CAPEX figure for gas projects were submitted only for parts of the projects, **after including total cost, CAPEX of gas projects went up from 2350 million € to 5610 million €.**

Illustrative location of Submitted Gas Projects



Project code	Project name
GAS_01	Interconnector BiH-HR (Slobodnica-Brod-Zenica)
GAS_02	Interconnector BiH HR (Licka Jesenica-Trzac-Bosanska Krupa)
GAS_03	Interconnector BiH HR (Ploce-Mostar-Sarajevo / Zagvozd-Posusje-Travnik)
GAS_04A	Interconnector Macedonia Bulgaria
GAS_04B	Interconnector Macedonia Greece
GAS_05	Interconnector Macedonia Albania
GAS_07	TESLA project
GAS_08	Interconnector Serbia-Romania
GAS_09	Gas Interconnector Serbia Bulgaria
GAS_10	Gas Interconnector Serbia Croatia
GAS_11	Gas Interconnector Serbia Macedonia
GAS_12	Gas Interconnector Serbia Montenegro (incl. Kosovo)
GAS_13	Albania Kosovo Gas Pipeline (ALKOGAP)
GAS_14	Gas Interconnection Poland Ukraine
GAS_15	Development of the HU to UA firm capacity
GAS_16	Ionian Adriatic Pipeline
GAS_LNG_17	EAGLE LNG and Pipeline

List of modelled gas projects I.

Project code	Project name	Project promoter	From A	To B	Capacity from A to B	Capacity from B to A	Commissioning date
					GWh/day	GWh/day	
GAS_01	Interconnector BiH-HR (Slobodnica-Brod-Zenica)	BHGas Ltd	BA	HR	35	44	2023
GAS_02	Interconnector BiH HR (Licka JesenicaTrzacBosanska Krupa)	BHGas Ltd	BA	HR	0	73	2023
GAS_03	Interconnector BiH HR (Ploce-MostarSarajevo / Zagvozd-Posusje Travnik)	BHGas Ltd	BA	HR	38	73	2021
GAS_04A	Interconnector Macedonia Bulgaria	MER JSC Skopje	BG	MK	63	0	2020
GAS_04B	Interconnector Macedonia Greece	MER JSC Skopje	GR	MK	63	0	2020
GAS_05	Interconnector Macedonia Albania	MER JSC Skopje	MK	AL	56	56	2020
GAS_07	TESLA project	JSC GAMA Skopje	GR	MK	675	675	2020
			MK	RS	640	640	2020
			RS	HU	582	582	2020
			HU	AT	524	524	2020
GAS_08	Interconnector Serbia-Romania	JP Srbijagas	RS	RO	35	35	2020
GAS_09	Gas Interconnector Serbia Bulgaria	JP Srbijagas	BG	RS	39.44	39.44	2019
GAS_10	Gas Interconnector Serbia Croatia	JP Srbijagas	HR	RS	32.8	32.8	2023

List of modelled gas projects II.

Project code	Project name	Project promoter	From A	To B	Capacity from A to B	Capacity from B to A	Commissioning date
					GWh/day	GWh/day	year
GAS_11	Gas Interconnector Serbia Macedonia	JP Srbijagas and MER JSC Skopje	RS	MK	10.4	10.4	2021
GAS_12	Gas Interconnector Serbia Montenegro (incl. Kosovo) - Section Nis (Doljevac) - Pristina	JP Srbijagas	RS	KO*	25.4	25.4	2023
GAS_13	Albania Kosovo Gas Pipeline (ALKOGAP)	Ministry of Energy & Industry of Albania	AL	KO*	53	53	2022
GAS_14	Gas Interconnection Poland Ukraine	GAZSYSTEM S.A.; UKRTRANSGAZ	PL	UA	245	215	2020
GAS_15	Development of the HU to UA firm capacity	UKRTRANSGAZ	HU	UA	178	0	2016
GAS_16	Ionian Adriatic Pipeline	Plinacro	AL	ME	150	150	2021
			ME	HR	150	150	2021
GAS_LNG_17	EAGLE LNG and Pipeline	TransEuropean Energy B.V., Sh.A	AL	IT	300	-	2020
			FSRU	AL	150	-	2020

Verification of Cost Data

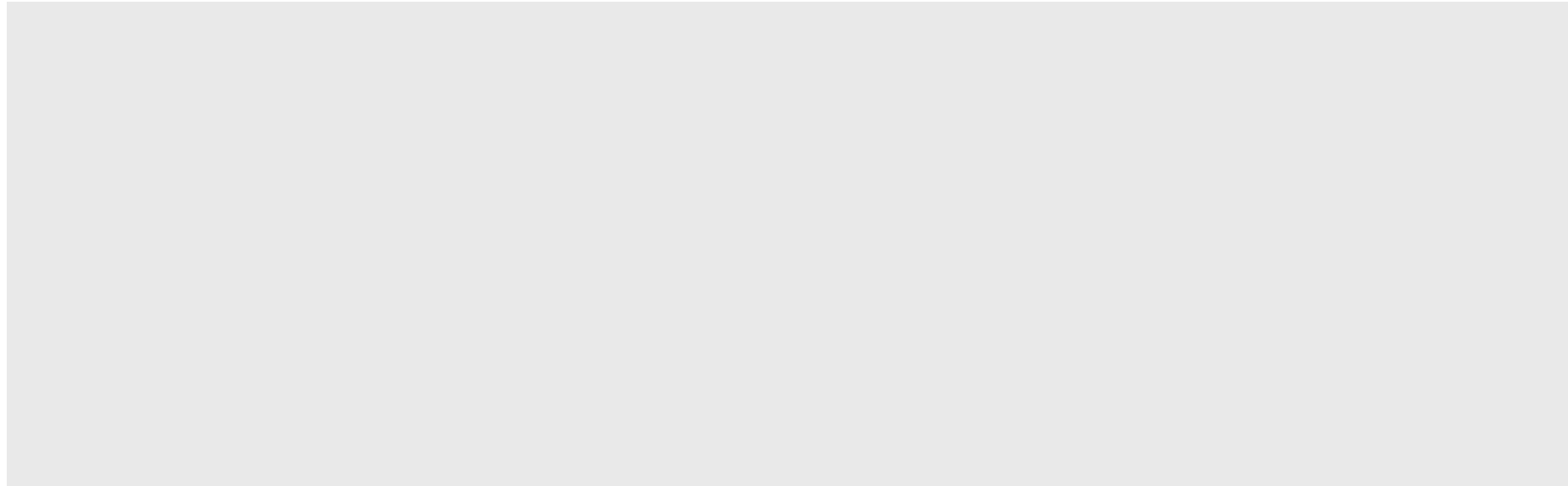
2015 indexed unit investment cost of transmission pipelines commissioned in 2014 (average values)

Pipeline diameter	<16"	16-27"	28-35"	36-47"	48-57"
Average unit cost, real 2015 €/km	643 936	746 801	847 966	1 427 041	2 098 567

Source: ACER

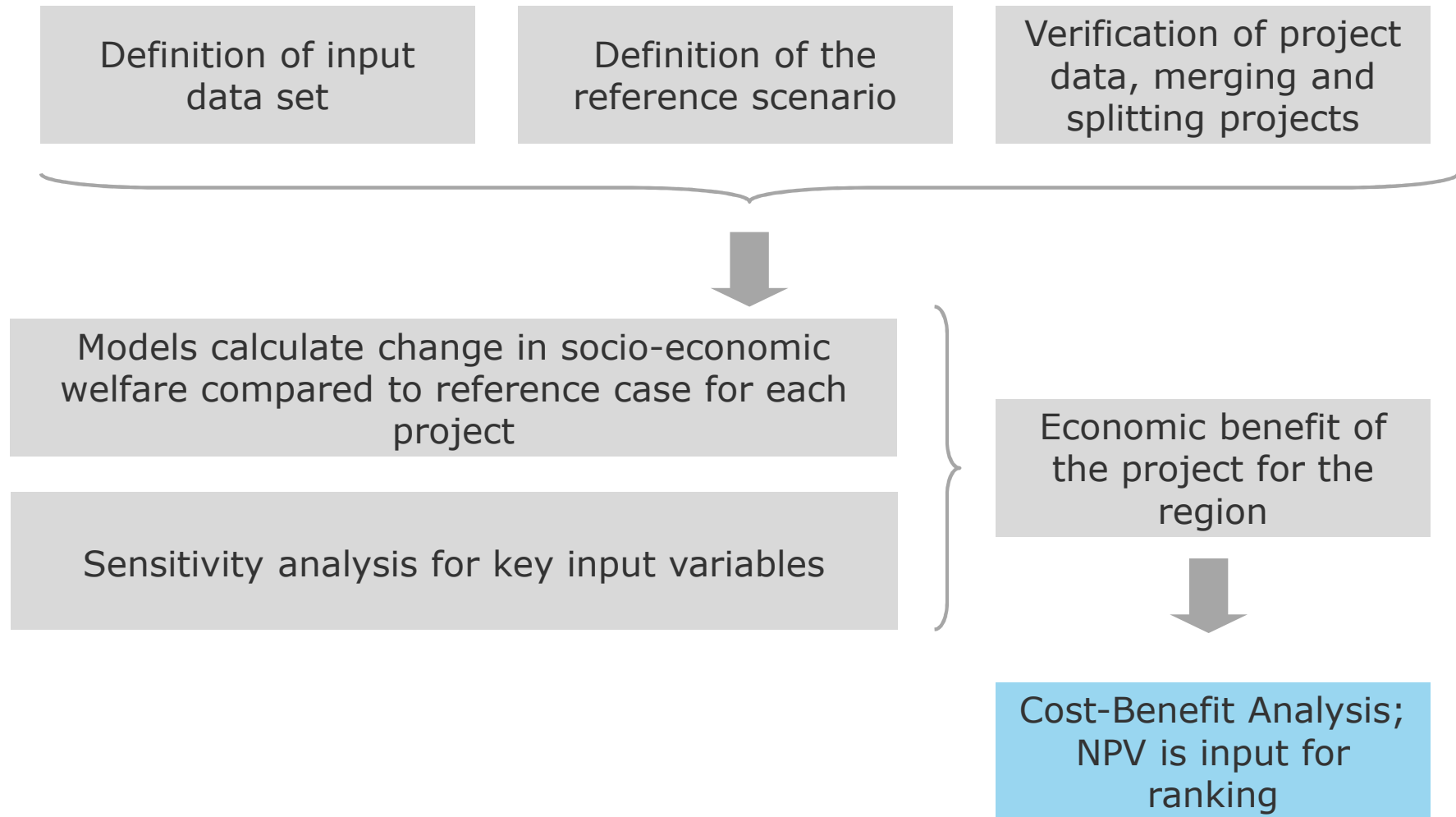
- CAPEX cost for gas projects was cross-checked with ACER's *Report On Unit Investment Cost Indicators And Corresponding Reference Values For Electricity And Gas Infrastructure - Gas Infrastructure Annex* 2015 real € investment cost (€/km)
- Projects that have submitted CAPEX seems generally to be in line with ACER's cost data, some clarifications were needed.
- Some projects failed to provide CAPEX figures. If no CAPEX was provided, ACER report average cost figures were used for project evaluation.

**This was the case for GAS_07 (TESLA),
GAS_08 (RS-RO for the RO part),
GAS_12 (RS-ME) for the part outside RS)**

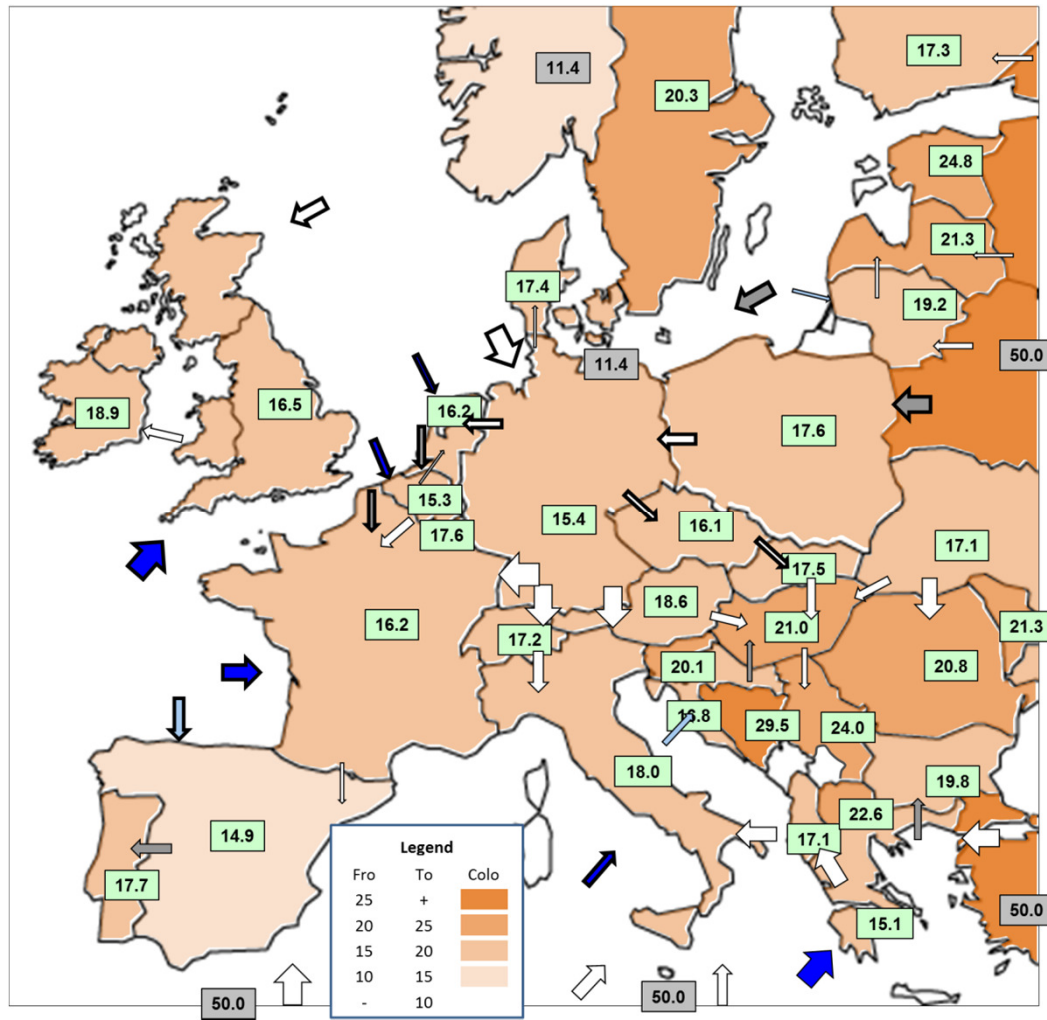


Gas Market Modelling

The process of modelling



European Gas Market Model – Major Characteristics



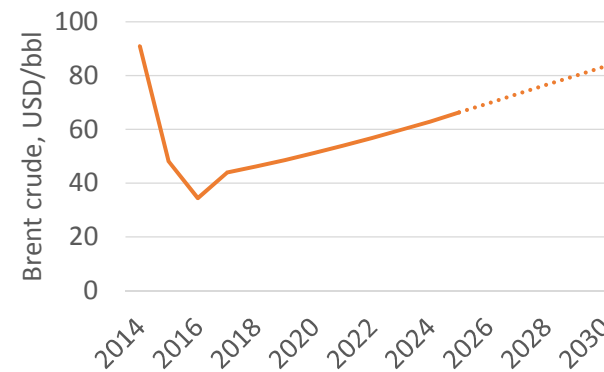
- Whole Europe (35 countries) is modelled
- Competitive prices by countries; price modelled for each 12 months
- Trade is based on long term contracts and spot trade within the EU and with exogenous countries and global LNG market (NO, RU, TR, LNG)
- Natural gas flows and congestions on interconnectors
- Physical constraints are interconnection capacities (transmission tariffs are also included)
- Trade constraints: TOP obligations with flexibility
- Domestic production and storage facilities are included
- Arrows: modelled gas flows
- LNG market representation is linked to Asian LNG prices

Key Modelling Assumptions and Data Sources

	2016-2020	2021-2025	2026-2030	Source
Demand, production	TYNDP 2015	TYNDP 2015 (revised) forecast	TYNDP 2015 (revised) forecast	ENTSO-G TYNDP 2015
Infrastructure (LNG, pipeline, storage)	Existing infrastructure + new projects under construction (PL_LNG)	FID projects based on ENTSO-G TYNDP 2016-2020 + HR_LNG	ES_LNG	ENTSO-G GIE, GSE, GLE ENTSO-G TYNDP 2015
LTC-s	Current prices, Current routes Current ACQs Flexibility of LTCs is uniform (30%), except for energy island countries	LTC prices are adjusted to oil forecast price (according to assumed formula), Russian LTCs do not expire	LTC prices are adjusted to oil forecast price (according to assumed formula)	Publicly available sources (press, Cedigas, Quarterly report) double checked with Commission LTC data
LNG	By 2020 100 bcm LNG enters Europe	By 2025 140 bcm LNG enters Europe	By 2030 140 bcm LNG enters Europe	Bloomberg, expert opinion

Further Modelling Assumptions

- Infrastructure tariffs: TSO/SSO publications
 - We assume tariffs at their actual (2015 December) level
- New infrastructure is modelled with a uniform 2 €/MWh tariff
- Outside market prices are set exogenously
 - Turkish and Algerian markets trade only through long term contracts the 50€/MWh price on the border is the spot trade price (we assume that there is no spot trade)
 - Russian spot gas is allowed in a low quantity (TTF price + 2 €/MWh)
 - Norwegian spot price is set based on TTF price (seasonal fluctuation is also assumed)
 - Oil price forecast is based on World Bank



Source: World Bank Commodities price forecast, 01.20.2016. and for 2025-2030 REKK

Input data for the Energy Community Contracting Parties

Gas demand TWh/year				
	2015	2020	2025	2030
Albania	0	4,9	8.82	11.76
Bosnia	1.66	1.66	8.37	8.92
Kosovo*	0	0	3.92	5.88
Montenegro	0	0	0.26	0.4
Moldova	10	11	12	13
FYR of Macedonia	1.96	6.61	6.85	6.88
Serbia	22	27	30	35
Ukraine	369	368	371	375

Gas production TWh/year				
	2015	2020	2025	2030
Albania	0	0	0	0
Bosnia	0	0	0	0
Kosovo*	0	0	0	0
Montenegro	0	0	0	0
Moldova	0	0	0	0
FYR of Macedonia	0	0	0	0
Serbia	5.43	3.72	2.78	1.9
Ukraine	208.1	222.5	237.0	251.4

Source: ENTSOG, project promoters, REKK

Long term contract with Russia	
TWh/year	ACQ
Albania	0
Bosnia	1.66
Kosovo*	0
Montenegro	0
Moldova	10
FYR of Macedonia	1
Serbia	up to 50
Ukraine	60

Pipeline	From market	To market	Maximum flow	Tariff	
				Entry	Exit
			GWh/d	€/MWh	€/MWh
HU-RS	HU	RS	141	1.06	2.00
RS-BA	RS	BA	16	1.56	2.85
BG-MK	BG	MK	27	1.96	0.90
UA-HU	UA	HU	600	1.25	2.55
HU-UA	HU	UA	0	0.00	0.00
UA-MD	UA	MD	73	2.22	1.95
UA-PL	UA	PL	0	1.28	1.46
PL-UA	PL	UA	45	0.00	0.94
UA-SK	UA	SK	2 288	0.80	2.67
SK-UA	SK	UA	265	0.00	0.63
UA-RO	UA	RO	855	1.45	2.17
RO-MD	RO	MD	67	1.00	1.00
MD-RO	MD	RO	67	1.00	1.00

New Infrastructures in the reference

By 2020

New interconnector		Capacity (GWh/day)
Biriatou	FR-ES	60
	ES-FR	55
Alveringem-Maldegem	FR-BE	270
Griespass-Passo Gries	IT-CH	421
Ellund	DE-DK	40.56
Ruse-Giurgiu	BG-RO	14.38
	RO-BG	14.38

LNG	Country	Capacity (GWh/day)
Revythoussa extension	GR	+80.38
Dunkerque	FR	348
Klaipeda extension	LT	+27.1
Krk Terminal (non FID)	HR	108

By 2025

LNG	Country	Capacity (GWh/day)
Musel	ES	+214

Source: TYNDP 2015

We consider TAP to be a crucial infrastructure in the region

- Many gas projects in the region are dependent on Trans-Atlantic Pipeline. This is why we propose to analyse the projects with having TAP in the reference (2020)

New interconnector		Capacity (GWh/day)
Trans Adriatic pipeline (TAP)	TR-GR	803
	GR-AL	
	AL-IT	
Interconnector Greece Bulgaria (IGB)	GR-BG	90
	BG-GR	

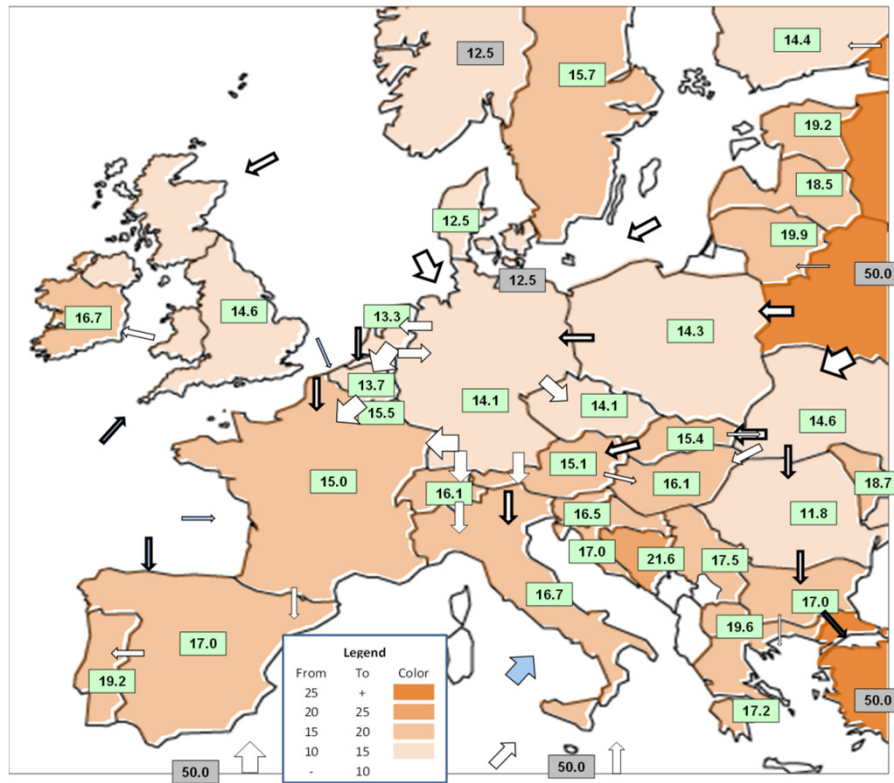
New LTCs	to	ACQ (bcm/year)
SOCAR	Italy	8
	Greece	1
	Bulgaria	1

Assessed Geographical Area – Same for All Project Types

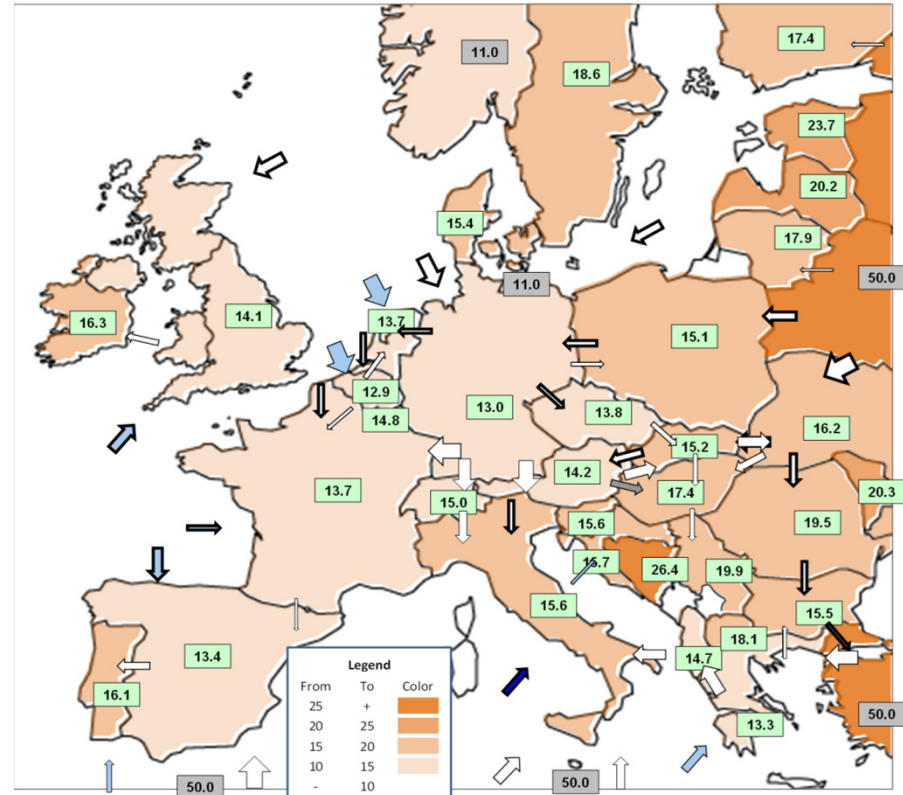
- *Ministerial Council Decision 2015/09/MC-EnC Annex IV./(6)*
 - „The area for the analysis of an individual project shall cover all Contracting Parties and Member States, on whose territory the project shall be built, all directly neighbouring Contracting Parties and Member States and all other Contracting Parties and Member States significantly impacted by the project.”
 - Our proposal for the definition of area for the analysis:
 - All Energy Community Contracting Parties
 - Neighbouring EU Member States (Bulgaria; Croatia; Greece; Hungary; Italy; Poland; Romania, Slovakia)

Model validation for 2016 – reference building for each year until 2030

2016 reference prices (€/MWh)

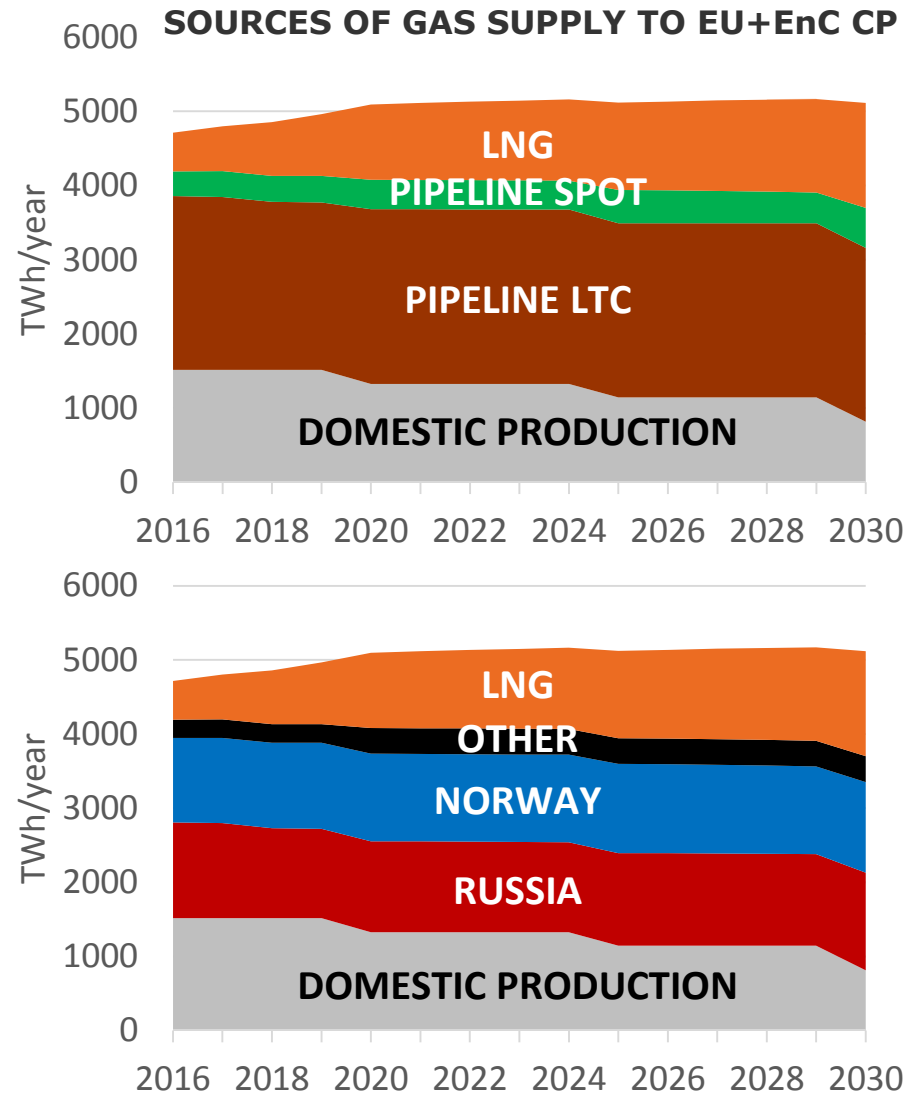


2030 reference prices (€/MWh)



Modelling the European gas market to 2030 – Best estimate scenario

- LNG will play a more pronounced role in the supply mix of Europe:
 - From 500 TWh/year, LNG imports to Europe will rise to 1000 TWh in 2020 and to 1400 TWh in 2030
- Russia will react to the LNG market and keep its market share as a supplier to Europe
 - Russian sales to Europe will remain at the same level through the period, but the share of spot sales will increase
 - Spot sales will target Germany, using the Nord Stream for spot flows
- Domestic production in Europe will drop by nearly 50% to 2030
- Demand in Europe will increase by ~20% from 2016 to 2030



Components of Net Present Value Calculation

- $NPV = 0.95 \cdot \text{Total welfare change (normal)} + 0.05 \cdot \text{Total welfare change (SOS)} - \text{Investment cost} + (\text{CO}_2)$
- Modelled welfare components: $\text{Total welfare change} = \text{CS} + \text{PS} + \text{TSO} + \text{LTC holder} + \text{SSO} + \text{LSO}$
 - CS: Consumer surplus change in the countries of the area of analysis compared to reference
 - PS: Producer surplus change in the countries of the area of analysis
 - TSO, SSO, LSO: Change in profit
 - Change in LTC contract holder's profit
 - Investment cost: verified investment cost
 - CO_2 : Calculated as described in next slide
- When calculation the NPV 25 years of lifetime and a residual value of zero are applied → ACER recommendation
- Values between 2016-2030 are modelled by EGMM yearly; after 2030 values are kept constant → harmonized with ENTSG methodology
- Real social discount rate: 4 % → ENTSG methodology

Estimating the CO₂ emission effect of increased gas consumption

- CO₂ emission effect of increased gas consumption is based on the 2009-2013 energy balances of the EnC Contracting Parties and affected Member States
- Main assumptions of CO₂ vector:
 - Energy consumption of transport and non-energy use of fuels is not considered
 - The country's total energy consumption is kept constant
 - Additional 1 TWh of gas consumption crowds out other fuels in their ratio in the primary energy mix
- Although the effect is negative in most countries as suggested by intuition, in MD and AL additional gas consumption increases CO₂ emissions
- The reason is that additional gas consumption crowds out sources which emit less CO₂

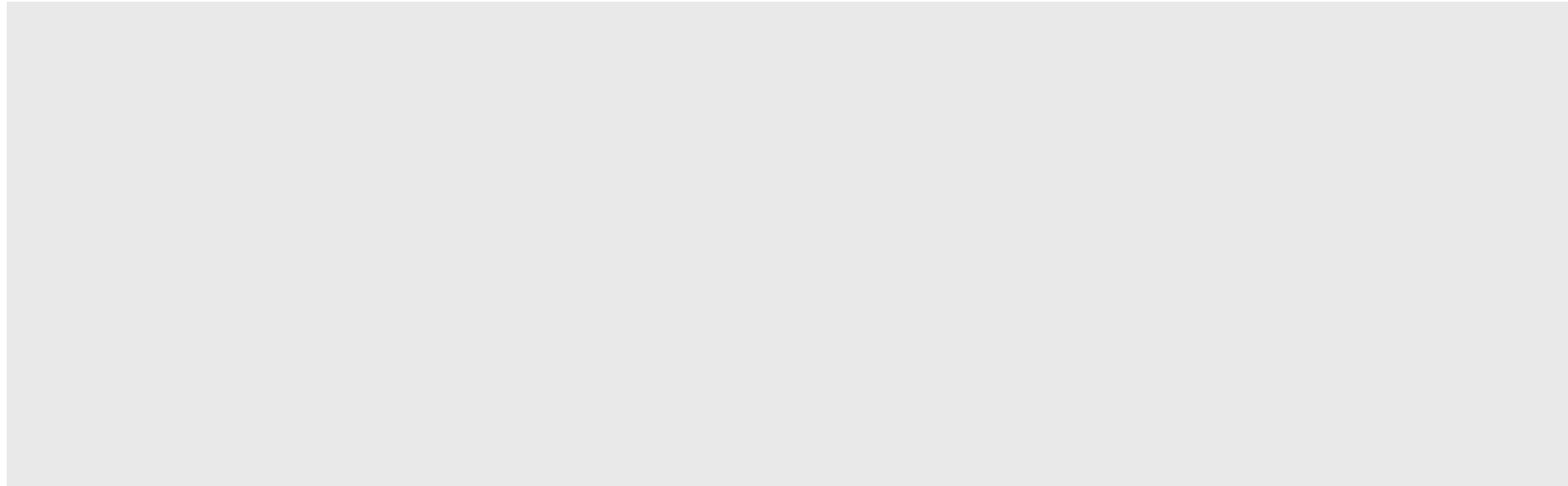
	Δ ktCO₂/TWh
AL	30.8
BA	-93.8
BG	-68.6
GR	-88.0
HR	-30.8
HU	-29.2
IT	-28.8
KO*	-113.6
MD	63.1
ME	-20.6
MK	-98.5
PL	-64.6
RO	-35.4
RS	-88.4
SK	-41.9
UA	-41.0

Year	CO ₂ price, €/t
2016	4.10
2020	9.21
2025	15.61
2030	22.00

TOOT vs. PINT

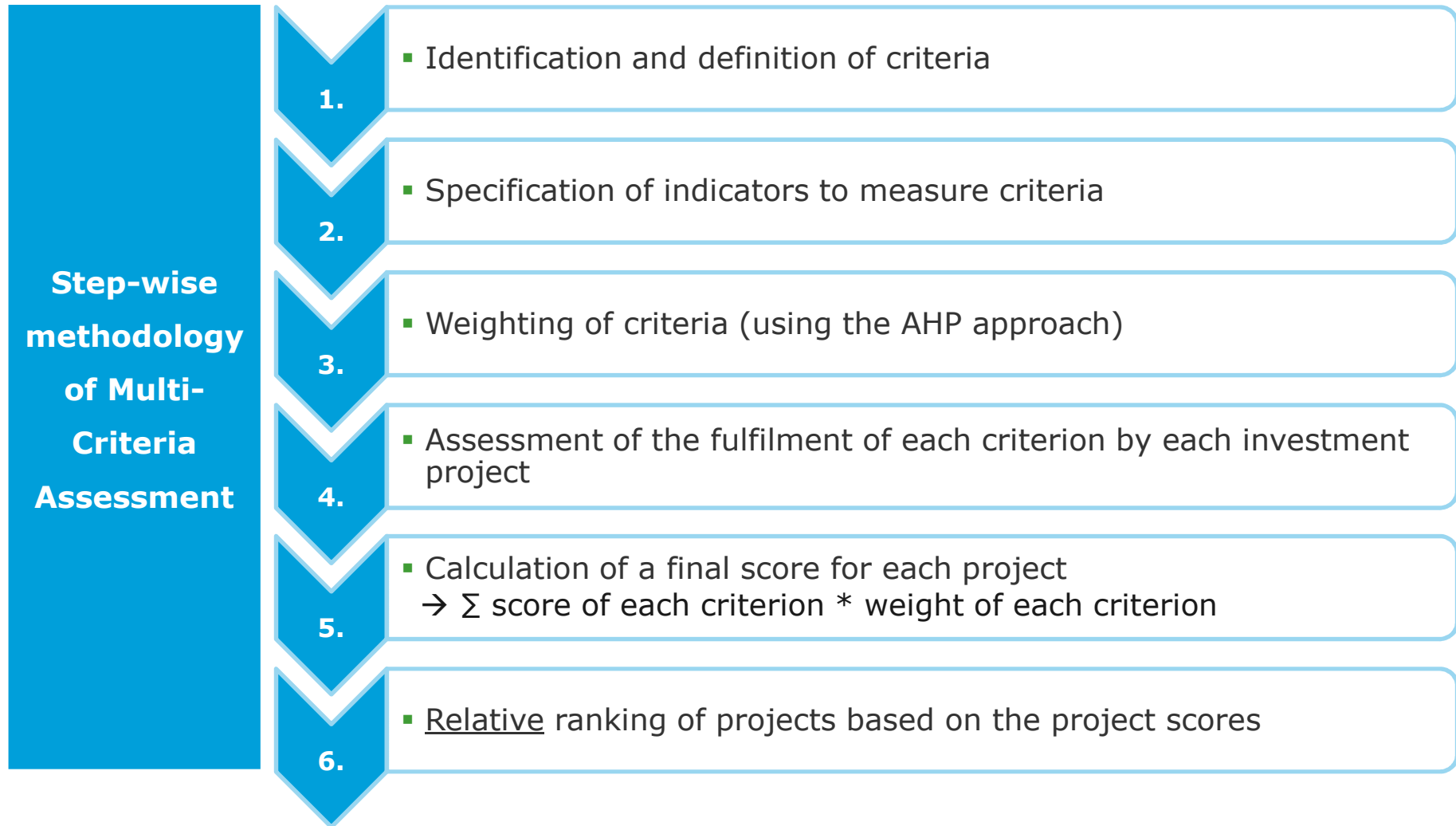
- REF(PINT) scenario includes all infrastructure elements of the current gas infrastructure + FID projects (investments into gas infrastructure is more uncertain/implementations are delayed) + HR LNG
- REF(TOOT) scenario includes all infrastructure elements of Ref (Pint) and all PECE/PMI candidates. From this pool PECE/PMI candidates are taken out one-by-one.
- Calculating the change in welfare/prices the following rules are followed:

	PINT	TOOT
Base scenario	REF(Pint)	REF(Toot)
Assessed scenario	REF(Pint) + assessed project	REF(Toot) - assessed project
Calculating the change of the assessed project	Assessed SC - REF(Pint)	REF(Toot) - Assessed SC



Multi Criteria Assessment

Overview on Multi-Criteria Assessment Methodology



Project Assessment Criteria

1

Change in socio-economic welfare

60%

- *Incremental welfare changes* resulting from individual investment projects are estimated as regards the project's impact on
 - **market integration / price changes**
 - **improvement of security of supply**
 - **reduction of CO2 emissions**
- Calculation of the **economic net-present value (NPV)** discounting the incremental costs and benefits of each investment project back to their present values

2

Enhancement of Competition

12%

- *Incremental enhancement of competition* is calculated as change in the simplified **Import Route Diversification (IRD)** index with and without the individual project as aggregate of the impacts in the countries on each end of interconnector
- The higher the value of the index the higher the market concentration

$$\text{IRD} = \sum \left(\frac{\text{tech. interconnection capacity at each border}}{\text{total system entry capacities}} \right)^2 + \sum \left(\frac{\text{tech. send-out capacity at each LNG terminal}}{\text{total system entry capacities}} \right)^2$$

Project Assessment Criteria

3

Improvement
of System
Reliability

18%

- The incremental *improvement of overall system reliability* with regards to the daily operational flexibility and ability of the system to withstand extreme conditions is calculated as the change of the **System Reliability Index (SRI)** with and without the individual project
- The higher the value of the index the higher the level of system reliability

SRI =

$$\frac{(\text{import capacities} + \text{production} + \text{storage} + \text{LNG}) - \text{single largest infrastructure}}{\text{daily peak demand}}$$

Project Assessment Criteria

4

Progress in
Implement-
ation

10%

- The **Progress in Implementation Index (MPI)** assesses the preliminary implementation potential of each individual project based on information provided in questionnaires:
 - Commissioning = 5 points (maximum score)
 - Construction = 4.63 points
 - Tendering = 4.27 points
 - Final Investment Decision (FID) = 3.90 points
 - Financing Secured = 3.54 points
 - Permitting = 3.18 points
 - Public consultation of Art. 9 = 2.81 points
 - Preliminary investment decision = 2.45 points
 - Market test = 2.09 points
 - Preliminary design studies = 1.72 points
 - Planning approval = 1.36 points
 - Consideration phase or no information provided = 1 point (minimum score)

Calculation and Scoring of Indicators

Calculation of Indicators

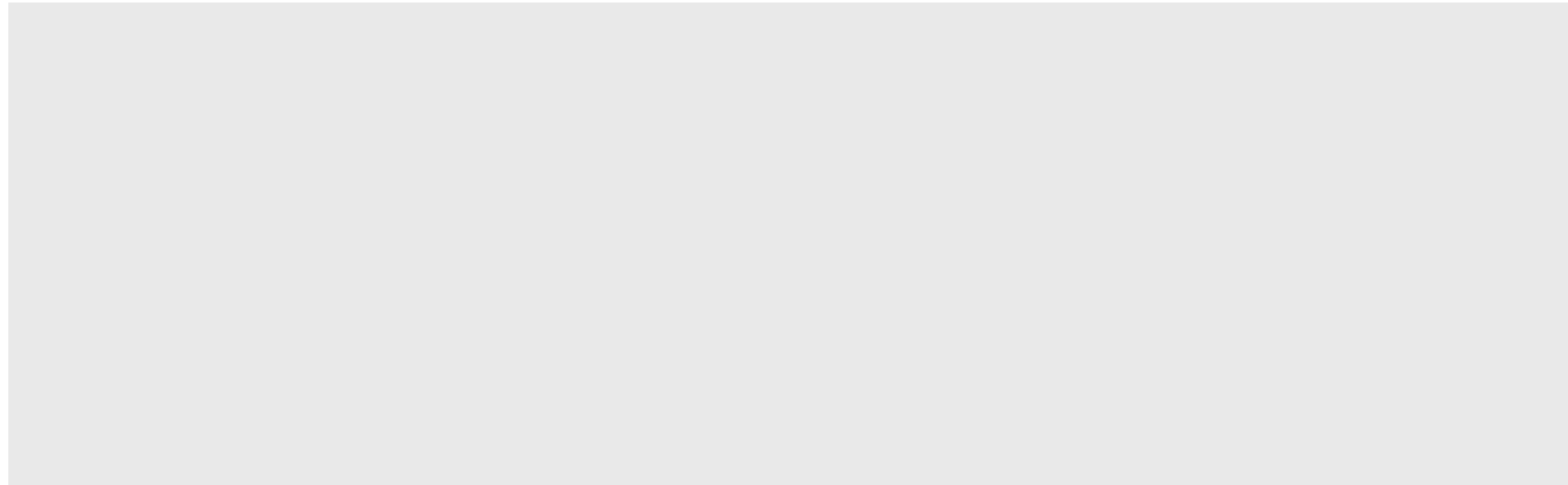
SRI, IRD

- Indices calculated
 - with and without the individual project
 - for the year of commissioning of the project
 - as aggregate of the impacts in the countries on each end of the interconnector

Scoring of Indicators

NPV, SRI, IRD

- Score of 1 and 5 assigned to projects with the smallest and largest change in the indicator respectively
- Scores of projects with changes in-between calculated by linear interpolation between min and max values of the change of the indicator
- Where changes of an individual indicator are significantly larger for one project than for all other projects this project has been treated as an outlier and the interpolation been conducted between all other projects
- Negative NPVs scored with 0
- SRI and IRD for non-gas markets scored with 1 reflecting a dependency on a single interconnection pipeline



Assessment Results

Explanatory Notes on Assessment Results

- Assessment conducted from **overall economic point of view** (impact of each project on *socio-economic welfare*)
- Assessment accounts for **all effected stakeholders in the Contracting Parties** of the Energy Community **and neighbouring EU countries**
- Assessment does not aim to nor can substitute detailed project feasibility studies focusing on the specific details related to every single project
- Environmental impacts of individual projects (e.g. on hydrology, soil, fauna or flora) can only be assessed in a detailed project specific environmental impact assessment, which is outside the scope of this study
- Assessment does not considering criteria only relevant for investor of project, such as the commercial strength / attractiveness of the project (which would also require an evaluation of the specific regulatory framework)
- Objective of assessment: relative ranking of all projects
 - who comply with the requirements of 347/2013 as adopted by the Ministerial Council Decision, and
 - whose **long-term benefits outweigh their costs**

Explanatory Notes on Assessment Results

- Aggregated results presented here estimate regional welfare impact for all stakeholders, with (as agreed) **equal weights on welfare change of all groups of stakeholders** (consumer, producers, TSO)
- **Project specific information** / data has been taken from questionnaires
 - Where no further information could be obtained from project promoters or has been provided to us, the questionnaires have been the general source for project specific data
 - Where provided data has been questionable further verification checks have been conducted, including communication with the project promoters
 - Where data has not been provided assumptions (e.g. on cost data) have been taken
- As a results of the project assessment a **relative ranking** of all eligible projects is provided
 - Scores or ranks do not indicate whether project is beneficial as such, they only provide an indication on whether the realization of other projects would be more or less beneficial than the realization of the specific project
 - Since ranking only shows relative benefit of a project, difference in ranks does not provide any information on the absolute difference of the welfare between two projects
 - Since assessment approaches slightly differ, comparisons of results between electricity and gas cannot be made (e.g. whether electricity projects on rank 1 to 5 are more/less/equally beneficial than gas projects on rank 1 to 5)

Results, projects CBA of the best estimate scenario – PINT (REAL 2016 M€)

Project Code	Project name	Year of Commissioning	Normal Welfare change (m€)	SOS Welfare change (m€)	Total Welfare change (m€) (95%normal +5%SOS)	CO2 benefit (m€)	Total inv. costs (m€)	NPV (m€)
GAS_01	BA-HR	2023	408	405	408	49	XXXX	362
GAS_02	BA-HR	2023	408	405	408	49	XXXX	407
GAS_03	BA-HR	2021	414	415	414	48	XXXX	346
GAS_04A	MK-BG	2020	11	10	11	3	XXXX	-39
GAS_04B	MK-GR	2020	43	52	43	13	XXXX	-51
GAS_05	MK-AL	2020	-146	-153	-146	-2	XXXX	-323
GAS_07	TESLA	2020	609	628	610	117	XXXX	-2617
GAS_08	RS-RO	2020	0	12	1	-1	XXXX	-32
GAS_09	RS-BG	2019	680	614	676	36	XXXX	596
GAS_10	RS-HR	2023	526	479	524	25	XXXX	428
GAS_11	RS-MK	2021	24	32	24	2	XXXX	4
GAS_12	RS-KO*	2023	575	548	574	71	XXXX	576
GAS_13	AL-KO*	2022	653	624	652	85	XXXX	537
GAS_14	PL-UA	2020	641	722	645	49	XXXX	454
GAS_15	HU-UA	2020	0	0	0	0	XXXX	-20
GAS_16	IAP	2021	43	43	43	0	XXXX	-562
GAS_17	EAGLE LNG	2020	0	0	0	0	XXXX	-295

Negative NPV projects marked red score 0 in the MCA

Multi criteria assessment results – Scores and Ranking

Project ID	Project Name	Result of the CBA (NPV)	Improvement of System Reliability (SRI)	Enhancement of Competition (IRD)	Project Maturity (MPI)	Total Score	Rank
		60%	18%	12%	10%		
Gas_09	Gas Interconnector Serbia Bulgaria	5.00	1.18	2.01	1.36	3.59	1
Gas_12	Gas Interconnector Serbia Montenegro (incl. Kosovo) Section Nis (Doljevac) Pristina	4.76	1.00	1.00	1.00	3.26	2
Gas_13	AlbaniaKosovo Gas Pipeline (ALKOGAP)	4.29	1.00	1.00	1.36	3.01	3
Gas_14	Gas Interconnector Poland Ukraine	3.29	1.12	1.29	1.73	2.50	4
Gas_10	Gas Interconnector Serbia Croatia	2.98	1.12	2.29	1.00	2.36	5
Gas_02	Interconnection Pipeline BiH HR (Licka JesenicaTrzacBosanska Krupa)	2.74	1.10	1.73	1.00	2.15	6
Gas_01	Interconnection pipeline BiH-HR (Slobodnica-Brod-Zenica)	2.19	1.17	2.49	1.00	1.93	7
Gas_03	Interconnection Pipeline HR-BiH (Ploce-MostarSarajevo / ZagvozdPosusje Travnik)	2.00	1.20	2.21	1.00	1.78	8
Gas_07	TESLA	0.00	5.00	5.00	1.00	1.60	9
Gas_16	Ionian Adriatic Pipeline	0.00	5.00	2.07	1.73	1.32	10
Gas_17	EAGLE LNG and pipeline	0.00	5.00	2.10	1.00	1.25	11
Gas_11	Gas Interconnector Serbia Macedonia	1.00	1.12	2.53	1.00	1.20	12
Gas_05	Gas Interconnector Macedonia Albania	0.00	3.59	2.61	1.00	1.06	13
Gas_04B	Gas Interconnector Macedonia Greece	0.00	1.44	2.25	1.73	0.70	14
Gas_08	Gas Interconnector Serbia Romania	0.00	1.09	2.03	1.00	0.54	15
Gas_04A	Gas Interconnector Macedonia Bulgaria	0.00	1.14	1.00	1.73	0.50	16
Gas_15	Development of HU to UA firm capacity	0.00	1.00	1.01	1.00	0.40	17

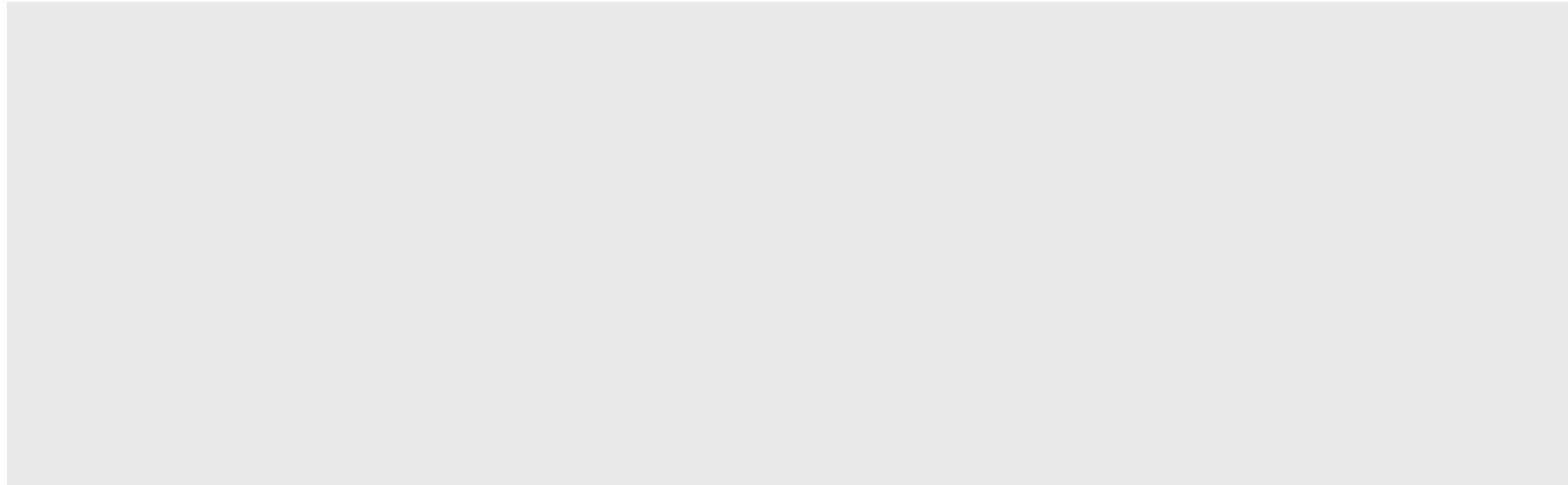
No gas markets in reference case

Multi criteria assessment results – Relative Ranking

Rank	Project ID	Project Name
1	Gas_09	Gas Interconnector Serbia Bulgaria
2	Gas_12	Gas Interconnector Serbia Montenegro (incl. Kosovo) Section Nis (Doljevac) Pristina
3	Gas_13	AlbaniaKosovo Gas Pipeline (ALKOGAP)
4	Gas_14	Gas Interconnector Poland Ukraine
5	Gas_10	Gas Interconnector Serbia Croatia
6	Gas_02	Interconnection Pipeline BiH HR (Licka JesenicaTrzacBosanska Krupa)
7	Gas_01	Interconnection pipeline BiH-HR (Slobodnica-Brod-Zenica)
8	Gas_03	Interconnection Pipeline HR-BiH (PloceMostarSarajevo / ZagvozdPosusje Travnik)
9	Gas_07	TESLA
10	Gas_16	Ionian Adriatic Pipeline
10	Gas_17	EAGLE LNG and pipeline
12	Gas_11	Gas Interconnector Serbia Macedonia
13	Gas_05	Gas Interconnector Macedonia Albania
14	Gas_04B	Gas Interconnector Macedonia Greece
15	Gas_08	Gas Interconnector Serbia Romania
16	Gas_04A	Gas Interconnector Macedonia Bulgaria
17	Gas_15	Development of HU to UA firm capacity

Positive
NPVs

Negative
NPVs



Sensitivity Analysis

Sensitivity scenarios for modelling CBA


- Supply scenarios
 - Flat oil price scenario (Brent crude price set at 2016 level)
 - 10% more supply of LNG to Europe
 - 10% less supply of LNG to Europe
- Demand
 - Constrained demand in EnC contracting parties (-50%)
 - Constrained demand in EnC contracting parties (-25%)
 - 20% lower demand in Europe
 - 10% lower demand in Europe
 - 10% higher demand in Europe
 - 20% higher demand in Europe
- Infrastructure
 - HR LNG is not commissioned
- TOOT

Sensitivity of CBA: Robust results

NPV, M€ 2016	Best estima te	Supply scenarios			Demand scenarios						Infra sc.	TOOT
		Flat oil price	-10% LNG supply	+10% LNG supply	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	with- out HR LNG	
GAS_01	362	363	235	306	32	153	136	155	291	173	-64	-94
GAS_02	407	408	281	352	77	198	182	200	336	218	-18	-49
GAS_03	346	341	216	294	5	129	110	135	279	162	-84	-107
GAS_04A	-39	-38	-39	-39	-46	-42	-44	-42	-39	-40	-39	-53
GAS_04B	-51	-50	-62	-51	-77	-64	-38	-74	-55	-58	-52	-106
GAS_05	-323	-306	-229	-237	-197	-253	-141	-235	-236	-162	-328	-175
GAS_07	-2617	-2837	-2910	-2355	-3267	-3297	-3177	-2917	-2618	-2895	-2261	-3846
GAS_08	-32	-42	-30	-28	-20	-11	-32	-30	-53	-37	-11	35
GAS_09	596	525	379	542	4	248	110	216	539	443	685	-68
GAS_10	428	432	264	232	-59	203	69	108	222	-15	-91	-122
GAS_11	4	-6	-22	28	-32	-12	-19	-23	12	67	61	-22
GAS_12	576	601	532	694	293	434	554	585	621	585	479	-68
GAS_13	537	556	546	695	197	364	541	517	627	690	538	-278
GAS_14	454	-112	-117	608	-186	-219	-233	-111	418	315	585	-65
GAS_15	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20	-20
GAS_16	-562	-560	-562	-553	-582	-573	-560	-562	-557	-553	-507	-561
GAS_17	-295	-295	-295	-266	-295	-295	-295	-295	-261	100	-295	-292

Green cells indicate positive project NPV, red cells negative project NPV

TOOT results

- Utilisation of new infrastructure is on average 10 percentage point below the PINT utilisation results
 - The benefits are lower due to overbuilt infrastructure in TOOT case
 - The same infrastructure is used
- 
- TOOT justifies that negative NPV PINT projects should not be commissioned
 - Second TOOT carried out with only positive PINT NPV projects
 - The projects that are good both in PINT and in TOOT are:
 - GAS_09: Serbia-Bulgaria
 - GAS_14: Poland Ukraine
 - Competing projects are:
 - the three interconnectors between HR and BA GAS_01,02,03,
 - and the ones that target Kosovo*: GAS_12 and GAS_13
 - GAS_09 and GAS_10

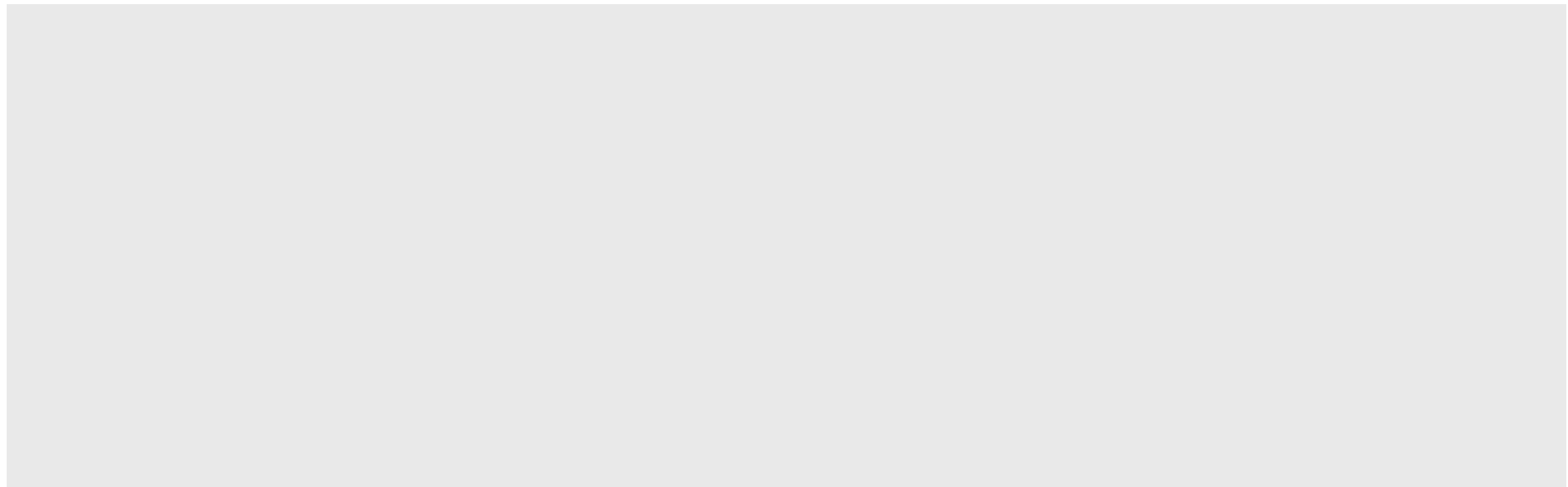
		PINT utilisation	TOOT utilisation
GAS_01	HR-BA	40%	18%
GAS_02	BA-HR	24%	8%
GAS_03	HR-BA	23%	5%
GAS_04A	BG-MK	21%	0%
GAS_04B	GR-MK	23%	27%
GAS_05	AL-MK	24%	0%
GAS_07	GR-MK	8%	3%
GAS_07	MK-RS	6%	3%
GAS_07	RS-HU	0%	0%
GAS_07	HU-AT	0%	0%
GAS_08	RS-RO	0%	28%
GAS_08	RO-RS	8%	0%
GAS_09	RS-BG	2%	0%
GAS_09	BG-RS	91%	34%
GAS_10	HR-RS	100%	0%
GAS_11	MK-RS	27%	26%
GAS_12	RS-KO	43%	0%
GAS_13	AL-KO	24%	23%
GAS_14	PL-UA	22%	9%
GAS_15	HU-UA	0%	0%
GAS_16	AL-ME	1%	1%
GAS_16	HR-ME	0%	0%
GAS_17	AL-IT	0%	0%
GAS_17	AL LNG	0%	0%

Results and ranking – COMPETING PROJECTS marked blue

Rank	Project ID	Project Name
1	Gas_09	Gas Interconnector Serbia Bulgaria
2	Gas_12	Gas Interconnector Serbia Montenegro (incl. Kosovo) Section Nis (Doljevac) Pristina
3	Gas_13	AlbaniaKosovo Gas Pipeline (ALKOGAP)
4	Gas_14	Gas Interconnector Poland Ukraine
5	Gas_10	Gas Interconnector Serbia Croatia
6	Gas_02	Interconnection Pipeline BiH HR (Licka JesenicaTrzacBosanska Krupa)
7	Gas_01	Interconnection pipeline BiH-HR (Slobodnica-Brod-Zenica)
8	Gas_03	Interconnection Pipeline HR-BiH (PloceMostarSarajevo / ZagvozdPosusje Travnik)
9	Gas_07	TESLA
10	Gas_16	Ionian Adriatic Pipeline
10	Gas_17	EAGLE LNG and pipeline
12	Gas_11	Gas Interconnector Serbia Macedonia
13	Gas_05	Gas Interconnector Macedonia Albania
14	Gas_04B	Gas Interconnector Macedonia Greece
15	Gas_08	Gas Interconnector Serbia Romania
16	Gas_04A	Gas Interconnector Macedonia Bulgaria
17	Gas_15	Development of HU to UA firm capacity

Positive NPVs (Ranks 1-8)

Negative NPVs (Ranks 9-17)



Assessment Results for Individual Projects

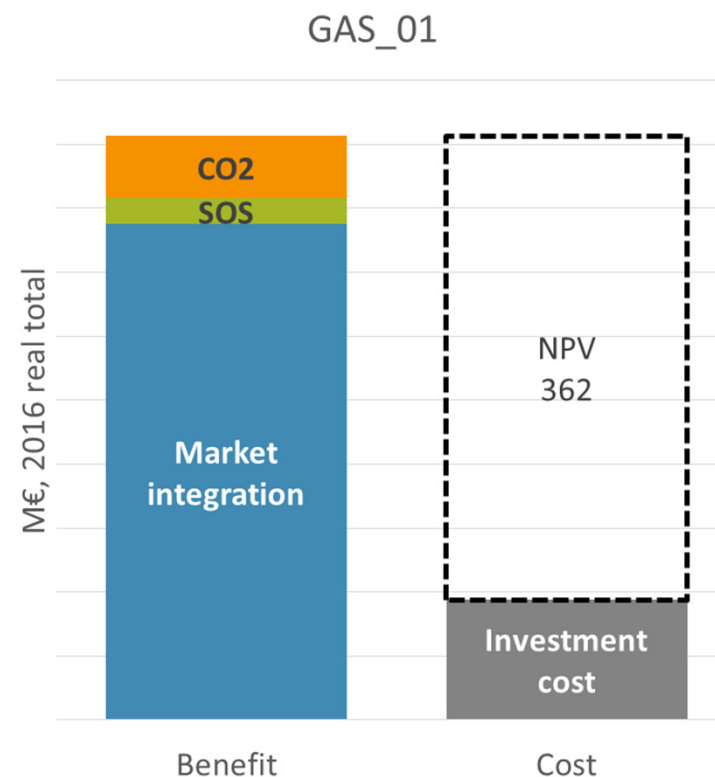
GAS_01: Interconnector BiH-HR (Slobodnica-Brod-Zenica)

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	1	0	0	0	0	0	XXX	0
BA	481	0	-86	-35	360	39	XXX	314
BG	-4	0	3	-1	-2	0	XXX	-2
GR	-5	0	3	2	-1	0	XXX	-1
HR	-6	1	1	269	266	0	XXX	257
HU	87	-3	-58	-101	-75	2	XXX	-73
IT	88	-8	-63	2	19	2	XXX	20
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	-1	0	0	0	-1	0	XXX	-1
MD	3	0	0	0	3	0	XXX	3
PL	6	-1	-3	-1	0	0	XXX	0
RO	40	-24	-1	3	18	1	XXX	19
RS	25	-2	-13	-173	-163	2	XXX	-161
SK	12	0	-16	-34	-39	0	XXX	-38
UA	116	-81	-21	7	22	3	XXX	25
Region	844	-119	-255	-62	408	49	XXX	362

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_01											

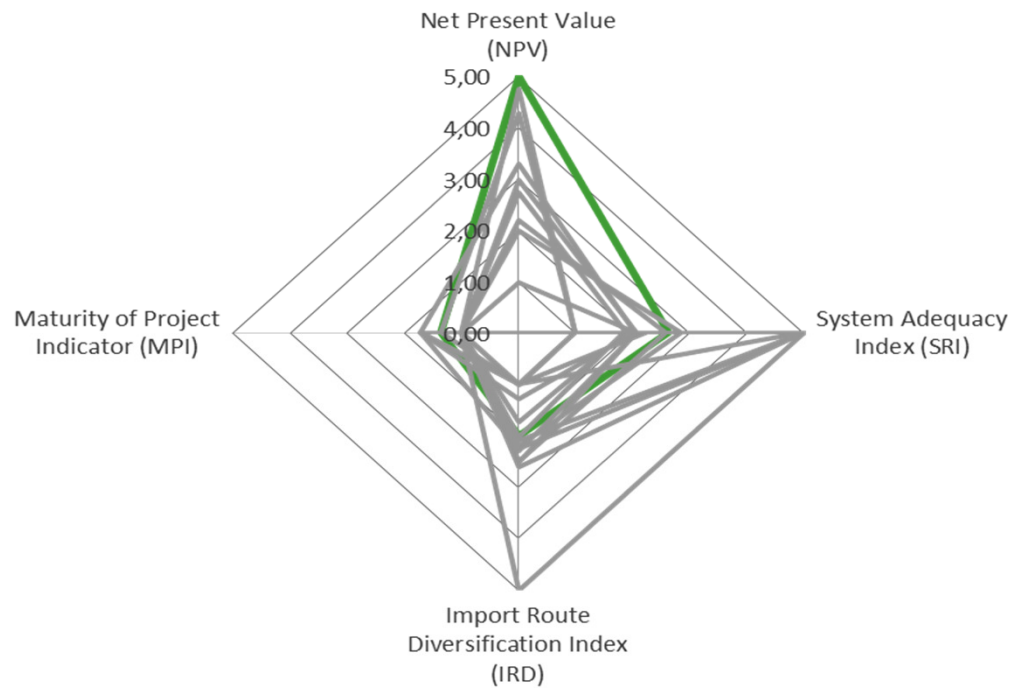
Utilization: from HR to BA 40%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 01	BA	HR	35	44	2023



GAS_01: Interconnector BiH-HR (Slobodnica-Brod-Zenica)

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	2,19	1,17	2,49	1,00	1,93	7
Value	362,20	1,17	-0,52	Consideration phase		



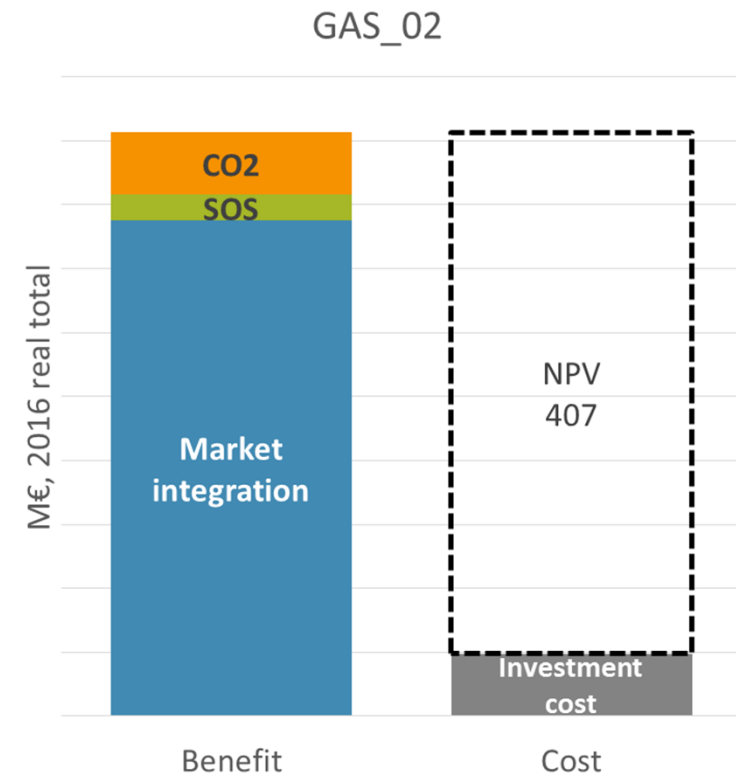
GAS_02: Interconnector BiH HR (Licka JesenicaTrzacBosanska Krupa)

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	1	0	0	0	0	0	XXX	0
BA	481	0	-86	-35	360	39	XXX	366
BG	-4	0	3	-1	-2	0	XXX	-2
GR	-5	0	3	2	-1	0	XXX	-1
HR	-6	1	1	269	266	0	XXX	250
HU	87	-3	-58	-101	-75	2	XXX	-73
IT	88	-8	-63	2	19	2	XXX	20
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	-1	0	0	0	-1	0	XXX	-1
MD	3	0	0	0	3	0	XXX	3
PL	6	-1	-3	-1	0	0	XXX	0
RO	40	-24	-1	3	18	1	XXX	19
RS	25	-2	-13	-173	-163	2	XXX	-161
SK	12	0	-16	-34	-39	0	XXX	-38
UA	116	-81	-21	7	22	3	XXX	25
Region	844	-119	-255	-62	408	49	XXX	407

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_02											

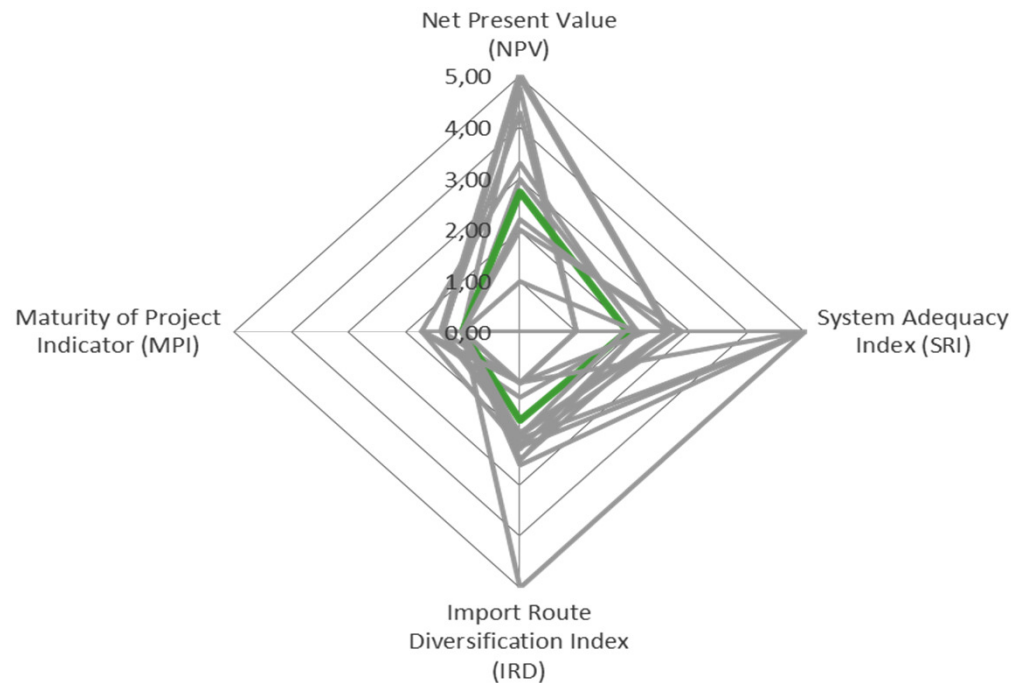
Utilization: from HR to BA 24%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 02	BA	HR	0	73	2023



GAS_02: Interconnector BiH HR (Licka Jesenica Trzac Bosanska Krupa)

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	2,74	1,10	1,73	1,00	2,15	6
Value	407,40	1,10	-0,27		N/A	



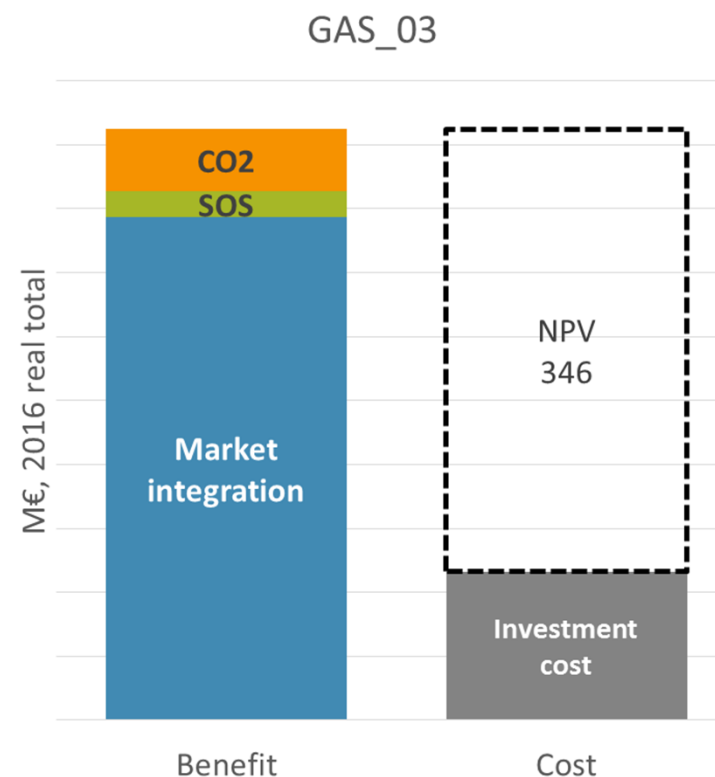
GAS_03: Interconnector BiH HR (PloceMostarSarajevo / Zagvozd Posusje Travnik)

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	1	0	0	0	1	0	XXX	0
BA	490	0	-94	-34	363	39	XXX	302
BG	-4	0	3	-1	-2	0	XXX	-2
GR	-5	0	2	2	-1	0	XXX	-1
HR	-6	1	1	275	272	0	XXX	256
HU	89	-4	-59	-104	-78	2	XXX	-76
IT	93	-9	-67	5	23	2	XXX	24
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	-1	0	0	0	0	0	XXX	-1
MD	3	0	0	0	3	0	XXX	3
PL	7	-2	-4	-1	0	0	XXX	0
RO	39	-23	-1	3	17	1	XXX	18
RS	25	-2	-13	-175	-165	2	XXX	-163
SK	12	0	-16	-36	-40	0	XXX	-39
UA	116	-81	-20	7	22	3	XXX	25
Region	861	-120	-268	-59	414	48	XXX	346

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_03											

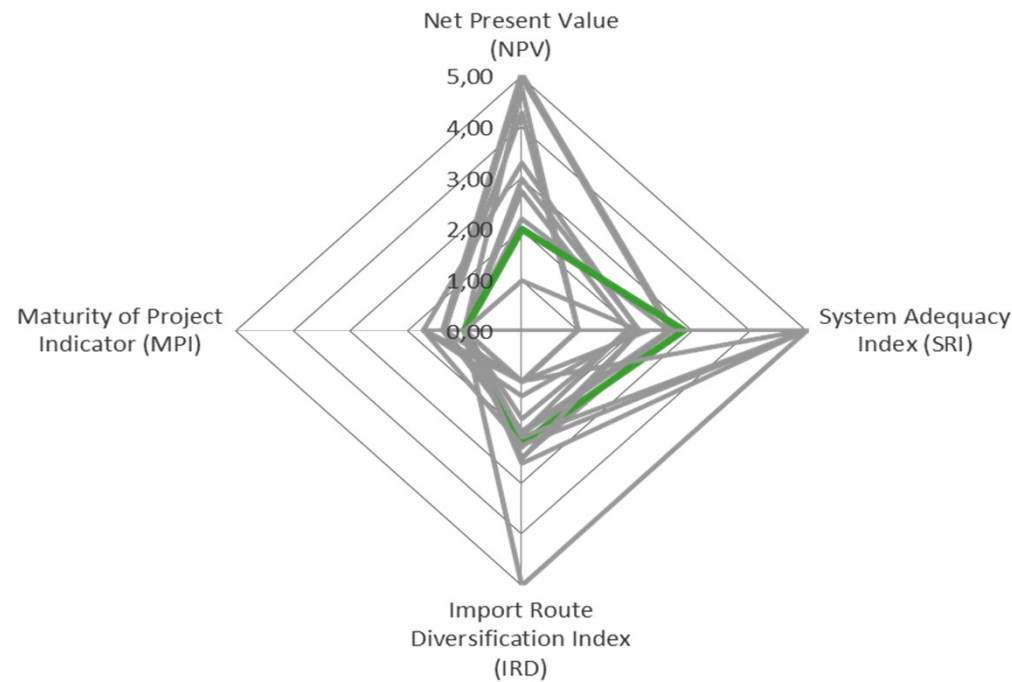
Utilization: from HR to BA 23%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 03	BA	HR	38	73	2021



GAS_03: Interconnector BiH HR (PloceMostarSarajevo / Zagvozd Posusje Travnik)

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	2,00	1,20	2,21	1,00	1,78	8
Value	345,94	1,20	-0,43	Consideration phase		



GAS_04a: Interconnector Macedonia - Bulgaria

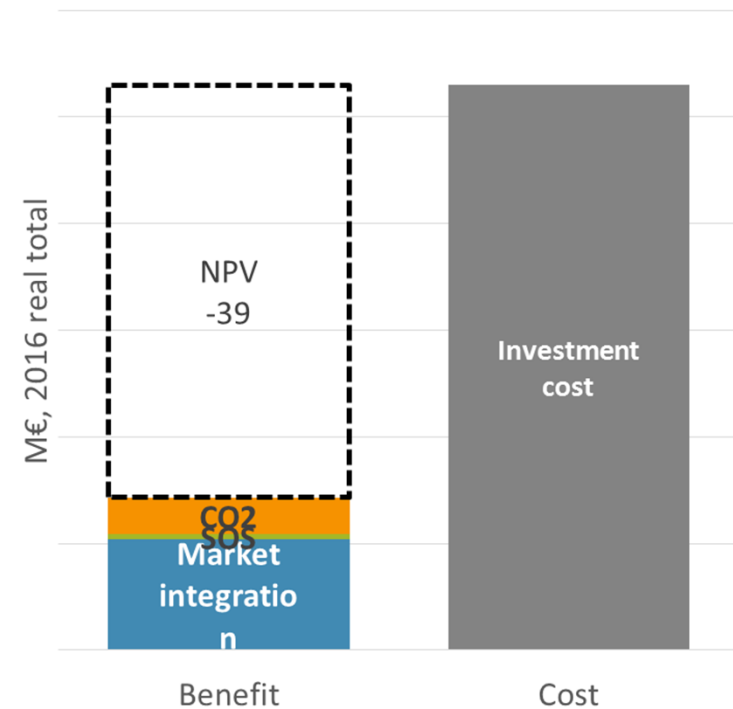
	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	0	0	0	XXX	0
BA	0	0	0	0	0	0	XXX	0
BG	-1	0	1	9	9	0	XXX	-31
GR	0	0	0	6	6	0	XXX	6
HR	0	0	0	0	0	0	XXX	0
HU	0	0	0	0	0	0	XXX	0
IT	-2	0	1	0	0	0	XXX	0
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	56	0	-11	-48	-3	4	XXX	-12
MD	0	0	0	0	0	0	XXX	0
PL	0	0	0	0	0	0	XXX	0
RO	0	0	0	0	0	0	XXX	0
RS	0	0	0	0	0	0	XXX	0
SK	0	0	0	0	0	0	XXX	0
UA	-1	0	0	0	0	0	XXX	0
Region	51	1	-8	-33	11	3	XXX	-39

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_04a											

Utilization: from BG to MK 21%

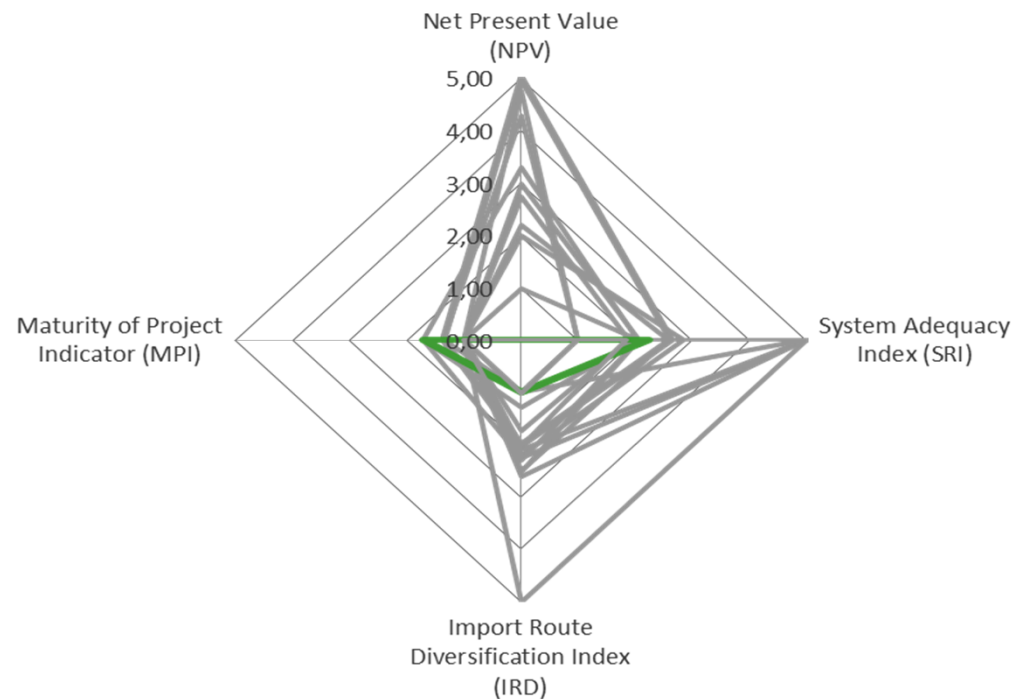
Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 04a	BG	MK	63	0	2020

GAS_04A



GAS_04a: Interconnector Macedonia - Bulgaria

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	0,00	1,14	1,00	1,73	0,50	16
Value	-38,70	1,14	-0,03	Preliminary design studies		



GAS_04b: Interconnector Macedonia - Greece

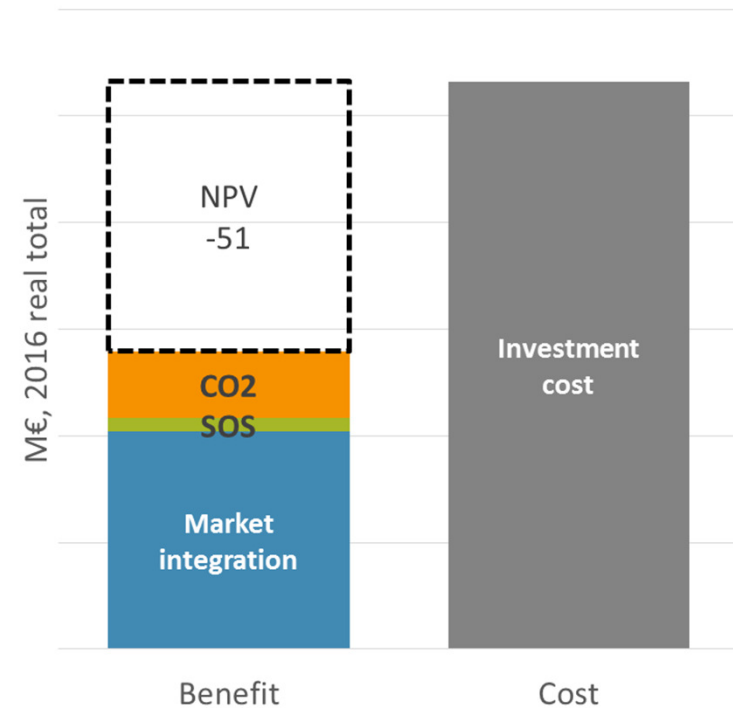
	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	0	-1	0	XXX	-1
BA	0	0	0	0	0	0	XXX	0
BG	17	0	-18	-87	-88	1	XXX	-87
GR	-3	0	1	18	15	0	XXX	-34
HR	0	0	0	1	0	0	XXX	0
HU	0	0	0	0	0	0	XXX	0
IT	4	0	-3	2	2	0	XXX	3
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	194	0	-37	-44	113	12	XXX	68
MD	0	0	0	0	0	0	XXX	0
PL	0	0	0	0	0	0	XXX	0
RO	1	-1	0	1	1	0	XXX	1
RS	0	0	0	0	0	0	XXX	0
SK	0	0	0	0	0	0	XXX	0
UA	3	-2	-1	0	0	0	XXX	0
Region	216	-3	-59	-111	43	13	XXX	-51

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_04b											

Utilization: from GR to MK 23%

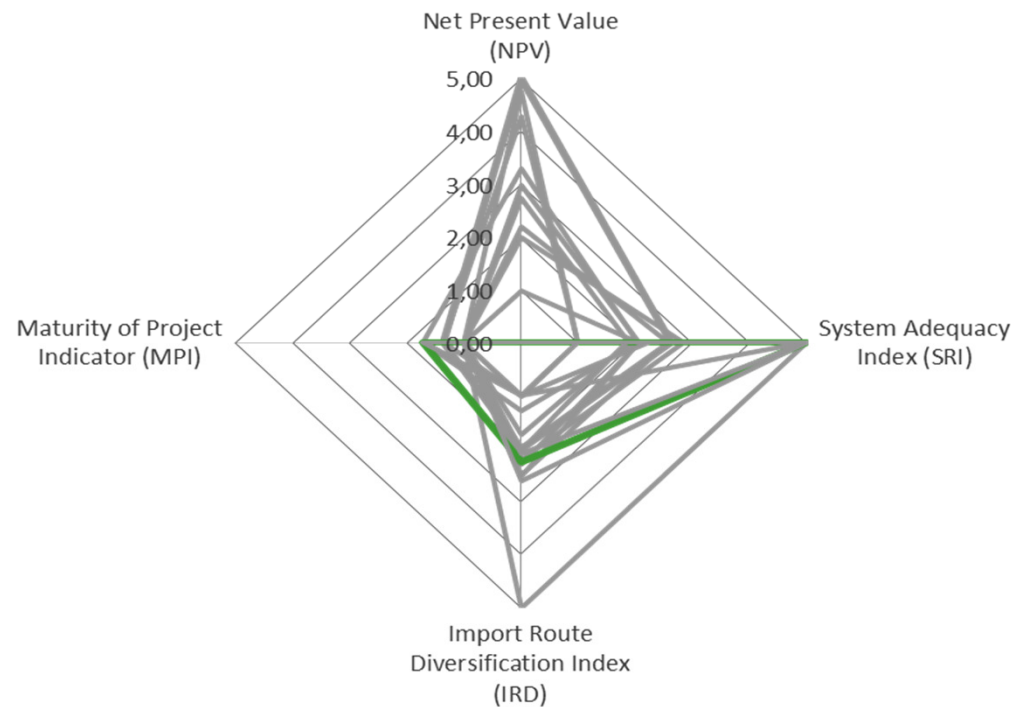
Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 04b	GR	MK	63	0	2020

GAS_04B



GAS_04b: Interconnector Macedonia - Greece

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	0,00	1,44	2,25	1,73	0,70	14
Value	-50,62	1,44	-0,44	Preliminary design studies		



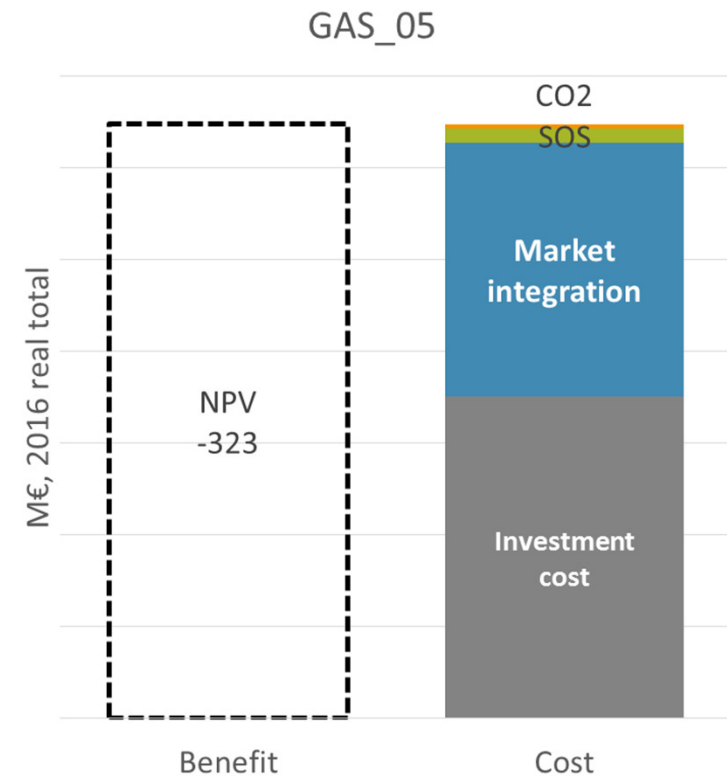
GAS_05: Interconnector Macedonia - Albania

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	-4	0	0	69	66	0	XXX	-74
BA	0	0	0	0	0	0	XXX	0
BG	18	0	-18	-87	-87	1	XXX	-86
GR	-1	0	0	-91	-92	0	XXX	-92
HR	0	0	1	-1	1	0	XXX	1
HU	-7	1	5	-2	-3	0	XXX	-4
IT	-345	32	251	21	-40	-6	XXX	-47
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	88	0	-16	-47	24	5	XXX	-5
MD	-1	0	0	0	-1	0	XXX	-1
PL	-12	3	7	0	-2	0	XXX	-2
RO	-10	7	0	1	-2	0	XXX	-2
RS	-2	0	1	0	-1	0	XXX	-1
SK	-7	0	6	-1	-1	0	XXX	-2
UA	-44	30	6	1	-7	-1	XXX	-8
Region	-326	73	243	-136	-146	-2	XXX	-323

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_05											

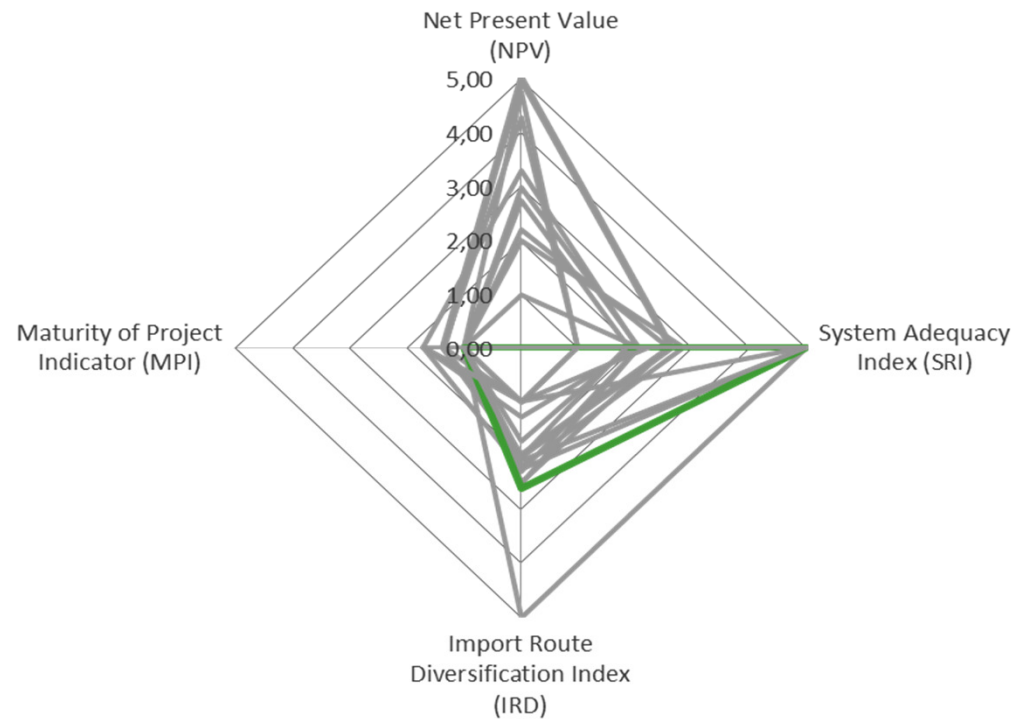
Utilization: from AL to MK 24%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 05	MK	AL	56	56	2020



GAS_05: Interconnector Macedonia - Albania

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	0,00	3,59	2,61	1,00	1,06	13
Value	-323,43	3,59	-0,56		N/A	



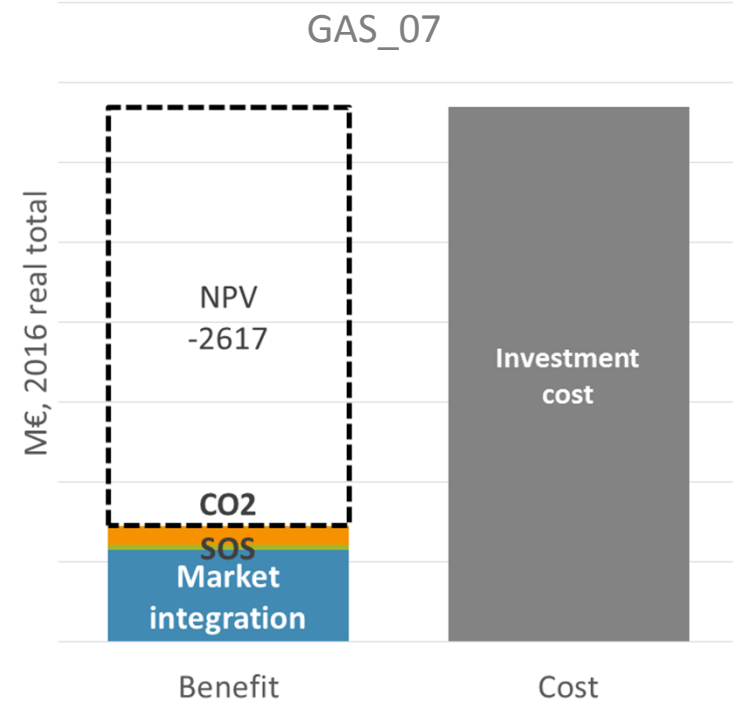
GAS_07: Macedonian part of TESLA project

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	-1	-1	0	XXX	-1
BA	24	0	-10	39	53	1	XXX	54
BG	3	0	-7	-98	-101	0	XXX	-101
GR	-21	0	8	470	457	-1	XXX	-544
HR	-6	2	0	-76	-80	0	XXX	-80
HU	1027	-57	-639	-275	56	19	XXX	-610
IT	77	-7	-58	-35	-23	3	XXX	-20
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	192	0	-37	213	368	12	XXX	-36
MD	38	0	-2	3	39	-2	XXX	37
PL	-2	-1	7	-30	-26	0	XXX	-26
RO	340	-218	-13	15	124	9	XXX	132
RS	730	-72	-349	38	348	45	XXX	-852
SK	-19	0	58	-648	-609	0	XXX	-609
UA	1355	-912	-225	-211	7	32	XXX	39
Region	3738	-1264	-1266	-598	610	117	XXX	-2617

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_07											

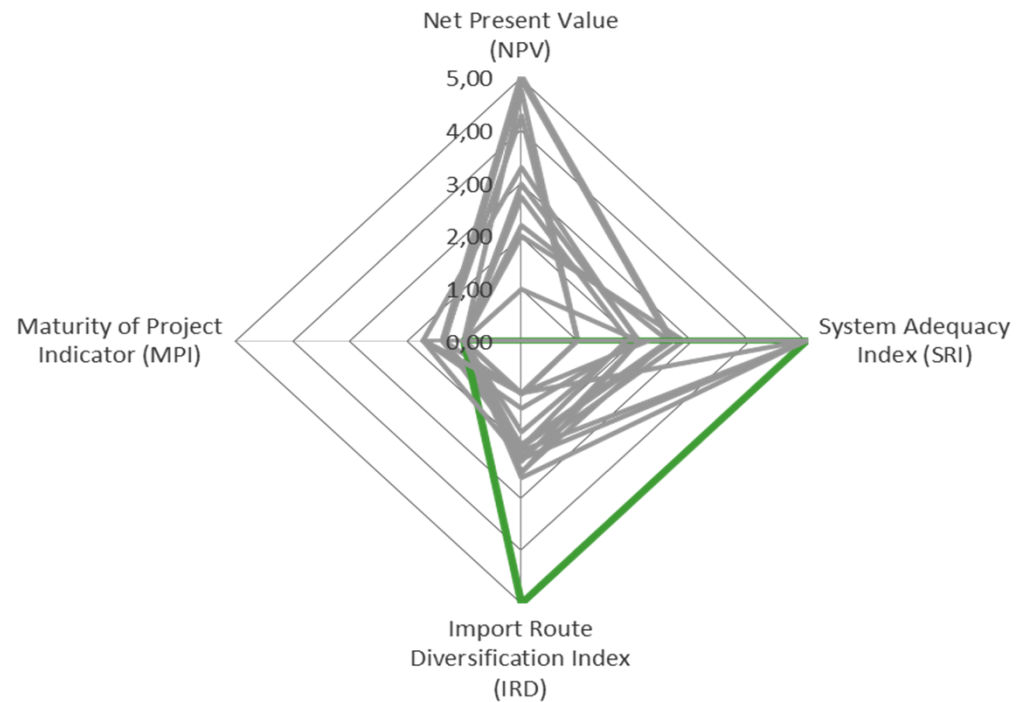
Utilization: from GR to MK: 8%,
from MK to RS 6%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 07	GR	MK	675	675	2020
	MK	RS	640	640	2020
	RS	HU	582	582	2020
	HU	AT	524	524	2020



GAS_07: Macedonian part of TESLA project

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
	0,00	5,00	5,00	1,00	1,60	9
	-2617,23	5,00	-1,34		N/A	



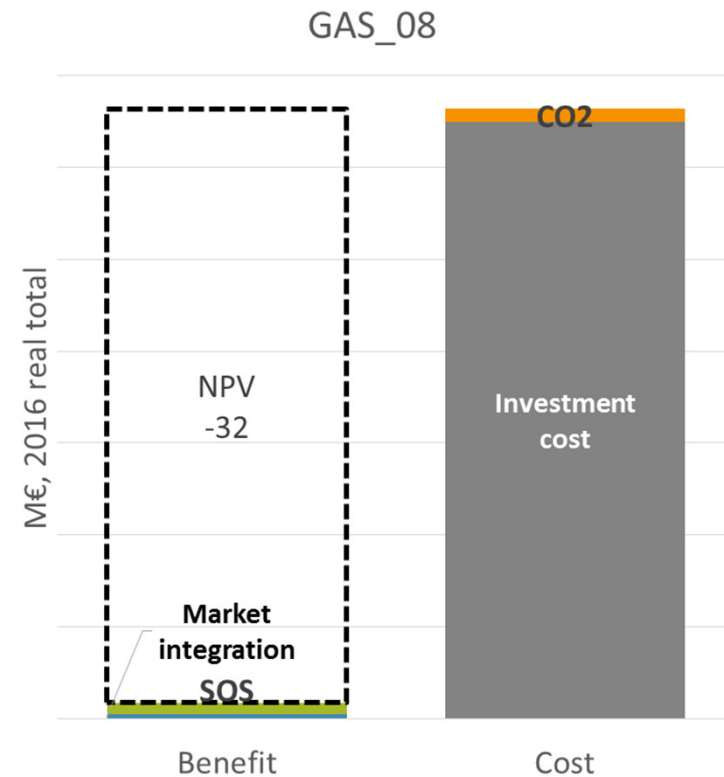
GAS_08: Interconnector Serbia-Romania

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	0	0	0	XXX	0
BA	1	0	-1	0	1	0	XXX	1
BG	0	0	0	4	4	0	XXX	4
GR	0	0	0	4	4	0	XXX	4
HR	0	0	0	0	0	0	XXX	0
HU	22	-2	-14	-35	-29	0	XXX	-28
IT	49	-5	-34	-1	9	1	XXX	9
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	0	0	0	0	0	0	XXX	0
MD	0	0	0	0	0	0	XXX	0
PL	5	-1	-3	1	1	0	XXX	1
RO	-139	132	6	-3	-3	-2	XXX	-35
RS	13	-2	-7	-5	-1	1	XXX	-3
SK	2	0	-1	-6	-5	0	XXX	-5
UA	-15	10	4	22	20	0	XXX	20
Region	-61	131	-51	-19	1	-1	XXX	-32

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_08											

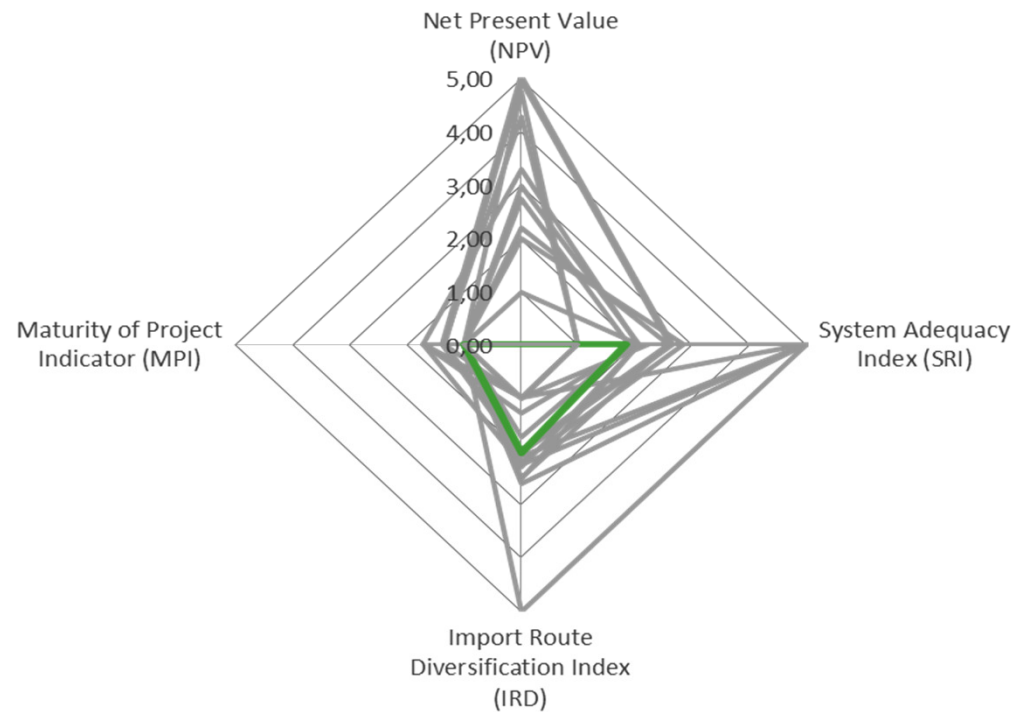
Utilization: from RO to RS 8%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 08	RS	RO	35	35	2020



GAS_08: Interconnector Serbia-Romania

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	0,00	1,09	2,03	1,00	0,54	15
Value	-32,33	1,09	-0,37	Consideration phase		



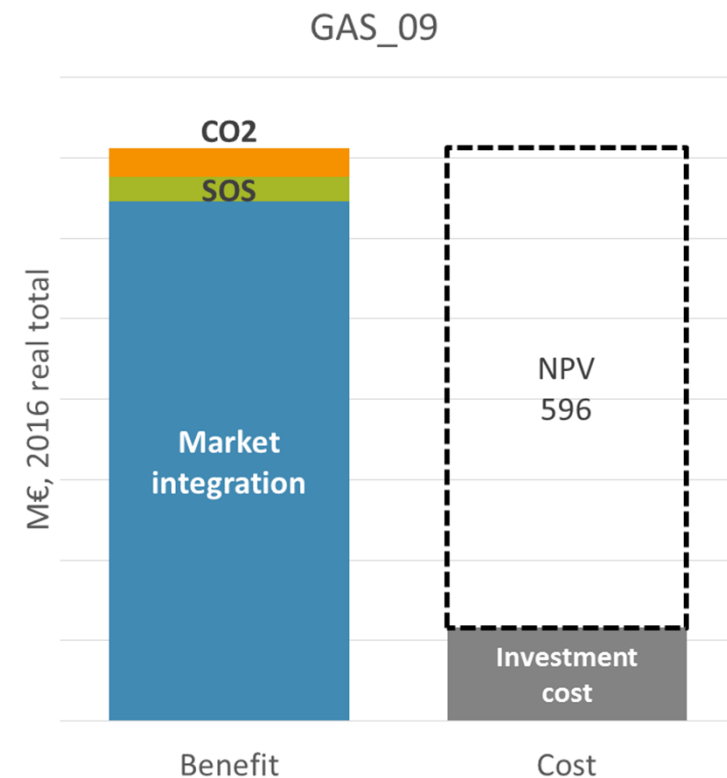
GAS_09: Gas Interconnector Serbia Bulgaria

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	1	0	0	0	1	0	XXX	1
BA	18	0	-8	11	20	1	XXX	21
BG	68	-2	-72	364	358	1	XXX	313
GR	-9	0	5	432	428	0	XXX	428
HR	-4	1	-1	-45	-48	0	XXX	-48
HU	218	-11	-143	-359	-294	4	XXX	-290
IT	263	-24	-189	-3	47	4	XXX	51
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	7	0	-4	1	4	0	XXX	5
MD	7	0	0	1	7	0	XXX	7
PL	35	-9	-20	-1	4	1	XXX	5
RO	93	-57	-3	4	36	2	XXX	39
RS	273	-34	-147	102	193	14	XXX	138
SK	33	0	-41	-125	-132	1	XXX	-131
UA	229	-164	-38	24	52	7	XXX	59
Region	1232	-300	-662	407	676	36	XXX	596

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_09											

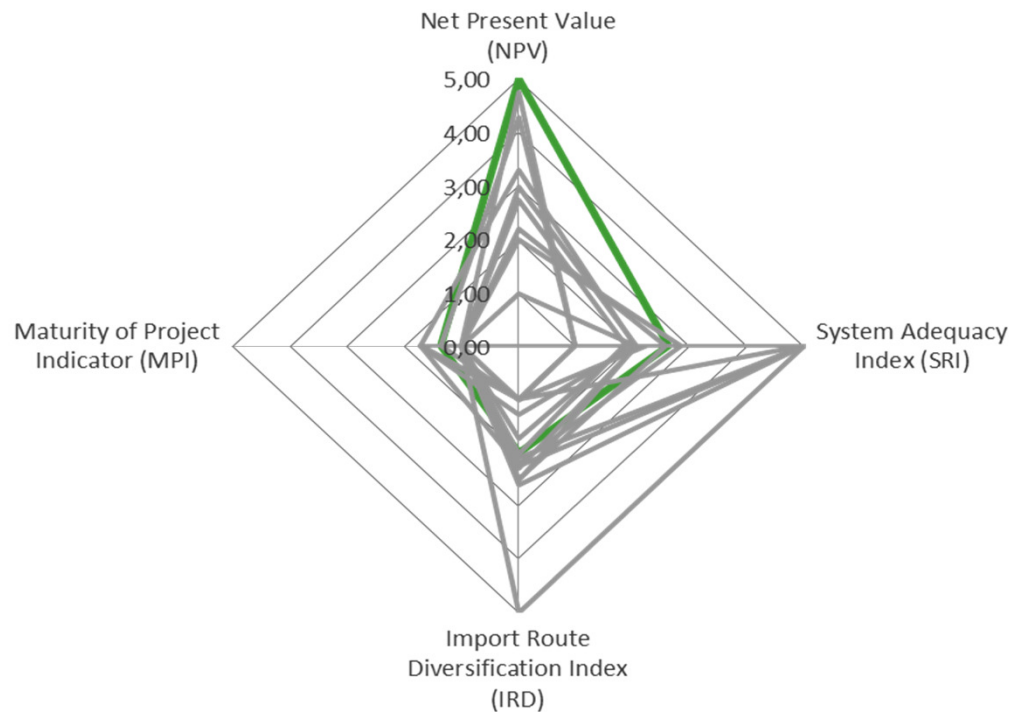
Utilization: from BG to RS 91%,
from RS to BG:2%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 09	BG	RS	39	39	2019



GAS_09: Gas Interconnector Serbia Bulgaria

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	5,00	1,18	2,01	1,36	3,59	1
Value	596,34	1,18	-0,36		Planning approval	



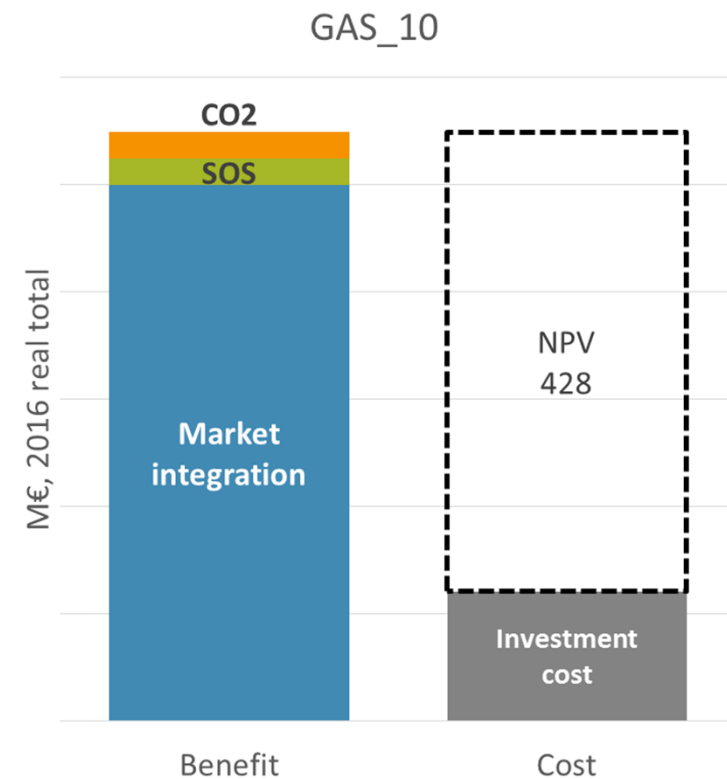
GAS_10: Gas Interconnector Serbia Croatia

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	1	0	0	0	1	0	XXX	1
BA	6	0	-3	6	9	0	XXX	9
BG	-5	0	4	-3	-4	0	XXX	-4
GR	-7	0	4	3	0	0	XXX	0
HR	-22	5	-9	632	606	0	XXX	517
HU	197	-8	-134	-301	-247	4	XXX	-243
IT	198	-18	-142	20	57	4	XXX	61
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	-1	0	0	0	-1	0	XXX	-1
MD	8	0	0	1	8	0	XXX	8
PL	27	-7	-16	-4	0	1	XXX	1
RO	95	-58	-4	6	39	2	XXX	42
RS	98	-11	-53	78	112	6	XXX	86
SK	31	0	-40	-105	-113	1	XXX	-113
UA	279	-195	-47	19	56	8	XXX	63
Region	905	-293	-440	352	524	25	XXX	428

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_10											

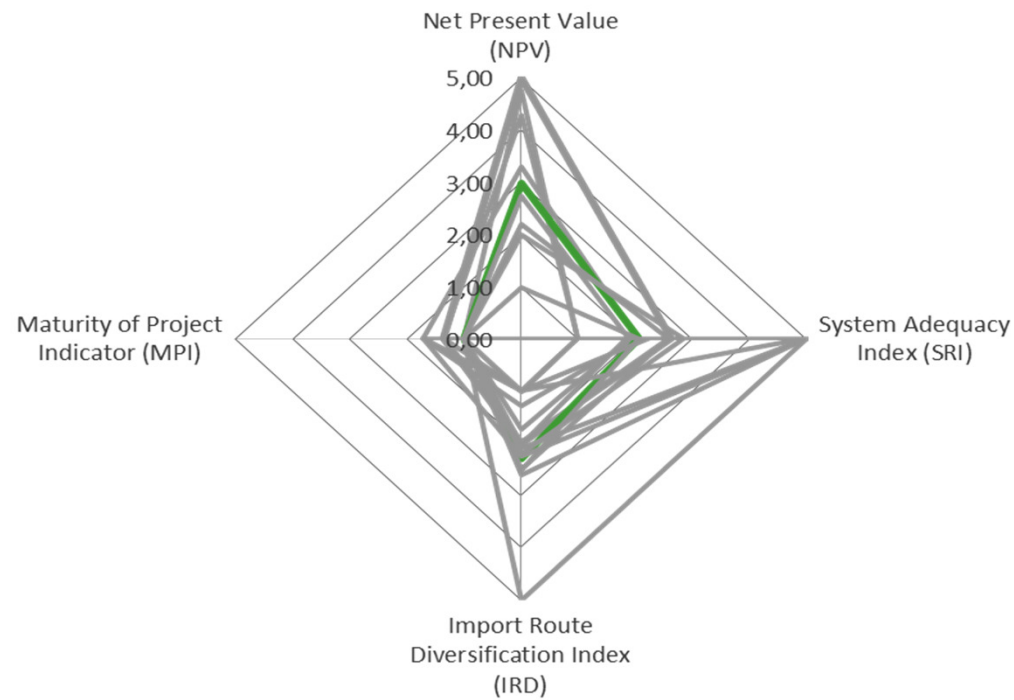
Utilization: from HR to RS 100%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 10	HR	RS	33	33	2023



GAS_10: Gas Interconnector Serbia Croatia

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	2,98	1,12	2,29	1,00	2,36	5
Value	427,77	1,12	-0,45	Consideration phase		



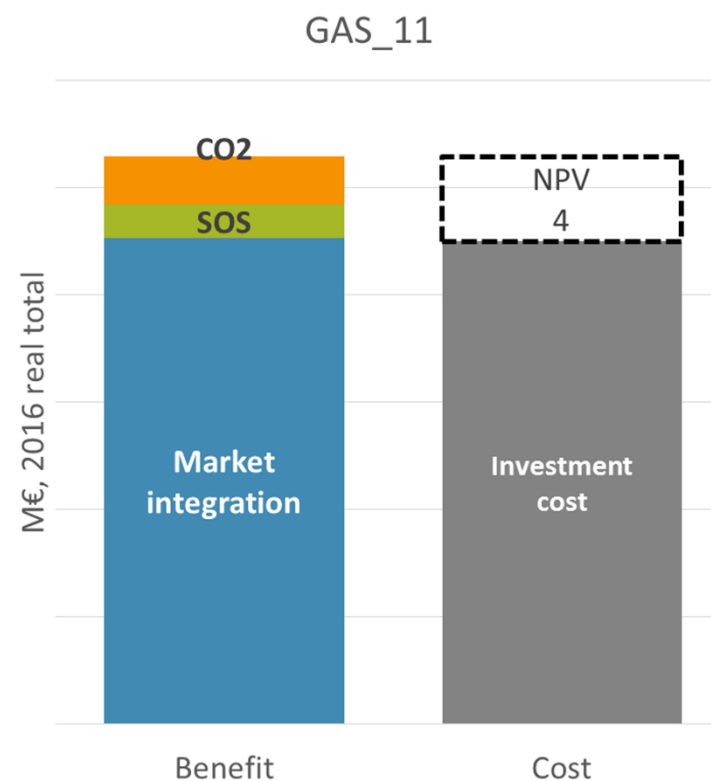
GAS_11: Gas Interconnector Serbia Macedonia

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	0	0	0	XXX	0
BA	0	0	-1	1	0	0	XXX	0
BG	-1	0	1	19	19	0	XXX	19
GR	0	0	0	25	25	0	XXX	25
HR	0	0	0	-21	-21	0	XXX	-21
HU	42	-1	-26	-32	-17	1	XXX	-16
IT	18	-2	-13	-4	-1	0	XXX	0
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	-4	0	1	30	27	0	XXX	12
MD	0	0	0	0	0	0	XXX	0
PL	2	0	-1	0	0	0	XXX	0
RO	4	-3	0	0	2	0	XXX	2
RS	10	-1	-6	-5	-1	1	XXX	-9
SK	1	0	-1	-11	-11	0	XXX	-11
UA	14	-10	-2	0	2	0	XXX	2
Region	88	-17	-49	2	24	2	XXX	4

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_11	Green	Red	Red	Green	Red	Red	Red	Red	Green	Green	Green

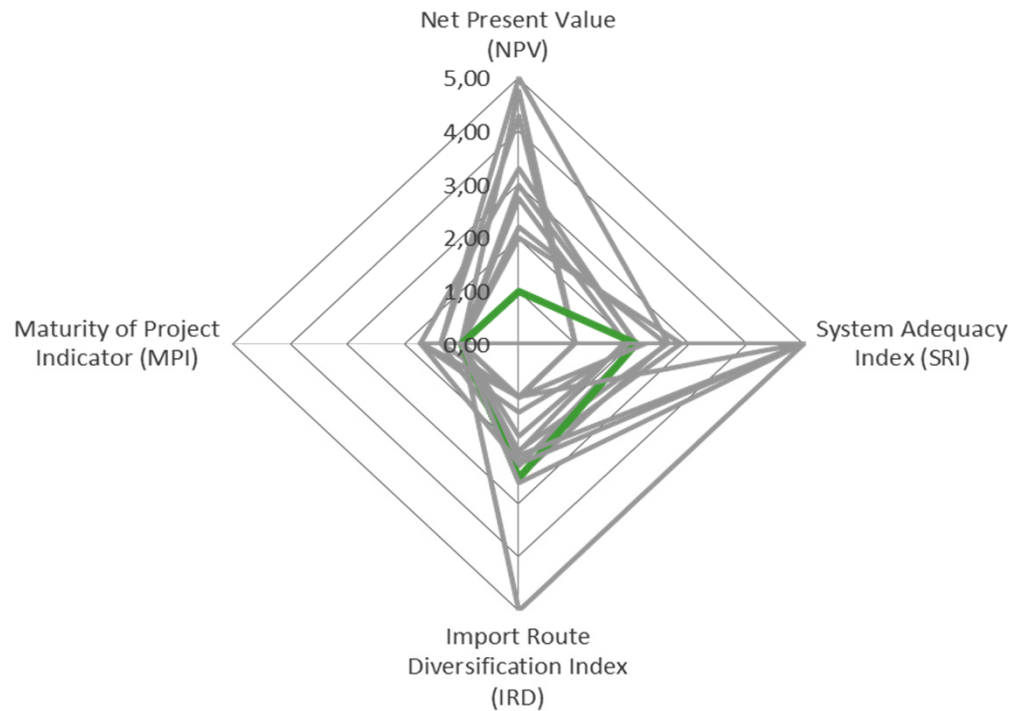
Utilization: from MK to RS 27%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 11	RS	MK	10	10	2021



GAS_11: Gas Interconnector Serbia Macedonia

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	1,00	1,12	2,53	1,00	1,20	12
Value	3,96	1,12	-0,53	Consideration phase		



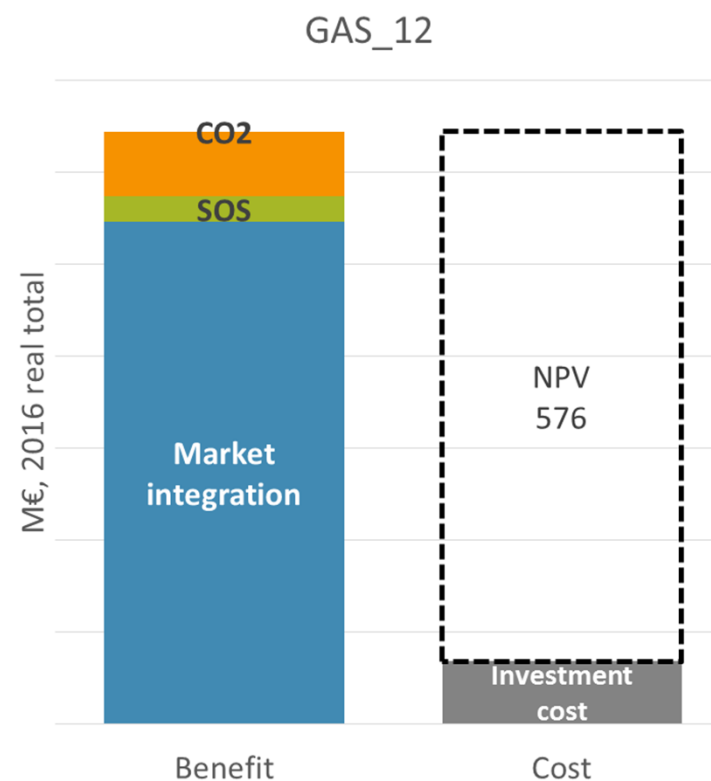
GAS_12: Gas Interconnector Serbia Montenegro (incl. Kosovo) Section Nis (Doljevac) Pristina

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	0	0	0	XXX	0
BA	-1	0	0	-2	-3	0	XXX	-3
BG	-2	0	1	0	0	0	XXX	0
GR	-2	0	1	0	-1	0	XXX	-1
HR	-1	0	0	45	44	0	XXX	44
HU	-96	4	61	95	63	-2	XXX	61
IT	-48	4	34	7	-2	-1	XXX	-3
KO*	403	0	0	30	433	79	XXX	493
ME	0	0	0	0	0	0	XXX	0
MK	0	0	0	0	0	0	XXX	0
MD	-2	0	0	0	-2	0	XXX	-2
PL	-10	3	6	0	-1	0	XXX	-2
RO	-19	13	1	-6	-11	0	XXX	-12
RS	-29	3	13	62	48	-2	XXX	-4
SK	-12	0	17	23	29	0	XXX	28
UA	-55	37	11	-14	-22	-1	XXX	-23
Region	124	63	146	241	574	71	XXX	576

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_12											

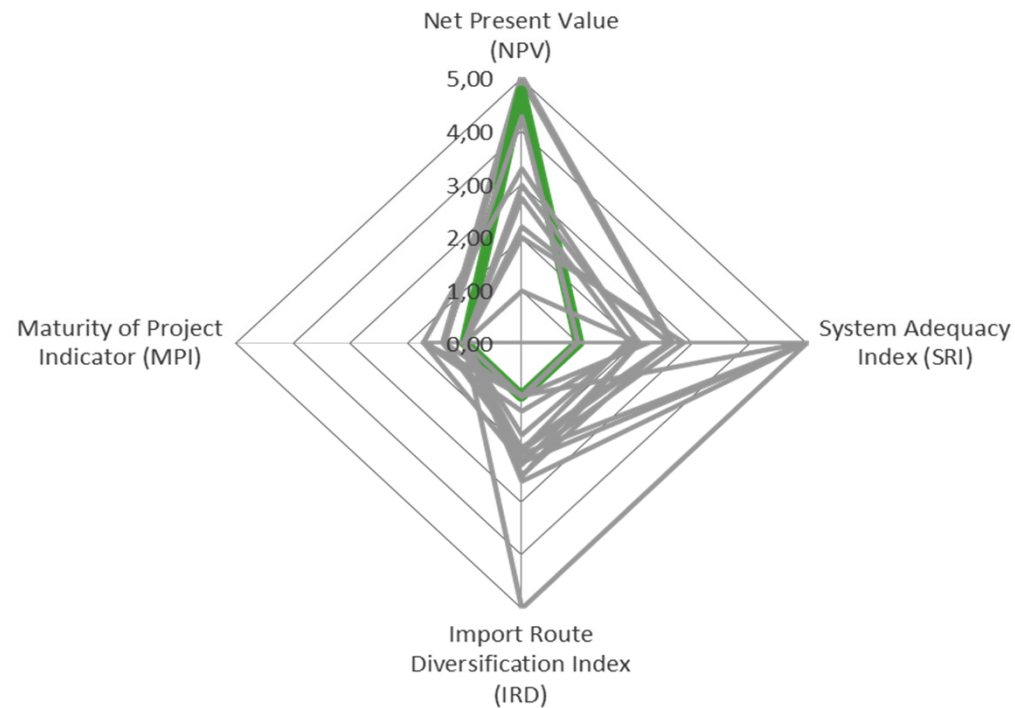
Utilization: from RS to KO* 43 %

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 12	RS	KO*	25	25	2023



GAS_12: Gas Interconnector Serbia Montenegro (incl. Kosovo) Section Nis (Doljevac) Pristina

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	4,76	1,00	1,00	1,00	3,26	2
Value	576,37	1,00	0,00	Consideration phase		



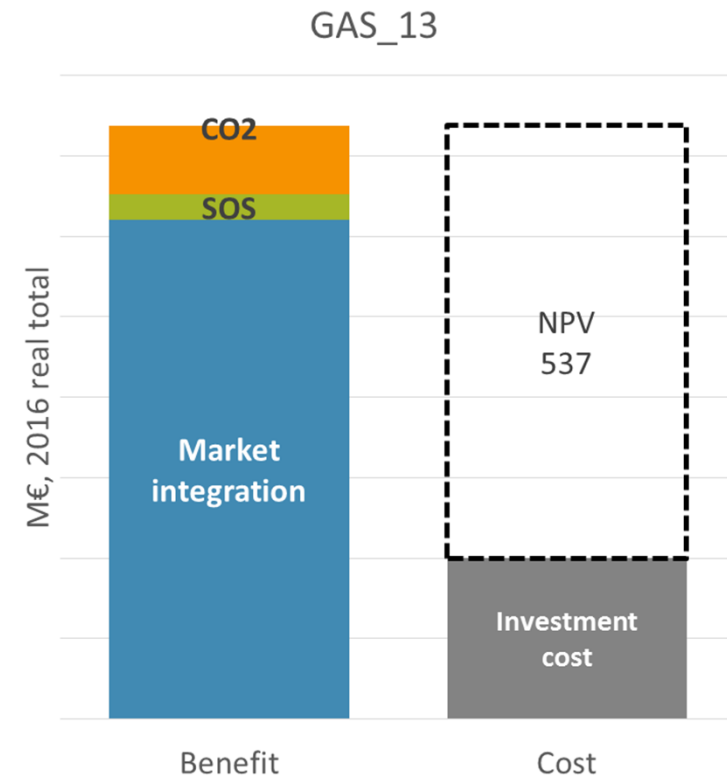
GAS_13: Albania Kosovo Gas Pipeline (ALKOGAP)

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	-4	0	0	51	47	0	XXX	-153
BA	0	0	0	0	0	0	XXX	0
BG	-2	0	2	-1	-1	0	XXX	-1
GR	-4	0	1	39	37	0	XXX	36
HR	-1	0	0	1	0	0	XXX	0
HU	-6	1	4	-2	-3	0	XXX	-3
IT	-345	32	251	21	-40	-7	XXX	-47
KO*	591	0	0	37	628	95	XXX	723
ME	0	0	0	0	0	0	XXX	0
MK	0	0	0	0	0	0	XXX	0
MD	-1	0	0	0	-1	0	XXX	-1
PL	-14	3	8	0	-2	-1	XXX	-3
RO	-10	6	0	0	-3	0	XXX	-3
RS	-2	0	1	-1	-1	0	XXX	-1
SK	-7	0	6	-2	-3	0	XXX	-3
UA	-32	22	5	0	-5	-1	XXX	-6
Region	165	65	279	143	652	85	XXX	537

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_13											

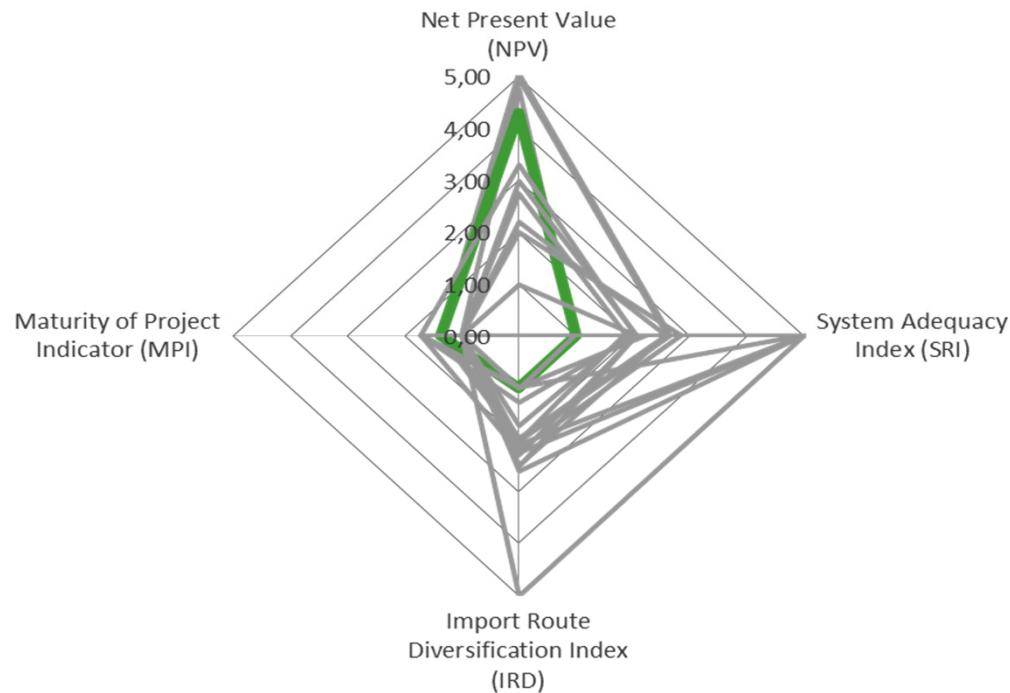
Utilization: from AL to KO* 24%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 13	AL	KO*	53	53	2022



GAS_13: Albania Kosovo Gas Pipeline (ALKOGAP)

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	4,29	1,00	1,00	1,36	3,01	3
Value	537,41	1,00	0,00	Planning approval		



GAS_14: Gas Interconnection Poland Ukraine

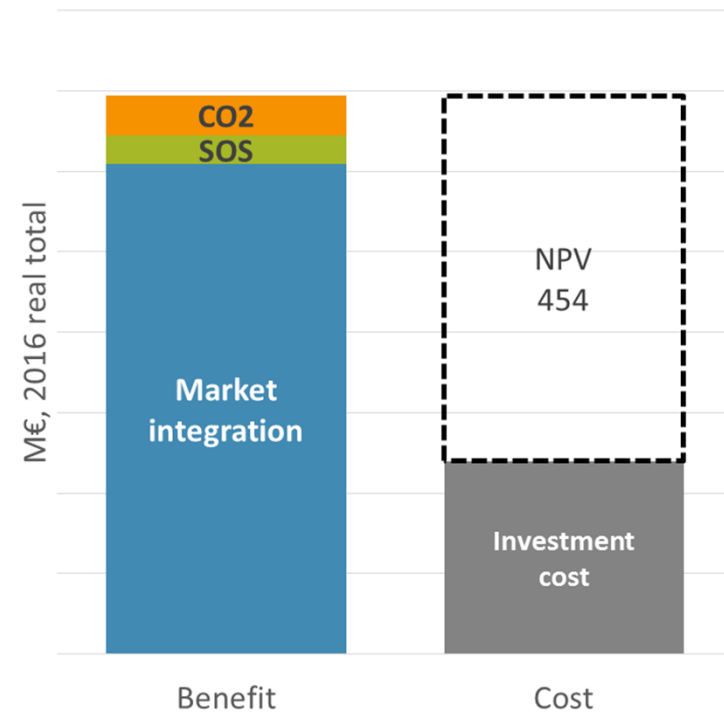
	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	4	0	0	0	4	0	XXX	4
BA	4	0	-1	2	4	0	XXX	4
BG	1	0	-1	-7	-7	0	XXX	-7
GR	1	0	-1	-3	-3	0	XXX	-3
HR	1	0	0	-8	-7	0	XXX	-7
HU	114	-13	-92	-137	-127	2	XXX	-126
IT	495	-46	-355	-27	67	9	XXX	75
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	0	0	0	0	0	0	XXX	0
MD	40	0	-2	3	40	-2	XXX	39
PL	-89	32	77	406	427	-3	XXX	183
RO	320	-208	-12	2	102	8	XXX	110
RS	43	-6	-22	14	29	2	XXX	31
SK	31	0	-28	-250	-248	1	XXX	-247
UA	1417	-948	-230	125	365	32	XXX	397
Region	2382	-1189	-667	119	645	49	XXX	454

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_14	Green	Red	Red	Green	Red	Red	Red	Red	Green	Green	Green

Utilization: from PL to UA 22%

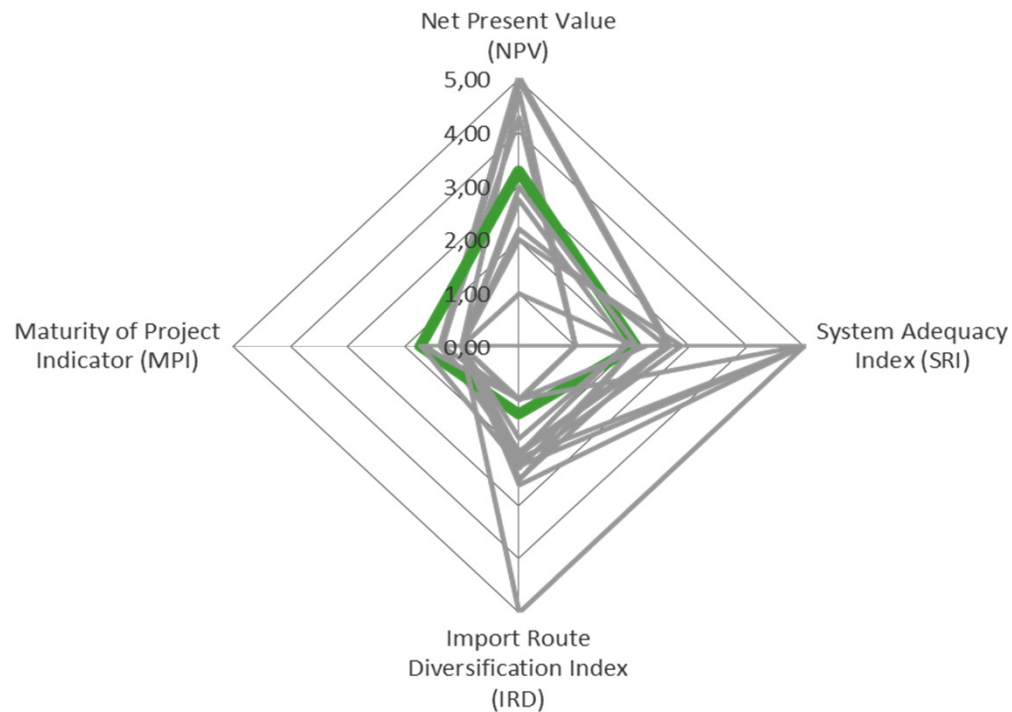
Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 14	PL	UA	245	215	2020

GAS_14



GAS_14: Gas Interconnection Poland Ukraine

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	3,29	1,12	1,29	1,73	2,50	4
Value	453,74	1,12	-0,13	Preliminary design studies		



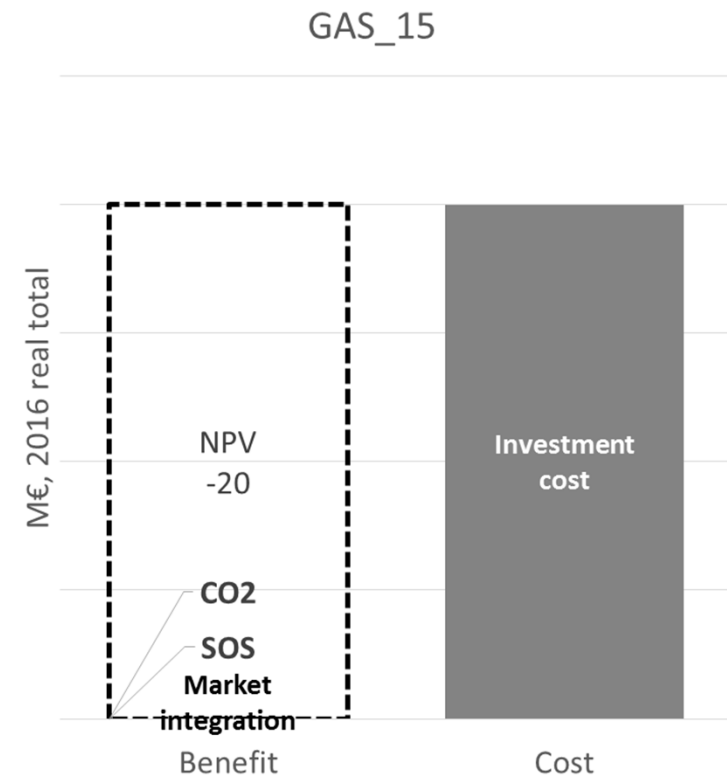
GAS_15: Development of the HU to UA firm capacity

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	0	0	0	XXX	0
BA	0	0	0	0	0	0	XXX	0
BG	0	0	0	0	0	0	XXX	0
GR	0	0	0	0	0	0	XXX	0
HR	0	0	0	0	0	0	XXX	0
HU	0	0	0	0	0	0	XXX	-20
IT	0	0	0	0	0	0	XXX	0
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	0	0	0	0	0	0	XXX	0
MD	0	0	0	0	0	0	XXX	0
PL	0	0	0	0	0	0	XXX	0
RO	0	0	0	0	0	0	XXX	0
RS	0	0	0	0	0	0	XXX	0
SK	0	0	0	0	0	0	XXX	0
UA	0	0	0	0	0	0	XXX	0
Region	0	0	0	0	0	0	XXX	-20

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_15											

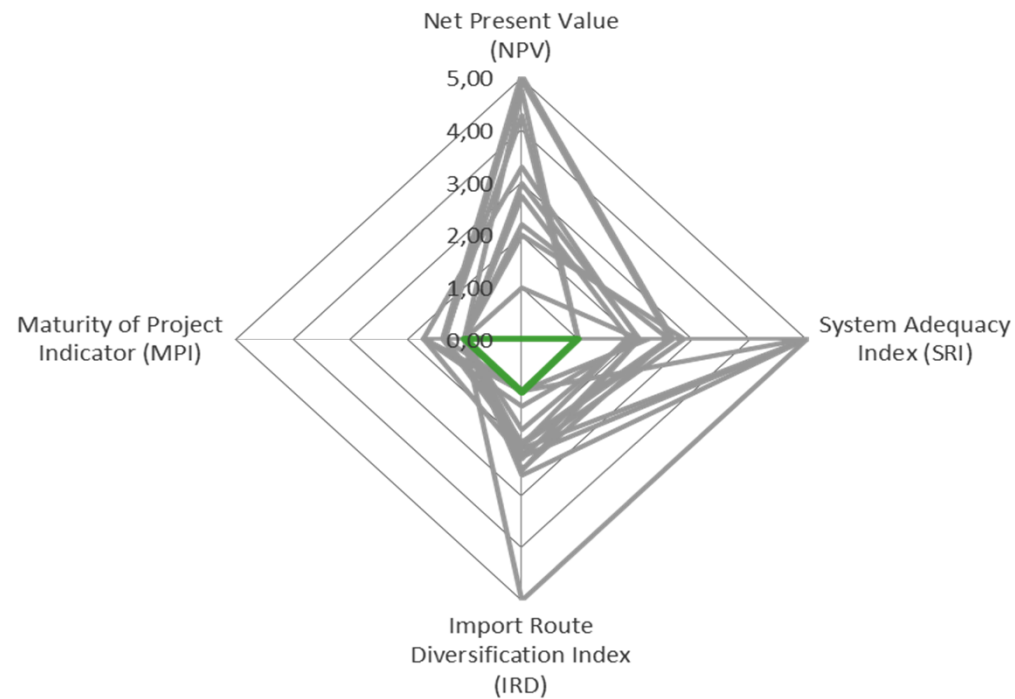
Utilization: from HU to UA 0%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 15	HU	UA	178	0	2016



GAS_15: Development of the HU to UA firm capacity

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	0,00	1,00	1,01	1,00	0,40	17
Value	-20,00	1,00	-0,04	Consideration phase		



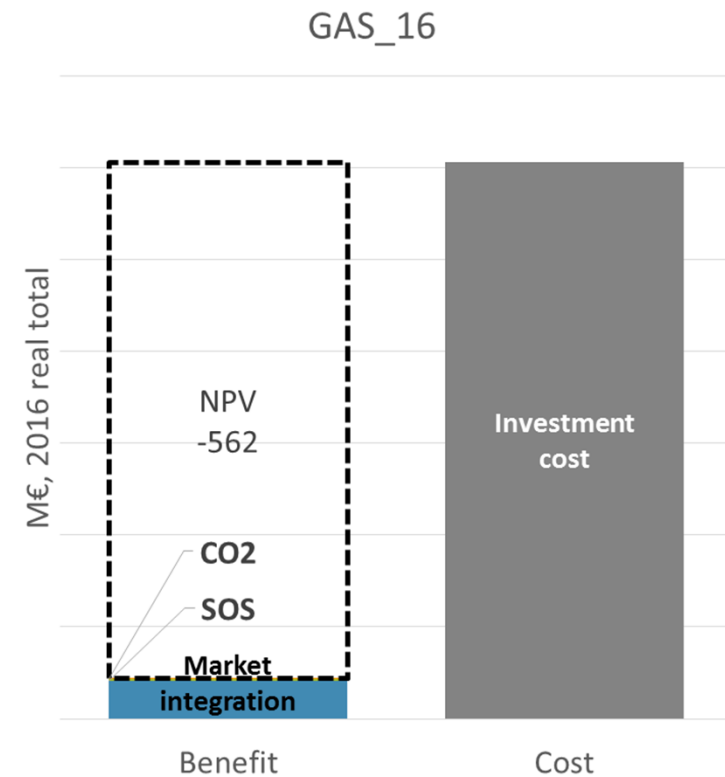
GAS_16: Ionian Adriatic Pipeline

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	3	3	0	XXX	-193
BA	0	0	0	0	0	0	XXX	0
BG	0	0	0	0	0	0	XXX	0
GR	0	0	0	3	2	0	XXX	2
HR	0	0	0	0	0	0	XXX	-297
HU	-1	0	0	0	0	0	XXX	0
IT	-17	2	13	0	-3	0	XXX	-3
KO*	0	0	0	0	0	0	XXX	0
ME	40	0	0	2	42	1	XXX	-70
MK	0	0	0	0	0	0	XXX	0
MD	0	0	0	0	0	0	XXX	0
PL	-1	0	1	0	0	0	XXX	0
RO	-2	1	0	0	-1	0	XXX	-1
RS	0	0	0	0	0	0	XXX	0
SK	-1	0	1	0	0	0	XXX	0
UA	-5	4	1	0	0	0	XXX	-1
Region	12	7	16	9	43	0	XXX	-562

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_16											

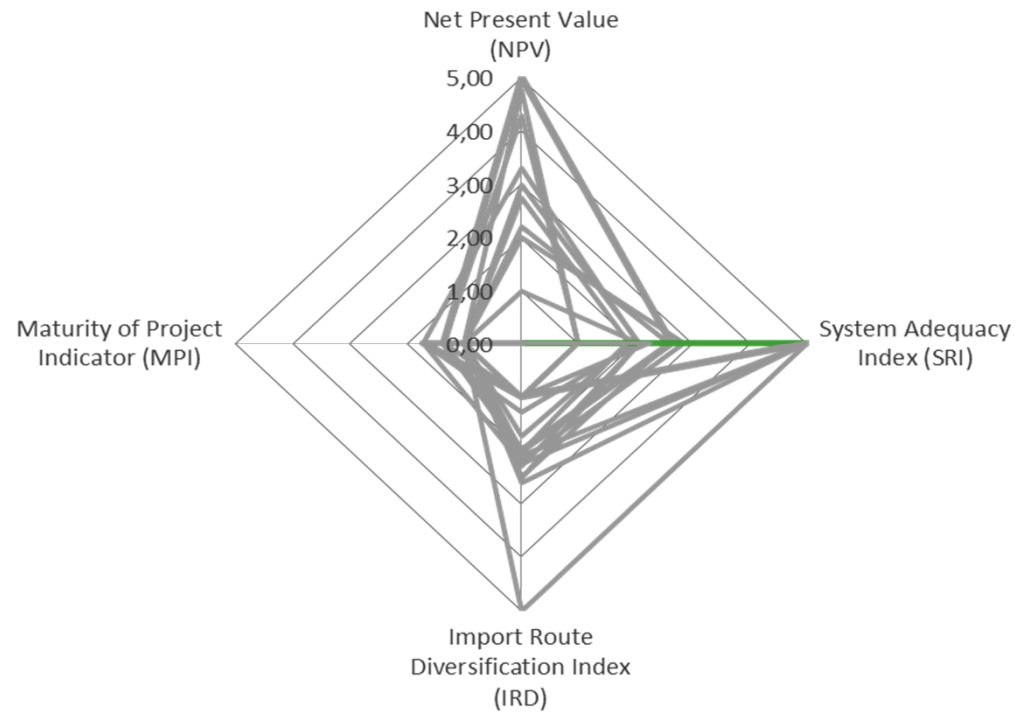
Utilization: from AL to ME 1%,
from ME to HR 0%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS 16	ME	HR	150	150	2021
	AL	ME	150	150	2021



GAS_16: Ionian Adriatic Pipeline

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	0,00	5,00	2,07	1,73	1,32	10
Value	-562,37	5,00	-0,38	Preliminary design studies		



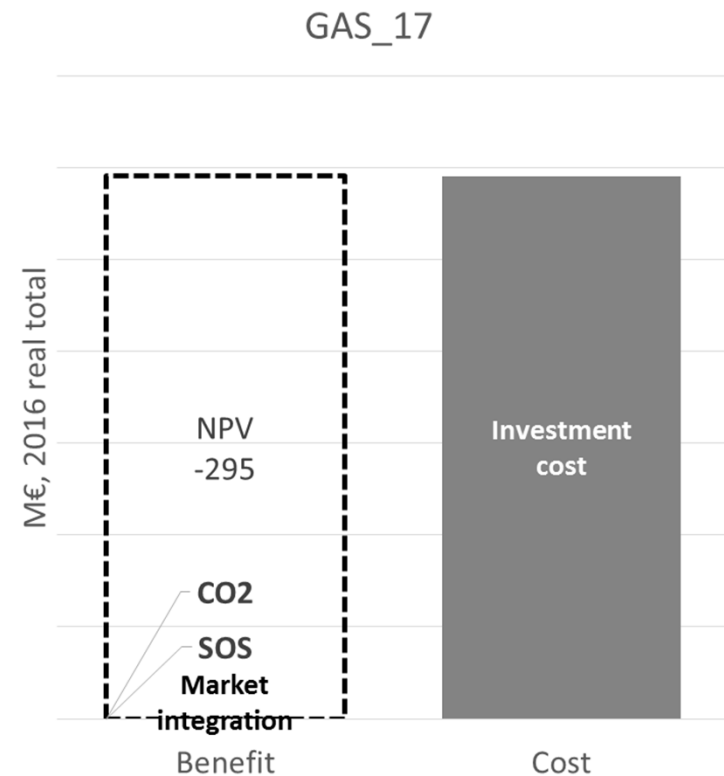
GAS_17: Eagle LNG + pipeline

	Welfare change, M€					CO ₂ , M€	Inv. cost, M€	NPV, M€
	Cons.	Prod.	Trad.	Infra	Total			
AL	0	0	0	0	0	0	XXX	-295
BA	0	0	0	0	0	0	XXX	0
BG	0	0	0	0	0	0	XXX	0
GR	0	0	0	0	0	0	XXX	0
HR	0	0	0	0	0	0	XXX	0
HU	0	0	0	0	0	0	XXX	0
IT	0	0	0	0	0	0	XXX	0
KO*	0	0	0	0	0	0	XXX	0
ME	0	0	0	0	0	0	XXX	0
MK	0	0	0	0	0	0	XXX	0
MD	0	0	0	0	0	0	XXX	0
PL	0	0	0	0	0	0	XXX	0
RO	0	0	0	0	0	0	XXX	0
RS	0	0	0	0	0	0	XXX	0
SK	0	0	0	0	0	0	XXX	0
UA	0	0	0	0	0	0	XXX	0
Region	0	0	0	0	0	0	XXX	-295

Sensitivity for NPV	Best est.	Flat oil	-10% LNG	+10% LNG	-50% in EnC CP	-25% in EnC CP	-20% in Europe	-10% in Europe	+10% in Europe	+20% in Europe	without HR LNG
GAS_17											

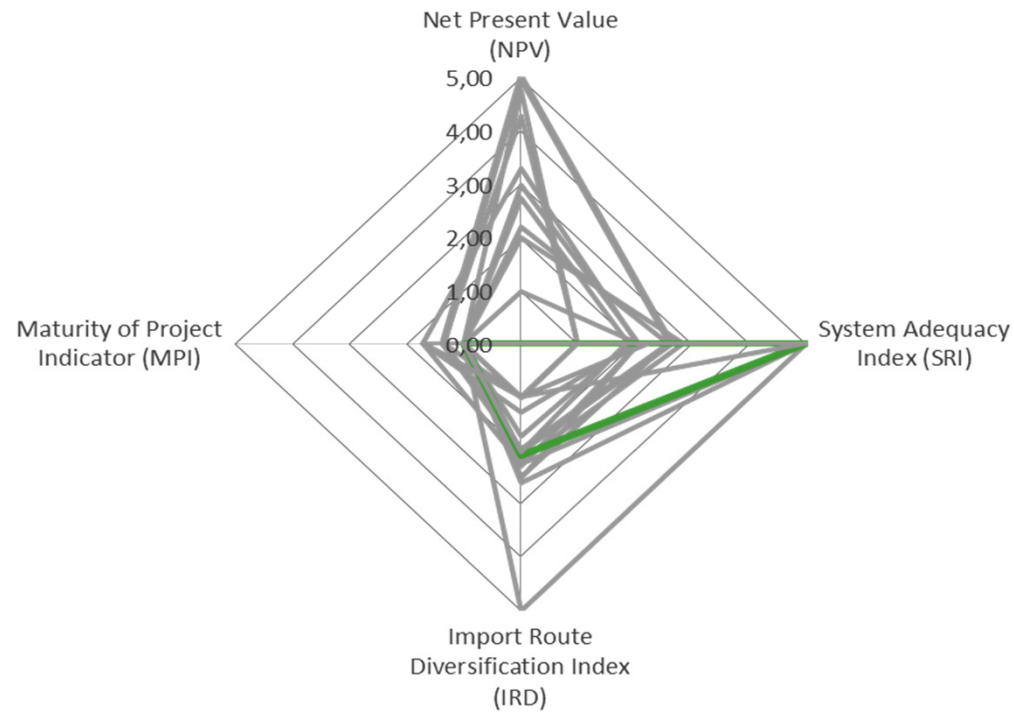
Utilization: AL-IT 0%, AL LNG 0%

Project code	Country A	Country B	Capacity, GWh/d		Date
			A→B	B→A	
GAS LNG 17	AL	IT	300	-	2020
	FSRU	AL	150	-	2020



GAS_17: Eagle LNG + pipeline

	Net Present Value (NPV)	System Adequacy Index (SRI)	Import Route Diversification Index (IRD)	Maturity of Project Indicator (MPI)	Total Score	Ranking
Score	0,00	5,00	2,10	1,00	1,25	11
Value	-295,30	5,00	-0,39	Consideration phase		



Thank you!

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