

Implementation of large-scale energy infrastructure projects with transboundary environmental impact

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Belgrade - Hyatt Regency Hotel

Projects of Energy Community and Mutual Interest – PECI and PMIs

Introduction

- ☀ **Trans-boundary project selection exercise for electricity, gas and oil projects**

- ☀ **Merit-based evaluation procedure**

 - Economic Analysis –**

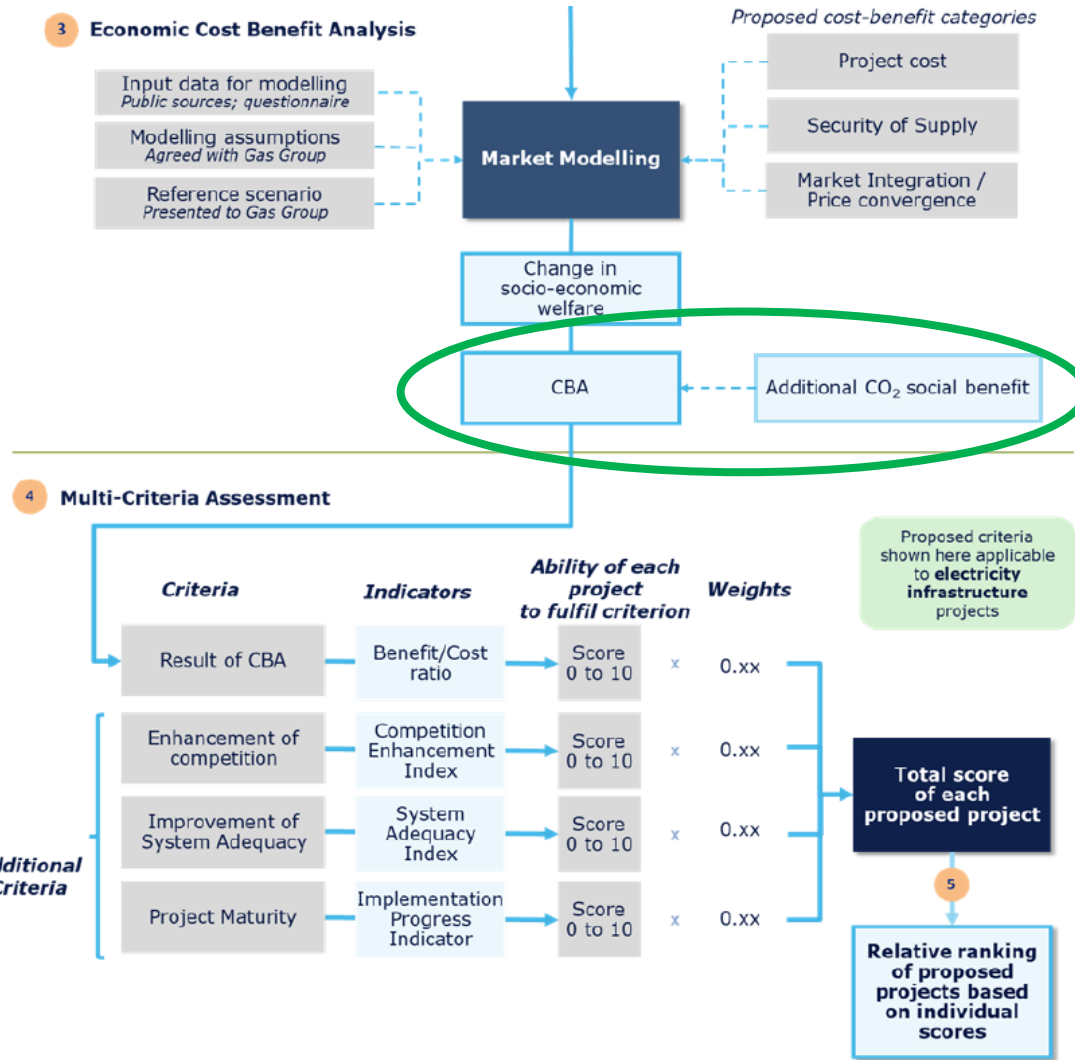
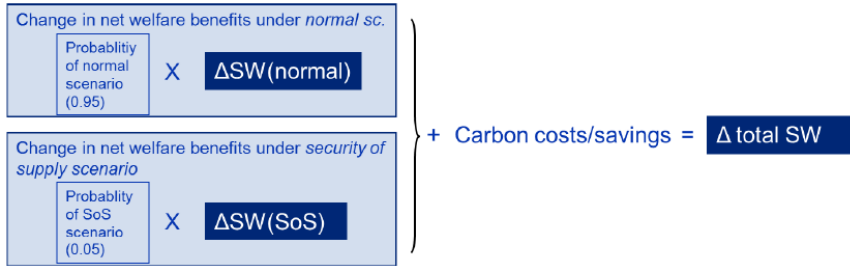
 - Net Present Value, Internal Rate of Return, Benefit/Cost Ratio, CO2 impact**

 - Indicators – e.g. Enhancement of Competition**

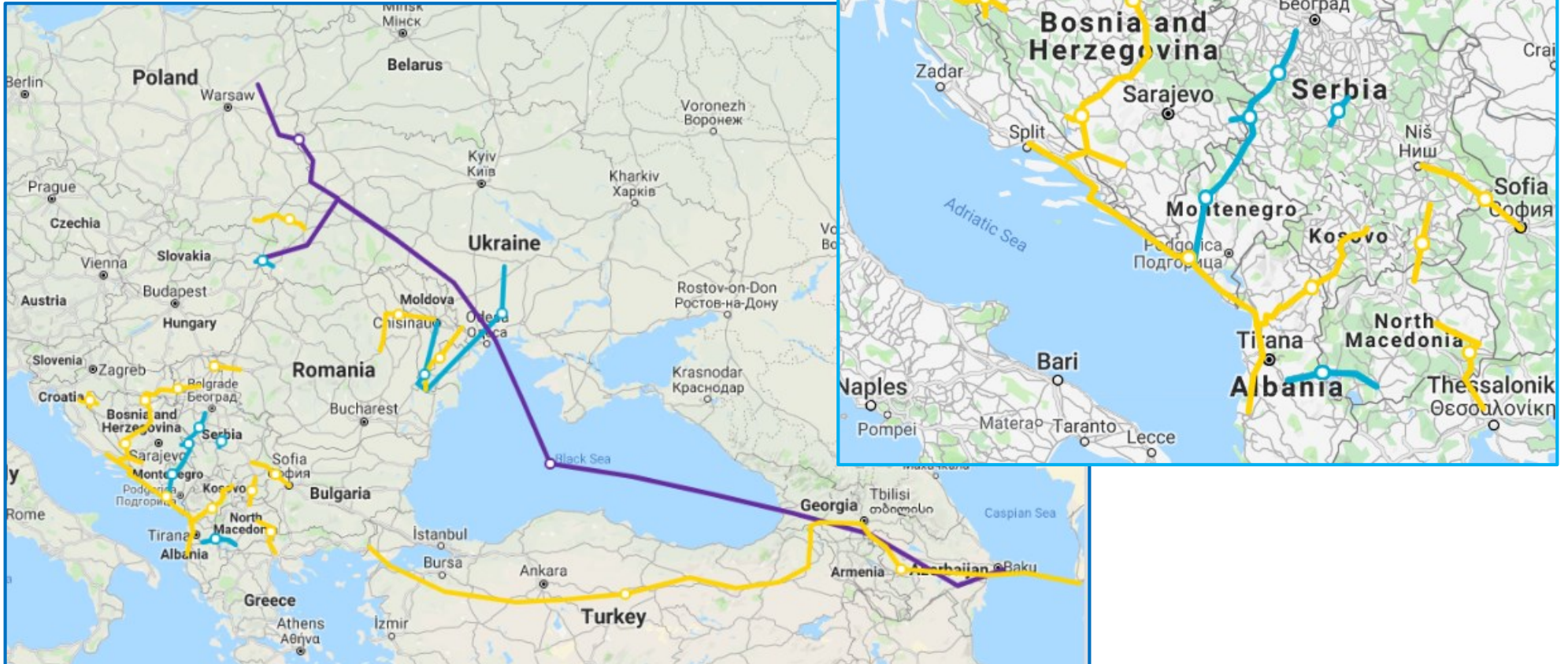
 - Normalized aggregation of results**

Projects of Energy Community and Mutual Interest – PECIs and PMIs #2

Figure 8. Calculation method of project related aggregate economic welfare change



Selected Projects



Projects with trans-boundary environmental impact Analysis

Environmental Impact defined as

Impact of projects in changing
greenhouse gas emissions

CO₂ emission effect of increased natural
gas consumption +/-

Benefits are estimated by the impact of
projects in changing greenhouse gas
emissions

Projects with trans-boundary environmental impact

Simplified Assumptions

- the modelled change in gas demand changes the average primary energy mix of the respective countries but without crowding out renewables
- Energy consumption of transport and non-energy use of fuels is not considered
- Additional 1 TWh of gas consumption crowds out other fossil fuels in their ratio in the primary energy mix
- Carbon Price in WB6 assumed only from 2030

Table 39. CO₂ emission factors of fossil fuels

CO ₂ emission factors, kg/GJ	
Hard coal	93.65
Lignite	112.07
Gas	55.82
LFO	73.70
HFO	77.00

Source: UNFCCC

- Except for North Macedonia, there is no HFO/LFO based installed capacity assumed

Projects with trans-boundary environmental impact

Installed capacities of selected countries

Table 50. Installed capacity in Serbia, MW

Net installed capacity, MW	2015	2020	2025	2030	2035	2040	2045	2050
Coal, lignite	- Existing	4 417	4 373	4 073	4 073	4 073	3 343	3 343
	- New	0	0	350	707	707	707	707
Natural gas	- Existing	403	0	0	0	0	0	0
	- New	0	140	478	478	478	478	478
Nuclear	- Existing	0	0	0	0	0	0	0
	- New	0	0	0	0	0	0	0
HFO/LFO	-	0	0	0	0	0	0	0
Hydro	-	3 070	3 098	3 118	3 387	3 387	4 067	4 067
Wind	-	11	500	500	600	600	600	600
Solar	-	3	10	100	200	200	200	200
Other RES	-	11	144	213	285	285	285	285
Total	-	7 915	8 265	8 832	9 730	9 730	9 680	9 680

Table 47. Installed capacity in Montenegro, MW

Net installed capacity, MW	2015	2020	2025	2030	2035	2040	2045	2050
Coal, lignite	- Existing	219	225	0	0	0	0	0
	- New	0	0	225	225	225	225	225
Natural gas	- Existing	0	0	0	0	0	0	0
	- New	0	0	0	0	0	0	0
Nuclear	- Existing	0	0	0	0	0	0	0
	- New	0	0	0	0	0	0	0
HFO/LFO	-	0	0	0	0	0	0	0
Hydro	-	668	729	1 281	1 281	1 281	1 281	1 281
Wind	-	0	151	168	190	190	190	190
Solar	-	3	8	20	32	32	32	32
Other RES	-	0	10	10	49	49	49	49
Total	-	890	1 123	1 704	1 777	1 777	1 777	1 777

Table 49. Installed capacity in Macedonia, MW

Net installed capacity, MW	2015	2020	2025	2030	2035	2040	2045	2050
Coal, lignite	- Existing	800	675	450	0	0	0	0
	- New	0	130	130	330	330	330	330
Natural gas	- Existing	294	294	294	294	0	0	0
	- New	0	0	280	280	774	774	774
Nuclear	- Existing	0	0	0	0	0	0	0
	- New	0	0	0	0	0	0	0
HFO/LFO	-	210	210	210	0	0	0	0
Hydro	-	673	673	673	673	809	1 054	1 353
Wind	-	37	40	40	16	14	59	256
Solar	-	20	35	35	39	65	143	323
Other RES	-	7	11	12	13	12	14	27
Total	-	2 041	2 068	2 123	1 645	2 004	2 375	3 063

Table 43. Installed capacity in Albania, MW

Net installed capacity, MW	2015	2020	2025	2030	2035	2040	2045	2050
Coal, lignite	- Existing	0	0	0	0	0	0	0
	- New	0	0	0	0	0	0	0
Natural gas	- Existing	0	0	0	0	0	0	0
	- New	0	100	300	400	400	700	700
Nuclear	- Existing	0	0	0	0	0	0	0
	- New	0	0	0	0	0	0	0
HFO/LFO	-	0	0	0	0	0	0	0
Hydro	-	1 920	2 212	2 336	2 870	3 000	3 150	3 310
Wind	-	0	0	80	150	180	200	784
Solar	-	0	0	50	80	85	120	249
Other RES	-	5	5	5	8	8	10	16
Total	-	1 925	2 317	2 771	3 508	3 673	4 180	5 730

Table 44. Installed capacity in Bosnia and Herzegovina, MW

Net installed capacity, MW	2015	2020	2025	2030	2035	2040	2045	2050
Coal, lignite	- Existing	1 970	1 660	1 460	1 350	1 130	530	300
	- New	0	1 400	1 700	1 700	1 700	1 700	1 700
Natural gas	- Existing	0	0	0	0	0	0	0
	- New	0	0	0	0	0	0	0
Nuclear	- Existing	0	0	0	0	0	0	0
	- New	0	0	0	0	0	0	0
HFO/LFO	-	0	0	0	0	0	0	0
Hydro	-	2 155	2 179	2 221	2 263	2 364	2 738	3 060
Wind	-	0	41	41	31	113	338	900
Solar	-	9	44	44	44	58	93	189
Other RES	-	0	1	1	2	3	6	9
Total	-	4 134	5 325	5 467	5 390	5 368	5 404	7 667

■ Except for North Macedonia, there is no HFO/LFO based installed capacity assumed

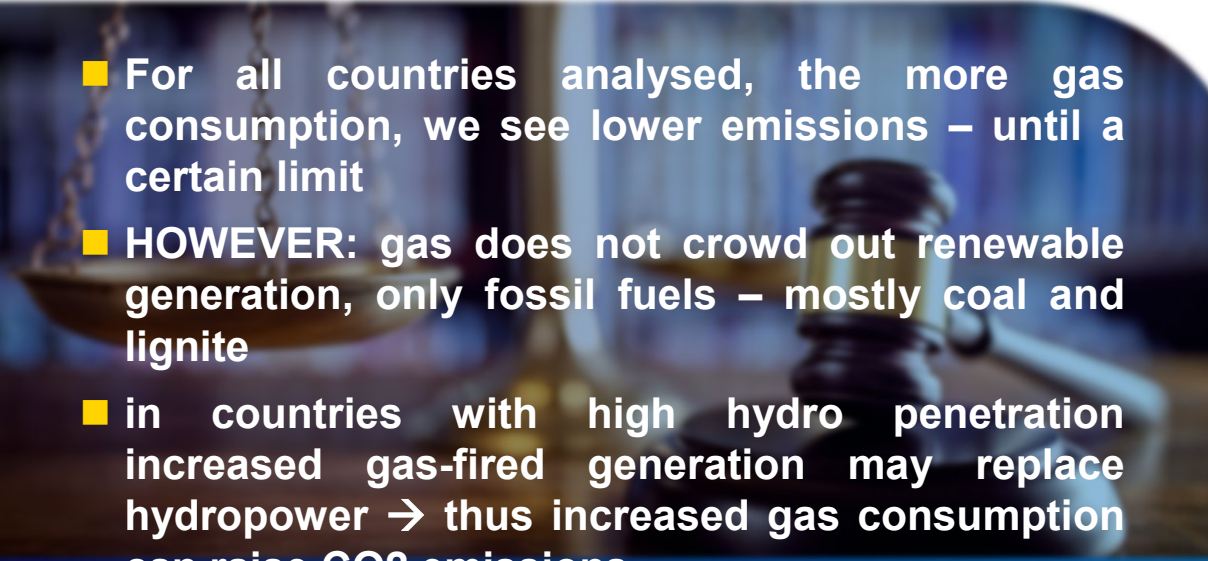
Projects with trans-boundary environmental impact

Results and Conclusion

Table 40. CO₂ emission vector applied for gas project evaluation

Additional CO ₂ emissions for 1 TWh higher gas consumption Δ ktCO ₂ /TWh	
AL	-76.9
BA	-125.3
BG	-128.7
GE	-124.6
GR	-101.1
HR	-80.6
HU	-92.1
IT	-81.3
KO*	-185.7
MD	-88.1
ME	-178.6
MK	-172.8
PL	-117.2
RO	-102.6
RS	-143.7
SK	-91.0
UA	-114.7

Source: REKK based on IEA



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- For all countries analysed, the more gas consumption, we see lower emissions – until a certain limit
 - **HOWEVER:** gas does not crowd out renewable generation, only fossil fuels – mostly coal and lignite
 - in countries with high hydro penetration increased gas-fired generation may replace hydropower → thus increased gas consumption can raise CO₂ emissions



THANK YOU FOR YOUR ATTENTION

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