Selection of Projects of Energy Community Interest (PECIs/PMIs)

2nd PECI/PMI Electricity Working Group Meeting

Presentation REKK / DNV GL

Vienna 18.03.2020

Agenda

1. Overview of project submissions and prescreening (eligibility, data verification)
2. Summary of country data received and introduction of scenarios (data sources and assumptions)
3. Application of assessment methodology on a dummy project and finalization of open methodological questions

Summary of project submissions

	Elec-tricity trans-mission	Elec-tricity storage	Gas trans-mission	Gas storage	LNG	Smart grid	Oil	Total
Number of projects	6	0	19	1	0	0	3	29
Submitted investment cost (million €)	2879	-	7908	75	-	-	416	11278

- More candidates in gas & oil, than in el & smart grid; 70% of the CAPEX
- in 2018 we had 34 projects, - most of them were resubmitted, but some NEW (2 electricity)
- 6 EL projects not resubmitted (eg. PMI EL_06 MD-RO)

Summary of the eligibility check

	Electricity trans-mission	Electricity storage	Gas trans-mission	Gas storage	LNG	Smart grid	Oil	Total
Submitted projects	**6**	0	19	1	0	0	3	29
Eligible projects	**6**	0	18	1	0	0	2	27

- ALL ELECTRICITY PROJECTS ARE ELIGIBLE

List of electricity projects

Project code	Project name	Final commission date	Project Promoters	Type of investment
EL_01	Trans Balkan Corridor (Serbia, Montenegro, Bosnia)	2026	JP Elektromreža Srbije, Montenegrin Electric Transmission System CGES ,NOS BiH/Elektroprenos BiH a.d. Banja Luka	Construction of new transmission infrastructure; Voltage upgrade of existing transmission infrastructure
EL_03	OHL 400 kV Banja Luka (Bosnia) - Lika (Croatia)- complete	2030	Nezavisni operator sistema u BiH NOSBiH/Elektroprenos BiH a.d. Banja Luka	Construction of new transmission infrastructure
EL_07	400 kV Mukacheve (Ukraine) – V.Kapusany (Slovakia) OHL rehabilitation	2030	State Enterprise NPC Ukrenergo- Slovenská elektrizačná prenosová sústava, a.s. SEPS	Current upgrade of existing transmission infrastructure, Construction of new transmission infrastructure
EL_09	750 kV Pivdennoukrainska NPP (Ukraine) – Isaccea (Romania) OHL rehabilitation and modernisation,	2029	State Enterprise NPC Ukrenergo – C.N. Transelectrica S.A.	Construction of new transmission infrastructure; Current upgrade of existing transmission infrastructure; Extension of existing transmission infrastructure; Replacement of existing transmission infrastructure
EL_12	North CSE corridor (Serbia, Romania)	2030	JP Elektromreža Srbije	Extension of existing transmission infrastructure, Construction of new transmission infrastructure
EL_13	Black Sea Submarine Cable Georgia - Romania	2029	JSC Georgian State Electrosystem, C.N. Transelectrica S.A.	Construction of new transmission infrastructure

Summary of Electricity Projects – map I.

Summary of Electricity Projects – map II.

Summary of all relevant technical data of the projects

Project code	Total cost (M€)	Commission date	NTC A-B 2020 (MW)	NTC A-B 2025 (MW)	NTC A-B 2030 (MW)	NTC B-A 2020 (MW)	NTC B-A 2025 (MW)	NTC B-A 2030 (MW)
EL_01 (Montenegro-Serbia)	165.49	2026	0	0	500	0	0	500
EL_01 (Serbia-Bosnia)			0	0	600	0	0	500
EL_03 (Croatia-Bosnia)	160.14	2030	0	0	644	0	0	298
EL_07 (Ukraine-Slovakia)	10.5	2031	597	597	628	440	440	465
EL_09 (Ukraine-Romania)	388.37	2029	0	0	1000	0	0	1000
EL_12 (Serbia-Romania)	51.5	2030	0	0	347	0	0	622
EL_13 (Georgia-Romania)	2100	2028	0	0	1050	0	0	1050

Eligibility of electricity projects

Project code	Infrastructure category	Significant cross border impact	TYNDP or NNDP	Technical data verification	Cost verification	Candidate for (PECI/PMI/ not eligible)
EL_01	☑	☑	☑	?	?	PECI
EL_03	☑	☑	☑	?	☑	PMI
EL_07	☑	?	☑	?	?	PMI
EL_09	☑	☑	?	?	☑	PMI
EL_12	☑	☑	☑	☑	☑	PMI
EL_13	☑	☑	?	Not possible to validate	☑	PMI

- All projects are eligible either for PECI or PMI label
- EL_07 have positive NTC effect in 2020 when neither section of the project is completed – Additional increase in NTC after 2020 is less than 500 MW
- EL_09 and EL_13 are included neither in ENTSO-E TYNDP 2018 nor in NNDPs, but both are projects of mutual acceptance

Technical data verification, length and commission date

Project code	Submitted length	Secondary source length	Length match	Submitted commission date	Secondary source commission date	Commission date match
EL_01_1	60 km	60 km	☑	2022	2020	delayed
EL_01_2	109 km	109 km	☑	2024	2024	☑
EL_01_3	45.5 km	45.2 km	☑	2026	2024	delayed
EL_01_4	94.2 km	94.2 km	☑	2025,2026	2024	delayed
EL_03_1	180 km	155 km	✗	2028,2030	2030	☑
EL_03_2	203 km	200 km	☑	2030	2030	☑
EL_03_3	68 km	68 km	☑	2030	2030	☑
EL_07	53 km	51 km	☑	2023,2030	2023,2031	✗
EL_09_1	150 km	150 km	☑	2026	2026	☑
EL_09_2	230 km	300 km	✗	2029	2026	delayed
EL_12_1	60 km	60 km	☑	2030	2030	☑
EL_12_2	2 km	2 km	☑	2030	2030	☑
EL_13_1	56.8 km?	N/A	?	2028	2020	?
EL_13_2	1138.2 km?	N/A	?	2028	2020	?

- Length difference between the submission and secondary source data with respect to Banja Luka – Lika (EL_03_1), Prymorska – Issacea (09_2) lines
- Not evident whether the commission date of EL_07 is 2030 or 2031
- Technical details (for subsections) of EL_13 are missing

Technical data verification, NTCs

Project code	Submitted NTC A-B (MW)	Secondary source NTC A-B (MW)	Submitted NTC B-A (MW)	Secondary source NTC B-A (MW)	Validation
EL_01 (Serbia- Montenegro)	500	400	500	20	✗
EL_01 (Serbia-Bosnia)	600	950	500	700	✗
EL_03 (Croatia-Bosnia)	644	647	298	298	☑
EL_07 (Ukraine-Slovakia)	628?	1000	465?	1000	✗
EL_09 (Ukraine-Romania)	1000	1000	1000	1000	☑
EL_12 (Serbia- Romania)	347	347	622	622	☑
EL_13 (Georgia-Romania)	1050	N/A	1050	N/A	?

- Difference of NTC values between the submission and ENTSO-E TYNDP 2018 for EL_01
- EL_07 have positive NTC effect in 2020, when neither section of the project is completed also there is a mismatch between the current and previous PECI submissions

Cost verification results

Project code	Project name	Submitted cost (million €)	Estimated cost (million €) - CEER	Estimated cost (million €) – EC	Estimated cost-average (million €) – ACER	Lower inter-quartile boundary (million €)	Higher inter-quartile value (million €)	CAPEX EVALUATION
EL_01	Trans-Balkan Corridor	165.49	500.56	245.05	407.09	217.53	535.12	LOWER
EL_03	400 kV OHL Banja Luka (BA) – Lika (HR) (full)	160.14	268.89	117.01	284.17	143.29	364.68	☑
EL_07	400 kV Mukacheve (Ukraine) – V.Kapusany (Slovakia)	10.5	82.06	40.09	57.73	31.59	76.79	LOWER
EL_09	750 kV Pivdennoukrainska NPP (Ukraine) – Isaccea (Romania)	388.37	562.13	347.66	421.54	231.80	560.37	☑
EL_12	North CSE corridor	51.5	97.61	50.95	73.64	41.21	97.66	☑
EL_13	Black Sea Underwater Cable	2100	2103.37	N/A	1880.66	1724.52	1983.84	☑

- The submitted investment costs for EL_01 and EL_07 are significantly lower than any of the benchmarked values

Additional requests for the project promoters

Project code	Project short name	Issues which require further clarification/decision/data submission
EL_01	Trans Balkan	a, Why is there a difference between submitted and ENTSO-E TYNDP 2018 NTCs (Serbia-Montenegro, Serbia – Bosnia)? b, Why are submitted investment costs at this low level (Submission: 165.5, EC Benchmark: 245 million EUR)?
EL_03	BA-HR	a, Why is there a length difference of Bajna Luka – Lika line between the submission (180 km) and ENTSO-E TYNDP 2018 (155 km)?
EL_07	UKR-SK	a, Clarification is needed about the NTC values, as NTC increase is associated with year 2020, when neither part of the proposed project will be completed b, What is the final commission date of the project 2030 or 2031? c, Are the submitted lines single or double circuit ones? d, Why are submitted investment costs at this low level (Submission: 10.5, EC Benchmark: 40 million EUR)? e, Clarification is needed about the submitted operation costs for the project as the submitted values seem unrealistically high (Please check the unit, it should be in million EUR). (10 000/year) f, Submission of the operation costs of the Ukrainian side is required
EL_09	UKR-RO	a, Information is needed whether it is planned to include the project in the Ukrainian (internal line already included) and Romanian National development plans b, Why is there a length difference of the Prymorska – Issacea line in the current submission (230 km), and the previous submission of PECI in 2018 (300 km)? c, Submission of the operation costs of the Romanian side is required
EL_12	North CSE	a, Separate investment and operation costs are required for Serbia and Romania (only the joint costs were submitted)
EL_13	Black Sea	a, Information is needed whether it is planned to include the project in the Romanian National development plan b, Submission of the technical data (length, line characteristics etc.) are required for the separate sections of the project c, Clarification is needed about the submitted operation costs for the project as the submitted values seem unrealistically high (Please check the unit, it should be in million EUR). (38.9/ year) d, Submission of the costs associated with Romania are required

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Overview of the received country data

Country data	Gas	Electricity
Albania	X	
Bosnia and Herzegovina	X	X
Georgia	X	X
Kosovo*		X
Moldova		
Montenegro	X	X
North Macedonia	X	X
Serbia	X	X
Ukraine	X	X
Romania		X

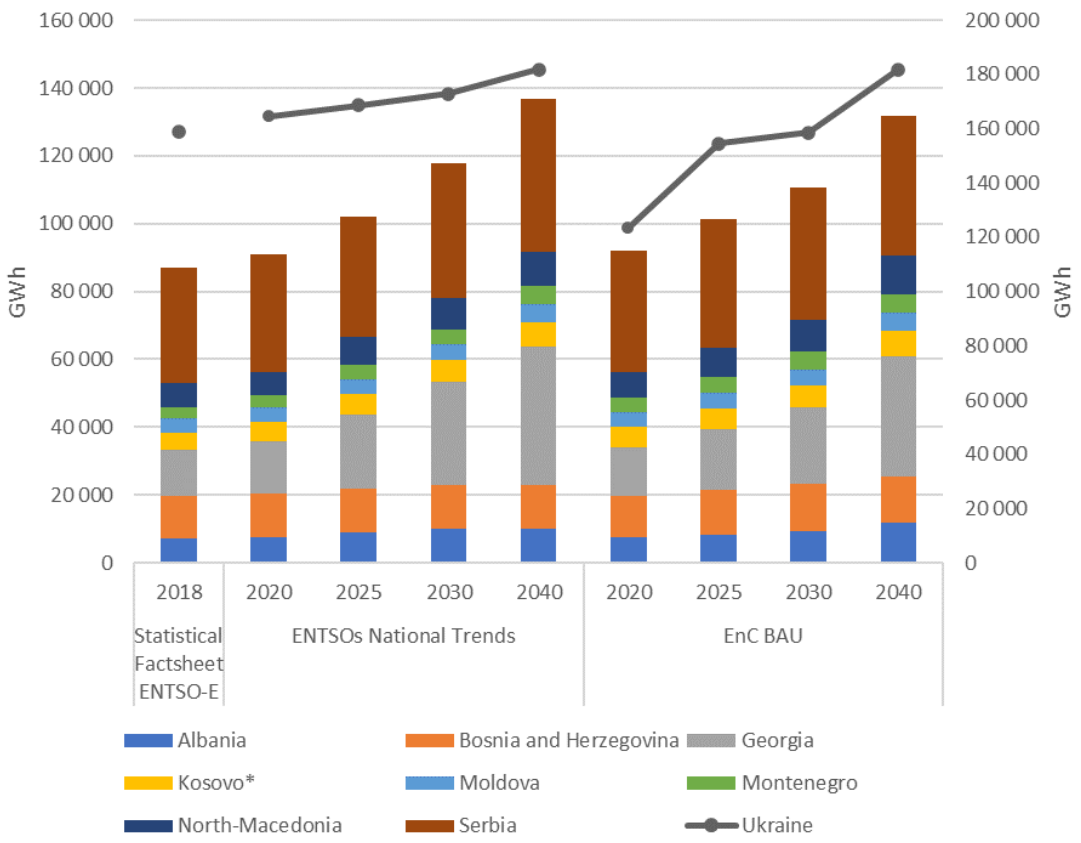
Introduction to scenarios - Electricity

- Two scenarios will be analysed:
  - **ENTSOs National Trends Scenario** – primary based on ENTSOs TYNDP 2020 data
  - **Energy Community BAU scenario** – primary based on submitted country data
- Whenever data is not available from either of the two sources REKK assumptions are used

	Statistical Factsheet ENTSO-E	ENTSOs National Trends				EnC BAU			
	2018	2020	2025	2030	2040	2020	2025	2030	2040
Albania	ENTSO-E	REKK	ENTSOs	ENTSOs	ENTSOs	REKK	REKK	REKK	REKK
Bosnia and Herzegovina	ENTSO-E	REKK	ENTSOs	ENTSOs	ENTSOs	Submitted	Submitted	Submitted	REKK
Georgia	REKK	REKK	REKK	REKK	REKK	Submitted	Submitted	Submitted	Submitted
Kosovo*	REKK	REKK	REKK	REKK	REKK	Submitted	Submitted	REKK	REKK
Moldova	REKK	REKK	REKK	REKK	REKK	TO BE SENT	TO BE SENT	TO BE SENT	TO BE SENT
Montenegro	ENTSO-E	REKK	ENTSOs	ENTSOs	ENTSOs	Submitted	Submitted	Submitted	REKK
North-Macedonia	ENTSO-E	REKK	ENTSOs	ENTSOs	ENTSOs	Submitted	Submitted	Submitted	Submitted
Serbia	ENTSO-E**	REKK	ENTSOs**	ENTSOs**	ENTSOs**	Submitted	Submitted	Submitted	Submitted
Ukraine	REKK	REKK	REKK	REKK	REKK	Submitted	Submitted	Submitted	Submitted

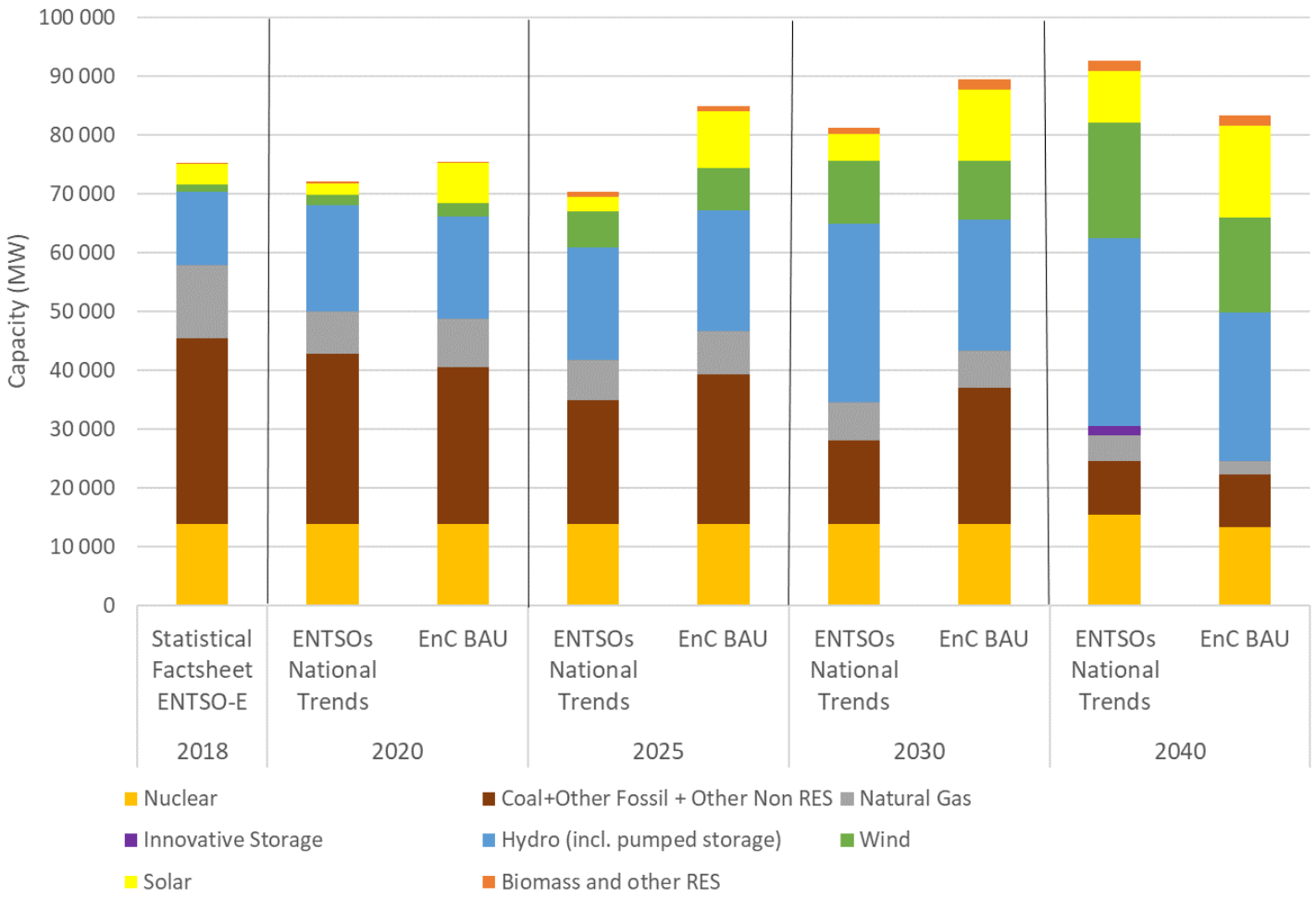
**ENTSO-E data for Serbia includes Serbia and Kosovo*, thus this data was corrected with the data available for Kosovo*

Demand assumptions



	2025-2040 CAGR (%)	
Country	ENTSOs National Trends	ENC BAU
AL	0.5%	1.7%
BA	0.0%	0.3%
GE	3.2%	3.5%
KO*	0.9%	0.8%
MD	0.8%	0.8%
ME	1.5%	0.7%
MK	0.8%	1.4%
RS	1.2%	0.4%
UA	0.4%	0.8%
EU27	0.57%	-0.18%
Sources for EU	**ENTSOs**	**EUCO3232.5**

Installed capacity assumptions – EnC total



- Coal phase-out and higher RES penetration is visible to a different extent in the two scenarios
- Fossil capacities may change endogenously in the modelling

Main input price assumptions

CO_2 quota price (€/t_{CO2})	2018	2020	2025	2030	2040
ENTSOs National Trends		19.7	23.0	27.0	75.0
EnC BAU (based on EU EUCO3232.5)		19.2	23.0	28.0	50.0
Fact (European Environmental Agency)	15.5				
Natural gas price (€/MWh)	2018	2020	2025	2030	2040
ENTSOs National Trends		Result of the iteration, differentiated by country			
EnC BAU		Result of the iteration, differentiated by country			
Fact (TTF, EU Quarterly Report)	23.3				
Coal price €/GJ	2018	2020	2025	2030	2040
ENTSOs National Trends		3.0	3.8	4.3	6.9
EnC BAU (based on Worldbank)		2.6	2.4	2.2	2.2
Fact (ARA, marketwatch)	3.4				

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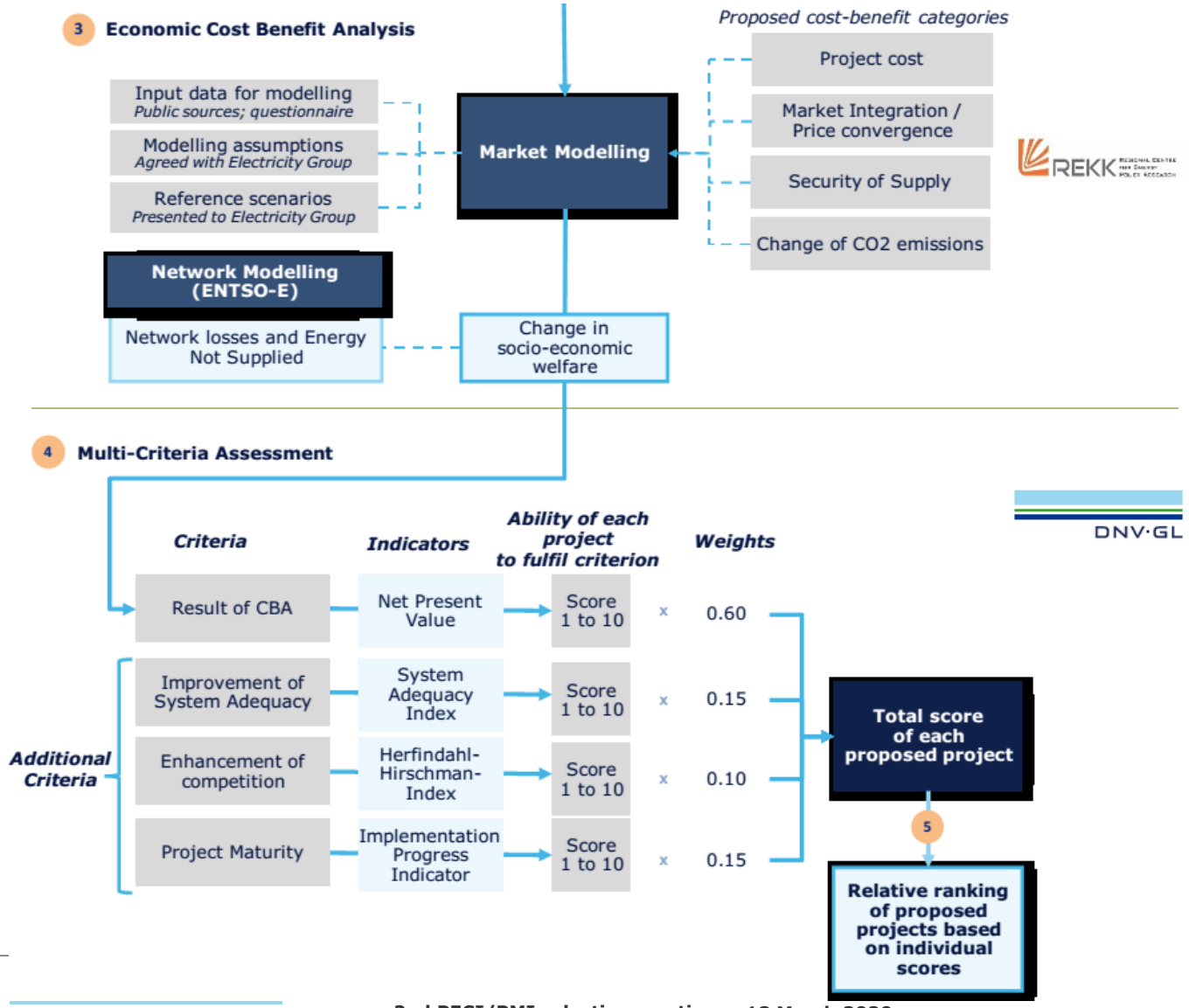
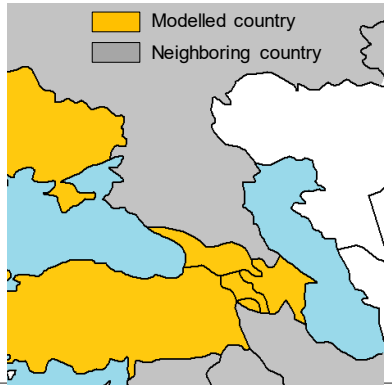
Overview of the Project Assessment Methodology for Electricity

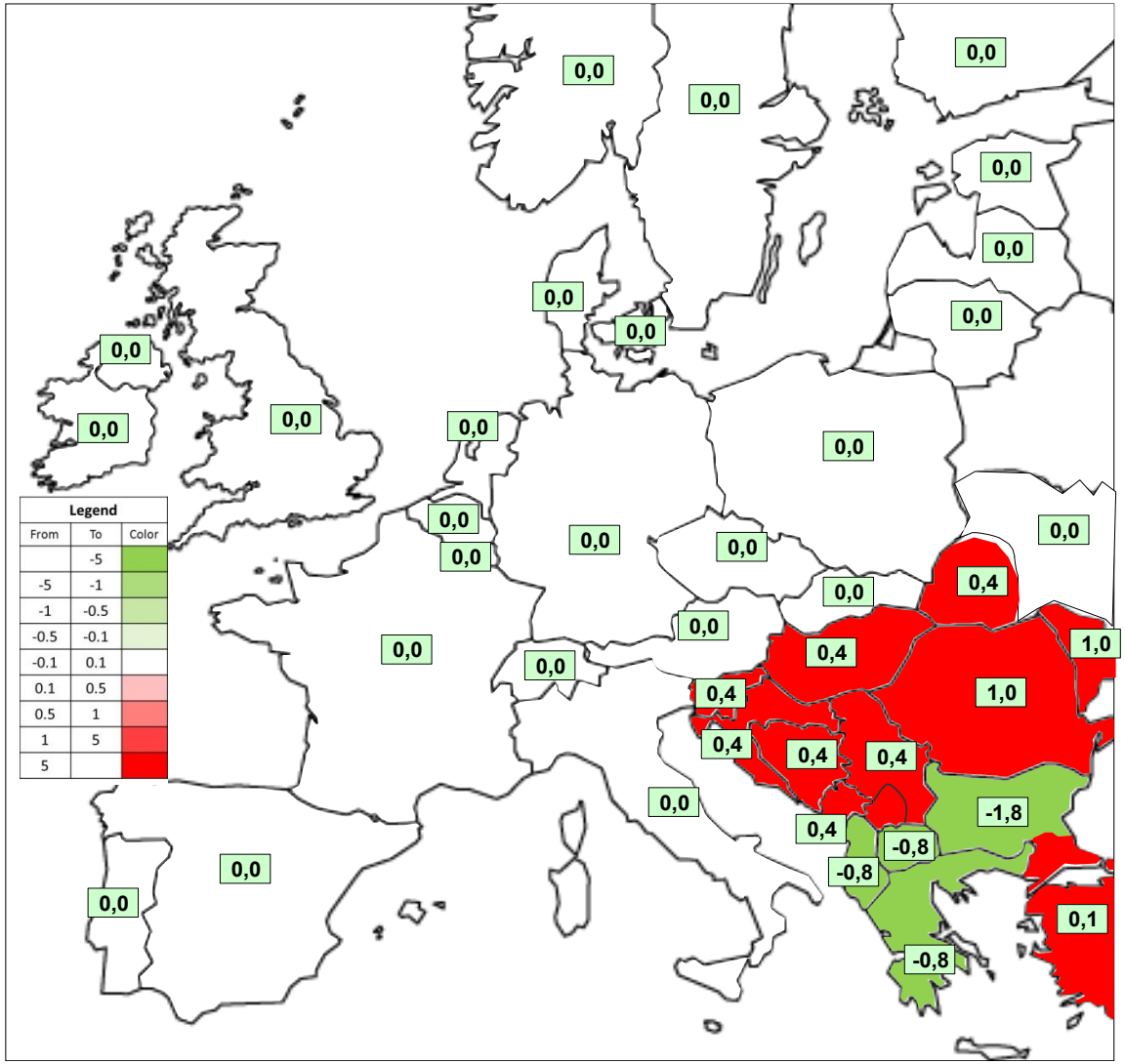


European Electricity Market Model – Functionality



- EEMM is a market model, not a network model
- The whole ENTSO-E and EnC countries are covered
- Time period: 2020-2050
- One country is one node, cross-border capacities are based on Net Transfer Capacity (NTC) values
- Three welfare components:
  - Producer surplus change
  - Consumer surplus change
  - Rent change
- This modell was used in the last three PECI/PMI assessment

EEMM Modelling Results: Price Changes Due to Dummy Project in 2030 in EnC BAU scenario, €/MWh



Description of the dummy project:

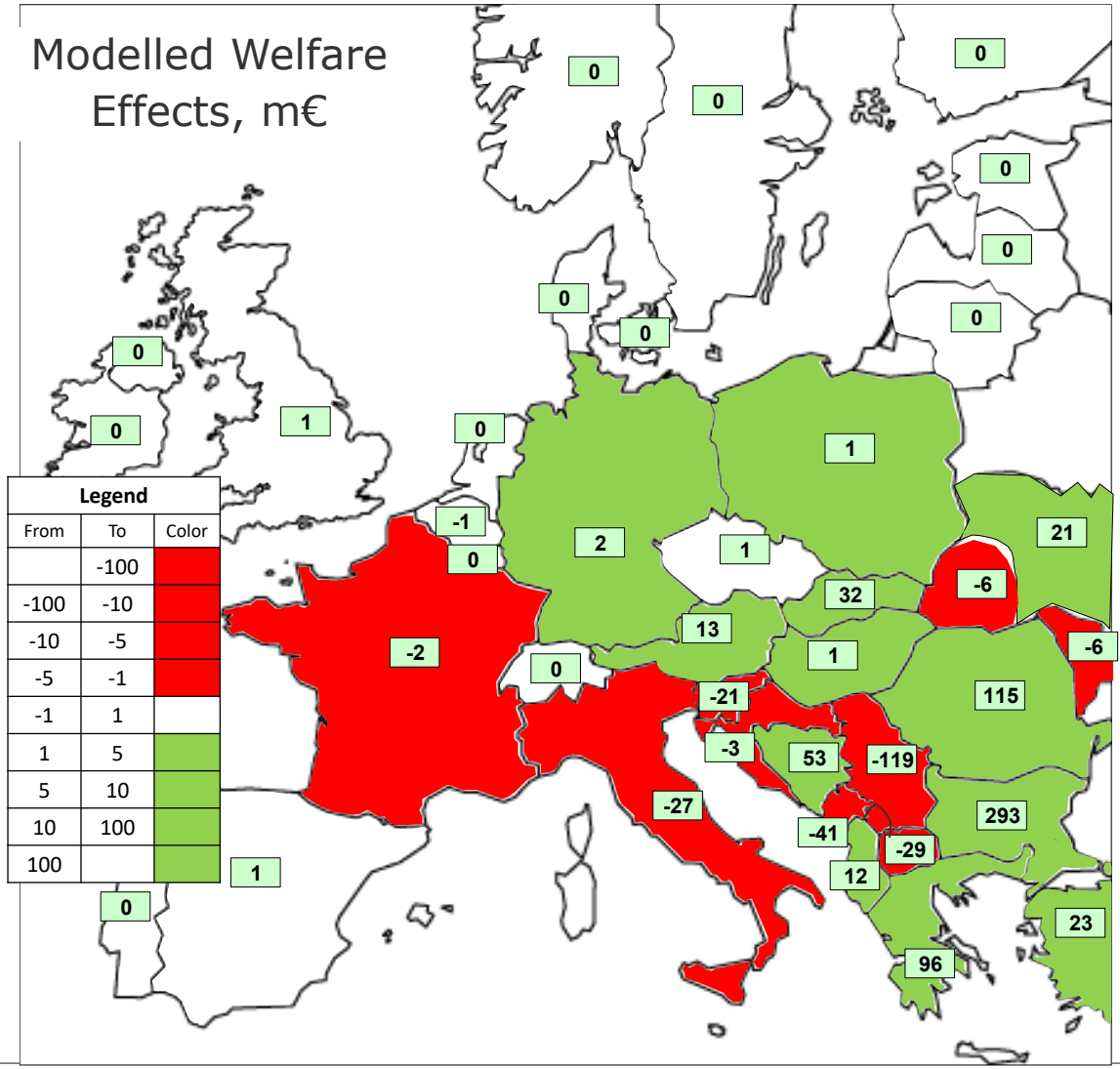
- New 400 kV OHL between RO-BG
- NTC increase by 1000 MW in both directions
- Year of commissioning: 2020
- Assessed scenario: EnC BAU

Social Welfare Effects in BG and in RO

- Due to the new OHL, wholesale price increases in Romania and reduces in Bulgaria
- Price reduction in BG results in a consumer welfare gain, but producers loose
- Price increase in RO results in a producer welfare gain, but consumers loose

	Unit (M€)	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
BG	Consumer welfare change	8.4	14.1	29.6	58.6	153.5	359.6	410.5	65.8	56.1	78.2	75.9
	Producer welfare change	-8.3	-13.8	-27.2	-53.9	-91.4	-187.2	-207.2	-57.3	-49.6	-65.7	-62.7
	Rent change	-0.1	-1.1	-2.8	-6.1	-25.6	-71.7	-84.5	-1.0	1.9	0.8	1.5
	Total social welfare change	**-0.1**	**-0.9**	**-0.3**	**-1.5**	**36.5**	**100.7**	**118.8**	**7.5**	**8.4**	**13.3**	**14.8**
RO	Consumer welfare change	-2.5	-4.4	-14.4	-19.9	-36.6	-46.8	-43.1	-33.5	-29.7	-36.8	-65.8
	Producer welfare change	2.8	5.1	18.7	26.6	50.4	60.6	55.7	42.2	38.1	50.5	85.8
	Rent change	-1.1	-1.9	-4.4	-8.1	-12.0	-30.8	-32.2	-3.4	-0.2	-2.9	-1.0
	Total social welfare change	**-0.7**	**-1.2**	**0.0**	**-1.4**	**1.8**	**-17.1**	**-19.6**	**5.2**	**8.2**	**10.8**	**19.0**

Net Present Value of Total Social Welfare Changes, m€



- Total welfare change in modelled countries in is **407 M€**
- Total welfare change in **BG+RO** is **408 m€**
- Total welfare change in **EnC+Neighbouring** countries is **385 m€**
- **Geographical coverage matters!**
  - **Calculation is based on EnC + neighbouring EU members (e.g. Welfare of Armenia or Turkey are not taken into account)**

Monetization of Transmission Loss Changes

- Transmission loss change monetization steps:
  - 1. step: Determine the volume of transmission loss changes due to the project -> based on submitted data by the project promoters/ENTSO-E TYNDP 2020
  - 2. step: Calculate the yearly baseload price -> result of the market model, this price serves as a basis for valuing the loss changes
  - 3. step: Calculate the net present value of the yearly cost of transmission loss changes
- 1. step: Assumed transmission change is:
  - +100 GWh/year in BG; -50 GWh/year in RO
- 2. step: Baseload price between 2016-2044
- 3. step: Same method as in social welfare change: **NPV=48.5M€**

		2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	…	2044
Baseload price, €/MWh	BG	40.3	42.6	47.0	49.3	56.7	61.0	64.7	64.2	67.6	69.9	75.1	…	75.1
	RO	40.1	42.4	46.1	48.2	52.3	54.0	57.4	60.3	62.7	64.1	68.2	…	68.2
Monetization of transmission loss changes, M€	BG	4.0	4.3	4.7	4.9	5.7	6.1	6.5	6.4	6.8	7.0	7.5	…	7.5
	RO	-2.0	-2.1	-2.3	-2.4	-2.6	-2.7	-2.9	-3.0	-3.1	-3.2	-3.4	…	-3.4
	Total	**2.0**	**2.1**	**2.4**	**2.5**	**3.1**	**3.4**	**3.6**	**3.4**	**3.6**	**3.8**	**4.1**	**…**	**4.1**

Monetization of Changes in Energy not Supplied

- **EENS change monetization steps**:
  - 1. step: Determine the volume of EENS due to the project (in MWh) -> based on submitted data by the project promoters/ENTSO-E
  - 2. step: Monetize the EENS value by using the average yearly GDP figures of the EnC countries (GDP/electricity consumption, based on Eurostat Unit:€/kWh)
  - 3. step: Calculate the net present value of the yearly cost of EENS changes

Proposed values in calculations:

- 1. step: Assumed EENS change is (it will come from network modelling in the assessment):
  - 0.3 GWh/year in BG; 0.6 GWh/year in RO
- 2. step: ~1.04 € /KWh based on latest Eurostat figures
- 3. step: NPV calculation of benefits over 25 years: **NPV (BG)= 4.33 M€; NPV (RO)= 8.67 M€**

Net Present Value of Investment Cost and OM Cost

- Investment cost:
  - BG: 25 m€ in 2018; 25 m€ in 2019
  - RO: 25 m€ in 2018; 25 m€ in 2019
- The operation cost is 0.5 m€/year in both countries from 2020
- Net present value of investment cost:
  - Discounted each CAPEX value to 2016
  - **NPV** of investment cost is **-90.7 M€ (BG+RO)**
- Net present value of OM cost:
  - OM costs occur between 2020-2044 (assessment period of the project is 25 years)
  - Discounted OPEX costs value to 2016
  - **NPV** of OPEX cost is: **-13.8 M€ (BG+RO)**

Summary of Cost-Benefit Analysis of Dummy Project, m€

	Welfare change				Investment cost	OM cost	Trans. loss change	EENS change	**Total net present value**
	Consumer	Producer	Rent	Subtotal					
Modelled countries	-40	850	-403	407	-91	-14	49	13	**364**
EnC + Neighbours	746	56	-416	385	-91	-14	49	13	**342**

Net Present Value = 342 m€

Benefit/Cost ratio = (385+49+13)/(91+14)=4.25

This results is the input of the MCA

Overview on Multi-Criteria Assessment Methodology

Rationale for MCA

- Not all dimensions of impacts may be monetised (which is necessary for inclusion within economic CBA)
- MCA allows to integrate qualitative criteria with results of the CBA

Step-wise methodology of Multi-Criteria Assessment

1. Identification and definition of criteria
2. Specification of indicators to measure criteria
3. Weighting of criteria (using the AHP approach)
4. Assessment of the fulfilment of each criterion by each investment project
5. Calculation of a final score for each project
   → ∑ score of each criterion * weight of each criterion
6. Relative ranking of projects based on the project scores

Overview of Project Assessment Criteria

Source of criteria

- EU Regulation 347/2013 as adopted by the Ministerial Council Decision
- Assessment approach for EU Projects of Common Interest (PCI)
- ENTSO-E and ENTSOG methodologies with feedback provided from ACER
- Consultant's expertise from previous PECI 2016 and 2018 selection

	Criterion	*Indicator*
Result of CBA	Change in socio-economic welfare	1 Net Present Value(NPV) or Benefit/Cost ratio
Additional Criteria of MCA	Improvement of System Adequacy	2 System Adequacy Index (SAI)
	Enhancement of competition	3 Herfindahl-Hirschman Index (HHI)
	Project Maturity	4 Implementation Progress Indicator (IPI)

Project Assessment Criteria – Change in Socio-Economic Welfare

1

Change in socio-economic welfare

- Within the economic CBA, *incremental changes in socio-economic welfare from project implementation* measures the project's impact on:
  - **market integration** via the impact on wholesale price changes (convergence)
  - **security of supply** related benefits measured by reductions of outages and non-supplied electricity
  - variation of **CO2 emissions** related to changes in regional electricity production patterns
  - variation of **network losses** related to changing load flow patterns
- The change in socio-economic welfare is measured by the net present value (NPV) or the Benefit/Cost (B/C) ratio
- The higher the NPV (or the B/C ratio) the larger the net benefit
- Score of 1 assigned to project with smallest NPV (or B/C ratio) above zero
- Project with NPV negative but close to zero, will be assigned a score of 0

Dummy project example Romania – Bulgaria interconnector

NPV values of dummy project and three other electricity infrastructure projects calculated within CBA

NPV	Value (m€)	Score
Project 1	700	10.00
Project 2	200	1.00
Project 3	400	4.60
IP RO-BG	**342**	**3.56**

Project Assessment Criteria – System Adequacy Index

3

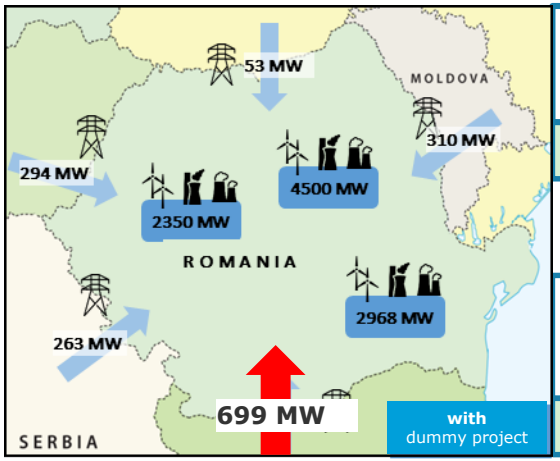
Improvement of System Adequacy

- The incremental *improvement of overall system reliability* accounting for the structural change of capacities by providing an additional source of supply is calculated as the change of the **System Adequacy Index (SAI)** with and without the individual project
- The higher the value of the index the higher system adequacy

$$SAI = \frac{(\text{generation} + \text{interconnection}) - \text{system peak demand}}{\text{system peak demand}}$$

- **Calculation of index**
  - 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 index**
  - Score of 1 and 10 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

MCA Example of Dummy Project – System Adequacy Index



$$\frac{(9818 + 1119) - 8228}{8228} = 0.33$$

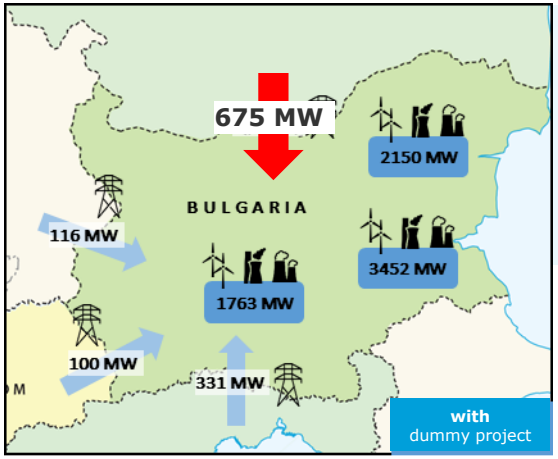
SAI for Romania without project

system peak demand of 8228 MW

$$\frac{(9818 + 1119 + 500) - 8228}{8228} = 0.39$$

SAI for Romania with project

Increase of SAI by 0.06 indicates improvement in adequacy due to implantation of dummy project



- Applying same approach for Bulgaria results in an increase of SAI by 0.08 (indicating an improvement of adequacy).
- Adding up both numbers results in an overall SAI impact of the dummy project of 0.14

	Change in SAI	Score
Project 1	0.06	1.00
Project 2	0.10	3.77
Project 3	0.19	10.00
IP RO-BG	**0.14**	**6.54**

Project Assessment Criteria – Herfindahl-Hirschman Index

2

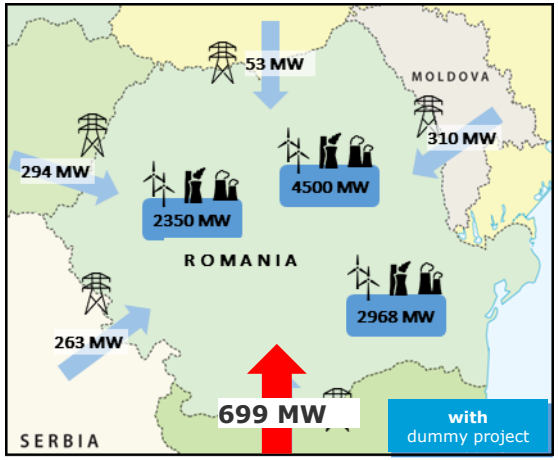
Enhancement of Competition

- *Incremental enhancement of competition* is calculated as change in the simplified **Herfindahl-Hirschman Index (HHI) that is** based on the national market shares in power generation and of the interconnection capacities.
- Index with and without the individual project as aggregate of the impacts in the countries on each end of interconnector
- All existing and proposed generation capacities are assigned according to ownership of power plants, interconnection capacities are considered as independent players on each border
- The higher the value of the index the higher the market concentration

$$\text{HHI} = \sum [\ (market\ share\ gen.A)^2 + (market\ share\ gen.B)^2 + \ldots + (market\ share\ \ interc.X)^2 + (market\ share\ \ interc.Y)^2 + \ldots\ ]$$

- **Calculation of index**
  - 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 index**
  - Score of 1 and 10 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

MCA Example of Dummy Project – Herfindahl-Hirschman Index



$$[\ 21.49^2 + 41.14^2 + 27.14^2 + 0.48^2 + 2.83^2 + 2.69^2 + 2.40^2 + 1.82^2\ ] = 2916$$

market shares generation | "market shares" interconnection

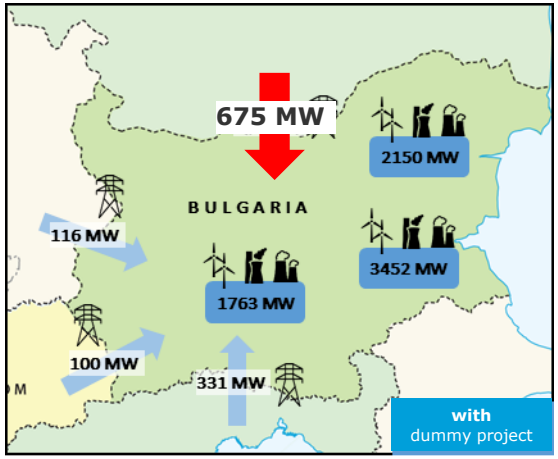
HHI for Romania without project

$$[\ 20.55^2 + 39.35^2 + 25.95^2 + 0.46^2 + 2.71^2 + 2.57^2 + 2.30^2 + 6.11^2\ ] = 2701$$

market shares generation | "market shares" interconnection

HHI for Bulgaria with project

Decrease of HHI by 215 indicates an increase of competition due to implementation of dummy project



- Applying same approach for Bulgaria results in a change of HHI of -109.
- Adding up both numbers results in an overall HHI impact of the dummy project of -324

	Change in HHI	Score
Project 1	1486	5.78
Project 2	785	2.90
Project 3	2513	10.00
IP RO-BG	**324**	**1.00**

Project Assessment Criteria – Implementation Progress Indicator

4

Implemen-tation Progress Index

- The **Implementation Progress Index (IPI)** assesses the preliminary implementation potential of each individual project based on information provided in questionnaires
- A score of 1 is assigned for each project implementation step already undertaken, based on information provided in questionnaire
- Evaluation is conducted separately for each proposed investment project
- Where project maturity is significantly different on each side of a border, progress of least developed part will be applied for calculation
- Favours projects which have a clear implementation plan and/or have already commenced their preparatory activities

- **Scoring of index**
  - A score of 1 is assigned for each project implementation step already undertaken by a project in 2020 (i.e. IPI score between 1-10)
  - IPI score is reduced by 10 points in case no progress is observed for a project compared to previous assessment in 2018

Proposed change

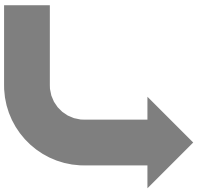
  - Projects with progress as well as new projects (not assessed previously) will receive an IPI score according to the steps already undertaken

MCA Example of Dummy Project – Implementation Progress Indic.

Dummy project example Bulgaria – Greece interconnector

Project implementation steps	Score	
Consideration phase	✓	1
Preparatory studies / pre-feasibility studies	✓	1
Technical feasibility study / Environmental impact assessment	✓	1
Economic feasibility study / cost-benefit analysis		1
Detailed design study (FEED/Main Design)		1
Financing secured		1
Planning approval / permitting		1
Approval by regulatory authority		1
Final investment decision		1
Tendering		1

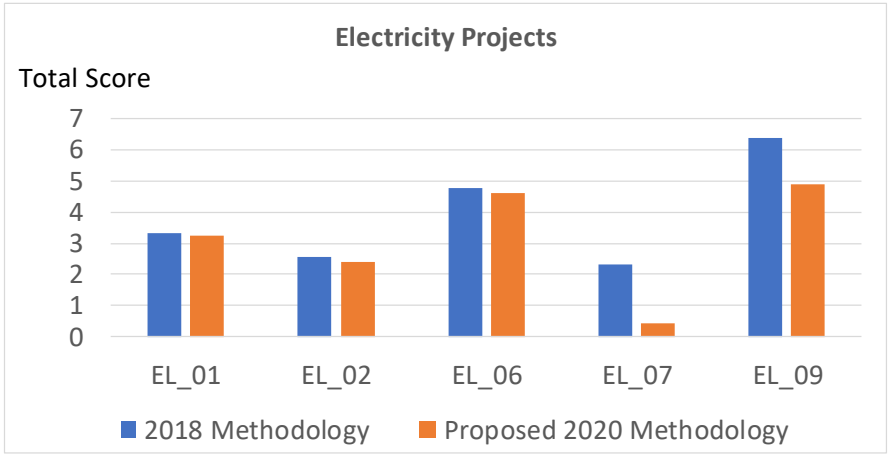
Assumption only **"consideration phase", "Preparatory studies"** and **"Technical feasibility"** have been completed and recorded in questionnaire for the whole project (i.e. sections located in both countries)



	IPI	Score
Project 1	1.00	1.00
Project 2	2.00	2.00
Project 3	2.00	-8.00
IP RO-BG	**3.00**	**3.00**

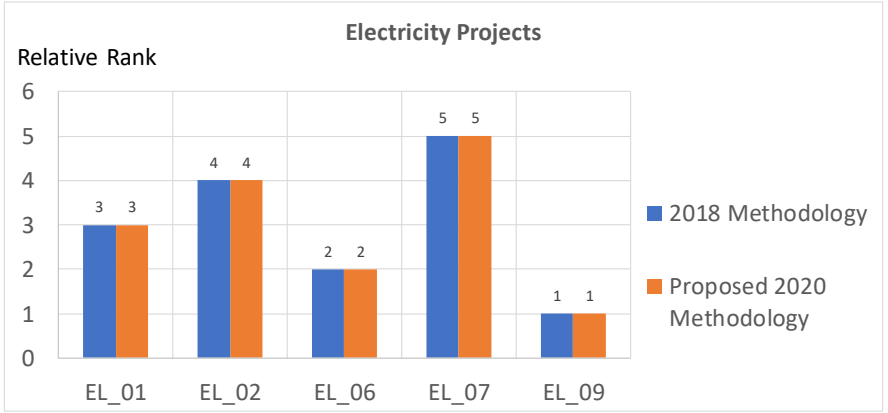
Impact of Proposed Adjustments for Assessment of Maturity on 2018 Results (i.e. Change of Weights and IPI Scoring)

Impact on total score



Reduction of IPI Score applied to all projects where no clear progress was reported in questionnaires (2018 vs. 2016)

Impact on relative rank



No change in relative rank

Impact of Proposed Adjustments for Assessment of Maturity on 2018 Results (i.e. Change of Weights and IPI Scoring)

Scoring of Maturity in 2016

Project Phase	Score
Consideration phase	1.00
Planning approval	1.36
Preliminary design studies	1.73
Market test	2.09
Preliminary investment decision	2.45
Public consultation (according to Art. 9(4) of adapted Regulation 347/2013)	2.82
Permitting	3.18
Financing secured	3.55
Final investment decision	3.91
Tendering	4.27
Construction	4.64
Commissioning	5.00

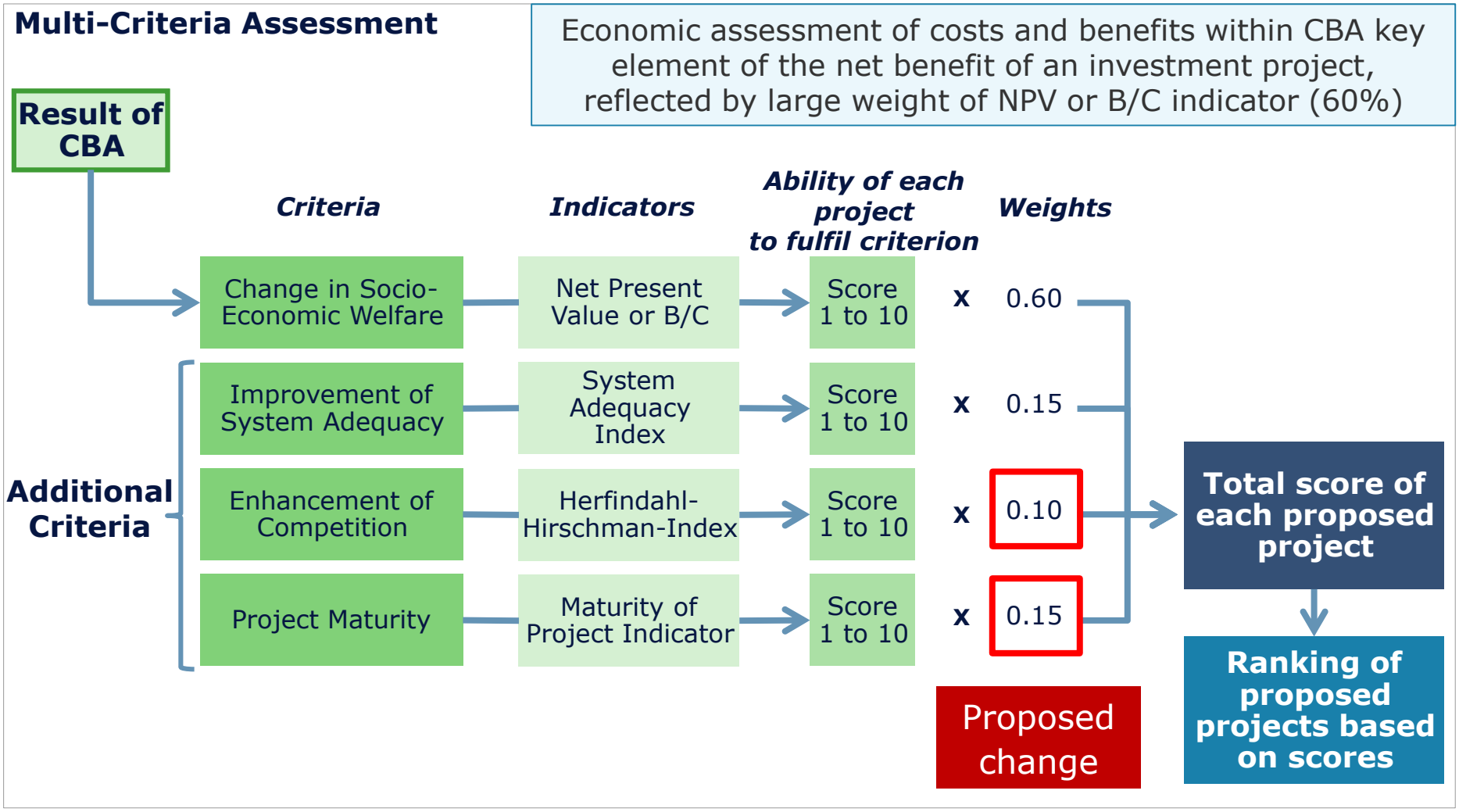
As steps do not fully match: Difficult to compare scores from 2018 with 2016

Scoring of Maturity in 2018

Project implementation steps	Score
Consideration phase	1
Preparatory studies / pre-feasibility test	1
Technical feasibility study / Environmental impact assessment	1
Economic feasibility study / cost-benefit analysis	1
Detailed design study (FEED / Main Design)	1
Financing secured	1
Planning approval / permitting	1
Approval by regulatory authority	1
Final investment decision	1
Tendering	1

Reduced IPI score due to lack of progress reported between 2018 and 2020 may affect potentially 1 out of 6 projects

Overview on Multi-Criteria Assessment Methodology



Relative Ranking of Projects

- Ranking is done by multiplying the score for each criterion, with the weight of each criterion a total score will then calculated for each project or project cluster (previous slide)
- Based on the calculated total scores of each individual project or project cluster a relative ranking of all eligible projects (i.e. a comparison of each individual project with the other submitted projects) will be provided in the final step

Dummy project example Romania – Romania Interconnector

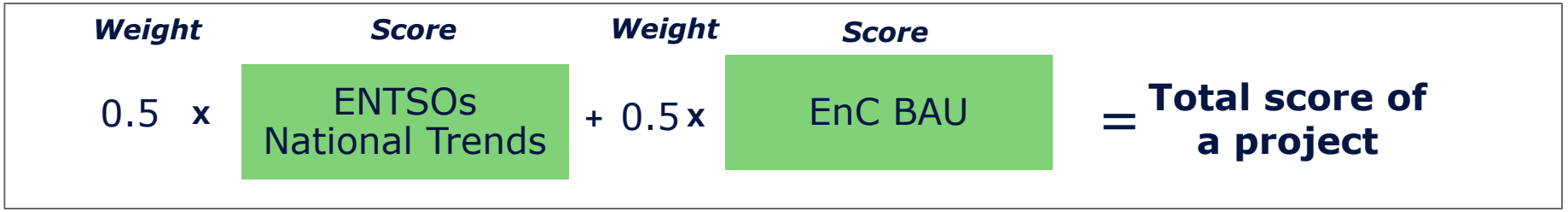
Project	Indicators (Scores)				Weights				Indicators (Weighted Scores)				Total Score	Ranking
	Result of the CBA	Improvement of System Adequacy	Enhancement of Competition	Project Maturity	Result of the CBA	Improvement of System Adequacy	Enhancement of Competition	Project Maturity	Result of the CBA	Improvement of System Adequacy	Enhancement of Competition	Project Maturity		
	Net Present Value (NPV)	System Adequacy Index (SAI)	Herfindahl-Hirschman-Index (HHI)	Implementation Progress Indicator (IPI)	Net Present Value (NPV)	System Adequacy Index (SAI)	Herfindahl-Hirschman-Index (HHI)	Implementation Progress Indicator (IPI)	indicator * weight					
P 1	10.00	1.00	5.78	1.00	60%	15%	10%	15%	6	0.15	0.578	0.15	6.878	
P 2	1.00	3.77	2.90	2.00	60%	15%	10%	15%	0.6	0.5655	0.29	0.3	1.756	
P 3	4.60	10.00	10.00	-8.00	60%	15%	10%	15%	2.76	1.5	1	-1.2	4.06	2
IP RO-BG	**3.56**	**6.54**	**1.00**	**3.00**	**60%**	**15%**	**10%**	**15%**	**2.136**	**0.981**	**0.1**	**0.45**	3.667	**3**

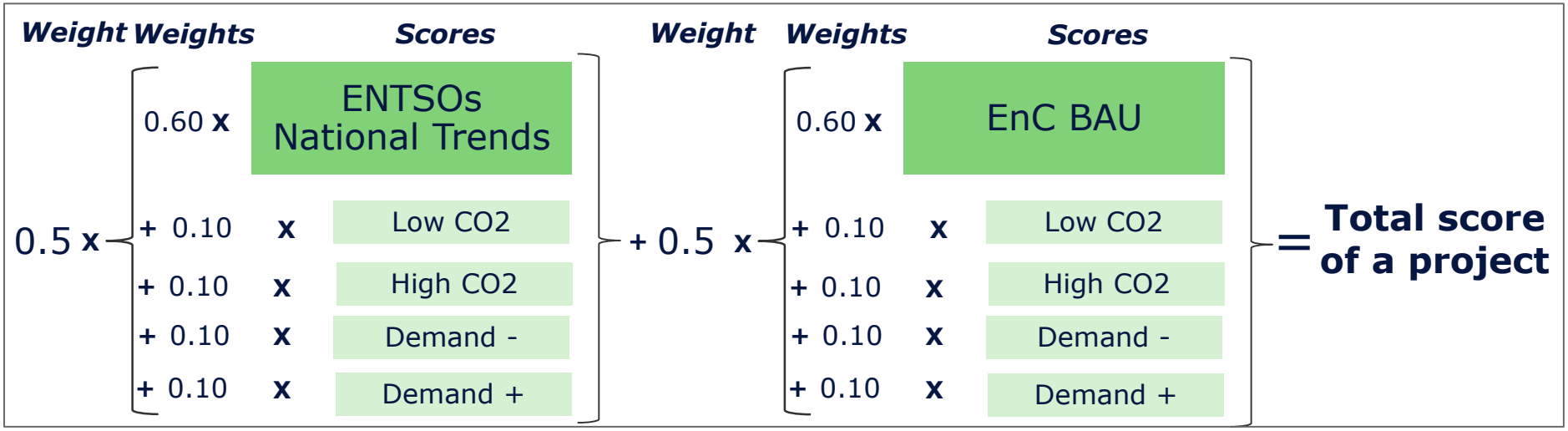
New This Year: Scoring and Ranking based on two Scenarios

Both the CBA (market modelling) and the MCA will be done for different scenarios.

Option 1) Weighting of the two scenarios (ENTSOs National Trends and Enc BAU) conducting additional sensitivity analysis for CO2 prices and demand forecasts **(recommended option)**

Option 2) Aggregation of scenarios and sensitivities in a single score for each project





Thank you!

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