Energy Institute Hrvoje Požar
Croatia

Technical support to the Energy Community and its Secretariat to assess the candidate Projects of Energy Community Interest in electricity, smart gas grids, hydrogen, electrolysers, and carbon dioxide transport and storage, in line with the EU Regulation 2022/869

- Final data used, scenarios and assumptions, sensitivity analysis, update of previous reports -

TEN-E (PECI) Groups meeting – 4th meeting of the “Electricity” Group

19 June 2024

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1. Deadlines and project activities
2. Final input data set
3. Scenarios and assumptions
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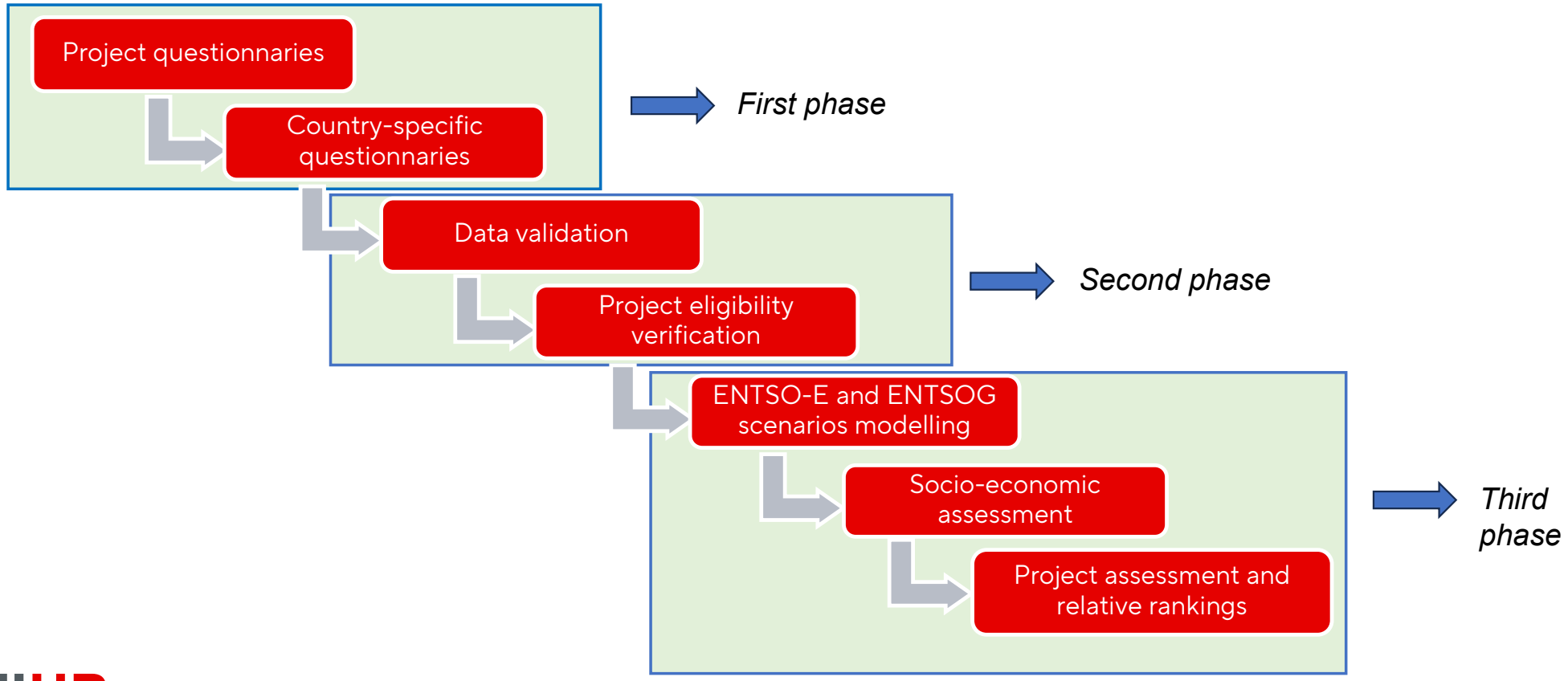
5. Update of previous reports

Main project activities



Work plan and deliverables

1. **Inception Report**

   Description of activities, work plan, approach, presentation of project-specific and country specific questionnaires

2. **Data Validation and Scenario Report**

   Report on the collected project and country data, data validation process and compliance of the data with the proposed analysis, results of the project eligibility verification, description of defined scenarios

3. **Analysis Techniques' Guidance Document**

   Final description of the data, scenarios, applied methodologies and techniques, sensitivities to be carried out, and structure of results and indicators

4. **Final Report**

   Summary of the applied methodology, scenarios, data and assumptions and detailed presentation and interpretation of the results for each analysed project in all scenarios and sensitivities

No	Activity	Begining	End
1	Kick-off meeting	16/02/2024	16/02/2024
2	**Inception Report** preparation and submission ✓	16/02/2024	29/02/2024
3	1st Groups' meetings	07/03/2024	07/03/2024
4	Data Collection	26/02/2024	08/04/2024
5	**Data Validation and Scenario Report** ✓	18/03/2024	15/04/2024
6	2nd Groups' meetings	18/04/2024	19/04/2024
7	Data and Scenario Finalization	19/04/2024	03/05/2024
8	**Analysis Techniques' Guidance Document** ✓	19/04/2024	10/05/2024
9	3rd Groups' meetings	15/05/2024	16/05/2024
10	Project Assessment	17/05/2024	14/06/2024
11	Assessment Results Consultation with the Secretariat	12/06/2024	17/06/2024
12	4th Groups' meetings	19/06/2024	20/06/2024
13	**Final Report** preparation and submission	22/04/2024	28/06/2024

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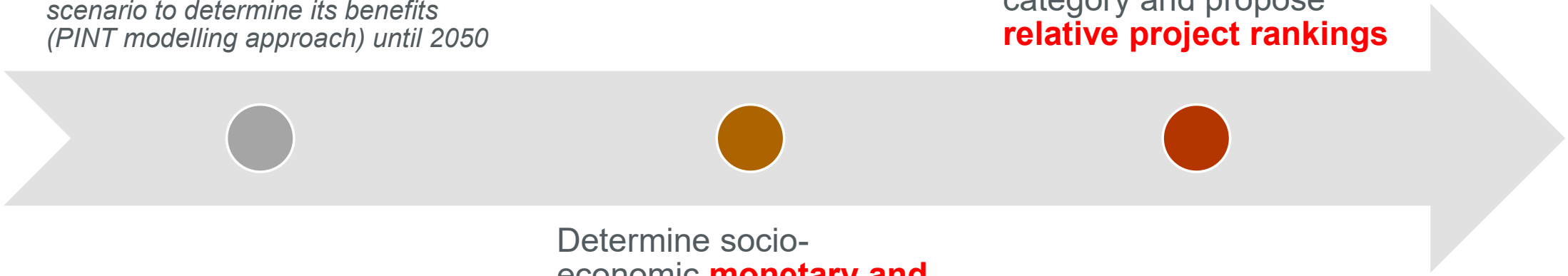
Approach for project assessment

Develop a **reference scenario**, against all projects are assessed

- *Each project is added to the reference scenario to determine its benefits (PINT modelling approach) until 2050*



Determine socio-economic **monetary and non-monetary benefits** and costs for each project (project-specific CBA and MCA)

Compare individual project assessment results between projects in the same project category and propose **relative project rankings**

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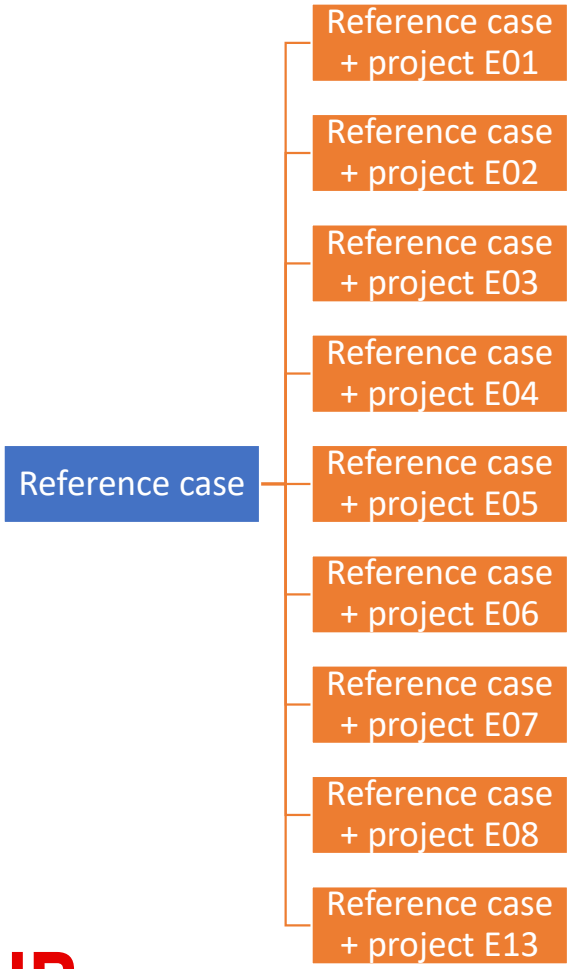
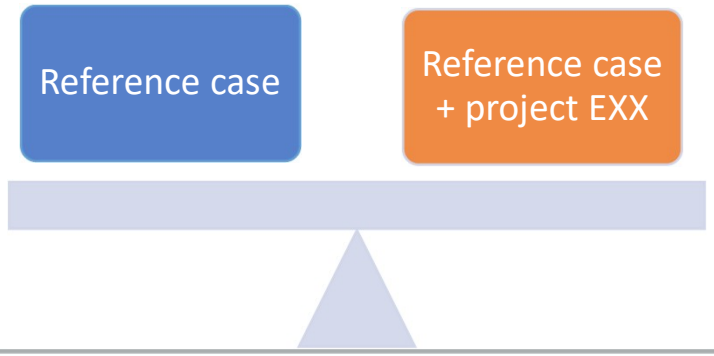
Project assessment approach

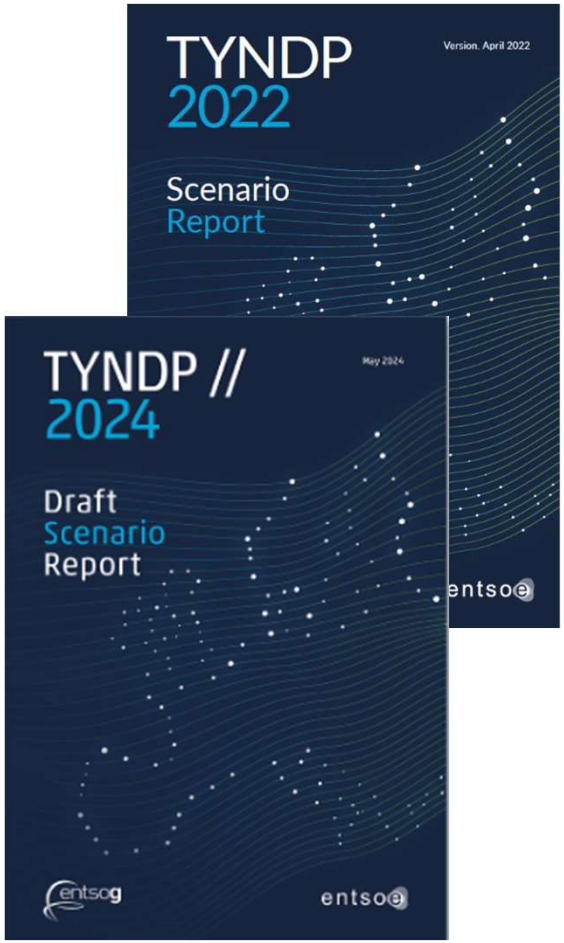


- **Put IN one at the Time (PINT)** considers each new project on the given network structure one-by-one and evaluates the **results** with and without the examined network investment/project reinforcement
- Results are used to determine project **benefits** according to the relevant methodologies
- **Costs** are determined based on the submitted project data by project promoters
- Relevant indicators for each project are determined based on comparison with the reference case



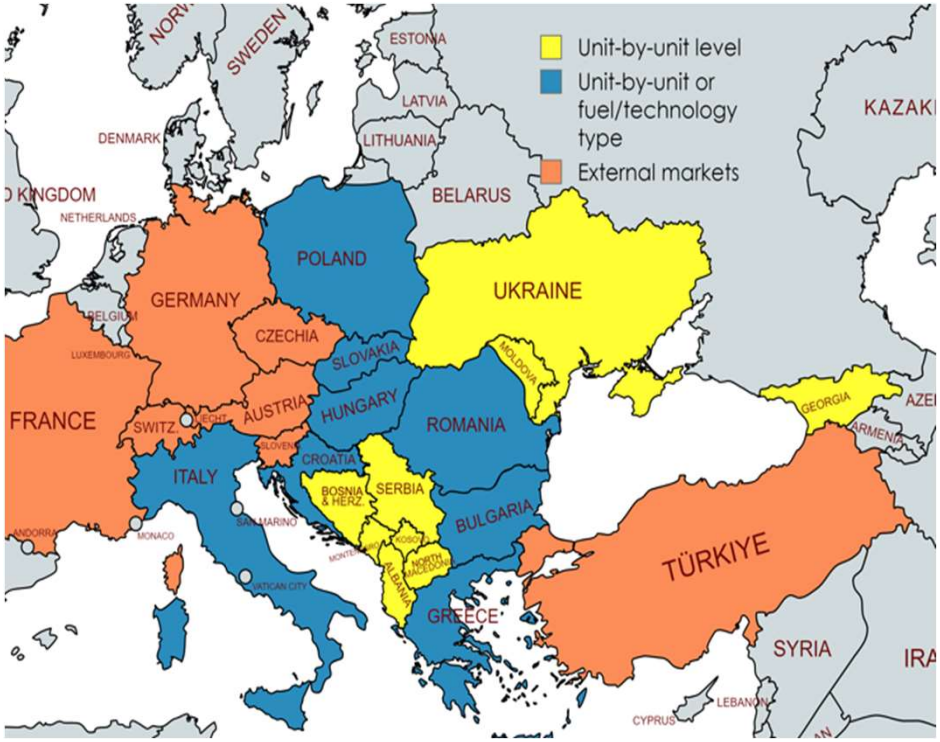
Modelling scenarios

- The **input data for the reference scenario and CPs** is primarly based on the country-specific data delivered by the ministries or TSOs, assuming that the data are in line with 2030 energy and climate targets for the EnC CPs
- For other input data, **ENTSO-E and ENTSOG TYNDP 2022 data** are primarily used as the relevant source because data for TYNDP 2024 were not available at the time when modelling activities were initiated
    - **National Trends (NT) for 2030/2040**
    - **Distributed Energy (DE) for 2050**
- As agreed with EC/EnC, since TYNDP 2024 scenario report was published in the second half of May 2024, some data important are used from this plan



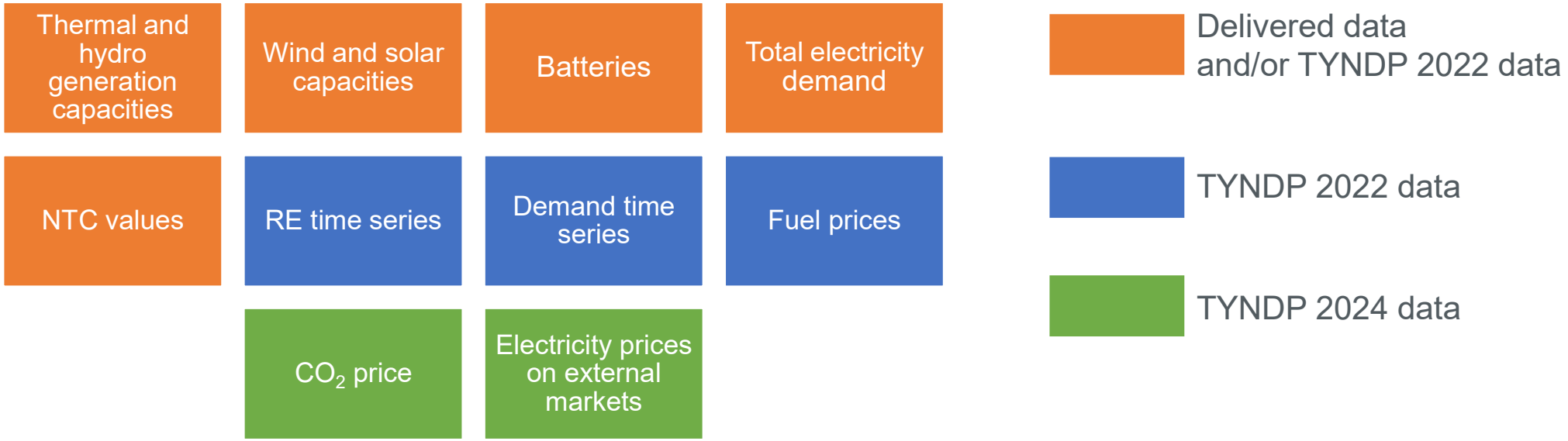
General modelling assumptions

- **Geographical scope**: Albania, Bosnia and Herzegovina, Georgia, Kosovo*, Moldova, Montenegro, North Macedonia, Serbia and Ukraine
  - Detailed unit-by-unit models based on the delivered data
- **Neighbouring countries**:
  - Use of the best available data and models (ENTSO-E TYNDP, EIHP in house data sets and developed models)
    - Some countries presented on a unit-by-unit level, others modelled on a fuel/technology level
    - Power systems of other countries, that have borders with neighbouring countries of CPs, are considered in PLEXOS as **spot markets** (hourly market prices are insensitive to price fluctuations in the CPs region and its neighbouring countries)
- **Time horizon:** 2030/2040/2050
- **Hydrological conditions:** Average/Normal
- **Climatic year:** 2009
- **Modelling tools:** PLEXOS Energy Modelling Software, PSS/E



Input data and modelling assumptions

- Input data and assumptions for **reference scenario (without projects)** based on the delivered country-specific data and **ENTSO-E and ENTSOG TYNDP 2022 (and 2024)** scenarios



Input data and modelling assumptions

- **Generation capacities**
  - Data on generation capacities for CPs collected from TSOs and ministries
  - In case of differences between the delivered data and the data based on the TYNDP 2022 scenarios, **the data provided by relevant national authorities is used**
    - *The modifications of the provided input data are made where necessary in 2050 (DE scenario) by decommissioning all coal-fired thermal power plants without any exception, and by eventually assuming the application of carbon capture technology on gas-fired power plants or their usage of clean gases*

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Input data and modelling assumptions

- **Generation capacities (MW)**

2030	Nuclear	Thermal-gas	Thermal-lignite/coal	Hydro	Wind	Solar	Batteries
AL	-	300	-	2623	300	700	-
BA	-	-	1418	2323.8	798	1514	50
GE	-	1598.2	22.3	4065	750	700	200
XK	-	-	904	100.7	677	550	170
MD	-	1720	47.2[1]	64.5	442	470	10
ME	-	49[2]	225	961.4	250	750	28
MK	-	760	31[3]	938.1	443	580	-
RS	-	400.9	4584	3244.2	3844	235	-
UA	13 940	4772.3	15855	2572.9	580	7350	258

2040	Nuclear	Thermal-gas	Thermal-lignite/coal	Hydro	Wind	Solar	Batteries
AL	-	300	-	2633	700	1300	-
BA	-	-	1418	2480.3	1500	3000	381
GE	-	1598.2	22.3	5805	1700	1650	200
XK	-	-	904	100.7	1275	1340	170
MD	-	1720	47.2	64.5	960	750	10
ME	-	49	225	961.4	600	2400	28
MK	-	-	31	1480.5	723	998	-
RS	-	400.9	3899	3848.3	3246	950	-
UA	13 940	4772.3	15 855	2572.9	2580	11 120	258

2050	Nuclear	Thermal-gas	Thermal-lignite/coal	Hydro	Wind	Solar	Batteries
AL	-	300	-	2633	1650	1650	-
BA	-	-	-	2480.3	2500	5000	500
GE	-	1598.2	-	8350	2900	2600	200
XK	-	-	-	100.7	1873	1938	170
MD	-	1720	-	64.5	1120	880	10
ME	-	-	-	961.4	700	4300	28
MK	-	-	-	1480.5	605	11553	105
RS	-	400.9	-	3848.3	2968	725	-
UA	13 940	4772.3	-	2572.9	6750	21220	258

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[1] In Moldova thermal is not lignite/coal but other non-renewable thermal capacity
[2] In Montenegro thermal is not natural gas but other renewable thermal capacity
[3] In North Macedonia thermal is not natural gas but other renewable thermal capacity

Input data and modelling assumptions

- **Electricity demand**
  - Data on electricity demand for CPs collected from relevant national authorities (based on the TYNDP 2022 scenarios)
  - There are some differences between the collected data and the data based on the TYNDP 2022 scenarios
  - Proposal by the Secretariat and the Consultant:
    - to use the data provided by relevant national authorities
    - in cases where data were not provided, TYNDP 2022 data is used

GWh	2030	2040	2050
AL	8900	9400	12 116
BA	11 158	12 681	13 457
GE	19 111	23 907	29 071
XK	6802	7998	10 180
MD	7002	8417	9993
ME	4539	5534	6281
MK	8879	10 147	10 759
RS	36 498	37 240	37 218
UA	151 840	208 500	296 600

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Input data and modelling assumptions

- **Fuel and CO_2 prices**

€/GJ	2030	2040	2050
Nuclear		0.47	
Biomethane	20.74	16.94	13.97
Shale Oil	1.86	2.71	3.93
Lignite:			
Group 1 (BG, MK and CZ)	1.40		N.a
Group 2 (SK, DE, RS, PL, ME, UK, IE and BA)	1.80		N.a
Group 3 (SI, RO and HU)	2.37		N.a
Group 4 (GR and TR)	3.10		N.a

	Unit	Scenarios	2030	2040	2050
CO_2	€/tonne		**113.4**	**147.0**	**168.0**
Hard coal	€/GJ	**NT**	**2.48**	**2.41**	N.a
		DE	1.97	1.92	**1.87**
Light oil		**NT**	**13.78**	**15.41**	N.a
		DE	10.09	9.61	**9.12**
Natural gas		**NT**	**6.23**	**6.90**	N.a
		DE	4.02	4.07	**4.07**
Biomethane		**NT**	**20.74**	**16.94**	N.a
		DE	20.74	16.94	**13.97**
Synthetic methane		**NT**	**28.09**	**23.35**	N.a
		DE	28.96	23.35	**18.09**
Renewable H2 imports		**NT**	**20.25**	**16.08**	N.a
		DE	20.63	16.08	**12.52**
Decarbonised H2 imports		**NT**	**20.25**	**16.08**	N.a
		DE	17.11	17.55	**17.91**

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Input data and modelling assumptions

- **NTC values**
  - Data on NTC values between CPs and CPs and neighbouring countries are collected from relevant authorities
  - Given that there were some differences in the collected data and the data based on the TYNDP 2022 scenarios, the final input data set regarding NTC values is determined by using the following principles:
    - ✓ based on the data provided by relevant CPs authorities in cases where there are no differences between the provided data by the two national authorities for the same border,
    - ✓ based on the TYNDP 2022 data if the provided data by relevant CPs authorities differs from each other and from the TYNDP 2022 data,
    - ✓ in cases where TYNDP 2022 doesn't provide data for specific border, values provided by relevant CPs authorities are used. If values provided by relevant CPs authorities differ for the same border, a lower NTC value is used.

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Sensitivity analysis

- Proposed parameters for sensitivity analyses for CBA:
  - **Load (±20%)** – it is expected that an increasing number of applications and different sectors like transport and heating will be electrified in the future (e.g. e-mobility, heat pumps, etc.), which would cause an **increase in load** and the necessary generation and therefore possibly affect several CBA indicators such as SEW. On the other hand, energy efficiency measures will lead to **decreasing load**,
  - **RES (+20%)** – amendments to the national RES goals, which could occur frequently in the observed horizon, could lead to impacts on the results of the CBA assessment

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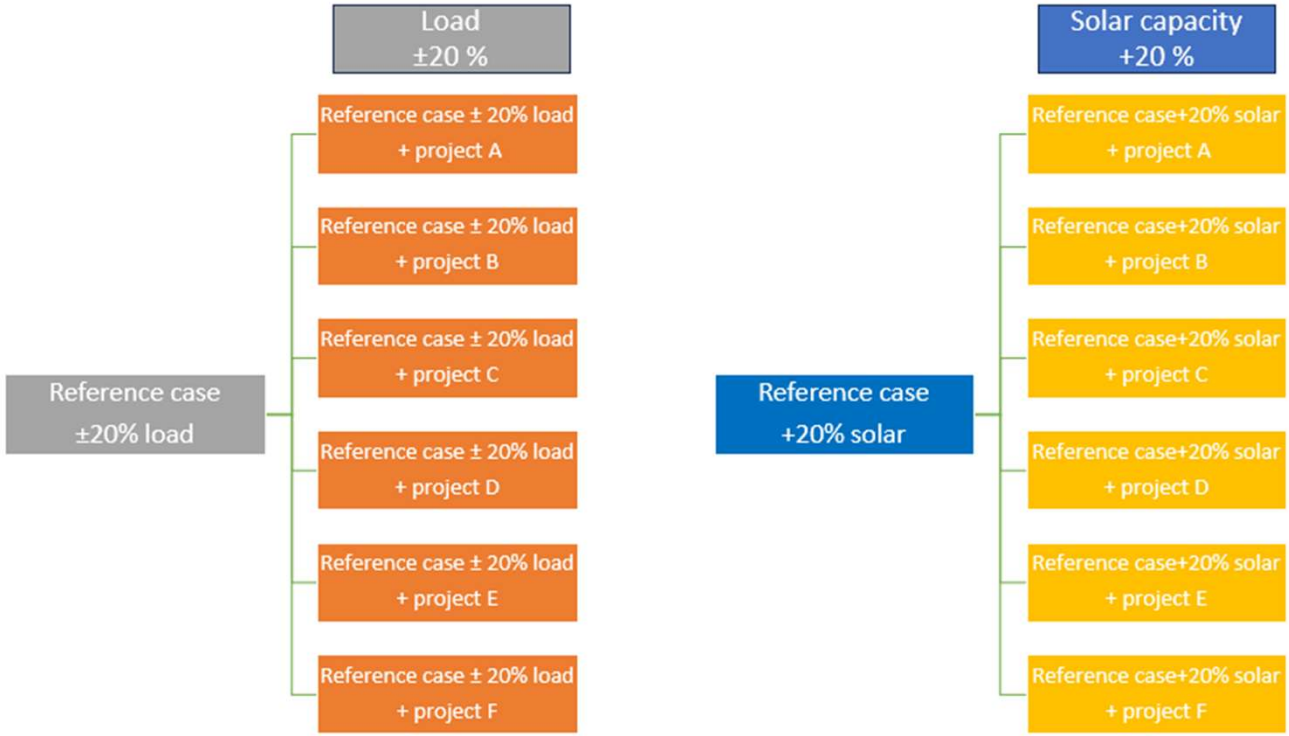
Proposed parameters for sensitivity analyses

- Proposed values for sensitivity analyses for CBA under PECI 2024 process:



Update of the previous reports

- ***Data Validation and Scenario Report*** and ***Analysis Techniques' Guidance Document*** were updated due to changes in assumptions and input data
  - Change in CO_2 price
    - ✓ New price based on the TYNDP 2024 Report published in May 2024
  - Change in parameters for sensitivity analysis
    - ✓ ±20% Load, +20 Solar capacity
  - B2 indicator (variation of CO_2 emission) monetised
  - Change in total scores for project ranking
    - ✓ 27 instead of 30, due to the monetisation of the CO_2 variation

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Thank you for your attention

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