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

- Presentation of the methodologies -

TEN-E (PECI) Groups meeting – 2nd joint meeting of the “Electricity” and “Gases” Groups

18 April 2024

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Approach for project assessment

Develop a **reference scenario**, against which all projects will be assessed

- *Each project will be 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**

Socio-economic assessment

- **Objective**
  - to determine socio-economic monetary and non-monetary project **benefits and costs**
- **Cost-benefit and multi-criteria analysis**
  - CBA evaluates project impact on costs and benefits at the level of society
  - MCA determines non-monetised project impacts
  - Integrated CBA and MCA approach to ensure **a full assessment of all benefits**, both monetized and non-monetized

Socio-economic assessment

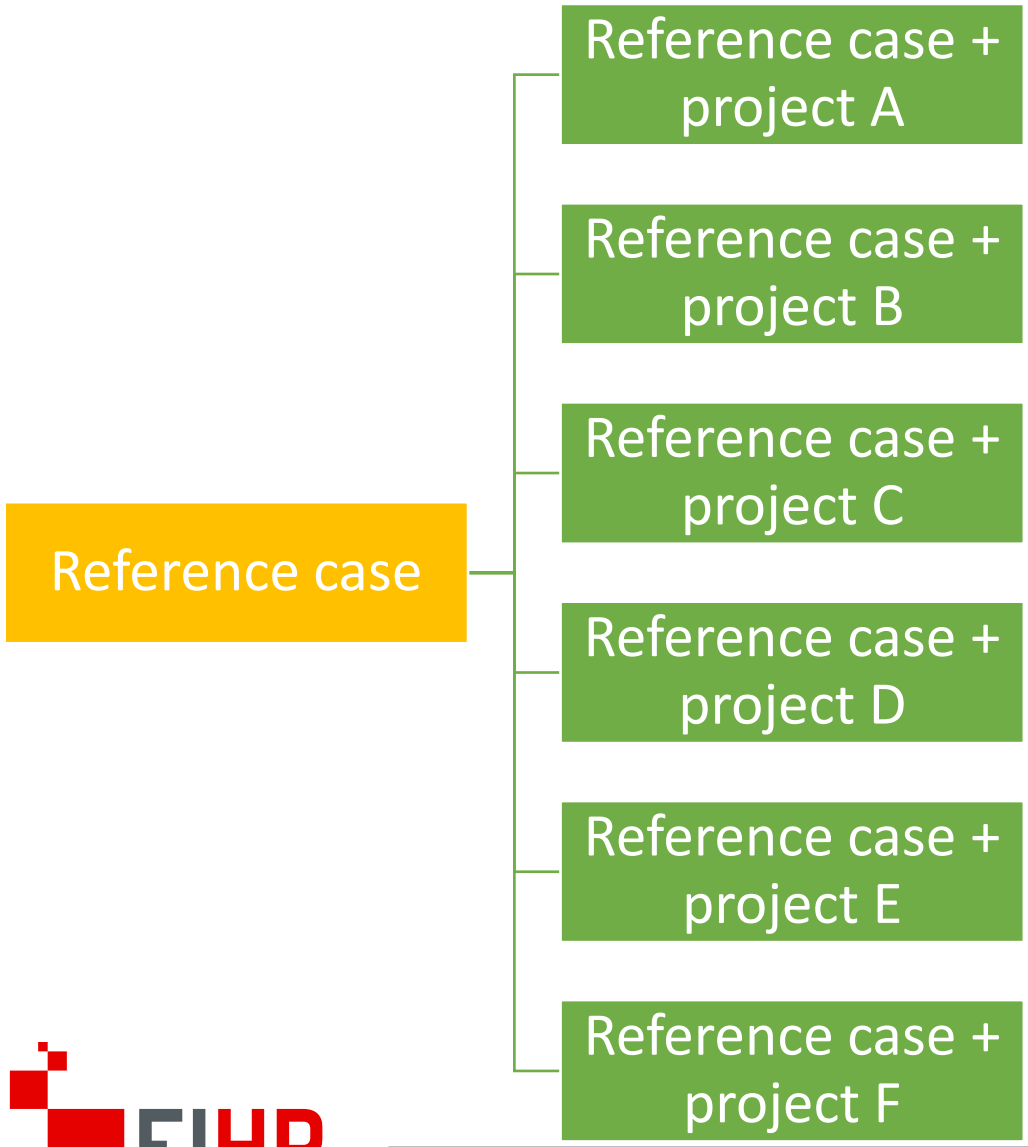
Costs

- Verified investment costs **(CAPEX)** and operation and maintenance costs **(OPEX)** delivered by the project promoters

Benefits

- Indicators calculated **using market and network models**, and
- Indicators determined based on **the data delivered by the project promoters**, depending on specific assessment criteria set out in the methodologies

Approach for project assessment



- ***Main objective:*** *to determine if the potential* ***overall benefits of the project outweigh its costs***
- ***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*

Methodologies for project assessment

- **CBA Methodologies of the ENTSO-E and ENTSOG**
  - ✓ *4th ENTSO-E Guideline for Cost-Benefit Analysis of Grid Development Projects, April 2023*
  - ✓ *2nd ENTSOG Methodology for Cost-Benefit Analysis of Gas Infrastructure Projects, February 2019*
- Methodologies developed and published by **the European Commission**
  - ✓ *Harmonised System Wide Cost-Benefit Analysis for Candidate Electrolyser Projects, May 2023*
  - ✓ *Harmonised System Wide Cost-Benefit Analysis for Candidate Hydrogen Projects, May 2023*
  - ✓ *Harmonised System Wide Cost-Benefit Analysis for Candidate Smart Gas Grid Projects, May 2023*
  - ✓ *Harmonised System Wide Cost-Benefit Analysis for Candidate Smart Electricity Grid Projects, May 2023*
  - ✓ *Harmonised System Wide Cost-Benefit Analysis for Candidate Cross-Border Carbon Dioxide Network Projects, May 2023*
- Methodology for assessing the **hydrogen and electrolyser candidate** PCI/PMI projects 2022-2023 exercise, June 2023
- Methodology for assessing the **electricity and offshore infrastructure** candidate PCI and PMI 1st Union PCI-PMI list 2023, June 2023
- Previous methodologies used for the selection of PECI/PMI projects in the Energy Community

EIHP

Methodologies for project assessment

Methodology for assessing the electricity and offshore infrastructure candidate PCI and PMI 1st Union PCI-PMI list 2023, June 2023

- The assessment methodology applies to **electricity transmission** and offshore projects as well as **energy storage facilities**
- The PECI candidate project shall contribute:
  - significantly to **sustainability** through the integration of renewable energy into the grid, the transmission or distribution of renewable generation to major consumption centers and storage sites, and to reducing energy curtailment, where applicable;

  and to at least one of the specific criteria:

  - **market integration**, including through lifting the isolation of at least one CPs and reducing energy infrastructure bottlenecks, competition, interoperability and system flexibility;
  - **security of supply**, including through interoperability, system flexibility, cybersecurity, appropriate connections and secure and reliable system operation.

EIHP

Methodologies for project assessment

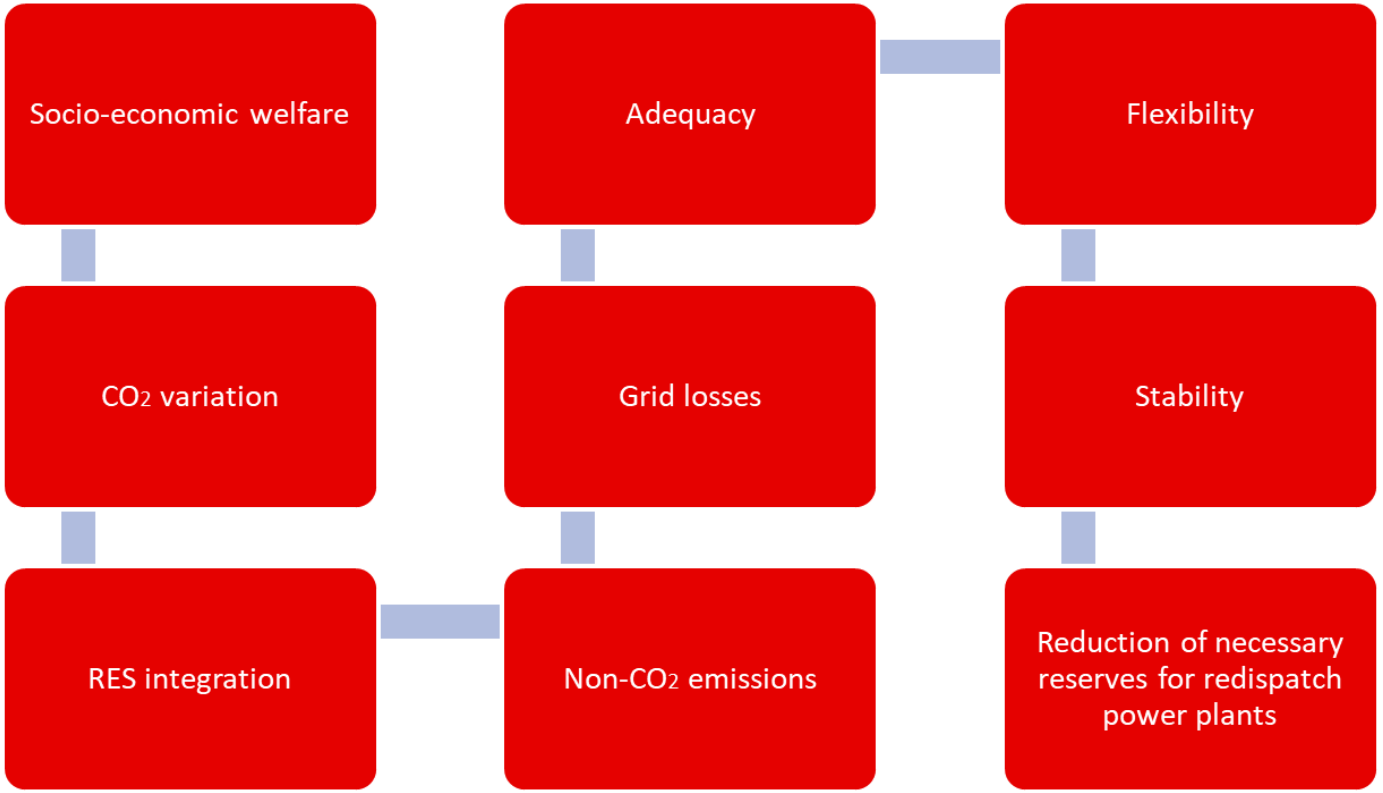
Methodology for assessing the electricity and offshore infrastructure candidate PCI and PMI 1st Union PCI-PMI list 2023, June 2023

- The fulfilment of the specific criteria is indicated by positive values for the following relevant indicators:
  - **Sustainability**: increase in RES integration (**B3 ΔRES** indicator - Annual avoided curtailment)
  - **Market integration**: increase in annual Socio-Economic Welfare (**B1 ΔSEW** indicator)
  - **Security of supply**: improvement in system adequacy (**B6 ΔSoS**, weighted average)
    - and/or (i) for transmission projects: system stability (**B8 Stability** (Transient, Voltage and Frequency Stability)), non-scenario dependent),
    - (ii) for energy storage: system flexibility (**B7 System Flexibility**, non-scenario dependent)

Methodologies for project assessment

4th ENTSO-E Guideline for Cost-Benefit Analysis of Grid Development Projects, April 2023

- defines nine categories of possible benefits for overhead transmission lines



Some project benefits can be quantified and monetised, while others can only be qualitatively described.

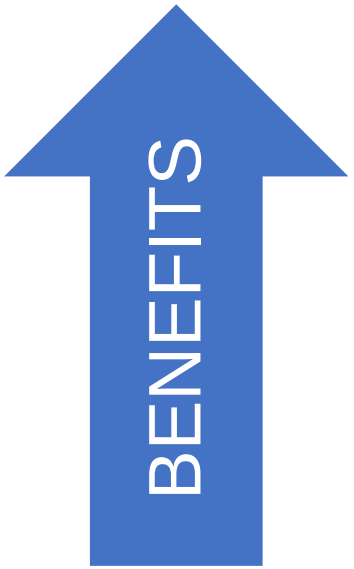
Methodologies for project assessment

Costs and benefits for electricity storage and overhead lines based on the relevant methodologies

- Through the use of synchronized market and network models, the following indicators will be monetised:
  - **Socio – economic welfare (SEW)** – assessed through the contribution of the project to increasing transmission capacity, making an increase in commercial exchanges possible so that electricity markets can trade power in a more economically efficient manner. Monetisation of SEW is done in EUR/yr. Generation cost method will be used to monetize the increase in SEW.
  - **CO_2 variation** – assessed through the change in CO_2 emissions produced by the power system due to the project. It is a consequence of changes in generation dispatch and the unlocking of renewable generation potential.
  - **Grid losses** – assessed through the cost of compensating for thermal losses in the power system due to the project. For the grid losses calculation, both market and network models will be used – in the network model the amount of losses (GWh) will be calculated and then multiplied by marginal prices acquired from the market model in order to fully monetize this benefit.

Methodologies for project assessment

Costs and benefits for electricity storage and overhead lines based on the relevant methodologies



MONETISED

Market integration – socio-economic welfare (SEW)

Sustainability – additional societal benefit due to CO_2 reduction

Savings due to reduction of **grid losses**

NON-MONETISED

Security of Supply

CAPEX

OPEX

Methodologies for project assessment

Methodology for assessing the hydrogen and electrolyser candidate PCI/PMI projects 2022-2023 exercise, June 2023

- The assessment methodology applies to **hydrogen infrastructure** and electrolyser projects
- The PECI candidate project shall contribute:
  - significantly to **sustainability**, including by reducing greenhouse gas emissions, by enhancing the deployment of renewable or low carbon hydrogen, with an emphasis on hydrogen from renewable sources in particular in end-use applications, such as hard-to-abate sectors, in which more energy efficient solutions are not feasible, and supporting variable renewable power generation by offering flexibility, storage solutions, or both;

  and to at least one of the specific criteria:

  - **market integration**, including by connecting existing or emerging hydrogen networks of CPs, or otherwise contributing to the emergence of a network for the transport and storage of hydrogen, and ensuring interoperability of connected systems;
  - **security of supply and flexibility**, including through appropriate connections and facilitating secure and reliable system operation;
  - **competition**, including by allowing access to multiple supply sources and network users on a transparent and non-discriminatory basis.

Methodologies for project assessment

Methodology for assessing the hydrogen and electrolyser candidate PCI/PMI projects 2022-2023 exercise, June 2023

- The fulfilment of the specific criteria is indicated by positive values for the following relevant indicators:
  - **Variation of CO_2 emissions** through integration of renewable and low-carbon hydrogen: variation of CO_2 emissions achievable thanks to the candidate hydrogen project by enabling the integration of renewable and low-carbon hydrogen in the system
  - **Improvement of market integration**: sum of countries that the candidate hydrogen project connects by 2030

Methodologies for project assessment

Harmonised System Wide Cost-Benefit Analysis for Candidate Smart Electricity Grid Projects, May 2023

- The assessment methodology applies to **smart electricity grid** projects
- The smart electricity grid project shall contribute significantly to **sustainability** through the integration of renewable energy into the grid, and contributes to **at least two of the following specific criteria**:
  - **security of supply**, including through efficiency and interoperability of electricity transmission and distribution in day-to-day network operation, avoidance of congestion, and integration and involvement of network users;
  - **market integration**, including through efficient system operation and use of interconnectors;
  - **network security, flexibility and quality of supply**, including through higher uptake of innovation in balancing, flexibility markets, cybersecurity, monitoring, system control and error correction;
  - **smart sector integration**, either in the energy system through linking various energy carriers and sectors, or in a wider way, favouring synergies and coordination between the energy, transport and telecommunication sectors

EIHP

Methodologies for project assessment

Harmonised System Wide Cost-Benefit Analysis for Candidate Smart Electricity Grid Projects, May 2023

- The fulfilment of the specific criteria is indicated with 19 different benefit indicators (B1-B19)
- Project benefits related to **sustainability** should be calculated through the following indicators:
  - Increase of electricity generated from new renewable sources,
  - Reduction of greenhouse gas emissions,
- The remaining benefits should be calculated for at **least two of the four** remaining specific criteria

Methodologies for project assessment

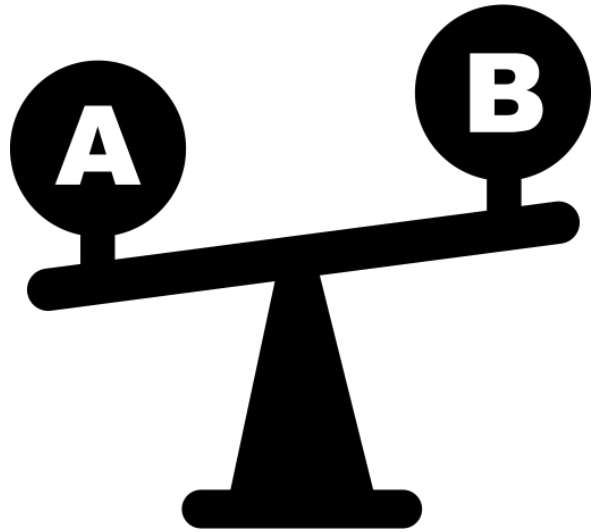
Harmonised System Wide Cost-Benefit Analysis for Candidate Smart Gas Grid Projects, May 2023

- The assessment methodology applies to **smart gas grids** projects and identifies seven categories of benefits divided into four specific criteria:
- **Sustainability**
  - Variation of GHG emissions
  - Variation of non-GHG emissions
  - Detection of methane leakage
- **Network security and quality of supply**
  - Variation of the share of renewable and low-carbon gases integrated into the gas network
  - Reduction of curtailed gas demand
- **Market functioning and customer services**
  - Increase of socio-economic welfare in the gas system
- **Smart energy sector integration**
  - Cross sectoral cost savings
- The project must contribute to sustainability and at least **one of the remaining three** specific criteria

EIHP

Relative rankings of projects

- Based on the results of quantitative and qualitative analysis, individual project assessment will be made for each of the eligible project categories
- Each of the criteria evaluated in a specific project category (monetised and non-monetised) will have a certain weight in the total possible score
- Based on the calculated total scores of each individual project a **relative ranking of all eligible projects** will be provided as the final output of the assessment



Thank you for your attention

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