

METHODOLOGY FOR CLEAN HYDROGEN JU SPECIFIC KPIS

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Resources (input), processes and activities

The set of KPIs under “resources (input), processes and activities” report on the actions undertaken by the Clean Hydrogen JU towards its objectives. For most KPIs the targets are reflecting the ambitious objectives of the JU in the context of the Green Deal.

KPI-1a Share of JU budget supporting hydrogen end-use solutions in hard to abate sectors

- Percentage of JU budget directed towards projects with direct application in the industrial and heavy-duty transport sectors.
- Classification based on the descriptions of the projects.
- Percentage is calculated as cumulative JU funding for relevant projects over total planned JU funding.
- Baseline determined achievement over the lifetime of the predecessor partnership.
- Targets set reflecting the ambitious objectives of the JU in the context of the Green Deal.

KPI-1b Share of JU budget supporting circular and sustainable solutions

- Percentage of JU budget directed towards projects which include KPIs or objectives related to sustainability, recycling or circularity.
- Classification based on the descriptions of the projects.
- Percentage is calculated as cumulative JU funding for relevant projects over total planned JU funding.
- Baseline determined achievement over the lifetime of the predecessor partnership.
- Targets set reflecting the ambitious objectives of the JU in the context of the Green Deal.

KPI-2 Early research projects

- Percentage of JU budget directed towards projects starting at TRL up to level 3.
- Percentage is calculated as cumulative JU funding for relevant projects over total planned JU funding, excluding REPowerEU Plan additional budget for hydrogen valleys, as the at least 10% target was set in the SRIA (Section 5.1) in relation to the 1 billion funding from the JU.
- Baseline determined by the achievement over the lifetime of the predecessor partnership.
- Targets set in line with the 10% budget requirement for low TRL activities mentioned in the SRIA, Section 5.1.

KPI-3 Demonstration projects

- Number of JU projects with a goal to end at least at TRL 7.
- Number is calculated cumulatively over the JU lifetime.
- Baseline determined by the achievement over the lifetime of the predecessor partnership.
- Targets set based on FCH JU trends, but further enhanced considering the increased budget and new objectives.

KPI-4 Education and training

- Number of JU projects addressing education and training, including skills.

- Classification based on the description of the projects, including hydrogen valleys which foresee such activities.
- Number is calculated cumulatively over the JU lifetime.
- Baseline determined by the achievement over the lifetime of the predecessor partnership.
- Targets set based on FCH JU trends, but further enhanced considering the increased budget and new objectives.

KPI-5 Monitoring technology progress

- Qualitative indicator, reporting on the actions performed related to the assessment and monitoring of technological progress, as per Article 74 (a) of the SBA.
- Due to the nature of this indicator, no targets (and thus baseline) have been set.

KPI-6 Supporting European Commission in its activities targeting the market uptake of hydrogen

- Qualitative indicator, reporting on the actions performed related to (a) JU's contribution to the development of regulations and standards, as foreseen in Article 74 (b) of the SBA, and (b) supporting the European Commission in its international initiatives on the hydrogen strategy, as foreseen in Article 74 (c) of the SBA.
- Due to the nature of this indicator, no targets (and thus baseline) have been set.

Outcomes

The set of KPIs under “outcomes” focus more on the results coming from the actions of the Clean Hydrogen JU. For most KPIs the baseline and targets are based on the relevant KPI targets mentioned in the SRIA.

KPI-7a Reduction in the use and increase in the recycling rate of Critical Raw Materials (CRM)

- Indicator monitoring the achievement of targets for all relevant SRIA KPIs:
 - SRIA Table 2 KPI 8
 - SRIA Table 3, KPI 8
 - SRIA Table 5, KPI 8
 - SRIA Table 16, KPI 6
 - SRIA Table 18, KPI 4
 - SRIA Table 21, KPI 8
 - SRIA Table 23, KPI 1-2-3
- Baseline set at zero, as none of the indicators were achieved before the start of the JU Programme.
- Targets set reflecting the increased ambition. Target for 2025 will be measured against the 2024 SRIA targets, while targets for 2027 and 2030 against the 2030 SRIA targets.
- No Target was set for 2023, as first projects were only signed that year.
- Methodology was developed in collaboration with Hydrogen Europe, as a deliverable of a Framework Contract¹ between the JU and Hydrogen Europe.

KPI-7b Improvement in the Quality of Life Cycle Assessments (LCA)

- Average quality of LCA submitted by the JU projects up to the reference year, based on the JRC review process and expert assessment performed each year, as a specific task of the Framework Contract signed with the JU.
- Baseline determined by the quality of LCA for H2020, reviewed by JRC until the end of 2022.
- Targets set reflecting the gradual expected improvement of the LCAs submitted, considering the increasing support the JU is going to provide to the projects via guidelines and tools, prepared with the support of JRC and the European Hydrogen Sustainability and Circularity Panel.
- No Target was set for 2023, as first projects were only signed that year.
- Methodology was developed in collaboration with JRC.

KPI-8a Capital cost of electrolyzers

- Reporting the reduction in the CAPEX across all main electrolyser technologies, following the formula:

$$KPI8a = \frac{(CRF_{AEL} + CRF_{PEMEL} + CRF_{SOEL} + CRF_{AEMEL})}{4}$$

where CRF_x = CAPEX reduction factor for each of the electrolysis technologies, calculated as:

$$CRF = \frac{\text{lowest capital cost } \left[\frac{\text{€}}{\text{kW}} \right] \text{ achieved by funded projects to date}}{\text{baseline CAPEX for each technology as defined in Annex 2 to the CH JU SRIA } \left[\frac{\text{€}}{\text{kW}} \right]} \times 100\%$$

- The relevant SRIA KPIs considered for this calculation are the capital cost in €/kW in Tables 2-5 (KPI 2 in all cases).
- Baseline is set at 100% (i.e. no reduction)

¹ The task has been foreseen as part of the procurement No FCH/OP/Contract 332.

- Targets are set by performing a linear interpolation between 2024 to 2030 for the capital costs of each of the four technologies to determine the intermediate capital costs, estimating the CRF for each technology for the relevant years and then calculating the formula above.
- No Target was set for 2023, as first projects were only signed that year.
- For the purpose of calculating the CAPEX indicators the data obtained from projects should always be adjusted for inflation (i.e. all values should always be expressed in 2020€).
- Methodology was developed in collaboration with Hydrogen Europe, as a deliverable of a Framework Contract between the JU and Hydrogen Europe.

KPI-8b Capital cost of heavy-duty road applications

- Reporting the CAPEX of the fuel cell module of heavy-duty road applications, as in SRIA Table 16, indicator #1.
- Baseline corresponds to the State of the Art in Table 16.
- Target for 2030 as in Table 16, while targets for 2025 and 2027 are a result of a linear interpolation between the targets of 2024 and 2027.
- No Target was set for 2023, as first projects were only signed that year.
- For the purpose of calculating the FC module CAPEX indicators the data obtained from projects should always be adjusted for inflation (i.e. all values should always be expressed in 2020€).
- Methodology was developed in collaboration with Hydrogen Europe, as a deliverable of a Framework Contract between the JU and Hydrogen Europe.

KPI-9 Research and Innovation Synergies

- Number of JU projects co-funded with other Partnerships, EU Programmes, Regional and National Funds.
- Number is calculated cumulatively over the JU lifetime.
- Baseline determined by the achievement over the lifetime of the predecessor partnership.
- Targets set in the SRIA reflecting the ambitious objectives of the JU in terms of achieving synergies with other Programmes.

KPI-10 Public perception of hydrogen technologies

- Qualitative indicator, reporting on the public opinion on hydrogen technologies and associated aspects.
- The indicator will be largely based on a periodic public opinion survey² and the deliverables of a Call 2022 topic³.
- Due to the nature of this indicator, no targets (and thus baseline) have been set.

KPI-11 Total persons trained

- Number of persons trained from projects funded by the JU across all categories (primary, secondary, higher education, professionals).
- Number is calculated cumulatively over the JU lifetime, in thousands of persons.
- Baseline determined by the achievement over the lifetime of the predecessor partnership, based at the latest available figures for H2020, up to the end of 2022.
- Targets set by summing the individual SRIA targets in Table 24 of the SRIA for each category and for all tiers, for each respective year. Targets for higher education students were set based on the ratio of students in primary/secondary to students of higher education for H2020.

² The task has been foreseen as part of the procurement No FCH/OP/Contract 307 ("Public Opinion Survey").

³ Public understanding of hydrogen and fuel cell technologies, [HORIZON-JTI-CLEANH2-2022-05-01](https://ec.europa.eu/horizon-jti-cleanh2-2022-05-01).

Targets for years 2025 and 2027 were calculated by linear interpolation of the SRIA Targets for 2024 and 2030.

- No Target was set for 2023, as first projects were only signed that year.

KPI-12 Patents and publications

- KPI providing reporting on two figures, one on the number of awarded patents and one on the number of publications.
- Number is calculated cumulatively over the JU lifetime, but including also the new patents and publications of the inherited FCH JU projects.
 - For awarded patents, due to the long time required for their approval, they also include FCH JU projects. So the number is cumulative over also the predecessor's lifetime.
 - For peer-reviewed publications they are reported cumulatively as of 2022, with the initial publications stemming from inherited FCH JU projects.
- In terms of methodology, there is an inherent difficulty to collect all relevant data and associate them with specific JU projects, outside from the ones reported by the projects during continuous reporting, especially if these are published after the conclusion of the grant period. This could be either because publications and patents may not clearly specify the link with a project or because the tools used to identify them (mainly through text mining) do not have access to this information.
- In order to collect this information as widely as possible, a number of sources will be used apart from the information reported in the e-Grants tool (as part of the continuous reporting), including project data collected through the Programme Review exercise, Tools for Innovation Monitoring (TIM, JRC), CORTEX, European Hydrogen Observatory and the European Patent database. In order to address the methodology issues mentioned above, JRC will try to further enhance TIM capabilities in this respect.
- Baseline determined by the achievement over the lifetime of the predecessor partnership, as reported in its last annual activity report in 2021 (AAR20).
- Targets set in the SRIA based on FCH JU trends, but further enhanced considering the increased budget.

KPI-13 Promoting cross-sectoral solutions

- Percentage of JU budget supporting projects covering more than one area of the hydrogen value chain.
- Classification based on the descriptions of the projects.
- Percentage is calculated as cumulative JU funding for relevant projects over total planned JU funding.
- Baseline determined achievement over the lifetime of the predecessor partnership.
- Targets set in the SRIA based on FCH JU trends, but further enhanced considering the increased budget and new objectives.

Impacts

The set of KPIs under “impact” report the progress of the hydrogen sector at EU level, to which the JU is contributing. Targets for KPI-14 to KPI-17 are based on the relevant ambition set in EU’s Hydrogen Strategy. Targets for KPI-18a and KPI-18b are based on current trends and expectations for the sector, while KPI-18c reflects the 2025 target mentioned in the Joint Declaration signed between the European Commission and the European electrolyzers manufacturers in May 2022. For this set of KPIs, the status refers to Europe as a whole and not on the individual actions of the JU, helping to identify where more effort should also be placed by the JU in the coming years.

KPI-14 Expected avoided emissions

- Calculation of expected avoided emissions, based on a complex methodology.
- The input data are collected from the European Hydrogen Observatory.
- Baseline based on the European Hydrogen Observatory.
- Only a target for 2030 was set, applying the same methodology based on input from the "Ports and industrial coastal areas" study⁴.
- Methodology was developed in collaboration with Deloitte, as the contractor of the European Hydrogen Observatory (the methodology being one of the foreseen deliverables) and was commented afterwards by Hydrogen Europe as part of a specific task.

KPI-15 Deployment of electrolyzers

- Total capacity of electrolyzers deployed in the EU.
- The data are collected from the European Hydrogen Observatory.
- Baseline based on the available data on FCHO platform.⁵
- Targets based on interpolation of the 2024 and 2030 targets set in EU’s Hydrogen Strategy, Communication COM(2020) 301 of 8 July 2020.

KPI-16 Market uptake of clean hydrogen

- Total quantity of clean⁶ hydrogen consumed in EU in the end-use sectors or used as feedstock.
- The data are collected from the European Hydrogen Observatory.
- Baseline based on the available data on FCHO platform.⁷
- Targets based on interpolation of the 2024 and 2030 targets set in EU’s Hydrogen Strategy, Communication COM(2020) 301 of 8 July 2020.

KPI-17 Total cost of producing renewable hydrogen

- Calculation of total cost of renewable hydrogen production.
- The data are collected from the European Hydrogen Observatory.
- Baseline based on the available data on FCHO platform.
- Targets based on the ambition for the cost reduction set in EU’s Hydrogen Strategy, Communication COM(2020) 301 of 8 July 2020.
- Methodology was developed in collaboration with Deloitte, as the contractor of the European Hydrogen Observatory (the methodology being one of the foreseen deliverables).

⁴ https://www.clean-hydrogen.europa.eu/media/publications/study-hydrogen-ports-and-industrial-coastal-areas-reports_en

⁵ [FCHO, Supply & Demand Annual Report, 2021](#)

⁶ Definition of clean hydrogen as per the Hydrogen Strategy, unless otherwise defined in regulation.

⁷ For the baseline, capacity was based on the [FCHO, Supply & Demand Annual Report, 2021](#) and Hydrogen Europe’s Clean Hydrogen Monitor 2021, while a utilisation of 63% was assumed for the electrolyser capacity (based on FCH JU electrolyzers demonstration projects) and 80% for the steam methane reforming with CCS/CCU (based on the average capacity utilisation, mentioned in the Clean Hydrogen Monitor).

KPI-18a Activity in terms of companies

- Reporting number of companies in Europe operating in the hydrogen sector.
- The data are collected from the European Hydrogen Observatory.
- Baseline based on the available data on FCHO platform, as reported in its final report, in June 2022.
- Targets based on current trends and expectations for the sector.
- Methodology was developed in collaboration with Deloitte, as the contractor of the European Hydrogen Observatory (the methodology being one of the foreseen deliverables) and was commented afterwards by Hydrogen Europe as part of a specific task.

KPI-18b Activity in terms of projects in the pipeline (ongoing or under construction)

- Reporting number of projects in Europe – on-going or under construction - in the hydrogen sector.
- The data are collected from the European Hydrogen Observatory.
- Baseline based on the available information in 2021.
- Targets based on current trends and expectations for the sector, as also reported e.g. in the Communication for the European Hydrogen Bank⁸.
- Methodology was developed in collaboration with Deloitte, as the contractor of the European Hydrogen Observatory (the methodology being one of the foreseen deliverables) and was commented afterwards by Hydrogen Europe as part of a specific task.

KPI-18c Electrolyser manufacturing capacity

- Reporting manufacturing capacity of electrolyzers in Europe.
- The data are collected from the European Hydrogen Observatory.
- Baseline based on the available information in 2021.
- Targets based on the Joint Declaration signed between the European Commission and the European electrolyzers manufacturers in May 2022, to increase their manufacturing capacity tenfold to 17.5 GW per year.⁹
- Methodology was developed in collaboration with Deloitte, as the contractor of the European Hydrogen Observatory (the methodology being one of the foreseen deliverables) and was commented afterwards by Hydrogen Europe as part of a specific task.

⁸ COM(2023) 156 final, 16.3.2023

⁹ https://ec.europa.eu/commission/presscorner/detail/es/ip_22_2829