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EVALUATION

Ex-ante Evaluation

Accompanying the document

Proposal for a
COUNCIL DECISION

on the adoption of the Research Programme of the Research Fund for Coal and Steel, on the multiannual technical guidelines for this programme, on the multiannual financial guidelines for managing the assets of the Research Fund for Coal and Steel, and repealing Decisions 2003/77/EC and 2008/376/EC

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1. INTRODUCTION

This Commission staff working document provides an ex-ante evaluation of the legislative proposal for a reform of the Research Fund for Coal and Steel, which is divided into two proposals for Council Decision. Both proposals for Council Decision have the same accompanying ex-ante evaluation. Such evaluation is required for all programmes that entail significant spending[1]. The scope of the evaluation covers the problems to be addressed, the added value of Union involvement, policy objectives, expected impacts of different options, their contribution to wider EU policy objectives, and monitoring and evaluation arrangements.

European integration started in 1950 with the Schuman Declaration laying the foundations of the European Coal and Steel Community. Since then, both Europe and the world have undergone tremendous changes, with new global players, radically new technologies and a thoroughly transformed world order. These deep changes have accelerated in recent years. Nevertheless, steel remains a crucial industry for Europe's competitiveness and strategic autonomy. The deep challenges that it now faces range from energy prices and decarbonisation to global tariffs and overcapacity. They need to be addressed through determined public support, including to the sector's research, innovation and deployment of advanced technologies. At the same time, the clean transition of coal mining regions also requires European support, including through research, development and demonstration of innovative solutions. The Research Fund for Coal and Steel, funded through the assets of the European Coal and Steel Community in liquidation, remains the prime EU instrument to provide for this support. Its reform is taking place in the broader context of a wide range of EU initiatives to protect and promote Europe's competitiveness, sustainable growth, security and strategic autonomy.

With the Competitiveness Compass[2], published in January 2025, the European Commission presented its roadmap and actions to boost industrial competitiveness. It responded to the call by stakeholders, as expressed in the Antwerp Declaration[3] for making a business case for investments in Europe and to the Draghi report[4] by following up on its recommendations to close the innovation gap, to present a joint decarbonisation and competitiveness plan, and to increase Europe's economic security and reduce dependencies. The Draghi report recognised decarbonisation and circular economy as a powerful drivers of growth, when integrated with industrial, competition, economic and trade policies.

The Clean Industrial Deal (CID)[5], presented by the European Commission in February 2025, set concrete actions to support the decarbonisation of European industry while ensuring that the EU remains competitive and an attractive manufacturing location. The CID placed a particular focus on energy-intensive industries and clean tech sectors and presented actions for lowering energy prices, creating lead markets to boost demand for clean products, financing investments for the clean transition, focusing on circularity and access to materials, acting on a global scale, and supporting skills and quality jobs. It was accompanied by the Affordable Energy Action Plan[6] and followed by sector-specific action plans that tailor its implementation to the specific needs of sectors.

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[1] European Commission: Directorate-General for Budget, *Financial regulation applicable to the general budget of the Union (recast)*, Publications Office of the European Union, 2024, Art 34.1

[2] COM(2025)30 final

[3] https://antwerp-declaration.eu/

[4] The future of European competitiveness: Report by Mario Draghi, September 2024, https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en

[5] COM(2025)85 final

[6] COM(2025)79

This includes the European Steel and Metals Action Plan[7], adopted in March 2025, which lists concrete measures aiming at boosting the competitiveness of the steel sector and eliminating bottlenecks for businesses and announces an overall reform of the Research Fund for Coal and Steel "to simplify and further accelerate investments in steel research, including research on defence applications".

Some of the announced CID measures have already been presented. For instance, the European Commission adopted on 25 June 2025 a new Framework for State Aid measures to support the Clean Industrial Deal (CIDSAF)[8]. This helps Member States to support more easily the development of clean energy, industrial decarbonisation, circular economy, and clean technologies. This was followed on 2 July 2025 by a Recommendation on Tax Incentives to support the CID, which outlines a comprehensive framework for Member States to design cost-effective tax measures that stimulate investment in clean technologies and industrial decarbonisation.

Another key measure announced for the implementation of the CID is the Industrial Accelerator Act, also announced for the end of 2025, that aims to channel investments in infrastructure and industry, address permitting bottlenecks, and create lead markets for the development of European clean and resilient industrial technologies. The Act is expected to establish a low-carbon product label and apply sustainability, resilience, and minimum EU content requirements for low-carbon products in public procurement.

Moreover, a flagship call worth around EUR 600 million announced under the CID is expected to be published under the 2026-2027 Horizon Europe work programme to support fit-for-deployment projects. Furthermore, a EUR 1 billion pilot auction will be set up under the Innovation Fund on the decarbonisation of key industrial processes across various sectors and an IPCEI Design Support Hub will be launched to facilitate the development of IPCEIs by Member States. Finally, in the first half of 2026, a proposal for an Industrial Decarbonisation Bank will be put forward.

Another important new measure, targeting coal industries, fossil gas and oil specifically, is the EU's world-leading Methane Regulation (EU/2024/1787)[9], which entered into force on 4 August 2024. It aims to reduce methane emissions from the energy sector, reinforcing the EU's global leadership in the fight against climate change. The Regulation will require the sectors concerned to measure, monitor, report, and verify their methane emissions.

The proposed reform of the Research Fund for Coal and Steel (RFCS) is embedded in this wider policy context, which prioritises support to energy-intensive industries for their decarbonisation journey, while creating conditions that foster their competitiveness.

2. CONTEXT: THE REFORM OF THE RESEARCH FUND FOR COAL AND STEAL BEFORE AND AFTER 2021

2.1 The Research Fund for Coal and Steel before 2021

The European Coal and Steel Community (ECSC) was established for a period of fifty years by the ECSC Treaty signed in Paris on 18 April 1951 by Belgium, Germany, France, Italy, Luxembourg, and

[7] COM(2025)125 final

[8] https://competition-policy.ec.europa.eu/about/contribution-clean-just-and-competitive-transition/clean-industrial-deal-state-aid-framework-cisaf_en

[9] https://eur-lex.europa.eu/eli/reg/2024/1787/oj/eng

the Netherlands, later joined by new Member States on successive enlargements of the European Communities. Having entered into force on 23 July 1952, it expired as scheduled on 23 July 2002 and all assets and liabilities existing at this expiry date were transferred to the European Community. The Member States decided to add a Protocol to the EU Treaties that provides for using these funds for research in the sectors related to the [10] industry. The Protocol foresees that the revenue from the assets of the ECSC in liquidation would constitute the Research Fund for Coal and Steel (RFCS). The Council Decision on the adoption of the Research Programme of the RFCS and its guidelines[11] indicate that with the general aim of increasing competitiveness and contributing to sustainable development, the main emphasis is on funding research and technological development, to guarantee the economic, clean and safe production that aims at reducing costs, improving the quality of products and processes and contributing to environmental objectives and the conservation of resources, health and safety aspects, as well as improvement of working conditions.

The RFCS has since then been a standalone programme set up under Protocol 37 of the Treaty and regulated by three Council Decisions[12] that establish measures aiming at implementing the Protocol as well as establishing financial and technical guidelines.

Every year since its creation, the Fund supports research activities through annual calls. The current legal base[13] foresees a budget breakdown between coal and steel for supporting research, with 27.2% of the annual allocations to be devoted to coal-related research and 72.8% to steel-related research.

2.2 RFCS Reform in 2021

The RFCS initially started by funding research activities through the revenues of the assets of the ECSC in liquidation. Until 2016, the RFCS was able to deliver stable annual programmes, using only revenues to ensure long-term viability of the assets[14]. As of 2016, it became clear that due to the low revenues, the size of the programme could not be retained without the use of some of the assets.

This was echoed in 2019 by a review of the European Court of Auditors ([15]) that raised the issue that the revenues generated by the original fund (at the end of 2018, the equity of the ECSC in liquidation amounted to EUR 1.5 billion) were continuously decreasing along with the constant decrease of the interest rate in the financial markets during the previous decade[16].

To address this issue, the Commission submitted a proposal allowing for partial use of the assets of the ECSC, which led to the adoption of Council Decision (EU) 2021/1207[17], which allowed the use of the assets as long as the revenues were not enough to cover an annual allocation for the programme. This provision will remain in effect until 31st December 2027, included.

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[10] Protocol 37 on the financial consequences of the expiry of the ECSC Treaty and on the Research Fund for Coal and Steel, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:12008M/PRO/37

[11] Council Decision 2008/376/EC

[12] Council Decision 2003/76/EC amended by 2018/599, Council Decision 2003/77/EC amended by 2021/1207, and Council Decision 2008/376/EC amended by 2017/955.

[13] Article 4 point 2 of Council Decision 2003/76/EC

[14] Resolution of 20.07.1998

[15] Review No.10/2019 of the European Court of Auditors, available at https://www.eca.europa.eu/en/publications?did=51111#:~:text=Page%20Image-,Review%20No%2010/2019:%20The%20European%20Coal%20and%20Steel%20Community,RO

[16] As per Council Decision 2003/76/EC, ECSC funds totalled approximately EUR 1.6 billion as of 23 July 2002.

[17] Council Decision (EU) 2021/1207 of 19 July 2021 amending Decision 2003/77/EC laying down multiannual financial guidelines for managing the assets of the ECSC in liquidation and, on completion of the liquidation, the Assets of the Research Fund for Coal and Steel, OJ L 261/47.

With the Decision 2021/1207, the Council did not merely authorise the use of the assets in order to maintain the same size of the programme as before, but decided that a much more considerable annual allocation than before was necessary in order to "to provide meaningful support for worthwhile collaborative research projects that have the critical mass[18]". The Decision 2021/1207 also points to the Union needs for 'climate and resource frontrunners' to develop breakthrough technologies in key industrial sectors by 2030 and to be climate-neutral by 2050.

This need for critical mass and the development of breakthrough technologies were the rationale behind the introduction of the Big Tickets instrument under the RFCS, aiming at supporting large pilot and demonstration projects, providing an indicative EU budget per project up to EUR 18 million for coal and EUR 25 million for steel, to cover high Technology Readiness Levels (TRLs). The Decision 2021/1207 also introduced the Clean Steel Partnership, which receives EU funding of EUR 700 million between 2021 and 2027, equally split between RFCS and Horizon Europe. The main objective of the Clean Steel Partnership was to enable the developments of technologies related to steel at a demonstration scale, through the Big Tickets instruments, aiming at funding high TRL projects (up to TRL 7 or 8).

To allow for such investments, the annual allocation of the programme was set at EUR 111 million per year (with EUR 40 million for the annual research call, and EUR 71 million allocated for two The Big Tickets calls for coal and for steel).

2.3 Current assets

Total current and non-current assets held by the ECSC portfolio amounted to EUR 1.229 billion as of 31 August 2025 compared to EUR 1.220 billion at the end of 2023, and EUR 1.5 billion in 2018.

From these assets, the following liabilities can be deducted:

- EUR 36.874.795 for the last Brexit instalment (payable in November 2025);
- EUR 433.772.302 for the allocations to RFCS until 2025 (payable at request);
- EUR 111.000.000 for the allocation to RFCS 2026 (payable as from 2026 at request).

Overall, the net value of the assets (at the market value as at 31.08.2025) amounts to EUR 647.150.923.

This amount does not take account of the non-allocated funds of the RFCS for the period 2021-2026, which are estimated at around EUR 150 million.

[18] Recital 3 of Decision 2021/1207/EC.

3. PROBLEM ANALYSIS AND NEEDS ASSESSMENT FOR AN OVERALL REFORM

3.1 Challenges in the steel sector

The European steel industry is a vital component of the EU economy and a key enabler of its strategic autonomy. Around five hundred production sites across 22 Member States[19] contribute about EUR 80 billion to the EU's GDP and underpin over 2.5 million jobs (including indirect jobs)[20].

However, the steel industry faces significant challenges. The increasing global steel excess capacities in third countries, as well as unfair trade practices and tariffs, threaten the viability of the European steel sector. Since stability and predictability of demand are fundamental drivers for investment in all clean technologies, the combination of high energy prices and operating costs, strategic dependencies on critical raw materials, longer permitting times, and an uneven playing field are hindering the roll-out of investments in clean steel.

At the EU level, steel production capabilities are still divided between the blast furnace - basic oxygen furnace (BF-BOF) route (58%) and the scrap-based electric arc furnace (EAF) route (41%)[21]. While the EAF route is considered, when coupled with renewable energy, as one of the routes for decarbonisation of this energy intensive and highly carbon emitting industry, the BF-BOF is still part of the traditional technologies that strongly contribute to CO2 emissions. The transition to carbon neutrality requires heavy financial investments to innovate industrial technologies and installations. Hydrogen-base DRI and electrolysis of iron are – together with the evolution of the EAF and carbon capture approaches – fundamental technologies for the decarbonisation of the steel sector[22]. While electricity and hydrogen are pivotal solutions for decarbonising the steel industry, their high costs and the limited availability of green hydrogen remain a barrier for investments. As of late 2024, Europe was producing only an estimated 0.023 million tonnes of renewable hydrogen annually[23]. Addressing this gap will require substantial investments in infrastructure, with the related costs. The difficulty to de-risk these high investments constitute a real challenge for decarbonisation, since steel production is highly CO_2-intensive, accounting for around 7% of global greenhouse gas (GHG) emissions and 5-6% of the EU total. To overcome the lack of hydrogen infrastructure availability, the steel industry is also pushed to install onsite hydrogen production and storage facilities, to create synergies with parallel sectors, or to intensify the transition to electricity-based ironmaking.

Despite these challenges, the EU remains a global player in steel (along with China, India, Japan, USA, Russia, and South Korea), with strong production capacity and industrial capabilities. It is, therefore, crucial to support the sector in its transition and safeguard EU competitiveness in this strategic field, which is indispensable to Europe's overall industrial fabric.

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[19] AT, BE, BG, HR, CZ, DK, EE, FI, FR, DE, GR, HU, IT, LT, LU, NL, PL, PT, RO, SK, ES, SE.

[20] https://ec.europa.eu/commission/presscorner/api/files/document/print/en/ip_25_805/IP_25_805_EN.pdf#:~:text=The%20European%20steel%20industry%2C%20with%20approximately%20500%20production,always%20been%20a%20core%20engine%20for%20European%20prosperity.

[21] Joint Research Centre, European Commission

[22] 2024-CSP-SRIA.pdf

[23] The State of European Steel transition, https://caneurope.org/content/uploads/2025/03/THE_STATE_OF_THE_EUROPEAN_STEEL_TRANSITION_mar2025.pdf

3.2 Coal sector in transition

The coal production in Europe has been steadily declining since the 1980s, a trend that continues to accelerate throughout the 1990s and 2000s, thus contributing insignificant share to the GDP. In 2024, EU hard coal production according to Eurostat stood at just 44 million tonnes—an 84% decrease compared to 277 million tonnes in 1990[24]. Notably, in 2023, solar energy overtook brown coal as an electricity source in the EU for the first time, marking a significant milestone in the energy transition[25]. In 2023, the EU's import dependency rate for hard coal was 67%, which, while high, remains below the import dependency rates for oil (95%) and natural gas (90%).

Today, coal (hard and brown coal) is mined in nine EU countries[26]. While its primary use remains electricity generation and district heating, coal also plays a critical role in industrial processes, particularly in iron and steel production, as well as in cement manufacturing.

The decline of the coal sector has had considerable social and economic impacts. Numerous mines and coal-fired power plants have been shut down, especially in regions historically dependent on coal. In 2021, coal-related activities provided direct employment to approximately 208,000 people in Europe, 76% of whom worked in the mining sector. This represents a 37% drop in coal-related employment compared to 2018[27]. Similarly, a European Parliament report from 2019 estimated that 238,000 jobs were tied to coal mines and power plants, projecting further job losses of up to 160,000 by 2030[28].

As of 2023, 18 EU Member States still used hard coal for electricity generation. However, its significance has sharply diminished, with Poland standing out as the only country where hard coal remains the dominant source of electricity. In Poland, hard coal accounted for 39% of electricity generation in 2023, followed by brown coal (lignite) at 21%[29].

Germany represented 46% of the total brown coal consumption of the EU in 2024, followed by Poland (21%), Czechia (12%), Bulgaria (8%), Romania (6%) and Greece (4%). Brown coal is primarily used for electricity generation in the nine EU Member States[30] that produce it. It has a low energy content and does not have a lot of potential uses besides electricity and heat generation. In most EU countries using brown coal in 2023, according to EUROSTAT, at least 90% of brown coal was used to produce electricity and heat.

The diminishing role of coal is mirrored in its shrinking share of electricity generation. In the EU, coal's contribution dropped from 16% in 2022 to 12% in 2023.

Additionally, the EU remains heavily reliant on imports for hard coal. In 2023, 90% of net imports came from five countries: Australia, the United States, Colombia, South Africa, and Kazakhstan. Sanctions have effectively banned Russian coal imports (which plummeted by 98% between 2021 and 2023), following Russia's invasion of Ukraine.

The Just Transition Fund (JTF)[31] has been created to support coal-dependent regions in diversifying and modernising their economies with a total budget of EUR 19.3 billion (including EUR 10.87

[24] Coal production and consumption statistics - Statistics Explained - Eurostat
[25] Coal production and consumption statistics - Statistics Explained - Eurostat
[26] In 2023, production of hard coal and brown coal is found in DE, PL, CZ, BG, RO, EL, HU, SI, and SK.
[27] EU coal regions in transition - European Commission
[28] EU support for coal regions
[29] Coal production and consumption statistics - Statistics Explained - Eurostat
[30] BG, DE, CZ, SK, HU, RO, PO, SI.
[31] Regulation (EU) 2021/1056 of the European Parliament and of the Council of 24 June 2024, established the Just Transition Fund, see more at: https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/just-transition-fund_en

million under the recovery instrument NextGenerationEU) for Member States in the 2021-2027 MFF. These structural transformations are inherently long-term, but targeted research and innovation (R&I) activities can play a vital role in accelerating the transition and ensuring sustainable economic and social outcomes.

Besides, with more stringent measures in the recent 2024 Methane Regulation, activities around coal mines will need to contribute to the objective of mitigating methane emissions.

3.3 Outcome of the 2021 reform and feedback from stakeholders

As explained earlier, the 2021 reform of the legal base of the RFCS introduced several changes, including the Big Tickets instrument directed at supporting large pilot and demonstration projects.

The proposal was based on the results of a monitoring exercise of the RFCS Research Programme, including an assessment of the expected benefits[32]. The experts that analysed the functioning of the RFCS Research Programme, assessed the technological developments and expected benefits of the programme to the sector and society. They drew recommendations for the improvement of the programme, namely the introduction of support for breakthrough research on clean technologies. These results were discussed with stakeholders, who agreed on the need to invest efforts on R&I for clean technologies to further reduce industrial carbon footprint.

The main objective of the reform was to set up a robust research programme for coal and steel, in line with EU climate objectives of the Green Deal, and to encourage the roll out of private investments.

Outcome of the RFCS reform for the period 2021-2024

In the period 2021-2024, the RFCS programme supported a total of 122 projects involving 422 unique participants, with a total budget of EUR 269 million (see Table I).[33] The projects covered a wide range of topics, including coal mine repurposing, methane abatement, steel production processes, energy efficiency, recycling and environmental sustainability. The total number of steel projects is significantly higher than the number of coal projects, reflecting the difference in funding distribution, as per the RFCS legal base.

Although the RFCS has proven its efficiency via the yearly annual call in supporting coal and steel sectors through excellent collaborative research and involvement of the private sector, it has failed to meet the expectations of the 2021 reform in respect to the Big Tickets, reflected by the underspending of the programme The programme and in particular the Big Tickets calls in the present conditions are not attractive enough to yield large private investment necessary to meet current industrial decarbonisation objectives.

For the Big Tickets on coal, only EUR 43 million (57%) out of EUR 76 million available during the years 2021-2024 have been spent. Regarding the Big Tickets on steel, the situation is worse: only EUR 64 million (31%) out of EUR 208 million. Similar underspending, although to a lesser extent, occurred in the Annual call – yet only for coal and only for the outcomes of the 2022 call, which was a specific case. In fact, the 2022 call was merging funds foreseen for 2021 that could not be used due the late entry into force of the 2021 amendment of the RFCS legal base.

[32] European Commission: Directorate-General for Research and Innovation and Rossetti di Valdalbero, D., *Steel and coal – A new perspective – European research and innovation in action*, Publications Office, 2019

[33] More details on RFCS projects for the period 2021-2024 can be traced in Annex II: Contribution from the Research Executive Agency (REA) to the Ex-ante evaluation for the revision of the Research Fund for Coal and Steel.

Table I: *RFCS spending in 2021-2024*[34].

Note: the negative signs appearing in the underspending column for the Annual call indicate an overspending.

		2021	2022	2023	2024	Ttl 2021 - 2024	Budget 2021 -2024	Underspending
Annual Call	Coal	2.875.573,87 €	8.938.719,33 €	10.643.743,34 €	14.176.149,72 €	36.634.186,26 €	43.520.000,00 €	6.885.813,74 €
	Steel	8.105.357,29 €	50.104.492,97 €	28.968.149,71 €	38.871.621,17 €	126049621,1	116.480.000,00 €	- 9.569.621,14 €
	Ttl	10.980.931,16 €	59.043.212,30 €	39.611.893,05 €	53.047.770,89 €	162.683.807,40 €	160.000.000,00 €	- 2.683.807,40 €
B.T.	Coal	- €	10.746.577,16 €	9.026.463,18 €	22.943.568,70 €	42.716.609,04 €	76.000.000,00 €	33.283.390,96 €
	Steel	- €	24.710.696,44 €	- €	38.922.541,44 €	63.633.237,88 €	208.000.000,00 €	144.366.762,12 €
	Ttl	- €	35.457.273,60 €	9.026.463,18 €	61.866.110,14 €	106.349.846,92 €	284.000.000,00 €	177.650.153,08 €
		10.980.931,16 €	94.500.485,90 €	48.638.356,23 €	114.913.881,03 €	**269.033.654,32 €**	**444.000.000,00 €**	**174.966.345,68 €**

While the programme has overall seen a slight trend towards an increase in the number of funded projects, the underspending of the programme is rooted in a lack of attractiveness of certain aspects of the programme, made worse by external factors, such as the challenging geopolitical context and uncertainty. When the Big Tickets calls were created and established, the situation and the needs of the steel industry were different. The first Big Tickets calls were launched in the crisis period of the aftermath of the COVID pandemic and coincided with the geopolitical upheavals caused by Russia's unprovoked war of aggression against Ukraine, as well as with the related steep increases in the costs of energy. This chain of events was made worse by the sector-specific challenges faced by the industry, such as increased overcapacity (caused by higher products costs due to increases energy bills, along with state subsidies in some third countries) and trade issues, complemented by a highly unstable financial market. Additionally, the costs of innovation necessary to migrate the industry to low-carbon steelmaking, along with lack of primary materials (like hydrogen), infrastructures and an important increase of energy prices, contributed to a situation where the industry found itself with a missing direction in term of business plan and consequently became extremely cautious with regard to investments, including in research.

Coupled with this specific uncertain context, the overall RFCS call conditions were not sufficiently attractive to leverage substantial investments and trigger the expected participation in the Big Tickets calls.

Feedback from Member States and stakeholders on the RFCS reform proposal

The Commission reached out to Member States through the Committee for Coal and Steel (COSCO) and other stakeholders to identify the main obstacles to participation to the RFCS, with the purpose to address them through a revision of the legal base when dealing with the challenges of the financial regime [35]. The discussions started in 2024 with the purpose to understand the problems behind the lack of engagement of the industry in the Big Tickets. More focused consultations took place via joint meetings of the Coal and Steel Advisory Group on 12 May 2025 and 19 September 2025, the COSCO meeting on 24 April 2025 and 23 September 2025, and at a dedicated large-scale public consultation event with the stakeholder community on 19 June 2025. These consultations, coupled with the analysis of the programming period 2021-2024 done by the European Commission's Directorate-General for Research and Innovation (DG RTD) in collaboration with Research Executive Agency (REA) led to the identification of several factors leading to the undersubscription to the RFCS:

- *Funding rates*

Stakeholders pointed out that the 50% funding rate for pilot and demonstration projects, thus also for the Big Tickets, is a major reason for the programme's lack of attractiveness. That funding rate is much lower compared to Horizon Europe. In addition, there is no differentiation between the types of

[34] Research Executive Agency (REA).

[35] The full summary of stakeholders consultation is in Annex

beneficiaries (industry and non-profit / academia). This comparison indicates a difficulty for the industry to contribute 50% of the project costs when it comes to large pilot and demonstration activities. Given the difficult economic situation for both coal and steel sectors, it is important that funding rates are increased to help de-risk investments in R&I.

- *Timing of calls*

The route to achieve approval for substantial R&I investments in the industry can be very long, which makes it difficult to have proposals ready in time for Big Ticket calls under current call conditions. The development of pilot and demonstration facilities is inherently a complex and time intensive process, often requiring several years from initial concept to operational deployment. Before public funding can be formally requested from national or international sources, projects typically undergo multiple preparatory phases – including feasibility assessments, stakeholder alignment, and technical planning – which require considerable time and coordination. Since the current legal base binds the applicants to a submission every 15th September for the Annual Call, the timing of launching the call significantly impacts the ability of applicants to submit their proposal on time. The same goes for the Big Tickets instruments: the timing of the call was considered too short by applicants, who called for a timing that would be more adjusted to the industrial timeline.

- *Prescriptiveness of Research Fund for Coal and Seel calls*

The current legal base contains detailed definitions of coal and steel, as well as R&I objectives for coal and steel. On top of this, additional specific call objectives, that have been considered too prescriptive by several stakeholders, are developed annually for the RFCS Big Tickets calls. Industrially oriented research needs flexibility since it is difficult to predict the scale up and integration of new technology in a cost-effective way. This is why stakeholders pointed out that a high prescriptiveness risks overlooking high-value projects that contribute significantly to industrial excellence and long-term economic success, in a competitive sector like steel. Additionally, they reminded that flexibility allows adapting to new needs and ideas in a rapidly evolving industry.

3.4 Research needs for coal and steel

In light of the policy context, this section will analyse the specific research needs for coal and steel. It draws on the findings of the literature review and from reports of the Technical Groups on coal and steel.

Coal

In the context of transitioning away from coal, post-mining and land restoration continue to challenge the industry, which is relying on research and innovation to ensure the long-term stability and safety of closed mines. Besides, as the EU energy system transitions away from fossil fuels towards a greater reliance on renewable energy sources, coal regions can play an important enabling role in this shift. Repurposing former coal sites for renewable energy projects—such as pumped hydro storage, geothermal applications, or other sustainable uses—offers a valuable pathway to support the energy transition while revitalising affected regions. The findings of a recently published report of the Technical Group on Coal[36] even highlight the need to conduct further research on the environmental

[36] European Commission: European Research Executive Agency, Tsakalidis, A., Merkourakis, S., Jenet, A. and Fumero, S., Research Fund for Coal and Steel – A summary of the findings of the Coal Research Technical Groups – 2023, Publications Office of the European Union, 2025, https://data.europa.eu/doi/10.2848/5815364, available at https://op.europa.eu/en/publication-detail/-/publication/3ddc2c7b-e764-11ef-b5e9-01aa75ed71a1/language-en

impact of mining, post-mining environmental issues and energy storage and production. The new EU regulation on methane emissions is also putting additional pressure to thoroughly monitor and report on methane emissions from active and closed mines. The feedback to policy produced by the European Research Executive Agency 'REA' (see added value section of Annex II) indicates the significant research contributions that the RFCS has made and can make to these objectives.

Steel

Decarbonisation of steel is one of the major challenges to be tackled in achieving the overall EU targets of at least 55% CO_2 emission reduction by 2030, and net-zero by 2050. This transition will require substantial changes across the production chain, through a combination of efficiency of material use, circularity, fostering scrap-based steel production *via* Electric Arc Furnaces (EAF), and the deployment of innovative low-carbon production routes, such as hydrogen-based Direct Reduced Iron (H2-DRI)[37]. Carbon Capture, Utilisation, and Storage (CCUS) technologies have also a potential in decarbonisation, however this route has less potential for taking up at European level.

At EU level, steel production capacities are currently divided between the conventional blast furnace-basic oxygen furnace (BF-BOF) route (58%), which is high in CO2 emissions, and the scrap-based electric arc furnace (EAF) route (41%). However, scrap-based production has some limitations, since it cannot deliver a steel with the purity level that is needed in some parts of the value chain. EAF also relies strongly on scrap, thus on circularity and related scrap upgrade activities still under evolution.

To replace the standard BF-BOF, Direct Reduced Iron combined with Electric Arc Furnace is projected to significantly expand its role in EU steelmaking, reaching 18% of the capacity in 2035. This technology has the advantage of taking up increasing proportions of hydrogen to displace natural gas[38]. At the same time, the BF-BOF capacity may decrease since a substantial share of BF-BOF facilities in the EU were constructed during the 1950s and 1960s and will require replacement or retrofitting within the next decade. It is estimated 74% of BF-BOF furnace capacity in the EU will need to be upgraded with high investments associated to ensure their economic viability.

Finally, there are high needs for research on the development of high-quality steel products that can be used, in particular, in renewable applications (e.g. wind turbines) on technologies for reducing scrap impurities to increase recycling, and additive manufacturing[39].

The feedback to policy produced by REA (see added value section of Annex II) indicates that selected RFCS pilot and demonstration projects provide tangible evidence of the sector's capacity to innovate and reduce emissions.

The cost of these low-carbon technologies is often higher than current production methods. This is especially the case in the early stages of the transition. Targeted support and increased R&I cooperation are thus needed to make the business case and build on the current momentum and enable an accelerated transformation of the steel sector.

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[37] MAURY, T., TORRES DE MATOS, C., BLANCO PEREZ, S., ARCIPOWSKA, A., MOYA, J. et al., Analysis of the EU Steel supply chain: current trends and circularity opportunities - Raw Material Information System Brief, European Commission, Ispra, 2025, JRC142660

[38] Agora Industry, Wuppertal Institute and Lund University (2024): Low-carbon technologies for the global steel transformation. A guide to the most effective ways to cut emissions in steelmaking

[39] European Commission: European Research Executive Agency, Tsakalidis, A., Merkourakis, S., Jenet, A. and Fumero, S., *Research Fund for Coal and Steel – A summary of the findings of the Steel Research Technical Groups – 202*

3.5 Need for a reform

The coal and steel sectors should receive the appropriate support in their transition journey, one that contributes to competitiveness and decarbonisation objectives. This requires accelerating R&I investments, which is fully aligned with the current EU policy objectives. At the same time, there is a need to ensure that the RFCS can attract enough participation, which, according to the feedback received from stakeholders, requires a revision of its overall functioning and its call conditions. These elements point to the need to revise the legal base of the RFCS in order to enhance its attractiveness and maximise its impact.

Not only the calls conditions require a revision, especially in term of funding rates, but also a further selling of the fund's assets is necessary in order to continue providing adequate R&I funding with a critical mass to effectively support coal and steel sectors in their transition. Decarbonisation efforts, as one of the priorities of the Competitiveness Compass, are costly for energy intensive industries and thus also requires a competitiveness focus: the steel sector alone is declaring financial needs until 2030 which are estimated at €31 billion for capital expenditures (CAPEX) and €54 billion for operating expenditures (OPEX), totalling €85 billion[40].

However, not investing now in decarbonisation will lead to higher costs in the future. As reported by the steel industry already in 2021, additional direct carbon costs for the steel industry – with the combined effect of CBAM/ETS on the free allocation phase out – will be nearly EUR 14 billion in 2030 with business-as-usual emissions, or EUR 8,4 billion, if the sector is able to reduce its emissions by 30% by 2030[41].

Until now, energy-intensive sectors have been evolving in an economic and political context that makes it harder to meet the conditions for a strong business case for decarbonisation. In this regard, the Draghi report and the consequent intense political activities of the Commission since the end of 2024 have set the foundation for the business case that would support rapid investment, decarbonization, and competitiveness. The time for a big change is set at political level in two fundamental documents: the Clean Industrial Deal communication and the Steel and Metals Action Plan and the Industrial Accelerator Act will further contribute to this.

Additionally, based on the provisions outlined in the Council Decision 2021/1208, the use of part of the assets for dedicated calls will expire at the end of 2027. Should there be no new legislative proposal after 2027, the only type for call for proposals on which the programme will rely on will be the RFCS Annual call, as before the reform in 2021. The call budget will be only based on the income generated by the assets, with related fluctuations. This will lead to a very small programme, in which the financial sustainability is not secured.

In this context, there is an urgent need and a timely opportunity to revise the programme and strengthen the role of research and innovation in effectively supporting the coal and steel sectors during their transition. The current call conditions, research objectives, and available budget are not leveraging enough R&I investment from the industry and do not offer either an easy access for the academia and the research community.

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[40] https://www.eurofer.eu/issues/climate-and-energy/maps-of-key-low-carbon-steel-projects

[41] https://www.eurofer.eu/press-releases/prohibitive-energy-and-carbon-prices-risk-undermining-eu-steel-industry-decarbonisation-eu-leaders-must-act-warns-eurofer#:~:text=According%20to%20EUROFER%E2%80%99s%20impact%20assessment%2C%20the%20additional%20direct,proposed%2025%20billion%20euros%20investments%20in%20clean%20technologies.

4. EU ADDED VALUE AND ACHIEVEMENTS OF THE RFCS

As the RFCS legal basis is based on Protocol 37 annexed to the Treaties, it falls under the competence of the EU. The measures implementing the Protocol are established in a Council Decision whose revision belongs to the Commission's exclusive right of initiative for legislative proposals.

Over the years, the RFCS Programme has provided significant advancements for both sectors. These advancements are compiled in the recent reports from the RFCS technical groups for coal and steel[42] and are based on strong collaboration between entities from different Member States of the EU and from different organization type. For steel companies and universities participating in research projects, the benefits ranged from cost reduction (resulting from savings in energy use and/or raw materials), increased productivity, improved sustainability to gaining new market share through the development of innovative steel products[43]. For the coal sector, the RFCS contributed to improving health and safety in mines and minimising the impact of post-mining activities on the environment.

The RFCS is overall an important industrial programme, with peculiarities that distinguish it from typical state-level research programmes. It is specifically tailored to support cross-border collaboration, and at the same time it allows industry-academia collaboration with the aim to support dedicated industrial research. It is also extremely relevant for the social impact it creates, like it is the case for coal regions and re-skilling of the sector's workers.

4.1. Achievements of projects in the coal sector

In the period 2021-2024, the RFCS has supported several projects in the coal sector, which focused on the repurposing of former coal mines and lignite mines, and targeting renewable energy production, green hydrogen generation, and waste management. Five projects can be highlighted as examples: two demonstrators (GreenJOBS and MINE-TO-H2) and three pilots (HydroMine, MidSafe, and GrEnMine). These projects fall into two primary clusters:

<u>Cluster 1: Renewable energy production (including hydrogen production) and energy storage:</u> GreenJOBS, MINE-TO-H2, and HydroMine, focus on repurposing former coal and lignite mines for green hydrogen production, renewable energy generation, and energy storage. The projects explore various clean technologies, such as i) electrolysis of mine water for hydrogen production, ii) renewable energy production (geothermal, photovoltaic, wind power), iii) energy storage (unconventional pumped hydro using dense fluids), iv) waste heat recovery and blending hydrogen into the natural gas grid.

[42] European Commission: European Research Executive Agency, Tsakalidis, A., Merkourakis, S., Jenet, A. and Fumero, S., *Research Fund for Coal and Steel – A summary of the findings of the Coal Research Technical Groups – 2023*, Publications Office of the European Union, 2025, and European Commission: European Research Executive Agency, Tsakalidis, A., Merkourakis, S., Jenet, A. and Fumero, S., *Research Fund for Coal and Steel – A summary of the findings of the Steel Research Technical Groups – 2023*, Publications Office of the European Union, 2025,

[43] European Commission: Directorate-General for Research and Innovation and Sealy, C., Smart steel – Research fund for coal and steel – Supporting steelmaking and use in the 21st Century, Sealy, C.(editor), Publications Office, 2016

Cluster 2: Circular economy, including advanced materials development: The projects MidSafe and GrEnMine, focus on post-mining waste management, risk mitigation, and the development of innovative materials. The projects investigate aspects such i) geotechnical risk management and circular economy practices (recycling mining wastes to produce new geomaterials), ii) innovative geomaterials (developing geopolymers and zeolites to enhance soil stabilisation and reduce environmental pollution), iii) gravity-based energy storage technology and assessment tools for post-mining areas.

RFCS has also made significant research contributions to methane emission abatement, supporting three projects: one pilot (ProVAM) and two demonstrators (REM and GI-mine). These projects aim to capture methane from coal mines, reducing emissions and enhancing sustainability. The projects address methane-related challenges from multiple angles, including:

- Capturing and utilising methane: REM focuses on capturing and utilizing Abandoned Mine Methane (AMM) from closing mines, while GI-mine focuses on both reducing and utilizing AMM, integrating it with solid waste management.
- Reducing Ventilation Air Methane (VAM): ProVAM focuses on reducing VAM from active mines, improving capture and utilization, but does not utilize methane.
- Enhancing safety: All projects prioritize safety, addressing methane-related risks, and preventing uncontrolled methane leaks.

The projects have achieved significant methane emission reductions, with i) ProVAM + GI-mine: 140,121 t/year of methane captured and utilized (2022); ii) REM: 18,013 t/year of methane captured and used (2024), with a reduction target of 12,924 t/year (2025)[44].

The projects have scalability potential in the EU: 41 shafts of Polish and Romanian gassy coal mines (ProVAM), 13 mines across Poland, Slovenia, Romania, and Serbia (REM) and combined technologies applicable to mining waste dams and municipal sewage (GI-mine).

4.2. Achievements of projects in the Steel Sector

The European Union's commitment to climate neutrality by 2050, as outlined in the European Green Deal, necessitates the transformation of high-emission industrial sectors, including steelmaking. RFCS plays a role in this transition by funding projects aimed at reducing greenhouse gas emissions. An evaluation has been conducted[45] in relation to the contribution of selected RFCS-funded projects to the decarbonisation of the steel industry, with a focus on their alignment with the objectives of the Clean Steel Partnership and their potential for scalability and impact.

RFCS has funded five key projects—four pilots and one demonstrator—focused on near-market decarbonisation technologies (Table II). These projects collectively address various technological pathways and exhibit varying levels of technology readiness (TRL 3 to TRL 9).

The combined direct emission abatement from four demonstration plants is estimated at approximately 35,000 tonnes of CO_2 per year for a production volume of 1.5 million tonnes of steel. Extrapolated to the EU level, assuming moderate adoption, these technologies could contribute to a reduction of up to 10 million tonnes of CO_2 annually, which corresponds to the scaling estimate of ProSynteg technology.

[44] Analysis conducted by REA for the period 2021-2024
[45] Analysis conducted by REA for the period 2021-2024

Table II. *How selected steel projects contribute to decarbonisation policy objectives of the clean steel partnership and EGD*[46].

Project	Focus Area	TRL	Estimated CO_2 Reduction
ProSynteg	Hydrogen-rich syngas for blast furnaces	3–6	14 kg CO_2/t steel; up to 9.86 Mt/year (EU-wide potential)
HYDREAMS	Waste heat to clean hydrogen	4–7	75 kg CO_2/t steel; 14,000 t/year (Ugine plant)
TWINGHY	Hybrid H_2/NG burners and digital twin	5–7	85 kg CO_2/t steel; up to 351 t/year (100% H_2 scenario)
MODIPLANT	Electrification of heating systems	6–9	5–16 kg CO_2/t steel; up to 10,000 t/year for flat products (electrification) 3,000 t/year for flat products (HDG line) 7,969 t/year for long products
BIOCODE	Biomass substitution in coke production	5–7	400 kg CO_2/t coke; 0.24–0.48 Mt/year

It is important to note that the five evaluated projects represent only 6% of the RFCS portfolio. Another 78% of lower TRL research projects may yield substantial further decarbonisation benefits in the future. Therefore, the estimates provided above are based only on some illustrative examples while RFCS's total contribution is, with certainty, significantly higher.

The RFCS steel research portfolio demonstrates a strong alignment with the European Green Deal, the Clean Industrial Deal, and the Clean Steel Partnership. The selected pilot and demonstration projects provide tangible evidence of the sector's capacity to innovate and reduce emissions.

4.3. RFCS and scaling up of projects

The RFCS programme has demonstrated a coherent and progressive sequencing of research and innovation activities across successive calls. This sequencing often involves scaling-up (from lower to higher TRL), building on previously validated concepts in the RFCS Annual Call research projects, and fostering cross-programme synergies with initiatives such as Horizon 2020 and Horizon Europe. For more information, see Annex II in the Annexes section.

5. POLICY OBJECTIVES

As explained above, coal and steel industries are facing important challenges in their transition towards a decarbonised and competitive economy. The objectives of reforming the legal base would

[46]Analysis conducted by REA for the period 2021-2024).

be to improve the attractiveness of the programme and leverage its best impact for supporting these sectors, while address R&I needs and stakeholders' recommendations.

5.1 Improve the attractiveness and impact of the RFCS programme

The proposed reform aims to simplify and improve the RFCS functioning, making it more accessible and attractive to industry, including for SMEs, research and academia. Revised call conditions will help reduce investment risks for industry. The joint decarbonisation and competitiveness objectives set out in the Competitiveness Compass and the Clean Industrial Deal (together with the specific targeted sectoral implementation outlined in the Steel and Metals Action Plan), as well as other relevant support initiatives targeting the transition of coal and steel sectors, can only be achieved if private capital is supported by a coherent and coordinated framework of public funding.

At the same time, reinforcing the EU's strategic autonomy in critical sectors, such as coal and steel, requires a strong R&I capacity, with an impact-oriented approach. The overall goal is, therefore, not only developing lead markets in clean industrial products, but also supporting dual use related capabilities. The proposed reform would support e research and development for dual use applications to achieve a higher impact.

5.2 Addressing R&I needs and stakeholders' recommendations

The proposed reform has the objective to enhance the participation to the RFCS, by revising the call conditions and providing higher, more flexible budget, to encourage and de-risk private investments. The current policy context is aligned to the objectives of the reform, given the need for the steel and coal sectors to transition through the present challenges, the indicated ambition to support this transition, as well as the expiry of the current financial regime by end 2027. In addition, recent consultations conducted with stakeholders (including Coal Advisory Group (CAG) and Steel Advisory Group (SAG) and Member States (through COSCO), together with the finding of the Technical Groups and evaluation of programming period 2021-2024, provide valuable insights on the type of adjustments needed for the improvement of the RFCS Programme (see Annex I).

The reform would address the recommendations of stakeholders to strengthen R&I capabilities for coal and steel and bring new knowledge applicable even beyond these industries.

6. POLICY OPTIONS

6.1 Option 1: Baseline scenario

The current financial regime introduced by the 2021 reform will expire on 31st December 2027. The first option would be not to propose financial and technical guidelines after this date. This would imply that on 1st January 2028, the RFCS can only be funded via the income generated by the revenue of the assets with related fluctuations. In addition, the Big Tickets calls would be terminated.

The only call would be the Annual call, which would continue to exist on a budget only based on the income generated by the assets, with related financial fluctuations. This situation would bring the programme to a pre-2021 status, possibly worse given the recent volatility of the interest rates. This will lead to a financially unsustainable programme and the Annual call would run on a very small budget, if any, not enough to support the intense R&I needs of the industry in the actual transitional situation.

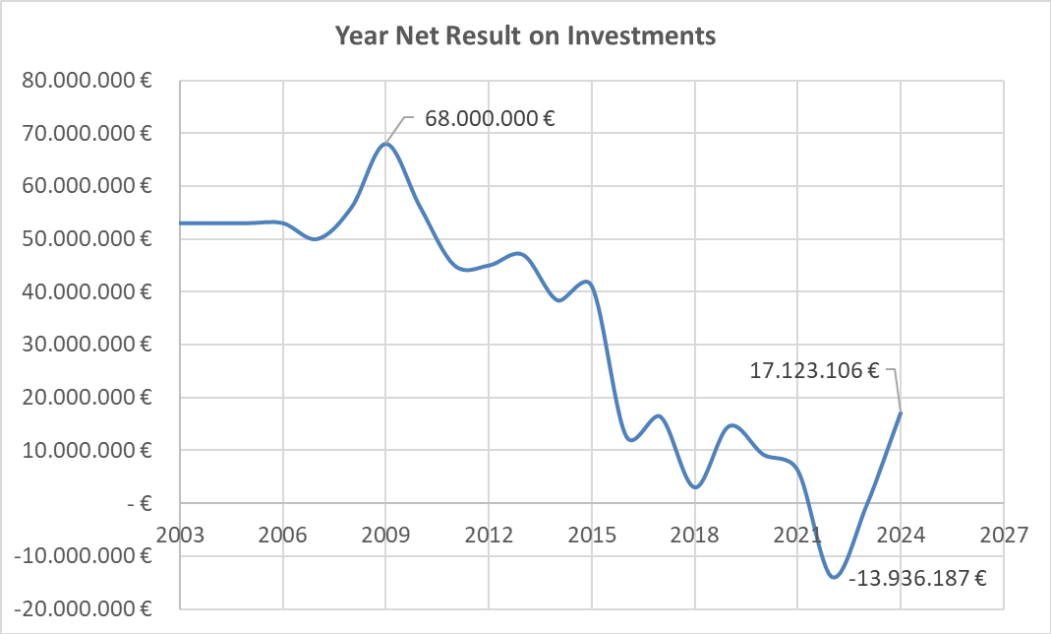

***Figure 1**: RFCS assets net results on investments*

Source: DG BUDG, European Commission,

6.2 Option 2: Renew the current legal framework post-2027 with same technical and financial guidelines

The second option would be to use the same technical and financial guidelines beyond 2027, with the current regime of annual allocations of EUR 111 million with same funding rates. This option would lead to the full liquidation of all assets for 2033 or for 2034. Besides, this option would not provide solutions to boost the attractiveness of the programme and would not allow for larger R&I investments which are needed in the short-run, given the current difficulties faced by the steel sector and its transition needs. It would also not address the importance of aligning the RFCS objectives with current stakeholder needs, nor implement more attractive funding rates.

6.3 Option 3: Overall reform of the RFCS legal basis

The third option is an overall reform of the RFCS legal basis that will tackle the following aspects:

Improving the attractiveness of the programme

Based on the feedback received from stakeholders, raising the funding rate for collaborative research projects and pilot and demonstration projects to 70% for industry and 100% for non-profit entities would help significantly to boost the attractiveness of the programme. This funding rate frame takes into consideration the large panorama of stakeholders' requests and mediating on the voice of stakeholders requesting a full coverage for non-profit organisations, which would come along with the requirement for non-profits to collaborate with industry. For instance, a requirement for an industrial partner or other demonstrable industry support could be provisioned in the eligibility criteria of the call.

The definitions of coal and steel and the related research objectives would be streamlined, since the current legal base goes into an unnecessary degree of detail, adding complexity for potential applicants. The overall impact would be more emphasised and related to broader policy objectives allowing more flexibility for applicants, adding to the principles of simplification and openness. This approach would allow for stakeholders to specifically target the evolving needs of their industry.

Additionally, biannual call scheme can support long-term predictability and better planning for application. More specifically, one call would remain open over an extended period of time along the two-years programme with two deadlines per year, allowing applications better matching the industrial investment clock in terms of predictability and flexibility. In the implementation, one call could include all types of projects, allowing for applications throughout the TRL scale and with more flexibility in the budget per project, thus grouping under one scheme the current schemes of the Annual call and Big Tickets calls.

To increase attractiveness, the proposal is also to move towards explicit dual use projects in a dedicated topic under the Work Programme 2026 to match the political agenda with more innovative research that could benefit civil applications and technologies.

Although this will not be reflected in a reformed legal base itself, the proposed reform would be accompanied by enhanced communication efforts from RTD and REA to promote the RFCS programme and its novelties. This would be also conducted through the CAG/SAG advisory groups, which are the ambassadors of the programme.

Accelerating investment for the years 2027-2030

The proposed reform also introduces the frontloading of assets in work programmes that would run for 2027-2028 and for 2029-2030. This responds to the challenges and transition needs that the sectors are currently facing and the favourable policy context to support the sectors, as well as the need for a higher budget envelope. The call would be established in a Commission Implementing Decision, with technical expertise from the Coal Advisory Group (CAG) and Steel Advisory Group (SAG). The call would allow for proposals up to TRL 6 for collaborative research projects and TRL 7 and TRL 8 for larger scale demonstration projects.

The frontloading would amount to a potential investment package of ca. EUR 800 million for the years 2027-2030, as there are EUR 647 million (market value as of 31 August 2025) of remaining assets at the end of 2026, whereas non-allocated funds of the RFCS for the period 2021-2026 are estimated at around EUR 150 million. This would allow for setting annual allocations of up to EUR 200 million for 2027, 2028 and 2029, and remaining unspent appropriations for 2030. These higher annual allocations aim to ensure a meaningful programme with a strong EU added value. This would allow the continuation of funding for ambitious projects, while taking account of the increased EU funding needs from the envisaged higher EU funding rate to increase the attractiveness of the programme.

Simplification of the programme governance and overall funding EU funding landscape

The proposed reform includes a provision on the advisory structure of the programme, which foresees to establish the advisory and technical groups in a Commission Decision.

Technical Groups could remain in place until the end of 2030 to support the final technical review of the programme. However, their expertise and cluster monitoring role over the portfolio of the respective group would be dismissed after that time, given that no additional calls are planned, for the preparation of which their input has been relevant.

In addition, the above-mentioned increase of the EU funding rate for collaborative research projects and pilot and demonstration projects to 70% for industry and 100% for non-profit entities would also contribute to simplification and harmonisation of the EU funding landscape, by aligning the EU funding rate with the funding modalities of the new EU programmes for competitiveness, research and innovation.

Breakdown on Coal and Steel

The breakdown for coal and steel of 27,2% and 72,8% respectively, was decided in 2003 and calculated according to the amount paid by the respective industries via the levy that collected the money to start the ECSC, which was paid based on the production rate of each company in the respective sector[47]. This breakdown between coal and steel will be maintained at the level of the work programme, instead of the Council Decision. This will provide the necessary flexibility if necessary to ensure full use of the assets in the last year of implementation of the programme.

7. PREFERRED OPTION AND EXPECTED IMPACTS

Option 3 appears as the most impactful, the one that would strongly contribute to EU's long-term policy objectives, the announcements in the European Steel and Metals Action Plan and address stakeholder needs. The frontloading of investment would allow for ambitious research projects, which could help reaching climate targets by 2050 while maintaining competitiveness. It would also allow to finance the revised funding rates that would address stakeholders' recommendations and contribute to attract more investments and a wider participation to the RFCS programme. The streamlining of research objectives, more adapted to current realities faced by the sectors, would help to maximise the impact of the programme. The proposed reform also introduces a requirement to conduct deployment and commercialisation activities in Europe, to ensure the best impact of R&I projects for EU competitiveness.

Regarding the timing, the reform would ideally take effect in January 2027. While this timing has not specifically been requested by stakeholders, it would offer more attractive call conditions earlier. It would correlate with a series of measures aiming at supporting energy intensive industries (for instance the Industrial Accelerator Act), as described in the introduction. Indeed, this reform is to be understood in a broader policy context in which energy-intensive sectors are considered key actors for the EU industrial competitiveness and decarbonisation strategy.

7.1 Expected impacts for the steel sector

Supporting research on clean steel will contribute to decarbonising industrial processes in Europe, with significant benefits for the environment and health. It is also expected to generate positive employment effects across the steel value chain and the economy overall when mastering to unlock the growth opportunities from the green transition when an adequate business case is made.

Under the planned reform, the RFCS programme is expected to support research still across various segments of the innovation chain and promote a fast-track pipeline for maturing mid-TRL projects into large-scale deployment.

[47] Council resolution 98/C 247/04 of 1998 has invited the Commission to consider how the breakdown could be applied, stating that it "should initially be based on the financial contribution paid by the two industries".

The implementation of hydrogen-based Direct Reduced Iron (DRI) and Electric Arc Furnace (EAF) technologies is expected to reduce dependence on imported natural gas and coking coal, lowering production emissions and carbon costs. This is expected to enhance the global competitiveness of the European steel industry, while simultaneously supporting the development of a domestic green technology supply chain. This includes upstream sectors such as renewable energy and hydrogen production, creating positive spillovers across the EU economy.

On a societal level, investment in clean steel R&I is expected to contribute directly to the EU's climate objectives by reducing greenhouse gas emissions. It is also expected to position the European steel sector as a future leader in renewable energy technologies, supporting the creation of high-quality jobs across green industrial value chains.

Importantly, clean steel should be regarded as a distinct product category from conventionally produced steel. Its successful deployment requires dedicated lead markets capable of absorbing production volumes — an ambition aligned with the forthcoming Industrial Accelerator Act.

One such strategic lead market is the automotive sector, for which the European Commission adopted its Industrial Action Plan for the European automotive sector in March 2025.[48] Automotive and steel are deeply interconnected: steel is a critical component of vehicle structures and parts. Ensuring a stable, secure supply of clean, high-quality steel is essential for the competitiveness of the automotive industry — not only for civil applications, but increasingly in response to rising defence sector demand. Moreover, as the reformed RFCS is expected to support dual-use technologies, this opens up new market opportunities in both civilian and defence-related applications.

Finally, by boosting the competitiveness of the EU steel sector, the RFCS Programme is expected to reinforce the resilience of strategic supply chains, enable improvements in scrap quality, and foster circularity. These are key to reducing raw material dependency and strengthening Europe's strategic autonomy.

7.2 Expected impacts for the coal sector

In the coal sector, targeted research related to methane emission reductions, along with continued efforts in mine repurposing, will play a key role in supporting the transition of coal-dependent regions in Europe. Extending the time available for proposal preparation is expected to increase submission rates, particularly as the coal sector has shown interest in pursuing the Big Tickets instrument. These larger-scale projects often require research at higher TRLs, which in turn demand substantial investment.

Industrial partners typically require time-consuming internal decision-making processes before committing financially. Providing longer preparation periods and higher funding rates is expected to encourage broader participation from both the private sector and academia, thereby reinforcing support for the regions most affected by coal phase-out.

Increasing the scope and intensity of coal-related research under the RFCS is also expected to contribute to the development of new skills and the creation of high-quality jobs for the workforce. To optimise this, it will be crucial that RFCS-funded coal projects clearly demonstrate how the knowledge and technologies developed can be transferred to related areas, such as biomass cultivation or CO_2 capture and storage.

[48] COM(2025) 95 final

To conclude, the reform of the RFCS Programme under option 3 is designed to drive research excellence, strengthen the competitiveness of the coal and steel sectors, and actively support their transition towards decarbonisation.

8. CONTRIBUTION TO WIDER UNION POLICY OBJECTIVES

The proposed reform of the RFCS, which aims to support the decarbonisation pathways of the coal and steel sectors, is not a stand-alone initiative but is embedded in a broader EU policy framework.

The *Competitiveness Compass*, published in January 2025, establishes industrial competitiveness as a core priority and sets out cross-sectoral actions for the coming years. It recognises decarbonisation and circular economy as a key drivers of growth when aligned with industrial, competition, economic, and trade policies. This follows the recommendations from the *Draghi Report* (2024) on the future of European competitiveness.

Building on the Competitiveness Compass, the *Clean Industrial Deal* in February 2025 operationalises its objectives and introduces transversal measures to keep the EU an attractive manufacturing hub, particularly for energy-intensive industries. Its implementation is supported through sectoral action plans, including notably the European Steel and Metals Action Plan of March 2025.

The Clean Industrial Deal also proposes the *Industrial Accelerator Act*, designed to stimulate demand for EU-made clean products. The proposal complements initiatives such as the auctioning system enabled by the forthcoming *Industrial Decarbonisation Bank*, and aligns with the *Net-Zero Industry Act* (NZIA), which streamlines permitting and enables strategic project status.

The steel sector, which has historically received free allowances under the EU Emissions Trading System (ETS), will face increasing carbon costs with the phase-out of these allowances by 2035. To remain competitive, the sector must make timely investments. The *Draghi Report* anticipates carbon prices to reach €100/tonne or more by 2030. The *Carbon Border Adjustment Mechanism* (CBAM), entering into force in January 2026, will further support decarbonisation by preventing carbon leakage and ensuring fair competition. In addition, the reform will be designed to explore bridging opportunities with other instruments of the next MFF.

The current RFCS already implements synergies with the Framework Programme through the Clean Steel Partnership, as well as the upcoming Clean Industrial Deal call under Horizon Europe, planned in 2026. On this basis, and following the eventual full liquidation and use of the ECSC assets, a smooth transition towards research and innovation support for coal and steel in the programmes in the next EU Multiannual Financial Framework (MFF) 2028-2034, such as Horizon Europe, could be considered.

For the coal sector, the proposed reform will be fully aligned with the goals of the *Just Transition Mechanism* and the *Methane Regulation*, supporting research that aims to reduce both CO_2 and methane emissions.

The proposed reform will be tailored to the evolving needs of both coal and steel sectors. Substantial research investment is required to accompany the transition, particularly over the next decade, to meet decarbonisation goals and maintain European steel production. Higher annual budget allocations and streamlined research priorities will better align RFCS funding with the Union's broader objectives on decarbonisation, strategic autonomy, and competitiveness.

Importantly, the legal provision enabling Member States to complement RFCS funding with State aid will help close the funding gap for clean steel R&I, creating a stronger business case for private investment. This integrated approach will prevent inefficient public spending on unsustainable legacy value chains and instead focus support on economically viable, future-proof solutions.

For the steel sector, since green technologies remain in need of optimisation, medium- to high-TRL research will be essential for testing, improving, and validating performance. The next decade is critical, as many large-scale investments backed by State aid will go online. These projects will need to demonstrate and gradually integrate new technologies into industrial operations. Hence, sufficient support needs to be made available to support this process.

As for the coal sector, the 2040 phase-out target and methane mitigation objectives also require urgent R&I support. Past projects have shown strong added value, and now mature technologies must be demonstrated, scaled, and deployed within existing infrastructure. Coal regions in transition will need near-term industrial continuity and viable alternatives, which is translated in a need for sustained support, namely in high TRL, ready to deploy research. The proposed reform will support a competitive funding scheme covering low, medium, and high TRLs, with budgets aligned to project scale and ambition.

9. MONITORING AND EVALUATION

The implementation of the RFCS programme will be monitored by the Research Executive Agency (REA), which is responsible for executing the programme, in collaboration with the European Commission's Directorate-General for Research and Innovation (DG RTD). This work will require regular coordination meetings and annual reporting, which provides structured feedback on how funded projects contribute to broader EU policy objectives, namely through the feedback to policy (F2P) exercise, conducted by REA. Reporting will also inform about the attractiveness of the programme, e.g. by providing data on the evolution of number of proposals and the absorption rate of the funding. Regular discussion with the advisory committee and the COSCO will also help to assess the effectiveness of the reform in addressing R&I needs, as well as the recommendations made by stakeholders.

In addition, the technical progress of specific project portfolios under the RFCS will continue to be monitored by the Coal and Steel Technical Groups ('the Technical Groups' or TGs), which will be set up by a Commission decision. These groups are composed of recognised high-level experts with substantial experience in their respective sub-sectors. Information about the Technical Groups – including their membership, meeting agendas, and other details – is made publicly available in the Register of Commission Expert Groups.[49] Management of the TGs is entrusted to REA, as established in the Memorandum of Understanding between REA and DG RTD.

The Technical Groups provide a comprehensive overview of technological developments within their specific domains. This assessment is based on information collected from RFCS-funded projects, primarily through dedicated annual meetings between the Technical Groups and project coordinators, organised by REA.

Additionally, the Technical Groups are expected to produce the necessary content for REA to provide the annual reports offering a broader analysis that also considers developments in related areas and

[49] https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups?lang=en

parallel European programmes. This ensures a more integrated understanding of progress and impact across the innovation ecosystem.

To enable comprehensive monitoring and evaluation, it is essential that future project proposals more effectively address the “impact” criterion. In REA’s contribution to this ex-ante analysis (see Annex II in the Annexes section), it was reported that many applicants either failed to adequately describe the potential impact of their proposals or offered only superficial statements without supporting evidence.

Given that the RFCS operates as a bottom-up programme, each project may deliver unique outcomes. As a result, evaluating the impact across the entire portfolio presents challenges. In 2024, the evaluation criteria were refined to introduce the concept of "scale and significance" and to clarify the distinction between "outcomes" and "impacts" of research projects. Continued implementation and promotion of these refined criteria in project design and reporting, as started by REA, will allow for more accurate and meaningful monitoring of RFCS research objectives, thereby enhancing the overall effectiveness of project evaluation and monitoring.

10. CONTRIBUTION TO SIMPLIFICATION OBJECTIVES

The proposed reform further aligns with the European Commission’s broader objectives of simplifying and consolidating legislation, eliminating overlaps and contradictions and better implementation. In line with stakeholders’ feedback as well as the political guidelines for this Commission’ and its ongoing simplification efforts in line with the Communication on implementation and simplification “A simpler and faster Europe”[50], there is a need to identify simplification measures to make business easier and faster. Outdated provisions will be repealed or adapted in the proposed reform, to reflect the most recent and relevant legislation, creating a clearer and more coherent legal framework. The consolidated new proposal will be implemented through two new Council Decisions to emphasise the approach of modernising and streamlining the legal base. The overall number of provisions will be shortened, as a large portion of the current RFCS legal base duplicates details already covered at the Work Programme and Model Grant Agreement levels. This will improve clarity and ease of implementation. Provisions that impose administrative burdens without added policy value will be removed.

The updated proposal for the legal base will also enhance the usability of the RFCS Programme by introducing a single call covering both medium and high TRL research and applying increased funding rates across academia and industry. The introduction of a single call is expected to give applicants sufficient flexibility along with an extended time to plan and design proposals more tailored to the specific industrial needs. Similarly, research objectives will be streamlined, with a broader emphasis on project impact.

Moreover, as indicated earlier, the envisaged increase of the EU funding rate for collaborative research projects and pilot and demonstration projects to 70% for industry and 100% for non-profit entities would also contribute to simplification and harmonisation of the EU funding landscape, by having it aligned to the funding modalities of the new EU programmes for competitiveness, research and innovation, notably HorizonEurope.

[50] COM/2025/47 final

ANNEXES

ANNEX I: SUMMARY OF THE CONSULTATION WITH MEMBER STATES, ADVISORY GROUPS, AND STAKEHOLDERS

Summary of the consultation for the Reform of the Research Fund for Coal and Steel (RFCS)

The consultation, held as a virtual, public event on 19 June 2025, gathered 150 participants from the industry, academia, and research centres, all active in the coal and steel sectors to identify and discuss effective solutions for the announced RFCS reform. The event featured presentations from different Commission services to set the scene and an open discussion, based on guiding questions that focussed on three key areas: accelerating investments, improving program attractiveness, and enhancing impact.

(i) Accelerating Investment

Stakeholders supported implementing the RFCS reform by 2028, as necessary according to present legal base to ensure continuity and avoid funding gaps in the programme. The Annual Call was praised as a successful tool of the programme and its general approach should continue. The Big Tickets call should focus on specific, high technology readiness level (TRL) projects (TRLs 5–8), but avoid overlapping with EU instruments, such as the Innovation Fund. To enable industrial planning, calls should open 9–18 months in advance of the submission deadline. RFCS must be complementary, and not overlapping, to other EU investment tools, especially the Innovation Fund, which is seen as the logical continuation to reach deployment. The RFCS should be also aligned with other European policies that require industrial investments. Predictability in energy prices, trade policies, and the carbon mechanisms (e.g. CBAM) was deemed critical for investments.

(ii) Improving Program Attractiveness

Participants recommended increasing EU funding rates for the Big Tickets to 70–80%, with industry co-financing as a quality filter. Project budgets should remain flexible: Annual calls for smaller R&D projects and Big Tickets calls for larger, justified initiatives. Estimated budget was suggested to be between EUR 300,000 and up to about a maximum of EUR 40 million, depending on the type and scope of the project. A longer submission window and pre-evaluation support were suggested for the Big Tickets. CAPEX rules should address ownership risks and modular scalability, while OPEX challenges (e.g. high energy costs) require complementary policies. The current coal/steel funding split (27.2%/72.8%) was deemed equitable.

(iii) Enhancing Impact

Stakeholders cautioned against focussing only on large flagship projects, advocating also for smaller, TRL-progressive initiatives to build foundational knowledge. They emphasised EU-centric valorisation of project outcomes to strengthen industrial competitiveness and strategic autonomy, including EU-based Intellectual Property (IP) and pilot demonstrations. Encouraging the deployment, upscaling, and commercialisation of results in Europe would not only maximise the return on public investment, but also support job creation, innovation ecosystems, and long-term effectiveness. Dual use research was seen as compatible with the programme, but secondary to decarbonisation priorities.

Key Takeaways:

- Continuity and predictability were central to all sessions.
- The RFCS should remain a flexible, industry-led program, avoiding direct overlap with broader EU funds.
- Long-term funding stability and alignment with industrial cycles (CAPEX, permitting) are critical for success.
- The consultation underscored the need to balance innovation, decarbonisation, and competitiveness, while preserving the RFCS's unique role in supporting the coal and steel sectors.

Summary of the advice received from the Coal Advisory Group and the Steel Advisory Group

The members of Coal Advisory Group (CAG) and Steel Advisory Group (SAG) were asked, following the meeting with the European Commission of 12 May 2025 and on 19 September 2025, to provide written input on potential reasons for the observed low participation in the RFCS Big Tickets calls and strategies to improve the situation. The RFCS Big Tickets serve as a critical funding mechanism for innovation in both sectors. The programme is widely recognized for its high-quality, industry-relevant research, with strong international visibility. It supports critical decarbonisation goals, including CO_2-neutral iron production and energy efficiency, aligning with the Clean Industrial Deal and European Green Deal, and it has a unique value in bridging academia and industry, fostering innovation through collaborative projects.

For steel, the program supports a wide spectrum of projects, from targeting CO_2-neutral iron ore reduction to energy efficiency, alloys for special applications, circular economy, and digitalisation - aiming to align with the European Green Deal's 2050 climate neutrality objectives. A EUR 100 million budget for 2025 emphasised large-scale R&D with a focus on achieving Technology Readiness Level (TRL) 7–8. However, participation from the steel industry remained low, despite substantial funding. Key barriers reported include a funding rate difficult for the industry, complex administrative requirements, and limited awareness among the wide range of industrial stakeholders. For coal, the program addresses mine repurposing as renewable energy hubs, methane mitigation, and recovery of critical raw materials from waste. Reported challenges include aligning coal sector initiatives with broader decarbonisation goals while ensuring economic viability for legacy regions. In general, the program also faces challenges in sufficiently showcasing the positive impact of past projects, calling for stronger dissemination strategies to alignment with other EU initiatives.

To enhance engagement, recommendations include adjusting funding rates, allow longer call opening time, and simplifying call structures to reduce administrative burdens. Co-designing calls with both academic and industrial stakeholders, along with targeted support like proposal development grants, could boost participation. For coal, clearer integration of mine repurposing and waste valorisation projects into funding priorities is urged. Both sectors require stronger collaboration to leverage synergies, such as using steel industry byproducts in coal repurposing initiatives, to maximise the RFCS program's impact on the green transition.

<u>Advice from the Coal Advisory Group (CAG)</u>

Key suggestions include:

- Streamlined application processes: A two-stage submission model to reduce upfront effort and overlap, with stage 1 as a concise outline and stage 2 for full proposals.
- Lump-sum budgeting: Introducing optional lump-sum funding to lower administrative complexity for small coal-region municipalities and SMEs.

- RFCS ambassadors: A CAG ambassador scheme to promote the program at conferences and regional forums, supported by grants and standardised materials.
- Enhanced communication: Increased social media presence, storytelling (e.g. RFCS transition awards), and video case studies to highlight success stories and attract newcomers.
- Administrative simplification: Pre-filled templates, automated budget tools, and multilingual communication toolkits to reduce burdens, particularly for SMEs. Very often EU programmes are perceived as burdensome.
- Funding adjustments: Higher co-funding rates for SMEs (60–70%), possibly 100% for universities, and sub-funds to prioritize energy security and diverse projects.
- Allow high TRL projects: Coal is close to final phase out. Hence, there is no time for R&D on a lower TRL, but only for research in conditions "close to market".

CAG members emphasised the need for closer collaboration between academia and industry, with proposals often initiated by research institutions. However, limited academic engagement has hindered coal industry participation. The group also recommended aligning RFCS with the Just Transition Fund and REPowerEU to sustain projects that miss funding thresholds.

Advice from the Steel Advisory Group (SAG)

Key suggestions include:

- Program structure: Differentiate between RFCS Big Tickets (focusing on large-scale innovation) and Annual Calls to clarify objectives, budgets, and funding rates.
- Simplification and continuity: Standardise proposal templates, communicate changes early, and maintain consistent funding goals to reduce administrative complexity.
- Expert involvement: Retain industrial steel experts in advisory groups (SAG, TGA) and evaluation processes to ensure project relevance and quality.
- Funding flexibility: Allow higher funding rates for research and technology organisations (RTOs) without compromising industrial participation and allow full funding if KPIs are met even with reduced project hours.
- Strategic alignment: Keep RFCS focused on steel-specific challenges, avoiding dilution into other sectors, and align with EU policy goals like CO_2-neutral iron production and energy efficiency.
- High TRL research projects (RPJs) in the Big Tickets calls: There seems to be a lack of openings for medium-size, medium TRL projects.
- Plant builders are beneficiaries as equipment providers and research partners: Plant builders can be funded for the R&D part (e.g. design, engineering, development test, etc). As soon as the pilot or demo is on the site of the final user (consortium partner), the ownership should be transferred to the final user (the plant builder being paid for that). Currently, the ownership of the equipment remains with the plant builder during the project, generating several issues regarding liability and operations safety.

SAG members noted the RFCS's unique value for the EU steel sector, enabling direct industry applications of results. However, they criticised the low participation in Big Tickets calls despite substantial funding (EUR 100 million for 2025), attributing this to complex processes and limited industry engagement. Suggestions to address this include targeted grants for SMEs, clearer communication of call schedules, and post-2027 continuity.

Input and advice received from the Coal and Steel Committee (COSCO)

In relation to the effort to improve the RFCS programme in view of the upcoming reform of the legal base and as follow up to the two meetings held respectively on 29 January 2025, 24 April 2025 and 23 September 2025, ten members of the COSCO, namely Austria, Belgium, Czech Republic, Finland, France, Germany, Netherlands, Slovakia, Spain and Sweden, provided the specific advice summarised as follows:

- Communication and dissemination activities are considered to be very helpful for increasing participation in the programme and more of such activities should be fostered.
- The programme as is it is unattractive and not always compatible with industry timing, also in respect to scaling-up products. The RFCS and its conditions should be made more attractive, while securing an adequate quality of the selected projects.
- The reform is considered crucial and necessary to allow the further use of the assets for research within the RFCS program. The programme should show continuity and be directed for use only of the sectors involved.
- Fund more basic, disruptive research. Given the high value of the industry-driven low TRL research for the sector, it is recommended to use the assets primarily for supporting the annual call dedicated to basic research. For the annual calls, an annual budget of EUR 40-50 million is considered adequate.
- In the EUR 600 million dedicated to the Clean Industrial Deal over the period 2026-2027 (EUR 550 million from Horizon Europe and EUR 50 million from the RFCS Big Tickets steel of 2026), the EUR 50 million coming from the Big Tickets for steel should be allocated to the Annual Calls instead.
- Simplification & reducing administrative burden for an efficient use of the money.
- Since the assets have been built by special levies from the steel industry and to ensure the industry-driven character of the programme, the fund should be safeguarded and a dialogue between the sector, Member States and the Commission would be appreciated to shape the reform.

ANNEX II: CONTRIBUTION FROM THE RESEARCH EXECUTIVE AGENCY (REA) TO THE EX-ANTE EVALUATION FOR THE REVISION OF THE RESEARCH FUND FOR COAL AND STEEL

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List of abbreviations of Annex II

AM	Accompanying Measures
AMM	Abandoned Mine Methane
AC	Annual Call
CAG	Coal Advisory Group
BT	Big Tickets Call
CSP	Clean Steel Partnership
D&E	Dissemination and Exploitation
DG	Directorate General
EGD	European Green Deal
F2P	Feedback to Policy
GAP	Grant Agreement Preparation
JT	Just Transition
PDP	Pilot & Demonstration Projects
PRC	Private for profit entities (excluding Higher or Secondary Education establishments)
RFCS	Research Fund for Coal and Steel
RPJ	Research Projects
SAG	Steel Advisory Group
TRL	Technology Readiness Level
TGs	Technical Groups
VAM	Ventilation Air Methane

Introduction

This report provides input to the ex-ante evaluation for the revision of the Research Fund for Coal and Steel (RFCS) legal basis. The content of the report is limited to specific requests from DG RTD. As such, it is not an overview of the entire range and outputs of the RFCS programme activities.

The "reference period" chosen was 2021 – 2024, and the data and analyses presented belong to this period. On few occasions, information on activities carried out in 2025 are briefly presented, to give an idea of future perspectives for the programme. This is always clearly indicated in the text.

All data presented in the report come from the eGrants Data warehouse (formerly called CORDA - Common Research Family Data Warehouse). The data extractions were operated during 12-16/05/2025.

The report is divided in 10 chapters. The information related to the Coal sector and to the Steel sector are presented separately whenever possible, in order to highlight, the differences between the two.

- Chapter 1 gives an overview of the funded projects per sector and per call.
- Chapter 2 shows the evolution in the scoring of the proposals across the years.
- Chapter 3 details the EU contribution per sector. This chapter also analyses the budget allocation for equipment purchases (CAPEX) and provides insights on the size of CAPEX giving particular attention to the Steel Big Tickets.
- Chapter 4 gives information on gender balance of different types of stakeholders of the RFCS community: expert evaluators, members of the Technical Groups, and members of the Advisory Groups.
- Chapter 5 provides information on SME participation.
- Chapter 6 gives an overview of "newcomers", i.e. how much RFCS can enlarge its participant pool with new entities.
- Chapter 7 provides examples of projects that were initially funded as Research projects at lower TRL and have later on developed at Pilot & Demonstration level.
- Chapter 8 enumerates areas of concern that were encountered during the grant agreement signature process (notably the termination of two GAPs due to serious issues faced by the consortia), or during project implementation. A specific sub-chapter explains how limiting the amount of pre-financing was implemented as a major simplification measure.
- Chapter 9 gives an overview of the RFCS dissemination events organized by REA, details issues that were identified through contacts with the stakeholders and explains some of the solutions that were designed to solve them.
- Chapter 10 describes the added value of RFCS by presenting: RFCS work on feedback to policy, examples of promising projects/success stories, the feedback from the Technical and the Advisory Groups and some insight on scientific impact and how to improve it.

Chapter 1: Projects 2021 – 2024

The RFCS programme supported **a total of 122 projects** during the period 2021-2024 involving 422 unique participants, with a **total budget of EUR 268.9 million** (see Annex Overview A: RFCS projects awarded in the period 2021 - 2024). The projects covered a **wide range of topics**, including coal mine repurposing, methane abatement, steel production, energy efficiency, and environmental sustainability.

The total number of steel projects is significantly higher than the number of coal projects, reflecting the difference in funding distribution, as per the RFCS legal basis[51]. The total number of Annual Call projects is higher than those of the Big Tickets Calls (BT). BT is a new instrument, targeting Pilot & Demonstration projects with higher TRL. The Annual Call is a long-established RFCS instrument which mostly funds research projects with lower TRL (Figure 1).

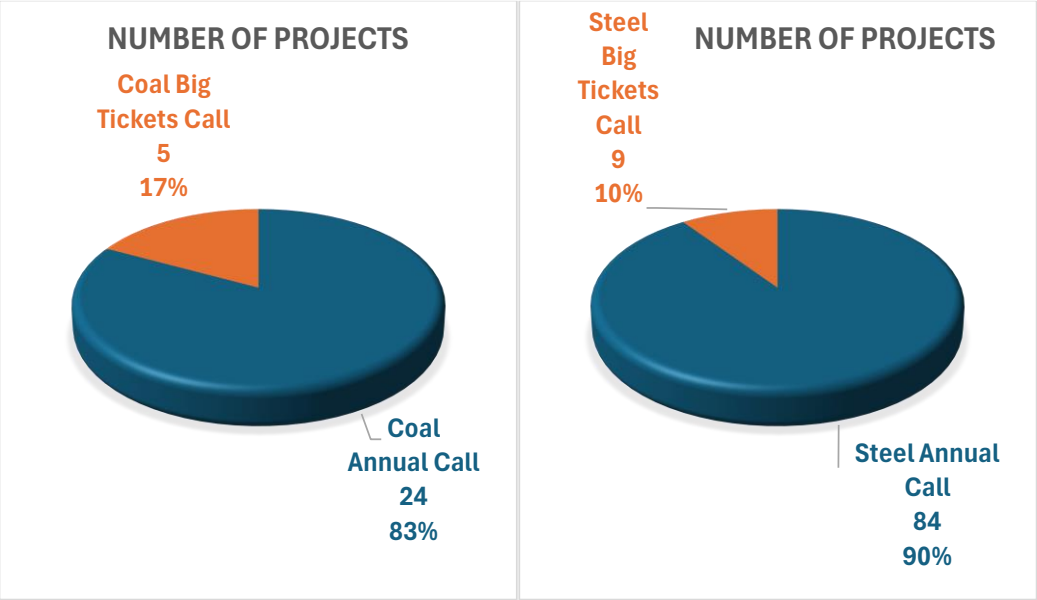

Figure 1. Number of projects by call type (2021-2024). 1 in 9 projects is linked to a Big Tickets call showing proximity to market access.

2021 was the first year of implementation, after the delegation[52] from DG RTD to REA. The relatively low number of funded projects in 2021 was caused by the late adoption of the new RFCS legal basis (Figure 2 and Figure 3).

[51] 27,2 % being allocated to the coal-related research and 72,8 % to the steel-related research: Art 4.2. of COUNCIL DECISION of 1 February 2003 establishing the measures necessary for the implementation of the Protocol, annexed to the Treaty establishing the European Community, on the **financial consequences of the expiry of the ECSC Treaty and on the Research Fund for Coal and Steel** (2003/76/EC),

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02003D0076-20210811&qid=1748531037025

[52] COMMISSION DECISION delegating powers to the European Research Executive Agency with a view to the performance of tasks linked to the implementation of Union programmes in the field of Research and Innovation, Research of the Fund for Coal and Steel and Information Provision and Promotion Measures concerning Agricultural Products comprising, in particular, implementation of appropriations entered in the general budget of the Union, Register of Commission Documents - C(2021)952.

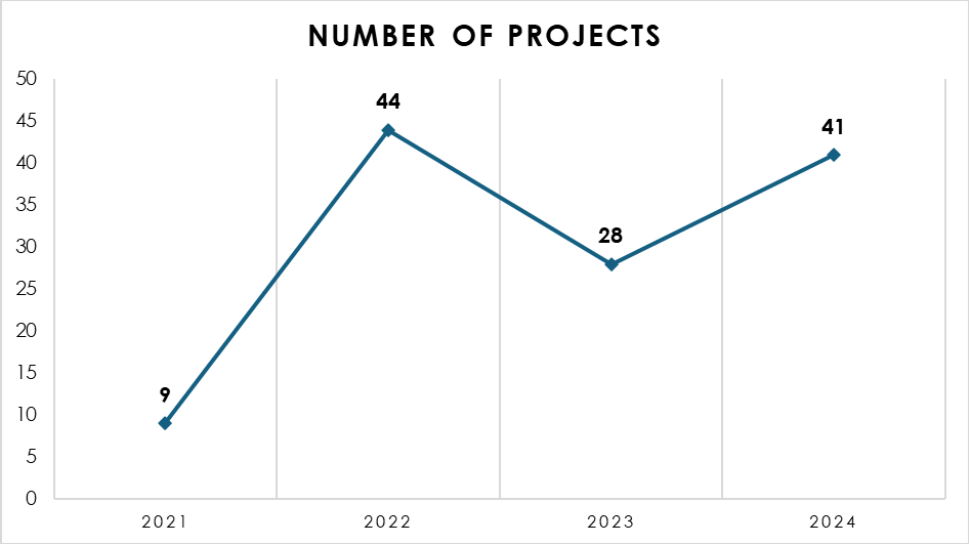

Figure 2. Evolution of number of grants from 2021 to 2024 (total sum of steel and coal projects) depict high variability, partly explained by late adoption of the legal basis in 2021.

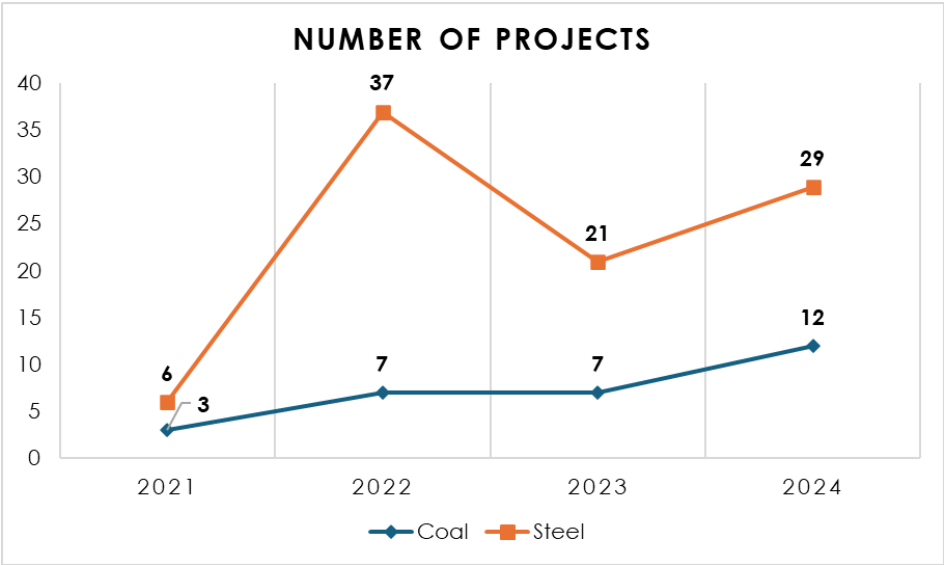

Figure 3. Evolution of number of grants from 2021 to 2024 for both sectors (steel and coal) depict high variability, partly explained by the late adoption of the legal basis in 2021 and poor quality of steel proposals in 2023.

Figure 4 depicts the number of "not unique" participants (i.e. a given participant can be involved in several RFCS projects). A total of 905 beneficiaries, with the steel sector accounting for 77% of the total and the coal sector for 23%.

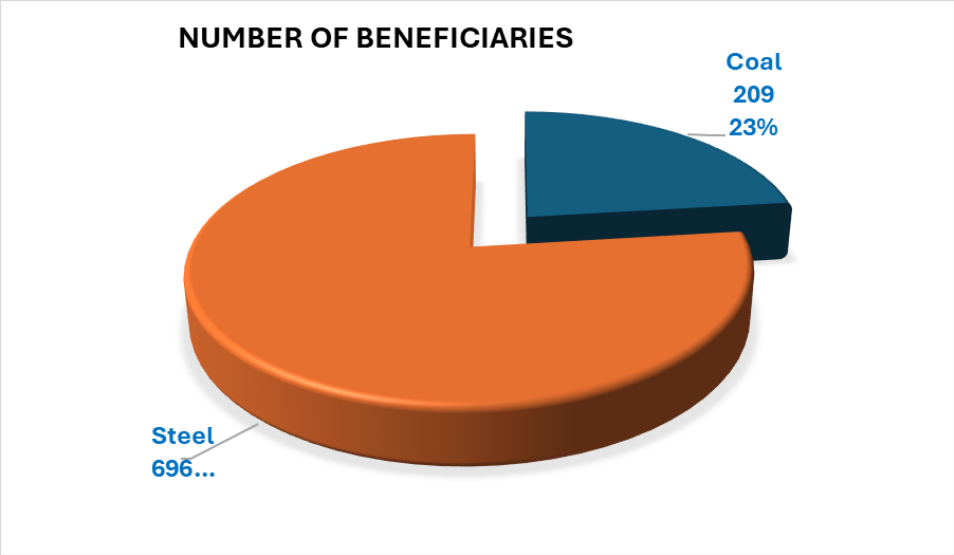

Figure 4. Number of beneficiaries per sector that received funding in 2021 -2024

The programme's project portfolio comprises **29 projects in the coal sector and 93 in the steel sector.** For the coal part this comprises 4 Accompanying Measures (AM), 7 Pilot and Demonstration Projects (PDP), and 18 Research Projects (RPJ). The steel sector has a more extensive portfolio, with 6 AM, 24 PDP, and 63 RRJ.

Research Projects are the most prevalent type of project in both sectors, accounting for 62% of the total projects in the coal sector and 68% of the total projects in the steel sector (Figure 5).

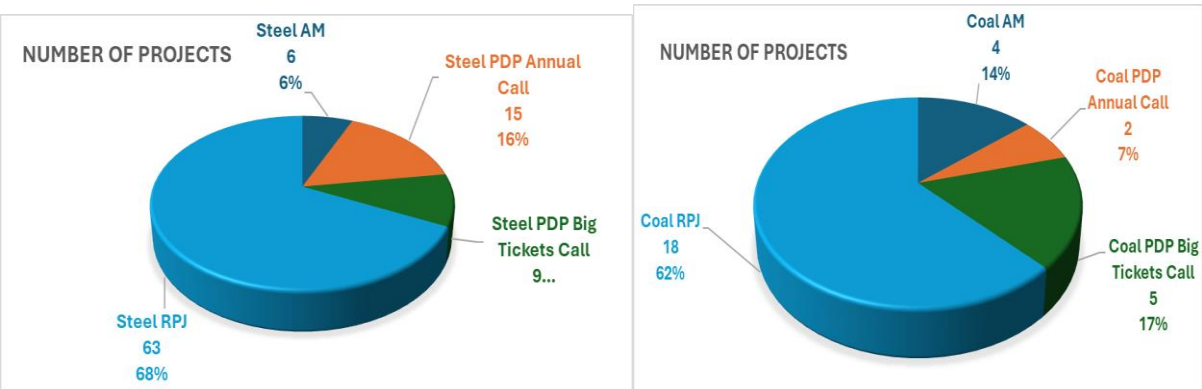

Figure 5. Number of projects per sector (steel and coal) and per type of action (Research (RPJ), Accompanying Measures (AM) and Pilot/Demonstration (PDP)) demonstrating two thirds of research-oriented projects.

Chapter 2: Ranking evolution

In Figure 6 the overall evaluation's score of the proposals increases over time. This shows that the **quality of the submitted proposals improves steadily over time**.

This is the result of sustained efforts from REA to assist the stakeholder community to prepare proposals with higher quality (some examples are provided in paragraph 10.2).

The figure also shows that the scores of the proposals submitted to the Annual Calls are consistently higher than the scores of the proposals submitted to the Big Ticket (BT) Calls.

The BT calls are exclusively addressing Pilot and Demonstration projects at high TRLs. The BT is a relatively new instrument for the RFCS, with new requirements. On the other hand, the number of proposals, and consequently the level of competition among proposers is higher for the Annual Call.

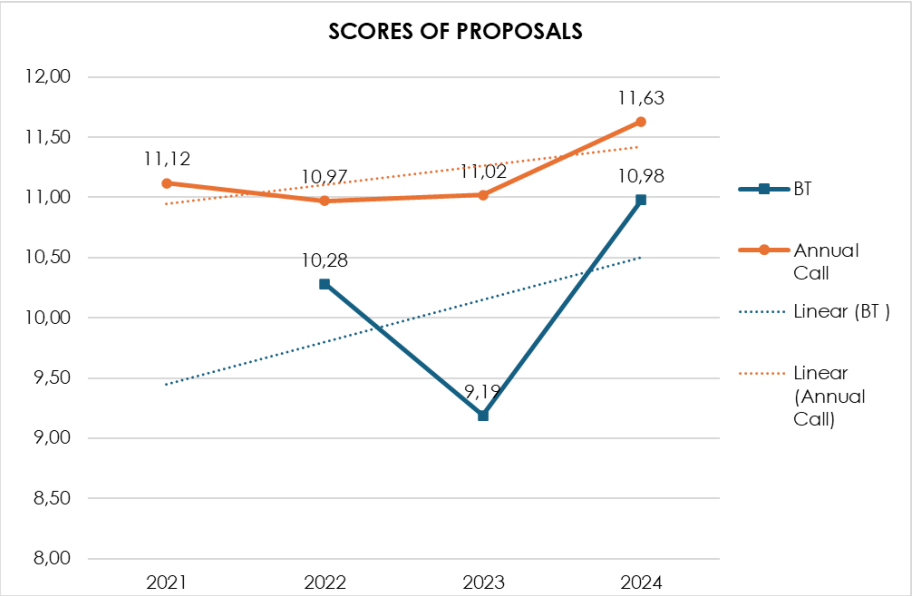

Figure 6. Evaluation average scores of proposals (Annual and the Big Tickets Calls, 2021–2024) showing increased proposal quality over time.

Note: the maximum score that can be obtained by a proposal is 15 points. Proposals that obtain a score of at least 10 points are above the requested threshold. The total score is the sum of the individual scores obtained in the three evaluation criteria (Excellence, Impact, and Quality and efficiency of the implementation).

Chapter 3: EU Contribution

Figure 7 shows the amount of funding (EU contribution) allocated to the coal and the steel sectors.

Figure 8 and Figure 9 show that for coal and steel, the research projects of the annual call received most of the funding (EUR 130.9 million), followed by Pilot & Demonstration projects (EUR 25.8 million). For Coal, the research projects of the annual call have received a co-financing amount of EUR 31.2 million, the Pilot & Demonstration projects of the Big Tickets EUR 42.7 million and the Pilot & Demonstration projects of the Annual Call obtained a far lower funding EUR 3 million.

These results show that the Annual Call is clearly dominated by Research projects for both sectors, with a far less focus on Pilot & Demonstration projects.

One possible future modification/improvement of RFCS could be to dedicate the Annual Call exclusively to Research projects and Accompanying Measures and reserve the high TRL Pilot & Demonstration only for the Big Tickets. This separation would provide even more clarity of the purpose of each instrument towards RFCS's stakeholders.

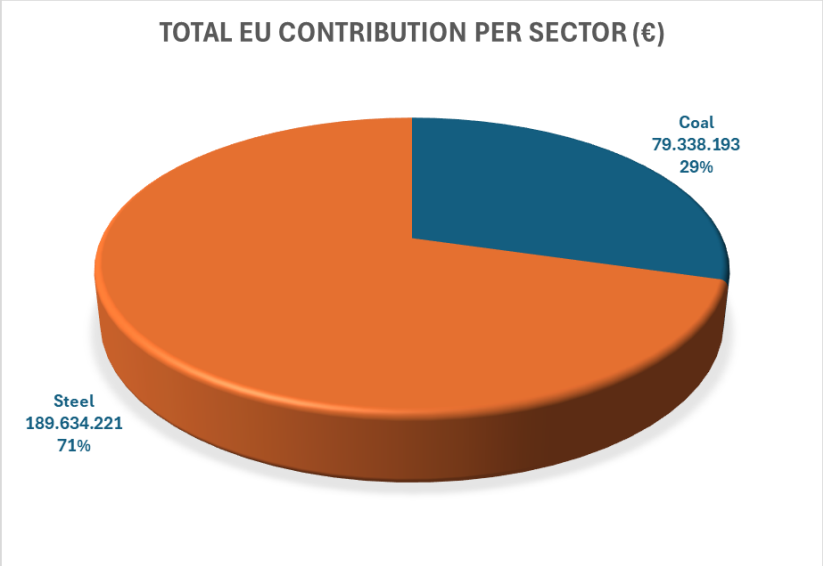

Figure 7. Breakdown of funding by sector showing an allocation of EUR 268.9 million, with steel receiving 71% (EUR 189.6 million) and coal 29% (EUR 79.3 million).

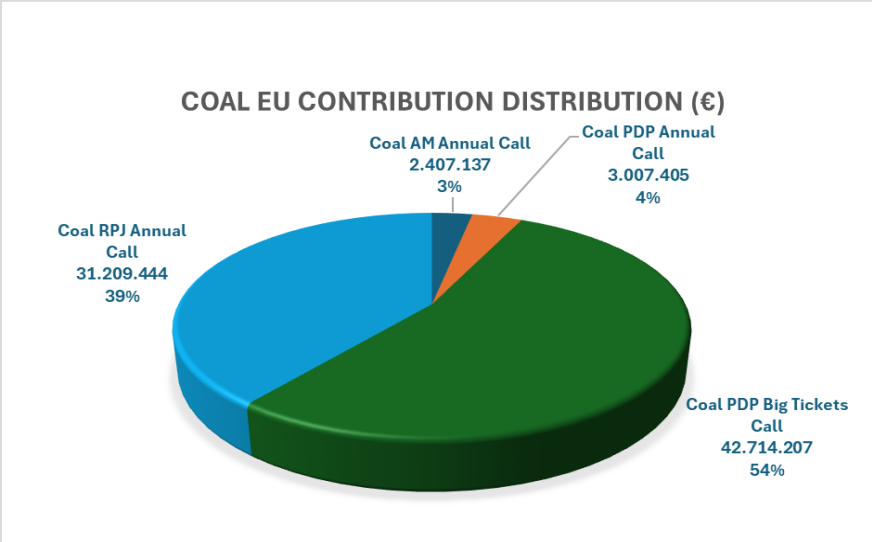

Figure 8. EU Contribution of EUR 79.3 million for coal by type of project (research projects, accompanying measures, pilot & demonstration projects) and type of call (annual and big tickets) (2021-2024) showing that 58% is directed to innovation actions close to market uptake.

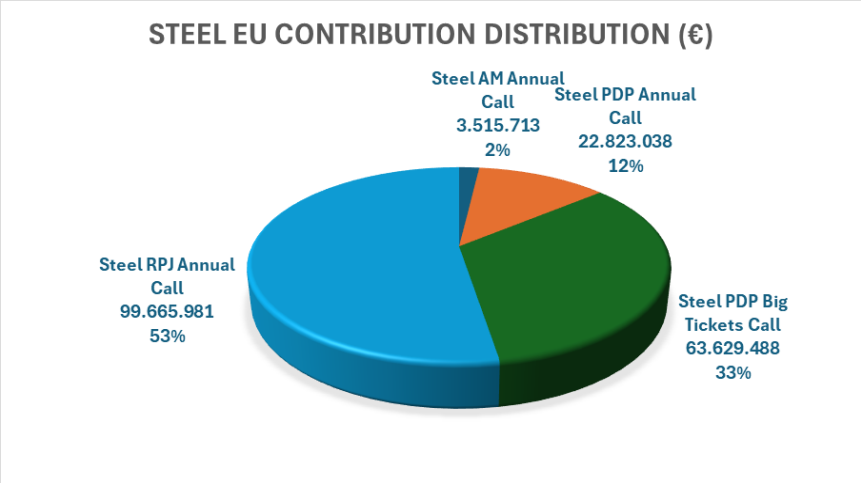

Figure 9. EU Contribution of EUR 189.6 million for steel by type of project (research projects, accompanying measures, pilot & demonstration projects) and type of call (annual and big tickets) (2021-2024) showing that 45% is directed to innovation actions close to market uptake.

3.1. Types of participants in RFCS projects

Most of the participants for both sectors are private companies (PRC, 44% for coal and 66% for steel). The coal sector has a higher participation of research centres (REC, 23% for coal and 12% for steel) and higher education entities (HES, 27% for coal and 20% for steel).

Overall, the programme has a strong private sector involvement (Figure 10).

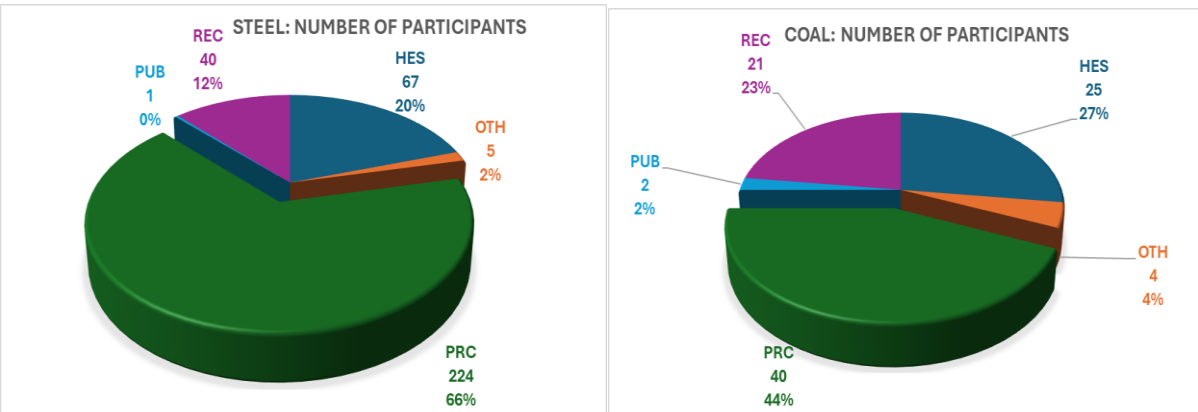

Figure 10. Comparison of participant organisations in coal and steel sectors (private companies (PRC), research centres (REC), higher education sector (HES), public entities (PUB), others (OTH), showing similar distribution with industry partners leading in both, 44% and 66%, respectively.

3.2. Share of the budget used for equipment (CAPEX)

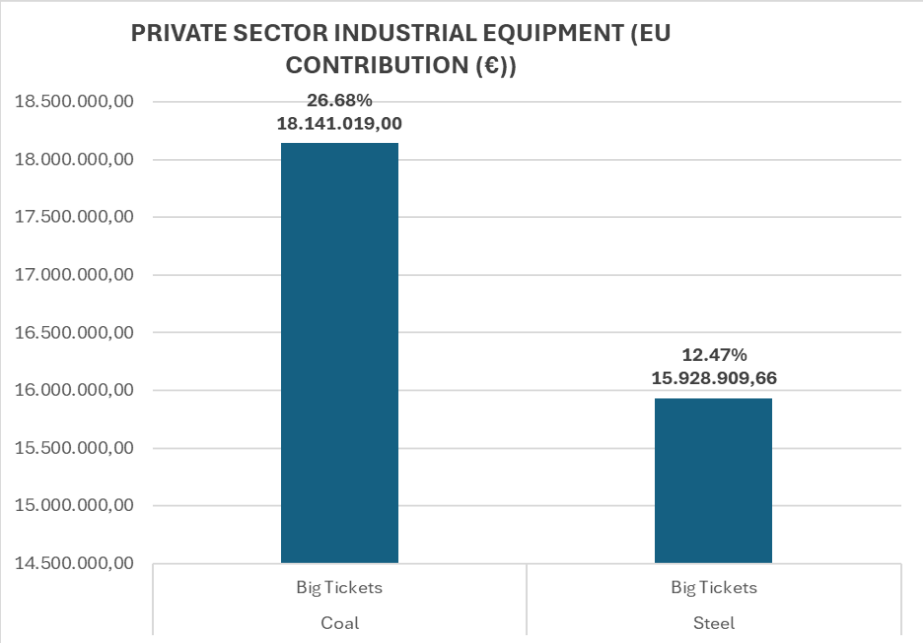

Figure 11. Share of industrial equipment (CAPEX)

3.2.1. CAPEX for the Steel sector

Figure 11 shows that **for the Steel sector, a lower part of the budget is dedicated to the purchase of equipment**, i.e. capital expenditures (abbreviated as CAPEX), whereas for the Coal sector the figures are higher.

To explain this, REA has conducted a more detailed analysis of some projects, especially those for which the equipment costs were the lowest among the Steel BT portfolio (see below). In conclusion, it appears that **several BT projects focus on either using existing equipment for industrial scale trials** (e.g. CROSSCUT, HYDREAMS) **or deploy digital innovations** (e.g. TWINGHY, PRISMA), instead of purchasing or developing "traditional" industrial installations.

Some Big Tickets steel projects seem to have a relative low percentage regarding the costs (3-5% of total project costs) **for purchasing industrial equipment** (HYDREAMS, TWINGHY, CROSSCUT, PRISMA). Various reasons may play a role here: The total individual project costs, with a budget of between EUR 8.5 million and EUR 10.3 million, are relatively high. Nevertheless, the respective expenditures for industrial equipment are relatively low, ranging between EUR 325,000 and EUR 428,000 (total EUR 1.406.553) per project. It must be taken into account that the total investment for industrial equipment for these four projects amounts to EUR 2,972,026, but only 47% of this is billed via the project due to different depreciation periods and different allocation ranges regarding the respective use in the project.

Direct project-related reasons for a lower investment for industrial equipment include the development and application of digital twins (TWINGHY) for furnace demonstrators, the use of multi-material approaches to test alternatives to fossils (CROSSCUT), the focus on leveraging modern digital infrastructures and platforms (PRISMA) and the use of existing industrial equipment from consortia partners (HYDREAMS).

Chapter 4: Gender balance

The RFCS legal basis does not foresee any specific measures to promote gender issues or to collect information on gender from projects.

In general, the female workforce ranges between 3-20% in the Steel sector[53, 54, 55] and between 8-17% in the Coal mining sector[56].

However, in line with the EU policies, efforts were made to improve the gender balance of the evaluation experts and of the members of the various RFCS groups (Technical Groups and Advisory Groups).

RFCS managed to achieve a participation of female evaluation experts and female members of the Technical Groups (TGs) and of the Coal and Steel Advisory Groups (CAC/SAG) ranging from 30% to 42% depending on the group of experts (see below for more details per category of expert/member of an RFCS group).

Gender balance of the RFCS expert evaluators

The participation of women in the RFCS evaluations shows a stable balance ranging from around 35 to 43 % for the years 2021 – 2024.

Gender balance in the RFCS Technical Groups

The members of the Technical Groups were renewed in early 2023. RFCS has managed to attract and select several qualified women candidates. Overall, 39% of the new members are women. Within the Steel TGs, 38% are women and within the Coal TGs, 42% are women[57].

Gender balance in the RFCS Advisory Groups

The members of the Advisory Groups were renewed in early 2025 (see paragraph 10.4). Also here, a good number of qualified female candidates were selected. Overall, 34% of the new members are women. For SAG, 36% are women[58], and for CAG 31% are women[59].

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[53] Salminen-Karlsson, M. (2020). Women in the Steel Industry: Closed in Corners or Provided with Possibilities. Nordic Journal of Working Life Studies, 10(4). https://doi.org/10.18291/njwls.122189

[54] Responsible Steel: International Women's Day: Celebrating women working across the steel supply chain. March 8, 2025;

https://www.responsiblesteel.org/news/international-womens-day-celebrating-women-working-across-the-steel-supply-chain#:~:text=Despite%20these%20advancements%2C%20industries%20like,the%20workforce%20(S%26P%20Global)

[55] Women in metals, mining make modest gains in leadership roles | S&P Global,

https://www.spglobal.com/commodity-insights/en/news-research/blog/metals/052323-women-in-metals-mining-make-modest-gains-in-leadership-roles

[56] Eiter, B.M. et al. 2023 Occupational Safety and Health of Women in Mining. J of Women's Health; 32:4; https://doi.org/10.1089/jwh.2023.0034

[57] RFCS Technical Groups - Outcome of the call for applications for the selection of members of the Coal and Steel Technical Groups, **Ares(2023)2581588**.

[58] REA RFCS SAG Membership - Outcome of the selection procedure for members of the steel advisory group, **Ares(2025)2447821**

[59] REA RFCS CAG Membership - Outcome of the selection procedure for members of the coal advisory group, **Ares(2025)2447737**.

Chapter 5: SMEs

The RFCS legal base[60] does not explicitly promote SME participation. However, the programme encourages the involvement of SMEs, recognising their potential to drive technological advancements and economic growth.

In the RFCS Calls from 2021 to 2024, applicants were required to provide administrative information about the participants (part A of the application form). While the form collects data on the applicants' legal status, it does not explicitly require an SME status declaration.

In the 2021–2024 period, out of 254 unique private for-profit organisations (PRCs) participating in RFCS, 63 declared themselves as SMEs, 138 declared that they were not SMEs, and 53 did not provide any SME status information. Figure 12 shows the EU contribution distributed to SME and non-SME entities.

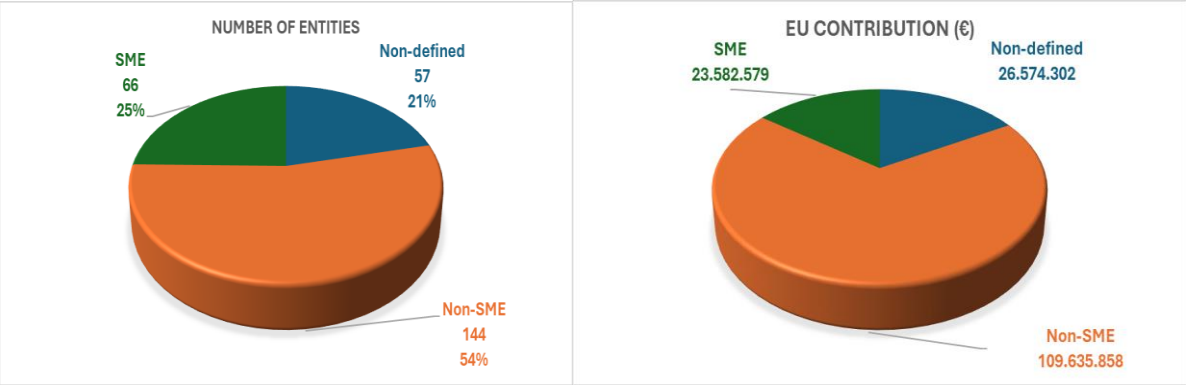


Figure 12. EU Contribution to private for-profit organisations by SME status, shows most of the EU funding went to non-SMEs (industry), while SMEs also received a significant share (a quarter), highlighting the importance of SMEs in the research actions.

Chapter 6: Newcomers

"Newcomers" are defined as entities that have not participated in RFCS before 2021. During the last programming period (2021-2024), 259 entities out of a total of 885, representing a share of 29.3% were newcomers, 54 for coal and 205 for steel[61].

The **programme has shown the capacity to attract a significant number of new entities**, with Spain, Italy, Germany, France, and Poland being the top 5 countries of origin, accounting for 68% of all newcomers, indicating a successful outreach to diverse organisations across Europe (Figure 13).

[60] Council Decision of 29 April 2008 on the adoption of the Research Programme of the Research Fund for Coal and Steel and on the **multiannual technical guidelines** for this programme (2008/376/EC) (Consolidated text),

https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02008D0376-20210725#E0005

[61] This information is not shown in the figures.

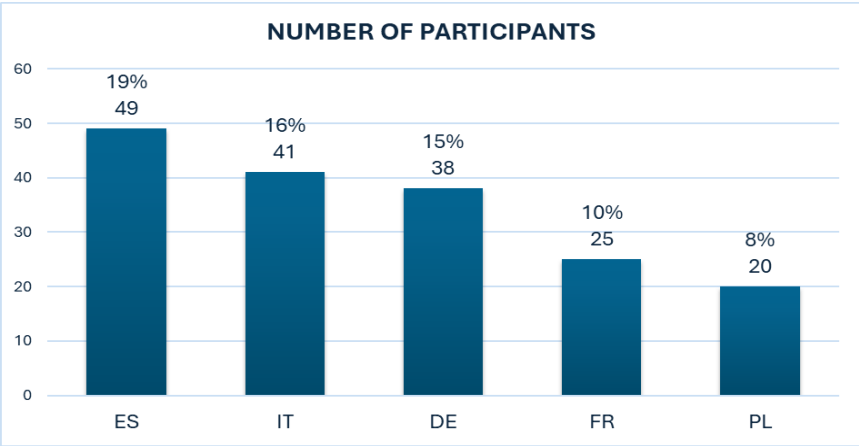


Figure 13. Country of origin (top 5) of new RFCS participants.

Chapter 7: Scaling-up: from low to high technology readiness level (TRL)

The RFCS programme has **demonstrated a coherent and progressive sequencing of research and innovation activities across successive calls**. This sequencing often involves scaling-up (from lower to higher TRL), building on previously validated concepts in the RFCS Annual Call research projects, and fostering cross-programme synergies with initiatives such as Horizon 2020 and Horizon Europe. Below are selected examples of such sequencing efforts, structured by Coal and Steel sector.

Coal

1. **REM (Big Tickets 2022)** builds directly on the outcomes of the earlier DDMET project (RFCS 2018), further advancing the technological development of post-mining methane emission management. The project exemplifies a scale-up of the core technology and aims to enhance the system's TRL through improved efficiency in emission control.

2. **MINE-TO-H2** (**Big Tickets 2023**) continues work initiated in POTENTIALS and GreenJOBS (both RFCS), with the goal of scaling up integrated green hydrogen production from mining environments. This project illustrates how RFCS fosters continuity in strategic themes, transitioning from proof-of-concept to applied industrial systems.

3. **PRIMI** (**Big Tickets 2024**) integrates findings from both FLOW (H2020 ERA-NET) and MINRESCUE (RFCS 2019), aiming to upscale recycling methodologies for mining and inorganic industrial residues. This is a clear case of cross-programme integration and scaling, enhancing the TRL of circular economy technologies within the coal sector.

4. **METH2GEN** (**Big Tickets 2024**) follows the ROCCS project (RFCS 2019), advancing CO_2 storage capabilities in European coal seams. It represents a scale-up of carbon utilization and storage methodologies toward higher operational readiness and impact.

5. **POSTEN** (**Big Tickets 2024**) is a technological continuation of HEET II (RFCS 2019), focusing on scaling up the single-wire energy transfer (SWET) system. This initiative highlights incremental innovation aimed at increasing energy transfer capacity and efficiency in post-mining energy applications.

Steel

1. **Hy4Smelt** (**Big Tickets 2024**) builds upon H2FUTURE (H2020), targeting industrial-scale green ironmaking. With TRL > 5, the project is a direct scale-up of pilot concepts toward market readiness, marking a critical step in decarbonizing primary steel production.

2. **HYDREAMS** (**Big Tickets 2022**), while not a direct continuation, parallels the HYSTALPI proposal under Horizon Europe. It aims to demonstrate clean H_2 oxycombustion at TRL 7, marking significant progress in industrial combustion systems for low-emission steelmaking.

3. **MODIPLANT (Big Tickets 2022**) synthesizes insights from multiple projects, including LowCarbonFuture, BURNER 4.0, GREENSTEEL, and BAMBOO (RFCS, EP-PP, and H2020). The project exemplifies integrative scaling of modular plant innovations for more efficient steel production.

4. **TWINGHY** (**Big Tickets 2022**) builds upon results from DevH2forEAF (RFCS), ALCHIMIA (H2020), FLEX4FACT, and GREENSTEEL (RFCS). It advances hydrogen integration in electric arc furnaces and supports digital energy transition tools, showing both technological and digital scale-up trajectories.

5. **SLAG2BUILD (Big Tickets 2024**) continues Ecoslag (RFCS), targeting full industrial implementation (TRL 8) of slag recycling technology. It exemplifies a transition from pilot scale to operational capacity in circular resource use within the steel industry.

6. **H2loop** (**Big Tickets 2024**) builds on PROSYNTEG, H2TransBF 2030, and HYDREAMS (all RFCS), scaling hydrogen production and utilization technologies for emissions reduction. With TRL 7, it reflects both continuity and technological maturation.

7. **CROSSCUT** (**Big Tickets 2024**) builds upon GREENEAF2, RETROFEED, and POLYNSPIRE, combining RFCS and H2020 efforts to demonstrate sustainable substitution of fossil coal in steel production. The project illustrates scale-up in both circularity and energy transition.

8. **PRISMA (Big Tickets 2024**) synthesizes outputs from Arrowhead fPVN, AIMS5.0 (Chips-JU), and ALCHIMIA (H2020), scaling up digital infrastructure for smart manufacturing and environmental data integration within the steel sector.

These examples demonstrate the strategic foresight of the RFCS programme and its synergy with broader EU research efforts. The consistent reinforcement of earlier results and progressive scale-up of technologies—often to TRL 7 or 8—contribute significantly to the long-term competitiveness and sustainability of Europe's steel industries and positively support a just transition of the coal regions.

Chapter 8: Areas of concern identified during project implementation

Several areas of concern have been identified during project implementation, including delays, budget overruns, and few adjustments in project scope. These issues have been addressed through a range of measures, including project monitoring, risk management, and communication with participants.

8.1. Suspension of a running project

Big Tickets 2022/Steel/ FULLH2REHEAT: this project was suspended in April 2024 due to the high costs of using green hydrogen and its availability. ArcelorMittal is seeking for an alternative pilot

plant in Spain, contingent on accessing affordable local green hydrogen prices. Negotiations are ongoing with the Spanish authorities (EU contribution EUR 8.2 million).

8.2. Termination of a project during GAP

Below are described two cases of projects that were terminated during the Grant Agreement Preparation (GAP) process.

Big Tickets 2022/Coal/GreendealInertia: this proposal dealt with the repurposing of Coal power plant sites, utilizing inter-alia "second life" batteries from public buses. The EU contribution was substantial, of approx. EUR 11.3 million. When the grant was about to be signed, the coordinator informed REA that RWE (a German multinational energy company), represented in the project by four legal entities, had decided not to sign the grant agreement, due to a change in the company strategy in relation to the use of second-hand batteries. At the request of the Consortium the GAP was terminated in July 2023.

Big Tickets 2023/Steel/REINJECT: this proposal focussed on of fossil carbon sources in metallurgical processes. The EU contribution was of approx. EUR 5.8 million. Towards the final stages of the grant agreement preparation, the coordinator informed REA that the financial situation of the company (Celsa Group) did not allow it to continue with the grant. At the request of the Consortium the GAP was terminated in February 2024.

8.3. Amendments

Four main kinds of amendments were implemented (Figure 14):

a) **Budget modifications** (which include Change in Annex 2; Change concerning unit costs/contributions (Annex 2a) and Change of the maximum grant amount (Annex 2));
b) **Consortium update** (including *Beneficiary termination; Beneficiary termination (non-accession to the GA*; *Addition of a new beneficiary*; *Addition of an associated partner and Change concerning listed equipment*);
c) **Implementation issues** (including *Change of Annex 1*; GA suspension and Change concerning listed equipment);
d) **Pre-financing** (including bank guarantees, for more details see the dedicated sub-section below).

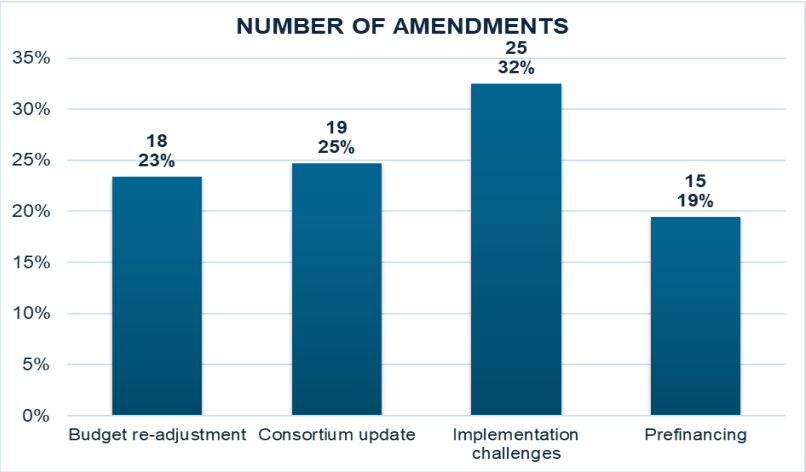


Figure 14. Types of contract amendments requested by RFCS applicants depict implementation issues as most common reason for contract amendments (32%), followed by consortium updates (25%) and budget readjustments (23%), indicating that project execution and partnership adjustments are the main challenges faced by RFCS participants.

8.3.1. Pre-financing

After the first two years of implementation, REA decided in order to **streamline the Grant Agreement Preparation process, to modify the bank guarantee modalities**. This measure was implemented to **simplify the administrative burden** and as well preserve the EU financial interest. The new process has been used for the first time for the 2023 Annual Call and generalised for both Big Tickets and Annual Calls thereafter.

It has led to efficiency gains as this change had an important operational component, as it has simplified the process and decreased the workload for both the consortia and the implementing body, by limiting the number of bank guarantees.

Bank guarantees are not requested anymore except for the case of a coordinator with weak financial capacity, when keeping such a coordinator is manifestly to the benefit of the project (this type of exceptional decision may be taken after a careful case by case assessment). Processing bank guarantees is a time-consuming and cumbersome process. Also, the costs incurred by the consortia to secure the bank guarantees can now usefully be employed in other activities. As a counterpart, **in order to protect the EU financial interests, the percentage of the pre-financing has been reduced from 40% to 20%.**

By streamlining this part of the GAP process this measure has also had a positive impact on the Time-To-Grant. Its implementation was smooth, with no complaints received by the consortia.

Chapter 9: Issues identified during dissemination events and contacts with stakeholders

9.1. RFCS dissemination events

Since 2022, REA systematically organises annual dissemination events for Coal and for Steel, and Information days for Annual and Big Tickets Calls.

The info days for the Big Tickets contain an additional feature, the 1-to-1 session where stakeholders/potential applicants can clarify issues related to the preparation of the proposals.

The **workshop "How to write a good proposal"** constituted a landmark one-off event, which markedly boosted proposal quality (Table 1). This event was an opportunity to collect, and clarify, issues faced by RFCS's stakeholders.

Some of the most prominent ones are briefly listed below after an overview of the RFCS dissemination events carried out:

Table 1. RFCS Events

Name of event	Date	Venue	Number of participants

RFCS Summit 2022 - ‘celebrating the 20th anniversary of RFCS’	21-22 March 2022	Brussels	~50 participants in-person and ~115 on-line ~300 connections to the web streaming during the two days and ~200 users of Slido
RFCS-2023-BT Info Day	30 January 2023	Brussels	~150 participants
RFCS-2023 Annual Call Info Day	13 June 2023	Brussels	~200 participants
RFCS Workshop ‘How to write a good proposal’	13 December 2023	Brussels	~40 participants in person and >150 on-line
RFCS annual Steel event: “European clean steel: stand up together for a future low emission industry - Hydrogen: a powerful ally”.	25 January 2024	Venice	~50 participants in person and >200 on-line
RFCS-2024-BT Info Day	27 February 2024	Brussels	~50 participants in person and >80 on-line
RFCS-2024-BT ‘1-1 Session’	27 February 2024	Brussels	14 one-to-one sessions with potential applicants
RFCS annual Coal event: “European Coal in Transition: rising like a phoenix”	8 May 2024	Oviedo	~300 participants in person and >150 on-line
RFCS-2024 Annual Call Info Day	4 July 2024	Brussels	~25 participants in person and >290 on-line
RFCS-2025-BT Info Day*	19 February 2025	Brussels	~70 participants in person and >100 on-line
RFCS-2025-BT ‘1-1 Session’*	19 February 2025	Brussels	14 one-to-one sessions with potential applicants
RFCS annual Coal event: “European Coal in Transition: “from an industrial legend to cutting-edge research for the future”. Organised with the support of the Polish EU presidency.	15-16 May 2025	Jastrzębie-Zdrój	~200 participants in person and >100 on-line

*Note: these events took place outside the reference period (2021 – 2024) but are included here for information purposes.

9.2. Academic partners

Participants from academia belong to the broader category of Higher or Secondary Education Establishments. Their participation is more prominent in the Annual Coal, however for the Big Tickets it is lower. This is clearly justified by the type of instrument, having the research projects addressing lower TRLs and thus requiring more academia involvement than the pilot and demonstration projects.

In addition, in RFCS, **the funding rate of 60% or 50% for any type of participant**, contrary e.g. to Horizon Europe, where a much better co-financing is dedicated to academia, research centres and SMEs, **hinders the participation of academic partners, especially in the Big Tickets** where the budget size is generally higher than the budget of the annual call and the funding rate is, at the same time, lower. Academic institutions face difficulties in ensuring the remaining percentage of project costs with their own resources.

9.3. Subcontracting

Research activities funded by the RFCS can be only performed in EU Member States, unlike Horizon Europe. This obligation has created some challenges for the RFCS stakeholders that are multinational entities with often research centres established in other areas of the world. In order to overcome this limitation, **some of the consortia have decided to subcontract those activities**. This has led to several requests for clarification at the Grant Agreement Preparation stage and to discussions during the implementation of the projects.

9.4. Issues with the evaluation criteria

Some proposers had difficulties in replying satisfactorily to some of the evaluation criteria, especially in relation to the first two criteria, i.e. excellence and impact. Clarifications have been systematically provided during the various info days, and in the dedicated event on “How to write better proposals”. In addition, some of the **questions were adjusted to make them clearer**. Some examples are given below.

9.4.1. Criterion 2: Impact

The RFCS is a bottom-up programme, where each project has the potential to achieve distinct impacts. In consequence, assessing the impact of projects on a portfolio-wide scale can be challenging. The RFCS proposal and evaluation guidelines focus on broader aspects, such as "expected benefits for the Coal/Steel sector" and "expected wider scientific, economic, environmental, and societal effects." As a result, proposals often vary significantly in their impact statements.

A common issue observed was that many proposers either failed to describe the impact of their proposal or provided superficial descriptions without sufficient evidence to support their analysis. This led to low scores, especially during the first year after the delegation of the management of the fund to REA. To address this, it was clarified that proposers should provide meaningful assumptions and forecasts of their proposal's impact, backed by transparent justifications, references to scientific literature, or other relevant projects.

Furthermore, the evaluation criteria were refined to include the concept of "scale and significance," and the distinction between "outcomes" and "impacts" was emphasized during the Info Days. This

aims to encourage proposers to provide more accurate and detailed impact assessments, enabling more effective evaluation and monitoring of project outcomes.

9.4.2. Technology Readiness Level

Until the transfer of the programme to the REA, in the RFCS Annual Call all types of actions were competing with each other: Research proposals (RPJ), Pilot/Demonstration proposals (PDP) and Accompanying Measures (AM). REA first implemented a budget split with i) one indicative budget for AM and ii) one for RPJ and PDP.

However, in 2022, several proposals were submitted as RPJ actions but were having a clear correspondence to a PDP action (with high TRL) (e.g. perhaps to benefit from the higher % of financing for the RPJ). During evaluations some proposals received lower scores because of this erroneous categorisation of actions.

As off 2023 the RFCS annual calls had a **separate budget for research and for pilot/demonstration actions**[62]. This had an immediate positive impact in a number of areas, such as (i) applicants had a better understanding of call requirements in relation to matching the activities/TRL of their proposal with the Research or Pilot/Demonstration action type; (ii) proposals with similar objectives, activities and expected impact were compared to, and competed with, each other; (3) the TRL aspect of the evaluation was clearer for expert evaluators; (iv) if expert evaluators assessed that a proposal belonged to a different type of action, with the applicant's agreement, the proposal could be transferred to the correct type of action instead of being penalised at the evaluation stage.

9.4.3. Business case

In the RFCS Work Programmes for 2022–2024, a new requirement was introduced for project proposals to include a **business case or economic impact scenario**. This change reflects an increased emphasis on the economic viability and industrial impact of proposed research. Applicants should outline how their project results could be integrated into industry and to demonstrate preliminary economic feasibility. In practice, proposals must present an exploitation strategy and a "preliminary assessment of their economic viability," effectively providing a business case or new business model for the innovation.

The purpose of including business cases in RFCS proposals is to ensure that funded projects deliver tangible economic benefits and are aligned with industry needs. By articulating a credible path to market or implementation, projects show how they will contribute to the competitiveness and sustainable growth of the steel sectors and how they can positively contribute to a just transition for the former coal regions.

This addition to the Work Programme was part of the RFCS programme's evolution and modernisation, **aligning with broader EU research funding trends that encourage feasibility and impact planning from the outset**. It has also been integrated into the RFCS evaluation framework: expert evaluators assess the credibility of the project's economic impact and deployment plans as a key component of the proposal's impact criterion. During the RFCS Info Days for the 2022, 2023, and 2024 calls, REA highlighted this new requirement, underscoring that proposals should not only demonstrate technical excellence but also show a convincing economic case for future implementation. This ensures that RFCS-supported innovations are backed by a sound business rationale, facilitating their uptake and contributing to the programme's objectives of industrial

[62] RFCS split of the budget between Research and Pilot & Demonstration proposals, **Ares(2023)1672711**, and **Ares(2023)2020372**.

innovation and economic transition. This is particularly relevant for the Pilot and demonstration projects (high TRLs).

Chapter 10: Added value of RFCS

10.1. Feedback to Policy

Hereunder, it is showcased how the research results from the investments have contributed to achieving policy objectives of linked Commission policies. To better highlight the interdependence between policies and research investments, REA has recently (December 2024) received a detailed Feedback to Policy (F2P) request from DG RTD[63], focussing on four priority areas, two for Coal and two for Steel.

Coal priority areas

i) Repurposing of Coal mines
ii) Methane emissions

Steel priority areas

iii) Level of decarbonisation per project and overall impact on the steel industry in Europe
iv) Obstacles encountered in terms of industrial engagement, material availability and costs

A summary of the reply from REA[64] to this request is given below, together with some additional relevant considerations collected during the 2025 Coal sector annual RFCS event organised by REA[65].

10.1.1. F2P results for the Coal sector

Repurposing of Coal mines and the Just Transition package

RFCS has made **significant research contributions to the repurposing of coal mines**. As examples, the following five projects could be highlighted: two demonstrators (GreenJOBS and MINE-TO-H2) and three pilots (HydroMine, MidSafe, and GrEnMine). These projects fall into two primary clusters:

Cluster 1: Renewable energy production (including hydrogen production) and energy storage: GreenJOBS, MINE-TO-H2, and HydroMine, focus on repurposing former coal and lignite mines for green hydrogen production, renewable energy generation, and energy storage. The projects explore various clean technologies, such as i) electrolysis of mine water for hydrogen production, ii) renewable energy production (geothermal, photovoltaic, wind power), iii) energy storage (unconventional pumped hydro using dense fluids), iv) waste heat recovery and blending hydrogen into the natural gas grid.

Cluster 2: Circular economy, including advanced materials development: The projects MidSafe and GrEnMine, focus on post-mining waste management, risk mitigation, and the development of

[63] RFCS Feedback to Policy Plan 2025 – Requests to Strengthen the Analysis, **Ares(2024)9179704**

[64] RFCS Feedback to Policy Plan 2025 – Requests to Strengthen the Analysis - REA analysis, **Ares(2025)2443467**

[65] RFCS annual Coal sector event, "From an industrial legend to cutting-edge research for the future", https://euracoal.eu/2025/05/16/research-fund-for-coal-and-steel-conference-on-european-coal-in-transformation/

innovative materials. The projects investigate aspects such i) geotechnical risk management and circular economy practices (recycling mining wastes to produce new geomaterials), ii) innovative geomaterials (developing geopolymers and zeolites to enhance soil stabilisation and reduce environmental pollution), iii) gravity-based energy storage technology and assessment tools for post-mining areas.

Insights from the recent REA annual Coal sector event[65]*:*

The RFCS research projects have a significant impact on supporting the just transition to a low-carbon economy. The projects help to create new economic opportunities and promote social cohesion in former coal-producing regions, supporting the transition to a low-carbon economy. For example, projects such as GI-MINE, RECOVERY, and GreenJOBS aim to repurpose coal mines for new uses, such as renewable energy production, carbon capture and storage, and underground storage of hydrogen. These projects promote sustainable economic growth, create high-quality green jobs, and support the development of new industries and economic activities. Additionally, the RFCS projects provide training and re-skilling programmes for workers previously working in the coal sector, enabling them to transition to new roles in the clean energy sector. By preserving knowledge and data from active mining operations, the RFCS projects also empower post-mining planning and decision-making, supporting the development of new forms of spatial and social management.

Methane emission abatement and the EU Methane Regulation

RFCS has made **significant research contributions to methane emission abatement**, supporting three projects: one pilot (ProVAM) and two demonstrators (REM and GI-mine). These projects aim to capture methane from coal mines, reducing emissions and enhancing sustainability. The projects address methane-related challenges from multiple angles, including:

- Capturing and utilizing methane: REM focuses on capturing and utilizing Abandoned Mine Methane (AMM) from closing mines, while GI-mine focuses on both reducing and utilizing AMM, integrating it with solid waste management.
- Reducing Ventilation Air Methane (VAM): ProVAM focuses on reducing VAM from active mines, improving capture and utilization, but does not utilize methane.
- Enhancing safety: All projects prioritize safety, addressing methane-related risks, and preventing uncontrolled methane leaks.

The projects have achieved significant methane emission reductions, with i) ProVAM + GI-mine: 140,121 t/year of methane captured and utilized (2022); ii) REM: 18,013 t/year of methane captured and used (2024), with a reduction target of 12,924 t/year (2025

Insights from the recent REA annual Coal sector event[65]*:*

The projects have scalability potential in the EU: 41 shafts of Polish and Romanian gassy coal mines (ProVAM), 13 mines across Poland, Slovenia, Romania, and Serbia (REM) and combined technologies applicable to mining waste dams and municipal sewage (GI-mine

The RFCS research projects provide significant support to EU policies on methane abatement. The projects develop innovative technologies and methodologies to reduce methane emissions from coal mining operations, contributing to the implementation of the EU Methane Regulation while aligning with the Global Methane Pledge. For example, projects such as REM, ProVAM, MEMO, and METH2GEN aim to minimize methane outflow, reduce VAM, establish reliable methods for creating methane inventories, and convert methane into hydrogen for cleaner energy production. These projects help to reduce greenhouse gas emissions, promote sustainable growth, and support the

transition to a climate-neutral future. By providing practical tools and systems for operators to substantially reduce methane emissions, the RFCS projects also help to avoid penalties for non-compliance with the EU Methane Regulation.

10.1.2. F2P results for the Steel sector

Industrial Decarbonization of Steelmaking and the European Green Deal

The European Union's commitment to climate neutrality by 2050, as outlined in the European Green Deal, necessitates the transformation of high-emission industrial sectors, including steelmaking. RFCS plays a role in this transition by funding projects aimed at reducing greenhouse gas emissions. REA evaluated the contribution of selected RFCS-funded projects to the decarbonisation of the steel industry, with a focus on their alignment with the objectives of the Clean Steel Partnership and their potential for scalability and impact.

RFCS has funded five key projects—four pilots and one demonstrator—focused on near-market decarbonization technologies. These projects collectively address various technological pathways and exhibit varying levels of technology readiness (TRL 3 to TRL 9).

Table 2. How selected steel projects contribute to decarbonization policy objectives of the clean steel partnership and EGD

Project	Focus Area	TRL	Estimated CO_2 Reduction
ProSynteg	Hydrogen-rich syngas for blast furnaces	3–6	14 kg CO_2/t steel; up to 9.86 Mt/year (EU-wide potential)
HYDREAMS	Waste heat to clean hydrogen	4–7	75 kg CO_2/t steel; 14,000 t/year (Ugine plant)
TWINGHY	Hybrid H_2/NG burners and digital twin	5–7	85 kg CO_2/t steel; up to 351 t/year (100% H_2 scenario)
MODIPLANT	Electrification of heating systems	6–9	5–16 kg CO_2/t steel; up to 10,000 t/year for flat products (electrification) 3,000 t/year for flat products (HDG line) 7,969 t/year for long products
BIOCODE	Biomass substitution in coke production	5–7	400 kg CO_2/t coke; 0.24–0.48 Mt/year

The combined direct emission abatement from four demonstration plants listed in Table 2 (excluding scaling estimates of the research project ProSynteg) is estimated at approximately 35,000 tonnes of CO_2 per year for a production volume of 1.5 million tonnes of steel. Extrapolated to the EU level, assuming moderate adoption, these technologies could contribute to a reduction of up to 10 million tonnes of CO_2 annually, which corresponds as well to the scaling estimate of ProSynteg technology. Key performance indicators for the projects include:

- Emission reduction per tonne of steel: Ranges from 5 kg (HDG steel) to 85 kg (TWINGHY).
- Annual CO_2 savings: Varies by project and implementation scale, with MODIPLANT and HYDREAMS demonstrating the highest site-specific reductions.

It is important to note that the five evaluated projects represent only 6% of the RFCS portfolio. Another 78% of lower TRL research projects may yield to substantial decarbonisation benefits in the future. Therefore, the impact assessment estimates provided above are based only on some illustrative examples while RFCS's total contribution is, with certainty, significantly higher.

The RFCS steel research portfolio **demonstrates a strong alignment with the European Green Deal and the Clean Steel Partnership**. The selected pilot and demonstration projects provide **tangible evidence of the sector's capacity to innovate and reduce emissions**.

10.2. Success stories

Successful projects have been presented in the annual dissemination events that take place gathering the steel and the coal community. Some selected projects that show potential to deliver high impact results are briefly described below. These "success stories", are going to be published soon in the Horizon Magazine[66] to increase further the outreach of our dissemination measures.

SmartCool, aims to modernise the transfer bar cooling process in hot strip mills, addressing issues with asymmetric thermal profiles that affect strip flatness and mechanical properties, and is expected to improve efficiency, quality, and sustainability in steel production, contributing to the EU's competitiveness in the steel industry.

The **DissHEAT** project is advancing knowledge in the European steel industry by sharing and promoting past EU research results and developing a strategic roadmap for future research in carbon direct avoidance technologies, which will facilitate technological progress, identify promising technologies, and contribute to the steel industry's efforts to reduce CO_2 emissions and improve efficiency, thus enhancing the EU's competitiveness.

H2transBF2030 is working towards reducing CO_2 emissions in the steel sector by 55% by 2030, by using hydrogen and direct reduced iron (DRI) to lower emissions and adapt to the growing demand for "green" steel, which will support the EU's climate goals and promote a more sustainable steel industry, boosting the region's competitiveness.

The **TWINGHY** project is transforming the steel industry's reheating process with advanced hybrid burners that combine hydrogen and oxygen, significantly reducing carbon emissions and enhancing energy efficiency, which will deliver major environmental benefits, reduce CO2 emissions, and keep nitrogen oxide (NOx) emissions low, supporting the EU's competitiveness in the steel sector.

10.3. The RFCS Technical Groups

10.3.1. TGs: tasks and way of working

The Technical Groups (TGs) are composed by high level experts having experience in specific sub-areas of the Coal and Steel sectors. Information on the TGs (members, agenda of the meetings, etc.) is published in the Register of Commission Expert Groups[67]. The management of these groups is

[66] Horizon, the EU Research & Innovation Magazine,

https://projects.research-and-innovation.ec.europa.eu/en/horizon-magazine

[67] Register of Commission expert groups and other similar entities,

https://ec.europa.eu/transparency/expert-groups-register/screen/home?lang=en

entrusted to REA, as mentioned in the Memorandum of Understanding between REA and DG RTD[68]. After the delegation of the implementation of the RFCS programme to the agency, REA begun putting in place a series of measures to align the project monitoring to standard REA practices and streamline and maximise the output of the Technical Groups[69]. As these constituted important changes to the TG way of working, continuous improvement was, and remains, an important consideration. A key development was also the renewal of the TG members: the new TG members started working with their new TG tasks in mid-2023. More details are provided below.

i) Project monitoring

Until 2021, the TGs were entrusted with the task of project monitoring and corresponding advice for payments at project level. This approach, albeit scientifically acceptable, resulted in unacceptable delays in the reporting and payments at individual project level, considering the important change in the programming of the RFCS implementation after the decision to implement two calls per year.

REA has thus decided to **decouple the feedback provided by the TGs from the payment process**. Instead, dedicated expert monitors, were assigned per project following standard Horizon Europe procedures and practices. In addition, selecting experts from a larger pool of expert monitors (i.e. not only confined to the limited number of TG members), allows for a better fit between the scientific/technical background of the expert and the content of each project, thereby safeguarding the scientific quality of the assessment.

ii) "New" TG output

Instead of limiting their activities to project monitoring linked to payments, the TGs have started, as of 2022, to become "**feedback to policy" hubs**. They focussed on providing portfolio analysis, identifying technological gaps, following the alignment of RFCS with the EGD, the Just Transition and other EU priorities, assessing the impact of the projects and their market readiness, giving advice for future calls, thinking about the RFCS D&E strategy etc. The final product of this work are two annual reports, one for Steel[70] and one for Coal[71], summarising the advice and findings of the TGs. The first published annual reports present the outputs of the 2023 TG meetings.

iii) Continuous improvement

The transformation of the role of the TGs, as described above, is an on-going process and every year the approach is further fine-tuned and improved. During the first years, detailed guidance was provided to TG members and to project coordinators. For example, using a pre-defined template, project coordinators were prompted to focus their presentations on issues relevant to the new way of working of the TGs, instead of presenting detailed results on deliverables etc. A novelty implemented in 2025 will be to further align the TG output to the F2P requests coming from DG RTD[63], notably in the areas of repurposing and methane emissions for Coal, and decarbonisation levels and EU-wide impact for Steel (see paragraph 10.1). Another idea, also to be implemented in 2025, is to ask all the

[68] MEMORANDUM OF UNDERSTANDING between the European Research Executive Agency and the Directorate General Research and Innovation on the management and implementation of the Research Fund for Coal and Steel (RFCS), **Ares(2022)4299326**.

[69] RFCS - New Technical Groups Coal and Steel – 2022, **Ares(2022)876492**

[70] Research Fund for Coal and Steel - A summary of the findings of the Steel Research Technical Groups : 2023, Research Fund for Coal and Steel - Publications Office of the EU

[71] Research Fund for Coal and Steel - A summary of the findings of the Coal Research Technical Groups : 2023, Research Fund for Coal and Steel - Publications Office of the EU.

projects to identify their contribution to the specific areas and sub-areas covered by the RFCS legal basis. This information will allow to identify in which areas the RFCS budget is spent, and which areas are under or over-represented (this will be done in a semi-automatic way, using the EU survey tool). It is expected that these new "outputs" will improve RFCS's input to F2P.

iv) Renewal of the membership

The mandate of the previous TG members expired in December 2022. REA has published a call for applications to appoint new members on 30/08/2022. The new members were appointed in early 2023 for a 5-year term, and the TGs have immediately started working with the new membership and the new "way of working"[57].

10.3.2. Feedback from the TGs

The TGs analyse each year a portfolio of RFCS projects against the following **criteria and key questions**:

- Extent that the TG portfolio projects contribute to the programme research objectives and in general to the objectives of the European Green Deal and Just Transition Fund
- Benefits for industry and for society
- Timeframe to scale-up high TRL project results and to enter into production
- Examples of collaboration with other projects in the TG portfolio or other European and/or national funded programmes
- Technological, or other gaps, that the TG portfolio should fill in the future
- Contribution to the KPIs of the Clean Steel Partnership (Steel projects), the performance indicators of the Just Transition Fund (Coal projects), and those of the Innovation Fund (all projects).

The TGs meet on an annual basis to discuss and analyse selected RFCS projects falling within the group's portfolio. Each TG produces an annual report to highlight the most important outcomes of the project analysis identified. These include various findings related to the status of projects and their potential impact on the industry's performance (e.g. synergies, competitiveness) and regarding EU policies (e.g. the European Green Deal). The findings of the individual TGs are synthesised and published in an annual publication.

The annual analyses of the RFCS TGs provide essential input for the ongoing review and further development of the RFCS. Their annual portfolio analyses are the most valuable source of details on how RFCS projects contribute not only to the programme research objectives, to the objectives of the European Green Deal and to the Just Transition Fund, but also how they positively contribute to the benefits for industry and society.

At the inaugural meeting of the new CAG and SAG Advisory Boards in May 2025, their members also confirmed the role of the reports of the RFCS Technology Advisory Groups as meaningful analyses and input for the future design of the RFCS.

The Coal Technical Groups

There are two Coal research technical groups (TGKs), namely TGK1 – Post-mining issues, safe and productive coal mining operations; and TGK2 – Environmental, technical, and economic issues related to coal treatment and use.

The current Coal-related RFCS portfolio comprises 29 projects focusing on areas such as carbon capture, utilisation and storage (CCUS), coal mine closure and repurposing, and low-carbon, coal-based power generation.

Actually, the TGs propose the following **prioritised research areas**:

- Use of existing infrastructures of power plants and mines to support an accelerated and effective implementation of the European Green Deal.
- Long-term environmental impact assessment and risk management of the different mining hazards and waste.
- Research on potentials of mine areas for future industrial activities incorporating levelized economic and cost analysis and ensuring a complete life-cycle analysis.
- Development of new and economically feasible technologies in mine water reuse, related to mine water treatment for different purposes (reuse, hydrogen production, mitigation of droughts).
- Development and demonstration of the use of CO_2 as feedstock for low-carbon hydrogen derivates.
- Development of business models, based on existing knowledge, that promote the integration of the workforce and existing structures and infrastructures.

TGs have also put forward a more **general recommendation**, related to commercialisation:

- Develop and prepare guidelines on a go-to-market strategy for technological solutions that can be used in pilot and demonstration projects, which are the main outputs of the RFCS Big Ticket calls.

The Steel Technical Groups

There are five steel research technical groups (TGAs), namely TGA1 – Iron- and steelmaking; TGA2 – Downstream steel processing; TGA3 – Conception of steel products; TGA4 – Steel applications and solutions for existing and new markets; and TGA5 – Steel factories – smart and human.

The results provided by the five TGs allow an assessment of the state of play in the field, the identification of gaps in research efforts and proposals for the way forward for individual projects and for research in the sector as a whole. The TGs, in their meeting reports, provide recommendations that span from the introduction of novel techniques to quality improvement, resource savings and safety-related issues.

Newly identified recommendations include:

- With a clear and quantifiable benefit to the environmental sustainability and circularity, RFCS should aim to continue funding highly technical projects that investigate structural performance, integrity and safety of steel/composite structures, at all TRL levels.
- Projects exploiting Artificial Intelligence and Machine Learning tools and technology rely on the availability of data including data already collected in previous projects. The availability and exchange between partners of data is the main issue to be encouraged.
- A better coverage of the TRL range for 4 to 6, starting from the RFCS call and/or encourage the follow-up of projects into a second pilot/demonstration stage and/or promote and increase of the number of pilot/demonstration projects in general.
- A quota of the available overall budget should be allocated to each TG, to ensure that projects from every specific topic R&D will be granted funding. Additionally, the formulation of priorities might help to boost topics of high relevance and necessity.

- Similar to the European Partnership programmes (e.g. BluePartnership, Clean Energy Transition Partnership), RFCS should foster the participation of project coordinators in common jointly organised dissemination events.

Furthermore, the TGs propose the following **prioritised research areas**:

- CCUS topics are increasingly considered as a key element for the long transition towards carbon neutrality.
- “Blast Furnace (BF) greening" as a priority, justified by its significant carbon footprint and the need for R&D on topics like hearth, fuel injection, and process optimization to reduce emissions and support a sustainable steel industry.
- “Casting" as a priority, justified by its challenges in fossil-free steel production, such as trace elements affecting castability, and the need for research on new casting formats and technologies to enable a low-carbon transition.
- "Advanced steel solutions for harsh environments" as a priority, justified by the need for new steels and products that can withstand high- and low-temperatures and aggressive environments, supporting clean energy initiatives such as offshore wind and tidal wave energy.
- "Steel composites with bio-based materials" as a priority topic area, justified by current trends towards sustainability and circularity, with potential for lower embodied carbon and enhanced environmental sustainability, aligning with the European Green Deal objectives.
- “Cyber-security and trustful data sharing" as a priority topic area, justified by current trends towards digitalisation and Industry 5.0, with increasing reliance on AI, machine learning, and data-driven solutions, making cyber-security and secure data sharing crucial for the steel industry's future resilience and sustainability.

10.4. The RFCS Advisory Groups

The Coal and Steel Advisory Groups (CAG and SAG) are composed by high level experts from the coal and steel sectors. Both groups have been meeting regularly since 2021 (the practice has been to organise at least 2 meetings per group per year). The minutes of each meeting are published in the Register of Commission Expert Groups[72, 73], together with other information on the groups, such as the list of members. The groups are regularly consulted and have provided advice to practically all improvements and changes that have led to the modernisation of RFCS, after the delegation of its implementation to REA. The management of these groups is ensured by REA, as stipulated in the Memorandum of Understanding between REA and DG RTD[68]. The membership has been renewed recently since the mandate of the previous groups had ended (REA has published a call for applications to appoint new members on 04/07/2024). The first meeting with the new members took place in May 2025.

10.5. Scientific impact – Publications

The scientific impact of the programme can be measured by the number and quality of RFCS-referenced publications. Although scientific publications in peer reviewed journals are encouraged in RFCS, it is not a mandatory requirement. This stems from the fact that for an industrial programme such as RFCS, confidentiality of the results is an important consideration. However, it must be

[72] Steel Advisory Group (X00808), Register of Commission expert groups and other similar entities

[73] Coal Advisory Group (X00807), Register of Commission expert groups and other similar entities

possible to publish non-confidential results. In comparison, in Horizon Europe, publications and the requirement for open access are a crucial dissemination feature of the programme.

The **relevance of the RFCS actions to legislation is relatively high**, as the transition and phase-out of the industrial coal sector is only limitedly addressed in other Commission instruments.

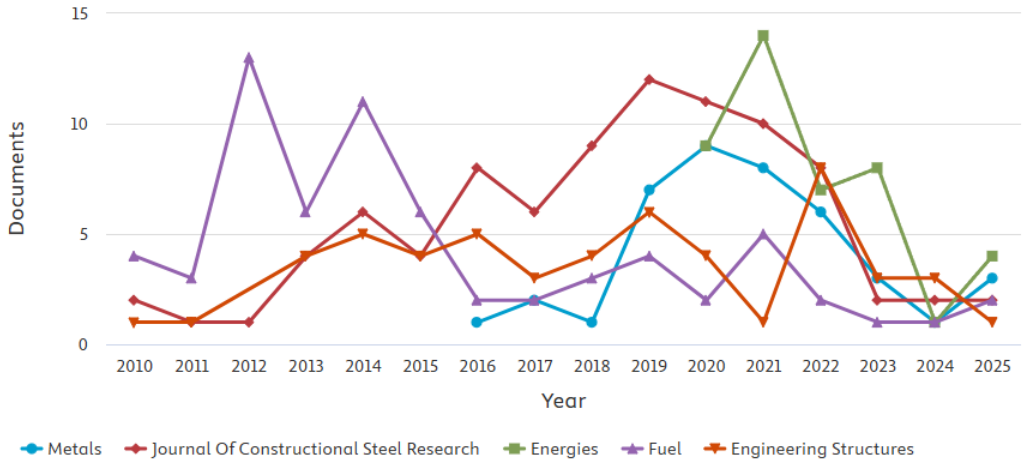
The ambitious Methane Regulation, from 2024, which focuses on methane leakages of operational and closed mines, will rely to a significant part on the development of Measurement Reporting and Verification (MRV) methodologies resulting from RFCS research actions. Similarly, the support to increased competitiveness and decarbonisation of the industrial steel sector is historically addressed in RFCS. However, there were barely reports found that reference RFCS in policy documents, neither on European, nor international levels. From this background, lessons learnt and policy advice that originate from RFCS research results need to be better packaged, channelled and reported to European and International policy networks.

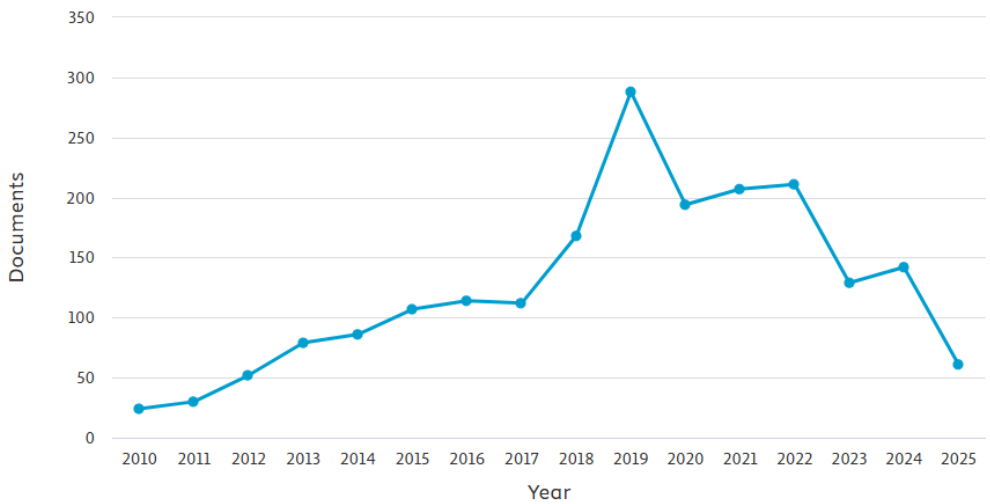
Annex Overview A: RFCS projects awarded in the period 2021 - 2024

STEEL	Activity	Call	Year	Project ID	Project Acronym	N of Participants	Total Costs	EU Contribution
	Accompanying Measure	Annual Call						
			2021	101057930	DissHEAT	5	560,343	560,343
			2022	101112269	ADVANCE	12	794,017	794,017
			2023	101155952	METACAST	5	490,338	490,338
				101156509	Symbio-Steel	5	499,978	499,978
			2024	101216382	SUPER	8	673,848	673,848
				101216785	STROBEPLUS	5	497,190	497,190
	Pilot & Demonstration Projects	Annual Call						
			2021	101057274	SmartCool	6	1,854,874	927,437
				101057965	ProSynteg	6	3,448,897	1,724,449
			2022	101112102	iSteel-Expert	6	1,845,686	922,843
				101112264	BIOCODE	4	5,095,019	2,547,509
				101112421	DynReAct_PDP	4	1,496,850	748,425
				101112433	RollOilFree II	6	2,122,043	1,061,022
			2023	101156458	OLACSKIN	3	1,263,234	631,617
				101156718	SHELL-CRACK	10	3,299,725	1,649,863
				101156852	VISMAIN	3	1,371,043	685,521
				101157368	EdgerRolls	6	2,648,490	1,324,245
				101157601	ANNEAL-LUS	4	3,051,473	1,525,737
				101157885	SUNSHINE	7	3,702,864	1,851,432
			2024	101216570	THELMA	7	6,178,993	3,089,496
				101216572	InduGasHeat	6	5,632,714	2,816,357
				101216757	DigitalRollTOP	5	2,634,174	1,317,087
		Big Tickets Call	**2022**	101098480	HYDREAMS	10	8,545,422	4,272,711
				101099118	MODIPLANT	6	15,947,463	7,973,732
				101099132	FULLH2REHEAT	5	16,353,187	8,176,593
				101099158	TWINGHY	11	8,575,321	4,287,661
			2024	101193261	SLAG2BUILD	8	9,100,419	4,550,210
				101193354	H2loop	4	12,463,760	6,231,880
				101193407	CROSSCUT	10	10,004,159	5,002,079
				101193416	Hy4Smelt	10	50,507,950	25,253,975
				101193563	PRISMA	16	10,269,244	5,134,622
	Research Projects	Annual Call						
			2021	101057239	HELIX	6	1,881,421	1,128,853
				101057790	H2transBF2030	10	3,443,576	2,066,146
				101057957	CONSTRUCTADD	12	2,877,307	1,726,384
			2022	101111547	DreamFAB	9	2,448,259	1,468,955
				101111885	SurfConInspect	8	2,735,415	1,641,249
				101112158	GREENVESTS	12	2,879,056	1,727,433
				101112270	INNOPick	5	1,161,278	696,767
				101112300	CONNECT4C	10	3,263,620	1,958,172
				101112346	SuPreAM	7	2,608,967	1,565,380
				101112371	NewAIMS	6	2,552,926	1,531,756
				101112383	BioReSteel	10	3,420,796	2,052,478
				101112392	LIGHTFORGE	5	1,777,258	1,066,355
				101112398	NanoWinTur	7	2,601,332	1,560,799
				101112414	SMARTWELD	7	3,220,167	1,932,100
				101112425	WarP-AHSS	6	1,956,293	1,173,776
				101112471	FEATHER	5	2,186,417	1,311,850
				101112479	HBI C-Flex	10	2,385,701	1,431,420
				101112485	COOPHS	7	1,868,881	1,121,328
				101112488	MultiSensEAF	8	2,187,931	1,312,759
				101112504	STWIN	13	3,495,533	2,097,320
				101112516	SILENCE	5	1,737,808	1,042,685
				101112518	Si-Shift	4	2,055,155	1,233,093
				101112540	Sup3rForm	8	2,489,253	1,493,552
				101112544	ALCOAT	8	2,547,081	1,528,249
				101112571	HYSCORE	10	3,580,542	2,148,325
				101112600	TRANSinter	5	2,753,228	1,651,937
				101112601	BioRECAST	9	2,362,962	1,417,777
				101112614	IAMFat	8	2,744,516	1,646,710
				101112631	ZincVal	8	3,023,979	1,814,387
				101112650	SAFEH2PIPE	7	2,808,174	1,684,904
				101112665	InSGeP	13	4,458,062	2,674,837
			2023	101150482	Safe H-DRI	18	3,824,140	2,294,484
				101155761	HYDAM	8	2,835,636	1,701,382
				101155823	HYSTORY	6	2,557,598	1,534,559
				101156140	e-TRUCKS	6	1,984,668	1,190,801
				101156474	MetConZero	5	1,897,715	1,138,629
				101156779	ShotTempering	5	1,964,341	1,178,604
				101156908	Duralink	8	2,616,674	1,570,004
				101157157	H2II	6	3,061,970	1,837,182
				101157237	H2FORM3G	11	2,892,541	1,735,524
				101157245	Steel4Fatigue	11	2,694,792	1,616,875
				101157797	DESSERT	7	2,501,516	1,500,910
				101157799	TAPERFRAME	5	2,504,213	1,502,528
				101157943	effiTUBE	8	2,513,232	1,507,939
			2024	101216397	RAVES	8	2,853,541	1,712,124
				101216402	AUSNANITE	9	2,613,734	1,568,240
				101216407	SAVERACK	12	2,547,678	1,528,607
				101216417	TIMELESS	12	2,962,055	1,777,233
				101216419	ReselScale	5	2,316,313	1,389,788
				101216420	FatDED	8	2,721,674	1,633,004
				101216538	SHIFT	4	1,346,224	807,735
				101216553	DeepScheduling	4	1,407,635	844,581
				101216556	superProDR	6	2,476,039	1,485,623
				101216575	I-ROLLS	5	1,912,675	1,147,605
				101216579	SUMMSEED	7	2,714,896	1,628,938
				101216643	EnWaRec	9	3,455,266	2,073,160
				101216645	SafeClean	10	2,408,172	1,444,903
				101216665	REBRIDGE	9	3,324,620	1,994,772
				101216672	THERMAX	7	2,987,325	1,792,395
				101216680	STEEL-ALIVE	8	4,299,978	2,579,987
				101216702	MITHRIL	8	3,936,358	2,361,815
				101216707	OPTES	5	2,419,550	1,451,730
				101216801	Winclusion	5	2,129,856	1,277,913
Grand Total						**696**	**357,124,235**	**196,939,526**

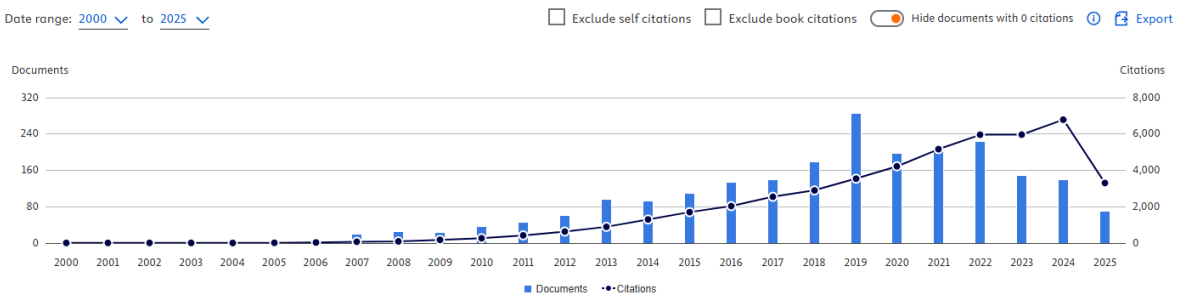
COAL	Activity	Call	Year	Project ID	Project Acronym	N of Participants	Total Cost	EU Contribution
	Accompanying Measures	Annual Call	**2021**	101057228	WINTER	3	498,782	498,782
			2022	101112138	CoalHeritage	6	947,671	947,671
			2024	101216335	RAISING	4	460,861	460,861
				101216750	COFA	6	499,825	499,825
	Pilot & Demonstration Projects	Annual Call	**2023**	101157792	GI-mine	7	2,544,460	1,272,230
			2024	101216790	SEDAS	11	3,470,351	1,735,176
		Big Tickets Call	**2022**	101099061	REM	6	21,493,154	10,746,577
			2023	101140154	MINE-TO-H2	8	18,052,926	9,026,463
			2024	101193556	PRIMI	2	6,516,661	3,258,330
				101193747	METH2GEN	7	25,632,937	12,816,468
				101193769	POSTEN	6	13,732,737	6,866,369
	Research Projects	Annual Call	**2021**	101057326	POMHAZ	7	1,758,675	1,055,205
				101057789	GreenJOBS	8	2,202,647	1,321,588
			2022	101112380	HESS	5	2,226,740	1,336,044
				101112386	H2GEO	7	2,549,586	1,529,751
				101112618	ProVAM	8	2,817,378	1,690,427
				101112629	HydroMine	7	2,864,577	1,718,746
				101112657	REECOL	11	2,861,049	1,716,629
			2023	101155814	CORAL	9	3,985,023	2,391,014
				101157379	MidSafe	11	2,797,271	1,678,363
				101157400	SIRIMA	8	2,852,062	1,711,237
				101157790	GrEnMine	10	3,551,700	2,131,020
				101157810	Waste2CRM	5	2,454,377	1,472,626
			2024	101216495	GeoSolar	8	2,110,619	1,266,371
				101216522	DISTINCTION	8	3,276,876	1,966,125
				101216667	FRAM	7	2,420,349	1,452,209
				101216677	CRMsDataSpace	8	3,966,877	2,380,126
				101216769	MEMO	9	3,279,143	1,967,486
				101216794	HIGHWAY	7	4,062,954	2,437,773
Grand Total						**209**	**145,888,266**	**79,351,492**

Annex Overview B: RFCS publications

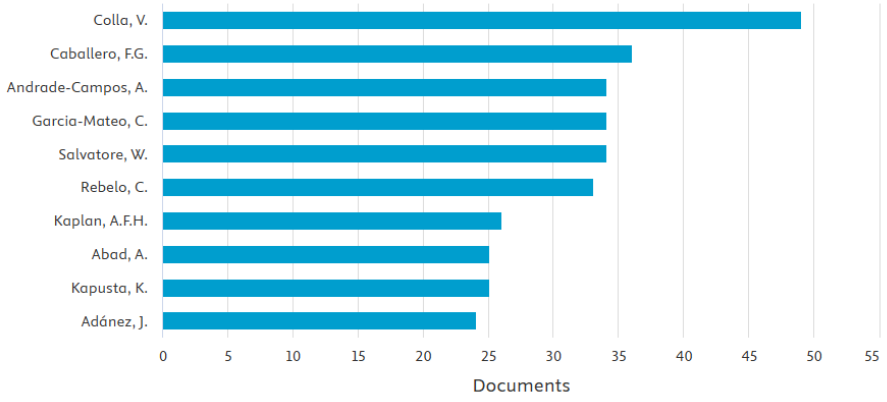


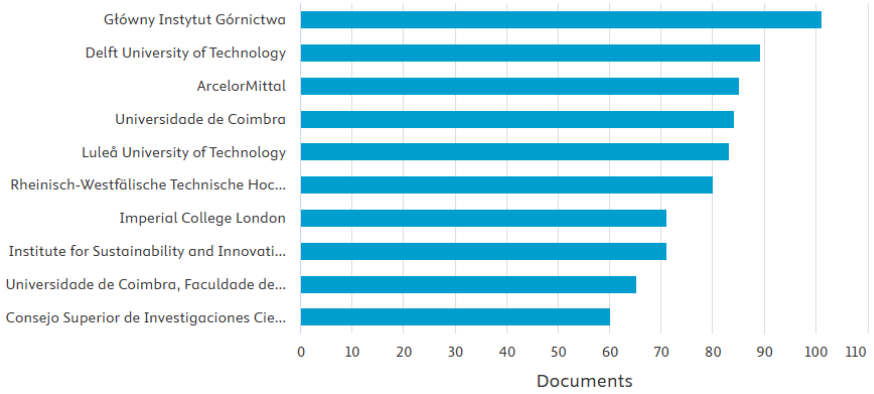


From 2010 up to 2025 a total 2169 Scopus registered documents have been published.



The top cited article is a NATURE article from 2019: https://doi.org/10.1038/s41586-019-1798-7


Colla, V.
Caballero, F.G.
Andrade-Campos, A.
Garcia-Mateo, C.
Salvatore, W.
Rebelo, C.
Kaplan, A.F.H.
Abad, A.
Kapusta, K.
Adánez, J.
0 5 10 15 20 25 30 35 40 45 50 55
Documents


Główny Instytut Górnictwa
Delft University of Technology
ArcelorMittal
Universidade de Coimbra
Luleå University of Technology
Rheinisch-Westfälische Technische Hoc...
Imperial College London
Institute for Sustainability and Innovati...
Universidade de Coimbra, Faculdade de...
Consejo Superior de Investigaciones Cie...
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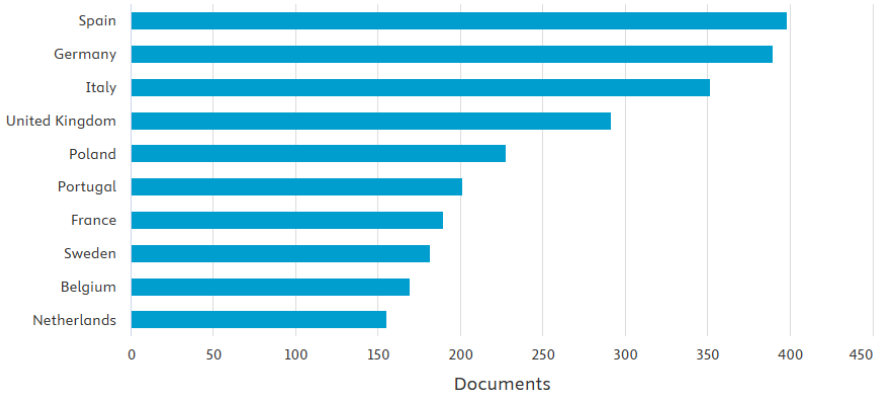
Documents


Spain
Germany
Italy
United Kingdom
Poland
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France
Sweden
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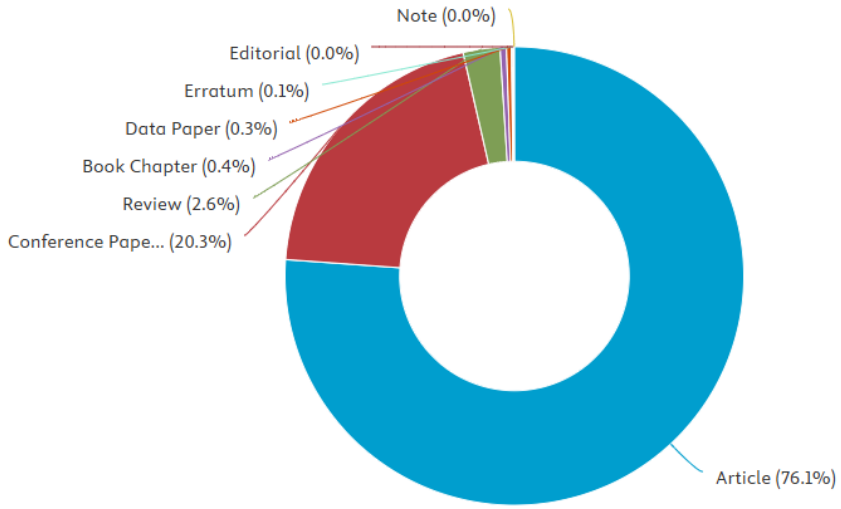
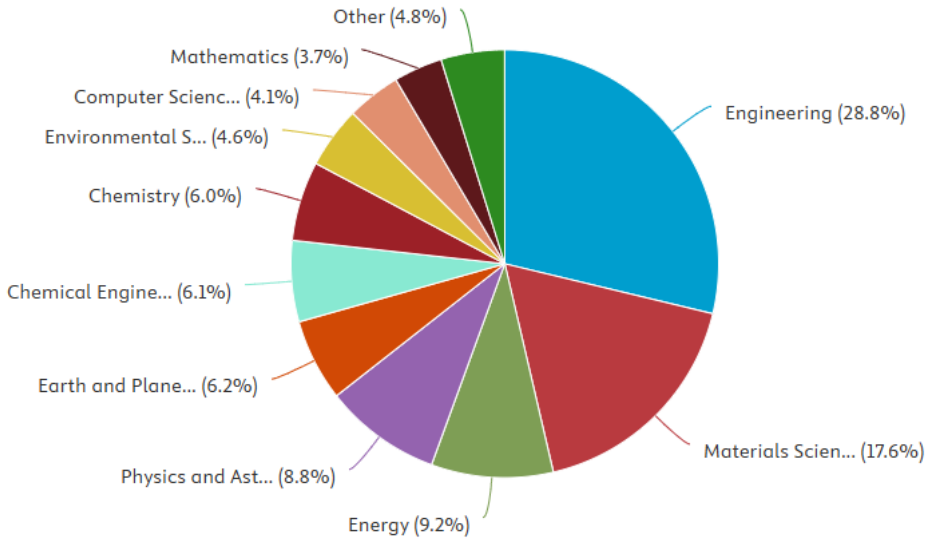
Documents

Documents by type



Documents by subject area