GreenHeatEAF

Gradual integration of REnewable non-fossil ENergy sources and modular HEATing technologies in EAF for progressive CO2 decrease

Report on DC activities-V1

Deliverable D5.5

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1. Introduction

1.1 Purpose and scope of the present document

The GreenHeatEAF Consortium is keen to communicate and disseminate project results across the European steel sector and beyond as a way to maximise the impact of the project by raising the interest of the European steel industry.

This deliverable is the first of a set of 4 deliverables that will be provided at M12, M24, M36 and M42, respectively. Each of these 4 deliverables will describe the dissemination and communication activities implemented by the GreenHeatEAF Consortium during a period of 12 months, apart from the last one which will refer to the last 6 months of the project and will provide a final overview. All these 4 deliverables will also assess the status of achievement of the different dissemination and communication targets established in the Dissemination and Communication Plan (Deliverable D5.1) and will identify possible revisions of the identified Dissemination and Communication strategy, wherever applicable.

This document summarises the dissemination and communication activities carried out by the GreenHeatEAF partners in the first year of the project. It includes the activities carried out in its social media channels (such as LinkedIn or Twitter) as well as the events targeted by the consortium for dissemination purposes.

Being the project in its first year of activity, most outcomes were not mature enough for dissemination. Nonetheless, the Consortium was active in raising awareness, curiosity, and interest towards the project in the European steel sector by means of the social network and the project website. Moreover, some activities related to modelling and simulation benefitted from the background of some of the partners. Therefore, several presentations were provided by some of the partners in relevant international events.

All the developed activities followed the Dissemination and Communication Plan (Deliverable D5.1), which proved to be well aligned with the aims and scope of the project. The overall strategy established in that document proved to be effective and presently does not need revision.

1.2 Structure of the document

This rest of document is divided into 4 main sections:

- Section 2 focuses on the activities that were carried out to raise awareness and interest toward the project in the European steel sector and to disseminate some preliminary outcomes.
- Section 3 describes the developed communication activities.
- Section 4 overviews the future events that are targeted by the Consortium to disseminate and communicate the project outcomes.
- Section 5 provides some concluding remarks and considerations for a fine tuning of the established Dissemination and Communication strategy to amplify the project impact and meet the ambitious targets that were identified at the beginning of the project in the Dissemination and Communication Plan (Deliverable D5.1).

2. Dissemination Activities

Dissemination is focused on the **public disclosure of the project results to specific target groups,** and has the following main Dissemination Objectives (DOs):

DO1. to raise awareness and interest of potential users on the project results;
DO2. to foster interaction with stakeholders and potential users (the ecosystem) to obtain key feedback and enhance exploitation opportunities;
DO3. to transfer knowledge of the developed solutions to the scientific community and exchange experiences which can support improvements and refining of the research activities;
DO4. to foster the acceptance of GreenHeatEAF outcomes and tools in the EU steel industry;
DO5. to ensure a broad applicability of the project results also beyond the steel sector.

During the first year of the project, although only a few preliminary results were available for dissemination, the Consortium showed a positive attitude toward dissemination and tried to exploit the most suitable chances to promote the project within the scientific, technical, and industrial stakeholders. In order to make the European steel community aware of the project objectives, ongoing and planned activity, the partners were committed to introduce the project in the following more general presentations held within technical and scientific events targeting various actors and stakeholders in the steel sector:

- A presentation held by Swerim at TMS 2023 152nd annual meeting & exhibition, which was held on March 19-23 in San Diego, where 1 slide concerning the project was presented and discussed.
- A presentation held by BFI in the webinar series of the RFCS project dissHEAT, which was held on May 02, 2023, where 1 slide concerning the project was presented and discussed.
- A presentation held by the project Coordinator during the SWERIM Recycling Day, an online webinar that took place on September 29, 2023, where 2 slides concerning the project were presented and discussed.

Moreover, three presentations fully focused on the project were provided within international Workshops and meetings by the project Coordinator (see also a summary in **Table 1**): the first one aimed at presenting in a comprehensive way the objectives and methodology of the project, while the other two presented some preliminary results obtained by SSSA and SIDENOR concerning the work developed within WP3.

The abstracts of the three full presentations are provided in the following subsections, while the D&C reports related to all the events where GreenHeatEAF was somehow presented, prepared according to the template available in the Dissemination and Communication Plan, are reported (in chronological order) in **Appendix I** of the present document.

Table 1. List of events where detailed presentations concerning GreenHeatEAF were discussed.

Authors	Partners	Title of the presentation	Date	Conference
V. Colla	SSSA	Gradual integration of renewable Carbon and alternative non-Carbon energy sources and modular heating technologies in EAF for progressive CO_2 decrease	29.03.2023	ESTEP Spring Dissemination Event 2023
V. Colla, I. Matino, A. Petrucciani, A. Zaccara, O. Toscanelli, A. Soto	SSSA SIDENOR	Flowsheet model for the prediction of the effects of the use of renewable non-fossil carbon sources in electric arc furnace	04.10.2023	ESTEP Annual Event 2023: A Circular Economy driven by European steel
V. Colla, I. Matino, A. Petrucciani, A. Zaccara, O. Toscanelli, A. Soto	SSSA SIDENOR	Exploring the use of alternative non-fossil carbon and energy sources, and novel iron carriers in electric steelworks through a dedicated flowsheet model	01.12.2023	EAF International Meeting

2.1 Gradual integration of renewable Carbon and alternative non-Carbon energy sources and modular heating technologies in EAF for progressive CO_2 decrease

V. Colla, Scuola Superiore Sant'Anna, TeCIP, ICT-COISP (Italy)

The main objectives of the project entitled "*Gradual integration of Renewable non-fossil Energy sources and modular HEATing technologies in EAF for progressive CO2 decrease - GreenHeatEAF*", which is funded by the European Union through the Horizon Europe framework, and started on January 1st 2023, are presented and discussed. The methodological approach pursued in the project and the structure of the workplan will also been presented.

2.2 Flowsheet model for the prediction of the effects of the use of renewable non-fossil carbon sources in electric arc furnace

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The European Union is focusing its efforts on maximizing circular economy applications and on reducing greenhouse gas emissions for targeting the Green Deal ambitions of making EU sustainable and climate neutral [1].

Circular economy can lead to significant environmental benefits such as reduction of the usage of natural resources and of the landfilling of valuable products and can allow reducing raw material dependence especially in the current situation of geopolitical issues [2].

In this context, electric steelmaking is playing a fundamental role as it is directly involved in the recycling of steel scrap. However, further actions can be pursued to enable further circular economy practices and enhance process sustainability, for instance, in terms of reduction of CO2 emissions. As suggested in the ESTEP Electric Arc Furnace (EAF) scrap route roadmap [3], a possible option

is represented by the substitution of fossil fuels by other alternative C-bearing renewable materials such as biomass, biochar, plastics. Depending on the C-content and other chemical features, these materials can replace anthracite and coal generally used as energy sources in the melting process and can, therefore, reduce fossil CO2 emissions. In addition, materials like biomass perfectly fit the circular economy concept of "the value of resources being maximised indefinitely, requiring that virtually no unrecoverable waste occurs" [4].

However, uncertainties exist on the effect of these materials on the process behaviour and evolution. Although real experimentation can be done, the horizon of exploration is generally limited to avoid issues on the process and to avoid interrupting standard production plan. For this reason, ad-hoc developed models can help exploring several scenarios and can be complementary to industrial trials to demonstrate the technical feasibility of the proposed solutions.

In EU-funded project "*Gradual integration of Renewable non-fossil Energy sources and modular HEATing technologies in EAF for progressive CO2 decrease - GreenHeatEAF*", both industrial trials and simulations are planned to focus on the alternative renewable carbon sources usage in EAF. As far as models are concerned, an already existing EAF process route flowsheet model developed in Aspen Plus environment [5] and continuously updated during other EU-funded projects [6] has been furtherly adapted to investigate the effects of the use of alternative renewable carbon sources. In particular, several alternative C-sources available at regional and international levels have been modelled as non-conventional components by using ultimate, proximate and sulphur analyses starting from available information and finding missing ones (i.e., content of Hydrogen and Oxygen) for fitting the known higher heating value (HHV). The characteristics of the modelled C-bearing materials are reported in **Table 2** together with the computed H and O values, while **Figure 1** shows a comparison between real and simulated HHV showing generally very good accuracy.

Table 2. Characteristics of modelled renewable carbon materials.

ID	Material	Fixed C	S	N	H (from model)	O (from model)	Moisture	Volatile	Ash
		%							
1	Biochar	87.7	0	0	3.45	6.35	32.6	9.8	2.5
2	Biochar	62.2	0	0	4.92	13.38	12.9	18.3	19.5
3	Biochar	64	0	0	2.67	9.33	0	0	24
4	Biochar	80	0.8	2	0	9.2	13	12	8
5	Biochar	70	0.85	2	1.57	18.08	13	21	7.5
6	Biochar	41.3	0.26	0	8.61	16.03	0	24.9	33.8
7	Biomass	20.4	<0.1	0	16.26	61.98	0	78.3	1.31
8	Biomass	13.9	<0.1	0	18.88	67.03	0	86	0.14
9	Biomass	20.3	0.01	0	17.46	62.22	0	79.4	0.0035
10	Biochar	80	0.03	0	3.36	12.45	7	8.9	4.16
11	Biochar	95	0.01	0.29	1.55	1.74	0.8	3	1.4
12	Tires	28.7	1.8	0.54	27.02	34.64	0.49	64	7.29
13	Plastics	97.2	0.03	0	0.2	0	0.15	0.23	2.57
14	Charcoal	48	0.08	0.58	5.81	32.03	5.3	69.3	13.5

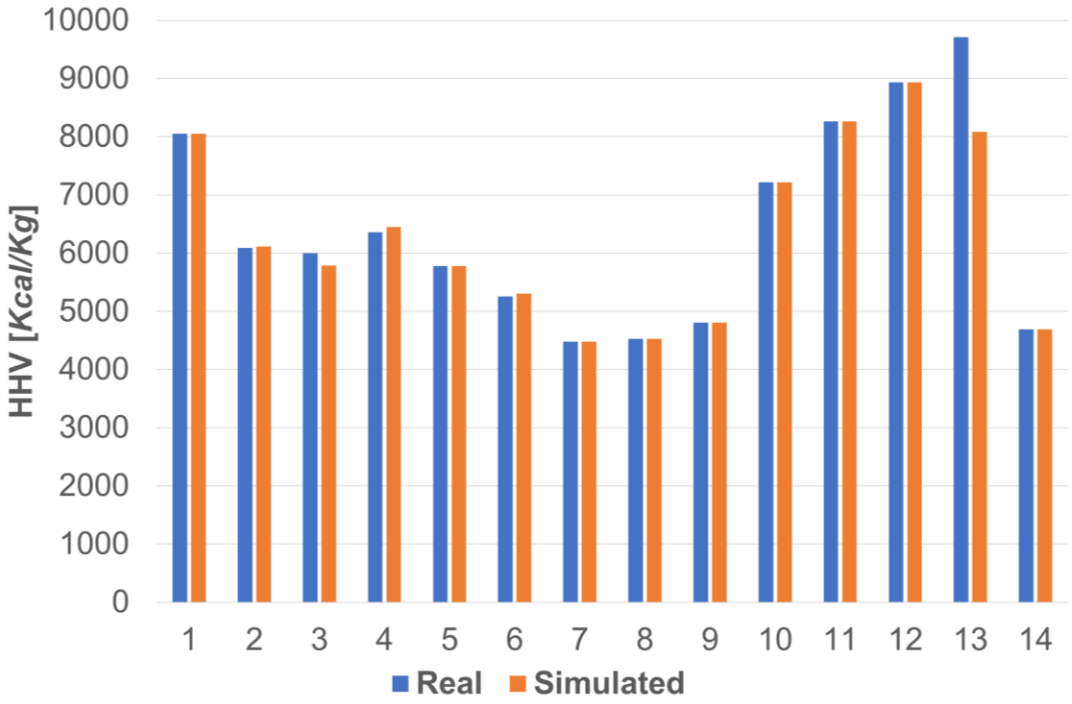

Figure 1. Comparison of real and computed HHV of modelled renewable carbon materials.

Then, considering both literature information and real industrial data on production trials where biochar was introduced in the EAF through the 5th hole, the model has been modified (e.g. by adding/changing dedicated blocks and reactions), tuned and validated to consider the effects of these alternative C-bearing materials on process, on material and energy streams as well as on liquid steel and by-products compositions. Such model will be used in the project to simulate several scenarios, for instance, by varying the used alternative C-bearing material, ratios of renewable and fossil C-bearing material, and by computing different Key Performance Indicators to evaluate the impact in terms of environmental and energetic sustainability of the process. The simulations will provide indications for field tests to be developed a later stage of the project. Based on simulations and real trials, reliable operating strategies will be defined on the use of these renewable C-bearing materials.

References

[1] European Parliament, “Green Deal: key to a climate-neutral and sustainable EU” [Online]

https://www.europarl.europa.eu/news/it/headlines/society/20200618STO81513/green-deal-europeo-la-chiave-per-un-ue-sostenibile-e-climaticamente-neutrale?at_campaign=20234-Green&at_medium=Google_Ads&at_platform=Search&at_creation=DSA&at_goal=TR_G&at_audience=&at_topic=Climate_policies&gclid=Cj0KCQjwldKmBhCCARIsAP-0rfwF_0TW9ZSU1bw6D3-Zx4y_jWGKeZf6JDYxZSYjkJYfqvKGR77qDkIaAllwEALw_wcB

[2] European Parliament, " Circular economy: definition, importance and benefits," [Online]. https://www.europarl.europa.eu/news/en/headlines/economy/20151201STO05603/circular-economy-definition-importance-and-benefits?&at_campaign=20234-Economy&at_medium=Google_Ads&at_platform=Search&at_creation=RSA&at_goal=TR_G&at_audience=eu%20circular%20economy&at_topic=Circular_Economy&at_location=IT&gclid=Cj0KCQjwldKmBhCCARIsAP-0rfwaqd_4RopnhZ1pTbQpHTyZcBMIu37WfftLtNpcsDhF-kf6-_ymNJAaAiS9EALw_wcB

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[4] Sherwood, J. (2020). The significance of biomass in a circular economy. Bioresource Technology, 300, 122755.

[5] Matino, I., Alcamisi, E., Colla, V., Baragiola, S., Moni, P. (2016). Process modelling and simulation of electric arc furnace steelmaking to allow prognostic evaluations of process environmental and energy impacts. Matériaux & Techniques, 104(1), 104.

[6] Petrucciani, A., Zaccara, A., Matino, I., Colla, V., Ferrer, M. (2022). Flowsheet Model and Simulation of Produced Slag in Electric Steelmaking to Improve Resource Management and Circular Production. Chemical Engineering Transactions, 96, 121-126.

2.3 Exploring the use of alternative non-fossil carbon and energy sources, and novel iron carriers in electric steelworks through a dedicated flowsheet model

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Electric steelworks play a fundamental role in the steelmaking transition towards decarbonization. They intrinsically implement the circular economy concept, but further research efforts are being invested to adapt EAF steelmaking process to the new challenges related to C-lean processes. Potential improvements are related to carbon, energy and iron sources: fossil carbon and energy sources have to be replaced by bio-based carbon and green hydrogen and the use of different iron carriers has to be envisaged from first grade scrap to more DRI/HBI with various C-content. The effects of the introduction of these materials in the standard EAF route are not completely known and investigations are needed. Research on these topics is included in some of the activities foreseen in the EU-funded project entitled "*Gradual Integration of REnewable carbon and alternative non-carbon Energy sources and modular HEATIing technologies in EAF for progressive CO_2 decrease – GreenHeatEAF*". The project will adapt, develop and demonstrate technologies for integrating non-carbon gases and renewable C-bearing materials and for obtaining a wide control range of the whole heat capacities in EAF processes. It relies on the parallel and complementary application of demonstration and pilot tests, digital simulations, and monitoring and control strategies. Digital tools are being exploited to plan and support real tests as well as to explore wider testing horizons. One of the tools applied in GreenHeatEAF is a flowsheet model of the EAF steelmaking route developed in Aspen Plus environment that is under continuous improvement. It has been adapted for managing the use and injection of novel energy and carbon sources (i.e. biomass) as well as alternative iron carriers by exploiting literature and real industrial data.

The first scenarios analysed that were developed by using this model will be presented, which are related, for instance, to the effects of biomass injection. Use of different biomasses, various ratios between fossil and bio carbon carriers have been explored. The following Key Performance Indicators (KPIs) were computed to compare the simulated scenarios: Electric Energy Efficiency, Fossil CO_2 Reduction, Metal material efficiency, Not-metal material efficiency, Slag production.

2.4 Collaboration and synergies with other EU-funded projects

On May 2, 2023, the GreenHeatEAF project was presented by O. Hatzfeld from BFI within a webinar dedicated to "Heating and burner technology " that belongs to the webinar series organised in the context of the project entitled *"Dissemination of the heating technology research results for emission minimization and process optimization towards todays fossil-free heating agenda" (dissHEAT)*, which is co-funded by the European Union through the Research Fund for Coal and Steel (RFCS) (G.A. No 101057930). dissHEAT is a dissemination project coordinated by SWERIM and where BFI is one of the five partners. Although the project was at the very beginning, the outcome of the lively discussion which took place in the seminar provided a fruitful knowledge exchange and was exploited in the project to draw some preliminary considerations on the potential intensifier for and barriers to transferability of some of the project outcomes.

Moreover, on 25.10.2023 a joint meeting was organised with some partners of the project entitled *"Hydrogen technologies for decarbonization of industrial heating processes" (HyInHeat)*, which is funded by the European Union through the Horizon Europe framework (G.A. No 101091456). Short presentations of both projects were held, and an in-depth discussion was held concerning potential synergies in terms of knowledge exchange, joint activities and joint dissemination actions.

As partners of both Consortia plan to attend the 13th European Electric Steelmaking Conference (EEC 2024) that will be held in Essen (Germany) on June 3-7 2024, it was planned to hold a further exchange and networking event in that occasion, also taking advantage of the further partial outcomes that are expected from both projects at that stage.

2.5 Achievement status of the established dissemination targets

Dissemination actions mostly rely on the availability of at least partial outcomes of the project. Therefore, the dissemination actions which were carried out in the first year were quite limited, and a much more intense dissemination is expected in the second Year. Nonetheless, some progress can be registered in the achievement of two established target values for the Key Performance Indicators (KPIs) of dissemination actions established within the Dissemination and Communication plan (Deliverable D5.1), such as summarised in **Table 3**. Moreover, following the participation of the last two workshops listed in **Table 1** (i.e. the ESTEP Annual Event on Circular Economy and the EAF International Meeting) the presenters have been invited to submit two papers to special issues of the journals *Matériaux et Techniques* and *La Metallurgia Italiana*, respectively.

Moreover, it is worth noting that several members of the Consortium are very active in the EU-funded research and are working to favour synergies with other EU-funded projects. For instance, SSSA, BFI and SIDENOR are partners of the Project entitled *"Investigations of Slags from Next Generation Steel Making Processes" (InSGeP)*, which is co-funded by the EU through the Research Fund for Coal and Steel (RFCS) (Grant Agreement No 101112665) and started on 01.07.2023. A synergy can be created with this project on the topic of the maximization of slag latent heat exploitation for their valorisation. Further opportunities for networking activities and synergies with other ongoing projects will be continuously analysed during the General Assemblies of the project.

To sum up, at the present status of the project, the dissemination strategy appears appropriate and does not need revision.

Table 3. Comparison between target and actual values of the established KPIs for the dissemination activities.

Communication activity	KPI Communication	Target	Actual value	% vs target.	Status
Scientific and technical papers	• No. of articles in well reputed scientific journals in Open Access mode	15	0	0%	
	• No. of downloads for the published papers overall	9000	0	0%	
Presentations, lectures, posters in conferences, congresses and workshops	• No. of papers published in proceedings of international conferences and workshops	12	0	0%	
	• No. of presentations/posters discussed in international scientific events	18	3	17%	
	• No. of persons in the general audience reached in the attended scientific events)	10000	~800	8%	
Internal seminars and dissemination events	• No. of internal partners' events	8	0	0%	
	• No. of pilot training sessions related to the outcomes of the project and some of the developed tools	4	0	0%	
Webinars and seminars on GreenHeatEAF outcomes	• No. of webinars and seminars	3	0	0%	
	• No. of persons overall attending the held webinars and seminars	150	0	0%	
Attendance to exhibitions/trade fairs	• No. of exhibitions or trade fairs attended	3	0	0%	
	• overall number of the audience of the attended exhibitions and trade fairs	3500	0	0%	
Presentations in events promoted by EU initiatives, platforms, and associations	• No. of presentations	4	0	0%	
	• Total number of experts and industrial representatives reached in the presentation events	200	0	0%	
Collaboration and synergies with other CSP and HEU projects	• No. of projects contacted for potential synergies in terms of knowledge exchange and future project scale-up	10	2	20%	
	• No. of joint activities put in place with some of the previously identified and contacted projects	5	0	0%	
GreenHeatEAF final Workshop	• No. of presentations held during the Workshop both by GreenHeatEAF beneficiaries and by external experts	8	0	0%	
	• No. of attendees	100	0	0%	

3. Communication activities

Communication activities mostly aim at **promoting the project itself and its impacts among the identified groups**. The following main Communication Objectives (CO) have been defined:

- CO1. to raise awareness in the steel community of the benefits of the GreenHeatEAF technologies and solutions in terms of socio-economic and environmental sustainability of the steel production cycle;
- CO2. to raise awareness and favour opportunities for transferability of concepts;
- CO3. to raise awareness among European Commission (EC), Public Authorities and policymakers to foster cooperation in spreading the benefits of the GreenHeatEAF outcomes and solutions;
- CO4. to involve workers and young talents in further development and deployment of the GreenHeatEAF tools and solutions and create among them awareness on their impact by also promoting connected career opportunities;
- CO5. to promote gender equality and integrate gender dimension in research and innovation activities.

Based on the strategy elaborated at the very beginning of the project, the communication activities implemented by the GreenHeatEAF Consortium were mostly aimed at raising awareness of the project objectives and potential benefits in the steel community.

The Consortium made the choice to keep a “technically focused” profile in Communication activities, i.e. implementing communication actions which mostly refer to technical objectives, activities, and outcomes of the project. Consequently, communication activities were limited in number due to lack of mature results to showcase. However, especially in the second semester of the year, communication via social media was intensified to accompany and promote the implemented dissemination actions, by announcing and promoting the first presentations of preliminary results of the project in relevant Workshops (see also **Section 2**).

The communication strategy mostly exploited the project website, the social media (LinkedIn) and some presentations made by single partners on more general topics connected to GreenHeatEAF. One newsletter was issued, mostly devoted to providing basic information on project objectives and Consortium) and one press release in Italian daily newspaper.

3.1 Project website

The GreenHeatEAF website is online since spring 2023 and was finalised by the end of the first semester of 2023 (see Deliverable D5.2), according to the project schedule. The website is hosted on the ESTEP website and can be found under the list of projects of the Clean Steel Partnership (https://www.estep.eu/clean-steel-partnership/list-of-csp-projects/greenheateaf/).

By the end of 2023, the GreenHeatEAF website was visited by a total 818 visitors, mostly concentrated in the last quarter of the year, such as shown by the time trend of visitors, which is depicted in **Figure 2**. This is a result of other dissemination and communication actions put in place by the consortium, such as the posts on LinkedIn and the presentations made in Workshops of the sector. In effects, some peaks in the visitors’ number can be observed close to the dates of the first ESTEP Dissemination Workshop, which was held on March 29-30, of the ESTEP Workshop on Circular Economy, which was held on October 3-5, and at the beginning of December, being both the 10th PROMETIA seminar the EAF International Meeting held at the very end of November 2023. Moreover, at the end of the year the launch of the 1st project survey connected to the first stakeholder consultation developed within Task 5.3 (see Deliverable D5.3) further stimulated the curiosity of the steel community around the project and represented an incentive to visit the project website.

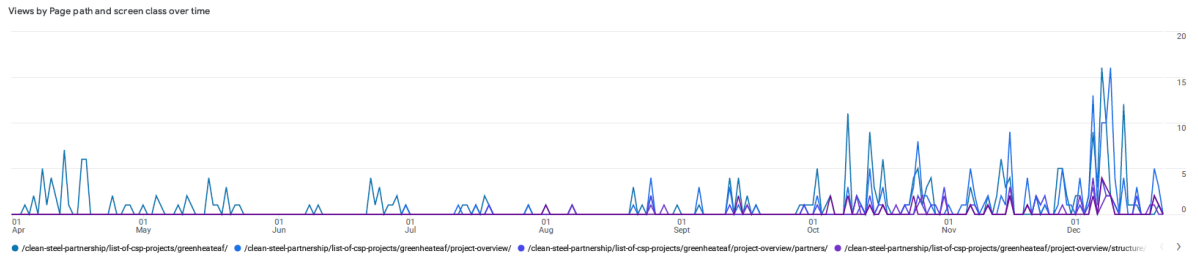

Figure 2. Time trend of the number of visitors of the project website starting from 01.04.2023.

Considering that very few technical results, documents or papers are so far available on the project website, the results can be considered satisfactory.

A more intensive promotion of the project website is planned for the second year of the project, for instance, by introducing the link to the website (also in the form of a QR code) in the last slide of all presentations/posters related to the project.

3.2 LinkedIn Account

A LinkedIn account was created for the project at the end of March 2023 (see also Deliverable D5.1) and presently holds 661 followers. 11 posts were published, which gathered a total of 8479 views. The time trend of the visitors who accessed the GreenHeatEAF page on LinkedIn (based on the LinkedIn analytics) is shown in **Figure 3**, while the distribution of their profiles is shown in **Figure 4**.

Figure 3. Time trend of the visitors of the LinkedIn page of the project.

Figure 4. Distribution of the profiles of the visitors of the LinkedIn page of GreenHeatEAF.

3.3 Newsletter and press releases

Two newsletters were released in 2023: the first one presents the overall concept of the project, its main objectives, and the Consortium, while the second one summarises the work developed in the first year of the project. Moreover, some dissemination events of the first year were shortly overviewed. The newsletters were spread through the project website and the project Linkedin page. The publication of the newsletter was not as regular as it should be, but the Consortium is committed to release more numerous newsletters in the incoming months and on a more regular basis.

One press release was also produced on November 29, 2023, by the Italian daily newspaper named “Il Tirreno”, which belongs to a big Italian editorial group and ranks 19th among the Italian newspapers for sale of paper version of the newspaper[1], being widely spread in Tuscany and holds an estimated total number of readers (considering both paper and online version) equal to 246.000[2]. The project Coordinator extensively mentioned the project and its objectives in the context of a dissertation on the role of Hydrogen-based technologies in improving sustainability of steel production. The integral text of the press release is reported in **Appendix II**.

[1] Data related to October 2023, Source Prima Comunicazione, https://www.primaonline.it/2023/12/13/395839/trend-diffusione-quotidiani-bene-sole-avvenire-e-pochi-altri-crollo-in-edicola/ last access January 10, 204.
[2] Source Datastampa https://www.datastampa.it/

3.4 Achievement status of the established communication targets

Table 4 present the current value of the established KPIs for communication activities and compares them with the target values established in the Dissemination and Communication Plan (Deliverable D5.1). Such values are very ambitious, and their trend cannot be "linear" throughout the project duration, as communication initiatives are expected to be more numerous and effective as soon as concrete results will be available. However, especially the activity on social media (LinkedIn) proved to be effective, with the target number of followers expected for the whole project duration largely overcome in the first year.

Table 4. Comparison between target and actual values of the established KPIs for the communication activities.

Communication activity	KPI Communication	Target	Actual value	% vs target.	Status
Project website with dedicated contents. Link to partners' website. Sharing public deliverables, reports, and training material	• No. of views by M40	10000	818	8%	
	• No. of documents downloads	1000	n.a.	n.a.	
	• Total audience (No of persons) reached	70000	n.a.	n.a.	
Newsletters and bulletins	• No. of press releases	2	1	50%	
	• Online newsletters with news, events, and information of interest	2	2	100%	✓
	• No. of readers (total over the project duration)	5000	12300*	246%	✓
Press releases to newspapers and social media.	• No. of social media followers	500	661	132%	✓
	• Reached audience (no of people)				
Presentations in events organized by or relevant to EU, platforms, and associations. Publications on EC communication channels	• No. of clustering events at EU level	1	0	0%	
	• No. of publications on EC communication mean	1	0	0%	
Communications and seminars dedicated to students and young minds	• Overall audience of students reached	300	0	0%	
Communications and seminars dedicated to gender equality	• No. of presentations on gender equality in project event	1	0	0%	
	• No. of sessions on career opportunities	1	0	0%	

* This value is estimated assuming that 5% of the readers of "Il Tirreno" read the article mentioning the project.

In the future, newsletters should be published on a more regular basis and, with respect to the initial communication strategy, it was decided that they should not necessarily overview all the activities

carried out on a certain period. In other words, also “thematic” newsletters could be published additionally to the more “comprehensive” ones, which focus on one specific WP or research topic.

Only one press release was delivered in 2023, as also in this case it is not easy to reach attention of press and media when very few results are available, but the size of the potential audience reached by that press release was large enough to compensate for the missing one, although such audience is based only in Italy. Even if, from a merely formal point of view, the objective concerning the target audience is already reached, the GreenHeatEAF Consortium is aware that this is not enough and is committed to enforce its strategy on this side and all the partners are planning to mobilise local press in the future.

The presentations in events organized by or relevant to EU, platforms, and associations. Publications in EC’s communication channels and the communications and seminars dedicated to students and young minds as well as to gender equality are clearly foreseen mostly for the last two years of the project.

4. Future targeted events

During regular meetings (Steering Committee meetings and 6-monthly General Assemblies) and, more in general, during the project execution, the GreenHeatEAF consortium periodically analyses the events being planned and update the list of potential targets for GreenHeatEAF. The target events include conferences, workshops, exhibitions and other dissemination and communication opportunities, where the consortium can make presentations to share the results of the work carried out in GreenHeatEAF, as well as trade fairs, exhibitions and dissemination and communication initiatives organised by the EU.

In the Dissemination and Communication Plan established at the beginning of the project (Deliverable D5.1) an initial list of events was provided. In such list 3 out of the 4 events initially identified for 2023 were attended, the missing one being ESTAD 2023, which was not exploited as dissemination opportunity for the project mainly due to lack of concrete although preliminary outcomes to present. One additional event (the EAF International meeting) was identified after March 2023 and attended by a representative of SSSA.

This list of potentially relevant events has been revised at the end of the first year to reflect future opportunities for disseminating and communicating the project outcomes, and **Table 5** provides the list of future events identified by the Consortium at the date of delivery of the present document.

In particular, following the presentation given at the EAF International Meeting of Bergamo, SSSA has been officially invited as Keynote Speaker to the 25th IAS Steel Conference, organized by the Instituto Argentino de Siderurgia (Argentine Iron&Steel Institute) taking place on 01-03.10.2024, at the City Center Convention Center in the city of Rosario, Santa Fe, Argentina to give a 45 minutes speach on the research work developed within the GreenHeatEAF project.

Table 5. list of relevant events (question marks are included when the exact dates or locations are still not defined).

Event	Date	Location	Description
18th Society and Materials Conference	14.05.2024-15.05.2024	Jonkoping (S)	Preliminary results of WP 3
13th European Electric Steelmaking Conference EEC 2024	03.06.2024-07.06.2024	Essen (D)	Preliminary results of WP 3
40th Congress of the Italian Association of Metallurgy	11.09.2024-13.09.2024	Naples (IT)	Main outcomes related to WPs 1-3
25th IAS Steel Conference	01.10.2024-03.10.2024	Rosario (Argentina)	Main outcomes related to WPs 1-3
Circular Metallurgy International Meeting	28.11.2024-29.11.2024	Bergamo (IT)	Main outcomes related to WPs 2-3
3rd ESTEP International Conference on H2forGreenSteel	??.??.2024	??	Main outcomes related to WPs 1-2
The Iron & Steel Technology Conference and Exposition	??.05.2025	?? (USA)	Main outcomes related to WPs 2-3
METEC & ESTAD 2025	??.06.2025	Milan (IT)	Final outcomes of the project
21st IFAC Workshop Symposium on Control, Optimization and Automation in Mining, Mineral and Metal Processing MMM2025	??.??.2026	??	Final outcomes of the project, with reference to aspects related to control approaches

5. Conclusions

In the first year of the project, also considering the limited availability of concrete results, the GreenHeatEAF consortium developed a quite intense Dissemination and Communication activity. The elaborated Dissemination and Communication strategy proved to be effective and, in general, all the partners showed a positive and collaborative attitude in spreading research objectives, ambitions, concepts and preliminary outcomes. This enabled a good progress on the achievement of the established target values of some of the identified KPIs for Dissemination and Communication.

No publications on international Journals have been issued so far, but there are concrete plans and opportunities for the second year of the project.

Moreover, and besides of HyInHeat, the consortium is active in establishing connections and identifying opportunities for synergies with other EU-funded research initiatives.

The consortium also identified some margins for improvements to be stressed for communication activities, also based on the expected development of activities and availability of partial results, especially as regard to:

- development of press releases, also with a national and international visibility;
- more numerous and more “regular” publication of newsletters, also focused on specific topics;
- intensification of the frequency of the LinkedIn posts.

6. List of Figures

7. List of Tables

8. List of acronyms and abbreviations

Acronym	Full Name
AB	Advisory Board
BFI	VDEh-Betriebsforschungsinstitut GmbH
CFD	Computational Fluid Dynamics
DRI	Direct Reduced Iron
EAF	Electric Arc Furnace
EC	European Community
EU	European Union
HEC	Hydrogen Enhanced Combustion
KER	Key Exploitable Result
KPI	Key performance Indicator
SSSA	Scuola Superiore Sant'Anna

Appendix I. Reports on dissemination and communication activities pursued in the first year of the project

I.1 ESTEP Spring Dissemination Event 2023

Event information	
Event name (and acronym)	ESTEP Spring Dissemination Event 2023
Type of event	Workshop
Date	March 29-30, 2023
Location	Pisa
Geographic coverage	European
Type of audience	RTOs, Academia, Steel Companies, Associations
Approximate size of audience	61
Short description	One of the two dissemination events organised by ESTEP each year to disseminate ongoing public-funded and private research activities at both National and International level, which are of interest for the European steel community.
Information about dissemination activity	
Presentation title	Gradual integration of renewable Carbon and alternative non-Carbon energy sources and modular heating technologies in EAF for progressive CO_2 decrease
Presenter	Valentina Colla (SSSA)
Other partners involved	ALL
Hashtag(s) for Social Media	n.a.
Attachments (e.g. agenda, invitation)	Flyer and detailed program of the event

The European Steel Technology Platform (ESTEP) **Spring Dissemination Event 2023** will take place in-person on **29 & 30 March 2023** in Pisa (**from 12:00 CET**) at the **Aula Magna** of Scuola Superiore Sant'Anna (SSSA) in Pisa, Italy.

The main purpose of the event is to celebrate the ESTEP community while also sharing results and knowledge gained from research & innovation projects related to the steel sector.

This will also be the occasion to celebrate the 5th anniversary of ESTEP.

Registration: Attendance is free but registration is required for the event.
Please register on our website here

Venue information

The event will be held at the **Aula Magna** of Scuola Superiore Sant'Anna (SSSA). The venue address is :

PIAZZA MARTIRI DELLA LIBERTÀ 33, 56127 PISA (ITALY)

Celebration Dinner

The dinner will take place at the first floor of the Royal Victoria Hotel, starting with a welcome drink at 19.30.
ESTEP proudly invites for its 5th anniversary.

Address for the dinner venue: 12 Lungarno Pacinotti, Pisa

Hotel recommendations

- **Hotel Di Stefano** *** (Close to SSSA headquarters - 3 min walk to SSSA)
  https://www.hoteldistefano.it/it/
- **Royal Victoria Hotel** *** (Historical hotel on the Arno river – 7min walk to SSSA)
  https://www.royalvictoria.it/
- **Grand Hotel Duomo** **** (Close to Piazza dei Miracoli – 9min walk to SSSA)
  https://www.grandhotelduomopisa.it/it/
- **Hotel Pisa Tower** *** (Very close to Piazza dei Miracoli – 12min walk to SSSA)
  https://www.hotelpisatower.com/it/
- **Hotel Bologna** **** (Garage available if coming by car – 14min walk to SSSA)
  https://hotelbologna.pisa.it/
- **Villa Tower Inn** ****(Close to Miracle square – 15min walk to SSSA)
  https://www.villatowerinn.com/

More information about the city of Pisa: https://www.aboutpisa.info/

Preliminary Programme

DAY 1 – Wednesday 29 March 2023

12:00	Registration & lunch
12.45 – 13.50	**Opening & welcome** • Klaus Peters (ESTEP) • Sabina Nuti (SSSA) • Valentina Colla (SSSA) **Keynote speakers** • Swedish perspectives to the decarbonisation challenge of the steel industry?, Annika Roos (Jernkontoret) • Andrea Gentili, (European Commission - DG RTD)
13.50 – 15.00	**SESSION 1** • Development for use of hydrogen in green steel production, Joachim von Scheele (Linde) • Steel sector decarbonization – state of play in Türkiye, Dursun Bas (Istanbul Policy Center) • Steel sector decarbonisation – state of play in the EU, Jean Theo Ghenda (EUROFER) • Skills for Industrial Symbiosis and Energy Efficiency in the steel industry (SPIRE-SAIS), Adrian Götting (TU Dortmund University) **Discussion**
15.00 – 15.30	*Coffee break*
15.30 – 17.15	**SESSION 2: Clean Steel Partnership Projects** Klaus Peters moderation ▪ PURESCRAP, Melanie Leitner (K1-MET) ▪ TransZeroWaste, Gerald Stubbe (BFI) ▪ ReMEra, Manuel Mosconi (Tenaris) ▪ GreenHeatEAF, Valentina Colla (SSSA) ▪ HyTecHeat, Filippo Cirilli (Rina CSM) ▪ ModHEATech, Edoardo D'Amanzo (Rina CSM) ▪ Modiplant, Eduardo D'Amanzo (Rina CSM) ▪ CAESAR, Ahmed Rassili (CRM) ▪ HyDreams, RecHycle, HIYIELD, MaxH2DR, Twinghy, FullH2Reheat, Klaus Peters (ESTEP) **Discussion**
17.15 – 17.30	**Wrap- up of the day**
17.30	*End of event*
18.30	*Guided city tour of Pisa (optional)*
19.30 20.00	*Welcome Drink at the Royal Victoria Hotel* *Celebration dinner at the Royal Victoria Hotel*

DAY 2 – Thursday 30 March 2023

08:30	Welcome coffee
09.00 – 09.30	**Opening** • Klaus Peters (ESTEP) • Hy4Smelt – A demonstration project for green hot metal from ultrafine iron ores, Hanspeter Ofner (Primetals) & Thomas Bürgler (voestalpine)
9.30 – 10.50	**SESSION 3** • University of Oulu's recent national projects toward fossil-free steel and carbon neutral metals, Henri Pauna & Eetu-Pekka Heikkinen (University of Oulu) • Independent industrial water supply by digitalization and simulation, Gerald Stubbe (BFI) • Optimising slag reuse and recycling in electric steelmaking (iSlag), Valentina Colla (SSSA) • BURNER 4.0, Alessandro Della Rocca (Tenova) **Discussion**
10.50 – 11.15	*Coffee break*
11.15 – 13.10	**SESSION 4** • Novel technology for pure H_2 production, Sebastian Bock (Rouge H2 Engineering) • Alchimia, Jordi Galvez (Celsa) • BAMBOO, Victor Cuervo & Juan José Arribas (ArcelorMittal) • CO2OLHEAT, Paolo Bruttini (Baker Hughes) • Steam and gas networks revamping for the steelworks of the future (SMARTER), Valentina Colla (SSSA) **Discussion**
13.10 – 13.15	**Closing comments & future perspectives**
13.15	*End of event* *Light lunch offered by ESTEP*

Please note some adjustments on the programme may still occur

I.2 dissHEAT webinar 2023

Event information	
Event name (and acronym)	dissHEAT webinar on «Heating and burner technology»
Type of event	Webinar
Date	May 2, 2023
Location	online
Geographic coverage	Europe
Type of audience	RTOs, Academia, Steel Companies
Approximate size of audience	~120
Short description	A series of online webinar organised by in the context of the RFCS project entitled «*Dissemination of the heating technology research results for emission minimization and process optimization towards todays fossil-free heating agenda*» to analyze the research and development R&D of the past 25 years in the field of reheating and thermoprocessing technology (downstream) for processing steel in rolling mills and forges.
Information about dissemination activity	
Presentation title	
Presenter	Oliver Hatzfeld (BFI)
Other partners involved	SWERIM
Hashtag(s) for Social Media	#steel #heating #burner #EU #research #projects
Attachments (e.g. agenda, invitation)	Online program of the webinar series Online detailed program of the webinar on «Heating and burner technology». Slide concerning GreenHeatEAF that was presented and discussed at the event

dissHEAT webinars

17 april, 2023

Webinar within RFCS project Dissheat. Dissemination of the heating technology research results for emission minimization and process optimization towards todays fossil-free heating agenda – dissHEAT (G.A. 101057930)

We would like to invite you to a seminar series within RFCS project Dissheat. Register via the registration links for each topic.

- May 2 (Time: 2.00–3.30 pm), Heating and burner technology
- May 9 (Time: 2.00–3.30 pm) Modeling and control of entire furnaces
- May 23 (Time: 2.00–4.00 pm) Materials in the furnace and product quality
- May 30 (Time: 2.00–3.15 pm) Heat transfer, heat recovery, productivity, economy
- June 1, (Time: 2.00–3.15 pm) Sensors and control, standards, regulations

Kontakt och mer information

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Career Press Publications Login Svenska

SWERIM

Areas of expertise Services Collaboration About Swerim

Home / Calendar / dissHEAT: Heating and burner technology

dissHEAT: Heating and burner technology

Webinar within RFCS project Dissheat. Dissemination of the heating technology research results for emission minimization and process optimization towards todays fossil-free heating agenda – dissHEAT (G.A. 101057930)

Programme – Heating and burner technology

2.00 pm Introduction to the project and webinar series, Andreas Johnsson, Swerim

2.05 pm Sustainable routes towards the carbon neutrality of the reheating process from the perspective of a technology provider, Massimiliano Fantuzzi, Danieli

2.25 pm Research findings and technical development over the last 20 years, Oliver Hatzfeld, BFI

2.45 pm New concepts for industrial heating and burner technology, Oliver Hatzfeld, BFI

3.00 pm Q & A, Oliver Hatzfeld, BFI

3.20 pm Event close, Oliver Hatzfeld, BFI

Information and registration

Date: May 2
Time: 2.00-3.30 pm
Place: Webinar
Registration >>

Contact and more information

Andreas Johnsson
andreas.johnsson@swerim.se
Phone: +46 (0)70 699 89 72

Current research

dissHEAT

Gradual integration of REnewable non-fossil ENergy sources and modular HEATing technologies in EAF for progressive CO_2 decrease, **GreenHeatEAF** (Horizon Europe):

- HEC to decrease fossil fuels in EAF process
- Investigating HEC with existing burner for EAF heating by combustion
- Simulation study of combustion and EAF heating
- Other topics regarding CO_2-decrease

GreenHeatEAF

I.3 SWERIM recycling day 2023

Event information	
Event name (and acronym)	SWERIM recycling day 2023
Type of event	Webinar
Date	September 29, 2023
Location	online
Geographic coverage	Europe
Type of audience	RTOs, Academia, Steel Companies
Approximate size of audience	~150
Short description	A yearly online webinar organised by SWERIM concerning recycling, reuse and valorization of residual materials supporting the green transition of the mining and metals industry towards the green transition, and to foster a sustainable society.
Information about dissemination activity	
Presentation title	The role of digital technologies in increasing recycling and enhancing valorization of by products
Presenter	Valentina Colla (SSSA)
Other partners involved	SWERIM, Sidenor
Hashtag(s) for Social Media	#steel #byproducts #recycling #reuse #sustainability #circulareconomy #industrialsymbiosis #EU #research #projects
Attachments (e.g. agenda, invitation)	Flyer with detailed program of the event. Slides concerning GreenHeatEAF that were presented at the event

WEBINAR INVITATION

Recycling Day

SEPTEMBER 29, 2023, AT 13.00–15.30

Recycling, reuse and valorization of residual materials facilitate the Swedish mining and metals industry towards the green transition, and a sustainable society.

PROGRAM

12.50-13.00	Meeting opened to allow connection check
13.00-13.10	**Welcome and introduction** *Chuan Wang*, Group Manager Recycling and Environment, Swerim and *Christer Ryman*, Research Manager Steel Production Residues, Jernkontoret, Sweden
13.10–13.30	**Slag utilization today and challenges in a decarbonized steel industry** *David Algermissen*, Head of Department Secondary Raw Materials/Slag Metallurgy, FEhS, Germany
13.30–13.50	**Description of case study of industrial symbiosis: process description, mass balances and calculation and analysis of Environmental indicators** *Giorgio Bertanza* Head of the Department of Civil, Environmental, Architectural Engineering and Mathematics of the University of Brescia and *Daphne Mirabile*, Process & Control System – Combustion & Environment, RINA-CSM, Italy
13.50–14.10	**The role of digital technologies in increasing recycling and enhancing valorization of by products** *Valentina Colla*, Responsible of the Research Center ICT-COISP of the TeCIP Institute of SSSA, Italy
14.10–14.20	Short break
14.20–14.40	**Some examples of recycling developments in Technical area – Steel production residues** *Björn Haase*, Manager Non Metal Products, Höganäs Sweden, Sweden
14.40–15.00	**ReeMap-A Swedish source of critical minerals, from mine waste** *Ulrika Håkansson*, Business Development Manager, LKAB, Sweden
15.00–15.20	**Alleima & MyKita – A full circle operation** *Mikael Silver*, Quality & Sustainbility Manager at Alleima Strip division, Sweden
15.20–15.30	Questions, discussion and conclusion
15.30	End of seminar

DATE: September 29, 2023
TIME: 13.00–15.30
TIME ZONE: CEST (Central European Summer Time) · UTC + 2h
PLACE: Teams

The seminar is **free** of charge but you have to sign up to receive the link.

Please make your registration no later than September 27.

REGISTRATION ▶▶

Welcome!

Jernkontoret

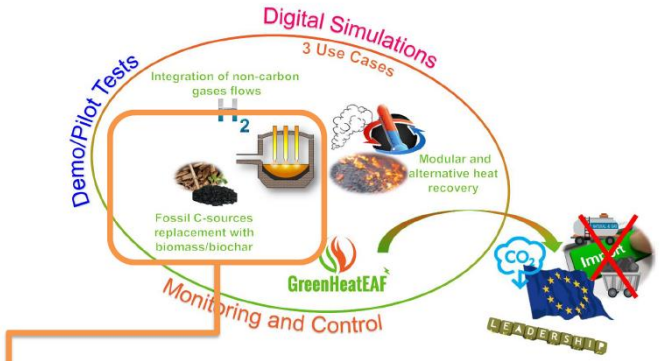
SWERIM
We create benefit for industry

A further example: the GreenHeatEAF project

GreenHeatEAF

"Gradual integration of Renewable non-fossil Energy sources and modular HEATing technologies in EAF for progressive CO_2 decrease"
G.A. No. 101092328

Horizon Europe

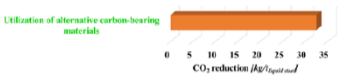


Among other activities, both industrial trials and simulations are planned to focus on the alternative renewable carbon sources usage in EAF.

13

Further evolution in the GreenHeatEAF project

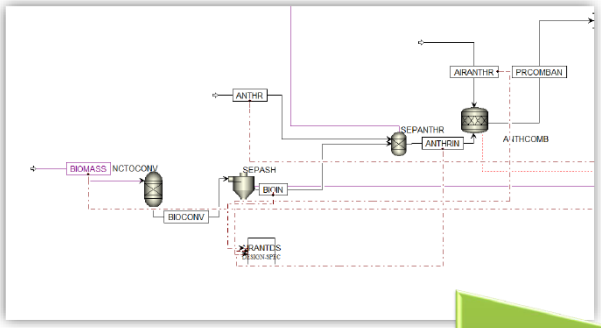
Replacing fossil fuels with other alternative C-bearing renewable materials such as biomass, biochar, plastics can reduce fossil CO_2 emissions



Uncertainties exist on the effect of these materials on the process behavior

Models and simulation can support planning of field trials and can extend the tests

The iSlag flowsheet model has been furtherly updated to manage injection of these materials and for making related scenario analyses

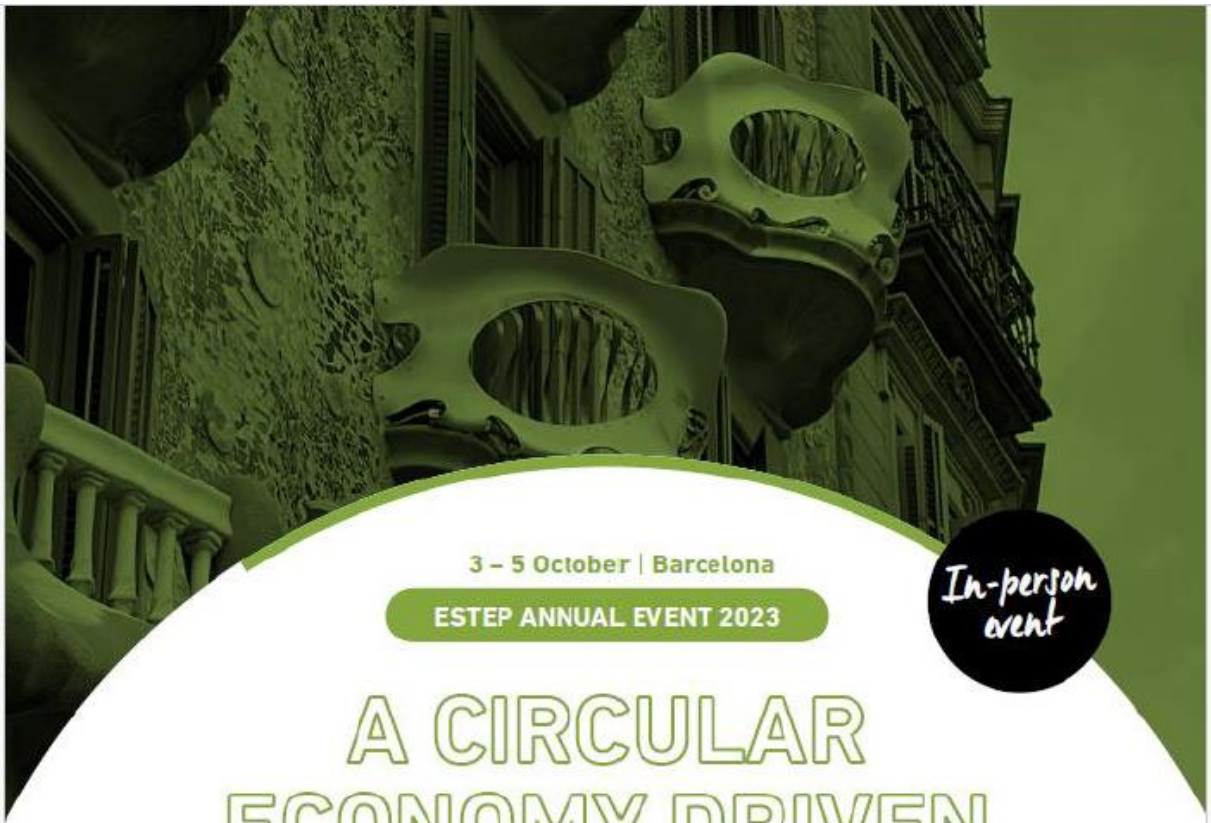


Different C-bearing materials

Different ratios of renewable and fossil C-bearing materials

I.4 ESTEP Annual Event 2023: A Circular Economy driven by European steel

Event information	
Event name (and acronym)	ESTEP Annual Event 2023: A Circular Economy driven by European steel
Type of event	Workshop
Date	October 3-5, 2023
Location	Barcelona
Geographic coverage	European
Type of audience	RTOs, Academia, Steel Companies, Associations, Companies from other industrial sectors, European Commission
Approximate size of audience	112
Short description	A dissemination event organised by ESTEP to disseminate ongoing public-funded and private research activities at both National and International level, which are of interest for the European steel community. The focus was on Circular Economy solution and practices in the steel sector.
Information about dissemination activity	
Presentation title	Flowsheet model for the prediction of the effects of the use of renewable non-fossil carbon sources in electric arc furnace
Presenter	Valentina Colla (SSSA)
Other partners involved	Sidenor
Hashtag(s) for Social Media	#GreenHeatEAF #steel #circulareconomy #sustainability #EAF #biomass #biochar #EU #research #project #HorizonEurope
Attachments (e.g. agenda, invitation)	Flyer and detailed program of the event



3 – 5 October | Barcelona

ESTEP ANNUAL EVENT 2023

In-person event

A CIRCULAR ECONOMY DRIVEN by European Steel

TOPICS:

- Resource efficiency
- Recycled content
- Material recirculation
- Industrial symbiosis
- Enablers
- Hubs for circularity

Abstract submission deadline : 28 August

Authors wishing to present a contribution are asked to prepare maximum a two-page abstract including figures and references.
Abstract to be submitted to ESTEP by e-mail: D.Snaet@estep.eu with the indication of the topic and the intention (or not) to submit a paper for the dedicated special issue.

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European Commission

Abstract topics

- Resource efficiency
- Increasing the recycling of steel scrap and scrap processing residues:
  - Ferrous scrap tracking and handling inside the steel plant, considering also scrap yard management, scrap charge preparation for quality upgrading and valorisation of scrap
  - Valorisation of low-quality scrap streams (e.g. scrap classification, removal of tramp elements, scrap treatments, processing, and cleaning)
  - Recovery of certain non-ferrous fractions, such as tin, copper, and zinc, Automotive Shredder Residue (fluff, plastics)
  - Adjustment and processing of residuals
- Materials recirculation (external and internal) with high recycling rate:
  - Recovering valuable metal and mineral fraction contents from metal oxide-rich residue streams (slags, scale, sludge ...) from in-plant steel making residues associated with present or next generation iron ore and steelmaking process
  - Substitution of primary raw materials (lime, ferroalloys) in iron and steelmaking process with residue
  - Secondary carbon carriers in iron and steelmaking processes as substitute of carbon fossil sources (anthracite, natural gas) along with their new or improved preparation processes (agglomeration, torrefaction, carbonisation, gasification, etc.)
  - Upcycling / application of by-products and other residual materials from iron and steelmaking process in different sectors (e.g. slags as construction material)
- Circularity of other resources:
  - Water: recovery of residues from water, water reusage (internally or externally) and regeneration
  - Energy: waste heat recovery and application in steelmaking or in other sectors. (e.g. EAF gas or BOF gas to preheat scrap, steam & electricity production)
  - CO2 (CCUS): focus on capture & usage; no storage.
  - Logistics
- Enablers:
  - Digital solutions (Artificial intelligence, traceability, Digital Product Passport, cybersecurity and other digital solutions) for continuously monitoring the effects of circular approaches and solutions on the societal & environmental impact
  - Methods and tools applied to measure and demonstrate the impact of circular economy approach, including Life Cycle Assessment and Life Cycle Cost Analysis (LCA/LCCA).
  - Upskilling of the steel workforce in the area of circular economy
  - Creation of a market for valorizing residue from and in iron and steelmaking residue (new roles, matching supply and demand, regulation, creation of incentives, etc.)
  - Social innovation for circular economy practices and technologies in steelmaking (e.g. inclusivity in scrap collection)
- Disruptive collaboration with clients and suppliers for the circularity of: automotive, construction, energy generation plants (e.g. eco-design):
  - Servitisation – new circular businesses and services around steel (e.g. steel reusage, scrap collection and recycling)
- Industrial-urban symbiosis cases in steel sector
- Hubs for circularity (or circular industrial parks) in which steelmaking/metal working plays a critical role

CELSA GROUP ESTEP European Steel Technology Platform European Commission

ESTEP
European Steel Technology Platform

ESTEP ANNUAL EVENT 2023

A CIRCULAR ECONOMY DRIVEN BY EUROPEAN STEEL

PROGRAMME

4 OCTOBER

08:00 Registration
Barcelona Gallery Hotel (Calle Rosselló, 249, Barcelona)

08:45 Introduction and welcome
Room Ambassador, Barcelona Gallery Hotel

Klaus Peters, *Secretary General, ESTEP*

Anna Domenech Abella, Head of Innovation, CELSA

09:15 Session 1 - Increasing recycle content: scrap, iron and resIdues

09:15 ***Introduction***
Enrico Malfa *(Session chairman)*

09:20 ***Key note lecture:*** *Towards circularity in steel industry: a joint journey between industry and universities along multiple TRL levels.*
Inge Bellemans, *Assistant professor/FWO postdoctoral fellow, UGent*

09:50 ***Presentation I:*** *Increasing the recycling of steel scrap and scrap processing residues.*
Giovanni Bavestrelli, *Director of Data Science, Tenova*

10:10 ***Presentation II:*** *Circularity Enhancements by low quality Scrap Analysis and Refinement (CAESAR HEU project).*
Jean-Christophe Pierret, *Program Leader "Circular Steelmaking", CRMGroup*

10:30 ***Presentation III:*** *ReMFra – possibilities for residues from steel plants.*
Marco Simoni, *Melting & Casting Consultant, RINA-CSM*
Wolfgang Reiter, *Researching doctoral student, K1-MET*

10:50 ***Presentation IV:*** *Circular Boron Steel: a Case Study on High Performance Materials for a Zero Emission Automobile Industry.*
Jaume Pujante, *Researcher, EURECAT*

11:10 ***Coffee break***

11:30 Session 2- Resource Efficiency

11:30 ***Introduction***
Fabio Praolini *(Session chairman)*

11:35 ***Presentation I:*** *Hot Oxygen Technology: Supporting Decarbonisation, Resource Efficiency, and Circular Economy Development.*
Esin Iplik, *Research and Development Engineer, Linde*

11:55 ***Presentation II:*** *Circular metallurgy: Valorizing valuable metals from Lithium-Ion Batteries in steel industrial symbiosis.*
Elizaveta Cheremisina, *Senior Project Manager, K1-MET*

12:15 ***Presentation III:*** *Resource Efficiency Revolution: Swerim's Journey Towards a Circular Economy and Environmental Protection.*
Elsayed Mousa, *Senior Researcher, SWERIM*

12:35 Lunch
Barcelona Gallery Hotel

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ESTEP ANNUAL EVENT 2023

A CIRCULAR ECONOMY DRIVEN BY EUROPEAN STEEL

PROGRAMME

4 OCTOBER

13:55 Session 3 - Materials recirculation: carbon carriers - Part 1

13:55 ***Introduction***
Agnieszka Morillon (Session chairwoman)

14:00 ***Key note lecture:*** *Secondary carbon carriers for steel production: a comprehensive review.*
Filippo Cirilli, Deputy Manager, Rina Consulting, Centro Sviluppo Materiali

14:30 ***Presentation I:*** *The Torero project : substituting fossil carbon with biomass in integrated steel plants*
Bert Riems, Researcher Circular Economy, ArcelorMittal

14:50 ***Presentation II:*** *Pilot tests with use of secondary material streams as replacement of fossil carbon and burnt lime in EAF steelmaking.*
Erik Sandberg, Researcher, SWERIM

15:10 ***Presentation III:*** *BIOCode - BIOmass for COkemaking Decarbonization.*
Rosella Attrotto, Research & Development Project Engineer, Acciaierie d'Italia

15:30 ***Presentation IV:*** *Pyrolyzed residual biomass as a substitutional fuel for iron ores sintering process.*
Wojtek Szulc, International Co-operation expert , Łukasiewicz - GIT

15:50 ***Presentation V:*** *Flowsheet model for the prediction of the effects of the use of renewable non-fossil carbon sources in electric arc furnace.*
Valentina Colla, Assistant Professor & Coordinator, Scuola Superiore Sant'Anna

16:10 ***Coffee break***

16:30 Session 4 - Materials recirculation: carbon carriers and slags - Part 2

16:30 ***Introduction***
Filippo Cirilli (Session chairman)

16:35 ***Presentation I:*** *Perspectives in exploitation of biochar to achieve the carbon neutrality in the steelmaking route.*
Carlo Mapelli, Professor, Politecnico di Milano

16:55 ***Presentation II:*** *Tenova's dry slag granulation process: the experience of Pittini group on LF slag.*
Marta Guzzon, Senior Scientist, Tenova

17:15 ***Presentation III:*** *The HYMET project.*
Jon Ander Erdozain, Critical Raw Material & Co-Products Head of group, CELSA

17:35 ***Presentation IV:*** *Prediction of slags composition through digital tools for scenario analyses and for enhancing circular usage of slags.*
Antonella Zaccara, Research Collaborator, Scuola Superiore Sant'Anna
Alice Petrucciani, PhD Student, Scuola Superiore Sant'Anna

17:55 ***Presentation V:*** *Replace coal with densified polymers from waste plastic in EAF: an industrial application.*
Enrico Malfa, Research and Development Director, Tenova
Loredana Di Sante, Senior Scientist, Rina Consulting, Centro Sviluppo Materiali

18:15 **Closure**

19:00 **Visit to casa Batlló**

20:30 **Conference Dinner**
Windsor restaurant, Calle de Còrsega, 286, Barcelona

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ESTEP
European Steel Technology Platform

ESTEP ANNUAL EVENT 2023

A CIRCULAR ECONOMY DRIVEN BY EUROPEAN STEEL

PROGRAMME

5 OCTOBER

08:20 **Registration**
Barcelona Gallery Hotel (Calle Rosselló, 249, Barcelona)

08:45 **Introduction and welcome**
Room Ambassador, Barcelona Gallery Hotel
Klaus Peters, Secretary General, ESTEP

08:50 ***Opening:*** *Circular economy in RFCS, Big Tickets Steel and beyond. Novelties in funding opportunities.*
Sebastiano Fumero, Head of Unit, European Commission, REA B1

09:20 ***Session 5 - Circularity of other ressources than steel***

09:20 ***Introduction***
Marta Guzzon (Session chairwoman)

09:25 ***Presentation I:*** *Pilot demonstration of carbon capture and utilization technology to close the carbon cycle in the steel industry.*
Michael Derntl, Senior expert, K1-MET
Irmela Kofler, Head of research area decarbonisation, K1-MET

09:45 ***Presentation II:*** *CO2 (CCUS) focus on capture & usage.*
Sanjeev Manocha, Global Director of Business Development, Lanzatech

10:05 ***Presentation III:*** *Blast furnace gas and Basic Oxygen Furnace gas exploitation in steel Reheating Furnaces - Revamping of ArcelorMittal España Reheating Furnaces'.*
Andrea Turolo, Head of Technical Sales, SMS Group

10:25 ***Presentation IV:*** *Enabling and spreading water circularity in steelworks through digital tools*
Ismael Matino, Assistant professor of Metallurgy, Scuola Superiore Sant'Anna

10:45 ***Presentation V:*** *Laboratory tests to evaluate hydrogen production using slag and surplus heat generated in steel facilities. Preliminary results.*
Giuseppe Campo, Researcher, Politecnico de Torino

11:05 ***Coffee break***

11:25 **Session 6 - Digital solutions and workforce empowerment - Part 1**

11:25 ***Introduction***
Alexia Boet (Session chairwoman)

11:30 ***Keynote Lecture:*** *Digital tools paving the way to circular economy in the European steel sector through new business models.*
Valentina Colla, Assistant professor & Coordinator, Scuola Superiore Sant'Anna

12:00 ***Presentation I:*** *Skills for Industrial Symbiosis and Energy Efficiency.*
Antonius Schröder, Management Board, Social Scientist, Dortmund University

12:20 ***Presentation II:*** *Effects of Industrial Symbiosis and Energy Efficiency in terms of new skills requirement in the steel sector.*
Teresa Branca, Researcher, Scuola Superiore Sant'Anna

12:40 **Lunch**
Barcelona Gallery Hotel

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14:00 Session 7 - Digital solutions and industrial solutions - Part 2

14:00 ***Introduction***
Valentina Colla *(Session chairwoman)*

14:05 ***Presentation I:*** *Enablers and barriers for Steel - Cement symbiosis in a case study of H2 Green Steel.*
Erland Nylund, *Researcher, SWERIM*

14:25 ***Presentation II:*** *InSGeP - Slags from Next Generation Steel Making Processes - Suitable for established Applications?*
David Algermissen, *Head of Department Secondary Raw Materials / Slag Metallurgy, FEhs*

14:45 ***Presentation III:*** *Overview of recent research activities on circular economy in the iron & steel industry at the Process Metallurgy Research Unit, University of Oulu*
Rita Kallio, *Postdoctoral Researcher, University of Oulu*
Eetu-Pekka Heikkinen, *University Lecturer, University of Oulu*

15:05 ***Presentation IV:*** *Cement 2 Zero : Steel & cement circularity. EAF transformation - UK research collaboration*
Eoin Bailey, *Innovation Lead, CELSA*
Patricio A. Burdiles, *Senior Project Manager, University of Cambridge*

15:25 ***Presentation V:*** *European Steel: playing a key role in technological innovation, self-reliance, ethics, and circularity of more than steel alone.*
Harmen Oterdoom, *Founder of Butter Bridge BV*

15:45 ***Closure of the conference "A circular economy driven byEuropean Steel"***
Klaus Peters, *Secretary General, ESTEP*

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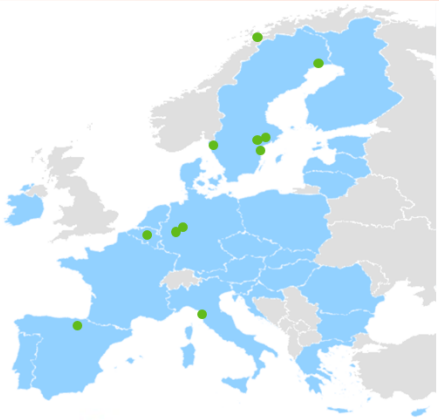
I.5 PROMETIA's 10th Scientific Seminar

Event information	
Event name (and acronym)	10th Scientific Seminar Prometia
Type of event	Annual Scientific Seminar for Prometia
Date	November 28-30, 2023
Location	Lisbon Portugal
Geographic coverage	
Type of audience	Industry (Boliden/Eramet/Elkem etc), Universities, Research organizations, funding agencies (EraMin/EIT/EU Commission, DG GROW, ETP SMR etc)
Approximate size of audience	100-150
Short description	-Global view on EU Raw Material Production Challenges -Collaborative Projects (CRM, sustainable processes, green transition -Pilot activities within METNET
Information about dissemination activity	
Presentation title	Hydrogen and Piloting for Green Transition for the Metal Industry
Presenter	Guozhu Ye (SWERIM)
Other partners involved	None
Hashtag(s) for Social Media	None
Attachments (e.g. agenda, invitation)	Slides concerning GreenHeatEAF that were presented at the event

Gradual integration of REnewable non-fossil ENergy sources and modular HEATing technologies in EAF for progressive CO2 decrease

GreenHeatEAF key facts

- Duration: 42 months (January 2023 – June 2026)
- Budget: 3.5 million Euro
- Type of Action: Innovation Action, CALL TOPIC: HORIZON-CL4-2022-TWIN-TRANSITION-01-16 Modular and hybrid heating technologies in steel production
- 11 partners from 6 countries



Technical objectives

- Integration of **non-fossil gases flows** in EAF processes with different charge materials and configurations towards GHG reduction and green transition of steelmaking
- Development of **modular regenerative and alternative heating technologies** for increasing in-process **heat recovery from off-gases** and **maximizing slag latent heat exploitation** for their valorization.
- Demonstration of the technical feasibility of **biomass/biochar exploitation for non-fossil energy intake** in EAF process ;
- Coupling of **novel measurement techniques** and **optimized control strategies** to manage exploitation and facilitate integration of novel non-fossil heat/energy sources and streams.

This project has received funding from the European Union under grant agreement NUMBER — 101092328 — GreenHeatEAF

I.6 EAF International meeting

Event information	
Event name (and acronym)	EAF International Meeting
Type of event	Workshop
Date	November 30- December 1, 2023
Location	Bergamo (Italy)
Geographic coverage	European
Type of audience	RTOs, Academia, Steel Companies, Associations, Companies from other industrial sectors, European Commission
Approximate size of audience	203
Short description	A dissemination event organised by the Italian Association of Metallurgy (AIM) to discuss research trends and industrial advancement related to all aspects of EAF technology. The meeting aimed at allowing a comparison between the current and future needs and at contributing to set the ground to satisfy these demands now or in the future, by encouraging scientific and technological exchanges between technology providers, suppliers, manufacturers, academia, and research organisations.
Information about dissemination activity	
Presentation title	Exploring the use of alternative non-fossil carbon and energy sources, and novel iron carriers in electric steelworks through a dedicated flowsheet model
Presenter	Valentina Colla, Ismael Matino (SSSA)
Other partners involved	Sidenor
Hashtag(s) for Social Media	#GreenHeatEAF #steel #circulareconomy #sustainability #EAF #biomass #biochar #EU #research #project #HorizonEurope
Attachments (e.g. agenda, invitation)	Detailed program of the event

EAF international meeting

PRODUCTIVITY
ENERGY EFFICIENCY
RAW MATERIALS &
DECARBONIZATION

BERGAMO
30 NOVEMBER
AND
1 DECEMBER
2023

ORGANISED BY
ASSOCIAZIONE ITALIANA DI METALLURGIA

PROGRAMME

EAF international meeting

Throughout the years, the EAF meetings have become a key-event for the industrial and academic experts involved in the EAF steelmaking. Not only they allow the improvement of technology, but most important they guarantee the "know-how inheritance": transfer, sharing and recording of the knowledge within the company at any level. Besides the improvement in process efficiency, continuous measurements and automatic control contribute decisively to all aspects related to safety and environment. On the other hand, the transition to circular economic and the action against the climate change implies new challenges: improvement of scrap quality, use of DRI/HBI, substitution of coal injection, improvement of slag quality, control of slag composition, possible exploitation of hydrogen-burners etc. The Meeting aims at gathering and sharing information on all aspects of EAF technology, among delegates with academic and industrial backgrounds. Such an event, capable of bringing together suppliers and manufacturers, will allow the comparison between the current and future needs and will set the ground to satisfy these demands now or in the future.

CONFERENCE CHAIRPERSON
Carlo Mapelli - Politecnico di Milano

ORGANISING COMMITTEE
Mauro Bianchi Ferri - Acciarium
Serena Fasolini - DEREF
Gianpaolo Foglio - Feralpi Group
Mario Marcozzi - Tenova
Jose Noldin - GravitHy
Luca Orefici - Pipex Energy
Weihong Yang - KTH

EAF international meeting

30th November 2023

8:00 Welcome coffee & registration

8:50 Welcome addresses

9:00 **(eaf_038) Opportunities for supporting research and development initiatives**
A. Colli - Commissione Europea, Italy

9:15 **(eaf_030) Energy-efficient and hydrogen-ready technologies for EAF steelmaking**
J. von Schéele, H. Groiss - Linde GmbH, Germany
H. Alshawarghi - Linde Inc., USA
P. Kwaschny - Linde AB, Sweden
J. van Lingen - Linde Gas Netherlands, Netherlands
D. Razzari - Linde Gas Italia, Italy

9:25 **(eaf_003) Insight into the behavior of a Hydrogen Arc in an EAF furnace**
A. Kharicha, M. Al-Nasser - Montanuniversität Leoben, Austria

9:55 **(eaf_002) Hy3 (Hy-cube) project : Hyundai Steel's carbon neutral strategy**
H. Kim, M. Sun, Y. H. Kim - Hyundai Steel, Korea

10:15 **(eaf_012) Failure analysis of a HDPE liner in a type IV hydrogen storage tank**
A. Rondinella, G. Capurso, F. Andreatta, L. Fedrizzi - Università di Udine, Italy
D. Menotti, A. Agnoletti - Faber Industrie, Italy

10:35 LONGARETTI AWARD

10:55 *coffee break*

EAF international meeting

30th November 2023

11:10 **(eaf_001) Future Green Steelmaking for high-quality steel grades via the DRP-EAF route: Case study for high and low grade DRI input**
S. Chatterjee, S. Kumar Panda - Tata Steel Netherlands, The Netherlands

11:30 **(eaf_013) The value of DRI - impact on steel quality**
B. Vucinic - Danieli & C., Italy

11:50 **(eaf_014) Role of physiochemical properties of biochar on the mechanical and metallurgical performance of self-reducing briquettes made of biochar and mill scale**
G. Dall'Osto, D. Mombelli, L. D'Aurea, C. Mapelli - Politecnico di Milano, Italy

12:10 **(eaf_019) Optimizing Fe yield and DRI integration: leveraging fast and simple OES technology for short tap-to-tap EAF operations and slag control**
A. Schlemminger - QuantoLux Innovation, Germany
M. Ounanian, A. Kunz - QuantoLux GmbH, Germany

12:30 **(eaf_036) I-Smelt: new smelting technology based on electricity and biochar**
C. Mapelli, G. Dall'Osto, D. Mombelli - Politecnico di Milano, Italy
R. Carli - Prosimet, Italy

12:50 **(eaf_033) Combination of EAF process modelling and process control for improvements of steel production through innovative approaches**
P. Frittella, L. Angelini, A. Landini, G. Foglio, F. Fredi, C. Di Cecca, M. Tellaroli, B. Cinquegrana, F. Morandini - Feralpi Siderurgica, Italy

13:10 *lunch*

30th November 2023

14:00 (eaf_011) **Numerical modeling of mass and energy balances in EAF**
S. Ferro, C. Cicutti, F. Marchini - Tenaris, Argentina
P. Galbiati - Tenaris, Italy
A. Bilancieri - Tenaris University, Italy

14:20 (eaf_022) **Optimization of the energy consumption through waste heat recovery and advanced digital integrator**
R. Bontempi, U. De Miranda, M. Zanforlin - ORI Martin, Italy
E. Pingaro, M. Baresi - Turboden, Italy
E.J. Chiarullo, G. Di Zanni R. Girelli - Tenova, Italy

14:40 (eaf_027) **Efficient heat buffering for ORC systems on EAF**
A. Dallasta, F. Ratto - Area GenoVeSE, Italy

15:00 (eaf_004) **The effect of arc stability on EAF performance**
N. Lugo, S. Goulden, P. Stafford, R. Corbari - GrafTech International Ltd., Switzerland

15:20 (eaf_039) **DevH2forEAF project - Developing and enabling H2 utilization to produce liquid steel in EAF**
F. Ferrari - Nippon Gases Industrial, Italy

15:40 (eaf_040) **Waste heat from EAF offgas utilization**
A. De Vito, G. Faslivi, I. Luzzo, A. Provesi, M. Chini, L. Bianco, D. Gaspardo - RINA Consulting-CSM, Italy

16:00 *coffee break*

30th November 2023

16:30 (eaf_025) **Tenova's approach for the efficient and reliable transition of the steel industry**
A. Grasselli, P. Stagnoli, S. M. Reali - Tenova, Italy

16:50 (eaf_020) **Transparency - The key pillar on the path towards sustainable industrial production and fundamental for CO2 engineered EAF refractory concepts**
K-M. Zettl - RHI Magnesita, Austria

17:10 (eaf_032) **Q-ONE technology, developed and patented by DANIELI, represents a breakthrough innovation in power transfer to the arc furnace**
L. Morsut - Danieli & C., Italy

17:30 (eaf_007) **Revolutionary EAF solution: a review of the operation of eleven EAF Quantums by Primetals**
D. Catan, A. Masolini, A. Hegazy, M. Hein, J. Schwörer, C. Nayman, H. Fuchs, H-J. Krassnig - Primetals Technologies Germany GmbH, Germany

17:50 *End of the session*

19:00 **Conference dinner at Roof Garden restaurant – Hotel San Marco**

1st December 2023

8:30 (eaf_009) **Application of different tools to improve process control in the Electric Arc Furnace**
J. Gaspari, L. Waridel, S. Goya - Tenaris Siderca
S. Ferro, C. Cicutti - Tenaris, Argentina

8:50 (eaf_006) **The maintenance free coupling**
L. Gottellini, E. Borlandelli - Rima, Italy

9:10 (eaf_008) **Robotics applied to EAF steel bath deslagging**
I. Rusu - Polytec, Italy

9:30 (eaf_031) **Stirring efficiency generated by electromagnetic stirring vs bottom gas stirring for a giant electric arc furnace -water modelling and numerical simulation results**
L. Teng, H. Yang - ABB Metallurgy, Sweden
M. Zielinska - ABB Corporate Technology Center, Poland

9:50 (eaf_024) **Efficient and highly productive EAF: operational results of a Tenova's reference plant**
C. Leoni, A. Grasselli, P. Stagnoli - Tenova, Italy
B.B. Cheng, J. Chen - Tenova Technologies, China

10:10 *coffee break*

10:40 (eaf_023) **EIT Raw Materials RIS-DUSTREC: investigation and selection of furnace dust samples for valuable metals recovery**
D. Mombelli, C. Mapelli, G. Dall'Osto - Politecnico di Milano, Italy
G. Tavčar, R. Kocjančič - Jožef Stefan Institute, Slovenia
D. Radulović - Institute for technology of nuclear and other mineral raw materials (ITNMS), Serbia
I. Ristović - University of Belgrade, Serbia
M. Ciszewski - Łukasiewicz Research Network, Poland
J. Kastivnik - TH ReMining, Slovenia
A. Mladenovič, A. Mauko - Slovenian National Building and Civil Engineering Institute (ZAG), Slovenia

1st December 2023

11:00 (eaf_015) **Utilization of secondary lead slag as a secondary raw material**
G. Tavčar, R. Kocjančič, A. Stergaršek, M. Ponikvar-Svet - Jožef Stefan Institute, Slovenia
U. Herlec, M. Dolenec - University of Ljubljana, Slovenia

11:20 (eaf_016) **The Synthetic Graphite Industry: The Achilles heel of Green Steel and Green Mobility through the lens of announced shortages and geopolitical disruptions**
R. Van Rensburg - Africa AST Technology, South Africa
S. Alameddine - AST Technology, Switzerland
G. Ferreira - Americas AST Technology, Brazil
F. Masia - Europe ALTech Group, Italy
A. Kaushik - Asia Pacific ALTech Group, United Arab Emirates

11:40 (eaf_029) **SwingDoor – immediate mean to reduce CO2 emissions in EAF operation and future improvement by hydrogen burners**
M. Leber - INTECO PTI
C. Buchmaier, C. Redl - INTECO, Austria
A. Valoppi - INTECO, Italy

12:00 (eaf_037) **Scrap conditioning for improving energy consumption and productivity**
O. della Gaspera, V. Zanaglio - ZATO, Italy
C. Mapelli, D. Mombelli - Politecnico di Milano

12:20 *lunch*

13:30 (eaf_035) **Fossil free graphite produced from biomass for greener steel**
W. Yang, Z. Shi - KTH, Sweden

13:50 (eaf_021) **Exploring the use of alternative non-fossil carbon and energy sources, and novel iron carriers in electric steelworks through a dedicated flowsheet model**
I. Matino, V. Colla, O. Toscanelli - Scuola Superiore Sant'Anna, Italy
A. Soto Larzabal - Sidenor I+D, Basauri, Spain

1st December 2023

14:10 (eaf_028) **Chromium refining during scrap melting process in an EAF**
D. Papamantellou, R. B. Lopes Cancado, F. Schrama - Tata Steel Netherlands
A. Smith - Materials Processing Institute

14:30 (eaf_034) **iSlag: The improved control of slag conditions through application of process modelling and new detection systems aiming at improvement of steelmaking process and slag recovery conditions**
P. Frittella, L. Angelini, M. Bersani, C. Senes, C. Di Cecca, F. Fredi, F. Guerra, V. Duro, G. Badina, G. Miglietta, G. Mazzi - Feralpi Siderurgica, Italy

14:45 coffee break

Session GREEN STEEL *(in Italian language only)*

15:10 Decarbonizzazione e definizione di "Green steel"
Alfredo Schweiger - Federacciai

15:35 Il calcolo dell'impatto ambientale nel settore acciaio
Carlo Brondi - CNR-STIIMA

16:00 Approfondimento dello standard GSCC per il processo EAF
Giovan Battista Landra - Gruppo Beltrame

16:25 TAVOLA ROTONDA
moderata da: Davide Lorenzini - Siderweb
Roberto De Miranda - Ori Martin
Vincenzo Maragliano - Gruppo Feralpi
Marco Geneletti - TenarisDalmine
Carlo Beltrame - Gruppo Beltrame
Alessandro Misul - Cogne Acciai Speciali

17:45 End of the Meeting

POSTER SESSION

(eaf_010) **Optimization of deoxidation process to control nitrogen and inclusions of ER50-6 produced by EAF**
T. Chen, J. Yang, J. Zhou, M. Yi, Y. Liu - Shougang Group Co. Ltd, China

(eaf_017) **iSteel-Expert: a solution to improve situation awareness in the EAF area which enforces process efficiency, reliability and sustainability while favouring preservation and transfer of steelworks know-how**
R. Girelli, V. Scipolo - Tenova, Italy
V. Colla, M. Vannucci - Scuola Superiore Sant'Anna, Italy
L. Bianco, L. Battigelli - Siderpotenza, Italy
J. Possik, B. Paree - Institut Catholique de Lille, France
E. Jimenez, B. Argáiz - Universidad de la Rioja, Spain
M. Cardelli, M. Massei - Sim4Future, Italy
A. Bruzzone - Università di Genova, Italy

(eaf_018) **Bio-lubricants in cold aluminium rolling application**
M. Bellini, S. Pota - Bellini, Italy

NOTE OF THE PROGRAMME This programme is not definitive and it may be slightly modified: title and authors, cancelled or added papers, chairperson, timetable or duration, etc.
Possible changes in the programme will be communicated before the beginning of the Conference

Appendix II. Press Release of 29.11.2023

Acciaio e idrogeno un connubio per la sostenibilità

La Scuola Sant'Anna di Pisa coordina due progetti europei per nuove tecnologie

IL FUTURO DELLA SIDERURGIA