TOWARDS THE DECARBONISATION OF THE ENERGY INTENSIVE SECTOR: PRESENTING RE4INDUSTY PROJECT

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ABSTRACT: The EU has started a progressive decarbonisation with the aim to become carbon neutral by 2050. Energy Intensive Industries (EII) are expected to play an important role in this transition as they represent almost a quarter of the final energy consumption, but a clear long-term vision and strategy is required in order to remain competitive while contributing to the decarbonization targets of the EU. The H2020 project RE4Industry will work on determining the most suitable, economically and technologically feasible renewable solutions for EIIs in the short-term (2030) and long-term (2050) visions, together with the definition of an action plan for industrial decarbonization, pointing at transforming the EU industrial landscape into a large market niche for the uptake of RE.
Keywords: energy intensive industries, decarbonisation, renewable energies

1 INTRODUCTION

The project RE4Industry- 100 % renewable energies for Energy Intensive Industries, is coordinated by CIRCE Research Center, and started on the 1st of September 2020, lasting until the end of August 2023 (36 months). With a total EU-funded budget of approximately 3 Million Euro, RE4Industry was granted under the umbrella of the Horizon 2020 topic "Market Uptake support" in which renewable energy technologies (biomass and bioenergy, among them) are proposed to play a crucial role in this transition, leading to a share increase of the renewable consumption in the EU [1, 2].

RE4Industry consortium is a multidisciplinary and complementary group gathering expertise from 6 different countries (ES, NL, DE, BE, AT) in renewable energy and industrial retrofitting, as well as social studies, and knowledge transfer activities in the energy-intensive sector. Composed of 11 partners, the consortium will guarantee extensive engagement of external stakeholders and broad dissemination of project results at European level.

The companies and organisations that form RE4Industry will cover specific roles: 5 technological and social experts (Fundación CIRCE, BTG Biomass Technology Group, CERTH, WIP Renewable Energies, White Research), 3 renewable energy-oriented associations (Bioenergy Europe, Energy Efficiency in Industrial Processes, European Sustainable Energy Innovation Alliance) and 3 energy-intensive industries (SIDENOR, MYTILINEOS, CORBION).

The main objective of RE4Industry is to facilitate for the energy intensive industry (EII) sector in Europe a smooth and more secure transition to the adoption of Renewable Energies (RE) in their production processes and facilities. It is thereby recognised that, i.a. due to the scale and to the long lead times in EIIs, many of the future solutions are already known today.

The first step for an effective transition of EIIs towards carbon neutral production by 2050 relies on the adoption of currently available RE solutions, without disregarding the long-term transition to more advanced and carbon-neutral facilities. The targeted industrial sectors might have a limited knowledge on their current retrofitting options, thus needing the external support from R&D consultancy to identify the potential solutions. This directly reflects on the decision-making process, which needs a reliable vision towards 2050.

In this sense, the project will support the EII sectors, including both industries and sectoral organisations, from different industrial activities, by guiding them in their path towards decarbonisation, providing vision and guidance to establish their long-term strategy for a coherent and more secure retrofitting and integration of current and future RE solutions.

2 METHODOLOGY

Four main issues need to be addressed to establish clear strategies for the short and long term,: (1) to gather the needs, requirements, vision, and opportunities of main EIIs and associated stakeholders; (2) to identify and characterise the EII sectors and companies to transform them into a large market niche for RE; (3) to identify the different technology and retrofitting options, and (4) to activate and empower these big RE consumers and raise awareness of their new role and position towards RE integration.

For this reason, a specific methodology has been developed in RE4Industry, that can be expressed through 7 main action axes, targeted to create confidence, provide vision and support, and ensure the market options for the EIIs:

1. A strong engagement strategy following a multiactor approach. The target actors of the project are principally EIIs and EIIs organisations, but the framework in which they operate are influenced by other key actors that could be supporters. Particularly, this refers to business organisations, policy makers, market and consumers of EIIs goods and the society.
2. A dialogue with and within EIIs and EII organisations. All project actions are designed to involve the sector effectively. Different interactions are foreseen, such engaging actors through direct contacts or making them part of the project through the different networks created at national (ES, GR, DE and NL) and European level, and populated by experts with different background (technical, social, policy). These networks form in combination a 'Collaborative Expert Network'.
3. A thoughtful review of RE technologies and options for a 100% RE consumption by 2050. A review of the EII sectors, as well as the identification of best practices and success cases will be performed to identify new cases and populate RE4Industry mapping-tool, that will enable a usar-friendly interaction to gather

information on EIIs success cases in RE adoption. Additionally, a clear vision on RE options and their implications for retrofitting processes in the short and long term will be provided, including current RE solutions and other technologies to be available until 2050. As a result, a technological roadmap for RE adoption will be released, with the support and vision of the Collaborative Networks.

4. Insights into industry retrofitting and promotion of RE integration. Keys for RE adoption by EIIs will be explored through review of 10 success cases, in addition to the three case studies from the industrial partners. RE4Industry will work closely with EIIs in the development of a baseline methodology for the development of Action Plans towards decarbonization, whose non-confidential lessons learned will be shared with the Collaborative Network and the sector. For existing success cases, RE4Industry will extract the drivers behind their implementation and principal lessons learned for replication.

5. Recommendations for the uptake of RE by EIIs and advocacy. Specific actions of advocacy are foreseen with the purpose to gather the vision and needs for a favourable framework and to be transposed to EIIs organizations and to policy makers. On the basis of multiple consults to target and key actors throughout all project, a dedicated action for the analysis of current situation, barriers and driving forces will be performed. The analysis, to be supported by the Collaborative Networks and with vision from multiple countries and cases, will yield a set of specific policy recommendations focused on pointing out urgent needs for policies or revision of regulations, so as the promotion of new policy frameworks and instruments in the medium and long term.

6. Multiplication and replication. RE4Industry has designed a detailed replication plan to promote and enhance the knowledge transfer, so the project results do not remain as a static action. A knowledge transfer compendium of actions is foreseen to be implemented at several levels, such as designing handy materials which will compile the main highlights of the project for target and key actors, in-house knowledge transfer to other facilities from the industrial partners, so as knowledge transfer to other companies from these sectors, and cross-border transfer to additional countries. Also, visiting success cases will allow to understand the RE adoption from the practice.

7. A solid dissemination and communication strategy, that will allow to reach as many stakeholders as possible and ensure the uptake of the project results. Different actions are planned, such as organisation of workshops, events, attending to conferences and meetings with key representatives of the industry, regulatory bodies, technological manufacturers, among others.

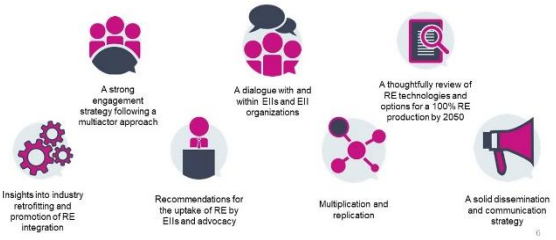

Figure 1: RE4Industry action axes

3 EXPECTED RESULTS AND IMPACTS

RE4Industry has being designed to work in alignment and in parallel with the EC strategic long-term vision for climate neutrality by 2050, 'A Clean Planet for all' and European Directive (2009/28/EC) to boost the path towards a full decarbonisation era. RE4Industry will promote and facilitate an increasing share of RE in the short-term period without disregarding the requirements to accomplish the 2050 targets.

The main impacts expected in the work programme are summarized in the following Table I and detailed below.

Table I: Summary of Expected impacts in the work programme

Expected Impact	Actions
1. Wider uptake of RE generation in EIIs	Developing of Action Plans for industrial partners Accompaniment to 12 additional EIIs
2. Increase of RE share	1.9 % annual RE share in industrial partners 37 % or RE share by 2030 in RE4Industry case studies
3. Cost reductions for company decision makers	40 % for draft Project analysis 25 % for consultancy in Decarbonisation Action Plans
4. Addressing needs for environm. impact asssesm.	3-9.5 Mt CO_2 emissions reduction Proposal for labelling EIIs goods
5. Public engagement and Collaborative Network	Advisory Boards and Thematic Panels at National and European dimension
6. Favourable policy, market support and financial frameworks	Consultation to key stakeholders, policy makers, National and European authorities
7. More cost-effective support schemes and lower financing costs	At least 3 schemes and 1 specific policy recommendation

Enabling the wider adoption of RE in the EII sectors is a final target of RE4Industry. During project lifetime it is expected that thanks to awareness raising, facilitation of roadmaps and vision to CEOs and company boards, and the direct coaching and support to companies, new steps towards RE utilisation will occur. In line with the support given to the project industry partners, in addition to the development of their respective Actions Plans for decarbonisation and knowledge transfer in collaboration with the industry personnel,12 additional industries will be provided with a brief accompaniment.

Following RE4Industry strategy all actions are intended to cause a substantial increase of RE to contribute to the RE target of 32% by 2030 set by EC. EIIs represent 24% of the final energy consumption in Europe, and will become increasingly RE consumers, thus leading to a higher share of RE. Although this effect cannot be controlled or fully be attributed to RE4Industry, the advances will be monitored through project life-time.

Project development by EIIs require usually an initial scoping justifying the investments, a balance of expected investment and ROI, and a clear vision on the alternatives. RE4Industry will provide EIIs CEOs, boards and plant managers with a clear scope of alternatives for decarbonisation in the short-term (2030) and long term (2050), with an argumentation of preferred paths

according to the feedback and vision learned from the Collaborative Networks of the project. This, together with the catalogue of existing and promising RE technologies, and the description of EIIs already promoting RE use (success cases), will allow to speed-up the preparation of initial financial and economic project drafts.

Regarding the environmental impact assessment RE4Industry will apply methods to assess the CO_2 reductions achieved by EIIs. This will accompany the proposed Action Plans provided to industrial partners and will be in connection with LCA based approaches like RED II, Ecoinvent or PAS2050. Additionally, indicative values and a proposal for "eco-label" for EIIs goods (based on energy or CO2 impacts) will be produced upon revision and agreement with the EIIs sector.

A Collaborative Network will be grown, and several Panels will be populated as top-notch advisory bodies for the project. The multi-actor strategy involves multiple mechanisms of engagement and participation, and it is a key to identify real solutions and pathways for adopting RE by EIIs, including entrepreneurial elements, adjustments to the economic, regulatory and policy framework, or social perspectives that support RE adoption.

The development of favourable policy, market support and financial frameworks will play a crucial role. RE4Industry will provide direct recommendations and guidelines to policy makers both at EU and national level with the objective of supporting the uptake of RE in the industries under their jurisdiction. Different actions with decision makers to transfer the main highlights will empower the key stakeholders, creating a breeding ground to extend the vision and recommendations developed in RE4Industry to new consumers.

Finally, and as a consequence of the previous impact, policy recommendations will contain indications on effective support schemes that shall trigger the adoption and investment of EIIs in RE. EIIs are bound to become new consumers of vast amounts of RE, and financing through PPAs (Power Purchase Agreements) is an alternative that will be explored in the action plans of the coached industries and discussed in some dedicated events organised by the project. As a result, RE4Industry will provide financing schemes to promote the adoption and investment of EIIs in RE.

Despite the fact that RE4Industry will addressed multiple actions in the short term along the project life-time, medium- and short-term impacts are also expected. Project actions are shaped for this purpose, especially as a result of (i) the awareness raised; (ii) the actors already positioned through the collaborative network; (iii) the replication and multiplicative actions; (iv) the expected effects deriving in a better framework. Table II summarises some of the impacts detected beforehand.

RE4Industry impacts are aligned with the EC targets on renewable energy share for 2030 and 2050. Taking into account that the current RE share is around 18% [4] and the emissions linked to the fuel combustion for heating represents a 40% of the total industrial plants' emissions, the contribution from RE4Industry will have a major environmental impact on the industrial sector as well as an economic impact on the RE technology providers. In particular, RE4Industry vision expect to reach a 37% of RE share in EIIs by 2030, thus exceeding the 32% target set by the EC. This will pave the way to increase annually in at least a 3.15% the share of RE from 2030 to 2050, thus enabling the consecution of a carbon neutral economy by 2050.

Table II: Summary of RE4Industry impacts paving the way for the wider uptake of its results until 2050

Action field	Long-term impact
Energy	A 3.15% annual increase in the share of RE in the period from 2030 to 2050. 1.8 Mtoe non-RE reduction by 2030 through more RE heating and power use at EII sector. Reaching a 37% of renewable energy share by 2030 in the EEI sector.
Policies	EIIs pointed as RE consumers in the National Energy and Climate plans by 2023 in 12 member states. RE4Industry recommendations will be tested and adopted in 12 out of 28 EU countries
Social	General EU citizen acceptance and acknowledgement of EIIs as RE promoters (>50% surveys) Creation of approximately 8000 new jobs (direct and indirect) considering installers, technicians, manufacturers, biomass supply chain and considering the competitiveness increasing of EIIs [1].
Economy/ market	EII quota in RE consumption of more than 25% of RE consumed in Europe. Increasing 8% annual turnover of RE4Industry Case Studies. An energy label for EII goods in use by at least 25% of the European EII goods production
Environment	Savings of 340 and 950 Mt CO_2 eq by 2030 and 2050. Reduction of EIIs pollutants (SO_2/SO_x, NO_x, NMVOCs and NH_3) related to Energy to 20% by 2030 and 75% by 2050.

4 FINAL REMARKS

RE4Industry will approach the challenge of the EIIs decarbonisation from different perspectives, which will allow to define and establish a clear strategy to achieve this great goal in the short and long term. In addition to the technological review for current and future RE solutions, and also the sector status overview, the core of the RE4Industry approach relies on the engagement and interaction with a wide number of stakeholders, providing an internal sectoral vision, stakeholders connection and knowledge transfer, triggering the project impacts.

The mobilization of the Collaborative Network and its stakeholders will be part of a wider multiplication and replication strategy. This Network will allow to maximise the impacts of the project outputs in terms of its dissemination to relevant stakeholders including society, industry, technology providers or authorities. The Collaborative Network will be very relevant to promote the visualization of key project results, so as to spread its outcomes. They will play a key role on the definition of the exploitation strategy and business plan, ensuring an effective uptake of the project main results, according to the market conditions.

5 REFERENCES

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7 LOGO SPACE