



# SUNER-C

**Deliverable 7.1:** Prioritised scenarios and related HE instruments for a SUNER-C LSRI





## Table 1

Project Summary	
<b>Project Number</b>	101058481
<b>Project Acronym</b>	SUNER-C
<b>Project Name</b>	SUNER-C: SUNERGY Community and eco-system for accelerating the development of solar fuels and chemicals
<b>Starting date</b>	01/06/2022
<b>Duration in months</b>	36
<b>Call identifier (part)</b>	HORIZON-CL4-2021-RESILIENCE-01
<b>Topic</b>	HORIZON-CL4-2021-RESILIENCE-01-16
<b>Type of action</b>	HORIZON-CSA (Coordination and Support Actions)
<b>Service</b>	HADEA/B/03

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**Table 2**

<b>Management Information</b>	
<b>Final version</b>	28 September 2023
<b>WP</b>	7 – Large Scale Research Initiative beyond the CSA
<b>Lead and co-lead beneficiaries</b>	COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES (2-CEA) & UNIVERSITEIT UTRECHT (1-UU)
<b>Dissemination Level</b>	Public
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<b>Deliverable Number</b>	D7.1
<b>Deliverable Name</b>	Prioritised scenarios and related HE instruments for a SUNER-C LSRI
<b>Reviewers</b>	Project Coordination Team (UU, CEA, CVE & ICIQ) & SUNER-C Quality and Impact Assurance (Q&IA) Board
<b>Abstract</b>	This report outlines prioritized scenarios and related HE instruments for a Large Scale Research Initiative to be launched at the end of the SUNER-C CSA (06/2022 → 05/2025). It details concrete propositions and advocacy actions undertaken in this sense with different stakeholders, European Commission and Member States.



**Table 3**

Document History			
Version	Date	Responsible	Action
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Draft 2	31 August	Nathan Coutard	First revision of sections 1 and 3
Draft 3	28 September	Frédéric Chandezon	First version finalized
Draft 4			
Draft 5			
Final version			



## Table 4

### Consortium Information

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**Beneficiaries:**

2. COMMISSARIAT A L'ENERGIE ATOMIQUE ET AUX ENERGIES ALTERNATIVES (CEA)
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4. UNIVERSITEIT GENT (GU)
5. UNIVERSITEIT LEIDEN (LU)
6. UNIWERSYTET WARSZAWSKI (UW)
7. FUNDACIO PRIVADA INSTITUT CATALA D'INVESTIGACIO QUIMICA (ICIQ)
8. SIEMENS ENERGY GLOBAL GMBH & CO. KG (SE)
9. DECHEMA GESELLSCHAFT FUR CHEMISCHETECHNIK UND BIOTECHNOLOGIE (DECH)
10. FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV (Fraunhofer)
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14. UPPSALA UNIVERSITET (UppU)
15. COVESTRO DEUTSCHLAND AG (COV)
16. CO2 VALUE EUROPE AISBL (CVE)
17. FUNDACION IMDEA ENERGIA (IME)
18. ALMA DIGIT SRL (AD)
19. INTERUNIVERSITAIR MICRO-ELECTRONICA CENTRUM (IMEC)
20. AVANTIUM CHEMICALS BV (AVT)
21. ALLIANCE EUROPEENNE DE RECHERCHE DANS LE DOMAINE DE L'ENERGIE (EERA)
22. SYNERGEIES STIN EPISTIMI KAI TECHNOLOGIA-SYNEST IDIOTIKI KEFALAIOUCHIKI ETAIREIA (SYN)
23. UNIVERSITATEA DIN BUCURESTI (UB)
24. ARCELORMITTAL BELGIUM NV (AM)
25. VICAT (VIC)
26. BELGISCH LABORATORIUM VAN ELEKTRICITEITSINDUSTRIE (ENGIE-LAB)
27. ENGIE (ENGIE) – **Affiliate Entity**
28. RHODIA OPERATIONS (SOLVAY)
29. BOND BETER LEEFMILIEU VLAANDEREN (BBL)
30. TOTALENERGIES ONE TECH BELGIUM (TEOTB) -- **Associated Partner**





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## Executive summary

This document, D7.1 Prioritised scenarios and related HE instruments for a SUNER-C LSRI, is a deliverable of the SUNER-C project, which is funded by the European Union's Horizon Europe under Grant Agreement No 101058481. The document outlines the work done in the frame of **Task 7.1** "*Develop scenarios and identify instruments for a SUNER-C LSRI*". The task aimed at exploring opportunities and building scenarios for a LSRI beyond the CSA including: (i) Existing instruments in Horizon Europe (HE) for LSRI (partnerships, etc.); (ii) Analyze the landscape of LSRI in the field of renewable energy sources and the complementarity and added value of a SUNER-C LSRI; (iii) Synergy and benefits that a SUNER-C LSRI could bring to existing national and regional programs.

Taking into account the landscape of existing and planned European partnerships, the topic of sustainable fuels (SFs *i.e.* synthetic renewable fuels and advanced fuels) was identified as a gap in this landscape. There is currently no European partnership dedicated to SFs to coordinate scattered initiatives and efforts. A co-programmed public-private partnership proposition on SFs in cluster 5 was thus made to the EC and MS in the frame of the discussions for the second wave of European partnerships of Horizon Europe (see section 3.2 and Annex. 6.2).. This proposal was endorsed by industrial and academic stakeholders from different EU countries and by several MS delegates.

Besides SUNERGY/SUNER-C, the SFs partnership proposal could also build on other platforms, including **CO<sub>2</sub> Value Europe** (industry-driven initiative) which represents the European Carbon Capture and Utilisation (CCU) community and the **European Energy Research Alliance** (especially the Joint Programme on Bioenergy), both members of SUNER C. Other initiatives strongly related to SFs are the **Renewable and Low-Carbon Fuels Value Chain Industrial Alliance**, the **eFuel Alliance**, the **Alliance for Zero Emissions Aviation**, the **European Technology Innovation Platform (ETIP) Bioenergy** (on biofuels), the **European Waste-based & Advanced Biofuels Association** and **Bioenergy Europe**. There are already contacts with some of those initiatives and others will be contacted shortly to discuss cooperation, given a SFs candidate partnership.

A SFs partnership could moreover build links and synergies with other existing European partnerships: **Processes4Planet**, **Clean Hydrogen**, **Clean Aviation**, **Clean Energy Technology Partnership** and **Circular Bio-based Europe**. Synergies could also be built with other partnerships, including **Key Digital Technologies**, **Clean Steel**, **Zero-emission Waterborne Transport**, **Water4All** as well as in Pillar 3, with the EITs **InnoEnergy**, **Climate-KIC** and **Urban Mobility**. In relation to candidate partnerships, synergies could be built in particular with the partnerships on materials (**I'M for EU**), the **Raw Materials for the Green and Digital**





**Transition** and the **Solar Photovoltaics**. The SUNERGY European initiative, as one of the initiators of the SFs partnership proposal, participates in an ongoing dialogue with a number of these partnerships to discuss possible collaboration.

A sustainable fuels partnership would not fully cover the scope of the SUNER-C CSA on solar fuels and chemicals, chemicals being covered by the European partnerships **Processes4Planet** and **Circular Bio-based Europe**. In order to keep the momentum on solar fuels and chemicals, SUNERGY could exist as a sub-structure of the SFs partnership, focusing on forward looking prospective related to solar fuels and chemicals, with the support of new follow-up CSAs and dedicated topics in the work programmes of Horizon Europe and the next framework programme.

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## List of abbreviations

List of abbreviations	
<b>AISBL</b>	Association Internationale Sans But Lucratif (in english, international association without lucrative purpose)
<b>CSA</b>	Coordination and Support Actions
<b>C&amp;D</b>	Communication and Dissemination
<b>D</b>	Deliverable
<b>EC</b>	European Commission
<b>HE</b>	Horizon Europe
<b>KPIs</b>	Key Performance Indicators
<b>LSRI</b>	Large-Scale Research and Innovation Initiative
<b>LoS</b>	Letter of Support





<b>MS</b>	Member State
<b>RFNBO</b>	Renewable Fuel of Non Biological Origin
<b>RMP</b>	Risk Management Report
<b>RTOS</b>	Research and Technology Organisations
<b>R&amp;D</b>	Research and Development
<b>R&amp;I</b>	Research and Innovation
<b>SF</b>	Sustainable Fuels
<b>SMEs</b>	Small and Medium-Sized Enterprises
<b>SRIA</b>	Strategic Research and Innovation Agenda
<b>WP</b>	Work Package

# 1 | Introduction

## 1.1. SUNER-C in short

SUNER-C is a project that has received funding from the European Union’s Horizon Europe research and innovation programme under grant agreement No 101058481. The project has officially started on 1 June 2022 and will last 36 months. Under the umbrella of the SUNERGY pan-European initiative, the SUNER-C programme entitled “SUNERGY Community and eco-system for accelerating the development of solar fuels and chemicals” will strengthen the solar fuels and chemicals community within Europe. The European Union has awarded 4 M€ to this project.

The SUNER-C consortium is a unique and balanced partnership of 30 organisations (including one affiliate and one associate partner), bringing together a large diversity of partners, expertise, fields, and representatives of all the EU regions. The consortium consists of 13 academic partners (UU, CEA,





GU, LU, UW, ICIQ, Fraunhofer, UTU, HIPC, UppU, IME, IMEC, UB), 12 industrial companies (SE, CAR, COV, AD, AVT, SYN, AM, TEOTB, VIC, ENGIE-Lab, ENGIE, SOLVAY), 4 network organizations and federations (ERIC, DECH, CVE, EERA), and 1 Non-Governmental Organization (BBL).

The overarching objective of the SUNER-C project is to create an inclusive innovation community and eco-system that builds on the current SUNERGY network and includes new stakeholders across Europe. Bringing together fundamental and applied knowledge from various sectors of society as well as often unique resources, the enhanced community will prepare a Large-Scale Research and Innovation initiative (LSRI) beyond the CSA, as a partnership or another instrument to be discussed and agreed upon with the Commission and the Member States and Associated Countries. The goal is to overcome scientific, technological, organizational, and socio-economic challenges, accelerate innovation in solar fuels and chemicals, and enable the transition of existing and future technologies from laboratory and demonstrator levels to large-scale industrial and broad societal applications.

The SUNER-C consortium will also work on the development of a strategic roadmap towards the broad implementation of solar fuels and chemicals, with supporting strategies for innovation and exploitation, and a firm focus on crosscutting and socio-technical aspects.

Through a holistic approach, SUNER-C will contribute to a circular economy by replacing fossil-derived fuels and chemicals with renewables and carbon recycling as a key element toward the EU net-zero emissions target by 2050. SUNER-C will build upon the work of SUNERGY, a pan-European initiative on fossil-free fuels and chemicals from renewable power and solar energy, with currently over 300 supporting organizations across and beyond Europe to date.

In Figure 1 is represented an overview of the work package structure of SUNER-C with its eight WPs. The deliverable D7.1 "LSRI Report" is a deliverable of WP7 "Large Scale Research Initiative beyond the CSA". More precisely, it outlines the work done in the frame of **Task 7.1** "*Develop scenarios and identify instruments for a SUNER-C LSRI*".

Please see here <https://sunergy-initiative.eu/suner-c/> for more information.





**Figure 1:** SUNER-C CSA project and its eight work packages. The “Prioritised scenarios and related HE instruments for a SUNER-C LSRI Report (D7.1)” is a deliverable of WP7 “Large-scale R&I initiative beyond the CSA”

## 1.2. Purpose and structure of the deliverable

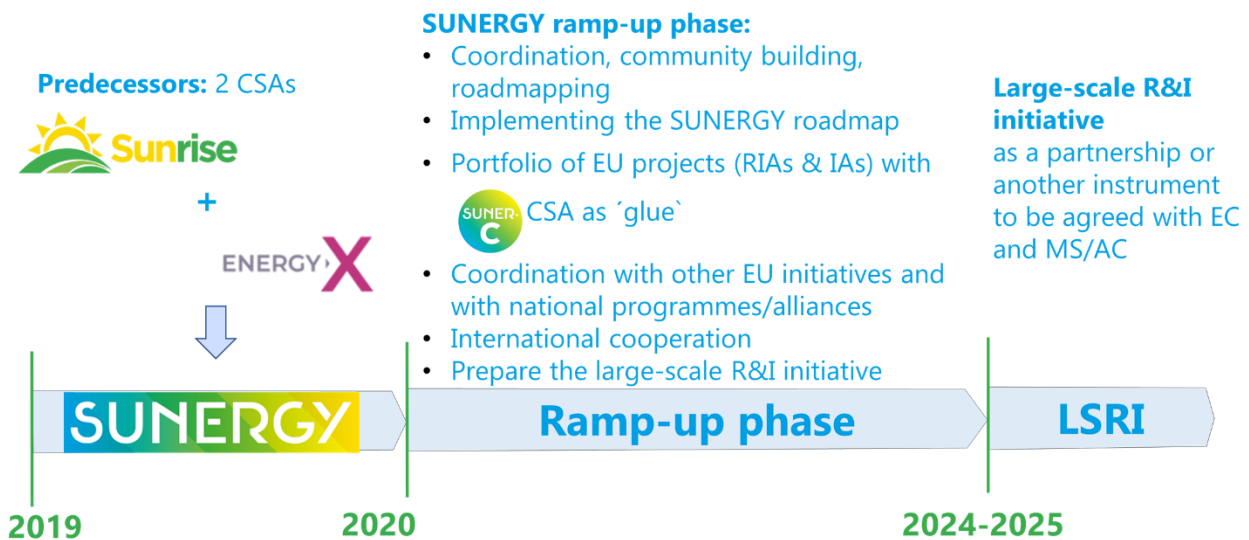
The present document outlines the actions realized, ongoing and planned as part of **Task 7.1** to explore opportunities to perpetuate this initiative by identifying scenarios to address the following point of the scope of topic **HORIZON-CL4-2021-RESILIENCE-01-16**<sup>1</sup> under which SUNER-C was funded: “Preparing a large-scale research and innovation initiative beyond the CSA, as a partnership or another instrument to be discussed and agreed upon with the Commission and the Member States and Associated countries”.

<sup>1</sup> **HORIZON-CL4-2021-RESILIENCE-01-16:** Creation of an innovation community for solar fuels and chemicals (CSA)



**Task 7.1** of SUNER-C is thus dedicated to preparing a European large-scale research and innovation initiative (LSRI) beyond the CSA (which ends in May 2025), building upon the outcomes of SUNER-C and ensuring the long-term sustainability and impact of the project. Since the beginning of SUNER-C, the elements to launch the LSRI at the end of the CSA have been put in place, with a continuous dialogue with the European Commission, several Member States and with the support and advisement of the scientific, industrial and societal stakeholders. Specific attention has been paid to the industrial engagement and commitment to the LSRI and to seeking concrete input from the industry in preparing the LSRI, e.g. by encouraging participation of industrial stakeholders in workshops, seeking advice and support from industry members and through dedicated campaigns for letters of support from the industrial sector in order to make the industry support explicit to Member States. The involvement of partners for the definition of input has been ensured through workshops and meetings as detailed in the next section. This was complemented through various meetings and advocacy interventions with national and EU representatives.

The envisioned timeline for SUNERGY and for this LSRI is displayed in **Figure 2**. The period covered by the SUNER-C project corresponds to the so-called ramp-up phase (06/2022 → 05/2025). The targeted large-scale R&I initiative is targeted to begin in 2025.



**Figure 2:** SUNERGY and SUNER-C tentative timeline with its different phases. The project is currently in the so-called ramp-up phase

# 2 | Building and implementing scenarios for a LSRI beyond the SUNER-C CSA

## 2.1. Online workshops on scenarios for a SUNER-C LSRI

In order to discuss within the SUNER-C consortium on possible scenarios for a large-scale European research and innovation initiative beyond the CSA, including opportunities and suitable instruments in Horizon Europe (e.g. European partnerships or Missions), a dedicated workshop was organized for that. The workshop was open to all consortium partners, thus representing a panel of European industry, academic partners and societal stakeholders.

### 2.1.1 Organization, methodology and main facts

The workshops were co-organized by CEA and Utrecht University, the two co-leads of Task 7.1. The co-organizers were:

- CEA: Frédéric Chandezon, Sylvain Nizou, Nicolas Augé, Nathalie Herlin, Karim Sidi Ali Cherif;
- Utrecht University: Nathan Coutard and Elena Guarneri.

In order to ensure the maximum participation of participants from the consortium partners, two online similar sessions were held on respectively 23 November and 7 December 2023. In total, there were 45 attendees to the two online sessions, representing 28 consortium partners (for a total of 30). Additionally, two members for the International Advisory Board of SUNER-C (Philippe Jacques, EMIRI and Martin Roeb DLR) also joined the sessions and discussions and shared their views. The consortium partners who were not available at the time of the sessions had the possibility to contribute off-line as they received all information and material and the consultation was open for several weeks beyond the sessions. The online tool used to collect the contributions from participants as “post it notes” was the Klaxoon virtual board<sup>2</sup>.

Each of the two sessions lasted around 1 H 30 and was organized with the following three sequences:

- Sequence 1 (approx. 20 min, with supporting slides): to set the scene and report on the conclusions from the WP7 session during the SUNER-C kick-off meeting (27-29 September 2022);
- Sequence 2 (approx. 40 min): working session where suggestions and views from participants were collected as post-it notes;

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<sup>2</sup> Klaxoon : Visual collaborative platform for today's teamwork





- Sequence 3 (approx. 30 min): session to share and cluster ideas and suggestions, to draw out first conclusions and more elaborate scenarios.

The sequence 2 was the key one during which the participants were invited to contribute under 3 scenarios which were used as starting points. These scenarios were prepared based on a preliminary discussion during a dedicated WP7 break-out session held as part of the SUNER-C kick-off meeting (27-29 September 2022). Those three starting point scenarios were:

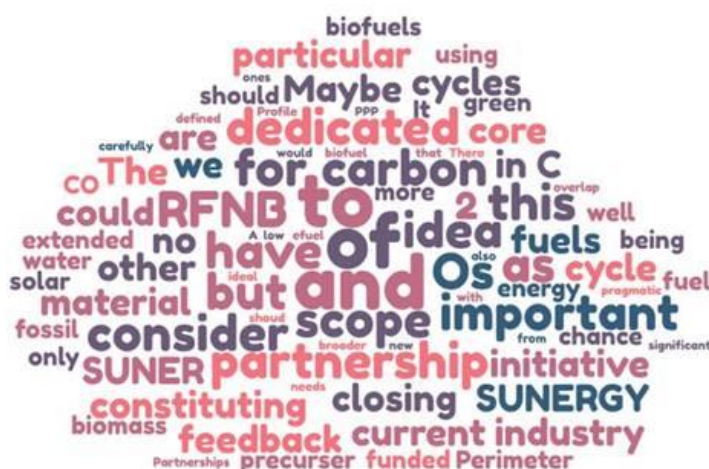
- **Scenario option 1**: having a SUNERGY/SUNER-C dedicated large-scale European research and innovation initiative (e.g. European partnership, mission);
- **Scenario option 2**: SUNERGY/SUNER-C becomes part of existing European initiatives and partnerships;
- **Scenario option 3**: Other options in the context of the preparation of Horizon Europe 2025-2027 strategic planning.

These three different scenarios include various aspects such as the scenario's timeline, what TRL range to be covered, how to build support from stakeholders, European Commission and Member States, etc.

During the last sequence of each session, a first analysis was done by commenting and clustering the contributions and ideas in groups and finally to draw-out first preliminary conclusions. The Klaxoon board was kept open during a few weeks after the sessions so that participants and those who were unavailable for the two sessions could further contribute, with ideas and comments on contributions from other participants. The contributions of all participants for the two sessions is displayed with screenshots of the Klaxoon board in section 6, Annexe 1. All these contributions were further analysed to draw-out updated scenarios, as described in the next section of this document.

## 2.1.2 Outcomes of the scenarios online workshops

A first general overview of the contributions expressed by the participants to the workshops can be done by building a cloud of the most expressed keywords, see Figure 3. The words *RFNB*, *Carbon*, *materials*, *fuels*, *dedicated*, *partnership* and *industry* are amongst the most expressed.



**Figure 3:** Cloud of words

The feedback in terms of the different scenarios discussed is presented below.

*i) Scenario option 1: having a SUNERGY/SUNER-C dedicated LSRI*

This scenario is the one which raised most interest and received the largest number of contributions: 29 contributions on 23 November and 23 contributions on 7 December. The partners expressed their interest for a co-programmed public-private partnership (either connected to clusters 4 or 5). Even if a dedicated partnership would be ideal a pragmatic approach, the profile of this new partnership should be clearly defined and carefully differentiated from existing ones. The participants insisted that SUNERGY should bring a unified vision needed to guide on high impact topic, fossil-free fuels and chemicals. Fragmented projects cannot deliver this vision and would lead renewable fuels and chemicals into different directions missing the synergies these two aspects.

The participants expressed a balanced opinion regarding the content of the initiative in particular regarding biofuels. The “RFNBO” (Renewable Fuel of Non Biological Origin) scope appears too large and “direct solar fuels” too narrow ( as it excludes e-fuels). However, renewable fuels might be too large The question was also raised question whether LCFNBO (Low-Carbon Fuels of Non Biological Origin) should be considered in the scope a dedicated partnership.

Several participants include 4<sup>th</sup> gen biofuels from photosynthetic microorganisms, not from biomass but direct fuel production from the photosynthetic process and propose a terminology “fuels from microbial cell factories” and note that the fuels and chemicals from genetically modified photosynthetic microorganisms is already part of SUNERGY. In the European terminology, 4<sup>th</sup> generation biofuels are considered as RFNBOs. Several participants pointed that biofuels from biomass cannot be sustainable at scale because 1) of competition with other agricultural products, and 2) other sustainability goals such as biological diversity. In a co-programmed partnership, does it make sense on an industrial point of view to include also biofuels? From a societal point of view, the meaning of “technology neutral” must be clarified. It appears that technology is not neutral and (not) making choices between them is also not neutral.





About terminology, it is noted that “renewable fuels and chemicals” or “non-fossil fuels and chemicals” terms can be used in addition to solar fuels and chemicals. In this way of thinking, partners note that Tech neutral & comparison of techs to RFNBO is very important. SUNERGY should be impartial and suggest and follow the most competitive technologies for RFNBOs in order to maximize impact!

There is good agreement between participants that closing the C-cycle must remain at the core of the initiative based on chemical materials, fuel, energy that could only be covered in a new initiative with a wide TRL range, including emerging routes at currently low TRL. Building synergies and complementarities with other ongoing partnerships in particular P4P (Processes4Planet) appears necessary to most participants of the workshops. They also see possible synergies with the Clean Hydrogen partnership and eco-system but with emphasis on C-based chemicals in a SUNERGY dedicated proposal with hydrogen being considered as a platform molecule. A dedicated SUNERGY partnership could be linked to either Cluster 4 (regarding chemicals) or Cluster 5 (regarding fuels): this is problematic and the choice of which cluster to belong must be done carefully taking into account that a cross-cluster partnership is not feasible, as indicated during discussions with EC representatives. It could be interesting to check initiatives recently launched (sept 2022) such as the planned Biomethane Industrial Partnership<sup>3</sup>.

Anyway, as there won't be many new partnerships funded by the EC in the second wave of European partnerships of Horizon Europe, the scope of a SUNERGY proposition should be well considered in particular in line with the strategic plan of the framework programme. In parallel, the participants emphasize that it is necessary to establish connections with relevant other EU Partnerships and Missions and approach EC & MS in the frame of the preparation of the HE 2025-2027 strategic planning to continue proposing topics relevant to SUNERGY and SUNER-C.

*ii) **Scenario option 2:** SUNERGY/SUNER-C becomes part of existing European initiatives and partnerships*

This option also received many comments: 28 contributions on 23 November and 11 ones during the 7 December session. The participants pointed to the complementarities and overlaps of SUNERGY with some existing European partnerships, including the Processes4Planet, Clean Hydrogen and the Circular Bio-based Europe (CBE) partnerships, the AMI2030 Materials initiative and the planned solar photovoltaic partnership and the Solar PV industry Alliance (an outcome of the EU Solar Energy strategy<sup>4</sup> published in 2022). On the positive side, they noted that it is good to merge ideas from existing platforms, and that seeking synergies can broaden the scope and help to stay tech neutral and that building synergies could limit competition on similar topics. Considering

<sup>3</sup> Biomethane Industrial Partnership: [https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomethane\\_en](https://energy.ec.europa.eu/topics/renewable-energy/bioenergy/biomethane_en)

<sup>4</sup> EU Solar Energy Strategy : <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2022%3A221%3AFIN&qid=1653034500503>





that the possibility to have a dedicated partnership is not yet ensured, participants suggest that a good option is to initiate in parallel a dialogue with existing partnerships, P4P and hydrogen, and then see what works in the end (or not).

However partners point out the risk of fragmentation thus limiting impact. In the same way, they identify a strong risk to lose part of SUNERGY scope. Moreover, other partnerships have an established structure and already a multi-annual budget plan. Whether a "newcomer" would impact on the orientations in these ongoing partnerships is an open question, raised by several participants.

*iii) **Scenario option 3:** Other options in the context of the preparation of Horizon Europe 2025-2027 strategic planning.*

This option was the one who received the less contributions: 11 on 23 November and 7 on 7 December, thus reflecting the lesser interest for this scenario. If it is not possible to have a dedicated partnership or join existing ones, then SUNERGY/SUNER-C partners should think what the SUNERGY initiative wants to be in the future, whether it makes sense to keep existing as a kind of "think tank" initiative or just disappear.

Some partners note that in the past, such approaches like networks of excellence (NoE) did not turn out very effective and did not survive more than one framework programme. SUNERGY and SUNER-C could learn from those NoE experiences. However, NoE projects were not strictly be considered as a research project, since their goal was not to conduct research, but rather to contribute to the clarification of the concepts in the covered field. Outside Europe, there are examples of successful programmes and innovative tools, *e.g.* successful DoE programs in the US. But they make specific calls and fund research networks which is a very different approach.

Several participants consider as a back-up plan a COST action. However, others pointed that COST actions only funds networking actions with a limited budget and it should be complemented by other funds for collaborative projects. Moreover, if COST actions are great for creating community/events/discussion forums or meetings as well as short stays, they mean probably a more academic oriented network.

Another suggestion was whether a follow-up CSA to SUNER-C (which ends in mid-2025) would be possible in order to wait for a new instrument of EU or a dedicated partnership starting during the next framework programme FP10. A possibility would be another but larger CSA that could make sense in view of EC/MS budget limitations and timeline (difficult to have a new partnership starting in 2025) and while preparing a LSRI for the upcoming FP (beginning in 2028), but there is the risk to fall into another transition and lose momentum. There is an example of a very large scale CSA that coordinates national geological surveys at the EU scale, but the funding is not of a scale that could significantly impact R&I in our field. Also CSA funding is for networking and not for collaborative projects, thus it needs to be complemented by topics in the work programmes of the ongoing framework programme.





Joining the SET plan and the implementation working group on “renewable fuels and bioenergy” was also mentioned as a relevant channel to advocate for SUNERGY & SUNER-C priorities in the European agendas.

ERANET-likes approach for a transnational funding scheme with the EU co-funded partnerships were also mentioned. One example is the Clean Energy Technology Partnership, a Public-public European partnership with has a very broad scope as it covers all the R&I aspects relevant to the energy transition. The main objective of a co-funded public-public partnership is to align the agendas of EU and MS and it is a rather complex instrument and industry is little involved. Anyway, the relevancy of connecting with the CET partnership was mentioned by several participants.

During the discussion, the possibility that the EC launches a new instrument adapted to SUNERGY was also mentioned. However, creating a new instrument calls from strong support from the EC and MS. This option seems very hypothetical and would mean significant additional delay, unless there a new instrument that could fit the SUNERGY purposes in the pipeline. But we are not aware of anything in this sense.

### 2.1.3 Main conclusions of the online workshops

After analysing the feedback received during the workshops, it appears that option 1 "*Dedicated SUNERGY-SUNER-C European partnership*" is the preferred option. Below are the key points retained from the feedback received during the online workshops, option by option.

- **Scenario option 1:** *Dedicated SUNERGY/SUNER-C European partnership:*

➤ **Scope of the partnership:**

- Most participants agreed that the scope cannot be limited to direct solar fuels and chemicals (*i.e.* artificial photosynthesis production route) but should clearly include e-fuels (indirect routes). Concerns were raised by some about including biofuels
- Biofuels (1G, 2G) are out of scope for most participants but advanced biofuels and fuels using biology as a tool (e.g. using cell factories and sometimes referred to as 4G biofuels) are considered to be part of the scope.

➤ **Type of European partnership:** the partnership should allow both participation of public and private stakeholders. This points to a co-programmed European public-private partnership as the most adapted instrument.

➤ **Specificity of SUNER-C based partnership and synergies with existing partnerships and European initiatives:** all participants raised the importance of building an identity for such partnership to complement the existing landscape of partnerships and European initiatives



- **Scenario option 2:** *SUNERGY/SUNER-C as part of other EU partnerships and Horizon Europe Work Programmes*

In terms of feedback received, some considered this option as a pragmatic approach and others as a plan B. All agreed that whatever the solution, synergies and connections with other relevant partnerships must be built.

➤ **Advantages of such option:**

- Federating aspects & creating synergies between existing partnerships and initiatives;
- It does not necessarily impede having a dedicated action later (e.g. during the next European Union framework programme for research and innovation FP10);
- Could allow to start without delay (*i.e.* not waiting 2025).

➤ **Drawbacks:**

- There is a high risk of being diluted and cornered in existing and funded partnerships, initiatives and platforms;
- There is a risk of little or even no impact if there is no additional budget to the partnerships or initiatives SUNERGY/SUNER-C would join.

- **Scenario option 3:** *“Bluesky” option*

On this option, no alternative clear option emerged although some suggestions were made:

- Implement a “delayed option 1”, *i.e.* having a dedicated partnership in FP10 - the next European Union's framework programme for research and innovation - with another follow-up CSA to bridge until FP10 and the partnership and keep the community together, extending thus somehow the ramp-up phase (Figure 2) up to 2028;
- Rely on a new instrument adapted to be implemented by EC, e.g. as a FET Flagship revisited. Nevertheless this seems an highly hypothetical option.
- Applying for a COST action was also mentioned, but it means a much smaller scale and mostly academic scheme and it means probably losing the impetus and most of the (industrial) community of SUNERGY.

All in all, this option, did not raise much interest and feedback, the only notable exception being the “delayed option 1”.





## 2.2. Follow-up of the online scenarios workshops:

A dedicated plenary session entitled "Beyond the SUNER-C CSA: scenarios for a large scale R&I initiative - Follow up of the "scenarios" workshop Frédéric Chandezon, WP7, Task 7.1" was held during the 2nd SUNER-C consortium meeting (15-16 February 2023, Brussels, see the following [link](#) on the SUNER-C website). On this occasion, the analysis of the contributions received during the scenarios online workshops as well as a new proposal for prioritised scenarios was presented to the participants. A discussion on this analysis and these new proposals then took place.

Here are the revisited scenarios which were presented and discussed during that dedicated session at the 2<sup>nd</sup> Consortium meeting.

- **Scenario option 1 revisited** : dedicated co-programmed public-private partnership taking into account boundary limits due to the existing landscape of existing large European partnerships and initiatives and the priorities for the strategic planning of Horizon Europe 2025-2027
  - Pillar 2/cluster 5 (Climate, Energy and Mobility) as the topic of synthetic renewable fuels (or RFNBOs) and advanced biofuels is identified as a gap in the strategic planning of HE 2025-2027 for this cluster;
  - Build connections and synergies with other relevant partnerships (P4P, Clean H<sub>2</sub>, CETP, ...) in particular with P4P for the chemicals aspects
  - Advantages: build synergies and limit overlap with P4P (cluster 4) which has the closest connections with this tentative new partnership

To implement this scenario, here are the actions to be implemented which were identified:

- Build support from EC & MS in the frame of the preparation of the HE 2025-2027 Strategic Planning: importance of SUNERGY/SUNER-C national stakeholder events;
  - Build connections and synergies with other relevant partnerships (P4P, Clean H<sub>2</sub>, CETP, ...);
  - Get support from industrial stakeholders;
  - Mapping of the new partnership in the existing landscape.
- **Scenario option 2 revisited**: SUNERGY/SUNER-C as part of other EU Partnerships and HE WPs
    - Processes4Planet (P4P), Clean Hydrogen, Clean Energy Transition Partnership (CETP);
    - Materials 2030 Initiative (AMI 2030) (new partnership under cluster 4);
    - Complement the analysis by a mapping of existing and planned partnerships and other EU platforms (also related to option 1);
    - A model could be SUNERGY connecting those partnerships and initiatives on aspects related to synthetic renewable fuels (RFNBOs) and chemicals and eventually be supported by a dedicated CSA to limit (avoid) fragmentation.





This option can build on the work done for option and activated if option 1 fails *i.e.* if there is no possibility for a new related partnership in the strategic planning 2025-2027 of Horizon Europe.

These scenarios and related actions to implement then were discussed in the frame of a dedicated advocacy group within the SUNER-C consortium, which meets on a monthly basis. The actions to implement these scenarios are detailed in section in the next section of this document.



# 3 | Proposition of a co-programmed public-private European partnership as the preferred scenario

## 3.1. Introduction and context

Following the workshops and meetings, analyses and advocacy actions carried out to identify plausible scenarios for perpetuating solar fuels and chemicals R&I beyond the SUNER-C CSA (which ends in May 2025) detailed above, a 7-year, Horizon Europe-funded European partnership was identified as the most suitable instrument for carrying out a major R&D programme coordinated at the European level. Three different types of partnerships exist in HE: **co-funded**, **co-programmed** and **institutionalised**, each of them functioning under different types of governance and with varying rules and levels of involvement of public and private partners as well as Member States. In this case, the **co-programmed public-private partnership** instrument was identified as the most suitable: It is the simplest type of partnership to implement and a flexible instrument. It associates public and private partners – required here, as the SUNERGY community has an important contribution of industry – to the EC, Member States (MS) and Associated Countries (AC) via memoranda of understanding and/or contractual arrangements. Co-programmed partnerships follow a roadmap based on a Strategic R&I Agenda (SRIA). The SRIA of the SUNERGY initiative has been elaborated over the past 2 years in close collaboration with all relevant stakeholders and is now publicly available. In a co-programmed partnership, the contribution of the EU is implemented via open calls in the HE work programmes with propositions of topics based on the SRIA and a roadmap. The partners implement their commitments (*i.e.* activities and contributions) under their own responsibility, in particular the industrial partners. We found that the two other types of European partnerships – *i.e.* co-funded and institutionalized partnerships - would be less adapted to the SUNERGY initiative and community. Indeed, co-funded public-public partnerships are a mostly public-driven partnership involving MS, with research funders and other public authorities at the core of the consortium and a limited possibility of participation of industry. This would have obvious drawbacks, as SUNERGY proposes a systemic, pan-European industrial paradigm shift for the production of fuels and chemicals. Institutionalized partnerships allow the participation of private stakeholders, but it is a very binding and constraining instrument in terms of implementation as it requires legislative proposals from the EC and are based on a Council Regulation or a decision by the European Parliament and Council of the EU. It is an instrument typically implemented where other types of partnership would not prove sufficient to achieve the desired objectives and expected impacts.



We proposed a new European partnership in discussions regarding the Horizon Europe 2025-2027 strategic planning concerning the second wave of partnerships for this new phase of the Horizon-Europe framework programme. These discussions began in the second half of 2022 and lasted throughout 2023, with the aim of validating the 2025-2027 strategic planning in spring 2024. Those discussions, including those on new European partnerships, are addressed during the regular Horizon Europe strategic committee meetings, which brings together the EC with delegates from the MS, who explicit their positions on national priorities. New partnerships proposals must meet a certain number of selection criteria,<sup>5</sup> in particular to demonstrate that they will enable the achievement of the Work Programme's objectives and while fostering collaboration and avoiding redundancy with other existing (and proposed) partnerships and initiatives.

For defining the scope of the partnership to be proposed by SUNERGY/SUNER-C, two key aspects were considered:

- The current portfolio of existing EU partnerships in Horizon Europe (**Figure 3**);
- The priorities identified in the Horizon Europe strategic planning 2025-2027 analysis<sup>6</sup>.

An overview of the portfolio of EU partnerships is displayed in Figure 3. Currently, the chemical storage of energy **as commodity molecules for the chemical or fertilizers industries** is addressed by the Processes4Planet (Cluster 4) and Circular Bio-based Europe (Cluster 6) partnerships, in the latter case using bio-based and bio-sourced approaches. There is however at present no partnership addressing **chemical energy storage as molecular energy carriers, in particular as fuels for mobility applications**. This aspect is currently covered by individual calls for projects in the Cluster 5 work programmes under pillar 2 "Climate, energy and mobility" leading to scattered projects and efforts. Moreover, a recent gap analysis for Cluster 5 has identified a clear gap in a sovereign EU energy supply: "*Use of R & I to improve and upscale technologies using **advanced biofuels and synthetic renewable fuels** for made-in-Europe industrial manufacturing to avoid creating a new dependency on outside supply*"<sup>7</sup>. Phasing-out of fossil resources for fuels is mentioned several times in the same document.

Therefore having a consistent framework at EU to support R&I in the field effort of **sustainable fuels** – i.e. synthetic renewable fuels<sup>8</sup> and advanced biofuels<sup>9</sup>– appears necessary. At present, the EU does

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<sup>5</sup> Selection criteria for European partnerships, ERA LEARN

<sup>6</sup> Horizon Europe strategic planning 2025-2027 analysis, European Commission (2023).

<sup>7</sup> Horizon Europe strategic planning 2025-2027 analysis, European Commission (2023).

<sup>8</sup> **Synthetic renewable fuels** also called **Renewable Fuels of Non Biological Origin (RFNBOs)** in the EC terminology are liquid or gaseous fuels, the energy of which is derived from renewable sources other than biomass.

<sup>9</sup> **Advanced biofuels** are liquid or gaseous biofuels made from biomass feedstocks as listed in Part of Annex IX of REDII directive, including municipal waste, agricultural residues, biomass fraction of wastes and residues from forestry and forest-based industries, etc.





not have such a framework but rather scattered EU and national initiatives and projects. A **new EU public-private co-programmed partnership on sustainable fuels** - bringing together industry, research, societal stakeholders, EU and national decision makers -, would be an appropriate instrument to support a coordinated and systemic effort to accelerate progress, helping industry to continue investing in this field in Europe. It would complement existing EU partnerships and could build on existing European initiatives, including SUNERGY, CO<sub>2</sub> Value Europe, the Renewable and Low-Carbon Fuels Value Chain Industrial Alliance and the eFuel Alliance.

PILLAR II - Global challenges & European industrial competitiveness				PILLAR III - Innovative Europe	
Cluster 1: Health	Cluster 4: Digital, industry and space	Cluster 5: Climate, energy and mobility	Cluster 6: Food, bioeconomy, natural resources, agriculture and environment	EIT: The European Institute of Innovation and Technology	European innovation ecosystems
Innovative Health Initiative	Key Digital Technologies	Clean Hydrogen	Circular Bio-based Europe	EIT InnoEnergy	Innovative SMEs
Global Health EDCTP3	Smart Networks and Services	Clean Aviation	Biodiversa+	Climate-KIC	
Transformation of Health Care Systems	High Performance Computing	Single European Sky ATM Research 3	Blue Economy	EIT Digital	
Risk Assessment of Chemicals	European Metrology (Art. 185)	Europe's Rail	Water4All	EIT Food	
ERA for Health	AI-Data-Robotics	Connected, Cooperative and Automated Mobility	Animal Health and Welfare	EIT Health	
Rare Diseases	Photonics	Batteries	Accelerating Farming Systems Transitions	EIT Raw materials	
One-Health Antimicrobial Resistance	Made in Europe	Zero-emission Waterborne Transport	Agriculture of data	EIT Manufacturing	
Personalised Medicine	Clean Steel – Low-Carbon Steelmaking	Zero-emission Road Transport	Safe and Sustainable Food Systems	EIT Urban Mobility	
Pandemic Preparedness	Processes4Planet	Built4People		Cultural and Creative Sectors and Industries	
	Globally Competitive Space Systems	Clean Energy Transition			
		Driving Urban Transitions			
				<b>CROSS-PILLARS II and III</b>	
					European Open Science Cloud

**Figure 3:** Portfolio of EU partnerships. Source: Performance of European partnerships Biennial Monitoring Report (BMR), European Commission (2022).  
Color-code: ■ Institutionalised partnerships - ■ Co-programmed - ■ Co-funded

A proposition was thus submitted to the European Commission and the EU Members States in July 2023 in the frame of the ongoing discussions on the Horizon Europe Strategic Planning 2025-2027 including new partnerships. This proposition, following a template provided by the European Commission, is presented in the next section. It was completed by a short description of the fiche in two slides, which are provided in the Annexes of this document.

## 3.2. Text of the partnership proposition

<p>Based on the new policy approach and its selection criteria, as well as the overall proposed partnerships portfolio (existing and new candidates), are there additional priorities for which you propose that a European Partnership approach could be considered?</p>	<p><b>Yes:</b></p> <p style="text-align: center;"><b>European co-programmed public-private partnership on « Sustainable Fuels as Energy Carriers »</b></p>
<p><b>3.1 Short description:</b> Please provide a short description of the scope, the possible objectives and their relevance for Horizon Europe's expected impacts, the current state of play, and the type of partners you would consider necessary (private and/or public sector partners):</p>	<p>The partnership will engage industry, research &amp; societal stakeholders along the value chain, working with policy makers to support coordinated R&amp;I activities and investments, creating a <b>European innovation ecosystem on Sustainable Fuels (SFs)</b>, <i>i.e.</i> synthetic renewable fuels (RFNBOs) &amp; advanced biofuels. SFs are fossil-free high energy density carriers for storing/distributing renewable energy where other carbon-neutral solutions (<i>e.g.</i> electrification) are not (or not yet) adapted. SFs integrate with existing infrastructures in multisectoral applications from mobility (<i>e.g.</i> aviation, maritime) to hard-to-abate industrial sectors (<i>e.g.</i> cement, steel, chemicals). They play a key role in the EU energy transition towards a resilient circular economy, contribute to the EU climate, sustainability, sovereignty &amp; competitiveness goals. The partnership will accelerate SFs development and uptake, building on a critical mass of EU/MS projects, initiatives and platforms including SUNERGY.</p>
<p><b>3.3 Directionality:</b> Please explain the expected objectives and impacts of this proposal and their relevance for EU policy priorities.</p>	<p>The EU has a powerful R&amp;D landscape of industrial players, academia and NGOs active in the field of SFs but efforts are currently uncoordinated at EU level. The <b>RED III Directive</b> gives binding targets for the uptake of SFs in transport and industry: 5,5% (&gt; 1% advanced biofuels/biogas + RFNBOs) in transport and 42% of H<sub>2</sub> from RFNBOs for industry by 2030, 60% by 2035. Without an effective coordinated effort, these targets won't be met.</p> <p>The objectives of this proposal are:</p> <ul style="list-style-type: none"> <li>- Coordinate efforts for reducing costs across the whole value chain/TRLs by strengthening and synergising the EU R&amp;I;</li> <li>- Involve the EU R&amp;I and societal stakeholders in the co-creation and implementation of EU strategy;</li> <li>- Create continuity and synergy in actions between high and low TRL research and technology;</li> <li>- Make use of existing fuel manufacturing and distribution infrastructure to save costs and accelerate technology uptake;</li> <li>- Accelerate long-term disruptive routes, <i>e.g.</i> artificial photosynthesis, synthetic biology or bio-inspired/biomimetic approaches, microalgae-based biofuels;</li> <li>- Valorize technology and knowledge developed for SFs to manufacture other fossil-free energy vectors such as chemical building blocks;</li> <li>- Collaborate with complementary EU and MS initiatives and platforms;</li> </ul>

	<ul style="list-style-type: none"> <li>- Contribute to the ambitions of the EU Energy Union including the <b>Green Deal</b>, the <b>Clean Energy for All Europeans</b> and Fit for 55 packages, the <b>EU Circular Economy Action Plan</b>, the <b>SET-Plan</b>, the <b>Net Zero Industry Act</b> regulation proposal and the EU’s 2050 carbon neutrality strategy;</li> <li>- Contribute to <b>REPowerEU</b> and EU energy sovereignty goals by developing alternatives to imported fossil-resources;</li> <li>- Introduce societal impact as a driving factor for the selection of technologies;</li> <li>- Contribute to the harmonization EU/MS national market strategies/regulations in the field of SFs to prioritize key sectors;</li> <li>- - Support EU in creating stronger links with relevant international initiatives/platforms to catalyse global progress.</li> </ul>
<p><b>3.4 Additionality:</b> Please explain the EU added value of the proposed candidate.</p>	<p>The EU currently lacks <b>a consistent framework to coordinate R&amp;I and investments for SFs along the value chain and across multiple sectors</b>. A partnership will overcome this gap and capitalise on EU’s strong industrial and research expertise and accelerate progress towards EU targets.</p> <p>EU industry is investing several B€ in SFs: the <u>CCU Projects Database</u> identifies 69 ongoing or upcoming industrial projects for producing synthetic renewable fuel and chemicals in Europe. The 20 most advanced ones represent a production capacity of 750 kt/y of renewable fuels and chemicals by 2025, and more than 1500 kt/y by 2030. The main focus is the cost of indirect processes (<i>e.g.</i> e-fuels, fuels derived from thermochemical processes and Concentrated Solar Power). The EU and MS are also investing several hundred M€ in R&amp;I for the direct conversion of solar to chemical energy (<i>i.e.</i> artificial photosynthesis for direct solar fuels) towards a decentralized, resilient circular production. Ongoing R&amp;I and investments in Europe on advanced biofuels (2<sup>nd</sup> generation and the forward looking, promising 3<sup>rd</sup> generation microalgal biofuels) aim at improving efficiencies to minimize land use, and to integrate processes. Coordinating efforts between these actions, accelerating the information exchange across TRLs, and generating a rational, coherent exploitation path is necessary now to reap the benefits starting in 2030.</p> <p>Moreover, the technology and knowledge associated with SFs can be used to decarbonise the <b>manufacture of commodity chemicals</b>, another key aspect of a transition to a circular economy, in collaboration with the European partnerships <b>Processes4Planet</b> and the <b>Circular Bio-based Europe</b> on bio-sourced chemicals.</p> <p>A SFs partnership will solve the current fragmentation of activities and scattering of resources, help grow and retain skills and investments in the EU and support cooperation to achieve the objectives and tackle the challenges outlined in section <b>3.1</b>.</p>
<p><b>3.5 Coherence and synergies:</b> Please explain how this candidate will improve coherence and synergies within the EU R&amp;I landscape</p>	<p>There is currently no European private-public partnership dedicated to SFs that coordinates scattered initiatives and efforts. The <b>Clean Hydrogen</b> Partnership focuses on H<sub>2</sub>, which for some applications is a fuel and energy carrier and a key enabling molecule for the synthesis of higher energy density SFs – thus there is a clear complementarity between SFs and Clean Hydrogen as the synthesis of SFs will require hydrogen. SFs are also included in the Clean Energy Transition co-funded partnership along with many other clean energy technologies. But being a fully public partnership, it does not allow a strong participation of industry.</p> <p>Additional relevant Horizon Europe <b>partnerships</b> with complementarities and potential synergies with the SFs candidate partnership are: <b>Processes4Planet</b>, <b>Clean Hydrogen</b>, <b>Clean Aviation</b>, <b>Clean Energy Technology Partnership</b> and</p>

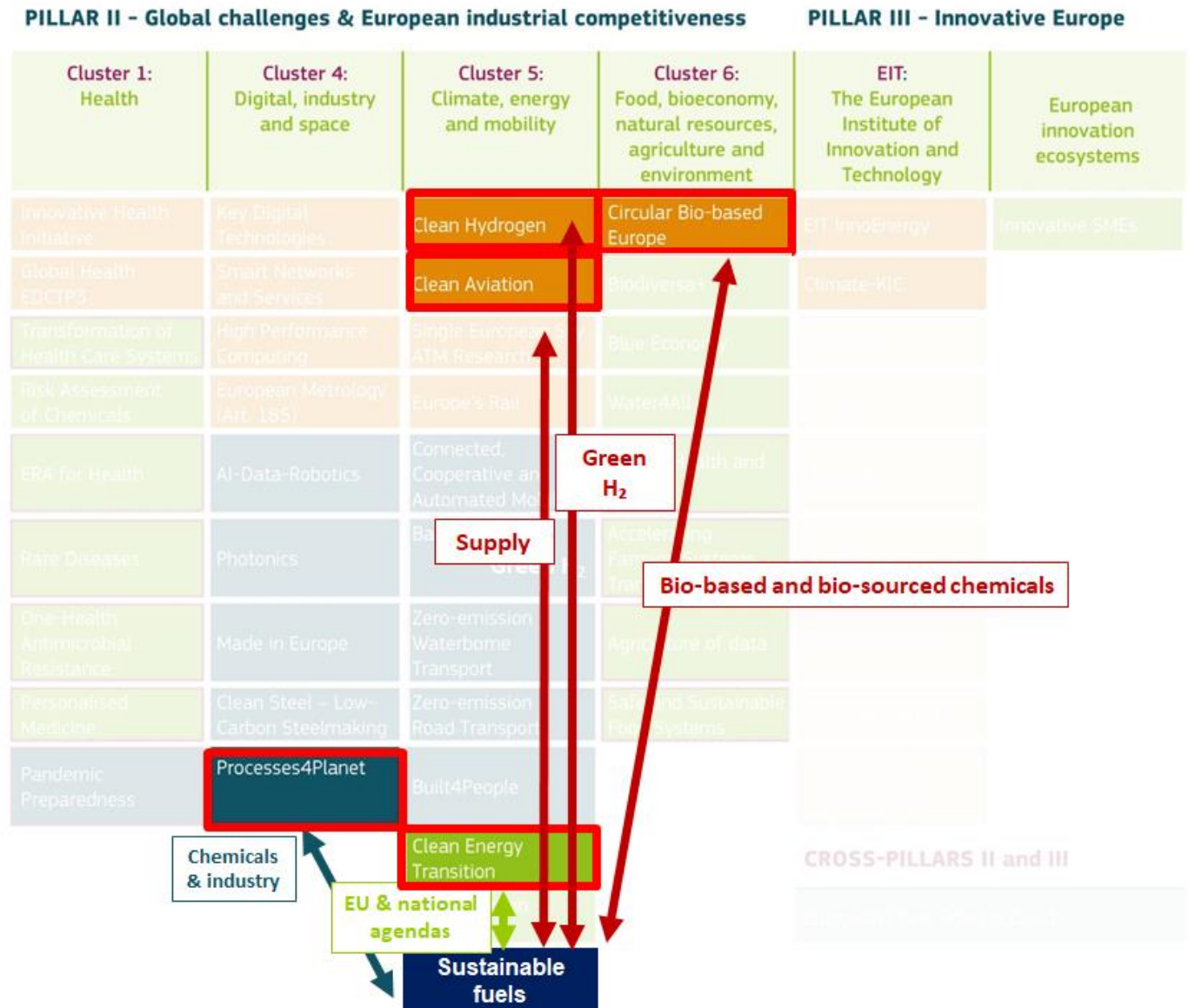
	<p><b>Circular Bio-based Europe.</b> Synergies could also be built with other partnerships, including <b>Key Digital Technologies, Clean Steel, Zero-emission Waterborne Transport, Water4All</b> as well as in Pillar 3, with the EIT's <b>InnoEnergy, Climate-KIC</b> and <b>Urban Mobility</b>. In relation to candidate partnerships, synergies could be built in particular with the partnerships on materials (<b>I'M for EU</b>), the <b>Raw Materials for the Green and Digital Transition</b> and the <b>Solar Photovoltaics</b>. The SUNERGY European initiative, as one of the initiators of the SFs partnership proposal, participates in an ongoing dialogue with a number of these partnerships to discuss possible collaboration.</p> <p>Moreover, alignment and cooperation with member states R&amp;I and industrial strategies in SFs will be essential and a special point of care of the partnership. This proposition already has garnered the support of several MS, and the topic of SFs is of noted interest for several other MS.</p>
<p><b>3.6 Existing initiatives:</b> Please explain what currently ongoing initiatives this proposal builds on and/or how it fits into the EU R&amp;I landscape:</p>	<p>The proposed partnership builds upon the work of existing European/national initiatives and networks, particularly SUNERGY, a pan-European initiative involving stakeholders from industry, academia, RTOs, societal players and end-users, and EU and national networks and platforms. It works with policy/decision makers and international organisations and initiatives (e.g. Mission Innovation, International Energy Agency) to expand its global outreach. Through the Horizon Europe SUNER-C CSA project (2022-25), the EC has given SUNERGY a mandate to develop the sustainable fuels &amp; chemicals community further and to establish an R&amp;I long-term roadmap and prepare “<i>a large-scale research and innovation initiative beyond the CSA, as a partnership or another instrument to be discussed and agreed upon with the Commission and the Member States and Associated countries</i>”.</p> <p>The partnership will also build on several existing platforms, including <b>CO<sub>2</sub> Value Europe</b> (industry-driven initiative) which represents the European Carbon Capture and Utilisation (CCU) community and the <b>European Energy Research Alliance</b> (especially the Joint Programme on Bioenergy), both members of SUNERGY/SUNER-C). Other initiatives which are strongly related to SFs partnership proposition are the <b>Renewable and Low-Carbon Fuels Value Chain Industrial Alliance</b>, the <b>eFuel Alliance</b>, the <b>Alliance for Zero Emissions Aviation</b>, the <b>European Technology Innovation Platform (ETIP) Bioenergy</b> (on biofuels), the <b>European Waste-based &amp; Advanced Biofuels Association</b> and <b>Bioenergy Europe</b>. There are already established contacts with part of those initiatives and others will be contacted shortly to discuss cooperation, given a SFs candidate partnership.</p>
<p><b>Necessity test:</b> Please explain why a European Partnership would be more effective in achieving the objectives of this proposed candidate than traditional instruments (e.g. open calls):</p>	<p>At present, the EU does not have a consistent framework to support R&amp;I in the field of sustainable fuels, but rather scattered initiatives and projects, both at EU and national level. The EU needs to address this gap to accelerate, improve and scale-up technologies as well as to develop solutions – including next generation ones – with high impact.</p> <p><b>The proposed partnership thus aims at bringing together industry, research, societal stakeholders, EU and national decision makers in an effort coordinated at EU level. Thus, it will support the European innovation ecosystem on SFs along the full value chain and accelerate progress in this field, enticing industry to continue investing in Europe. A partnership dedicated to SFs will enhance the coherence of the European R&amp;D activities in the field of SFs. Duplication of work and investments will be prevented,</b></p>

	<p><b>and R&amp;D efforts streamlined under the umbrella of a stringent and targeted Strategic Research and Innovation Agenda.</b> A co-programmed partnership will be able to associate private partners with EC and MS via a Memorandum of Understanding (MoU). The contribution of the EU will be implemented via open calls in the Horizon Europe Work Programmes following a long-term roadmap. The MoU will specify the objectives of the partnership as well as the expected commitment and contribution of partners.</p> <p>This public-private co-programmed partnership proposal on sustainable fuels is explicitly supported by many key global industrial actors and industrial networks, with currently 27 industrial supporters – large and medium-sized companies, SMEs from different sectors – and 40 academic and network supporters. The most up-to-date list of supporters can be found at <a href="https://sunergy-initiative.eu/industry/">https://sunergy-initiative.eu/industry/</a>. It will continue growing as potential supporters contact the SUNERGY initiative to endorse the letter.</p>
<p><b>3.7 Cluster:</b> Please indicate which cluster or work programme part this proposal is most relevant for and that you believe would be the most appropriate funding source.</p>	<p><input checked="" type="checkbox"/> <b>Cluster 5 (Climate, Energy and Mobility)</b></p>
<p><b>3.8 Relevant megatrends:</b> The expert group supporting strategic coordinating process for partnerships recently developed a methodology to better assess the relevance of European Partnerships as instruments to address the Union’s political priorities (find the full report here). Please indicate which if the following megatrends this proposal addresses:</p>	<p><b>Aggravating resource scarcity;</b>  <b>Climate change and environmental degradation;</b>  <b>Expanding influence of east and south;</b>  <b>Growing consumption.</b></p>

### 3.3. A tentative sustainable fuels Europe partnership in the landscape of existing European partnerships

A tentative **new EU public-private co-programmed partnership on sustainable fuels** would have to ensure added value as well as coherence and synergy in the current landscape existing European initiatives and large-scale initiatives, in particular European partnerships. This is the so-called

“additionality” criterion for new partnerships. An overview of the connections to be built with the most relevant existing European partnerships is displayed in **Figure 4**.



**Figure 4:** Complementarity of a "sustainable fuels" co-programmed public-private partnership with the current portfolio of European partnerships. Key “core” connections to be built.

As mentioned above, there are straightforward connections with **Processes4Planet** (Cluster 4, focusing on fossil-free commodity chemicals for European process industries) and the **Circular Bio-based Europe Joint Undertaking** (Cluster 6) for bio-sourced chemicals. This would allow to potentialize the technology and knowledge developed for sustainable fuels as energy vectors by furthering the manufacture of commodity chemicals as building blocks for the chemical industry



using renewable energy, another key aspect of a transition to a circular economy which lies in the scope of SUNERGY and SUNER-C (for more information, see e.g. SUNERGY's Strategic R&I Agenda<sup>10</sup>).

Additional key European partnerships to collaborate with would include: the **Clean Hydrogen Joint Undertaking**, as **green hydrogen is a key building block to produce sustainable fuels**; the **Clean Energy Transition partnership**, focused on the coordination of national strategic R&I agendas on different aspects of the energy transition (including solar and sustainable fuels); and the **Clean Aviation Joint Undertaking** as jet fuels are a key application of, and a major market for, sustainable fuels. Less obvious, but nonetheless crucial connections could also be built with the following European partnerships: Key Digital Technologies Joint Undertaking and the Clean Steel partnership (cluster 4); zero-emission waterborne transport (cluster 5); Water4All (cluster 6); EIT InnoEnergy, Climate-KIC and EIT Urban Mobility (Pillar, EIT – European Institute of Innovation and Technology).

There are already established contacts with several of those initiatives, and others will be contacted shortly to discuss cooperation.

### 3.4. Current status of the sustainable fuels partnership in the landscape of existing partnerships, and next steps

In the frame of the ongoing discussions on the Horizon Europe 2025-2027 strategic planning, the EC proposed 10 new topics for the second wave of European partnerships<sup>11</sup>. This list - which did not include sustainable fuels - was discussed with the Member States in the frame of the Horizon Europe Strategic Committee. During the 12 July 2023 meeting of this Committee, some MS representatives proposed additional topics to the list, including the "sustainable fuels as energy carriers" proposition described above. The EC proposed thus to postpone the decision on the final list after a vote from MS giving their own priorities. A decision should be made in autumn 2023 after this vote, the outcome of which is not known at the time of writing this deliverable.

In the list of new partnerships proposed by the Commission, there are two topics of interest to build connections with a tentative "sustainable fuels" partnership: **Innovative Materials for EU (I'M for EU)**, a follow-up of the Advanced Materials 2030 Initiative (AMI 2030), as innovative materials are key enablers of efficient synthesis of renewable of fuels, through e.g. (bio)catalysts and materials for membranes; and **Solar Photovoltaics**, which shares many scientific and technical commonalities with solar fuels are which are a category of synthetic renewable fuels.

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<sup>10</sup> SUNERGY's Strategic Research and Innovation Agenda on Solar Fuels and Chemicals (SRIA)

<sup>11</sup> Commission proposals for new candidate European Partnerships are now public, European Commission, 17 July 2023



# 4 | Alternative scenarios as back-up options

## 4.1. Back-up options

If, following the vote on 15 September, the co-programmed European public-private partnership for sustainable fuels is finally not included in the short list of new partnerships to be launched in 2025, we can envisage several scenarios.

In the first scenario, the launch of this partnership could be postponed during the European Union's next and tenth framework programme for research and innovation - which will start in 2028 - with the idea of better structuring the proposal and strengthening support, in particular from industry. In this case, it will be necessary to keep the SUNERGY community active, and this could be done through a second CSA, provided there is a relevant call for this in the Horizon Europe work programmes. This is currently being considered in connection with the preparation of the 2025 work programme. In addition, the SUNERGY community could in this case also be active for proposing topics for collaborative projects (Research and Innovation Actions, Innovation Actions) on solar fuels and chemicals by participating in the discussions led by the member states with their national communities, based on the priorities identified in the SUNERGY/SUNER-C SRIA and roadmap. This type of action is in line with the actions already carried out to build the ramp-up phase of SUNERGY (see Figure 2) with RIA and IA calls whose funded projects were invited to contribute to the actions of the SUNER-C CSA project.

In case that the launch of a sustainable fuels partnership is not envisaged by the European Commission and the Member States in the medium term, particularly in the European Union's next framework programme for research and innovation, the SUNERGY community could try to remain active, the ideal being support with follow-up CSAs, subject to dedicated calls for projects. The SUNERGY community could then position itself to lead and animate the solar fuels and chemicals community, as was the case during the ramp-up phase (Figure 2): proposing topics for the work programmes including those stemming from relevant partnerships with thematic links to SUNERGY (e.g. Processes4Planet, Clean Hydrogen, Materials partnership), animation/structuring actions with the R&D community in Europe, etc. .... However, it is to be feared that the community's interest will wane over time and that the initiative, without a clear perspective or framework in the mid-term, will be dispersed among other initiatives and partnerships, with the risk of fragmentation that this presents.





If the partnership proposal is not retained at the end of the discussions in mid-September 2023, a discussion will need to be held rapidly with representatives of the European Commission and Member States, aware of SUNERGY/SUNER-C to see what prospects may be offered for the continuation of the project and the initiative.

## 5 | Conclusion

At the end of this task, two scenarios were identified for a SUNERGY/SUNER-C LSRI after the SUNER-C CSA has ended, in mid-2025.

The preferred scenario is to have a dedicated co-programmed public-private partnership taking into account the landscape of existing and planned European partnerships and initiatives and the priorities for the strategic planning of Horizon Europe 2025-2027. This led to the proposition for a co-programmed public-private partnership on *"Sustainable fuels as energy carriers"* in Cluster 5 of Horizon Europe. In parallel, this scenario involves building connections and synergies with other relevant partnerships (including P4P, Clean H<sub>2</sub>, CETP, see Figure 4). To implement this scenario, a number of actions which were identified including building support from EC & MS in the frame of the preparation of the HE 2025-2027 Strategic Planning, and developing the support from industrial stakeholders. If this scenario cannot be implemented in the frame of the second wave of European partnerships in Horizon Europe, and yet if there is already interest, it could be implemented in the next European Union framework programme for R& I, FP10. In that case, a support for SUNERGY with a follow-up CSA.

A second, alternative, scenario is that SUNERGY/SUNER-C be involved in existing and planned European partnerships and also contributes to the work programmes of Horizon Europe and of FP10. In that case, it could benefit from the mapping partnerships and platforms performed under option 1. To circumvent the risk of dilution, SUNERGY could be maintained as an existing platform connecting those partnerships and initiatives on aspects related to synthetic renewable fuels (RFNBOs) and chemicals. For that, it could be supported by a dedicated CSA to limit (avoid) fragmentation.

At the time of writing this deliverable, the discussions on the list of the second wave of European partnerships are still ongoing and the *"Sustainable fuels as energy carriers"* proposition is being discussed between MS and EC in the frame of the Horizon Europe strategic committee. The final list should be known at the end of 2023.



# 6 | Annexes

## 6.1. Elements of the Klaxoon board for the online workshops scenarios for a SUNER-C Large-Scale Research & Innovation Initiative LSRI (23 November and 7 December 2022)

The Figures shown in this section are screenshots of the Klaxoon<sup>12</sup> boards showing the contributions (post-its) deposited by participants during the two online workshops with respect to the three different scenarios discussed:

- **Option 1** (**amber** color for the post-its): SUNERGY/SUNER-C dedicated partnership;
- **Option 2** (**green**): SUNERGY/SUNER-C becoming part of existing initiatives/partnerships;
- **Option 3** (**pink**): Other options in the context of the preparation of Horizon Europe 2025-2027 strategic planning.

These served as the basis for the analysis on scenarios as discussed in section 2.

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<sup>12</sup> Klaxoon : Visual collaborative platform for today's teamwork



# Place among existing partnerships

SUNER-C WP7 onl

The SUNERGY partnership will bridge current P4P and Clean Hydrogen partnerships, by focus on direct energy conversion processes

Current partnerships and their funding already by existing funding /partners, new scopes need separate funding and governance structure supporting them

The unique perspective on SUNERGY partnership compared to existing ones is the focus on the upstream, direct conversion, primarily by solar (hence SUNergy) but also wind

The main difference/added compared to existing partnerships is that we are upstream in the conversion chain

Other initiatives do not cover high-relevance topic of RFNBOs completely!

Agree

How long is he current h...

Carbon capture fits in th...

Synergies with hydrogen partnership and circular economy

Link with hydrogen and Direct Air Capturing is obvious and allows to surf potentially on the hydrogen wave

direct conversion seen a...

# Scope

SUNER-C WP7 ONLINE

I suppose option 1 only makes sense when SUNER-C has a clear different identity from existing initiatives. So if we focus on option we have to be able to distinguish ourselves

Scope should be RFNBO as renewable fuels is too large (includes bio) and solar fuels too narrow (excludes wind energy)

the focus should still be on fuels AND chemicals. An co-programmed PPP will be linked to either Cluster 4 or Cluster 5 -> need to focus on fuels (C15) or Chemicals (C14).

Tech neutral & comparison of techs to RFNBO very important! Sunergy should be impartial and suggest & follow the most competitive techs for RFNBO! This gives highest impact!

It is probably necessary to be more explicit about what we mean with "technology neutral". The academic field of STS has shown overwhelmingly that technology is not neutral. (Not) making choices between them is also not neutral

Biofuels from biomass cannot be sustainable at scale. Sure, it is good as a complement, but we must consider 1) competition with other agricultural products, and 2) other sustainability goals such as biological diversity. I.e. don't cut down the forests that are remaining, please!

In a co-programmed partnership, does it make sense on an industrial point of view to include also biofuels? Might also reinforce the proposition to fund a new partnership towards EC/MS provided it is balanced in terms of support between RFNBOs and biofuels

But the fuel is and chemio...

Renewable fuel might b...

Wind is indirectly a solar...

As said above 'renewabl...

Should not only include ...

What about LCFNBO Lo...

Agree

Completely agree, I think...

Agree that it should be f...

Think it problematic, I thi...

Very good point

Brood cyclic scope for chemical materials, fuel, energy can only be covered in a new one

It should include 4th gen biofuels from photosynthetic microorganisms, not from biomass but direct fuel production from the photosynthetic process. Terminology: "fuels from microbial cell factories" ?

Last September 2023 Th...

Blocksh, need to answer

Figure 6.1.a: Online scenarios workshop 23 November 2023. Screenshot of the Klaxoon board with the feedback from the participant on scenario option 1: SUNERGY/SUNER-C dedicated partnership. Complement can be found in the next Figure 6.1.b



## Arguments for a standalone partnership

We have the chance to build something new that differentiates by strong industrial and societal contribution.

Renewable fuels and chemicals from CO2 (independent of source) and H2O (preferably from waste/sea) with emphasis on circular and non-critical materials, efficient helio-chemical processes and optimized for each location in EU

Sustainable fuels and chemicals from renewable energy, and CO2, H2O and N2 will be massive. Therefore, a clear and focused partnership is key to archive decarbonization objectives.

## Timeline, TRL

Time horizon Should aim to set up demo project in the short term (even if TRL is till low). Commercial demo/products/technologies should start to enter the commercial market latest at 2030, if not it does not get the attention of industry/politicians

Order if there are comm...  
How could be possible...  
Agreed  
Aucun commentaire

Focus TLR 3 - 5 (but including up to TRL 9 for comparisons/ references!)

Timelines for SUNERGY up to 2050. Roadmap will identify short-medium-long-term milestones for large scale industry application. Focus on TRL 4-7 but not excluding TRL 1-3 for direct conversion systems

Time horizon: Now to 2050 !  
I agree with time horizon...  
Aucun commentaire

Sunergy covers short /mid/long-term time to markets (which is new) requiring a specifically designed partnership

Short-term follows new legislation, e.g. e-crude. As legislation is developing, we should be sufficiently flexible

Even though SUNERGY technologies span across TRLs & time horizons, to get a partnership would be important to focus positioning/messages on short/medium objectives first, and then include longer-term ones

## How to build support

It is important to show support for this option, both through a big number of supporters and support from MS and other "alliances"

Especially industrial sup...  
Aucun commentaire

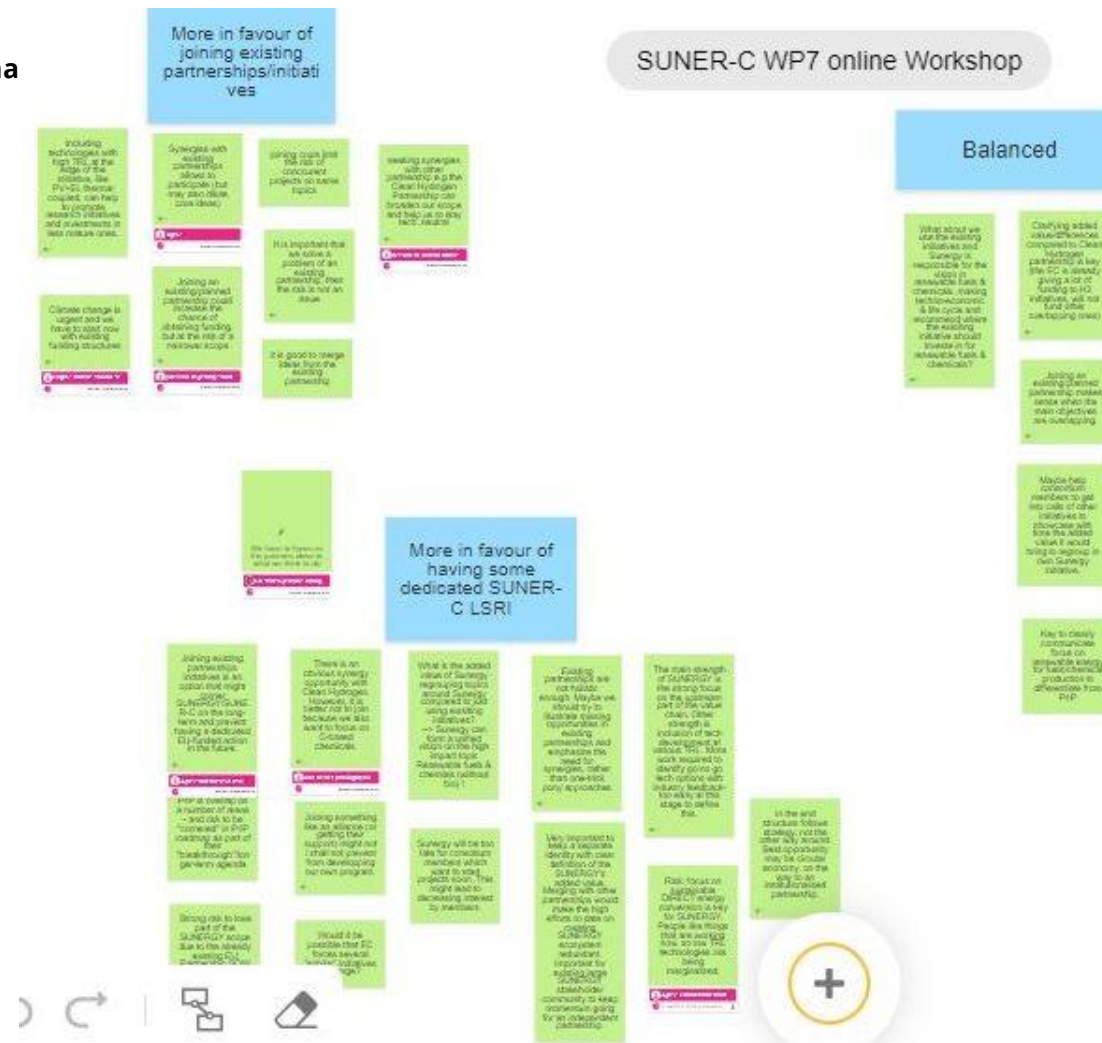
It is key that the R&I initiative aims to have tangible results for the industry/climate. Tangible results for the industry are often directly or indirectly related to economic benefits

Tangible results are key...  
Aucun commentaire

co-programmed PPPs are often very industrial driven. Risks/Questions: 1/ still technology agnostic? 2/ Universities and RTO under-represented

The producing industry l...  
Aucun commentaire

Figure 6.1.B: Online scena



om the participant on scenario

**Figure 6.1.b: Online scenarios workshop 23 November 2023.** Screenshot of the Klaxoon board with the feedback from the participant on scenario option 2: *SUNERGY/SUNER-C becoming part of existing initiatives/partnerships.*

**SUNER-C WP7 online Workshop**

**For the scale we are confronting there will be no other option than an institutionalized partnership, this is a point on the horizon. Then it is good to develop multiple scenarios on how to get there, do not put all your eggs in one basket. It gives e.g. a framework for dialogue with other partnerships, if we cannot join them we probably have to beat them**

**Creating a new instruments need strong support from inside the commission and from political stakeholders and I do not see that we have this support yet.**

**Time will be too long: time for creating the new instrument + time to get a project for this new instrument adds to time needs for development and industrialisation.**

**The only chance to do this is the case that the Commission is already preparing a new instrument we can jump on: so do we have info that they are preparing a new instrument.**

**Is this not the alliance?**

**There is a small chance that the commission will agree to our suggestion to create a SET plan Implementation plan and Working Group on renewable fuels. This would perhaps not be funded but at least give SUNERGY a platform of influence**

**Still as a backup plan if option 1 or 2 is not possible: ask the EC for an othe CSA to follow-up SUNER-C?**

**Is it possible to have a C...**

**There is an example of a ...**

**Option 3 (e.g. another but larger CSA) could make sense also in view of EC/MS budget limitations and timeline (difficult to have a new partnership starting in 2025) and while preparing a LSRI for the upcoming FP (starting 2028) – but risk to fall into another transition, lose momentum etc.**

**Maybe it is too early to think about at this level. Other transitions would be possible**

**Considering that the other partnerships are not at the table now probably our best option is to follow both options and start a dialogue with existing partnerships, P4P and hydrogen, and then see what works in the end (or not)**

**COST News | COST**  
COST News Archive (Media, Press releases, COST Action...)  
www.cost.eu/action/C...  
Maybe as backup plan (if option 1 and 2 are not possible) but not ideal... ask the EC for a COST action (https://www.cost.eu/w hat-do-we-fund/ = one example: https://www.cost... ) + something else (?) as COST only fund networking actions...  
**COST actions are great f...**



**Figure 6.1.c: Online scenarios workshop 23 November 2023.** Screenshot of the Klaxoon board with the feedback from the participant on scenario **option 3: Other options in the context of the preparation of Horizon Europe 2025-2027 strategic planning.**



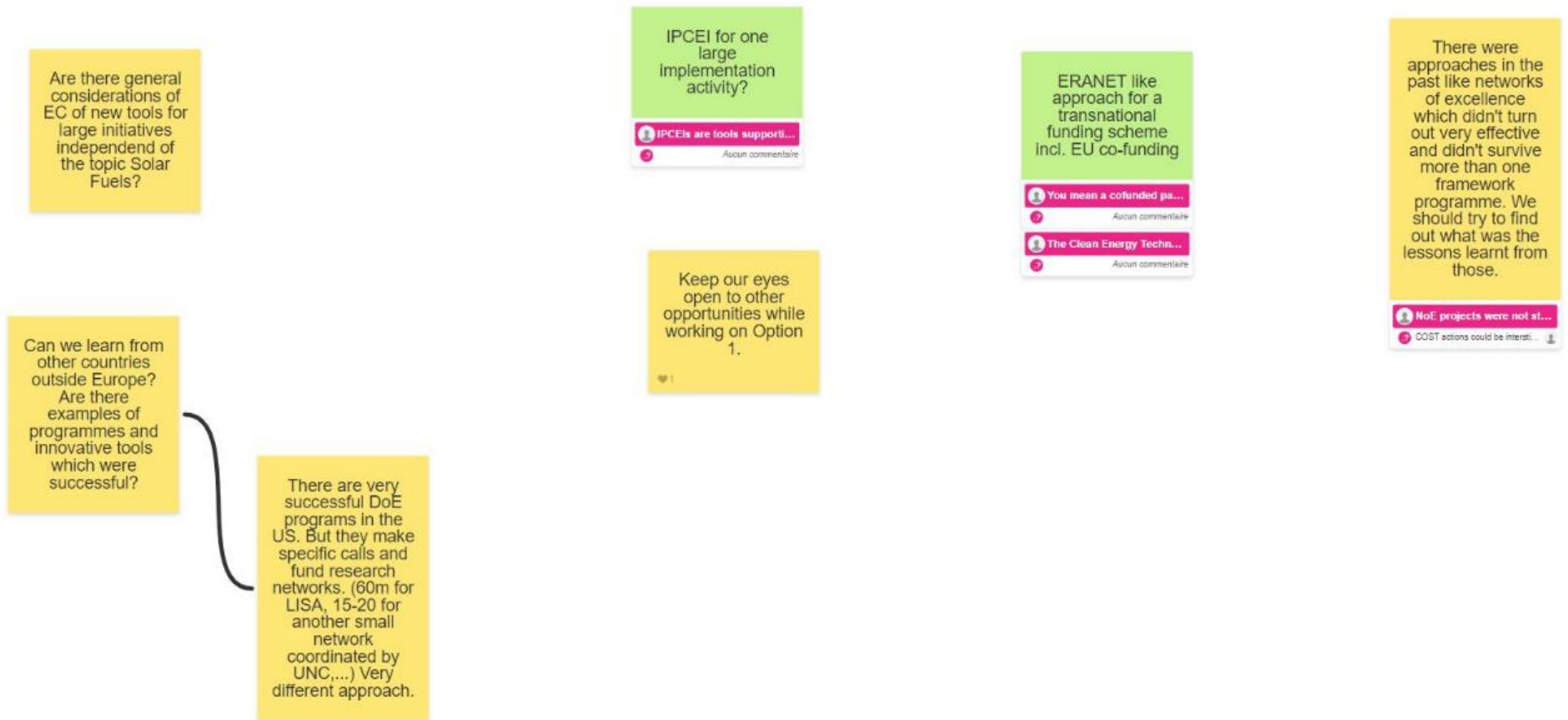


**Figure 6.1.d: Online scenarios workshop 7 December 2023.** Screenshot of the Klaxoon board with the feedback from the participant on scenario option 1: *SUNERGY/SINER-C dedicated partnership*





**Figure 6.1.e: Online scenarios workshop 7 December 2023.** Screenshot of the Klaxoon board with the feedback from the participant on scenario **option 2: SUNERGY/SUNER-C becoming part of existing initiatives/partnerships**



**Figure 6.1.f: Online scenarios workshop 7 December 2023.** Screenshot of the Klaxoon board with the feedback from the participant on scenario **option 3: Other options in the context of the preparation of Horizon Europe 2025-2027 strategic planning**

## 6.2. Summarizing slides for the co-programmed public-private European partnership fiche

Candidate European Partnership, Strategic Plan 2025 -2027

# Sustainable Fuels as Energy Carriers (I)

### Short description

The partnership will engage industry, research & societal stakeholders along the value chain, working with policy makers to boost innovation in Sustainable Fuels (SFs), *i.e.* synthetic renewable fuels (RFNBOs) and advanced biofuels.

SFs are fossil-free high-energy density carriers for storing/distributing renewable energy where other carbon-neutral solutions are not yet adapted. SFs integrate with existing infrastructures and users in multisectoral applications from mobility to industrial sectors.

They play a key role in the EU's energy transition, helping to meet climate goals and promoting a circular economy. This partnership will accelerate SFs development, aiding EU decarbonization targets in transport and industry, building on a critical mass of EU/MS projects and initiatives, including SUNERGY.

### Objectives and expected impacts (additionality & directionality)



#### Research and Innovation Strategy:

- Make use of existing fuel manufacturing and distribution infrastructure (allowing important cost savings and acceleration of technology uptake);
- Accelerate long-term disruptive routes, *e.g.* direct conversion of solar to chemical energy with artificial photosynthesis (direct solar fuels), synthetic biology or bio-inspired/biomimetic approaches, microalgae-based biofuels;
- Introduce societal impact as a driving factor for the selection of technologies;



#### Technology and Infrastructure:

- Coordinate efforts for reducing cost across the whole value chain/TRLs by strengthening and synergising the EU R&I
- Involve R&I + societal stakeholders in the co-creation and implementation of EU strategy;
- Create continuity and synergy in actions between high and low TRL research and technology;
- Valorize technology and knowledge developed for SFs to manufacture other fossil-free energy vectors such as chemical building blocks;



#### Collaboration and Integration:

- Collaborate with complementary EU/MS initiatives
- Contribute to the European Green Deal, the Clean Energy for All Europeans and Fit for 55 packages, EU Circular Economy Action Plan, the SET-Plan, the Net Zero Industry Act regulation proposal and the EU's 2050 carbon neutrality strategy;
- Contribute to REPowerEU and EU energy goals by developing alternatives to fossil-resources;
- Contribute to the harmonization of EU/MS market strategies in SFs to prioritize key sectors;



Candidate European Partnership, Strategic Plan 2025 -2027

## Sustainable Fuels as Energy Carriers (II)

### Rationale for a European Partnership

Currently, the EU lacks a consistent framework for sustainable fuels R&I, with only scattered initiatives and projects at EU and national level. The proposed partnership will:

- Bring together industry, research, societal stakeholders, and decision makers at the EU level
- Support the entire SFs value chain, boosting innovation and industry investment in Europe
- Enhance the coherence of the European R&D activities in the field of SFs streamlined with a clear roadmap
- Associate private partners with EC and MS via a Memorandum of Understanding (MoU)
- The contribution of the EU will be implemented via open calls in the Horizon Europe Work Programmes

### Links with other Union programmes and partnerships (coherence & synergies)

#### European partnerships

- Processes4Planet
- Clean Hydrogen
- Clean Aviation
- Clean Energy Technology Partnership
- Circular Bio-based Europe

#### Other partnerships:

- Key Digital Technologies
- Clean Steel
- Zero-emission Waterborne Transport
- Water4All
- EITs: InnoEnergy, Climate-KIC and Urban Mobility

#### Candidate partnerships:

- (I'M for EU)
- Raw Materials for the Green and Digital Transition
- Solar Photovoltaics

We have ongoing dialogues with some partnerships to discuss collaboration. This proposition already has garnered support of several MS, and the topic noted interest for several other MS.

### Expected composition of partners

The partnership builds on existing EU/MS platforms and their stakeholders including SUNERGY, CO<sub>2</sub> Value Europe and the European Energy Research Alliance (EERA).

**Other initiatives include:** Renewable and Low-Carbon Fuels Value Chain Industrial Alliance, the eFuel Alliance, the Alliance for Zero Emissions Aviation, the European Technology Innovation Platform (ETIP) Bioenergy (on biofuels), the European Waste-based & Advanced Biofuels Association and Bioenergy Europe.

This public-private co-programmed partnership proposal is also supported by many key global industrial: <https://sunergy-initiative.eu/industry/>

### Implementation

Co-programmed

### Cluster

5

### Starting year

2025



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The European Union,  
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